EXHIBIT N – DRAINAGE ANALYSIS

ELEMENT ENGINEERING LLC
DILIGENT • INNOVATIVE • RESPONSIVE

MEMORANDUM

TO: El Paso County

FROM: Element Engineering

DATE: May 12, 2022

SUBJECT: Town of Ramah Wastewater System Improvements – Grading and Drainage

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PURPOSE:

The purpose of this memorandum is to briefly provide background on the grading and drainage items necessary for the design and construction of the proposed Ramah Wastewater System Improvements.

GRADING AND DRAINAGE

Excavation will be limited to a small area (approximately 40 x 30) for the installation of the lift station. A trench with a width of less than three-ft will be excavated for the installation of the force main. No grading or drainage changes are proposed as a part of the lift station and force main construction and existing drainage patterns will not be impacted. All excavated areas will be replaced at their current elevation and disturbed areas will either be re-seeded or re-paved (as applicable). Furthermore, no additional impermeable or semi-permeable area will be added or modified as a part of this project.

Excavation and earth work for the evaporative ponds will consist of a substantially larger area, comprising an approximate 630 x 860 footprint. The earth work will be evenly dispersed between excavation cuts and fill for the pond embankments with approximately 43,243 CY of cut and 43,226 CY of fill for a net volume of approximately 17 CY of excavation cut. The proposed ponds will be 6 feet deep from the top of the berm to the bottom of ponds. Pond 3 will be at the northern end of the evaporative ponds and will be constructed of mostly fill for the embankments with the maximum total depth of the fill material ranging from approximately 9 to 11 feet. At the southwest end of the proposed ponds, the embankments will be constructed predominately by excavation cut into the moderate sloping hillside of the property that runs high to low from the west to the east. For the two southern ponds, the average cut depth will range from about 5 to 7 feet deep with a total maximum cut depth of approximately 14 feet at the far southwest corner where the grading cuts the furthest into the hillside. The ponds and exterior embankments will be graded at a 3:1 slope per CDPHE design criteria.

The natural topography of the ponds area runs to from the southwest to the northeast and appears to join with an existing natural wash approximately 600 feet to the east of the ponds that flows from the south to the north. Although the evaporative ponds will require a substantial excavation, the natural topography and flow of the area will not change. The topography will continue to travel from the southwest to the northeast of the property as it flows towards the unnamed wash that crosses East Ramah Rd just to the east of the site. The exterior embankments on the east and north sides of the ponds will continue to follow a northeast sloping topography as the existing site does now. The embankments to the

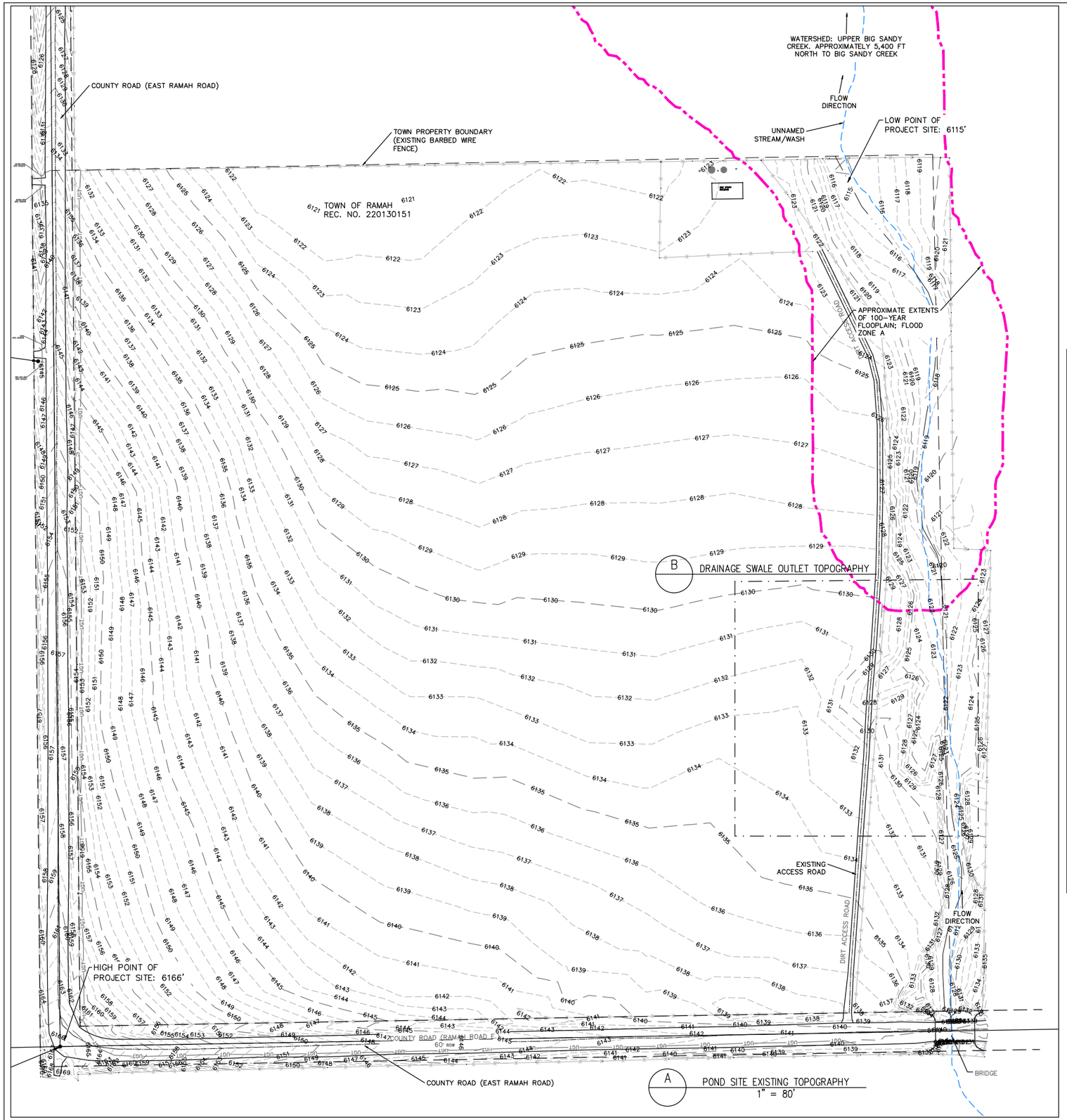
south and west will be part of the excavation cut into the existing moderately sloping hillside. To maintain adequate drainage at this section of the ponds, and to ensure that runoff from the existing hillside does not enter the ponds, a secondary drainage berm will be constructed to capture the runoff from the exterior pond embankments and the existing hillside. The drainage berm will follow the exterior contours around the southwest embankment of the ponds and convey any runoff around the ponds so that it continues to follow the natural northeast sloping topography of the site. The drainage swale will be approximately 2 feet deep, graded at 3:1 slope and will run approximately 900 feet starting at the middle embankment of the ponds and running south and then east unit it meets with the natural, existing topography of the site. The berm will be graded so that it conveys flow at an approximate 0.5 % slope with the high point of 6,137.0 ft in elevation to a low point of approximately 6,128.9 ft. Because the proposed ponds and lift station work will be constructed to maintain the natural topography and stormwater of the respective sites, no further grading or drainage analysis was determined to be necessary for this project.

BEST MANAGEMENT PRACTICES (EROSION CONTROL)

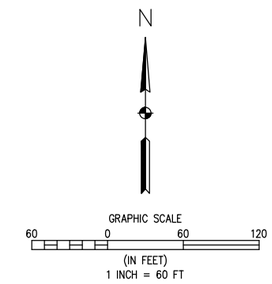
Erosion control layout and details have been provided in the updated plan set. Erosion control measures will be installed to prevent sediment from being carried away from the excavation area and excessive erosion from occurring.

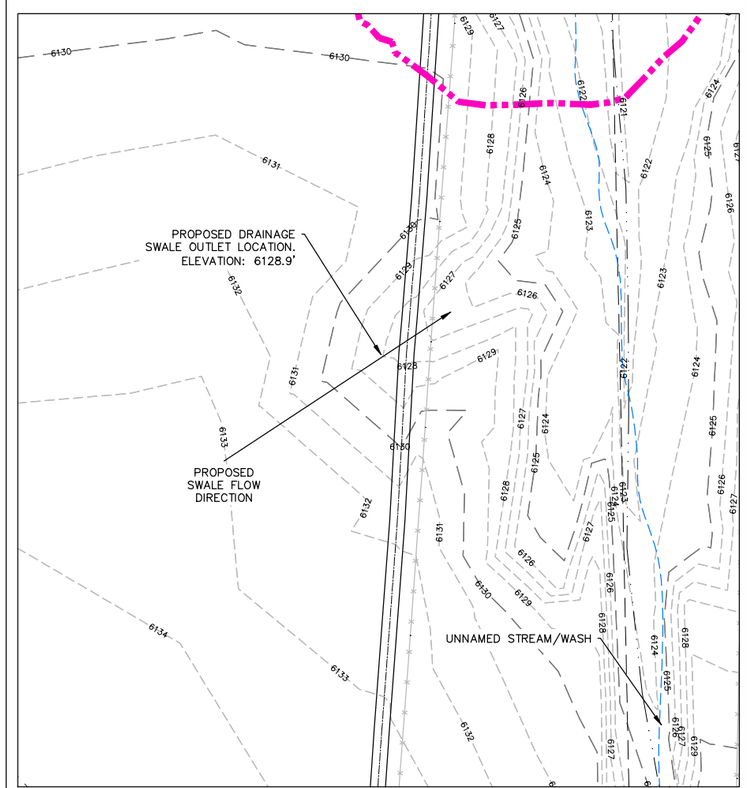
ATTACHMENTS

1. PROPOSED EVAPORATIVE PONDS DRAINAGE PLAN
2. PROPOSED EVAPORATIVE PONDS EROSION & SEDIMENTATION CONTROL PLAN



A POND SITE EXISTING TOPOGRAPHY
1" = 80'





B DRAINAGE SWALE OUTLET TOPOGRAPHY
1" = 40'

ELEMENT ENGINEERING LLC
12687 W. CEDAR DRIVE, SUITE 300
LAKEWOOD, CO 80228
720.749.4165
WWW.ELEMENTENGINEERING.NET

REVISIONS

NO.	DESCRIPTION	DATE	BY

WASTEWATER TREATMENT PLANT

EXISTING TOPOGRAPHY

TOWN OF RAMAH
113 S. COMMERCIAL STREET
RAMAH, CO 80832

PREPARED UNDER THE DIRECT SUPERVISION OF

FOR AND ON BEHALF OF ELEMENT ENGINEERING, LLC

DATE
MARCH 2022

JOB NUMBER
0043.0001

SCALE

EDITION
EX TOPO

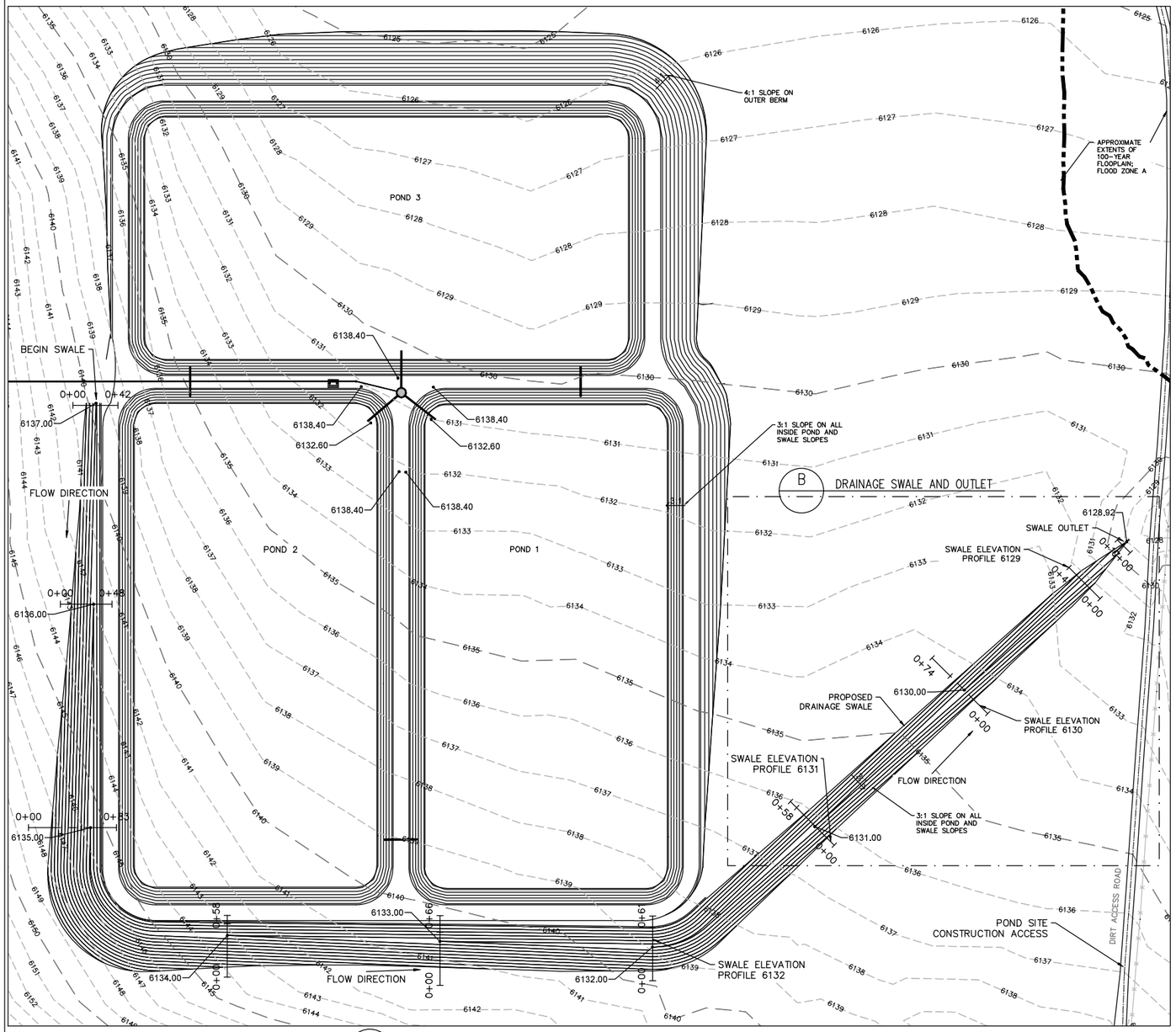
SHEET
1 of 2

N

GRAPHIC SCALE

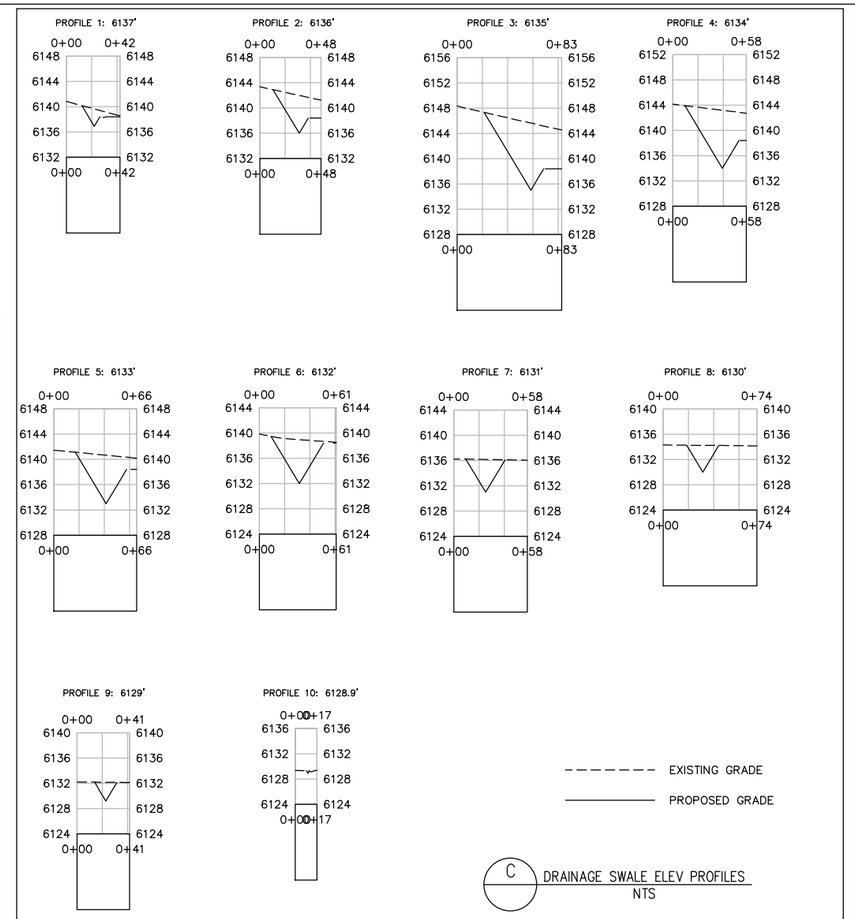
60 0 60 120

(IN FEET)
1 INCH = 60 FT

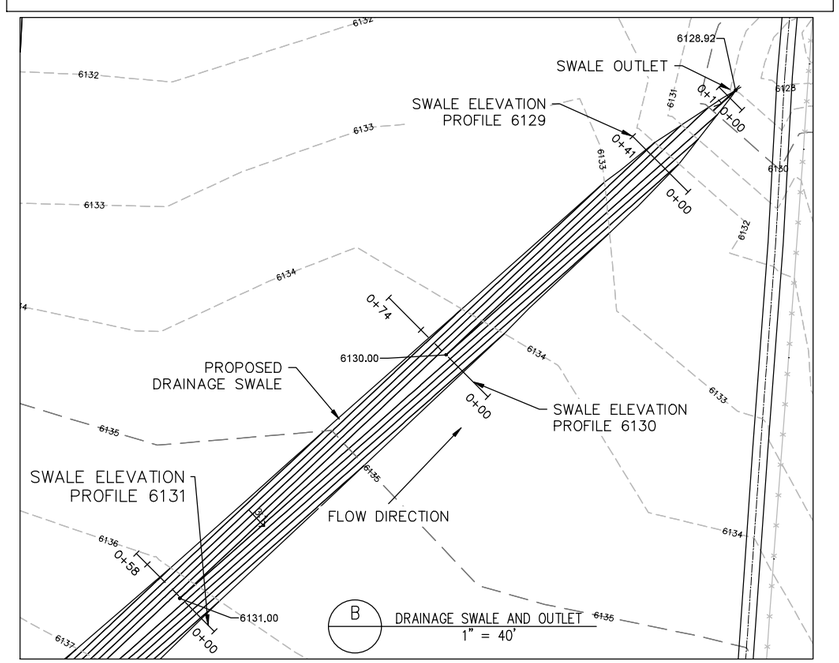


A EVAPORATIVE PONDS DRAINAGE PLAN
1" = 60'

B DRAINAGE SWALE AND OUTLET



C DRAINAGE SWALE ELEV PROFILES
NTS



B DRAINAGE SWALE AND OUTLET
1" = 40'

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REVISIONS

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WASTEWATER TREATMENT PLANT

POND DRAINAGE PLAN

TOWN OF RAMAH
113 S. COMMERCIAL STREET
RAMAH, CO 80832

PREPARED UNDER THE DIRECT SUPERVISION OF

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DATE
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SCALE

EDITION
DRAINAGE

SHEET
2 OF 2

STANDARD EROSION AND SEDIMENT CONTROL PLAN NOTES

GENERAL NOTES

1. THE APPROVED EROSION CONTROL PLAN SHALL BE MAINTAINED FOR THE ENTIRE DURATION OF THIS PROJECT.
2. THE CONTRACTOR IS RESPONSIBLE FOR IMPLEMENTING AND MAINTAINING EROSION AND SEDIMENT CONTROL MEASURES AT ALL TIMES DURING CONSTRUCTION.
3. A THOROUGH INSPECTION OF THE STORMWATER MANAGEMENT PLAN BEST MANAGEMENT PRACTICES (BMPS) IS RECOMMENDED EVERY FOURTEEN (14) DAYS AND AFTER ANY PRECIPITATION OR SNOW MELT EVENT.
4. PERIODIC INSPECTIONS SHALL ALSO INCLUDE INSPECTING EQUIPMENT FOR LEAKS AND REVIEWING EQUIPMENT MAINTENANCE PRACTICE. ALL INSPECTIONS AND MAINTENANCE SHALL BE DOCUMENTED BY THE PROJECT EROSION CONTROL SUPERVISOR AND MADE AVAILABLE TO THE OWNER AND CDPHE UPON REQUEST. ANY EROSION CONTROL BMP THAT HAS BEEN COMPROMISED OR HAS BEEN DISTURBED SHALL BE REPLACED OR RECONSTRUCTED. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO HAVE ALL EROSION CONTROL BMPS IN PLACE AND EFFECTIVE PRIOR TO A STORM EVENT.
5. THE STORMWATER MANAGEMENT PLAN LOG BOOK SHALL BE UPDATED EVERY FOURTEEN (14) DAYS. THIS LOG SHALL REMAIN ON SITE AVAILABLE FOR REVIEW BY SAGUACHE COUNTY AND CDPHE UPON REQUEST UNTIL AN INACTIVATION NOTICE FOR CONSTRUCTION STORMWATER DISCHARGE GENERAL PERMIT CERTIFICATION HAS BEEN OBTAINED. MAINTENANCE ACTIVITIES TO CORRECT PROBLEMS NOTED DURING INSPECTIONS MUST BE DOCUMENTED AND KEPT IN THE STORMWATER MANAGEMENT PLAN LOG BOOK.
6. ALL STREETS WITHIN AND IMMEDIATELY SURROUNDING A CONSTRUCTION SITE SHALL BE CLEANED OF DIRT AND DEBRIS ON A WEEKLY BASIS. STREETS SHALL BE CLEANED BY SCRAPING AND SWEEPING THE DIRT OFF THE ROADWAYS. SCRAPED OR SWEPT MATERIAL SHALL NOT BE DEPOSITED IN THE STORM SEWER SYSTEM. DIRT TRACKED ONTO ROADWAYS AND OTHER PAVED SURFACES SHALL BE CLEANED UP BY THE END OF THE WORKDAY.
7. ALL CONSTRUCTION SITE OPERATORS SHALL CONTROL WASTE SUCH AS DISCARDED BUILDING MATERIALS, CONCRETE TRUCK WASHOUT, HAZARDOUS CHEMICALS (TO INCLUDE BUT NOT LIMITED TO HEAVY EQUIPMENT MAINTENANCE FLUIDS, MOTOR OIL, ANTIFREEZE AND VEHICLE FUEL), LITTER, AND SANITARY WASTE AT THE CONSTRUCTION SITE THAT MAY CAUSE ADVERSE IMPACTS TO STORMWATER QUALITY
8. ALL POTENTIAL POLLUTION SOURCES ON-SITE SHALL BE IDENTIFIED AND CONTROL MEASURES INSTALLED AND PRACTICED TO MINIMIZE THE LIKELIHOOD OF A RELEASE. REFER TO THE SPILL PREVENTION, CONTROL, AND COUNTERMEASURE (SPCC) PLAN FOR MEASURES TO RESPOND TO ANY SPILLS, LEAKS OR OTHER RELEASES.
9. ALL PORTABLE TOILET FACILITIES SHALL BE LOCATED AWAY FROM GUTTERS, INLETS DITCHES, DRAINAGEWAYS, RECEIVING WATERS AND AREAS SUSCEPTIBLE TO FLOODING OR DAMAGE BY CONSTRUCTION EQUIPMENT.
10. ALL PORTABLE TOILET FACILITIES SHALL BE SECURED IN PLACE BY STAKES INTO THE GROUND TO PREVENT TIPPING.
11. STOCKPILES INCLUDING LANDSCAPING MATERIALS, EARTH MATERIALS AND DIRT FROM GRADING OR EXCAVATION SHALL NOT BE LOCATED ADJACENT TO WATERWAYS; SHALL BE STABILIZED WITHIN FOURTEEN (14) DAYS OF ESTABLISHMENT BY SURFACE ROUGHENING, SEEDING, AND MULCHING; AND SHALL NOT EXCEED TEN FEET IN HEIGHT.
12. SLOPES 3:1 OR STEEPER SHALL BE PROTECTED WITH BIODEGRADABLE EROSION CONTROL BLANKETS.
13. ALL MATERIAL IMPORTED TO OR EXPORTED FROM THE SITE SHALL BE PROPERLY COVERED TO PREVENT THE LOSS OF MATERIAL DURING TRANSPORT. HAUL ROUTES MUST BE PRE-APPROVED BY THE COUNTY. NO MATERIAL SHALL BE TRANSPORTED TO ANOTHER SITE WITHOUT FIRST OBTAINING A HAULING PERMIT FROM THE OWNER.
14. THE CONCRETE WASHOUT CONTAINMENT STRUCTURE SHALL CONTAIN ALL WASHOUT WATER. STORMWATER SHALL NOT CARRY WASTES FROM WASHOUT LOCATION.
15. THE CONCRETE WASHOUT CONTAINMENT STRUCTURE SHALL BE LOCATED A MINIMUM OF FIFTY (50) FEET HORIZONTAL FROM WATERS OF THE STATE. THE CONCRETE WASHOUT CONTAINMENT STRUCTURE SHALL BE SIGNED AS – CONCRETE WASHOUT.
16. PERMANENT SOIL STABILIZATION MEASURES SHALL BE APPLIED WITHIN FOURTEEN (14) DAYS TO DISTURBED AREAS IN WHICH FINAL GRADE IS COMPLETED.

BMP MAINTENANCE NOTES

1. IT IS ANTICIPATED THAT THE BMPS IMPLEMENTED AT THE SITE WILL HAVE TO BE MODIFIED TO ADAPT TO CHANGING CONDITIONS OR TO ENSURE THAT POTENTIAL POLLUTANTS ARE BEING PROPERLY MANAGED AT THE SITE.
2. ALL INLET/OUTLET PROTECTIONS WILL BE CHECKED FOR MAINTENANCE AND FAILURE. SEDIMENT SHALL BE REMOVED AND PROPERLY DISPOSED OF ONCE IT HAS ACCUMULATED TO HALF THE DESIGN OF THE TRAP.
3. ALL SPILLS SHALL BE CLEANED UP IMMEDIATELY AFTER DISCOVERY, OR CONTAINED UNTIL APPROPRIATE CLEANUP METHODS CAN BE EMPLOYED. MANUFACTURE'S RECOMMENDED METHODS FOR SPILL CLEANUP SHALL BE FOLLOWED, ALONG WITH PROPER DISPOSAL METHODS.
4. EACH CONCRETE TRUCK OPERATOR SHALL BE AWARE OF THE DESIGNATED CONCRETE WASHOUT AREA.
5. THE CONTRACTOR SHALL CHECK THE CAPACITY FOR ALL CONCRETE WASHOUT AREAS. WASTE MATERIALS MUST BE REMOVED BY THE CONTRACTOR AND LEGALLY DISPOSED OF WHEN ACCUMULATIONS AMOUNT TO TWO-THIRDS OF THE WET STORAGE CAPACITY OF THE STRUCTURE.
6. ALL CONCRETE WASHOUT AREAS SHALL BE CLEARLY MARKED. THE CONCRETE WASHOUT CONTAINMENT DETAIL WILL INCLUDE ORANGE PLASTIC CONSTRUCTION FENCING OR EQUIVALENT AROUND THE WASHOUT STRUCTURE AND A SIGN POSTED WITH THE WORDS 'CONCRETE WASHOUT'.
7. THE CONCRETE WASHOUT AREA SHALL BE REPAIRED AND/OR ENLARGED AS NECESSARY TO MAINTAIN CAPACITY FOR WASTED CONCRETE.
8. AT THE END OF CONSTRUCTION, ALL CONCRETE SHALL BE REMOVED FROM THE SITE AND LEGALLY DISPOSED OF AT AN APPROVED WASTE SITE.
9. ALL SEDIMENT SHALL BE REMOVED UPON INITIAL ACCEPTANCE FROM TEMPORARY SEDIMENT BASINS AND STORM SEWER FACILITIES, I.E., PIPES, OUTLETS AND INLETS. THIS SEDIMENT SHALL NOT BE FLUSHED OFF-SITE, BUT SHALL BE CAPTURED ON-SITE AND DISPOSED OF AT AN APPROVED LOCATION.
10. INSPECT BMPS EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPS SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPS AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
11. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPS IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
12. WHERE BMPS HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

CHECK DAM INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - 1.1. LOCATION OF CHECK DAMS
   - 1.2. CHECK DAM TYPE (CHECK DAM OR REINFORCED CHECK DAM)
   - 1.3. LENGTH (L), CREST LENGTH (CL), AND DEPTH (D)
2. CHECK DAMS INDICATED ON INITIAL SWMP SHALL BE INSTALLED AFTER CONSTRUCTION FENCE, BUT PRIOR TO ANY UPSTREAM LAND DISTURBING ACTIVITIES.
3. RIPRAP UTILIZED FOR CHECK DAMS SHOULD BE OF APPROPRIATE SIZE FOR THE APPLICATION. TYPICAL TYPES OF RIPRAP USED FOR CHECK DAMS ARE TYPE M (D50 12") OR TYPE L (D50 9").
4. RIPRAP PAD SHALL BE TRENCHED INTO THE GROUND A MINIMUM OF 1'.
5. THE ENDS OF THE CHECK DAM SHALL BE A MINIMUM OF 1'-6" HIGHER THAN THE CENTER OF THE CHECK DAM.

CHECK DAM MAINTENANCE NOTES

1. SEDIMENT ACCUMULATED UPSTREAM OF THE CHECK DAMS SHALL BE REMOVED WHEN THE SEDIMENT DEPTH IS WITHIN ½ OF THE HEIGHT OF THE CREST.
2. CHECK DAMS ARE TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND APPROVED BY THE LOCAL JURISDICTION.
3. WHEN CHECK DAMS ARE REMOVED, EXCAVATIONS SHALL BE FILLED WITH SUITABLE COMPACTED BACKFILL. DISTURBED AREA SHALL BE SEEDED AND MULCHED AND COVERED WITH GEOTEXTILE OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE LOCAL JURISDICTION.

CULVERT INLET PROTECTION INSTALLATION NOTES

1. SEE PLAN VIEW FOR LOCATION OF CULVERT INLET PROTECTION
2. SEE ROCK SOCK DESIGN DETAIL FOR ROCK GRADATION REQUIREMENTS AND JOINTING DETAIL.

CULVERT INLET PROTECTION MAINTENANCE NOTES

1. SEDIMENT ACCUMULATED UPSTREAM OF THE CULVERT SHALL BE REMOVED WHEN THE SEDIMENT DEPTH IS ½ THE HEIGHT OF THE ROCK SOCK.
2. CULVERT INLET PROTECTION SHALL REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS PERMANENTLY STABILIZED AND APPROVED BY THE LOCAL JURISDICTION.

EARTH DIKE AND DRAINAGE SWALE INSTALLATION NOTES

1. SEE SITE PLAN FOR:
   - 1.1. LOCATION OF DIVERSION SWALE
   - 1.2. TYPE OF SWALE (UNLINED, COMPACTED AND/OR LINED)
   - 1.3. LENGTH OF EACH SWALE
   - 1.4. DEPTH, D, AND WIDTH, W DIMENSIONS
   - 1.5. FOR ECB/TRM LINED DITCH, SEE ECB DETAIL
   - 1.6. FOR RIPRAP LINED DITCH, SIZE OF RIPRAP, D50
2. SEE DRAINAGE PLANS FOR DETAILS OF PERMANENT CONVEYANCE FACILITIES AND/OR DIVERSION SWALES EXCEEDING 2-YEAR FLOW RATE OR 10 CFS.
3. EARTH DIKES AND SWALES INDICATED ON SWMP SHALL BE INSTALLED PRIOR TO LAND-DISTURBING ACTIVITIES IN PROXIMITY.
4. EMBANKMENT IS TO BE COMPACTED TO 90% OF MAXIMUM DENSITY AND WITHIN 2% OF OPTIMUM MOISTURE CONTENT ACCORDING TO ASTM D698.
5. SWALES ARE TO DRAIN TO A SEDIMENT CONTROL BMP.
6. FOR LINED DITCHES, INSTALLATION OF ECB/TRM SHALL CONFORM TO THE REQUIREMENTS OF THE ECB DETAIL.
7. WHEN CONSTRUCTION TRAFFIC MUST CROSS A DIVERSION SWALE, INSTALL A TEMPORARY CULVERT WITH A MINIMUM DIAMETER OF 12 INCHES.

EARTH DIKE AND DRAINAGE SWALE MAINTENANCE NOTES

1. SWALES SHALL REMAIN IN PLACE UNTIL THE END OF CONSTRUCTION; IF APPROVED BY LOCAL JURISDICTION, SWALES MAY BE LEFT IN PLACE.
2. WHEN A SWALE IS REMOVED, THE DISTURBED AREA SHALL BE COVERED WITH TOPSOIL, SEEDED AND MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY LOCAL JURISDICTION.

EROSION CONTROL BLANKET INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - 1.1. LOCATION OF ECB
   - 1.2. TYPE OF ECB (STRAW, STRAW-COCONUT, COCONUT, OR ECELSIOR)
   - 1.3. AREA, A, IN SQUARE YARDS OF EACH TYPE OF ECB
2. 100% NATURAL AND BIODEGRADABLE MATERIALS ARE PREFERRED FOR RECPS, ALTHOUGH SOME JURISDICTIONS MAY ALLOW OTHER MATERIALS IN SOME APPLICATIONS.
3. IN AREAS WHERE ECBS ARE SHOWN ON THE PLANS, THE PERMITTEE SHALL PLACE TOPSOIL AND PERFORM FINAL GRADING, SURFACE PREPARATION, AND SEEDING AND MULCHING. SUBGRADE SHALL BE SMOOTH AND MOIST PRIOR TO ECB INSTALLATION AND THE ECB SHALL BE IN FULL CONTACT WITH SUBGRADE. NO GAPS OR VOIDS SHALL EXIST UNDER THE BLANKET.
4. PERIMETER ANCHOR TRENCH SHALL BE USED ALONG THE OUTSIDE PERIMETER OF ALL BLANKET AREAS.
5. JOINT ANCHOR TRENCH SHALL BE USED TO JOIN ROLLS OF ECBS TOGETHER (LONGITUDINALLY AND TRANSVERSELY) FOR ALL ECBS EXCEPT STRAW WHICH MAY USE AN OVERLAPPING JOINT.
6. INTERMEDIATE ANCHOR TRENCH SHALL BE USED AT SPACING OF ONE-HALF ROLL LENGTH FOR COCONUT AND EXCELSIOR ECBS.
7. OVERLAPPING JOINT DETAIL SHALL BE USED TO JOIN ROLLS OF ECBS TOGETHER FOR ECBS ON SLOPES.
8. MATERIAL SPECIFICATIONS OF ECBS SHALL CONFORM TO TABLE ECB-1.
9. ANY AREAS OF SEEDING AND MULCHING DISTURBED IN THE PROCESS OF INSTALLING ECBS SHALL BE RESEEDED AND MULCHED.
10. DETAILS ON DESIGN PLANS FOR MAJOR DRAINAGEWAY STABILIZATION WILL GOVERN IF DIFFERENT FROM THOSE SHOWN HERE.

EROSION CONTROL BLANKET MAINTENANCE NOTES

1. ECBS SHALL BE LEFT IN PLACE TO EVENTUALLY BIODEGRADE, UNLESS REQUESTED TO BE REMOVED BY THE LOCAL JURISDICTION.
2. ANY ECB PULLED OUT, TORN, OR OTHERWISE DAMAGED SHALL BE REPAIRED OR REINSTALLED. ANY SUBGRADE AREAS BELOW THE GEOTEXTILE THAT HAVE ERODED TO CREATE A VOID UNDER THE BLANKET, OR THAT REMAIN DEVOID OF GRASS SHALL BE REPAIRED, RESEEDED, AND MULCHED AND THE ECB REINSTALLED.

SILT FENCE INSTALLATION NOTES

1. SILT FENCE MUST BE PLACED AWAY FROM THE TOE OF THE SLOPE TO ALLOW FOR WATER PONDING. SILT FENCE AT THE TOW OF A SLOPE SHOULD BE INSTALLED IN A FLAT LOCATION AT LEAST SEVERAL FEET (2-5 FT) FROM THE TOW OF THE SLOPE TO ALLOW ROOM FOR PONDING AND DEPOSITION.
2. A UNIFORM 6" X 4" ANCHOR TRENCH SHALL BE EXCAVATED USING TRENCHER OR SILT FENCE INSTALLATION DEVICE. NO ROAD GRADERS, BACKHOES, OR SIMILAR EQUIPMENT SHALL BE USED.
3. COMPACT ANCHOR TRENCH BY HAND WITH A "JUMPING JACK" OR BY WHEEL ROLLING. COMPACTION SHALL BE SUCH THAT SILT FENCE RESISTS BEING PULLED OUT OF ANCHOR TRENCH BY HAND.
4. SILT FENCE SHALL BE PULLED TIGHT AS IT IS ANCHORED TO THE STAKES. THERE SHOULD BE NO NOTICEABLE SAG BETWEEN STAKES AFTER IT HAS BEEN ANCHORED TO THE STAKES.
5. SILT FENCE FABRIC SHALL BE ANCHORED TO THE STAKES USING 1" HEAVY DUTY STAPLES OR NAILS WITH 1" HEADS. STAPLES AND NAILS SHOULD BE PLACED 3" ALONG THE FABRIC DOWN THE STAKE.
6. AT THE END OF A RUN OF SILT FENCE ALONG A CONTOUR, THE SILT FENCE SHOULD BE TURNED PERPENDICULAR TO THE CONTOUR TO CREATE A "J-HOOK". THE "J-HOOK" EXTENDING PERPENDICULAR TO THE CONTOUR SHOULD BE OF SUFFICIENT LENGTH TO KEEP RUNOFF FROM FLOWING AROUND THE END OF THE SILT FENCE (TYPICALLY 10' – 20').
7. SILT FENCE SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.

SILT FENCE MAINTENANCE NOTES

1. SEDIMENT ACCUMULATED UPSTREAM OF THE SILT FENCE SHALL BE REMOVED AS NEEDED TO MAINTAIN THE FUNCTIONALITY OF THE BMP, TYPICALLY WHEN DEPTH OF ACCUMULATED SEDIMENTS IS APPROXIMATELY 6".
2. REPAIR OR REPLACE SILT FENCE WHEN THERE ARE SIGNS OF WEAR, SUCH AS SAGGING, TEARING, OR COLLAPSE.
3. SILT FENCE IS TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND APPROVED BY THE LOCAL JURISDICTION, OR IS REPLACED BY AN EQUIVALENT PERIMETER SEDIMENT CONTROL BMP.
4. WHEN SILT FENCE IS REMOVED, ALL DISTURBED AREAS SHALL BE COVERED WITH TOPSOIL, SEEDED, AND MULCHED OR OTHERWISE STABILIZED AS APPROVED BY LOCAL JURISDICTION.

STABILIZED STAGING AREA INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - 1.1. LOCATION OF STAGING AREA(S)
   - 1.2. CONTRACTOR MAY ADJUST LOCATION AND SIZE OF STAGING AREA WITH APPROVAL FROM THE LOCAL JURISDICTION
2. STABILIZED STAGING AREA SHOULD BE APPROPRIATE FOR THE NEEDS OF THE SITE. OVERSIZING RESULTS IN A LARGER AREA TO STABILIZE FOLLOWING CONSTRUCTION.
3. STAGING AREA SHALL BE STABILIZED PRIOR TO OTHER OPERATIONS ON THE SITE.
4. THE STABILIZED STAGING AREA SHALL CONSIST OF A MINIMUM 3" THINK GRANULAR MATERIAL.
5. UNLESS OTHERWISE SPECIFIED BY LOCAL JURISDICTION, ROCK SHALL CONSIST OF DOT SECT. #703, AASHTO #3 COARSE AGGREGATE OR 6" (MINUS) ROCK.
6. ADDITIONAL PERIMETER BMPS MAY BE REQUIRED INCLUDING BUT NOT LIMITED TO SILT FENCE AND CONSTRUCTION FENCING.

STABILIZED STAGING AREA MAINTENANCE NOTES

1. ROCK SHALL BE REAPPLIED OR REGRADED AS NECESSARY IF RUTTING OCCURS OR UNDERLYING SUBGRADE BECOMES EXPOSED.
2. STABILIZED STAGING AREA SHALL BE ENLARGED IF NECESSARY TO CONTAIN PARKING, STORAGE, AND UNLOADING/LOADING OPERATIONS.
3. THE STABILIZED STAGING AREA SHALL BE REMOVED AT THE END OF CONSTRUCTION. THE GRANULAR MATERIAL SHALL BE REMOVED OR, IF APPROVED BY THE LOCAL JURISDICTION, USED ON SITE, AND THE AREA COVERED WITH TOPSOIL, SEEDED, AND MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY LOCAL JURISDICTION.
4. NOTE: MANY MUNICIPALITIES PROHIBIT THE USE OF RECYCLED CONCRETE AS GRANULAR MATERIAL FOR STABILIZED STAGING AREAS DUE TO DIFFICULTIES WITH RE-ESTABLISHMENT OF VEGETATION IN AREAS WHERE RECYCLED CONCRETE WAS PLACED.

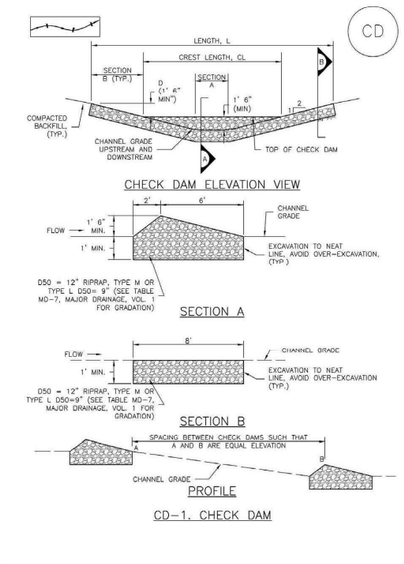
STABILIZED CONSTRUCTION ENTRANCE/EXIT INSTALLATION NOTES

1. SEE PLAN VIEW FOR
   - 1.1. LOCATION OF CONSTRUCTION ENTRANCE(S)/EXIT(S)
   - 1.2. TYPE OF CONSTRUCTION ENTRANCE(S)/EXIT(S) (WITH/WITHOUT WHEEL WASH, CONSTRUCTION MAT OR TRM)
2. CONSTRUCTION MAT OR TRM STABILIZED CONSTRUCTION ENTRANCES ARE ONLY TO BE USED ON SHORT DURATION PROJECTS (TYPICALLY RANGING FROM A WEEK TO A MONTH) WHERE THERE WILL BE LIMITED VEHICULAR ACCESS.
3. A STABILIZED CONSTRUCTION ENTRANCE/EXIT SHALL BE LOCATED AT ALL ACCESS POINTS WHERE VEHICLES ACCESS THE CONSTRUCTION SITE FROM PAVED RIGHT-OF-WAYS.
4. STABILIZED CONSTRUCTION ENTRANCE/EXIT SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.
5. A NON-WOVEN GEOTEXTILE FABRIC SHALL BE PLACED UNDER THE STABILIZED CONSTRUCTION ENTRANCE/EXIT PRIOR TO THE PLACEMENT OF ROCK.
6. UNLESS OTHERWISE SPECIFIED BY LOCAL JURISDICTION, ROCK SHALL CONSIST OF DOT SECT. #703, AASHTO #3 COARSE AGGREGATE OR 6" (MINUS) ROCK.

STABILIZED CONSTRUCTION ENTRANCE/EXIT MAINTENANCE NOTES

1. ROCK SHALL BE REAPPLIED OR REGRADED AS NECESSARY TO THE STABILIZED ENTRANCE/EXIT TO MAINTAIN A CONSISTENT DEPTH.
2. SEDIMENT TRACKED ONTO PAVED ROADS IS TO BE REMOVED THROUGHOUT THE DAY AND AT THE END OF THE DAY BY SHOVELING OR SWEEPING. SEDIMENT MAY NOT BE WASHED DOWN STORM SEWER DRAINS.

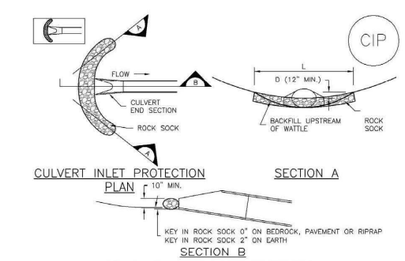
Check Dams (CD) **EC-12**



CD-1. CHECK DAM

November 2010 Urban Drainage and Flood Control District CD-3
Urban Storm Drainage Criteria Manual Volume 3

Inlet Protection (IP) **SC-6**



CIP-1. CULVERT INLET PROTECTION

ELEMENT ENGINEERING LLC
12687 W. CEDAR DRIVE, SUITE 300
LAKEWOOD, CO 80228
720.749.4165
WWW.ELEMENTENGINEERING.NET

REVISIONS

NO.	DESCRIPTION	DATE	BY

WASTEWATER TREATMENT PLANT
EROSION CONTROL DETAILS 1
TOWN OF RAMAH
113 S. COMMERCIAL STREET
RAMAH, CO 80832

PREPARED UNDER THE DIRECT SUPERVISION OF

FOR AND ON BEHALF OF ELEMENT ENGINEERING, LLC

DATE
MARCH 2022

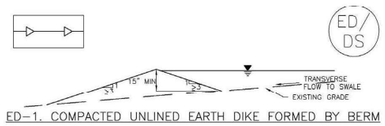
JOB NUMBER
0043.0001

SCALE

EDITION
EROSION

SHEET
29 OF

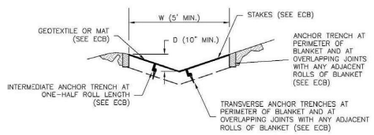
Earth Dikes and Drainage Swales (ED/DS) EC-10



ED–1. COMPACTED UNLINED EARTH DIKE FORMED BY BERM

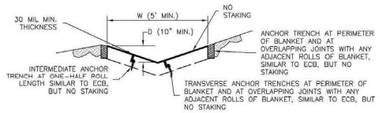
DS–1. COMPACTED UNLINED EXCAVATED SWALE

DS–2. COMPACTED UNLINED SWALE FORMED BY CUT AND FILL

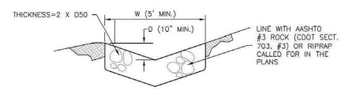


DS–3. ECB LINED SWALE (CUT AND FILL OR BERM)

EC-10 Earth Dikes and Drainage Swales (ED/DS)

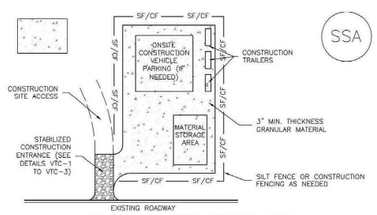


DS–4. SYNTHETIC LINED SWALE



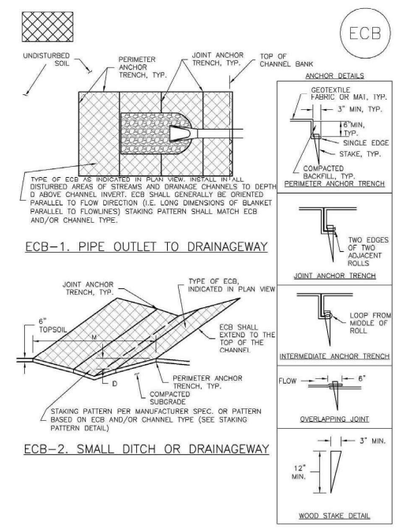
DS–5. RIPRAP LINED SWALE

Stabilized Staging Area (SSA) SM-6

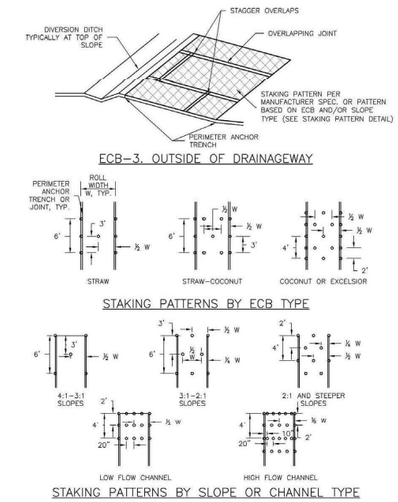


SSA–1. STABILIZED STAGING AREA

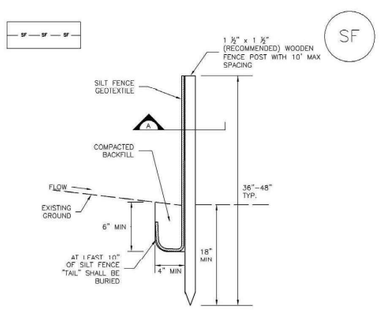
EC-6 Rolled Erosion Control Products (RECP)



Rolled Erosion Control Products (RECP) EC-6

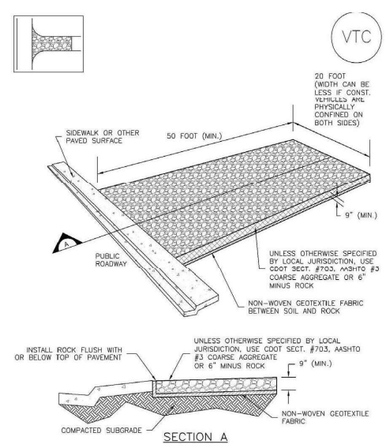


Silt Fence (SF) SC-1



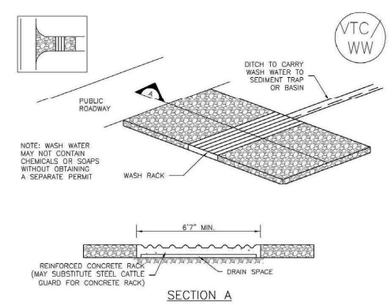
SF–1. SILT FENCE

Vehicle Tracking Control (VTC) SM-4



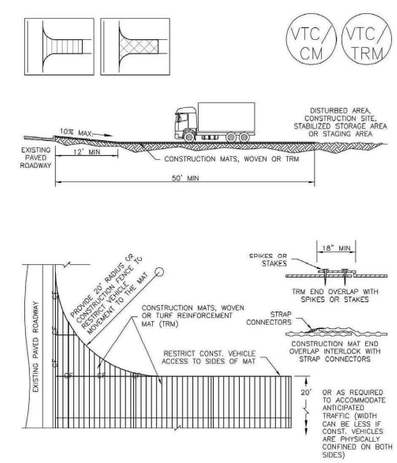
VTC–1. AGGREGATE VEHICLE TRACKING CONTROL

SM-4 Vehicle Tracking Control (VTC)



VTC–2. AGGREGATE VEHICLE TRACKING CONTROL WITH WASH RACK

Vehicle Tracking Control (VTC) SM-4



VTC–3. VEHICLE TRACKING CONTROL W/ CONSTRUCTION MAT OR TURF REINFORCEMENT MAT (TRM)

ELEMENT ENGINEERING LLC
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