MINIMUM DESIGN STANDARDS

October 2018

Table of Contents

The following general minimum design standards sections apply to all of the listed services:

SECTION 1 General Conditions 1-1
1.1 Interpretation 1-2
1.2 Engineering Design and Components 1-3
1.3 Reports 1-4
1.3.1 Geotechnical Report 1-4
1.3.2 Supplementary Reports 1-4
1.3.3 Design Reports 1-4
1.4 Submission of Engineering Design 1-4
1.3.4 Submission 1-4
1.4.1 Labeling 1-5
1.4.2 Design Drawings 1-5
1.4.3 Revision 1-5
1.4.4 Contract Drawings 1-5
1.4.5 Approval 1-5
1.5 Engineering Supervision 1-6
1.6 Testing 1-6
1.7 Plan of Record Drawings 1-7
1.8 Municipal Acceptance 1-7
SECTION 2 Design Reports 2-1
2.1 Introduction 2-2
2.2 Content 2-2
2.2.1 Preparation 2-2
2.2.2 Professional Seal 2-2
2.2.3 Submission Requirements 2-2
2.2.3.1 Water Distribution 2-2
2.2.3.2 Sanitary Sewer 2-3
2.2.3.3 Storm Sewer 2-3
2.2.3.4 Transportation Systems 2-4
SECTION 3 Development Servicing Agreement 3-1
3.1 Introduction 3-2

3.2 Execution of Servicing Agreement 3-2
3.2.1 Information Required 3-2
3.2.2 Schedules Required 3-3
3.2.2.1 Design Approval Process 3-3
3.2.2.2 Construction Approval Process 3-5
3.2.3 Endorsement Requirements 3-5
SECTION 4 Engineering Plans and Plan of Record Drawings 4-1
4.1 General 4-2
4.1.1 Drawing Size 4-2
4.1.2 Scales 4-2
4.1.3 Elevations 4-2
4.1.4 Drawing Techniques 4-2
4.1.5 Dimensioning 4-3
4.1.6 Title Block 4-3
4.2 Design Drawings 4-3
4.2.1 Cover Sheet 4-3
4.2.2 Index Plan 4-4
4.2.3 Contour Plan 4-4
4.2.4 Water and Sanitary Sewer Overall Plan 4-4
4.2.5 Roads, Lanes, Sidewalk, Utility Lot and Drainage Plan 4-4
4.2.6 Lot Grading Plan 4-4
4.2.6.1 Low Density – Residential 4-4
4.2.6.2 High Density – Residential 4-4
4.2.6.3 Elevations 4-5
4.2.6.4 Footings 4-5
4.2.6.5 Commercial / Industrial 4-5
4.2.7 Shallow Utilities Plan 4-6
4.2.8 Pavement Markings / Street Signs / Traffic Signals 4-6
4.2.9 Street / Road Hardware 4-6
4.2.10 Detail Plan / Profile Drawings 4-6
4.2.10.1 General 4-6
4.2.10.2 Plan Profile 4-7
4.2.10.3 Profile Portion 4-7
4.2.11 Landscaping Plan 4-8
4.2.12 Design Revisions After Approval 4-8

4.2.13 Plan of Record Drawings / Operation & Maintenance Manuals 4-8
4.2.14 Storm and Sanitary Sewer 4-9
4.2.15 Water Mains 4-9
4.2.16 Road, Curbs, Sidewalks 4-10
4.2.17 Water and Sanitary Service Connections 4-10
SECTION 5 Water Distribution Systems 5-1
5.1 General 5-2
5.2 Design Criteria 5-2
5.2.1 Per Capita Consumption 5-2
5.2.2 Design Population 5-2
5.2.3 Peak Hour Demand 5-3
5.2.4 Maximum Demand 5-3
5.2.5 Maximum / Minimum Pressure 5-3
5.2.6 Fire Flow - Urban Areas 5-3
5.2.7 Main Detail and Location 5-3
5.2.8 Hydrant Detail and Location 5-4
5.2.9 Water Main Pipe Material 5-5
5.2.10 Water Main Installation Criteria 5-5
5.2.11 Water Valves 5-6
5.2.12 Hydrants 5-8
5.2.13 Trenching and Backfilling 5-9
5.2.14 Cathodic Protection 5-9
5.2.15 Testing 5-10
SECTION 6 Sanitary Sewer System 6-1
6.1 General 6-2
6.2 Trunk System 6-2
6.3 Collection System 6-2
6.3.1 Sanitary Catchment Calculations 6-2
6.3.2 Velocities 6-3
6.3.3 "n" Value 6-3
6.3.4 Minimum Pipe Slopes 6-3
6.3.5 Oversizing 6-3
6.3.6 Main Detail and Location 6-3
6.3.7 Manhole Detail and Location 6-4

6.3.8 Curved Sewers 6-5
6.4 Weeping Tile 6-6
6.4.1 Water and Wastewater Standards 6-6
6.4.2 Footing Elevations 6-6
6.4.3 Other Considerations 6-6
6.5 Testing 6-7
6.6 Reports 6-7
SECTION 7 Service Connections 7-1
7.1 General 7-2
7.1.1 Alignment 7-2
7.1.2 Driveways and Appurtenances 7-2
7.1.3 Connection to Lot(s) 7-2
7.1.4 Bedding 7-2
7.1.5 Cathodic Protection 7-2
7.1.6 Connection to Parks 7-3
7.2 Sanitary Sewer Service 7-3
7.2.1 Depth, Size and Minimum Grade 7-3
7.2.2 Clean Out Pipe 7-3
SECTION 8 Storm Drainage System 8-1
8.1 General 8-2
8.2 Minor System 8-2
8.2.1 System Components 8-2
8.2.2 Roof Drainage 8-2
8.2.3 Ponding 8-3
8.2.4 Sump Pumps 8-3
8.2.5 Storm Catchment Calculations 8-3
8.2.6 Velocity/Slope 8-4
8.2.7 "n" Valves 8-5
8.2.8 Hydraulic Gradeline 8-5
8.2.9 Maximum Surface Drainage 8-5
8.2.10 Drainage Interception 8-6
8.2.11 Minimum Gutter Grade 8-6
8.2.12 Main Detail and Location 8-6
8.2.13 Manhole Detail and Location 8-6

8.2.14 Catchbasin Lead Detail and Location 8-7
8.2.15 Outfall Detail 8-8
8.3 Major System 8-8
8.3.1 Composition and Control 8-8
8.3.2 Return Period Event 8-8
8.3.3 On-Street Storage and Flow- Across Considerations 8-8
8.3.4 Grading of Lots 8-9
8.3.5 Inlet/Outlet Control Devices 8-9
8.4 Storm Water Wet/Dry Pond Facilities 8-9
8.4.1 Overview 8-9
8.4.2 Wet Ponds 8-10
8.4.3 Dry Ponds 8-11
8.5 Receiving Waters 8-11
8.6 Culverts and Bridges 8-11
8.7 Surface Drainage (Swales) 8-12
8.8 Testing 8-12
SECTION 9 Roadway Systems 9-1
9.1 General 9-4
9.2 Roadway Classifications 9-4
9.2.1 General 9-4
9.2.2 Access Road or Service Road 9-4
9.2.3 Local Road 9-4
9.2.4 Collector Road 9-5
9.2.5 Arterial Road 9-5
9.3 Design Criteria – Urban Standard 9-5
9.3.1 General 9-5
9.3.2 Vertical Alignment 9-6
9.3.2.1 Grades 9-6
9.3.2.2 Crown and Cross-Fall 9-6
9.3.2.3 Vertical Curves 9-6
9.3.2.4 Approach Grades 9-7
9.3.3 Horizontal Alignment 9-7
9.3.3.1 Minimum Radius for Roads 9-9
9.3.3.2 Minimum Radii for Cul-De-Sacs 9-9
9.3.3.3 Maximum Length of Cul-De-Sacs 9-9

9.3.4 Concrete Curb and Gutter 9-9
9.3.4.1 General 9-9
9.3.4.2 Curb Return 9-9
9.3.4.3 Vertical Face Curb and Gutter 9-10
9.3.5 Pavement Structure 9-10
9.3.5.1 Staged Construction 9-10
9.3.5.2 Pavement Design 9-10
9.3.5.3 Pavement Structures 9-11
9.4 Separations in Road Right of Ways - Urban Standard 9-13
9.4.1 Storm and Sanitary Mains 9-13
9.4.2 Curb Stop and Shallow Utility Crossings 9-13
9.4.3 Residence 9-13
9.4.4 Easements 9-14
9.4.5 Sidewalks 9-14
9.4.6 Hydrant and Hydrant Valve 9-14
9.4.7 Watermain and Sanitary Sewer 9-14
9.4.8 Watermain and Storm Sewer 9-14
9.4.9 Edge of Concrete Works 9-15
9.5 Temporary Access Roads - Urban Standard 9-15
9.5.1 Temporary Road 9-15
9.5.2 Temporary Cul-De-Sac 9-15
9.5.3 Detailed Engineering Drawings 9-16
9.6 Sidewalks and Trails 9-16
9.7 Driveways 9-16
9.8 Lanes 9-16
9.9 Intersections 9-17
9.10 Design Criteria - Rural Standard 9-17
9.10.1 General 9-17
9.10.2 Geometric Design 9-18
9.10.3 Road Intersections 9-18
9.10.4 No Exit Roads 9-19
9.10.5 Culverts And Drainage 9-19
9.10.6 Road Approaches 9-20
9.10.7 Utilities 9-21
9.10.8 Pavement Structure 9-21

9.10.9 Staged Asphalt Construction – High Density Residential 9-23
9.11 Construction Standards and Materials 9-23
9.11.1 Roadway Preparatory Work 9-23
9.11.2 Road Grade Construction 9-23
9.11.2.1 Roadway Excavation 9-23
9.11.2.2 Roadway Embankment 9-24
9.11.2.3 Subgrade Preparation 9-25
9.11.3 Gravel and Granular Course Base 9-25
9.11.3.1 General 9-25
9.11.3.2 Pit Run Gravel 9-25
9.11.3.3 Sub-Base Gravel 9-26
9.11.3.4 Surfacing Gravel 9-26
9.11.3.5 Granular Base Course 9-27
9.11.3.6 Testing Requirements of The Developer/Contractor 9-28
9.11.4 Asphaltic Concrete Pavement 9-29
9.11.4.1 General 9-29
9.11.4.2 Materials 9-29
9.11.4.3 Asphalt Cement 9-30
9.11.4.4 Aggregate 9-30
9.11.4.5 Mix Design Requirements 9-31
9.11.4.6 Variation from Approved Job Mix Formula 9-32
9.11.4.7 Asphalt Mix Verification 9-32
9.11.4.8 Preparation 9-33
9.11.4.9 Placement 9-33
9.11.4.10 Prime Coat, Tack Coat and Fog Coat 9-35
9.11.4.11 Thickness 9-36
9.11.4.12 Density 9-37
9.11.5 Asphalt Testing 9-38
9.11.5.1 Urban 9-38
9.11.5.2 Representative Core – Urban 9-39
9.11.5.3 Rural 9-39
9.12 Quality Control and Testing 9-41
SECTION 10 Roadway Lighting, Traffic Control and Street Name Signs 10-1
10.1 General 10-2
10.2 Design 10-2
10.2.1 Davits and Fixtures 10-2

10.2.2 Illumination 10-2
10.3 Location 10-3
10.4 Costs 10-3
10.5 Traffic Signalization 10-3
10.6 Street Names Signs And Traffic Control Signs 10-4
SECTION 11 Miscellaneous Requirements 11-1
11.1 General 11-2
11.2 Survey Control System 11-2
11.3 Property Boundary Markers 11-2
11.4 Municipal Addressing Signage 11-3
11.5 Subdivision Signs 11-4
11.6 Landscaping 11-5
11.7 Protection And/Or Coordination Of Utilities 11-6
11.8 Environmental Reserve Signage 11-6
11.9 Electrical Power Service 11-7
11.10 Natural Gas Service 11-7
11.11 Street Lighting 11-7
11.12 Mailbox Pullouts 11-7
11.13 Offsite Road Construction 11-7
11.13.1 Coordination of Existing Utilities 11-8
11.13.1.1 Telephone 11-8
11.13.1.2 Power 11-8
11.13.1.3 Natural Gas Distribution Lines 11-9
11.13.1.4 Pipeline Crossings 11-9
11.13.1.5 Utility Markers 11-10
11.13.2 Land Acquisition and Access Agreements 11-10
11.13.2.1 Road Allowance Widening 11-10
11.13.2.2 Back-sloping 11-11
11.13.2.3 Borrow Areas 11-11
11.13.2.4 Power Line Clearing 11-12
11.13.2.5 Telephone Right-of-Access 11-12
11.13.2.6 Fencing 11-12
11.13.3 Coordination of Traffic 11-13
11.13.3.1 Construction Signs 11-13
11.13.3.2 Existing Signs 11-13

11.13.3.3 Flag persons 11-14
11.13.3.4 Detours 11-14
11.13.3.5 Traffic Assistance 11-14
SECTION 12 Shallow Utilities 12-1
12.1 Gas Service 12-2
12.1.1 Right-Of-Ways 12-2
12.1.2 Conditions 12-2
12.1.3 Costs 12-2
12.2 Telephone Service 12-2
12.2.1 Right -Of-Ways 12-2
12.2.2 Conditions 12-3
12.2.3 Costs 12-3
12.3 Electric Power Service 12-3
12.3.1 Right -Of-Ways 12-3
12.3.2 Conditions 12-3
12.3.3 Costs 12-4
12.4 Television Cable 12-4
12.4.1 Right -Of-Ways 12-4
12.4.2 Conditions 12-4
12.4.3 Costs 12-4
SECTION 13 Landscape Design 13-1
13.1 General 13-2
13.1.1 Boulevards 13-2
13.1.2 Road Medians, Entry Feature Medians and Entry Features 13-2
13.1.3 Walkways / Trails 13-2
13.1.4 Public Utility Lots (P.U.L.'S) 13-3
13.1.5 Storm Water Management Facilities 13-3
13.1.6 Natural Areas 13-3
13.1.7 Municipal Reserve (M.R.) 13-3
13.2 Landscape Plan and Playground Plan If Applicable 13-4
13.2.1 M.R.s, Storm Water Management Areas and Natural Areas 13-4
13.2.2 Boulevards. Entry Features and Walkways 13-4
13.3 Design Guidelines 13-5
13.3.1 Setbacks 13-5

13.3.2 Planting Beds 13-5
13.3.3 Topsoil 13-6
13.3.4 Fences 13-6
13.3.5 Furniture 13-6
13.3.6 Testing 13-6
13.3.7 Plant Selection 13-6
13.3.7.1 Requirements for Boulevards along Roads, Trails/Walkways/ROWs 13-7
13.3.7.2 Requirements for Parks, Boulevards with Setback 13-7
13.4 Design Requirements 13-9
13.4.1 Boulevards 13-9
13.4.1.1 Arterial/Collector Roadways 13-9
13.4.1.2 Major Entrance Roadways to Subdivisions 13-9
13.4.2 Entry Feature Medians and Entry Features 13-10
13.4.3 Walkways / Trails 6 Meters Wide Right of Way Or Greater 13-10
13.4.4 Public Utility Lots (P.U.L.) 13-11
13.4.5 Storm Water Management Facilities 13-11
13.4.6 Natural Areas 13-12
13.4.7 Municipal Reserve. (M.R.) 13-13
13.4.8 Berms 13-13
13.5 Testing 13-13
SECTION 14 Lot Grading 14-1
14.1 Overall Concept 14-2
14.2 Retaining Walls 14-2
14.3 Sump Pumps 14-3
SECTION 15 Parks 15-1
15.1 General 15-2
15.2 Park Categories 15-2
15.2.1 Tot Lot Park 15-2
15.2.2 Neighborhood Park 15-2
15.2.3 School / Community Park 15-3
15.3 Landscape Plan 15-3
15.4 Design Requirements 15-4
15.4.1 General 15-4
15.4.2 Furniture and Fixtures 15-4

15.5 Playground Design 15-5
15.5.1 General 15-5
15.5.2 Location 15-5
15.5.3 Natural Topography 15-5
15.5.4 Layout 15-6
15.5.5 Sand Play Areas 15-6
15.5.6 Play Equipment 15-6
15.5.7 Fencing 15-7
15.6 Outdoor Rinks 15-7
15.7 Toboggan Hills and Berms 15-8
15.7.1 Landscape Berms 15-8
15.7.2 Toboggan Hills 15-8
15.7.3 Sound Control Berms 15-8
15.8 Informal Playing Fields 15-8
15.9 Formal Sports Fields 15-9
15.10 Testing Requirements 15-9
SECTION 16 Typical Cross Sections & Specified Servicing Conditions 16-1
16.1 General 16-2
16.2 Basic Servicing Concepts 16-2
16.2.1 Back Lot Servicing (Consider Eliminating) 16-2
16.3 Requirements for Lot Servicing 16-2
16.3.1 Trench Width Control 16-2
16.3.2 Backfill Placement Control 16-3
16.3.3 Backfill Compaction Control 16-3
16.4 Commercial Lot Servicing 16-4
16.5 Common Cross Section Conditions 16-4

SECTION 1 General Conditions

1.1 Interpretation 1-2
1.2 Engineering Design and Components 1-3
1.3 Reports 1-4
1.3.1 Geotechnical Report 1-4
1.3.2 Supplementary Reports 1-4
1.3.3 Design Reports 1-4
1.4 Submission of Engineering Design 1-4
1.4.1 Submission 1-4
1.4.2 Labeling 1-5
1.4.3 Design Drawings 1-5
1.4.4 Revision 1-5
1.4.5 Contract Drawings 1-5
1.4.6 Approval 1-5
1.5 Engineering Supervision 1-6
1.6 Testing 1-6
1.7 Plan of Record Drawings 1-7
1.8 Municipal Acceptance 1-7

1.1 Interpretation

In these Minimum General Design Standards, the following words have a detailed meaning assigned to them:

"Applicant" shall mean a person or entity who has applied for approval of a proposed subdivision, or to service an existing parcel of land, whether as the owner or an agent for the owner of the land included therein.

"Contractor" shall mean any person, persons, or corporation which shall undertake the construction of municipal improvement on behalf of the Developer.

"County" shall mean the County of Grande Prairie in the Province of Alberta as represented by the Council. Council shall mean the Council of the County as constituted from time to time.

“Municipal Engineer” shall mean the Superintendent of Public Works, Development Control Officer, the engineer or professional engineers engaged or employed by the County from time to time to supervise, control, approve, and inspect the work to be performed by the Developer pursuant to this Agreement.

"Developer" shall mean a person or entity that has executed a Development Servicing Agreement with the County, in which Agreement the Developer has undertaken to develop those lands described by a tentative plan of subdivision, with such development to be in compliance with the County Subdivision Development Standards and General Minimum Design Standards as set out herein and the Development Agreement.

"Developer's Engineer" shall mean a qualified Professional Engineer, registered and licensed to practice in the Province of Alberta, who is appointed or engaged by the Developer to be responsible for the design and preparation of drawings and specifications and provision of engineering inspection during the construction of the municipal improvements for the subdivision and/or land development area.

"Municipal Improvements" shall mean both underground and surface structures including, but not necessarily limited to, water mains, sewer systems, storm drainage systems, roadways, lanes, walkways, park areas, shallow utilities, signage, fencing, street lighting, power, gas and other improvements as required by the County, all of which shall become the property of the County to operate and maintain following the issuance of a Final Acceptance Certificate.

“Owner” shall mean the County of Grande Prairie No.1.

“Completion Certificate” shall mean a certificate issued following accepted construction completion as issued by the County.

“Final Acceptance Certificate” shall mean a certificate issued at final acceptance of the project by the County, following the warranty period.

“General Design Standards” shall mean the standards that are approved by the Municipal Engineer for the construction and installation of the Local Improvements.

"Local Improvements" shall mean those Local Improvements together with all necessary appurtenances which are described and specified in a development servicing agreement and plans and specifications.

"Warranty Period" shall mean the following:

For the Local Improvements, that period commencing on the date of issuance of a Completion Certificate for the Local Improvements and ending on the date of the issuance by the County of a Final Acceptance Certificate for the Local Improvements as issued by the County.

"Plans and Specifications" shall mean the plans, and specifications and material lists for Local Improvements approved by the Municipal Engineer covering the design, construction and installation of the Local Improvements.

1.2 Engineering Design and Components

The Developer shall retain the services of a qualified Professional Engineer, registered and licensed to practice in the Province of Alberta, who shall be responsible for the design and preparation of drawings and specifications for all municipal improvements to be constructed within and/or related to the proposed development area. All required municipal improvements shall be designed in accordance with accepted engineering practices and shall meet or exceed the County Subdivision Minimum General Design Standards as set out herein.

It shall be the responsibility of the Developer's Engineer to establish the location and alignment of all existing and proposed municipal improvements including coordination with the shallow utilities. Unless approved otherwise by the Municipal Engineer, the location of all underground utilities shall generally conform to the Typical Utilities Layout as illustrated in Standard Detail Drawings contained herein.

The Developer's Engineer shall be responsible for carrying out all engineering surveys and investigations necessary to prepare the design. It shall further be the responsibility of the Developer's Engineer to identify the need for any easements or additional rights-of-way that may be required within or outside of the development area. Where such easements or rights-of-way are required, the plans and related documents shall be prepared by a qualified licensed Alberta Land Surveyor at the Developer's expense.

While the Developer's Engineer may arrange to have certain portions of the work carried out by other qualified persons, he shall remain responsible for the coordination of the work and the certification of its quality and accuracy.

1.3 Reports

1.3.1 Geotechnical Report

As part of the Subdivision application, the Developer shall submit a Geotechnical Engineering Report, prepared by a qualified Professional Geotechnical Engineer, which identifies and evaluates the subsurface ground characteristics of the subdivision development area.

Such report shall identify soil types and conditions including frost susceptibility, soil stability, water table elevations, etc. as well as any potential difficulties that could be encountered during the construction of the municipal improvements.

At the requirement of the Municipal Engineer, additional geotechnical information (report) may be requested outlining recommended design and construction requirements and techniques that may have to be followed to satisfactorily develop the subdivision, particularly related to construction of underground utilities and roadway structures.

1.3.2 Supplementary Reports

Supplementary reports may be required to be presented by the developer; typical supplementary reports are Environmental assessment, Hydrogeological assessment, Historical assessment, Flooding assessments, and Slope Stability assessment.

1.3.3 Design Reports

Design Reports are to be prepared by the Developer and are intended to provide technical backup for a development proposal, demonstrating the “functional viability” of the proposed development and showing its impact on existing infrastructure and future system requirements. The design reports must address impacts on adjacent lands, including both upstream and downstream influences. Refer to section 2.0 Design Reports. Once approved, these documents provide the basis for the preparation of detailed engineering drawings.

1.4 Submission of Engineering Design

1.3.4 Submission

Two (2) complete sets of plans and specifications for the proposed subdivision area shall be submitted to the Municipal Engineer for review at subdivision application unless a pre-approved concept plan exists. A print of the approved tentative plan(s) of subdivision shall be included as well as the design reports to assist in the review and evaluation of the plans and specifications.

1.4.1 Labeling

All proposed roadways and streets shall be named on the drawings with the names, where applicable, as approved by the County. In addition, all lots shall be numbered consistent with the rural addressing system employed by the County.

1.4.2 Design Drawings

The design drawings, specifications and relevant data shall be reviewed by the Municipal Engineer and/or outside Consultant, who shall return one (1) marked up set to the Developer's Engineer, within three (3) weeks of the date of receipt, identifying any required revisions. The County reserves the right to recover costs from the Developer incurred for reviewing applications.

1.4.3 Revision

The Developer's Engineer shall incorporate the required revisions and submit four (4) sets of the Contract Drawings and Documents to the Municipal Engineer for final review and "approval to construct".

1.4.4 Contract Drawings

Two (2) sets of the Contract Documents, stamped "Approved to Construct" shall be returned to the Developer's Engineer within two (2) weeks of the date of their receipt. The Municipal Engineer’s review of the Contract Documents is to confirm their compliance with the County's Subdivision General Minimum Design standards; approval to construct does not, in any manner, imply approval of the technical aspects of the engineering design.

1.4.5 Approval

No site work of any kind shall commence until the proposed development plan is approved. Approval includes all of the following: the signing of the Development Agreement, Receipt by the County of Grande Prairie No.1 of the required financial securities and/or levies, Approval of the drawings and related study documents by the Municipal Engineers of the County of Grande Prairie No.1, and all applicable Government approvals including but not limited to Environmental constraints are obtained.

1.5 Engineering Supervision

For the construction of municipal improvements, the Developer's Engineer shall be responsible for:

- The inspection and approval of all materials to be used.
- Carrying out all necessary construction survey layouts to ensure the finished construction conforms to the lines, grades and details shown on the approved plans and specifications.
- Carrying out all necessary construction supervision to ensure all construction is carried out to meet the requirements of the approved plans and specifications and any supplementary standards required by the County;
- The recording of all "as-built" information and submission of as-built drawings and or operation/maintenance manuals within three (3) months of Construction Completion Certificate issuance.

A complete set of all approved drawings and specifications shall be maintained at the construction site at all times.

In addition to the supervision carried out by the Developer's Engineer, the Municipal Engineer may periodically inspect the work to ensure conformance with the standards. The Municipal Engineer and the Developer's Engineer will conduct coordination of the subdivision works with any other related municipal works.

The Municipal Engineer shall bring the use of any unacceptable materials or practices, in particular matters related to safety, to the attention of the Developer's Engineer or his contractors. If remedial action is not taken to the satisfaction of the Municipal Engineer, he may stop the work until such time as the required corrective action has been taken.

If the Developer's Engineer wishes to make any revisions to the design prior to or during the execution of the work, he shall first submit a marked print (drawing) showing the proposed revision(s) to the Municipal Engineer. If approval is granted for the revision, the original drawing shall be immediately revised and new prints issued.

The Developer's Engineer shall be responsible (not the responsibility of the Developer), for maintaining field surveys from which municipal improvements may be installed if such installations are required to be made prior to the acceptance of the work being done by the Developer.

1.6 Testing

It shall be the responsibility of the Developer's Engineer to ensure that testing of all materials called for in the specifications are carried out by an accredited testing firm. Copies of all test results shall be forwarded to the Municipal Engineer as soon as possible after completing the tests. The cost of all testing shall be borne by the Developer.

Underground municipal improvements shall not be permitted to operate or be operated as part of the existing municipal systems until the respective subdivision services have been inspected, tested and approved in writing by the Municipal Engineer and Aquatera.

1.7 Plan of Record Drawings

Within three (3) months of the completion of all municipal improvements within the subdivision development, the Developer's Engineer shall deliver "Plan of Record" drawings to the Municipal Engineer, plus a computer disk in AutoCAD format.

1.8 Municipal Acceptance

Upon the satisfactory completion of the municipal improvements in the development and after all the identified deficiencies have been corrected, a Construction Completion Certificate (C.C.C.) shall be issued by the Municipal Engineer to the Developer, noting acceptance of the work and the duration of the maintenance period. The developer shall be responsible, at his own expense, to remedy any defect, fault or deficiency in the completed work during the maintenance period, all in accordance with the terms and conditions of the Development Servicing Agreement.

Upon completion of the maintenance period and after a final inspection and correction of all deficiencies thereof, a Final Acceptance Certificate (F.A.C.) will be issued to the Developer by the Municipal Engineer.

SECTION 2 Design Reports

2.1 Introduction 2-2
2.2 Content 2-2
2.2.1 Preparation 2-2
2.2.2 Professional Seal 2-2
2.2.3 Submission Requirements 2-2
2.2.3.1 Water Distribution 2-2
2.2.3.2 Sanitary Sewer 2-3
2.2.3.3 Storm Sewer 2-3
2.2.3.4 Transportation Systems 2-4

2.1 Introduction

The Design Reports are a critical link between the General Design Standards and Detailed Engineering Drawings, and commit the engineering design to the approved Outline Plan. Design Reports address four components sanitary sewer, water supply, storm drainage, and transportation systems. Each component must consider relationships to the other components and to the Supplementary Reports.

2.2 Content

2.2.1 Preparation

The preparation of the Design Reports is the responsibility of the Developer at his sole expense.

The report(s) shall contain adequate design detail in terms of calculations, demonstrations, and reduced drawings / maps so as to provide the County with a comprehensive understanding as to the functional capabilities of the area for development.

Subdivision proposals and detailed engineering drawings related to the area will not be approved in the absence of approved Design Reports. Prior to proceeding with any of the reports, the Developers' Consulting Engineer should meet with representatives of the County to review available background information and to establish Terms of Reference.

2.2.2 Professional Seal

Completed reports and support documentation are to bear the professional seal and permit stamp of the Consulting Engineer and firm responsible, and all responsibilities, for authorship of all documents is to be clearly identified. The engineer must be recognized as a professional engineer by APEGA.

2.2.3 Submission Requirements

Requirements shall include the following four components with the criteria labelled:

2.2.3.1 Water Distribution

- Description of analysis method used;
- Statement of criteria used for analysis (e.g. Average demands, peak factors, population densities, etc.)
- Location and description of high demand users;
- Water pressure contour maps at average day and peak hour demands with maximum and minimum pressures noted;

- Pressure zone boundaries and PRV (Pressure Reduction Valves) locations;
- Locations and size of all pipes;
- Locations of fire hydrants verification of spacing/areas of service;
- Phasing of improvements and fire flows during phasing;
- Discussion of conformance to or deviation from the General Design Standards, Studies or previous Design Reports including all existing and approved developments, including justification for deviations; and
- Provision for extensions to future developments.

2.2.3.2 Sanitary Sewer

- Assessment of topographic constraints as related to gravity flow in pipes;
- Statement of criteria used to determine flows (e.g. Average demands, peak factors, population densities, inflow/infiltration, etc.);
- Peak flows at connections to existing system and analysis of impacts on existing systems;
- Location and sizes of proposed pipes;
- Discussion of conformance to or deviation from General Design Standards or previous reports, including all existing and approved developments, including justification for deviations;
- Limits of catchment areas including future upstream areas;
- Discussion of servicing alternatives for future upstream areas including provisions made for future flows;
- Phasing of improvements.
- Provision for extensions to future developments based on Master Plans indicating future developments contributing areas.

2.2.3.3 Storm Sewer

- Existing 1 m contours map;
- Outline of drainage basins and justification of proposed boundaries, including areas beyond the proposed development;
- Proposed minor (piped) system including method and criteria used, discharge rate from each basin, allowance for upstream flows, and impacts on downstream systems;
- Storm water ponds including location, type, sizing based on 4 hr. Chicago, 12 hr. Atmospheric Environmental Services (AES) and 24 hr. soil Conservation Services (SCS) events, minimum and

maximum depths, discharge rates, controls and impacts on receiving watercourses and system;

- Proposed major (overland) system including design methods and criteria used, routing, depths of ponding, flow rates at each basin outlet, connections to and impacts on major systems in adjacent lands and provisions for major system flows from upstream areas;
- Discussion of servicing alternatives for future upstream areas including provisions made for future flows;
- Phasing of improvements.

2.2.3.4 Transportation Systems

- Description of existing conditions including linkages to the existing transportation system, and current/pre-development traffic volumes on abutting streets or roads.
- Analysis of anticipated trip generation, distribution and assignment, and related design volumes; and
- Transportation assessment based on the previous two considerations, including intersection analysis, location and classification of area roadways, pedestrian networks, provision for transit, if applicable, and noise attenuation requirements.

SECTION 3 Development Servicing Agreement

3.1 Introduction 3-2
3.2 Execution of Servicing Agreement 3-2
3.2.1 Information Required 3-2
3.2.2 Schedules Required 3-3
3.2.2.1 Design Approval Process 3-3
3.2.2.2 Construction Approval Process 3-5
3.2.3 Endorsement Requirements 3-5

3.1 Introduction

This is a contractual agreement between the County and Developer ensuring that infrastructure on and possibly offsite required to service a proposed development is constructed to the County's municipal standards. Servicing Agreements also contain provisions for the payment of applicable levies and securities, and may contain provision for payment for services previously installed by others that benefitted the new subdivision or development or, alternatively, any moneys that will be owing to the developer when further development occurs by others late comers agreement. These agreements are required as a condition of some development permits and most subdivision approvals in accordance with Section 655 of the Municipal Government Act.

3.2 Execution of Servicing Agreement

3.2.1 Information Required

Approvals / acceptance required prior to the request of a Servicing Agreement are as follows:

- Subdivision or Development Permit Approval
- Accepted Design Reports
- Accepted Geotechnical Report and other applicable Supplementary Reports
- Alberta Environmental Protection Letter of Authorization to extend or install Municipal Services
- Finalized Detailed Engineering Drawings

To commence preparation of a Servicing Agreement a request, in writing, from the Developer or representative, expressing a desire to enter into a Servicing Agreement is required with the following information:

- Developer's company name, address, telephone number, e-mail, fax number, and contact person.
- Schedule A - Plan of Subdivision, identifying legal description of parcel, and subdivision area and name.
- Schedule D - Value of Services to be installed conforming to the following Section 3.2.2 including detailed cost estimates used to arrive at value of Services.
- Schedule E - Levy Payments and Oversize Recovery conforming to the following Section 3.2.2.
- Schedule F - Other provisions if applicable:
  - Recovery from other developments, if applicable (Example: Over sizing)
  - Payments to other developments, if applicable

- Other special conditions that may be required.

3.2.2 Schedules Required

Schedules A, D, and E are required as part of the design approval process and Schedules B and C are required as part of the construction approval process. Ensure Schedule lettering conforms with the Development Agreement.

3.2.2.1 Design Approval Process

Schedule A - Development Area Map

This is a copy of the unregistered Plan of Subdivision conditionally approved by the County, showing the legal description of the land, the gross area in hectares, and the subdivision name.

Schedule D - Value of Security

As a requirement of the Servicing Agreement, it is necessary for the Developer to post a letter of credit or cash deposit with the County as security to ensure the orderly, timely, and proper completion of the municipal improvements attributed to the development.

SECURITY CALCULATIONS:

The dollar value of Security is calculated by taking fifty (50%) percent of all major municipal improvement estimated construction costs. Major municipal improvements are deemed to be Sanitary and Water Systems including Services, Storm Sewer Systems, and Road and Concrete Works. Additional Securities will be required for minor municipal improvements such as U-lot, Boulevard, and Municipal Reserve Grading & Landscaping, Trail Lighting, or other improvements as deemed appropriate and are calculated at one hundred (100%) percent of the estimated construction costs. The Consulting Engineer shall submit to the County detailed cost estimates in the form of a Schedule of Quantities of the improvements with extended costs derived from current construction unit rates, along with a calculation of the required Security in the form as shown following this text. The extended costs shall include Engineering & GST.

As each phase of construction is completed and the Initial Construction Completion and Acceptance Certificate (CCC) issued, the Developer may request, in writing, a review and reduction of the Security requirements.

The County may, under their discretion, reduce the amount of Security held for that particular phase of improvement by up to ninety percent (90%) of the improvement cost. The remaining ten percent (10%) would be held until the issuance of the Final Construction Completion and Acceptance

Certificate (FAC), at which time the County would accept full responsibility for the municipal improvement and all the Securities would be released.

SUMMARY OF REQUIRED SECURITY (Example after CCC for all items)

SCHEDULE "D"

Date	YYYY-MM-DD
File #	##GP## / PLSUB20YY####
Legal	W6M
Owner	SUBDIVISION A – PHASE 1

			Original Securities		Current Securities	
	Item	**Full Cost**	**% of Full Cost**	**$**	**% of Full**	**$**
a	Roads	$150,000	50.00%	**$75,000**	10.00%	**$ 15,000.00**
b	Municipal Services	$200,000	50.00%	**$100,000**	10.00%	**$ 20,000.00**
c	Storm Sewer	$40,000	50.00%	**$20,000**	10.00%	**$4,000.00**
d	Overland Storm	$50,000	50.00%	**$25,000**	10.00%	**$5,000.00**
e	Parks	$6,000	50.00%	**$3,000**	10.00%	**$600.00**
f)	Landscaping	$5,000	100.00%	**$5,000**	10.00%	**$500.00**
g	Second Stage ACP	$15,000	100.00%	**$15,000**	10.00%	**$1,500.00**
	Total	**$466,000**		**$ 243,000**		**$46,600.00**
	Always based on Full Cost		**TCA 2%**	**$9,320.00**		**$9,320.00**
	Based on Securities Taken		**GST 5%**	**$12,150.00**		**$2,330.00**
	Based on Securities Taken		**ENG / Cont. 15%**	**$36,450.00**		**$6,990.00**
		Original Securities Required		**$300,920.00**	**New Securities Held**	**$65,240.00**

Schedule E - Levies

Total levies are payable to the County on a per Gross Developable Hectare (g.d.h.) including Municipal Reserve but not Environmental Reserve basis, and may vary from time to time as adjustments are made in terms of current costs. Levies payable by the Developer include, but are not limited to:

- Contribution towards costs of arterial roadway development and upgrading and contribution towards the cost of available capacity in existing utility systems.

3.2.2.2 Construction Approval Process

Schedule B - Initial Construction Completion and Acceptance Certificate (CCC)

Schedule C - Final Construction Completion and Acceptance Certificate (FAC)

3.2.3 Endorsement Requirements

For the Servicing Agreement to be endorsed the following must be provided:

- Securities in the form of a letter of credit or cash deposit acceptable to the County as per Schedule D.
- Payment of levies as per Schedule E.
- Payment of Servicing Agreement Fee which is set at $2,000 or $200 per gross hectare (whichever is greater) by Council.
- Provision of certificate of liability insurance acceptable to the County.

SECTION 4 Engineering Plans and Plan of Record Drawings

4.1 General 4-2
4.1.1 Drawing Size 4-2
4.1.2 Scales 4-2
4.1.3 Elevations 4-2
4.1.4 Drawing Techniques 4-2
4.1.5 Dimensioning 4-3
4.1.6 Title Block 4-3
4.2 Design Drawings 4-3
4.2.1 Cover Sheet 4-3
4.2.2 Index Plan 4-4
4.2.3 Contour Plan 4-4
4.2.4 Water and Sanitary Sewer Overall Plan 4-4
4.2.5 Roads, Lanes, Sidewalk, Utility Lot and Drainage Plan 4-4
4.2.6 Lot Grading Plan 4-4
4.2.6.1 Low Density – Residential 4-4
4.2.6.2 High Density – Residential 4-4
4.2.6.3 Elevations 4-5
4.2.6.4 Footings 4-5
4.2.6.5 Commercial / Industrial 4-5
4.2.7 Shallow Utilities Plan 4-6
4.2.8 Pavement Markings / Street Signs / Traffic Signals 4-6
4.2.9 Street / Road Hardware 4-6
4.2.10 Detail Plan / Profile Drawings 4-6
4.2.10.1 General 4-6
4.2.10.2 Plan Profile 4-7
4.2.10.3 Profile Portion 4-7
4.2.11 Landscaping Plan 4-8
4.2.12 Design Revisions After Approval 4-8
4.2.13 Plan of Record Drawings / Operation & Maintenance Manuals 4-8
4.2.14 Storm and Sanitary Sewer 4-9
4.2.15 Water Mains 4-9
4.2.16 Road, Curbs, Sidewalks 4-10
4.2.17 Water and Sanitary Service Connections 4-10

4.1 General

All detailed engineering plans and specifications submitted to the County for review and approval must comply with the following standards and specifications:

4.1.1 Drawing Size

The standard A-1 drawing size 594 mm x 841 mm (24" x 34") will be prepared with the profile located at the bottom of the sheet.

4.1.2 Scales

Drawings shall be prepared using the following scales:

Overall Plan	1:1000
Plan/ Profiles	1:500 Horizontal 1:50 Vertical
Cross-Sections and Details	1:100 m Horizontal 1:50 m Vertical

4.1.3 Elevations

Elevations will be relative to geodetic datum, and relative to the Alberta Survey Control system. Reference benchmarks and their elevations will be identified on the Index Plan.

A north arrow will be shown on each drawing. In general, north arrows should be directed towards the top of the plan.

4.1.4 Drawing Techniques

Points of drawing techniques that are significant to the preparation of drawings are as follows:

- Clarity, legibility, and accuracy will be the governing criteria when preparing drawings.
- Care shall be taken to ensure a balanced distribution of detail throughout the drawing. Plan profile sheets shall have profile on bottom of the sheet and the plan shall not extend into the profile section of the drawing.
- Letters and figures will be clearly legible, 2 mm size or larger, well-spaced, properly formed and proportioned.
- Computer drafting shall be submitted in AutoCAD format.

4.1.5 Dimensioning

Dimensioning of a drawing is extremely important and should be such that it will not be misinterpreted. Dimensions shall be given from an iron pin, lot line, chainage station, a centerline, or any other reference that can be readily established. All dimensions shall be in the SI System (standard metric system and units).

4.1.6 Title Block

All drawings must clearly show the following in the title block:

- Developer's / Owner's name
- Developer's Engineer or consulting engineering name.
- Subdivision name including staging and/or phasing.
- Drawing name and number and issue date.
- Drawing scale, including horizontal and vertical scales.
- Space for the dates and signature of the designer, draftsperson, reviewer or checker and approving professional or principal.
- Space for professional stamps and permits.
- Space for revisions including number, date, description, and approval signature.

4.2 Design Drawings

The detailed engineering plans and drawings submitted to the County for review and approval shall typically include the following:

4.2.1 Cover Sheet

This sheet shall show the name of the subdivision, stage of development, and the names of the Developer, planner, and consulting engineer. In addition, the County shall be identified. A key plan of the County, or a significant portion thereof, shall be included illustrating the location of the development project.

4.2.2 Index Plan

This plan shall be prepared at a scale of 1:1000, or a reduction thereof, to fit the standard A-1 sheet and will indicate that portion of the development which relates to a particular plan/profile sheet. This plan shall also list each drawing included in the set of drawings. Each drawing is to be listed sequentially along with its corresponding drawing number.

4.2.3 Contour Plan

This plan shall be prepared at a scale of 1:1000 and will indicate the existing contours at 1.0 m interval, the proposed land use and all significant above ground features such as buildings, trees, utilities, etc.

4.2.4 Water and Sanitary Sewer Overall Plan

This plan shall be prepared at a scale of 1:1000 and shall show the location and alignment of the water and sanitary sewer mains, pipe size, direction of flow, and the location of all related fixtures and appurtenances.

4.2.5 Roads, Lanes, Sidewalk, Utility Lot and Drainage Plan

This plan shall be prepared at a scale of 1:1000 and shall show all roads, lanes, and walkways, curb & gutter, sidewalks including road surface and right-of-way widths and alignments and the storm water drainage system including the local drainage areas, pipe and culvert locations, sizes, inverts, direction of flow, etc., as well as all proposed lot approaches/driveways.

4.2.6 Lot Grading Plan

4.2.6.1 Low Density – Residential

If grading of lots is not proposed, this plan will shall show existing grades. If grading of lots is proposed a plan shall be prepared at a scale of 1:1000 which will indicate original contours (at 0.5 m intervals shown in screened format), proposed areas of grading, finishing lot grades and direction of finished surface drainage flows.

4.2.6.2 High Density – Residential

This plan shall be prepared at a scale of 1:1000 and will indicate the following:

- original contours (0.5 m intervals shown in screened format)
- proposed finished lot corner elevations
- proposed finished lot grades
- direction of lot surface drainage flows including major overland flow routing
- all easements and right of ways, drainage swales, area affected by stream ponding during major storm events
- minimum building footing grades
- alignment of sewer and water lines c/w manholes, valves and hydrants
- location of lot services at the property invert elevation of sewer service
- size and material of water service
- location of geotechnical test holes, water table level and fill over 1.2 meters in depth

4.2.6.3 Elevations

Provide proposed elevations and grades for all Public Lands, road elevations at centerline at each intersection, major flow routing and discharge, depth and extent of ponding at sag points during 1:100 storm event, show water table elevation at proposed footing elevations in the form of a table as follows:

Water Table – Footing Elevations Analysis						
Lot	Block	Estimated Footing Elevations		High Water Table	Vertical Distance	
		Full Basement	Bi-Level			
2	3	660.150	661.350	659.900	0.250	1.450

4.2.6.4 Footings

Typical full basement footing depth is 2.4 meters below finished lot grading and typical bi-level footing depth is 1.2 meters below finished lot grading (subject to geotechnical report and frost penetration).

4.2.6.5 Commercial / Industrial

This plan shall be prepared at a scale of 1:1000 and will indicate the following:

- Original contours (at 0.5 m intervals shown in screened format) proposed lot grades

- Proposed finished lot corner elevations
- Proposed finished lot grades
- Direction of lot surface drainage flows
- This plan may be combined with the Road and Drainage Plan and Contour Plan provided clarity can be maintained.

4.2.7 Shallow Utilities Plan

An overall plan, drawn to a scale of 1:1000, shall be prepared compiling the location and alignment of water and sewer lines, power, gas, telephone, and cablevision lines and including the location of all related surface encumbrances such as power poles, street lights, transformers, pedestals, hydrants, valves, manholes, etc.

4.2.8 Pavement Markings / Street Signs / Traffic Signals

Plans shall be provided to the Municipal Engineer which depicts the locations and details of all pavement markings, street signs and traffic signals using a 1:500 plan.

4.2.9 Street / Road Hardware

This plan shall show all driveway locations and street hardware to ensure that one does not impact the other. Street hardware includes: street lights, street signs, manhole locations, catch basin locations, service connections or valves, super mailboxes, fire hydrants and any other hardware that could impact a driveway location.

4.2.10 Detail Plan / Profile Drawings

These plans, prepared in accordance with accepted engineering drafting standards and practices, are intended to provide location, alignment and dimensioning detail respecting the proposed municipal improvement required to be constructed. Existing infrastructure and other relevant features shall also be shown in detail.

4.2.10.1 General

- These plans shall be prepared at a scale of 1:500 horizontal and 1:50 vertical.
- The plan portion shall be positioned at the top of the Standard A-1 sheet and the profile portion at the bottom.
- The location and alignment of all underground utilities including mains, valves, hydrants, manholes, catch basins, etc. and surface improvements including carriageways, drainage channels, ditches, approaches, culverts, etc. shall all be shown on the same plan portion.

- Profiles of all underground utilities and surface improvements shall be shown on the same drawing.
- Stationing and chainages shall be so arranged that both the plan and profile portions align.
- All dimensioning shall be relative to property lines. Wherever possible, all dimensions shall be provided to a minimum of two (2) property lines.

4.2.10.2 Plan Profile

Information to be shown on the profile portion shall include, but not be limited to, the following:

- Legal subdivision information including lot and block numbers consistent with the rural addressing system employed by the County, and lot dimensions, where practical.

- Road and street names and, where applicable, civic addresses. Horizontal alignment of all roadways, carriageways, ditches, approaches, culverts, signage, etc. including horizontal curve data (curve arc lengths, chainages of PI, BC, EC, etc.), chainages and dimensions of all items tied to the property lines.

- Horizontal alignment of all underground mains and fittings, size and type of materials, valves, hydrants, manholes, catch basins, pipe grades, service connection locations, etc. all dimensioned through stationing and chainages and offsets to the property lines.

- Any other information or data deemed necessary and\or appropriate to the Municipal Engineer to make the plans complete.

4.2.10.3 Profile Portion

Information to be shown on the profile portion shall include, but not be limited to, the following:

- Existing ground profile of center line of any right-of-way.

- Proposed design profiles for centerline of road carriageway including chainages, vertical alignments and grades, vertical curve data (chainages, elevations length and radius of curves, etc.)

- Proposed design profile for the underground utilities including chainage, percent grades, size, type and class of pipe, class of bedding, type of trench backfill, invert elevations at all inlets and outlets as well as at all grade changes, manhole rim elevations, existing underground utilities data, etc.

4.2.11 Landscaping Plan

The landscaping plan shall be drawn to a scale of 1:500 and shall utilize the Road, Sidewalk, Utility Lot and Walkway Plan as a base. This plan shall identify areas to be seeded or sodded, location of and name of all trees and shrubs, location of planting beds and any street lighting, park furniture or playground equipment being installed.

See Section 13 – Landscape Design.

4.2.12 Design Revisions After Approval

If changes to the Detailed Engineering Drawings must be made after they are approved, two prints of each of the original drawings affected shall be submitted with the proposed changes shown in red, accompanied by a letter outlining the reasons for the required changes. If the proposed changes meet with the approval of the County, one copy will be signed and returned, accompanied by a letter authorizing the changes to be made on the original.

4.2.13 Plan of Record Drawings / Operation & Maintenance Manuals

The Plan of Record drawings are to be submitted to the Municipal Engineer at application for an Initial Construction Completion Certificate (CCC). Upon request from the Developer's Engineer, the Municipal Engineer may allow the Plan of Record drawings to be submitted no later than within three (3) months of the issuing of a construction Completion Certificate.

The Plan of Record information shall be submitted in the form of electronic files on USB drive of the AutoCAD format currently in use by the County. Any operating or maintenance manuals shall be submitted with the Plan of Record drawings.

The Plan of Record drawings shall clearly show the location of all services as installed using offsets from survey pins.

Plan of Record drawings submitted to the County shall include the following information on each drawing, **and** the cover sheet:

- Date of completion of each improvement (usually corresponds to the date on the Construction Completion Certificate);
- Name of Contractor for each improvement;
- Date on which record information was added.
- All drawings must be stamped and signed by a Professional Engineer recognized by APEGA.

4.2.14 Storm and Sanitary Sewer

The following information shall be required:

- Size, pipe material, pipe class, bedding, and location of mains.
- Location of manholes, cleanouts, and other appurtenances.
- Grades, lengths, and inverts of mains and leads, and frame and cover elevations.
- Verification of pipe capacity and velocity and calculated 5 year flows for each section of storm pipe.
- Elevations on each end of augured sections of main.

4.2.15 Water Mains

The following information shall be required:

- Size, pipe class, pipe material, pipe manufacturer, and pipe location.
- Location of valves, tees, hydrants, bends, plugs reducers, and other appurtenances.
- Profile of pipe and any amendments to invert elevations.
- Verification of flange elevations on hydrants.
- Elevations on each end of augured sections of main.

4.2.16 Road, Curbs, Sidewalks

The following information shall be required:

- Location of curbs and elevations given at the invert of gutter, changes of grade, high/low, end of construction.
- Location of sidewalk, width and type of sidewalk, and distance to property line from back of walk.
- Adjustment of gutter grades as necessary.
- Details of road construction thickness including any changes during construction.

4.2.17 Water and Sanitary Service Connections

The following information shall be required:

- A schedule on each plan\profile drawing shall be prepared giving the following information with respect to all service connections.
  - Lot and Block number;
  - Distance of service Wye from the downstream manhole;
  - Invert elevation of sanitary service at main and at the end of the service connection;
  - Length and grade of service connection.
- The service connection provided to each lot shall be shown on the plan and the location referenced horizontally to each property lot corner. A typical dimension can be shown with variances labeled.

In cul-de-sacs and other locations where it is not possible to service all lots at right angles to the mains, additional as-built information is required. This information is to include the location of water taps in relation to a main valve or property line. Any deviations from straight-line connection, from mains to the property line, also require additional information.

SECTION 5 Water Distribution Systems

5.1 General 5-2
5.2 Design Criteria 5-2
5.2.1 Per Capita Consumption 5-2
5.2.2 Design Population 5-2
5.2.3 Peak Hour Demand 5-3
5.2.4 Maximum Demand 5-3
5.2.5 Maximum / Minimum Pressure 5-3
5.2.6 Fire Flow - Urban Areas 5-3
5.2.7 Main Detail and Location 5-3
5.2.8 Hydrant Detail and Location 5-4
5.2.9 Water Main Pipe Material 5-5
5.2.10 Water Main Installation Criteria 5-5
5.2.11 Water Valves 5-6
5.2.12 Hydrants 5-8
5.2.13 Trenching and Backfilling 5-9
5.2.14 Cathodic Protection 5-9
5.2.15 Testing 5-10

5.1 General

This section outlines the minimum standards or requirements for water distribution systems required to be provided in a development.

The standards outlined herein are intended to be the minimum standards, not the standard. It is the Developer's responsibility to develop the subdivision to meet or exceed the standards in accordance with good engineering practices, specific site condition requirements, and/or as may be required by the Municipal Engineer, Aquatera, and Alberta Environmental Protection.

All materials used in the development shall be new and in compliance with the most recent standards of AWWA, ASTM, or CSA.

5.2 Design Criteria

The water distribution system shall be designed in accordance with recommended standards and the design manual of the American Water Works Association (AWWA) and Alberta Environmental Protection requirements and/or guidelines.

The system shall be designed as part of the overall or ultimate distribution system to meet maximum day consumption plus fire flows or peak hour flows, whichever is the greater. For areas not required to provide fire flows, as determined by the Municipal Engineer, the peak hour flows shall be used. A design report shall be submitted to the Municipal Engineer outlining the calculations for pipe sizing, hydrant flows and pressures including flow and pressure criteria when sprinkler systems are required.

5.2.1 Per Capita Consumption

Per capita consumption shall be based on the following:

Residential Avg. Daily Demand	275 L\person\day
Maximum Daily Demand	2.0 x Average Daily Demand
Peak Hourly Demand	3.0 x Average Daily Demand
Industrial (light)	10,000 L\ha\day
Highway Commercial\Industrial	26,000 L\ha\day
Institutional (includes schools)	30,000 L\ha\day
Maximum Daily Demand	1.5 x Average Daily Demand
Peak Hourly Demand	2.0 x Average Daily Demand

5.2.2 Design Population

The design population shall be as approved by the County.

5.2.3 Peak Hour Demand

A hydraulic analysis shall be made by the Developer for Peak Hour Demand and mains shall be sized such that there will be a minimum residual pressure of 280 kPa at ground level at any location in the system.

5.2.4 Maximum Demand

Separate analysis shall be made by the Developer for Maximum Demand plus Fire Flow. The residual pressure at any location at the ground level shall not be less than 140 kPa.

5.2.5 Maximum / Minimum Pressure

Maximum allowable pressure at any location in the system shall be 690 kPa. The minimum allowable pressure at any location in the system shall be 280 kPa at peak hours and 140 kPa at maximum daily demand plus fire flow.

5.2.6 Fire Flow - Urban Areas

Areas that connect to the City of Grande Prairie's Water System and are located in the boundary identified in the City of Grande Prairie/County of Grande Prairie No. 1 Inter-Municipal Development Plan, are to be designed to provide fire flows as determined in the latest City of Grande Prairie's Standard Guidelines for Design of Municipal Improvements, Section 25.3.6 - Fire Flow.

Fire flow requirements located in other urban areas, including the Hamlets of Clairmont, Bezanson, La Glace and Valhalla shall be as determined by the Municipal Engineer.

Areas determined by the Municipal Engineer to require fire flows shall be designed to meet the latest Fire Underwriter's Survey - Water Supply for Public Fire Protection Guidelines. Where these cannot be met and fire protection is required, private fire suppression systems shall be utilized.

5.2.7 Main Detail and Location

The minimum size of distribution main shall be:

- 200 mm diameter for single family residential,
- 200 mm for multi-family development, and
- 250 mm for industrial\commercial.

- Oversizing may be required at the County's discretion.

P.V.C. Pipe shall be used and the value of "c" in the Hazen-Williams formula shall be 140.

Distribution lines must all be looped except in single family residential cul-de-sacs where the water main length is less than 100 m or serves less than 20 residences.

Mains shall be installed to provide a minimum cover depth of 3.0 m to top of pipe from final finished surface grade.

Mains shall be located within the road or utility right-of-way in accordance with the Typical Detail Drawings following Cross Sections.

A minimum horizontal separation shall be maintained between a water main(s) and any sewer main(s) shall be 2.5 meters.

At crossings, a minimum vertical distance shall be maintained between a water main(s) and sanitary main(s) of 500 mm with the alignment such that the water main is over the sanitary main whenever possible.

At crossings, a minimum vertical distance shall be maintained between a water main(s) and storm main(s) of 500 mm.

The minimum requirements for pipe bedding shall be **Class B granular bedding**.

5.2.8 Hydrant Detail and Location

Hydrants on the distribution mains shall be installed:

- At the projection of property lines
- Beginning of curb returns or road radius
- Where the hydrants are installed on a cul-de-sac of 75 m in length or less, they shall be installed at the intersection of the cul-de-sac and adjacent collector roadway.

All hydrants must be separated from the distribution system by a valve.

Additional hydrants shall be installed at high value properties if deemed necessary by the County.

Hydrant flanges are to be designed at between 50 mm and 150 mm above the finished ground elevation.

Refer to Standard Drawing **Detail No. 5.1**, Hydrant Connection.

5.2.9 Water Main Pipe Material

Pipe shall be polyvinyl chloride (PVC) pressure pipe AWWA C-900 with a minimum 1035 kPa working pressure unless approved otherwise in writing by the Municipal Engineer.

Fittings (tees, elbows, crosses) up to and including 200mm diameter shall be molded polyvinyl chloride (PVC) to CSA B137.2 (Class 150) unless approved otherwise in writing by the Municipal Engineer.

Fittings greater than 200mm in diameter shall be cast-iron conforming to AWWA C-110.

5.2.10 Water Main Installation Criteria

All mains shall be installed to a minimum depth of 3.0 meters of cover below finished design grade of the surface.

All pipes shall be installed on compacted granular bedding. Class B granular bedding material shall be placed and compacted around the pipe to at least 300mm above the top of pipe. The granular bedding shall be a material approved by the Municipal Engineer and shall typically consist of:

- Crushed or screened stone, gravel or sand consisting of hard durable particles free from clay lumps, cementation, organic material, frozen material or other deleterious material;
- Gradations to be within limits specified when tested to ASTM C136 and ASTM C117 and to have a smooth curve without sharp breaks when plotted on semi-log charts.

Sieve Designation *(um)*	**% Passing**
10,000	100
5,000	95 - 100
2,500	80 - 100
1,250	50 - 85
630	30 - 65
315	10 - 30
160	2 - 10

Refer to **Standard Drawing Detail No. 6.0, Pipe Bedding Details**.

All pipe installations shall be in compliance with the manufacturer's recommendations, including vertical and horizontal allowable deflections.

Unless approved otherwise, all water mains shall be installed within the road right-of-way.

A minimum of 2.5 meters separation shall be maintained between a water main and any sewer (sanitary or storm).

A minimum distance of 3.0 meters separation shall be maintained between any water main, hydrant, valve, or other water distribution system fixture and any power line including street lights, gas line, telephone\television cable, or any duct line or pipeline, subject to further approval by the shallow utility and/or Pipeline Company and the Municipal Engineer.

Unless approved otherwise, water mains shall cross above sewers with sufficient vertical separation to allow for proper bedding and structural support of the water and sewer mains.

Thrust blocking shall be type 50 sulfate resistant concrete having a minimum compressive strength of 20 MPA at 28 days.

Refer to Standard Drawing Detail No. 5.2, Thrust Block Details.

Pipe Restraint Devices shall be used separately or in conjunction with thrust blocks, where identified as being required, and shall be installed in accordance with the manufactures recommendations. Restraint Devices for Mechanical Joint or Push-On fittings shall be Uni-Flange Block Buster 1300 or approved equal.

Timber blocking shall be pressure treated hemlock or fir.

5.2.11 Water Valves

Water main valves shall be the same size as the diameter of the main.

Valves on the distribution mains shall be installed:

- At the projection of property lines at intersections
- At the projection of property lines at mid-block.

Valves on the distribution mains shall be located such that during a shutdown:

- No more than three (3) valves are required to effect the shutdown;
- No more than one (1) hydrant is taken out of service;
- No more than twenty (20) single family services are taken out of service.

For water mains with a diameter up to and including 400 mm, gate valves conforming to AWWA C509, latest revision thereof, shall be used and shall include the following supplementary requirements:

- Resilient seated,
- Non-rising spindle,
- To open by turning counter-clockwise direction,
- Minimum operating pressure of 1200 kPa,
- Exterior shall be plant epoxy coated,
- All bolts and nuts to be stainless steel coated at installation with Denso Mastic and wrapped with Denso tape.

For water mains with a diameter greater than 400 mm butterfly valves conforming to AWWA C504, latest revision thereof, shall be used and shall include the following supplementary requirements:

- Tight-closing, rubber seated type,
- Seat material shall be EPDM, field replaceable,
- Disc material shall be aluminum bronze ASTM B-148 952,
- Shafts shall be solid stainless steel 18-8, type 304,
- Minimum bubble tight differentia at 1050 kPa,
- Exterior shall be plant epoxy coated,
- All bolts and nuts shall be stainless steel coated at-installation with Denso Mastic and wrapped with Denso Tape.

Butterfly valves greater than 400 mm shall be installed with appropriate bypass capabilities and shall be installed in a chamber or vault.

Valve boxes complete with operating stem and rock disk are required on all valves. Valve boxes shall be a two section, bituminous coated, Type A, cast iron adjustable type with a cast iron lid. The rock disk shall be no more than 0.3 m below finished surface grade. Valve boxes shall be sufficient length to provide for adjustments of 300 mm in up and down directions.

Each valve box shall be marked by a vertical, nominal size 2" x 4" timber, set one (1) meter into the ground adjacent to the valve box and extending one (1) meter above the top of

the surrounding ground. The top 300 mm of the exposed portion of this marker post shall be painted blue.

As-built drawings shall be provided by the Developer's Engineer illustrating the exact locations of all valves complete with their model and make.

5.2.12 Hydrants

Hydrants shall be the approved make and models as presently used in the County.

Hydrants shall be "dry barrel" type conforming to AWWA C502, latest revision therefore, and shall include the following supplementary requirements:

- Compression shut-off closing with line pressure,
- Turn to open counter-clockwise,
- Minimum 150 mm I.D. riser barrel,
- 600 mm extension on top with breakaway flange,
- 150 mm diameter gasket push-on type bottom connection,
- Two (2) 65 mm hose outlets, Alberta Mutual Aid Thread,
- One (1) 100 mm pumper connection complete with quick connect "Storz" coupler, internal lug,
- Bottom connection with drip valve and drain,
- Operating nuts to be 3-sided, with each side being an arc of 36.5 mm long,
    - all bolts and nuts to be stainless steel type 304 coated with Denso Mastic and wrapped with Denso Tape at time of installation,
- All hydrants to be finished to "fire yellow" color.

A 150 mm gate valve complete with valve box located 3.0 meters from the hydrant shall be provided on each hydrant lead.

All hydrants along roadways shall be located consistent with Standard Detail Drawing No. 9.42, Typical Shoulder Widening for Fire Hydrant Rural Standard.

A minimum 0.5 m washed rock drainage sump shall be provided around the hydrant base. Top of sump to be 150 mm above the hydrant drain and covered with 6 mil polyethylene to minimize intrusion of silt or clay into the gravel. Refer to Standard Detail Drawing No. 5.1, Typical Hydrant and Valves Detail.

The maximum allowable spacing between fire hydrants measured in any direction shall generally be consistent with the Fire Underwriter's guidelines and shall not exceed:

- 150 meters for single family residential areas,
- 120 meters for multi-family residential and institutional,
- 90 meters for commercial/industrial.

Furthermore, hydrants shall be located such that the distance to any commercial/industrial building shall not be greater than 75 meters.

Where the dwellings in a residential area are equipped with sprinkler systems, the hydrant spacing may be increased to 250 meters.

Plan of Record drawings shall be provided by the Developer's Engineer illustrating the exact location of all hydrants and hydrant valves relative to the property line and the main water valves.

5.2.13 Trenching and Backfilling

All trenching and backfilling operations shall be carried out in accordance with the Occupational Health and Safety standards.

Prior to trenching and backfilling of water main installations the construction area shall be stripped of all topsoil and/or organic materials.

Widths of trenches shall be such that pipes and fittings can be laid, jointed properly and backfilled and compacted properly.

- Minimum trench width -O.D. of pipe diameter plus 450 mm.

Backfilling shall be carried out with approved native material in 300 mm layers, compacted to a minimum of 98% Standard Proctor Density.

In areas of existing hard surface, backfilling shall be carried out with granular material in 150 mm layers compacted to a minimum of 98% of Standard Proctor Density.

Backfill around valves, valve boxes, and hydrants shall be placed in 150 m layers and compacted with mechanical tampers to a minimum of 98% of Standard Proctor Density.

5.2.14 Cathodic Protection

Cathodic protection shall be required on all metallic main valves, fittings and hydrants.

a) A 2.3 kg zinc sacrificial anode shall be connected to each valve, fitting and coupling.

b) A single 5.5 kg zinc sacrificial anode shall be connected to a hydrant.

Refer to Standard Detail Drawing No. 5.6, Typical Anode Installation at Steel or Iron Fittings with Steel and PVC Water mains.

5.2.15 Testing

Following construction, all water mains shall be flushed, disinfected, and leakage tested. The Municipal Engineer shall be notified at least 48 hours in advance of all proposed tests which shall be carried out in his presence.

Water main installations shall be pressure and leakage tested in accordance with AWWA standards respecting the pipe material, latest revision thereof, and the following additional criteria:

- Maximum length of distribution main to be tested shall not exceed 400 m.
- Maximum length of transmission main to be tested shall not exceed 800 m. Testing shall be carried out only after concrete thrust blocking has cured - minimum of 5 days from date of pour.
- Apply a minimum hydrostatic and leakage test pressure of 1035 kPa after complete backfill for period of 2 hours.
- Define leakage as amount of water supplied from water storage tank in order to maintain test pressure for 2 hours.
- Allowable leakage of 0.0033 L/mm diameter per 100 m of pipe, including lateral connections, per hour.

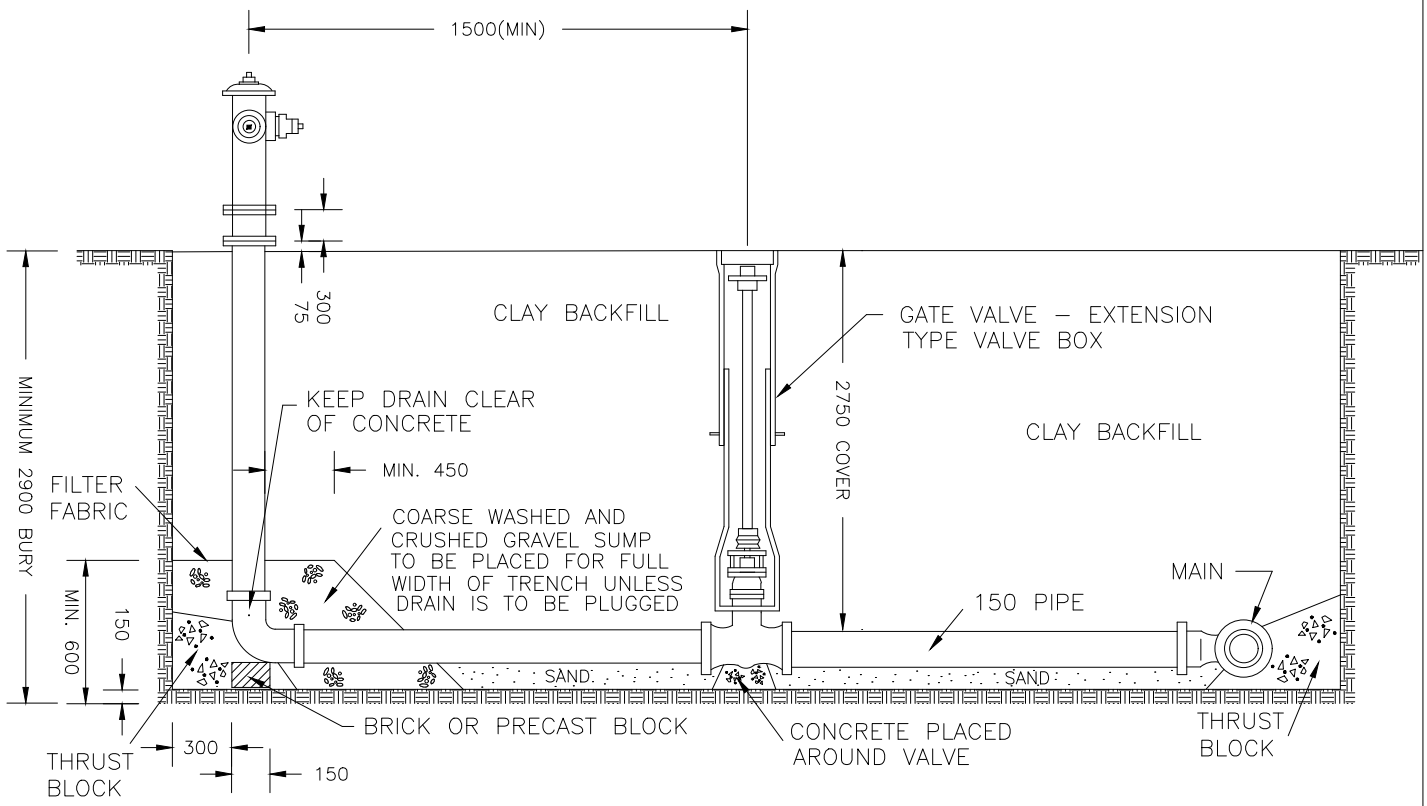
Water Systems which will not provide water main flushing velocities of at least 3.0m/sec shall be flushed using foam pigs prior to disinfecting of the water mains.

Disinfection shall be carried out in accordance with standards outlined in AWWA C651, latest revision thereof. Chlorination levels after chlorinating shall be 50 parts (min.) and 25 parts (min.) after 24 hours of exposure in water main. Minimum acceptable bacterial level shall be as follows:

- A sample must show the absence of coliform organisms,
- Total bacteria count shall not be greater than 300 organisms per ml.

Following disinfection, all water mains shall be thoroughly flushed. Extreme care shall be exercised to ensure that no contamination of any adjacent works occurs. In addition, discharge of water during flushing operations shall be undertaken in such a manner as to minimize erosion of, or damage to, adjacent property.

All testing results shall be documented and submitted to the Municipal Engineer for approval prior to commissioning of the system and the issuance of a construction completion certificate.

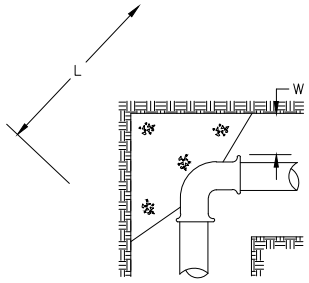


ALL DIMENSIONS SHOWN ARE IN METERS AND DECIMALS OF.

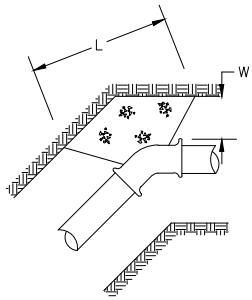
COUNTY of GRANDE PRAIRIE No. 1

HYDRANT CONNECTION

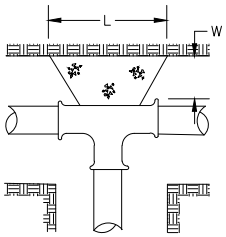
DATE:	2002-05-01	DRAWN BY:	GWA	APPROVED:	DRAWING 5.1
SCALE:	NOT TO SCALE	CHECKED BY:	BHG		



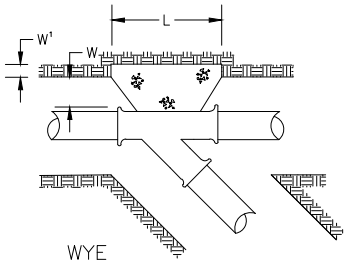
HORIZONTAL 90° BEND



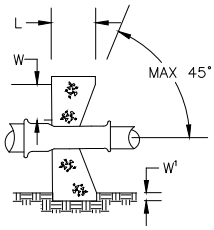
HORIZONTAL 45° BEND



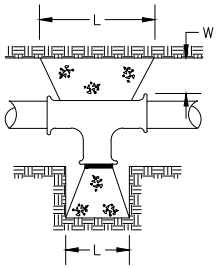
TEE



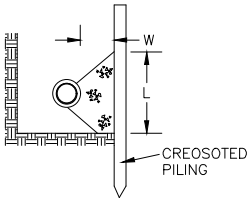
WYE



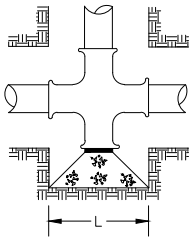
REDUCER



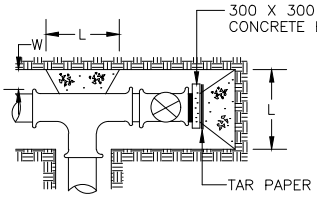
TEE WITH PLUG



NOTE: WHERE GROUND CANNOT BE EXCAVATED TO FREE STANDING UNDISTURBED SOIL, A SMALL PLANK SHEET PILING SHALL BE DRIVEN TO PROVIDE UNDISTURBED THRUST AREA. THE PILING IS TO BE DRIVEN PRIOR TO EXCAVATING FOR THRUST BLOCK. THE PILING SHOULD BE USED ONLY BELOW YHE PERMANENT WATER TABLE.



CROSS WITH PLUG



TEE WITH VALVE

MINIMUM THRUST AREAS FOR FITTINGS AT 1035 kPa PRESSURE AND FOR SOILS WITH MINIMUM BEARING OF 9765 kg/m (NOT TO BE USED FOR SOFT CLAY, MUCK, PEAT, etc.)

TYPE OF FITTING	FITTING SIZE	OUTSIDE OF FITTING TO BEARING FACE	RECESS IN TRENCH WALL	LENGTH	HEIGHT	TYPE OF FITTING	FITTING SIZE	OUTSIDE OF FITTING TO BEARING FACE	RECESS IN TRENCH WALL	LENGTH	HEIGHT
	D	W	W'	L	H		D	W	W'	L	H
90° BEND	150	300		900	450	CROSS	150	300		600	450
	200	350		1050	600		200	350		825	600
	250	375		1445	750		250	375		975	825
	300	400		1650	900		300	400		1200	900
45° BEND	150	300		450	450	45° WYE	150	300	300	450	450
	200	350		600	600		200	350	400	600	600
	250	375		750	750		250	375	500	825	825
	300	400		900	900		300	400	600	900	900
22 1/2° BEND	150	300		450	230	REDUCER *	150	300	150	450	450
	200	350		600	300		200	350	200	600	600
	250	375		825	450		250	375	250	825	825
	300	400		900	450		300	400	300	900	900
TEE	150	300		600	450	CAPS AND PLUGS (IF NOT BOLTED)	150	300		450	450
	200	350		825	600		200	350		600	600
	250	375		975	825		250	375		825	825
	300	400		1200	900		300	400		900	900

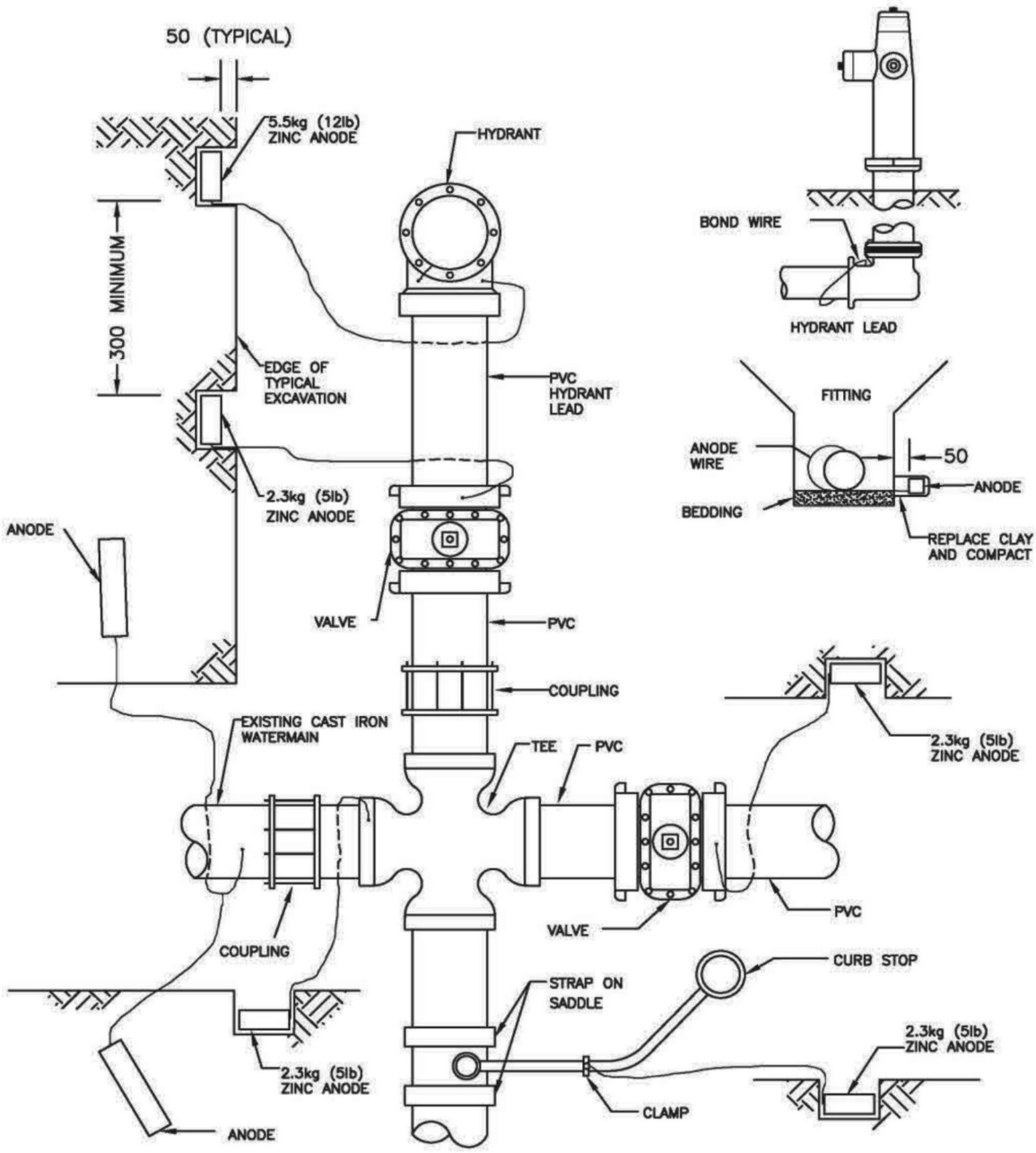
NOTE: ALL DIMENSIONS ARE IN MILIMETRES

* DIMENSIONS APPLY TO THE LARGER DIAMETER END OF FITTING

COUNTY of GRANDE PRAIRIE No. 1

THRUST BLOCK DETAILS

DATE:	2002-05-01	DRAWN BY:	GWA	APPROVED:	DRAWING
SCALE:	NOT TO SCALE	CHECKED BY:	BHG		5.2



NOTES:

1. MINIMUM DISTANCE FROM ANODE TO PIPE, FITTING, VALVE OR HYDRANT IS 150mm
2. INSTALL ANODE AT APPROX. PIPE DEPTH IN NATIVE SOIL
3. ALL ZINC ANODES ON FITTINGS AND VALVES ARE 2.3kg (5lb)
4. ALL ZINC ANODES ON HYDRANTS ARE 5.5kg (12lb)
5. ZINC ANODES TO BE EMBEDDED INTO TRENCH WALL TO PROVIDE FOR A MINIMUM OF 50mm OF NATIVE CLAY COMPLETELY SURROUNDING THE ANODE
6. ANODES TO BE AT LEAST 300mm CLEAR OF THRUST BLOCK
7. ANODES FOR CAST IRON OR STEEL WATERMAINS TO BE DESIGNED BY THE ENGINEER
8. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

County of Grande Prairie No. 1

COUNTY of GRANDE PRAIRIE No. 1

TYPICAL ANODE INSTALLATION AT STEEL OR IRON FITTINGS WITH STEEL AND PVC WATERMAINS

DATE:	2012-07-12	DRAWN BY:	SCOTT WALLS	APPROVED:	DRAWING
SCALE:	NOT TO SCALE	CHECKED BY:	BRAD VALL, C.E.T.		5.6

SECTION 6 Sanitary Sewer System

6.1 General 6-2
6.2 Trunk System 6-2
6.3 Collection System 6-2
6.3.1 Sanitary Catchment Calculations 6-2
6.3.2 Velocities 6-3
6.3.3 "n" Value 6-3
6.3.4 Minimum Pipe Slopes 6-3
6.3.5 Oversizing 6-3
6.3.6 Main Detail and Location 6-3
6.3.7 Manhole Detail and Location 6-4
6.3.8 Curved Sewers 6-5
6.4 Weeping Tile 6-6
6.4.1 Water and Wastewater Standards 6-6
6.4.2 Footing Elevations 6-6
6.4.3 Other Considerations 6-6
6.5 Testing 6-7
6.6 Reports 6-7

6.1 General

The sanitary sewer system shall be of sufficient capacity to carry peak flows plus infiltration.

The design of this municipal improvement shall be undertaken in such a manner as to conform to the approved Sanitary Sewer Design report for area, construction specifications in the County Construction Manual and other Acts or Regulations.

The Sanitary Sewer System shall be approved by the Municipal Engineer and Alberta Environmental Protection Services.

6.2 Trunk System

As required to comply with the County's Standards.

6.3 Collection System

6.3.1 Sanitary Catchment Calculations

a) Residential:

Average Sewage Flow	=	225 Liters / person / day
Peaking Factor (PF)	=	$1 + \frac{14}{(4+\sqrt{p})}$ (Harmon's Formula)
		Where p = tributary population in 1000's
Minimum Peaking Factor	=	3.0
Infiltration	=	0.10 Liters / sec. / hectare

b) Institutional, Commercial, and Industrial (unless otherwise accepted by the County based on detailed calculations & flow monitoring - e.g. Schools.):

Average Sewage Flow:

Institutional	=	30 Cu. Meters / hectare /day
Commercial	=	26 Cu. Meters / hectare /day
Industrial	=	20 Cu. Meters / hectare / day (heavy)
	=	10 Cu. Meters / hectare / day (light)
Peak Flow	=	2.0 x Average Flow
Infiltration	=	0.10 Liters / sec. / hectare

6.3.2 Velocities

Minimum Velocity	=	0.60 meters / sec.
Maximum Velocity	=	3.00 meters / sec.

6.3.3 "n" Value

Pipe sizing and capacity shall be determined by utilizing the Manning's Formula using an "n" value of 0.013.

6.3.4 Minimum Pipe Slopes

Minimum pipe slopes shall be as recommended by Alberta Environmental Protection, including the first upstream length of pipe:

200 mm dia.	0.40 %
250	0.28 %
300	0.22 %
375	0.15 %
450	0.12%
525	0.10 %
600	0.10%
750mm	***0.10%***

Minimum pipe slope values for curved sanitary sewers are to be 50% greater than the above values.

6.3.5 Oversizing

Sanitary sewers may have to be oversized to conform to the County's requirements, as required to service adjacent land for future development.

6.3.6 Main Detail and Location

a) The minimum size for sanitary sewer mains shall be 200 mm diameter for residential and 250 mm for industrial/commercial areas.

b) Pipe bedding shall be **Class B granular** for all sizes of mains with water tight joints. Pipe classes shall be determined to withstand subsequent superimposed loading.

c) Mains shall be designed to provide a minimum depth of 2.75 m to top of

pipe to below the final finished grade at the surface, or shall be insulated to the satisfaction of the Municipal Engineer.

d) Mains shall be designed to provide an adequate sanitary sewer service connection grade and depth at the property line.

e) Mains shall be located within a road right-of-way or utility lot, in accordance with the Typical Detail Drawings of Cross Sections.

f) For augured sanitary sewers, the design grade shall be 50% greater than the minimum grade required between the manholes upstream and downstream of the augured section.

g) Mains shall be separated from the water main(s) by a horizontal distance of not less than 2.5 meters.

h) At crossings, mains shall be separated from the water main(s) by a vertical distance of not less than 500mm, and the vertical alignment must be with the water over the sanitary whenever possible.

i) At crossing, mains shall be separated from storm main(s) by a horizontal distance of 500 mm between the outside walls of the pipe.

6.3.7 Manhole Detail and Location

a) All manholes shall be water tight.

b) Manholes shall be located at the upstream end of each line, and at all changes in pipe size, grade and alignment. Manholes shall be designed to provide a minimum depth of 2.75 meters to the pipe obvert. Under no circumstances will manholes be permitted in driveways or private property. When planning manhole locations, due consideration must be given to access by sewer cleaning equipment.

c) Where the inlet and outlet pipes are of the same diameter, inverts in manholes at changes in direction shall have a maximum 60 mm fall across manhole, and at least 30 mm on non-directional changes. The obvert elevation of a sewer entering a manhole shall not be lower than the outlet sewer obvert. The drop across a manhole shall be where sewer piping is installed through a manhole, the slope across the manhole, from inlet to the outlet, shall not be less than the greater of the slopes of the downstream or upstream sewers. Alignment changes in excess of 90 degrees are not permitted.

d) A smooth, semi-circular transition is to be provided between the inverts of the inlet and outlet sewer except where drop manholes have been provided.

Extreme changes in elevation across non-drop manholes are to be avoided except in situations where a small diameter pipe meets a large diameter pipe at matching obvert elevations. Where drops in excess of this occur, drop manholes, slope changes, or lowering the profile of the in-coming pipe are required.

In general, one internal drop per manhole will be allowed for pipes up to 300mm in diameter and for drops of up to a maximum of 3.0 m. External drops will need to be individually designed and thoroughly detailed in the typical details section of the Detailed Engineering Drawings. Internal drop structures may not be installed in manholes with an inside diameter of less than 1200mm, unless otherwise approved by the Development Engineer.

Where the drop is less than that which would allow the construction of drop manholes, excepting conditions in d), the grade of the incoming sewer shall be increased or the profile lowered in order to achieve the requirements of 6.3.7.c).

Where the drop is greater, then a drop manhole is to be provided.

External drops are preferred, but internal drops will be considered provided adjustment is made in the manhole diameter.

e) The maximum straight run distance between manholes shall not exceed 120m.

f) Manholes shall not be located in sags or in areas subject to flooding during a major storm event. If it is necessary to locate in such an area, gasket covers and other special requirements will be necessary to prevent inflow into the manhole**.**

g) **Manhole bases** shall be reinforced concrete poured-in place, precast slabs, vaults or precast tees.

h) Safety platforms at intermediate levels are required for manholes greater than 6.5m in depth.

6.3.8 Curved Sewers

Curved sewers will be permitted with the following restrictions:

- Only to follow curved ROW's

- The sewer shall be laid as a simple curve with a radius equal to or greater than 90 m or the manufacturer's minimum recommended radius, whichever is larger.
- Manholes shall be located at the beginning and end of the curve.
- Manholes shall be located at intervals not greater than 90 m along the curve.
- The main shall run parallel to property line.
- The minimum grade for sewers on a curve shall be 50% greater than the minimum grade required for straight runs of sewers.

6.4 Weeping Tile

6.4.1 Water and Wastewater Standards

In accordance with the Water and Wastewater Standards, weeping tiles, roof drains, yard drains, window wells and the like shall not be permitted to discharge into sanitary sewers, Weeping tiles may be connected to sumps with pumped discharge directly to the ground surface (splash pads are required to insure positive drainage away from the house for a distance of 1.5 m). Sump pump discharge lines at the ground surface shall be limited to 1.5 m from the face of the building at the point of discharge.

Connections to the storm sewer shall be permitted only if the storm sewer system is designed to handle weeping tile flow and only after the Municipal Engineer has reviewed and accepted the design. Other alternatives may be submitted to the Municipal Engineer for acceptance.

6.4.2 Footing Elevations

Critical footing elevations for all lots that do not have sump pump connections are to be shown on the Lot Grading Plan. Critical footing elevations are the minimum necessary to maintain a 1.0 m separation with the high groundwater table.

6.4.3 Other Considerations

A developer shall be required to resolve any continuous discharge icing problems in the subdivision up to the date of the expiry of the Servicing Agreement.

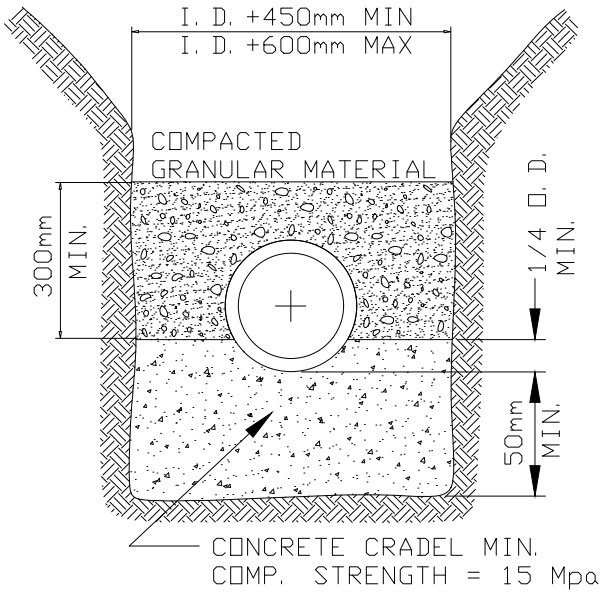
6.5 Testing

The design must be conducive to achieving appropriate construction as per County's approvals.

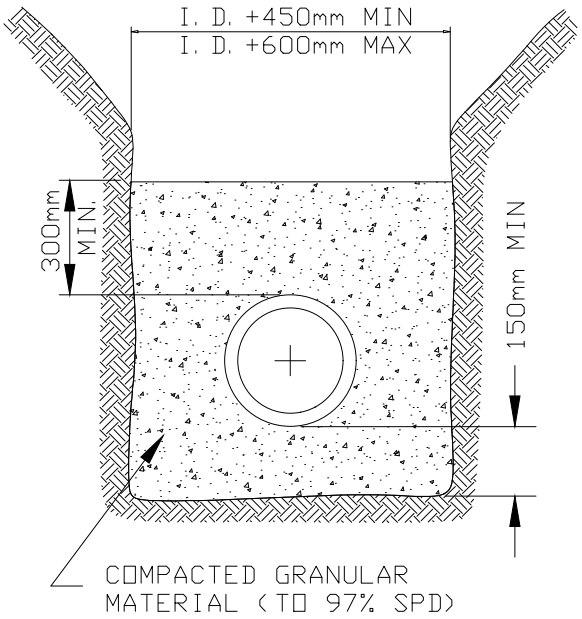
QA/QC testing to include compaction density tests and CCTV inspections in accordance with Construction Specifications.

6.6 Reports

All reports must be stamped and signed by a Professional Engineer recognized by APEGA.

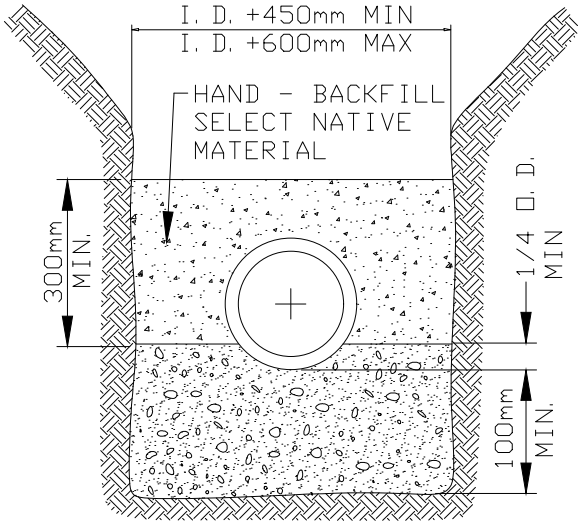


CLASS 'A'



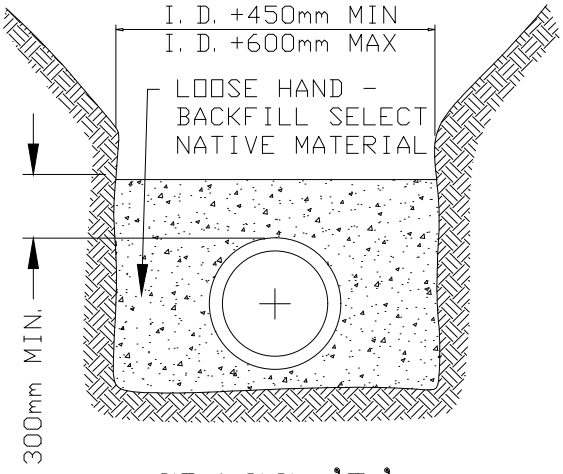
CLASS 'B'

(WATER AND SEWER MAINS)



CLASS 'C'

P. V. C. SEWER SERVICE)



CLASS 'D'

COUNTY of GRANDE PRAIRIE No. 1

PIPE BEDDING DETAILS

DATE:	2002-05-01	DRAWN BY:	GWA	APPROVED:	DRAWING 6.0
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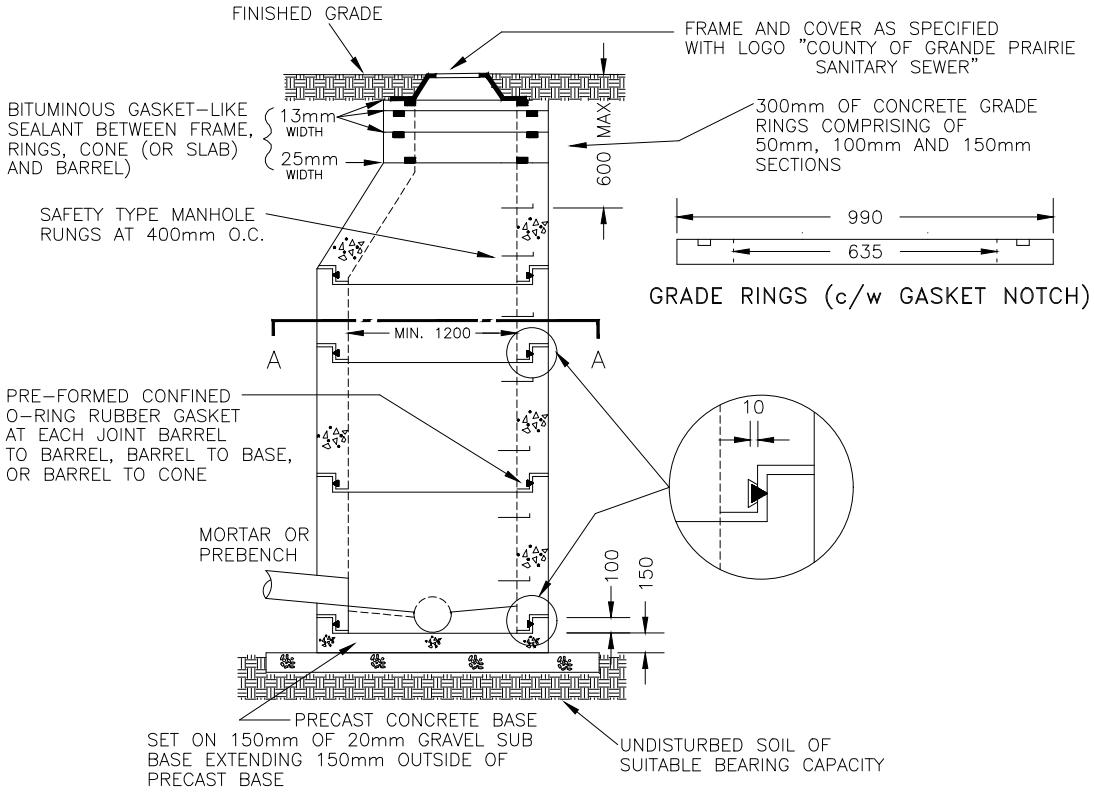

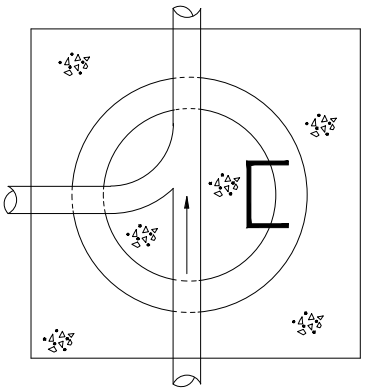

SECTION A–A

NOTE:

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

COUNTY of GRANDE PRAIRIE No. 1

PRECAST CONCRETE MANHOLE

DATE:	2002-05-01	DRAWN BY:	GWA	APPROVED:	DRAWING
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SECTION 7 Service Connections

7.1 General 7-2
7.1.1 Alignment 7-2
7.1.2 Driveways and Appurtenances 7-2
7.1.3 Connection to Lot(s) 7-2
7.1.4 Bedding 7-2
7.1.5 Cathodic Protection 7-2
7.1.6 Connection to Parks 7-3
7.2 Sanitary Sewer Service 7-3
7.2.1 Depth, Size and Minimum Grade 7-3
7.2.2 Clean Out Pipe 7-3

7.1 General

A separate service will be provided to all lots unless specific approval is received in writing from the Municipal Engineer. Separate sanitary service connections are required to each duplex lot.

7.1.1 Alignment

Services shall be placed so that when facing the lot from the water and sanitary mains, the water service shall be on the right side of the sanitary sewer service. Water and sewer connections are to be installed in a straight line between the mains and the property line and perpendicular to the mains, wherever possible. In no case shall the sanitary sewer service be installed at an angle of less than 90 degrees to the direction of flow.

7.1.2 Driveways and Appurtenances

Services shall be located such that they do not conflict with driveways or street lights, transformers, pedestals and shallow bury utilities. Curb stops and clean-outs shall not be located in sidewalks or driveways.

7.1.3 Connection to Lot(s)

Services are to be located at the center of the lot only when lots are undeveloped. If due to a conflict, services are located off center, services shall be installed no closer than 2.0 meters to the side lot line where no other utilities exist. If another utility is to pass between the services and the side lot line, then the minimum distance between the service and the side lot line shall be 3.0 meters. Common lot line servicing will be allowed as approved by the Municipal Engineer, in writing.

All water and sewer service connections are to be installed into private property, a minimum of 1.5 meters beyond the property line or the easement boundary, as the case may require.

7.1.4 Bedding

All sizes of sanitary sewer and water services shall be installed using granular bedding conforming to the materials specifications of the construction manual, provided the pipes have water tight joints.

7.1.5 Cathodic Protection

Unless specifically recommended in the geotechnical report, cathodic protection shall not be provided for all service connections.

7.1.6 Connection to Parks

It may be required that Parks and other municipal lands may be provided with a water service. The size and type are to be determined according to the type of park or as required by the Municipal Engineer.

7.2 Sanitary Sewer Service

7.2.1 Depth, Size and Minimum Grade

The minimum depth of cover shall be 2.60 m to top of pipe at the property line.

The minimum size of a sanitary sewer service connection to a single family dwelling shall be 150 mm inside diameter. Each lot shall have its own separate, sanitary service connection.

The minimum grade on the service line shall be 1.00%.

Sewer service risers are required to deep sewer mains where the main is deeper than 4.0 meters below finished grade.

Note pipe flow direction, i.e. bell and spigot fitting in the correct direction.

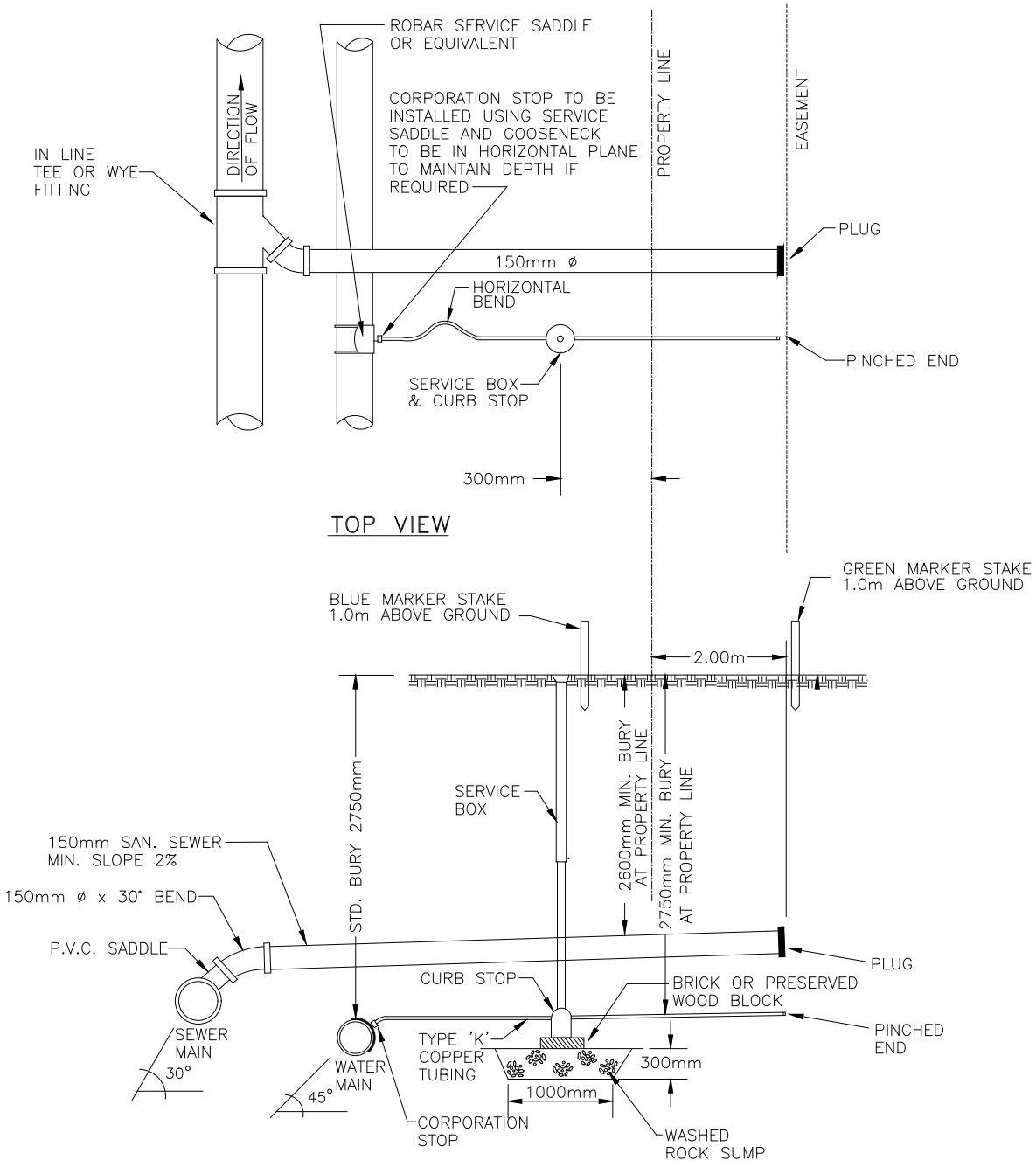
7.2.2 Clean Out Pipe

A clean out pipe may be required for all sanitary sewer services, at the discretion of the Municipal Engineer. The clean out pipe shall be the same size and material as the service connection itself, and shall include a 45 degree bend at the stub into the lot and a well secured cap where the clean out pipe ends. The end of the clean out pipe shall protrude above the ground surface by at least 600 mm measured vertically.

For augured service connections, video inspection shall be required on all sanitary sewer services.

For open trenched service connections, a video inspection is not required unless during the Maintenance / Warranty period problems related to the service connection develop.

Refer to Standard Drawing Detail No. 7.2, Service Connection.



COUNTY of GRANDE PRAIRIE No. 1

SERVICE CONNECTION

DATE:	2002-05-01	DRAWN BY:	GWA	APPROVED:	DRAWING 7.2
SCALE:	NOT TO SCALE	CHECKED BY:	BHG		

SECTION 8 Storm Drainage System

8.1 General 8-2
8.2 Minor System 8-2
8.2.1 System Components 8-2
8.2.2 Roof Drainage 8-2
8.2.3 Ponding 8-3
8.2.4 Sump Pumps 8-3
8.2.5 Storm Catchment Calculations 8-3
8.2.6 Velocity/Slope 8-4
8.2.7 "n" Valves 8-5
8.2.8 Hydraulic Gradeline 8-5
8.2.9 Maximum Surface Drainage 8-5
8.2.10 Drainage Interception 8-6
8.2.11 Minimum Gutter Grade 8-6
8.2.12 Main Detail and Location 8-6
8.2.13 Manhole Detail and Location 8-6
8.2.14 Catchbasin Lead Detail and Location 8-7
8.2.15 Outfall Detail 8-8
8.3 Major System 8-8
8.3.1 Composition and Control 8-8
8.3.2 Return Period Event 8-8
8.3.3 On-Street Storage and Flow- Across Considerations 8-8
8.3.4 Grading of Lots 8-9
8.3.5 Inlet/Outlet Control Devices 8-9
8.4 Storm Water Wet/Dry Pond Facilities 8-9
8.4.1 Overview 8-9
8.4.2 Wet Ponds 8-10
8.4.3 Dry Ponds 8-11
8.5 Receiving Waters 8-11
8.6 Culverts and Bridges 8-11
8.7 Surface Drainage (Swales) 8-12
8.8 Testing 8-12

8.1 General

The storm sewers in urban areas shall be designed as a separate system and shall be of sufficient capacity to carry storm sewer runoff from the ultimate catchment. The storm sewer should be designed considering both the minor and major drainage systems.

Control shall be provided to minimize sediment discharge into the storm sewers. This shall be in the form of properly graded and surfaced streets and lanes, landscaping, sediment control structures at pond and lake inlets, or other means where appropriate.

Effluent from sanitary sewers and any drainage from industrial, agricultural or commercial operations that may potentially be contaminated shall not be discharged into the storm sewers.

The storm system must be approved by the Municipal Engineer and Alberta Environmental Protection Services.

As a guideline for raw land a pre-development flow of 0.55 to 0.70 cu. meters / sec per Km^2 is to be used. The allowable flows for a particular development may be increased if it can be proven that the actual pre-development flow was greater. Each development is to be evaluated on an individual case basis. This would involve a study by a qualified hydrologist to determine actual pre-development rates and an analysis of downstream constraints if any exist.

8.2 Minor System

8.2.1 System Components

The minor system comprises piping, manholes, catch basins and outfall structures. The minor system shall convey runoff from snowmelt and rainfall events to an adequate receiving body of water (river, stream, lake or pond) without sustaining any surface ponding, excessive surface flows, downstream erosion, or flooding for events up to and including a 1-in-5-year return period. Where required by the Municipal Engineer, high value commercial areas shall have their minor systems designed to accommodate the 1-in-10-year return period.

Detention facilities shall be designed as part of both the minor and major drainage systems. They must control the peak runoff conditions for events up to the 1-In-100- year return period.

8.2.2 Roof Drainage

Roof drainage from one-family and two-family dwellings shall discharge to grassed or pervious drainage areas. The point of discharge shall be a minimum distance of 1.5 m away from the building to ensure the water flows away from it. Roof drainage from apartment buildings, commercial areas, and industrial areas may discharge to the storm sewer if approved by the Municipal Engineer.

8.2.3 Ponding

Ponding of runoff on roofs, parking lots or landscaped areas to reduce runoff rates must be approved by the Municipal Engineer.

8.2.4 Sump Pumps

All developments shall provide sump pumps to discharge weeping tile water to the surface and away from the building.

8.2.5 Storm Catchment Calculations

The following criteria shall be used in the design of the minor storm sewer system:

a) For areas less than 65 ha:

- As an option to computer modeling, the Rational Method of storm sewer system may be used.

$$Q = 2.78\ CIA$$

Where: Q = the design peak flow rate in liters per second

I = the intensity of rainfall in millimeters per hour corresponding to the time of concentration

A = the contributing area in hectares

C = the runoff coefficient

- The five-year and the one-hundred-year rainfall intensity table developed by Atmospheric Environment Services for the Grande Prairie Airport shall be used as shown on Tables 8.1a and 8.1.b.
- Runoff coefficients shall be according to Table 8.2.
- For developed areas, the weighted average of pervious and impervious area runoff coefficients shall be estimated from the following equation:

$$C = \frac{C_p A_p + c_1 A_1}{A_p + A_1}$$

Where: subscript *p* = pervious surfaces, and

subscript 1 = impervious surfaces

- For planning of new areas, the minimum “C" value for various land uses are summarized in Table 8.2.

- The duration of rainfall used to determine the intensity is equal to the time of concentration. The time of concentration is comprised of the overland time to the storm sewer inlet and the time of travel in the conduit.

- The minimum time of concentration shall be:

    - 15 minutes for residential and parklands
    - 10 minutes for all other lands.

b) For areas greater than or equal to 65 ha:

- Computer models shall be used to determine design flows and the sizing of systems which contain non-pipe storm water management facilities (e.g. detention ponds) or systems that include a significant amount of undeveloped land.

- The selection of an appropriate computer model shall be based on an understanding of the principles, assumptions, and limitations in relation to the system being designed.

- Where new developments connect to existing developments, the computer model shall be calibrated utilizing flow monitoring information. In all analyzes, the parameters used, the drainage boundaries, the pipe network and its connectivity shall be clearly identified on the overall plan in the Detailed Engineering Drawings, computer printouts and a design summary report.

- The design storm hyetograph shall be the four-hour Chicago distribution. See Table 8.3

- Design of storm water ponds shall also include the 12 hour AES (Atmospheric Environment Services) (Table 8.4) and the 24 hours SCS (Soil Conservation Services) design storms (Table 8.5). The largest storage requirement will determine the pond size.

8.2.6 Velocity/Slope

The minimum velocity shall be 0.6 m/s. Where velocities in excess of 3 m/s are attained, special provisions shall be made to protect against displacement by erosion or impact.

Pipe Size	Min. Slope
300 mm	0.22 %
375 mm	0.15 %
450 mm	0.12 %
525 mm	0.10 %
600 mm and larger	0.10 %

8.2.7 "n" Valves

Pipe sizing shall be determined by utilizing the Manning's Formula, using an "n" value of 0.013 for concrete and plastic pipes.

8.2.8 Hydraulic Gradeline

Storm sewer pipe shall be designed to convey the design flow when all pipes are flowing full, with the hydraulic grade line occurring at the pipe obvert / crown.

All pipe obvert elevations must match at manhole junctions to carry the hydraulic gradient.

8.2.9 Maximum Surface Drainage

Surface water shall not be permitted to run a distance greater than the following, without provision for interception by the first catch basin or catch basin manhole, as the case may be:

- Paved Lanes as measured in the center line of the lane
    - 200 meters or the intersection of the curb/gutter or shoulder of a road, whichever is shorter, for longitudinal grades greater than 1 %,
    - 150 meters or the intersection of the curb/gutter or shoulder of a road, whichever is shorter, for longitudinal grades between 0.7% and 1 %.
- Local Roads as measured in a continuous concrete gutter or road shoulder
    - 200 meters with longitudinal grades greater than 1 % ,
    - 150 meters with longitudinal grades between 0.5% and 1.
- In all cases, an analysis of catch basin grate capability will be required to determine if the system requires a double set of catch basins to accommodate the volume of water carried over that distance.
- Collectors or Arterial roads, as measured in a continuous concrete gutter or road shoulder shall not exceed 120 meters.
- On PUL lots, as measured in the grass swale, the maximum distance shall be 120 meters at a minimum longitudinal grade of 0.5%.

8.2.10 Drainage Interception

Surface water shall be intercepted with an adequate number of catch basins such that the inlet capacity is sufficient to receive the design storm water flow. Catch basin capacity shall be considered as shown on Table 8.6 where values are given for sag conditions and on slope conditions based upon inlet grate type.

8.2.11 Minimum Gutter Grade

The minimum gutter grade shall be 0.50%, and 0.80% at a curb return.

8.2.12 Main Detail and Location

The minimum size of storm sewer mains shall be 300mm in diameter.

Pipe classes shall be determined to withstand subsequent superimposed loading. Approved Class B granular bedding shall be used with all size pipes having water tight joints. CSP pipe is not considered as having water tight joints, and will require Class B crushed gravel bedding.

- Various factors affecting the pipe class shall be taken into account, and pipe class shall be evaluated as per standard engineering practice, and clearly identified on the Detailed Engineering Drawings.

Mains shall be installed to provide a minimum cover to top of pipe of 1.50 m from the final finished surface grade.

Mains shall be located within the right-of-way in accordance with Cross Sections.

Curved sewers will be allowed as per details in Section 6 of the Sanitary Sewer System.

Storm main(s) shall be separated by a minimum horizontal distance from the water main(s) by 2.5 meters

At crossings, storm main(s) shall be separated by a minimum vertical distance from the water main(s) by 500 mm. measured from the outside walls of the pipes.

At crossings, storm main(s) shall be separated by a minimum vertical distance from the sanitary main(s) by 500 mm measured from the outside walls of the pipes.

8.2.13 Manhole Detail and Location

Manholes shall require:

- Safety platforms at intermediate levels greater than 6.5m in depth.
- Manholes shall be located at the upstream end of each line, at all changes in pipe size, grade, material and alignment. Under no circumstances will

manholes be permitted in driveways or private property. Due consideration should be given to access by a flusher truck.

- Benching in manholes shall be provided to minimize hydraulic losses. The downstream invert in a manhole shall be a minimum of 30mm lower than the lowest upstream invert. At a change in direction, the drop shall be at least 60mm. If an influent pipe diameter is greater than 525mm and the bend is greater than 45 degrees or if the outflow pipe velocity exceeds 1.5 m/s, then minor losses shall be considered.

- Tee riser manholes may be utilized on lines 900mm in diameter and larger. Tee riser manholes must be bedded in concrete to the spring line of the pipe.

- Manhole spacing on storm sewers may not exceed 120m.

- Manhole spacing on curved sewers will be allowed as per details in Section 6 of the Sanitary Sewer System.

- Manhole bases should be reinforced concrete poured-in place, precast slabs, vaults, or precast tees.

8.2.14 Catch basin Lead Detail and Location

Catch basin leads shall:

- Be installed only into manholes or catch basin manholes, as the case may be.

- Catch basin leads shall be installed to maintain designed hydraulic gradient within the system, and shall be installed matching the senior pipe obvert.

- Have a minimum lead size of 300mm in diameter with a minimum grade of 2.0%.

- The maximum length of a catch basin lead shall be 30m.

- If a lead of over 30m in length is required, a catch basin manhole shall be installed at the upper end.

- Catch basin leads shall have a minimum cover of 1.20 m from the finished road surface to the top of pipe.

Refer to Standard Drawing Detail No. 8.1, Precast concrete.

8.2.15 Outfall Detail

Obverts of outfall pipes shall have at least 150 mm above the 1-in-5-year flood level in the receiving stream.

Inverts of outfall pipes shall be above the winter ice level. Otherwise, outfall pipes shall be located to avoid damage from moving ice during breakup.

Drop structures and energy dissipaters shall be used where necessary to prevent erosion.

Facilities shall be provided which will prevent entry or access by children.

The outfall shall require the approval of the Municipal Engineer.

8.3 Major System

8.3.1 Composition and Control

The major system comprises the street system, detention facilities, parkland and any other land required to convey runoff from events up to and including a 1-in-100-year return period to the receiving water. The major system shall be evaluated in a manner sufficient to ensure that no flooding that may cause significant property damage (e.g. flooding of buildings) occurs during the 1-in-100-year event.

Detention facilities shall be designed as part of both the minor and major drainage systems. They must control the peak run-off condition for events up to the 1-in-100 year return period.

8.3.2 Return Period Event

The major drainage system shall be assessed with respect to the 1-in-100-year return period event. New developments must also accommodate the major flows from adjacent developments.

8.3.3 On-Street Storage and Flow- Across Considerations

The grading of streets and the layout of the major drainage system shall be assessed, relative to the following guidelines, during the 1-in-100-year event:

- Storm water will be contained within County property.
- No building shall be inundated at its ground line.
- Continuity of the overland flow routes between adjacent developments shall be maintained.
- The depth of water for all roads should be less than the following:

- All ponding areas are to be denoted on the detailed engineering drawings and to adhere to Alberta Environment's standards regarding depth.

- The velocities and depths of flow in the major drainage system shall not exceed the values outlined in Table 8.7.

- The major overland route and calculated depth of ponding shall be clearly identified on the overall lot grading plan of development.

8.3.4 Grading of Lots

See Section 14: Lot Grading

8.3.5 Inlet/Outlet Control Devices

Orifice plates or "hydro-brakes" shall be employed as outlet control devices. Controlling flow by restricting pipe diameter and slope should not be approved. Inlet control, utilizing different styles of catch basin grates is also recommended.

8.4 Storm Water Wet/Dry Pond Facilities

8.4.1 Overview

Detention facilities and the entire area that would be submerged by the 1-in-100 year event shall be contained on County property. The need for a specific detention facility shall require the approval of the Municipal Engineer. In assessing the need for specific detention facilities, the Developer's Engineer must consider the impacts of uncontrolled drainage as well as the capital and operating costs of providing control.

Soil investigations specific to the detention facility shall be undertaken to determine appropriate design factors. Where the facility is sited above a shallow aquifer the potential for groundwater contamination must be minimized.

Wet pond detention facilities shall be designed for utilization of impervious soils to minimize water losses during dry weather periods. Intruding silt or sand seams shall be sealed off.

Where a detention facility is to have multiple functions, its design shall consider the aesthetic implications of shape, grading and landscape features. The Municipal Engineer should be contacted to provide input during the conceptual stages.

An emergency overflow system shall drain to a receiving stream, if possible, for storms greater than the 1-in-100-year event.

The effects of the maximum pond water levels shall be considered in the design of the minor system and lot grading. The hydraulic grade line elevations for the minor system

piping shall be calculated starting from the maximum ponding level during the 1-in-5-year storm event.

The maximum water level fluctuation for detention ponds in residential areas during the 1-in-100-year storm event shall be 1.5 m.

Underground storage tanks shall be considered only if no other economical alternative means of storage is feasible.

Parking lot and rooftop storage shall be considered only for developments where the facilities are part of the project. Proposals that rely on third party implementation shall not be accepted.

Infiltration and evaporation facilities will not be approved.

8.4.2 Wet Ponds

In design, wet ponds shall:

- Be located at local low points or adjacent to an existing water course and shall have a minimum surface area at normal water level of 2 hectares,
- Have a minimum permanent pool depth of 2.0 meters and a maximum permanent pool depth of 3.0 meters. The maximum water level should be below adjacent house basement footings.
- Have side slopes no steeper than 3 (horizontal) to 1 (vertical) from the bottom of the pond to one meter (vertical) below normal water level; from here to 5 m (horizontal) beyond the 1-in-100-year flood level, the side slopes shall be no steeper than 5 (horizontal) to 1 (vertical). Above this elevation, the slope shall be no steeper than 4 (horizontal) to 1 (vertical),
- Have inorganic shoreline treatment for 1.5 m below and 3.0 m horizontally above the normal water level; the edge treatment shall be compatible with adjacent land use and consider safety, maintenance and access,
- Have inlets and outlets submerged below ice level and above the level of anticipated sediment accumulation; the obverts shall be at least 1.0 m below the normal water level, with less than 10 meters of pipe allowed to be flooded.
- Have provision for sediment accumulation at the points of inflow, and for the later removal of the sediment,
- Address all safety issues,
- Have no dead bay areas, and
- Have inlets located across the pond from the outlet to encourage water circulation.

8.4.3 Dry Ponds

In design, dry ponds shall:

- Have a low flow bypass for flows from minor events,
- Have a bottom with a minimum longitudinal slope of 1%,
- Have a bottom with a minimum lateral slope of 2.0%,
- Have French drains where longitudinal slopes are less than 1.0% or when lateral slopes are less than 2.0%,
- Have side slopes flatter than 4 (horizontal) to 1 (vertical),
- Have length, width and depth dimensions that are acceptable to the Municipal Engineer. Maximum ponded water depth for the 1:100-year event is 1.5 at the deep end,
- Have trash bars on inlets and outlets to preclude access by children, and
- Address all safety issues (particularly during operation).

8.5 Receiving Waters

Measures should be incorporated in new development to prevent any increase in the amount of downstream erosion.

If a development will cause downstream erosion despite the use of on-site peak runoff rate controls, appropriate measures should be constructed in the downstream areas.

Preservation of watercourse aesthetics and wildlife habitat should be considered in erosion and bank stability work.

8.6 Culverts and Bridges

Culvert and bridge design should consider backwater effects over a range of flows. The design of a hydraulic structure requires assessment of both its nominal design "capacity" and its performance during the 1-in-100-year event. The intensity-duration-frequency curves developed by Atmospheric Environment Services of Environment Canada for the Grande Prairie Airport shall be used. The results of their most recent analysis are summarized in Tables 8.1a and 8.1b.

8.7 Surface Drainage (Swales)

Drainage swales, whether on municipal or private property (through drainage easements), shall be constructed completely prior to any development of subdivision lots. Drainage swales running between adjacent private lots shall be constructed of concrete along their entire length to ensure lots are graded to the correct elevation.

Design and construction shall be of an acceptable quality to County requirements. A detailed design shall be submitted to the Municipal Engineer, including a brief explaining:

- Materials to be used,
- Design calculations,
- Explanation of design features which eliminate or minimize the possibility of damage to the drainage swale by activities within the subdivision.

8.8 Testing

The design must be conducive to achieving appropriate construction results as per County approvals.

Table 8.1a
Rainfall Intensities based on 5 year 1-D-F Curve
Grande Prairie Airport

Time in Minutes	Intensity (mm/hr)	Time in Minutes	Intensity (mm/hr)	Time in Minutes	Intensity (mm/hr)	Time in Minutes	Intensity (mm/hr)	Time in Minutes	Intensity (mm/hr)
1	204	*21*	31	*41*	21	*61*	16	*81*	14
2	133	*22*	31	*42*	21	*62*	16	*82*	14
3	104	*23*	30	*43*	20	*63*	16	*83*	14
4	87	*24*	29	*44*	20	*64*	16	*84*	13
5	76	*25*	28	*45*	20	*65*	16	*85*	13
6	68	*26*	28	*46*	19	*66*	16	*86*	13
7	62	*27*	27	*47*	19	*67*	15	*87*	13
8	57	*28*	26	*48*	19	*68*	15	*88*	13
9	53	*29*	26	*49*	19	*69*	15	*89*	13
10	50	*30*	25	*50*	18	*70*	15	*90*	13
11	47	*31*	25	*51*	18	*71*	15		
12	44	*32*	24	*52*	18	*72*	15	*120*	11
13	42	*33*	24	*53*	18	*73*	15		
14	40	*34*	23	*54*	18	*74*	15	*240*	7
15	39	*35*	23	*55*	17	*75*	14		
16	37	*36*	23	*56*	17	*76*	14		
17	36	*37*	22	*57*	17	*77*	14		
18	35	*38*	22	*58*	17	*78*	14		
19	33	*39*	21	*59*	17	*79*	14		
20	32	*40*	21	*60*	17	*80*	14		

Table 8.1b
Rainfall Intensities based on 100 year 1-D-F Curve
Grande Prairie Airport

Time in Minutes	Intensity (mm/hr)	Time in Minutes	Intensity (mm/hr)	Time in Minutes	Intensity (mm/hr)	Time in Minutes	Intensity (mm/hr)	Time in Minutes	Intensity (mm/hr)
1	204	*21*	31	*41*	21	*61*	16	*81*	14
2	133	*22*	31	*42*	21	*62*	16	*82*	14
3	104	*23*	30	*43*	20	*63*	16	*83*	14
4	87	*24*	29	*44*	20	*64*	16	*84*	13
5	76	*25*	28	*45*	20	*65*	16	*85*	13
6	68	*26*	28	*46*	19	*66*	16	*86*	13
7	62	*27*	27	*47*	19	*67*	15	*87*	13
8	57	*28*	26	*48*	19	*68*	15	*88*	13
9	53	*29*	26	*49*	19	*69*	15	*89*	13
10	50	*30*	25	*50*	18	*70*	15	*90*	13
11	47	*31*	25	*51*	18	*71*	15		
12	44	*32*	24	*52*	18	*72*	15	*120*	11
13	42	*33*	24	*53*	18	*73*	15		
14	40	*34*	23	*54*	18	*74*	15	*240*	7
15	39	*35*	23	*55*	17	*75*	14		
16	37	*36*	23	*56*	17	*76*	14		
17	36	*37*	22	*57*	17	*77*	14		
18	35	*38*	22	*58*	17	*78*	14		
19	33	*39*	21	*59*	17	*79*	14		
20	32	*40*	21	*60*	17	*80*	14		

Table 8.2
RECOMMENDED MINIMUM RUNOFF COEFFICIENTS

Land Use or Surface Characteristics	Rainfall Event Return Period		
	5 Years	10 Years	100 Years
Residential	0.35	0.40	0.60
Apartments[1]	0.70	0.70	0.80
Downtown Commercial[1]	0.85	0.90	0.90
Neighbourhood Commercial[1]	0.65	0.70	0.80
Light Industrial[2]	0.60	0.70	0.70
Lawns, Parks, Playgrounds	0.20	0.25	0.30
Undeveloped Land (Farmland)	0.10	0.15	0.20
Paved Streets	0.90	0.95	0.95
Gravel Street	0.25	0.35	0.65

[1] Where specific land surfaces are known for Apartment and Commercial areas, the runoff coefficient may be determined based on the surface characteristics for the ultimate development conditions.

[2] Runoff coefficients for industrial land use must be estimated based on ultimate land use condition.

Note: Values are the recommended minimum for use in the Rational Method.

Table 8.3
County of Grande Prairie
Design Storm Hyetographs
Based on Chicago Distribution 4-Hour Design Storms Rainfall Intensity in mm/h

Time (minutes)	1-in-5 Year Storm	1-in-10-Year Storm	1-in-25-Year Storm	1-in-100-Year Storm
5.0	1.9	1.9	2.2	3.6
10.0	2.0	2.1	2.4	3.8
15.0	2.1	2.2	2.5	4.1
20.0	2.4	2.4	2.7	4.3
25.0	2.6	2.5	2.9	4.6
30.0	2.8	2.8	3.2	5.2
35.0	3.1	3.0	3.5	5.7
40.0	3.5	3.3	3.9	6.3
45.0	3.9	3.7	4.4	7.7
50.0	4.5	4.2	5.1	8.9
55.0	5.3	5.0	6.0	10.6
60.0	6.5	6.2	7.4	13.9
65.0	8.3	8.1	9.9	18.2
70.0	12.4	12.2	15.2	26.2
75.0	27.0	26.9	34.0	41.0
80.0	69.8	83.2	100.2	125.2
85.0	33.1	33.8	43.3	60.6
90.0	19.7	19.7	23.7	43.1
95.0	13.8	13.8	15.2	32.1
100.0	10.8	10.7	13.2	23.3
105.0	9.0	8.8	10.7	19.5
110.0	7.7	7.5	9.1	16.4
115.0	6.8	6.5	7.9	13.6
120.0	6.0	5.8	7.0	12.0
125.0	5.4	5.2	6.3	10.6
130.0	4.8	4.8	5.7	9.5
135.0	4.5	4.4	5.2	8.4
140.0	4.2	4.1	4.8	7.8
145.0	3.9	3.8	4.6	7.3

150.0	3.7	3.6	4.3	6.9
155.0	3.5	3.4	4.0	6.5
160.0	3.3	3.2	3.8	6.1
165.0	3.2	3.1	3.6	5.8
170.0	3.0	2.9	3.4	5.4
175.0	2.9	2.8	3.3	5.2
180.0	2.8	2.7	3.1	5.0
185.0	2.7	2.6	3.0	4.8
190.0	2.6	2.5	2.9	4.6
195.0	2.4	2.4	2.8	4.4
200.0	2.2	2.3	2.7	4.3
205.0	2.1	2.2	2.6	4.1
210.0	2.1	2.2	2.5	4.0
215.0	2.0	2.1	2.4	3.9
220.0	2.0	2.1	2.4	3.7
225.0	1.9	2.0	2.3	3.7
230.0	1.9	1.9	2.2	3.5
235.0	1.8	1.9	2.1	3.5
240.0	1.8	1.8	2.1	3.4
TOTAL ppt	28.0	28.9	34.8	53.5

Table 8.4
County of Grande Prairie
Design Storm Hyetographs
Based on Atmospheric Environment Services (AES)
12-hour Design Storm

Time (hours)	Discrete Rainfall (%)	Rainfall (mm/hr)
0	0	0
1	1	0.8
2	5	3.8
3	18	13.8
4	33	25.3
5	16	12.3
6	11	8.4
7	7	5.4
8	4	3.1
9	2	1.5
10	1	0.8
11	1	0.8
12	1	0.8
Total Precipitation (mm)		76.6

Table 8.5
County of Grande Prairie
Design Storm Hyetographs
Based on SCS Type II 24-Hour Design Storm

Time (hours)	Increased Curve Value	Rainfall (mm/hr)	Time (hours)	Increased Curve Value	Rainfall (mm/hr)	Time (hours)	Increased Curve Value	Rainfall (mm/hr)
0.0	0.000	0.00	8.0	0.004	2.00	16.0	0.006	3.0
0.2	0.002	1.00	8.2	0.006	3.00	16.2	0.004	2.0
0.4	0.002	1.00	8.4	0.006	3.00	16.4	0.004	2.0
0.6	0.002	1.00	8.6	0.006	3.00	16.6	0.004	2.0
0.8	0.002	1.00	8.8	0.006	3.00	16.8	0.004	2.0
1.0	0.002	1.00	9.0	0.006	3.00	17.0	0.004	2.0
1.2	0.002	1.00	9.2	0.006	3.00	17.2	0.004	2.0
1.4	0.002	1.00	9.4	0.006	3.00	17.4	0.004	2.0
1.6	0.002	1.00	9.6	0.006	3.00	17.6	0.004	2.0
1.8	0.002	1.00	9.8	0.006	3.00	17.8	0.004	2.0
2.0	0.002	1.00	10.0	0.006	3.00	18.0	0.004	2.0
2.2	0.002	1.00	10.2	0.011	5.50	18.2	0.004	2.0
2.4	0.002	1.00	10.4	0.011	5.50	18.4	0.004	2.0
2.6	0.002	1.00	10.6	0.011	5.50	18.6	0.004	2.0
2.8	0.002	1.00	10.8	0.011	5.50	18.8	0.004	2.0
3.0	0.002	1.00	11.0	0.011	5.50	19.0	0.004	2.0
3.2	0.002	1.00	11.2	0.015	7.50	19.2	0.003	1.5
3.4	0.002	1.00	11.4	0.022	11.00	19.4	0.003	1.5
3.6	0.002	1.00	11.6	0.050	25.10	19.6	0.003	1.5
3.8	0.002	1.00	11.8	0.110	55.10	19.8	0.003	1.5
4.0	0.002	1.00	12.0	0.230	115.2	20.0	0.003	1.5
4.2	0.004	2.00	12.2	0.040	20.0	20.2	0.003	1.5
4.4	0.004	2.00	12.4	0.025	12.5	20.4	0.003	1.5
4.6	0.004	2.00	12.6	0.018	9.0	20.6	0.003	1.5
4.8	0.004	2.00	12.8	0.017	8.5	20.8	0.003	1.5

5.0	0.004	2.00	13.0	0.012	6.0	21.0	0.003	1.5
5.2	0.004	2.00	13.2	0.010	5.0	21.2	0.002	1.0
5.4	0.004	2.00	13.4	0.010	5.0	21.4	0.002	1.0
5.6	0.004	2.00	13.6	0.010	5.0	21.6	0.002	1.0
5.8	0.004	2.00	13.8	0.010	5.0	21.8	0.002	1.0
6.0	0.004	2.00	14.0	0.010	5.0	22.0	0.002	1.0
6.2	0.004	2.00	14.2	0.006	3.0	22.2	0.002	1.0
6.4	0.004	2.00	14.4	0.006	3.0	22.4	0.002	1.0
6.6	0.004	2.00	14.6	0.006	3.0	22.6	0.002	1.0
6.8	0.004	2.00	14.8	0.006	3.0	22.8	0.002	1.0
7.0	0.004	2.00	15.0	0.006	3.0	23.0	0.002	1.0
7.2	0.004	2.00	15.2	0.006	3.0	23.2	0.002	1.0
7.4	0.004	2.00	15.4	0.006	3.0	23.4	0.002	1.0
7.6	0.004	2.00	15.6	0.006	3.0	23.6	0.002	1.0
7.8	0.004	2.00	15.8	0.006	3.0	23.8	0.002	1.0
						24.0	0.002	1.0
						Total Precipitation (mm)		100.6

Table 8.6
CATCH BASIN CAPACITIES (L/S)

	Flow Condition	
Catch basin	Continuous Slope	Sump Condition
F33	11	20
F36	10	23
F38, F39	20	38
F51	40	80
K2	25	45

Note: Capacities for F33 and F36 are based on hydraulic studies on units. Continuous slope capacity based on gutter flow of 40 L/s (1.4 cfs). Sump capacity is based on 5 cm (2 in) head.

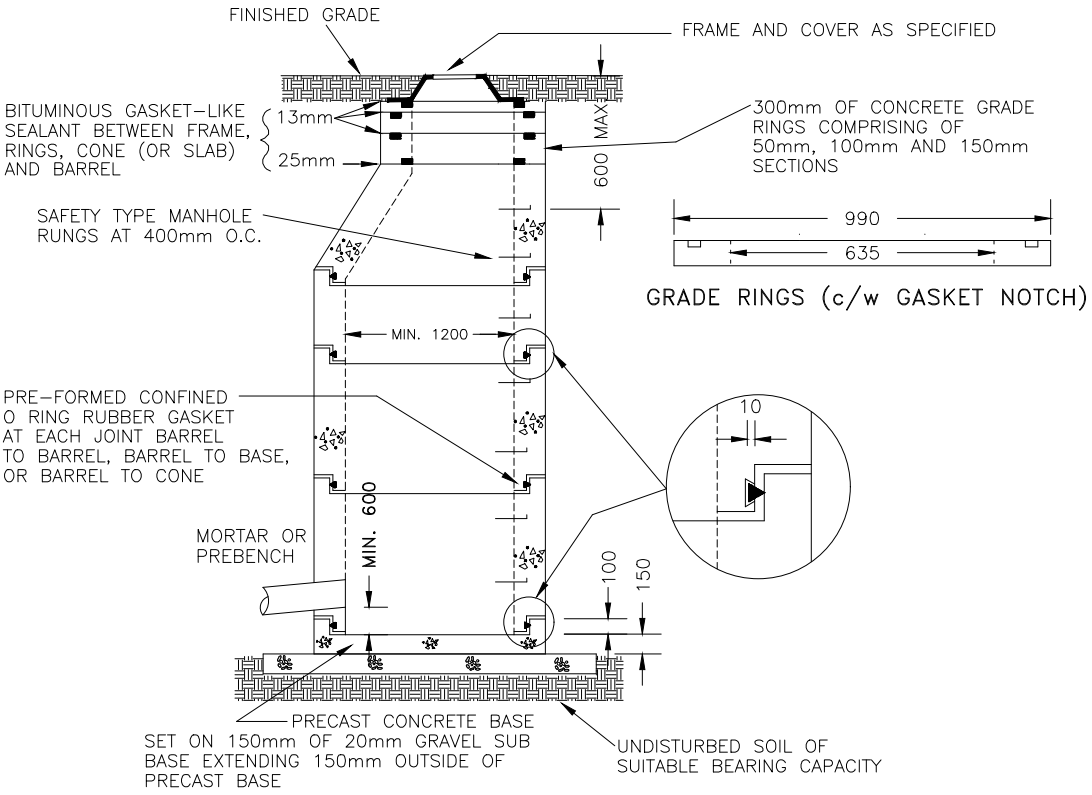
Continuous slope capacity based on ratios for F33 and F36 tests. Sump capacity based on 65% of theoretical capacity for 5 cm (2 in) head.

Capacities can be considered to be double those shown in the table when assessing the 1-in-100-year event.

Table 8.7
PERMISSIBLE DEPTHS FOR SUBMERGED OBJECTS

Water Velocity (m/s)	Permissible Depth (m)
0.5	0.8
1	0.32
2	0.21
3	0.09

Note: Based on a 20 kg child and a concrete lined channel. Larger persons may be able to withstand deeper flows.



COUNTY of GRANDE PRAIRIE No. 1

PRECAST CONCRETE CATCH BASIN MANHOLE

DATE:	2002-05-01	DRAWN BY:	GWA	APPROVED:	DRAWING 8.1
SCALE:	NOT TO SCALE	CHECKED BY:	BHG		

SECTION 9 Roadway Systems

9.1 General 9-4
9.2 Roadway Classifications 9-4
9.2.1 General 9-4
9.2.2 Access Road or Service Road 9-4
9.2.3 Local Road 9-4
9.2.4 Collector Road 9-5
9.2.5 Arterial Road 9-5
9.3 Design Criteria – Urban Standard 9-5
9.3.1 General 9-5
9.3.2 Vertical Alignment 9-6
9.3.2.1 Grades 9-6
9.3.2.2 Crown and Cross-Fall 9-6
9.3.2.3 Vertical Curves 9-6
9.3.2.4 Approach Grades 9-7
9.3.3 Horizontal Alignment 9-7
9.3.3.1 Minimum Radius for Roads 9-9
9.3.3.2 Minimum Radii for Cul-De-Sacs 9-9
9.3.3.3 Maximum Length of Cul-De-Sacs 9-9
9.3.4 Concrete Curb and Gutter 9-9
9.3.4.1 General 9-9
9.3.4.2 Curb Return 9-9
9.3.4.3 Vertical Face Curb and Gutter 9-10
9.3.5 Pavement Structure 9-10
9.3.5.1 Staged Construction 9-10
9.3.5.2 Pavement Design 9-10
9.3.5.3 Pavement Structures 9-11
9.4 Separations in Road Right of Ways - Urban Standard 9-13
9.4.1 Storm and Sanitary Mains 9-13
9.4.2 Curb Stop and Shallow Utility Crossings 9-13
9.4.3 Residence 9-13
9.4.4 Easements 9-14
9.4.5 Sidewalks 9-14

County of Grande Prairie No. 1 Alberta, Canada

9.4.6 Hydrant and Hydrant Valve 9-14
9.4.7 Watermain and Sanitary Sewer 9-14
9.4.8 Watermain and Storm Sewer 9-14
9.4.9 Edge of Concrete Works 9-15
9.5 Temporary Access Roads - Urban Standard 9-15
9.5.1 Temporary Road 9-15
9.5.2 Temporary Cul-De-Sac 9-15
9.5.3 Detailed Engineering Drawings 9-16
9.6 Sidewalks and Trails 9-16
9.7 Driveways 9-16
9.8 Lanes 9-16
9.9 Intersections 9-17
9.10 Design Criteria - Rural Standard 9-17
9.10.1 General 9-17
9.10.2 Geometric Design 9-18
9.10.3 Road Intersections 9-18
9.10.4 No Exit Roads 9-19
9.10.5 Culverts And Drainage 9-19
9.10.6 Road Approaches 9-20
9.10.7 Utilities 9-21
9.10.8 Pavement Structure 9-21
9.10.9 Staged Asphalt Construction – High Density Residential 9-23
9.11 Construction Standards and Materials 9-23
9.11.1 Roadway Preparatory Work 9-23
9.11.2 Road Grade Construction 9-23
9.11.2.1 Roadway Excavation 9-23
9.11.2.2 Roadway Embankment 9-24
9.11.2.3 Subgrade Preparation 9-25
9.11.3 Gravel and Granular Course Base 9-25
9.11.3.1 General 9-25
9.11.3.2 Pit Run Gravel 9-25
9.11.3.3 Sub-Base Gravel 9-26
9.11.3.4 Surfacing Gravel 9-26
9.11.3.5 Granular Base Course 9-27
9.11.3.6 Testing Requirements of The Developer/Contractor 9-28

9.11.4 Asphaltic Concrete Pavement 9-29
9.11.4.1 General 9-29
9.11.4.2 Materials 9-29
9.11.4.3 Asphalt Cement 9-30
9.11.4.4 Aggregate 9-30
9.11.4.5 Mix Design Requirements 9-31
9.11.4.6 Variation from Approved Job Mix Formula 9-32
9.11.4.7 Asphalt Mix Verification 9-32
9.11.4.8 Preparation 9-33
9.11.4.9 Placement 9-33
9.11.4.10 Prime Coat, Tack Coat and Fog Coat 9-35
9.11.4.11 Thickness 9-36
9.11.4.12 Density 9-37
9.11.5 Asphalt Testing 9-38
9.11.5.1 Urban 9-38
9.11.5.2 Representative Core – Urban 9-39
9.11.5.3 Rural 9-39
9.12 Quality Control and Testing 9-41

9.1 General

Roadways in subdivision development areas within the County of Grande Prairie shall be developed to an urban or rural cross-section with overland swales to accommodate storm water and snowmelt runoff.

The standards outlined herein are intended to be the minimum acceptable standards, not the standard. It is the Developer and the Developer's Engineer's responsibility to develop the subdivision roadways to meet or exceed the standards in accordance with good engineering practices, specific site condition requirements, and as may be required by the Municipal Engineer.

9.2 Roadway Classifications

9.2.1 General

Roadway classifications in these standards are limited to the type of roadways that could typically be required to be provided by a Developer.

Roadway classifications and designations in subdivision development areas shall generally follow the classification system outlined in the Transportation Association of Canada Geometric Design Guide for Canadian Roads and Streets.

Individual roadway classifications are further based on their functional use as established by the County of Grande Prairie and as shown in Table 9.1.

9.2.2 Access Road or Service Road

An access road or service road is a low-speed, low-volume road whose purpose is to provide access to adjacent properties. Access roads connect with local roads and in limited cases, collector roads. This classification is also applicable to roads that provide access to a limited number of properties, such as properties along a short no exit road or cul-de-sacs. Stub roads are included in this definition.

Typical cross-sections are illustrated in Drawings No. 9.10 and 9.26.

9.2.3 Local Road

A local road is an internal subdivision road whose primary purpose is to provide property access.

In addition to providing property access, local roads connect lanes and local roads to collector roads.

Typical cross-sections of residential and commercial/industrial local roads are illustrated in Drawings No. 9.4, 9.5, 9.26, and 9.28.

9.2.4 Collector Road

A collector road collects traffic from local roads and feeds it to arterial roads such as County grid roads or provincial highways, or distributes the traffic from arterial roads to local roads. The *"collector road"* classification is also applicable to subdivision roads that provide access through the subdivision and that provide access to two or more subdivisions. In addition to the movement of traffic, collector roads also provide access to adjacent properties.

Typical cross-sections of residential and commercial/industrial collector roads are illustrated in Drawings No. 9.6, 9.7, 9.8, 9.9, 9.11, 9.12, 9.27 and 9.29.

9.2.5 Arterial Road

An arterial road is a high capacity road designed to move traffic from collector roads to higher order roads such as freeways, expressways or provincial highways and between urban centers at the highest level of service possible. Access to adjacent properties is controlled on arterial roads in order to move traffic with minimal interruptions over longer distances. Parking is not permitted on arterial roads.

Typical cross-sections of urban arterial roads are illustrated in Drawings No. 9.01, 9.02, 9.1, 9.2 and 9.3.

For Residential Subdivision and Rural Standard Road Classifications; Refer to Standard Drawing Detail No. 9.25.

9.3 Design Criteria – Urban Standard

9.3.1 General

Roads and streets shall be designed in accordance with the geometric design standards outlined in the latest edition of the County of Grande Prairie Minimum Design Standards, Transportation Association of Canada Geometric Design Guide for Canadian Roads and Streets and Alberta Transportation and Utilities - Highway Geometric Design Guide; urban standards as identified in the County of Grande Prairie's municipal plans and statutory plans.

The County of Grande Prairie geometric design standards as outlined in Table 9.1 and Table 9.2, shall be incorporated into roadway designs.

Roundabouts for new developments shall be designed in accordance with *"Roundabouts: An Informational Guide Second Edition, U.S. Department of Transportation, Federal Highway Administration, Publication No. NCHRP-672, March 2010",* or its most recent version.

9.3.2 Vertical Alignment

9.3.2.1 Grades

Minimum gutter grades for concrete structures around all curves and along all tangents shall not be less than 0.5%. Minimum gutter grades on curb returns shall be 0.8%.

Maximum gutter grades shall not exceed those defined by tables in this Section.

Rear lanes shall have a minimum longitudinal grade of 0.7%. Paved lanes shall have a center swale and cross slopes of 2.5%.

9.3.2.2 Crown and Cross-Fall

All roads shall be crowned or shall have a cross-fall as shown on the Typical Detail Drawings at the end of this section. The standard cross-fall and curve rate is 2.5%. Cross falls are not permitted on local and collector roads.

9.3.2.3 Vertical Curves

All vertical curves shall be designed to meet or exceed the following minimum requirements:

	K Value	
Design Speed km/h	**Crest m**	**Sag * m**
50	7	12
60	13	18
70	23	25
80	36	32

K = L/A which represents a horizontal distance over which there is a change of grade of 1 %.
L = Horizontal length of vertical curve in meters
A = Algebraic difference in grades in percent
* = Based on comfort control and assumes street lighting

9.3.2.4 Approach Grades

Approach grades from any designation of road, for a distance of 30 meters from the nearest projected face of curb of the intersecting road, shall not exceed the following in terms of positive or negative grades:

Destination	**Accessing**		
	Local	Collector	Arterial
Local Road	2%	2%	1%
Collector Road	-	2%	1%
Arterial Road	-	-	1%

9.3.3 Horizontal Alignment

Table 9.1
DESIGN STANDARDS FOR URBAN ROADS

Classification		Traffic Volumes (vpd)	Running Speed (km/h)	Design Speed (km/h)	Minimum Radius of Curvature	Maximum Gradients (%)	Minimum Gradients (%)	Maximum Super-Elevation
Urban Arterials	Undivided	5000-20000	50-60	70	200 m	4	0.5	0.06
	Divided	10000-30000	60-70	80	250 m	4	0.5	0.06
Residential Local		up to 1000	30	50	110 m	6	0.5	No
Residential Collector	Minor	1000-3000	40	50	120 m	5	0.5	No
	Major	3000-8000	50	60	130 m	4	0.5	No
Commercial/Industrial Service Road & Local Road		up to 3000	30	50	125 m	5	0.5	No
Commercial/Industrial Collector	Minor	3000-6000	40	50	135 m	5	0.5	No
	Major	6000-12000	50	60	185 m	4	0.5	No

When using reverse curves, double the minimum radius.

All minimum radii are to the center of the road.

Industrial Roads are considered to be comparable to Commercial Roads.

Table 9.2
DESIGN STANDARDS FOR URBAN ROADS

CLASSIFICATION		ROAD				Recommended Minimum Right-of-way[2] (m)	Inter - section Spacing (m)	PARKING	ACCESS
		WIDTH[1] (m)	CURB AND GUTTER						
			Face Type	GUTTER	Min. Return (m)				
URBAN ARTERIAL									
Undivided		15.8 to 20.0	Vert.	300.00	Design	40.00	400	No	Restricted
Divided	4 Lanes, No Berm	21.0	Vert.	300.00	Design	40.00	400	No	Restricted
	4 Lanes, With Berm	21.0	Vert.	300.00	Design	52.00	400	No	Restricted
	6 Lanes, With Berm	31.5	Vert.	300.00	Design	62.50	400	No	Restricted
RESIDENTIAL LOCAL									
Front Lot Servicing									
Sidewalk	Monolithic	9.00	Mod-Roll	250.00	9.00	22.00	60.00	Permitted	Driveways[3]
	Separate	9.00	Mod-Roll	250.00	9.00	22.00	60.00	Permitted	Driveways[3]
Back Lot Servicing									
Sidewalk	Monolithic	9.00	Mod-Roll	250.00	9.00	22.00	60.00	Permitted	Driveways[3]
	Separate	9.00	Mod-Roll	250.00	9.00	22.00	60.00	Permitted	Driveways[3]
Rear Lane Servicing									
Sidewalk	Monolithic	9.00	Mod-Roll	250.00	9.00	22.00	60.00	Permitted	Driveways[3]
	Separate	9.00	Mod-Roll	250.00	9.00	22.00	60.00	Permitted	Driveways[3]
RESIDENTIAL COLLECTOR									
Front Lot Servicing									
Minor									
Sidewalk	Separate	11.50	Mod-Roll	250.00	10.00	24.00	60.00	Permitted	Driveways[3]
Major									
Sidewalk	Separate	13.50	Mod-Roll	250.00	12.50	26.00	60.00	Permitted	Driveways[3]
Back Lot Servicing									
Minor									
Sidewalk	Separate	11.50	Mod-Roll	250.00	10.00	24.00	60.00	Permitted	Driveways[3]
Major									
Sidewalk	Separate	13.50	Mod-Roll	250.00	12.50	26.00	60.00	Permitted	Driveways
Rear Lane Servicing									
Minor	Monolithic	11.50	Mod-Roll	250.00	10.00	24.00	60.00	Permitted	Driveways[3]
Sidewalk	Separate	11.50	Mod-Roll	250.00	10.00	24.00	60.00	Permitted	Driveways[3]
Major	Monolithic	13.50	Mod-Roll	250.00	12.50	26.00	60.00	Permitted	Driveways[3]
Sidewalk	Separate	13.50	Mod-Roll	250.00	12.50	26.00	60.00	Permitted	Driveways[3]
COMMERCIAL/INDUSTRIAL									
Service Road/Local Road		9.00	Vertical	300.00	12.50	22.00	60.00	No	Driveways[3]
Minor Collector		11.50	Vertical	300.00	15.00	24.00	60.00	One Side	Driveways[3]
Major Collector		13.50	Vertical	300.00	Design	26.00	60.00	Two Side	Optional

[1] Between face of curb (F.O.C.), [2] Right-of-Way width dependent on infrastructure required in the R.O.W., [3] Driveways restricted to lanes when available.

9.3.3.1 Minimum Radius for Roads

The minimum radius is relative to the road classification, the design speed, and the maximum super elevation.

All horizontal curves shall be designed to meet the minimum design requirements.

9.3.3.2 Minimum Radii for Cul-De-Sacs

The minimum edge of pavement radius for cul-de-sacs is 12 meters to face of curb in residential areas and 15 meters in industrial areas.

9.3.3.3 Maximum Length of Cul-De-Sacs

The maximum cul-de-sac length shall be 100 m from the entrance at the property line of the intersecting road to the beginning of the return radius at the cul-de-sac, or the length required to service a maximum of 20 single family housing units in lower density rural subdivisions. Longer cul-de-sacs shall be designed with an alternate emergency access.

9.3.4 Concrete Curb and Gutter

9.3.4.1 General

Concrete curb and gutter shall be constructed in accordance with Standard Drawings No. 9.13 and 9.14.

9.3.4.2 Curb Return

Curb returns at residential local road intersections shall be constructed to a minimum radius of 9.0 m.

Curb returns at residential collector road intersections shall be constructed to a minimum radius of 12.5 m.

Curb returns in industrial/commercial areas shall be designed with a minimum radius of 15.0 m to accommodate truck turning movements.

For arterial road intersections the curb returns shall be designed in consideration of the type and volume of the turning traffic. Two and three centered curves with or without islands may be required.

9.3.4.3 Vertical Face Curb and Gutter

Vertical face curb and gutter shall be used on arterial roads and commercial/industrial collector roads. All roads fronting parks, PUL's, and walkways shall also require vertical face curb and gutter as a means to prevent vehicular access onto these public lands.

9.3.5 Pavement Structure

9.3.5.1 Staged Construction

Unless otherwise approved by the County, all roads will be constructed with two stages of construction, with the final lift of asphalt (minimum 50 mm) placed immediately prior to Final Acceptance Certificate eligibility. The final lift will be treated as new construction subject to specifications as approved by the County. Final asphalt lift shall exceed the lip of gutter elevation by 10 mm. The gutter around catch basins is to match initial asphalt elevation to provide drainage during staged construction.

9.3.5.2 Pavement Design

All roads shall be paved with hot mix asphalt concrete. A geotechnical report with recommended pavement designs shall be stamped by a Professional Engineer recognized by APEGA and employed by a recognized engineering agency, and submitted to the Municipal Engineer for review and approval.

Paved roadways shall be designed in accordance with the Asphalt Institute method of pavement design using a minimum design loading of 8165 kg (18,000 pound) axle loads for local streets and 10,886 kg (24,000 pound) axle loads for collector streets. All industrial/commercial roads shall be designed using a minimum design loading of 10,886 kg (24,000 pound) axle loads.

The design parameters such as traffic count, percentage of trucks, California Bearing Ratio (CBR), etc., are to be outlined to the Municipal Engineer. The County reserves the right to require the Developer to engage a geotechnical engineering agency to carry out CBR tests on the subgrade prior to paving to confirm adequacy of design.

The pavement design shall be performed in such a way that pavement structure recommendations address performance during the interim and final stages of paving. The County reserves the right to require a structural

analysis of the pavement, at the Developer's expense, prior to the final lift of asphalt being placed.

9.3.5.3 Pavement Structures

The following are the minimum pavement structure requirements. An independent pavement design prepared by a qualified geotechnical engineer is required for all developments.

Additional pavement structure strengths and/or materials may be required in areas with poor subgrade materials pending the results of the geotechnical investigation.

Table 9.3
MINIMUM ROAD PAVEMENT STRUCTURE REQUIREMENTS
URBAN STANDARD

Type		Arterial		Residential	Commercial	
Maximum Aggregate Size (mm)		Undivided (mm)	Divided (mm)	(mm)	Service Road, Minor Collector (mm)	Major Collector (mm)
Local						
ACP	12.5			100		
GBC	20			250		
GBC	25/40			50		
Subgrade Prep				150		
Collector (Minor/Major)						
ACP	16 or 12.5			110	120	120
GBC	20			300	300	400
GBC	25/40			50	50	50
Subgrade Prep				150	300	300
Arterial						
ACP	16	120	120			
GBC	20	400	400			
GBC	25/40	50	50			
Subgrade Prep		300	300			

Note: The first lift of asphaltic concrete shall not be less than 60mm. The final lift of asphaltic concrete shall be placed in the second year before the expiration of the maintenance period.

Alternative pavement designs may be approved by the Municipal Engineer. Approval of alternate pavement designs must be obtained in writing from the Municipal Engineer prior to submission of design drawings.

Table 9.4
MINIMUM REAR LANE / TRAIL PAVEMENT STRUCTURE REQUIREMENTS
URBAN STANDARD

Type		Urban Arterial		Residential	Commercial	
	Maximum Aggregate Size (mm)	Undivided	Divided		Minor	Major
Rear Lane						
ACP	12.5			75		
GBC	20			250		
GBC	25/40			0		
Subgrade Prep				150		
Bike / Pedestrian Trail						
ACP	12.5	75	75		75	75
GBC	20	150	150		150	150
GBC	25/40	0	0		0	0
Subgrade Prep		150	150		150	150

Note: No ACP staging required at back lane, but required at front of lot road.
Interim gravel surfacing permitted on rear lanes (alleys). No ACP staging required on Bike/Pedestrian Trails.

9.4 Separations in Road Right of Ways - Urban Standard

The following principles with respect to separations must be adhered to:

9.4.1 Storm and Sanitary Mains

The minimum separation between sanitary and storm sewers is 1.0 m between outside diameters of pipes in residential areas and 2.0 m in commercial areas.

Sanitary and storm lines are to be the first deep utilities from the roadway to minimize the impact of maintenance on boulevard areas/driveways. Sanitary lines shall always be closer to the road.

9.4.2 Curb Stop and Shallow Utility Crossings

Where crossing shallow bury utilities and water services occur, the minimum separation between the curb stop and the shallow utility shall be as shown on the Typical Cross Sections.

9.4.3 Residence

Every effort is to be made to contain water and sewer mains or appurtenances within road or utility right of ways, in accordance with the detailed drawings.

Special conditions may exist where this is not possible, and upon obtaining approval from the Municipal Engineer, the following shall generally apply:

- The minimum separation from a house to a water or sewer main or appurtenance of normal depth (= 3.0 m depth) shall be 4.5 m. The setback requirement from the property line in the land use bylaw is currently 6.0 m for frontage.
- The minimum separation on a side yard is to be confirmed so the minimum 4.5 m separation occurs on side yards as well.

9.4.4 Easements

Where County utilities are located within easements, the easement agreement must be clarified to remove obligations by the County to repair beyond seeded and sodded standard. Fences and other permanent structures are to be prohibited within the easement.

9.4.5 Sidewalks

Separate sidewalk is preferred on collector roads to provide some storage space for snow in the boulevard; however monolithic sidewalks next to the curb will be accepted.

9.4.6 Hydrant and Hydrant Valve

The minimum distance between the center of a hydrant valve and a hydrant shall be 1.5 m.

9.4.7 Watermain and Sanitary Sewer

The minimum distance between water and the sanitary sewer is 2.5 m.

9.4.8 Watermain and Storm Sewer

The minimum distance between water main and the storm sewer is 2.5 m.

9.4.9 Edge of Concrete Works

Minimum separation between the edge of monolithic curb and gutter or monolithic curb and gutter sidewalk and either deep utility shall be as shown on the Detail Engineering Drawings or as per the Typical Cross Sections.

9.5 Temporary Access Roads - Urban Standard

When it is determined by the Municipal Engineer that a temporary road is required in a new subdivision, the road shall be built in accordance with the County of Grande Prairie Minimum Design Standards and the plans approved by the Municipal Engineer, with all costs borne by the Developer.

9.5.1 Temporary Road

An access road between a partially developed arterial road and a collector road shall be constructed to the satisfaction of the Municipal Engineer.

A temporary road connecting a proposed subdivision and an existing local road or collector road that is required as a point of access shall be constructed to one of the following specifications:

- When the road will be used by the residents of the proposed subdivision, it shall be constructed to the completed standard of a roadway. A temporary road constructed through or flanking a lot, shall have screen fencing provided to buffer the adjacent development.
- When the temporary road will be used by construction traffic only, and will be taken out of service before residential occupancy of the subdivision, and only following the construction of the permanent subdivision access, then the road shall be constructed to the interim gravel stage without curb and gutter. When the temporary road crosses curb, gutter, and sidewalk of adjoining roads, provision shall be made to permit regular vehicle movement across the curbs.

9.5.2 Temporary Cul-De-Sac

Where a road terminates at mid-block and has no provisions for egress, a temporary cul-de-sac shall be constructed. The cul-de-sac shall be constructed to the same Granular Base Course structure as the abutting roadway and shall be designed to permit emergency vehicles to perform a 180 degree turn in one maneuver. Paving will not be required unless the cul-de-sac is intended to be in use for a prolonged period of time.

9.5.3 Detailed Engineering Drawings

Detailed Engineering Drawings shall be prepared for temporary roadways, showing vertical and horizontal alignments, drainage details and typical cross-sections.

9.6 Sidewalks and Trails

All streets shall have sidewalks on both sides.

Separate sidewalks shall be a minimum width of 1.5 m and shall be constructed in accordance with Drawing No. 9.16. Separate sidewalks shall be constructed on all collector and arterial roads and may be used on local residential streets. Separate walks greater than 1.5 m shall be constructed in accordance with Drawing No. 9.17.

Monolithic sidewalks shall be a minimum width of 1.5 m and shall be constructed in accordance with Drawings No. 9.18 and 9.19.

Paraplegic Ramps with “Blind Bars” shall be constructed at all pedestrian crossings in accordance with Drawing No. 9.15.

Multi-use trails shall be a minimum width of 3.0 m and shall be constructed in accordance with Drawing No. 9.20.

9.7 Driveways

All driveways shall be constructed to give a minimum of 1.0 m clearance from any structure, (e.g. hydrants, light standards, service pedestals, manholes, and catch basins). The driveway locations shall be clearly shown on the overall lot grading plan and on all plan profiles.

Intersection spacing shall be at a minimum horizontal distance of 10.0 m from the near edge of the driveway to the near end of any curb return. Industrial or commercial driveways must be further designed to accommodate the types of vehicles the business will generate, including service vehicles, and the number of lanes being crossed.

Driveways shall not access directly onto arterial roads or onto major collector roads where the estimated traffic volume is 4,000 vpd or greater.

9.8 Lanes

Rear lanes (alleys) shall have a minimum width of 6.0 m within a 10.0 m right-of-way.

Lanes shall be paved over their full width with a minimum structure of 75 mm ACP over 250 mm of granular base.

An inverted cross-section shall be used for lanes with a minimum longitudinal grade of 0.8%.

Where rear lane traffic activity is expected to be high, (such as in certain commercial developments) a wider surface width and right-of-way may be required as determined by the Municipal Engineer. Lane corners shall have intersectional flares or corner lot lines where they form intersections with roads or other lanes. Requirements and/or approval of the use of rear lanes shall be at the discretion of the Municipal Engineer.

See Drawings No. 9.22 and 9.23.

9.9 Intersections

The Developer shall provide confirmation that sight distances and horizontal and vertical sightlines at intersections that access all collectors and arterials meet the minimum acceptable stopping sight distances.

The Developer shall analyze site line requirements, and where they are in conflict with typical house setbacks or probable fencing or other features that may affect site lines. The sight lines will then be plotted at each such conflicting intersection on the overall roads drawing.

The Developer shall secure the required site line by means of either, acquiring the property and dedicating it to the County or, by placing a caveat/easement on the affected lot(s) prohibiting the construction of any features which may interfere with the site line(s). Costs for such security shall be at the Developer's cost.

Intersection spacing shall be minimum 60.0m centerline to centerline along local and collector roads.

Intersectional treatments shall be designed to accommodate future traffic as determined by a traffic impact assessment approved by the Municipal Engineer. All necessary widening of rights-of-way shall be provided by the Developer.

9.10 Design Criteria - Rural Standard

9.10.1 General

Road rights-of-way shall be of adequate width to accommodate the roadway surface and the roadside ditches complete with the required side slopes and back slopes.

Minimum rights-of-way requirements are as follows:

Residential access	-	30.0 meters
Residential local	-	30.0 meters
Residential collector	-	30.0 meters
Industrial local	-	30.0 meters
Industrial collector	-	30.0 meters

9.10.2 Geometric Design

Roads shall be designed in accordance with the geometric design standards outlined in the latest edition of the Transportation Association of Canada manual "Geometric Design Standards for Canadian Roads and Streets".

Geometric design standards established by the County of Grande Prairie, as outlined in Table 9.5, shall be incorporated into the roadway designs.

In addition, the designer shall also give due consideration to the soil conditions in the area as derived through geotechnical investigations.

9.10.3 Road Intersections

The grades at intersections for all roadway classifications shall not exceed 2% for a minimum distance of thirty (30) meters, measured from the shoulder edge of the receiving road.

Flares at intersecting roadways shall have the following minimum radius from shoulder to shoulder:

Residential access and local	-	10.0 meters
Residential collector	-	15.0 meters
Industrial local and collector	-	15.0 meters

Refer to Standard Drawing Detail No. 9.32, Typical Road Intersections.

Table 9.5
Basic Design Standards - Rural Standard

Design Criteria		Residential Access Local	Residential Local	Residential Collector	Commercial Industrial Local	Industrial Collector
Drawing Reference		No. 9.26	No. 9.26	No. 9.27	No. 9.28	No. 9.29
R.O.W. Requirements (m)		30	30	30	30	30
TAC Classifications		RLU 60	RLU 60	RCU 90	RCU 60	RCU 90
Design Speed (km/h)		60	60	90	60	90
Subgrade Width (m)		9.2	9.2	11.2	11.4	12.4
Finished Surface Width (m)		7	7	8	8	9
Minimum Radius of Curve (m)		130	130	340	130	340
Maximum Gradient (%)		8	8	6	4	4
Vertical Crest Curve minimum "k" Value		15	15	35	15	35
Vertical Sag Curve minimum "k" Value		20	20	35	20	35
Embankments Side slope minimum		3:1	3:1	3:1	3:1	3:1
Embankments Back slope minimum		2:1	2:1	2:1	2:1	2:1
Minimum Ditch Grade (%)		0.5 AT specifies flat bottom	0.5	0.5	0.5	0.5
Super Elevation		0.06	0.06	0.06	0.06	0.06
Crown	Gravel	4%				
	Paved	2.50%	2.50%	2.50%	2.50%	2.50%

9.10.4 No Exit Roads

Unless approved by the Municipal Engineer as an interim solution, no exit roads shall not be allowed in industrial subdivisions. For the interim situation, refer to Standard Detail Drawing No. 9.30, Typical Rural Temporary Industrial Cul-de-sac.

In rural residential subdivisions, all no exit roads shall have a cul-de-sac or turnaround consistent with the requirements outlined in Standard Detail Drawing No.9.31, Typical Residential Cul-de-sac. The maximum length of a residential cul-de-sac shall be no longer than 100 m measured from the near property line of the intersecting road to the beginning of curve at the bulb.

9.10.5 Culverts And Drainage

The minimum allowable ditch grade shall be 0.5%. Ditch grades in excess of 2.0% shall be protected against erosion through rock ditch checks, silt fences, Enviroberm fences

and/or erosion control blankets. Typical ditch check installations are illustrated in Standard Detail Drawing No. 9.34, Typical Rock Ditch Checks.

Ditch side slopes shall not be steeper than 3: 1 and back slopes shall not be steeper than 2: 1.

The minimum ditch bottom width shall be 3.0 meters sloping away from the roadway at a minimum of 5.0%.

Culvert size requirements shall be determined through the storm water drainage analysis; however the minimum size culverts shall be as follows:

Roadway cross culvert	-	500 mm (20 inch)
Residential approach culvert	-	500 mm (20 inch)
Industrial approach culvert	-	500 mm (20 inch)

Culverts shall be new galvanized C.S.P. (corrugated steel pipe) with a minimum wall thickness of 1.6 mm, or as required by the loading criteria.

All culverts shall be installed in accordance with the manufacturer's recommendations.

In high density residential, all culverts shall be installed complete with beveled end sections on both the inlet and outlet sides with the invert extended to the toe of the side slope.

Culverts shall be installed to provide a minimum depth of cover of 500 mm or one-half (½) the culvert diameter, whichever is greater, as measured from the finished shoulder grade of the roadway to the top of the culvert. A typical culvert installation detail is illustrated in Standard Detail Drawing No.9.35, Typical Culvert Installation.

Where Rip Rap is required, Refer to Standard Drawing Detail No. 9.36, Typical Rip Rap Requirements for Culvert size 400-1200 dia.

Turf Reinforcement Mat shall specified at the culvert outlets. Refer to Standard Detail Drawing No. 9.37 for the specifications.

9.10.6 Road Approaches

This sub-section outlines the requirements respecting the design and construction of approaches within subdivision developments.

Standard Detail Drawing No. 9.38, Typical Approach Locations, provides standards for the location of approaches for corner or double-fronting lots. Deviations from these standards require approval by the Municipal Engineer.

Residential approaches shall typically be located as follows:

- For low density residential, the approach shall typically be located to

provide the best and most direct access to the building site on the lot.

- For internal high density residential lots, the approach shall typically be centered on the lot frontage.

A typical residential/industrial lot approach is illustrated in Standard Detail Drawing No. 9.33. A residential approach shall not exceed eight (8.0) meters in width; an industrial lot approach shall not exceed ten (10.0) meters in width. Any deviation from these maximum widths requires the approval of the Municipal Engineer.

All approaches shall be constructed to the same structure as the adjoining roadways with asphalt surfacing extending to the following limits:

Low/high density residential:	to property line
Commercial/Industrial:	to property line
Field access:	3.0 m past road shoulder

All residential subdivision developments shall require the Developer to construct one approach to each lot, consistent with the standards outlined herein.

Approaches to industrial/commercial lots are not required to be constructed by the Developer unless the access locations are known; the Owner/Developer of the lot shall be responsible for constructing such approaches, consistent with the standards outlined herein.

9.10.7 Utilities

All rural utilities will be placed in appropriate locations and in accordance with the typical utility layouts in Standard Drawing Details No. 9.39, 9.40 and 9.41. The standard drawing details provide the minimum standards for high and low density residential subdivisions as well as industrial subdivisions. The requirements for shoulder widening in the case of a hydrant are also detailed. Utilities layouts require the approval of the Municipal Engineer.

9.10.8 Pavement Structure

The following are the minimum standards; however, pavement structure alternatives may be accepted with the backing of a geotechnical report with recommendations authenticated by a professional engineer and submitted to the Municipal Engineer for review and approval.

Paved local roadways shall be designed in accordance with the Asphalt Institute method of pavement design using minimum design loadings of 8165 kg (18,000 pound) axle loads for local streets and 10,886 kg (24,000 pound) axle loads for collector streets. All industrial/commercial roads shall be designed using a minimum design loading of 10,886 kg (24,000 pound) axle loads. The design parameters such as traffic

count, percentage of trucks, California Bearing Ratio (CBR), etc., are to be outlined to the Municipal Engineer. The Municipal Engineer reserves the right to request the Developer to engage a geotechnical engineering agency to carry out CBR tests on the subgrade prior to paving to confirm adequacy of design.

For a detailed description of the rural asphalt concrete pavement construction standards and methodology, refer to the most recent edition of the Alberta Transportation Standard Specifications for Highway Construction for Asphalt Concrete Pavement.

Table 9.6

Typical Minimum Roadway Structures – Rural Standard

Roadway	Residential Land Use		Commercial/Industrial Land Use
	Low Density	High Density	
Access/Local	150 mm Subgrade Prep. 250 mm Aggregate Base Course 75 mm Asphaltic Concrete Surface	150 mm Subgrade Prep. 250-300 mm Aggregate Base Course 110 mm Asphaltic Concrete Surface 2 lifts 60 mm/50 mm final[1]	300 mm Subgrade Prep. 350-400 mm Aggregate Base Course 120 mm Asphaltic Concrete Surface 2 lifts 60 mm/60 mm final[1]
Collector	N/A	150 mm Subgrade Prep. 300-350 mm Aggregate Base Course 110 mm Asphaltic Concrete Surface 2 lifts 60 mm/50 mm final[1]	300 mm Subgrade Prep. 350-400 mm Aggregate Base Course 120 mm Asphaltic Concrete 2 lifts 60 mm/60 mm final[1]

[1] The final lift of asphaltic concrete shall be placed in the second year of the maintenance period.

9.10.9 Staged Asphalt Construction – High Density Residential

All roadways in High Density Residential Developments shall be constructed with the final lift placed in the year the subdivision is eligible for Final Acceptance. The County may accept cash-in-lieu for the final lift of asphalt if significant development has not occurred at the time of Final Acceptance.

For staged construction, the final lift of asphalt shall ensure that the roadway is brought to the original design crown as shown on the approved engineering drawings.

An additional one (1) year materials and workmanship warranty shall be required for the final lift after the Final Acceptance Certificate is issued for the surface improvements.

9.11 Construction Standards and Materials

9.11.1 Roadway Preparatory Work

The entire road right-of-way (R.O.W) shall be cleared of all vegetation (trees, shrubs, brush, etc.) including removal of all tree roots and stumps. All such material shall be removed from the site for disposal at approved locations. No burying of this material, or any portion thereof, shall be permitted within the R.O.W.

Organic soils and material are not acceptable as subgrade materials and shall be stripped within the roadway, ditch and back slope portion of the new construction. Organic soils (clean topsoil) shall be stockpiled in approved locations for the re-spreading on the ditches and back slopes after completion of the roadway construction.

9.11.2 Road Grade Construction

This sub-section deals with the requirements covering roadway excavation, roadway embankment and subgrade preparation.

9.11.2.1 Roadway Excavation

- All materials excavated for placing in roadway embankment shall be suitable road construction material.
- Where the subgrade is in transition from excavation to embankment, the transition area shall be sub excavated to a minimum depth of 600mm and replaced with suitable material.
- Where unsuitable material is encountered at the subgrade level of a cut, the subgrade shall be sub excavated to an acceptable depth, where a stable platform is achievable, and replaced with suitable material.

- Where suitable material is encountered at the subgrade level the subgrade shall be scarified to a minimum depth of 150mm shaped and compacted for residential roads and 300mm for commercial/industrial roads.
- The compaction of subgrade surfaces in excavations and the placement and compaction of materials replacing sub excavations shall be in accordance with section 9.11.2.2 Roadway Embankment and section 9.11.2.3 Subgrade Preparation.
- Excavation shall be carried out to conform to the lines, grades and cross-section of the approved roadway design.

9.11.2.2 Roadway Embankment

- All material used in roadway embankment shall be approved road construction material free from all wood, brush, roots, topsoil and other organic materials.
- Where the depth of embankment is less than one (1) meter all topsoil and/or organic materials shall be excavated prior to embankment placement.
- Where the proposed depth of embankment is less than one (1) meter from the finished subgrade, the stripped surface shall be excavated to a minimum depth of one (1) meter from the proposed finished subgrade before any embankment material is placed.
- Where embankments are to be placed on a slope or against an existing slope, the sloped surface shall be benched and scarified in a manner that the new material will bond with the existing surface.
- Prior to fill being placed the exposed surface shall be scarified to a minimum depth of 150mm and re-compacted to 98% of Standard Proctor Density.
- Successive lifts of embankment material shall be placed in uniform layers of 150mm maximum thickness across the entire width of the embankment.
- Suitable compaction equipment shall be used to thoroughly compact each layer of embankment material.

- The embankment material shall be compacted to not less than 98% of standard Proctor Density at optimum moisture content.
- Embankment construction shall be carried to the lines, grades and cross-section of the approved roadway design.

9.11.2.3 Subgrade Preparation

- The subgrade shall be scarified to a minimum depth of 150 mm or as designated in Table 9.6.
- The loosened material shall be windrowed to the side and the exposed surface shall be thoroughly scarified and compacted.
- The windrowed material shall then be uniformly mixed and compacted to obtain 100% Standard Proctor Density at optimum moisture content.
- The finished subgrade shall be shaped to conform to the required lines, grades and cross-section of the approved roadway design.

9.11.3 Gravel and Granular Course Base

9.11.3.1 General

The supply and installation of all gravel materials shall be in accordance with these specifications. If so requested, the Developer/Contractor shall provide the Municipal Engineer with a sample of each class of gravel to be installed.

9.11.3.2 Pit Run Gravel

Pit run gravel shall fall within the following gradation when subjected to a sieve analysis:

Sieve Size (microns)	Allowable % Passing
80,000	100
50,000	55 - 100
25,000	38 - 100
16,000	32 - 85
5,000	20 - 65
315	6 - 30
80	2 - 10

9.11.3.3 Sub-Base Gravel

Sub-base gravel shall meet the same gradation as Pit Run Gravel. However, a minimum of 20% of the material retained on the 5,000 sieve shall have at least two fractured faces.

9.11.3.4 Surfacing Gravel

a) 40 mm Crush

The 40mm crush gravel material shall fall within the following gradation when subjected to a sieve analysis.

Sieve Size (microns)	Allowable % Passing
40,000	100
20,000	55 - 90
10,000	25 - 75
5,000	8 - 55
1,250	0 - 30
80	0 - 12

Fracture count by % weight shall be a minimum of 25%. The material passing the 315 sieve will have a plasticity index below 8% and a Liquid Limit below 25.

b) 20 mm Crush

The 20mm crush gravel material shall fall within the following gradation when subjected to a sieve analysis.

Sieve Size (microns)	Allowable % Passing
20,000	100
10,000	35 - 77
5,000	15 - 55
1,250	0 - 30
80	0 - 12

Fracture count by % weight shall be a minimum of 40%. The material passing the 315 sieve will have a plasticity index below 8% and a Liquid Limit below 25.

Gravel installation/placement shall include the hauling and placing of all gravel materials. The Developer/Contractor shall place the crushed gravel to the areas specified and the quantities directed by the Municipal Engineer. The placed gravel must be free of lumps and left in a smooth and uniform condition.

9.11.3.5 Granular Base Course

Granular base course shall consist of a mixture of crushed aggregate and water, which is placed in layers upon the previously prepared surface, compacted and finished to the specified thickness, approved grade, lines and typical cross-section. The depth or thickness of granular base course material will depend upon the expected traffic volume but should typically not be less than the thickness outlined Table 9.6.

Base course material shall be consistent with the *Alberta Transportation Specifications* for Aggregate under the Designation 2 Class 20 and shall fall within the following gradation when subjected to a sieve analysis:

Sieve Size (microns)	Allowable %Passing
20,000	100
16,000	84 - 94
10,000	63 - 86
5,000	40 - 67
1,250	20 - 43
630	14 - 34
315	9 - 26
160	5 - 18
80	2 - 10

The material passing the 315 micron sieve shall have a plasticity index below 6% and a liquid limit below 25%. A minimum of 60% of the material retained on the 5000 sieve shall have at least one fractured face. L.A. Abrasion loss percentage maximum shall be 50%.

Granular base course installation/placement shall include the hauling, placing and compaction of all gravel materials. The Developer/Contractor shall install the crushed gravel to the grades and cross-sections shown in the drawings or as specified by the Municipal Engineer. The surface onto which the gravel is to be installed shall first be prepared in accordance with the Grading and Earthwork Specifications.

9.11.3.6 Testing Requirements of The Developer/Contractor

Confirmation of the material characteristics/composition of the Gravel and /or Granular Base Course proposed to be used must be provided by the Developer/Contractor prior to placement.

- The Developer/Contractor shall submit one (1) copy of a full sieve analysis, including fracture count, liquid limit, and plasticity index; per size of aggregate to be used. The sieve analysis may be a typical sample from/during aggregate production, or may be from a sample taken in the stockpile.
- The sieve analysis shall be submitted to the Municipal Engineer for approval. The Municipal Engineer shall have 10 working days to evaluate the documentation.
- No placement shall be permitted until written approval has been received from the Municipal Engineer.
- The Developer/Contractor shall take whatever measures necessary to safeguard and protect the existing utilities and structures.

Granular base course material shall be placed in lifts not exceeding 200 mm and compacted to 100% of Standard Proctor Density/Control Strip Density at optimum moisture content.

Unless otherwise specified, the following test methods shown in Table 9.7 shall be used to determine the material characteristics of each aggregate prior to installation/placement.

Table 9.7
Granular Base Course – Quality Control Test Methods

TEST	STANDARD	FREQUENCY (minimum)
SAMPLING, Gravel and Sand	ATT-38	As required
SIEVE ANALYSIS	ATT-25 or 26	As required in ATT-38
PERCENT FRACTURE	ATT-50	As required in ATT-38
STANDARD TEST METHODS FOR LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX	ASTM D4318-05	As required
STANDARD PROCTOR, Moisture-Density Relations of Soils and Soil Aggregate Mixtures using a (5.5 lb. (2.49kg) Hammer and a 12-inch (305mm) Drop	ATT-23 ASTM D698	As required
DENSITY, Control Strip Method	ATT-58	Control & Test Sections
RANDOM TEST SITE LOCATIONS	ATT-56	Each Test Section
MOISTURE CONTENT, Oven Method, Soil and Gravel	ATT-15	As required

For a detailed description of the rural granular base construction standards and methodology, refer to the most recent edition of the *Alberta Transportation* Standard Specifications for Highway Construction for Granular Base Course.

9.11.4 Asphaltic Concrete Pavement

9.11.4.1 General

Asphalt concrete pavement (ACP) shall consist of crushed aggregates, or a combination of crushed aggregates and reclaimed asphalt pavement (RAP), blend sand material as required and asphalt cement, combined in a hot mix plant, placed and compacted on a prepared surface in conformity to the lines, grades, dimensions and typical cross-sections.

The supply and construction of all asphalt pavement structures shall be in accordance with these specifications.

9.11.4.2 Materials

The Contractor/Developer shall supply the required materials that shall conform to the latest revisions of ASTM, AASHTO and Alberta

Transportation's Standard Specifications for Highway Construction for Asphalt Concrete Pavement.

9.11.4.3 Asphalt Cement

a) Asphalt cement shall be AASHTO Performance Grade (PG) 52-34, with a designation of H or M unless otherwise specified by the Municipal Engineer, and shall meet all specifications as to viscosity, flash point, thin film oven test, ductility, and solubility established by the Asphalt Institute for this Performance Grade.

b) The asphalt designation of H, M and L refers to High, Medium and Low service applications. The selection of the asphalt designation is governed by expected traffic loads, geographic location and type of application (new construction versus overlay rehabilitation). Asphalt mix types and characteristics are listed in *Alberta Transportation's* Standard Specifications for Highway Construction (Table 3.50.3.2). For additional information on the methods of selection of asphalt mix types see *Alberta Transportation's* Design Bulletin #13 (Revised June 2012).

9.11.4.4 Aggregate

a) The mineral aggregate shall consist of crushed gravel/aggregate, or a combination of crushed gravel/aggregate, reclaimed asphalt pavement (RAP), and blend sand material, the whole of which is to be free of clay, loam, foreign material or other deleterious substances.

b) Crushed aggregate when subjected to the Los Angeles Abrasion Test, shall have a loss not greater than 30% by weight, when tested in accordance with ASTM C131.

c) Mineral aggregate for hot mix asphalt shall meet the following gradation:

12.5mm Surface Course for Urban and Rural Roads

Sieve Size (Microns)	Percentage Passing by Dry Weight of Aggregate
16,000	100
10,000	83-92
5,000	55-70
1,250	26-45
630	18-38
315	12-30
160	8-20
80	4-10

Fracture count by % weight shall be a minimum of 100%. A minimum of 75% of material passing the 5,000 micron sieve shall be manufactured fines from crushed rock.

9.11.4.5 Mix Design Requirements

The Developer/Contractor shall supply the required materials that shall conform to the most recent revisions of ASTM, AASHTO, and Alberta Transportation's Standard Specifications for Highway Construction, unless otherwise stated.

The preparation and submission of asphalt mix designs for verification and approval are the responsibility of the Developer/Contractor. The Developer/Contractor shall use Professional Engineering services and a qualified testing laboratory licensed to practice in the Province of Alberta, to assess the aggregate materials proposed for use and to carry out the design of the asphalt mixture. The design testing laboratory shall have obtained pre-qualification status from the Municipal Engineer in the category of Mix Design – Marshall.

Asphalt mix designs shall follow the Marshall method of Mix Design. The mix design, at the Design Asphalt Content, shall meet the requirements in Table 3.50.3.2 in Alberta Transportation's Standard Specifications for Highway Construction for the Asphalt Concrete Mix Type specified.

All mixes shall be evaluated for moisture susceptibility in accordance with AASHTO test procedure T-283, Resistance of Compacted Bituminous Mixture to Moisture Induced Damage, using either gyratory or Marshall compacted specimens. All specimens shall be formed using the same procedure. All mix design submissions shall include the test results as outlined in test procedure T-283, including the visual estimate of the degree of moisture damage.

The target minimum value for Tensile Strength Ratio (TSR) shall be 75%. Mixes with a TSR value meeting the target minimum will be considered suitable for mix production.

9.11.4.6 Variation from Approved Job Mix Formula

Mixing Tolerances

a) Permissible variation in aggregate gradation from job mix (percentage of total mass) is indicated in the following table:

Sieve (microns)	Permissible Variation
+5,000	+/-5
5,000	+/-5
1,250	+/-3
630	+/-2
315	+/-2
160	+/-1.5
80	+/-1.5

b) Permissible variation of asphalt content from job mix formula, 0.3%.

c) Permissible variation of field Marshall air voids from design air voids, 0.5%.

d) Permissible variation of mix temperature at plant discharge, 5^{o}C.

e) If any deviation from the Job Mix Formula beyond the variations given above, or any alterations of the aggregate proportioning, is requested by the Contractor/Developer in writing, the Municipal Engineers will evaluate the request and determine if a new Mix Design is required.

9.11.4.7 Asphalt Mix Verification

The Municipal Engineer shall have access at all times to the asphalt plant and accessory equipment. Tests will be taken by Municipal Engineer, at

his discretion, to check compliance with specifications and to determine acceptability at the end product specification (EPS). The Developer/Contractor shall co-operate with the Municipal Engineer for such sampling, testing and inspection. This end product testing will be done at no expense to the Contractor/Developer.

9.11.4.8 Preparation

a) Manholes, Water Valve Boxes, and Catch Basins

The Developer/Contractor shall locate all manholes, water valve boxes and catch basins and raise them to finish surface grade prior to the paving operation.

The Developer/Contractor will be held fully responsible to ensure that all manholes, water valve boxes and catch basins are left in the condition they were prior to the start of paving operations.

b) Prime and Tack Coat Application

The contact surface of all curbs, manholes, etc. shall be coated immediately prior to the commencement of paving operations and on the clean, dry surface of the roadway to be paved.

The Developer/Contractor shall protect all adjacent structures during curing operations and shall remove any prime or tack coat sprayed on said structures at his own expense.

9.11.4.9 Placement

Following the application of prime or tack coat, all depressions and defective areas shall be eliminated by laying levelling course (patches) on areas designated by the Municipal Engineers. The material used for levelling shall be the 12.5mm aggregate mix as specified. The asphalt pavement shall only be placed when the atmospheric temperature is 5ºC or greater and the road surface is dry. At no time shall the Developer/Contractor place an asphalt pavement lift greater than 100mm in compacted thickness. No paving will be allowed on frozen surfaces.

a) Placement and Compaction

Placement and compaction of asphalt pavement shall be done with appropriate types of equipment and methods (paver, breakdown steel drum roller, rubber tired roller and finish steel drum roller). The finish

rolling shall be accomplished while the mix is still workable enough to remove roller marks.

b) Transverse Joints

Transverse joints shall be constructed and thoroughly compacted to provide a smooth riding surface and proper bonding for the full depth of the joint.

Transverse joint locations are to be staggered a minimum of 2m and shall be offset by at least 600mm from the joints in the underlying lift.

c) Surface Smoothness

The finished surface shall be smooth and true to established crown and grade and have an entirely smooth riding quality. The surface shall have a tightly knit texture and shall be free from cracking and segregation. The surface of the finished pavement shall be free from depressions exceeding six (6) mm as measured with a three (3) meter straight edge, parallel to the center of the road. Any low or defective areas shall be repaired immediately by cold milling the failed area. The area shall then be cleaned free of debris and tacked. Fresh asphalt mix shall then be placed and compacted, all the while ensuring that the repair conforms to the surrounding area and is thoroughly bonded to the underlying and adjacent asphalt surfaces.

d) Gutter Edge

At the gutter edge an average 10mm (minimum 5mm) lip should vertically protrude at the edge of gutter. All gutter edges must be coated with tack coat.

e) Vertical Joints

Care must be taken during the forming of vertical joints so that there is a continuum of surface planes devoid of ridges, depressions and irregularities at the joints. Any joint that is not straight or is hollow, segregated, raised or in any way deemed by the Municipal Engineer as being unsatisfactory will be rejected.

f) Cracking

Cracks in the asphalt pavement shall be repaired to the satisfaction of the Municipal Engineer prior to the issuance of the Construction Completion Certificate or prior to the issuance of the Final Acceptance Certificate. The cost of these repairs shall be incidental to asphalt placement and no additional payment shall be made for the repairs.

9.11.4.10 Prime Coat, Tack Coat and Fog Coat

a) Prime Coat

Prime coat is the application of liquid asphalt to an absorbent surface (granular base course) to waterproof and promote bonding between the surface being primed and the next course.
The Developer/Contractor may choose SEP-1, SEP-2 or SS-1 for application through to August 31 each season. The Developer/Contractor may choose MC-30, SEP-1, SEP-2 or SS-1 for application after August 31 each season.
The rate of application may vary based on the characteristics of the selected liquid asphalt, base material and coverage desired. The rate should allow for complete coverage of the base without producing ponding on the surface. The asphalt shall be applied uniformly without streaking. Joints and seams shall not be excessively overlapped. Structures, guardrail, and other roadway appurtenances shall not be splattered by the asphalt material. The Developer/Contractor shall remove, at his own expense, any splattering caused by his operation.
Sand used for the blotting of excess prime cost shall be supplied by the Developer/Contractor.
Traffic shall not be permitted to travel on prime coat until it has cured. Where traffic must be accommodated, the Developer/Contractor shall apply the prime coat covering only one-half of the roadway surface at a time.

b) Tack Coat

Tack coat is the application of liquid asphalt to ensure a bond between the surface being paved and the next course.

The Developer/Contractor may choose SS-1 or MS-1 for application throughout the construction season. As well, the Developer/Contractor has the option of using RC-30 or RC-70for application after August 31 each season.

Before applying the asphalt tack coat, the Developer/Contractor shall ensure that any loose dirt or other objectionable material is removed from the surface to be tacked or primed by sweeping or other acceptable methods as determined by the Municipal Engineer. Where base courses become raveled, the surface must be moistened and re-compacted to achieve a tight uniform surface.

Areas missed by the distributor or inaccessible by the distributor shall be treated using a hand spray or pouring pot.

Traffic shall not be permitted to travel on tack coat until it has cured. Where traffic must be accommodated, the Developer/Contractor shall apply the tack coat covering only one-half of the roadway surface at a time.

c) Fog Coat

Fog coat is an application of liquid asphalt to seal small cracks and surface voids, and is generally used as a curing seal for Asphalt Stabilized Base Course.

The Developer/Contractor may use SS-1 for application through August 31 each season. The Developer/Contractor may choose MC-30 or SS-1 for application after August 31 each season

The estimated application rate for fog coat to a pavement surface is from 0.4 to 0.7 kg/m2 of undiluted SS-1 or 0.2 to 0.5 kg/m2 of MC-30.

Traffic shall not be permitted to travel on fog coat until it has cured. Where traffic must be accommodated, the Developer/Contractor shall apply the fog coat covering only one-half of the roadway surface at a time.

9.11.4.11 Thickness

A minimum compacted thickness of 50 mm of asphalt concrete pavement shall be placed on all streets unless otherwise specified. The asphalt concrete pavement shall be constructed to the minimum thickness specified.

Asphalt pavement with excess thickness may be accepted if surface grade tolerances and textures are met, but no additional payment will be made.

In areas suspected to be deficient in asphalt thickness, three cores shall be taken from each 1000 m2 of applicable mat and the average thickness of the three cores will represent that area. If the average core thickness is deficient, that area of asphalt pavement will be assessed a pay factor according to the following and be applied to the price of the top 50 mm of asphalt surface.

Table 9.8
THICKNESS DEFICIENCY

Thickness Deficiency (mm)	Pay Factor (% of price of top 50 mm)
6	100
7	97
8	93.7
9	90
10	85.5
11	80.5
12	75
13	68
14	60
15	50
Over 15	Grind and resurface

9.11.4.12 Density

Each mat of hot-mix placed shall be compacted to the following minimum density (% Marshall Density) for the type of paving, or as indicated in Special Provisions.

Table 9.9
DENSITY

Minimum Density	Type of Paving
98%	New and staged paving of road base and surface
98%	arterial road overlays
97%	Second stage residential mat 50 mm thick or less
97%	lane paving
97%	local and collector overlays
97%	overlay 50 mm thick or less

If the average core density at each test-hole site is below specified, the represented area of mat may be accepted subject to the following pay factor being applied to the price of the quantity of hot-mix for that mat area:

Table 9.10
DENSITY DEFICIENCY

Density %	Unit Price Reduction	
	98% Required	97% Required
100.00 to 97.00	0%	0%
96.99 to 96.00	5%	0%
95.99 to 95.00	10%	5%
94.99 to 94.00	20%	15%
93.99 to 93.00	30%	30%
Less than 93%	Asphaltic Concrete to be Removed	

No adjustment to the unit price to be made for areas with excessive density. The application of an adjusted unit price does not relieve the Contractor of the Contract Maintenance requirements.

9.11.5 Asphalt Testing

9.11.5.1 Urban

Unless otherwise specified, the following Alberta Transportation test methods (ATT) shown in the following table will be used to determine the material characteristics. The following tests shall be carried out for each 200 tonnes of asphalt pavement produced or at least one per shift during placing operations.

Table 9.11
Quality Controls Testing Requirements – Urban Projects

Test Description	Test Method
Temperatures	ATT-30
Cores	ATT-5
Aggregate Sieve Analysis	ATT-26
Mix Moisture Content	ATT-15
Mix Asphalt Content	ATT-12, Part III or ATT-74
Density Immersion Method, Saturated Surface	ATT-7
Voids Calculations, Cores or Formed Specimens	ATT-36
Per Cent Compaction, Cores or Nuclear Density	ATT-67, ATT-5 or ATT-11
Correction Factors, Nuclear Moisture-Density Measurement	ATT-48
Field Formed Marshal Briquettes	ATT-13

9.11.5.2 Representative Core – Urban

A single core is initially taken representing the quantity of hot mix in not more than 1000m^2 of mat, with a minimum of one core taken from a day's production. The average density of the 2 new cores, combined with the original core's density, shall be used to calculate the final density to which any penalties may be applied. Densities greater than 100% shall be deemed to be at 100%. All cores shall be obtained from a licensed materials testing engineering firm.

9.11.5.3 Rural

The Developer/Contractor shall be totally responsible for production of aggregates and mixes that meet all the specified requirements. Test methods, sampling and minimum frequency of testing for Rural Managed Quality Assurance Paving projects shall be in accordance with *Alberta Transportation's* Standard Specifications for Highway Construction and are described and listed in Table 9.12. For detailed description of the rural construction standards and methodology for asphalt surfacing refer to the latest *Alberta Transportation Standard Specifications for Highway Construction* for Asphalt Concrete Pavement – End Product Specification (EPS).

Table 9.12
Quality Control Testing Requirements – Rural Managed QA Testing Projects

TEST	STANDARD	MINIMUM FREQUENCY
ASPHALT MIX PLANT		
Calibration	ATT-17	Once per project or as required
SAMPLES		
QA Cores – Stratified Random Test Sites Chosen by the Municipal Engineer i. QA Cores for Pavement Density ii. QA Cores for Asphalt Content and Gradation	ATT-56 ATT-5 ATT-5	One per segment for each Lot. One per segment for selected Lots or as directed by the Municipal Engineer.
TESTS WITH SPECIFIED MINIMUM FREQUENCIES		
Mix Asphalt Content	AASHTO T-164, T287 or ATT-12 or ATT-74	(2)
Correction Factors	ATT-12, Part III or ATT-74, Part II	As Required
Mix Moisture Content	ATT-15	(2)
Aggregate Sieve Analysis	ATT-26	(2)
Pavement Segregation	Segregation Rating Manual – *Alberta Transportation* 2002	Each Lot
TESTS WITH NO SPECIFIED FREQUENCIES		
Field Formed Marshall Briquettes Density Immersion Method, Saturated Surface Dry	ATT-13 ATT-7	(1) (1)
Void Calculations, Cores or Formed Specimens	ATT-36	(1)
Temperatures	Att-30	(1)
Per Cent Compaction, Cores or Nuclear Density	ATT-67, ATT-5 or ATT-11	(1)
Random Test Site Locations	ATT-56	(1)
Correction Factors, Nuclear Moisture-Density Measurement	ATT-48	(1)
Pavement Smoothness	ATT-59	(1)

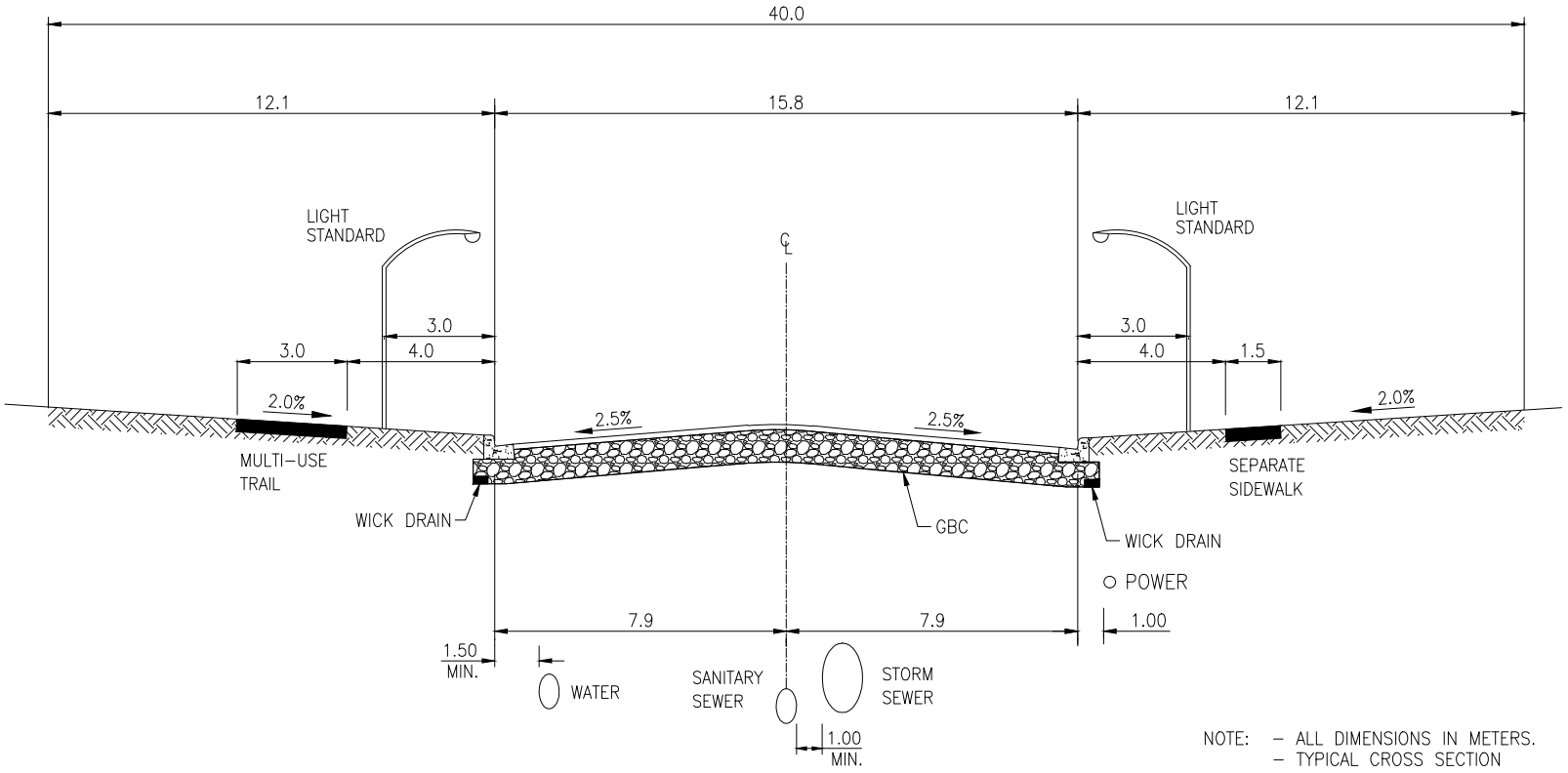
(1) Minimum Frequency not Specified

(2) When a Lot has eight hours of plant production or more, a minimum of four plant checks plus four asphalt contents and four sieve analysis of the combined aggregate are required. When a Lot has less than eight hours of plant production, these tests shall be performed once for every two full hours of plant production.

9.12 Quality Control and Testing

The Developer/Contractor shall be responsible for quality control testing and the cost of the quality control testing related to all phases of roadway construction, including aggregate sieve analysis, density testing, mix designs, core sampling, etc. at his own cost.

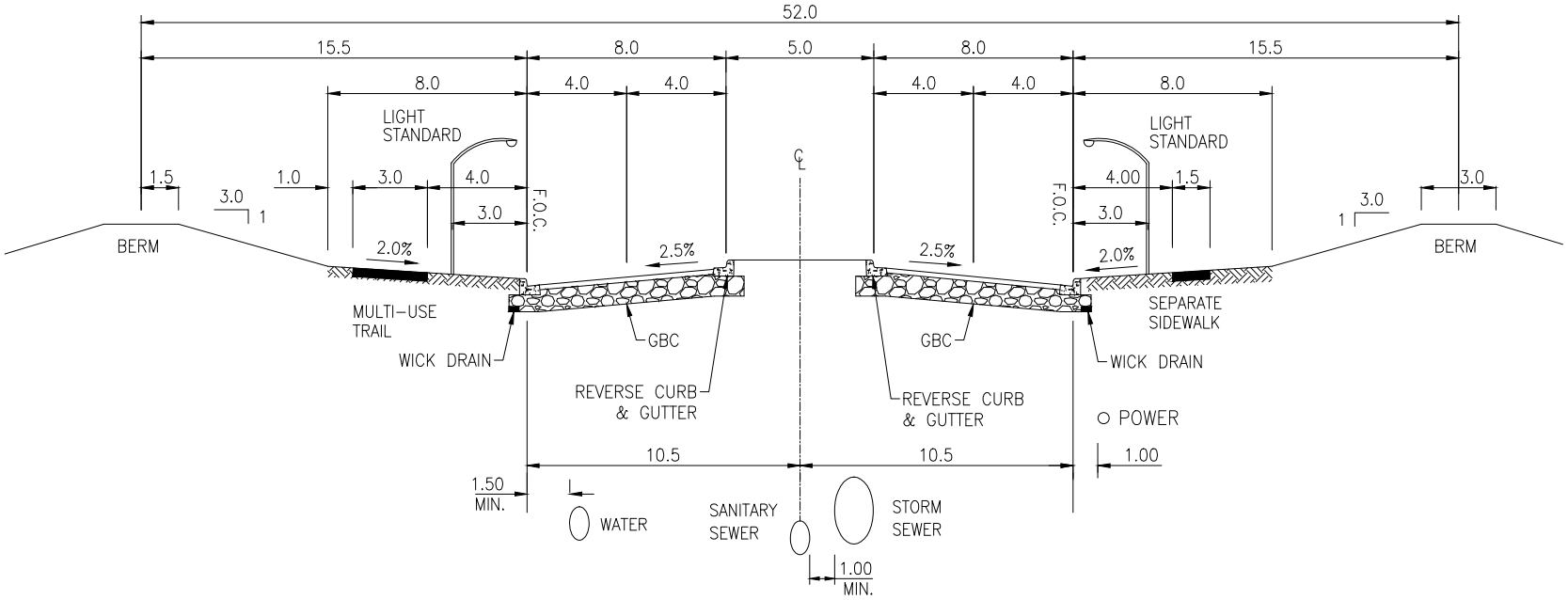
Copies of all quality control testing shall be submitted for review to the Municipal Engineer prior to the issuance of a Construction Completion Certificate.



COUNTY of GRANDE PRAIRIE No. 1

4 LANE URBAN UNDIVIDED ARTERIAL
40m R.O.W.

DATE:	2016-08-05	DRAWN BY:	DC	APPROVED:	DRAWING 9.01
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		

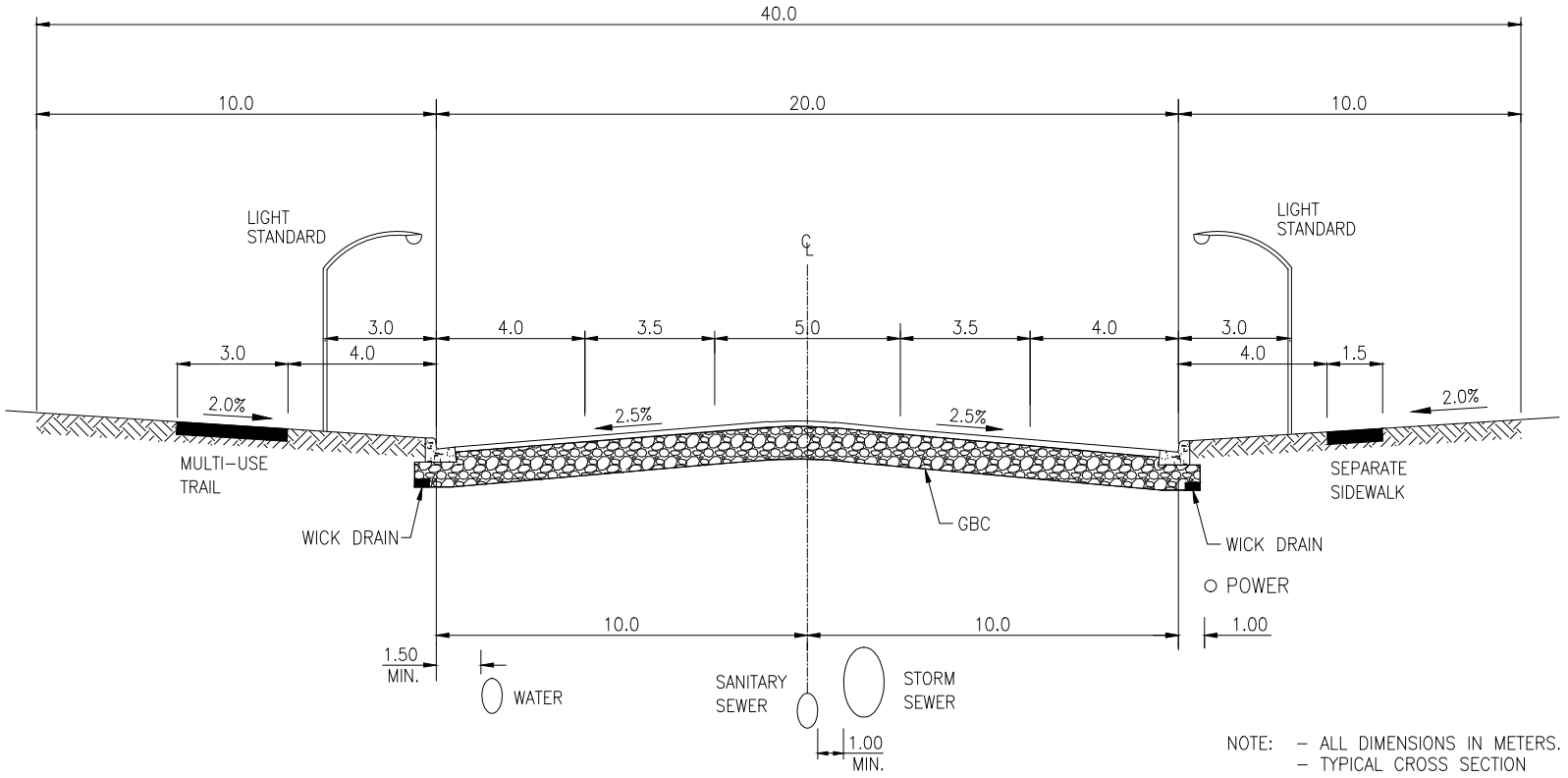


NOTE: – ALL DIMENSIONS IN METERS.
– TYPICAL CROSS SECTION

COUNTY of GRANDE PRAIRIE No. 1

4 LANE URBAN ARTERIAL DIVIDED WITH BERM
52m R.O.W.

DATE:	2016-08-05	DRAWN BY:	DC	APPROVED:	DRAWING 9.1
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		



COUNTY of GRANDE PRAIRIE No. 1

5 LANE URBAN UNDIVIDED ARTERIAL
40m R.O.W.

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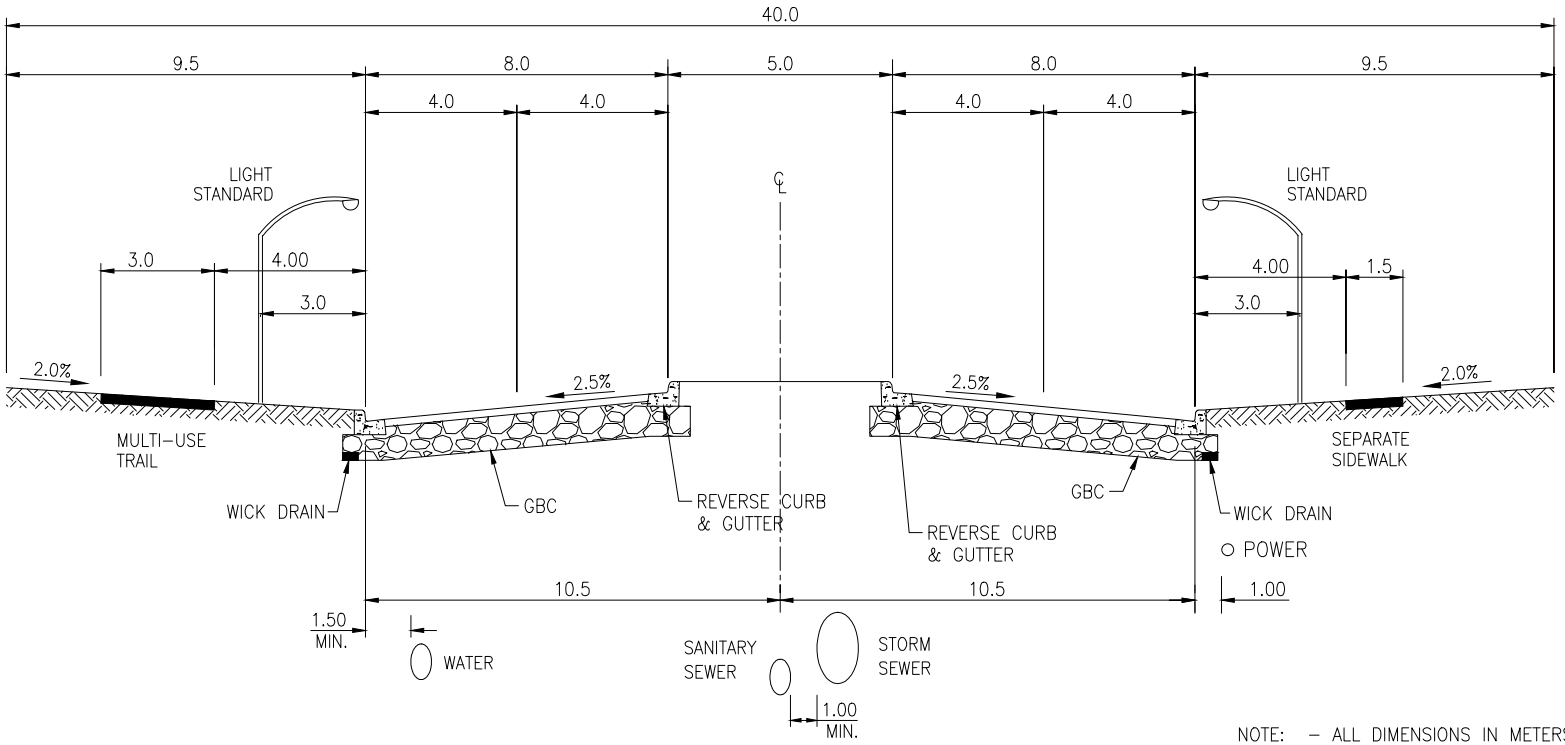
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		

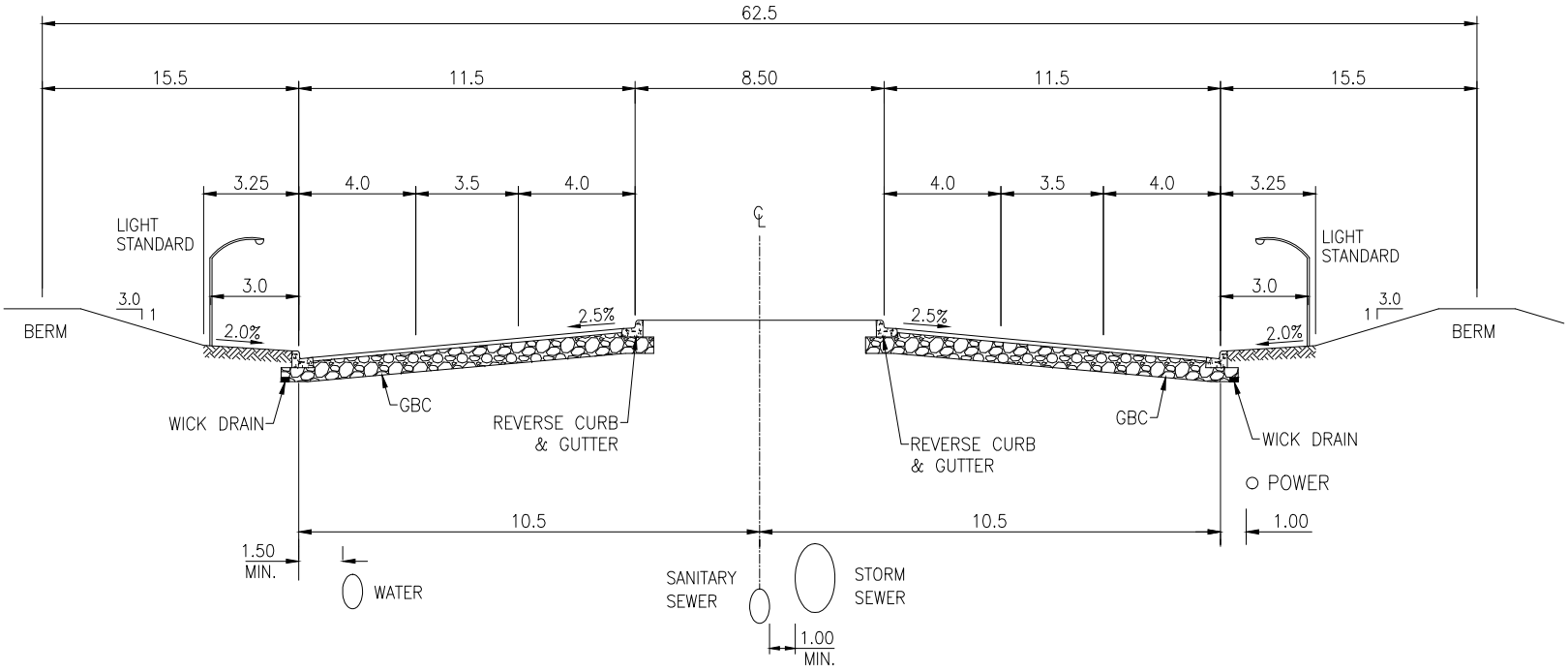


NOTE: – ALL DIMENSIONS IN METERS.
– TYPICAL CROSS SECTION

COUNTY of GRANDE PRAIRIE No. 1

4 LANE URBAN ARTERIAL DIVIDED WITHOUT BERM
40m R.O.W.

DATE:	2016-08-05	DRAWN BY:	DC	APPROVED:	DRAWING 9.2
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		



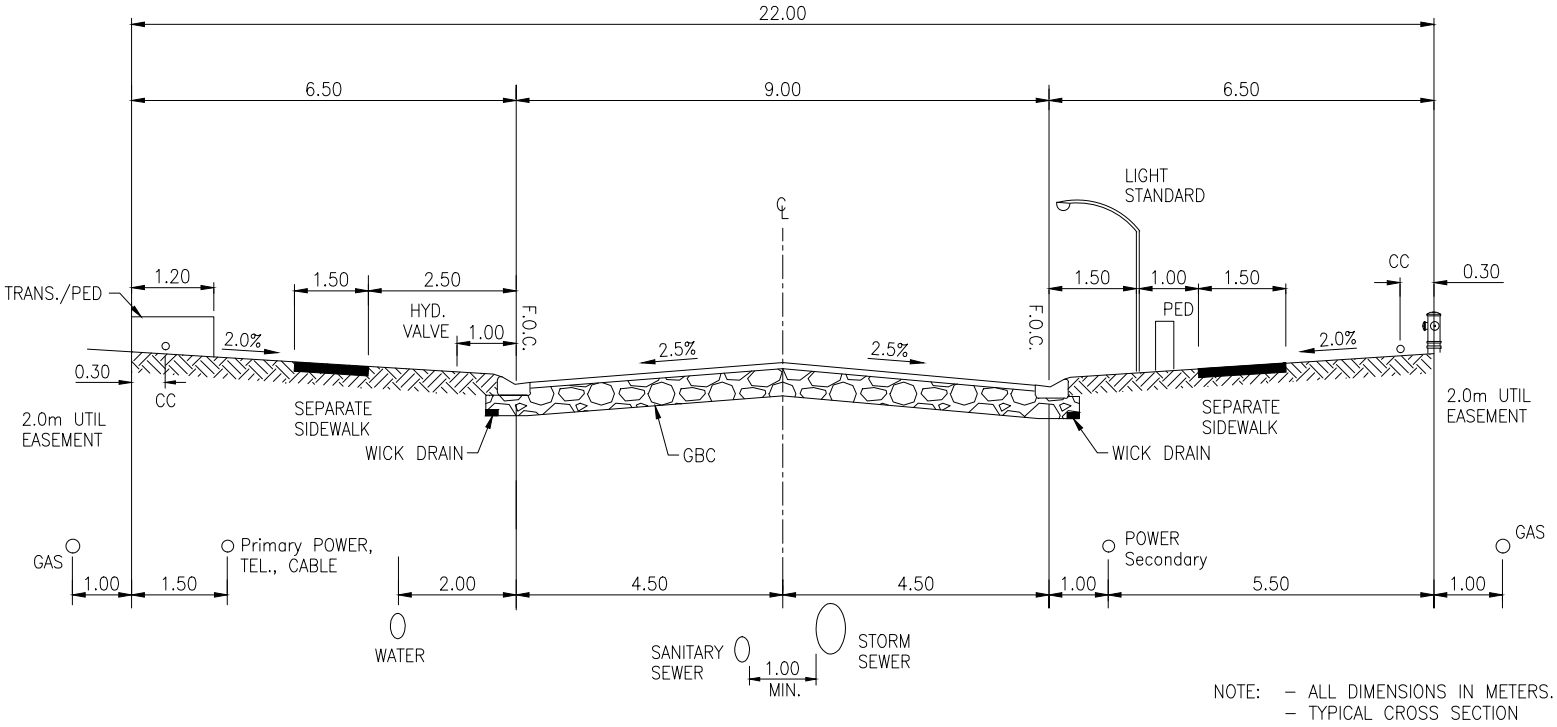
ADD 4.25m R.O.W ON EACH SIDE FOR TOTAL 62.5m R.O.W.
IF MULTI-USE TRAIL IS REQUIRED.

NOTE: - ALL DIMENSIONS IN METERS.
- TYPICAL CROSS SECTION

COUNTY of GRANDE PRAIRIE No. 1

6 LANE URBAN ARTERIAL DIVIDED WITH BERM
62.5m R.O.W.

DATE:	2016-08-05	DRAWN BY:	DC	APPROVED:	DRAWING 9.3
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		

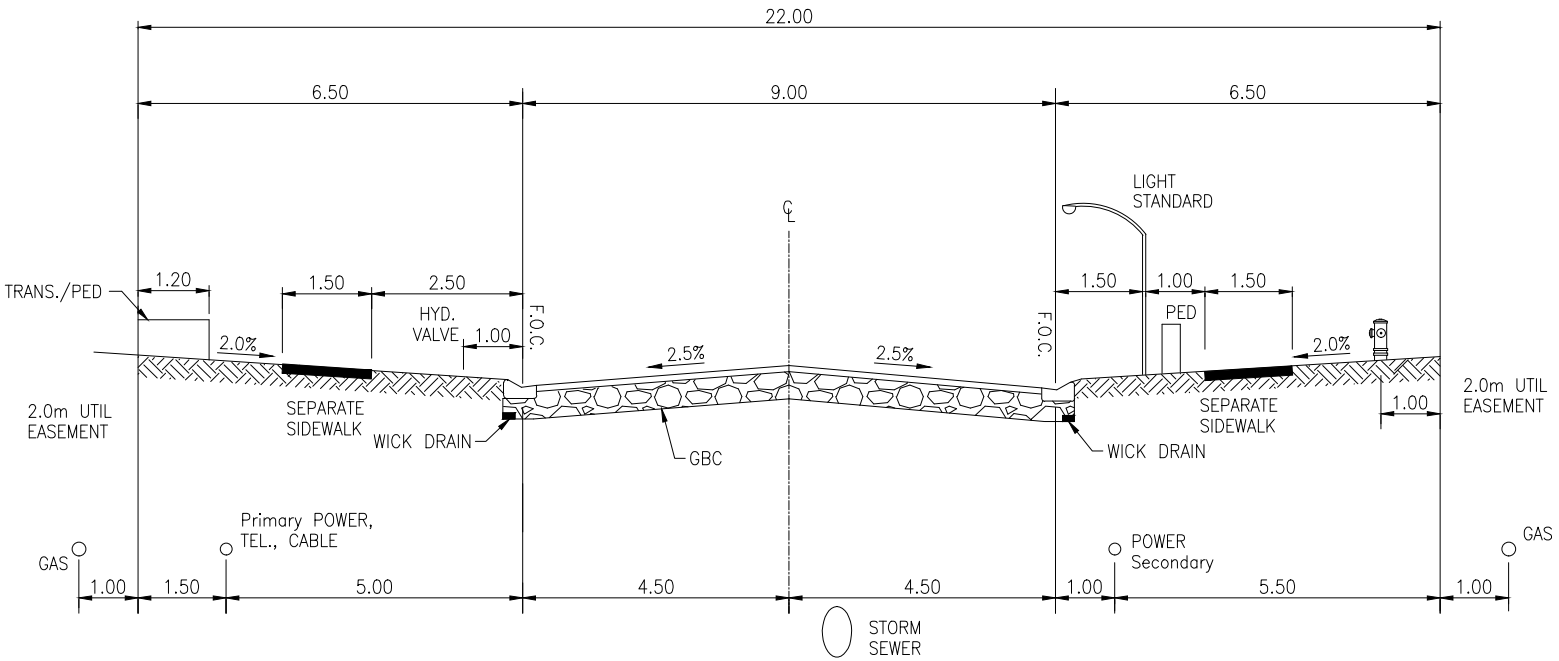


NOTE: – ALL DIMENSIONS IN METERS.
– TYPICAL CROSS SECTION

COUNTY of GRANDE PRAIRIE No. 1

URBAN RESIDENTIAL LOCAL 22m R.O.W.
FRONT LOT SERVICING

DATE:	2016-08-05	DRAWN BY:	DC	APPROVED:	DRAWING 9.4
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		



NOTE: – ALL DIMENSIONS IN METERS.
– TYPICAL CROSS SECTION

COUNTY of GRANDE PRAIRIE No. 1

URBAN RESIDENTIAL LOCAL - 22m R.O.W.
REAR LANE / PUBLIC UTILITY LOT SERVICING

DATE:	2016-08-05	DRAWN BY:	DC	APPROVED:	DRAWING 9.5
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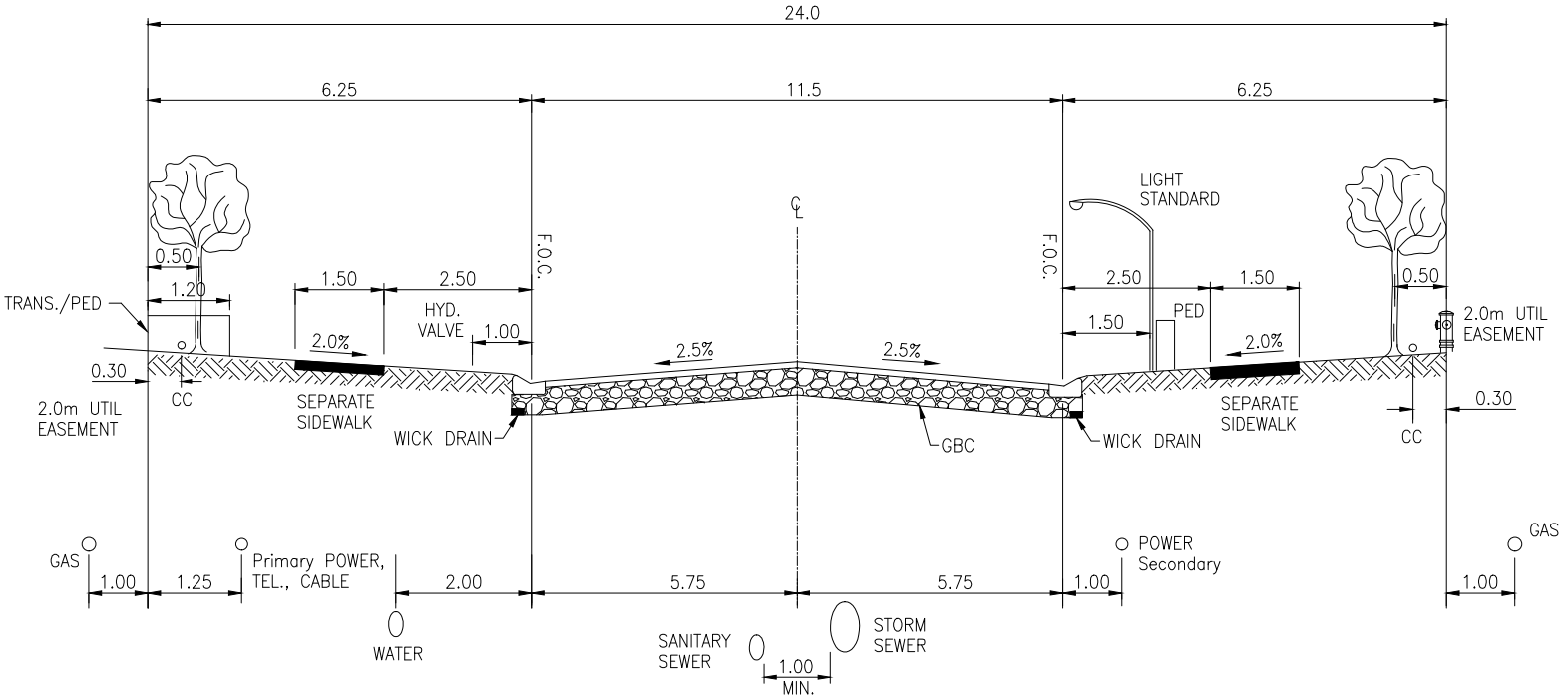

NOTE: – ALL DIMENSIONS IN METERS.
– TYPICAL CROSS SECTION

COUNTY of GRANDE PRAIRIE No. 1

URBAN RESIDENTIAL COLLECTOR
MINOR (11.5 m) - 24m R.O.W.
FRONT LOT SERVICING

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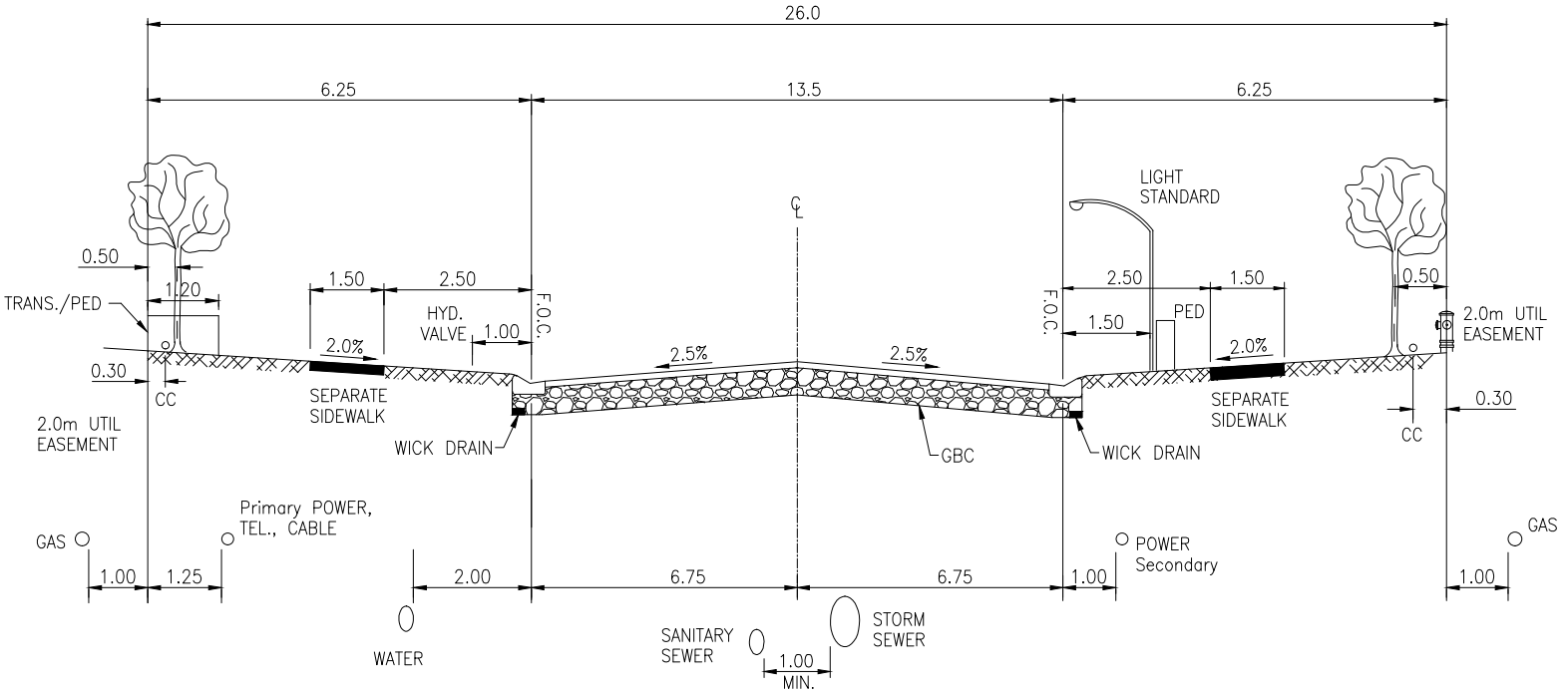

NOTE: – ALL DIMENSIONS IN METERS.
– TYPICAL CROSS SECTION

COUNTY of GRANDE PRAIRIE No. 1

URBAN RESIDENTIAL COLLECTOR
MAJOR (13.5 m) - 26m R.O.W.
FRONT LOT SERVICING

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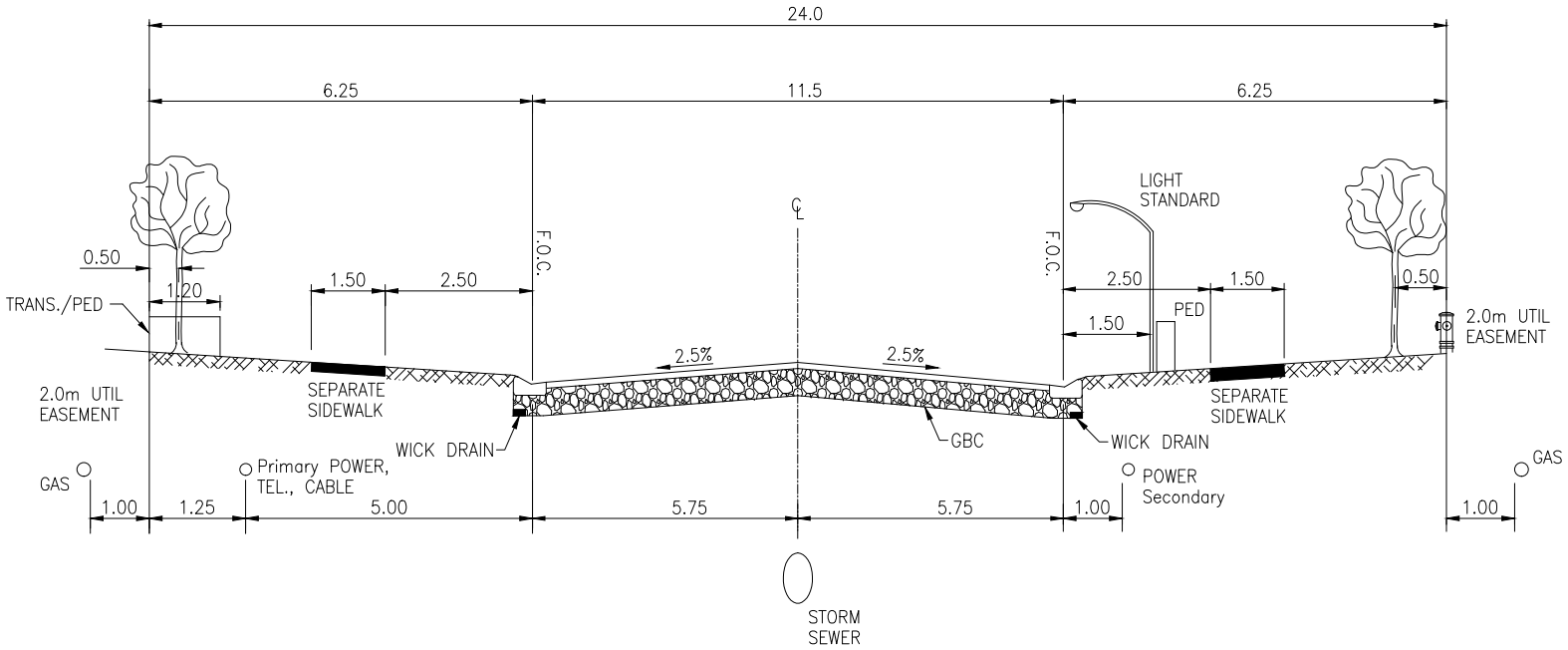

NOTE: – ALL DIMENSIONS IN METERS.
– TYPICAL CROSS SECTION

COUNTY of GRANDE PRAIRIE No. 1

URBAN RESIDENTIAL COLLECTOR
MINOR (11.5 m) - 24m R.O.W.
PUBLIC UTILITY LOT / REAR LANE SERVICING

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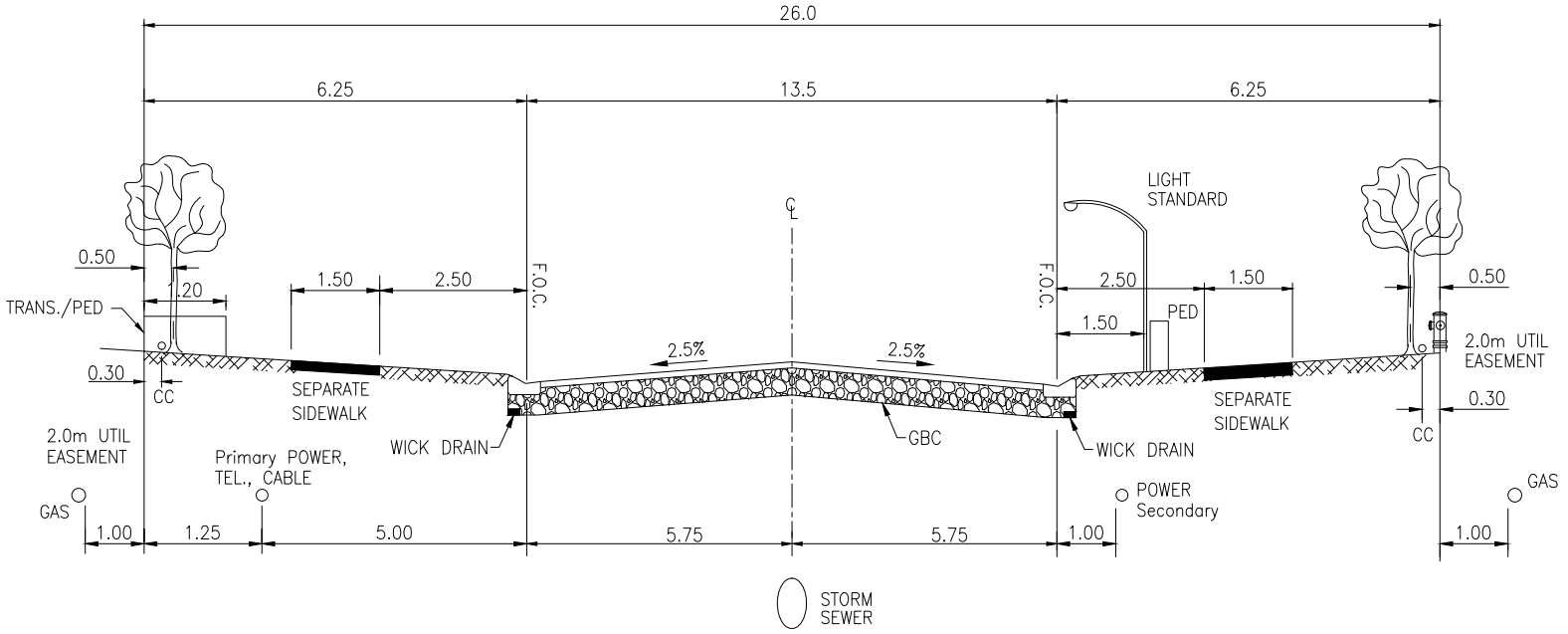

NOTE: – ALL DIMENSIONS IN METERS.
– TYPICAL CROSS SECTION

COUNTY of GRANDE PRAIRIE No. 1

URBAN RESIDENTIAL COLLECTOR
MAJOR (13.5 m) - 26m R.O.W.
PUBLIC UTILITY LOT / REAR LANE SERVICING

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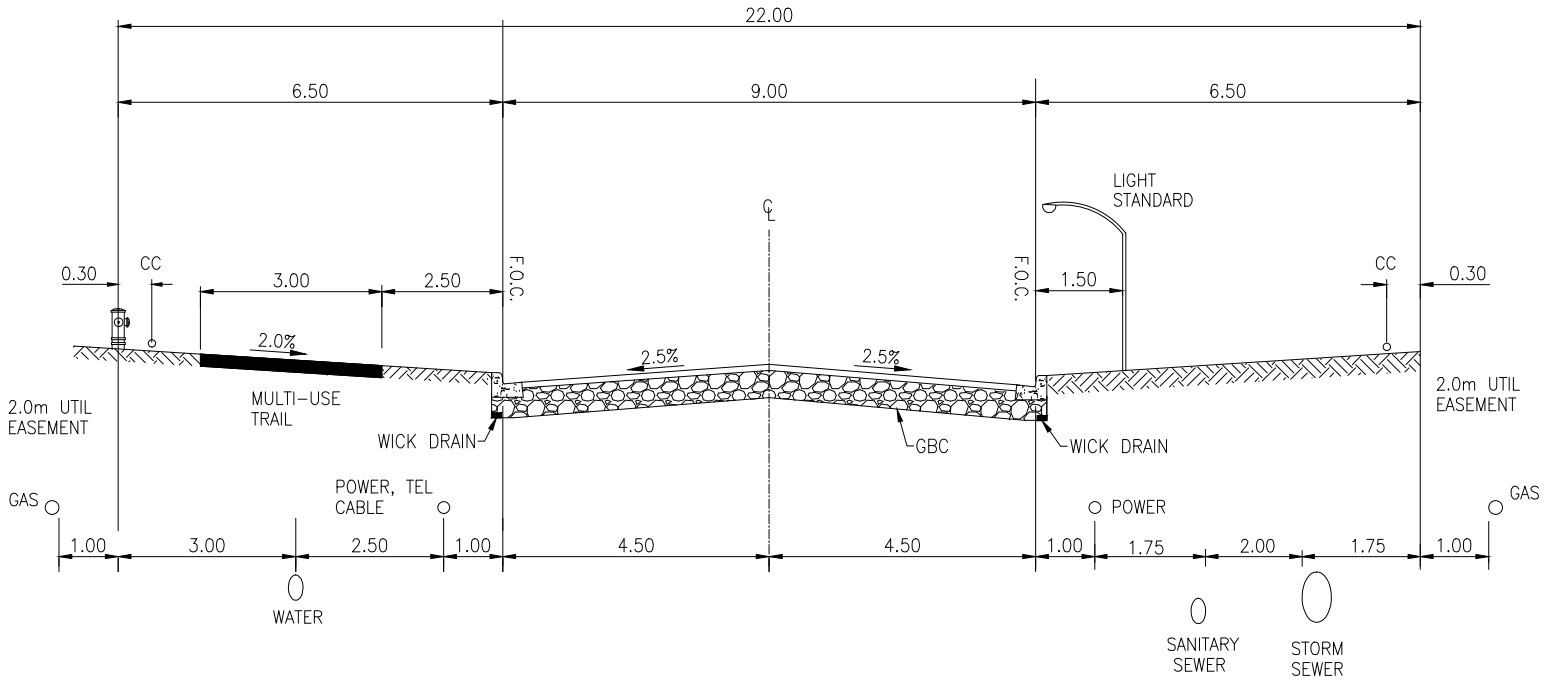

NOTE:
- ALL DIMENSIONS IN METERS.
- TYPICAL CROSS SECTION
- TRANSFORMERS AND SWITCHING CUBES LOCATED ON PRIVATE PROPERTY IN EASEMENT

COUNTY of GRANDE PRAIRIE No. 1

9.0m URBAN COMMERCIAL / INDUSTRIAL SERVICE ROAD
22m R.O.W.

DATE:	2016-08-05	DRAWN BY:	DC	APPROVED:	DRAWING 9.10
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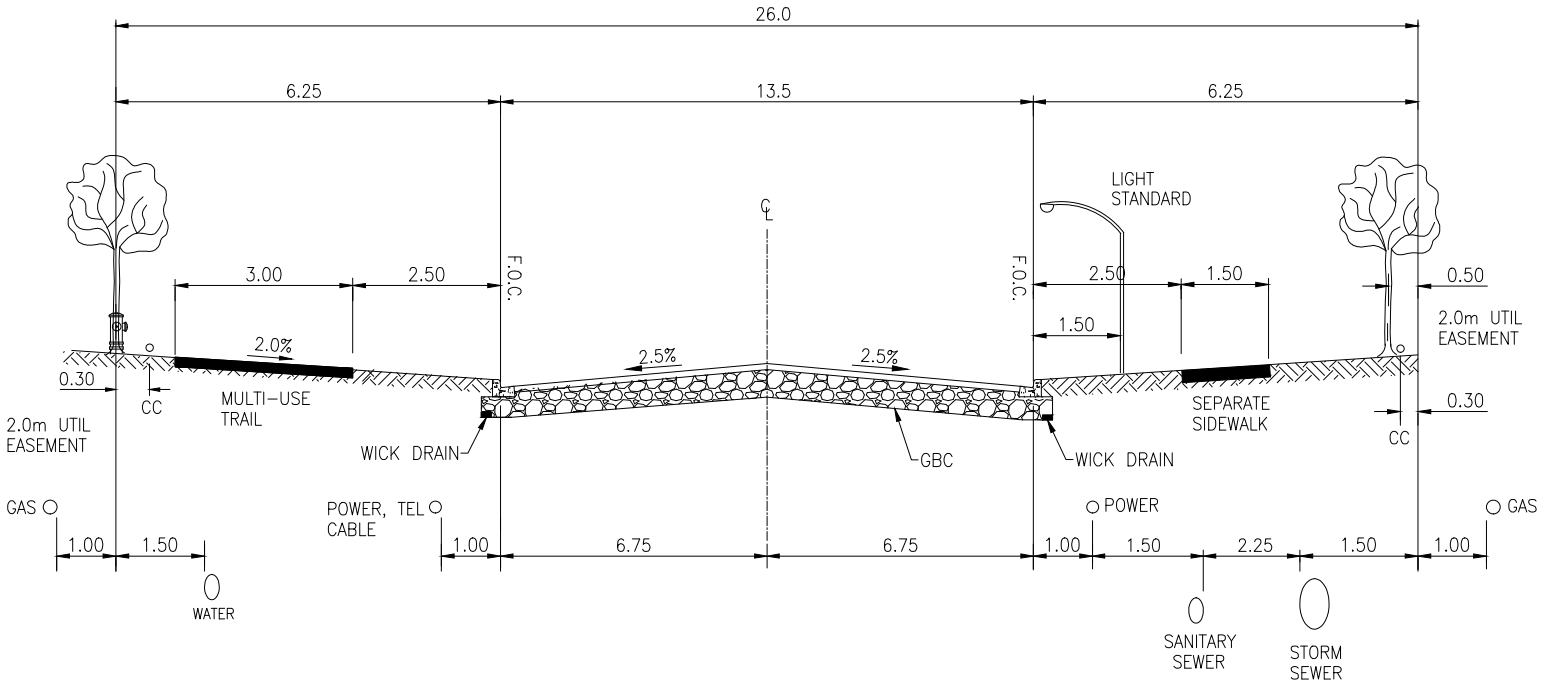

NOTE: – ALL DIMENSIONS IN METERS.
– TYPICAL CROSS SECTION
– TRANSFORMERS AND SWITCHING CUBES LOCATED ON PRIVATE PROPERTY IN EASEMENT

County of Grande Prairie No. 1

COUNTY of GRANDE PRAIRIE No. 1

13.5m URBAN COMMERCIAL / INDUSTRIAL COLLECTOR (MAJOR)
26m R.O.W.

DATE:	2016-08-05	DRAWN BY:	DC	APPROVED:	DRAWING 9.11
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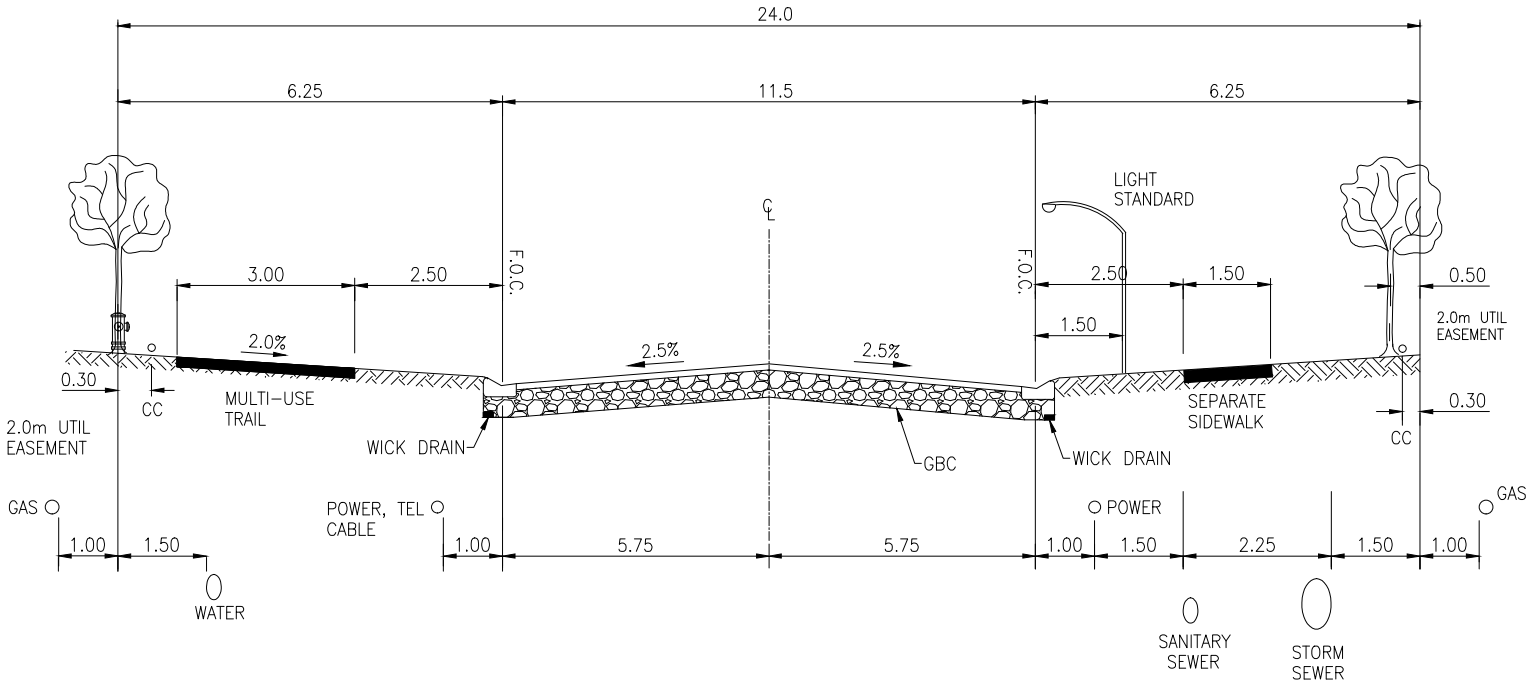

NOTE:
- ALL DIMENSIONS IN METERS.
- TYPICAL CROSS SECTION
- TRANSFORMERS AND SWITCHING CUBES LOCATED ON PRIVATE PROPERTY IN EASEMENT

COUNTY of GRANDE PRAIRIE No. 1

11.5m URBAN COMMERCIAL / INDUSTRIAL COLLECTOR (MINOR)
24m R.O.W.

DATE:	2016-08-05	DRAWN BY:	DC	APPROVED:	DRAWING 9.12
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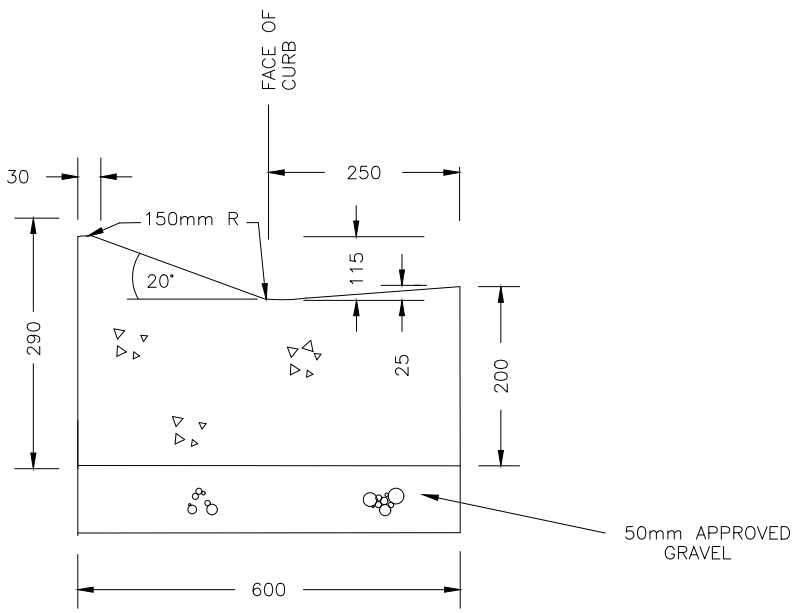
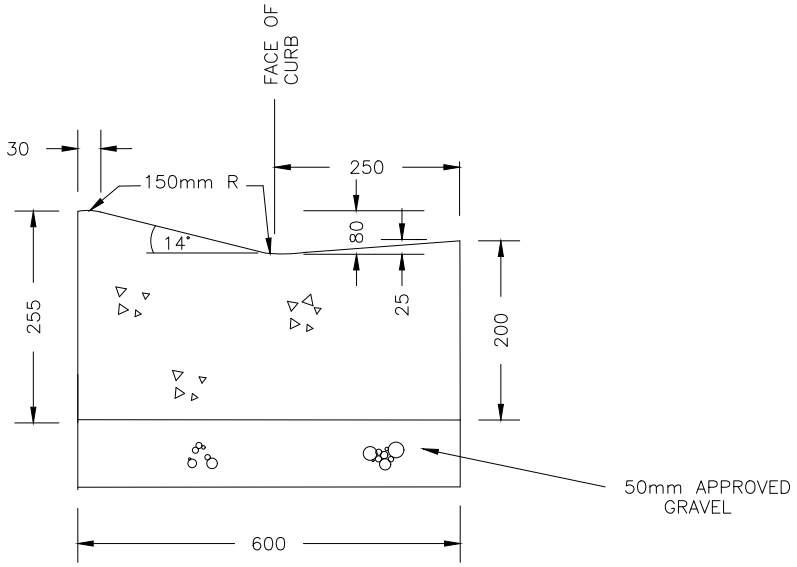


HIGH PROFILE SECTION

(PRE 1991)



LOW PROFILE SECTION

(1997)

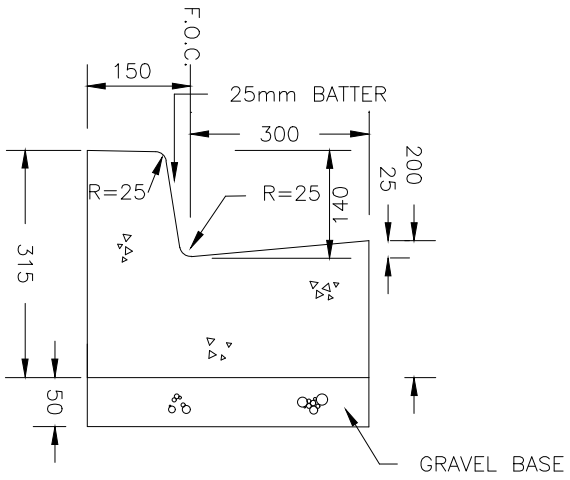
NOTE: ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED
GRAVEL BASE NOT REQUIRED IF EXTRUDED

County of Grande Prairie No. 1

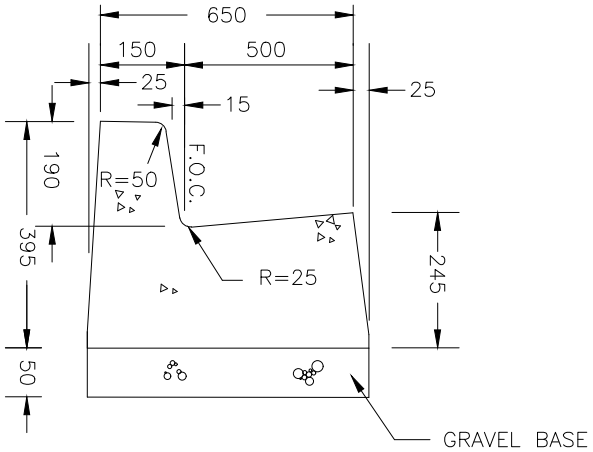
COUNTY of GRANDE PRAIRIE No. 1

MONOLITHIC CURB & GUTTER (MODIFIED ROLLED FACE)

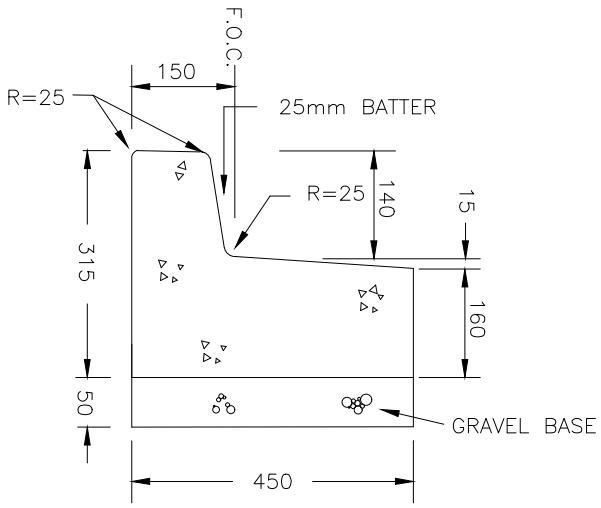
DATE:	2016-08-05	DRAWN BY:	DC	APPROVED:	DRAWING 9.13
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		



150 – 300 SECTION



190 – 500 SECTION



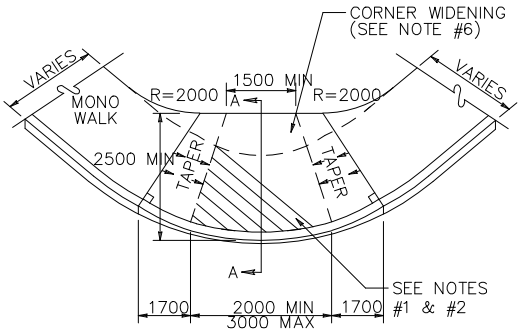
150 – 300 REVERSE SECTION

Note:
- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED.
- GRAVEL BASE NOT REQUIRED IF EXTRUDED.

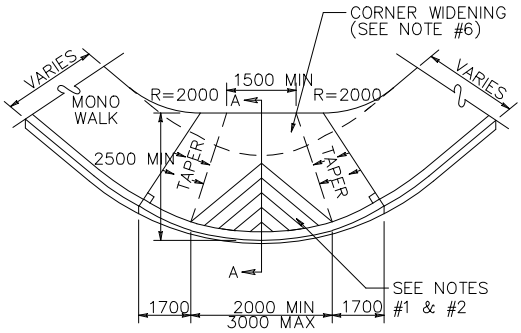
COUNTY of GRANDE PRAIRIE No. 1

MONOLITHIC CURB & GUTTER (VERTICAL FACE)

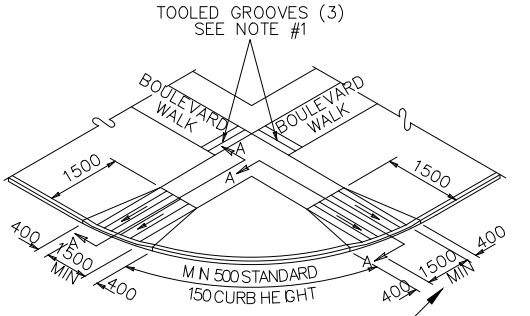
DATE:	2016-08-05	DRAWN BY:	DC	APPROVED:	DRAWING 9.14
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		



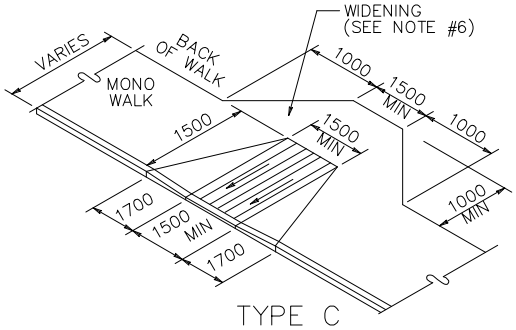
TYPE A1 (ONE DIRECTION)
N.T.S.



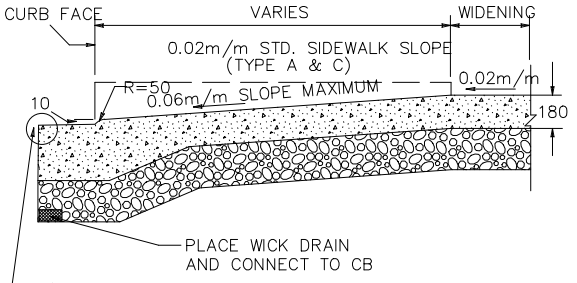
TYPE A2 (TWO DIRECTIONS)
N.T.S.



TYPE B
N.T.S.

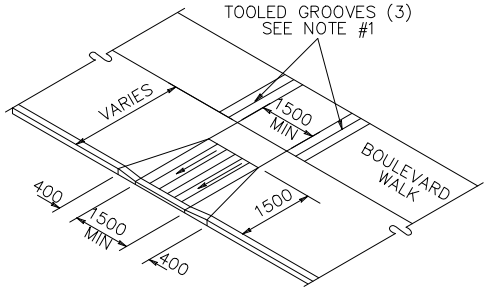


TYPE C
N.T.S.



a) MATCH ASPHALT SURFACE TO GUTTER LIP WITHIN 3mm.
b) IF ASPHALT TOPLIFT IS DEFERRED, PLACE ASPHALT RAMP FOR THE WIDTH OF CURB RAMP, AND EXTENDING MINIMUM 1.0m INTO ROAD.

TYPICAL CROSS SECTION A–A
SCALE: N.T.S



TYPE D
N.T.S.

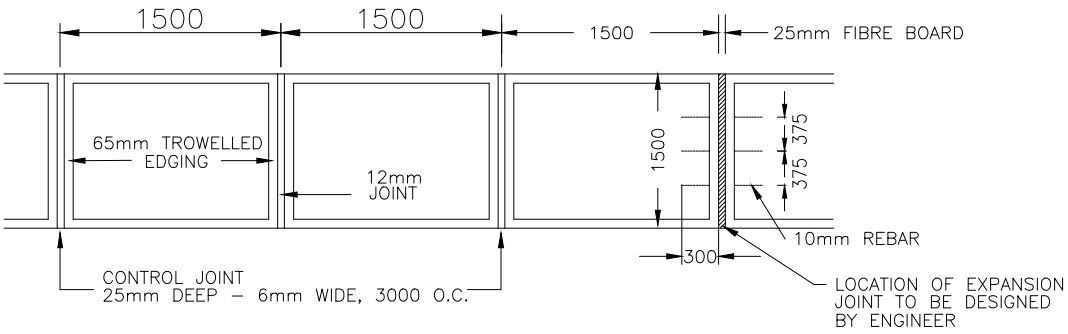
NOTES:
1. TOOLED GROOVES 5mm WIDE X 10mm DEEP, BROOM FINISH. GROOVE SPACING 150mm O.C. ADJACENT TO CURB.
2. GROOVES TO BE IN DIRECTION OF TRAVEL.
3. WHEN REQUIRED, TRANSITION FROM STRAIGHT FACE CURB TO ROLLED FACE CURB AT CURB RAMP.
4. CURBS AND RAMPS TO BE POURED MONOLITHICALLY.
5. WIDTH OF RAMP MUST EQUAL WIDTH OF WALK (MIN 1.5m, MAX 3.0m) EXCEPT "TYPE A".
6. PROVIDE 1.0m WIDENING (AT 2.0% X–FALL) FROM BACK OF CURB RAMP (TYPES A & C) WHERE ROAD RIGHT–OF–WAY ALLOWS.
7. FOR BOULEVARD WALK TO CURBLINE WALK, REFER TO DRAWING #5052 FOR CURB RAMP LOCATIONS AND TYPES.

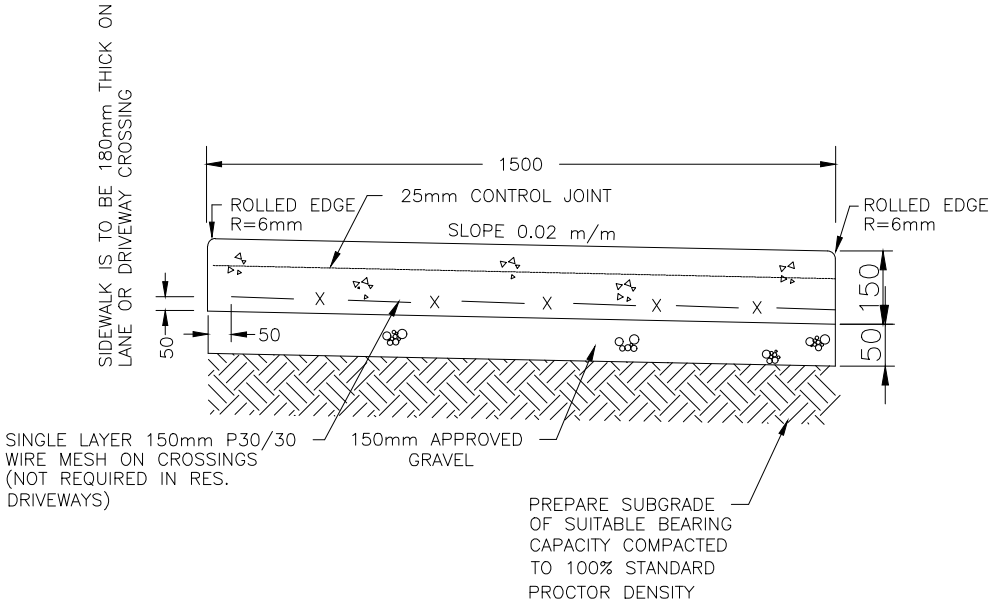
ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED

COUNTY of GRANDE PRAIRIE No. 1

PARAPLEGIC RAMPS WITH BLIND BARS

DATE:	2016-08-05	DRAWN BY:	DC	APPROVED:	DRAWING
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		9.15





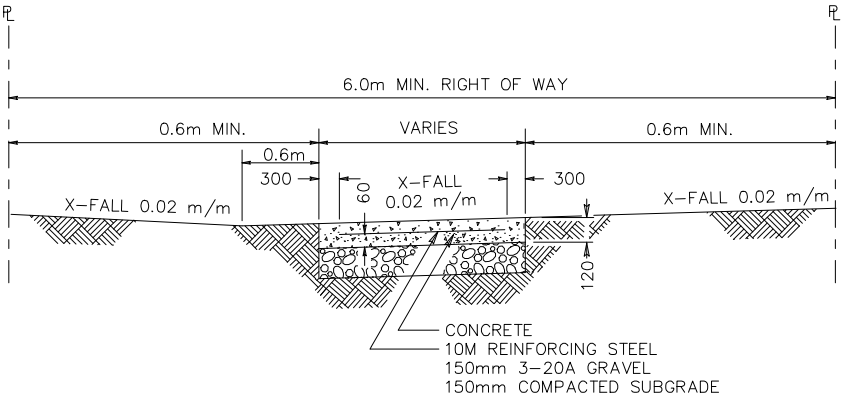
NOTE:

- CONSTRUCTION JOINT FILLER TO BE OF EXPANDABLE/COMPRESSABLE MATERIAL APPROVED BY THE ENGINEER. CONSTRUCTION JOINT AT END OF EACH POUR.
- EXPANSION/CONTRACTION JOINTS WILL BE SAME AS ABOVE DETAIL EXCEPT FOR RE-INFORCING, AND SPACED AS SHOWN ON ENGINEERING DRAWINGS.
- ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

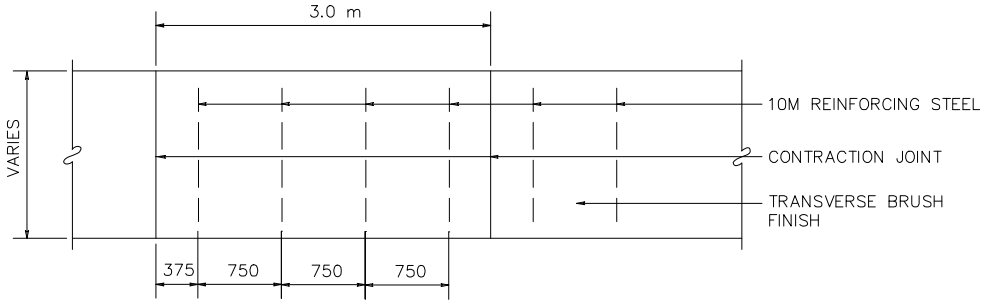
COUNTY of GRANDE PRAIRIE No. 1

SEPARATE SIDEWALK

DATE:	2016-08-05	DRAWN BY:	DC	APPROVED:	DRAWING 9.16
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		



TYPICAL SECTION



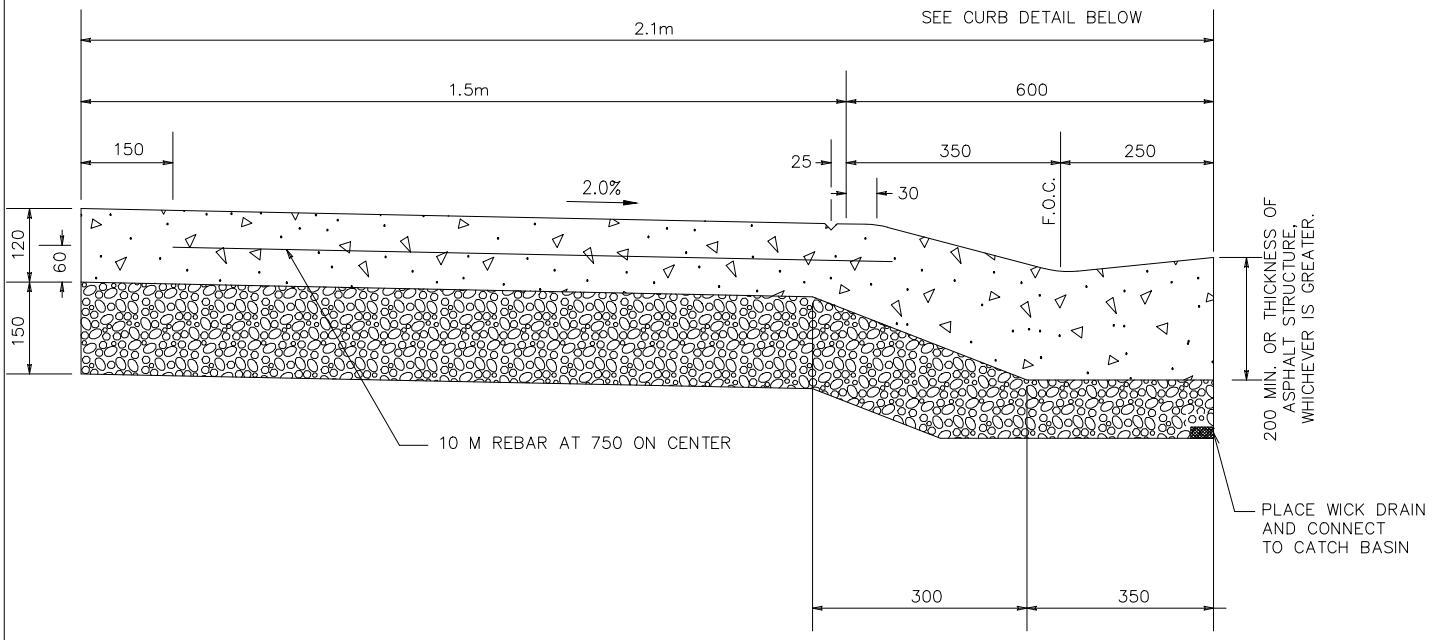
PLAN VIEW

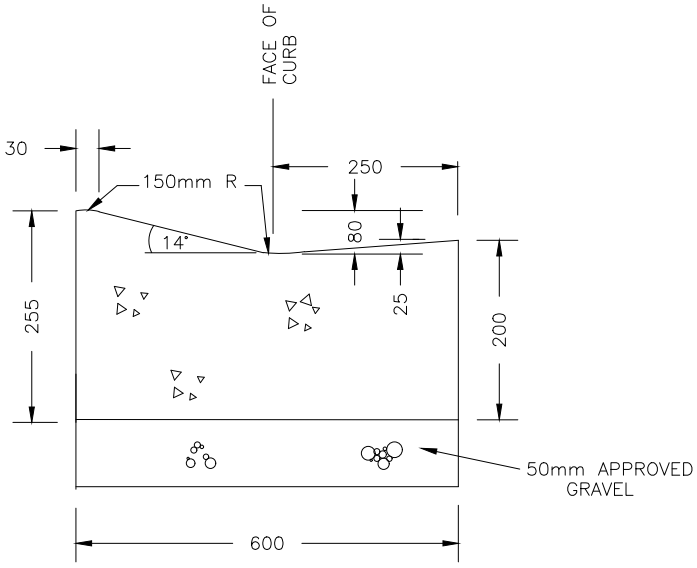
ALL DIMENSIONS
IN MILLIMETRES UNLESS
OTHERWISE NOTED

COUNTY of GRANDE PRAIRIE No. 1

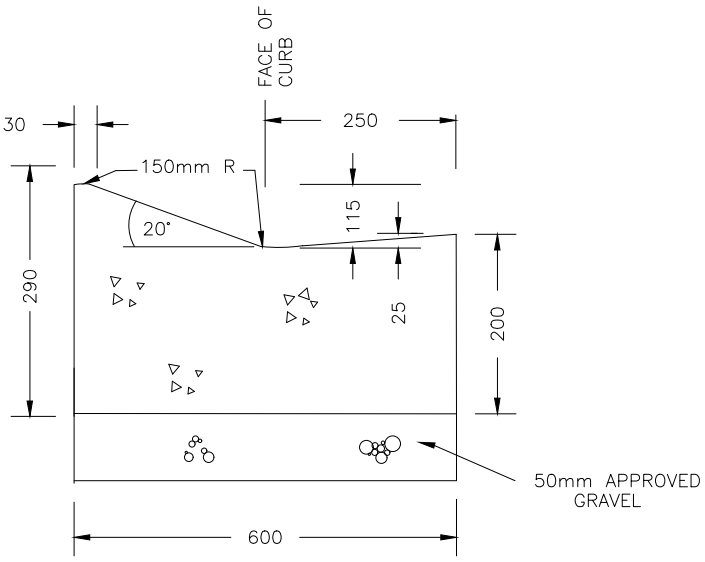
CONCRETE WALKWAY GREATER THAN 1.5 m

DATE:	2016-08-05	DRAWN BY:	DC	APPROVED:	DRAWING 9.17
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		





LOW PROFILE SECTION
(1997)



HIGH PROFILE SECTION
(PRE 1991)

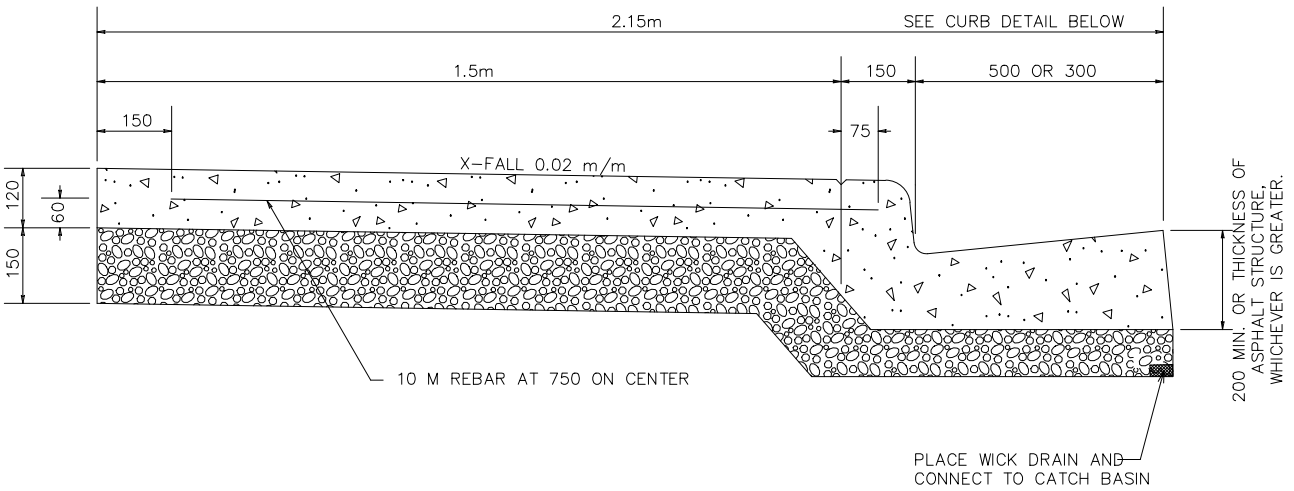
ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED

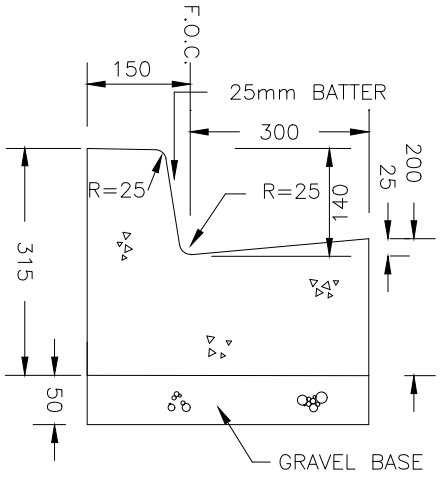
County of Grande Prairie No. 1

COUNTY of GRANDE PRAIRIE No. 1

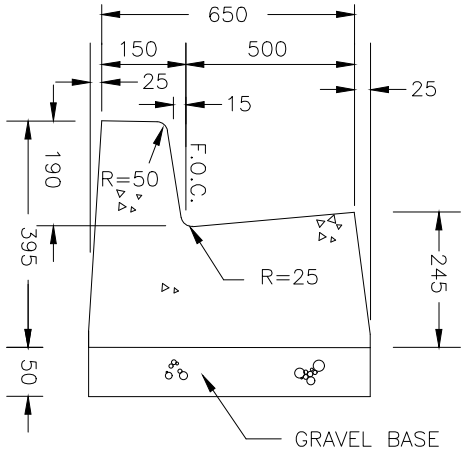
ROLL FACE MONOLITHIC WALK AND GUTTER

DATE:	2016-08-05	DRAWN BY:	DC	APPROVED:	DRAWING
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		9.18

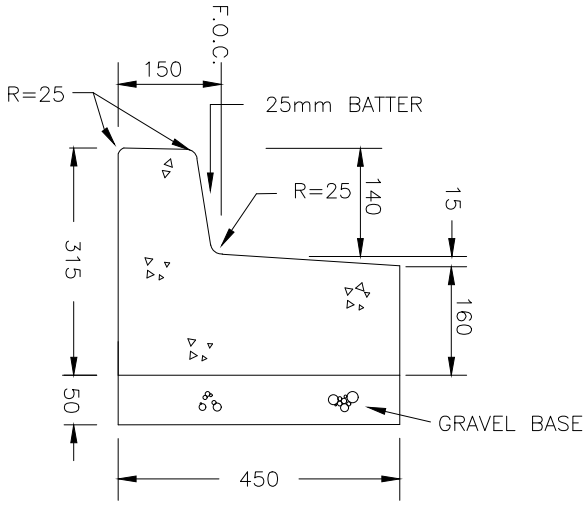




150 – 300 SECTION



190 – 500 SECTION



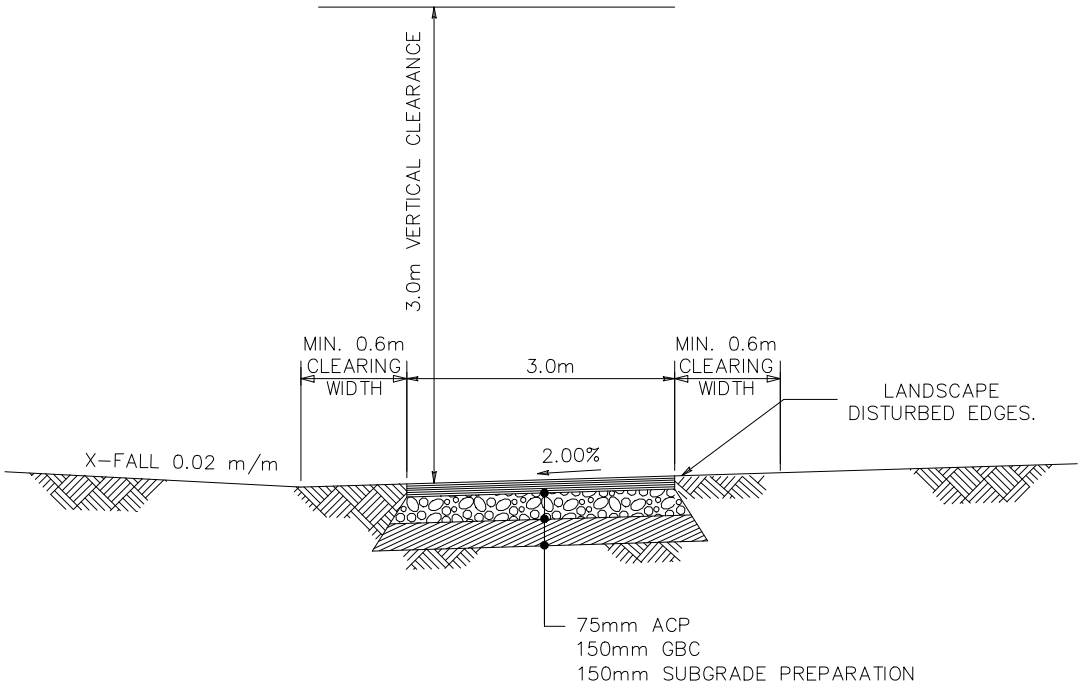
150 – 300 REVERSE SECTION

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED

COUNTY of GRANDE PRAIRIE No. 1

1.5m MONOLITHIC WALK WITH VERTICAL FACE CURB

DATE:	2016-08-05	DRAWN BY:	DC	APPROVED:	DRAWING 9.19
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		



TYPICAL SECTION

SEE TABLE 9.4 FOR

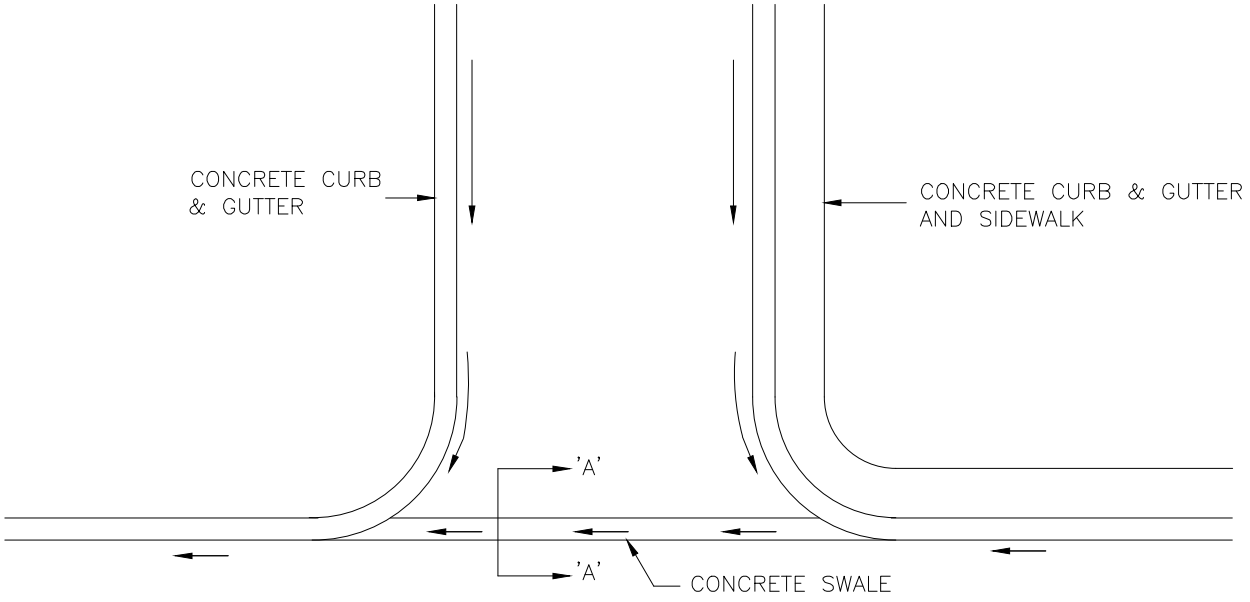
BIKE/PEDESTRIAN TRAIL STRUCTURES

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED

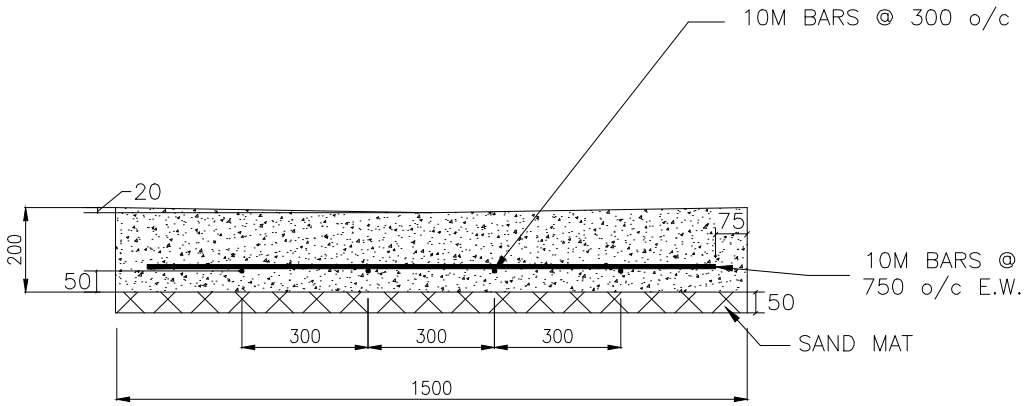
COUNTY of GRANDE PRAIRIE No. 1

MULTI-USE TRAIL

DATE:	2016-08-05	DRAWN BY:	SP	APPROVED:	DRAWING 9.20
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		



PLAN VIEW



SECTION 'A'–'A'

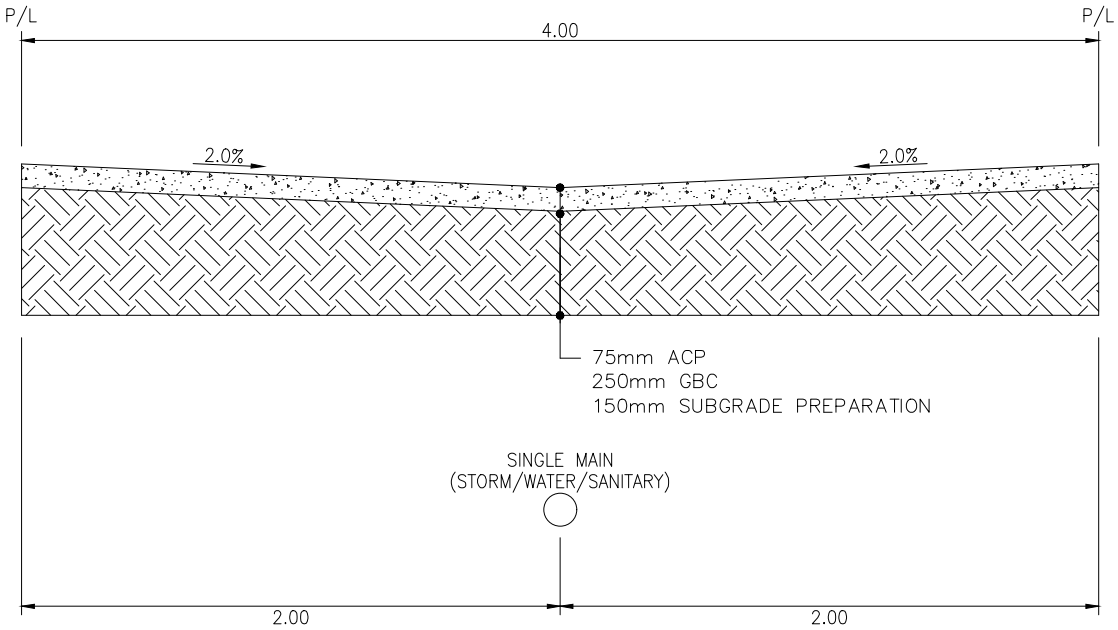
NOTE:
ALL CONCRETE TO BE 30 M.p.a. TYPE 50 CEMENT

County of Grande Prairie No. 1

COUNTY of GRANDE PRAIRIE No. 1

CONCRETE SWALE

DATE:	2016-08-05	DRAWN BY:	SP	APPROVED:	DRAWING
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		9.21



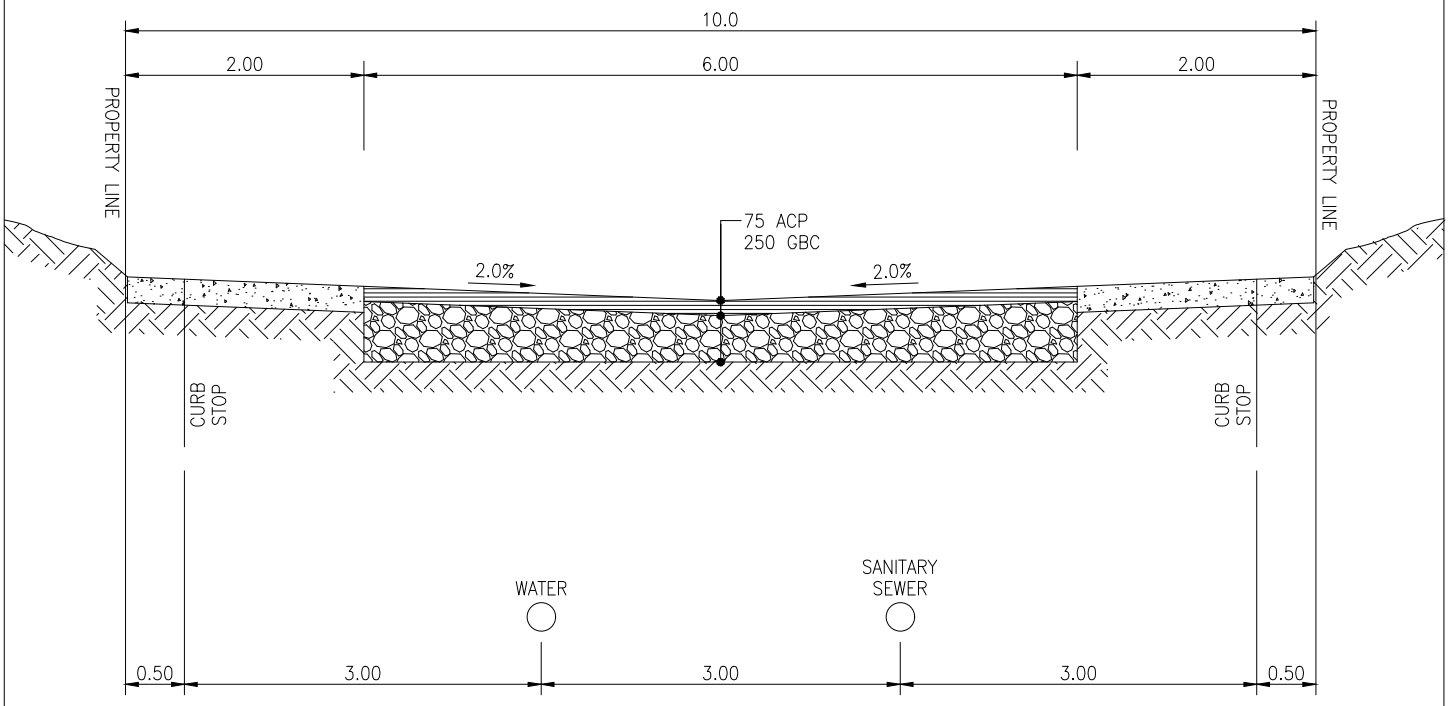
NOTES:

- TYPICAL CROSS SECTION
- LOCKABLE, UTILITY LOT BARRIER TO BE PROVIDED AT ENTRANCE TO ALL UTILITY LOTS
- EASEMENTS MAY BE REQUIRED.
- ALL DIMENSIONS IN METERS.

COUNTY of GRANDE PRAIRIE No. 1

TYPICAL SINGLE UTILITY LAYOUT
HIGH DENSITY URBAN SUBDIVISION
PARTIAL BACK LOT SERVICING

DATE:	2016-08-05	DRAWN BY:	SP	APPROVED:	DRAWING 9.22
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		



NOTES:

- TYPICAL CROSS-SECTION
- 'NO TRUCK' SIGNS TO BE PROVIDED AT ENTRANCE TO ALL PAVED LANES.
- PUL TO GRASSED SURFACE STANDARD.
- ALL DIMENSIONS IN METERS.

COUNTY of GRANDE PRAIRIE No. 1

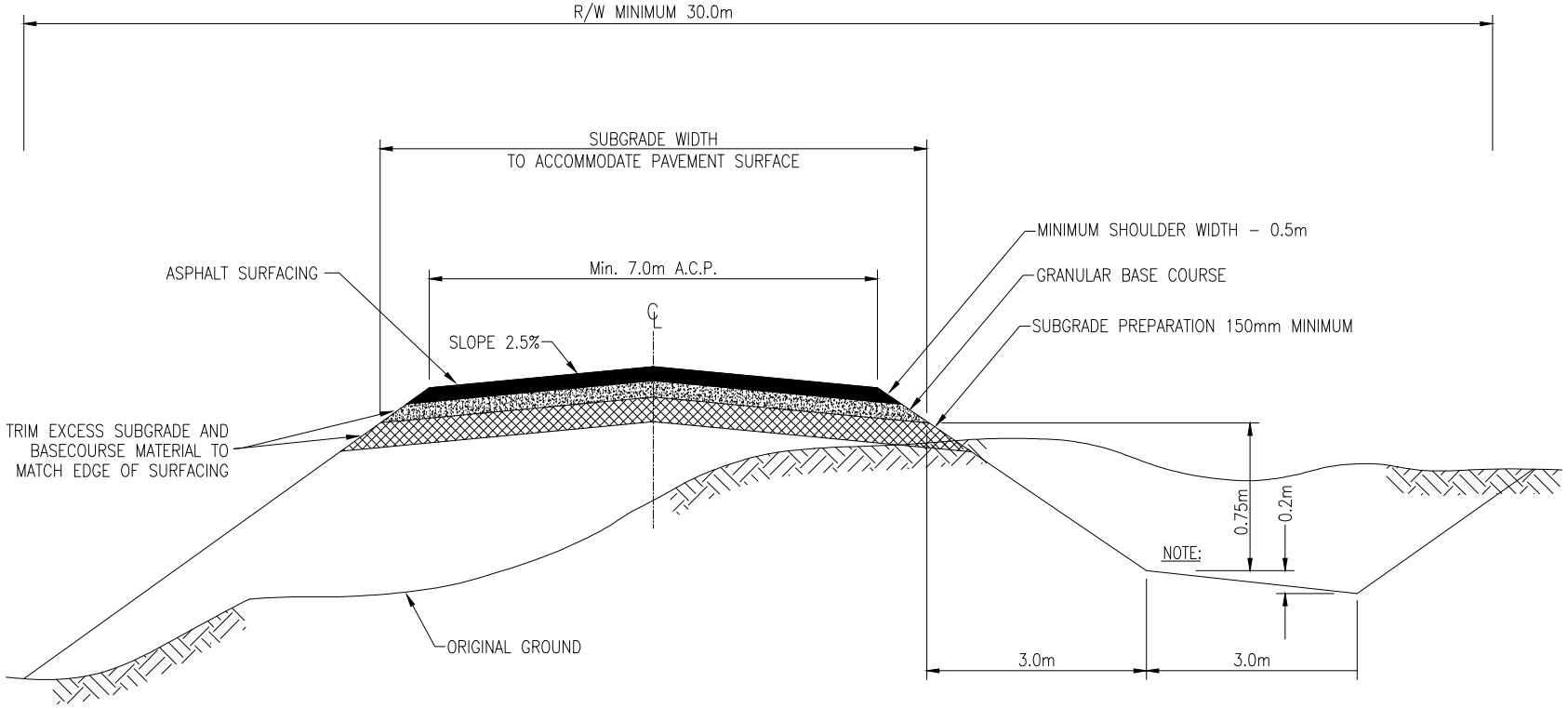
TYPICAL UTILITY LAYOUT
HIGH DENSITY URBAN SUBDIVISION
(REAR LANE / PUBLIC UTILITY LOT SERVICING)

DATE:	2016-08-05	DRAWN BY:	SP	APPROVED:	DRAWING 9.23
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		

COUNTY of GRANDE PRAIRIE No. 1

RESIDENTIAL SUBDIVISION AND
RURAL STANDARD
ROAD CLASSIFICATION

DATE:	2016-08-05	DRAWN BY:	SP	APPROVED:	DRAWING 9.25
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		



ALL BACK SLOPES 3:1 UNLESS NOTED OTHERWISE

FILL SLOPE TABLE

DEPTH of FILL	SLOPE
0 – 3.0m	3 : 1
3.0m – 4.5m	2 1/2 : 1
> – 4.5m	2 : 1

NOTE:

2:1 SLOPE REQUIRES 1m SHOULDER WIDENING & GUARDRAIL INSTALLATION

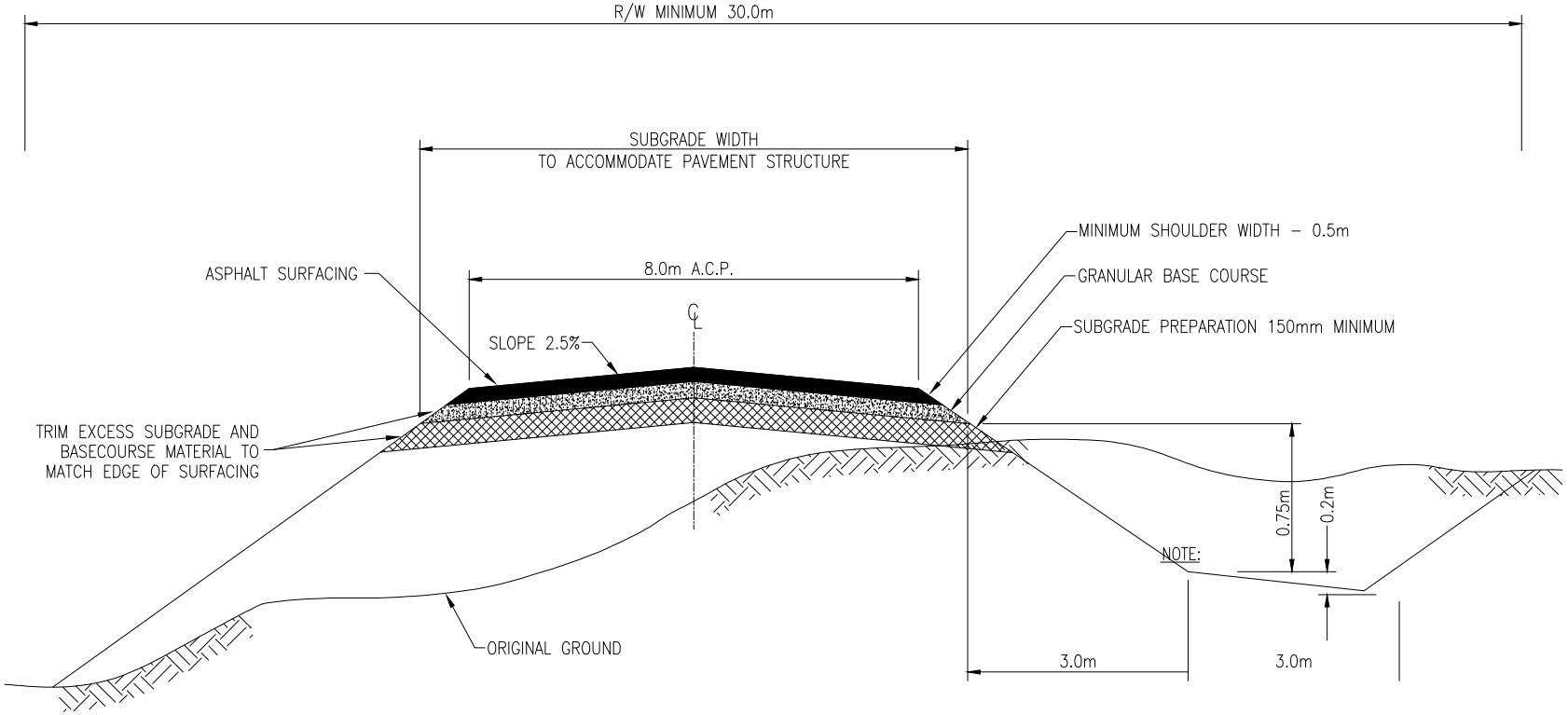
DIMENSIONS SHOWN IN METRES AND DECIMALS OF

County of Grande Prairie No. 1

COUNTY of GRANDE PRAIRIE No. 1

RESIDENTIAL ACCESS AND LOCAL ROAD

DATE:	2016-08-05	DRAWN BY:	SP	APPROVED:	DRAWING
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		9.26



ALL BACK SLOPES 3:1 UNLESS NOTED OTHERWISE

FILL SLOPE TABLE

DEPTH of FILL	SLOPE
0 – 3.0m	3 : 1
3.0m – 4.5m	2 1/2 : 1
> – 4.5m	2 : 1

NOTE:

2:1 SLOPE REQUIRES 1m SHOULDER WIDENING & GUARDRAIL INSTALLATION

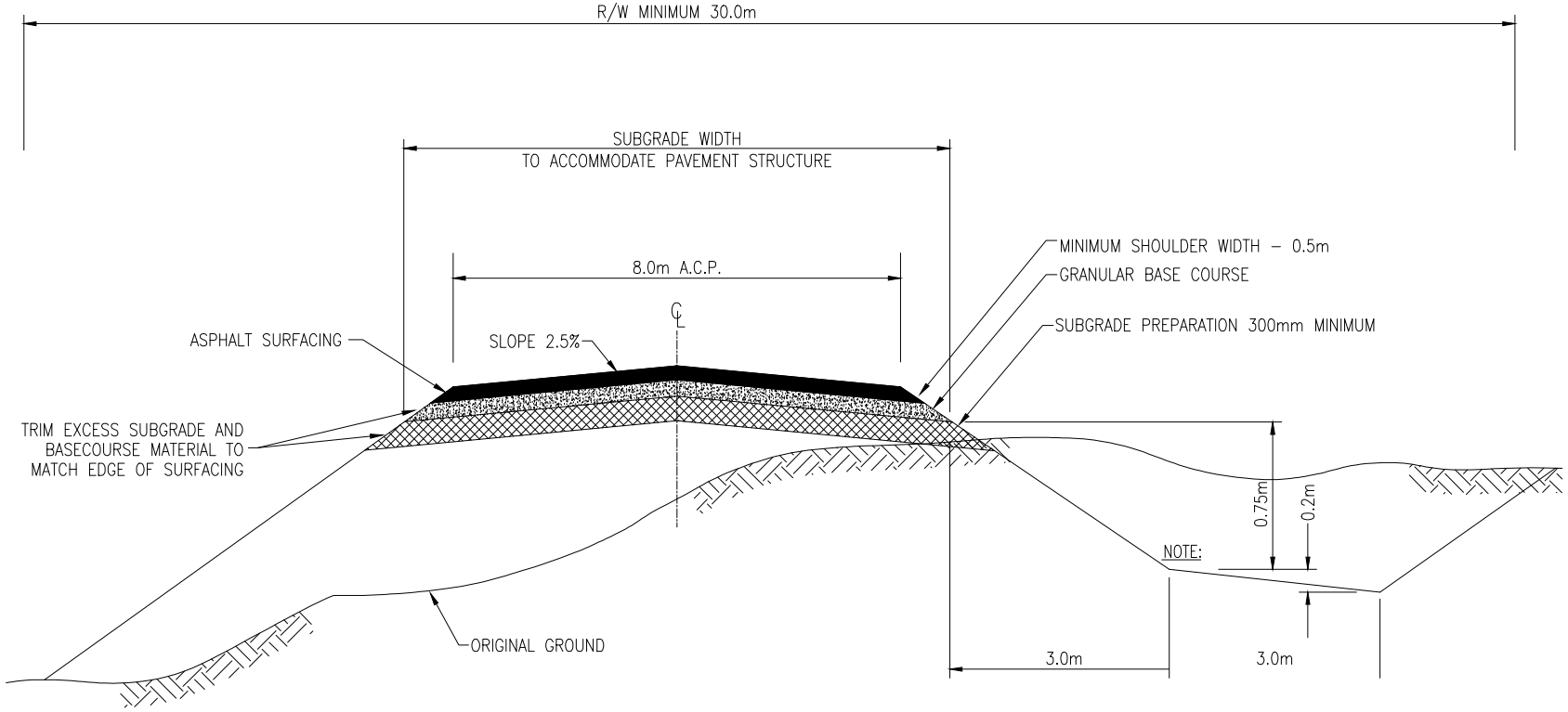
DIMENSIONS SHOWN IN METRES AND DECIMALS OF

County of Grande Prairie No. 1

COUNTY of GRANDE PRAIRIE No. 1

RESIDENTIAL COLLECTOR ROAD

DATE:	2016-08-05	DRAWN BY:	SP	APPROVED:	DRAWING
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		9.27



ALL BACK SLOPES 3:1 UNLESS NOTED OTHERWISE

FILL SLOPE TABLE

DEPTH of FILL	SLOPE
0 – 3.0m	3 : 1
3.0m – 4.5m	2 1/2 : 1
> – 4.5m	2 : 1

NOTE:

2:1 SLOPE REQUIRES 1m SHOULDER WIDENING
& GUARDRAIL INSTALLATION

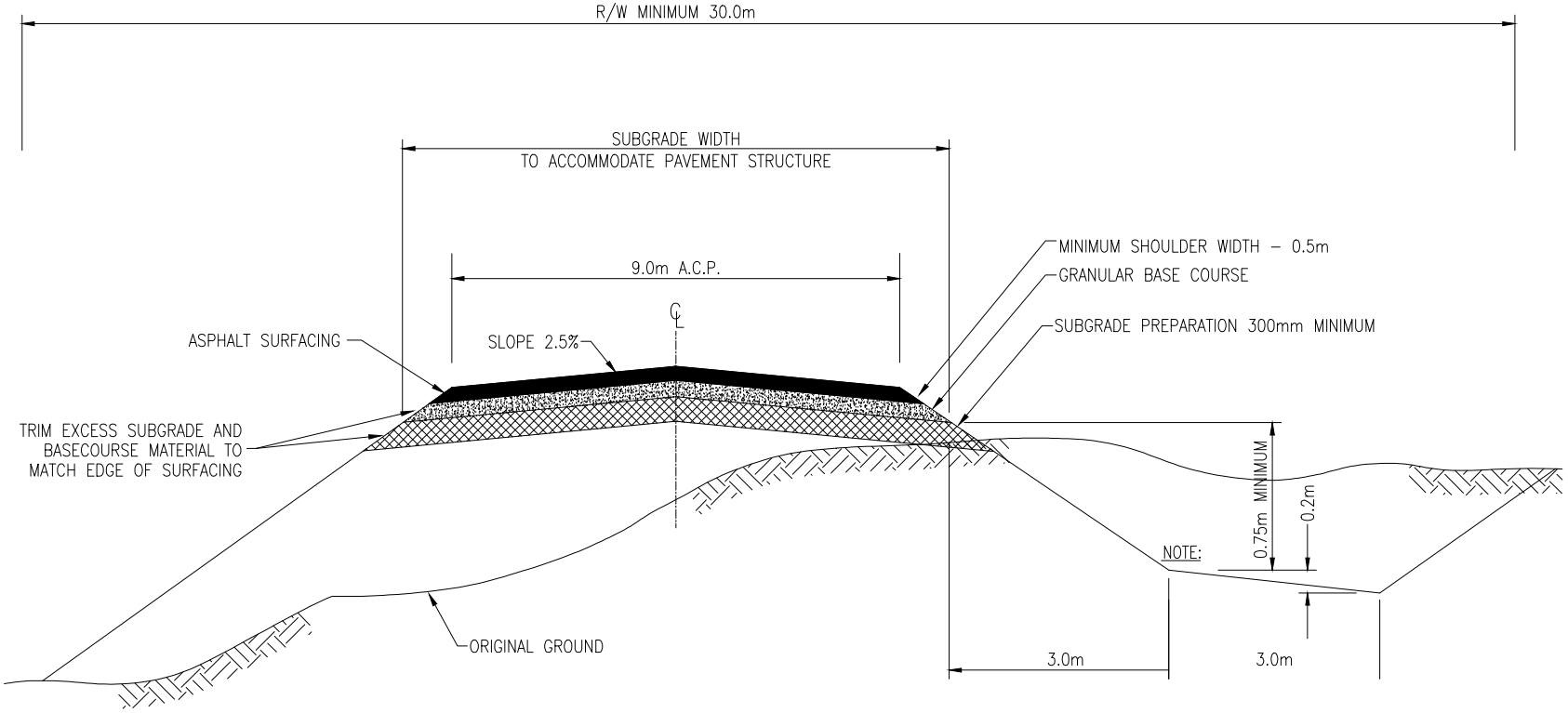
DIMENSIONS SHOWN IN METRES AND DECIMALS OF

County of Grande Prairie No. 1

COUNTY of GRANDE PRAIRIE No. 1

COMMERCIAL / INDUSTRIAL LOCAL ROAD

DATE:	2016-08-05	DRAWN BY:	SP	APPROVED:	DRAWING
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		9.28



ALL BACK SLOPES 3:1 UNLESS NOTED OTHERWISE

FILL SLOPE TABLE

DEPTH of FILL	SLOPE
0 – 3.0m	3 : 1
3.0m – 4.5m	2 1/2 : 1
> – 4.5m	2 : 1

NOTE:

2:1 SLOPE REQUIRES 1m SHOULDER WIDENING & GUARDRAIL INSTALLATION

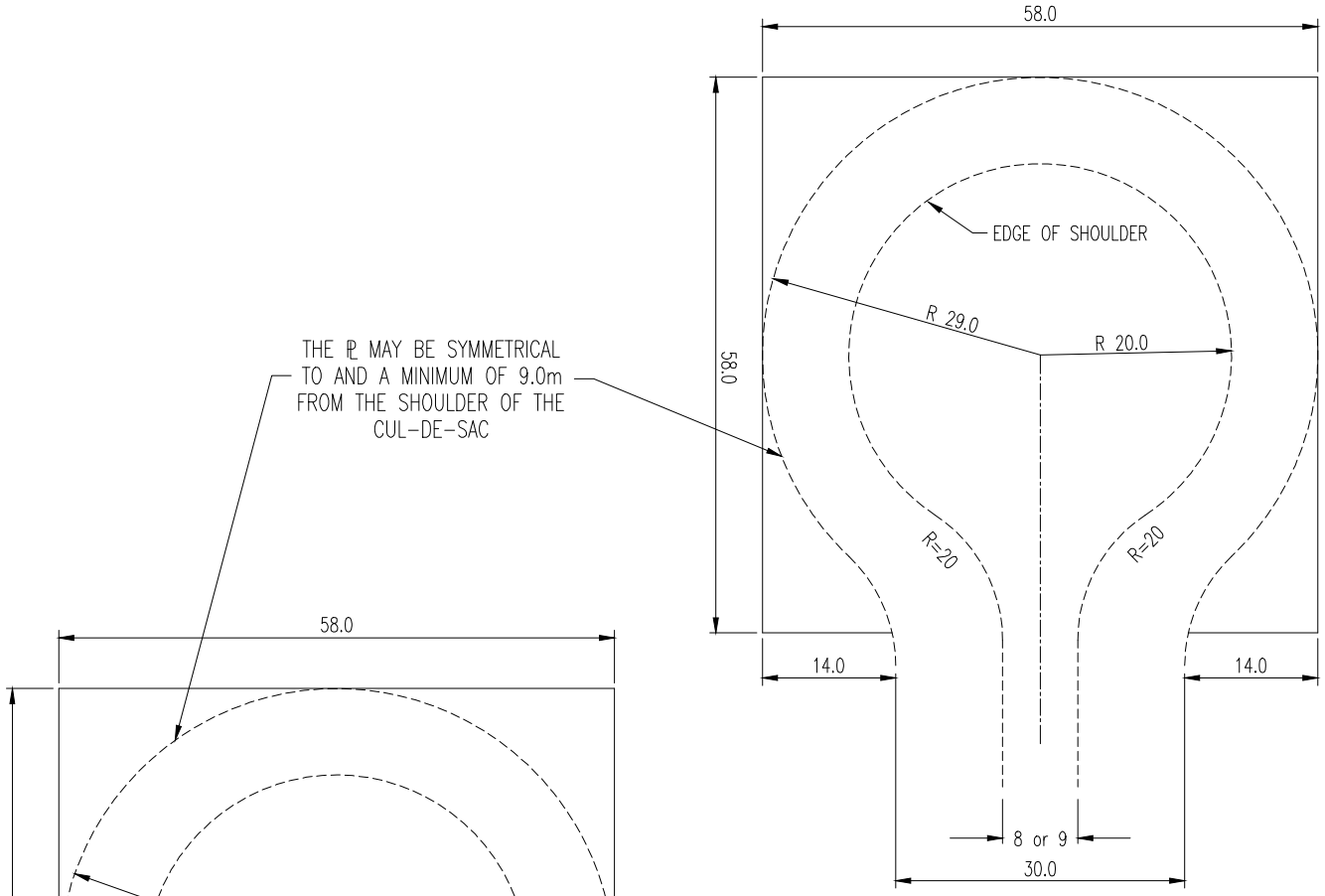
DIMENSIONS SHOWN IN METRES AND DECIMALS OF

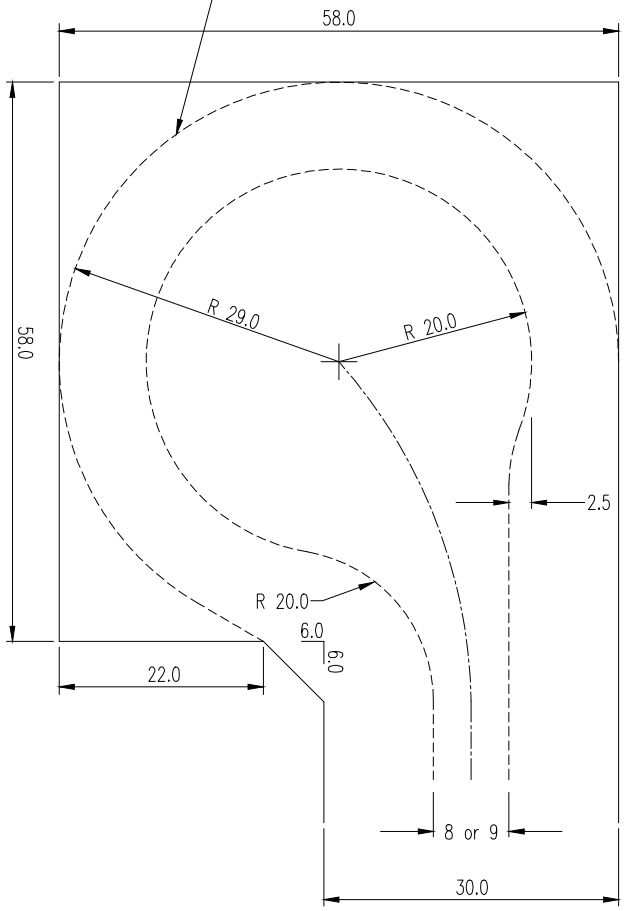
County of Grande Prairie No. 1

COUNTY of GRANDE PRAIRIE No. 1

INDUSTRIAL COLLECTOR ROAD

DATE:	2016-08-05	DRAWN BY:	SP	APPROVED:	DRAWING
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		9.29





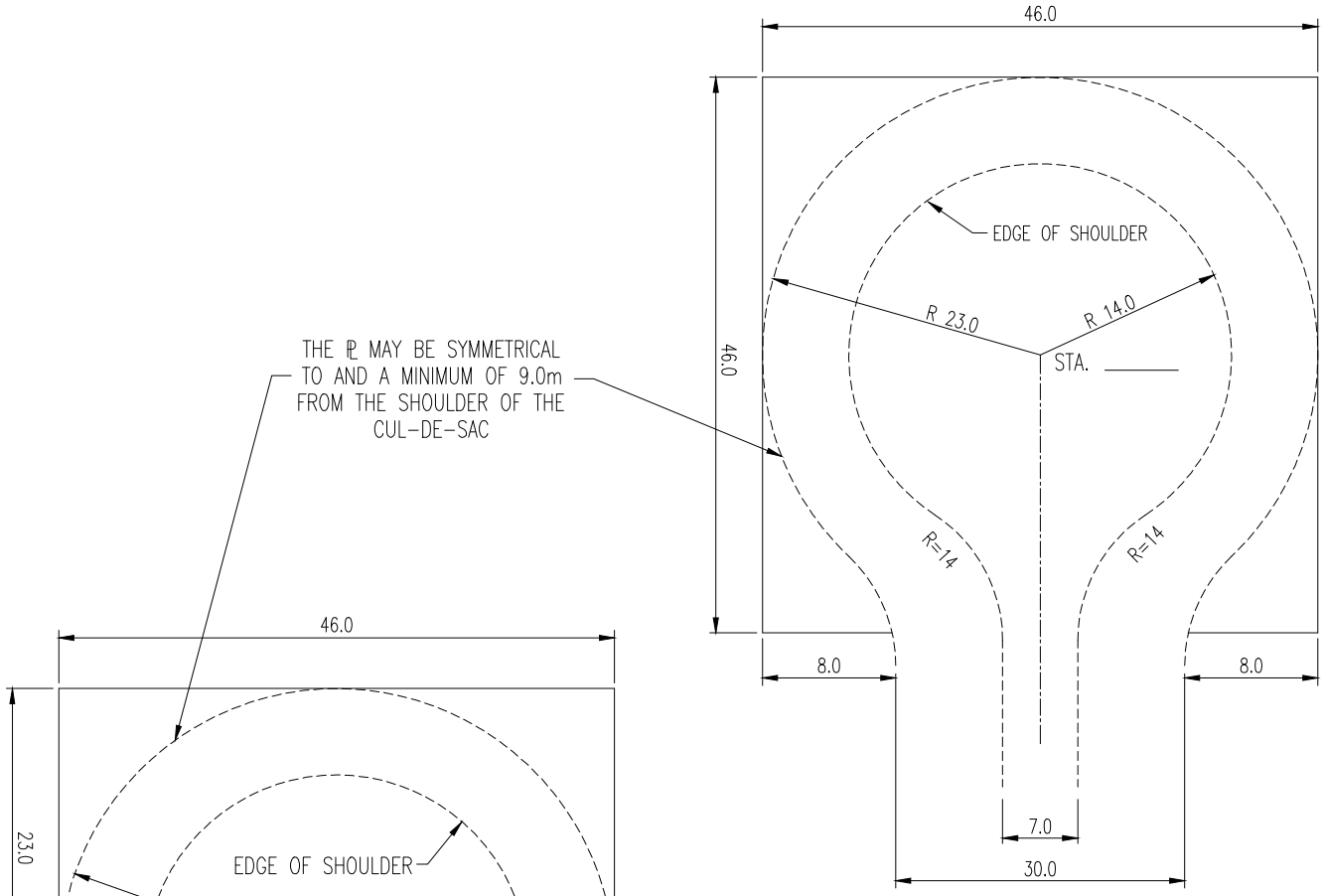
NOTE:
THE MINIMUM CROWN SLOPE WITHIN THE CUL-DE-SAC SHALL BE 0.040 meters/meter

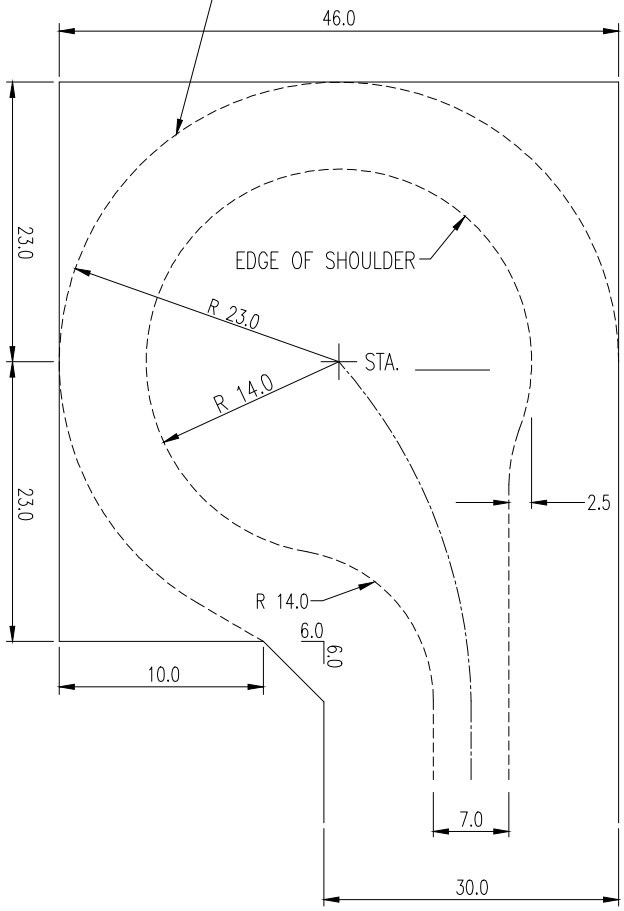
ALL DIMENSIONS ARE IN METERS AND DECIMALS OF

COUNTY of GRANDE PRAIRIE No. 1

TYPICAL RURAL TEMPORARY INDUSTRIAL CUL-DE-SAC

DATE:	2016-08-05	DRAWN BY:	SP	APPROVED:	DRAWING 9.30
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		





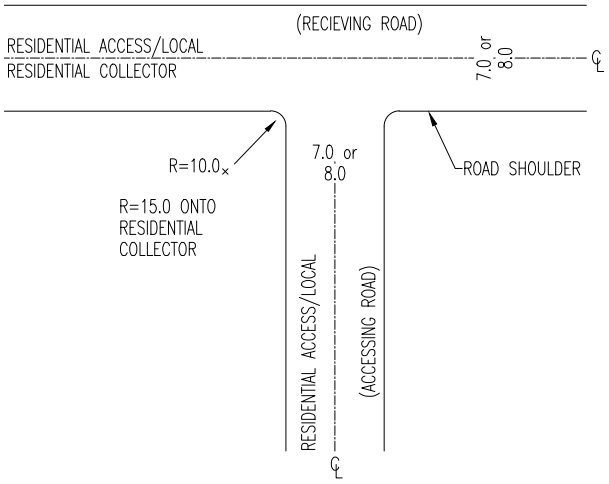
NOTE:
THE MINIMUM CROWN SLOPE WITHIN THE CUL-DE-SAC SHALL BE 0.040 meters/meter

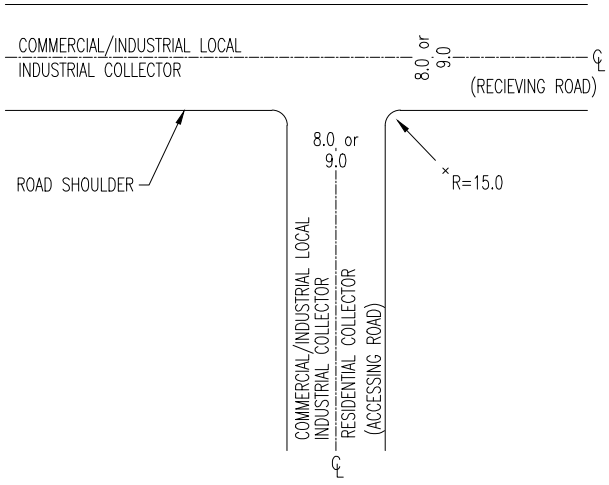
ALL DIMENSIONS ARE IN METERS AND DECIMALS OF

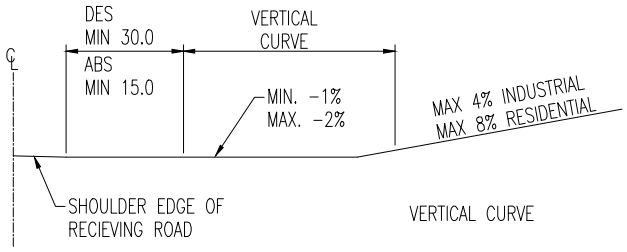
COUNTY of GRANDE PRAIRIE No. 1

TYPICAL RURAL RESIDENTIAL CUL-DE-SAC

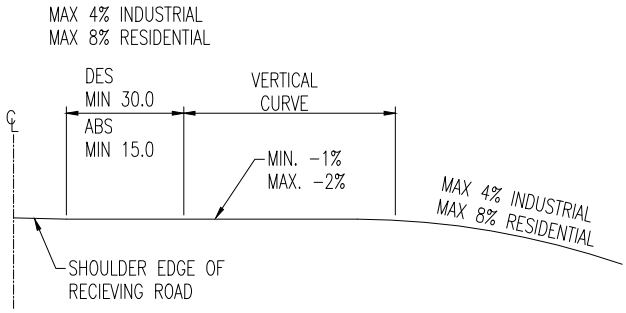
DATE:	2016-08-05	DRAWN BY:	SP	APPROVED:	DRAWING 9.31
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		







PROFILE – ACCESSING ROAD IN CUT



PROFILE – ACCESSING ROAD IN FILL

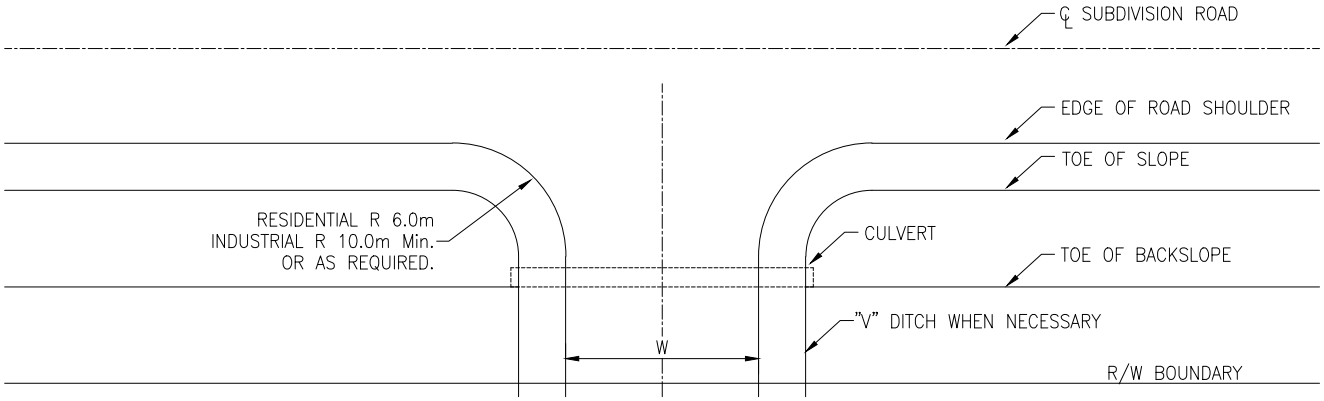
NOTE:
LENGTH OF VERTICAL CURVE SHALL BE ACCORDING TO TAC MANUAL.

ALL DIMENSIONS ARE IN METERS AND DECIMALS OF

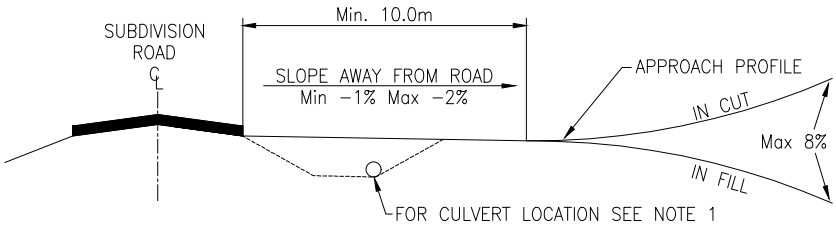
COUNTY of GRANDE PRAIRIE No. 1

TYPICAL ROAD INTERSECTIONS

DATE:	2016-08-05	DRAWN BY:	SP	APPROVED:	DRAWING
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		9.32



APPROACH PLAN

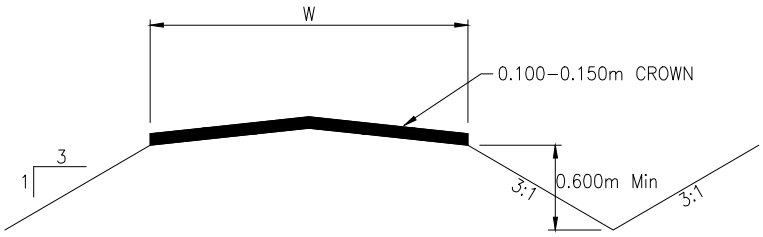


DITCH AND CULVERT LOCATION

RESIDENTIAL: W=6.0m MIN
W=8.0m MAX

INDUSTRIAL: W=8.0m MIN
W=10.0m MAX

NOTES:
1. WHEN CULVERTS ARE REQUIRED THEY MUST BE C.S.P. CULVERTS AND BE THE FOLLOWING MINIMUM DIAMETERS
   RESIDENTIAL – 0.50m
   INDUSTRIAL – 0.50m
   – LENGTH WILL VARY WITH DEPTH OF FILL
   – CULVERT TO BE PLACED AT TOE OF BACKSLOPE
2. MINIMUM APPROACH LENGTH–FROM EDGE OF ROAD SHOULDER TO R/W BOUNDARY.



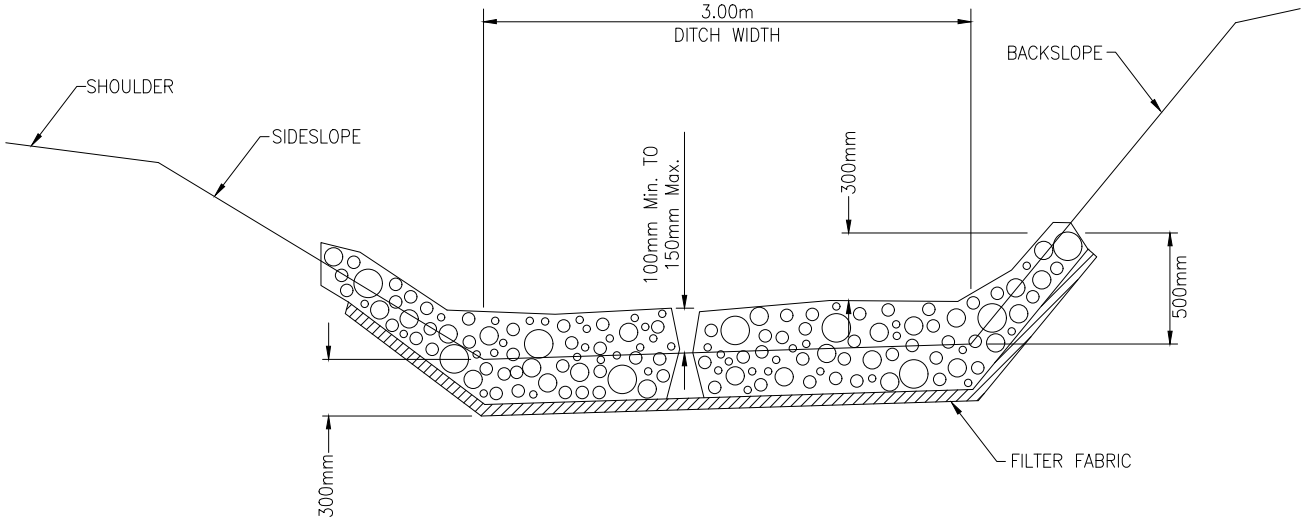
APPROACH CROSS SECTION

ALL DIMENSIONS SHOWN ARE IN METERS AND DECIMALS OF.

COUNTY of GRANDE PRAIRIE No. 1

TYPICAL RURAL RESIDENTIAL & INDUSTRIAL APPROACHES

DATE:	2016-08-05	DRAWN BY:	SP	APPROVED:	DRAWING
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		9.33

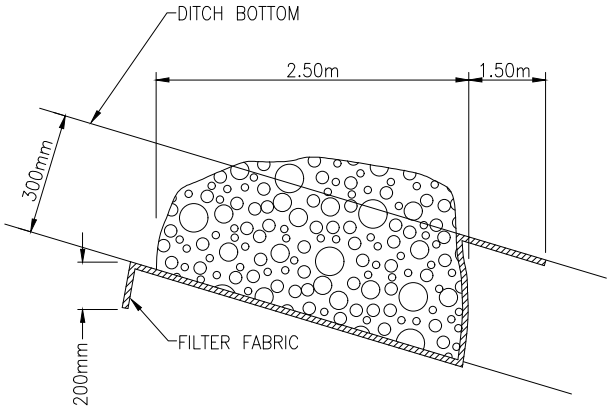


CROSS SECTION

NOTES:

1. ROCK SHALL BE TRENCHED INTO THE SIDESLOPE AND BACKSLOPE AT A POINT AT LEAST 500mm ABOVE THE DITCH BOTTOM AND AT LEAST 300mm ABOVE THE LOW POINT OF THE SURFACE OF ROCK IN THE DITCH.
2. THE ROCK SHALL BE TRENCHED INTO THE DITCH BOTTOM AND SLOPES A MIN. OF 250mm. THE LOWEST POINT OF THE DITCH CHECK MUST BE A MIN. OF 100mm TO A MAX OF 150mm ABOVE THE DITCH BOTTOM.
3. ROCKS TO BE USED SHALL BE AS NEARLY CUBICAL IN FORM AS POSSIBLE AND MUST NOT BE SMALLER THAN 150mm.
4. ROCKS SHALL BE LAID IN CLOSE CONTACT SO AS TO BREAK JOINTS WITH THE LARGER STONES ON THE BOTTOM.
5. FILTER FABRIC SHALL BE PLACED IN THE BOTTOM OF THE TRENCH.
6. MINIMUM SIDE SLOPE 2:1

ALL DIMENSIONS SHOWN ARE IN METERS AND DECIMALS OF



PROFILE

COUNTY of GRANDE PRAIRIE No. 1

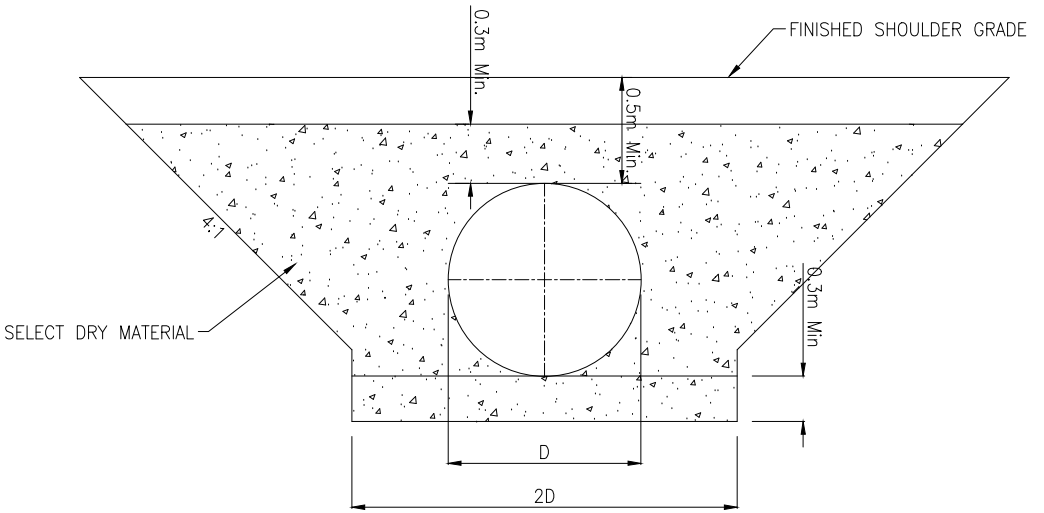
TYPICAL ROCK DITCH CHECKS

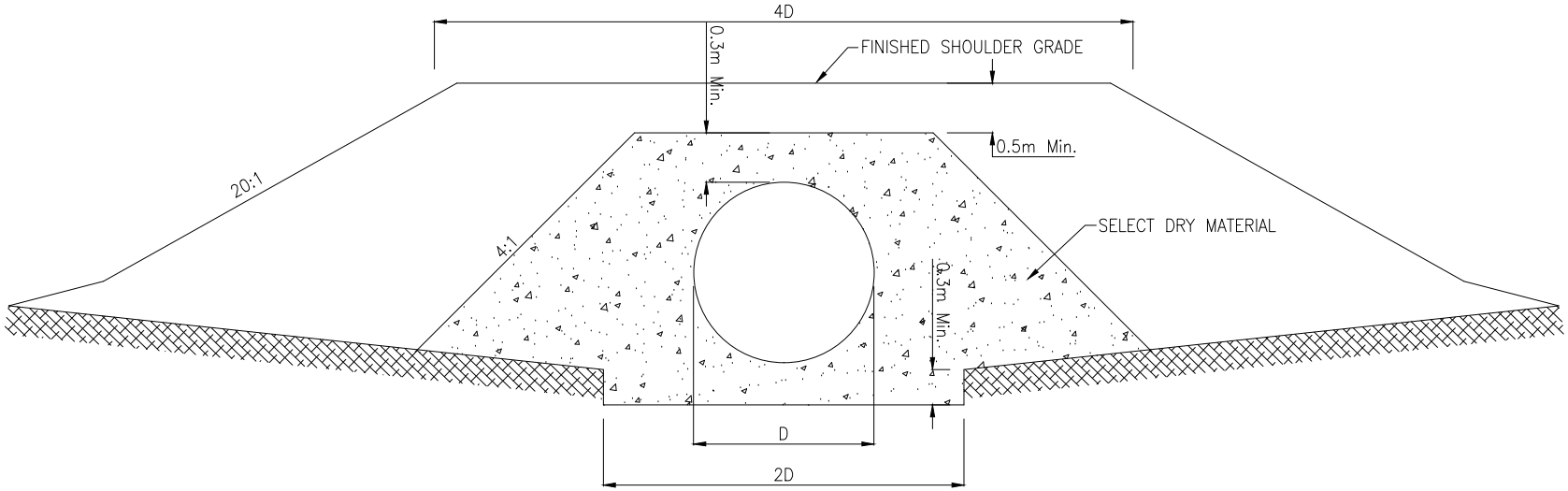
DATE:	2016-08-05	DRAWN BY:	SP	APPROVED:	DRAWING 9.34
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		

NOTES:

1. SELECT DRY MATERIAL SHALL BE PLACED IN 150mm COMPACTED LIFTS. IF GRANULAR BACKFILL IS USED A 1.0m CLAY PLUG SHALL BE PLACED ON INLET & OUTLET ENDS OF THE PIPE.
2. IN SOFT WET AREAS (ie MUSKEG) DEPTH OF SUBCUT BELOW THE PIPE WILL BE DETERMINED BY THE DEVELOPERS ENGINEER AS APPROVED BY THE DIRECTOR.
3. WHEN PIPES ARE PLACED PRIOR TO EMBANKMENT CONSTRUCTION, A MINIMUM OF 1000mm OF MATERIAL SHALL BE PLACED OVER TOP OF PIPES FOR PROTECTION DURING CONSTRUCTION.
4. ALL CULVERT INVERTS WILL BE STAKED IN THE FIELD BY THE DEVELOPERS ENGINEER.

ALL DIMENSIONS SHOWN ARE IN METERS AND DECIMALS OF.



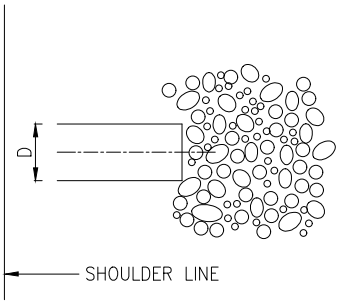


COUNTY of GRANDE PRAIRIE No. 1

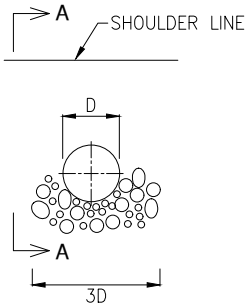
TYPICAL CULVERT INSTALLATION

DATE:	2016-08-05	DRAWN BY:	SP	APPROVED:	DRAWING
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		9.35

D	400	500	600	700	800	900	1000	1200
APRON DEPTH	500					600		

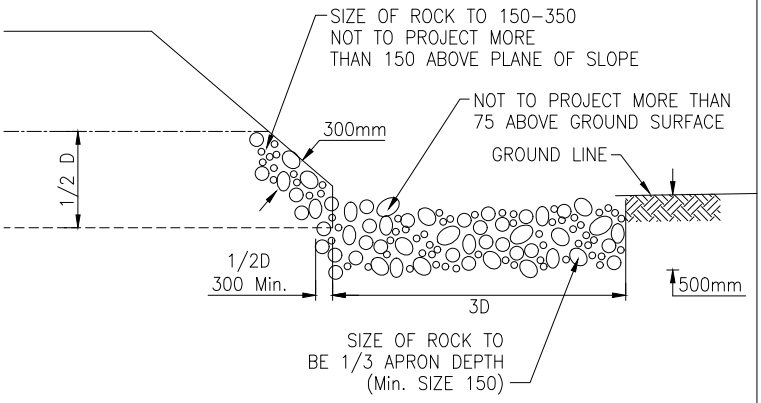


PLAN

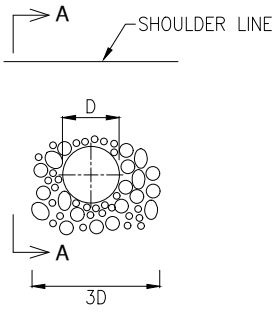


FRONT ELEVATION

OUTLET

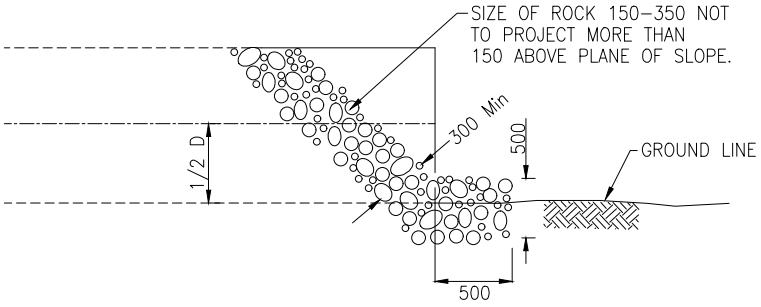


SECTION A-A



FRONT ELEVATION

INLET



SECTION A-A

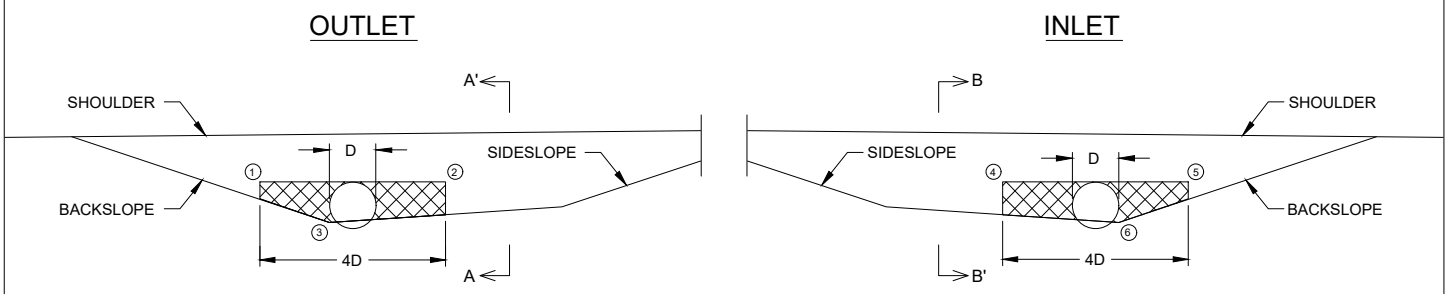
NOTE: ALL DIMENSIONS ARE IN MILLIMETERS

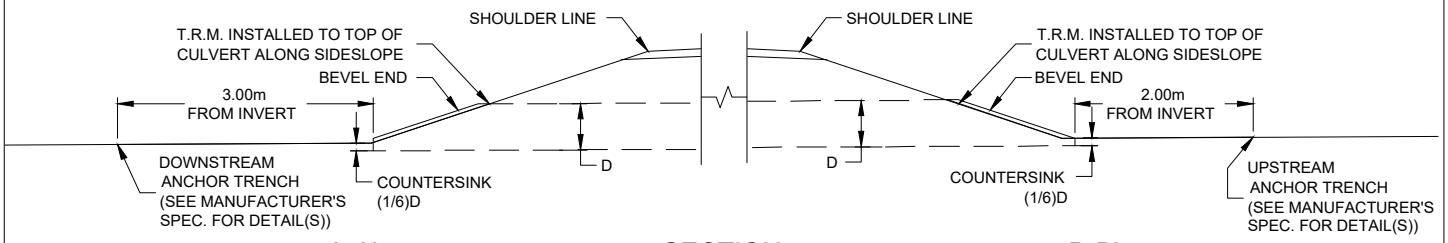
ALL DIMENSIONS SHOWN ARE IN METERS AND DECIMALS OF.

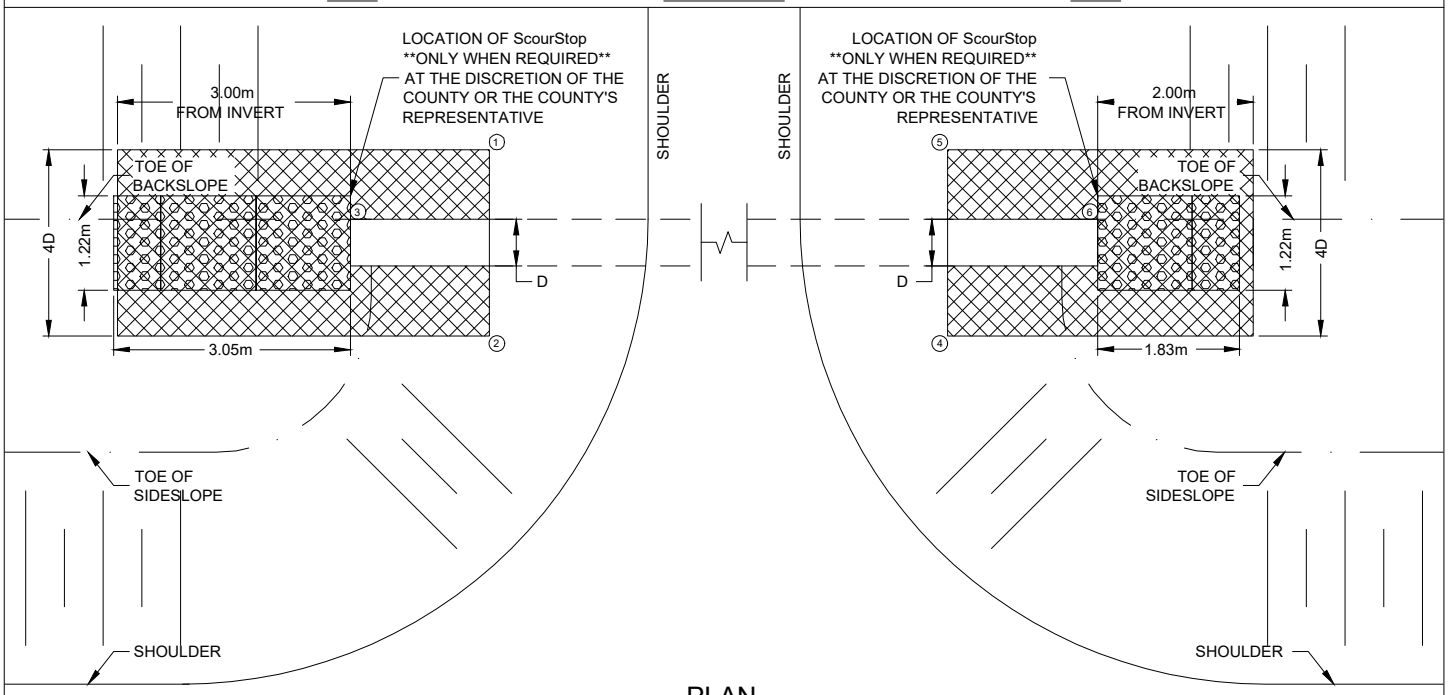
COUNTY of GRANDE PRAIRIE No. 1

TYPICAL RIP RAP REQUIREMENT FOR CULVERT SIZE 400-1200 DIA.

DATE:	2016-08-05	DRAWN BY:	SP	APPROVED:	DRAWING
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		9.36







PRODUCT: TURF REINFORCEMENT MAT
TYPE: P42 **OR APPROVED EQUIVALENT**
MANUFACTURER: EROSION CONTROL BLANKET

NOTES:
- INSTALL TO MANUFACTURER'S SPECIFICATIONS.
- THE FABRIC SHOULD BE BURIED IN ANCHOR TRENCHES AT THE TOP AND BOTTOM ENDS OF AN INSTALLATION TO PREVENT UNDERCUTTING OF THE FABRIC

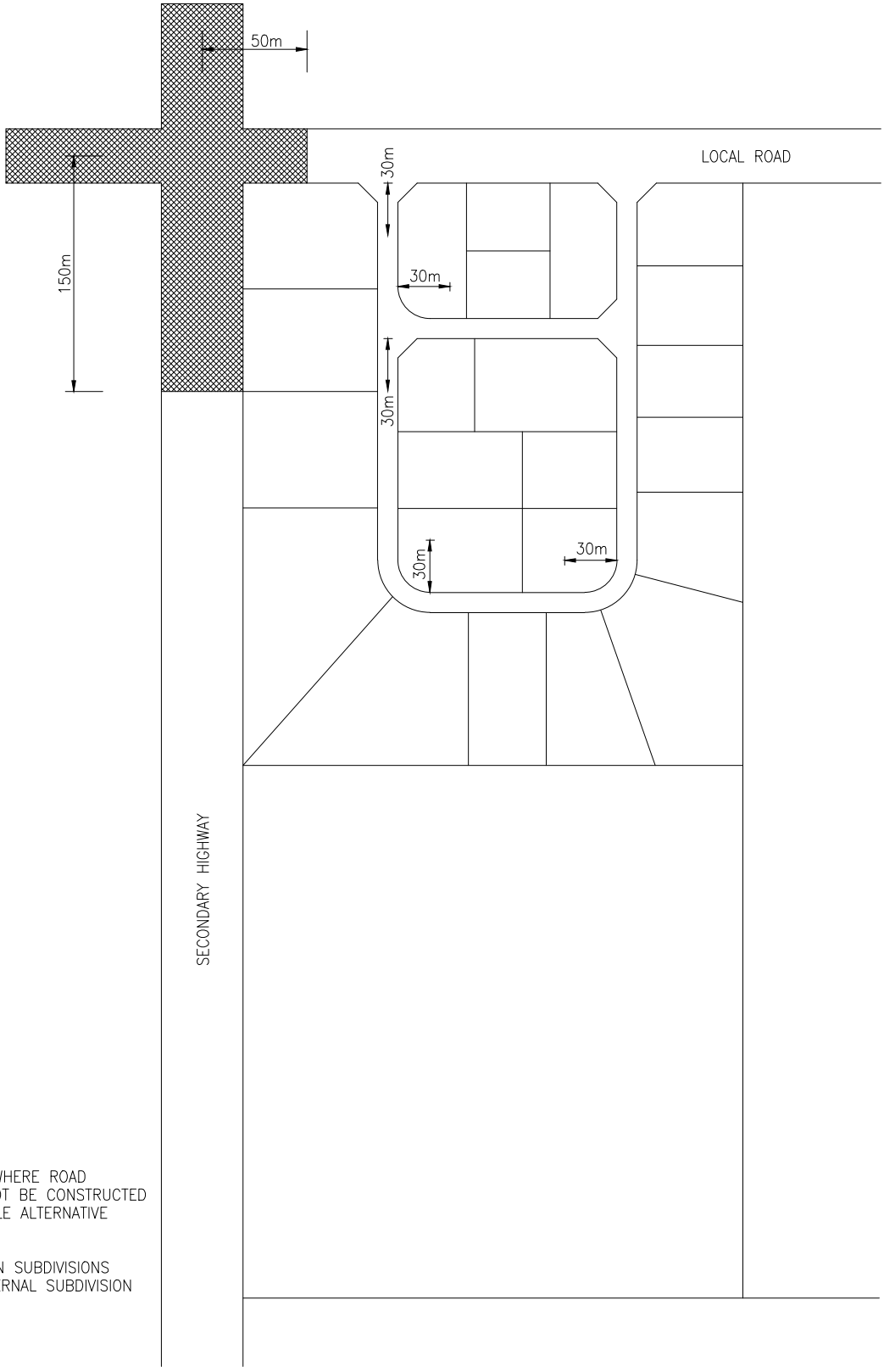
TURF REINFORCEMENT MAT
ScourStop (OR APPROVED EQUIVALENT) •ONLY WHEN REQUIRED
① MATCH POINT

TYPICAL TRM INSTALLATION (600mm CSP)
SURFACE AREA = ±17.5m² (10m² DS, 7.5m² US)
ADDITIONAL MATERIAL WILL BE REQUIRED FOR ANCHORING AND OVERLAP

COUNTY of GRANDE PRAIRIE No. 1

TYPICAL TURF REINFORCEMENT MAT FREQUIRED FOR CSP SIZES 600mm-1200mm DIA.

DATE:	2010-02-04	DRAWN BY:	LRK	APPROVED:	SAK	DRAWING	9.37
SCALE:	NOT TO SCALE	CHECKED BY:	SAK				



DIMENSIONS INDICATE WHERE ROAD APPROACHES SHALL NOT BE CONSTRUCTED UNLESS NO REASONABLE ALTERNATIVE EXISTS.

ALL LOT ACCESS WITHIN SUBDIVISIONS SHALL BE OFF OF INTERNAL SUBDIVISION ROADS.

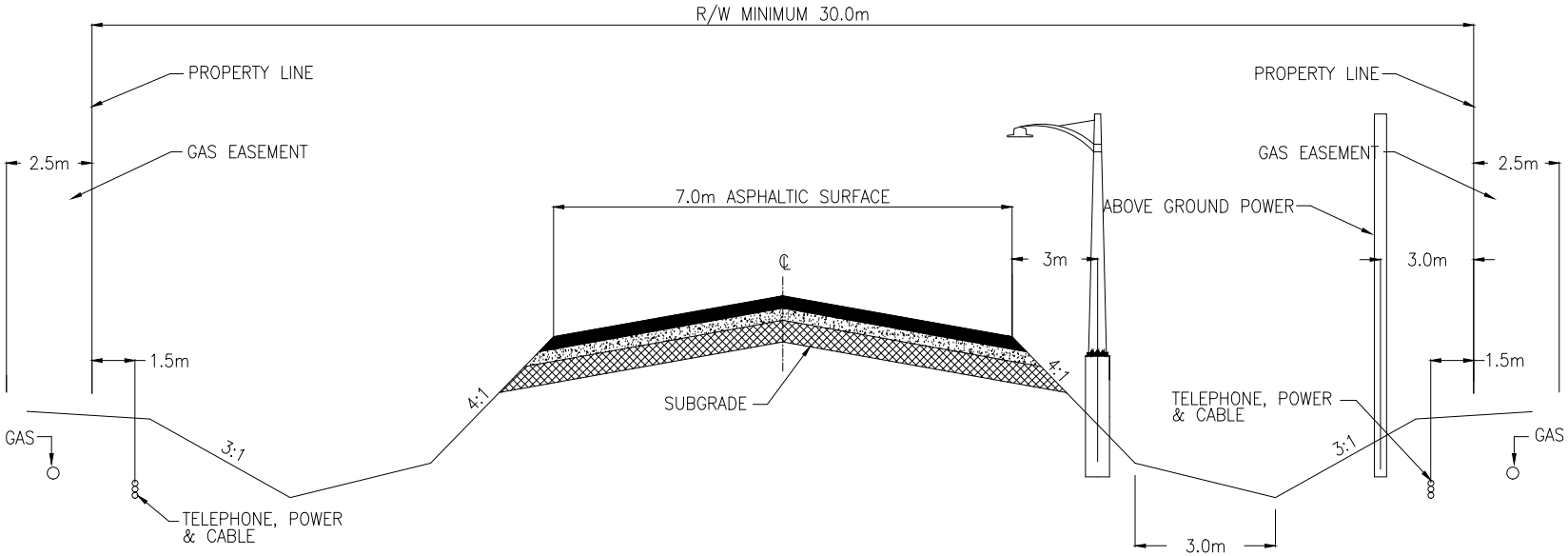
ALL DIMENSIONS SHOWN ARE IN METERS AND DECIMALS OF.

County of Grande Prairie No. 1

COUNTY of GRANDE PRAIRIE No. 1

TYPICAL APPROACH LOCATIONS

DATE:	2016-08-05	DRAWN BY:	SP	APPROVED:	DRAWING 9.38
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		



NOTE:

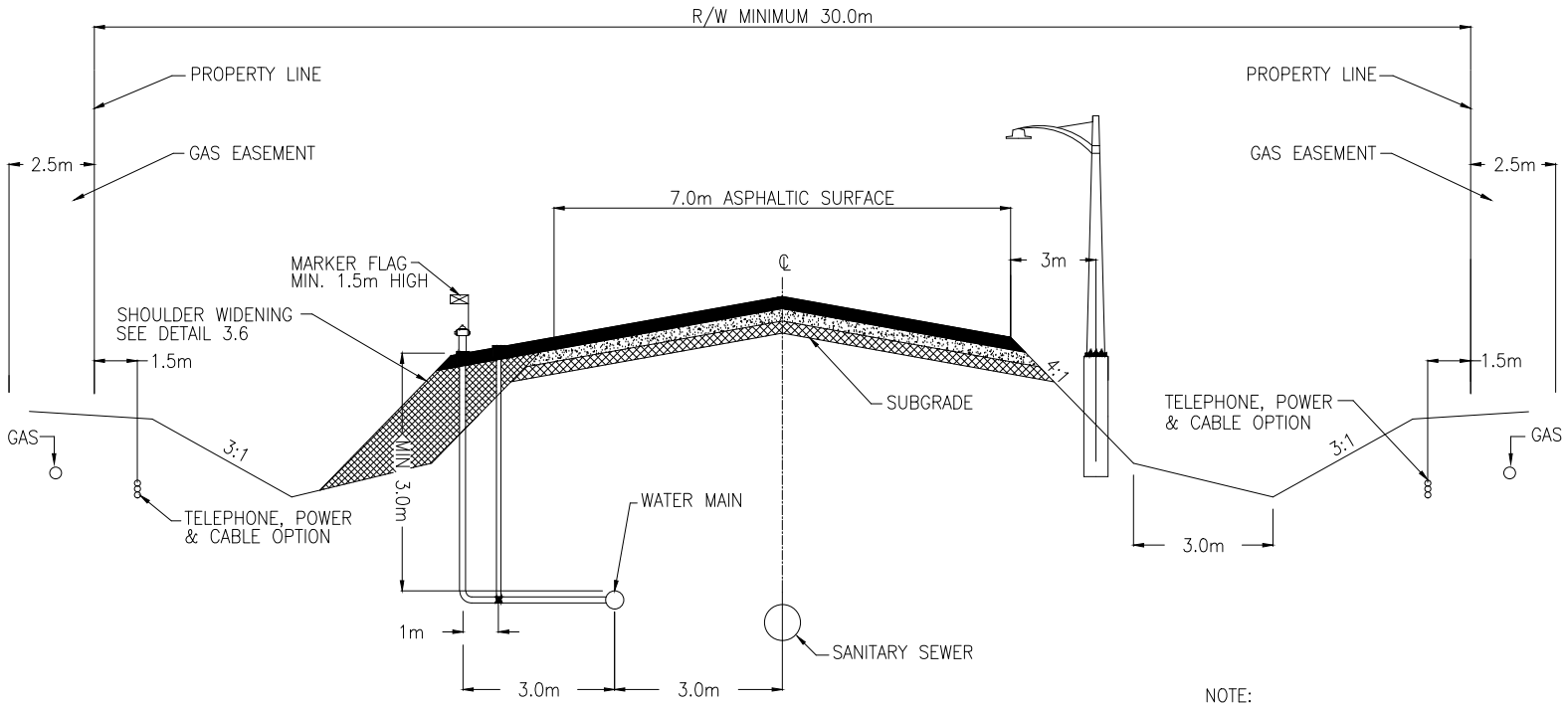
1. STREET LIGHT AS PER MINIMUM GENERAL DESIGN STANDARDS

ALL DIMENSIONS SHOWN ARE IN METERS AND DECIMALS OF.

COUNTY of GRANDE PRAIRIE No. 1

TYPICAL UTILITY LAYOUT
LOW DENSITY RESIDENTIAL SUBDIVISION
RURAL STANDARD

DATE:	2016-08-05	DRAWN BY:	SP	APPROVED:	DRAWING 9.39
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		



NOTE:

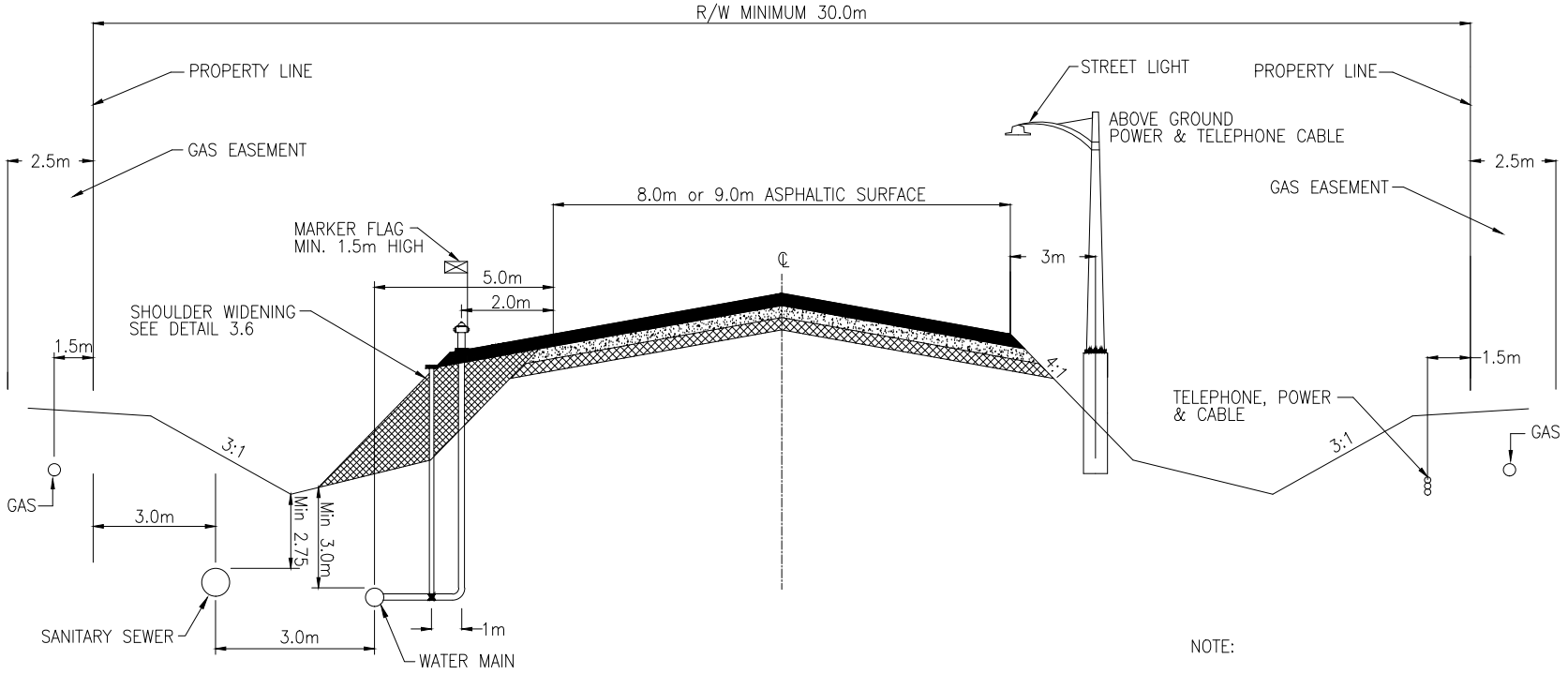
1. WATER MAIN AND HYDRANTS MAY BE LOCATED EITHER SIDE OF ROAD
2. STREET LIGHT TO BE OPPOSITE SIDE TO WATER MAIN
3. STREET LIGHTS AS PER MINIMUM GENERAL DESIGN STANDARDS

ALL DIMENSIONS SHOWN ARE IN METERS AND DECIMALS OF.

COUNTY of GRANDE PRAIRIE No. 1

TYPICAL UTILITY LAYOUT
HIGH DENSITY RESIDENTIAL SUBDIVISION
RURAL STANDARD

DATE:	2016-08-05	DRAWN BY:	SP	APPROVED:	DRAWING 9.40
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		



NOTE:

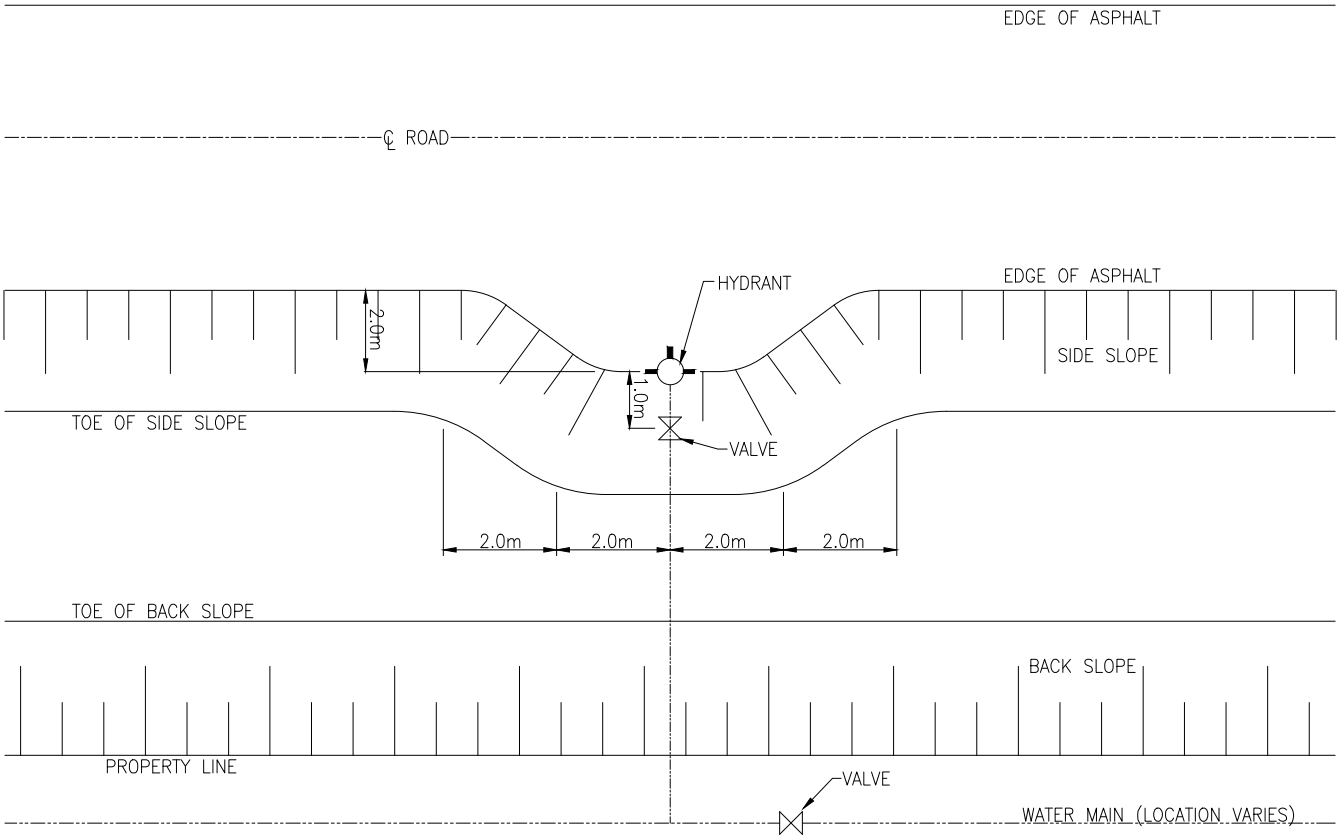
1. WATER MAIN AND SANITARY SEWER MAY BE LOCATED EITHER SIDE OF ROAD.
2. POWER POLES WITH STREET LIGHTS OR UNDERGROUND POWER TO BE OPPOSITE SIDE TO WATER & SEWER MAINS.
3. STREET LIGHTS AS PER MINIMUM GENERAL DESIGN STANDARDS.

ALL DIMENSIONS SHOWN ARE IN METERS AND DECIMALS OF.

COUNTY of GRANDE PRAIRIE No. 1

TYPICAL UTILITY LAYOUT
COMMERCIAL/INDUSTRIAL SUBDIVISION
RURAL STANDARD

DATE:	2016-08-05	DRAWN BY:	SP	APPROVED:	DRAWING 9.41
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		



NOTES:

1. WATER MAIN AND HYDRANTS MAY BE LOCATED EITHER SIDE OF ROAD.
2. STREET LIGHTS TO BE OPPOSITE SIDE TO WATERMAIN.

ALL DIMENSIONS SHOWN ARE IN METERS AND DECIMALS OF.

County of Grande Prairie No. 1

COUNTY of GRANDE PRAIRIE No. 1

TYPICAL SHOULDER WIDENING FOR FIRE HYDRANT - RURAL STANDARD

DATE:	2016-08-05	DRAWN BY:	SP	APPROVED:	DRAWING 9.42
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		

SECTION 10 Roadway Lighting, Traffic Control and Street Name Signs

10.1 General 10-2
10.2 Design 10-2
10.2.1 Davits and Fixtures 10-2
10.2.2 Illumination 10-2
10.3 Location 10-3
10.4 Costs 10-3
10.5 Traffic Signalization 10-3
10.6 Street Names Signs And Traffic Control Signs 10-4

10.1 General

The following standards are applicable to all types of development in the County of Grande Prairie except for industrial developments. Standards for industrial development shall be determined by the County during the initial planning stages of the proposed development.

All street lighting cables shall be installed underground in high density development areas. Overhead is acceptable in low density developments.

The illumination of roadways in the County of Grande Prairie shall be designed to the criteria provided by: the Transportation Association of Canada Guide for the Design of Roadway Lighting, Transportation Association of Canada Illumination of Isolated Rural Intersections, and Illuminating Engineering Society of North America, Roadway Lighting, RP-8-00.

A traffic control signage and signal plan shall be submitted for review and approval by the Municipal Engineer.

10.2 Design

10.2.1 Davits and Fixtures

Street lighting davits (posts) with fixtures shall be galvanized steel. The County and ATCO Electric shall approve proposed street light davits.

10.2.2 Illumination

The location and density of street lights shall be such to provide the following minimum lighting levels:

Roadway Class	Area Class	Illuminance Average (lux)	Criteria Uniformity Maximum Avg/Min Ratio	Maximum Max/Min Ratio
Arterial	Commercial Residential Industrial	17 12 9	3:1 3:1 3:1	6:1 6:1 6:1
Collector	Commercial Residential Industrial	13 10 6	3:1 3:1 3:1	6:1 6:1 6:1
Local	Commercial Residential Industrial	10 6 6	3:1 3:1 6:1	6:1 6:1 12:1
Lane	Commercial Residential	6 4	6:1 6:1	10:1 12:1

- Street lighting fixtures shall be high pressure sodium type.

- Street lighting design shall be approved by ATCO Electric.

10.3 Location

The Developer shall co-ordinate the location of street lights to ensure that they do not interfere with the other utilities and driveways.

Street lights in general shall be offset from the projection of common property lines between two lots.

Street lights shall be offset from roadway and sidewalks in accordance with the Typical Road Cross Sections in Section 9.

Street lights shall be provided for each internal park area that does not abut for one entire side onto a lighted street. A Street light shall be located at the point where each walkway opens out onto the park area. The street light may be substituted with a trail or walkway light(s).

Street lights shall be provided at the edge of Utility lots where the Utility lot meets the street.

Whenever possible, a street light shall be installed at community mail box turnouts.

10.4 Costs

Any capital cost that the utility company may charge for installation of underground street lighting shall be paid by the Developer. All fees paid shall be at the "No Investment" option, thereby reducing future operational costs to the County.

In Low Density and High Density Country Residential subdivision, the Developer shall pay for streetlight energy costs until at least 50% of the lots are occupied. Following 50% occupancy, the County of Grande Prairie No. 1 will assume streetlight energy costs and recover the energy costs from the lot owners through a Special Tax Levy Assessment.

In Industrial/Commercial subdivisions, the County of Grande Prairie will assume Street lighting Energy Costs following the installation of streetlight infrastructure by the Developer and subdivision plan registration.

Street lighting shall be installed in accordance with Typical Utilities Layout and Road Cross Section, Standard Detail Drawings.

10.5 Traffic Signalization

Traffic signal plans shall be provided to the Municipal Engineer for approval and shall depict the locations of all traffic signals and include signal timing plans, electrical and structural details as required.

All traffic control devices and pavement markings shall be designed and installed in accordance with the manual “Uniform Traffic Control Devices for Canada”, as issued and revised from time to time by the Transportation Association of Canada (TAC).

Emergency pre-emption equipment shall be required at all signalized intersections unless approved otherwise by the Municipal Engineer.

10.6 Street Names Signs And Traffic Control Signs

All traffic control signage and pavement markings shall be designed in accordance with the “Manual of Uniform Traffic Control Devices for Canada" as issued and revised from time to time by the Transportation Association of Canada (TAC) or as otherwise specified in the County’s Engineering Standards.

Street name signs at intersections shall consist of white lettering on a green metal plate. Lettering sizes shall be as follows:

- Arterial and Major Collector Roads: 250mm (10”) on a 300mm (12”) blade
- Minor Collector and Local Roads: 100mm (4”) on a 150mm (6”) blade

For rural roads, all traffic control signage erected within road allowances shall utilize reflective material that conforms to the brightness requirements set out in ASTM D4956-05 Type IV. And shall be in accordance with the standards contained in the latest edition of the “Standard Specifications for Highway Construction” published by: Alberta Transportation.

These standards include, but are not limited to the following sections:

- Section 5.18; “SUPPLY OF PERMANENT HIGHWAY SIGNS, POSTS AND BASES”
- Section 7.7; “PERMANENT HIGHWAY SIGNING”.

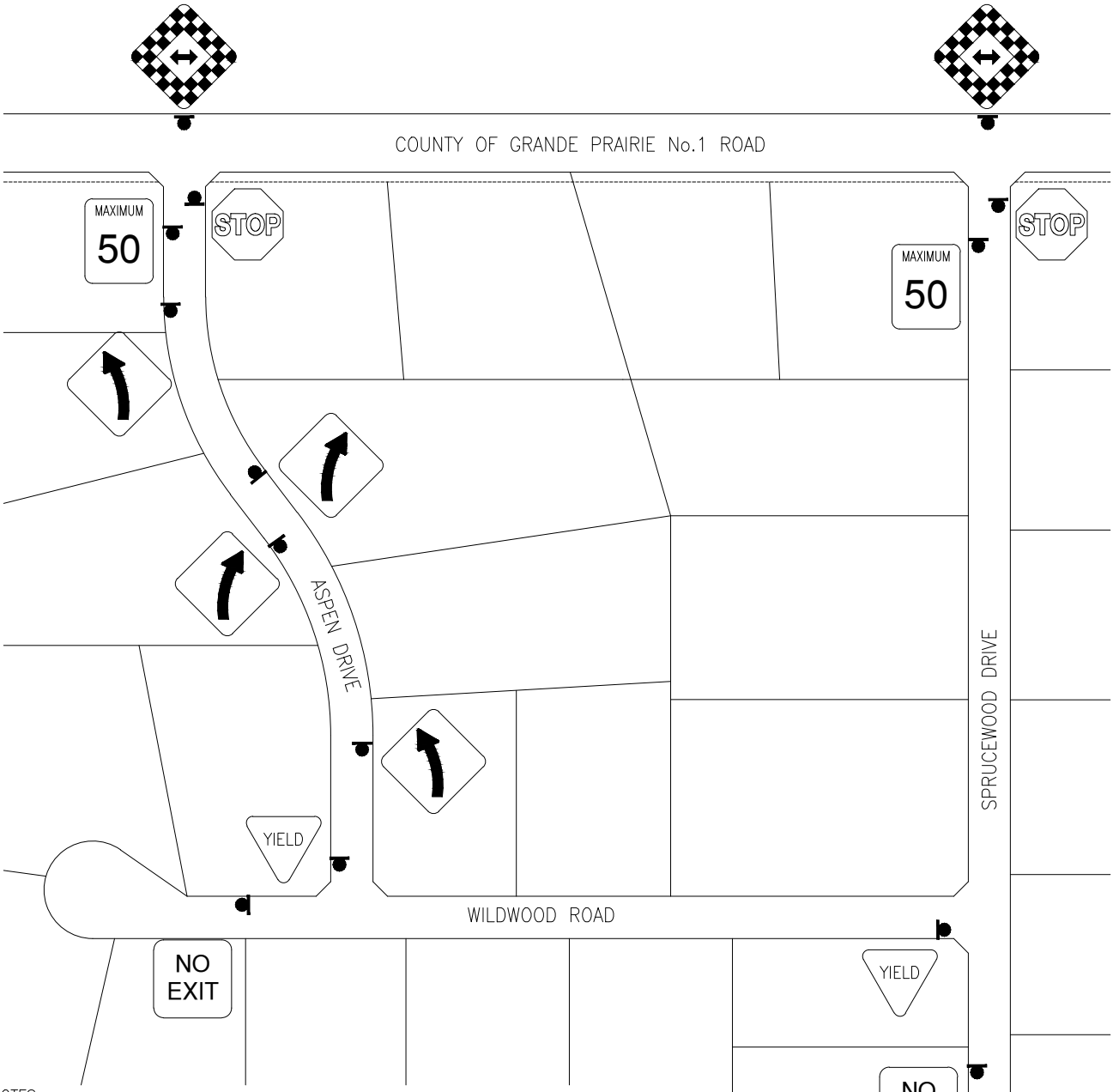
As well as the following Alberta Transportation Publications:

- “Typical Signage Drawings”, (T.E.B. 1.01 – 1.99)
- “Guidelines for School and Playground Zones and Areas”
- “Traffic Accommodations in Work Zones”

All sign posts shall be horizontally located a minimum of 3.0 meters from the shoulder of the adjacent road and the bottom of the sign shall be 1.5 meters above the shoulder elevation of the road. Refer to Standard Detail Drawing No. 10.1, Typical Traffic Sign Installation Detail. For rural subdivisions, refer to Standard Detail Drawing No. 10.0, Typical Traffic Sign Layout Rural Standard.

Guide and information signing shall be designed and installed in accordance with the “Urban Guide and Information Sign Manual”, as issued by the Government of Alberta.

Stop and yield signs shall be positioned in line with the near property lines of the intersecting road allowance.



NOTES:

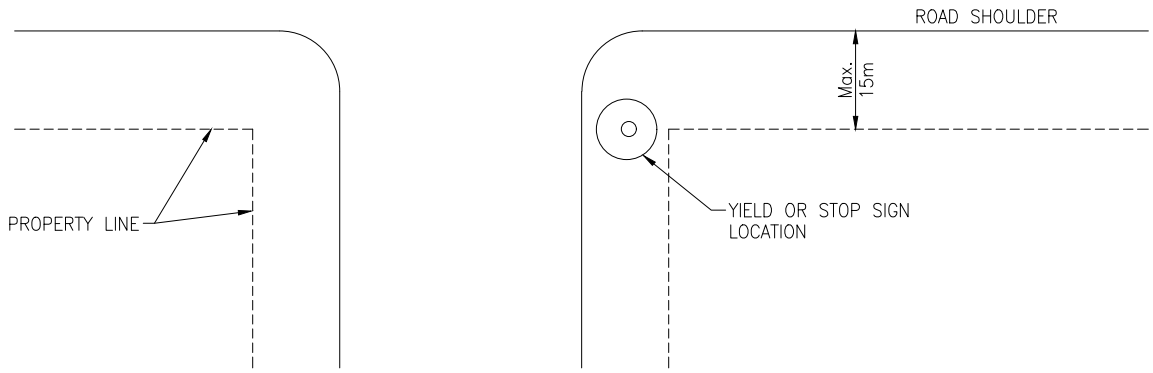
1. STOP SIGNS AT ENTRANCE POINTS TO ALL COUNTY ROADS.
2. 50km/h SPEED SIGNS AT ENTRANCES TO ALL SUBDIVISIONS.
3. YIELD SIGNS AT INTERSECTINS WITHIN SUBDIVISIONS.
4. TURNING SIGNS AT BEGINNING OF CURVE.
5. ANY OTHER TRAFFIC SIGNS DEEMED NECESSARY BY MUNICIPALITY.
6. STANDARD AND INSTALLATION SHALL CONFORM TO RTAC.

County of Grande Prairie No. 1

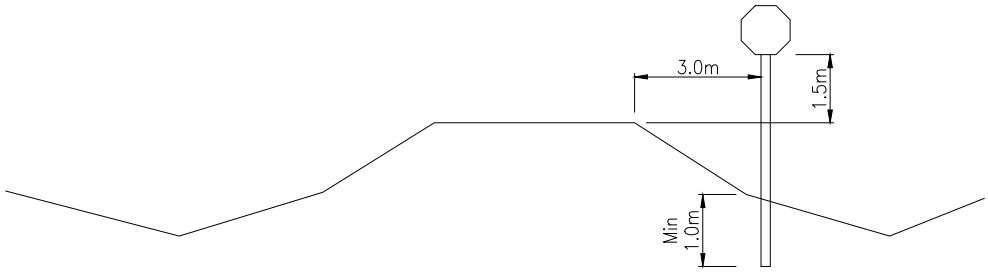
COUNTY of GRANDE PRAIRIE No. 1

TYPICAL TRAFFIC SIGN LAYOUT
RURAL STANDARD

DATE:	2016-08-05	DRAWN BY:	SP	APPROVED:	DRAWING 10.0
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		



PLAN



CROSS–SECTION

NOTE:

LOCATION AND HEIGHT IS COMMON TO ALL SIGNS PLACED.

ALL DIMENSIONS SHOWN ARE IN METERS AND DECIMALS OF.

COUNTY of GRANDE PRAIRIE No. 1

TYPICAL TRAFFIC SIGN INSTALLATION DETAIL

DATE:	2016-08-05	DRAWN BY:	SP	APPROVED:	DRAWING 10.1
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		

SECTION 11 Miscellaneous Requirements

11.1 General 11-2
11.2 Survey Control System 11-2
11.3 Property Boundary Markers 11-2
11.4 Municipal Addressing Signage 11-3
11.5 Subdivision Signs 11-4
11.6 Landscaping 11-5
11.7 Protection And/Or Coordination Of Utilities 11-6
11.8 Environmental Reserve Signage 11-6
11.9 Electrical Power Service 11-7
11.10 Natural Gas Service 11-7
11.11 Street Lighting 11-7
11.12 Mailbox Pullouts 11-7
11.13 Offsite Road Construction 11-7
11.13.1 Coordination of Existing Utilities 11-8
11.13.1.1 Telephone 11-8
11.13.1.2 Power 11-8
11.13.1.3 Natural Gas Distribution Lines 11-9
11.13.1.4 Pipeline Crossings 11-9
11.13.1.5 Utility Markers 11-10
11.13.2 Land Acquisition and Access Agreements 11-10
11.13.2.1 Road Allowance Widening 11-10
11.13.2.2 Back-sloping 11-11
11.13.2.3 Borrow Areas 11-11
11.13.2.4 Power Line Clearing 11-12
11.13.2.5 Telephone Right-of-Access 11-12
11.13.2.6 Fencing 11-12
11.13.3 Coordination of Traffic 11-13
11.13.3.1 Construction Signs 11-13
11.13.3.2 Existing Signs 11-13
11.13.3.3 Flag persons 11-14
11.13.3.4 Detours 11-14
11.13.3.5 Traffic Assistance 11-14

11.1 General

This section outlines standards, guidelines, and requirements for numerous miscellaneous items that are relevant to the development of subdivisions within the County of Grande Prairie No. 1.

11.2 Survey Control System

The Developer shall provide and maintain a survey control system within or adjacent to a multiple lot subdivision including the establishment of a permanent geodetic bench mark. Where a subdivision covers more than one quarter section of land, additional bench mark(s) may be required as specified by the Municipal Engineer.

- The preferred location of the proposed bench mark(s) respecting the subdivision will be as determined and approved by the Municipal Engineer, who shall also provide a County identification number for the bench mark(s).
- The transfer of datum from any existing bench mark(s) shall be completed by a minimum second order survey.
- The permanent geodetic bench marks shall be based on the elevation datum used for preliminary surveys, design, construction survey layout, and as-built information for the subdivision.
- The permanent bench mark shall be a square drive one piece power installed foundation support 2400 mm in length with a 200 mm helix on the buried end. Refer to Standard Detail Drawing No 11.1, Typical Geodetic Bench Mark Installation.
- A marker post shall be installed to identify and protect the permanent bench mark installation. The marker post shall consist of a standard "Hat Section" metal sign post. The County identification number shall be stamped on an aluminum plate attached to the metal sign post.
- The location of the permanent bench mark and its final established elevation will be shown on the as-built drawings along with identification of bench mark(s) used to establish the datum.

11.3 Property Boundary Markers

The Developer shall install acceptable marker posts to identify and protect all legal survey lot corner pins in the subdivision.

- The marker posts shall typically consist of 2.5 m x 100 mm x 100 mm treated wood posts or as approved by the Municipal Engineer. Refer to Standard Detail Drawing No. 11.10, Typical Lot Pin Marker Installation.

- The marker posts shall be imbedded to a depth of 600 mm. Care shall be taken not to disturb the legal survey pins.

- For all front of lot property pins adjacent to a subdivision road, the marker post shall be located a maximum of 300 mm from the pin on the roadway. For all back of lot property pins, the post shall be located along the side property boundary a maximum of 300 mm from the pin.

- A marker post is not required for any pin already provided with a legal survey marker post or an Environmental Reserve Lot marker.

11.4 Municipal Addressing Signage

The Developer shall supply and erect parcel identification markers in each multiple parcel subdivision based on the municipal addressing system in existence within the County of Grande Prairie. This will include the address for the main entrance to the subdivision and the assigned parcel numbers for each of the lots in the subdivision. The municipal addressing parcel numbers will be the same as the lot numbers shown on the legal subdivision plan.

The two or three digit parcel identification signs must be in an obvious place next to the driveway at the property line. The sign shall be located on the right side of the driveway, minimum 3 meters from the approach shoulder, minimum 1.5 meter above ground level and at 90° to the driveway.

Municipal Address Signs shall be constructed and installed in accordance with the following minimum requirements:

Size:	2 digit	300mm x 200mm (min.).
	3 digit	400mrn x 200mm (min.).
Sign Material:	2 mm high tensile flat aluminum.	
Finish:	3M medium black vinyl with silk screened or die-cut reflectorized white lettering.	
Lettering Size:	125mm (min.).	
Posts:	2.0m angled aluminum post.	
Sign Attachment:	the marker sign shall be attached to the post with two (2) steel bolts and nuts.	

Refer to Standard Detail Drawing No. 11.5, Typical Municipal Addressing Sign.

Municipal Address Signs may be purchased from the County of Grande Prairie, Public Works Department.

11.5 Subdivision Signs

The Developer shall supply and erect a subdivision display sign at the identified main entrance of each multiple lot subdivision with the exact location being approved by the Municipal Engineer prior to installation. The sign shall show the subdivision name, municipal address of the identified main entrance to the subdivision (sign location) and the subdivision layout with the assigned parcel identification number on each lot in the subdivision including the reserve parcel designations. These signs provide information for emergency first responders.

The subdivision sign shall be constructed by a Commercial Sign Manufacturer in exact accordance with the following minimum requirements. The sign shall be erected prior to occupation by the first resident:

Wood Option

Size

Map Sign:	1.2m x 2.4m (4 foot x 8 foot)
Address Tab:	0.300m x 2.4m (1 foot x 8 foot)

Material: Minimum 19mm H.D.O. Plywood properly sealed on the non-printed side.

Layout:

Map Sign:	Shall indicate the subdivision municipal numbering layout, subdivision name, County Logo and north arrow. Subdivision name to be minimum l50mm lettering shall include a "you are here" arrow, and lot numbering to be minimum 50mm lettering.
Address Tab:	Shall indicate the subdivision municipal address at minimum l50mm lettering.

Finish: 3M white high intensity reflective sheeting with computer cut lettering. Border strip is to be premium grade vinyl.

Date Stamp: To be on face of sign indicating date of manufacture.

Warranty: Manufacturer to provide 10 year guarantee against surface deterioration.

Posts: Shall be commercially available pressure treated minimum l50mm x l50mm x 3.5m wooden posts or approved galvanized telespar type metal posts.

Sign Attachment: The map sign and the address shall be attached to wood posts with a minimum of four (4) l9mm by l50mm bolts and nuts complete with minimum 38mm flat washers front and back. Wood signs attached to metal posts shall use the same size of bolt and hardware with the length adjusted according to the post dimensions.

Installation: Shall be installed as shown on Standard Detail Drawing No. 11.3, Typical Subdivision Sign Installation

Location: As determined and approved on site.

Aluminum Option

Shall be identical to the wood option with the exception of the following:

Material: 2mm high tensile flat aluminum minimum grade 5052-H38. Complete with aluminum bracing to provide a rigid structure.

Sign Attachment: As per manufacturers attachment design submitted and approved by the Municipal Engineer prior to sign installation.

Refer to Standard Detail Drawings No. 11.2, Typical Subdivision Sign No. 11.3 Typical Subdivision Sign Installation and No. 11.4 Typical Subdivision Sign North Arrow.

11.6 Landscaping

All roadway ditch bottoms, side slopes, back slopes, and open areas disturbed during construction shall be uniformly top-soiled with salvaged topsoil. If deficient in topsoil depth, additional topsoil shall be added to bring it up to the 150 mm depth standard specified in Section 13, and be seeded to grass following preparation of the seed bed.

The seed bed shall consist of a minimum 150 mm of topsoil capable of supporting good vegetation growth. The topsoil shall be spaced and graded evenly and shall be free of rock, roots, stumps, weeds and other deleterious material.

The seed mixture shall be as follows:

- For low density residential/commercial/industrial development:
  - 100% Creeping Red Fescue
- For high density residential:
  - 100% Creeping Red Fescue
- All seed shall be certified - weed free

The rate of application of seed shall be 20 kg per hectare by mechanical applicators.

Watering is required by the contractor/developer.

All seeded areas will be accepted following consistent germination and carrying out of a first cut following 50 mm of growth.

11.7 Protection And/Or Coordination Of Utilities

The Developer shall be responsible for the identification, location and protection of all utilities which may exist within or adjacent to the proposed subdivision or adjacent road allowances. Utilities commonly encountered on lands within the County of Grande Prairie No. 1 may include, but not be limited to:

- drainage structures/storm sewer
- water mains
- sewer, sanitary & storm
- telephone cables & cable system lines
- power cables
- natural gas distribution lines
- oil and gas transmission/distribution lines

The Developer shall be responsible for contacting all utility companies and for arranging and coordinating all protection and/or modifications to the utilities during the development of the subdivision at his sole cost or as agreed upon with the specific utility company.

11.8 Environmental Reserve Signage

The Developer shall supply and erect an Environmental Reserve Marker Sign at each property corner within a subdivision where a subdivision lot corner forms a common point with an Environmental Reserve.

Environmental Reserve signs shall be constructed by a commercial sign manufacturer and be installed in accordance with the following minimum requirements:

Size:	90 mm x 205 mm
Sign Material:	2 mm Aluminum
Finish:	3M grey vinyl with silk screened black lettering
Information:	As shown on "Typical Environmental Reserve Marker Sign" Standard Detail Drawing No. 11.6

Posts:	18 gauge galvanized steel U channel 87 mm wide x 31 mm deep x 1.800 m long
Sign Attachment:	The sign shall be attached to the post with two (2) min. 4 mm stainless steel rivets in pre-drilled holes
Installation:	Shall be installed as shown on "Typical Environmental Reserve Marker Sign" Standard Detail Drawing No. 11.6

11.9 Electrical Power Service

The Developer shall make arrangements with ATCO Electric for the installation of above ground and/or underground Electrical Power within a subdivision. The installation shall be carried out in accordance with "Typical Utilities Layout", Standard Detail Drawings.

11.10 Natural Gas Service

The Developer shall make arrangements with ATCO Gas for the installation of Natural Gas in a subdivision. The installation shall be carried out in accordance with "Typical Utilities Layout" Detail Standard Drawing.

The alignment and location of all natural gas utility within a subdivision shall be subject to the approval of the Municipal Engineer.

11.11 Street Lighting

See Section 10: Traffic Signalization, Street Signs & Traffic Signs

11.12 Mailbox Pullouts

The Developer shall construct, as required, a mailbox pullout at the entrance to or within the subdivision in accordance with Standard Detail Drawing No. 11.7, Typical Mailbox Pullout Cross-Section and Standard Detail Drawing No. 11.8, Typical Mailbox Pullout Locations.

11.13 Offsite Road Construction

A subdivision or development approval may require that the Developer reconstruct an existing County road or construct a road within a previously existing County road allowance. This section outlines the Developer's responsibility relative to such a requirement.

The Developer in the reconstruction or construction of a County Road shall ensure and be responsible for the safety of the travelling public and access to adjacent landowners.

11.13.1 Coordination of Existing Utilities

The Developer is responsible for contacting all affected utility agencies and for arranging and coordinating all protection and/or modifications necessitated by the reconstruction or construction of a County road. This section outlines some of the arrangements and approximate time requirements and cost responsibilities.

11.13.1.1 Telephone

TELUS requires a minimum of 3 weeks advance written notice to allow for scheduling of crews for modifications and/or relocation of existing underground lines within road allowances. TELUS will modify, relocate or supply and layout a temporary line along the edge of the road allowance in order to maintain telephone service during construction. Temporary lines are replaced by permanent lines re-plowed into the ditch area of the road allowance upon completion of construction.

Temporary lines must not hinder private entrances.

The cost of modifying, relocating or providing and replacing temporary lines may be charged directly to the County of Grande Prairie No. 1 by TELUS pursuant to an agreement with respect to construction within municipal road allowances. Such charges will then be assessed against the Developer by the County of Grande Prairie, along with any additional charges by TELUS with respect to inadequate notice of construction start provided by the Developer. Any damages to permanent or temporary telephone facilities by the Developer's construction activities will be the Developer's responsibility and will be charged directly to the Developer by TELUS.

11.13.1.2 Power

ATCO Electric requires a minimum 8 weeks advance written notice to arrange for and schedule power line adjustments or relocations required by County road construction. Along with the notification ATCO Electric will be provided with the design plan-profile for the section of road requiring power line adjustment or relocation. The Developer shall then provide ATCO Electric with 10 days' notice prior to the date on which ATCO can commence relocation work. The Developer is responsible for carrying out clearing in addition to roadway clearing as might be required for power line relocation, some of which may be beyond the road allowance boundary.

Where overhead pole lines and/or underground power lines crossings are within the existing road allowance, the costs of any required modification or relocation will normally be borne by ATCO Electric pursuant to an

agreement with the County of Grande Prairie No. 1. Where pole lines are presently on private property adjacent to the existing road allowance, the actual costs of any required modification or relocation incurred by ATCO Electric are charged to the County and in turn are assessed against the Developer. The cost of any damages to ATCO Electric's facilities by the Developer's construction activity will be charged directly to the Developer by ATCO Electric. In all cases, the Developer is responsible for arranging for and paying the costs of all clearing required.

11.13.1.3 Natural Gas Distribution Lines

ATCO Gas normally requires a minimum 8 weeks advance written notice to schedule and arrange for modifications of low pressure gas line crossings of the road allowance. In the case of high pressure steel line crossings longer periods of advance notice are required depending on the type and size of line and the extent of modification required. For such high pressure lines every effort shall be made to design the road grade so as to accommodate the existing pipeline grade.

In some cases the costs of modifications to natural gas line crossings are borne by ATCO Gas, pursuant to a previous agreement with the County of Grande Prairie. Where costs are chargeable to the County of Grande Prairie, such costs will be assessed against the Developer.

11.13.1.4 Pipeline Crossings

Where transmission pipelines, such as oil or gas pipelines, oil distribution pipelines, water, sewer or any other pipelines not covered elsewhere within these standards, are found to exist within the road allowance the developer shall be responsible for:

- Contacting and advising the appropriate pipeline agency of the proposed road construction or reconstruction crossing its pipeline.
- Acquiring the necessary approvals and crossing agreements from the pipeline agency prior to road construction start
- Coordinating and scheduling the road construction and any required modifications to the pipeline with the pipeline agency
- Monitoring the road construction in the area of the pipeline crossing to ensure the requirements of the pipeline agency have been met.

All costs incurred in the acquiring of approvals, crossing agreements, and all construction costs connected with the lowering, modifying or realigning of a pipeline to accommodate road construction as well as any damages resulting from the road construction shall be the responsibility of the Developer.

11.13.1.5 Utility Markers

Where utility markers exist within a road allowance identifying the location of an underground line, and the markers require relocating to accommodate road allowance widening and/or road construction, the Developer shall be responsible for contacting the appropriate utility company and arranging for marker relocation.

11.13.2 Land Acquisition and Access Agreements

The reconstruction or construction of a County road may result in the need for negotiation and formal agreements with adjacent landowners with respect to one or more of the following typical requirements:

- road allowance widening & clearing
- back-sloping
- borrow areas
- power line clearing
- telephone right-of-access
- fencing
- access

All negotiations and preparations of formal agreements will be carried out by the County land buyers for consideration and approval by the County of Grande Prairie. All required payments pursuant to the provisions of the agreements as well as the costs incurred by the County of Grande Prairie in arranging the agreements will be assessed against the Developer.

11.13.2.1 Road Allowance Widening

In all cases, the County of Grande Prairie will normally attempt to acquire additional road allowance equally on both sides of the original road allowance for a total width required to meet the standard and classification of road in question. The basic total width for most County roads is 30 meters.

Land acquisition payments to landowners are normally based on rates established by the County of Grande Prairie Council for various areas in the County. There may also be damage payments to the landowners for circumstances such as loss of crop, shelter belt trees, access, etc. There will be no payments made on developer driven projects.

11.13.2.2 Back-sloping

Back-sloping arrangements with a landowner enables roadway excavation and/or fill slopes to extend beyond the road allowance limits into private property to slope gradients and under conditions mutually agreed upon. Agreements for such arrangements are normally pursued by the County of Grande Prairie in cases where road allowance widening is not possible or where large cuts and/or fills necessitate construction beyond the road allowance widening acquired. The Developer is responsible for identifying the location and extent of areas along the road where back-sloping is necessary.

Landowner compensation for back-sloping normally consists of damage payments for such items such as loss of crops, trees, access, etc. There is generally no compensation for earth material removed from private property.

11.13.2.3 Borrow Areas

Where the Developer identifies the need for borrow material to complete reconstruction or construction of a County road, the County of Grande Prairie will endeavor to make arrangements with agreeing landowners for suitable borrow area(s). The location of suitable borrow relative to the area of requirement on the road will generally be governed by landowners willingness and adjacent terrain characteristics.

Landowner compensation for borrow areas normally consists of damage payments for such items as loss of crops, trees, access, etc. There may be a requirement to compensate the landowner for the volume of earth borrows removed.

All borrow areas shall be reclaimed to meet the requirements of Alberta Environment. (Topsoil and sub-soil shall be removed and stockpiled in separate piles, as directed by the Municipal Engineer.)

11.13.2.4 Power Line Clearing

In cases where road allowance widening has been acquired and power line relocation is required, the County of Grande Prairie will endeavor to obtain the affected landowners approval for the clearing of trees on private property beyond the widened road allowance to provide clearance for the power line. Through his liaison with ATCO Electric, the Developer is responsible for identifying the location and extent of such clearing required.

Landowner compensation for power line clearing, if required, normally consists of damage payments for tree loss, access, etc., and is generally included as part of the compensation for road allowance widening.

11.13.2.5 Telephone Right-of-Access

Where it is identified that a temporary telephone line is required to continue phone service during construction, the County of Grande Prairie will attempt to arrange an agreement with the affected landowner to allow TELUS to place the temporary line on private property adjacent to the road allowance. Through his liaison with TELUS, the Developer is responsible for identifying the area(s) where a temporary telephone line is required. There is normally no landowner compensation resulting from a Telephone Right-of-Access Agreement.

11.13.2.6 Fencing

The requirements for the replacement of property line fencing are commonly included in agreements with landowners for road allowance widening, back-sloping or borrow areas. Agreements for back-sloping or borrow areas may also include a requirement for temporary fencing during the period of construction. All fence construction will be arranged directly by the County of Grande Prairie to standards specified in the agreements with landowners. The County of Grande Prairie requires a minimum of two weeks' notice of any required permanent or temporary fencing.

All fencing costs will be assessed against the Developer by the County of Grande Prairie. Permanent fencing will be charged at the County rates with additional labour charges for erection and removal of temporary fencing where required.

11.13.3 Coordination of Traffic

Wherever it is considered necessary by the Municipal Engineer to accommodate the passage of traffic during reconstruction or construction of a County road, the Developer shall be responsible for ensuring that his Contractor makes all needed and suitable provisions for such traffic, whether pedestrian or vehicular, over the work being performed and that he supplies and maintain such signs, barrier, fences, lights, and flag persons as may be required for this purpose. No construction project shall start until all necessary construction signs are in place and approved by the Municipal Engineer.

Flag persons must have approved training.

11.13.3.1 Construction Signs

All construction signs and barricades shall be fully reflectorized and shall conform to the latest Transportation Association of Canada (TAC) edition of the "Manual of Uniform Traffic Control Devices for Canada". Any required oversize signs or special signs for specific circumstances shall be of a design meeting with the approval of the Municipal Engineer.

Refer to Standard Detail Drawing No. 11.9, Typical Minimum Construction Signage.

The type and spacing of construction signage shall conform to the requirements for the construction signage developed by Alberta Transportation and Utilities except where otherwise specified by the Municipal Engineer.

Signs shall be erected at right angles to the roadway with their bottom 1.5 meters above the road and not less than 3 meters or more than 4 meters from the nearest traffic lane. Signs shall be kept as close to the work as practical and portable signs on weighted stands may be used where signs must be moved often. All signs must be kept clean and clearly legible at all times.

When work is not in progress, regulatory and construction signs not essential for the protection of the public shall be removed or covered to reduce inconvenience to a minimum. All construction signs shall be removed as soon as possible after the project is completed.

11.13.3.2 Existing Signs

All existing signs and guide posts which must be removed to carry out the work shall be carefully salvaged and turned over to the Municipal Engineer. Certain essential existing signs such as railway crossing, intersection

warning or stop or yield signs shall be maintained as positioned for the duration of the project.

11.13.3.3 Flag persons

Flag persons, if required, shall be instructed in the proper traffic control procedures applicable to the work and shall be dressed in light colored clothing with fluorescent orange over-vests and armlets for maximum visibility. Flag persons shall be provided with standard traffic control sign paddles and where it is necessary to have a flag person at both ends of the work, they shall be provided with the ability to communicate with each other.

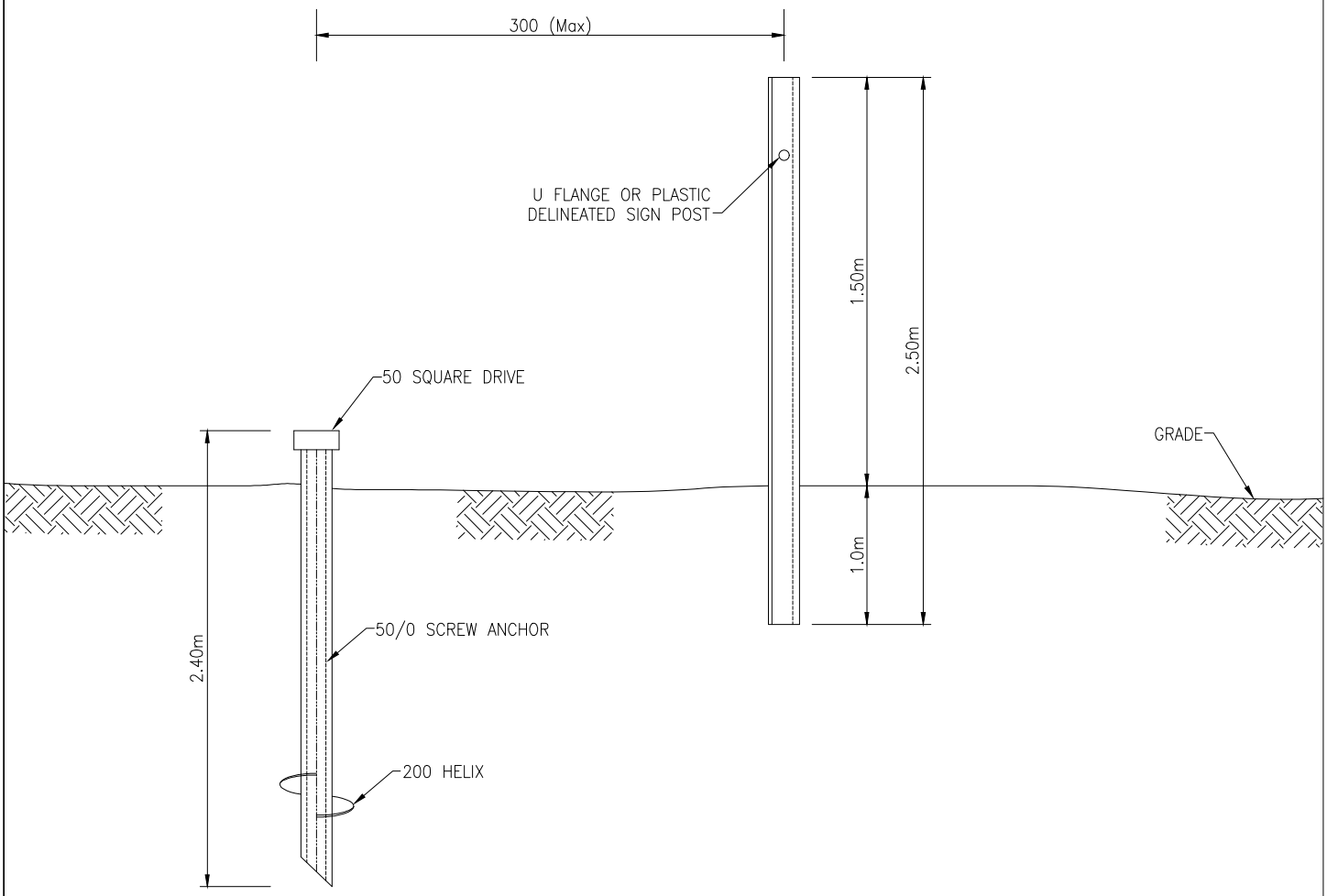
11.13.3.4 Detours

Detouring of traffic around the work off the road allowance or along other roadways must receive the prior written approval of the Municipal Engineer.

Where the Municipal Engineer approves the use of a detour route, the Developer's contractor shall provide and maintain such signs, barriers, lights and flag persons as may be considered necessary by the Municipal Engineer to divert the traveling public over the detour. The Contractor shall acceptably maintain the detour route, and upon completion of its use he shall leave it in a condition as good as previous to its use as a detour.

11.13.3.5 Traffic Assistance

Where traffic is required to use a route over or around the work which is of lower standard than was available before the work commenced, the Developer's Contractor shall continuously provide assistance to traffic as might be required on a 24 hour per day and 7 day per week basis, particularly during periods of inclement weather.



NOTE:

MARKER POST TO BE POSITIONED WITH THE OPEN U SECTION OF THE POST OR FLAT FACE FACING THE NEAREST ADJACENT ROAD AND WITH THE POST LOCATED DIRECTLY BEHIND AND WITHIN 300mm OF THE BENCH MARK.

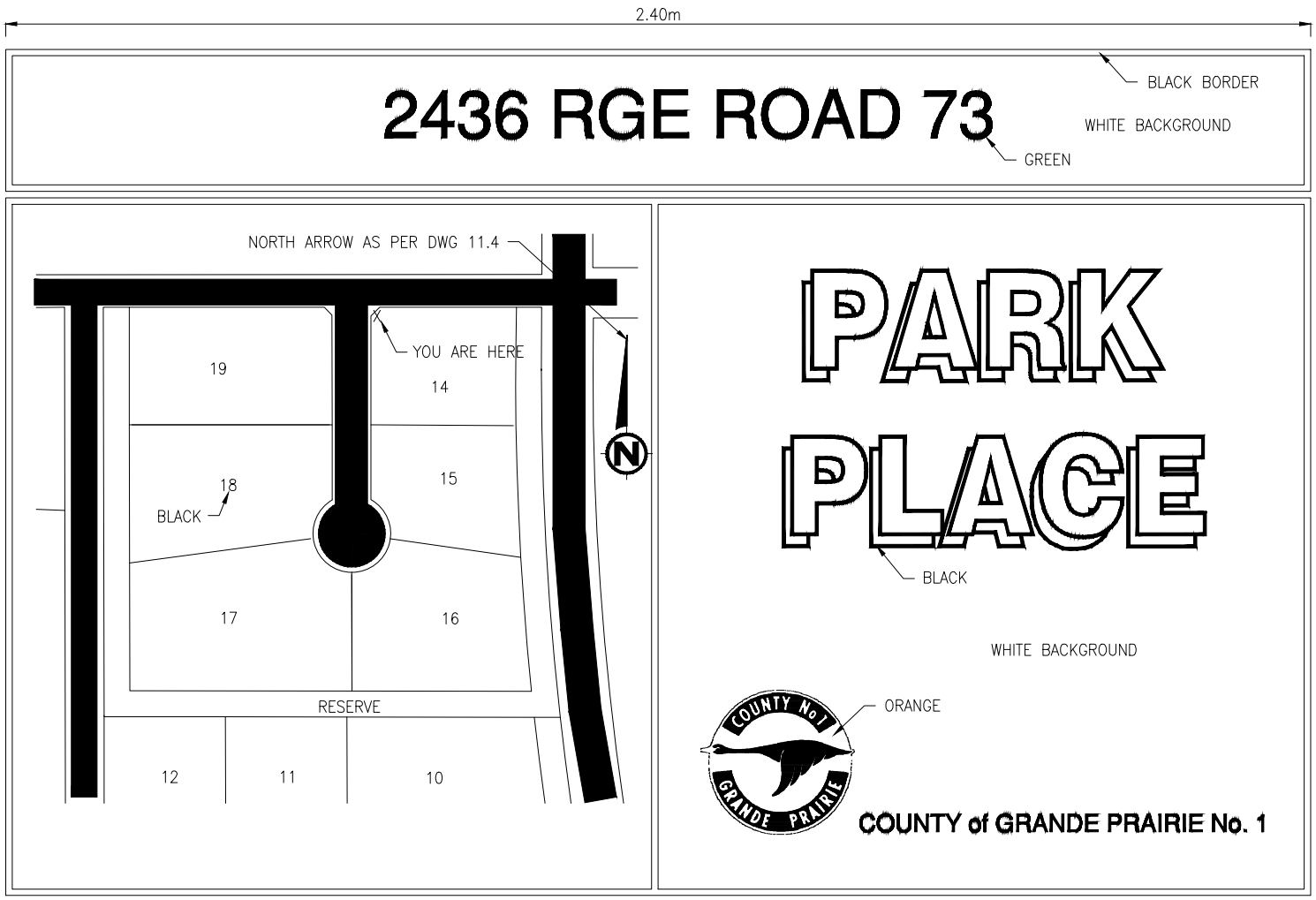
ALL DIMENSIONS SHOWN ARE IN METERS AND DECIMALS OF.

County of Grande Prairie No. 1

COUNTY of GRANDE PRAIRIE No. 1

TYPICAL GEODETIC BENCH MARK INSTALLATION

DATE:	2002-04-01	DRAWN BY:	GWA	APPROVED:	DRAWING 11.1
SCALE:	NOT TO SCALE	CHECKED BY:	BHG		



NOTE:

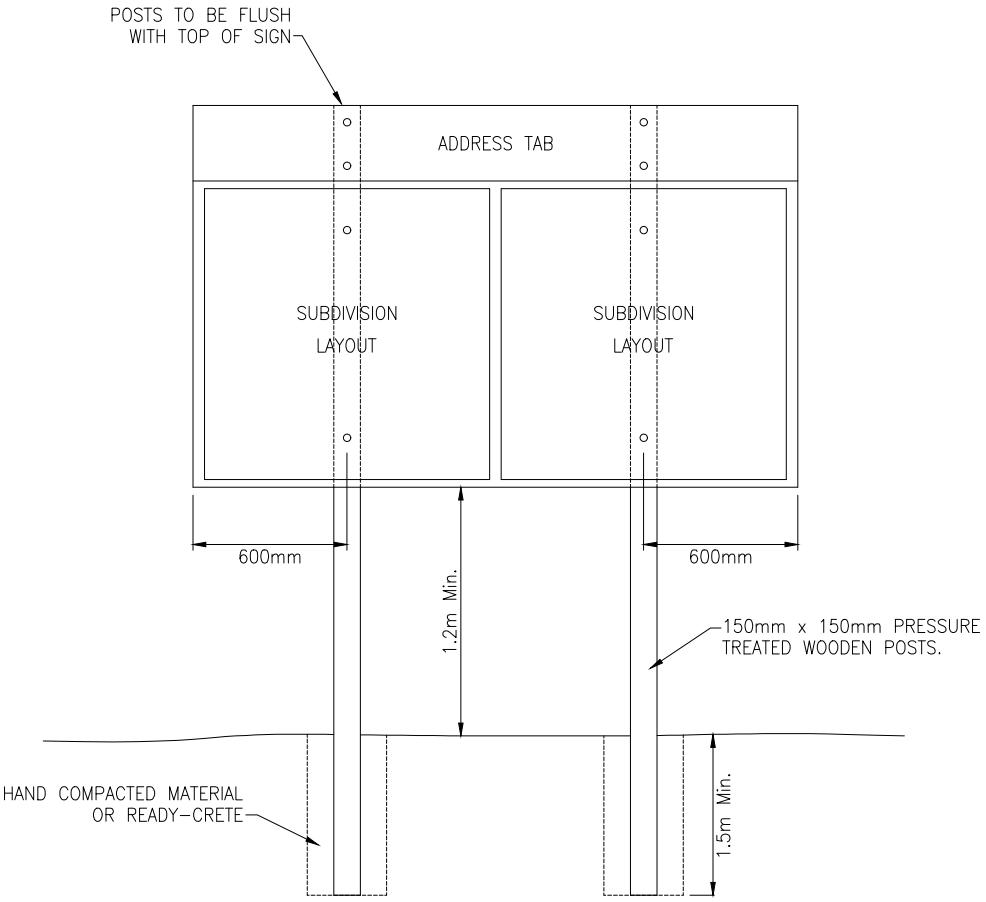
- OUTLINE AROUND LOT AREAS SHOWN IN BLACK
- PARK RESERVES TO BE GREEN
- WATER TO BE BLUE
- ROADS TO BE SOLID BLACK WITH WHITE NAMES INSIDE
- COLORS TO BE '3-M' RECOMMENDED INKS OR APPROVED EQUIVALENT
- ADDRESS NUMBERS TO BE PLACED ON MAP WHERE APPLICABLE
- DIMENSIONS SHOWN IN METERS

County of Grande Prairie No. 1

COUNTY of GRANDE PRAIRIE No. 1

TYPICAL SUBDIVISION SIGN

DATE:	2002-04-01	DRAWN BY:	GWA	APPROVED:	DRAWING 11.2
SCALE:	NOT TO SCALE	CHECKED BY:	BHG		



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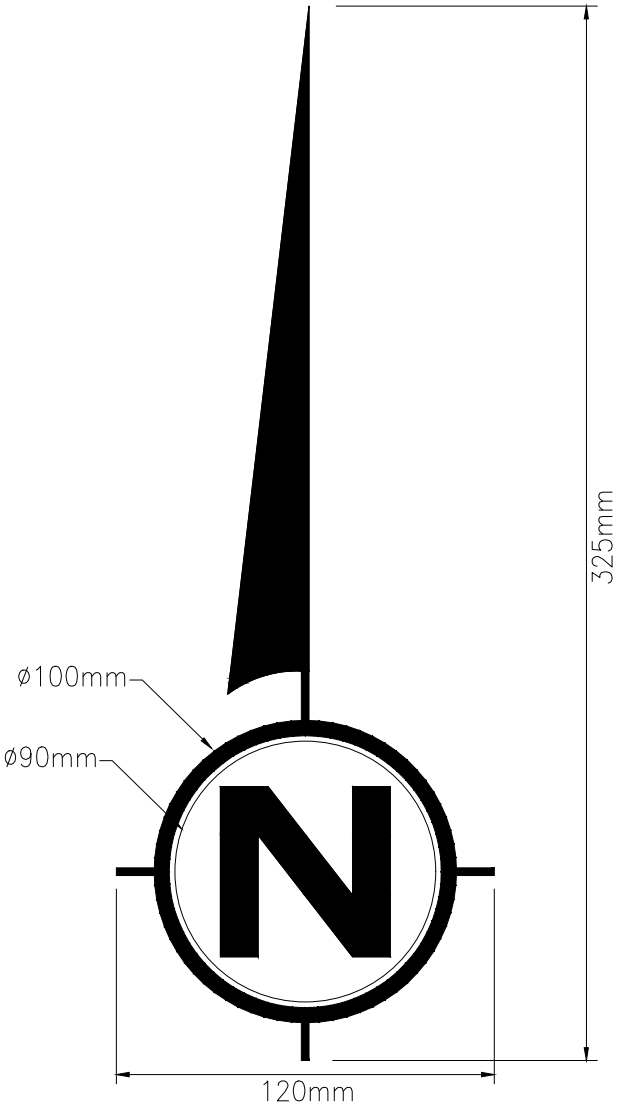
COUNTY of GRANDE PRAIRIE No. 1

TYPICAL SUBDIVISION SIGN INSTALLATION

DATE:	2002-04-01	DRAWN BY:	GWA	APPROVED:	DRAWING 11.3
SCALE:	NOT TO SCALE	CHECKED BY:	BHG		



NOTES:

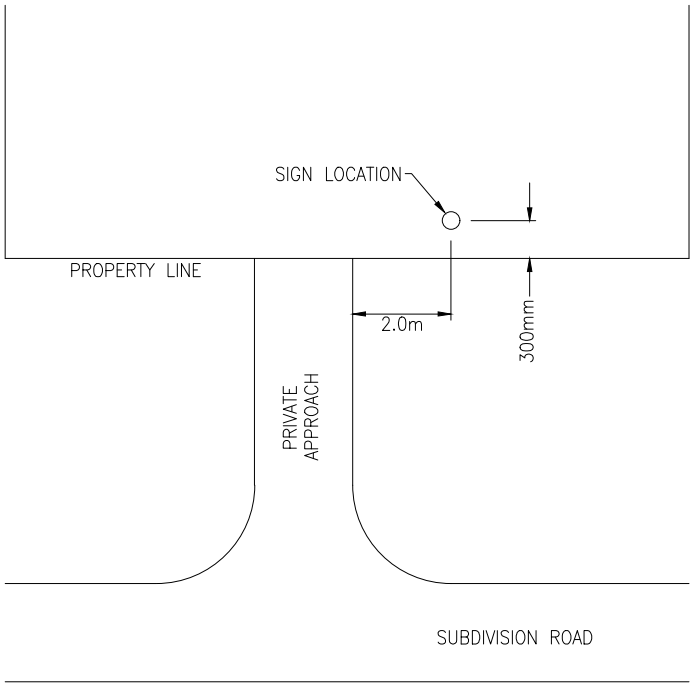
- NORTH ARROW COLOR BLACK
- COLORS TO BE "3-M RECOMMENDED INKS OR APPROVED EQUIVALENT

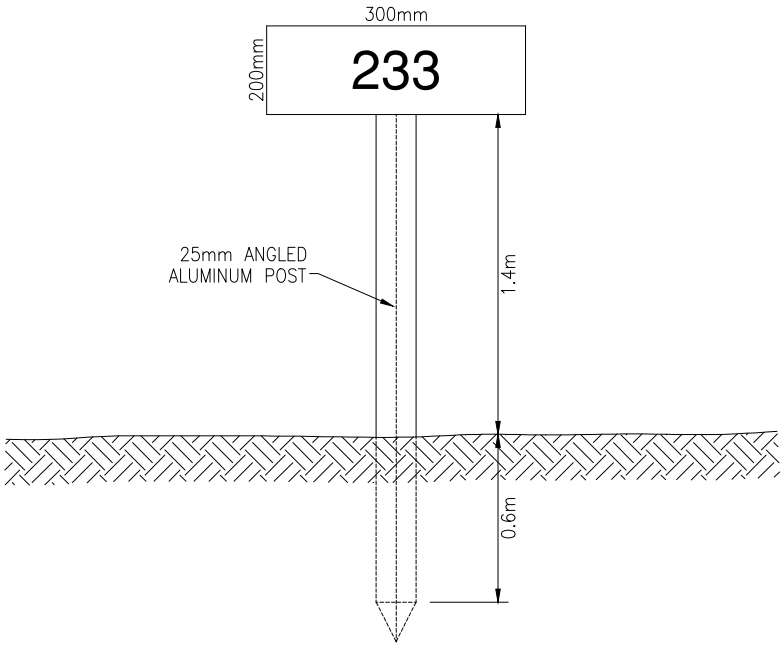
ALL DIMENSIONS SHOWN ARE IN METERS AND DECIMALS OF.

COUNTY of GRANDE PRAIRIE No. 1

TYPICAL SUBDIVISION SIGN
NORTH ARROW

DATE:	2002-04-01	DRAWN BY:	GWA	APPROVED:	DRAWING 11.4
SCALE:	NOT TO SCALE	CHECKED BY:	BHG		





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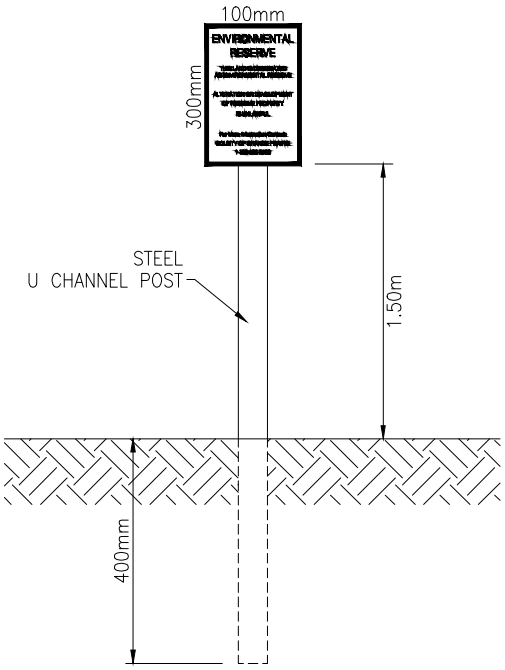
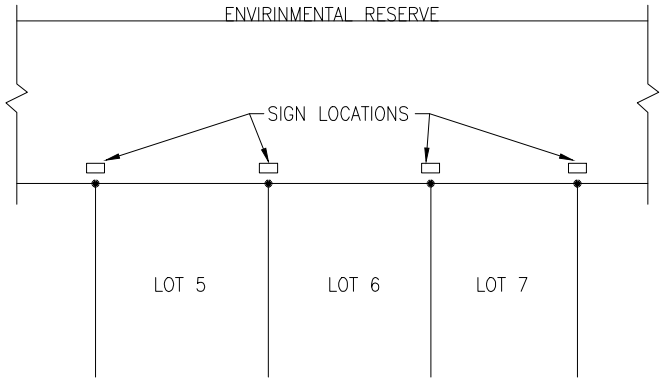
COUNTY of GRANDE PRAIRIE No. 1

TYPICAL MUNICIPAL ADDRESSING SIGN

DATE:	2002-04-01	DRAWN BY:	GWA	APPROVED:	DRAWING 11.5
SCALE:	NOT TO SCALE	CHECKED BY:	BHG		





NOTES:

- SIGNS TO BE LOCATED AT EACH COMMON ENVIRONMENTAL RESERVE AND PROPERTY LOT CORNER.
- SIGNS TO BE 300mm ON RESERVE FACING PRIVATE LOTS.

ALL DIMENSIONS SHOWN ARE IN METERS AND DECIMALS OF.

ENVIRONMENTAL RESERVE

THIS LAND IS DESIGNATED
AS ENVIRONMENTAL RESERVE

ALTERATION OR DEVELOPMENT
OF RESERVE PROPERTY
IS UNLAWFUL

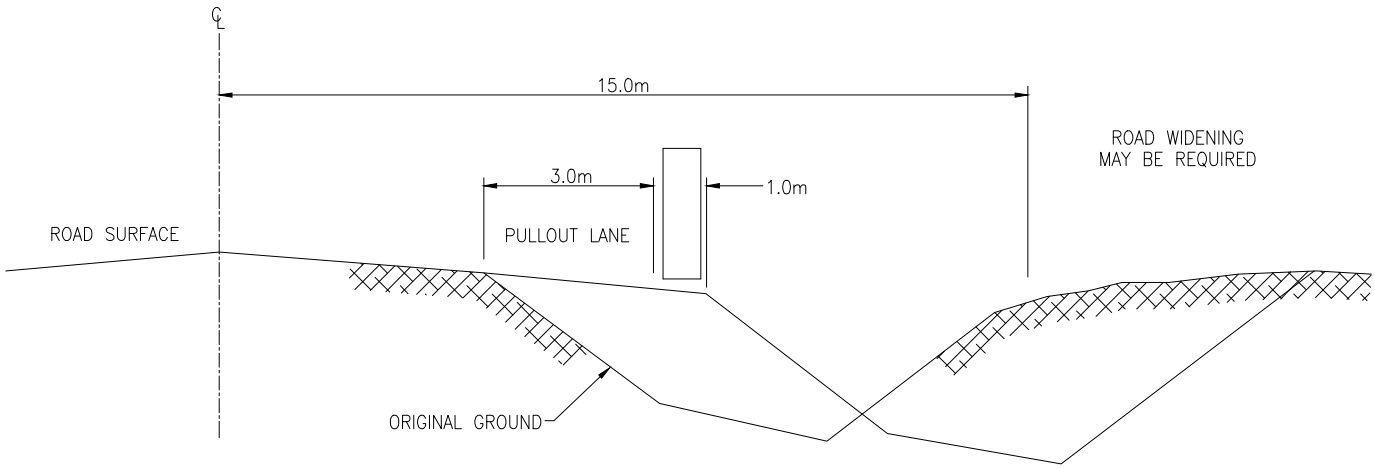
For More Information Contact:
COUNTY OF GRANDE PRAIRIE
1-780-532-9722

County of Grande Prairie No. 1

COUNTY of GRANDE PRAIRIE No. 1

TYPICAL ENVIRONMENTAL
RESERVE MARKER SIGN

DATE:	2002-04-01	DRAWN BY:	GWA	APPROVED:	DRAWING
SCALE:	NOT TO SCALE	CHECKED BY:	BHG		11.6



NOTE: ALL BACK SLOPES 3:1 UNLESS NOTED OTHERWISE

FILL SLOPE TABLE

DEPTH OF FILL	SLOPE
0 – 3.5m	3:1
3.5 – 4.5m	2 1/2:1
> – 4.5m	2:1

NOTE:

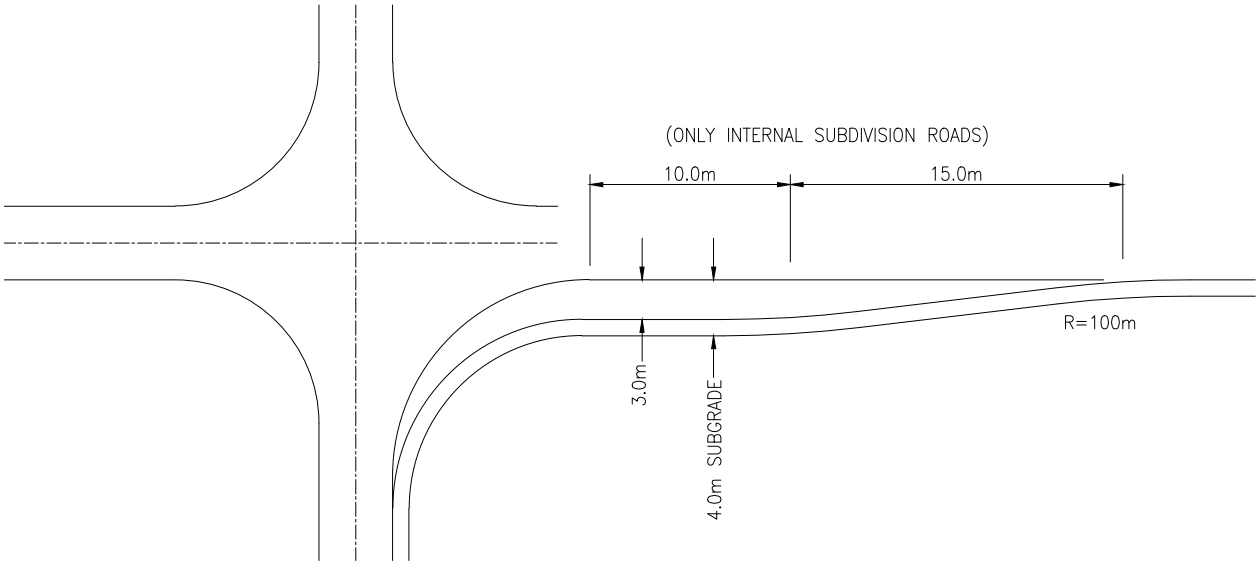
2:1 SLOPE REQUIRES 1m SHOULDER WIDENING & GUARDRAIL INSTALLATION

ALL DIMENSIONS SHOWN ARE IN METERS AND DECIMALS OF.

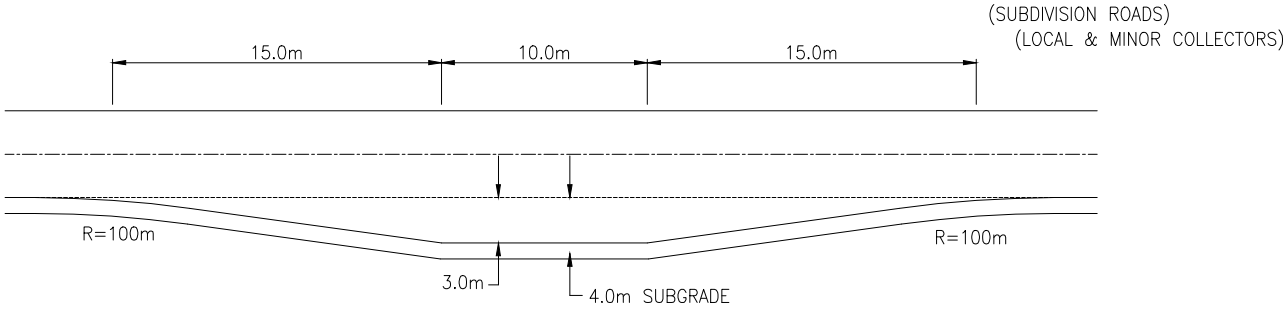
COUNTY of GRANDE PRAIRIE No. 1

TYPICAL MAIL BOX PULLOUT CROSS-SECTION

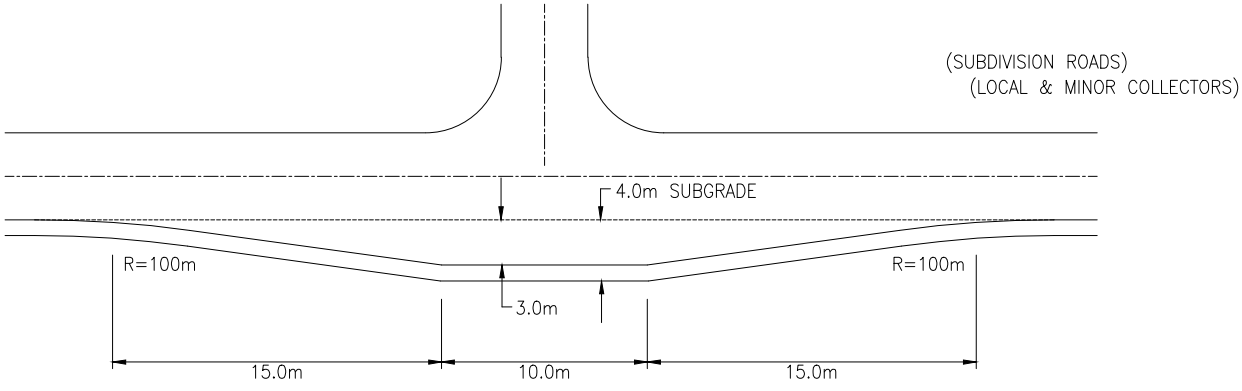
DATE:	2002-04-01	DRAWN BY:	GWA	APPROVED:	DRAWING 11.7
SCALE:	NOT TO SCALE	CHECKED BY:	BHG		



CORNER INTERSECTION LOCATION



MID BLOCK LOCATION



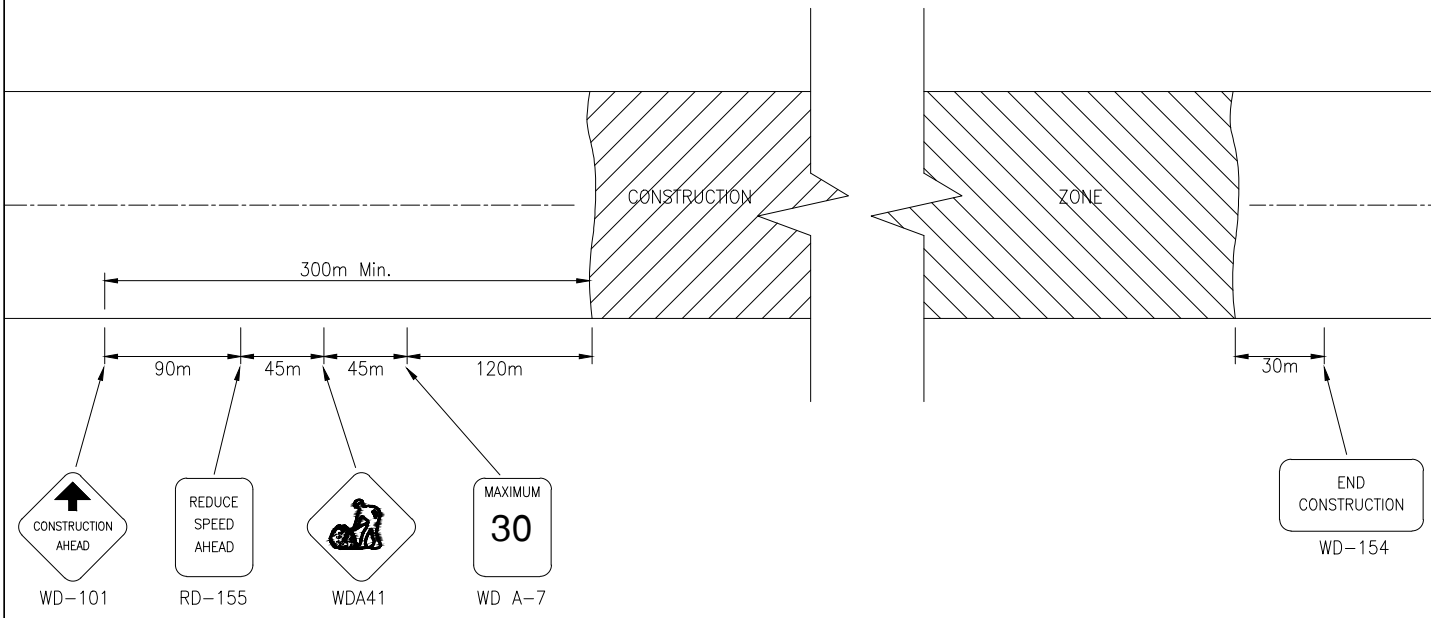
TEE INTERSECTION LOCATION

ALL DIMENSIONS SHOWN ARE IN METERS AND DECIMALS OF.

COUNTY of GRANDE PRAIRIE No. 1

TYPICAL MAIL BOX PULLOUT LOCATIONS

DATE:	2002-05-01	DRAWN BY:	GWA	APPROVED:	DRAWING 11.8
SCALE:	NOT TO SCALE	CHECKED BY:	BHG		



NOTES:

1. EACH SIGN TO BE PLACED 3m FROM EDGE OF TRAVELED SURFACE WITH BOTTOM OF SIGN 1.5m ABOVE ROAD TRAVEL.
2. REPEAT SIGNING FOR EACH DIRECTION OF TRAVEL.
3. ALL SIGNS TO BE INSTALLED ON METAL OR WOOD STANDARDS.
4. Min. STANDARDS FOR SIGNS SHALL CONFORM TO STANDARD SPECIFICATION NUMBERS ABOVE.

ALL DIMENSIONS SHOWN ARE IN METERS AND DECIMALS OF.

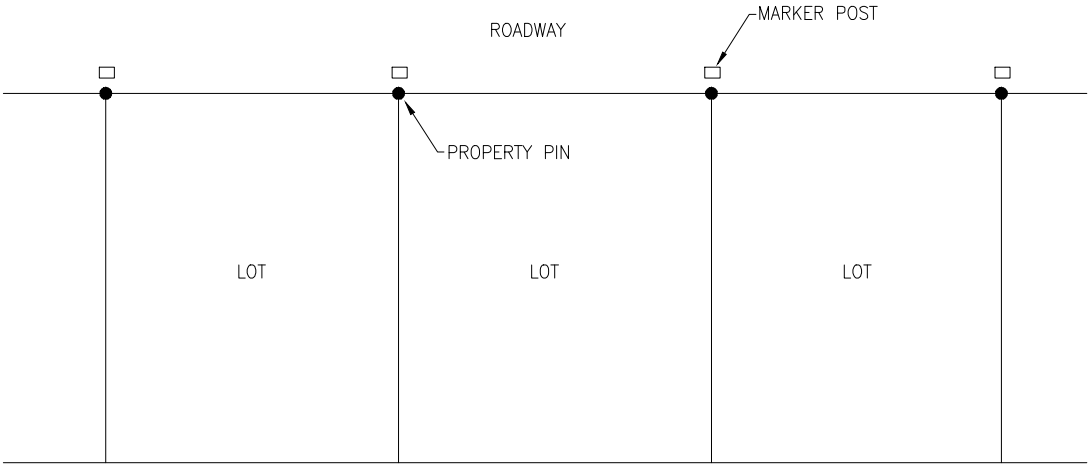
County of Grande Prairie No. 1

COUNTY of GRANDE PRAIRIE No. 1

TYPICAL MINIMUM CONSTRUCTION SIGNAGE

DATE:	2002-05-01	DRAWN BY:	GWA	APPROVED:	DRAWING 11.9
SCALE:	NOT TO SCALE	CHECKED BY:	BHG		

100mmx100mmx1,200mm TREATED POSTS
OR APPROVED EQUIVILANT PLACED
600mm INTO THE GROUND AND
300mm ON ROAD ALLOWANCE

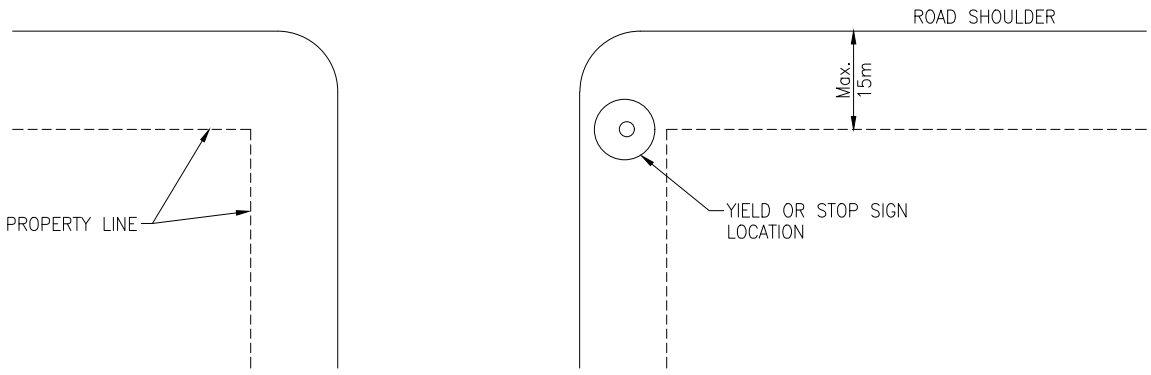


ALL DIMENSIONS SHOWN ARE IN METERS AND DECIMALS OF.

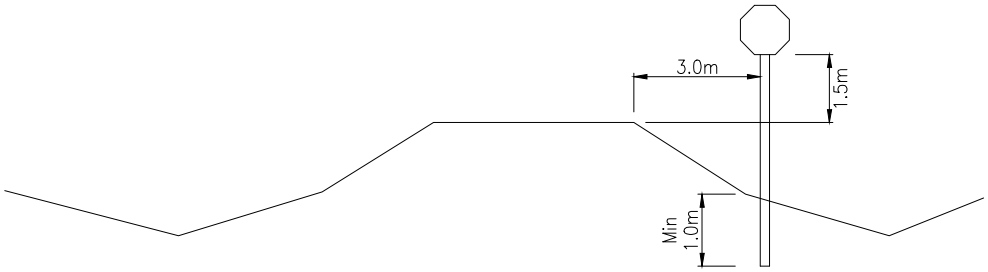
COUNTY of GRANDE PRAIRIE No. 1

TYPICAL LOT PIN MARKER INSTALLATION

DATE:	2002-05-01	DRAWN BY:	GWA	APPROVED:	DRAWING 11.10
SCALE:	NOT TO SCALE	CHECKED BY:	BHG		



PLAN



CROSS-SECTION

NOTE:

LOCATION AND HEIGHT IS
COMMON TO ALL SIGNS PLACED.

ALL DIMENSIONS SHOWN ARE IN METERS AND DECIMALS OF.

COUNTY of GRANDE PRAIRIE No. 1

TYPICAL TRAFFIC SIGN INSTALLATION DETAIL

DATE:	2002-05-01	DRAWN BY:	GWA	APPROVED:	DRAWING 11.11
SCALE:	NOT TO SCALE	CHECKED BY:	BHG		

SECTION 12 Shallow Utilities

12.1 Gas Service 12-2
12.1.1 Right-Of-Ways 12-2
12.1.2 Conditions 12-2
12.1.3 Costs 12-2
12.2 Telephone Service 12-2
12.2.1 Right -Of-Ways 12-2
12.2.2 Conditions 12-3
12.2.3 Costs 12-3
12.3 Electric Power Service 12-3
12.3.1 Right -Of-Ways 12-3
12.3.2 Conditions 12-3
12.3.3 Costs 12-4
12.4 Television Cable 12-4
12.4.1 Right -Of-Ways 12-4
12.4.2 Conditions 12-4
12.4.3 Costs 12-4

12.1 Gas Service

Natural gas service is provided by ATCO Gas under a Franchise Agreement.

12.1.1 Right-Of-Ways

Where required, the Developer shall provide right-of-ways and easements of sufficient size and location to satisfy the utility company.

All easements shall be registered in the name of the County of Grande Prairie.

12.1.2 Conditions

The Developer's Consultant and ATCO Gas shall obtain County approval for the method of installation including excavation and backfilling requirements.

The Developer's Consultant shall co-ordinate the location of gas services to ensure that they do not interfere with other utilities.

Where gas distribution is at the front of lots, gas service to individual lots shall be, installed such that the gas meter can be placed at the side or the rear of the dwelling.

Where gas meters are placed at the side of the dwelling unit, the gas meter shall be placed on the side of the dwelling opposite the driveway. Gas meters shall not be permitted at the front of the dwelling unit.

An Excavation Permit must be obtained from the County of Grande Prairie No. 1 for any excavation on County property if outside of the subdivision boundaries.

12.1.3 Costs

Any capital contribution that the utility company may charge for installation of gas services shall be paid by the Developer.

12.2 Telephone Service

Telephone services are to be installed by TELUS and shall be underground.

Wherever possible, power, telephone and cable T.V. lines shall run in a common trench.

12.2.1 Right -Of-Ways

Where required, the Developer shall provide right-of-ways and easements of sufficient size and location to satisfy TELUS.

All easements shall be registered in the name of the County of Grande Prairie No. 1.

12.2.2 Conditions

The Developer's Consultant and TELUS shall obtain County approval for the method of installation including excavation and backfilling requirements.

The Developer's Consultant shall co-ordinate the location of telephone service boxes to ensure that they do not conflict with driveways or interfere with other utilities. Alignments are to be approved by the Municipal Engineer.

An Excavation Permit must be obtained from the County of Grande Prairie No. 1 for any excavation on County property if outside the subdivision boundaries.

Service pedestals to be located on the intersection of lot lines where possible.

12.2.3 Costs

Any capital contribution that the utility company may charge for installation of telephone services shall be paid by the Developer.

12.3 Electric Power Service

Electrical power service is provided by ATCO Electric under a Franchise Agreement.

Power services to be installed by ATCO Electric and shall be underground or overhead, as permitted by the County.

Wherever possible, underground power, telephone and cable T.V. lines shall run in a common trench

12.3.1 Right -Of-Ways

Where required, the Developer shall provide right-of-ways and easements of sufficient size and location to satisfy ATCO Electric.

All easements shall be registered in the name of the County of Grande Prairie No. 1.

12.3.2 Conditions

The Developer and ATCO Electric shall obtain County approval for the method of installation including excavation and backfill requirements.

The Developer’s Consultant shall co-ordinate the location of power service boxes and transformers to ensure that they do not conflict with road/lanes or driveways or interfere

with other utilities and are in accordance with County separation standards. Wherever possible, service boxes and transformers should be located at the intersection of lot lines.

Alignments are to be approved by the Municipal Engineer.

An Excavation Permit must be obtained from the County of Grande Prairie No. 1 for any excavation on County property if outside the subdivision boundaries.

12.3.3 Costs

Any capital contribution that the utility company may charge for installation of electrical services shall be paid by the Developer.

12.4 Television Cable

Television cable services are supplied by Northern Cablevision Ltd.

Where possible, if an underground service, power, telephone, and cable T.V. lines shall run in a common trench.

All easements shall be registered in the name of the County of Grande Prairie No. 1.

12.4.1 Right -Of-Ways

Where required, the Developer shall provide right-of-ways and easements of sufficient size and location to satisfy the television cable company.

12.4.2 Conditions

The Developer's Consultant and the television cable company shall obtain County approval for the method of installation including excavation and backfill requirements.

The Developer's Consultant shall co-ordinate the location of television cable services to ensure that they do not interfere with the other utilities. Alignments are to be approved by the Municipal Engineer.

12.4.3 Costs

Any capital contribution that the utility company may charge for installation of television cable services shall be paid.

SECTION 13 Landscape Design

13.1 General 13-2
13.1.1 Boulevards 13-2
13.1.2 Road Medians, Entry Feature Medians and Entry Features 13-2
13.1.3 Walkways / Trails 13-2
13.1.4 Public Utility Lots (P.U.L.'S) 13-3
13.1.5 Storm Water Management Facilities 13-3
13.1.6 Natural Areas 13-3
13.1.7 Municipal Reserve (M.R.) 13-3
13.2 Landscape Plan and Playground Plan If Applicable 13-4
13.2.1 M.R.s, Storm Water Management Areas and Natural Areas 13-4
13.2.2 Boulevards. Entry Features and Walkways 13-4
13.3 Design Guidelines 13-5
13.3.1 Setbacks 13-5
13.3.2 Planting Beds 13-5
13.3.3 Topsoil 13-6
13.3.4 Fences 13-6
13.3.5 Furniture 13-6
13.3.6 Testing 13-6
13.3.7 Plant Selection 13-6
13.3.7.1 Requirements for Boulevards along Roads, Trails/Walkways/ROWs 13-7
13.3.7.2 Requirements for Parks, Boulevards with Setback 13-7
13.4 Design Requirements 13-9
13.4.1 Boulevards 13-9
13.4.1.1 Arterial/Collector Roadways 13-9
13.4.1.2 Major Entrance Roadways to Subdivisions 13-9
13.4.2 Entry Feature Medians and Entry Features 13-10
13.4.3 Walkways / Trails 6 Meters Wide Right of Way Or Greater 13-10
13.4.4 Public Utility Lots (P.U.L.) 13-11
13.4.5 Storm Water Management Facilities 13-11
13.4.6 Natural Areas 13-12
13.4.7 Municipal Reserve. (M.R.) 13-13
13.4.8 Berms 13-13
13.5 Testing 13-13

13.1 General

All landscape plans shall be submitted with the Detailed Engineering Drawings as required by the Service Agreement and in accordance with the Outline Plan and County Design Standards. The Municipal Engineer may approve parks and entry feature plans submitted separately.

All landscaping design and construction is the sole responsibility of the Developer.

13.1.1 Boulevards

Boulevards are defined as the areas between the curb and the property line and as areas separating local, collector, and arterial roads from residential property.

Boulevards are to be topsoiled, seeded/sodded; tree/shrub planted as per plan depending upon types of roadway (see 13.4.1).

13.1.2 Road Medians, Entry Feature Medians and Entry Features

Road medians, including such structures as road islands and turnouts, are areas between back of curbs on the intersecting road, generally at 90 degrees to the subdivision entrance. Road medians shall not be landscaped.

Entry feature medians are areas between back of curbs in the median at entries to subdivisions, if the subdivision is so designed. Entry feature medians may be landscaped (see 13.4.2.).

Entry features are areas back of the curb of road islands or turnouts, which contain the feature or features themselves. Entry Features are to be top soiled, seeded/sodded, and if so required by the Municipal Engineer, trees/shrubs planted.

13.1.3 Walkways / Trails

Walkways/trails are defined as the areas between the edge of walkway structures and the legal boundaries of the entity. This section refers to walkways/trails in parks, boulevards or wider Public Utility Lots. Amenities such as benches will be required at every 100l.m. of trail. Further, garbage receptacles will be required at entry and exit locations to a greenway/walkway that meets or exceeds 100l.m.

For walkways/trails for which the right of way is less than 6 m wide, only top soiling, paving and seeding/sodding will be required. For walkways/trails 6 m or greater (that are not in a P.U.L.) top soiling, paving, seeding/sodding, tree/shrub planting will be required. The minimum tree planting rate is 1 tree per lot spaced from 6.0 to 10.0 meters on center (depending on the species) for most roads and 5 trees per 35 linear meters for a trail. In green spaces tree planting shall be a minimum of 55 to 75 per hectare depending on the purpose of the park.

If decorative lighting fixtures are proposed the County and ATCO Electric must approve the fixtures.

13.1.4 Public Utility Lots (P.U.L.'S)

P.U.L.'s are defined as areas contained within the legal boundaries of the so designated lots, containing public utilities.

P.U.L.'s are to be rough graded to accommodate surface drainage.

P.U.L.'s are to be top soiled and seeded.

13.1.5 Storm Water Management Facilities

Storm water management facilities are defined as the areas contained within the legal boundaries of the so designated facilities, consisting of either retention or detention ponds.

If new, these areas are to be top soiled, seeded / sodded, and tree/shrub planted as per plan, around the perimeter (refer to Section 13.4.5). The minimum 75 trees/ha shall also meet a minimum 80/20% deciduous/coniferous tree split. Shrubs can be substituted at a rate of 20% of overall minimum requirement, with 5 shrubs per 1 tree. If existing SWMF is being expanded or disturbed, the planting requirement will need to brought up to or exceed the minimum standard set out in this document, Sections 13 and 14.

13.1.6 Natural Areas

Natural areas, include areas damaged during construction (including wetlands and tree stands), shall require restoration landscaping, as per the environmental assessment report, carried out by the developer, and as determined in consultation with the Developer's Landscape Consultant and the Municipal Engineer.

13.1.7 Municipal Reserve (M.R.)

A Municipal Reserve is defined as the areas contained within the legal boundaries of the so designated lands.

Plans are to be submitted to the Municipal Engineer with Detailed Engineering Drawings as required by the Servicing Agreement. Top soiled areas, seeded or sodded areas, and trees or shrubs planted as per plan are to be identified in the drawings. Amenities such as play structures within edged sand areas, site furnishings, walkways, play fields, outdoor lighting, ice rinks, and toboggan hills are to be provided as required. (Refer to Section 15: Parks, in this manual)

The County may accept cash in lieu of additional park development.

13.2 Landscape Plan and Playground Plan If Applicable

13.2.1 M.R.s, Storm Water Management Areas and Natural Areas

The Developer shall submit a Landscaping Plan as part of the Detailed Engineering Drawings and price quotes detailing the proposed improvements.

This plan shall be drawn to a scale of 1:500 for overall fencing and tree planting plans, and 1:250 for shrub planting enlargements and detailed layout plans. All drawings must show existing and proposed utilities and adjacent P.U.L.'s.

It shall identify areas to be seeded or sodded, location, size, and name of all trees and shrubs, location of park sign, planting beds, any walkways, trails, trail lighting, rinks, and berms or toboggan hills, location and type of fencing and any park furniture or playground equipment being installed. Phases of development shall be indicated on the plan, or in writing. The plan shall utilize the Overall Utilities, Road, and Sidewalk Plan as a base. The completed plan may be subject to public review, as determined by the Municipal Engineer. The minimum 75 trees/ha shall also meet a minimum 80/20% deciduous/coniferous tree split. Shrubs can be substituted at a rate of 20% of overall minimum requirement, with 5 shrubs per 1 tree.

The Developer shall submit Detailed Engineering Drawings and price quotes of proposed park furniture and/or playground equipment for approval by the Municipal Engineer, with Detailed Engineering Drawings. Individual components shall be shown, and named and/or listed. The Manufacturer's drawing/plan is acceptable.

No landscaping shall commence until the landscaping plan has been approved by the Municipal Engineer.

In the event the Developer is redeveloping existing facilities or previously serviced lands, the Development Officer may require the landscape plans to be approved by the appropriate County department prior to the issuance of a development permit.

13.2.2 Boulevards. Entry Features and Walkways

The following Detailed Engineering Drawings are required, with a scale of 1:500 (metric):

- Planting Cross-Section drawn at an appropriate scale showing all underground utilities within 3.0 m of planting root zones, limits to road base and sub-bases and the limits of the compacted verge base materials in relation to organic soils, mulches and to the root zones of trees and shrubs.

- Planting Plan drawn at an appropriate scale showing all underground utility alignments with walk, tree and shrub setbacks; proposed planting and spacing; landscaped edging, mulches and free-standing features (i.e. signs, gates, pedestals, sculptures, light poles, etc.).

- The Planting Cross-Section and Planting Plan are to be cross-referenced to the Detailed Engineering Drawings.

13.3 Design Guidelines

For landscape materials, installation, and testing, specifications will be required to be approved by the Municipal Engineer.

13.3.1 Setbacks

Where possible, trees will be set back a minimum distance from above and below grade utilities and property lines as specified in this section.

Deciduous trees will be set back a minimum of 1.0 m from back of curb, walk, fence or verge; for Coniferous trees (set back should be based on the mature drip line plus 1-2 meters and allowing for snow plowing). Poplars must be setback a minimum of 10m to private property to prevent damage from their roots, unless an appropriate root barrier is proposed.

No trees or shrubs are to be planted directly over any underground utilities or underneath any overhead utility lines. For shallow utilities, water, and sewer lines, a 2 m setback is required for all underground lines. For overhead power lines, the horizontal setback shall be the spacing requirement of the species as listed under Section 13.3.7 Plant Selection.

Planting beds will be set back a minimum of 0.5 m from back of curb, walk, verge or fence.

Trees shall never be planted at the very top of a berm; they shall be planted a minimum of one-third of the slope down from the top.

13.3.2 Planting Beds

All shrubs are to be incorporated into planting beds. Beds may include trees.

Planting bed & tree layouts are to be designed to facilitate easy maneuverability of large turf maintenance and cutting equipment. (Equipment varies from 3.0 - 6.0 m in width).

Planting bed layouts are to provide a minimum width of turf areas between planting beds of 4.0m.

Planting beds are to be designed complete with weed liners and landscape edging. All planting beds must have a minimum 75 mm of wood cellulose fiber mulch. Bark chip, wood chips or pine cones are acceptable Choice should be stated in landscape drawings.

Mulch shall be clean and free of weeds and other foreign matter. Rock mulch may be acceptable if approved by the Municipal Engineer.

Amend soil in shrub beds with 150 mm of topsoil and 75 mm of peat moss. Work-in amendments uniformly to create a shrub bed with a total depth of 450 mm of amended soil.

13.3.3 Topsoil

A minimum of 150 mm of topsoil is required for all areas to be seeded, and 100 mm for areas to be sodded.

13.3.4 Fences

Uniform or screen fences, as indicated in Detailed Engineering Drawings, will be positioned a minimum of 150 mm on adjacent privately-owned lands. The screen and uniform fencing shall meet County standards. The County may require a restrictive covenant.

13.3.5 Furniture

Furniture may be provided by the Developer and placed at strategic locations.

The following set backs are to be respected:

- Benches to be 1.5 m back of walkway or sand area (from seat edge)
- Benches inside sand area to be 1.0 m from back edge of bench to edging
- Waste Receptacles to be 0.30 m back of walkway or edging, from top of container edge, and 3.0-4.0 m from benches
- Picnic Tables to be designed in clusters to the satisfaction of the Municipal Engineer

All furniture is to meet Standard Specifications and must be approved by the Municipal Engineer. All furniture will be anchored to concrete bases.

13.3.6 Testing

Testing procedures and specifications must be approved by the Municipal Engineer.

13.3.7 Plant Selection

All plant materials shall be as specified on the plant list of approved landscape drawings.

A mixture of species is to be provided, suitable to the site and tree mix shall be approved by the County. General minimums are as follows:

- Minimum deciduous tree caliper is 60 mm.
- Minimum coniferous tree height is 2.5 m.

- Minimum shrub size: five-gallon pot-grown. Shrub height and spread will be between 450mm and 1200mm, subject to availability and species.

No annual plantings will be approved in planting beds to be maintained by the County of Grande Prairie.

Note: The Developer may suggest other trees, shrubs and ground covers depending on specific site constraints. These will be reviewed on an individual project basis.

Note: For plant material for planting directly under ATCO Electric overhead lines: consult ATCO Electric; use only those species acceptable to County of Grande Prairie.

13.3.7.1 Requirements for Boulevards along Roads, Trails/Walkways/ROWs

The following are the plant materials and minimum spacing requirements for Boulevards along Collector roads and major Arterials, and along walkways/trails/ROWs.

Common Name	Minimum Spacing (Meters)
Trees	See setbacks
Patmore Green Ash	8.0
Common Hackberry	10.0
American Elm	10.0
American or Russian Mountain Ash *(walkways only)*	6.0 - 8.0*
Flowering Crab Apple *(hardy species, walkways only)*	4.0 - 8.0*
Amur Cherry *(sheltered sites, walkways only)*	8.0
Shubert Chokecherry *(sheltered sites, walkways only)*	6.0
Japanese Tree Lilac *(sheltered sites, walkways only)*	6.0

*spacing dependent on species

Note: Groupings of trees in parks, wide boulevards or storm water management areas may be spaced closer together, using spacing of 4, 6 or 8 meters or any multiple of those numbers. For evergreens, a minimum spacing of 3 meters is allowed to create groups with overlapping branches.

13.3.7.2 Requirements for Parks, Boulevards with Setback

The following are the plant materials and minimum spacing requirements for Parks and for Boulevards with a minimum set back of 20 meters from carriageway.

Common Name	Minimum Spacing (Meters)
Trees	See note
Choose from previous list also	
Lodgepole Pine	4.0
Scots Pine	7.0
Colorado Spruce	6.0
White Spruce	6.0
Siberian Larch	6.0
Fallgold Black Ash	8.0
Manchurian Ash (sheltered site)	8.0
Bur Oak (slow-growing)	8.0
Poplar Brooks	10.0
Poplar N/W	10.0
European Bird Cherry (Mayday)	10.0
White birch (moist but well drained sheltered sites)	6.0
Weeping birch (moist but well drained sheltered sites)	10.0

Shrubs	Minimum Spacing (Meters)
Dogwood (moist site preferred)	3.0
Pussy willow (moist sites)	3.0
Pin Cherry	4.0
Potentilla varieties	1.0 - 1.5
Mugo Pine	3.0
Juniper varieties	1.5 - 3.0
American Highbush Cranberry	3.0

Lilac Elder Spirea, Caragana will be considered.

Ground Covers in Shrub Beds	
Juniper varieties	1.5 - 3.0

Perennials

Native perennials will be considered by the municipality authority where they deem it to be suitable to the look and function of the design.

Ornamental grasses may also be acceptable based on the suitability of the design.

In all cases, perennials will not make up the required minimum plant counts, but maybe an extra benefit to the planting design, as intended by the developer.

13.4 Design Requirements

13.4.1 Boulevards

13.4.1.1 Arterial/Collector Roadways

Top soiling and seeding/sodding shall be required.

Boulevards shall be designed with a minimum of one tree every 8 -10 linear meters depending on tree species as approved by the Municipal Engineer.

Boulevards may be designed to include planting beds with trees & shrubs, or trees grouped in clusters.

Boulevards fronting residences shall have 1 (one) tree per residential lot and shall be deciduous only.

Walks may be required and if provided, shall be to the satisfaction of the Municipal Engineer.

Furniture may be provided by the Developer and placed at strategic locations within the boulevard, if a walkway is required.

13.4.1.2 Major Entrance Roadways to Subdivisions

Boulevards shall be designed with a minimum of one tree every 8 -10 linear meters depending on tree species and as approved by the Municipal Engineer.

Boulevards shall be designed to include continuous large planting beds with trees & shrubs, at key points, and trees may be in clusters.

Tree and shrub planting design will consider important vehicular sight lines and street lighting efficiency.

Screen and uniform fences, if provided by the Developer, shall meet the specifications of the County of Grande Prairie.

Walks may be required and if provided, shall be to the satisfaction of the Municipal Engineer.

Furniture may be provided by the Developer and placed at strategic locations within the boulevard or along walkway.

Lighting, if provided, shall be to the satisfaction of the Municipal Engineer and ATCO Electric.

13.4.2 Entry Feature Medians and Entry Features

All entry feature medians and entry feature designs must be low maintenance, and of a design specifically approved by the County.

No trees or shrubs are to be used within entry feature medians less than 4.0 meters wide.

No turf areas are to be used within entry feature medians less than 4.0 meters wide.

Tree and shrub planting design must allow important vehicular sight lines and street lighting efficiency.

Free standing architectural features, i.e. signs, furnishings, sculpture, light poles, entry gates located within turf areas should be designed to minimize mowing requirements.

Paving stone and paving stone header, concrete or other special hard-surfaced verge or walks shall be to the satisfaction of the Municipal Engineer.

Lighting, if provided, shall be to the satisfaction of the Municipal Engineer.

Sewers and other underground utilities should not be aligned under landscaped road islands and medians to avoid conflicts with landscape improvements.

13.4.3 Walkways / Trails 6 Meters Wide Right of Way Or Greater

There shall be a minimum of four trees per every 35 linear meters of walkway right-of-way. Trees/shrubs are to be as approved by the Municipal Engineer.

Where possible, tree centers will be set back a minimum distance of 1.5 m from adjacent private property lines and walkways.

Walkways shall maintain adequate year-round sight lines through the walkway-trails for pedestrian safety and security.

There shall be a minimum 2 m (6 ft.) branching height at maturity for all deciduous trees to permit adequate clearance beneath tree branches for pedestrians and fences.

Trees shall be grouped in rows. Tree groupings shall be positioned on either side of the walk, and groupings will be staggered.

Furniture may be provided by the Developer and placed at strategic locations along the walkway, as specified in this section of the document.

Screen and uniform fences if provided by the Developer shall meet the County's specifications.

Walks may be required within walkway or top-of-bank right-of-ways to the satisfaction of the Municipal Engineer. Walks may be either asphalt or concrete as required by the Municipal Engineer. Walks cannot be in the proximity of underground utilities.

Note: The following design issues are to be considered by the Developer if alternative plant materials are recommended:

- Limited horizontal root growth and no sucker-type roots to avoid encroachment into adjoining privately-owned lands and walkways.
- Limited vertical root growth to avoid entry into sewer systems.
- Pyramidal/columnar tree forms to avoid tree branches overhanging into adjoining privately-owned lands.

13.4.4 Public Utility Lots (P.U.L.)

Rough grading (to +/-50 mm tolerance) is required to obtain positive drainage. Landscaping, generally top soiling and seeding/sodding, will be delayed by separate agreement until a significant quantity of house construction is completed or house lots are sold.

U-lot Barriers are to be installed to the dimensions shown in the Detailed Engineering Drawings. U-lot barriers are to be installed prior to topsoil installation or after seeding. Any excess material on-site as a result of hole auguring is to be removed.

13.4.5 Storm Water Management Facilities

Landscaping is to be provided in areas within and surrounding new storm water management facilities including Dry Ponds (detention ponds) for the temporary storage of water during peak flows, and Wet Ponds (retention ponds) to permanently retain water.

These areas must be graded, top soiled, seeded or sodded, and landscaped by the Developer to the satisfaction of the Municipal Engineer. A natural look is preferred over a man-made appearance.

Plant materials will be selected to respect hydrological and soil saturation characteristics of the facility.

Public lands within the facility must be planted with a minimum of 75 trees/hectare above the 1 in 5 year storm event water line and designed according to these specifications. If the facility is designated as Municipal Reserve a minimum of 30 trees per landscaped acre (75 /hectare), less play field, rink and playground area, is to be planted to these specifications.

Major storm sewer outlets/inlets shall be grassed only to provide an open view for safety of pedestrians and dry pond users. Fencing shall be provided where necessary to ensure safety of pedestrians and dry pond users.

A naturalized landscape design may be used in part or in whole for storm water management areas.

Screen and uniform fences if provided by the Developer shall meet the County's specifications.

Relatively flat, open areas should be designed to encourage active recreational uses where possible.

Walks may be required within walkway or top-of-bank rights-of-way to the satisfaction of the Municipal Engineer. Walks may be either asphalt or concrete as required by the Municipal Engineer. Multi-use trails will be a minimum of 3.0m for universal accessibility, and to satisfy the diversity of recreational needs.

Lighting must be provided for all walkways longer than 50 m, and must meet the specifications of Municipal Engineer and ATCO Electric.

Furniture may be provided by the Developer and placed at strategic locations above the flood line of the dry pond, next to the walkway.

Special or unique features, i.e. artificially pumped dry streams, special play courts, bridges and architectural and structural features, will be designed and sealed by a Professional Engineer recognized by APEGA.

13.4.6 Natural Areas

Existing natural and naturalized areas impacted by the proposed improvements which cannot be protected during construction must be re-naturalized with native plant materials having regard for the surrounding environment, new drainage patterns, soil conditions, and ecological rehabilitation. Remediation of the natural areas will be guided by the environmental assessments, which will be the sole responsibility of the developer.

The Developer will determine the level of restoration to be completed in consultation with the Municipal Engineer and the guiding documents.

The Developer will design an appropriate mix of native trees, shrubs, ground covers and wild seed mixes to rehabilitate impacted naturalized areas. The design shall be natural in appearance, not formal or man-made.

The Developer will design any required subsurface drainage, surface drainage and erosion control measures in the rehabilitation area in conjunction with the Developer's Engineer.

The Developer shall, if required, co-ordinate this rehabilitation with other consultants to implement geotechnical, structural and bio-engineering principles and recommendations.

The Landscape Plan will identify all plant communities to be established and all other information necessary to implement the proposed improvements.

The Developer will specify all tree, shrub and ground cover sizes. . If caliper trees are proposed that are above 50mm, they will be specified on the landscape drawings. Tree plugs, shrub stakes, and massing of native plant material will be accepted. Tree mix should be chosen to match natural setting.

Forestry stock, seedlings, deciduous tree whips, and propagated and rooted cuttings are acceptable for 80% of plant material, with remaining 20% consisting of more mature sizes interspersed throughout the plantings.

All plant materials to be nursery stock or materials transplanted from site.

The Developer's Landscape Consultant is to identify appropriate planting installation specifications and detailing on landscape drawings.

"Round-Up" or other approved herbicides may be used to eradicate natural slopes prior to planting of trees and shrubs. Herbicide is to be applied under a licensed applicator. Maintenance logs and applicator certificates will be provided to the municipalities upon request.

13.4.7 Municipal Reserve. (M.R.)

See Section 15.2.3, Parks of this manual.

13.4.8 Berms

See Section 15.7, Parks of this manual.

13.5 Testing

The design must be conducive to achieving appropriate construction results as required by the County's General Design Standards Manual.

SECTION 14 Lot Grading

14.1 Overall Concept 14-2
14.2 Retaining Walls 14-2
14.3 Sump Pumps 14-3

14.1 Overall Concept

The grading design shall compliment the overall design of both the major and minor storm sewer systems. In general, the lots shall be graded to achieve a minimum slope of 5% for 1.5 m from the building and a minimum slope of 1.5% along the sides of the building, with an overall minimum grade on the lot of 2% along the critical swales.

The grading of lots, where required in high density residential developments, shall meet the following requirements:

- The minimum overall slope for front to back draining lots shall be 2%. Overall slope is intended to mean that one side may be less than the minimum as long as it is compensated on the other side by a greater slope resulting in an average of 2%. The maximum slope shall be 10% without consideration of retaining walls.
- If the backyard area slopes toward the house, provision must be made to distance the runoff at least 3m perpendicular to the house and direct it laterally around the house and onto the street.
- Reverse driveways shall not be permitted unless the runoff can be directed away from the structure and off the property in a controlled fashion.
- Lot grading must not direct drainage onto adjacent lots except in unusual and extreme circumstances which prohibit accommodation of this concept by earthwork grading, and must be approved on an individual case basis.

Split drainage design must be clearly shown with corresponding elevations.

Reserves and public lands shall be graded to drain towards developed streets, utility lots, and/or storm sewer catch basins and not onto private property. Boulevard areas shall be graded to provide a minimum slope of 2 % from property line to top of curb.

Lot grading must take into consideration area or areas of seasonally high and normally stabilized ground water tables, and their impact upon foundations and the constant running of sump pumps. Lot grading must also take into consideration the effects and extent of on-street/road storm water storage in relation to the inundation of buildings or the additional loads on sump pumps.

Concrete swales shall be employed where appropriate to address concerns over erosion, high grades & front-back lot drainage.

Refer to Standard Drawing Detail No. 9.21, Concrete Swale.

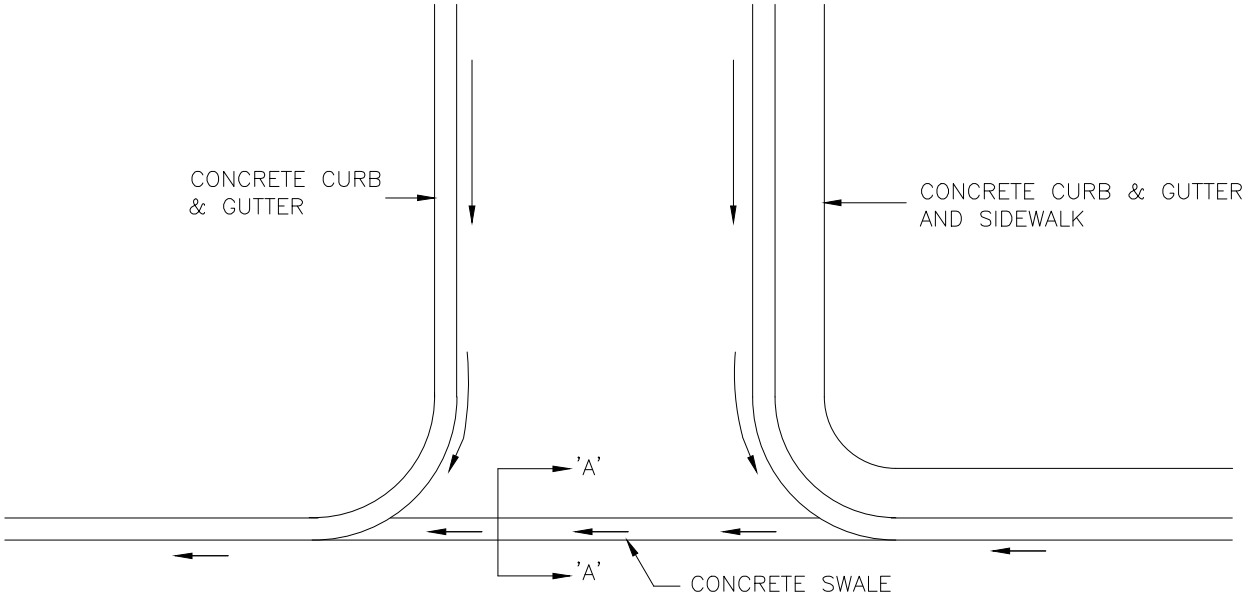
14.2 Retaining Walls

Where extremes in elevation of adjoining lots require the construction of a retaining wall, such shall be indicated on the proposed grading plan and no work or construction will be permitted on the building on lots which are the subject of or adjacent to the said retaining wall without a written

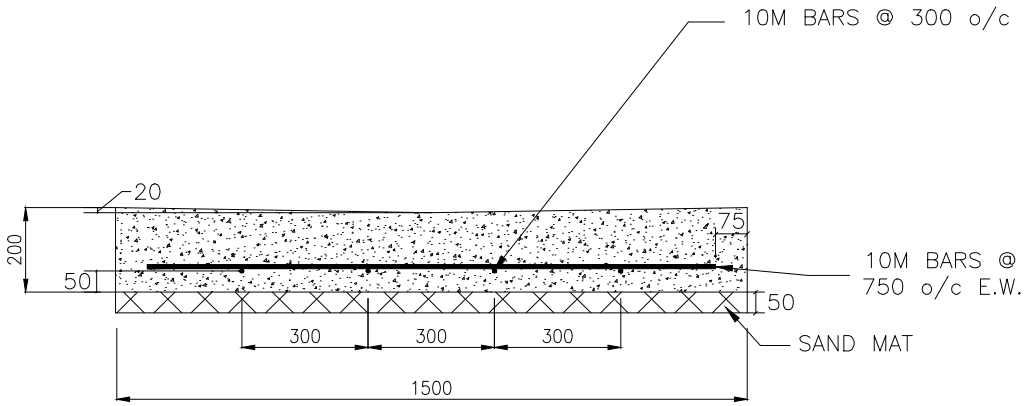
commitment by either owner of the two lots involved to construct such retaining wall at the time of construction of the proposed building.

14.3 Sump Pumps

Sump pump outflow shall be shown as discharged to the front if possible.



PLAN VIEW



SECTION 'A'–'A'

NOTE:
ALL CONCRETE TO BE 30 M.p.a. TYPE 50 CEMENT

COUNTY of GRANDE PRAIRIE No. 1

CONCRETE SWALE

DATE:	2016-08-05	DRAWN BY:	SP	APPROVED:	DRAWING 14.0
SCALE:	NOT TO SCALE	CHECKED BY:	JLF		

SECTION 15 Parks

15.1 General 15-2
15.2 Park Categories 15-2
15.2.1 Tot Lot Park 15-2
15.2.2 Neighborhood Park 15-2
15.2.3 School / Community Park 15-3
15.3 Landscape Plan 15-3
15.4 Design Requirements 15-4
15.4.1 General 15-4
15.4.2 Furniture and Fixtures 15-4
15.5 Playground Design 15-5
15.5.1 General 15-5
15.5.2 Location 15-5
15.5.3 Natural Topography 15-5
15.5.4 Layout 15-6
15.5.5 Sand Play Areas 15-6
15.5.6 Play Equipment 15-6
15.5.7 Fencing 15-7
15.6 Outdoor Rinks 15-7
15.7 Toboggan Hills and Berms 15-8
15.7.1 Landscape Berms 15-8
15.7.2 Toboggan Hills 15-8
15.7.3 Sound Control Berms 15-8
15.8 Informal Playing Fields 15-8
15.9 Formal Sports Fields 15-9
15.10 Testing Requirements 15-9

15.1 General

Size and location shall be as set out in Area Structure Plan and Outline Plan, and the M.R. shall meet all County Policies, Bylaws, and the Municipal Government Act.

Area Structure Plan shall be developed in accordance with County of Grande Prairie's Standards.

15.2 Park Categories

15.2.1 Tot Lot Park

The size of this park category ranges from 0.3 to 1.0 hectares in size.

This category of park requires a small playground, covering 300 - 400 sq. m, suitable for children ages 2-5 years inclusive and required if there is no school park planned. Bench/waste receptacles adjacent to play equipment as well as a grassed informal playing field for passive recreational opportunities . A small rink is optional

These parks are usually surrounded by residential units, and are evenly-distributed throughout the subdivision. Park areas shall have continuous street frontage for a minimum of 30% of the perimeter, unless otherwise approved by the Municipal Engineer on a site by site basis, for easy visibility so as to monitor activities occurring in the Park and therefore enhanced child security. The road curb shall be a vertical face (not a rolled curb) to deter vehicular access.

See planting requirements in Section 13, a minimum of 75 trees/hectare shall be planted.

15.2.2 Neighborhood Park

The size of this park category ranges from 2 Hectares (5 acres) to 3.2 Hectares (8 acres).

This category of park requires larger playgrounds, covering 450-1000 sq. m area, suitable for ages 2-12 inclusive. These parks shall also include an open, grassed, informal playing field, and a lighted skating rink. Bench/waste receptacles located in sand area or adjacent to play equipment shall be provided.

A second bench and waste receptacle shall be provided in neighborhood parks with walkways/trails.

These parks shall not have permanent baseball stops, basketball hoops, or soccer posts. Picnic tables, picnic shelter, and toboggan hill are optional.

These parks are usually centrally located in a neighborhood, easily accessible for pedestrians via walkways, and with street parking nearby for vehicles.

Park areas shall have continuous street frontage for a minimum of 20% of the perimeter for easy visibility so as to monitor activities occurring in the Park and therefore enhanced child security. The road curb shall be a vertical face (not a rolled curb) to deter vehicular access.

See planting requirements in Section 13. A minimum of 55 trees/hectare shall be planted.

15.2.3 School / Community Park

As part of 10% of Municipal Reserve, the site includes school buildings, larger playground or two playgrounds, one for preschool and one for elementary children, covering 600-1000 m^2 in total. The remainder of the site shall include basketball stands/hoops, (in asphalted areas of the schoolyard) with official-sized sports fields and posts, (baseball, soccer) and a large lighted skating rink nearby. Asphalt play surfaces, bicycle parking areas, and paved parking areas shall be provided. These parks are usually centrally located in a neighborhood, easily accessible for pedestrians via walkways, and with street parking nearby for vehicles.

Park areas shall have continuous street frontage for a minimum of 20% of the perimeter for easy visibility so as to monitor activities occurring in the Park and therefore enhanced child security. The road curb shall be a vertical face (not a rolled curb) to deter vehicular access.

To be designed in conjunction with School Board and Community User Groups.

Note: *Playground* refers to the edged sand area containing all play equipment, and sand play areas.

See Section 13 for planting requirements.

15.3 Landscape Plan

The Developer shall submit a detailed landscaping plan with the Detailed Engineering Drawings showing the proposed improvements, with price quotes as an attached document to the plan. This plan shall be drawn to a scale of 1:500 (and 1:250 as per the drawing requirements in Section 13) and must show existing / proposed utilities and adjacent PUL's. It shall identify areas to be seeded or sodded, location, name and size of all trees and shrubs, location of planting beds, location and size of any berms, toboggan hills, walkways and / or trails including lighting, location and type of fencing, and any park furniture, lighting or playground equipment being installed. Phases of development shall be indicated on the plan, or in writing with the attached document. The plan shall utilize the overall utilities, road, and sidewalk and walkway plan as a base.

The Developer shall submit Detailed Engineering Drawings of proposed park furniture and playground equipment with price quotes for approval by the Parks/Dept. and the Municipal Engineer. Individual components shall be shown, and named and / or listed. Manufacturer's drawing / plan is acceptable.

No landscaping shall commence until the landscaping plan has been approved by the Municipal Engineer.

In the event the Developer is redeveloping existing facilities or previously serviced lands, the Development Officer may require the landscape plans to also be approved by the appropriate County department prior to the issuance of a development permit.

Fencing is required adjacent to playgrounds and play fields along arterial and collector roads.

15.4 Design Requirements

15.4.1 General

For landscape, play equipment and park furnishings materials, installation, and testing specifications (i.e. site work, topsoil, seeding, trees, shrubs, and benches) shall be as per County Standards and approved by the Municipal Engineer.

For plant selection and general design guidelines and requirements, see Section 13, Landscape Design, in this manual.

All parks are to be landscaped, including grading, drainage, topsoil and seeding, and planted with trees/shrubs as per Section 13.

Parks shall be designed with a minimum of 75 trees per landscaped hectare (30 per acre). Areas such as official sport fields, informal playing fields, parking areas, playgrounds, walkways, winter skating rinks and other areas approved by the Municipal Engineer may be excluded from the acreage total for these calculations.

Handicapped access may be mandatory for the park and play equipment, depending upon where the park is located.

Boulevards in parks are to be planted as per Landscape Design, Section 13.

Parks shall be designed to limit vehicular access, using U-lot barriers or appropriate fencing.

15.4.2 Furniture and Fixtures

Furniture shall be provided by the Developer and placed at strategic locations. A minimum of one bench and receptacle shall be located within or beside the sand area, by the edge, in a quiet corner or section of the playground.

The following set backs are to be respected:

- Benches to be 1.0 m back from walkway or sand area (from front seat edge)
- Benches inside sand area to be 0.5 m from back edge of bench to edging
- Waste Receptacles to be 0.30 m back of walkway or edging from top edge of container, and 3.0-4.0 m from bench
- Picnic Tables to be designed in clusters to the satisfaction of the Municipal Engineer
- Rink light to be 3.0 m from closest edge of installed rink

- Walkway or Trail lights to be 1.0 m from edge of any adjacent walkways and spaced at approximately 45 meters longitudinally

- Benches & receptacles adjacent to play equipment shall be set 5 meters away from main play structures, with a minimum 3 m wide open sand area between them and the structure.

15.5 Playground Design

15.5.1 General

All playground design and components must meet or exceed minimum CSA standards. At completion of the playground, the developer will be responsible for providing the municipality with an approved letter from an independent CSA certified playground inspector, prior to the municipality taking the ownership of the developed playground.

15.5.2 Location

The location of any play spaces shall be made in co-operation with the County of Grande Prairie. In general, however, play spaces for preschool children and school- aged children shall be located separately or adjacent to each other. Play spaces may be located in residential areas or attached to facilities used by children such as schools and community centers.

Play spaces for preschoolers shall be located so that they are readily accessible to young children and their parents. The specific characteristics of the neighborhood should be taken into consideration when locating a playground, paying particular attention to lighting, access routes, walking distance, and public visibility of the playground.

15.5.3 Natural Topography

The plays pace should have good exposure to sunlight, especially in the winter, some shade by deciduous trees, especially in the summer, shelter from the west wind, and good drainage away from it.

Sites with steep gradients or high noise level or those over tile septic beds are not acceptable. Dangerous settings (such as high voltage power lines and transformer stations) adjacent to site are also unacceptable.

Vegetation and other landscape elements such as berms/fences should be used to create an appropriate setting for play that is appealing to and useable by children. The play area should have visually defined boundaries and abide to C.P.T.E.D. principles.

15.5.4 Layout

Play structures shall be placed in a confined sand area which shall be large enough to encompass activities by several groups of children without interference. Either sand or resilient synthetic play surfaces may provide the safety surfacing required for the play structures. The latter is mandatory in Handicapped Access Play structures.

Potential play spaces should be investigated for the presence of any hazardous materials. Spaces for each type of activity shall be well defined. Conflicting activities such as quiet play and physical play shall not be located next to each other.

Walkways shall link activity areas when required by the County. Parking for cars and bicycles shall be separate and located near the perimeter of the play space where possible. Bicycle parking areas should still be in view of the play area.

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All structures and landscaping within the play area shall provide reasonable opportunity for surveillance of the children at play in all portions of the playground. This means that masses of solid screening will be avoided, and screening and walls that offer opportunities for frequent visual penetration and surveillance are preferred.

Playground areas near busy streets shall be set back from roadside curbs a minimum of 20 m; if less, chain link or some other form of transparent fencing shall be required for safety.

15.5.5 Sand Play Areas

A sand play area of a total minimum size of 67 sq. m. (6576 sq. ft.) is required in public parks and other public play areas. This total does not include sand under play equipment or impact sand in the equipment area (i.e. landing area at end of slides) nor the safety distance around all play equipment. It is exclusive of any areas covered with resilient synthetic play surfaces.

As part of the required 67 sq. m., a minimum of 12 sq. m. for sand play by preschoolers shall be located immediately in front of the required bench and receptacle, and separated from other activity.

A minimum sand depth of 350-450mm is required in the safety area under and around all play structures, play equipment is designed to accommodate this depth. Resilient synthetic play surfaces are an acceptable alternative, and are mandatory for handicapped-accessible playgrounds. All sand/play surface areas must be edged. Edging detail to be shown on the Landscape Plan..

15.5.6 Play Equipment

Various designs and layouts that conform to CSA standards are permitted; employing a playground designer is recommended. Playground companies can usually provide one.

Handicapped-accessible equipment may be mandatory, depending upon the location of the park, and the Service Agreement.

All designs shall incorporate CSA standards for the spacing of play equipment and the size of the safety area around it.

TOT Lot Park Playgrounds are to include play equipment suitable for children ages 2 -8, with both baby seats and regular seats in the swing set(s), a small-to-medium sized climbing structure with a minimum of one (1) slide, and with heights appropriate to this age group.

The play area shall also include a bench, a waste receptacle, a small open sand area for play by preschoolers near the bench, and a large open sand area for the movement of older children.

All metal slides are to face southeast, east, northeast, north, or northwest; with the exclusion of spiral-shaped slides.

Neighborhood Playgrounds are to include play equipment suitable for children ages 2 -12 years inclusive, with both baby seats and regular seats in the swing set, a large climbing structure with a minimum of two slides and a tower platform (or two medium-sized structures, one for pre-school and one for elementary children).

The play area shall also include a bench, a waste receptacle, a small open sand area for play by preschoolers near the bench, and a large open sand area for the movement of older children.

15.5.7 Fencing

Fencing is required as outlined above. Fencing designs shall be submitted to the submitted to the municipal engineer for approval.

15.6 Outdoor Rinks

Outdoor rinks must be a minimum size of 12.6 m x 19.2 m (42' x 64'), with larger sizes being any multiple of 4.2 m (14').

School rinks must be a minimum size of 21.34 m x 25.6 m (70' x 84').

Areas that will be used for winter rinks shall be graded at 0.5% -1 % slopes, and all other adjacent land shall drain away from them.

All rinks shall be illuminated with a light standard satisfactory to Municipal Engineer and ATCO Electric, with a timer or photocell provided on the light, and shall be centered on the rink.

Rink hydrants and lines are to be provided by the Developer, and are to be installed prior to topsoil/walkway placement.

15.7 Toboggan Hills and Berms

Berms shall meet all site criteria, and integrate well into the existing landscape.

Trees shall never be planted at the very top of a berm; they shall be planted a minimum of one-third of the slope down from the top.

Berms adjacent to playgrounds may not exceed a height that inhibits visual surveillance.

The ratio of vertical to horizontal distances on all berms shall meet a minimum ratio of 1:3 with the horizontal factor being critical at 3 or greater.

15.7.1 Landscape Berms

Low, undulating and well-spaced berms containing some landscaping may be graded into the site design along the street frontage and within neighborhood or school park sites.

Maximum height of a berm used for only visual attractiveness shall be 3 m with a minimum width at the top of 2 to 4 m.

15.7.2 Toboggan Hills

Maximum height of toboggan hills shall be 6 m, with a minimum width at the top of 4 m.

If any hill can be expected to be used for tobogganing, there should be no obstructions such as roads, plants, benches, fences, power boxes or play equipment present on the slope or at the foot of the hill (i.e. runoff zone) for a distance of 18 m.

15.7.3 Sound Control Berms

Sound control berm areas are to be designated road ROW or PUL, not MR.

Berms used for sound control shall have a maximum height that is dependent upon the site criteria and conducive to sound control, with a minimum width at the top of 2.0 m. They may be used in conjunction with sound barrier walls.

Berms used for sound control shall be designed for acoustic effectiveness, visual attractiveness, and economical implementation and maintenance.

Whenever possible, top soiling and seeding or sodding of hills and berms should be delayed until the spring following construction, to allow for settlement of the soil.

15.8 Informal Playing Fields

Informal playing fields for activities such as kite flying, baseball, soccer, etc. are to be open, well drained, level grassed areas.

They shall be uninterrupted by trees, overhead lines, fences or berms, and their boundaries are to be defined by trees, berms and/or walkways. Shaded viewing/resting areas are to be provided.

All structures and landscaping in the area shall provide reasonable opportunity for surveillance of the children at play in all portions of the playing fields. This means that masses of solid screening will be avoided, and screening and walls that offer opportunities for frequent visual penetration and surveillance are preferred.

Minimum size shall be 300m^2 (within Tot Lot playgrounds) and maximum size shall be 2800m^2 (neighborhood playground). Size of playing field must be relative to size of park, and larger ones must accommodate a junior soccer field (40 m x 70 m). These dimensions will also accommodate a junior baseball diamond (40 m x 40 m) field dimensions. A 6-metre setback between sports fields, residential properties, roads, and any other uses is required for all fields as safety fall zone. Goal posts and backstops are excluded from these fields.

15.9 Formal Sports Fields

Formal sports fields shall meet official field sizes for softball or baseball, and soccer. They shall be uninterrupted by trees, overhead lines, fences or berms, and their boundaries are to be defined by trees, berms and/or walkways. Shaded viewing/resting areas are to be provided.

The field's orientation to the sun shall be appropriate to the sport and the time of day it is most-often used. The fields shall not overlap.

Acoustical screening shall be provided by the use of berms or vegetation, and be located at a distance from residences that may be disturbed by the sounds of children at play.

Soccer Field: On elementary school sites, one soccer field 100 m x 60 m (110 yds. x 65 yds.) with soccer goal posts will be developed. On junior high and middle school sites, a combined soccer/football field 100 m x 60 m (110 yds. x 65 yds.), complete with 18.3 meter (20-yard) end zones and combination goal posts will be developed.

A 20-metre setback between sports fields and residential properties or roads is required for all fields.

Ball Diamond: One ball diamond and backstop, with an outfield distance of 91.5 meters (100 yards) is required. A setback of approximately 20 meters shall be provided along the diamond perimeter.

In some locations where site constraints exist due to topography, existing vegetation or special restraints, other sizes will be considered within the Service Agreement with approval of the Municipal Engineer.

15.10 Testing Requirements

The design must be conducive to achieving appropriate construction results and approved by the Municipal Engineer.

SECTION 16 Typical Cross Sections & Specified Servicing Conditions

16.1 General 16-2
16.2 Basic Servicing Concepts 16-2
16.2.1 Back Lot Servicing (Consider Eliminating) 16-2
16.3 Requirements for Lot Servicing 16-2
16.3.1 Trench Width Control 16-2
16.3.2 Backfill Placement Control 16-3
16.3.3 Backfill Compaction Control 16-3
16.4 Commercial Lot Servicing 16-4
16.5 Common Cross Section Conditions 16-4

16.1 General

The Developer has several options related to the manner in which he may develop any lands in terms of utility, pedestrian, and vehicular conveyance through the construction of municipal improvements. Those options which the County refers to as Residential Basic Servicing Concepts are dependent upon a variety of factors that are important to the longevity and maintenance susceptibility of the municipal improvements.

16.2 Basic Servicing Concepts

16.2.1 Back Lot Servicing (Consider Eliminating)

Back lot servicing, sometimes referred to as utility lot servicing, allows service connections at the back of the lot to tie to the sanitary and water main aligned parallel to a corridor which is also located at the back of the lot.

Storm mains are located in the center of the road in the front of the lot.

Shallow utilities such as power, gas, telephone, and cable are also placed in alignments assigned to the front lot boulevards and / or easements.

All utilities, both deep and shallow, are installed by open cut trench excavation.

Although construction of the sanitary and water mains is largely limited to the corridors, diligent attention to the compactive effort is required at roadway crossings.

With the storm sewer located in the front lot road, the road must be built by stage construction.

16.3 Requirements for Lot Servicing

16.3.1 Trench Width Control

Trench width in the pipe zone shall be as per the Trenching and Backfill specifications and shall:

- Not be less than the pipe diameter plus 600 mm, Nor
- more than the pipe diameter plus 1000 mm, Or
- as shown on the detail engineering drawings and the pipes designed for embankment conditions.

16.3.2 Backfill Placement Control

The trench backfill shall be considered to be that layer of native material starting at the boundary of the bedding material, generally 0.3 meters above the pipe. These requirements do not waive the compaction of the bedding material to its' specified density

All backfill materials shall be placed in homogeneous lifts not exceeding 0.3 meters, and shall be evenly and uniformly distributed across the trench.

For utility lots, use Class B sand bedding.

For roads, use Class B1 bedding.

Bedding material shall be used as backfill material immediately around and between manholes, and compacted at 0.3 meter lifts vertically to surface to the same requirements as native material trench backfill. Class B sand bedding material shall also extend horizontally to such a point as heavy compaction equipment can effectively undertake compaction.

16.3.3 Backfill Compaction Control

Trench backfill compacted under this servicing concept shall be as follows:

- Density testing shall be related to density and optimum moisture content as established by a representative standard proctor test and calculation.
- All standard proctors shall be representative of the soil(s) encountered in placing the backfill.
- The minimum standard proctor density requirement to be met by compaction shall be 98.0%
- The allowable moisture content range for compaction shall be established by applying a factor of 0.10 to the optimum moisture content value. As an example of this process, for a soil whose optimum moisture content is 25% dry weight, the allowable range would be 0.10 X 25 % = 2.5 %. Therefore, any materials drier than 22.5 % or wetter than 27.5 % would need to be uniformly modified before commencement of compaction.
- Drying or the addition of water to the native material shall be done by such a means as to continue to produce a homogeneous material wherein there is an even distribution of water throughout the lift. In no cases shall surface application by itself be allowed. Testing shall be done on each 0.3 meter lift, and no subsequent lift will be placed until the preceding lift has been approved.
- Testing shall be done on each 0.3 meter lift, and no subsequent lift will be placed until the preceding lift has been approved.

- Frequency of testing shall be as per the County approvals.
- Failure to meet at least 90 % of the testing requirements will automatically result in an extension of the Maintenance / Warranty Period to 5 years from the date of the Initial Construction Completion and Acceptance Certificate (CCC).
- One point proctors shall be accepted as approved by the Municipal Engineer on a site by site basis.

16.4 Commercial Lot Servicing

Commercial servicing has no options available and must be constructed as shown in the typical cross sections.

16.5 Common Cross Section Conditions

All dimensions are in metric.

All typical cross sections are predicated on the assumption that soils conditions are adequately stable so as to allow for the trench wall to be constructed and the backfill to be compacted under slope conditions of 2: 1 vertical to horizontal.

All typical cross sections assume minimum pipe sizes at minimum cover to top of pipes.

Storm and sanitary mains, including water and sanitary service connections, shall have Class B sand bedding for all sizes of water tight pipes. Corrugated Steel Pipe (CSP) is not considered to be water tight and Class B1 crushed gravel bedding shall be used if this type of pipe is to be installed. All bedding materials shall meet the materials specification in the construction manual.

Water mains shall have Class B sand bedding.

Trench width in the pipe zone exceeding the maximum for trench earth load conditions, shall require the Developer's Engineer to provide calculations showing the capacity of the pipe to take earth loading under embankment conditions as opposed to trench conditions.

Trench walls which impinge on private property shall require easements.

Manholes located in road will be backfilled and compacted to surface with a surrounding blanket of Class B1 crushed gravel bedding material extending out adequately far so as to allow large compactive equipment to work the native soil.

Storm and sanitary manholes located in the road will be located offset from one another so as to not be built parallel and therefore to provide work space for compaction effort to be applied to the backfill material (Class B1 crushed gravel bedding) between them. Cones shall be orientated so as to allow the manhole covers to be at their closest to the center line of the road.

In the case of a single manhole, the manhole cover shall be located on the road centerline.

The Power location in the cross section includes telephone, power, and television cable.

All Asphaltic Concrete Pavement surfaces, with the exception of lanes, trails, and all categories of Commercial roads, shall be constructed in lifts in accordance with specifications.

All concrete structures crossing any trench or trenches which were open cut for deep utility installations shall be built with reinforced concrete adequately designed to withstand settlement forces.