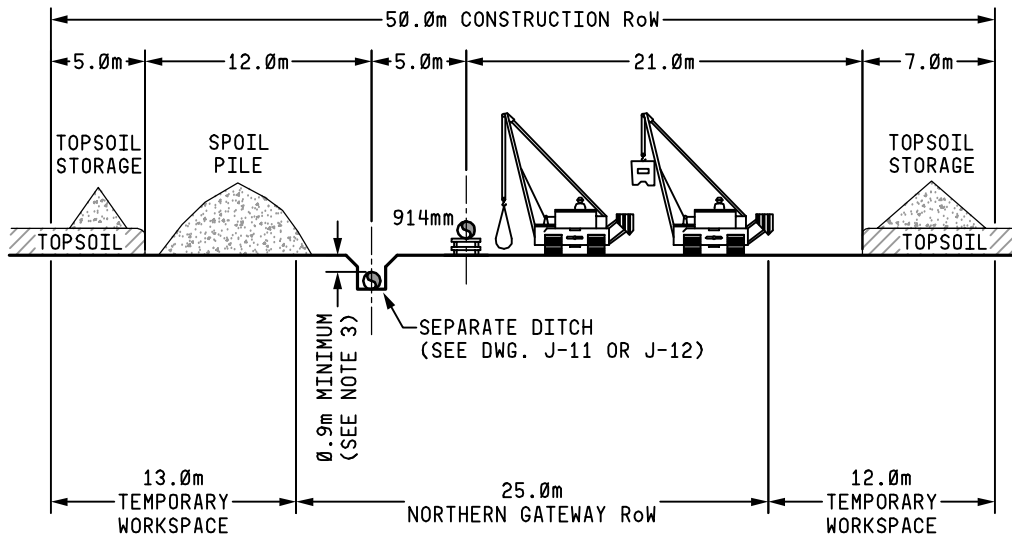


Appendix J Typical Construction Sketches

Figure No.	Title
J-1	Right-of-Way Configuration Summer – Dual Trench
J-2	Right-of-Way Configuration Winter – Dual Trench
J-3	Right-of-Way Configuration Summer/Winter – Single Trench
J-4	Right-of-Way Configuration Ditch Side Adjacent to Alliance Pipeline
J-5	Right-of-Way Configuration Work Side Adjacent to Alliance Pipeline
J-6	Right-of-Way Configuration Summer Wetland (Muskeg) Construction
J-7	Right-of-Way Configuration Extreme Side Slope Rock Cut
J-8	Right-of-Way Configuration Extreme Side Slope Rock Cut with Permanent Road
J-9	Right-of-Way Configuration – Summer – 10% Sidehill – Workside Fill
J-10	Right-of-Way Configuration – Summer – 10% Sidehill – Workside Cut
J-11	Ditch Design Single Pipe (914 mm/508 mm) (NPS 36/NPS 20) – Normal Trench
J-12	Ditch Design Single Pipe (914 mm/508 mm) (NPS 36/NPS 20) – Rock Trench
J-13	Ditch Design Dual Pipe – Normal Trench
J-14	Right-of-Way After Backfill Single Trench
J-15	Typical Watercourse Crossing Design
J-16	Typical Pipeline Crossing Design
J-17	Typical Primary Road Crossing Design
J-18	Typical Secondary Road Crossing Design
J-19	Typical Railway Crossing Design
J-20	Typical Extra Temporary Workspace for Crossings

PHASE 1 INSTALL 914mm (NPS 36) PIPE EAST TO WEST



NOTES:

1. DITCH EXCAVATION SHALL BE IN ACCORDANCE WITH OH&S REGULATIONS.
2. STRIP TOPSOIL IN ACCORDANCE WITH ENBRIDGE SPECIFICATIONS.
3. MINIMUM COVER MEASURED FROM GRADE AFTER STRIPPING.
4. MAINTAIN 0.9m COVER OVER BUOYANCY CONTROL ELEMENTS AND OTHER APPURTENANCES MEASURED FROM GRADE AFTER STRIPPING.
5. ASSUME NORMAL BACKFILL.

PHASE 2 INSTALL 508mm (NPS 20) PIPE EAST TO WEST

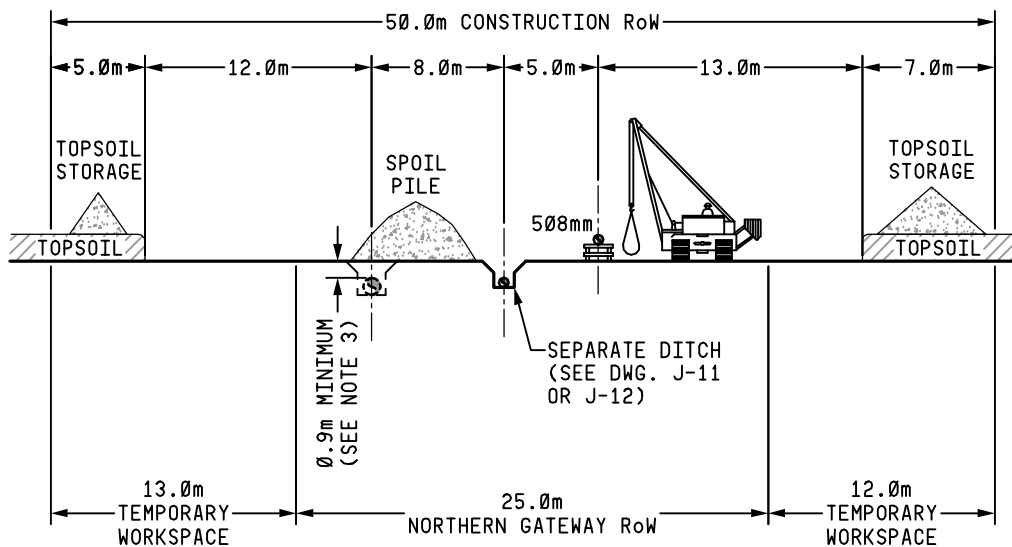


FIGURE ID

PREPARED FOR



ENBRIDGE NORTHERN GATEWAY PROJECT

RoW CONFIGURATION – SUMMER – DUAL TRENCH

SCALE

N.T.S.

REVISION

C

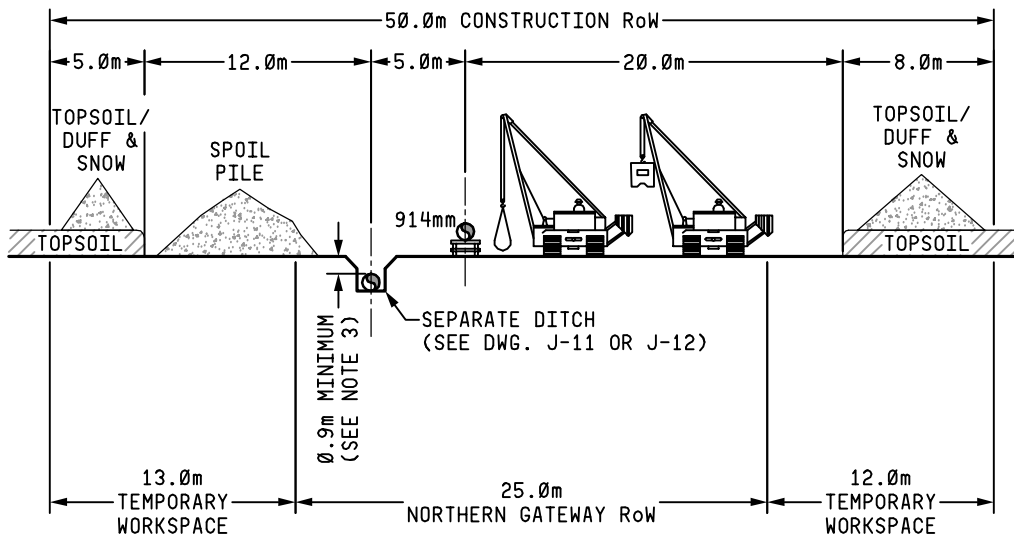
DATE

15 SEP 2009

FIGURE NO.

J-1

PHASE 1 INSTALL 914mm (NPS 36) PIPE



NOTES:

1. DITCH EXCAVATION SHALL BE IN ACCORDANCE WITH OH&S REGULATIONS.
2. STRIP TOPSOIL IN ACCORDANCE WITH ENBRIDGE SPECIFICATIONS.
3. MINIMUM COVER MEASURED FROM GRADE AFTER STRIPPING.
4. MAINTAIN 0.9m COVER OVER BUOYANCY CONTROL ELEMENTS AND OTHER APPURTENANCES MEASURED FROM GRADE AFTER STRIPPING.
5. ASSUME NORMAL BACKFILL.
6. DURING WINTER CONSTRUCTION THE TOPSOIL/DUFF LAYER MAY NOT BE STRIPPED FROM THE WORKING AREA, WHERE DESIGNATED ON ALIGNMENT SHEETS OR PERMITS.

PHASE 2 INSTALL 508mm (NPS 20) PIPE

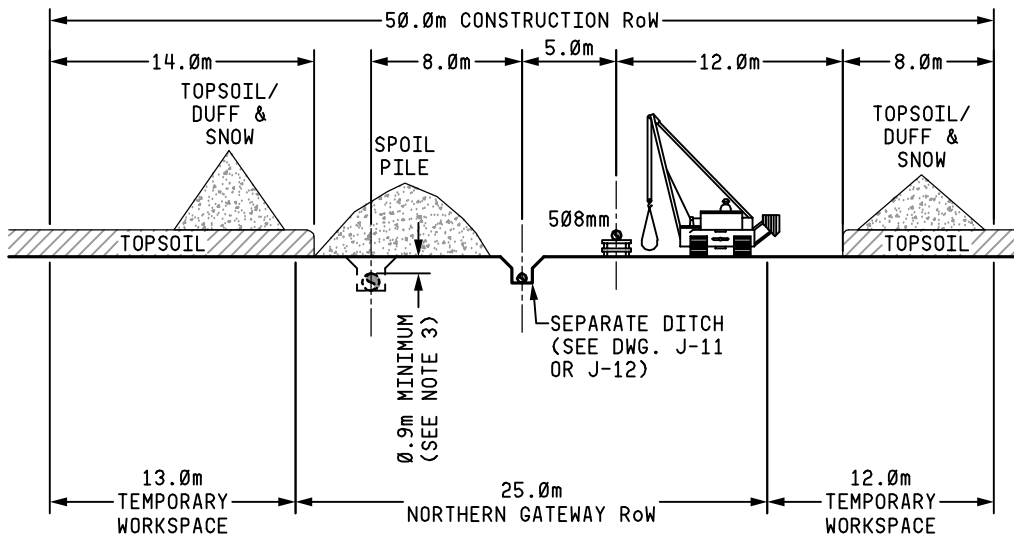


FIGURE ID

PREPARED FOR



ENBRIDGE NORTHERN GATEWAY PROJECT

RoW CONFIGURATION – WINTER – DUAL TRENCH

SCALE

N.T.S.

REVISION

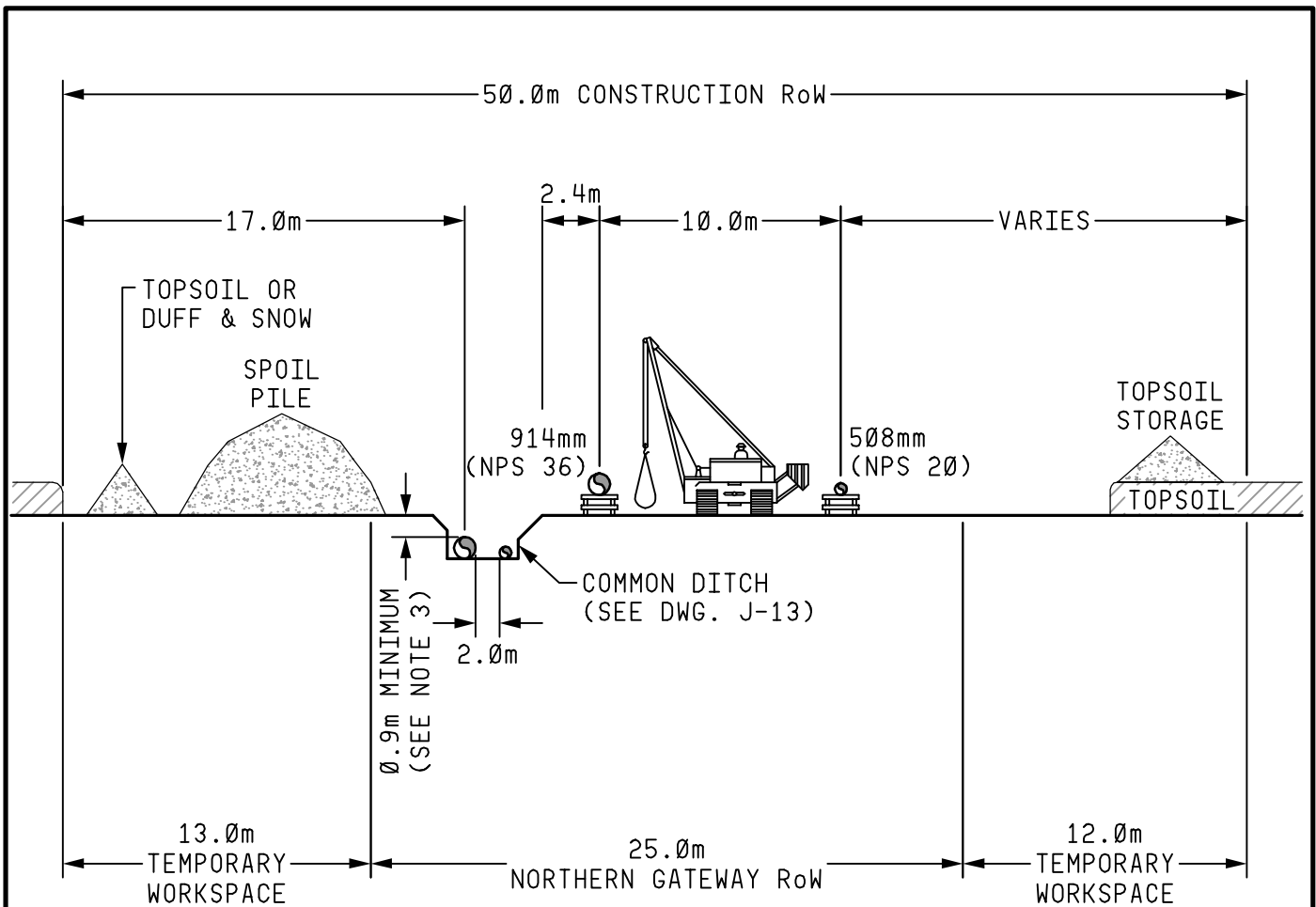
C

DATE

15 SEP 2009

FIGURE NO.

J-2

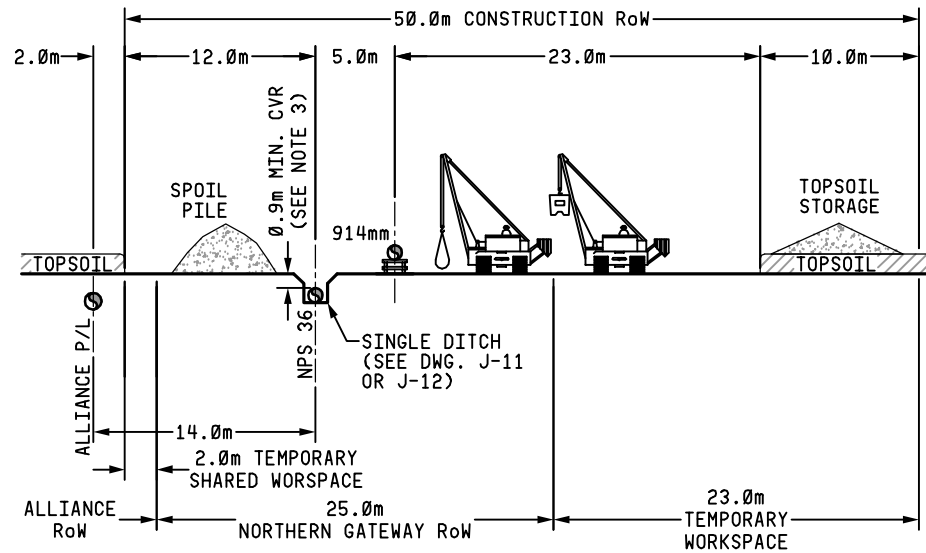


NOTES:

1. DITCH EXCAVATION SHALL BE IN ACCORDANCE WITH OH&S REGULATIONS.
2. STRIP TOPSOIL IN ACCORDANCE WITH ENBRIDGE SPECIFICATIONS.
3. MINIMUM COVER MEASURED FROM GRADE AFTER STRIPPING.
4. MAINTAIN 0.9m COVER OVER BUOYANCY CONTROL ELEMENTS AND OTHER APPURTENANCES MEASURED FROM GRADE AFTER STRIPPING. MINIMUM COVER REQUIREMENT IS REDUCED TO 0.6m THROUGH SOLID ROCK.
5. ASSUME NORMAL BACKFILL.
6. DURING WINTER CONSTRUCTION THE TOPSOIL/DUFF LAYER MAY NOT BE STRIPPED FROM THE WORKING AREA, WHERE DESIGNATED ON ALIGNMENT SHEETS OR PERMITS.

FIGURE ID		SCALE	N.T.S.
PREPARED FOR	ENBRIDGE NORTHERN GATEWAY PROJECT	REVISION	D
	RIGHT OF WAY CONFIGURATION	DATE	28 AUG 2009
	SUMMER/WINTER-SINGLE TRENCH	FIGURE NO.	J-3

PHASE 1 INSTALL 914mm (NPS 36) PIPE



NOTES:

1. DITCH EXCAVATION SHALL BE IN ACCORDANCE WITH OH&S REGULATIONS.
2. STRIP TOPSOIL IN ACCORDANCE WITH ENBRIDGE SPECIFICATIONS.
3. MINIMUM COVER MEASURED FROM GRADE AFTER STRIPPING.
4. MAINTAIN 0.9m COVER OVER BUOYANCY CONTROL ELEMENTS AND OTHER APPURTENANCES MEASURED FROM GRADE AFTER STRIPPING.
5. ASSUME NORMAL BACKFILL.

PHASE 2 INSTALL 508mm (NPS 20) PIPE

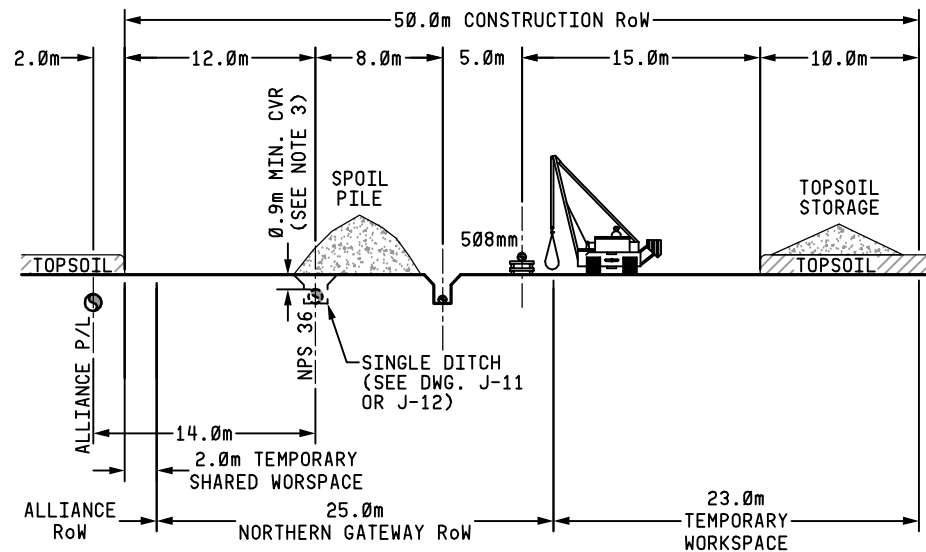


FIGURE ID

PREPARED FOR



ENBRIDGE NORTHERN GATEWAY PROJECT RoW CONFIGURATION DITCH SIDE ADJACENT TO ALLIANCE PIPELINE

SCALE

N.T.S.

REVISION

C

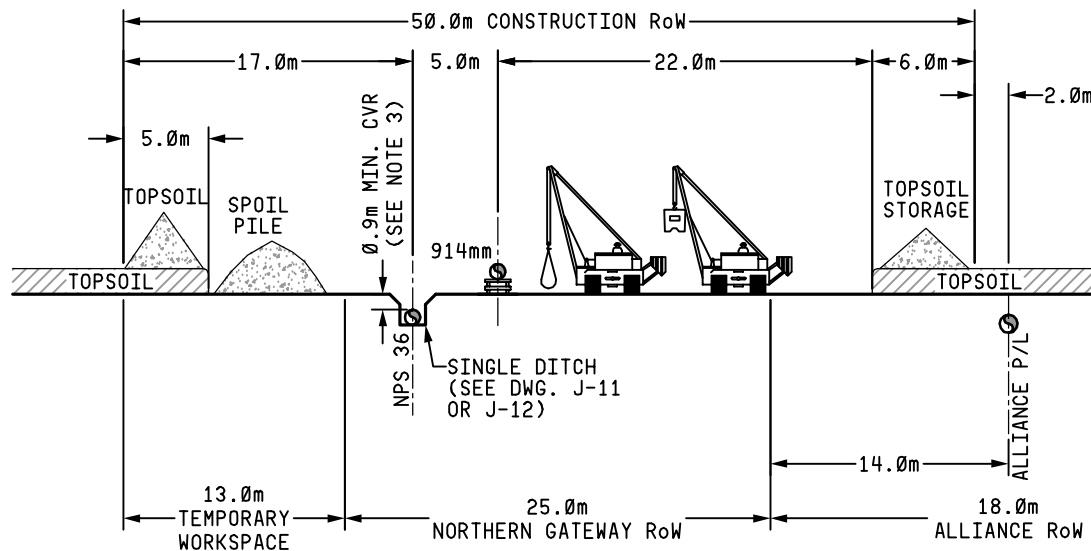
DATE

15 SEP 2009

FIGURE NO.

J-4

PHASE 1 INSTALL 914mm (NPS 36) PIPE



NOTES:

1. DITCH EXCAVATION SHALL BE IN ACCORDANCE WITH OH&S REGULATIONS.
2. STRIP TOPSOIL IN ACCORDANCE WITH ENBRIDGE SPECIFICATIONS.
3. MINIMUM COVER MEASURED FROM GRADE AFTER STRIPPING.
4. MAINTAIN 0.9m COVER OVER BUOYANCY CONTROL ELEMENTS AND OTHER APPURTENANCES MEASURED FROM GRADE AFTER STRIPPING.
5. ASSUME NORMAL BACKFILL.

PHASE 2 INSTALL 508mm (NPS 20) PIPE

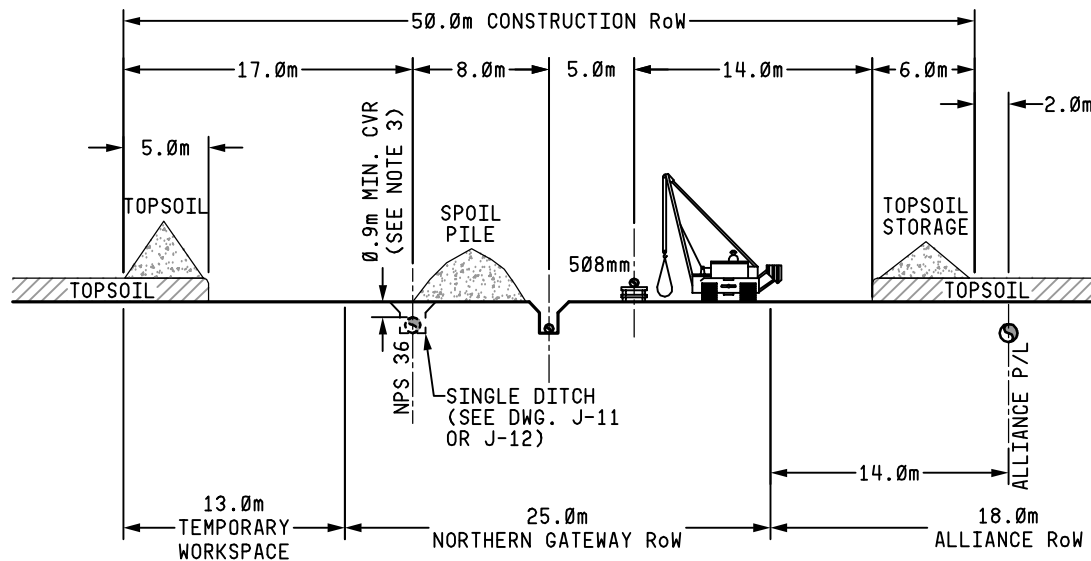


FIGURE ID

PREPARED FOR



ENBRIDGE NORTHERN GATEWAY PROJECT RoW CONFIGURATION WORK SIDE ADJACENT TO ALLIANCE PIPELINE

SCALE

N.T.S.

REVISION

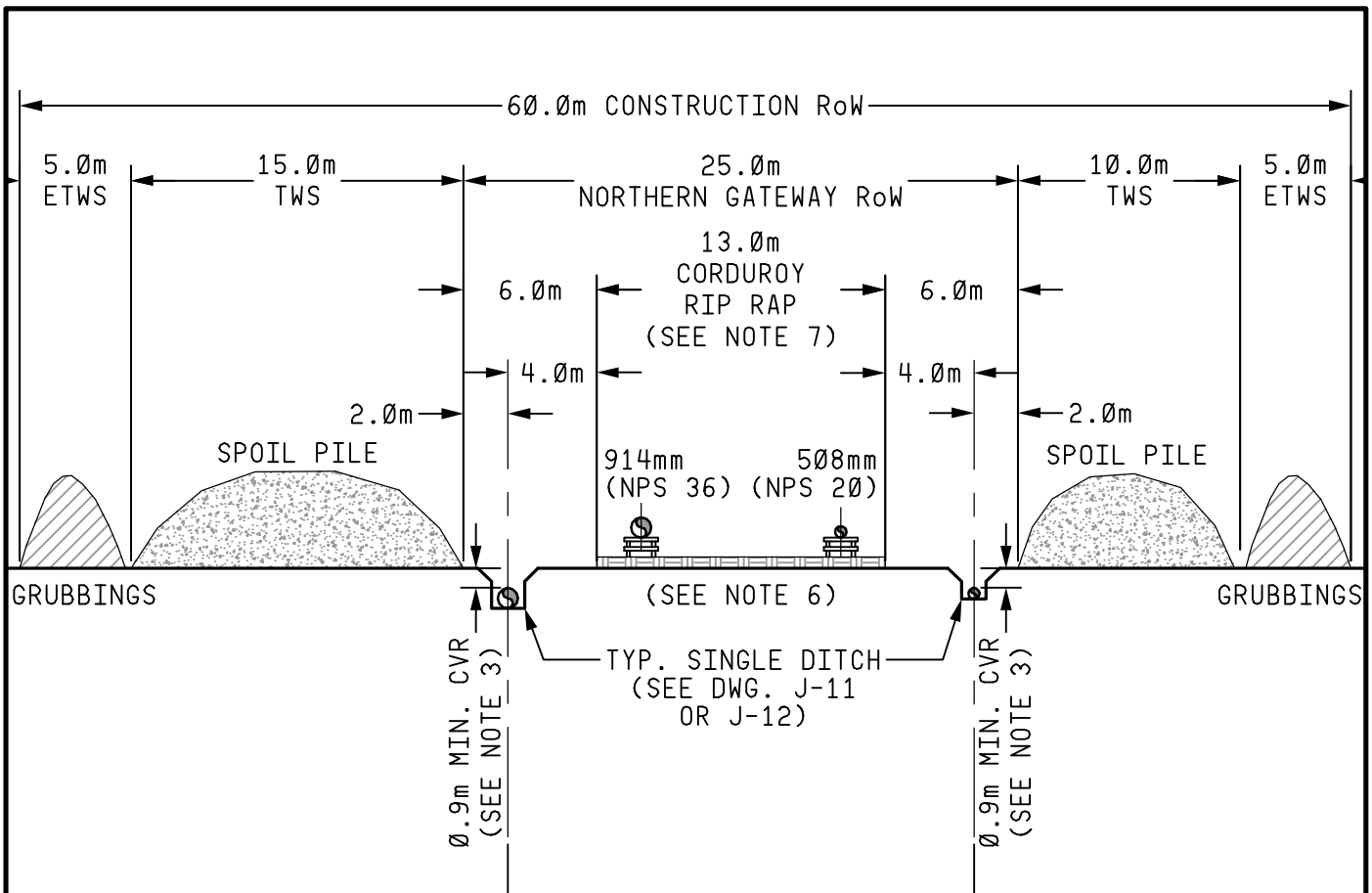
C

DATE

15 SEP 2009

FIGURE NO.

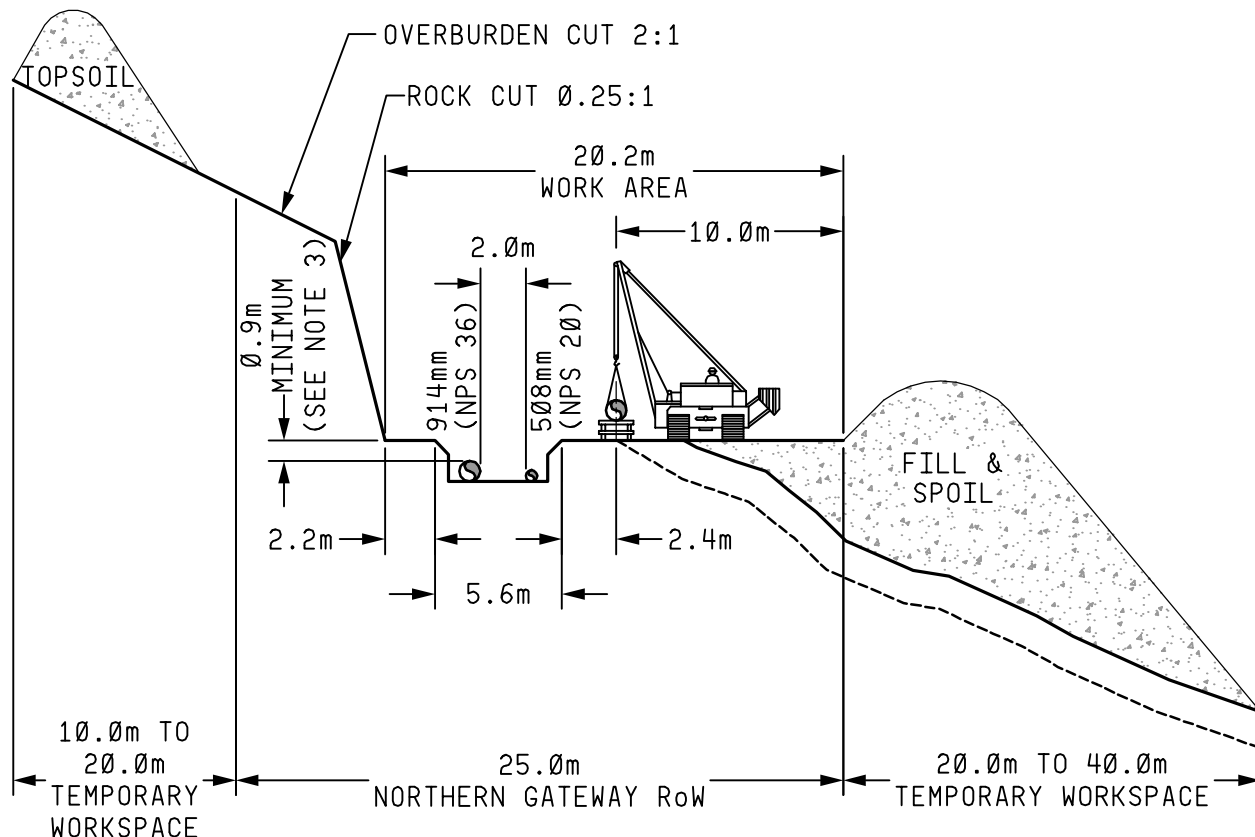
J-5



NOTES:

1. DITCH EXCAVATION SHALL BE IN ACCORDANCE WITH OH&S REGULATIONS.
2. STRIP TOPSOIL IN ACCORDANCE WITH ENBRIDGE SPECIFICATIONS.
3. MINIMUM COVER MEASURED FROM GRADE AFTER STRIPPING.
4. MAINTAIN 0.9m COVER OVER BUOYANCY CONTROL ELEMENTS AND OTHER APPURTENANCES MEASURED FROM GRADE AFTER STRIPPING.
5. ASSUME NORMAL BACKFILL.
6. 914mm INSTALLED FIRST AND TRENCH BACKFILLED. TURN AROUND TO INSTALL 508mm AND BACKFILL TRENCH.
7. ASSUME THE 13.0m WIDE RIP RAP WILL BE DIVIDED 4.0m FOR PIPE LAY DOWN AND 9.0m FOR WORK SIDE OR TRAVEL LANE, ALTERNATING AS DIRECTION OF LAY CHANGES.

FIGURE ID		SCALE	N.T.S.
PREPARED FOR	ENBRIDGE NORTHERN GATEWAY PROJECT	REVISION	C
	RIGHT OF WAY CONFIGURATION	DATE	15 SEP 2009
	SUMMER WETLAND (MUSKEG) CONSTRUCTION	FIGURE NO.	J-6

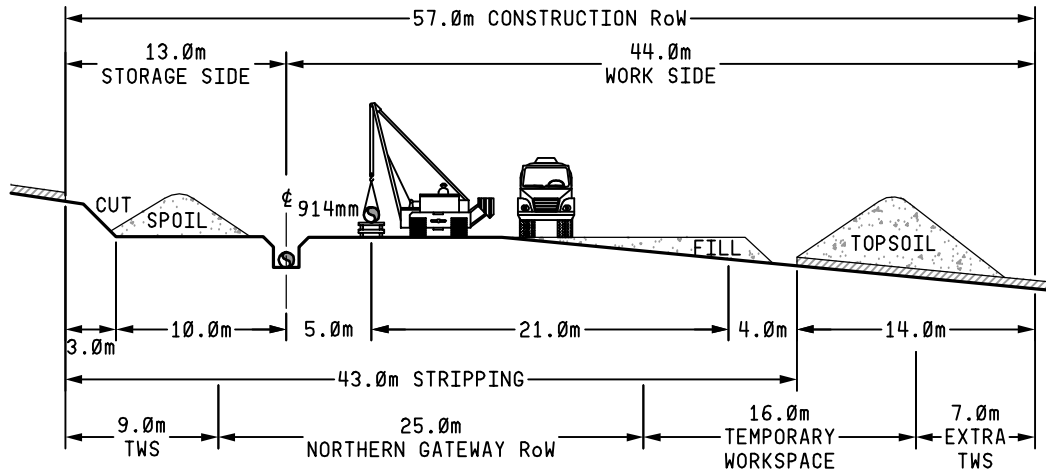


NOTES:

1. DITCH EXCAVATION SHALL BE IN ACCORDANCE WITH OH&S REGULATIONS.
2. STRIP TOPSOIL IN ACCORDANCE WITH ENBRIDGE SPECIFICATIONS.
3. MINIMUM COVER MEASURED FROM GRADE AFTER STRIPPING.
4. MAINTAIN 0.9m COVER OVER BUOYANCY CONTROL ELEMENTS AND OTHER APPURTENANCES MEASURED FROM GRADE AFTER STRIPPING. MINIMUM COVER REQUIREMENT IS REDUCED TO 0.6m THROUGH SOLID ROCK.
5. PIPE WILL BE WELDED THEN LOWERED-IN ONE SECTION AT A TIME.
6. TEMPORARY WORKSPACE WILL VARY WITH THE LAY OF THE LAND (THE CUT MATERIAL MAY ALSO BE PUSHED UP AND DOWN THE RoW AND STORED AS THE CONTOURS MAY ALLOW).
7. THE LAY DIRECTION MAY BE REVERSED TO ACCOMMODATE THE TRENCH CUT INTO THE HILL SIDE.

FIGURE ID		SCALE	N.T.S.
PREPARED FOR	ENBRIDGE NORTHERN GATEWAY PROJECT	REVISION	B
	RIGHT OF WAY CONFIGURATION	DATE	28 MAY 2009
	EXTREME SIDE SLOPE ROCK CUT	FIGURE NO.	J-7

PHASE 1 INSTALL 914mm (NPS 36) PIPE EAST TO WEST



NOTES:

1. DITCH EXCAVATION SHALL BE IN ACCORDANCE WITH OH&S REGULATIONS.
2. STRIP TOPSOIL IN ACCORDANCE WITH ENBRIDGE SPECIFICATIONS.
3. MINIMUM COVER MEASURED FROM GRADE AFTER STRIPPING.
4. MAINTAIN 0.9m COVER OVER BUOYANCY CONTROL ELEMENTS AND OTHER APPURTENANCES MEASURED FROM GRADE AFTER STRIPPING. MINIMUM COVER REQUIREMENT IS REDUCED TO 0.6m THROUGH SOLID ROCK.
5. ASSUME NORMAL BACKFILL.
6. 914mm INSTALLED FIRST AND TRENCH BACKFILLED. SPOIL FROM 508mm TRENCH PLACED OVER 914mm.
7. WINTER CONSTRUCTION MAY REQUIRE ADDITIONAL EXTRA TEMPORARY WORKSPACE FOR STORAGE OF SNOW.
8. SEE DRAWINGS J-11 OR J-12 FOR TYPICAL DITCH DESIGN.

PHASE 2 INSTALL 508mm (NPS 20) PIPE EAST TO WEST

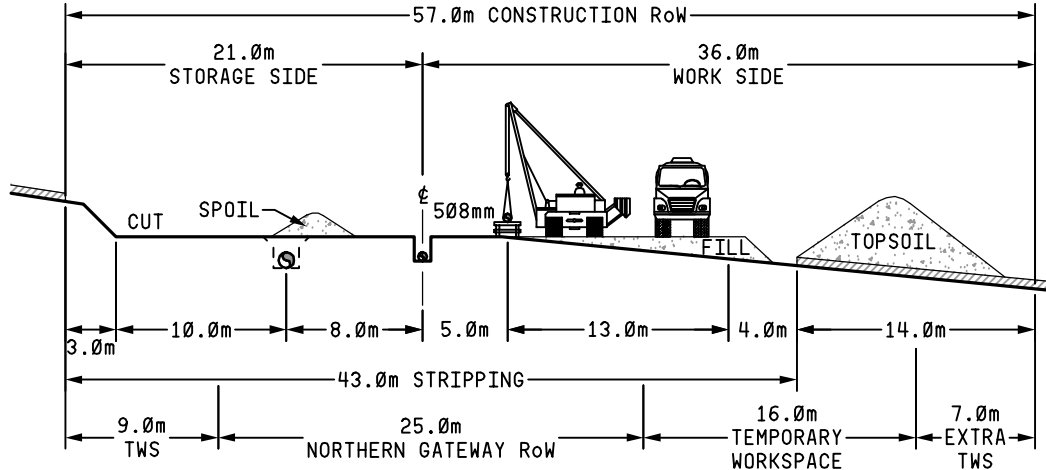
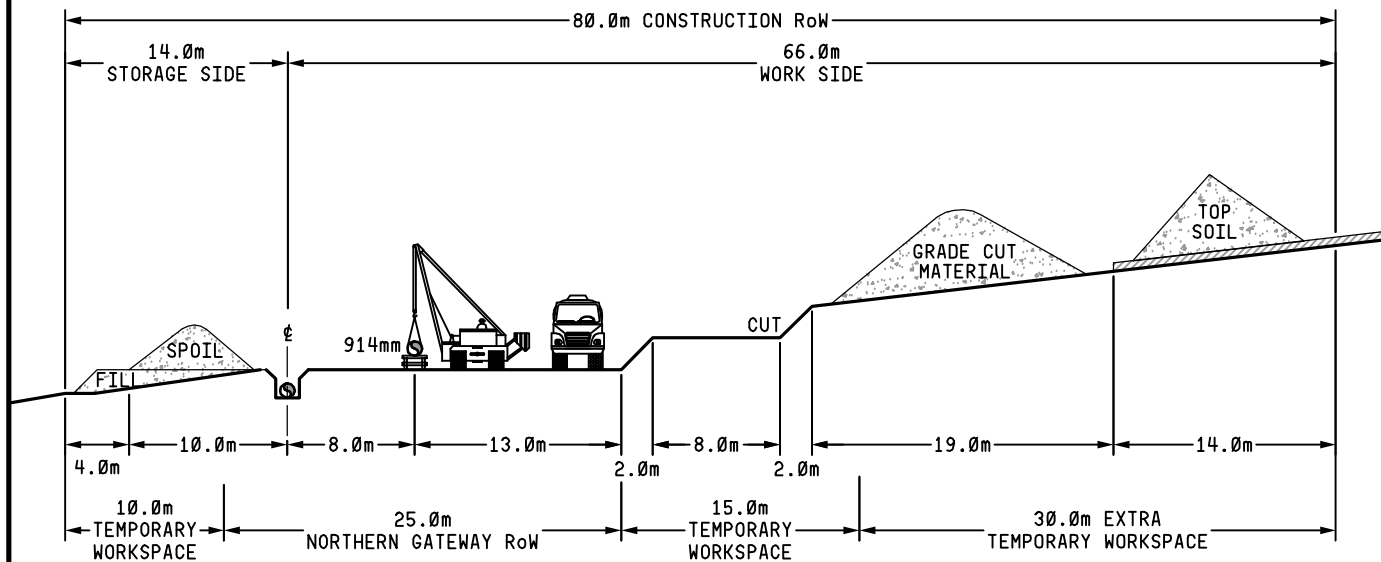
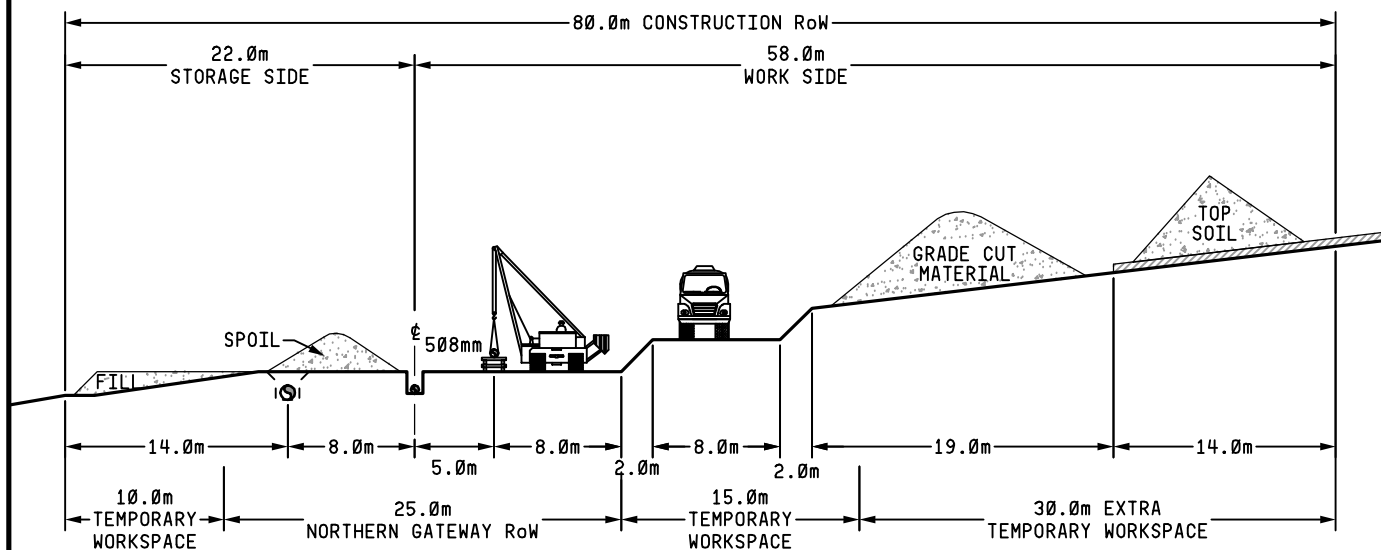


FIGURE ID		SCALE	N.T.S.
PREPARED FOR	ENBRIDGE NORTHERN GATEWAY PROJECT	REVISION	D
		DATE	15 SEP 2009
	RIGHT OF WAY CONFIGURATION – SUMMER-10% SIDEHILL-WORKSIDE FILL	FIGURE NO.	J-9

PHASE 1 INSTALL 914mm (NPS 36) PIPE EAST TO WEST



PHASE 2 INSTALL 508mm (NPS 20) PIPE EAST TO WEST



NOTES:

1. DITCH EXCAVATION SHALL BE IN ACCORDANCE WITH OH&S REGULATIONS.
2. STRIP TOPSOIL IN ACCORDANCE WITH ENBRIDGE SPECIFICATIONS.
3. MINIMUM COVER MEASURED FROM GRADE AFTER STRIPPING.
4. MAINTAIN 0.9m COVER OVER BUOYANCY CONTROL ELEMENTS AND OTHER APPURTENANCES MEASURED FROM GRADE AFTER STRIPPING. MINIMUM COVER REQUIREMENT IS REDUCED TO 0.6m THROUGH SOLID ROCK.
5. ASSUME NORMAL BACKFILL.
6. 914mm INSTALLED FIRST AND TRENCH BACKFILLED. SPOIL FROM 508mm TRENCH PLACED OVER 914mm.
7. WINTER CONSTRUCTION MAY REQUIRE ADDITIONAL EXTRA TEMPORARY WORKSPACE FOR STORAGE OF SNOW.
8. SEE DRAWINGS J-11 OR J-12 FOR TYPICAL DITCH DESIGN.

FIGURE ID

PREPARED FOR



ENBRIDGE NORTHERN GATEWAY PROJECT

RIGHT OF WAY CONFIGURATION – SUMMER-10% SIDEHILL-WORKSIDE CUT

SCALE

N.T.S.

REVISION

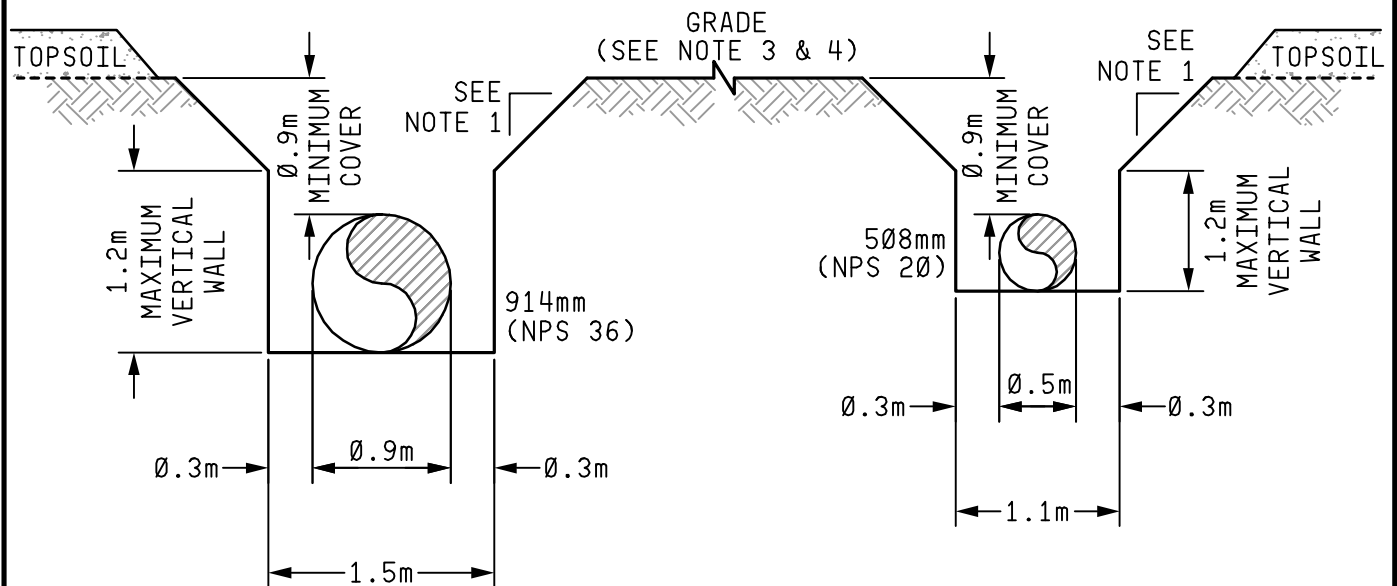
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DATE

15 SEP 2009

FIGURE NO.

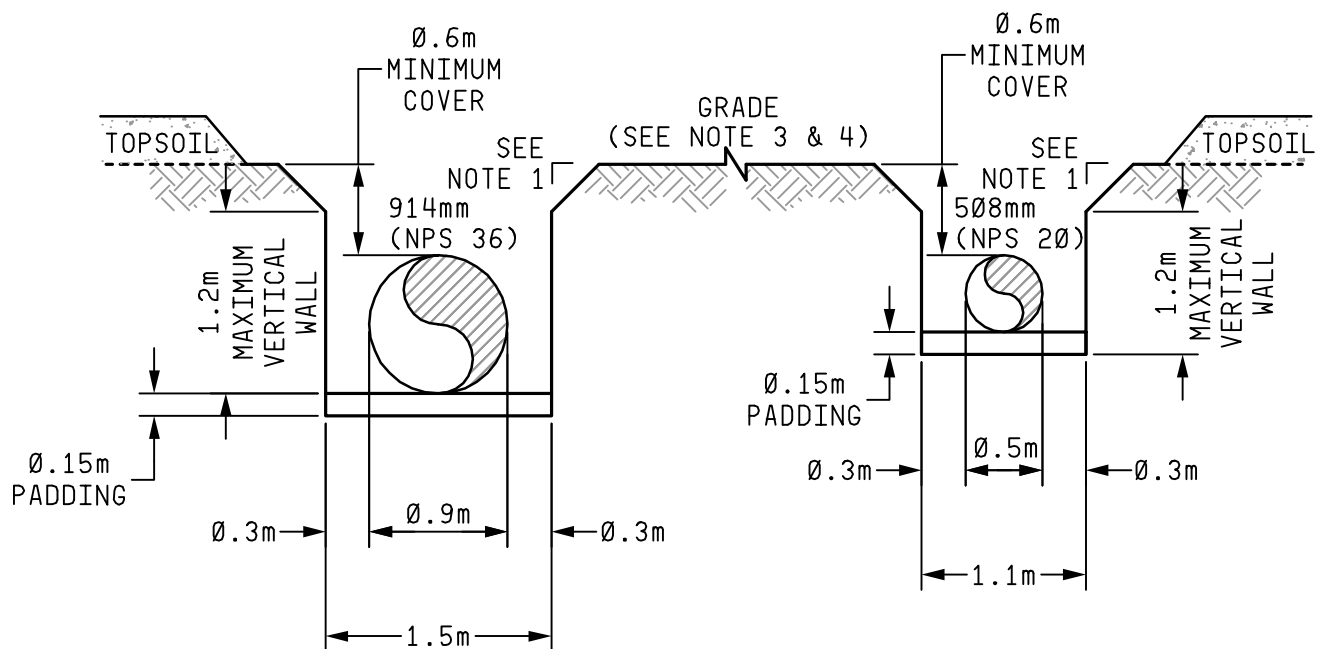
J-10



NOTES:

1. DITCH EXCAVATION SHALL BE IN ACCORDANCE WITH OH&S REGULATIONS BASED ON SOIL CONDITIONS.
2. STRIP TOPSOIL IN ACCORDANCE WITH ENBRIDGE SPECIFICATIONS.
3. MINIMUM COVER MEASURED FROM GRADE AFTER STRIPPING.
4. MAINTAIN 0.9m COVER OVER BUOYANCY CONTROL ELEMENTS AND OTHER APPURTENANCES MEASURED FROM GRADE AFTER STRIPPING.

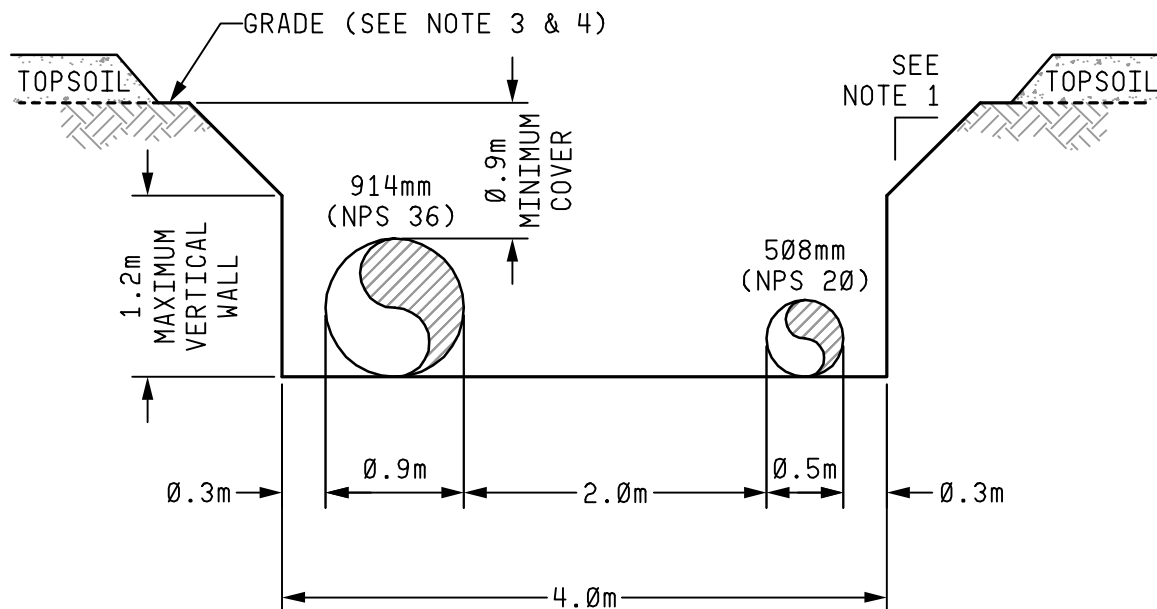
FIGURE ID		SCALE	N.T.S.
PREPARED FOR	ENBRIDGE NORTHERN GATEWAY PROJECT	REVISION	C
	DITCH DESIGN	DATE	28 MAY 2009
	SINGLE PIPE(914mm/508mm)–NORMAL TRENCH	FIGURE NO.	J-11



NOTES:

1. DITCH EXCAVATION SHALL BE IN ACCORDANCE WITH OH&S REGULATIONS BASED ON SOIL CONDITIONS.
2. STRIP TOPSOIL IN ACCORDANCE WITH ENBRIDGE SPECIFICATIONS.
3. MINIMUM COVER MEASURED FROM GRADE AFTER STRIPPING.
4. MAINTAIN 0.6m COVER OVER BUOYANCY CONTROL ELEMENTS AND OTHER APPURTENANCES MEASURED FROM GRADE AFTER STRIPPING.

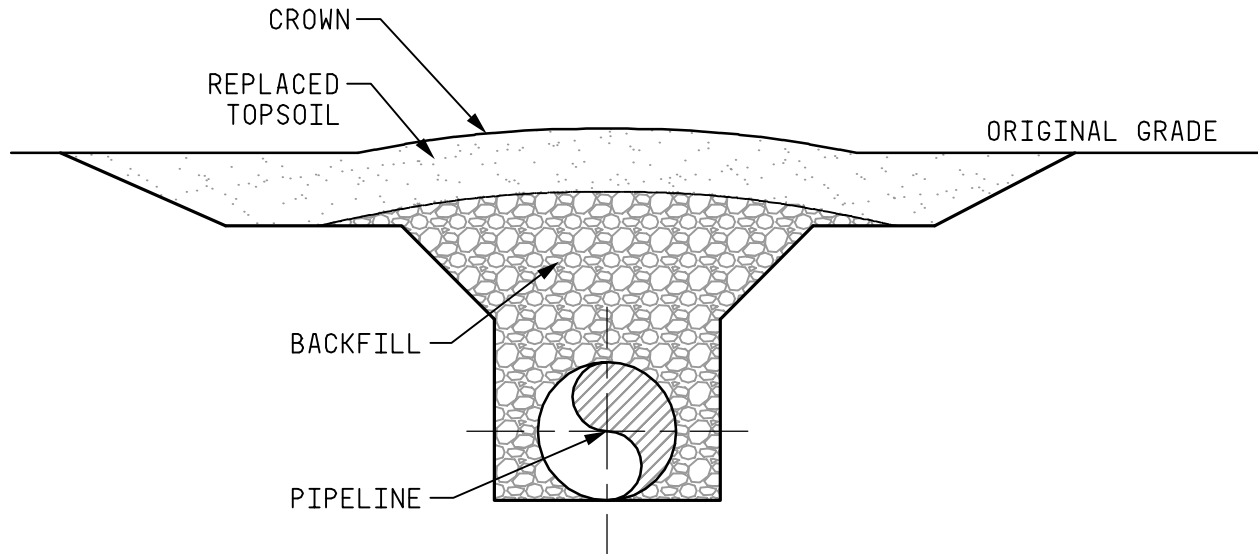
FIGURE ID		SCALE	N.T.S.
PREPARED FOR	ENBRIDGE NORTHERN GATEWAY PROJECT	REVISION	C
	DITCH DESIGN	DATE	28 MAY 2009
	SINGLE PIPE(914mm/508mm)-ROCK TRENCH	FIGURE NO.	J-12



NOTES:

1. DITCH EXCAVATION SHALL BE IN ACCORDANCE WITH OH&S REGULATIONS BASED ON SOIL CONDITIONS.
2. STRIP TOPSOIL IN ACCORDANCE WITH ENBRIDGE SPECIFICATIONS.
3. MINIMUM COVER MEASURED FROM GRADE AFTER STRIPPING.
4. MAINTAIN 0.9m COVER OVER BUOYANCY CONTROL ELEMENTS AND OTHER APPURTENANCES MEASURED FROM GRADE AFTER STRIPPING. MINIMUM COVER REQUIREMENT IS REDUCED TO 0.6m THROUGH SOLID ROCK.
5. IN LOCATIONS WHERE BOTH LINES ARE PROTECTED WITH A CONCRETE COATING, THE CLEARANCE BETWEEN THE LINES MAY BE REDUCED OR ELIMINATED.

FIGURE ID		SCALE	N.T.S.
PREPARED FOR	ENBRIDGE NORTHERN GATEWAY PROJECT	REVISION	C
	DITCH DESIGN	DATE	28 MAY 2009
	DUAL PIPE-NORMAL TRENCH	FIGURE NO.	J-13



NOTES:

1. CROWN THE TRENCH TO COMPENSATE FOR SETTLEMENT. THE HEIGHT OF THE CROWN WILL DEPEND UPON LAND USE, THE DEGREE OF COMPACTION ACHIEVED, AND SOIL TEMPERATURE. TYPICAL VALUES FOR CROWNING OF REPRESENTATIVE SOIL TYPES ARE PRESENTED BELOW.

$$R = A \times D$$

WHERE R = HEIGHT OF CROWN
A = CROWN ALLOWANCE
D = DEPTH OF TRENCH

TYPE OF BACKFILL

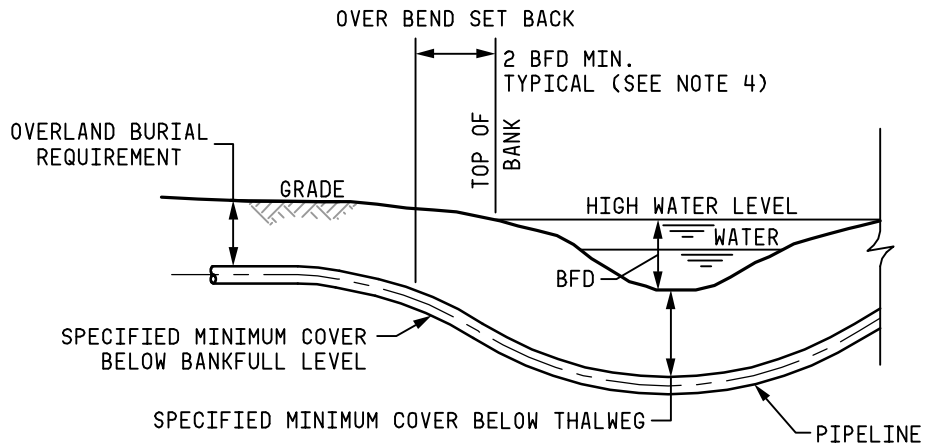
TYPICAL CROWN ALLOWANCE (A)

BLASTED ROCK	.00 - .05
SAND AND GRAVEL	.05 - .10
SAND	.08 - .15
SILTY SAND	.10 - .15
SILT	.10 - .20
CLAY	.10 - .25
ORGANIC (MUSKEG)	.50 - 1.00

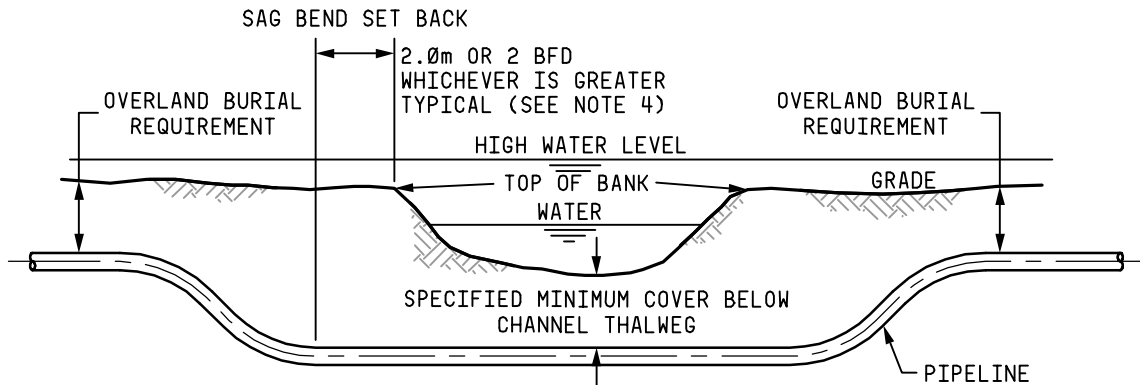
2. LEAVE GAPS IN CROWN AT ALL DRAINAGE COURSES AND AT TRENCH BREAKERS TO ALLOW FOR SURFACE RUN-OFF.
3. FEATHER OUT EXCESS SPOIL.
4. REPLACE TOPSOIL EVENLY.

FIGURE ID		SCALE	N.T.S.
PREPARED FOR	 ENBRIDGE NORTHERN GATEWAY PROJECT RIGHT OF WAY AFTER BACKFILL SINGLE TRENCH	REVISION	C
		DATE	28 MAY 2009
		FIGURE NO.	J-14

TYPICAL SINGLE SAG CROSSING



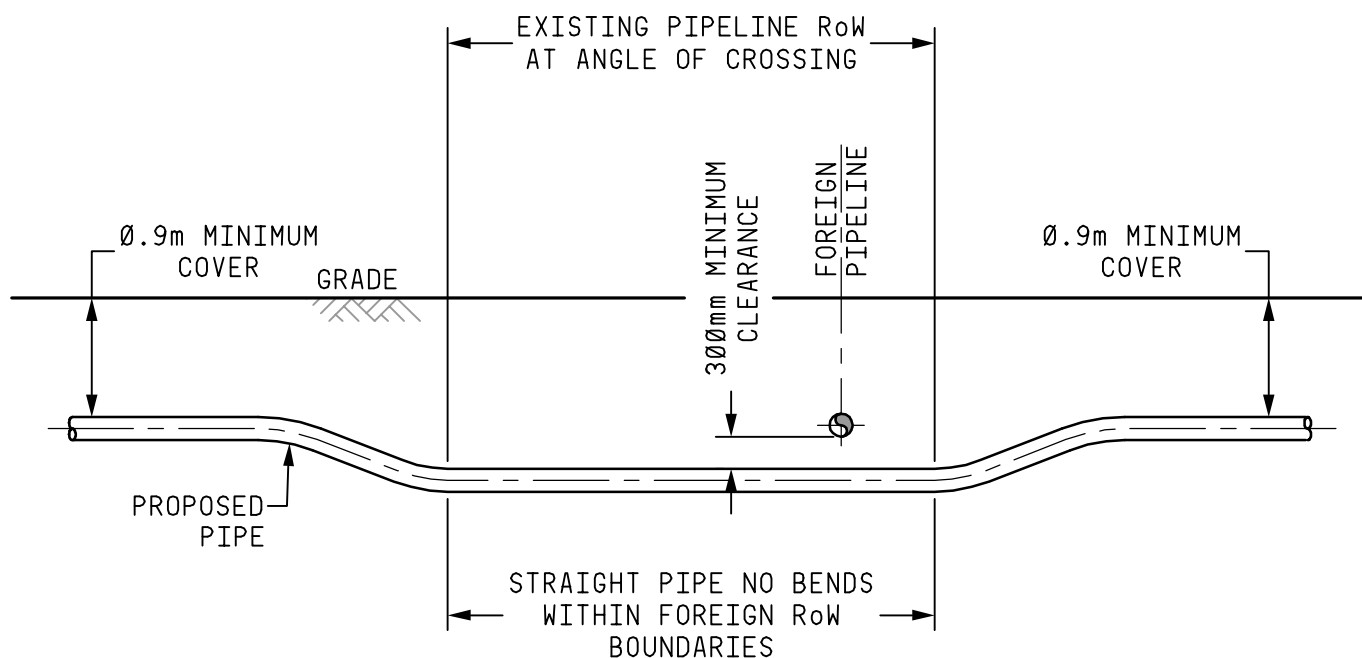
TYPICAL DOUBLE SAG CROSSING



NOTES:


1. USE SINGLE SAG CROSSING ON NARROW STREAMS WHERE IT IS POSSIBLE TO MAINTAIN MINIMUM COVER AND WHERE THERE IS NO EVIDENCE OF CAVING BANKS, SCOUR OR SHIFTING BOTTOM.
2. NORMALLY USE DOUBLE SAG CROSSING WHERE WIDTH PROHIBITS USE OF SINGLE SAG OR WHERE BANKS ARE WASHING AND PIPELINE MUST BE CARRIED INTO THE BANKS TO MAINTAIN MINIMUM COVER.
3. DISTURBED BANK AREAS SHALL BE RESTORED BY GRADING TO NO STEEPER THAN 3H:1V AND REVEGETATING AS SOON AS POSSIBLE FOLLOWING CONSTRUCTION. TRANSITIONS TO UPSTREAM AND DOWNSTREAM BANKS SHALL BE SMOOTH AND GRADUAL.
4. BFD (BANK FULL DEPTH) IS THE VERTICAL DISTANCE FROM THE LOWEST BANK TO THE LOWEST BED ELEVATION.
5. BUOYANCY CONTROL TO BE INSTALLED AS REQUIRED.

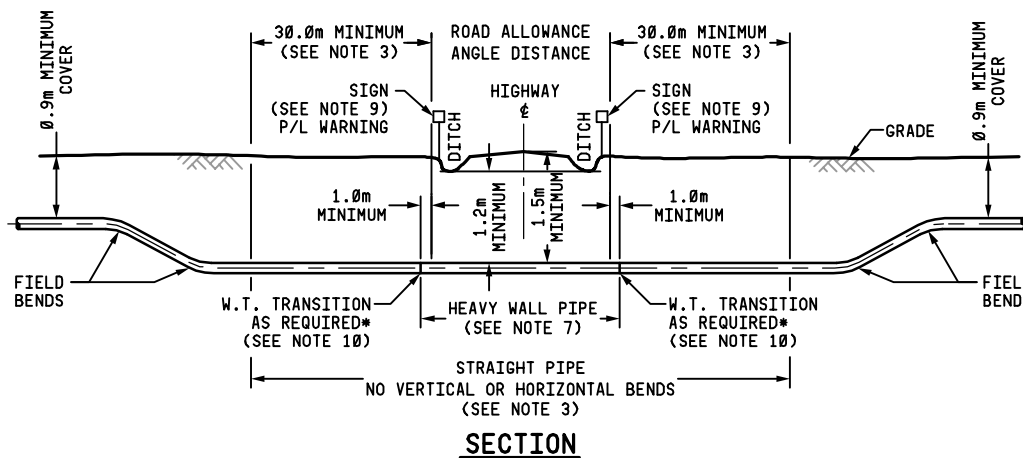
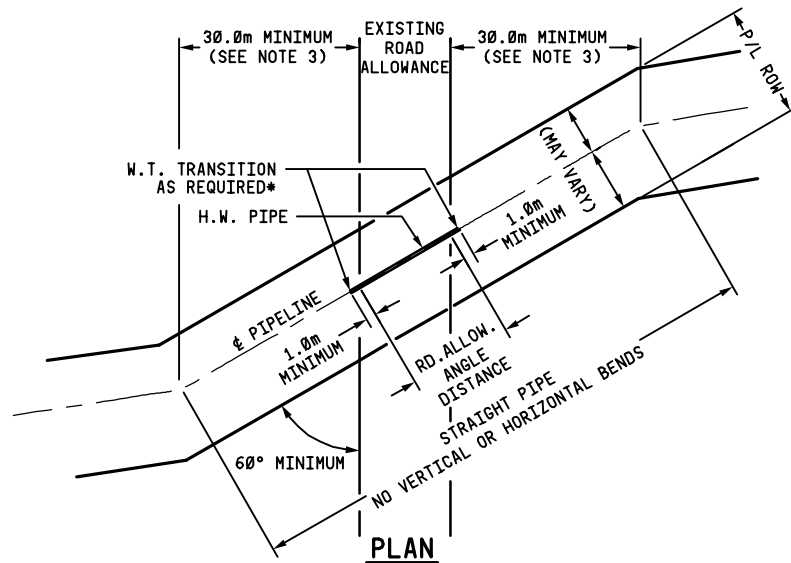
FIGURE ID		SCALE	N.T.S.
PREPARED FOR	ENBRIDGE NORTHERN GATEWAY PROJECT TYPICAL WATERCOURSE CROSSING DESIGN	REVISION	B
		DATE	28 MAY 2009
		FIGURE NO.	J-15



NOTES:

1. FOREIGN PIPELINE LOCATIONS AND DEPTHS TO BE DETERMINED BY ELECTRONIC MEANS IN ADVANCE OF PIPELINE OPERATION AND CONFIRMED BY CAREFULLY EXPOSING BY HAND DIGGING OR "HYDRO VAC".
2. THE OWNER OF FOREIGN PIPELINE(S) SHALL BE NOTIFIED AT LEAST 72 HOURS IN ADVANCE OF EXCAVATION OF CROSSING, OR AS REQUIRED BY THE CROSSING LINE LIST. THE FOREIGN PIPELINE OWNER OR HIS REPRESENTATIVE SHALL BE PRESENT ON SITE WHEN THE CROSSING OPERATION TAKES PLACE UNLESS OTHERWISE APPROVED IN WRITING BY THE FOREIGN PIPELINE OWNER.
3. PROPOSED PIPELINE MAY ONLY CROSS ABOVE FOREIGN PIPELINE(S) WHERE REQUESTED BY OR APPROVED BY THE FOREIGN PIPELINE OWNER IN WRITING, PROVIDED THAT MINIMUM CLEARANCE AND COVER IS MAINTAINED. THE FOREIGN PIPELINE OWNER IN WRITING, PROVIDED THAT MINIMUM CLEARANCE AND COVER IS MAINTAINED.
4. CROSSING SHALL BE CONSTRUCTED IN ACCORDANCE WITH CAN/CSA Z662-07 OIL AND GAS PIPELINE STANDARD AND NEB OPR 99 REGULATIONS.
5. PLASTIC OR COMPOSITE PIPELINES SHALL BE SUPPORTED AS REQUESTED BY THE FOREIGN PIPELINE OWNER. IF THE FOREIGN LINE OWNER HAS NO SPECIFIC REQUIRMENTS, ANGLE IRON 75mm x 75mm x 6mm SHALL BE USED.
6. ALL BACKFILL WITHIN 2.0m OF A FOREIGN PIPELINE CROSSING TO BE DEPOSITED IN 150mm LIFTS AND COMPACTED TO 85% STANDARD PROCTOR DENSITY.
7. CATHODIC PROTECTION TEST POINTS WILL BE INSTALLED WHERE CALLED FOR BY THE FOREIGN PIPELINE OWNER OR AS SPECIFIED BY ENBRIDGE.

FIGURE ID		SCALE	N.T.S.
PREPARED FOR	ENBRIDGE NORTHERN GATEWAY PROJECT	REVISION	C
		DATE	28 MAY 2009
		FIGURE NO.	J-16
		TYPICAL PIPELINE CROSSING DESIGN	



PIPELINE DATA	NPS 36		NPS 20		PIPE SPECIFICATION	COATING	CATH. PROT.
	O.D.(mm)	W.T.(mm)	O.D.(mm)	W.T.(mm)			
LINE PIPE	914.4	VARIES	508.0	VARIES	CSA Z245.1 GR. 483 CAT. I	FBE	YES
H.W. PIPE	914.4	VARIES	508.0	VARIES	CSA Z245.1 GR. 483 CAT. I	FBE WITH ABRASION OVERCOAT	YES

NOTES:

1. THE ROAD BED AND DITCHES AT THE PIPELINE CROSSING SHALL BE RESTORED TO THE APPROVAL OF THE AUTHORITIES HAVING JURISDICTION.
2. CORROSION CONTROL SHALL CONSIST OF FUSION BOND EPOXY COATING AND CATHODIC PROTECTION.
3. PRIMARY OR SECONDARY HIGHWAY CROSSINGS SHALL HAVE NO VERTICAL OR HORIZONTAL BEND WITHIN THE ROAD ALLOWANCE OR A 30.0m PERPENDICULAR DISTANCE FROM ROAD ALLOWANCE OR AS APPROVED BY THE AUTHORITIES HAVING JURISDICTION.
4. PIPELINE CONSTRUCTION SHALL BE CONSTRUCTED IN ACCORDANCE WITH CSA Z662-07 OIL AND GAS PIPELINE STANDARD AND THE NEB OPR 99 REGULATIONS.
5. THE PIPE COATING SHALL BE INSPECTED PRIOR TO INSTALLATION AND DAMAGED AREAS REPAIRED.
6. NO OPEN EXCAVATION SHALL BE CLOSER THAN 3.6m FROM THE SHOULDER OF THE ROAD WHEN USING BORING TECHNIQUES.
7. REFER TO CONSTRUCTION ALIGNMENT SHEET FOR HEAVY WALL PIPE W.T. AND LENGTH AT EACH CROSSING.
8. CROSSING SHALL BE CONSTRUCTED USING TRENCHLESS METHOD.
9. REFER TO DWG. FOR TYPICAL WARNING SIGN DETAILS.
10. REFER TO DWG. FOR TRANSITION DETAILS.
11. REFER TO CONSTRUCTION ALIGNMENT SHEETS FOR LINE PIPE W.T.

FIGURE ID

PREPARED FOR



ENBRIDGE NORTHERN GATEWAY PROJECT

TYPICAL PRIMARY ROAD CROSSING DESIGN

SCALE

N.T.S.

REVISION

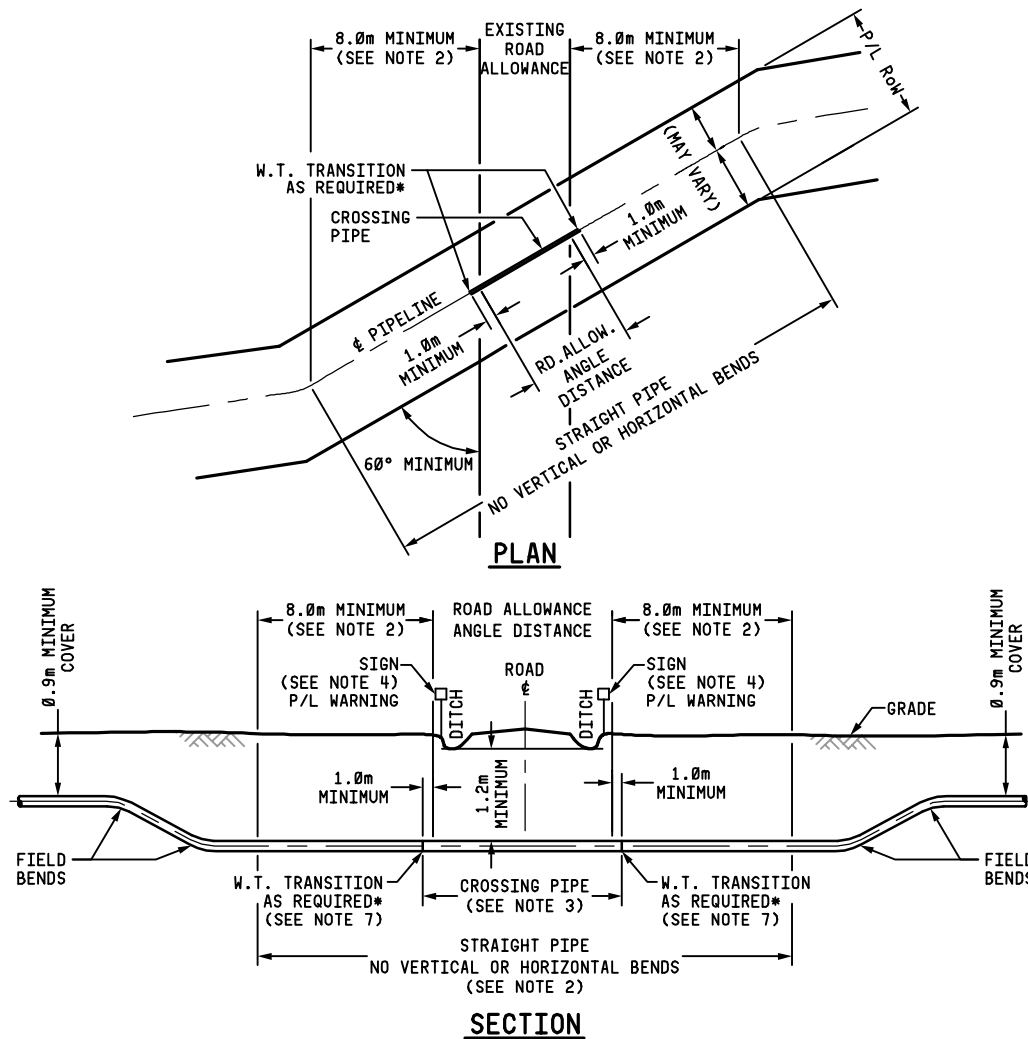
C

DATE

28 MAY 2009

FIGURE NO.

J-17



NOTES:

1. CROSSING SHALL BE CONSTRUCTED USING BORE METHOD OR OPEN CUT AS PER CONTRACT.
2. THE CONSTRUCTED PIPELINE SHALL BE STRAIGHT WITH NO VERTICAL OR HORIZONTAL BENDS ACROSS THE ROAD ALLOWANCE AND WITHIN A 8.0m PERPENDICULAR DISTANCE FROM ROAD ALLOWANCE BOUNDARY OR AS APPROVED BY AUTHORITIES HAVING JURISDICTION. LENGTH OF STRAIGHT PIPE AS A DISTANCE FROM ROAD BOUNDARY AND ANGLE OF CROSSING WILL VARY WITH SITE PLAN AND THE IMPACT OF ADJACENT ROW'S AND PIPELINES ON PROPOSED PIPELINE.
3. REFER TO CONSTRUCTION ALIGNMENT SHEET FOR HEAVY WALL PIPE W.T. AND LENGTH AT EACH CROSSING.
4. REFER TO DWG. FOR TYPICAL WARNING SIGN DETAILS.
5. CROSSING SHALL BE CONSTRUCTED IN ACCORDANCE WITH CSA Z662-07 OIL AND GAS PIPELINE STANDARD AND NEB OPR 99 REGULATIONS.
6. ALL MUNICIPAL/COUNTY (GRID) ROAD CROSSINGS SHALL BE MADE IN ACCORDANCE WITH ALL REQUIREMENTS OF THE PROVINCIAL AUTHORITY AND/OR THE MUNICIPALITY HAVING JURISDICTION.
7. REFER TO DWG. FOR TRANSITION DETAILS.
8. REFER TO CONSTRUCTION ALIGNMENT SHEETS FOR LINE PIPE W.T.

PIPELINE DATA	NPS 36		NPS 20		PIPE SPECIFICATION	COATING	CATH. PROT.
	O.D.(mm)	W.T.(mm)	O.D.(mm)	W.T.(mm)			
LINE PIPE	914.4	VARIES	508.0	VARIES	CSA Z245.1 GR. 483 CAT. I	FBE	YES
H.W. PIPE	914.4	VARIES	508.0	VARIES	CSA Z245.1 GR. 483 CAT. I	FBE WITH ABRASION OVERCOAT	YES

FIGURE ID

PREPARED FOR



ENBRIDGE NORTHERN GATEWAY PROJECT

TYPICAL SECONDARY ROAD CROSSING DESIGN

SCALE

N.T.S.

REVISION

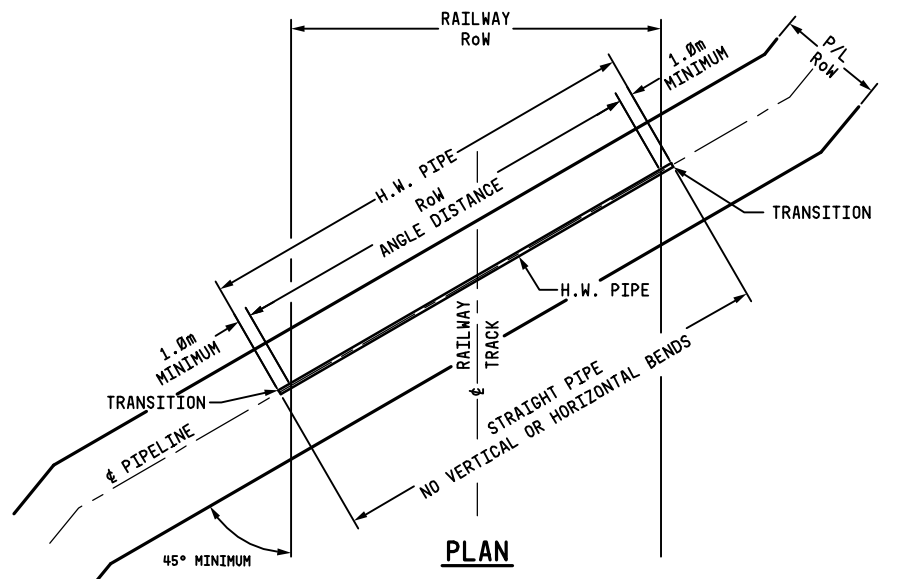
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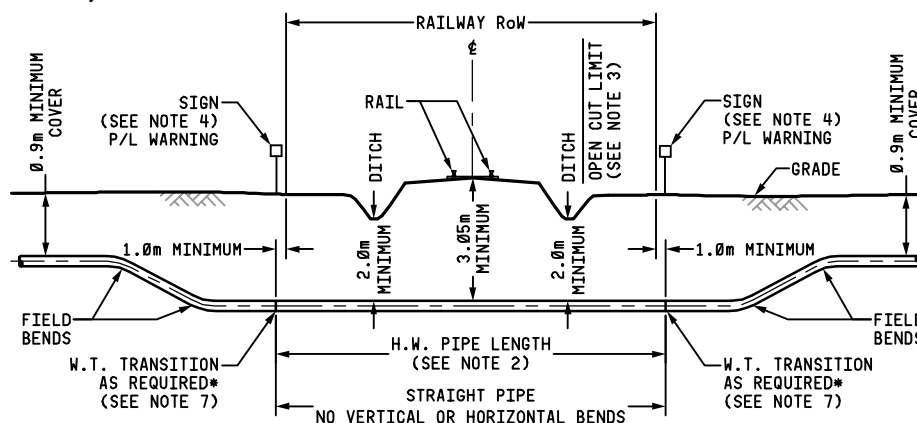
28 MAY 2009

FIGURE NO.

J-18



PLAN



SECTION

PIPELINE DATA	NPS 36		NPS 20		PIPE SPECIFICATION	COATING	CATH. PROT.
	O.D.(mm)	W.T.(mm)	O.D.(mm)	W.T.(mm)			
LINE PIPE	914.4	VARIES	508.0	VARIES	CSA Z245.1 GR. 483 CAT. I	FBE	YES
H.W. PIPE	914.4	VARIES	508.0	VARIES	CSA Z245.1 GR. 483 CAT. I	FBE WITH ABRASION OVERCOAT	YES

NOTES:

1. REFER TO DWG. FOR WARNING SIGN DETAILS.
2. REFER TO "SITE SPECIFIC" CROSSING DRAWING OR CONSTRUCTION ALIGNMENT SHEET FOR LENGTH OF H.W. PIPE REQUIRED.
3. ALL CROSSINGS SHALL BE TRENCHLESS. OPEN CUTTING TO BORE FACE SHALL BE IN ACCORDANCE WITH CONSTRUCTION CONTRACT.
4. CONSTRUCTION TO CONFORM TO CSA Z662-07 OIL AND GAS PIPELINE STANDARDS NEB OPR 99 REGULATIONS AND TRANSPORT CANADA (TC) STANDARD E-10.
5. EXTERIOR COATING OF CARRIER PIPE SHALL BE INSPECTED IMMEDIATELY PRIOR TO INSTALLATION AND ALL DAMAGED AREAS REPAIRED.
6. CORROSION CONTROL WILL BE ACHIEVED THROUGH THE USE OF FBE COATING AND CATHODIC PROTECTION.
7. VOIDS AROUND PIPE WITHIN BORE GREATER THAN 25mm SHALL BE FILLED BY PRESSURE GROUTING.
8. REFER TO DWG. FOR W.T. TRANSITION DETAILS.
9. REFER TO CONSTRUCTION ALIGNMENT SHEETS FOR LINE PIPE W.T.

FIGURE ID

PREPARED FOR



ENBRIDGE NORTHERN GATEWAY PROJECT

TYPICAL RAILWAY CROSSING DESIGN

SCALE

N.T.S.

REVISION

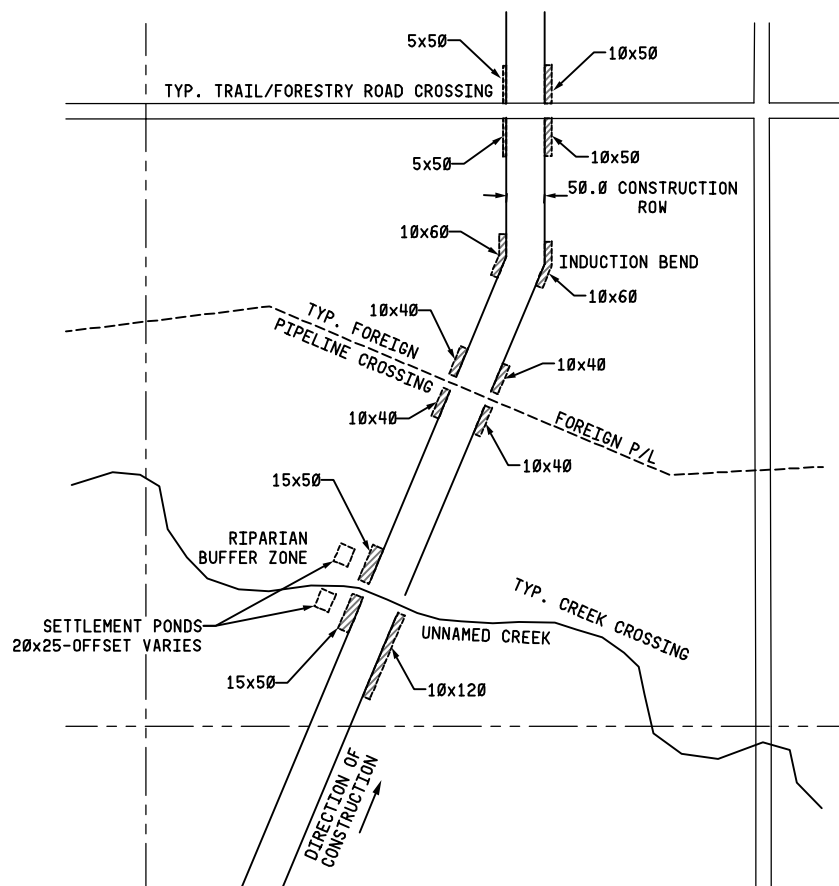
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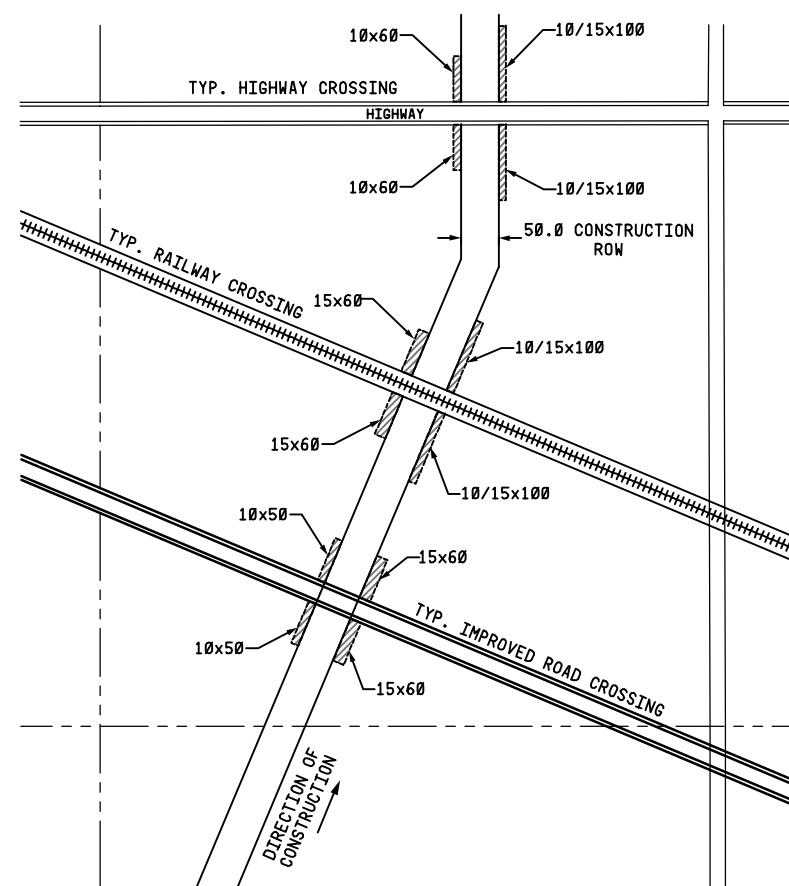
28 MAY 2009

FIGURE NO.

J-19



PLAN



PLAN

NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS SHOWN OTHERWISE.
2. DIMENSIONS ARE APPLICABLE FOR CROSSING INTERSECTING ROW AT OR NEAR 90°. LESSER ANGLES WILL INCREASE LENGTHS.
3. WHERE ROW IS ADJACENT TO AN EXISTING ROW MOST OF THE ETWS WILL BE ON THE ONE SIDE OPPOSITE THE EXISTING LINE.

FIGURE ID

PREPARED FOR



ENBRIDGE NORTHERN GATEWAY PROJECT

TYPICAL EXTRA TEMPORARY WORKSPACE FOR CROSSINGS

SCALE

N.T.S.

REVISION

D

DATE

28 AUG 2009

FIGURE NO.

J-20