

RIP RAP GRADATION (US IMPERIAL)				
RIP RAP CLASS	STONE WEIGHT (LBS.)	SIZE (INCHES)	LAYER THICKNESS	TYPICAL VELOCITIES
1	50 - 200	9 - 14	1'-6"	6 - 8 FPS
2	200 - 1,000	14 - 24	2'-0"	8 - 12 FPS
3	1,000 - 4,000	24 - 38	3'-0"	> 12 FPS
4	> 4,000	> 38	4'-0"	SPEC. CASES

RIP RAP GRADATION (METRIC)				
RIP RAP CLASS	STONE WEIGHT (KGS.)	SIZE (CM)	LAYER THICKNESS	TYPICAL VELOCITIES
1	23 - 91	23 - 36	45.72 CM	1.8 - 2.4 MPS
2	91 - 454	36 - 61	60.96 CM	2.4 - 3.7 MPS
3	454 - 1,814	61 - 97	91.44 CM	> 3.7 MPS
4	> 1,814	> 97	121.92 CM	SPEC. CASES

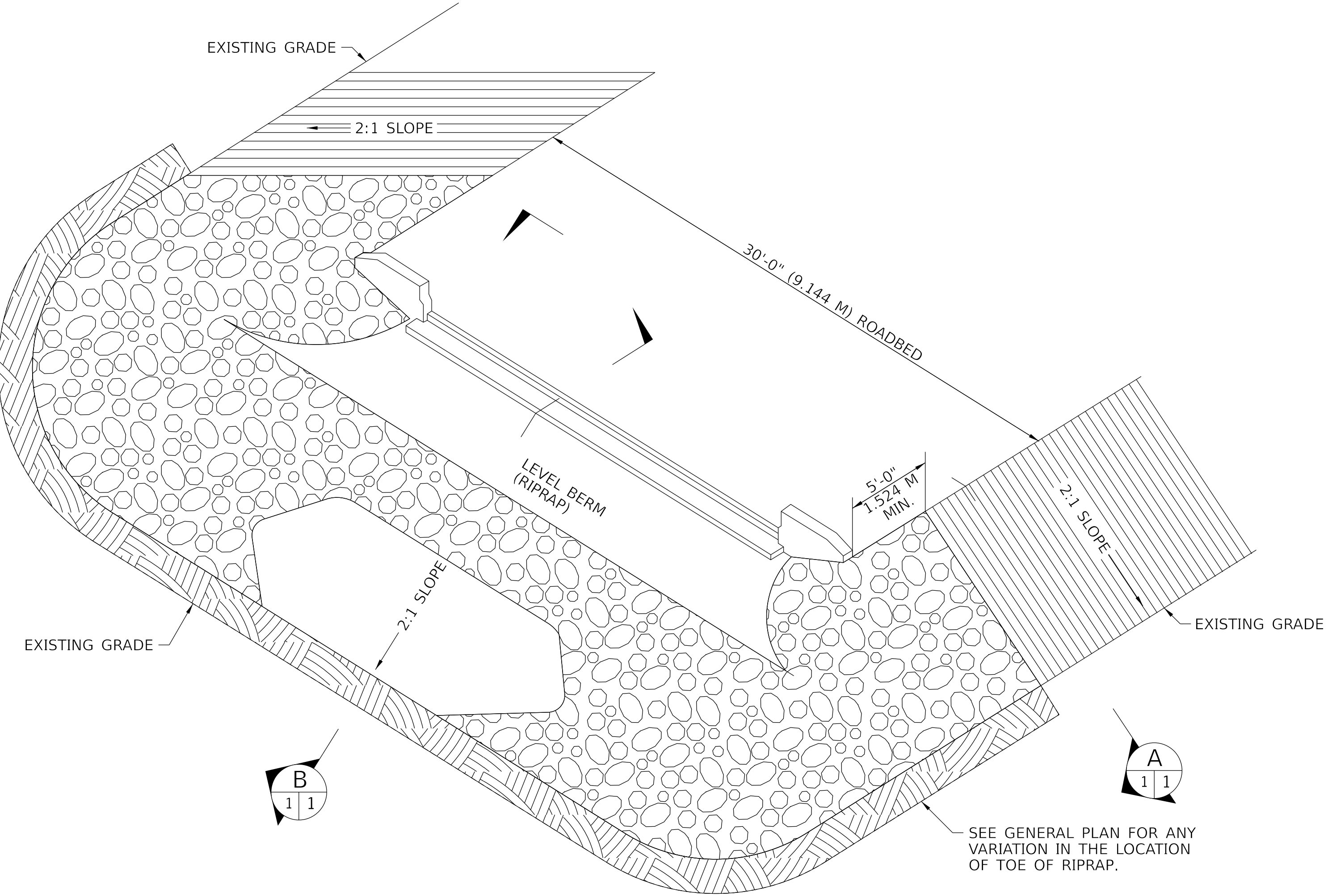
*INDIVIDUAL ROCK SHALL VARY

RIPRAP:
CLASS OF RIPRAP SHALL BE SPECIFIED BY THE ENGINEER. RIPRAP SHALL BE PLACED IN SUCH A MANNER AS TO AVOID SEGREGATION OF VARIOUS SIZES OF ROCK, AND DISTRIBUTED SO THAT THERE WILL BE NO LARGE ACCUMULATION OF EITHER THE LARGER OR SMALLER SIZES OF STONE. INDIVIDUAL ROCKS SHALL BE PLACED IN TIGHT CONTACT WITH ONE ANOTHER IN SUCH A WAY TO PRODUCE THE LEAST AMOUNT OF VOID SPACES. RIPRAP SHALL BE SOLID, UNFRACTURED ROCK, BULKY IN SHAPE WITH SHARP ANGULAR EDGES.

THE ENTIRE MASS OF RIPRAP SHALL BE WELL DISTRIBUTED WITHIN THE LIMITS SPECIFIED, HOWEVER, THE FOLLOWING ALLOWANCES SHALL BE ACCEPTABLE TO PRODUCE THE REQUIRED RIPRAP PROTECTION:

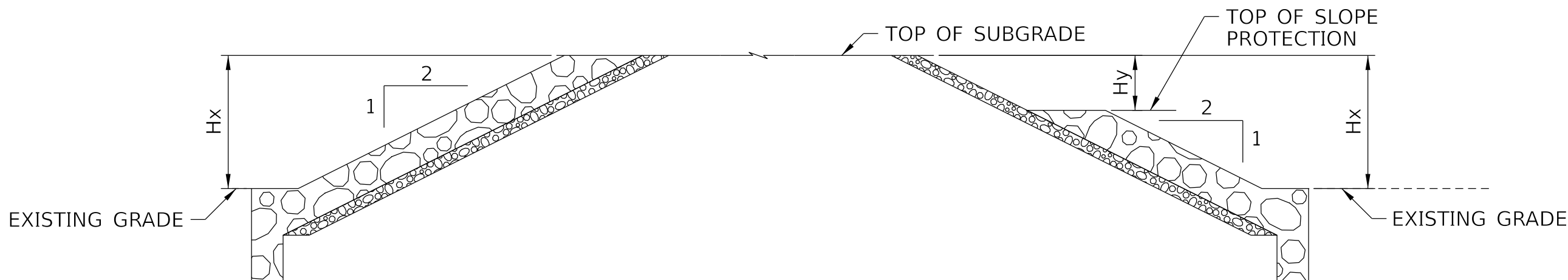
- RIPRAP CLASS I - NO ALLOWANCES ARE PERMITTED.
RIPRAP CLASS II - 15% OR RIPRAP CLASS I.
RIPRAP CLASS III - 15% OF RIPRAP CLASS I AND 15% OF RIPRAP CLASS II.
RIPRAP CLASS IV - 15% OF RIPRAP CLASS I, 15% OF RIPRAP CLASS II, AND 15% OF RIPRAP CLASS III

ESTIMATED QUANTITIES		
Hx & Hy FT. (M)	BEDDING STONE TONS (M TONS)	RIPRAP TONS (M TONS)
1 (0.305)	8 (7)	26 (24)
2 (0.610)	13 (12)	41 (37)
3 (0.914)	19 (17)	59 (54)
4 (1.219)	24 (22)	77 (70)
5 (1.524)	31 (28)	98 (89)
6 (1.829)	38 (34)	121 (110)
7 (2.134)	45 (41)	146 (132)
8 (2.438)	54 (49)	172 (156)
9 (2.743)	62 (56)	200 (181)
10 (3.048)	71 (64)	229 (208)
11 (3.353)	81 (73)	260 (236)
12 (3.658)	91 (83)	293 (266)
13 (3.962)	101 (92)	327 (297)
14 (4.267)	113 (103)	363 (329)
15 (4.572)	125 (114)	402 (365)
16 (4.877)	137 (125)	442 (401)
17 (5.182)	150 (137)	483 (438)
18 (5.486)	163 (148)	526 (477)
19 (5.791)	177 (161)	571 (518)
20 (6.096)	191 (173)	618 (561)
21 (6.401)	206 (187)	666 (604)
22 (6.706)	222 (201)	717 (650)
23 (7.010)	238 (216)	768 (697)
24 (7.315)	254 (230)	822 (746)
25 (7.620)	271 (246)	877 (796)
26 (7.925)	289 (262)	934 (847)
27 (8.230)	307 (279)	993 (901)
28 (8.534)	326 (296)	1,052 (954)
29 (8.839)	345 (313)	1,115 (1,012)
30 (9.144)	365 (331)	1,179 (1,070)



ISOMETRIC VIEW
SCALE: N.T.S.

SEE GENERAL PLAN FOR ANY VARIATION

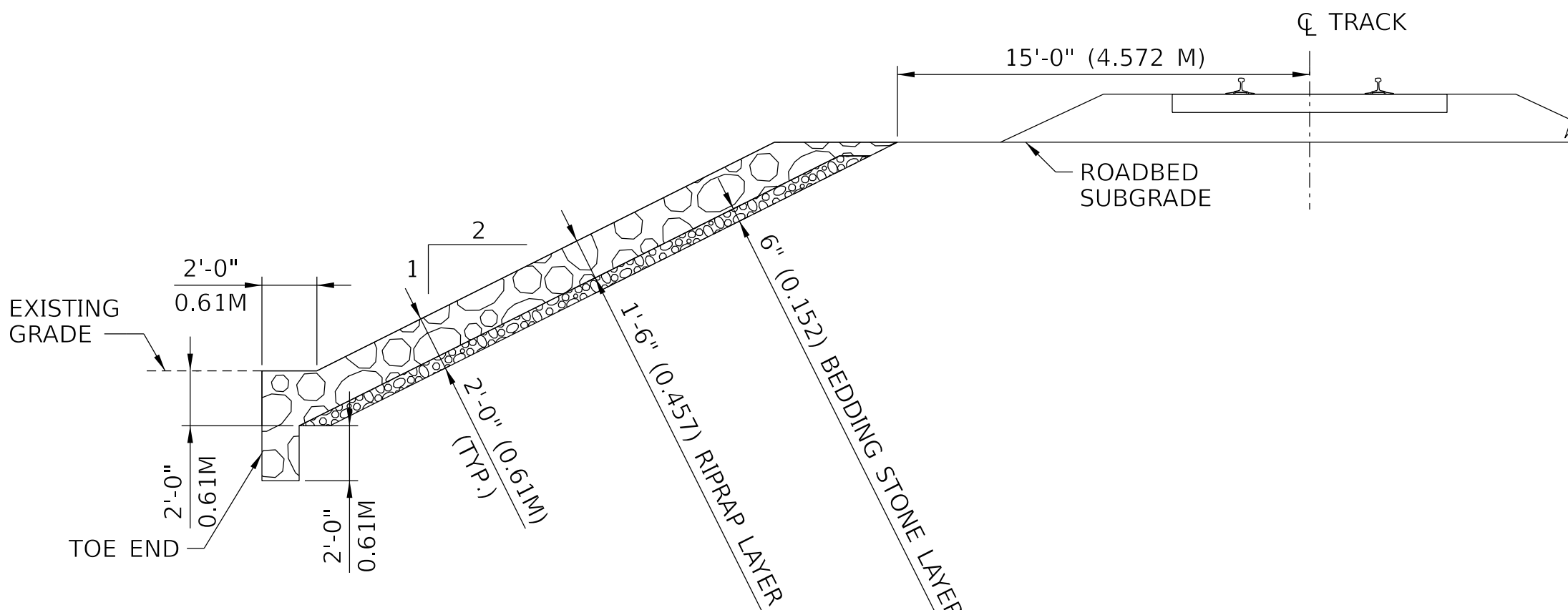


FULL SLOPE PROTECTION
SCALE: N.T.S.

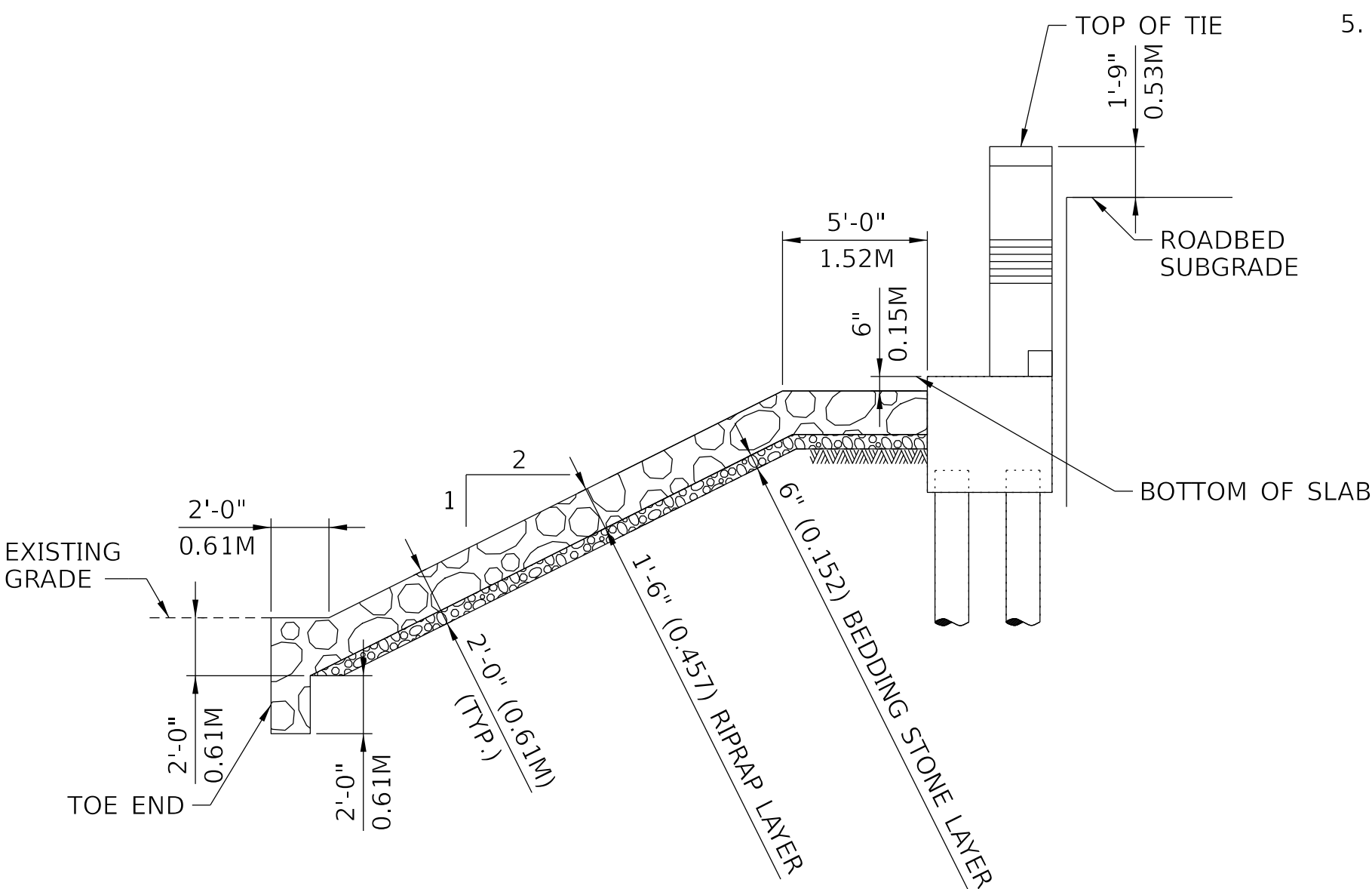
PARTIAL SLOPE PROTECTION
SCALE: N.T.S.

FULL SLOPE PROTECTION QUANTITY = QUANTITY FOR Hx
PARTIAL SLOPE PROTECTION QUANTITY = QUANTITY FOR Hx - QUANTITY FOR Hy

- NOTES:
1. BEDDING STONE SHALL BE BALLAST OR AREMA APPROVED EQUIVALENT.
2. INDIVIDUAL RIPRAP STONES SHALL VARY IN WEIGHT FROM 25 TO 100LBS.
3. PORTION OF RIPRAP UNDER SLABS SHALL BE PLACED BEFORE SLABS ARE SET.
4. RIPRAP SHALL TERMINATE AT AN ELEVATION BELOW ELEVATION OF ROADBED SUBGRADE IF SO SHOWN ON THE GENERAL PLAN. WHERE RIPRAP SO TERMINATES, THE BERM AND FILL CONES AT WINGWALLS SHALL BE SHAPED WITH EARTH FILL AS SHOWN FOR RIPRAP ON THIS STANDARD.
5. GRADATION VARIES WITH FLOW.



SECTION A
SCALE: N.T.S.



SECTION B
SCALE: N.T.S.