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)

RECEIVED
By Sondra Wood at 10:28 am, Jun 10, 2019

PRP-123369 15

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): Bush Brothers & Company			SOS #: 000090938 Status: Active
Primary Contact/Signatory: Robby Reece		Signatory's Title or Position: Manager	
Mailing Address: 3304 Chestnut Hill Road		City: Dandridge	State: TN Zip: 37725
Phone: 865-509-2361	Fax: N/A	E-mail: rreece@bushbros.com	

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: $ 500

Current application fee schedules can be found at the Division of Water Resources webpage at:
https://www.tn.gov/environment/permit-permits/water-permits1/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: Culvert Maintenance/Replacement		Nearest City, Town or Major Landmark: Dandridge
Street Address or Location (include Zip): 3304 Chestnut Hill Road, Dandridge, 37725		
County(ies): Jefferson	MS4 Jurisdiction: N/A	Latitude (dd.dddd): 35.9325 Longitude (dd.dddd): -83.3366

Resource Proposed for Alteration: ☒ Stream / River ☐ Wetland ☐ Reservoir

Name of Water Resource (for more information, access *http://tdeconline.tn.gov/dwr*): Clear Creek

Brief Project Description (a more detailed description is required under Section 8):
Replacement of two deteriorating/collapsed 60" Corrugated Metal Pipes (CMPs).

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: Activity permitted under USACE Nationwide #3 no PCN required.

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):

N/A

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Division of Water Resources

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

Section 5. Project Schedule *(fill in information and check appropriate boxes)*			
Proposed Start Date: June 2019		*Estimated End Date:*	August 2019
Is any portion of the activity complete now?	☐ *Yes*	☐ *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	Attached No
6.1	A narrative description of the scope of the project	☒	☐
6.2	USGS topographic map indicating the exact location of the project (*can be a photographic copy*)	☒	☐
6.3	Photographs of the resource(s) proposed for alteration with location description (*photo locations should be noted on map*)	☒	☐
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	☒	☐
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	☒	☐
6.6	In the case of wetlands, include a wetland delineation with delineation forms and site map denoting location of data points	☐	☒
6.7	A copy of all hydrologic or jurisdictional determination documents issued for water resources on the project site	☐	☒

Section 7. Project Rationale	Attached Yes	Attached 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	☒	☐

Section 8. Technical Information		Attached Yes	Attached No
8.1	Detailed plans, specifications, blueprints, or legible sketches of present site conditions and the proposed activity. Plans must be 8.5.x 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 *(e.g., stream cross sections where road crossings are proposed)*	☒	☐
8.2	For both the proposed activity and compensatory mitigation, provide a discussion regarding the sequencing of events and construction methods	☒	☐
8.3	Depiction and narrative on the location and type of erosion prevention and sediment control (EPSC) measures for the proposed alterations	☒	☐

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 minimus 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

Section 10. Detailed Alternatives Analysis		Attached Yes	Attached No
10.1	Analyze all reasonable alternatives and describe the level of degradation caused by each of the feasible alternatives	☐	☐
10.2	Discuss the social and economic consequences of each alternative	☐	☐
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	☐	☐

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

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	Manager		
Printed Name	Official Title	Signature	Date

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

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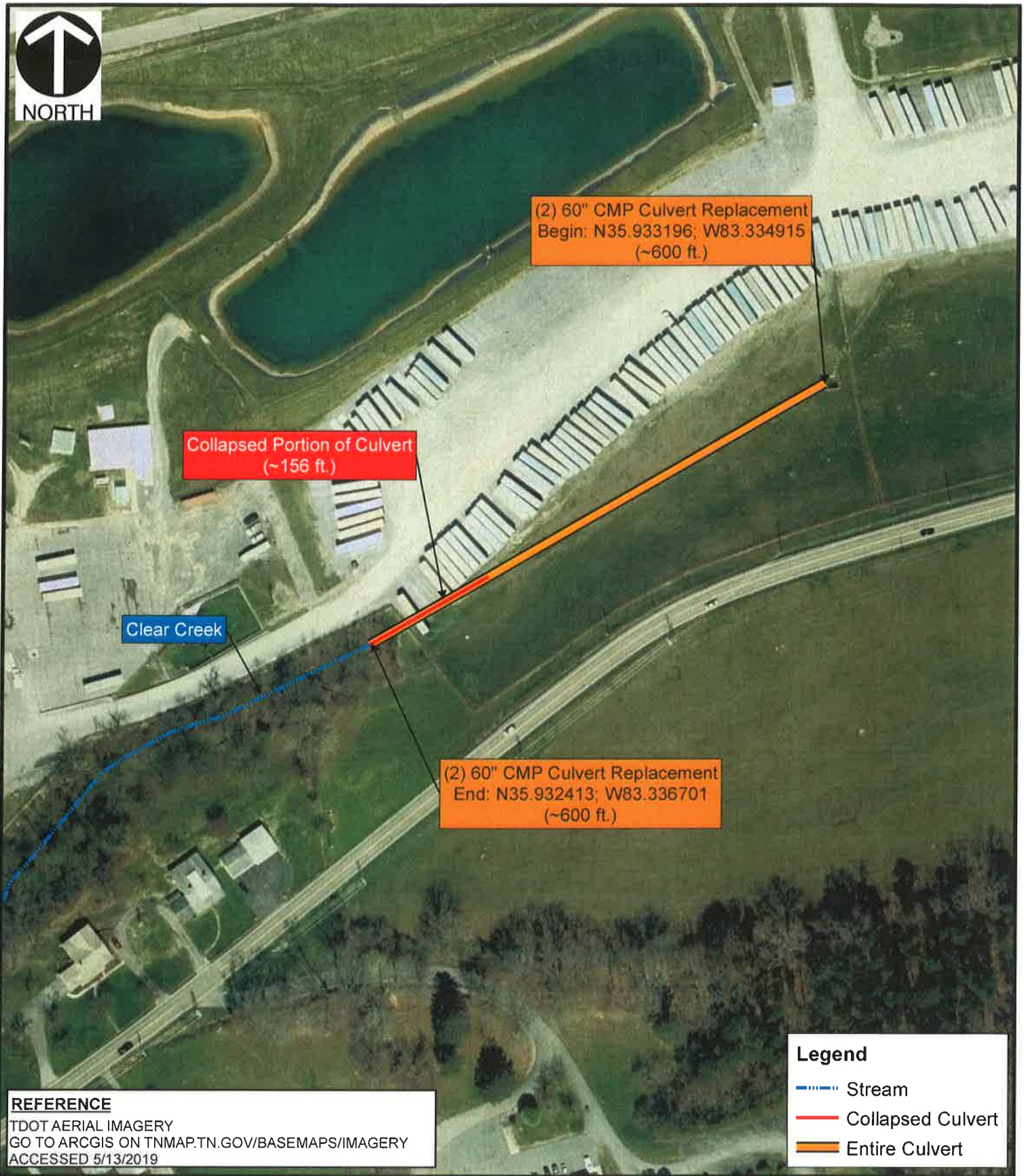

REFERENCE
TDOT AERIAL IMAGERY
GO TO ARCGIS ON TNMAP.TN.GOV/BASEMAPS/IMAGERY
ACCESSED 5/13/2019

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 ACTIVITIES
DANDRIDGE, JEFFERSON COUNTY, TN

PROJECT LOCATION AERIAL MAP

DRAWN BY:	BCL	CHECKED BY:	CDH	APPROVED BY:	JLW *Hand signature on file	FIGURE NO:	1
DATE:	5/13/2019	SCALE:	1 " = 150 '	PROJECT NO:	191-656		

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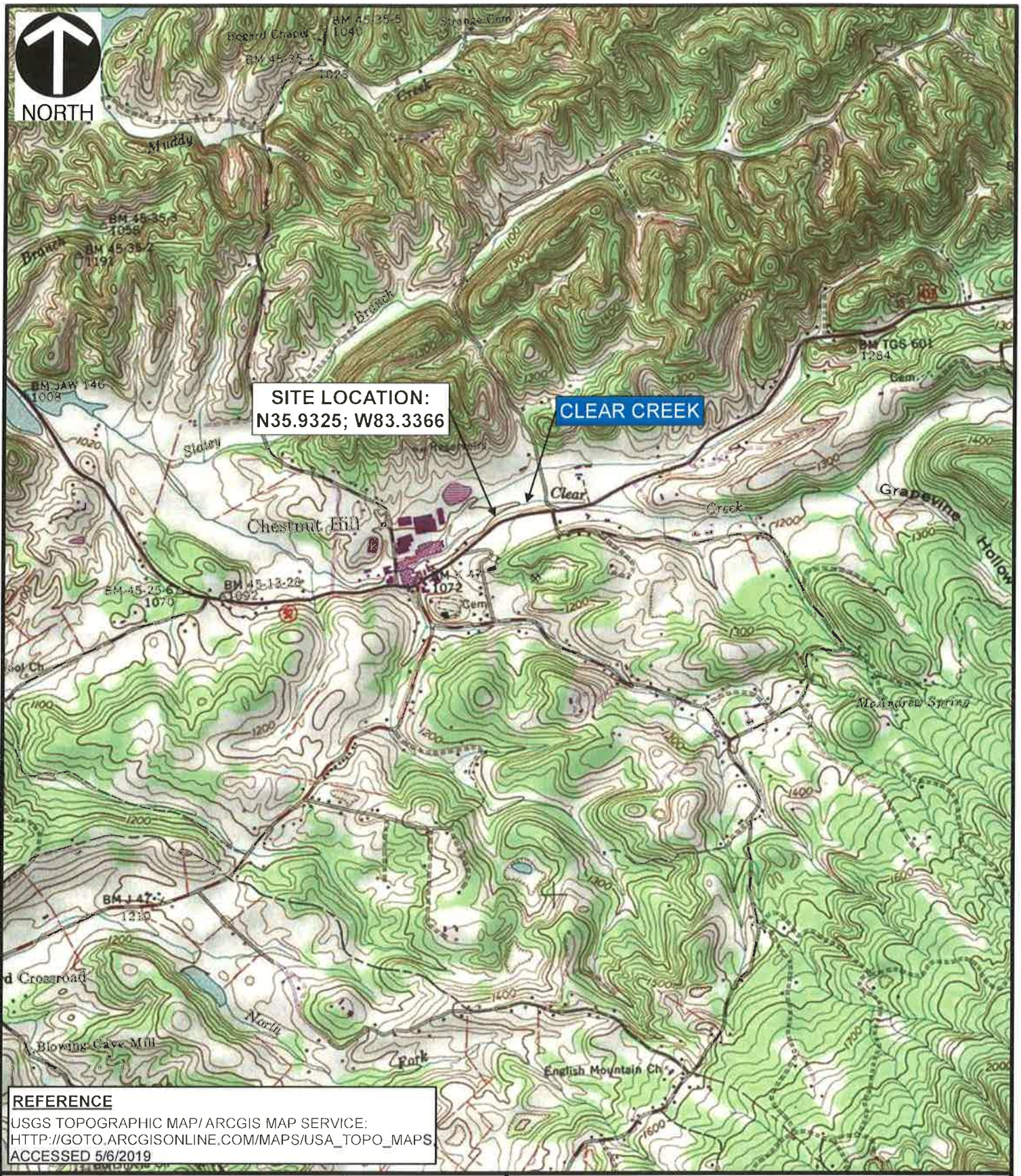

REFERENCE

USGS TOPOGRAPHIC MAP/ ARCGIS MAP SERVICE:
HTTP://GOTO.ARCGISONLINE.COM/MAPS/USA_TOPO_MAPS
ACCESSED 5/6/2019

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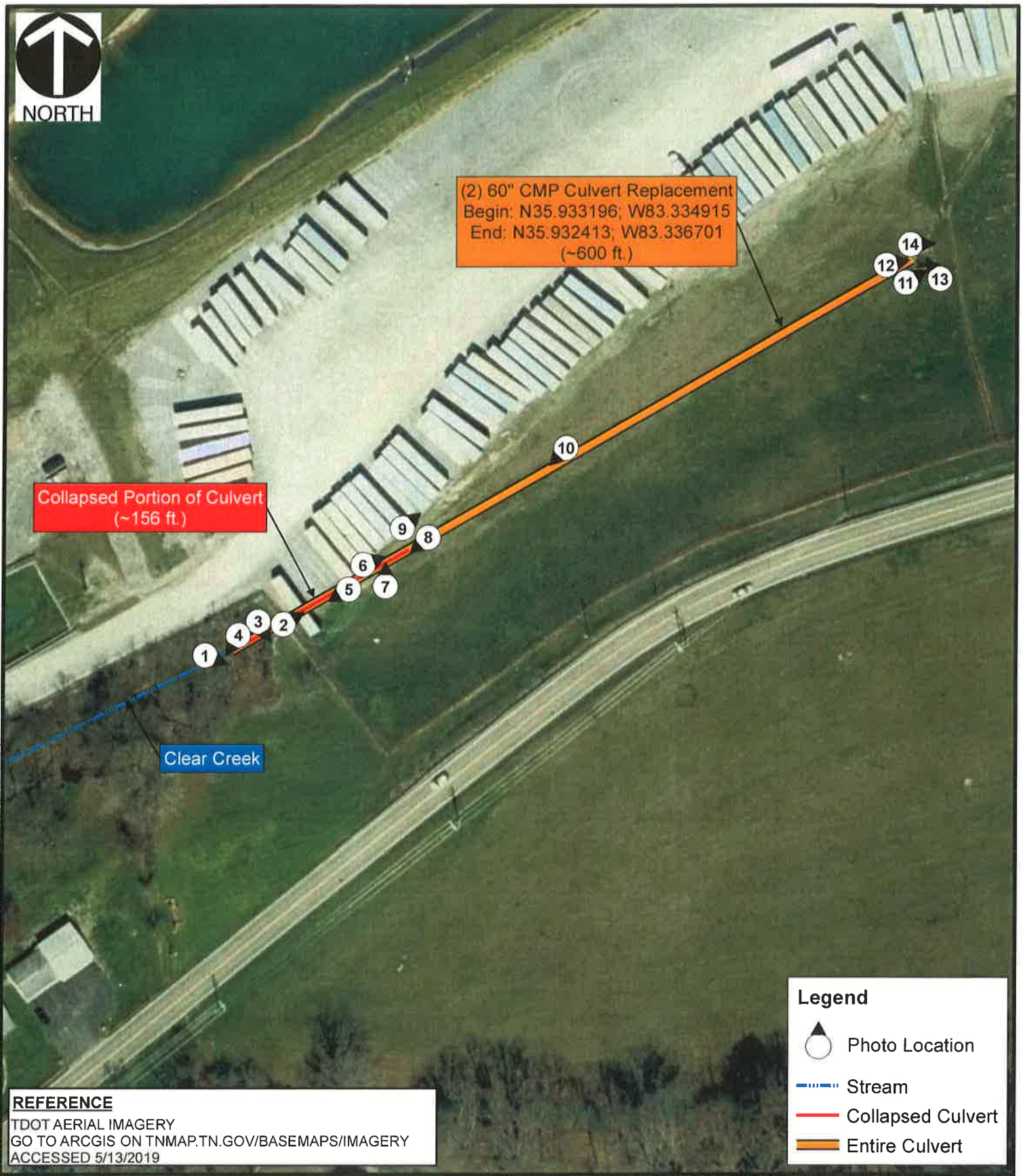
BUSH BROTHERS & COMPANY GENERAL AQUATIC RESOURCE ALTERATION PERMIT FOR MAINTENANCE ACTIVITIES DANDRIDGE, JEFFERSON COUNTY, TN

SITE LOCATION TOPOGRAPHIC MAP

DRAWN BY:	BCL	CHECKED BY:	CDH	APPROVED BY:	JLW *Hand signature on file	FIGURE NO:	2
DATE:	5/6/2019	SCALE:	1 " = 2,000 '	PROJECT NO:	191-656		

\\SVR-NASH\ P:\2019\191-656\-GIS\Maps\191-656 Figure 2 Site Location Topo.mxd (5/6/2019 10:00:59 AM)



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

PHOTO LOCATION MAP

DRAWN BY:	BCL	CHECKED BY:	CDH	APPROVED BY:	JLW *Hand signature on file	FIGURE NO:	3
DATE:	5/13/2019	SCALE:	1 " = 100 '	PROJECT NO:	191-656		

\\SVR-NASH\ P:\2019\191-656\GIS\Maps\191-656 Figure 3 Photo Location Map.mxd (5/13/2019 2:15:53 PM)

Bush Brothers & Company - 2 x 60" 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 600 ft of two 60" CMPs that convey 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 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 existing collapsed area extends approximately 156 ft upstream of the outlet concrete headwall. At a minimum, the collapsed portion will need to be repaired; however, Bush Brothers & Company is proposing to replace the entire 600 ft length from the concrete junction box to the outlet concrete headwall. The concern was that an additional collapse could occur within this section during another heavy rain event due to the unknown condition of the existing CMPs 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 2 x 60" CMPs will be removed and replaced with 2 x 60" CMPs. No additional length of encapsulation is proposed. The existing concrete headwall is in good condition and will remain in place. No disturbance around the headwall is anticipated. Following the repair/replacement, Bush Brothers will also repair their gravel parking lot and riprap ditch/French drain, 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 the 2 x 60" CMPs for the entire length of the proposed impact (600 ft). Currently, approximately 156 ft of the encapsulation is collapsed, such

that stream flow is escaping from the culverts and flowing through the collapsed area consisting of soil and debris, and then eventually flowing back into the CMPs connected to the concrete headwall and discharging back into an open channel. No impact is proposed downgradient of the concrete headwall. 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 2 x 60" CMPs will be replaced with 2 x 60" CMPs 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 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 in proximity to a plant access road and gravel parking used for trailers. Bush Brothers & Company have erected a temporary fence around the area; however, further collapse is possible and presents an on-going, unpredictable safety hazard. Replacement of the entire 600 ft length is proposed due to the unknown condition of the existing CMPs, and unknown construction fitting/banding technique. Additionally, on-site personnel suspect that debris and/or log jams may be present within the existing pipes that may have further damaged and/or separated pipes 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 entire 600 ft length of 2 x 60" CMPs.

Two alternatives were considered. The first alternative was to repair and replace just the damaged, collapsed portion of the pipes, approximately 156 ft. Concerns were raised that since the condition and construction method of the existing pipes is unknown an additional collapse and/or separation could occur upgradient in another large storm event that could ultimately damage the newly replaced pipes. The second alternative considered was the no-build option. The no build option is unacceptable since the current condition

of the collapse raises a safety concern for plant personnel and could further damage plant infrastructure (road and parking) if the collapsed area were to expand in subsequent storm events.

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. The stream will be plugged at the concrete junction box and a pump/pump around system 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 2 x 60" CMPs and concrete headwall. The headwall is in good condition and is not proposed for preplacement. End of proposed impact location.

Photo 2 – Looking upstream from headwall at collapsed area. CMPs are disconnected, deteriorating and permanently damaged. Collapsed area is approximately 6 to 8 feet deep.

Photo 3 – General view of damaged 60" CMPs immediately upstream of the outlet headwall.

Photo 4 – General view of damaged 60" CMPs facing downstream, immediately upstream of the outlet headwall.

Photo 5 – General view of collapsed area, approximately 100 ft upstream of the outlet headwall. A portion of the gravel parking lot and riprap side ditch/French drain is damaged and evident in this photo.

Photo 6 – Beginning of the collapsed area, approximately 156 ft upstream of the outlet headwall. The stream can be observed escaping from the culverts.

Photo 7 – Beginning of the collapsed pipe area, stream was observed escaping from the culverts. Normal flow conditions.

Photo 8 – General view immediately upgradient of collapsed area. Bush Brothers & Company erected a safety fence to restrict access to the area.

Photo 9 – Gravel parking lot and riprap side ditch/French drain upgradient of the collapsed area.

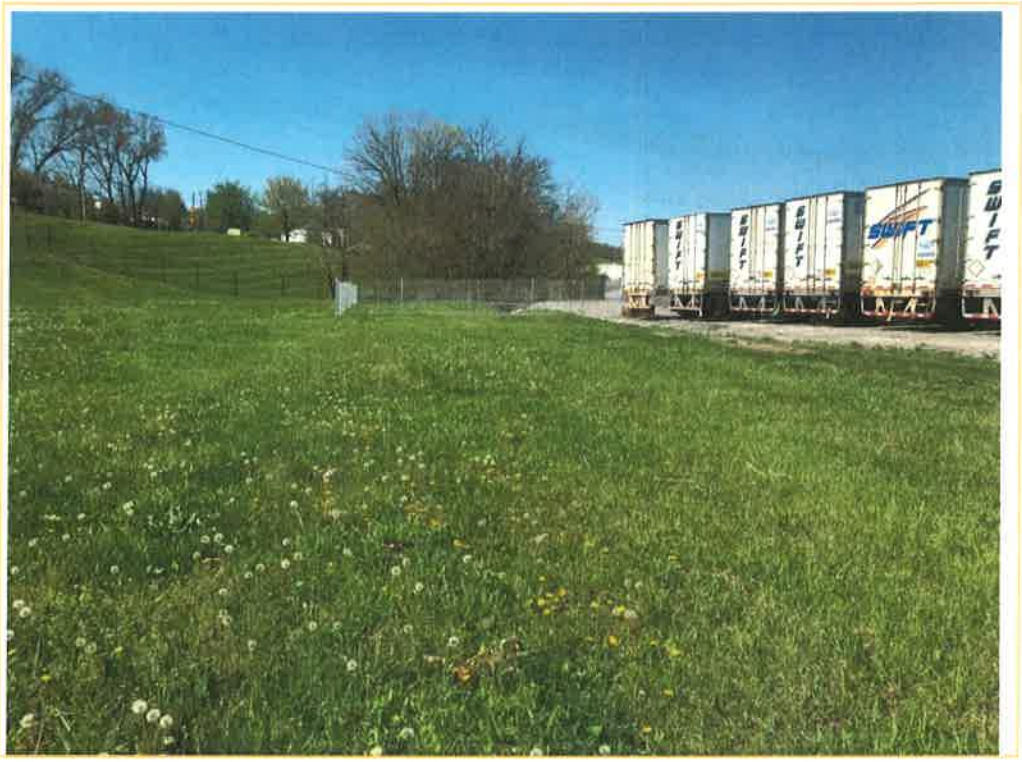


Photo 10 – Existing 2 x 60" CMPs are underground at this location and are proposed for replacement. Fencing around collapsed area is visible in this photo.

Photo 11 – Existing, grated junction box and begin impact proposed location.

Photo 12 – View inside the junction box, showing two of three CMPs that enter this junction box. These two CMPs convey Clear Creek.

Photo 13 – View of the third CMP entering the junction box. This junction box will be used to begin the stream diversion/pump around since it is a stable, accessible location.

Photo 14 – View of the outlet CMPs inside the junction box. These pipes are proposed for replacement, if needed.

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.

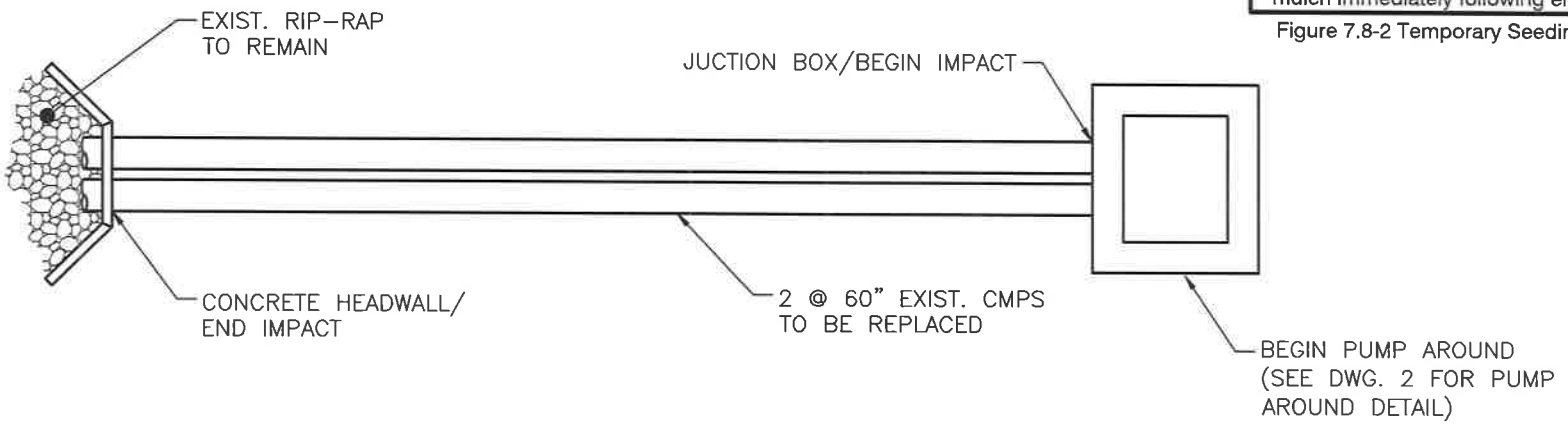
MULCH

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 AL 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.

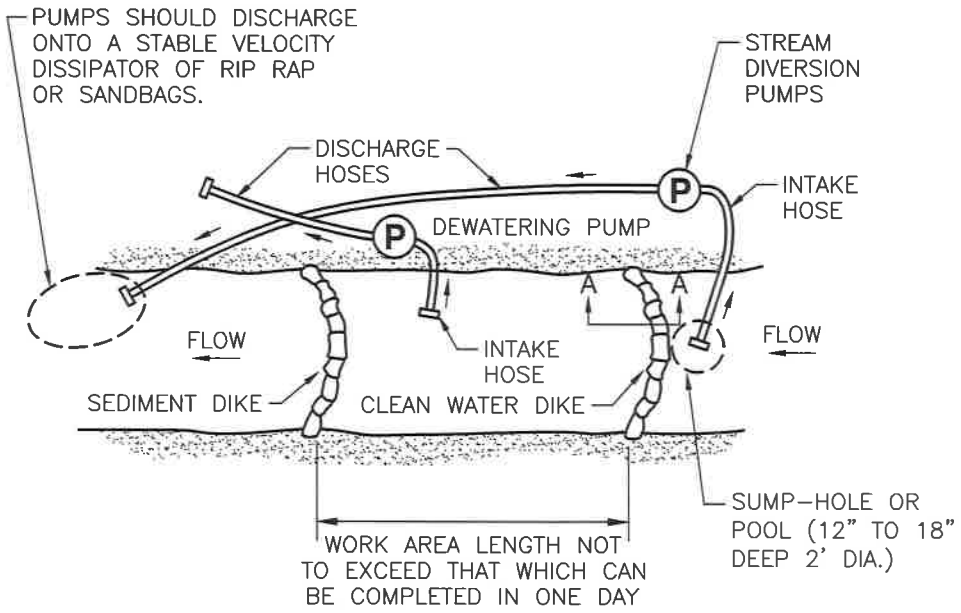
*HAND SIGNATURE ON FILE

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

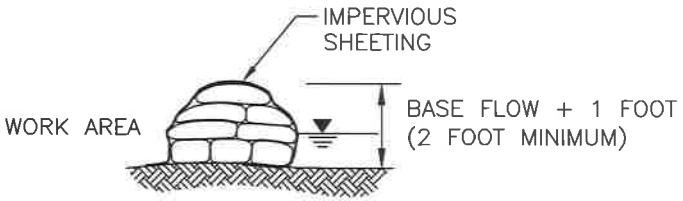
BUSH BROTHERS & COMPANY
3304 CHESTNUT HILL ROAD
DANDRIDGE TN. 37725

CONSTRUCTION DETAIL TYPICAL

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



SECTION A-A



CROSS SECTION OF SANDBAG DIKE

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.

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Division of Water Resources

*HAND SIGNATURE ON FILE

Civil & Environmental Consultants, Inc.
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BUSH BROTHERS & COMPANY
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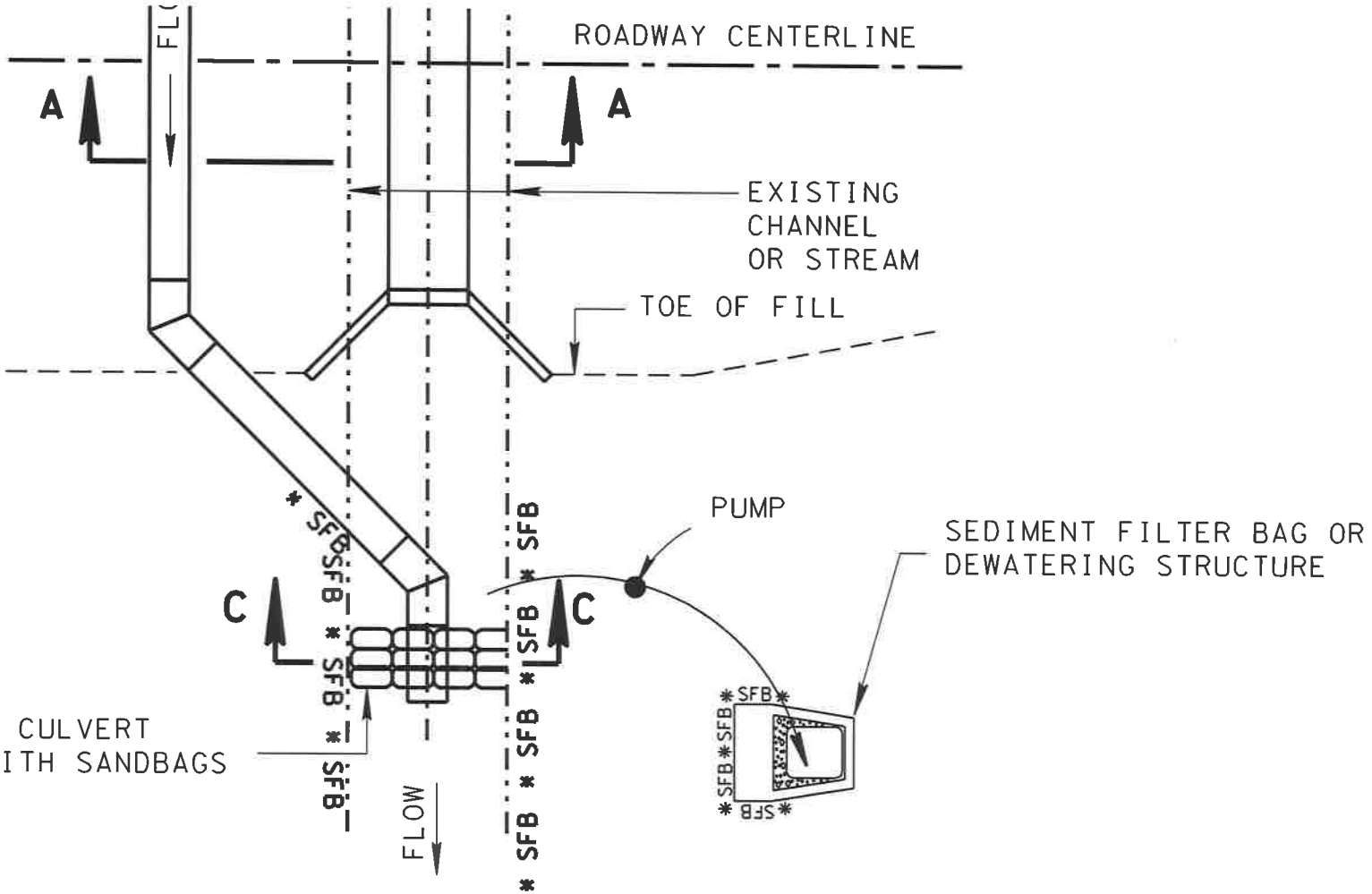
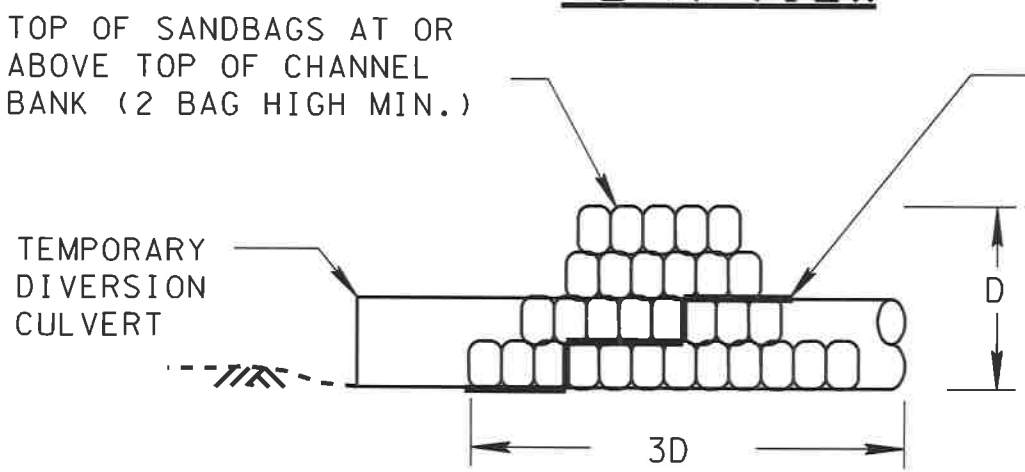
DANDRIDGE TN. 37725

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		



PLAN VIEW

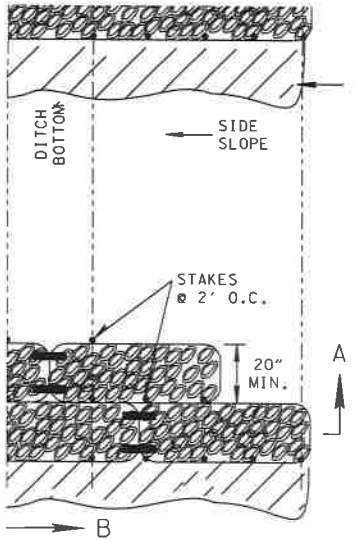


EXAMPLE:

Q2 = 87.6 CFS
CHANNEL SLOPE 1%

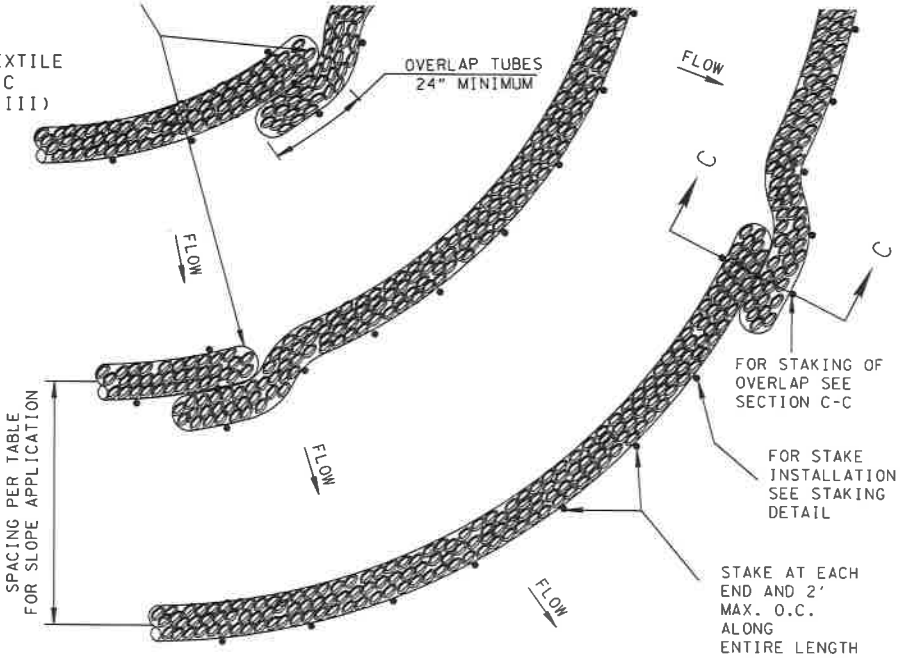
SELECT EITHER:

SINGLE 48 INCH PIPE OR



DITCH APPLICATION

SEE NOTE (G)



PLAN VIEW FOR SLOPE APPLICATION

SEDIMENT TUBE SPACING FOR SLOPE APPLICATION

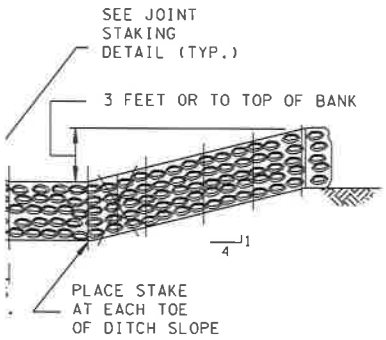
SLOPE	8"	12"	18"	20"	24"
2%	70'	80'	N/A	N/A	N/A
5%	30'	60'	80'	N/A	N/A
10%	20'	30'	70'	80'	80'
6:1	N/A	20'	40'	50'	55'
4:1	N/A	20'	30'	30'	30'
3:1	N/A	N/A	20'	20'	25'
2:1	N/A	N/A	20'	20'	20'

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

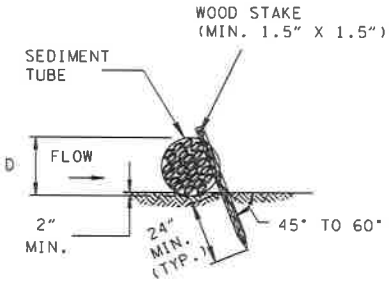
SE
SF
FOR DI

SLOPE
LESS THAN
2%
3%
4%
5%
6%
GREATER TH

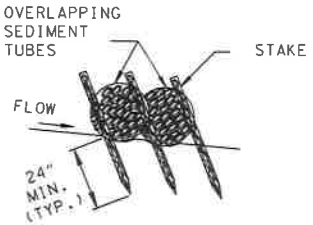
BASED ON A
SEE TABLE C



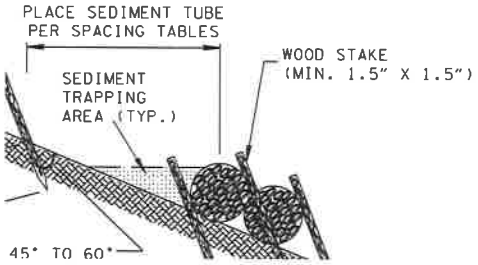
ON A-A

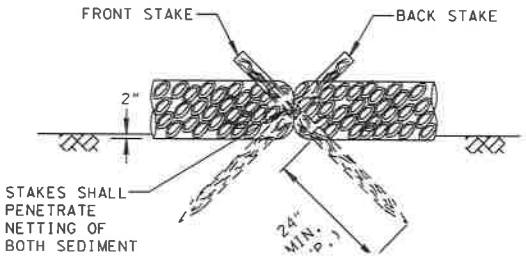


STAKING DETAIL



SECTION C-C





SEDIMENT TUBE GENERAL NOTE

(A) SEDIMENT TUBES CAN BE PLACED AT THE TOP, ON THE FACE, C TO INTERCEPT RUNOFF, REDUCE FLOW VELOCITY, RELEASE THE AND PROVIDE REMOVAL OF SEDIMENT FROM THE RUNOFF.

(B) SEDIMENT TUBES SHALL BE INSTALLED ALONG OR ON THE GROUN OF SLOPES, OR IN A DITCH TO HELP REDUCE THE EFFECTS OF SEDIMENT. SEDIMENT TUBES SHOULD NOT BE USED IN DITCHES

(C) FOR DITCH APPLICATIONS, THE MAXIMUM DRAINAGE AREA SHALL WHICH DRAIN TO EXCEPTIONAL TENNESSEE WATERS OR SEDIMENT MAXIMUM DRAINAGE AREA SHALL BE 10 ACRES. FOR SLOPE APPL DRAINAGE AREAS SHALL BE ¼ ACRE PER 100 LF OF TUBE.

(D) SEDIMENT TUBES SHALL NOT BE USED ON PAVEMENT, ROCKY SOI LOCATIONS WHERE THE STAKES CANNOT BE DRIVEN TO THE REQU

(E) SEDIMENT TUBES SHALL BE MANUFACTURED FROM WOOD EXCELSIC COCONUT FIBERS, OR HARDWOOD MULCH THAT IS ENCLOSED BY A NETTING MATERIAL. ALL MATERIALS INCLUDING THE NETTING

(F) PINE NEEDLE AND LEAF MULCH FILLED SEDIMENT TUBES AND ST ACCEPTABLE MATERIALS.

(G) THE DIAMETER OF A SEDIMENT TUBE SHALL BE A MINIMUM OF 8 OF 24 INCHES. DIAMETER TOLERANCE IS 2 INCHES. FOR DITC SEDIMENT TUBES SHALL BE A MINIMUM OF 20 INCHES.

(H) SEDIMENT TUBES SHALL BE INSTALLED WITH WOODEN STAKES (M ACTUAL). THE STAKE SHALL BE EMBEDDED A MINIMUM OF 2 FE

(I) SEDIMENT TUBES SHALL BE TRENCHED IN A MINIMUM OF 2 INCH

(J) IF MORE THAN ONE SEDIMENT TUBE IS PLACED IN A ROW IN SL TUBES SHALL BE OVERLAPPED A MINIMUM OF 24 INCHES TO PRE FROM PASSING THROUGH THE FIELD JOINT. WHEN USED IN DITC SHALL BE PLACED ON THE CHANNEL BOTTOM WITH STAGGERED JC

(K) FOR DITCH APPLICATIONS, SEDIMENT TUBES SHALL BE A MINIM AND SHALL BE PLACED PERPENDICULAR TO THE FLOW OF WATER. CONTINUE UP THE SIDE SLOPES A MINIMUM OF 3 FEET PLUS TH TUBE, OR TO THE TOP OF THE DITCH, WHICHEVER IS LESS.

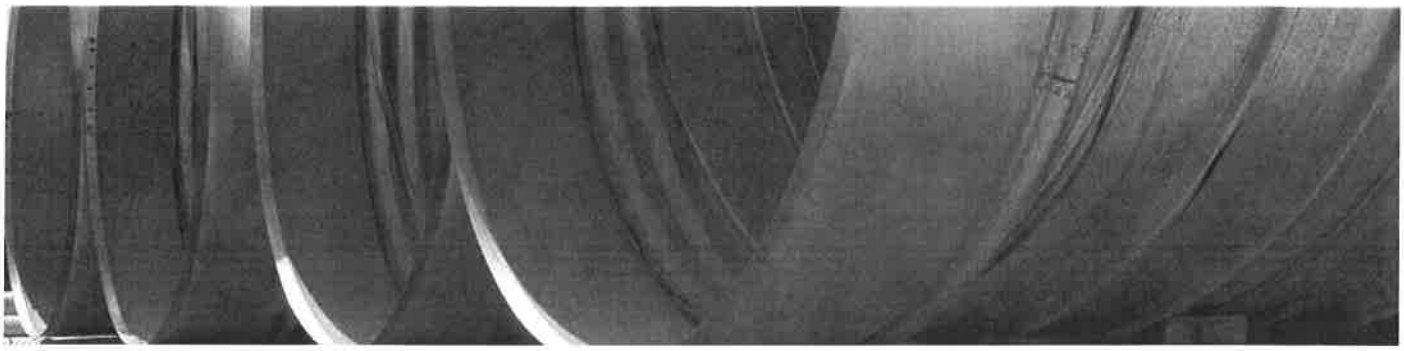
(L) SEDIMENT TUBES USED IN SLOPE APPLICATIONS MAY REMAIN I FOR DITCH APPLICATIONS SEDIMENT TUBES SHALL BE COMPLET FULLY ESTABLISHED VEGETATION HAS COMPLETELY DEVELOPED.

(M) SEDIMENT TUBES SHALL BE PAID FOR UNDER THE FOLLOWING IT

740-11.01 TEMPORARY SEDIMENT TUBE (8 INCH) PER LINE
740-11.02 TEMPORARY SEDIMENT TUBE (12 INCH) PER LIN
740-11.03 TEMPORARY SEDIMENT TUBE (18 INCH) PER LIN
740-11.04 TEMPORARY SEDIMENT TUBE (20 INCH) PER LIN
740-11.05 TEMPORARY SEDIMENT TUBE (24 INCH) PER LIN

CONTECH®
ENGINEERED SOLUTIONS

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. You 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

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.

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.

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.

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.

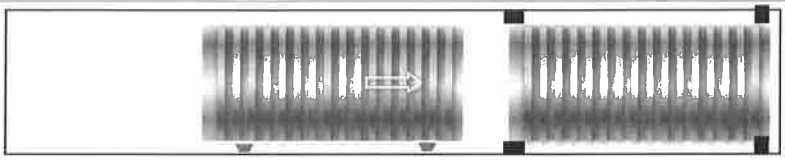
The most common method of slipling with CMP is to place liner pipe one section at a time through the inlet or outlet end (for culverts) or through an insertion pit (for closed systems) and to push or pull the single sections into final position. Handling just one section at a time is normally the most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

SEGMENTAL SLIPLINING PROCESS FOR CMP

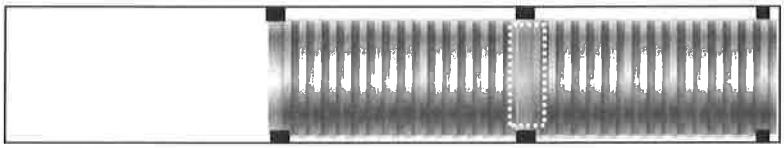
Consult your local Contech representative for more detail.

Insert first section.

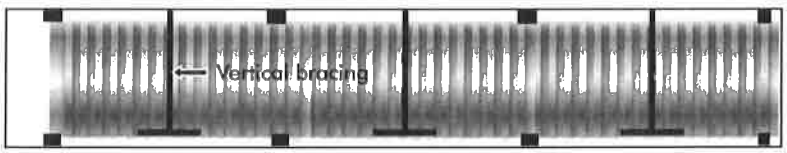
Block the first section and place the next section.



Block the tail end and place internal expanding band and gasket.



Repeat until all sections are installed. Place bracing to prevent flotation and displacement during grouting.



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

	Steel ULTRA FLO			Aluminum ULTRA FLO		
Dia. (in)	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.

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.

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.

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 1-½" stones can clog a 2" grout line resulting in significant back pressure which can result in a sudden 'blow out' of the reline structure (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 ½ 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.

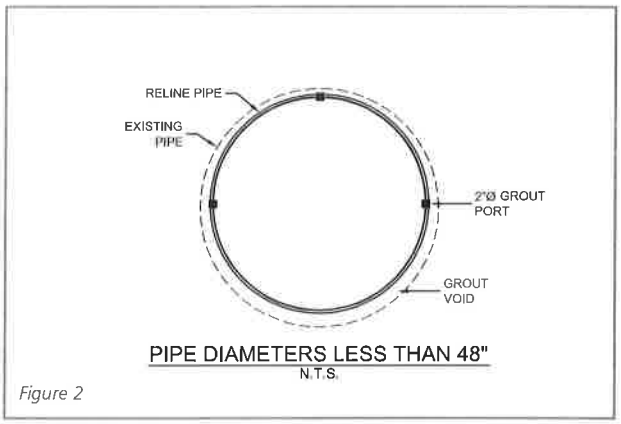


Figure 2

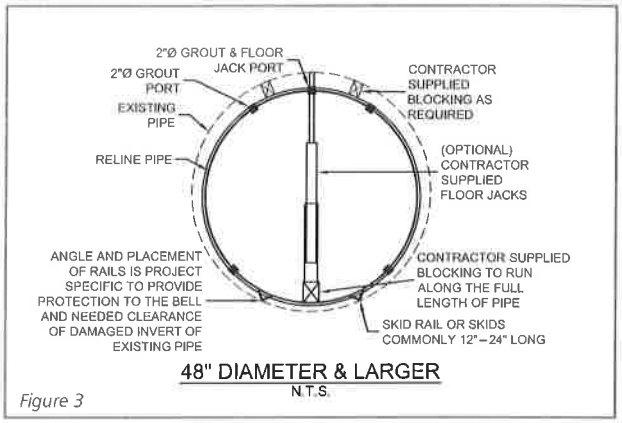


Figure 3

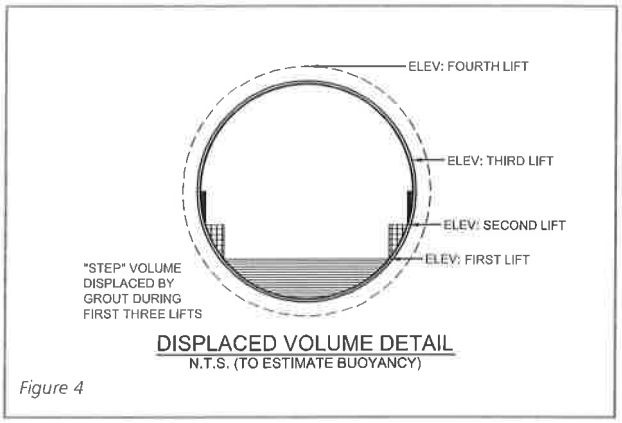


Figure 4

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.

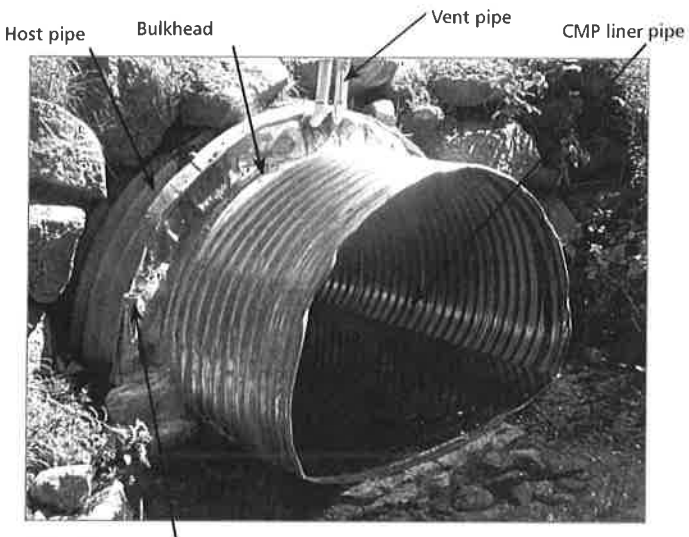


Figure 5

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

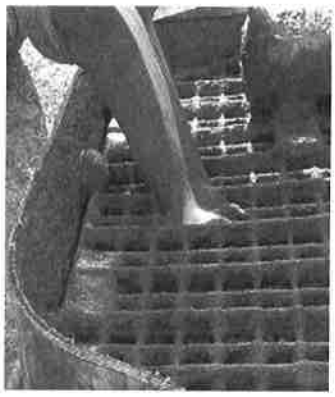
	Steel – Max PSI Recommended*[1]		Aluminum – Max PSI Recommended* [1]	
Liner Diameter (in)	Round	5% Deflection	Round	5% Deflection
18	5[2]	5[2]	5[2]	5[2]
21	5[2]	5[2]	5[2]	5[2]
24	5[2]	5[2]	5[2]	5[2]
30	5[2]	5[2]	5[2]	5[2]
36	5[2]	5[2]	5[2]	5[2]
42	5[2]	5[2]	5[2]	5[2]
48	5[2]	5[2]	5[2]	5[2]
54	5[2]	5	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 1-½" 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.*

Support

My Primary Contech Contact: _____

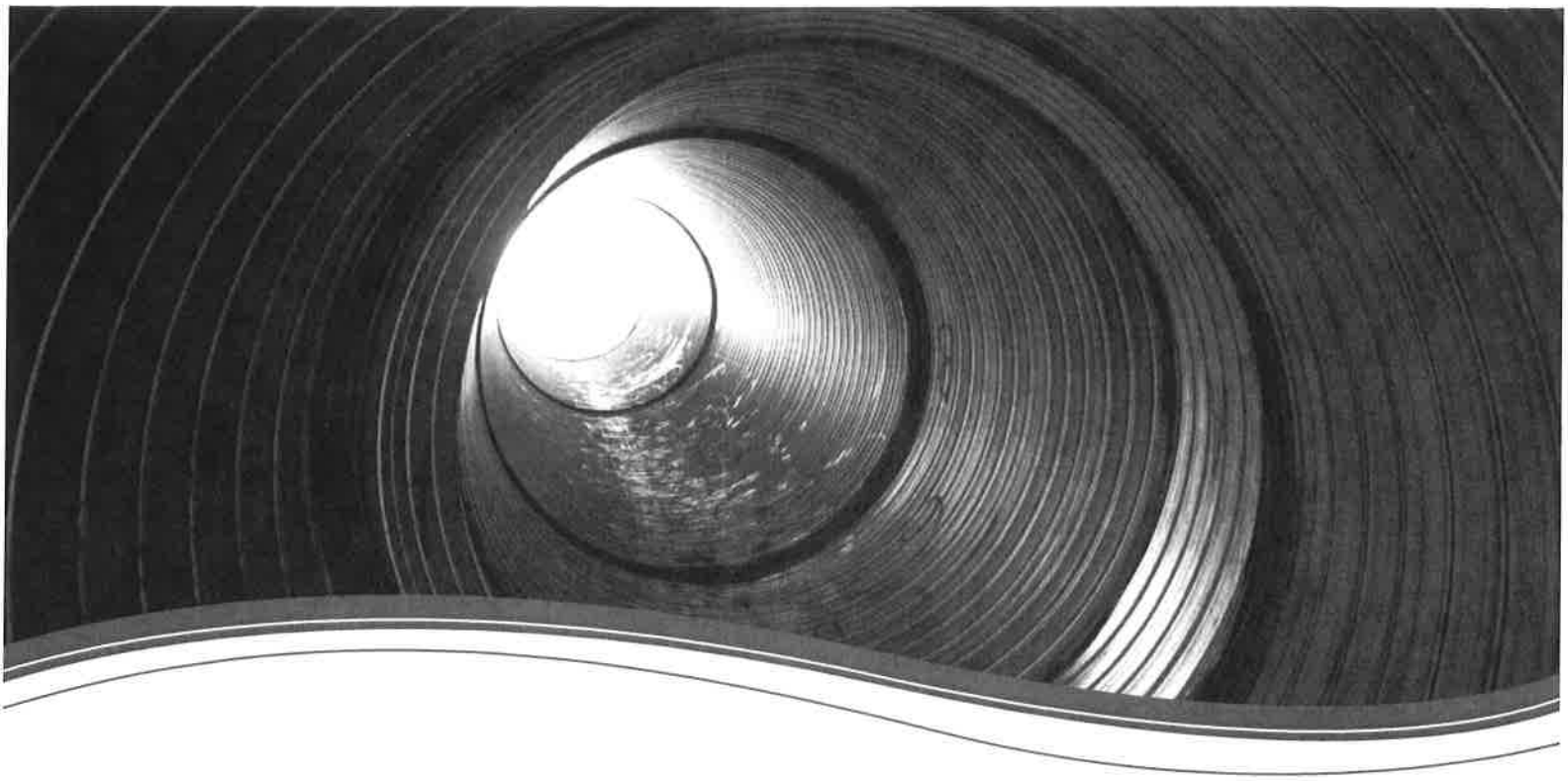
Phone: _____ Email: _____

My Customer Solutions Coordinator (CSC) is: _____ Email: _____

Phone: _____

Project Site Address: _____

Notes:



- 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.

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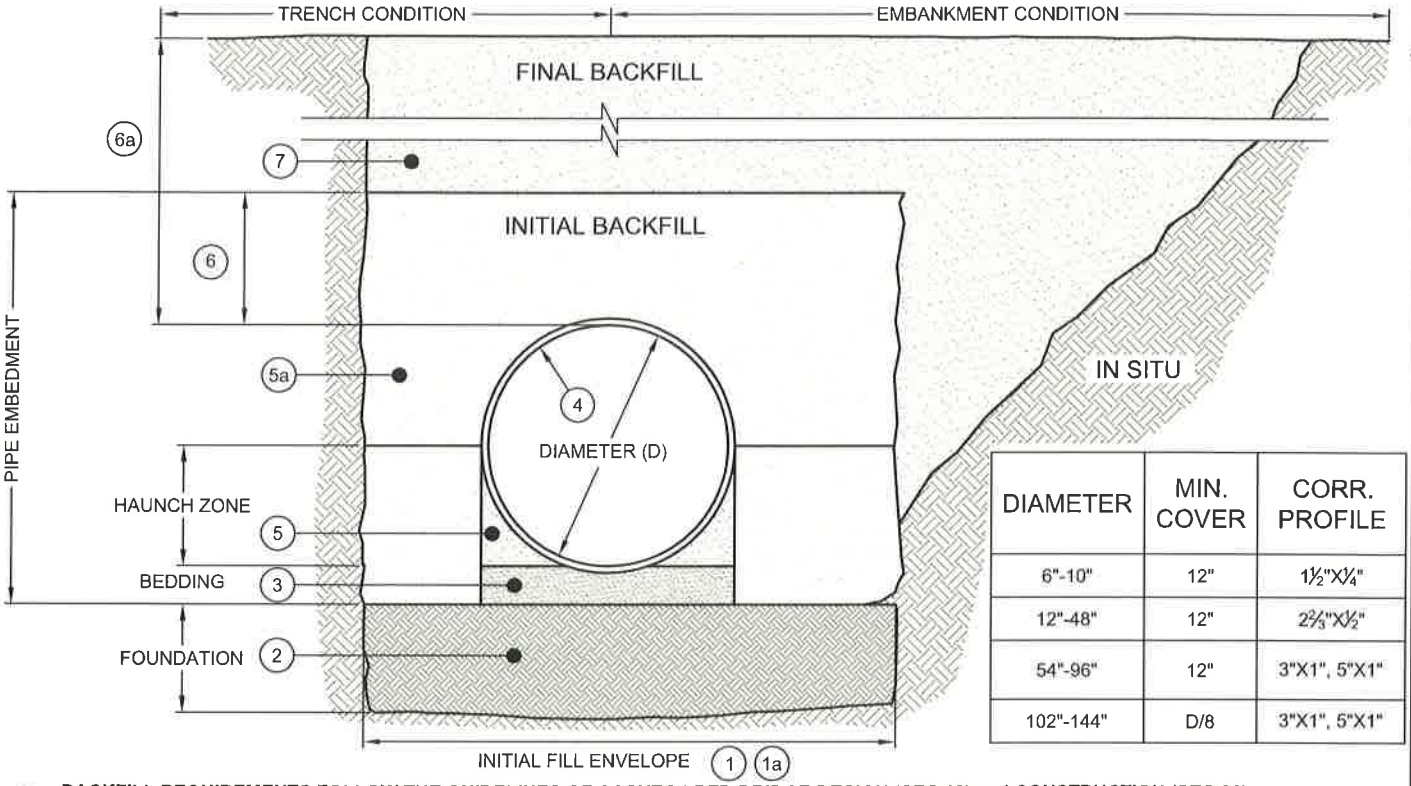


DIAMETER	MIN. COVER	CORR. PROFILE
6"-10"	12"	1½"X¼"
12"-48"	12"	2⅔"X½"
54"-96"	12"	3"X1", 5"X1"
102"-144"	D/8	3"X1", 5"X1"

- **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

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH PIPE SOLUTIONS

230 - CSP ROUND STANDARD BACKFILL DETAIL AASHTO

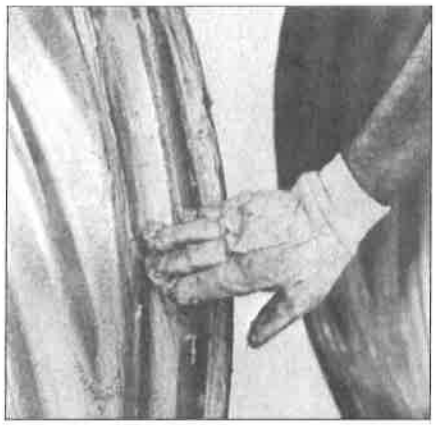
DATE DRAWN: 11/15/15	REV #: ----	REV DATE: ----	SCALE: N.T.S.	DRAWING TYPE: ----

CONTECH®
ENGINEERED SOLUTIONS

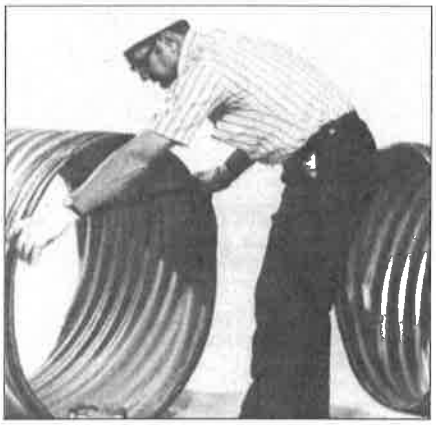
Installation Instructions
HUGGER® Band with Gaskets

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.

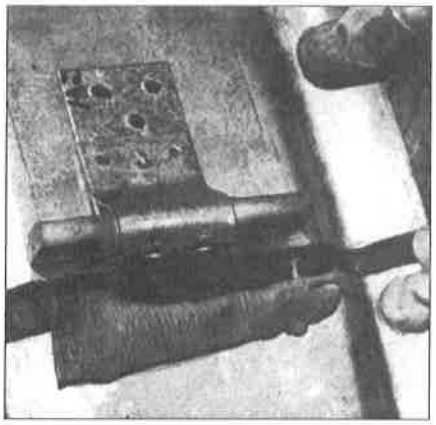
6 Check bars for proper position.

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

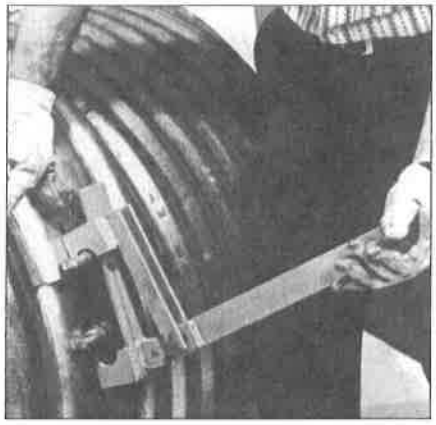
8 Tear off enough mastic to reach between the corrugations at the end of the band.

See other side for more detail.

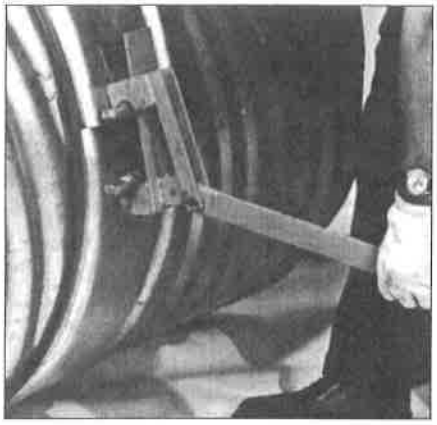
Installation Instructions
HUGGER® Band with Gaskets



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.*

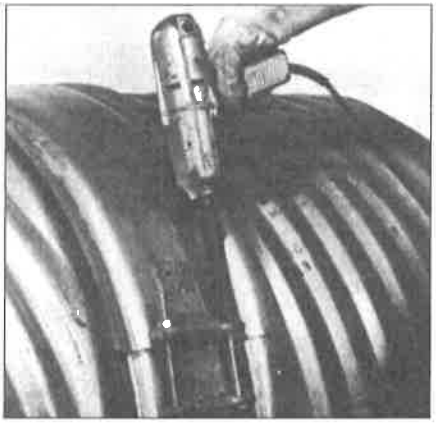


10 With the necessary parts lubricated and all foreign matter between the pipe and band removed, use a Felton Puller or long bolt to start the band lap.

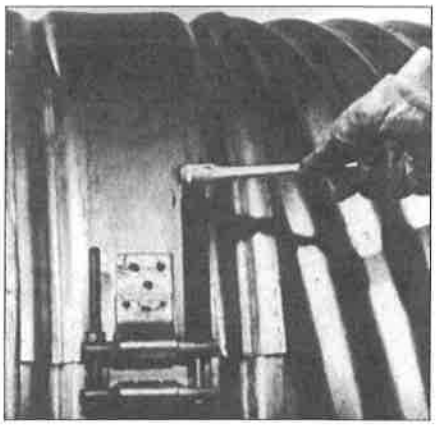


11 Pull the band into position. For maximum compression of the gasket, the band corrugation must be fully seated into the second corruagtion from each pipe end.

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 eating 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.

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Vendor : 154720, Treasurer State of Tennessee

Invoice number	Invoice date	Currency	Gross amount	Cash discount	Payment amount
SOS#90938	5/28/2019	USD	500.00	0.00	500.00
Total					500.00