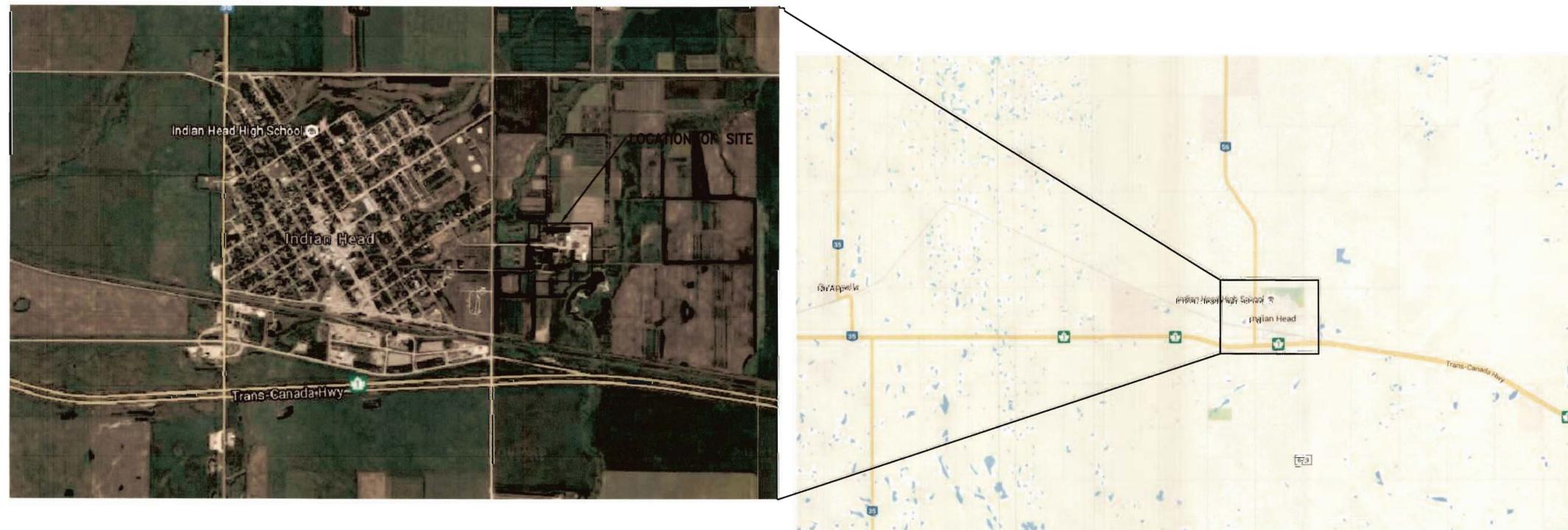


# AGRICULTURE AND AGRI-FOOD CANADA GRADING AND SITE PLAN FOR INDIAN HEAD RESEARCH STATION



DWG No.	DRAWING TITLE:
15-0217-002 C00	COVER PAGE AND DRAWING LIST
15-0217-002 C01	EXISTING TOPOGRAPHY
15-0217-002 C02	REMOVALS PLAN
15-0217-002 C03	DESIGN SITE PLAN
15-0217-002 C04	SUBGRADE GRADING PLAN
15-0217-002 C05	FINISHED SITE GRADING
15-0217-002 C06	DETAILS
15-0217-002 C07	DETAILS
15-0217-002 C08	SPECIFICATIONS
15-0217-002 C09	SPECIFICATIONS
15-0217-002 C10	SPECIFICATIONS
15-0217-002 C11	SPECIFICATIONS

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3	15/07/13	ISSUED FOR CONSTRUCTION	CFS
2	15/07/07	ISSUED FOR REVIEW	CFS
1	15/06/24	ISSUED FOR REVIEW	CFS

DWG. NO. 15-0217-002 C00 REV: 5



KSS24-368  
 File Name: F:\Projects\2015\15-0217-002\Aug-rev3\15-0217-002-C02-REMOVALS.dwg - Tab: C02 Plotted By: jbingaman 06/28/2015 [Fri 9:16am]  
 24,336 PLOT SCALE: 1"=11'



**NOTES:**  
 1. DRAWING DEVELOPED FROM INFORMATION RECEIVED FROM AAFC JUNE 2015

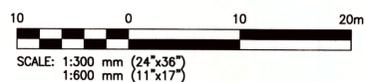
NO.	YY/MM/DD	DESCRIPTION	BY
5	15/08/24	ISSUED FOR CONSTRUCTION	CFS
4	15/08/19	ISSUED FOR REVIEW	CFS
3	15/07/13	ISSUED FOR CONSTRUCTION	CFS
2	15/07/07	ISSUED FOR REVIEW	CFS
1	15/06/23	ISSUED FOR REVIEW	CFS

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PROJECT:  
 GRADING AND SITE PLAN FOR INDIAN HEAD RESEARCH STATION

DWG. DESCRIPTION:  
 REMOVALS PLAN



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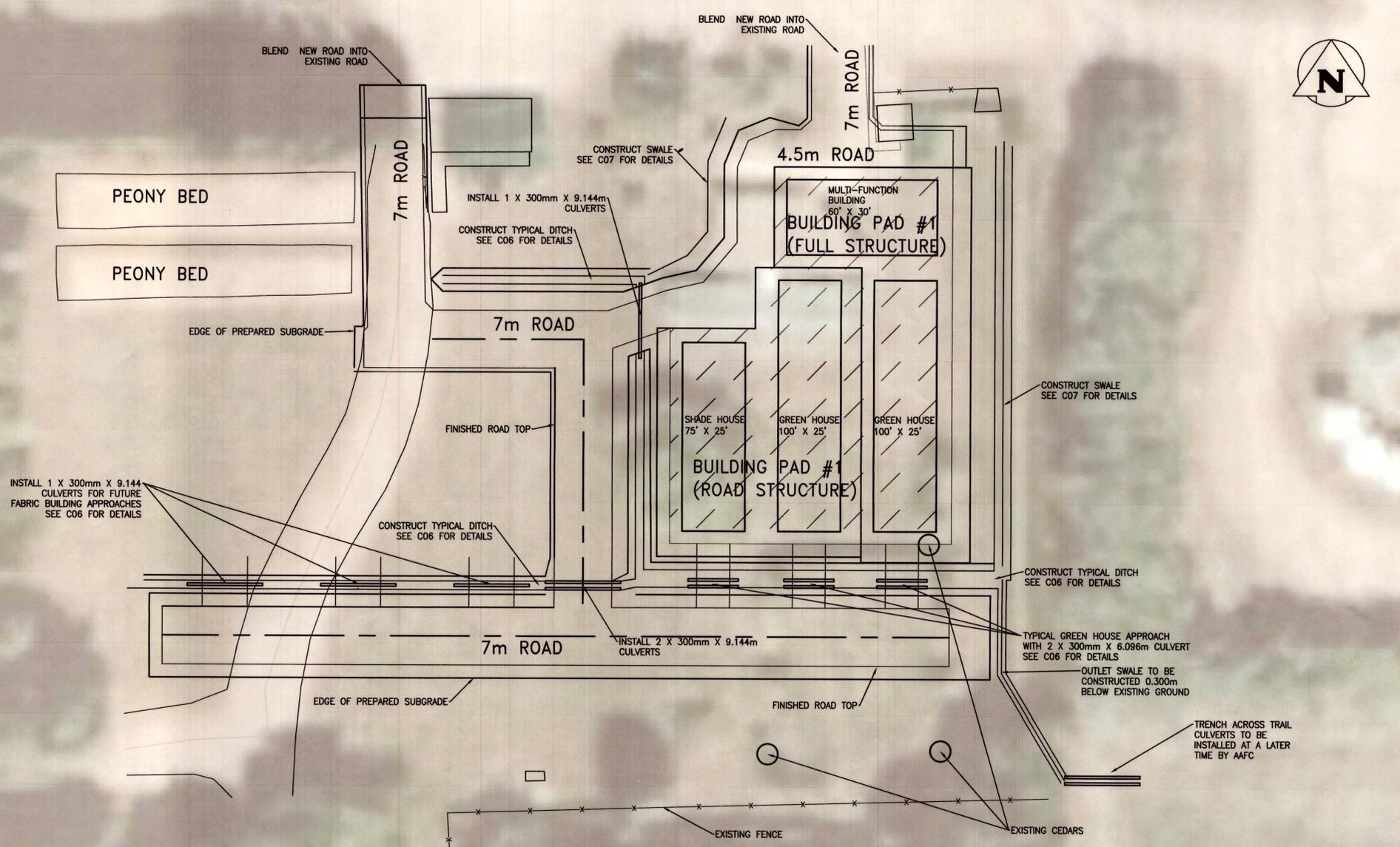


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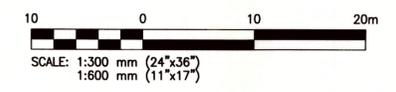
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DRAWN BY:	JJB	DATE:	15/06/23
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DWG. NO.: 15-0217-002 C02 REV: 5

KGS24k368  
 File Name: P:\Projects\2015\15-0217-002\DWG\Mun\Aug-rev\15-0217-002-C03.dwg - Tab: C03 Plotted By: jbingaman 08/28/2015 [Fri 3:27pm]  
 24x36 / PLOT SCALE: 1=1



- NOTES:**
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  2. AFTER BUILDINGS INSTALLED GRADE GROUND AWAY FROM FOUNDATION.
  3. CONSTRUCT DRAINAGE SWALES BETWEEN FABRIC BUILDINGS AND GREENHOUSES AFTER INSTALLATION.
  4. ALL DIMENSIONS IN METRES.
  5. CONTOUR INTERVAL IS 0.100m



NO.	YY/MM/DD	DESCRIPTION	BY
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3	15/07/13	ISSUED FOR CONSTRUCTION	CFS
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 GRADING AND SITE PLAN FOR INDIAN HEAD RESEARCH STATION

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 DESIGN SITE PLAN

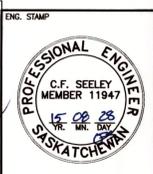
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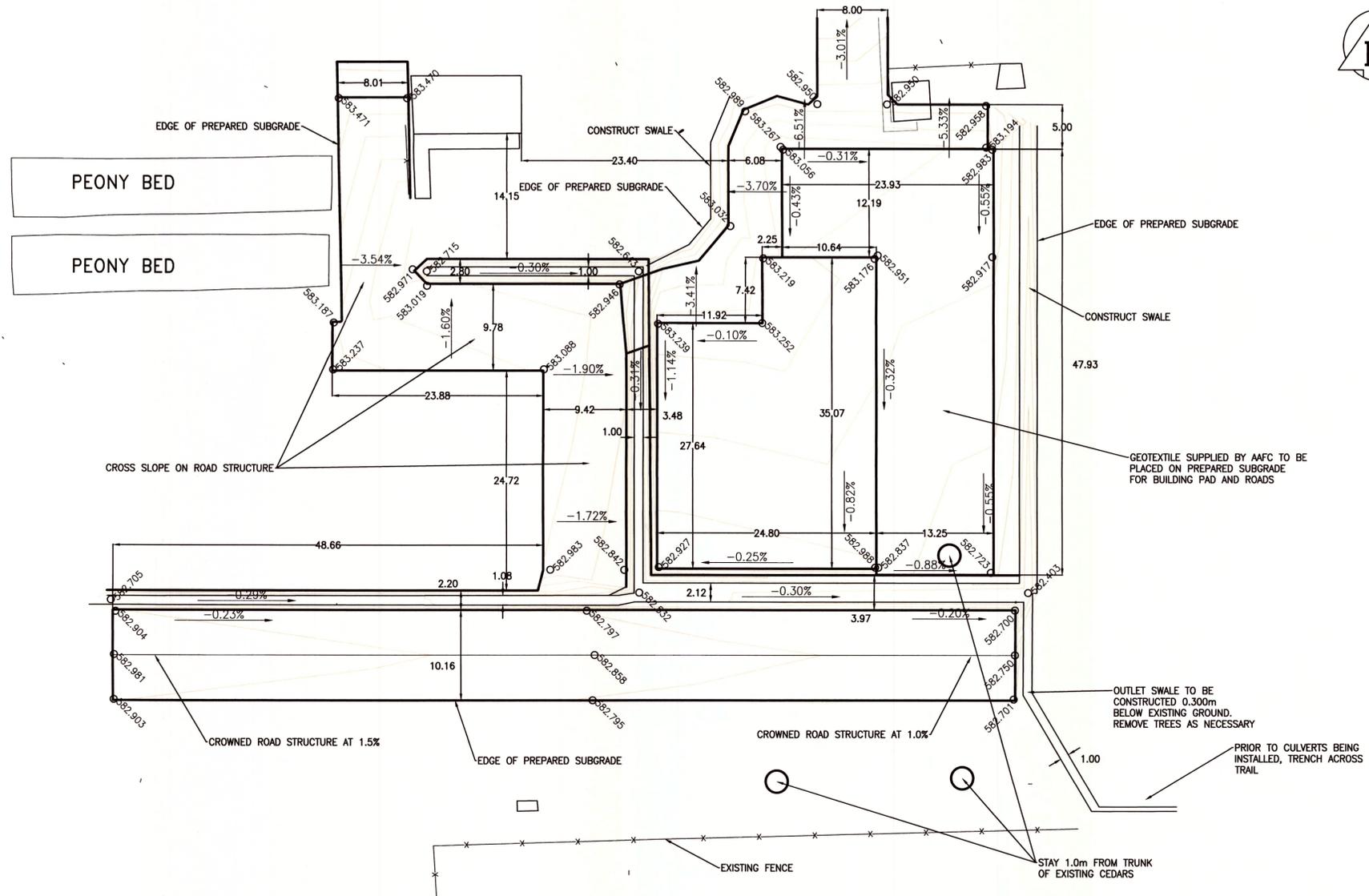
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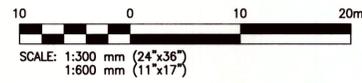
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DWG. NO.:	15-0217-002 C03	REV:	5



- NOTES:**
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  2. AFTER BUILDINGS INSTALLED GRADE GROUND AWAY FROM FOUNDATION.
  3. CONSTRUCT DRAINAGE SWALES BETWEEN FABRIC BUILDINGS AND GREENHOUSES AFTER INSTALLATION.
  4. ALL DIMENSIONS IN METRES.
  5. CONTOUR INTERVAL IS 0.100m



NO.	YY/MM/DD	DESCRIPTION	BY
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4	15/08/19	ISSUED FOR REVIEW	CFS
3	15/07/13	ISSUED FOR CONSTRUCTION	CFS
2	15/07/06	ISSUED FOR REVIEW	CFS
1	15/06/23	ISSUED FOR REVIEW	CFS

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PROJECT:  
**GRADING AND SITE PLAN FOR INDIAN HEAD RESEARCH STATION**

DWG. DESCRIPTION:  
**SUBGRADE GRADING PLAN**

**KGS GROUP**  
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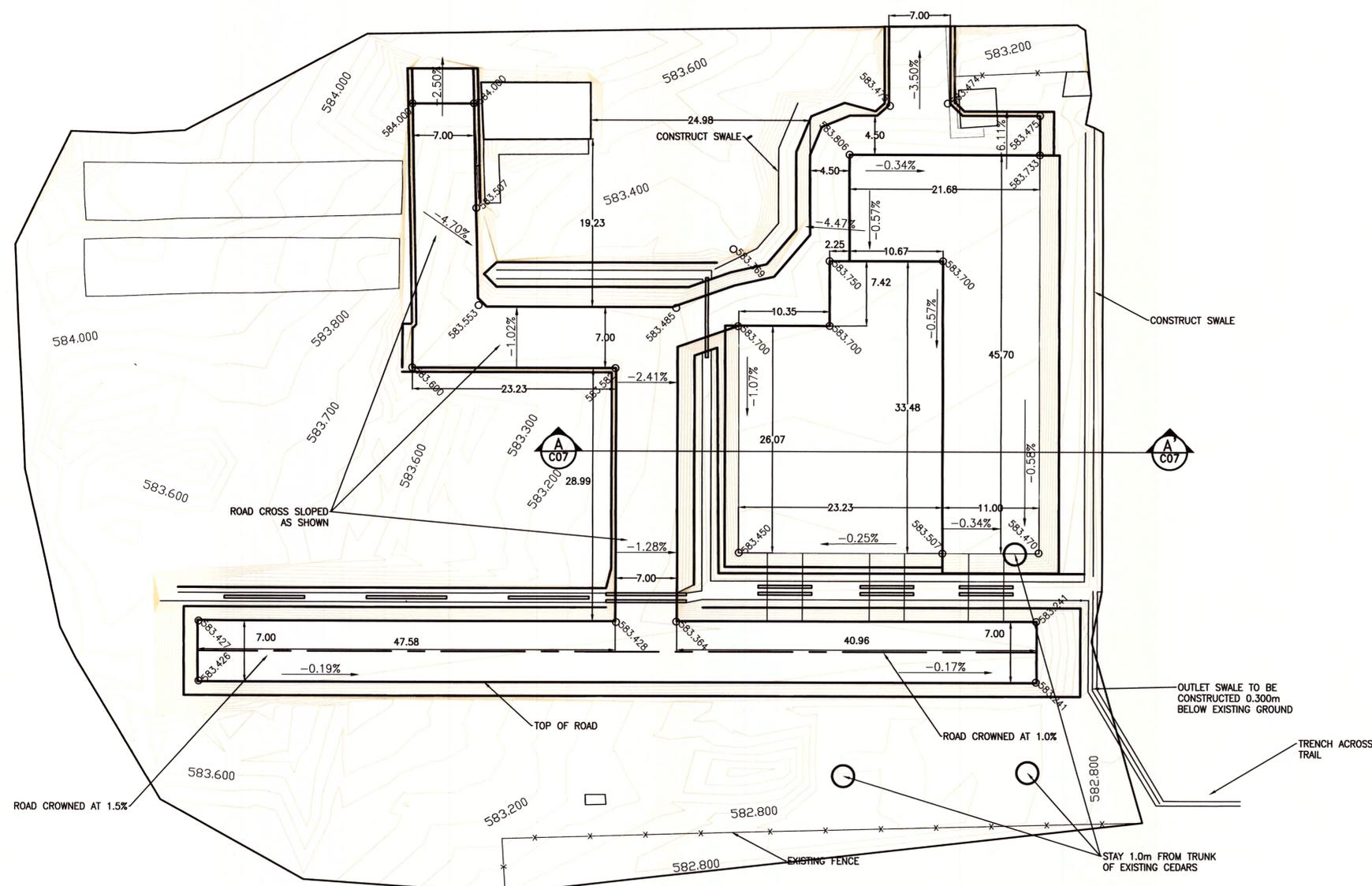
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DWG. NO.:	15-0217-002 C04	REV:	5

KGS24-368  
 File Name: P:\Projects\2015\15-0217-002\Drawings\15-0217-002-C05-rev3.dwg - Tab: C05 Plotted By: jhngman 08/28/2015 [Fri 3:32pm]  
 24 x 36 / Plot Scale: 1"=1'

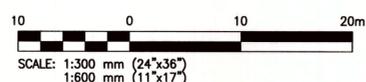


- NOTES:**
1. DRAWING DEVELOPED FROM SURVEY AND LIDAR INFORMATION RECEIVED FROM AAFC JUNE 2015.
  2. AFTER BUILDINGS INSTALLED GRADE GROUND AWAY FROM FOUNDATION.
  3. CONSTRUCT DRAINAGE SWALES BETWEEN FABRIC BUILDINGS AND GREENHOUSES AFTER INSTALLATION.
  4. ALL DIMENSIONS IN METRES.
  5. CONTOUR INTERVAL IS 0.100m
  6. CULVERT SLOPE TO MATCH DITCH SLOPE
  7. GRADE EDGES OF PAD AND ROAD AT 3:1 TO MATCH EXISTING GROUND

CUT VOLUME: 450m<sup>3</sup>  
 FILL VOLUME: 650m<sup>3</sup>  
 COMPACTION FACTOR: 1.2  
 NET FILL: 240m<sup>3</sup>

**MATERIALS**

WORK ITEM	ESTIMATED QUANTITY
TOPSOIL STRIPPING	3625 m <sup>3</sup>
IMPORTED SUBGRADE	200 m <sup>3</sup>
COMPACTED EMBANKMENT	650 m <sup>3</sup>
WASTE EXCAVATION	50 m <sup>3</sup>
SUB-BASE	1250 m <sup>3</sup>
BASE	475 m <sup>3</sup>
ROAD GRAVEL	175 m <sup>3</sup>
RIP RAP	45 m <sup>3</sup>
CULVERTS (300mm)	91 m
GEOTEXTILE	SUPPLIED BY AAFC
TOPSOIL SPREADING AND SEEDING	EXCLUDED FROM CONTRACT



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2	15/07/06	ISSUED FOR REVIEW	CFS
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PROJECT:  
**GRADING AND SITE PLAN FOR INDIAN HEAD RESEARCH STATION**

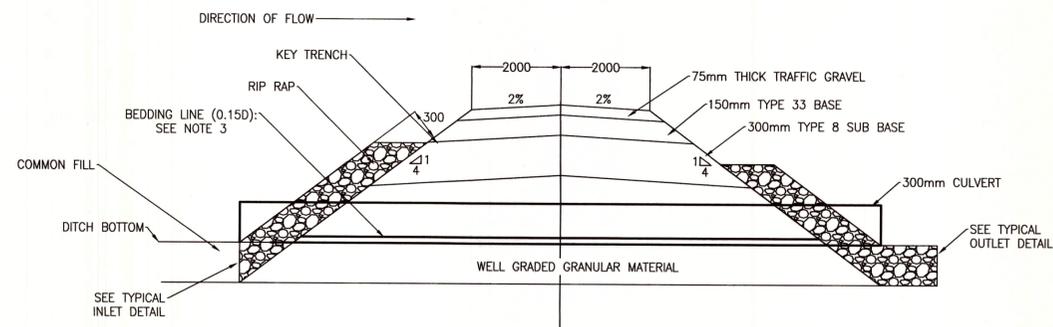
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**FINISHED SITE GRADING**

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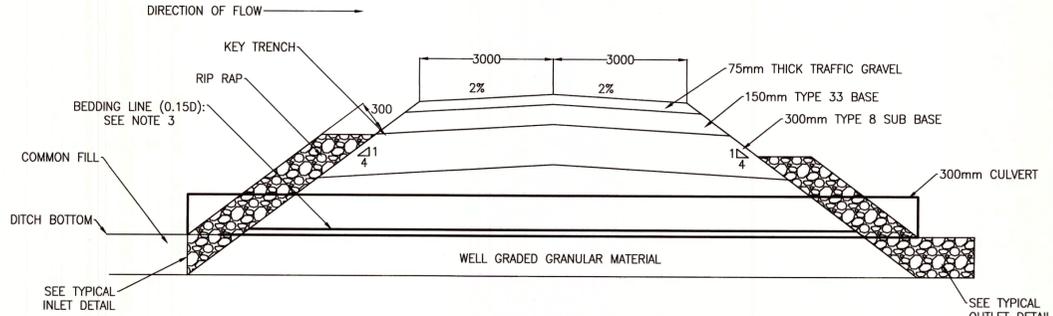


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JJB	YY/MM/DD
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JJB	15/08/21
DWG NO.:	REV:
15-0217-002 C05	5

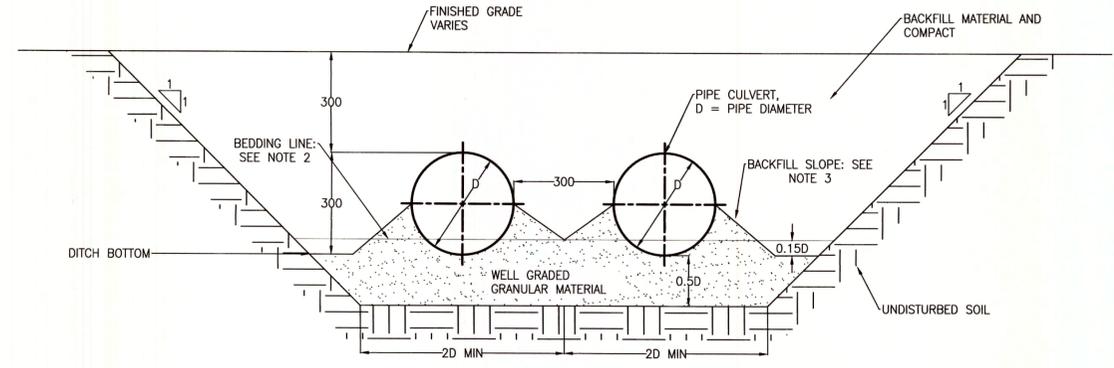
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 File Name: P:\Projects\2015\15-0217-002\_Dwg\Mun\Aug-rev\15-0217-002-C06-007-DETAILS.dwg - Tab: C06 Plotted By: jbingaman 08/28/2015 [Fr 3:34pm]  
 24.336 / PLOT SCALE: 1=1



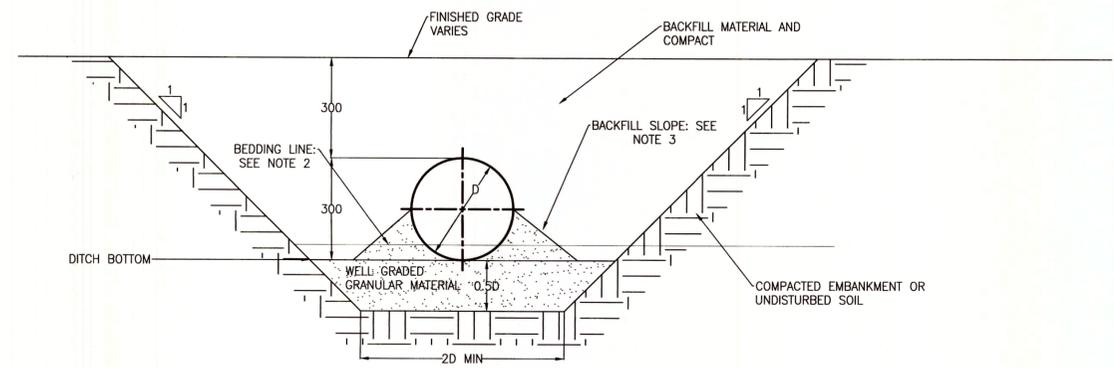
**TYPICAL GREEN HOUSE APPROACH PROFILE**  
 HORIZ: 1:75 VERT: 1:25



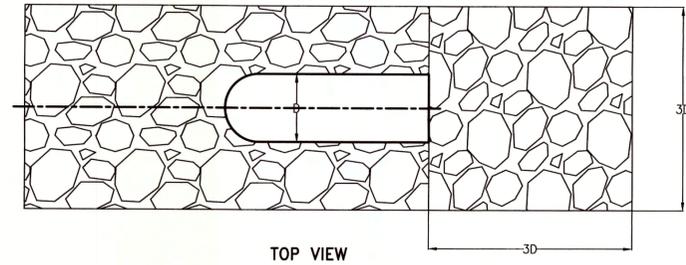
**TYPICAL FABRIC BUILDING APPROACH PROFILE**  
 HORIZ: 1:75 VERT: 1:25



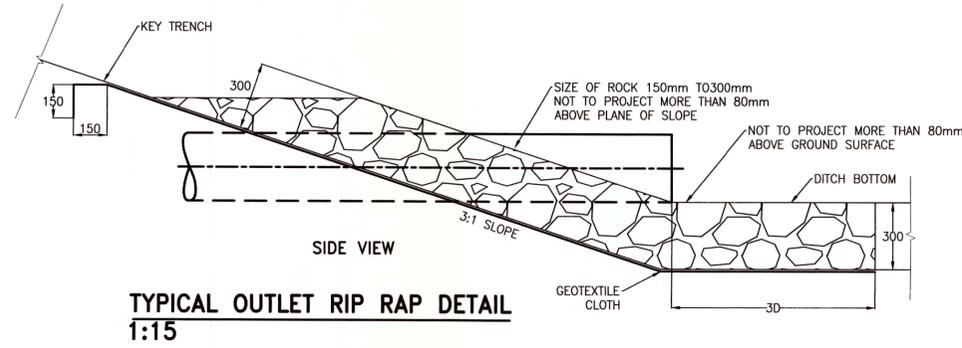
**TYPICAL GREEN HOUSE APPROACH CROSS SECTION**  
 1:10



**TYPICAL FABRIC BUILDING APPROACH CROSS SECTION**  
 1:10



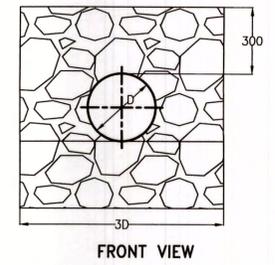
TOP VIEW



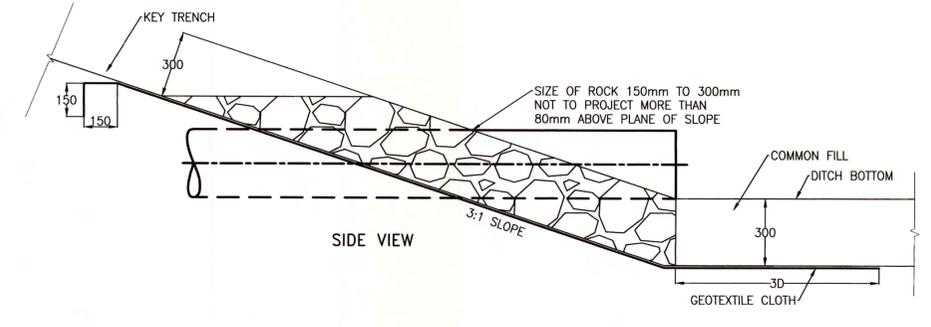
**TYPICAL OUTLET RIP RAP DETAIL**  
 1:15

**NOTES:**

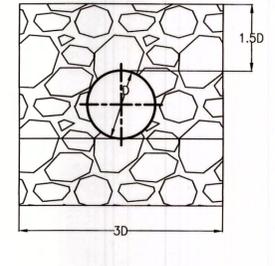
1. THE INSTALLATION DETAILS SHALL APPLY TO ROADBED CULVERTS AND CULVERTS IN APPROACHES UTILIZING EARTH BACKFILL.
2. BACKFILLING AND COMPACTION OF EARTH AND GRANULAR BACKFILL IS TO BE COMPLETED UP TO THE BEDDING LINE PRIOR TO SHAPING THE BEST TO FIT THE BOTTOM OF THE PIPE.
3. THE MATERIAL IN THE TRIANGULAR WEDGE ABOVE THE BEDDING LINE SHALL BE COMPACTED WITH MECHANICAL IMPACT TAMPERS.
4. THE EARTH BACKFILL SLOPE SHALL NOT BE LESS THAN 2 HORIZONTAL TO 1 VERTICAL.
5. ALL DIMENSIONS IN MILLIMETRES



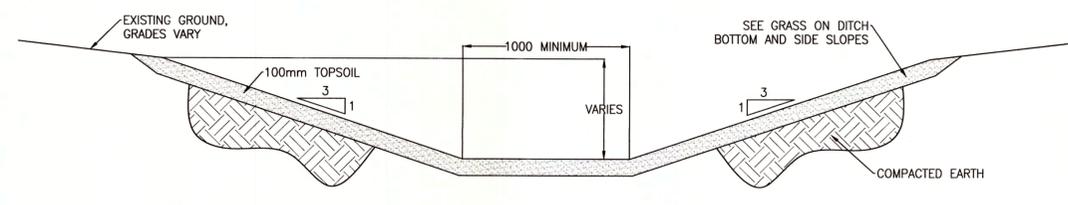
FRONT VIEW



**TYPICAL INLET RIP RAP DETAIL**  
 1:15



FRONT VIEW



**TYPICAL DITCH SECTION**  
 1:20

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PROJECT:  
**GRADING AND SITE PLAN FOR INDIAN HEAD RESEARCH STATION**

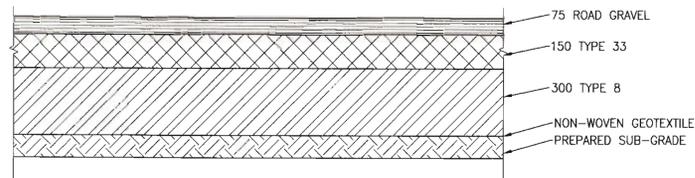
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CFS	15/06/23
DESIGN CHECK:	DATE:
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DRAWN BY:	DATE:
JJB	15/06/23
DWG CHECK:	DATE:
YY/MM/DD	

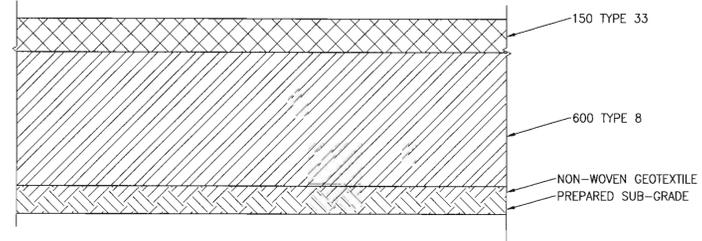
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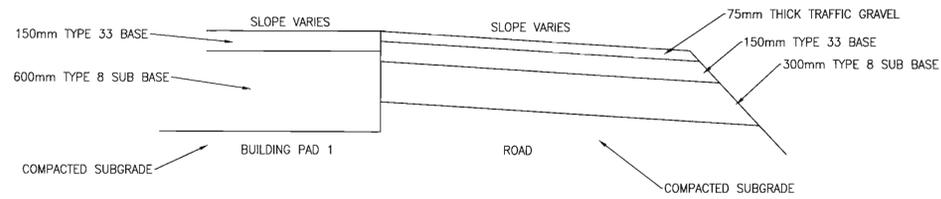
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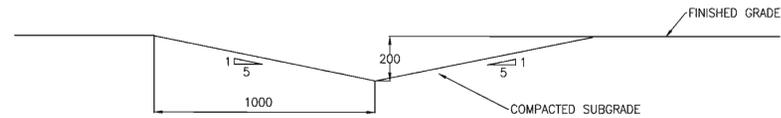
**ROAD STRUCTURE**



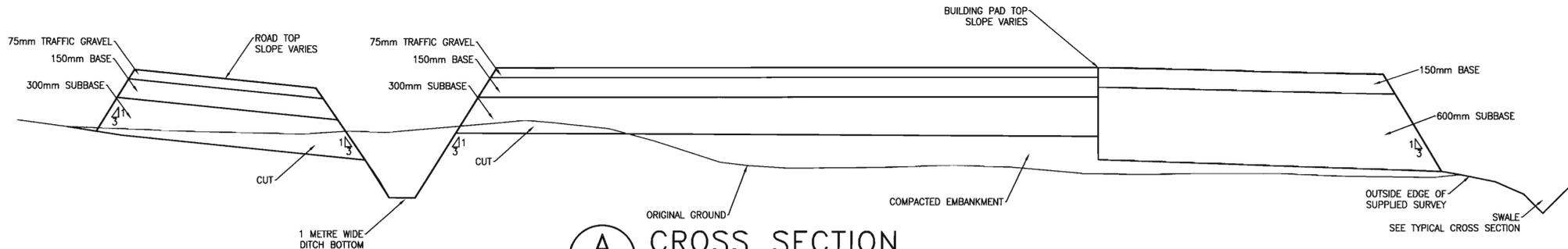
**PARTIAL BUILDING PAD 1 STRUCTURE (FULL STRUCTURE)**



**TYPICAL NORTH AND NORTH WEST SIDE BUILDING PAD 1**  
 HORIZ: 1:75 VERT: 1:25



**TYPICAL SWALE CROSS SECTION**  
 1:15



**A CROSS SECTION**  
 C05 H: 1:100 V:1:20

NO.	YY/MM/DD	DESCRIPTION	BY
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3	15/07/13	ISSUED FOR CONSTRUCTION	CFS
2	15/07/07	ISSUED FOR REVIEW	CFS
1	15/06/24	ISSUED FOR REVIEW	CFS

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**GRADING AND SITE PLAN FOR INDIAN HEAD RESEARCH STATION**

DETAILS

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KGS24368  
 File Name: C:\Projects\2015\15-0217-002\Drawings\ISSUED FOR REVIEW\15-0217-002-C08-11-SPECS.dwg - Tab: C08 Plotted By: morthmer 07/15/2015 [Wed 11:37am]  
 24 308 7/15/15

## PIPE CULVERTS

1. MATERIAL CERTIFICATION
  - 1.1. CERTIFICATION TO BE MARKED ON PIPE.
2. CORRUGATED HDPE PIPE WITH SMOOTH INTERIOR
  - 2.1. TO CSA B182.8.
  - 2.2. WATER TIGHT COUPLERS.
  - 2.3. PREFABRICATED END SECTIONS.
  - 2.4. SOLID WALL 210kPa STIFFNESS .
  - 2.5. BOSS 2000 OR EQUIVALENT WITH ULTRA SLAB 75. COUPLERS OR EQUIVALENT.
3. GRANULAR BEDDING AND BACKFILL
  - 3.1. DO GRANULAR BEDDING AND BACKFILL IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS.
4. TRENCHING
  - 4.1. DO TRENCHING WORK IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS.
5. BEDDING
  - 5.1. DE-WATER EXCAVATION, AS NECESSARY, TO ALLOW PLACEMENT OF CULVERT BEDDING IN THE DRY.
  - 5.2. PLACE MINIMUM THICKNESS OF 100mm OF APPROVED GRANULAR MATERIAL ON BOTTOM OF EXCAVATION AND COMPACT TO MINIMUM 95% OF CORRECTED MAXIMUM DRY DENSITY.
  - 5.3. SHAPE BEDDING TO FIT LOWER SEGMENT OF PIPE EXTERIOR SO THAT AT LEAST 50% OF PIPE DIAMETER IS IN CLOSE CONTACT WITH BEDDING AND TO CAMBER AS INDICATED OR AS DIRECTED BY OWNER OR ENGINEER, FREE FROM SAGS OR HIGH POINTS.
  - 5.4. PLACE BEDDING IN UNFROZEN CONDITION.
6. LAYING CORRUGATED HDPE CULVERTS
  - 6.1. COMMENCE PIPE PLACING AT DOWNSTREAM END.
  - 6.2. ENSURE BOTTOM OF PIPE IS IN CONTACT WITH THE SHAPED BED OR COMPACTED FILL THROUGHOUT ITS LENGTH.
  - 6.3. LAY PIPE WITH OUTSIDE CIRCUMFERENTIAL LAPS FACING UPSTREAM AND LONGITUDINAL LAPS OR SEAMS AT SIDE OR QUARTER POINTS.
  - 6.4. LAY PAVED INVERT OR PARTIALLY LINED PIPE WITH LONGITUDINAL CENTER LINE OF PAVED SEGMENT COINCIDING WITH FLOW LINE.
  - 6.5. DO NOT ALLOW WATER TO FLOW THROUGH PIPES DURING CONSTRUCTION EXCEPT AS PERMITTED BY ENGINEER OR OWNER.
7. JOINTS: CORRUGATED HDPE PIPE CULVERTS
  - 7.1. CORRUGATED HDPE PIPE:
    - 7.1.1. LUBRICATE GASKET
    - 7.1.2. PUSH PIPE INTO THE BALLED END TO THE ORANGE SEATING MARK.
8. BACKFILLING
  - 8.1. BACKFILL AROUND AND OVER CULVERTS AS INDICATED OR AS DIRECTED BY ENGINEER OR OWNER.
  - 8.2. PLACE GRANULAR BACKFILL MATERIAL, IN 150mm LAYERS TO FULL WIDTH, ALTERNATELY ON EACH SIDE OF CULVERT, SO AS NOT TO DISPLACE IT Laterally OR VERTICALLY.

- 8.3. COMPACT EACH LAYER TO 95% CORRECTED MAXIMUM DRY DENSITY TAKING SPECIAL CARE TO OBTAIN REQUIRED DENSITY UNDER HAUNCHES.
- 8.4. PROTECT INSTALLED CULVERT WITH MINIMUM 300mm COVER OF COMPACTED FILL BEFORE HEAVY EQUIPMENT IS PERMITTED TO CROSS. DURING CONSTRUCTION, WIDTH OF FILL, AT ITS TOP, TO BE AT LEAST TWICE DIAMETER OR SPAN OF PIPE AND WITH SLOPES NOT STEEPER THAN 1:2.
- 8.5. PLACE BACKFILL IN UNFROZEN CONDITION.

## RIP-RAP

1. STONE
  - 1.1. HARD, DENSE, DURABLE QUARRY STONE, FREE FROM SEAMS, CRACKS OR OTHER STRUCTURAL DEFECTS, TO MEET FOLLOWING SIZE DISTRIBUTION FOR USE INTENDED:
    - 1.1.1. HAND PLACED RIP RAP:
      - 1.1.1.1. MINIMUM SIZE OF INDIVIDUAL STONES 100 mm DIAMETER.
      - 1.1.1.2. NOT LESS THAN 75% OF TOTAL VOLUME OF STONES WITH DIAMETER OF 150 mm.
      - 1.1.1.3. SUPPLY ROCK SPALLS OR COBBLES TO FILL OPEN JOINTS.
2. GEOTEXTILE FILTER
  - 2.1. AS NOTED ON DETAILS
3. PLACING
  - 3.1. WHERE RIP RAP IS TO BE PLACED ON SLOPES, EXCAVATE TRENCH AT TOE OF SLOPE TO DIMENSIONS AS INDICATED.
  - 3.2. FINAL GRADE AREA TO BE RIP RAPPED TO UNIFORM, EVEN SURFACE. FILL DEPRESSIONS WITH SUITABLE MATERIAL AND COMPACT TO PROVIDE FIRM BED.
  - 3.3. PLACE GEOTEXTILE ON PREPARED SURFACE AS INDICATED. AVOID PUNCTURING GEOTEXTILE. VEHICULAR TRAFFIC OVER GEOTEXTILE NOT PERMITTED.
  - 3.4. PLACE RIP RAP TO THICKNESS AND DETAILS AS INDICATED.
  - 3.5. PLACE STONES IN MANNER APPROVED BY OWNER OR ENGINEER TO SECURE SURFACE AND CREATE A STABLE MASS. PLACE LARGER STONES AT BOTTOM OF SLOPES.
  - 3.6. HAND PLACING:
    - 3.6.1. USE LARGER STONES FOR LOWER COURSES AND AS HEADERS FOR SUBSEQUENT COURSES.
    - 3.6.2. STAGGER VERTICAL JOINTS AND FILL VOIDS WITH ROCK SPALLS OR COBBLES.
    - 3.6.3. FINISH SURFACE EVENLY, FREE OF LARGE OPENINGS AND NEAT IN APPEARANCE.

## SUB-GRADE PREP

1. GENERAL
  - 1.1. WORK INCLUDED
    - 1.1.1. PLACE AND COMPACT SELECTED FILL MATERIAL TO DESIGN SUB-GRADE ELEVATIONS USING STOCKPILED MATERIAL OR SUITABLE MATERIAL BEING EXCAVATED FROM OTHER AREAS.
    - 1.1.2. EXCAVATE, SCARIFY, COMPACT, WATER OR DRY, AND SHAPE SUB-GRADE TO LINES AND GRADES.
    - 1.1.3. PROVISION OF ALL PLANT, LABOUR, AND EQUIPMENT FOR TESTING.
2. MATERIALS
  - 2.1. COMMON EXCAVATION
    - 2.1.1. MATERIAL SHALL CONSIST OF ALL NON-ORGANIC MATERIALS SUCH AS CLAY, HARDPAN, SHALE, SILT, SAND, GRAVEL, AND ANY MATERIAL OTHER THAN ROCK.
  - 2.2. WASTE EXCAVATION
    - 2.2.1. EXCAVATION OF MATERIALS CONSIDERED NOT SUITABLE FOR SUB-GRADE.
  - 2.3. WASTE OVER EXCAVATION
    - 2.3.1. ALL MATERIALS BELOW THE DESIGN SUB-GRADE, OR AS STAKED BY THE OWNER OR ENGINEER CONSIDERED NOT SUITABLE FOR SUB-GRADE.
3. EXECUTION
  - 3.1. COMMON EXCAVATION
    - 3.1.1. ALL MATERIAL SHALL BE REMOVED, BY AN APPROVED METHOD, TO THE DESIGN SUB-GRADE, OR AS STAKED BY THE OWNER OR ENGINEER.
    - 3.1.2. SCARIFY THE TOP 150mm OF SUB-GRADE AND COMPACT TO A MINIMUM OF 100% OF STANDARD PROCTOR DENSITY.
    - 3.1.3. EXCAVATED MATERIAL, WHICH IS SUITABLE FOR SUB-GRADE FILL SHALL BE STOCKPILED FOR FUTURE USE OR HAULED DIRECTLY TO OTHER LOCATIONS REQUIRING FILL.
    - 3.1.4. DURING EXCAVATION THE CONTRACTOR SHALL ARRANGE SUCH TEMPORARY DRAINAGE AS IS NECESSARY TO PREVENT THE SUB-GRADE FROM BECOMING SATURATED.
    - 3.1.5. A BLADE GRADER SHALL BE USED IN CONJUNCTION WITH EXCAVATION EQUIPMENT, AS DIRECTED BY THE ENGINEER, TO TRIM THE SUB-GRADE TO THE REQUIRED LINES AND LEVELS BEFORE SUB-GRADE PREPARATION OR BACKFILL OPERATIONS COMMENCE.
  - 3.2. WASTE OVER EXCAVATION
    - 3.2.1. THESE AREAS ARE TO BE IDENTIFIED TO THE ENGINEER OR OWNER PRIOR TO REMOVAL.

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CLIENT:  
**AGRICULTURE AND AGRI-FOOD CANADA**

PROJECT:  
**GRADING AND SITE PLAN FOR INDIAN HEAD RESEARCH STATION**

DWG. DESCRIPTION:  
**SPECIFICATIONS**

**KGS GROUP**  
CONSULTING ENGINEERS

Association of Professional Engineers & Geoscientists of Saskatchewan  
CERTIFICATE OF AUTHORIZATION  
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 24 x 36 / PLOT SCALE: 1"=1'

- 3.2.2. UPON REMOVAL OF THE MATERIAL, THE AREA WILL BE BACKFILLED TO DESIGN SUB-GRADE, OR AS STAKED BY THE ENGINEER OR OWNER.
- 3.2.3. BACKFILL AREA WILL BE CONSTRUCTED AS PER SUB-GRADE CONSTRUCTION EXECUTION.
- 3.3. TEMPORARY DISPOSAL AREAS
  - 3.3.1. AREAS WHICH MAY BE USED FOR DISPOSING OF SURPLUS OR UNSUITABLE SUB-GRADE MATERIAL SHALL BE AUTHORIZED BY THE OWNER.
  - 3.3.2. OTHER DISPOSALS AREAS MAY BE ARRANGED FOR BY THE CONTRACTOR
  - 3.3.3. ALL ARRANGEMENTS FOR USE OF THE AREAS SHOWN OR OTHER PROPOSED DISPOSAL AREAS SHALL BE APPROVED BY THE ENGINEER OR OWNER.
  - 3.3.4. ALL DISPOSAL AREAS SHALL BE LEFT IN A NEAT AND TIDY CONDITION SATISFACTORY TO THE ENGINEER AND OWNER.
  - 3.3.5. DISPOSE OF WASTE MATERIAL AND WASTE OVER EXCAVATION AS DIRECTED BY THE OWNER.
- 3.4. PILING EXCAVATED MATERIAL
  - 3.4.1. EXCAVATED MATERIAL SHALL BE PILED IN SUCH A MANNER THAT IT WILL NOT ENDANGER PERSONS, THE WORK, OR ADJACENT PROPERTIES.
  - 3.4.2. IF THE CONSTRUCTION SITE IS SUCH THAT STOCKPILING OF EXCAVATED MATERIAL ADJACENT TO THE SITE IS NOT ACCEPTABLE, THE CONTRACTOR SHALL HAUL THE MATERIAL TO AN APPROVED LOCATION.
  - 3.4.3. EXTRA COMPENSATION WILL NOT BE MADE FOR THIS WORK UNLESS SPECIFIC REFERENCE IS MADE ELSEWHERE IN THE SPECIFICATIONS.
  - 3.4.4. ROADWAYS, DRIVEWAYS AND DRAINAGE FACILITIES SHALL NOT BE BLOCKED UNNECESSARILY.
- 3.5. SUB-GRADE PREPARATION
  - 3.5.1. ONLY SELECTED SUB-GRADE MATERIALS, APPROVED BY THE ENGINEER OR OWNER, SHALL BE USED IN THE CONSTRUCTION OF THE SUB-GRADE FILLS OR EMBANKMENT.
  - 3.5.2. THE FULL DEPTH OF FILLS SHALL BE CONSTRUCTED IN LAYERS NOT EXCEEDING 150mm IN LOOSE THICKNESS.
  - 3.5.3. EACH LAYER SHALL BE COMPACTED TO 100% STANDARD PROCTOR DRY DENSITY (ASTM D698) AT A MOISTURE CONTENT OF OPTIMUM TO  $\pm 3\%$  OF OPTIMUM.
  - 3.5.4. SILTS, CLAYS, OR OTHER SOILS WHICH CANNOT BE COMPACTED TO THE SPECIFIED DENSITY BECAUSE OF HIGH MOISTURE CONTENT SHALL NOT BE USED UNLESS THEY ARE DRIED TO THEIR OPTIMUM MOISTURE CONTENT.

- 3.5.5. THE PLACING OF FROZEN MATERIALS IN FILL AREAS WILL NOT BE PERMITTED.
- 3.5.6. NO TOPSOIL OR OTHER ORGANIC WILL BE ALLOWED WITHIN THE STRUCTURE.
- 3.6. FINISHING
  - 3.6.1. THE FINISHED COMPACTED SUB-GRADES SHALL BE CONSTRUCTED TO A TOLERANCE OF  $\pm 0.01$  METER. IT SHALL CLOSELY MATCH THE DESIGN PROFILE OF THE PAD AND ROADWAY FINISHED SURFACE.
  - 3.6.2. THE FINAL SUB-GRADE SHALL BE TIGHT AND SMOOTH SURFACE TRUE TO GRADE AND CROSS-SECTION, AND FREE FROM IRREGULARITIES CAUSED BY COMPACTION EQUIPMENT.
  - 3.6.3. PROOF ROLL THE COMPACTED SURFACE TO IDENTIFY SOFT SPOTS.
  - 3.6.4. LOCAL SOFT SPOTS THAT DEVELOP IN THE FINISHED SUB-GRADE SHALL BE CORRECTED BY EXCAVATING THE INFERIOR MATERIAL TO AN ADDITIONAL 600mm.
  - 3.6.5. REPLACE THE EXCAVATED AREA WITH TYPE 8 MATERIAL TO 98% STANDARD PROCTOR MAXIMUM DRY DENSITY.
  - 3.6.6. IF FOUND NECESSARY TO HAUL MATERIAL OVER PREPARED SUB-GRADE, ALL CUTS, RUTS, AND BREAKS IN THE SURFACES AS A RESULT SHALL BE REPAIRED TO THE OWNER'S OR ENGINEER'S SATISFACTION IMMEDIATELY PRECEDING THE PLACEMENT OF SUB-BASE OR GEOTEXTILE.
  - 3.6.7. FINAL COMPACTION OF THE SUB-GRADE SURFACE SHALL BE DONE WITH PNEUMATIC-TIRE ROLLERS.
  - 3.6.8. ROLLING SHALL BE CONTINUED UNTIL ALL LOOSE SOIL IS PROPERLY COMPACTED TRUE TO GRADE AND CROSS SECTION BEFORE SUB-BASE COURSE IS PLACED.
  - 3.6.9. GRAVEL PAD EDGED SHALL BE LEVELED AND GRADED FOLLOWING THE COMPLETION OF CONSTRUCTION. GRADING SHALL COVER THE OUTSIDE EDGES OF THE SUB-GRADE, BASE COURSE, AND GRAVEL PAD AS SHOWN ON THE DRAWINGS, OR AS DIRECTED BY THE ENGINEER OR OWNER.
- 3.7. PROJECT CLEANUP
  - 3.7.1. EXISTING AND NEWLY CONSTRUCTED DRAINAGE DITCHES, WATERWAYS, CULVERTS, AND OTHER UTILITIES SHALL BE CLEANED OUT TO REMOVE ANY OBSTRUCTION CAUSED BY THE CONSTRUCTION OPERATION.
  - 3.7.2. LOOSE ROCKS, BOULDERS, AND DEBRIS RESULTING FROM THE CONTRACTORS OPERATIONS SHALL BE REMOVED AND DISPOSED OF AS DIRECTED BY THE ENGINEER OR OWNER.

### SUB-BASE/BASE COURSE

- 1. GENERAL
  - 1.1. WORK INCLUDED
    - 1.1.1. INSTALLATION OF GEOTEXTILE MATERIAL(S) TO BE SUPPLIED BY OWNER.
    - 1.1.2. SUPPLY AND HAULING OF GRANULAR SUB-BASE AND BASE COURSE MATERIALS.
    - 1.1.3. SPREADING OF GRANULAR AND SUB-BASE MATERIALS BASE COURSE AND SUB-BASE MATERIALS TO THE GRADE LINES AND CROSS-SECTIONS AS SHOWN ON THE PLAN.
    - 1.1.4. OBTAINING AGGREGATE BEFORE PUGMILLING, AND MIXING AFTER PUGMILLING.
    - 1.1.5. COMPACTING OF SUB-BASE COURSE MATERIAL ON A PREPARED SUB-GRADE OR GEO SYNTHETIC.
    - 1.1.6. COMPACTING OF BASE COURSE MATERIAL ON A PREPARED SUB-BASE COURSE.
    - 1.1.7. SUPPLY AND INSTALLATION OF TRAFFIC GRAVEL
- 2. MATERIALS
  - 2.1. GRADATION - BASE COURSE DEFINITION: THE BASE AGGREGATE SHALL BE COMPOSED OF - GRANULAR TYPE: FRAGMENTS OF CRUSHED, DURABLE ROCK FREE FROM UNDESIRABLE QUANTITIES OF SOFT OR FLAKY PARTICLES, LAOM, AND ORGANIC OR OTHER DELETERIOUS MATERIAL.
    - 2.1.1. BASE COURSE SHALL COMPLY WITH THE REQUIREMENTS LISTED IN TABLE 1, WHEN TESTED ACCORDING TO ASTM C135, METHOD OF TEST FOR SIEVE ANALYSIS.
      - 2.1.1.1. TABLE 1 - BASE TYPE 33

SIEVE SIZE	PERCENT PASSING
25.0mm	
20.0mm	100
12.5mm	81-100
5.00mm	50-80
2.0mm	32-52
800µm	18-33
400µm	15-25
160µm	11-19
80µm	7-11
PLASTICITY INDEX	0-6

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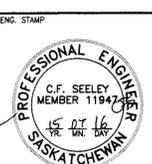
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 24"x36"/Plot SCALE: 1"=1'

2.1.1.2. IF THE LIFT OF BASE COURSE IS LESS THAN EIGHT CENTIMETERS (8cm), THE MAXIMUM PARTICLE SIZE SHALL NOT BE GREATER THAN ONE-HALF (1/2) THE DEPTH OF THE LIFT.

2.1.1.2.1. TABLE 2 - SUB-BASE TYPE 8

SIEVE	TYPE 8
50	100
2	0-90
400mm	0-60
160	0-25
71	0-15
PI	0-6

2.1. GRADATION - SUB-BASE COURSE

2.1.1. DEFINITION: THE SUB-BASE SHALL BE COMPOSED OF DURABLE ROCK, FREE FROM INJURIOUS QUANTITIES OF SOFT OR FLACKY PARTICLES, SHALE, LOAM, AND ORGANIC OR OTHER DELETERIOUS MATERIAL.

2.1.2. SUB-BASE COURSE SHALL COMPLY WITH THE REQUIREMENTS LISTED IN TABLE 2 WHEN TESTED ACCORDING TO ASTM C135, METHOD OF TEST FOR SIEVE ANALYSIS.

2.2. TRAFFIC GRAVEL

2.2.1. TRAFFIC GRAVEL SHALL BE COMPOSED OF FRAGMENTS OF DURABLE ROCK, FREE FROM UNDESIRABLE QUANTITIES OF SOFT OR FLAKY PARTICLES, LOAM, OR OTHER DELETERIOUS MATERIAL WITH THE FOLLOWING GRADATION.

2.2.1.1. TABLE 3 - TRAFFIC GRAVEL

SIEVE SIZE	PERCENT PASSING
14mm	100
5mm	50-80
2mm	30-60
400µm	15-30
80µm	5-15

2.2.2. MINIMUM PERCENT OF FRACTURED FACES RETAINED ON THE 5.0mm SIEVE - 25%, BY WEIGHT.

2.3. GEOSYNTHETIC MATERIALS

2.3.1. A LIGHT NON-WOVEN GEOTEXTILE SHALL BE USED FOR SEPARATION AND REINFORCEMENT.

2.3.2. GEOTEXTILE SUPPLIED BY OWNER.

2.4. STORAGE AND HANDLING.

2.4.1. GEOSYNTHETIC ROLLS SHALL BE FURNISHED WITH SUITABLE WRAPPING FOR PROTECTION AGAINST MOISTURE AND EXTENDED ULTRA-VIOLET EXPOSURE PRIOR TO PLACEMENT. IF STORED OUTDOORS, THEY SHALL BE ELEVATED AND PROTECTED WITH A WATERPROOF COVER.

2.5. WATER

2.5.1. WATER SHALL BE REASONABLY CLEAN AND FREE FROM SUBSTANCES, WHICH MIGHT RENDER IT UNFIT FOR USE.

3. EXECUTION

3.1. GEOSYNTHETIC MATERIALS APPLICATION

3.1.1. INSTALL GEOSYNTHETIC MATERIAL AFTER MATERIAL HAS BEEN APPROVED BY ENGINEER OR OWNER AND THE PREPARATION OF THE SUB-GRADE HAS BEEN COMPLETED. INSTALL THE APPROPRIATE GEOSYNTHETIC MATERIAL TO COMPLETE LIMITS AS INDICATED IN DRAWINGS.

3.1.2. INSTALL GEOSYNTHETIC MATERIAL IN THE LONGEST CONTINUOUS PRACTICAL LENGTH USE ALONG PROPOSED ROADWAYS, FREE FROM TENSION, STRESS, WRINKLES AND CREASES.

3.1.3. CUT OR FOLD GEOSYNTHETIC MATERIAL TO CONFORM TO CURVES.

3.1.4. INSTALL GEOSYNTHETIC MATERIAL IN ACCORDANCE WITH THIS SPECIFICATION AND PROCEDURES RECOMMENDED BY THE MANUFACTURER. CONSULT WITH OWNER OR ENGINEER IF OVERLAP OR ANCHORING SPECIFICATIONS APPEAR TO BE NOT FEASIBLE.

3.1.5. PLACE A MINIMUM OF 150mm OF SUB-BASE OVER THE GEOSYNTHETIC MATERIAL BEFORE DRIVING CONSTRUCTION VEHICLES OVER THE MATERIAL.

3.1.6. REMOVE AND REPLACE GEOSYNTHETIC MATERIAL THAT IS IMPROPERLY INSTALLED OR DAMAGED AS DETERMINED BY THE ENGINEER OR OWNER.

3.1.7. THE SECTION DESIGNATED FOR REPLACEMENT SHALL BE EXPOSED AND FRESH SECTION OF THE SAME GEOSYNTHETIC MATERIAL PLACED OVER THE DAMAGED SECTION. WHERE THE FRESH SECTION IS NOT SEWN TO THE ADJACENT MATERIAL IT SHALL BE LARGE ENOUGH TO PROVIDE NECESSARY OVERLAPS SPECIFIED BY MANUFACTURER ONTO THE UNDAMAGED GEOTEXTILE. ANY FILL MATERIAL ON THE DAMAGED AREA SHALL BE REPLACED AND COMPACTED TO THE REQUIRED STANDARD.

3.2. SUB-BASE CONSTRUCTION

3.2.1. UNLOADING THE SUB-BASE MATERIAL DIRECTLY ONTO THE GEOSYNTHETIC MATERIAL IS NOT PERMITTED.

3.2.2. IF PNEUMATIC TIRE ROLLERS ARE USED, THE LIFT OF SUB-BASE SHALL NOT EXCEED 120mm IN DEPTH. THE DEPTH OF LIFT MAY BE INCREASED IF MECHANICAL VIBRATORY ROLLERS ARE USED PROVIDED THAT ADEQUATE COMPACTION CAN BE OBTAINED.

3.2.3. THE MAXIMUM LIFT THICKNESS SHALL NOT EXCEED 300mm. SUB-BASE COURSE SHALL BE COMPACTED UNTIL NO FURTHER SETTLEMENT IS APPARENT AND THE PARTICLES ARE WELL-KEYED INTO PLACE. THE SUB-BASE COURSE SHALL BE FREE FROM ANY DEFORMATIONS PRIOR TO PLACEMENT OF THE NEXT COURSE. IF THE NATURAL MOISTURE CONTENT OF THE SUB-BASE COURSE IS INSUFFICIENT FOR PROPER COMPACTION, WATER MAY BE ADDED.

3.2.4. TRAFFIC OVER SUB-BASE COURSE WILL NOT BE PERMITTED EXCEPT AS APPROVED BY THE OWNER OR ENGINEER. IF HAULING OVER THE SUB-BASE IF PERMITTED, THE CONTRACTOR WILL AT THEIR OWN EXPENSE, MAINTAIN AND REPAIR THE SUB-BASE COURSE.

3.2.5. THE PLACEMENT OF THE SUB-BASE COURSE WILL BE CARRIED OUT IN A MANNER SUCH THAT HAULING AND PLACING OPERATIONS NOT DEFORM THE SUB-GRADE OR OVER COMPACT THE SURFACE ALONG DEFINED ROUTES RESULTING IN NON-UNIFORM DENSITY. IN GENERAL, THE HAULING OPERATION SHOULD BE CARRIED OUT IN SUCH A MANNER THAT THE TRAFFIC ON THE SUB-BASE IS LIMITED TO UNLOADED VEHICLES.

3.2.6. IDEALLY THE PLACEMENT WOULD INVOLVE DUMP AND DOZE OPERATION FROM A WORKING PAD OF SUB-BASE, WITH NO EQUIPMENT TRAVELING ACROSS THE PREPARED SUB-GRADE.

3.2.7. CONSTRUCTION SHALL BE COMPLETED AND TRIMMED TO ±20mm VERTICALLY AND ±100mm HORIZONTALLY. DEVIATIONS SHALL NEITHER BE CONSISTENTLY HIGH NOR CONSISTENTLY LOW.

3.2.8. TESTING

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3.2.8.1. ONE SIEVE ANALYSIS EVERY 1500m<sup>2</sup> OR PORTION THEREOF AND MINIMUM ONE PER DAY.

3.2.8.2. ONE FIELD DENSITY TEST FOR EVERY 500m<sup>2</sup> OR PORTION THEREOF.

3.2.9. EACH LIFT SHALL BE COMPACTED TO 100% STANDARD PROCTOR DRY DENSITY (ASTM D698) AT A MOISTURE CONTENT OF ±3% OF OPTIMUM. THE DENSITY OF THIS SECTION WILL BE CONSIDERED SATISFACTORY WHEN:

3.2.9.1. TEST RESULTS AVERAGE AT LEAST ONE HUNDRED PERCENT (100%) STANDARD PROCTOR DRY DENSITY, AND;

3.2.9.2. ALL INDIVIDUAL TEST RESULTS ARE GREATER THAN 98% STANDARD PROCTOR DRY DENSITY.

3.3. BASE CONSTRUCTION.

3.3.1. THE BASE MATERIAL SHALL BE END-DUMPED ONTO THE GROUND IN FRONT OF THE LEADING EDGE OF THE GEOTEXTILE AND LEVELED USING A TRACK TYPE DOZER TO A UNIFORM LIFT THICKNESS AS DESCRIBED BELOW OR AS DIRECTED BY THE ENGINEER OR OWNER.

3.3.2. INITIAL COMPACTION SHALL BE ACHIEVED BY THE REPEATING PASSES OF A TRACK MOUNTED DOZER OVER THE LIFT..

3.3.3. SUBSEQUENT LOADS MAY BE DIRECTLY DEPOSITED ONTO PREVIOUSLY SPREAD AND COMPACTED FILL MATERIAL AND SPREAD BY MOTOR GRADERS OR OTHER EQUIPMENT APPROVED BY THE ENGINEER OR OWNER.

3.3.4. THE THICKNESS OF ANY COMPACTED BASE COURSE LIFT SHALL BE NOT LESS THAN 40mm AND NOT GREATER THAN 120mm. IF NECESSARY FOR COMPACTING, WATER SHALL BE ADDED TO THE BASE COURSE IN ACCORDANCE WITH THE REQUIREMENTS FOR WATERING.

3.3.5. WATERING AND ROLLING SHALL BE CONTROLLED TO PREVENT PUMPING THE FINES TO THE SURFACE.

3.3.6. CONSTRUCTION SHALL BE COMPLETED AND TRIMMED TO ±20mm VERTICALLY AND ±100mm HORIZONTALLY. DEVIATIONS SHALL BE NEITHER CONSISTENTLY HIGH NOR CONSISTENTLY LOW.

3.3.7. EACH LIFT SHALL BE COMPACTED TO 100% STANDARD PROCTOR DRY DENSITY (ASTMD698) AT A MOISTURE CONTENT OF ±3. THE DENSITY OF THIS SECTION WILL BE CONSIDERED SATISFACTORY WHEN ALL INDIVIDUALS TEST RESULTS ARE EQUAL TO 100% STANDARD PROCTOR DRY DENSITY.

3.3.8. THE FINISHED SURFACE OF THE BASE COURSE SHALL BE TRUE TO GRADE AND CROSS SECTION AND FREE OF ANY RUTS OR IRREGULARITIES.

3.3.9. TESTING

3.3.9.1. ONE SIEVE ANALYSIS EVERY 1500m<sup>2</sup> OR PORTION THERE OF AND MINIMUM ONE PER DAY.

3.3.9.2. ONE FIELD DENSITY TEST FOR EVERY 500m<sup>2</sup> OR PORTION THERE OF.

3.3.10. FAILURES IN THE SUB-GRADE, OR BASE COURSE, WHICH DEVELOP ON A SECTION OF GRAVEL PAD UPON WHICH TRAFFIC GRAVEL HAS BEEN DEPOSITED, SHALL BE REPAIRED AT NO DIRECT EXPENSE TO THE OWNER.

3.4. GRADING

3.4.1. GRADE AREAS AS SHOWN ON THE DRAWINGS.

3.4.2. ROUGH GRADE BY MACHINE THEN HAND RAKE TO PRODUCE A UNIFORM CONTOURED GRADE.

3.5. TRAFFIC GRAVEL

3.5.1. FOLLOWING INSTALLATION AND ACCEPTANCE BY ENGINEER OR OWNER OR OWNER OF GRANULAR BASE LAYER PLACE AND COMPACT TRAFFIC GRAVEL ON THE BASE COURSE TO THE DEPTH INDICATED.

3.6. CONSTRUCTION DELAY

3.6.1. WORK CARRY OVER FROM ONE SEASON TO THE NEXT (e.g. OVER WINTER) MAY BE UNDERTAKEN IN THE FOLLOWING MANNER IF APPROVED BY THE OWNER:

3.6.1.1. TRAFFIC GRAVEL MAY BE PLACED TO A DEPTH OF 50mm ON THE FULL WIDTH OF ALL BASE COURSE, AT THE TIME SEASONAL OPERATIONS CEASE.

3.6.1.2. THE CONTRACTOR SHALL MAINTAIN IN THE AREAS TO ENSURE SATISFACTORY TRAFFIC ABILITY.

3.6.1.3. WHEN WORK RESUMES, THE CONTRACTOR SHALL BEAR THE COST OF REMOVING THE TRAFFIC GRAVEL AND STOCKPILING IT AT SITE ACCEPTABLE TO THE OWNER AND FOR THE OWNERS USE.

3.6.1.4. WHEN WORK RESUMES, THE CONTRACTOR SHALL BEAR THE COST REPAIRING DAMAGE ON A BASE COURSE. THE REPAIRS MAY INCLUDE PATCHING, SCARIFYING, RELAYING, AND RE-COMPACTING TO RESTORE THE BASE COURSE TO THE CONDITION WHICH EXISTED AT THE TIME SEASONAL OPERATIONS CEASED.

**CLEARING AND GRUBBING**

1. GENERAL
  - 1.1. SCOPE
    - 1.1.1. THE WORK SHALL CONSIST OF CLEARING AND GRUBBING FROM AREAS DESIGNATED ON THE PLANS OR BY THE ENGINEER OR OWNER.
2. PRODUCTS
3. EXECUTION
  - 3.1. CONSTRUCTION
    - 3.1.1. ALL SHRUBBERY, BUSH, WEEDS, OTHER VEGETATION, DOWNED TIMBER, BRANCHES, AND ROOTS, OFFSITE RUBBISH, AND OTHER OBJECTIONABLE MATERIAL SHALL BE CLEARED AND DISPOSED OF AT THE CONTRACTORS EXPENSE.
    - 3.1.2. NO TREES SHALL BE CUT DOWN OR PRUNED WITHOUT THE EXPRESSED PERMISSION OF THE OWNER IN WRITING. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PRESERVE ANY TREE FOR WHICH THE SPECIAL PROVISIONS OR PLANS PROVIDE OR WHICH THE OWNER MAY DIRECT TO BE PRESERVED. ALL TREES REQUIRING REMOVAL SHALL BE REMOVED TO A MINIMUM OF 250mm BELOW SUB-GRADE LEVEL AND IF REQUIRED THE STUMP REMOVED.
    - 3.1.3. THE GROUND SHALL BE RESTORED AND LEVELED WHERE DESIGNATED ON THE PLANS OR BY THE ENGINEER OR OWNER.
    - 3.1.4. LANDFILL CHARGES ARE THE RESPONSIBILITY OF THE CONTRACTOR.

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