



TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
 Division of Water Resources
 William R. Snodgrass Tennessee Tower, 312 Rosa L. Parks Avenue, 11th Floor,
 Nashville, Tennessee, 37243
 1-888-891-8332 (TDEC)

Application for Aquatic Resource Alteration Permit (ARAP) & State §401 Water Quality Certification

OFFICIAL STATE USE ONLY	Site #:	Permit #:
--------------------------------	---------	-----------

Section 1. Applicant Information *(individual responsible for site, signs certification below)*

Applicant Name (company or individual):		SOS #:	Status:
Primary Contact/Signatory:		Signatory's Title or Position:	
Mailing Address:		City:	State: Zip:
Phone:	Fax:	E-mail:	

Section 2. Alternate Contact/Consultant Information *(a consultant is not required)*

Alternate Contact Name:			
Company:		Title or Position:	
Mailing Address:		City:	State: Zip:
Phone:	Fax:	E-mail:	

Section 3. Fee *(Application will be incomplete until fee is received)*

No Fee Fee Submitted with Application Amount Submitted: \$ _____

Current application fee schedules can be found at the Division of Water Resources webpage at:
<https://www.tn.gov/environment/permit-permits/water-permits/1/aquatic-resource-alteration-permit--arap-.html>
 or by calling (615) 532-0625. Please make checks payable to "Treasurer, State of Tennessee".

Billing Contact Name (if different from Applicant): Name: Email:

Address: Phone:

Section 4. Project Details *(fill in information and check appropriate boxes)*

Site or Project Name:		Nearest City, Town or Major Landmark:	
Street Address or Location (include Zip):			
County(ies):	MS4 Jurisdiction:	Latitude (dd.dddd):	
		Longitude (dd.dddd):	
Resource Proposed for Alteration:		Stream / River	Wetland Reservoir
Name of Water Resource (for more information, access http://tdeconline.tn.gov/dwr):			
Brief Project Description (a more detailed description is required under Section 8):			
Does the proposed activity require approval from the U.S. Army Corps of Engineers, the Tennessee Valley Authority, or any other federal, state, or local government agency? Yes No			
If Yes, provide the permit reference numbers:			
Is the proposed activity associated with a larger common plan of development:		Yes	No
If Yes, submit site plans and identify the location and overall scope of the common plan of development.			
Plans attached?		Yes	No
If applicable, indicate any other federal, state, or local permits that are associated with the overall project site (common plan of development) that have been obtained in the past (e.g., construction general permit and/or other ARAP):			

Application for Aquatic Resource Alteration Permit (ARAP) & State §401 Water Quality Permit

Section 5. Project Schedule <i>(fill in information and check appropriate boxes)</i>	
Proposed Start Date:	Estimated End Date:
Is any portion of the activity complete now?	Yes <input checked="" type="checkbox"/> No
If yes, describe the extent of the completed portion:	

The required information in Sections 6-11 must be submitted on a separate sheet(s) and submitted in the same numbered format as presented below. If any question is not applicable, state the reason why it is not applicable.

Section 6. Description		Attached	
		Yes	No
6.1	A narrative description of the scope of the project	<input type="checkbox"/>	<input type="checkbox"/>
6.2	USGS topographic map indicating the exact location of the project <i>(can be a photographic copy)</i>	<input type="checkbox"/>	<input type="checkbox"/>
6.3	Photographs of the resource(s) proposed for alteration with location description <i>(photo locations should be noted on map)</i>	<input type="checkbox"/>	<input type="checkbox"/>
6.4	A narrative description of the existing stream and/or wetland characteristics including, but not limited to, dimensions (e.g., depth, length, average width), substrate and riparian vegetation	<input type="checkbox"/>	<input type="checkbox"/>
6.5	A narrative description of the proposed stream and/or wetland characteristics including, but not limited to, dimensions (e.g., depth, length, average width), substrate and riparian vegetation	<input type="checkbox"/>	<input type="checkbox"/>
6.6	In the case of wetlands, include a wetland delineation with delineation forms and site map denoting location of data points	<input type="checkbox"/>	<input type="checkbox"/>
6.7	A copy of all hydrologic or jurisdictional determination documents issued for water resources on the project site	<input type="checkbox"/>	<input type="checkbox"/>

Section 7. Project Rationale	Attached	
	Yes	No
Describe the need for the proposed activity, including, but not limited to, the purpose, alternatives considered, and what will be done to avoid or minimize impacts to water resources	<input type="checkbox"/>	<input type="checkbox"/>

Section 8. Technical Information		Attached	
		Yes	No
8.1	Detailed plans, specifications, blueprints, or legible sketches of present site conditions and the proposed activity. Plans must be 8.5x 11 inches. Additional larger plans may also be submitted to aid in application review. The detailed plans should be superimposed on existing and new conditions <i>(e.g., stream cross sections where road crossings are proposed)</i>	<input type="checkbox"/>	<input type="checkbox"/>
8.2	For both the proposed activity and compensatory mitigation, provide a discussion regarding the sequencing of events and construction methods	<input type="checkbox"/>	<input type="checkbox"/>
8.3	Depiction and narrative on the location and type of erosion prevention and sediment control (EPSC) measures for the proposed alterations	<input type="checkbox"/>	<input type="checkbox"/>

Section 9. Water Resources Degradation (degree of proposed impact) *Note that in most cases, activities that exceed the scope of the General Permit limitations are considered greater than de minimis degradation to water quality.*

Please provide your basis for concluding the proposed activity will cause one of the following levels of water quality

- degradation:
- a. *De minimis degradation*
 - b. *Greater than de minimis degradation (if greater than de minimis complete Sections 10-11)*

For information and guidance on the definition of de minimis and degradation, refer to the Antidegradation Statement in Chapter 0400-40-03-.06 of the Tennessee Water Quality Criteria Rule at: <http://publications.tnsosfiles.com/rules/0400/0400-40/0400-40.htm>

For information on specifics on what General Permits can cover, refer to the Natural Resources Unit webpage at:

<http://www.tn.gov/environment/permit-permits/water-permits1/aquatic-resource-alteration-permit--arap-/permit-water-aquatic-resource-alteration-list-of-general-permits.html>

Application for Aquatic Resource Alteration Permit (ARAP) & State §401 Water Quality Permit

Section 10. Detailed Alternatives Analysis		Attached	
		Yes	No
10.1	Analyze all reasonable alternatives and describe the level of degradation caused by each of the feasible alternatives	<input type="checkbox"/>	<input type="checkbox"/>
10.2	Discuss the social and economic consequences of each alternative	<input type="checkbox"/>	<input type="checkbox"/>
10.3	Demonstrate that the degradation associated with the preferred alternative will not violate water quality criteria for uses designated in the receiving waters, and is necessary to accommodate important economic and social development in the area	<input type="checkbox"/>	<input type="checkbox"/>

Section 11. Compensatory Mitigation		Attached	
		Yes	No
11.1	A detailed discussion of the proposed compensatory mitigation	<input type="checkbox"/>	<input type="checkbox"/>
11.2	Describe how the compensatory mitigation would result in no net loss of resource value	<input type="checkbox"/>	<input type="checkbox"/>
11.3	Provide a detailed monitoring plan for the compensatory mitigation site	<input type="checkbox"/>	<input type="checkbox"/>
11.4	Describe the long-term protection measures for the compensatory mitigation site (e.g., deed restrictions, conservation easement)	<input type="checkbox"/>	<input type="checkbox"/>

Certification and Signature

An application submitted by a corporation must be signed by a principal executive officer; from a partnership or proprietorship, by the partner or proprietor respectively; from a municipal, state, federal or other public agency or facility, the application must be signed by either a principal executive officer, ranking elected official, or other duly authorized employee.

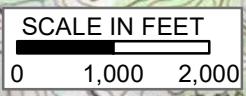
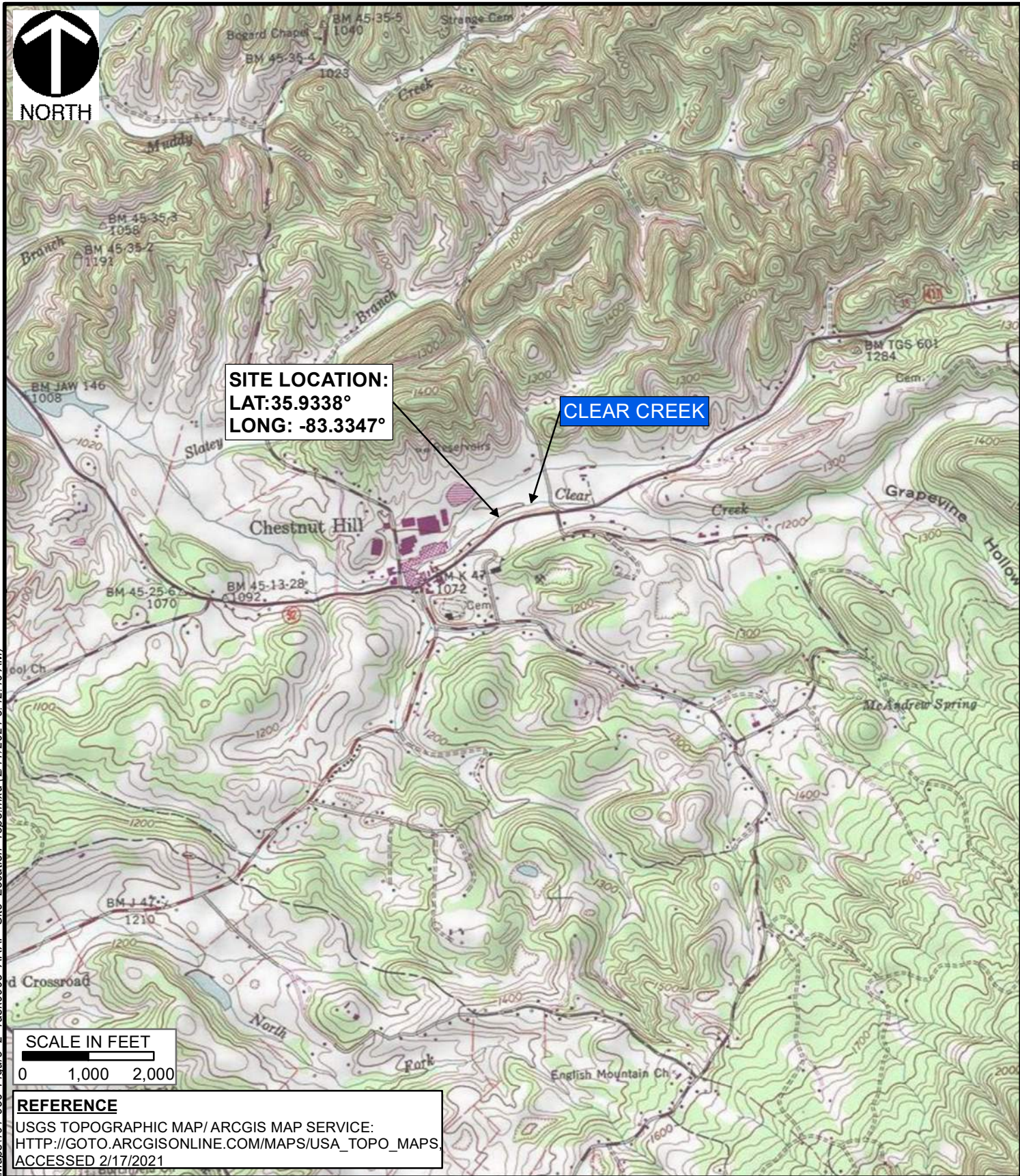
I certify under penalty of law that this document and all attachments were prepared by me, or under my direction or supervision. The submitted information is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. As specified in Tennessee Code Annotated Section 39-16-702(a)(4), this declaration is made under penalty of perjury.

Robby Reece <small>Printed Name</small>	Manager <small>Official Title</small>	 <small>Signature</small>	2/22/21 <small>Date</small>
---	---	------------------------------	---------------------------------------

Submitting the form and obtaining more information. Note that this form must be signed by the principal executive officer, partner or proprietor, or a ranking elected official in the case of a municipality; for details see **Certification and Signature** statement above. For more information, contact your local EFO at the toll-free number 1-888-891-8332 (TDEC). Submit the completed ARAP Application form (keep a copy for your records) to the appropriate EFO for the county(ies) where the ARAP activity is located, addressed to **Attention: ARAP Processing**. You may also electronically submit the complete application and all associated attachments to water.permits@tn.gov.

EFO	Street Address	Zip Code	EFO	Street Address	Zip Code
Memphis	8383 Wolf Lake Drive, Bartlett	38133-4119	Cookeville	1221 South Willow Ave.	38506
Jackson	1625 Hollywood Drive	38305-4316	Chattanooga	1301 Riverfront Pkwy., Ste. 206	37402
Nashville	711 R S Gass Boulevard	37243	Knoxville	3711 Middlebrook Pike	37921
Columbia	1421 Hampshire Pike	38401	Johnson City	2305 Silverdale Road	37601





REFERENCE
 USGS TOPOGRAPHIC MAP/ ARCGIS MAP SERVICE:
[HTTP://GOTO.ARCGISONLINE.COM/MAPS/USA_TOPO_MAPS](http://goto.arcgisonline.com/maps/usa_topo_maps),
 ACCESSED 2/17/2021



Civil & Environmental Consultants, Inc.
 325 Seaboard Lane, Ste. 170 Franklin, Tennessee
 615-333-7797 · 800-763-2326
 www.cecinc.com

BUSH BROTHERS & COMPANY
 GENERAL AQUATIC RESOURCE ALTERATION
 PERMIT FOR MAINTENANCE ACTIVITES
 PHASE 3
 DANDRIDGE, JEFFERSON COUNTY, TN

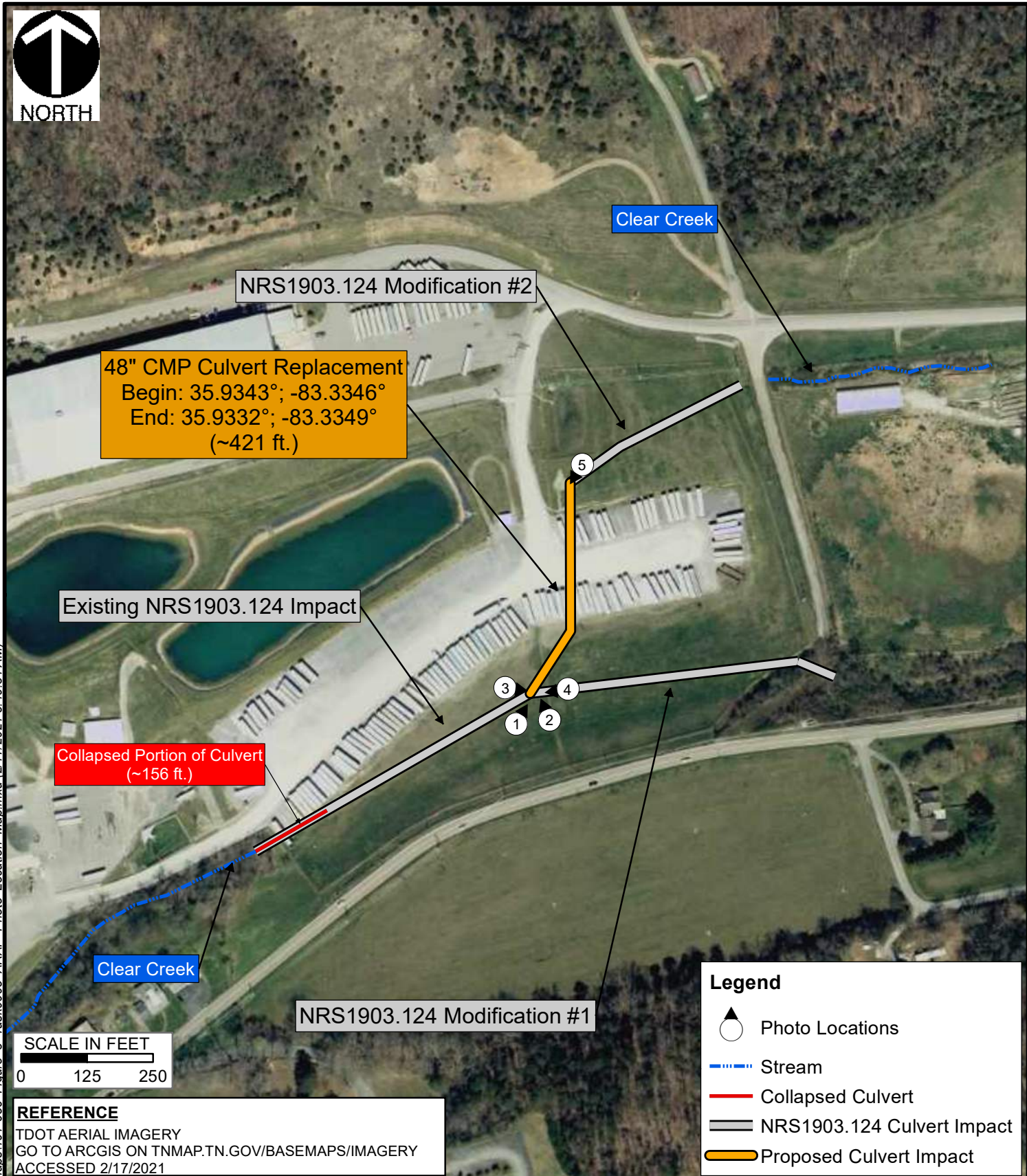
SITE LOCATION TOPOGRAPHIC MAP

DRAWN BY:	JTM	CHECKED BY:	JLW	APPROVED BY:	JLW <small>* Hand signature on file</small>	FIGURE NO:	2
DATE:	2/17/2021	SCALE:	1" = 2,000'	PROJECT NO:	191-656		

I:\SVR-NASH\P\2019\191-656-GIS\Maps\191-656 Figure 2 Task005 ARAP Site Location Topo.mxd (2/17/2021 8:42:40 AM)



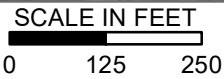
\\SVR-NASHI\P\2019\191-656-GIS\Maps\191-656 Figure 3 Task005 ARAP Photo Location Map.mxd (2/17/2021 8:49:34 AM)



48" CMP Culvert Replacement
Begin: 35.9343°; -83.3346°
End: 35.9332°; -83.3349°
(~421 ft.)

Existing NRS1903.124 Impact

Collapsed Portion of Culvert
(~156 ft.)



REFERENCE
TDOT AERIAL IMAGERY
GO TO ARCGIS ON TNMAP.TN.GOV/BASEMAPS/IMAGERY
ACCESSED 2/17/2021

Legend

- Photo Locations
- Stream
- Collapsed Culvert
- NRS1903.124 Culvert Impact
- Proposed Culvert Impact



Civil & Environmental Consultants, Inc.
117 Seaboard Lane, Suite E100, Franklin, Tennessee
615-333-7797 • 800-763-2326
www.cecinc.com

BUSH BROTHERS & COMPANY
GENERAL AQUATIC RESOURCE ALTERATION
PERMIT FOR MAINTENANCE ACTIVITIES
PHASE 3
DANDRIDGE, JEFFERSON COUNTY, TN

PHOTO LOCATION MAP

DRAWN BY: JTM	CHECKED BY: JLW	APPROVED BY: JLW <small>* Hand signature on file</small>	FIGURE NO: 3
DATE: 2/17/2021	SCALE: 1" = 250'	PROJECT NO: 191-656	



Bush Brothers & Company - 48” CMP Replacement General Aquatic Resource Alteration Permit Maintenance Activities

**The numbering scheme below follows TDEC’s Form CN-1091*

Section 6: Description

6.1 Narrative Description of the Scope of the Project

Bush Brothers and Company are proposing to replace 410 ft. of a single 48” CMP that conveys the northern branch of Clear Creek. On-site personnel are unaware as to the exact date as to when the pipes were originally installed, but estimate that it may have been at least 30 years ago. A collapse occurred on an encapsulated segment downgradient of the proposed impact during heavy rain events on 2/6/2019 and 2/7/2019. The site received approximately 7 inches of rain during this event. The collapse was identified by site personnel who observed flooding in the area and the stream gushing up from the beginning of the collapsed area. Upon further review after the water had subsided, it was evident that the pipes have become dislodged, separated, are deteriorating and in need of repair. Additionally, some large debris was observed at the collapsed area. The collapsed portion occurred on the southern branch of Clear Creek which is encapsulated by 2 x 60” CMPs. Bush Brothers and Company completed the replacement of the 60” CMPs and an upper portion of the 48” CMP in 2020, permitted via NR1903.124.

The remaining ~410 ft. proposed for replacement per this permit application is referred to as Phase 3 (and the final phase) of the proposed pipe replacement in this area. This final pipe replacement is primarily located beneath the existing trailer parking lot. Due to the damage experienced in early 2019 and the observed conditions of the pipes already removed during prior permitted activities, Bush Brothers and Company maintains a concern that a further collapse could occur within this section during another heavy rain event due to the unknown condition of the existing CMP and unknown detail of pipe construction/installation. It’s possible that the pipes became dislodged due to lack of sufficient pipe banding and/or excessive debris within the culvert system. The existing 48” CMP will be removed and replaced with a single 48” CMP. No additional length of encapsulation is proposed. Please refer to the photo summary for additional documentation of the area.

6.2 USGS Topographic Map showing location of project.

See attached Figure 1 and 2.

6.3 Photographs

See attached photo summary and photo location indicated on Figure 3.



6.4 Narrative Description of Existing Stream and/or Wetland Characteristics

Clear Creek is encapsulated in a 48” CMP for the entire length of the proposed impact (410 ft.). No tree removal is anticipated as part of this proposed impact.

The attached photographic summary depicts conditions present along the streams during the site visit.

6.5 Narrative Description of Proposed Stream and/or Wetland Characteristics

The existing 48” CMP will be replaced with a 48” CMP per standard practice. See attached CONTECH Engineered Solutions Guidance Documents. All proposed work within the streams will be conducted in the dry via a pump around system. No increase in pipe size and/or additional stream impact is proposed.

6.6 Wetlands

No wetlands will be affected as part of this project.

6.7 Hydrologic or Jurisdictional Determination Documents

Although a formal hydrologic determination by a qualified hydrologic professional was not submitted, Matthew Skelton (QHP No. 1034), with Civil & Environmental Consultants, Inc., visited the site on April 10th, 2019 and on July 22, 2020 and confirmed Clear Creek’s status as a jurisdictional stream.

Section 7: Project Rationale

The collapsed area is currently a safety concern for Bush Brothers & Company personnel. It is located beneath a gravel parking area used for trailers. Bush Brothers & Company Based on damage that occurred downgradient where 2 @ 60” CMPs conveying Clear Creek collapsed, further damage upgradient is possible and presents an on-going, unpredictable safety hazard. Replacement of the 410 ft. length is proposed due to the unknown condition of the existing CMP, and unknown construction fitting/banding technique. Additionally, on-site personnel suspect that debris and/or log jams may be present within the existing pipe that may have further damaged and/or separated pipe further upgradient from the collapsed area. Safety concerns and long term maintenance of the stream encapsulation in this area warrant the proposal to replace the 410 ft. length of 48” CMP.

Two alternatives were considered. The first alternative was to perform a more thorough evaluation of the existing pipe and only repair areas where degradation is evident. Concerns were raised that since the condition and construction method of the existing pipe, a thorough evaluation of the 410 ft. length of pipe could be safety concern in itself. The worst case scenario from a more thorough evaluation would be for the entire section of pipe to need replacing which is what Bush Brothers and Company is proposing to do



from a conservative approach. The second alternative considered was the no-build option. The no build option is unacceptable since the concern for a future collapse raises a safety concern for plant personnel and could damage plant infrastructure (parking) if a collapse were to occur in this section.

Temporary and permanent erosion and sediment controls will be implemented to ensure sediment resulting from project construction will remain onsite. In-stream work will be performed in the dry via a pump-around system.

Section 8: Technical Information

8.1 Detailed Plans

Please see the attached construction plan typical details.

8.2 Sequencing of events

The proposed construction will not begin until all materials necessary for the existing pipe removal and proposed pipe replacement are available on-site. Work will be scheduled to be performed in the summer sometime between the months of June and August such that stream flow conditions are at its minimum. If stream flow is present, and pump around system will be implemented to allow for work to be performed in the dry. An experienced contractor will be hired to perform the work. It is anticipated that the new pipe could possibly be laid in a single day; however, if work extends beyond a day, a temporary culvert diversion will be installed at the end of each day to allow for stream flow to continue unobstructed. Due to the degree of the proposed impact, no mitigation is proposed.

8.3 Erosion Prevention and Sediment Controls (EPSC)

All in-stream work will be performed in the dry via either stream diversions and/or pump around systems. No in-stream construction activities will commence during high flow conditions where adequate water diversion cannot be achieved. EPSC measures, such as straw wattles will be installed around disturbed areas and stockpiles within 30-ft. of the streams; however, it is anticipated that disturbed areas will be immediately stabilized with seed and straw mulch after backfill is complete; therefore, open disturbance will be kept to a minimum. Straw wattles will remain in place downgradient of the disturbance until the disturbed has achieved final stabilization as defined by Tennessee's Construction General Permit. No material will be placed in the stream beds. Additionally, construction is scheduled to begin in the summer such that drier weather conditions will be present for suitable construction conditions.

The Contractor is responsible for, and must maintain the quality of the water discharged from this construction site. The construction activities shall be carried out in a manner that will prevent violations of water quality criteria as stated in Rule 1200-4-3-.03 of the Rules of the Tennessee Department of Environment and Conservation. This includes, but



is not limited to the prevention of any discharge that causes a condition in which solids, bottom deposits, or turbidity impairs the usefulness of this water for any of the uses designated by Rule 1200-4-4.

All EPSC control measures must be properly installed and maintained in accordance with TDEC's Erosion & Sediment Control Handbook, 4th Edition. The Contractor is responsible for maintaining the effectiveness of the controls and must replace or modify the controls if they are deemed no longer effective.



Photo 1 – Outlet of the 48” CMP proposed for replacement. The 48” CMP outlets to a junction box where it connects to 2 @ 60” CMPs.



Photo 2 – Outlet of the 48” CMP proposed for replacement. The 48” CMP outlets to a junction box where it connects to 2 @ 60” CMPs.



Photo 3 – Aboveground view of the junction box where the 48” CMP outlets and discharges to 2 @ 60” CMPs.



Photo 4 – General view of the outlet junction box, looking north towards the existing truck parking area where pipe replacement is proposed.



Photo 5 – General view of the inlet junction box which houses the inlet of the 48” CMP proposed for replacement.



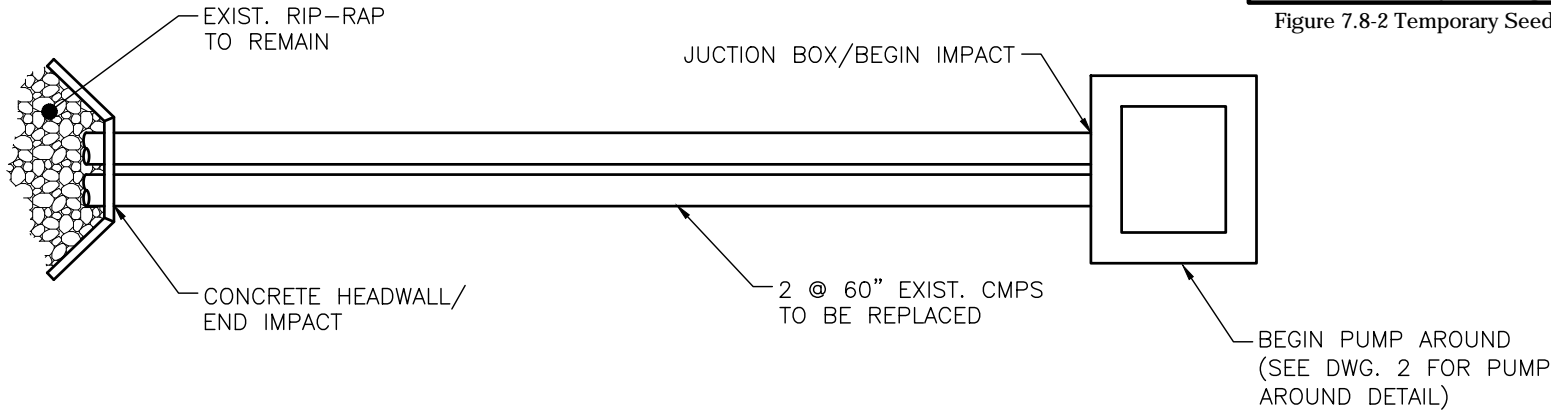
Photo 6 – Deteriorated condition of 60” CMPs after removal, permitted under NR 1903.124, located downgradient of impact proposed in this application.

Table 7.9-2 Allowable seed mixes and planting dates.

	Zone	Best	Marginal	Rate/Mix (lb/ac PLS)
Region II	Low maintenance, Slopes and Poor, shallow soils	Aug 25 - Sept 15 Feb 15 - Apr 21	Sept 15 - Oct 25 Mar 21 - Apr 15	100 Pensacola bahiagrass 40 Bermudagrass (hulled) 20 Korean Lespedeza** 10 Kobe Lespedeza**
	Low maintenance, Moderate Slopes, soils > 6 in. depth	Aug 25 - Sept 15 Feb 15 - Apr 21	Sept 15 - Oct 25 Mar 21 - Apr 15	80 Pensacola bahiagrass 30 Bermudagrass (hulled) 20 Korean Lespedeza** 15 Kobe Lespedeza**
	High maintenance	Aug 15 - Oct 15	Feb 15 - Apr 15	200 KY 31 fescue**

SPECIES	RATE (Lb/acre)
Oats	60
Brown top millet	30
SEEDING DATES	
East.....	May 15 - Aug. 15
Middle	May 1 - Aug. 15
West	Apr. 15 - Aug. 15
SOIL AMENDMENTS	
Follow recommendations of soil tests or apply 2,000 lb/acre ground agricultural limestone and 750 lb/acre 10-10-10 fertilizer.	
MULCH	
Apply 4,000 lb/acre straw. Anchor straw by tacking with asphalt, nesting, or a mulch anchoring tool. A disk with blades set nearly straight can be used as a mulch anchoring tool.	
MAINTENANCE	
Refertilize if growth is not fully adequate. Reseed, refertilize and mulch immediately following erosion or other damage.	

Figure 7.8-2 Temporary Seeding Recommendation Summer.



GENERAL NOTES/CONSTRUCTION SEQUENCING:

1. IN-STREAM WORK SHALL BE PERFORMED IN THE DRY.
2. WORK SHALL NOT BEGIN UNTIL ALL MATERIALS NECESSARY FOR PIPE REMOVAL/REPLACEMENT ARE AVAILABLE ON-SITE.
3. PLACE SEDIMENT TUBES, PER TDOT STANDARD DRAWING EC-STR-37, DOWNGRADIENT OF DISTURBANCE.
4. IF NECESSARY, A TEMPORARY PIPE DIVERSION, PER TDOT STANDARD DRAWING EC-STR-32, SHALL BE INSTALLED AT THE END EACH WORK DAY TO CONVEY STREAM FLOW.
5. APPLY TEMPORARY STABILIZATION WITHIN 14 DAYS OF THE DATE OF LAST DISTURBANCE.
6. PERMANENT STABILIZATION SHALL BE APPLIED PER SEEDING SPECIFICATIONS THIS SHEET.
7. TEMPORARY EPSC MEASURES SHALL REMAIN IN PLACE UNTIL FINAL STABILIZATION HAS BEEN ACHIEVED PER THE TNCGP.


Civil & Environmental Consultants, Inc.
 325 Seaboard Lane · Suite 170 · Franklin, TN 37067
 615-333-7797 · 800-763-2326
 www.cecinc.com

BUSH BROTHERS & COMPANY
 3304 CHESTNUT HILL ROAD
 DANDRIDGE TN. 37725

CONSTRUCTION DETAIL TYPICAL

DRAWN BY:	KLU	CHECKED BY:	TJN	APPROVED BY:	*JLW	DRAWING NO.:	1
DATE:	MAY 2019	DWG SCALE:	N/A	PROJECT NO:	191-656		

*HAND SIGNATURE ON FILE

PUMP-AROUND DIVERSION

Temporary measure for dewatering in-channel construction sites

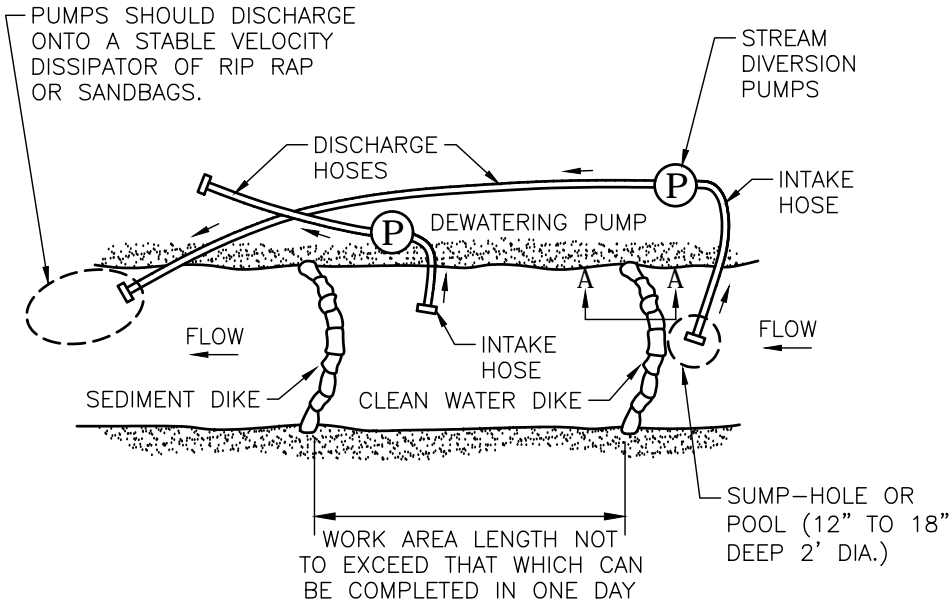
DESCRIPTION

The work should consist of installing a temporary pump and supporting measures to divert flow around in-stream construction sites.

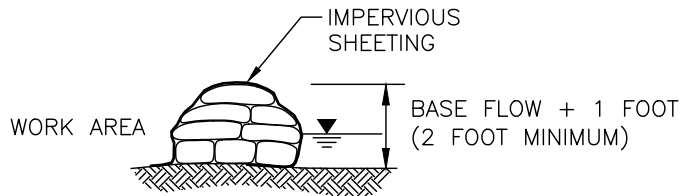
IMPLEMENTATION SEQUENCE

Sediment control measures, pump-around practices, and associated channel and bank construction should be completed in the following sequence

1. Construction activities including the installation of erosion and sediment control measures should not begin until all necessary easements and/or right-of-ways have been acquired. All existing utilities should be marked in the field prior to construction. The contractor is responsible for any damage to existing utilities that may result from construction and should repair the damage at his/her own expense to the city's, county's or utility company's satisfaction.
2. The contractor should stake out all limits of disturbance prior to the pre-construction meeting so they may be reviewed. The participants will also designate the contractor's staging areas and flag all trees within the limit of disturbance which will be removed for construction access. Trees should not be removed within the limit of disturbance without approval from the City or their Designated Representative.
3. Construction should not begin until all sediment and erosion control measures have been installed and approved by the engineer and the sediment control inspector. The contractor should stay within the limits of the disturbance as shown on the plans and minimize disturbance within the work area whenever possible.
4. Upon installation of all sediment control measures and approval by the sediment control inspector, the contractor should begin work at the upstream section and proceed downstream beginning with the establishment of stabilized construction entrances. In some cases, work may begin downstream, if appropriate. The contractor should only begin work in an area which can be completed by the end of the day including grading adjacent to the channel. At the end of each work day, the work area must be stabilized and the pump around removed from the channel. Work should not be conducted in the channel during rain events.
5. Sandbag dikes should be situated at the upstream and downstream ends of the work area as shown on the plans, and stream flow should be pumped around the work area. The pump should discharge onto a stable velocity dissipater made of riprap or sandbags.
6. Water from the work area should be pumped to a sediment filtering measure such as a dewatering basin, sediment bag, or other approved source. The measure should be located such that the water drains back into the channel below the downstream sandbag dike.
7. Traversing a channel reach with equipment within the work area where no work is proposed should be avoided. If equipment has to traverse such a reach for access to another area, then timber mats or similar measures should be used to minimize disturbance to the channel. Temporary stream crossings should be used only when necessary and only where noted on the plans or specified.
8. All stream restoration measures should be installed as indicated by the plans and all banks graded in accordance with the grading plans and typical cross-sections. All grading must be stabilized at the end of each day with seed and mulch or seed and matting as specified on the plans.
9. After an area is completed and stabilized, the clean water dike should be removed. After the first sediment flush, a new clean water dike should be established upstream from the old sediment dike. Finally, upon establishment of a new sediment dike upstream the old one, the old sediment dike should be removed.
10. A pump around must be installed on any tributary or storm drain outfall which contributes baseflow to the work area. This should be accomplished by locating a sandbag dike at the downstream end of the tributary or storm drain outfall and pumping the stream flow around the work area. This water should discharge onto the same velocity dissipater used for the main stem pump around.
11. The contractor is responsible for providing access to and maintaining all erosion and sediment control devices until the sediment control inspector approves their removal.
12. After construction, all disturbed areas should be regraded and revegetated as per the project specifications.



SECTION A-A



CROSS SECTION OF SANDBAG DIKE



Civil & Environmental Consultants, Inc.

325 Seaboard Lane · Suite 170 · Franklin, TN 37067
615-333-7797 · 800-763-2326

www.cecinc.com

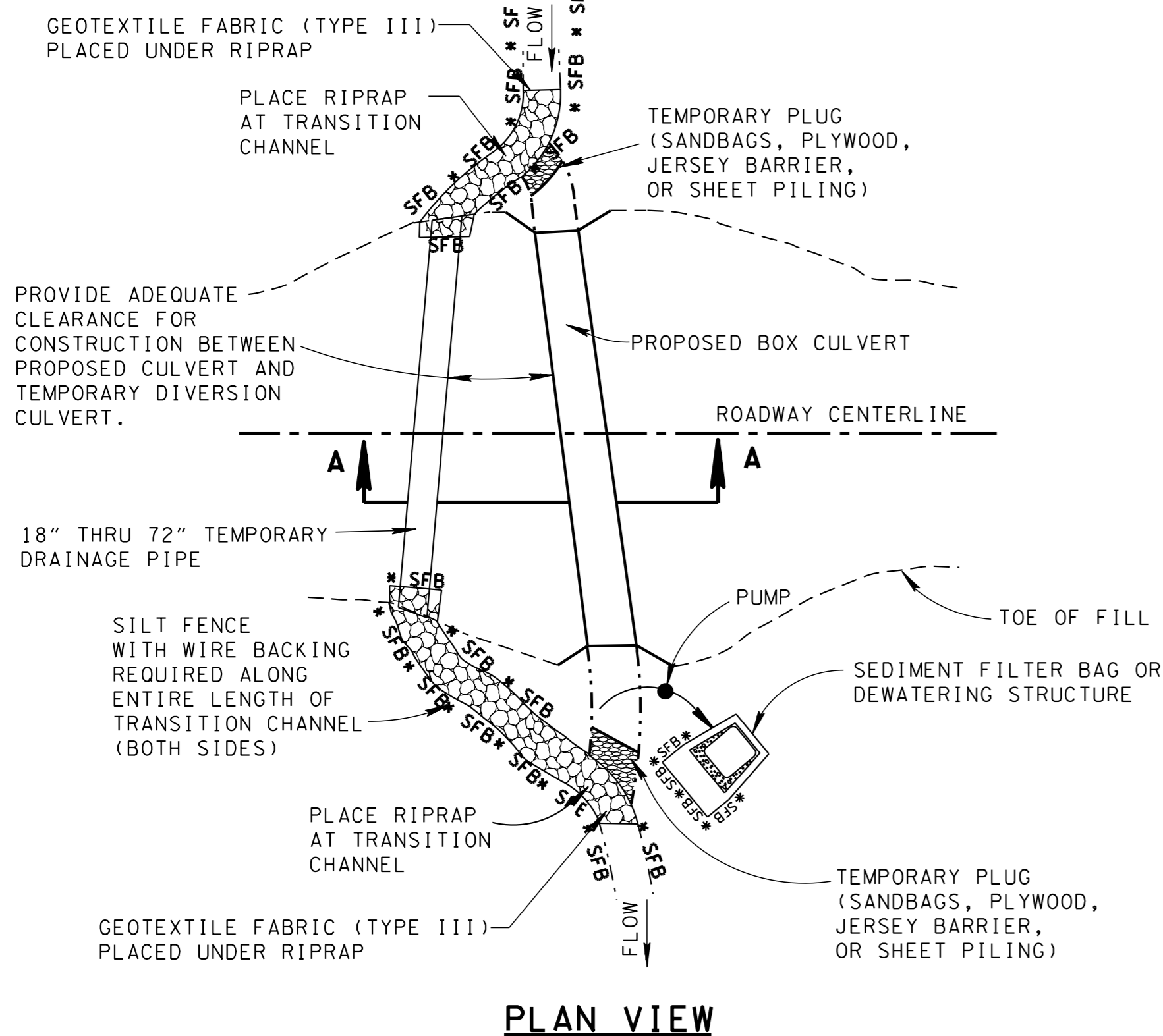
BUSH BROTHERS & COMPANY
3304 CHESTNUT HILL ROAD
DANDRIDGE TN. 37725

PUMP AROUND TYPICAL

DRAWN BY:	KLU	CHECKED BY:	TJN	APPROVED BY:	*JLW	DRAWING NO.:	2
DATE:	MAY 2019	DWG SCALE:	N/A	PROJECT NO:	191-656		

*HAND SIGNATURE ON FILE

TEMPORARY DIVERSION CULVERT WITH CHANNEL TRANSITIONS



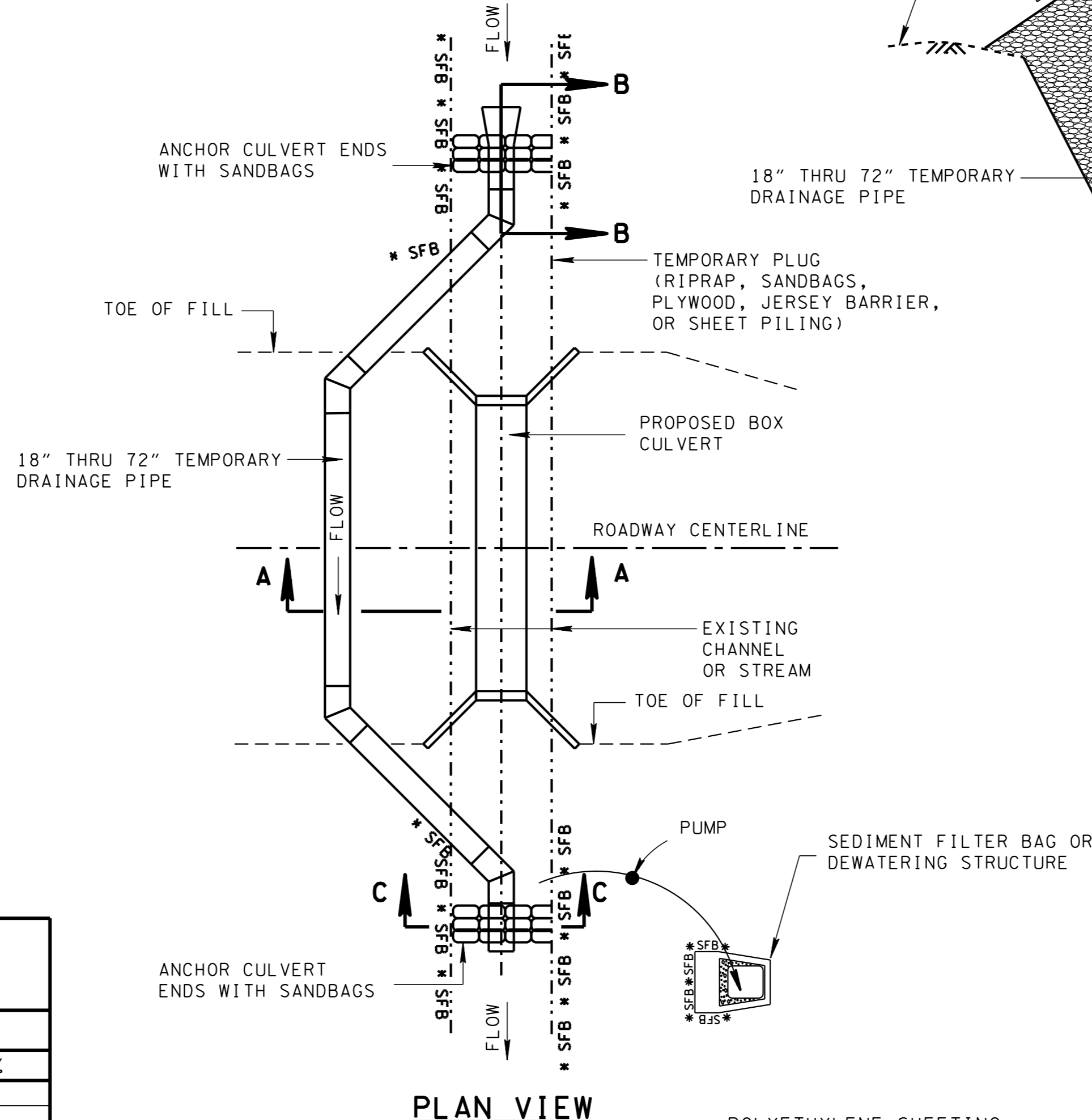
PLAN VIEW

TEMPORARY DIVERSION CULVERT SELECTION						
FLOW CAPACITY IN CFS OF A GIVEN PIPE AT A GIVEN CHANNEL SLOPE						
PIPE DIAMETER (INCHES)	AVERAGE CHANNEL SLOPE					
	0.5%	1%	1.5%	2.0%	2.5%	3.0%
18	8.5	9.1	9.8	10.4	11.0	11.3
24	17.4	18.8	20.0	21.4	21.5	21.7
30	30.1	32.3	33.9	34.1	33.5	33.0
36	46.8	50.4	49.5	47.8	46.6	45.8
42	67.7	69.0	65.5	62.8	61.0	59.6
48	92.6	88.1	76.8	78.6	75.8	73.7
54	127.2	107.0	91.9	94.9	91.1	88.1
60	146.5	121.1	118.4	111.1	106.1	101.9
72	194.9	142.2	153.6	141.3	133.3	127.9
RIPRAP	B	B	B	B	B/C	B/C

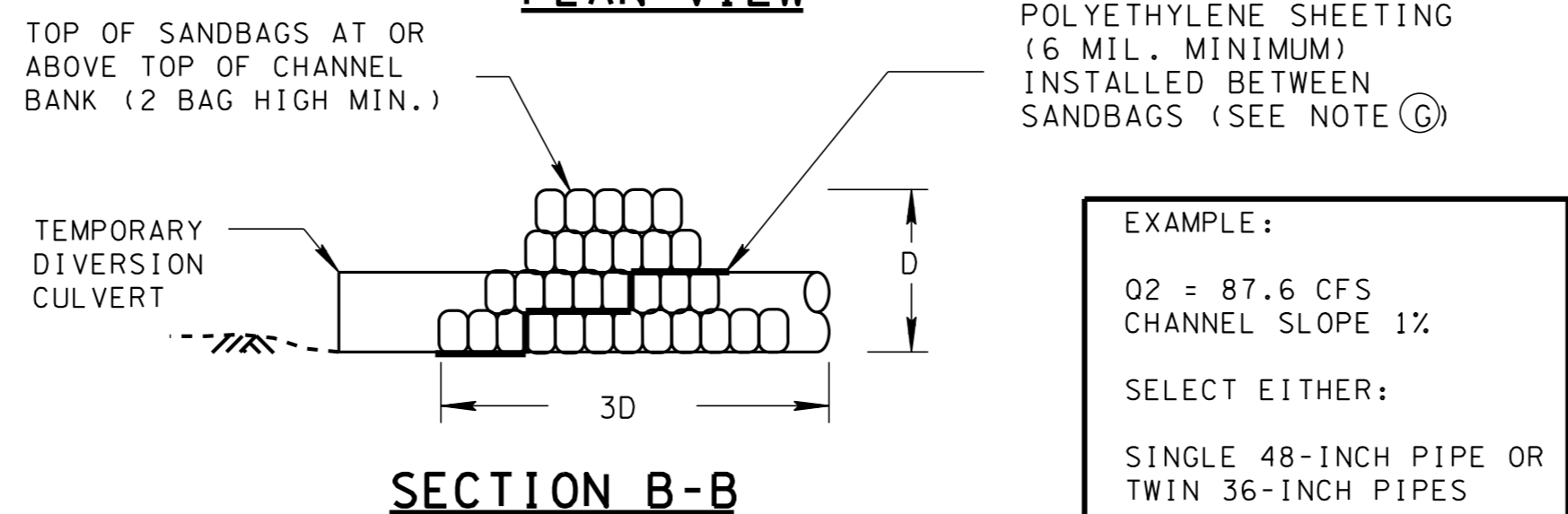
NOTES: FLOW RATES BASED ON 2.5-FOOT INCREASE IN WATER SURFACE ELEVATION ABOVE NORMAL LEVEL FOR THE 2-YEAR, 24 HOUR STORM EVENT

ASSUMES CORRUGATED PIPE (n = 0.024)

TEMPORARY DIVERSION CULVERT WITH ELBOWS

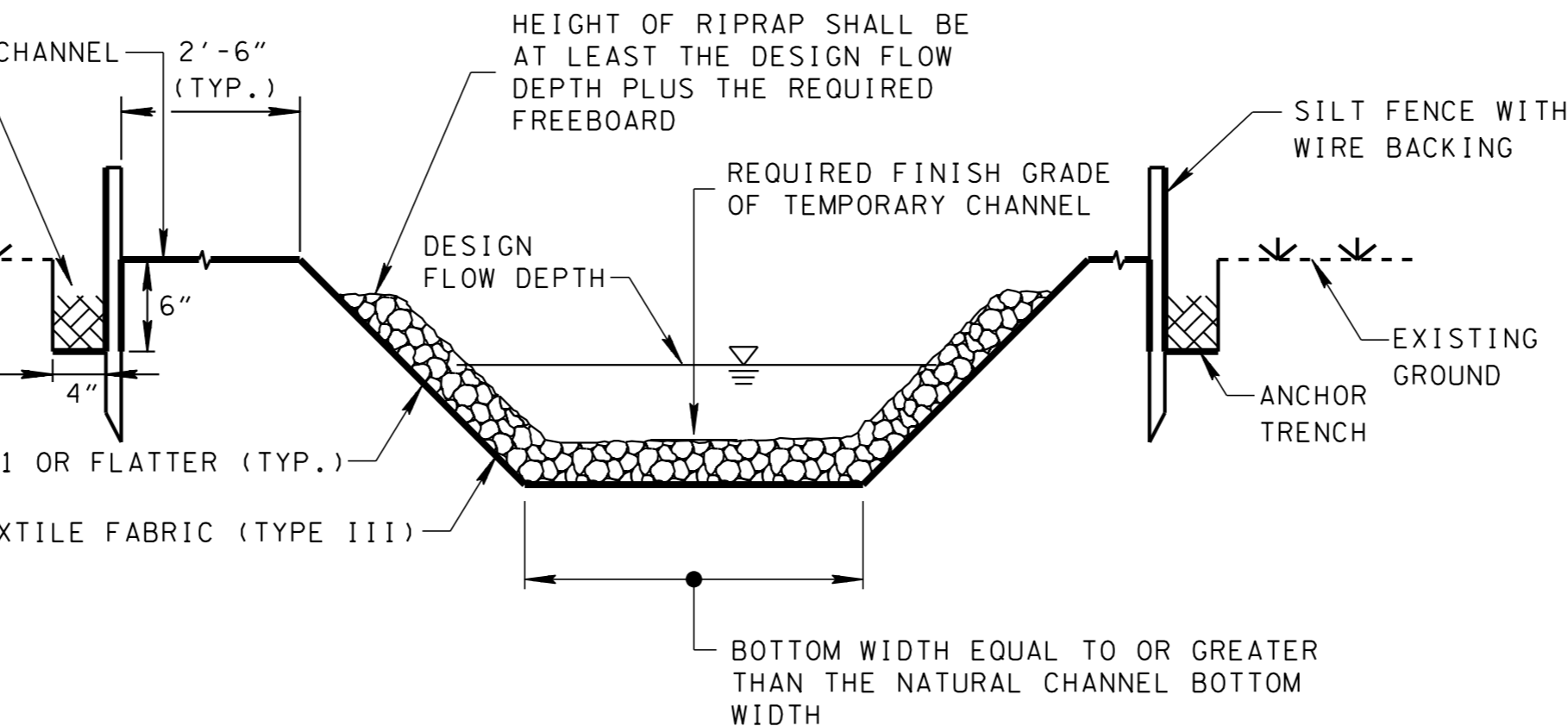


PLAN VIEW

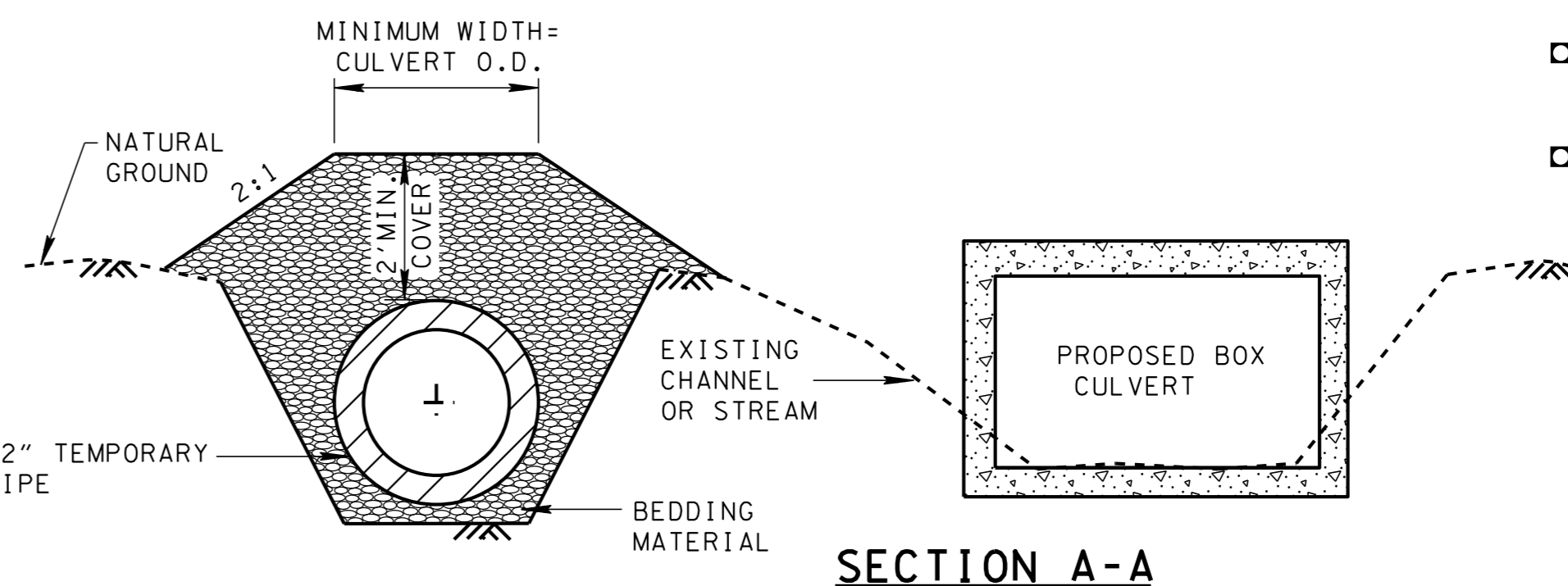


SECTION B-B

EXAMPLE:
Q2 = 87.6 CFS
CHANNEL SLOPE 1%
SELECT EITHER:
SINGLE 48-INCH PIPE OR
TWIN 36-INCH PIPES



TRANSITION CHANNEL CROSS-SECTION



SECTION A-A

TEMPORARY DIVERSION CULVERTS GENERAL NOTES

- (A) TEMPORARY DIVERSION CULVERTS ARE GENERALLY CONSTRUCTED UNDER AN EXISTING ROADWAY, WHERE IT IS NECESSARY TO MAINTAIN TRAFFIC, TO CONVEY STREAM FLOW AROUND IN-STREAM CONSTRUCTION. THIS ALLOWS IN-STREAM WORK TO BE COMPLETED IN THE DRY, SEPARATED FROM FLOWING WATER.
- (B) EXAMPLE SHOWN IS FOR CULVERT REPLACEMENT OR NEW CONSTRUCTION. OTHER PROJECTS WOULD BE CONSTRUCTED IN A SIMILAR MANNER.
- (C) TEMPORARY DIVERSION CULVERTS SHALL BE DESIGNED USING A 2-YEAR FREQUENCY STORM FLOW RATE. AT SITES WHICH INVOLVE EXCEPTIONAL TENNESSEE WATERS OR SEDIMENT-IMPAIRED STREAMS, THE PIPE SHALL BE ADEQUATE TO CONVEY THE 5-YEAR, PEAK FLOW. THE TABLE "TEMPORARY DIVERSION CULVERT SELECTION" MAY BE USED AS A GUIDELINE FOR DETERMINING THE PIPE SIZE. FOR ANY SITE WHERE Q_{50} EXCEEDS 500 CFS, THE DESIGN OF THIS MEASURE SHOULD BE COMPLETED BY THE HYDRAULICS SECTION OF THE STRUCTURES DIVISION.
- (D) THE DESIGNER SHALL PROVIDE CULVERT SECTIONS FOR TEMPORARY CULVERT CROSSINGS. MINIMUM COVER FOR CONSTRUCTION LOADS IS 2 FEET.
- (E) THE RIPRAP TRANSITION AT THE INLET AND THE DIVERSION CULVERT SHALL BE DESIGNED IN ACCORDANCE WITH APPROVED TOOT METHODS.
- (F) WHERE EXCAVATION FOR A DIVERSION TRANSITION EXPOSES BEDROCK, GEOTEXTILE FABRIC AND RIPRAP SHALL BE USED ONLY ON THE SIDES OF THE CHANNEL.
- (G) IN ORDER TO PROVIDE THE BEST POSSIBLE SEAL, THE POLYETHYLENE SHEETING USED IN AN UPSTREAM PIPE ANCHOR SHOULD BE FITTED AROUND THE PIPE. SANDBAGS ON THE DOWNSTREAM SIDE OF THE SHEETING SHOULD BE PLACED FIRST, AND THE SHEETING PLACED ON THESE BAGS. THE REMAINING SANDBAGS WOULD THEN BE PLACED ON THE SHEETING. WHERE MULTIPLE SHEETS ARE USED, THEY SHOULD OVERLAP A MINIMUM OF 18 INCHES.
- (H) DURING CONSTRUCTION OF THE TEMPORARY DIVERSION CULVERT, DAMAGE TO THE EXISTING STREAM AND CANOPY SHALL BE MINIMIZED. ALL EXISTING VEGETATION OUTSIDE THE CUT AND FILL LINES BUT INSIDE THE RIGHT-OF-WAY SHALL NOT BE DISTURBED UNLESS IT INTERFERES WITH SAFETY STANDARDS. THE TEMPORARY CULVERT SHOULD BE LOCATED SO AS TO MINIMIZE THE LENGTH OF ANY TRANSITIONS REQUIRED.
- (I) DIVERSION CULVERT CONSTRUCTION SHALL BE COMPLETED IN THE DRY BEFORE DIVERTING WATER FROM THE EXISTING CHANNEL. WHERE THIS IS NOT FEASIBLE, TEMPORARY FLOW DIVERSION STRUCTURES CAN BE USED UNTIL WORK IS COMPLETE. THESE STRUCTURES CAN BE ANY NON-ERODIBLE MATERIAL.
- (J) CONSTRUCTION SHALL PROCEED AS FOLLOWS:
 1. CONSTRUCT THE TEMPORARY CULVERT ADJACENT TO THE PROPOSED PROJECT. ISOLATE THE TEMPORARY CHANNEL FROM THE EXISTING CHANNEL WITH TEMPORARY PLUGS.
 2. DIVERT FLOW BY MOVING THE TEMPORARY PLUGS FROM THE TEMPORARY CHANNEL TO THE EXISTING CHANNEL. A COFFER DAM MAY BE USED UPSTREAM TO PREVENT STREAM FLOW DURING THIS OPERATION.
 3. CONSTRUCT THE PROJECT IN THE EXISTING STREAM AND PLACE PERMANENT EROSION CONTROL ON THE EXISTING STREAM BANKS.
 4. WHERE A TEMPORARY PLUG IS REQUIRED AT THE DOWNSTREAM END OF THE DIVERSION, IT SHOULD BE REMOVED FIRST. THEN REMOVE THE UPPER PLUG IN ORDER TO RELEASE FLOW INTO THE RECONSTRUCTED CHANNEL.
 5. REMOVE LINING MATERIALS FROM THE DIVERSION TRANSITIONS, RESTORE THE AREA TO GRADE AND STABILIZE EXPOSED SOILS.
- (K) DIVERSION CULVERT, SANDBAG ANCHORS AND TRANSITIONS SHALL BE INSPECTED WEEKLY OR AFTER EVERY RAIN EVENT. ANY NEEDED REPAIRS SHALL BE DONE IMMEDIATELY.
- (L) ONLY GEOTEXTILE FABRIC (TYPE III) LISTED ON THE QUALIFIED PRODUCTS LIST SHALL BE USED.
- (M) FOR INSTALLATION DETAILS AND ITEM NUMBERS FOR DEWATERING STRUCTURES (EC-STR-1), SEDIMENT FILTER BAGS (EC-STR-2), AND SILT FENCE WITH WIRE BACKING (EC-STR-3C), SEE THEIR RESPECTIVE STANDARD DRAWINGS.
- (N) TEMPORARY DIVERSION CULVERTS SHALL BE PAID FOR UNDER THE FOLLOWING ITEM NUMBERS:

203-01	ROAD AND DRAINAGE EXCAVATION (UNCLASSIFIED) PER CUBIC YARD
209-09.01	SAND BAGS PER BAG
209-20.03	POLYETHYLENE SHEETING (6 MIL. MINIMUM) PER SQUARE YARD
621-03.02	THRU
621-03.11	THRU
709-05.06	MACHINED RIP-RAP (CLASS A-1) PER TON
709-05.08	MACHINED RIP-RAP (CLASS B) PER TON
709-05.09	MACHINED RIP-RAP (CLASS C) PER TON
740-10.03	GEOTEXTILE (TYPE III) (EROSION CONTROL) PER SQUARE YARD

DEWATERING STRUCTURES, SEDIMENT FILTER BAGS, AND SILT FENCE WITH WIRE BACKING SHALL BE PAID FOR ACCORDING TO THEIR RESPECTIVE STANDARD DRAWINGS.

TEMPORARY PLUGS SHALL BE PAID FOR UNDER THEIR RESPECTIVE ITEM NUMBERS.

PAYMENT SHALL INCLUDE ALL MATERIALS AND LABOR NECESSARY FOR CONSTRUCTION, MAINTENANCE, AND REMOVAL OF TEMPORARY DIVERSION CULVERTS.

- REV. 4-15-06: REFORMATTED SHEET, REVISED NOTES, MISC. EDITS TO DRAWING.
- REV. 4-1-08: REVISED GENERAL NOTES, ADDED NOTE N, MISC. EDITS TO DRAWING, AND CHANGED STANDARD SYMBOL.
- REV. 8-1-12: MINOR EDITS TO GENERAL NOTES.

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

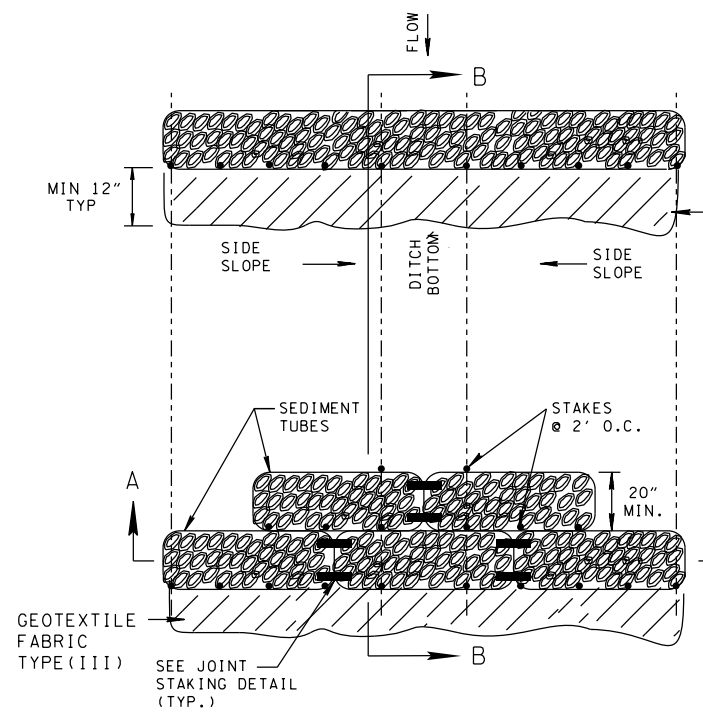
NOT TO SCALE

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

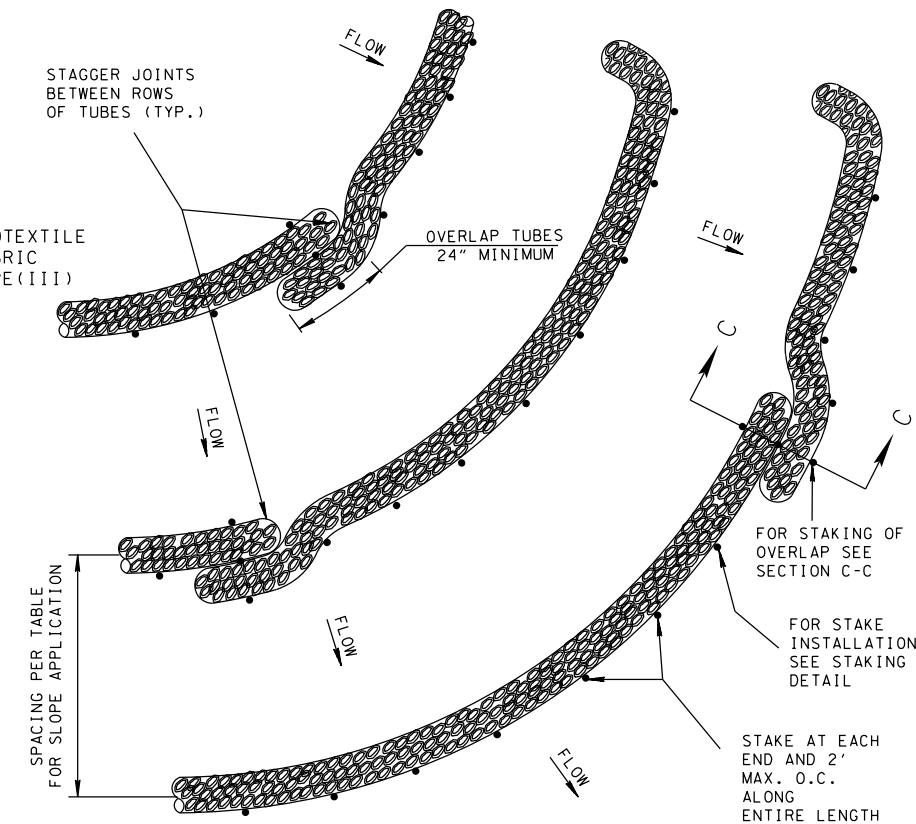
TEMPORARY DIVERSION CULVERTS

EROSION CONTROL PLAN LEGEND: TEMPORARY DIVERSION CULVERT (DESCRIBE NUMBER AND SIZE OF PIPES)

- REV. 4-15-06: REFORMATTED SHEET, REVISED NOTES, MISC. EDITS TO DRAWING.
- REV. 4-1-08: REMOVED TEMPORARY REFERENCE, ADDED OVERLAP DETAIL, OTHER MINOR MISC. EDITS, REVISED GENERAL NOTES.
- REV. 8-1-12: MINOR EDITS TO GENERAL NOTES.
- REV. 6-10-14: MODIFIED SPACING TABLES. ADDED GEOTEXTILES ADDED NOTE (P).



PLAN VIEW FOR DITCH APPLICATION
SEE NOTE (C)



PLAN VIEW FOR SLOPE APPLICATION

SLOPE	8"	12"	18"	20"	24"
2%	70'	80'	N/A	N/A	N/A
5%	30'	60'	80'	N/A	N/A
10%	20'	30'	70'	80'	80'
6:1	N/A	20'	40'	50'	55'
4:1	N/A	20'	30'	30'	30'
3:1	N/A	N/A	20'	20'	25'
2:1	N/A	N/A	20'	20'	20'

N/A = NOT RECOMMENDED
SPACING NOT TO EXCEED 80'

SLOPE	MAXIMUM SEDIMENT TUBE SPACING
LESS THAN 2%	80'
2%	80'
3%	50'
4%	40'
5%	30'
6%	20'
GREATER THAN 6%	20'

BASED ON A 20" SEDIMENT TUBE
SEE TABLE ON EC-STR-6 FOR OTHER HEIGHTS.

SEDIMENT TUBE GENERAL NOTES

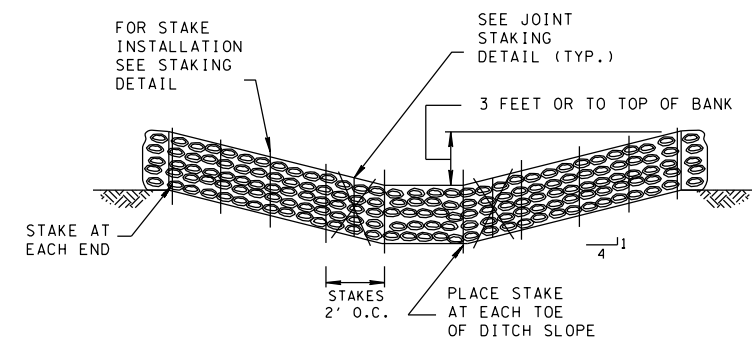
- (A) SEDIMENT TUBES CAN BE PLACED AT THE TOP, ON THE FACE, OR AT THE TOE OF SLOPES TO INTERCEPT RUNOFF, REDUCE FLOW VELOCITY, RELEASE THE RUNOFF AS SHEET FLOW AND PROVIDE REMOVAL OF SEDIMENT FROM THE RUNOFF.
- (B) SEDIMENT TUBES SHALL BE INSTALLED ALONG OR ON THE GROUND CONTOUR, AT THE TOE OF SLOPES, OR IN A DITCH TO HELP REDUCE THE EFFECTS OF SOIL EROSION AND RETAIN SEDIMENT. SEDIMENT TUBES SHOULD NOT BE USED IN DITCHES OR STREAMS.
- (C) FOR DITCH APPLICATIONS, THE MAXIMUM DRAINAGE AREA SHALL BE 15 ACRES. AT SITES WHICH DRAIN TO EXCEPTIONAL TENNESSEE WATERS OR SEDIMENT-IMPAIRED STREAMS, THE MAXIMUM DRAINAGE AREA SHALL BE 10 ACRES. FOR SLOPE APPLICATIONS, THE MAXIMUM DRAINAGE AREAS SHALL BE 1/4 ACRE PER 100 LF OF TUBE.
- (D) SEDIMENT TUBES SHALL NOT BE USED ON PAVEMENT, ROCKY SOILS, OR AT ANY OTHER LOCATIONS WHERE THE STAKES CANNOT BE DRIVEN TO THE REQUIRED DEPTH.
- (E) SEDIMENT TUBES SHALL BE MANUFACTURED FROM WOOD EXCELSIOR, RICE OR WHEAT STRAW, COCONUT FIBERS, OR HARDWOOD MULCH THAT IS ENCLOSED BY A TUBULAR FLEXIBLE NETTING MATERIAL. ALL MATERIALS INCLUDING THE NETTING SHALL BE BIODEGRADABLE.
- (F) PINE NEEDLE AND LEAF MULCH FILLED SEDIMENT TUBES AND STRAW BALES ARE NOT ACCEPTABLE MATERIALS.
- (G) THE DIAMETER OF A SEDIMENT TUBE SHALL BE A MINIMUM OF 8 INCHES AND A MAXIMUM OF 24 INCHES. DIAMETER TOLERANCE IS 2 INCHES. FOR DITCH APPLICATIONS, SEDIMENT TUBES SHALL BE A MINIMUM OF 20 INCHES.
- (H) SEDIMENT TUBES SHALL BE INSTALLED WITH WOODEN STAKES (MIN. 1.5" x 1.5" ACTUAL). THE STAKE SHALL BE EMBEDDED A MINIMUM OF 2 FEET.
- (I) SEDIMENT TUBES SHALL BE TRENCHED IN A MINIMUM OF 2 INCHES.
- (J) IF MORE THAN ONE SEDIMENT TUBE IS PLACED IN A ROW IN SLOPE APPLICATION, THE TUBES SHALL BE OVERLAPPED A MINIMUM OF 24 INCHES TO PREVENT FLOW AND SEDIMENT FROM PASSING THROUGH THE FIELD JOINT. WHEN USED IN DITCHES, TWO ROWS OF TUBE SHALL BE PLACED ON THE CHANNEL BOTTOM WITH STAGGERED JOINTS AS SHOWN.
- (K) FOR DITCH APPLICATIONS, SEDIMENT TUBES SHALL BE A MINIMUM OF 20 INCH DIAMETER AND SHALL BE PLACED PERPENDICULAR TO THE FLOW OF WATER. SEDIMENT TUBES SHALL CONTINUE UP THE SIDE SLOPES A MINIMUM OF 3 FEET PLUS THE DIAMETER OF THE TUBE, OR TO THE TOP OF THE DITCH, WHICHEVER IS LESS.
- (L) SEDIMENT TUBES USED IN SLOPE APPLICATIONS MAY REMAIN IN PLACE TO BIODEGRADE. FOR DITCH APPLICATIONS SEDIMENT TUBES SHALL BE COMPLETELY REMOVED AFTER FULLY ESTABLISHED VEGETATION HAS COMPLETELY DEVELOPED.
- (M) SEDIMENT TUBES SHALL BE PAID FOR UNDER THE FOLLOWING ITEMS NUMBERS:
 740-11.01 TEMPORARY SEDIMENT TUBE (8 INCH) PER LINEAR FOOT
 740-11.02 TEMPORARY SEDIMENT TUBE (12 INCH) PER LINEAR FOOT
 740-11.03 TEMPORARY SEDIMENT TUBE (18 INCH) PER LINEAR FOOT
 740-11.04 TEMPORARY SEDIMENT TUBE (20 INCH) PER LINEAR FOOT
 740-11.05 TEMPORARY SEDIMENT TUBE (24 INCH) PER LINEAR FOOT
 PAYMENT SHALL INCLUDE ALL MATERIALS (INCLUDING GEOTEXTILE FABRIC IF USED) AND LABOR NECESSARY FOR CONSTRUCTION, MAINTENANCE, AND REMOVAL OF SEDIMENT TUBE.
- (N) ONLY SEDIMENT TUBES LISTED ON THE QUALIFIED PRODUCTS LIST MAY BE USED.
- (O) SEDIMENT SHALL BE REMOVED FROM BEHIND THE SEDIMENT TUBE WHEN IT HAS ACCUMULATED TO ONE-HALF THE ORIGINAL HEIGHT OF THE STRUCTURE AND PAID FOR UNDER ITEM NUMBER 209-05, SEDIMENT REMOVAL PER CUBIC YARD.
- (P) GEOTEXTILE FABRIC REQUIRED FOR SLOPE APPLICATION STEEPER THAN 6:1.

□ MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

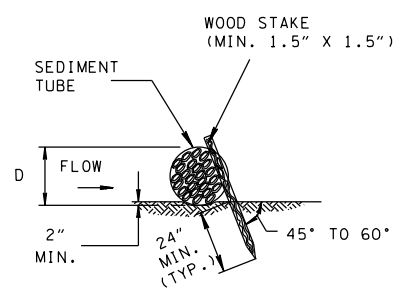
NOT TO SCALE

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

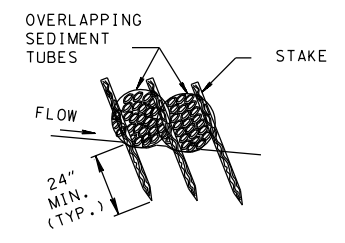
SEDIMENT TUBE



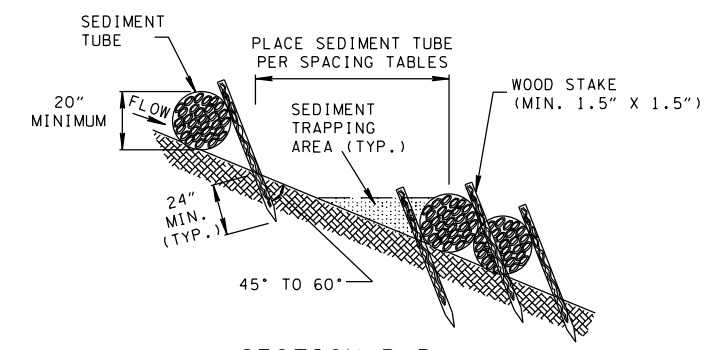
SECTION A-A



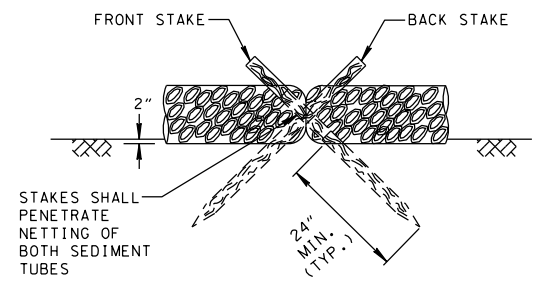
STAKING DETAIL



SECTION C-C



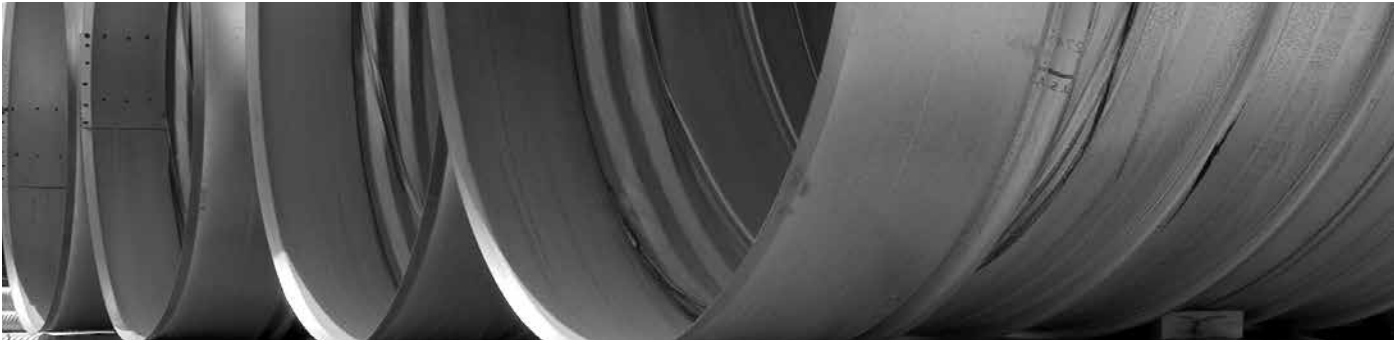
SECTION B-B



JOINT STAKING DETAIL
(DITCH APPLICATION ONLY)

ULTRA FLO[®] & Corrugated Metal Pipe Handling and Installation Guide for Reline





PREFACE

This instruction book is for your crews. Distribute it to help them install Contech® ULTRA FLO® and CMP Liner pipe correctly. ULTRA FLO is a spiral ribbed steel or aluminum segmental pipe that is inserted (sliplined) into an existing deteriorated pipe or into a casing pipe or tunnel as a carrier pipe. ULTRA FLO features very low wall friction to provide the greatest water flow and is the most common metal reline pipe. In addition to ULTRA FLO, other corrugated metal pipe (CMP) products can be used for liner pipe. These additional CMP products include SmoothCor™, HEL-COR®, MULTI-PLATE®, Aluminum Structural Plate and Tunnel Liner Plate. Your Contech representative can assist in using these guidelines along with other CMP products.

Don't assume experienced workers know all the answers. Review these instructions with your supervisors and crews. It can mean a safer and better job for you and your customer.

We recommend holding a preconstruction meeting with your Contech representative and all interested parties to ensure everyone involved in your project has a high level of understanding on what means and methods will be used to prepare for, install and grout the new structure(s).

If you have any questions about these instructions, call your Contech Representative.

CONTENTS	PAGE
Unloading and Safety Instructions	3
Preparation for Sliplining	4
Excavating Insertion Pits.....	4
ULTRA FLO and CMP Lining Insertion.....	5
Jacking Load and Distance	5
Assembling Gasketed Joint.....	6
Field Cutting Pipe.....	7
Annular Space Grouting	7
Installation Tips.....	9
Curved Sewers, Repairs, Taps.....	9
Dimensions and Handling Weights.....	9

TERMS YOU SHOULD KNOW

▲WARNING

Alerts you to hazards or unsafe practices that CAN result in severe personal injury or property damage.

SAFETY INSTRUCTIONS

Messages about procedures or actions that must be followed for safe handling and installation of ULTRA FLO and CMP Liner Pipe. Failure to follow these instructions can result in serious injury or death and/or damage to the pipe.

UNLOADING AND HANDLING

The following equipment is recommended for unloading pipe or pipe bundles:

- Forklift
- Front-end loader with fork adapters
- Backhoe with fork adapters
- Cranes
- Non-metallic slings

Other unloading methods such as lifting lugs, chains, wire rope, cinching or hooks in the end of the pipe should not be used.

SAFETY INSTRUCTIONS

1. Only trained and authorized equipment operators are to be permitted to unload the trailer.
2. Wear approved safety hat and shoes, gloves and eye protection.
3. **▲ Pipe ends may be sharp. Workers handling pipe must wear gloves made from cut-resistant materials.**
4. Park the truck and trailer on level ground before you start unloading. It is the responsibility of the consignee to direct the driver to level ground for parking the truck.
5. Keep all unauthorized persons clear of the area when the driver releases the binders from the trailer and during unloading.
6. **▲ Sometimes pipes are bundled together on the truck with steel straps. Do not cut the steel strapping around the bundles until the bundles have been placed on level ground, blocked or secured, and will not be moved again as a unit. It is recommended that the steel strapping be cut with appropriate sized cutting tools. Stand to the side when cutting a strap. Always be aware that pipe may move, roll or fall when a strap is cut.**
7. **▲WARNING Do not lift bundles or sections of pipe by the steel strapping around the bundles.**
8. Know the capabilities and rated load capacities of your lifting equipment. Never exceed them.
9. **▲WARNING Do not stand or ride on the load of pipe while it is being unloaded. Do not stand beneath or near the pipe while it is being unloaded.**
10. If unloading at multiple drop-off points, secure the remaining load and pallets between drop off points. Always unload the top pallets or bundles first.
11. The contractor shall be responsible for the safety of his/her employees and agents. Adequate safety indoctrination is his responsibility and shall be given to all personnel employed by his firm.
12. Safe practices on construction work as outlined in the latest edition of the "Manual of Accident Prevention in Construction," published by the Associated General Contractors, shall be used as a guide and observed.
13. The contractor shall comply with all applicable city, state, and federal safety codes in effect in the area where he is performing the work. This conformance shall include the provisions of the current issue of the "OSHA Safety and Health Standards (29 CFR 1926/1910)" as published by the U.S. Department of Labor.

GENERAL

1. Contech recommends the use of non-metallic slings for all pipe handling requirements.
2. Hooks, chains or wire rope may damage the pipe.
3. **▲WARNING** Do not push bundles off the trailer or permit pipe to drop to the ground.

PREPARATION FOR SLIPLINING

Follow all requirements of the project plans and specifications. Prior to sliplining, the following procedures should be performed to ensure satisfactory results are obtained.

1. **▲ Ensure continued space assessment procedures are followed prior to entry.**
2. The existing sewer line should be inspected to determine the condition of the line and identify problem areas or obstructions such as displaced joints, crushed pipe, protruding service laterals, roots, debris, out-of-roundness or inside diameter reductions.
3. Verify and record the location, number and size of all inlets and connections.
4. Where the pipe is to be pushed through existing manholes, check the alignment and clearance.
5. Remove any obstructions in the existing line that will prevent insertion of, or cause damage to, the new liner pipe. Large joint offsets or severely deteriorated pipe may need to be removed or repaired prior to installing the pipe. These may be good locations for insertion pits or point repairs.
6. Thoroughly clean the existing line as required (high-pressure water, buckets, reamers or other mechanical methods). Not cleaning the line thoroughly can result in excessive jacking/pulling loads or liner pipe hang ups that can damage the new pipe.
7. Verify adequate clearance for the liner pipe. Measure the inside diameter (ID) of the existing pipe at the worst location and compare the dimension to the liner pipe outside diameter (OD). Depending on the condition of the existing pipe and the obstructions present, it may be desirable to pull a trial liner or mandrel of the same outside diameter as the liner pipe (outside diameters are listed on Page 19). The trial liner may be a short section of ULTRA FLO or CMP pipe and should be attached to pulling cables at each end. If external bands are used, be sure there is adequate clearance for the band hardware.



SLIPLINING PROCESS

The best specifications allow for creativity on how to go about the reline process. When designed correctly, a project will have critical performance requirements and information within the project documents that will provide limitations, guidance, and perhaps some suggestions on how to approach the project.

The information contained herein is intended to introduce some of the techniques that have been used successfully in the past, and to provide limited guidance on what needs to be evaluated when considering a particular reline project. This information does not represent project specific recommendations from Contech and cannot be construed as a complete set of guidelines on how to successfully reline a drainage structure.

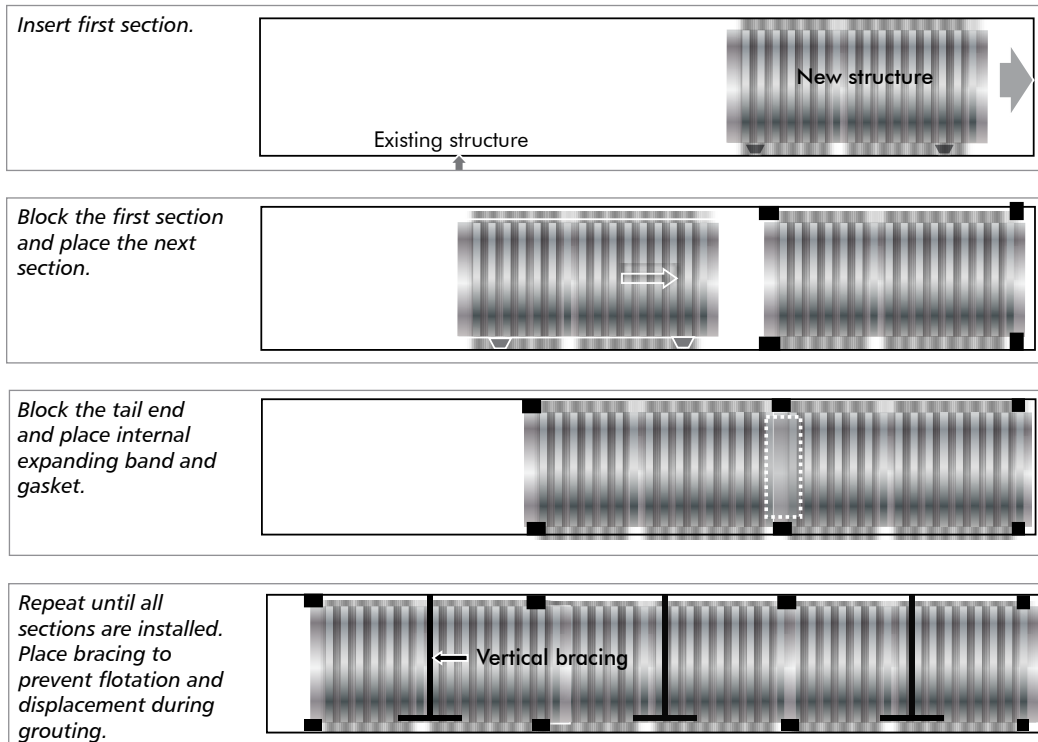
Complete and independent project specific evaluations must be conducted by a qualified contractor prior to them drawing any conclusions about how to approach a reline project.

The most common method of sliplining with CMP is to place liner pipe one section at a time through the inlet or outlet end (for culverts) or through an insertion pit (for closed systems) and to push or pull the single sections into final position. Handling just one section at a time is normally the most efficient as it minimizes the amount of weight being pushed or pulled.



SEGMENTAL SLIPLINING PROCESS FOR CMP

Consult your local Contech representative for more detail.



EXCAVATING INSERTION PITS

ULTRA FLO and CMP liner pipe are installed from an excavated insertion pit or other location allowing access to the existing pipe (i.e. manholes, culvert ends).

When insertion pit locations have not been designated by the engineer or owner, the following conditions should be considered when selecting locations:

- Changes in line and grade
- Large joint offsets
- Severely deteriorated pipe sections
- Manholes being replaced
- Service laterals
- Pushing and pulling distances
- Accessibility (structures, traffic and existing utilities)
- Soil conditions

It is possible to reduce the number of insertion pits by sliplining in both directions from one location. Depending on the pipe diameter, the condition of the existing line or casing pipe and compressive/jacking loads, sliplining up to 2,000 feet or more from a single location is possible. In some cases (tunnels, long runs of large diameter pipe, etc.) it may be desirable to insert and position individual pipe sections into the existing pipe and then join the sections together to extend the allowable work distance from one location.

After insertion pit locations have been designated or selected, the required size of the pit should be determined.

ULTRA FLO and helical CMP comes in lengths up to 40 feet. Shorter lengths are available for easier handling. Structural plate CMP lengths vary by material. The insertion pit length should allow for the longest length of pipe being used, clearance for joining pipe sections, adequate space for pushing/pulling equipment and trench sheeting or shoring. The width of the insertion pit should be sufficient to accommodate the new pipe diameter plus provide safe working room for the crew. The depth of the insertion pit should allow for exposing and removing the existing pipe's top down to the spring line. The remaining bottom half of the existing pipe can serve as an open channel to maintain sewage flow. Bypass pumping is generally not required for segmental sliplining. A clean, level work area between the existing pipe and trench shoring will prevent dirt and debris from being washed back into the opened pipe.

ULTRA FLO AND CMP LINING INSERTION

After the existing line has been properly prepared for liner pipe insertion and the insertion pit(s) have been excavated, liner insertion (installation) can begin. ULTRA FLO or CMP liner pipe can be either pushed or pulled through the existing line.

External skids are recommended to protect the liner pipe from abrasion during the insertion process. Factory attached metal skids are available through Contech as an option. Suitable skids can also be developed and installed at the jobsite by the installer.

Pushing Method

1. Bands connecting pipe segments may be either internal or external. External bands must be assembled outside of the host pipe. Be sure there is adequate clearance in the annulus between the liner and the host pipe.
2. Internal bands can be assembled after the segment is positioned in the host pipe. After grouting the internal band can be removed or re-used.
3. If internal bands are used, the ULTRA FLO or CMP liner pipe will have annular re-rolled ends that will accept a corrugated band. If the liner pipes are match-marked position them correctly, otherwise either end can be inserted as the leading end. Guide rails will help the liner pipe ride over small joint misalignments and other small obstructions and inconsistencies in the existing pipe. If liner passage is questionable, a steel cable can be threaded through the liner pipe during installation and attached to the leading edge. This allows the liner pipe to be retracted (pulled backward) if the liner pipe gets caught on an obstruction. A pushing ring should be used in the tail end to evenly distribute the load from the pushing equipment. The pushing ring can be a short, sacrificial piece of liner pipe or a timber frame.
4. See the "Assembling Gasketed Joints" section for more information on joining pipe sections.
5. Bulkheads should be formed to seal the annular space between the liner pipe and the existing pipe at each culvert end, all manhole and insertion pit entries and exits as required. If the entire annular space between bulkheads is to be filled with grout, then bulkheads should be constructed to provide adequate resistance to grouting pressures and to provide appropriate vent and drainage tubes. When service and lateral connections are to be connected, it may be desirable to complete downstream bulkheads for the line segment after connections have been reinstated to provide an outlet for sewage/drainage between the pipes.

Pulling Method

The pulling method is similar to the pushing method. A steel cable is threaded through the existing pipe and attached to a pulling ring or plate positioned against the far end of the liner pipe or to the skid rails or pulling hardware that can be attached to the pipe segments. Pulling hardware must be positioned at or near the invert.

The pipe pushing/pulling loads should be monitored. Excessive force can "telescope" pipe joints and/or buckle the liner pipe. On some installations, small diameter (1" to 2") plastic pipe can be installed as runner rails.

The cable is attached to a winch assembly to facilitate pulling the liner through the existing pipe section. After each pull, the steel cable is disconnected from the pulling ring and threaded through the next liner pipe section to be joined. After the pulling ring is reconnected to the cable, the process is repeated.



Table 1 – Jacking Loads and Pushing Distances

Dia. (in)	Steel ULTRA FLO			Aluminum ULTRA FLO		
	Safe Jacking Load (lbs)	Allowable Jacking Distance ¹ (ft)	Allowable Jacking Distance ² (ft)	Safe Jacking Load (lbs)	Allowable Jacking Distance ¹ (ft)	Allowable Jacking Distance ² (ft)
18	3,220	860	2,140	1,610	640	1,610
21	3,660	820	2,030	1,830	610	1,520
24	4,070	810	2,030	2,940	650	1,630
30	4,950	790	1,970	4,380	580	1,460
36	5,090	550	1,370	7,800	670	1,690
42	4,950	330	830	8,510	650	1,630
48	4,750	280	700	9,050	600	1,500
54	5,090	270	670	9,540	560	1,400
60	5,510	260	660	10,040	540	1,350
66	10,260	440	1,110	10,110	490	1,230
72	10,180	400	1,010	10,520	460	1,160
78	10,290	380	950	11,030	450	1,120
84	14,650	500	1,260	11,480	440	1,100
90	14,840	470	1,180	---	---	---
96	14,020	420	1,050	---	---	---
102	14,420	410	1,030	---	---	---

¹ Based on Sliding Coefficient of 0.25

² Based on Sliding Coefficient of 0.10

ASSEMBLING GASKETED JOINTS

ULTRA FLO and CMP liner pipe gaskets are fitted on the annular re-rolled end of the pipe. Follow these steps:

External Bands

1. Confirm that there is enough clearance for the pipe with the band and clamp to pass through the host pipe.
2. Lubricate gaskets and outside of pipe. Gaskets tend to get stiff in cold weather.
3. Remove any foreign matter that might be lodged between the pipe and the band.
4. Position gaskets around and into the first annular corrugation of the pipe end.
5. Snap the gasket several times to seat into the corrugation.
6. Lubricate the inside of the band.
7. Check the bars on the band clamp for position and align as needed.
8. Use seam sealant tape at the band laps
9. Align band clamps and position band laps. Band corrugation should be located in the second annular corrugation next to the gasket. Hand-tighten bolts.
10. While tightening the bolts, adjust the band by tapping to seat the band in corrugations.
11. Torque bolts between 25' and 30'-pounds and inspect for adequate seating of the band in the corrugations.

FIELD CUTTING PIPE

If ULTRA FLO or CMP liner pipe is field cut, the annular re-rolled ends may be removed. Bands and gaskets may not seal the joints to keep fluid grout in place. All voids under the band will have to be plugged prior to grouting. Field cutting should only be done at the end of pipe runs.

1. The recommended cutting tool is a chop saw and abrasive saw blade. Refer to the Operating Instructions from the saw manufacturer for additional information.
2. Blade thickness should be no less than 1/8" thick and is recommended to be made of 2-ply material that is used to cut steel pipe (see figure 1).
3. Use the leading edge of the blade to cut into the ribs of the pipe.
4. Bury the blade as much as possible into the pipe as you proceed.
5. The alternative cutting tool is a handheld reciprocating saw with bi-metal blade suited for cutting steel.



Always use safety glasses when cutting ULTRA FLO and CMP pipe and use protective gloves in case sharp edges are exposed.

Internal Bands

1. After two liner pipe segments are positioned check the spacing between the first annular corrugation on either side of the joint.
2. Clean the corrugations and remove any foreign matter.
3. Place a flat gasket evenly across the joint. Mastic or spray adhesive may be used to tack the gasket in place.
4. Lubricate the overlap section of the band.
5. Locate the corrugations and position the internal band over the pipe joint.
6. Turn the bolts to expand the band. Tap the band to make necessary adjustments and seat the corrugations.
7. If any gaps are detected, plug with oakum, silicone sealant or similar material.
8. After grouting the internal bands may be removed and reused. Be sure to clean all surfaces and threads before reusing. Inspect gaskets for reuse. Plan on having extra gaskets as some may be damaged beyond reuse during grouting and removal of the band.



Figure 1

BRACING & BLOCKING THE NEW PIPE

Bracing and blocking isn't always the best option but it is often the quickest and lowest risk way to get the structure grouted. Quick is a relative term here, since multiple grout stages and balanced, controlled grout placement are usually required. The notable exception is when a foaming agent is used to lighten the fluid unit weight of the grout, in which case the dead weight of the new pipe and perhaps sand bags in the invert can offset the buoyancy forces.

Another possible alternative to full bracing and blocking is to float the new structure to the crown of the existing. This can be done with little hydraulic impact on lengthy structures because the grades at the inlet and outlet ends can be transitioned with appropriate blocking/bracing while most of the structure can be allowed to float. When this technique is used, care must be taken to keep the joints sealed and to control the shape of the new structure against the buoyant loads by strutting the inside (as opposed to running a brace through the top of the structure. Floating to the crown of the old structure might also be a good option when an increase in elevation of the overall invert grade line of the structure doesn't negatively impact the hydraulic performance.

HOW TO DETERMINE BUOYANT LOADS DURING STAGED GROUTING

It is absolutely necessary to keep stray rocks out of the pump. Always use a screen on the pump hopper to sift out any larger aggregate that could inadvertently be mixed in the grout. The transport truck that delivers grout was likely carrying normal concrete as its prior load. A couple of 1-1/2" stones can clog a 2" grout line resulting in significant back pressure which can result in a sudden 'blow out' of the reline pipe (see figure 4).

A reasonable yet conservative approach is to make a vertical projection from the new structure at the lowest point where a particular depth of fluid grout touches the structure to the top of the fluid lift, or to the springline for any lift that tops the springline. The spring line is the elevation at which maximum span occurs. For round pipe, it is at 1/2 way up the pipe. On a structural plate pipe arch or underpass the spring line can be approximated as the 'B dimension' from the NCSPA handbook. This volume of 'displaced' fluid (the area resulting from the projection described herein) times the fluid unit weight of grout is the resulting upward buoyant force that must be resisted. To analyze each lift, consider the prior lift to have solidified. The shop drawings by Contech normally show this information. On a single radius arch less than 180°, there are no buoyant forces. However, lateral fluid pressures must be considered with arches.

To determine grout quantities, geometric properties of the existing structure need to be known or estimated in addition to consideration given to the slope of the new and old structures, and the use of intermittent bulkheads that are occasionally used between the inlet and outlet bulkheads.

Flotation

When project plans and specifications require the liner pipe to be positioned on the invert of the existing pipe, flotation of the liner pipe resulting from grouting operations should be addressed. Depending on the type of grout and the grouting method being used, it may be necessary to perform one or more of the following to offset buoyant forces on the pipe:

1. Fill the liner pipe with water, partially or fully, depending on the grout density and grout lift thickness. For monolithic grouting, the liner pipe should be full of water, and the grout density must be lower than that of the pipe when full of water.
2. Stage grout with a suitable lift thickness, depending on grout density.
3. Attach blocking or spacers to the pipe exterior with strapping.
4. Use internal jacks that pass through a liner grout port (12 o'clock position) to offset buoyant forces.

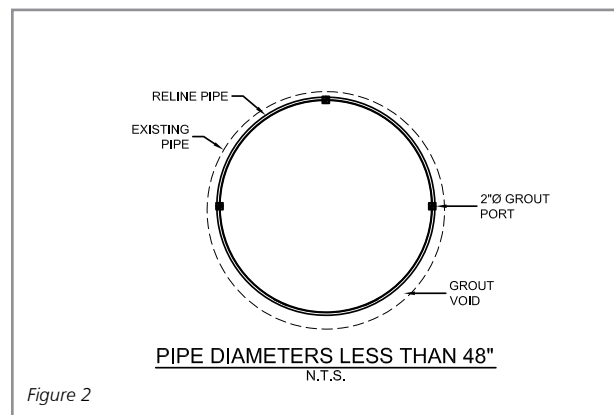


Figure 2

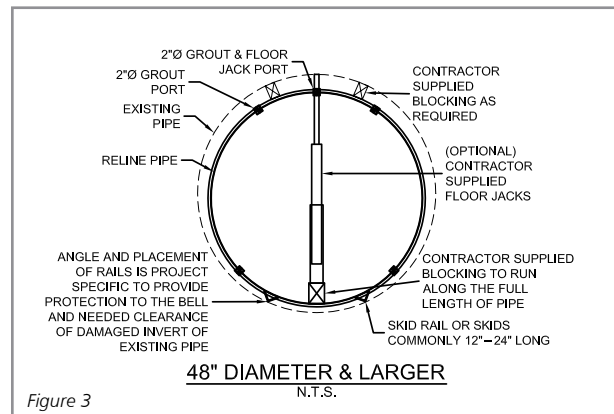


Figure 3

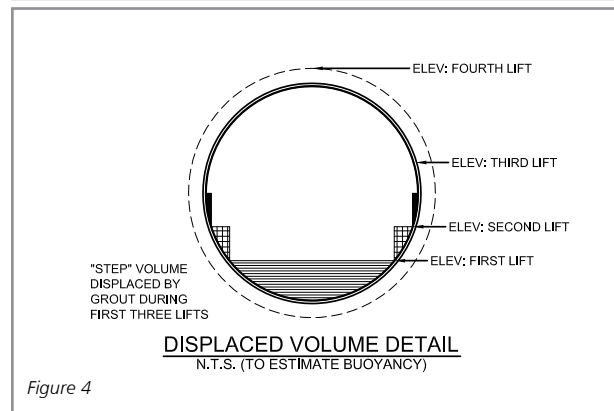


Figure 4

Placement

There are many acceptable grouting methods, and they usually fall under two general categories: monolithic grouting and stage grouting.

Diameters less than 48 inches

Monolithic grouting (in one step) involves filling the entire annular space with one lift. Grout is injected, under low pressure, from the upstream end of the pipe run from manhole to manhole, or from an insertion pit to manhole. The grout moves down the annulus in a wave-like fashion pushing any ground water ahead of the grout (see figure 2).

Diameters equal to or greater than 48 inches

Staged grouting involves placement of the grout in lifts and when done properly can eliminate liner flotation. The liner pipe is grouted into a cradle in the first stage. After the first lift of grout has cured, the remaining lift(s) of grout is placed. Since the liner pipe is in a cradle after the first lift, and further deformation is limited, it may be possible to increase grout injection pressures, if needed, to ensure complete grouting of the annular space. Factory installed grout ports are optional and can simplify the grouting process (see figure 3).

Other grout placement methods include grouting from the surface through drilled holes and slick-line grouting from a tube, within the annulus, that is retracted while grout is pumped through it.

For all placement methods, the annular space should be uniformly and completely filled on both sides of the liner simultaneously. Unbalanced or uneven grouting can affect liner shape, line and grade (see figure 5).

ANNULAR SPACE GROUTING

Most sliplining installations require the annular space between the existing (host) pipe and the liner pipe to be grouted. Grouting of the annular space fixes the position of the new liner pipe, provides uniform support, increases allowable external hydrostatic pressure on the liner pipe and inhibits further failure of the host pipe. Introducing the grout into the annulus is accomplished by gravity flow or by pumping. Properly controlled grouting is essential to prevent liner pipe flotation, deformation or even collapse.

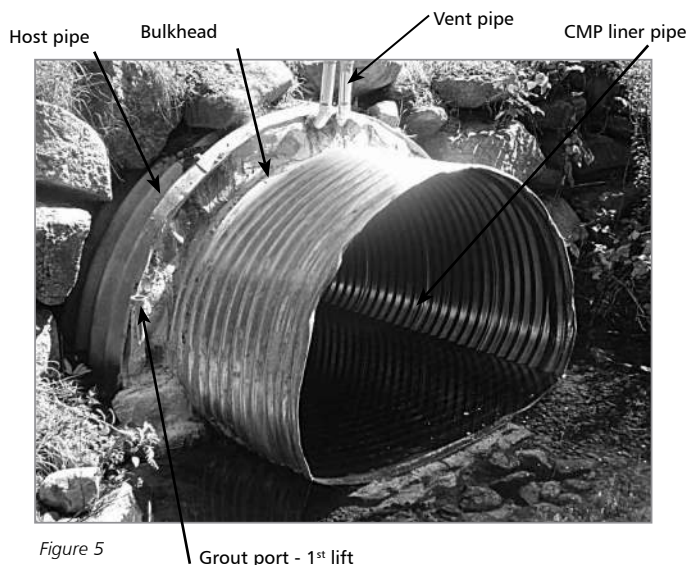


Figure 5

Grout port - 1st lift

MAXIMUM PRESSURE

The recommended maximum grouting pressure for ULTRA FLO and CMP is 5 psi. However, site conditions and pipe stiffness may allow slightly higher pressure. Appropriate gages should be used to monitor external pressures on the liner pipe. See Table 2 for more detail.

Table 2 – ULTRA FLO Grouting Pressure

Liner Diameter (in)	Steel – Max PSI Recommended* ¹		Aluminum – Max PSI Recommended* ¹	
	Round	5% Deflection	Round	5% Deflection
18	5 ²	5 ²	5 ²	5 ²
21	5 ²	5 ²	5 ²	5 ²
24	5 ²	5 ²	5 ²	5 ²
30	5 ²	5 ²	5 ²	5 ²
36	5 ²	5 ²	5 ²	5 ²
42	5 ²	5 ²	5 ²	5 ²
48	5 ²	5 ²	5 ²	5 ²
54	5 ²	5	5 ²	5
60	5	3	5	3
66	5	3	4	3
72	4	3	3	2
78	3	2	2	2
84	4	2	2	1
90	3	2	---	---
96	2	2	---	---
102	2	1	---	---

¹ Contact your local Contech representative for more information about recommended grout pressure and grout procedures.

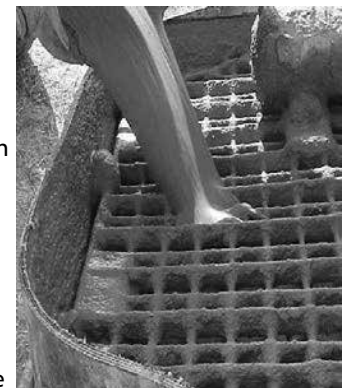
² Grout pressure limited to 5 psi maximum for practical, safe installation considerations. Higher grouting pressures may be possible and tolerable, depending upon the type of joint system used and other site-specific installation considerations.

* Includes a Factor of Safety (FS) = 3.0 for installed ULTRA FLO liner pipe that is perfectly round or a FS = 2.0 for liner pipe with 5% deflection.

Bulkhead designs should provide adequate venting and draining tubes. Hydrostatic head pressure resulting from the slope and/or diameter of the pipe, elevation change between the gage and the pipe, elevation difference between grout pump and the nozzle, etc. should be considered in addition to the grouting pressure on the gage. The hydrostatic head pressure combined with the pressure on the gage should not exceed the recommended maximum pressure. Contact your local Contech Sales Engineer for more information.

Typical Grouting Procedures

It is absolutely necessary to keep stray rocks out of the pump. Always use a screen on the pump hopper to sift out any larger aggregate that could inadvertently be mixed in the grout. The transport truck that delivers grout was likely carrying normal concrete as its prior load. A couple of 1-1/2" stones can clog a 2" grout line resulting in significant back pressure which can result in a sudden 'blow out' of the reline structure.



INSTALLATION TIPS

1. For curved sewers or severely misaligned sewers, using short ULTRA FLO or CMP liner pipe sections may reduce pushing or pulling forces and prevent hang ups. For large diameter sewers or tunnels, individual pipe lengths can be pulled through the line and joined within the line when necessary. When pulling individual pipe lengths, care should be taken to prevent damage to the re-rolled ends or alignment tabs.
2. When the annular space between the liner pipe and the exiting pipe is to be filled with grout, estimating the required grout volume before grout placement begins may be helpful. The estimate may include grout volume requirements for filling voids or sink holes outside the existing (host) pipe. Slope of the new structure must be taken into account when estimating volumes, buoyancy forces and bulkhead location.

REPAIRS

1. Should damage to the pipe occur at any point during installation, the Engineer should be contacted immediately.
2. For smaller abrasions or exposed steel after field cutting apply zinc-rich paint or cold galvanizing compound.
3. Contact your local Contech Sales Engineer if you have any questions or concerns and for recommendations.

TAPS AND LATERALS

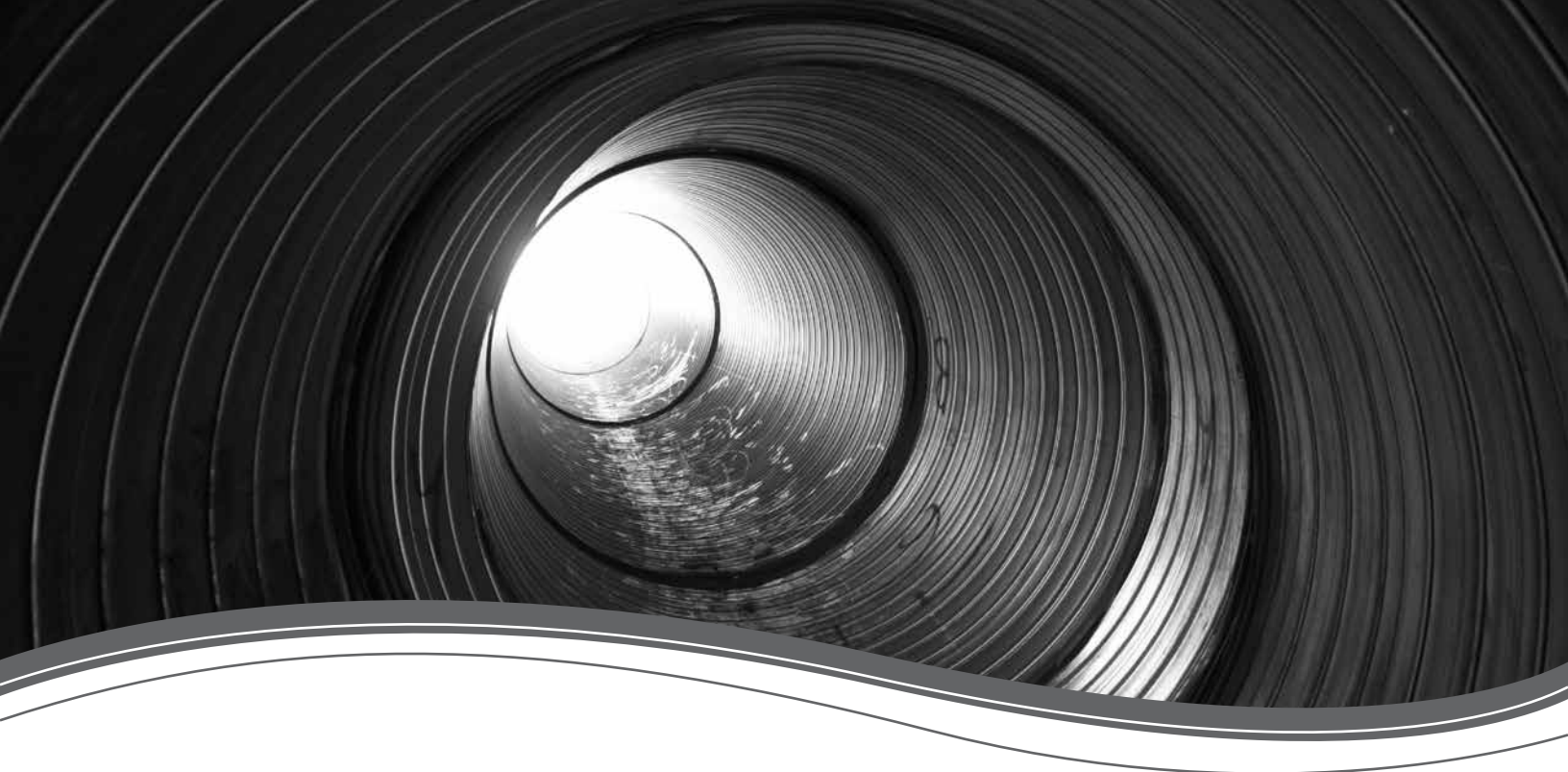
1. ULTRA FLO and CMP liner pipe can be supplied with standard prefabricated saddle stubs, fittings or components per job plans once prefabrication drawings are reviewed by Contech Engineering and approved by the Engineer. Overall clearance needs to be considered while choosing the appropriate details.
2. Consult the Engineer and your Contech Sales Engineer for further assistance.

Table 3 – ULTRA FLO Pipe Dimensions*

Pipe Diameter (in)	Max O.D. (in)	Steel Approx. Weight (lbs/ft)	Aluminum Approx. Weight (lbs/ft)
18	20.28	15	5
21	23.28	18	6
24	26.28	20	9
30	32.28	25	15
36	38.28	37	23
42	42.28	59	26
48	50.28	67	30
54	56.32	75	34
60	62.38	83	37
66	68.44	92	41
72	74.50	100	45
78	80.56	108	49
84	86.62	116	52
90	92.68	125	---
96	98.74	133	---
102	104.80	140	---

* Based on AASHTO M36 Specifications.
Custom diameters available upon request.



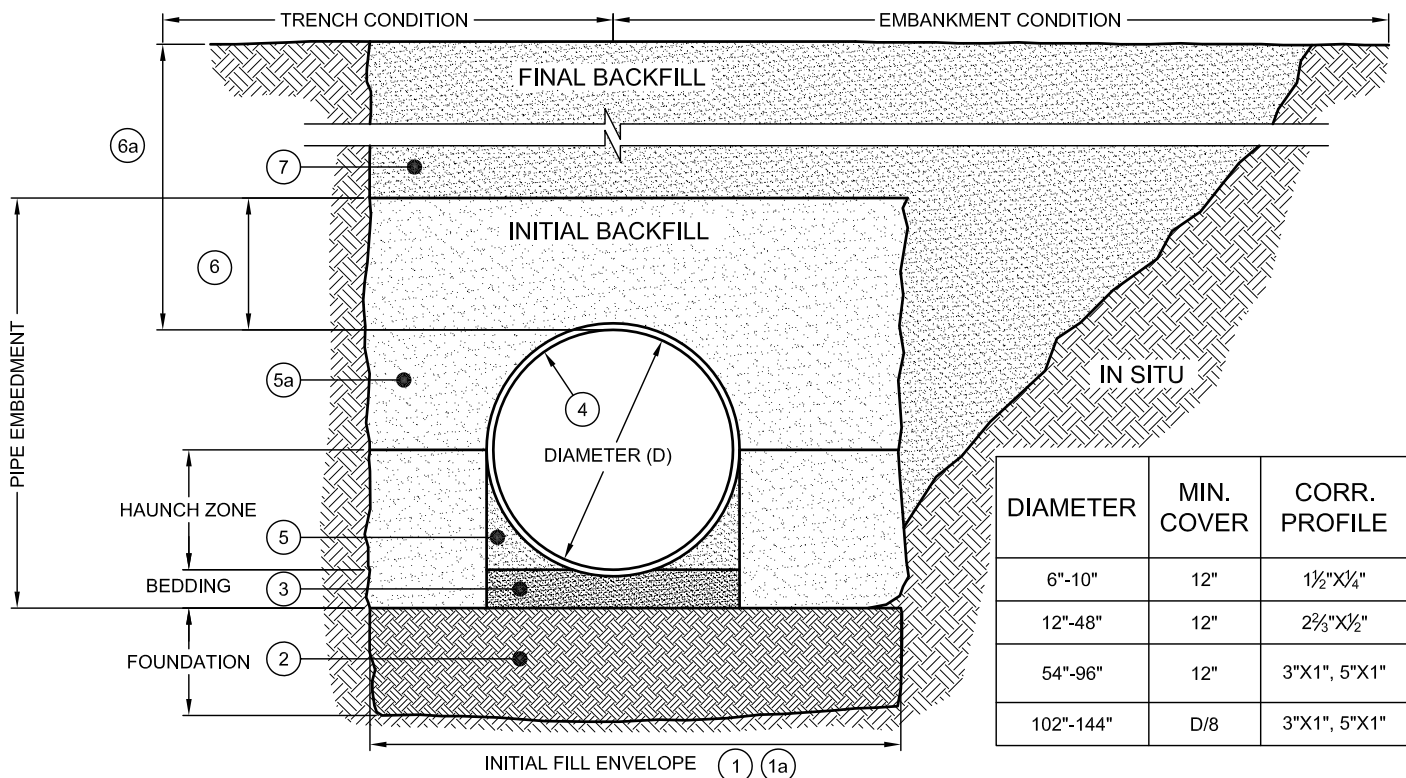


- Drawings and specifications are available at www.ContechES.com.
- Site-specific design support is available from our engineers.

Contech Engineered Solutions provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, retaining walls, sanitary sewer, stormwater, erosion control, soil stabilization and wastewater products. For information on other Contech offerings, visit www.ContechES.com or call 800-338-1122.

NOTHING IN THIS CATALOG SHOULD BE CONSTRUED AS A WARRANTY. APPLICATIONS SUGGESTED HEREIN ARE DESCRIBED ONLY TO HELP READERS MAKE THEIR OWN EVALUATIONS AND DECISIONS, AND ARE NEITHER GUARANTEES NOR WARRANTIES OF SUITABILITY FOR ANY APPLICATION. CONTECH MAKES NO WARRANTY WHATSOEVER, EXPRESS OR IMPLIED, RELATED TO THE APPLICATIONS, MATERIALS, COATINGS, OR PRODUCTS DISCUSSED HEREIN. ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND ALL IMPLIED WARRANTIES OF FITNESS FOR ANY PARTICULAR PURPOSE ARE DISCLAIMED BY CONTECH. SEE CONTECH'S CONDITIONS OF SALE (AVAILABLE AT WWW.CONTECHES.COM/COS) FOR MORE INFORMATION.

H:\DRAINAGE SOLUTIONS\ACAD DATA\DRAINAGE DETAILS\CURRENT STANDARD DETAILS\CMP\200-STANDARD-BACKFILL-ROUND-AASHTO.DWG 2/11/2016 10:45 AM



• **BACKFILL REQUIREMENTS FOLLOW THE GUIDELINES OF AASHTO LRFD BRIDGE DESIGN (SEC 12) and CONSTRUCTION (SEC 26).**

- ① MINIMUM TRENCH WIDTH MUST ALLOW ROOM FOR PROPER COMPACTION OF HAUNCH MATERIALS UNDER THE PIPE.
THE MINIMUM TRENCH WIDTH (12.6.6.1):
PIPE ≤ 12": D + 16"
PIPE > 12": 1.5D + 12"
- ①a MINIMUM EMBANKMENT WIDTH (in feet) FOR INITIAL FILL ENVELOPE (12.6.6.2):
PIPE < 24": 3.0D
PIPE 24" - 144": D + 4'0"
PIPE > 144": D + 10'0"
- ② THE FOUNDATION UNDER THE PIPE AND SIDE BACKFILL SHALL BE ADEQUATE TO SUPPORT THE LOADS ACTING UPON IT (26.5.2).
- ③ BEDDING MATERIAL SHALL BE A RELATIVELY LOOSE MATERIAL THAT IS ROUGHLY SHAPED TO FIT THE BOTTOM OF THE PIPE, AND A MINIMUM OF TWICE THE CORRUGATION DEPTH IN THICKNESS, WITH THE MAXIMUM PARTICLE SIZE OF ONE-HALF OF THE CORRUGATION DEPTH (26.3.8.1, 26.5.3).
- ④ CORRUGATED STEEL PIPE (CSP) [HEL-COR].
- ⑤ HAUNCH ZONE MATERIAL SHALL BE HAND SHOVELED OR SHOVEL SLICED INTO PLACE TO ALLOW FOR PROPER COMPACTION (26.5.4).
- ⑤a INITIAL BACKFILL FOR PIPE EMBEDMENT TO MEET AASHTO A-1, A-2 OR A-3 CLASSIFICATION OR APPROVED EQUAL, COMPACTED TO 90% STANDARD PROCTOR (T-99). MAXIMUM PARTICLE SIZE NOT TO EXCEED 3" (12.4.1.2). ALL LIFTS PLACED IN A CONTROLLED MANNER. IT IS RECOMMENDED THAT LIFTS NOT EXCEED AN 8" UNCOMPACTED LIFT HEIGHT TO PREVENT UNEVEN LOADING, AND THE LESSER OF 1/3 THE DIAMETER OR 24" AS THE MAXIMUM DIFFERENTIAL SIDE-TO-SIDE (26.5.4).
- ⑥ INITIAL BACKFILL ABOVE PIPE MAY INCLUDE ROAD BASE MATERIAL (AND RIGID PAVEMENT IF APPLICABLE). SEE TABLE ABOVE.
- ⑥a TOTAL HEIGHT OF COMPACTED COVER FOR CONVENTIONAL HIGHWAY LOADS IS MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TOP OF RIGID PAVEMENT (12.6.6.3).
- ⑦ FINAL BACKFILL MATERIAL SELECTION AND COMPACTION REQUIREMENTS SHALL FOLLOW THE PROJECT PLANS AND SPECIFICATIONS PER THE ENGINEER OF RECORD (26.5.4.1).

NOTES:

- GEOTEXTILE SHOULD BE CONSIDERED FOR USE TO PREVENT SOIL MIGRATION INTO VARYING SOIL TYPES (PROJECT ENGINEER).
- FOR MULTIPLE BARREL INSTALLATIONS THE RECOMMENDED STANDARD SPACING BETWEEN PARALLEL PIPE RUNS SHALL BE PIPE DIA./2 BUT NO LESS THAN 12", OR 36" FOR PIPE DIAMETERS 72" AND LARGER. CONTACT YOUR CONTECH REPRESENTATIVE FOR NONSTANDARD SPACING (TABLE C12.6.7-1).

230-CSP-STANDARD BACKFILL-ROUND-AASHTO



9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX



DATE DRAWN: 11/15/15

REV #: --

REV DATE: --

SCALE: N.T.S.

DRAWING TYPE: --

**230 - CSP ROUND
STANDARD BACKFILL DETAIL
AASHTO**

HUGGER Bands with gaskets have been used in thousands of successful installations. The key to success is proper installation. These instructions will help you achieve a good installation.



1 Liberally lubricate gaskets with either a soap-base lubricant such as Tylox 7 Lubricant or a vegetable base lubricant such as Crisco[®].



2 Applying additional lubricant to outside pipe ends is not mandatory but is recommended to product optimum results with larger diameters or asphalt-coated pipe in cold weather. Remove any foreign matter that might become lodged between the pipe and the band.



3 Snap gaskets around and into the first annular corrugation of each pipe end.



4 Snap the gasket several times to allow for final seating.



5 Lubricate the entire inner surface of the band between the corrugations with the same lubricant.



6 Check bars for proper position.



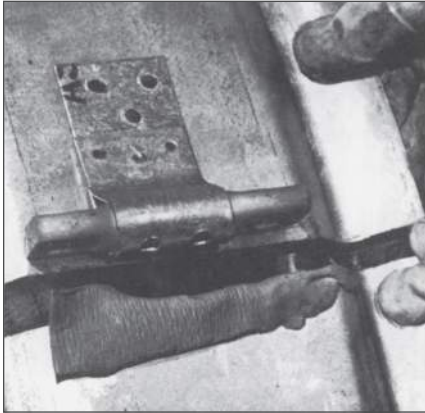
7 If necessary, use the bolt to turn the bar so that the holes are in alignment



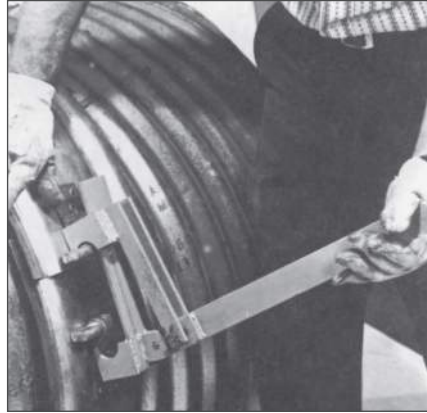
8 Tear off enough mastic to reach between the corrugations at the end of the band.

Installation Instructions

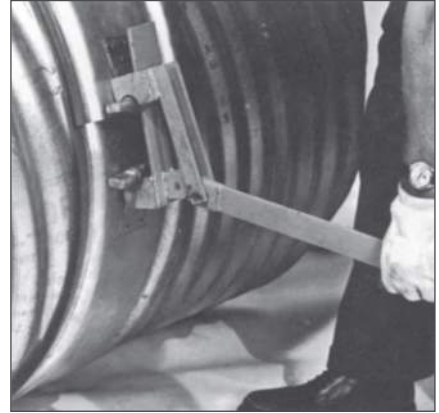
HUGGER® Band with Gaskets



9 Tuck the mastic over the lip of the band.
Note: With double asphalt-coated bands in warm weather (warm enough to cause the asphalt to flow), the mastic may not be necessary. For final determination, use a joint tester to evaluate performance.



10 With the necessary parts lubricated and all foreign matter between the pipe and band removed, use a Felton Puller or long bolt to start the band lap.



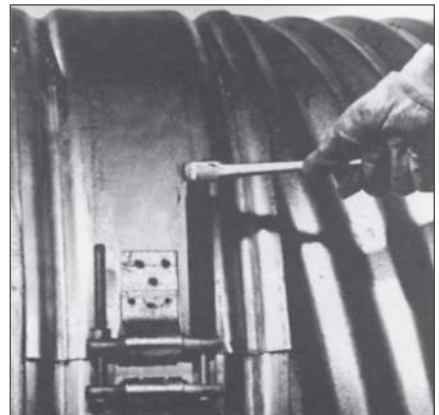
11 Pull the band into position. For maximum compression of the gasket, the band corrugation must be fully seated into the second corrugation from each pipe end.



12 Insert bolts and tighten the band.



13 Use a "deep-well socket" and power wrench for rapid assembly. Tap the band during tightening with a rubber mallet to ensure uniform seating of the gasket.



14 As a guide, torque bolts between 25 to 30 foot-pounds. For maximum compression of the gasket, the band corrugation must be fully seated into the second corrugation from each pipe end. Where specifications restrict infiltration/exfiltration, a test must be conducted on the assembled joint to confirm proper installation.

NOTHING IN THIS CATALOG SHOULD BE CONSTRUED AS AN EXPRESSED WARRANTY OR AN IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. SEE THE CONTECH STANDARD CONDITIONS OF SALE (VIEWABLE AT WWW.CONTECHES.COM/COS) FOR MORE INFORMATION.

Specifications and data referring to mechanical and physical properties or chemical analyses relate solely to test performed at the time of manufacture on specimens obtained from specific locations of the products in accordance with prescribed sampling procedures. For specific terms and conditions of sale, refer to standard CONTECH® documents.