Langley E-07, Langley K-30, and Kumak I-25 Well Abandonment Program Erosion and Sediment Control Plan

Submission to the Inuvialuit Water Board

KAVIK-STANTEC

Prepared for:
MGM Energy
Calgary, AB

Prepared by:
KAVIK-STANTEC Inc.
Inuvik, NWT and Calgary, AB

Program Number: 123515084

KAVIK-STANTEC

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Appendices

Abbreviations

°C	Degrees Celsius
BMPs	Best Management Practices
CCP	Community Conservation Plan
E-07	Langley E-07 Wellsite
ESC	Erosion and Sediment Control
GNWT	Government of Northwest Territories
ha	Hectares
I-25	Kumak I-25 Wellsite
ISR	Inuvialuit Settlement Region
K-30	Langley K-30 Wellsite
km	Kilometers
km/h	Kilometers Per Hour
m	Metres
MJ	Megajoule
mm	Millimetres
NWPA	*Navigable Waters Protection Act*
NWT	Northwest Territories
PDR	Project Description Report
Stantec	Stantec Consulting Ltd.
the Project	Langley K-30, Langley E-07, and Kumak I-25 Well Abandonment Program

1 INTRODUCTION

1.1 Project Description

The following Erosion and Sediment Control (ESC) Plan has been prepared by Stantec Consulting Ltd. (Stantec) for the Langley K-30, Langley E-07, and Kumak I-25 Well Abandonment Program (the Project) in the outer Meckenzie Delta of the Inuvialuit Settlement Region (ISR), Northwest Territories. The Project includes:

- Possible barge landings and staging areas for the storage of equipment and supplies. Should they be required, the chosen barge landing and staging sites will be at, or as close as possible to the wells. If barge and/or staging is not employed, equipment and supplies will be transported from permanent land bases, such as Inuvik using ice roads
- Construction of ice roads that align within the Mackenzie River and associated channels and overland routes
- Construction of camp facilities
- Construction of temporary airstrips and helicopter pads
- Abandonment of three wells; Langley K-30, Langley E-07, and Kumak I-25

This ESC Plan is a guidance document required to obtain permits to complete well abandonment and will cover ESC measures that are to be installed to help protect against the release of sediment from Project activities. This ESC Plan is a living document and will be amended as necessary based on site conditions over the course of the project.

1.1.1 Objectives

The objective of this ESC Plan is to:

- Comply with Project requirements for an ESC Plan
- Identify temporary ESC measures to be utilized to help to prevent soil loss during Project activities and to help to prevent sediment from exiting the Project footprint
- Recommend ESC monitoring

1.2 Erosion and Sediment Control

Erosion and sedimentation are natural processes in which sand, silt, and clay particles are loosened and transported by wind, water, and ice, and deposited downwind or downslope. These processes usually occur slowly over a long period of time. However, anthropogenic activities, such as construction, lead to accelerated levels of erosion through disturbance of soil and vegetation. Erosion and sediment control is important both during (temporary ESC) and after (permanent ESC) construction activities have taken place.

Due to the small disturbance footprint and time period related to Project activities (winter construction), water erosion from spring runoff provides the highest risk for erosion; therefore, only water erosion will be discussed below.

1.2.1 Forms of Erosion

Once soil has been loosened, there are several forms of erosion that are possible (Fifield 2011):

- Sheet Flow: Uniform removal and movement of sediment by runoff water flowing over the ground surface
- Rills: Long, narrow, shallow “incisions” (usually <75 millimeters [mm]) due to a concentrated flow of water and higher runoff velocities
- Gullies: Deep and wide depressions (usually >75 mm) due to concentrated flows of water
- Channel or Streambank: Erosion due to natural patterns of water flow over a landscape

Due to relatively flat slopes on the three wells, ESC measures should be chosen to protect against sheet flow and rill erosion.

1.3 Regulatory Instruments for Erosion and Sediment Control

1.3.1 Federal Legislation and Regulations

1.3.1.1 The Fisheries Act

The *Fisheries Act* was established to manage and protect Canada’s fisheries resources, and applies to all fishing zones, territorial seas, and inland waters of Canada.

Key provisions of the *Act* include prohibitions on deposition of deleterious substances (which includes sediment) and serious harm to fish including death of fish or any permanent alteration to, or destruction of, fish habitat. It includes requirements for reporting of sediment deposition and prevention or mitigation of adverse effects due to sediment deposition. The *Fisheries Act* also provides inspectors with the authority to suspend work and require actions to prevent or mitigate harm due to potential or actual sediment deposition.

1.3.1.2 Navigable Waters Protection Act

The *Navigable Waters Protection Act* (*NWPA*) protects the public right of navigation by regulating works over waterways such as bridges, dams and docks to minimize the overall impact on navigation. *NWPA* applies to in-stream work involving construction or placement in, on, over, under, through, or across navigable water.

1.3.2 Northwest Territories Legislation and Regulations

1.3.2.1 The Waters Act

The *Waters Act* governs the licensing of water use, including diversion or obstruction of waters, alteration of the flow of waters, and alteration of the bed or banks of rivers, streams, lakes or other waterbodies, whether or not the body of water is seasonal.

2 SITE LOCATIONS AND GENERAL SITE CHARACTERISTICS

2.1 Site Information

2.1.1 Project Location and Size

The Project is in the outer Meckenzie Delta of the ISR, Northwest Territories. The project will include:

- Construction of approximately 14 kilometers (km) of ice roads, ice pads, temporary airstrips, and helicopter pads.
- Construction of a temporary winter camp
- Abandonment of the E-07 well
- Abandonment of the I-25 well
- Abandonment of the K-30 well

2.1.2 Physiography and Landforms of the Project Area

2.1.2.1 E-07 Wellsite

The E-07 wellsite (see Figure 1) is within a mudflat and has grades from 1% to 5% in the vicinity of the wellsite. The wellsite sits less than 2.0 meters (m) above sea level. The E-07 wellsite is also located in an area of extensive discontinuous permafrost where freeze-thaw action is common, and a series of low-centered ice-wedge polygons are present. Soil on the wellsite is characterized as fine silt (KAVIK-STANTEC 2016a). The location of the barge landing site is stable and shows no signs of active erosion.

2.1.2.2 I-25 Wellsite Pad

The I-25 wellsite (see Figure 2) is flat with a 0% to 2% grade and covered with hummocky peat over silty soil. It is south of Trench Lake (KAVIK-STANTEC 2016b). The wellsite is in an area where freeze-thaw action is common, and a network of ice-wedge polygons is present. The wellhead is located just adjacent to an ice-wedge. Soil on the wellsite is characterized as grey silty material (KAVIK-STANTEC 2016b).

2.1.2.3 K-30 Wellsite

The K-30 wellsite (see Figure 3) is flat with no aspect or slope and minor ground undulations. The wellsite sits approximately 1.5 m above sea level and is in the discontinuous permafrost zone. No permafrost related features are present at the wellsite; however, pingos are located approximately 5 km west of the wellsite and low-centered polygons are present south of the wellsite. Soil on the wellsite is characterized as peaty organic material mixed with a minor fraction of fine sand and silt (KAVIK-STANTEC 2017).

Sections of shoreline within 100 m of the wellhead display signs of natural erosion and slumping. Monitoring of K-30 has documented active shoreline erosion at upwards of 10 m per year along the western shoreline, averaging at a rate of 6 m/year (KAVIK-STANTEC 2017).

2.1.2.4 Barge Activities

If a barge is required, barge landing sites that were successfully screened in the past will be selected from previous applications. Sites will have stable shorelines and deeper channels for transport. Barges may be used to mobilize equipment and materials to the program footprint for staging as close to the wells as possible. These locations are being considered for this Project and are identified in Figures 5-2 to 5-4 of the 2019 Well Abandonment Program PDR (KAVIK-STANTEC 2019).

2.1.3 Climate

The climate in the region of E-07, I-25, and K-30 is characterized by long, very cold winters and short, cool summers (ECG 2012). Climate data collected from the nearest weather stations (Tuktoyaktuk- ID 71985, Inuvik- ID 71364) indicated a daily average temperature of -10.1 degrees Celsius (°C) in Tuktoyaktuk and daily average of -8.2°C in Inuvik between 1981 and 2010. The coldest month for Tuktoyaktuk and Inuvik is January (-26.6°C and -26.9°C) and July is the warmest (11.0°C and 14.1°C) (ECCC 2022a, ECCC 2022b).

The average annual precipitation in the region ranges from 160.7 mm in Tuktoyaktuk to 240.6 mm in Inuvik with the greatest accumulations occurring from July to October (ECCC 2022a, ECCC 2022b).

2.1.4 Sensitive Areas

The project overlaps many Inuvialuit Special Areas, these include special land use area Categories B, C, D, and E. The special land use areas are defined as follows:

- Category B: Lands and waters where there are cultural or renewable resources of some significance and sensitivity but where terms and conditions associated with permits and leases shall assure the conservation of these resources.
- Category C: Lands and waters where cultural or renewable resources are of particular significance and are sensitive during specific times of the year. These lands and waters shall be managed to eliminate, to the greatest extent possible, potential damage and disruption.
- Category D: Lands and waters where cultural or renewable resources are of particular significance and are sensitive throughout the year. As with Category C, these areas shall be managed to eliminate, to the greatest extent possible, potential damage and disruption.
- Category E: Lands and waters where cultural or renewable resources are of extreme significance and are sensitive. There shall be no development on these areas. These lands and waters shall be managed to eliminate, to the greatest extent possible, potential damage and disruption. This category recommends the highest degree of protection in this document.

2.1.4.1 Soil Information

The active Project sites will be graded with snow and ice to level the footprints. Soil disturbance is anticipated to only occur around the well heads from excavation; however, incidental disturbance may occur along the access routes to the well heads during reclamation activities. The general site soil conditions after leveling will be undisturbed fluvial materials primarily consisting of silts and sands as described above (see Section 2.1.2).

2.1.4.2 Soil Erosion Potential

The potential for soils to erode is influenced by four factors:

- Soil Erodibility: This factor is a measure of the strength of the bond between soil particles, and the potential for each particle to be removed from the soil matrix. Generally, silty and fine sandy soils are more erodible, and as the clay content increases soil erodibility decreases
- Vegetative cover: Vegetation can protect the soil from rain drop impact, improve infiltration of runoff, and roots provide strength to the soil surface lowering the potential for soil to erode
- Topography: The greater the slope, the greater the potential for erosion of the soils due to movement of water over the soil surface
- Climate: This factor determines the total rainfall in an area, and the duration and intensity of individual rainfall events

To conservatively assess the erosion potential for soils around the site, the Revised Universal Soil Loss Equation (RUSLE) (Alberta Transportation 2011) can be used, with conservative estimates used for each of the following elements:

$$A = R \times K \times LS \times C \times P$$

Where

A = Annual soil loss (tonnes hectare [ha]$^{-1}$ year^{-1})

R = Rainfall factor (Megajoules [MJ] mm ha^{-1} hour^{-1} year^{-1})

K = Soil erodibility factor (tonne hour MJ^{-1} mm^{-1})

LS = Slope length and Steepness factors (respectively, dimensionless)

C = Vegetation and Management factor (dimensionless)

P = Support Practice Factor (dimensionless)

To conservatively estimate the erosion potential on the soil in the Project area prior to any ESC measures, C and P will not be used, the steepest slope will be used, and R = 82 (based on a rated R value of 82 for annual precipitation in Inuvik) (GNWT 2013).

E-07 WELLSITE

R = 82 (based on a rated R value of 82 for precipitation in Inuvik)

K = 0.050 (based on silt loam subsoil, consistent with fine silt as referenced in Section 2.1.2)

LS = 0.5 (based on a slope of 1% along the proposed access route, 300 m in length on disturbed soil conditions);

A = 2.05 tonnes ha^{-1} $year^{-1}$

Based on this value, the Site Hazard Classification based on RUSLE (for application in Canada) is very low (GNWT 2013). However, because of the proximity of the Beaufort Sea, potential impacts are possible. Based on this, ESC measures are required.

I-25 WELLSITE

The disturbance area for the I-25 wellsite is very small and is not anticipated to extend past the immediate zone of the well casing. The erosion risk has not been calculated; however, because of the proximity of the Beaufort Sea, potential impacts are possible. Based on this, ESC measures are required.

K-30 WELLSITE

R = 82 (based on a rated R value of 82 for precipitation in Inuvik)

K = 0.017 (based on a sandy loam textured subsoil, consistent with fine sand and silt subsoil where peaty organic material is removed prior to abandonment activities)

LS = 0.21 (based on a slope of 1% along the proposed access route, 50 m in length on disturbed soil conditions);

A = 0.29 tonnes ha^{-1} $year^{-1}$

Based on this value, the Site Hazard Classification based on RUSLE (for application in Canada) is very low (GNWT 2013). However, because of the proximity of the Beaufort Sea, potential impacts are possible. Based on this, ESC measures are required.

3 EROSION AND SEDIMENT CONTROL MEASURES

Proper planning and site management are important factors to protecting against erosion and sedimentation. The following measures are best management practices (BMPs) to be utilized as temporary ESC measures during abandonment and will help to protect against a release of sediment to the environment. See Appendix B for select BMP summaries from Northwest Territories Department of Transportation (sediment retention fiber rolls; GNWT 2013) and for manufacturer's information and recommended installation practices related to the recommended BMPs.

3.1 General Procedural Requirements

The priority on any project is to isolate the site, and direct potential runoff away from the active Project activity area or convey potential runoff through the site in a controlled manner:

- Project works must be carried out (clearing, stripping, and grading) in a sequential, phased approach and to not strip and grade areas of the site until needed (GNWT 2013)
- Temporary pumping or dewatering activities during Project activities require a permit from Inuvialuit Water Board to be pumped to vegetated buffers

3.2 Temporary ESC Measures

Disturbed areas are more likely to erode, resulting in potential sediment releases. Temporary ESC Measures are designed to protect from erosion of bare soil and sediment releases during active Project activities. At a minimum, BMP measures required for these sites (Figures 1, 2, and 3) include:

- Sediment Retention Fiber Roll (SRFR, Curlex sediment log is recommended) is to be installed along the boundary of disturbance at well center and all three wellsites, after abandonment activities are complete and vegetation/organic material layer and topsoil has been replaced and seeded (see Closure, Reclamation and Monitoring Plan, Section 5.6.4; Stantec 2024)
- SRFR (Curlex sediment log is recommended) is to be installed in semi-circle shapes facing up-slope along access routes as required to capture run-off along the access route and to divert flows around the potential barge landing locations for E-07 and K-30

3.3 Shut Down Considerations

Should the construction schedule be interrupted by a shutdown, additional temporary ESC may be required to prevent erosion and sedimentation. Recommendations on measures to be used for these cases will be required on a case by case basis, depending on site conditions, and may include silt fence and rolled erosion control product (RECP, including jute netting and erosion control blankets).

3.4 Modified Soil Erosion Protection Equation

Based on the above minimum required measures, if they are installed correctly and appropriately, the following modifications can be made to the RUSLE equation for the construction areas in K-30 and E-07 (a value was not calculated for I-25):

3.4.1.1 K-30

Practice (P-value)

- Assuming proper installation of Curlex sediment rolls: P = 0.46; LS = 0.05
- A = 0.002 t ha^{-1} y^{-1} x (0.1)

Annual soil loss with all ESC measures = 0.002 tonnes ha-1 year-1, which would make the Site Hazard Classification very low (GNWT 2013).

3.4.1.2 E-07

Practice (P-value)

- Assuming proper installation of Curlex sediment rolls: P = 0.46; LS = 0.71
- A = 0.607 t ha^{-1} y^{-1} x (0.1)

Annual soil loss with all ESC measures = 0.032 tonnes ha-1 year-1, which would make the Site Hazard Classification very low (GNWT 2013).

4 MONITORING AND MAINTENANCE

Monitoring is an important part of the ESC planning process. Installed ESC measures must be monitored, as BMPs are only effective if they are installed and maintained properly. Due to the sensitivity of the site (proximity to the Beaufort Sea), monitoring of the temporary ESC measures shall be conducted during Project activities:

- Informal monitoring is to take place daily at all active Project areas by site supervisors
- One weekly formal monitoring event is to be conducted for the entire Project footprints

Maintenance will be completed as soon as possible after any issue is identified. While rainfall and snow melt are not anticipated, should they occur additional monitoring events should be completed within 24 hours following a heavy rainfall event (greater than 12.5 mm) or snow melt events.

A report (including information on recent weather, site conditions, conditions of ESC measures, and time-stamped photos) will be created for every monitoring event and kept onsite for review when required. All deficiencies and subsequent repairs are also to be recorded and kept onsite. Additional information that is required to be recorded includes:

- The start and end date of any major Project activities;
- The start and end date when areas are left bare, with no activities planned on them; and
- The date when stabilization activities are initiated (i.e. soil replacement and installation of SRFR).

Appropriate follow up is to be completed on any deficiencies noted during the monitoring events as soon as possible, and prior to Project completion. If it is not possible to address all deficiencies, additional BMPs may be required. Sediment, should it be captured, is to be removed from SRFR once it reaches approximately 25% of the height of the material.

After abandonment is complete, monitoring will be required during regular reclamation monitoring events (during summer months, annually, for three to five years; Stantec 2024). Once vegetation has established, and there are no further deficiencies or maintenance requirements noted, all temporary ESC structures are required to be removed from the site with the following exceptions:

- SRFR can remain in place to degrade naturally

This ESC Plan is a living document, and as Project activities progress the ESC plan is to be modified as necessary based on changing site conditions.

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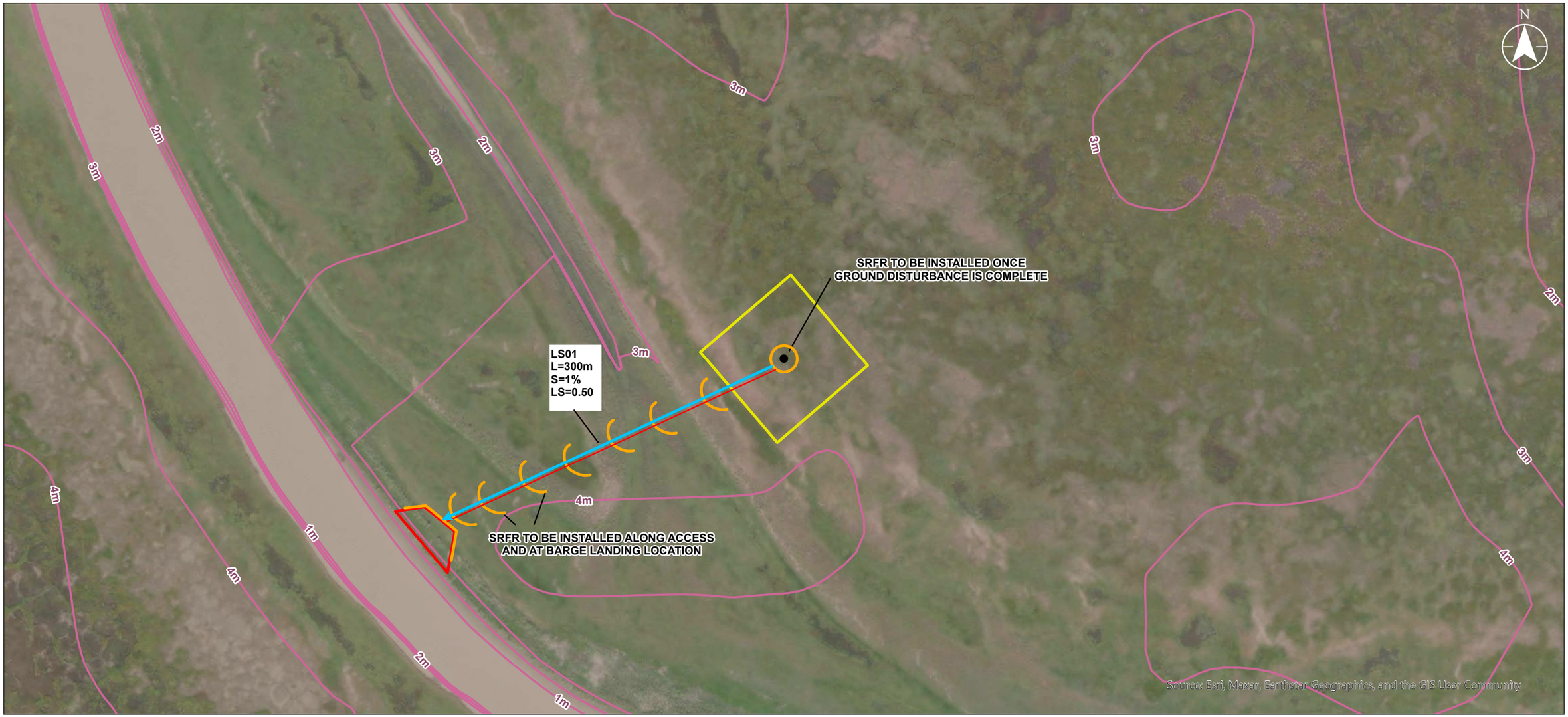
APPENDIX A Figures



- Wellhead
- LS Calculation for RUSLE Equation; L=length, S=slope
- Potential Access Route
- Sediment Retention Fiber Roll (SRFR)
- Topographic Contours (m)
- Potential Barge Landing Location
- Wellsite Area

0 100 200 metres

(At original document size of 11x17) 1:4,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 8N

2. Data Sources: Base Data - Natural Earth. Thematic Data - KAVIK-STANTEC Inc., Government of Northwest Territories

3. GPS coordinates for sampling locations were recorded in the field by an iPad collector tool. Accuracy of GPS coordinates may vary plus or minus 5 metres

Topographic contours generated from GNWT/Elevation_LCC(MapServer)

KAVIK-STANTEC

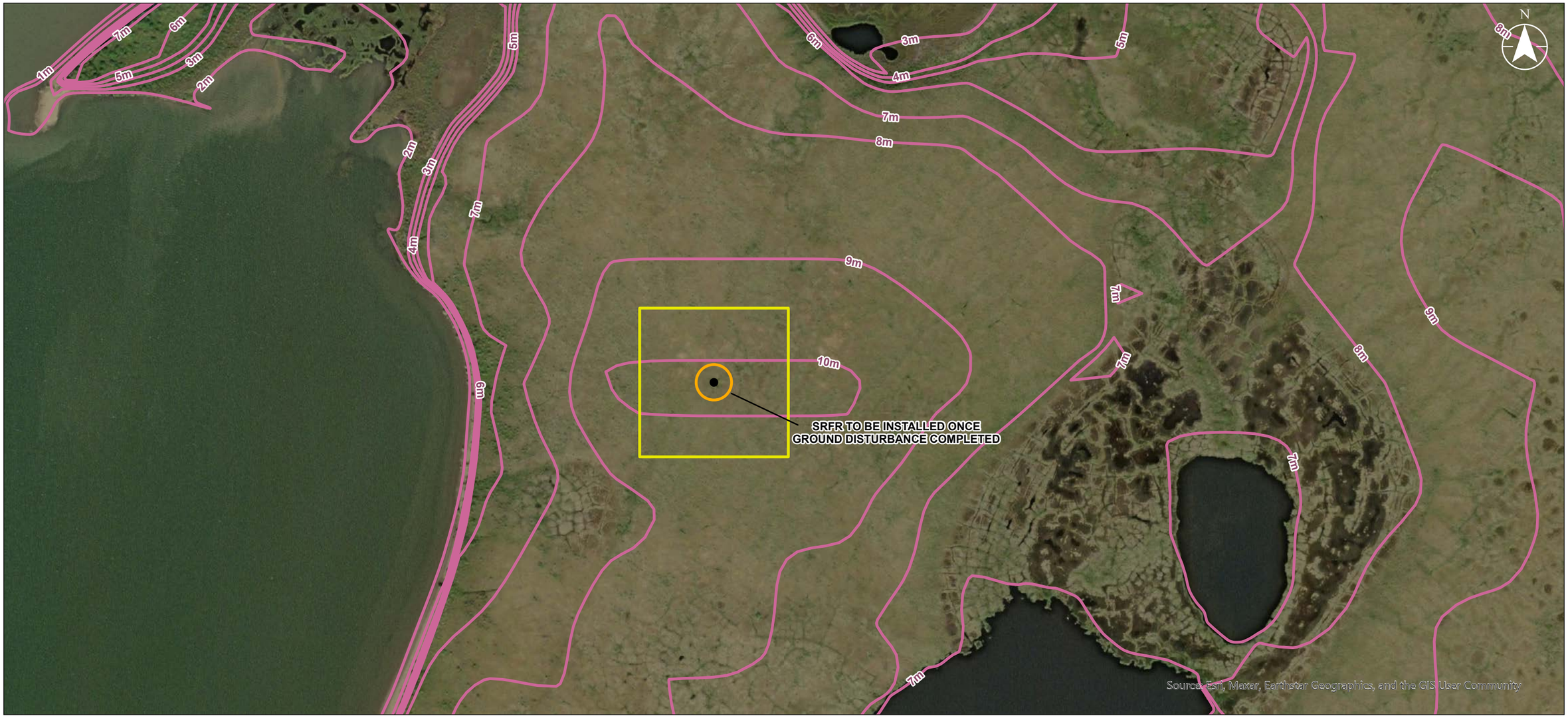
Project Location
Inuvialuit Settlement Region
NT

Prepared by AScoular on 2024-10-31
QR by - on -

Client/Project
123515084
MGM Energy
Erosion and Sediment Control Plan
Langley E-07 Wellsite Area

Figure No.
1

Title
Langley E-07 Wellsite Area



- Wellhead
- Topographic Contours (m)
- Wellsite Area
- Sediment Retention Fiber Roll (SRFR)

0 100 200 metres

(At original document size of 11x17) 1:4,000

KAVIK-STANTEC

Project Location
Inuvialuit Settlement Region
NT

Prepared by AScoular on 2024-10-30
QR by - on -
IR by - on -

Client/Project
123515084
MGM Energy
Erosion and Sediment Control Plan
Kumak I-25 Wellsite Area

Figure No.
2

Title
Kumak I-25 Wellsite Area

Notes
1. Coordinate System: NAD 1983 UTM Zone 8N
2. Data Sources: Base Data - Natural Earth. Thematic Data - KAVIK-STANTEC Inc., Government of Northwest Territories
3. GPS coordinates for sampling locations were recorded in the field by an iPad collector tool. Accuracy of GPS coordinates may vary plus or minus 5 metres
Topographic contours generated from GNWT/Elevation_LCC (MapServer)

- Wellhead
- LS Calculation for RUSLE Equation; L=length, S=slope
- Potential Access Route
- Sediment Retention Fiber Roll (SRFR)
- Topographic Contours (m)
- Potential Barge Landing Location
- Area naturally re-vegetated. Vegetation cover met land use permit requirements at the time of the site visit

0 25 50 metres

(At original document size of 11x17) 1:1,200

Notes

1. Coordinate System: NAD 1983 10TM AEP Forest
2. Data Sources: Base Data - Natural Earth. Thematic Data - KAVIK-STANTEC Inc., Government of Northwest Territories
3. GPS coordinates for sampling locations were recorded in the field by an iPad collector tool. Accuracy of GPS coordinates may vary plus or minus 5 metres
Topographic contours generated from GNWT/Elevation_LCC(MapServer)

KAVIK-STANTEC

Project Location
Inuvialuit Settlement Region
NT

Prepared by AScoular on 2024-10-30
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Client/Project
123515084
MGM Energy
Erosion and Sediment Control Plan
Langley K-30 Wellsite Area

Figure No.
3

Title
Langley K-30 Wellsite Area

APPENDIX B ESC Measure Descriptions

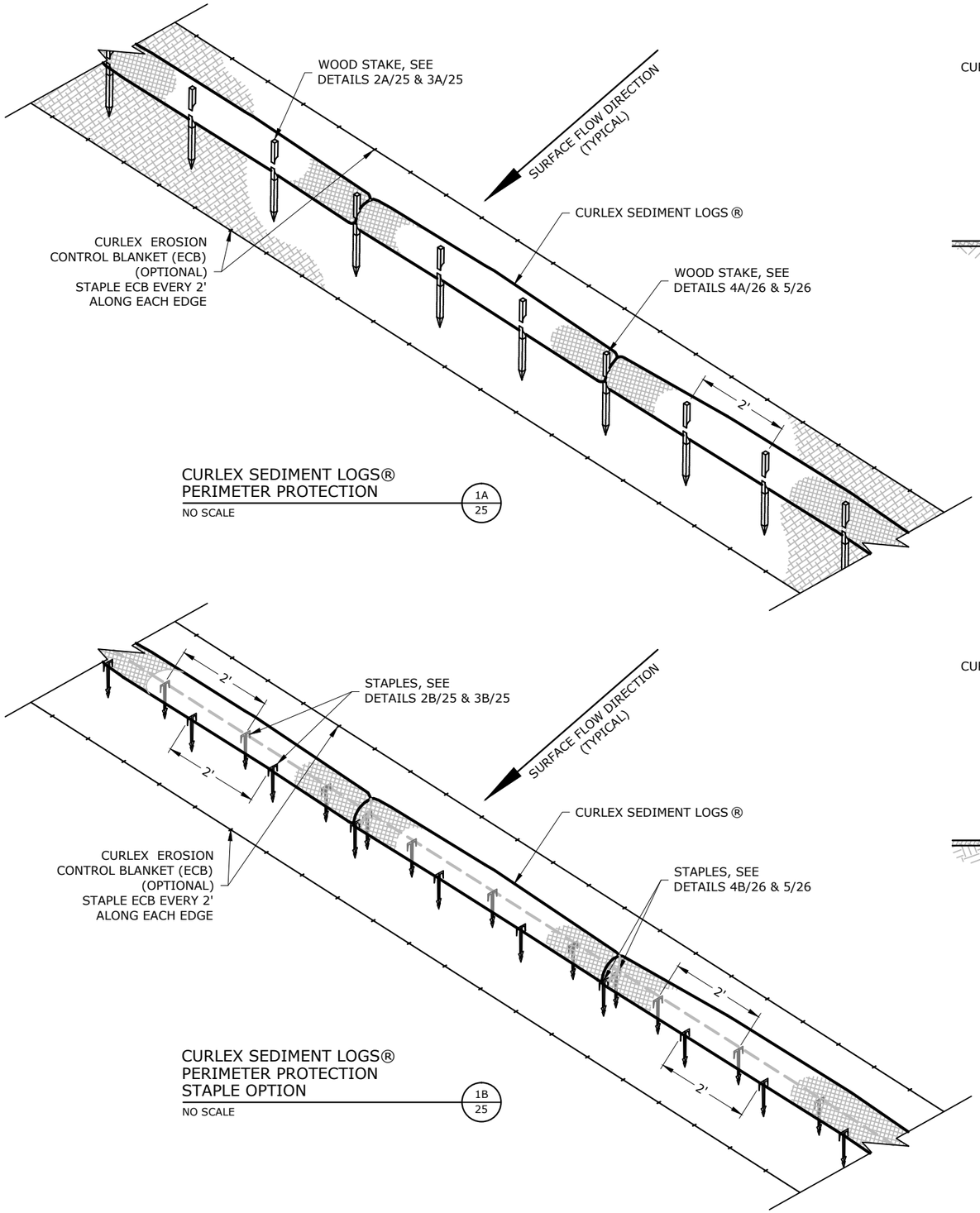
American Excelsior Company®
Earth Science Division

American Excelsior Company Recommended Curlex® Sediment Log® and AEC Premier Straw® Wattle Maximum Spacing on Slopes*

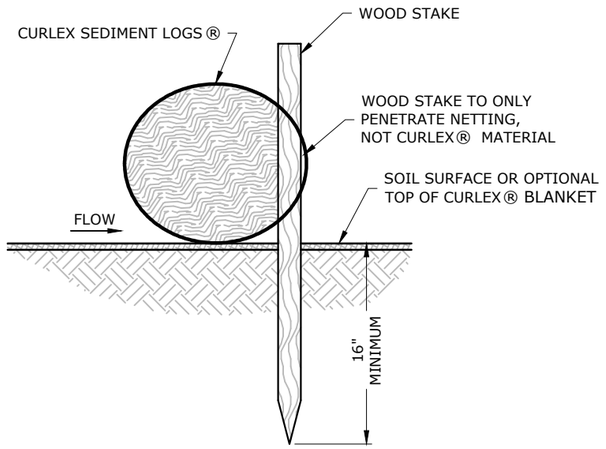
		Product Name			
		6" Curlex Sediment Log (m)	9" Curlex Sediment Log & 9" AEC Premier Straw Wattle (m)	12" Curlex Sediment Log & 12" AEC Premier Straw Wattle (m)	20" Curlex Sediment Log & 20" AEC Premier Straw Wattle (m)
Slope Gradient	≤4H:1V	6.096	12.192	18.288	24.384
	3H:1V	4.572	9.144	13.716	18.288
	2H:1V	3.048	6.096	9.144	12.192
	1H:1V	1.524	3.048	4.572	6.096

*Tighter spacing may be required based on soil type and seasonal rainfall patterns. For best results, use slope interruption devices in conjunction with rolled erosion control products.

850 Avenue H East / Arlington, Texas 76011
Phone 1-800-777-SOIL / Fax 817-385-3585 / www.Curlex.com



CURLEX SEDIMENT LOGS®
PERIMETER PROTECTION
1A / 25
NO SCALE



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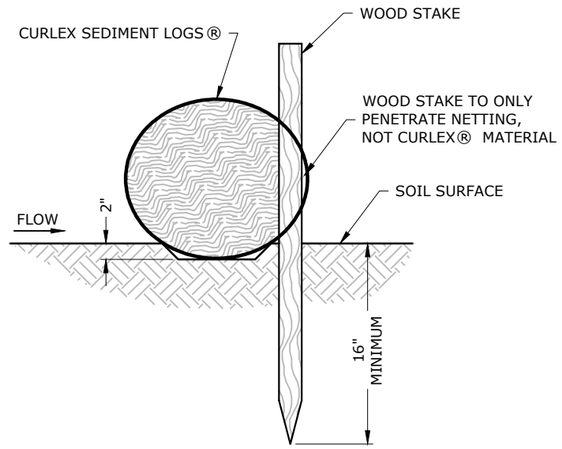

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CURLEX SEDIMENT LOGS®
PERIMETER PROTECTION
STAPLE OPTION
1B / 25
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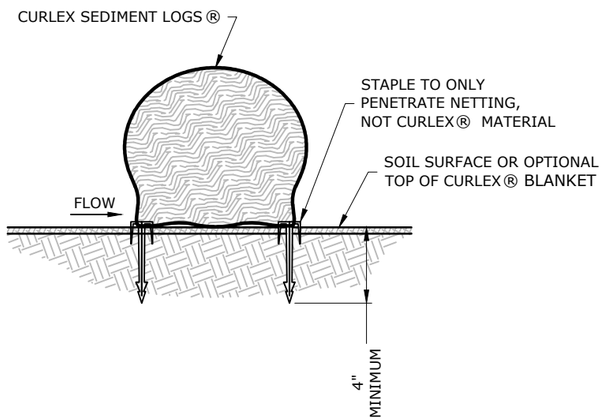

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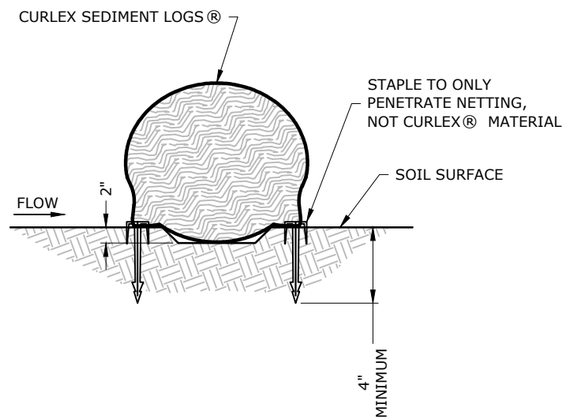


STAPLE DETAIL
OPTIONAL TRENCH
3B / 25
NO SCALE

NOTES:

SEE SHEET 26 FOR ADDITIONAL CURLEX SEDIMENT LOGS®
PERIMETER CONTROL DETAILS AND NOTES

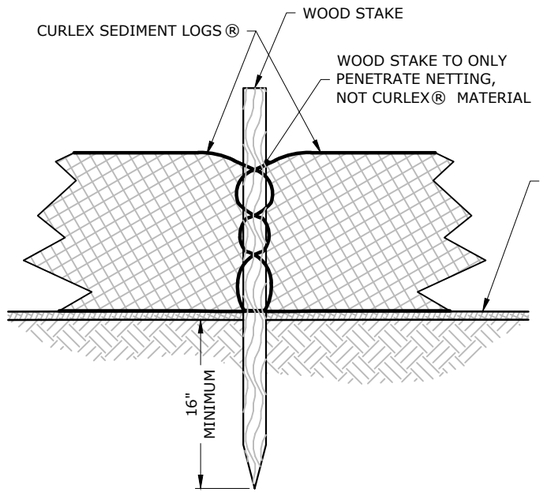
American Excelsior Company®
Earth Science Division

NO.	BY	DATE	REVISIONS	PROJECT MANAGER / CHECKED BY: / APPROVED BY:

AMERICAN EXCELSIOR COMPANY
ARLINGTON, TEXAS

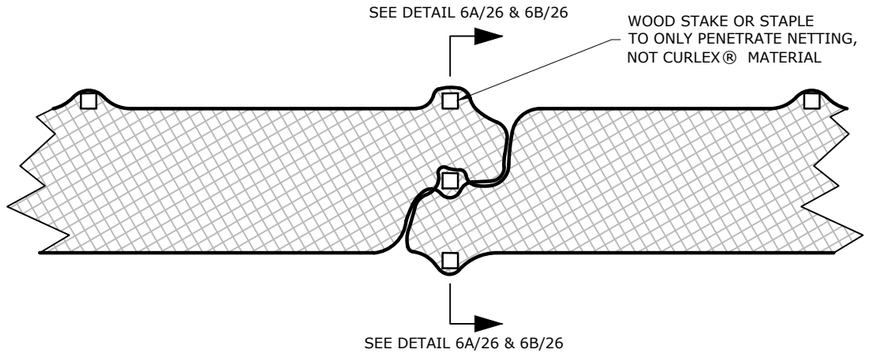
SHEET DESCRIPTION
CURLEX SEDIMENT LOGS ®
PERIMETER CONTROL DETAILS

DATE	DRAWN BY
7–15–15	
SCALE	PROJECT NO. / SHEET NO.
NONE	25



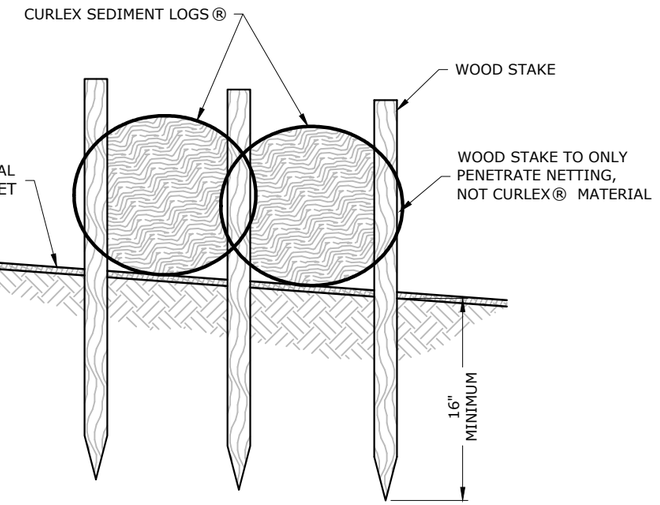
STAKE DETAIL (FRONT VIEW)
COMMON STAKE ABUTMENT JOINT — 4A / 26

NO SCALE



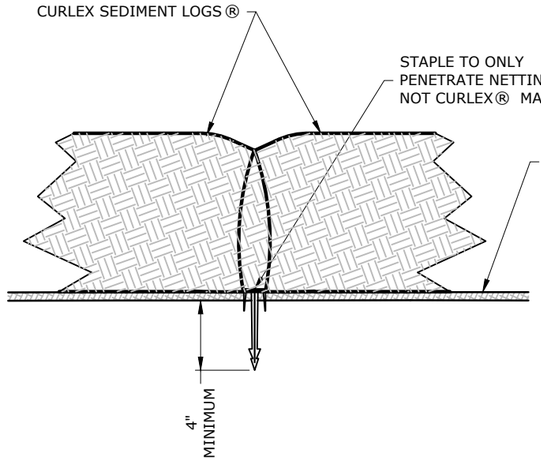
ANCHOR DETAIL (PLAN VIEW)
OPTIONAL OVERLAPPING JOINT — 5 / 26

NO SCALE



STAKE DETAIL — 6A / 26

NO SCALE

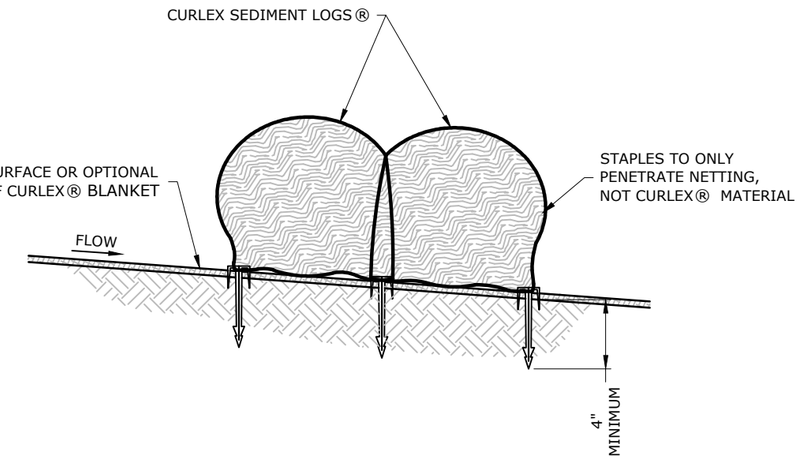


STAPLE DETAIL (FRONT VIEW)
COMMON STAPLE ABUTMENT JOINT — 4B / 26

NO SCALE

NOTES:

1. RECOMMENDED STAPLES ARE E-STAPLE®, 1 IN X 6 IN, U-SHAPED,11 GAUGE WIRE, OR 2 IN X 8 IN, U-SHAPED, 8 GAUGE WIRE.
2. STAPLES SHALL BE INSTALLED 24 IN APART ON EACH SIDE OF THE CURLEX SEDIMENT LOG. THE TWO ROWS OF STAPLES SHALL BE STAGGERED BY 12 IN ALONG THE LENGTH OF THE CURLEX SEDIMENT LOG. INSTALLATION OF ONE CURLEX SEDIMENT LOG SHALL INCLUDE ONE STAPLE ON EACH END OF THE PRODUCT. ALL STAPLES SHALL BE FULLY INSERTED INTO THE SUBGRADE BELOW THE CURLEX SEDIMENT LOG.
3. ADJOIN TWO CURLEX SEDIMENT LOGS BY PLACING STAPLES THROUGH THE NETTING OF BOTH LOGS ON BOTH SIDES OF THE PRODUCTS.
4. ANCHORING WITH STAPLES IS ONLY APPLICABLE FOR 6 IN AND 9 IN CURLEX SEDIMENT LOGS AND SHALL NOT BE USED IN CHANNELIZED FLOW APPLICATIONS.
5. STAKES MAY BE USED IN CONJUNCTION WITH STAPLES FOR ADDITIONAL ANCHORING OF 6 IN AND 9 IN CURLEX SEDIMENT LOGS, AS DEEMED NECESSARY BY THE ENGINEER.



STAPLE DETAIL — 6B / 26

NO SCALE

American Excelsior Company®
Earth Science Division

NO.	BY	DATE	REVISIONS	PROJECT MANAGER / CHECKED BY: / APPROVED BY:

AMERICAN EXCELSIOR COMPANY
ARLINGTON, TEXAS

SHEET DESCRIPTION
CURLEX SEDIMENT LOGS®
PERIMETER CONTROL DETAILS

DATE 7–14–15	DRAWN BY	
SCALE NONE	PROJECT NO.	SHEET NO. 26

Curlex® Sediment Log®

Excelsior Sediment Control Device

Curlex Sediment Logs use excelsior fibers to reduce hydraulic energy & filter sediment-laden runoff. Tired of straw and hay bale checks being blown out and the fibers washed downstream to clog the nearest outlet? Fed up with spending all of your time and effort installing silt fence only to see it get knocked down when it rains or a good wind comes along? How about when you have to go back and pick up the loose fibers and/or remove those worn out silt fences and take them to the landfill? Next time, consider giving our Bioengineered Sediment Logs a try. Water filters through (not underneath) the diameter of the porous, interlocked fiber log matrix. As it does, velocity is naturally reduced and sediment is collected on the upstream side of the excelsior fiber log. Install Curlex Sediment Logs over bare soil or over rolled erosion control products for a variety of typical job site applications.

Material Characteristics

Sediment Logs are versatile excelsior logs comprised of an outside containment fabric that is filled with unique Curlex fibers. Curlex fibers are made of Great Lakes Aspen excelsior fibers. The fibers are curled with soft interlocking barbs and 80% will be six inches in length or longer. The outside, open weave containment fabric is degradable, thus Sediment Logs will degrade in place if not removed. Sediment Logs are porous, allowing water to pass through the excelsior matrix, progressively slowing velocity and filtering sediment as it passes through the log diameter. Sediment Logs are extremely flexible and contour to the terrain to maintain intimate contact with the subgrade. In addition, they come with five other benefits; lightweight, no trenching, no seeds, no disposal hassle, and they may be reusable depending on the application.

Performance Capabilities

Product Names / Nominal Diameters

(20 in) energy dissipation in heavy duty concentrated flow areas, slope interruption, inlet protection, perimeter control

(12 in) energy dissipation in mild to medium concentrated flow areas, slope interruption, inlet protection, perimeter control

(9 in) energy dissipation in mild concentrated flow areas, slope interruption, inlet protection, perimeter control

(6 in) energy dissipation in low concentrated flow areas, slope interruption, inlet protection, perimeter control

Typical Applications

- Perpendicular to the flow of water in ditch bottoms, swales, and waterways
- As wattles on slopes
- Around job sites or perimeter control
- Around inlets and outlets
- Project ingress and egress termination points
- All other filtering applications
- In place of bales, silt fence, and rock checks

American Excelsior Company®
Earth Science Division
Arlington, Texas (800) 777-SOIL • www.curlex.com

MADE IN THE U.S.A.

American Excelsior Company®
Earth Science Division

Curlex® Sediment Log®

Excelsior Sediment Control Device

SUGGESTED SPECIFICATIONS

General

Sediment Log consists of an outside, open weave, containment fabric filled with Great Lakes Aspen curled excelsior fibers. Its purpose is to provide a flexible, lightweight, porous, sediment control device demonstrating the ability to conform to terrain details, dissipate water velocity, and filter contaminated flows.

Product

Sediment Control Device shall be Curlex Sediment Log, as manufactured by American Excelsior Company. Curlex Sediment Logs shall be made of Great Lakes Aspen excelsior fibers encased in an outside, open weave containment fabric secured on each end. Fibers shall be curled with soft, interlocking barbs to form a strong, organic filtration matrix. A minimum of 80 percent of the fibers shall be 15 cm (6 in) or greater in length. Fibers shall be evenly distributed throughout the diameter and length of the Sediment Log. Excelsior fibers shall be seed free. Density of Sediment Logs shall not exceed 2.6 lb/ft^3 to ensure necessary flow rates for filtering of ≥ 35 GPM/ft². Curlex Sediment Log shall be manufactured in the U.S.A. at company locations where QA/QC is implemented and managed by the manufacturer. Field fabricated products and products made by anyone other than the manufacturer (i.e. distributors, dealers, etc.) shall not be accepted.

Product Name/Nominal Diameter[a]	20 in	12 in	9 in	6 in
Length (±10%)	3.05 m (10 ft)	3.05 m (10 ft)	7.62 m (25 ft)	7.62 m (25 ft)
Weight (±10%)[b]	13.62 kg (30 lb)	9.02 kg (20 lb)	11.35 kg (25 lb)	5.45 kg (12 lb)
Net opening (hexagonal-shaped)	3.2 cm (1.3 in)	2.5 cm (1 in)	1.9 cm (.75 in)	1.3 cm (.5 in)

Performance Requirements

Property	Value	Method
Flow Rate (GPM/ft²)	≥ 35	ASTM D5141
Slope Soil Loss Reduction (%)	≥ 70	Quantified research[c]
Channel Soil Loss Reduction (%)	≥ 50	ASTM D7208
pH Buffering	8 ± 3	ASTM D1117, Modified
Functional Longevity[d]	≤ 24 Months	Documented laboratory and field studies
Oil Sorbent	Preapproved	U.S. Environmental Protection Agency
Removal of Polynuclear Aromatic Hydrocarbons (PAHs)	≥ 95%	Quantified research[e]
Fly Ash Filtration (TSS)	≥ 78%	Quantified research[f]
Fly Ash Filtration (NTU)	≥ 76%	Quantified research[f]

Curlex Sediment Logs Design Values With Comparisons To Typical Straw Wattles

	Channel Design			Slope Design	
Product Name/ Nominal Diameter	Density[b] (lb/ft^3)	GPM/ft^2 [g]	GPM/linear ft of installed product	P Factor[h] (event-based)	% Soil Retained
6 in Curlex Sediment Log	2.4	42.5	19.5	0.461	53.9
9 in Straw Wattle	4.5	7.5	5.6	0.676	32.4
9 in Curlex Sediment Log	2.3	42.5	29.0	0.461	53.9
12 in Straw Wattle	3.8	8.0	8.0	0.828	17.2
12 in Curlex Sediment Log	2.5	40.0	36.7	0.297	70.3
20 in Curlex Sediment Log	1.4	37.5	46.9	0.297	70.3

[a] Custom sizes available
[b] Weight and density are based on a dry weight basis at time of manufacture. Baseline moisture content of Great Lakes Aspen Excelsior, AEC Premier Straw and AEC Premier Coconut fibers are 22%, 15% and 20% respectively.
[c] Kelsey, K., T. Johnson and R. Vavra. 2006. "Needed Information: Testing, Analyses, and Performance Values for Slope Interruption and Perimeter Control BMPs." IECA Conference Proceedings. P. 171-181.
[d] Functional Longevity varies from region to region because of differences in climatic conditions.
[e] Boving and Zhang, Chemosphere 54 (2004) 831-839.
[f] Kelsey, K. and M. Murley. (2017, January). *Fly Ash Slurry Filtration Using Curlex® Sediment Log® - Quantifying Total Suspended Solids and Turbidity Reduction.* Unpublished internal document, ErosionLab.
[g] Based on ASTM D5141
[h] Based on large simulated rainfall testing

MADE IN THE U.S.A.

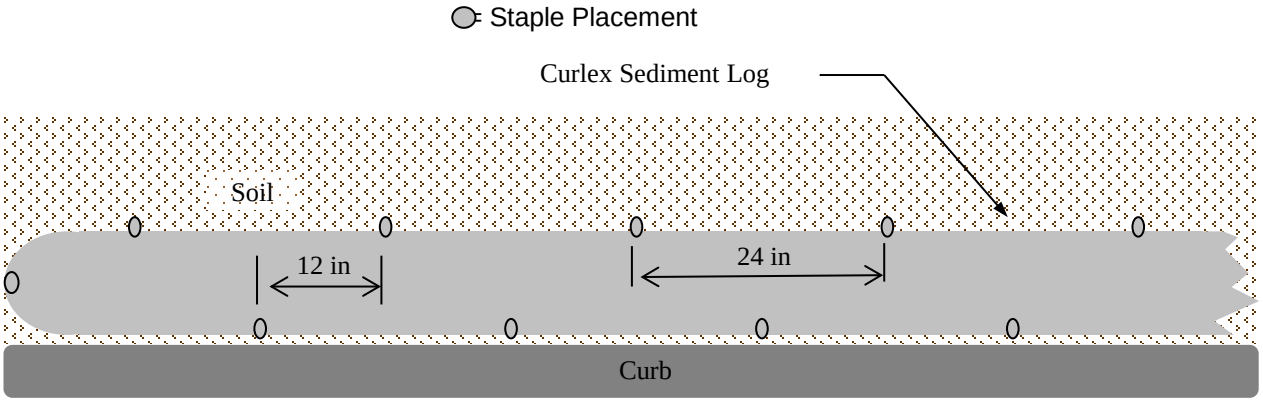
If you would like to receive more information or consult with one of our Customer Care Center Specialists, please call us toll free at (888-352-9582)

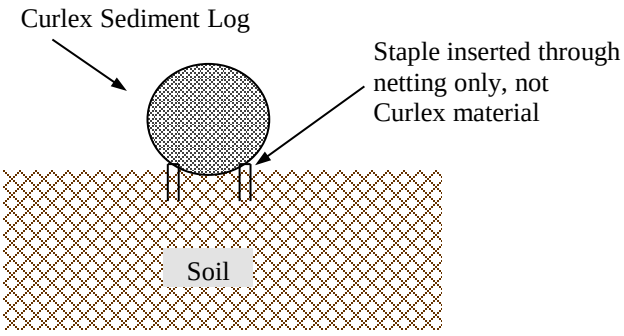
PDF download specifications available in the Technical Support Library at www.curlex.com

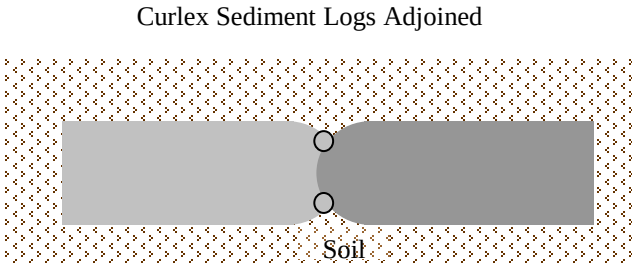
American Excelsior Company®
Earth Science Division

Proud Participant in NTPEP and Proud Member of:

Curlex® Sediment Log® Staple Pattern Guide







Notes:

1. Drawing not to scale.

2. Recommended staples are E-Staple®, 1 in x 6 in, U-shaped,11 gauge wire, or 2 in x 8 in, U-shaped, 8 gauge wire.

3. Staples shall be installed 24 in apart on each side of the Curlex Sediment Log. The two rows of staples shall be staggered by 12 in along the length of the Curlex Sediment Log. Installation of one Curlex Sediment Log shall include one staple on each end of the product. All staples shall be fully inserted into the subgrade below the Curlex Sediment Log.

4. Adjoin two Curlex Sediment Logs by placing staples through the netting of both logs on both sides of the products.

5. Anchoring with staples is only applicable for 6 in and 9 in Curlex Sediment Logs and shall not be used in channelized flow applications.

850 Avenue H East | Arlington, Texas 76011
Pnone 1-800-777-SOIL | Fax 817-385-3585 | www.Curlex.com

Rolls
a) Coir Roll
b) Fibre Roll
Streambank Stabilization Techniques and Erosion Control

B.M.P. #29

Description and Purpose

- Coir rolls are long cylindrical tubes that are composed of interwoven coconut fibres which are bound together with durable coir netting. Coir rolls are particularly applicable for wetland, streambank, and shoreline projects. Coir rolls are most commonly available in 0.3 m diameters and 6 m lengths. These rolls can be linked together to form longer tubes, and are often used in combination with other biotechnical techniques, such as brush layering or live siltation methods or branch staking. Coir logs encourage siltation and wetland/floodplain maintenance
- Fibre rolls are installed along slope contours as a grade break to reduce erosion potential by reducing overland flow velocities
- Straw rolls consist of bundled straw (or natural fibre) wrapped in photo-degradable open-weave plastic or natural fiber netting staked into the soil along slope contours as a grade break to reduce erosion potential
- Live stakes or branches can be installed to anchor the fibre rolls to provide deep rooted vegetation with potential favourable moisture retention provided by fibre roll
- Fibre rolls may capture sediment, organic matter, and seeds carried by runoff

Applications

- The tough, long-lasting coconut fibres make coir rolls appropriate for wetland, streambank, and shoreline applications. Coir rolls work well when immediate erosion control is needed. Brush layers work well with coir roll applications, adding further stabilization with a live root system , while also providing excellent habitat features. The coir roll provides a base for the brush layer cuttings to be laid upon at an appropriate angle which benefits the growth of cuttings. The cuttings provide further protection from breaking waves and high flows
- Fibre rolls may be used on slopes stable enough to support vegetation (steep, confined slopes and channel banks with gradients greater than 1H:1V may have low success potential)
- Fibre rolls may be used on long slopes as a grade break to shorten the length of slope between other slope retention features
- Fibre rolls may be used as grade breaks, where slopes transition from flatter to steeper gradients

Advantages

- The coir material is natural and long lasting (5 to 7 years), and has high tensile strength

- The coir rolls and fibre rolls accumulate sediment while the plant roots develop. Eventually the coir material biodegrades and the cohesive strength of the root systems and flexible nature of the roots become the primary stabilizing element
- The coir roll/brush layering combination provides immediate shoreline and streambank protection, with additional benefits of riparian enhancement when the cuttings become established
- Coir rolls address ecological concerns by encouraging vegetation and small wildlife habitat, and are an alternative to stone revetments or other structural measures
- The high tensile strength coconut fibres, the fibre netting and the wooden stakes used to anchor the material make up the initial structural components of the system, while plant root and top growth increase the strength and water velocity reduction and sediment capture effects of the structure
- Fibre rolls can be used on slopes too steep for sediment fences or straw bale sediment barriers
- In time, the plastic netting will degrade due to the sunlight and straw will degrade and be incorporated into the soil. Natural fiber netting (Bionet^{TM}) is also available
- The primary purpose of fibre rolls is erosion control, however fibre rolls do provide a small amount of sediment control as a secondary benefit.

Limitations

- This technique should be implemented during the dormancy period of the cuttings used for brush layering and staking
- Coir rolls are relatively expensive
- Fibre rolls are designed for low sheet flow velocities
- Fibre rolls are designed for short slopes with a maximum gradient of 1H:1V
- Fibre rolls may be labour intensive to install
- Straw rolls have a shorter life span due to natural degradation
  - Usually only functional for two seasons
  - Susceptible to undermining and failure if not properly keyed into the soil
- Labour intensive maintenance may be required to ensure rolls are in continuous contact with the soil, especially when used on steep slopes or sandy soils

Construction

- Determine the annual maximum water elevation
- Mark the water level on a stake driven into the substrate, 0.3 or 0.6 m offshore. Installing the materials and plants at the correct elevation is the most important aspect to assure success of the installation. Determine, on site, where the installation will begin and end
- Determine soil level by laying a straight cutting on the coir roll with approximately 20% of the cutting sticking out past the roll, and with the basal ends dipping down into the soil
- Begin installation at the downstream end (if using in a streambank project)
- Prepare the site for installation of coir rolls by removing any large rocks, obstructions or material that may prevent the coir from making direct and firm contact with the soil. Coir rolls must be level, installed along a horizontal contour. Place coir rolls parallel to the stream bank or shoreline. It is very important to key the ends of the coir rolls firmly into the shoreline or stream bank, so waves and flows will not scour behind the rolls and compromise the integrity of the structure
- Install the coir roll such that 0.05 m of the roll extends above the annual water elevation
- Adjacent rolls shall be laced together, end-to-end, tightly and securely
- If using brush layer cuttings, prepare the soil bed behind the installed coir rolls for brush laying. It is important that the bud ends of the live cuttings angle up to some degree from the basal ends. Lay cuttings in this fashion, slightly crisscrossed for additional strength
- Next, backfill over the cuttings with soil, covering the lower 80% of the branches. At this time, the soil can be levelled and prepared for a soil wrap for additional height and soil stability
- If simply covering the cuttings with soil, compact slightly and grade slope to appropriate angle. Use water to wash soil in between branch layers
- If using plant materials, such as container-grown, pre-rooted plant plugs or willow stakes, they should be planted into the coir rolls and through the coir mats and netting
- To install plant plugs and willow stakes into the coir roll, use a planting iron or pilot bar into the roll and wedge it back and forth to create a hole for the plant. It is extremely important that the root system of the plant be placed below the water

table for certain species. All plants shall be checked to ensure that they have been firmly installed through the fibre material, into the soil

- Mulch and seed exposed areas with native species
- Prepare the slope face and remove large rocks or other deleterious materials
- Excavate small trenches a minimum of 0.15 m deep and 0.15 m wide across the width of the slope, perpendicular to the slope direction, starting at the toe of the slope and working upwards towards the crest of slope
- Space trenches a maximum of 3 to 8 m apart along the slope incline, with steeper slopes having trenches spaced closer together
- Place fibre rolls into the trenches, ensuring continuous contact between the fibre roll and the soil surface
- Butt-joint adjacent fibre roll segments tightly against one another and lace together
- Use a metal bar to make a pilot hole through middle of the fibre roll a minimum depth of 0.3 m into underlying soil
- Pilot holes should be spaced a maximum of 1 m apart
- Secure fibre roll to soil using wooden stake or other appropriate anchor. Live stakes may be used as alternate anchors
- Place soil excavated from the trench on the upslope side of fibre roll Seed the soil along the upslope and downslope sides of the fibre roll to promote vegetation growth
- Compact the soil upslope of the fibre roll to minimize undermining by runoff

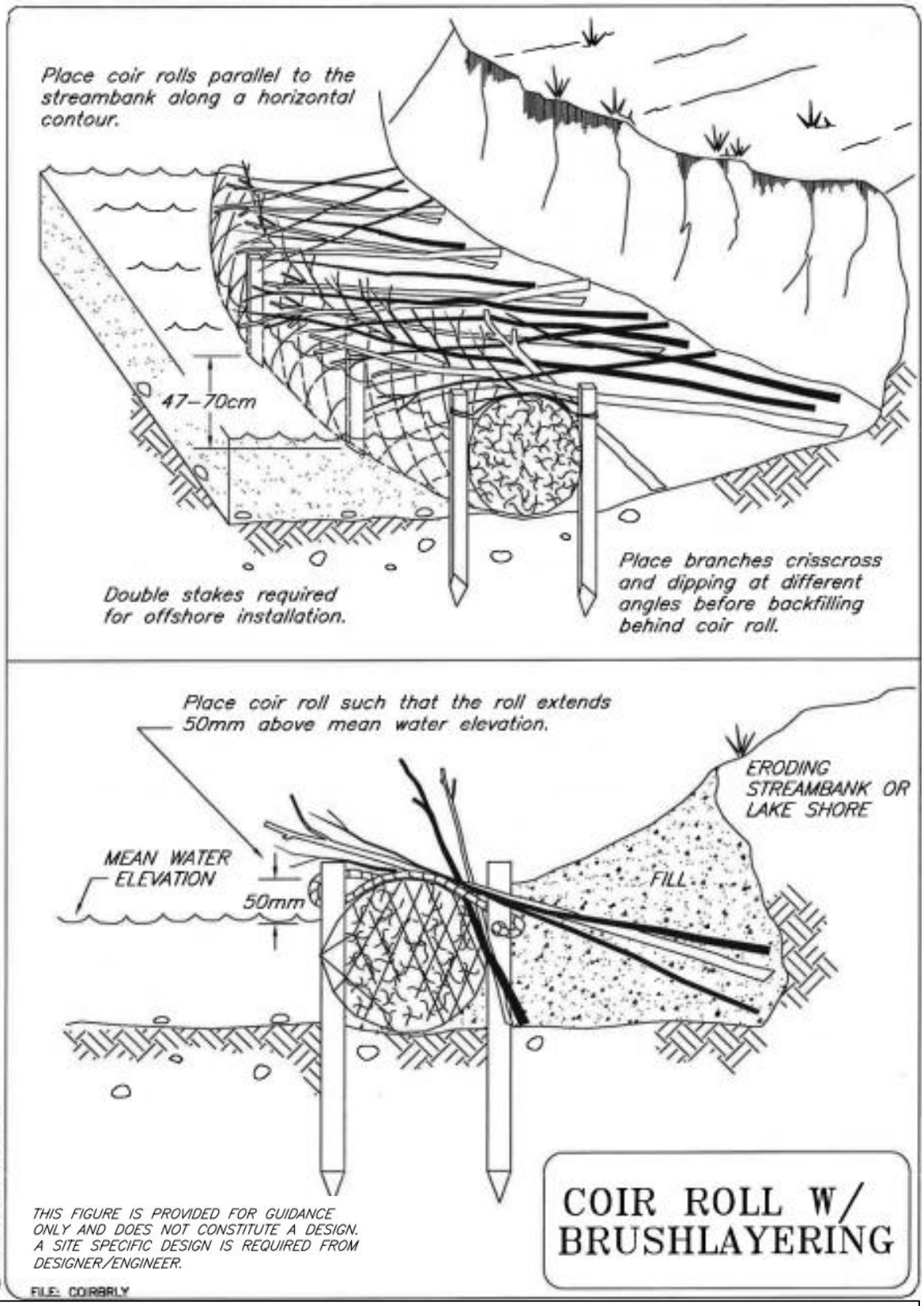
Construction Considerations

- All work site disturbance should be minimized. Protect any existing plants, when possible, and avoid additional disturbance that can lead to erosion and sedimentation
- Install additional erosion and sediment control measures such as temporary diversion dikes, sediment fences and continuous berms, as needed, before beginning work
- Coir rolls can be used in the stream as a sediment barrier, silt curtain, and/or coffer dam to control sediment while work is being done in the water
- Topsoil should be saved, if possible, and replaced once the subsoil has been removed or regraded. Soil shall be stored away from the water's edge and it shall be moved to its final location and stabilized as quickly as possible

- For typical applications at the water's edge, coir rolls are held in place with a single row of stakes, spaced 0.3 m apart. Stakes may be driven through the netting on the outer edge of the roll. It is very difficult to drive stakes through the high-density rolls, however, a stake can be driven with the help of a pilot hole through the low density part of the coir rolls
- Lacing among the stakes is recommended for coir mats exposed to extreme conditions such as ice, waves, or flooding
- Coir rolls shall be placed along streambanks or shorelines at a height sufficient to protect the bank from flows or waves. Additional coir rolls may be placed above the lower rolls, in a tile-like fashion, to protect the upper shore or stream bank
- Use live stakes in place of wooden stakes for streambank coil rolls
- If the slope soil is loose and uncompacted, excavate a trench to a minimum depth of 2/3 of the diameter of the coir roll
- For steep slopes, additional anchors placed on the downslope side of the coir roll may be required

Inspection and Maintenance

- Inspection frequency should be in accordance with the PESC and TESC Plans
- Check plants to ensure that they have been firmly installed into the soil below the fibre material
- Water plants, if necessary, during the establishment phase
- Check all materials periodically or after major storms to ensure they remain properly secured. Make necessary repairs promptly
- All temporary and permanent erosion control measures shall be maintained and repaired as needed to ensure continued performance of their intended use
- Areas damaged by washout (rilling or gulleying) should be repaired immediately
- Additional stormwater control measures should be considered for erosion (rilling or gulleying) areas damaged by runoff



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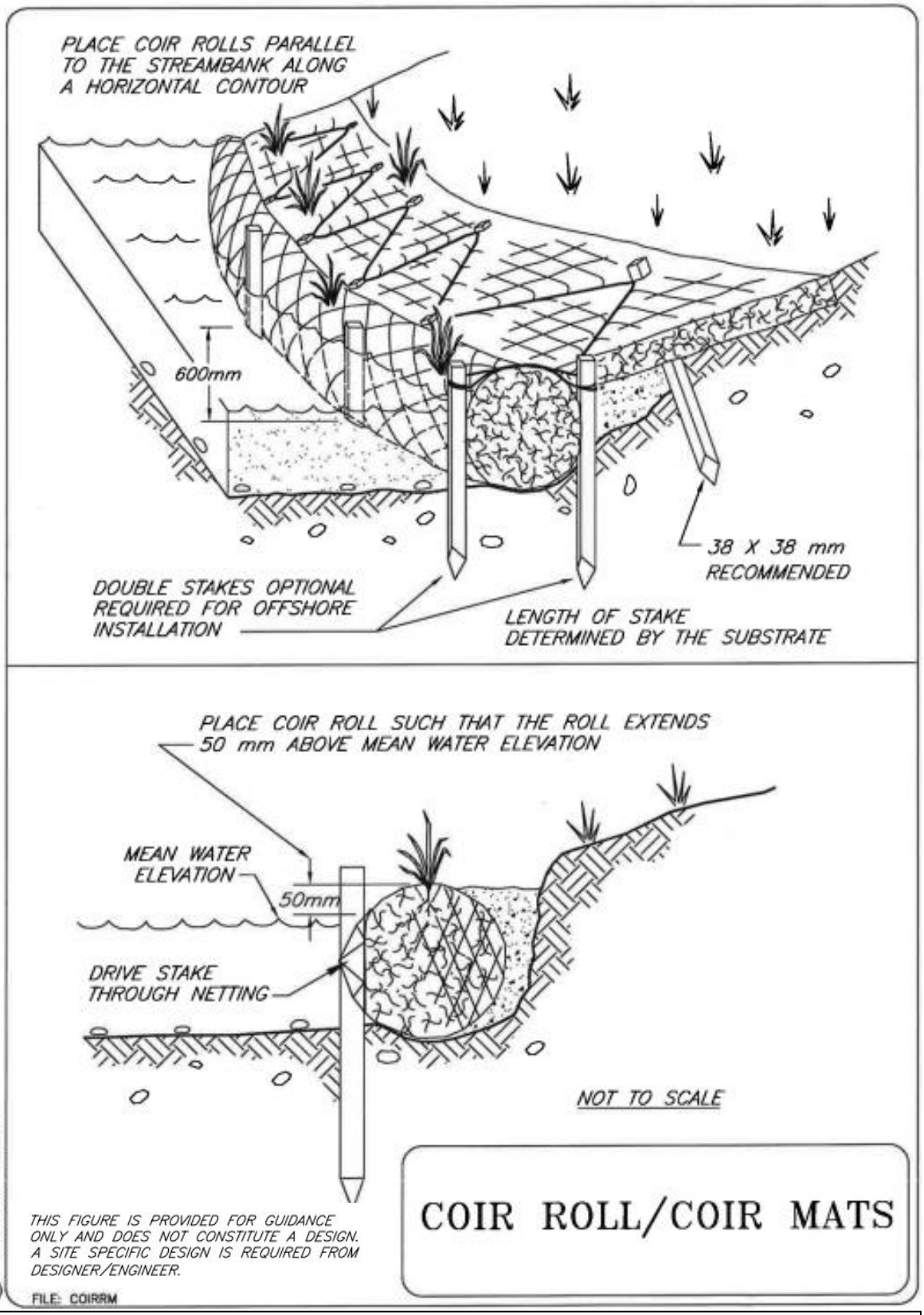
PLACE COIR ROLLS PARALLEL TO THE STREAMBANK ALONG A HORIZONTAL CONTOUR
600mm
38 X 38 mm RECOMMENDED
DOUBLE STAKES OPTIONAL REQUIRED FOR OFFSHORE INSTALLATION
LENGTH OF STAKE DETERMINED BY THE SUBSTRATE
PLACE COIR ROLL SUCH THAT THE ROLL EXTENDS 50 mm ABOVE MEAN WATER ELEVATION
MEAN WATER ELEVATION
50mm
DRIVE STAKE THROUGH NETTING
NOT TO SCALE
THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.
FILE: COIRRM
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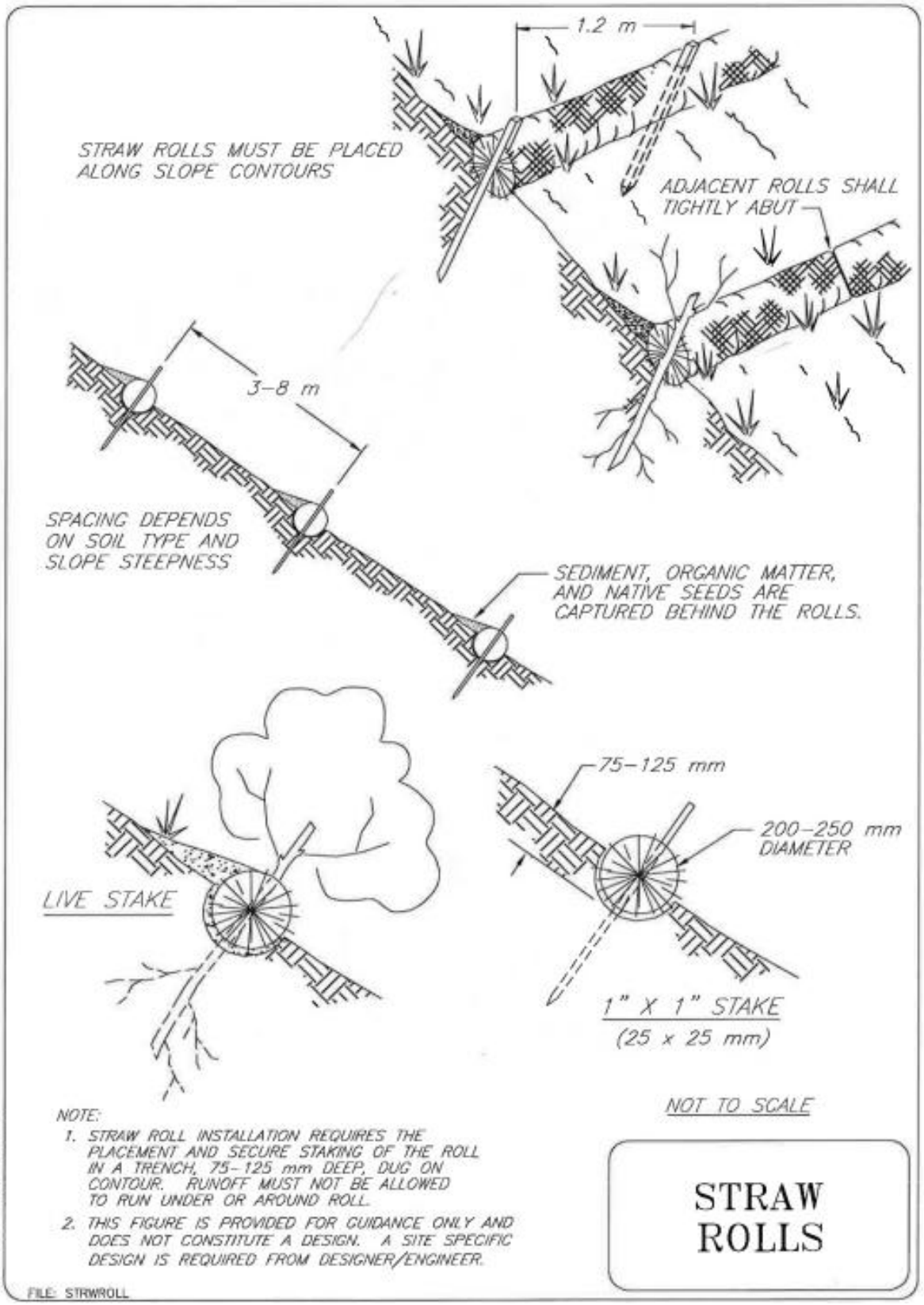
COIR ROLL/COIR MATS



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