Department of Energy

Ohio Field Office
Fernald Area Office
P. O. Box 538705
Cincinnati, Ohio 45253-8705
(513) 648-3155

2239

MAY 19 1999

Mr. James A. Saric, Remedial Project Manager
U.S. Environmental Protection Agency
Region V-SRF-5J
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

DOE-0769-99

Mr. Tom Schneider, Project Manager
Ohio Environmental Protection Agency
401 East 5th Street
Dayton, Ohio 45402-2911

Dear Mr. Saric and Mr. Schneider:

MODIFICATION TO THE ON-SITE DISPOSAL FACILITY LEACHATE CONVEYANCE SYSTEM

This letter is officially transmitting the proposed modifications to the On-Site Disposal Facility (OSDF) Leachate Conveyance System. The information contained in this submittal has previously been informally provided to the U.S. Environmental Protection Agency (U.S. EPA) and Ohio Environmental Protection Agency (OEPA). This enclosure contains the following components:

- DCN 1700-085 - Interim Leachate Conveyance System and Equipment Wash Discharge Line - Construction Drawings (5)
- DCN 1700-087 - Permanent Leachate Conveyance System; Manhole #1 to Manhole #3 and Interim Leachate Conveyance System - Technical Specification Sections (2)
- DCN 1700-089 - Permanent Leachate Conveyance System; Manhole #1 to Manhole #3 and Interim Leachate Conveyance System - Addendum to Final Design Criteria Package
- DCN 1700-090 - Permanent Leachate Conveyance System; Manhole #1 to Manhole #3 and Interim Leachate Conveyance System - Addendum to Final Design Calculation Package

000001

Recycled and Recyclable

- DCN 1702-060 - On-site Disposal Facility Project; Systems Plan 20100-PL-008 Revision 0 May 1997
- Hydrostatic Pipe Test Procedure Leachate Conveyance System
- Pneumatic Pipe Test Procedure Leachate Conveyance System

In addition to the above documentation, the agencies have requested information on other topics. The first topic relates to implementation of the monitoring requirements of the Systems Plan. Those requirements will be implemented by Fluor Daniel Fernald Aquifer Restoration and Wastewater Project field operations personnel. Such implementation will be governed by an operating procedure that will be in place prior to resumption of OSDF waste placement operations. This leachate system operation procedure is available for your review.

The second topic relates to design and construction of the entire permanent Leachate Conveyance System. DOE is committed to completion of design deliverables with the full Amended Consent Agreement review cycle. In addition, Department of Energy (DOE) is committed to having an independent design review of the final package. It is anticipated that construction would be completed during the Calendar Year (CY) 2000 construction season.

Please contact Jay Jalovec at (513) 648-3122 if you have any questions or wish to further discuss this submittal.

Sincerely,

Johnny Reising

Johnny W. Reising
Fernald Remedial Action
Project Manager

FEMP:Jalovec

Enclosure

cc w/enclosure:
N. Hallein, EM-42/CLOV
G. Jablonowski, USEPA-V, SRF-5J
R. Beaumier, TPSS/DERR, OEPA-Columbus
T. Schneider, OEPA-Dayton (three copies of enclosures)
F. Bell, ATSDR
M. Schupe, HSI GeoTrans
R. Vandegrift, ODH
F. Barker, Tetra Tech
AR Coordinator, FDF/78

cc w/o enclosure:
J. Reising, OH/FEMP
A. Tanner, OH/FEMP
D. Carr, FDF/52-2
T. Hagen, FDF/65-2
J. Harmon, FDF/90
R. Heck, FDF/2
M. Hickey, FDF/64
S. Hinnefeld, FDF/31
U. Kumthekar, FDF/64
T. Walsh, FDF/65-2
ECDC, FDF/52-7

RCI/DCN FORM

REQUEST FOR CLARIFICATION OF INFORMATION / DESIGN CHANGE NOTICE -

(1)WP / WO NO.:1700	(2)S/C NO.:	(5)Pg 1 OF 4	(6)DATE 4/30/99
(3)S/C TITLE: LEACHATE CONVEYANCE SYSTEM	2239	(11)RCI NO.:	
(4) RESPONSIBLE DISCIPLINE : E ☐ M ☐ C ☒ OTHER ☐	(4A)RCI/DCN TITLE:Interim Leachate Conveyance System and Equipment Wash Discharge Line	(11)DCN NO.: 1700-085	

(7)DOCUMENTS AFFECTED	(7)DOCUMENT NOS.	(7)REV.	(8)OTHER
a) Drawings to be modified - OSDF LCS Construction Design Drawings Affected by the LTS Pipeline Repair/Replacement Project (10 drawings) and OSDF Phase II Construction Design Drawings Affected by the LTS Pipeline Repair/Replacement Project (4 drawings) b) New Drawings to be issued - Drawing Index 90-X-5500-X-00536			

(9) ☐ RCI - INQUIRY ☐ USQD SCREENING BY PROJECT ENGINEER

USQD not required/see Request For Safety Analysis Support, SA-99-1039

(9) ☒ DCN - JUSTIFICATION, EXISTING CONDITION & REQUESTED/PROPOSED CHANGE

Because of the leakage detected in the Temporary LCS, this DCN provides the redesign of an interim LCS from manhole #3 to the permanent lift station. Due to the routing of this interim LCS, a redesign of the Equipment Wash Discharge line is also required.

(10)REQUESTOR: James C. Jenkins COMPANY: DATE: 4/30/99

(12)CE / PE James C. Jenkins DATE: 4/30/99

(13)RESPONSE: FOR RCI, IS A DCN REQ'D? ☐NO ☐YES

(14) FOR DCN: ☒APPROVED ☐APPROVED AS NOTED ☐DISAPPROVED

RCI - DCN ACCEPTANCE

(15)DESIGN ORGANIZATION APPROVAL/DISAPPROVAL: Nelim Tarabay DATE: 4-30-99 ☒FIT ☐FORM ☐FUNCTION

(20)CHARGE NO. FOR CADD SERVICES TO INCORPORATE:2DSU3

2DSU3

(16)FDF PE ACCEPTANCE & VERIFICATION THAT ALL REQUIRED REVIEWS ARE COMPLETE: (DCN ONLY) J Jenkins James C. Jenkins DATE: 4/30/99

PERFORMANCE GRADE: (17) 4

(18)CONSTRUCTION CONCURRENCE ~~R. McGuire~~ Lee E. McGuire 4/30/99 DATE:

PURCHASE REQUISITION REQUIRED: ☒YES ☐NO (19)

(21)WORK COMPLETED: (SIGNOFF BY CE OR PE) DATE:

ORIGINAL

FS-F-4259
REV. 4: 02/16/98

GEOSYNTEC CONSULTANTS

Page 1 of 1

2239

Written by: J. Burnett Date: 99 / Apr / 16 (YY MM DD) Reviewed by: Date: / / (YY MM DD)

Client: FDF Project: LCS Project/Proposal No.: GQ0409 Task No.: 02.1

OSDF LCS Construction Design Drawings Affected by the LTS Pipeline Repair/Replacement Project

1. Parsons Drawing No. 92X-5900-G-00251, Sheet No. G0001, Rev. No. 1, Civil – Master Plan

2. Parsons Drawing No. 92X-5900-G-00254, Sheet No. G0002, Rev. No. 1, Civil – Plan and Profile – Sheet 1 of 4

3. GeoSyntec Drawing No. 90X-6000-G-00057, Sheet No. BA Rev. No. 0, Leachate Transmission System – Plan and Profile Data I

4. GeoSyntec Drawing No. 90X-6000-G-00058, Sheet No. BB Rev. No. 0, Leachate Transmission System – Plan and Profile Data II

5. GeoSyntec Drawing No. 90X-6000-G-00059, Sheet No. BC Rev. 0, Leachate Transmission System – Plan and Profile Data III

6. GeoSyntec Drawing No. 90X-6000-M-00062, Sheet No. M-2A Rev. 0, Leachate Transmission System – Piping and Instrumentation Diagram

7. GeoSyntec Drawing No. 90X-6000-M-00063, Sheet No. M-4A, Rev. 0, Leachate Transmission System – Gravity Line and Manhole Mechanical Details I

8. GeoSyntec Drawing No. 90X-6000-M-00064, Sheet No. M-5A, Rev. 0, Leachate Transmission System – Gravity Line and Manhole Mechanical Details II

9. GeoSyntec Drawing No. 90X-6000-M-00066, Sheet No. M-6B, Rev. 0, Leachate Transmission System – Gravity Line and Manhole Mechanical Details IV

10. GeoSyntec Drawing No. 90X-6000-M-00067, Sheet No. M-9A, Rev. 0, Leachate Transmission System – Lift Station Mechanical Details III

DCN 1700-085

GEOSYNTEC CONSULTANTS

Page 1 of

Written by: J. Burnett Date: 99 / Apr / 18 (YY MM DD) Reviewed by: 2239 Date: / / (YY MM DD)

Client: FDF Project: LCS Project/Proposal No.: G00409 Task No.: 02.1

OSDF Phase II Construction Design Drawings Affected by the LTS Pipeline Repair/Replacement Project

1. Drawing No. 90X-6000-G-00202, Sheet No. G-2B, Rev. 1 — Site Development Plan I - Base Bid

2. Drawing No. 90X-6000-G-00203, Sheet No. G-2C, Rev. 2 — Site Development Plan I - Option A

3. Drawing No. 90X-6000-G-00221, Sheet No. G-2D, Rev. 2 — Site Development Plan I - Option C

4. Drawing No. 90X-6000-G-00204, Sheet No. G-5D, Rev. 0 — Subgrade Grading Plan

DCN 1700-085

2239

DRAWING INDEX		
DRAWING NO.	FILENAME	TITLE DESCRIPTION
90X-5500-X-00536	90XG0536.DGN	COVER/INDEX SHEET
90X-5500-G-00537	90XG0537.DGN	PLAN AND PROFILE SHEET 1 OF 3
90X-5500-G-00538	90XG0538.DGN	PLAN AND PROFILE SHEET 2 OF 3
90X-5500-G-00539	90XG0539.DGN	PLAN AND PROFILE SHEET 3 OF 3
90X-5500-G-00540	N/A	NOT USED
90X-5500-G-00541	90XG0541.DGN	CIVIL DETAILS

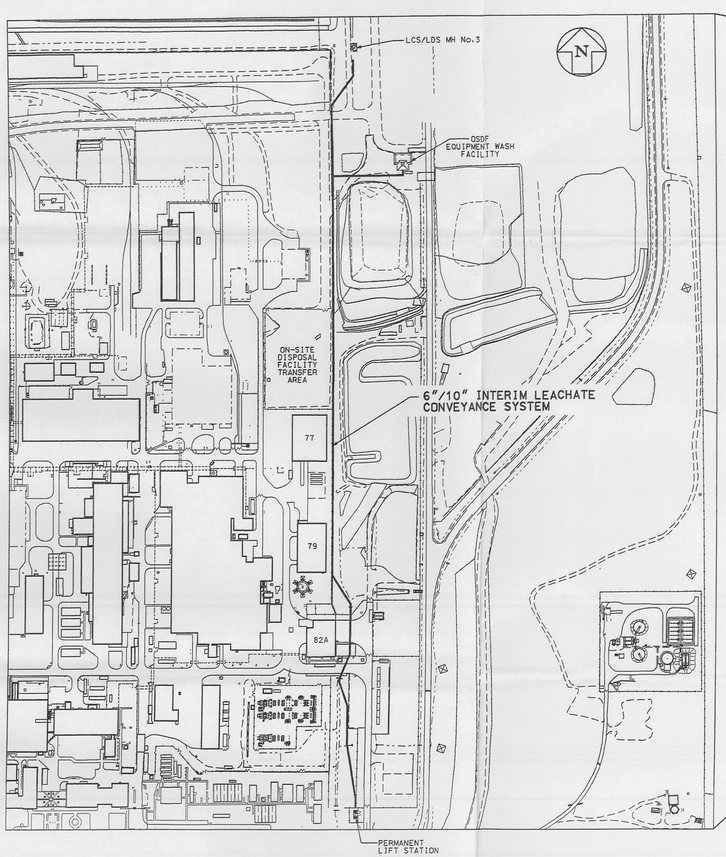
000007

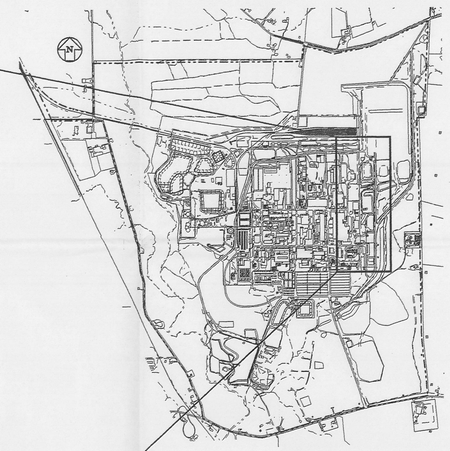
DCN 1700-085

SHT. 4 OF 4

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
INTERIM LEACHATE CONVEYANCE SYSTEM
FDF PROJECT NO. 20110

2239





FEMP VICINITY MAP

DRAWING INDEX		
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90X-5500-X-00536	90XG0536.DGN	COVER/INDEX SHEET
90X-5500-G-00537	90XG0537.DGN	PLAN AND PROFILE SHEET 1 OF 3
90X-5500-G-00538	90XG0538.DGN	PLAN AND PROFILE SHEET 2 OF 3
90X-5500-G-00539	90XG0539.DGN	PLAN AND PROFILE SHEET 3 OF 3
90X-5500-G-00540	N/A	NOT USED
90X-5500-G-00541	90XG0541.DGN	CIVIL DETAILS

LEGEND:

- EXISTING GRADE
- EXISTING TEMPORARY LEACHATE CONVEYANCE LINE
- INTERIM LEACHATE CONVEYANCE LINE ALIGNMENT
- EXISTING FENCE
- EXISTING UTILITY POLE
- GUIDE POST

000008

NO.	REVISIONS	DATE	DWN. BY	APPD.
0	ISSUED CERTIFIED FOR CONSTRUCTION (TCO-DES)	4/29/99	PGW RMF	GEJ
B	PREFINAL - ISSUED FOR ILCS TEAM REVIEW	4/27/99		
A	PRELIMINARY - ISSUED FOR ILCS TEAM REVIEW	4/21/99		

NO.	REVISIONS	DATE	DWN. BY	APPD.	REF. DWG. NO.

NOTE:
FLUOR DANIEL FERNALD CADD DRAWING, DO NOT REVISE MANUALLY.

CONFIGURATION MANAGEMENT DRAWING — SEE NOTE

SYSTEMS, STRUCTURES OR COMPONENTS DEPICTED ON THIS DRAWING ARE UNDER CONFIGURATION MANAGEMENT CONTROL. SEE NOTES.

COGNIZANT ENGINEER DATE

APPROVALS

CIVIL & STR.	J. JENKINS	SAFETY ENG.	G. JOHNSON		
ELECTRICAL	—	MAINTENANCE	—		
ENGINEER	J. JENKINS	FIRE PROTECT.	—		
INSTRUMENT	—	WASTE MANAGE	—		
MECHANICAL	—	SECURITY	—		
		PROJECTS	—		
		QUALITY	M. GOBBER		
CHECKED	S. TARABUS	CONSTR.	L. McDANIEL		
APPROVED	J. BEECH				

Fernald Environmental Management Project

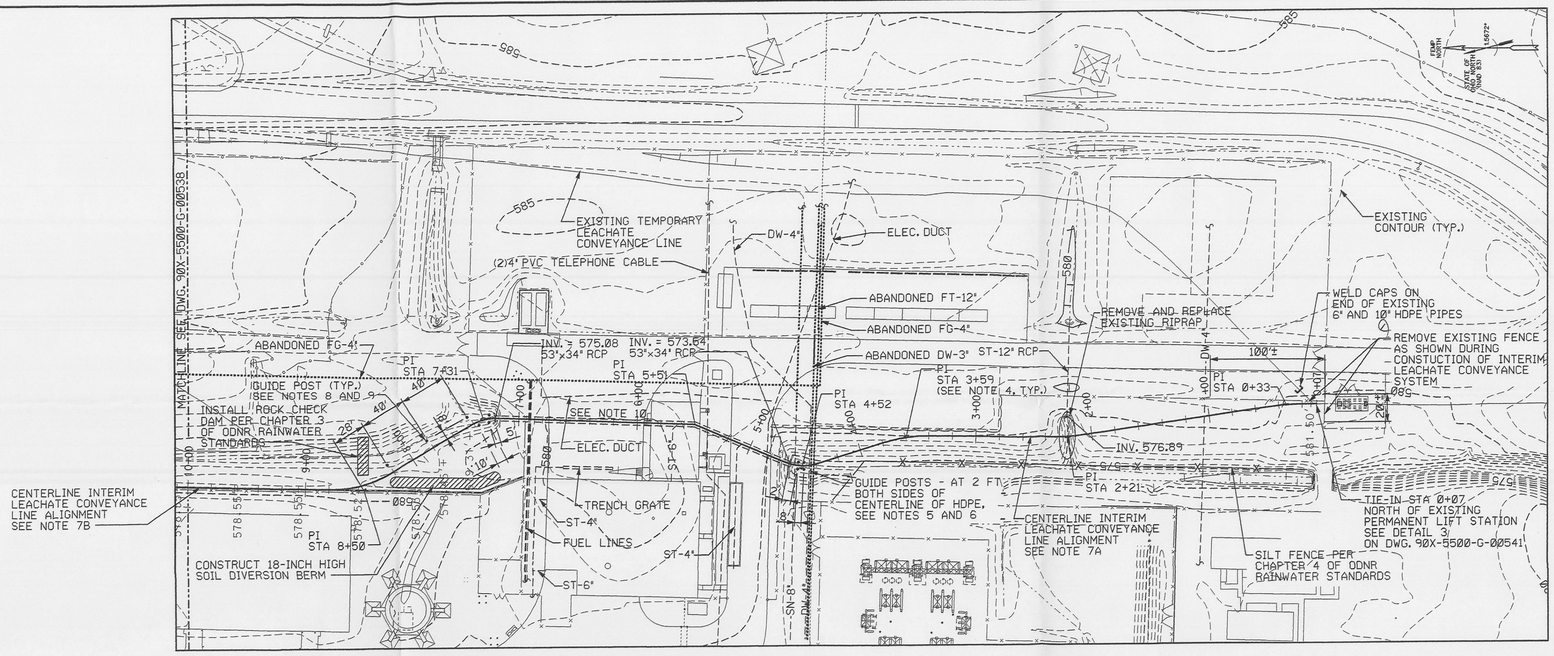
FLUOR DANIEL FERNALD

U.S. DEPARTMENT OF ENERGY

INTERIM LEACHATE CONVEYANCE SYSTEM
COVER/INDEX SHEET

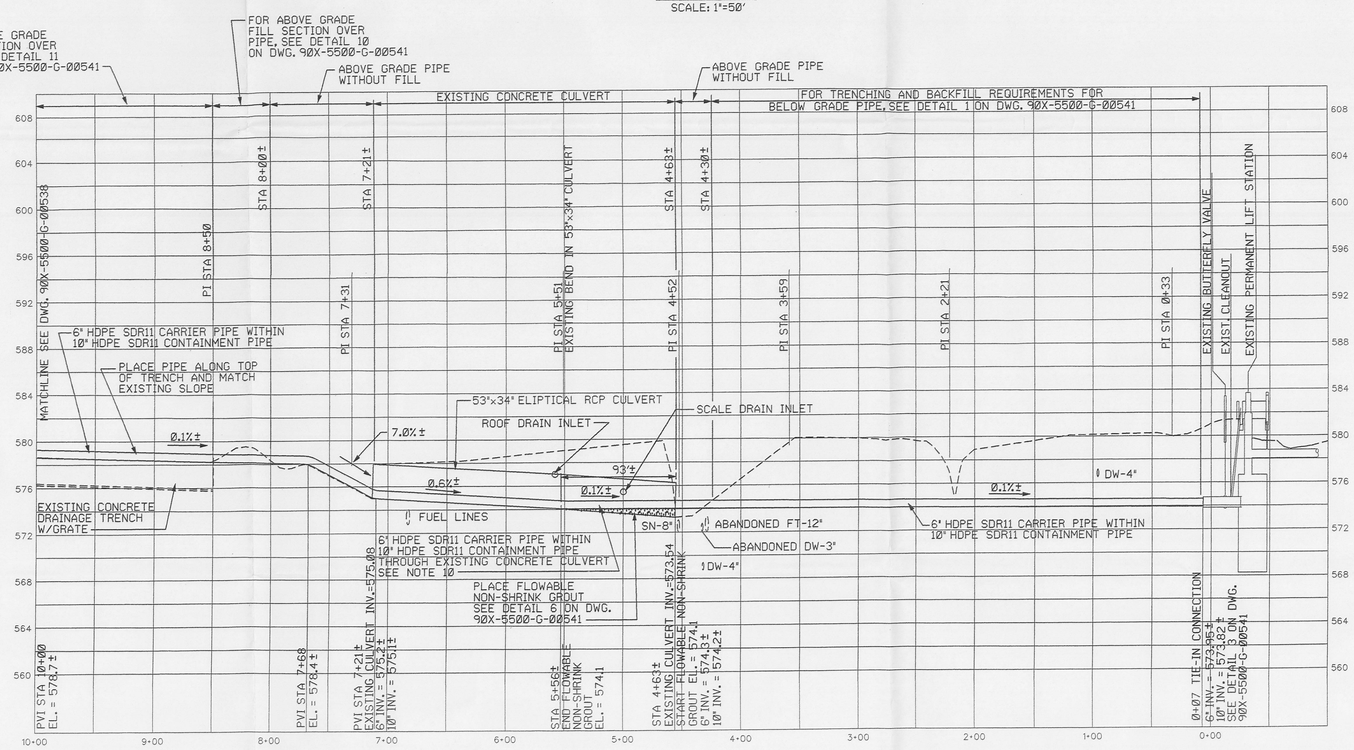
RES 3890
DATE 4-29-99
DRAWN D. FOX

90X-5500-G-00536 0



PLAN

SCALE: 1"=50'

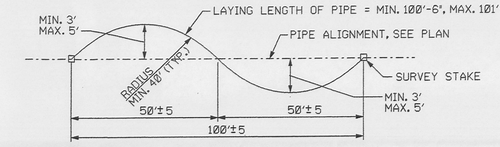


PROFILE - BOTTOM OF 10" CONTAINMENT PIPE (UNLESS OTHERWISE NOTED)

SCALE H: 1"=50'
V: 1"=5'

NOTES:

1. EXISTING SPOT ELEVATION INFORMATION ALONG INTERIM LEACHATE CONVEYANCE LINE PROVIDED BY HIRSCH AND ASSOCIATES. TOPOGRAPHY OBTAINED FROM AERIAL SURVEY DATED 6/25/98.
2. PVI ELEVATIONS SHOWN ON PROFILE ARE BOTTOM OF CONTAINMENT PIPE ELEVATIONS UNLESS OTHERWISE NOTED.
3. MATERIAL, INSTALLATION AND TESTING FOR INTERIM LEACHATE CONVEYANCE PIPE AND EQUIPMENT WASH DRAIN LINE SHALL BE IN ACCORDANCE WITH SPECIFICATION 02605A.
4. HDPE PIPE BENDS SHALL BE A MINIMUM RADIUS OF 40 FEET, UNLESS OTHERWISE APPROVED BY THE RESIDENT ENGINEER FOR TITLE III SERVICES.
5. LOCATE EXISTING UNDERGROUND AND ABOVE GRADE UTILITIES, AND STRUCTURES WITHIN WORK AREA PRIOR TO INSTALLATION OF THE INTERIM LEACHATE CONVEYANCE SYSTEM INCLUDING EQUIPMENT WASH DRAIN LINE. AVOID INTERFERENCE WITH THE EXISTING UTILITIES AND STRUCTURES.
6. FIELD ADJUST PIPE ALIGNMENT COORDINATES FOR PI'S AND LOCATION OF GUIDE POSTS TO MATCH THE EXISTING TOPOGRAPHIC CONDITIONS. IF THEY VARY BY MORE THAN ONE FOOT FROM THOSE SHOWN ON THE DRAWING, OBTAIN APPROVAL FROM THE RESIDENT ENGINEER, TITLE III SERVICES FOR FIELD ADJUSTMENT OF COORDINATES AND LOCATIONS.
7. LOCATION, ELEVATION, AND LAYING LENGTH OF INTERIM LEACHATE CONVEYANCE HDPE PIPES AND EQUIPMENT WASH DRAIN LINE:
   A. PLACE SURVEY STAKES AT EVERY 100-FT STATION ALONG PIPE ALIGNMENT SHOWN ON PLAN AND PROFILE. MAINTAIN THESE SURVEY STAKES FOR THE ABOVE GRADE PIPE TILL PIPE LINE IS OPERATIONAL.
   B. UNDERGROUND PIPE:
   PVI ELEVATIONS AND STATIONINGS AND PI ALIGNMENT LOCATIONS (STATIONING AND COORDINATES), FOR CONTAINMENT PIPE ALIGNMENT, AND LAYING LENGTHS OF PIPES BETWEEN (CONTAINMENT AND CARRIER PIPES) PI'S INCLUDING LAYING LENGTH OF PIPE THROUGH PIPE SLEEVES AND EXISTING CONCRETE CULVERT SHALL BE AS SHOWN ON THE PLAN AND PROFILE UNLESS OTHERWISE NOTED. FIELD VERIFY LOCATIONS AND ELEVATIONS OF THE EXISTING TEMPORARY LEACHATE CONVEYANCE HDPE PIPES AT THE TIE-IN POINTS PRIOR TO BUTT FUSION WELD. OBTAIN APPROVAL FROM THE RESIDENT ENGINEER, TITLE III SERVICES IF TIE-IN COORDINATES VARY BY MORE THAN 1.0 FOOT AND/OR EXISTING INVERT ELEVATIONS VARY BY MORE THAN 0.2 FOOT.
   C. ABOVE GRADE PIPE:
   PVI ELEVATIONS AND STATIONING AND PI LOCATOINS FOR CONTAINMENT PIPE ALIGNMENT SHALL BE SHOWN ON THE PLAN AND PROFILE UNLESS OTHERWISE NOTED. LAYING LENGTH OF THE ABOVE GRADE PIPES BETWEEN STA 7+21±AND STA 21+05± AND STA 21+60± AND STA 24+45± BEFORE PLACEMENT OF FILL SHALL BE INSTALLED AS FOLLOWS:
   (1) LAYING LENGTH OF THE ABOVE GRADE PIPES PER 500-FT LENGTH ALONG PIPE ALIGNMENT SHOWN ON THE PLAN AND PROFILE SHALL BE MINIMUM 503 FT AND MAXIMUM 505 FT.
   (2) LAYING LENGTH OF THE ABOVE GRADE PIPES PER 100 FT LENGTH ALONG PIPE ALIGNMENT SHOWN ON THE PLAN AND PROFILE SHALL BE MINIMUM 100-FT 6-INCH AND MAXIMUM 101-FT 6-INCH. TO ATTAIN THIS LAYING LENGTH PIPE SHALL BE INSTALLED AS SHOWN BELOW:
   (3) INSTALLED LAYING LENGTHS OF PIPES SHALL BE VERIFIED AT 100-FT AND 500-FT INTERVALS ALONG THE PIPE ALIGNMENT SHOWN ON PLAN AND PROFILE.



TYPICAL PLAN FOR LAYING ABOVE GRADE PIPE (BEFORE PLACEMENT OF FILL)
NTS

8. FOR GUIDE POST DETAIL, SEE DWG. 90X-5500-G-00541.
9. ON A WEEKLY BASIS, INSPECT GUIDE POSTS. REPAIR GUIDE POSTS IF FOUND DAMAGED. PROVIDE ADDITIONAL GUARD POST AT LOCATION(S) APPROVED BY RESIDENT ENGINEER, TITLE III SERVICES.
10. AFTER THE HDPE CONTAINMENT PIPE IS PULLED THROUGH THE EXISTING CONCRETE CULVERT, INSPECT THE INITIAL 10-FT OF PIPE. IF PIPE FOUND DAMAGED, REMOVE DAMAGED LENGTH OF PIPE.
11. INSTALL EROSION AND SEDIMENT CONTROLS AS SHOWN ON DRAWING (E.G. SILT FENCE, ROCK CHECK, ETC.) PRIOR TO BEGINNING GRADING, TRENCHING, BACKFILLING, FILL, OR ANY OTHER EARTHWORK. MAINTAIN EROSION SEDIMENT CONTROLS DURING CONSTRUCTION AND TILL VEGETATION IS ESTABLISHED.
12. MONITORING AND MANAGEMENT OF THE INTERIM LEACHATE CONVEYANCE SYSTEM SHALL BE AS SPECIFIED IN OSDF SYSTEM PLAN.

PIPE ALIGNMENT COORDINATES (SEE NOTE 6)

PI STA	NORTH	EAST
0+07	479517.81	1350614.18
0+33	479543.81	1350614.18
2+21	479729.06	1350587.15
3+59	479867.16	1350589.29
4+52	479956.42	1350561.38
5+51	480046.83	1350600.09
7+31	480226.86	1350607.02
8+50	480329.01	1350545.64

LEGEND:

- EXISTING GRADE
- EXISTING TEMPORARY LEACHATE CONVEYANCE LINE
- INTERIM LEACHATE CONVEYANCE LINE ALIGNMENT
- EXISTING FENCE
- EXISTING UTILITY POLE
- GUIDE POST

0 50 100 200
SCALE IN FEET

000009

NO.	REVISIONS	DATE	DWN. BY	APPD.
0	ISSUED CERTIFIED FOR CONSTRUCTION (DCN-0067)	4/29/99	DWF	DGW
C	PREFINAL - ISSUED FOR ILCS TEAM REVIEW	4/27/99		
B	PRELIMINARY - ISSUED FOR ILCS TEAM REVIEW	4/21/99		
A	CONCEPTUAL - ISSUED FOR ILCS TEAM REVIEW	4/16/99		

NO.	REVISIONS	DATE	DWN. BY	APPD.	REF. DWG. NO.

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CONFIGURATION MANAGEMENT DRAWING — YES / NO
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CIVIL & STR.	J. JENKINS	SAFETY ENG.	G. JOHNSON	
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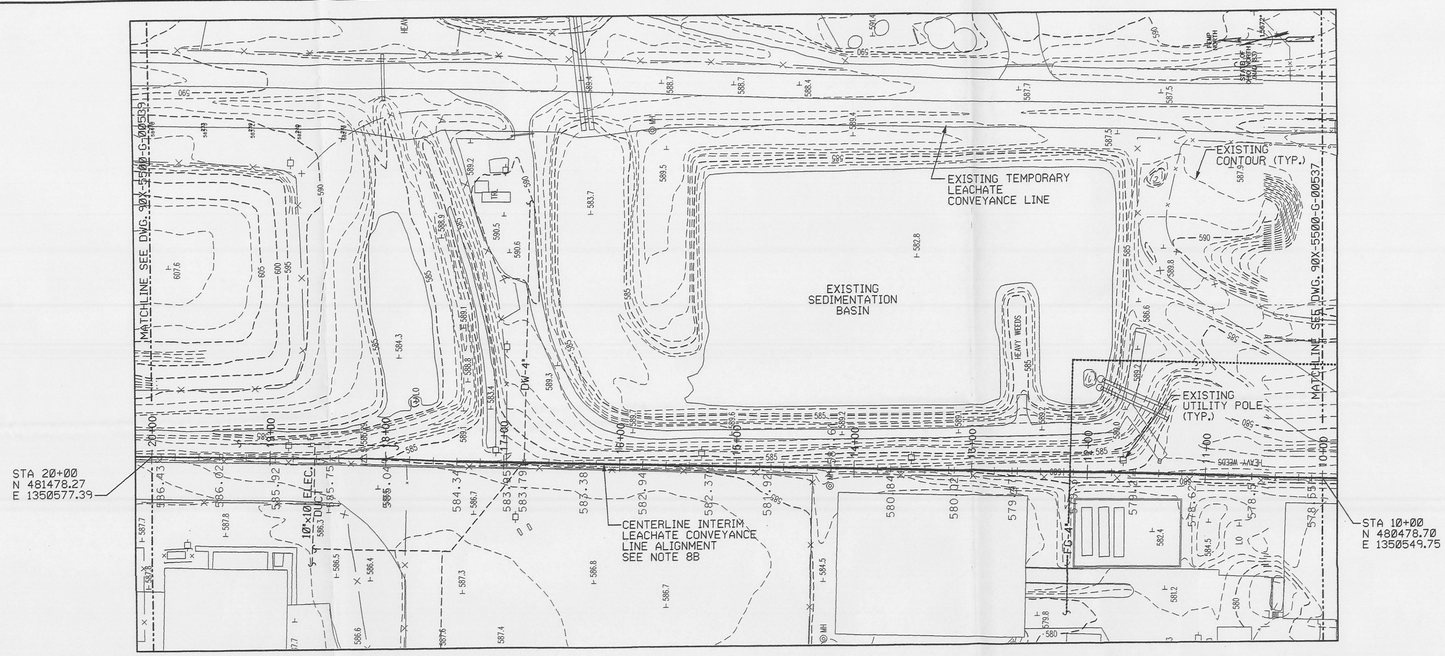
ENGINEER	J. JENKINS	FIRE PROTECT.		
INSTRUMENT		WASTE MANAGE.		
MECHANICAL		SECURITY		
		PROJECTS		
		QUALITY	M. GOOBER	
CHECKED	S. TARABUS	CONSTR.	L. McDANIEL	
APPROVED	J. BEECH			

Fernald Environmental Management Project
FLUOR DANIEL FERNALD
U.S. DEPARTMENT OF ENERGY

INTERIM LEACHATE CONVEYANCE SYSTEM
PLAN AND PROFILE
SHEET 1 OF 3

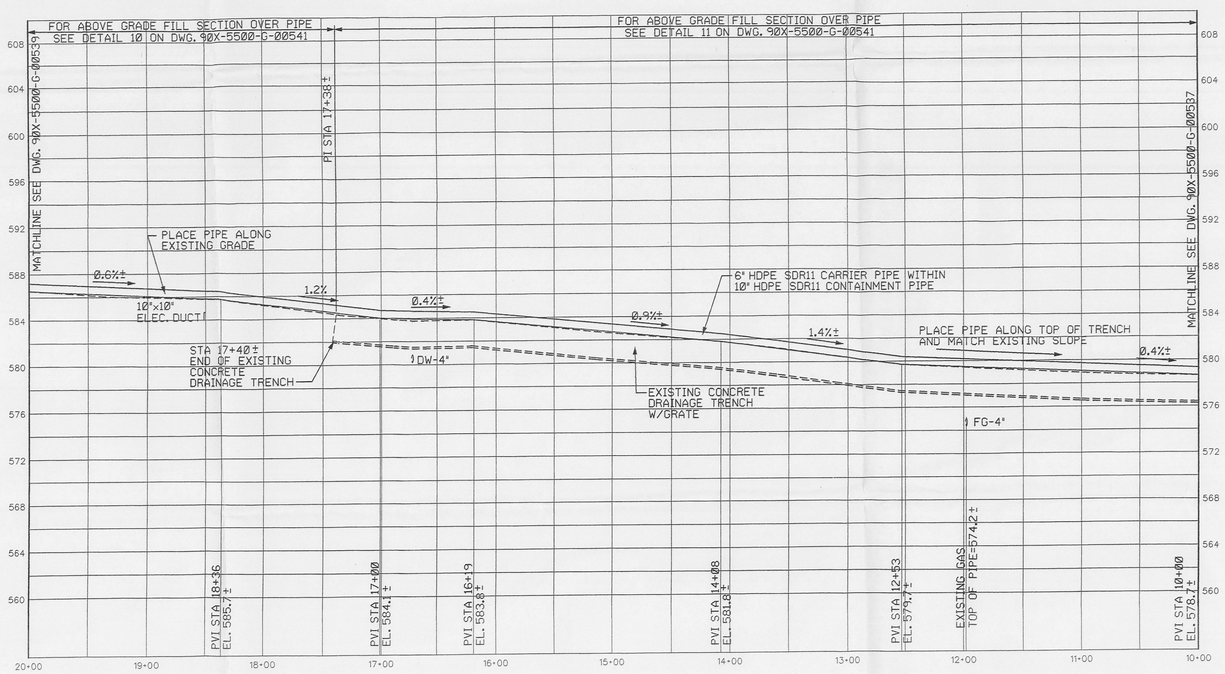
RES 3890
DATE 4-29-99
DRAWN D. FOX
90X-5500-G-00537 | 0

FORMAT REVISED 11/5/96 FDF5.DGN



PLAN

SCALE: 1"=50'



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3. FOR PIPE ALIGNMENT COORDINATES REFER TO DWG. 90X-5500-G-00537 AND 90X-5500-G-00539.
4. MATERIAL, INSTALLATION AND TESTING FOR INTERIM LEACHATE CONVEYANCE PIPE AND EQUIPMENT WASH DRAIN LINE SHALL BE IN ACCORDANCE WITH SPECIFICATION 02605A.
5. HDPE PIPE BENDS SHALL BE A MINIMUM RADIUS OF 40 FEET, UNLESS OTHERWISE APPROVED BY THE RESIDENT ENGINEER FOR TITLE III SERVICES.
6. LOCATE EXISTING UNDERGROUND AND ABOVE GRADE UTILITIES, AND STRUCTURES WITHIN WORK AREA PRIOR TO INSTALLATION OF THE INTERIM LEACHATE CONVEYANCE SYSTEM INCLUDING EQUIPMENT WASH DRAIN LINE. AVOID INTERFERENCE WITH THE EXISTING UTILITIES AND STRUCTURES.
7. FIELD ADJUST PIPE ALIGNMENT COORDINATES FOR PI'S AND LOCATION OF GUIDE POSTS TO MATCH THE EXISTING TOPOGRAPHIC CONDITIONS. IF THEY VARY BY MORE THAN ONE FOOT FROM THOSE SHOWN ON THE DRAWING, OBTAIN APPROVAL FROM THE RESIDENT ENGINEER, TITLE III SERVICES FOR FIELD ADJUSTMENT OF COORDINATES AND LOCATIONS.
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     - (2) LAYING LENGTH OF THE ABOVE GRADE PIPES PER 100 FT LENGTH ALONG PIPE ALIGNMENT SHOWN ON THE PLAN AND PROFILE SHALL BE MINIMUM 100-FT 6-INCH AND MAXIMUM 101-FT 6-INCH. TO ATTAIN THIS LAYING LENGTH PIPE SHALL BE INSTALLED AS SHOWN BELOW:
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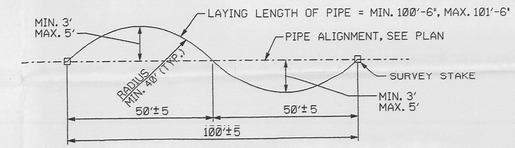


TYPICAL PLAN FOR LAYING ABOVE GRADE PIPE
(BEFORE PLACEMENT OF FILL)
NTS

8. MONITORING AND MANAGEMENT OF THE INTERIM LEACHATE CONVEYANCE SYSTEM SHALL BE AS SPECIFIED IN OSDF SYSTEM PLAN.

LEGEND:

- EXISTING GRADE
- EXISTING TEMPORARY LEACHATE CONVEYANCE LINE
- INTERIM LEACHATE CONVEYANCE LINE ALIGNMENT
- EXISTING FENCE
- EXISTING UTILITY POLE
- GUIDE POST

0 50 100 200
SCALE IN FEET

000010

NO.	REVISIONS	DATE	DWN. BY	APPD.
	DGN			
0	ISSUED CERTIFIED FOR CONSTUCTION (1100-08S)	4/29/99	MAUE FOX	GGJ
C	PREFINAL - ISSUED FOR ILCS TEAM REVIEW	4/27/99		
B	PRELIMINARY - ISSUED FOR ILCS TEAM REVIEW	4/21/99		
A	CONCEPTUAL - ISSUED FOR ILCS TEAM REVIEW	4/8/99		

NO.	REVISIONS	DATE	DWN. BY	APPD.

REF. DWG. NO.

NOTE: FLUOR DANIEL FERNALD CADD DRAWING, DO NOT REVISE MANUALLY.

CONFIGURATION MANAGEMENT DRAWING — YES / NO

SYSTEMS, STRUCTURES OR COMPONENTS DEPICTED ON THIS DRAWING ARE UNDER CONFIGURATION MANAGEMENT CONTROL. SEE NOTES.

COGNIZANT ENGINEER — DATE

APPROVALS

CIVIL & STR.	J. JENKINS	5/27/99	SAFETY ENG.	G. JOHNSON
ELECTRICAL	—		MAINTENANCE	—
ENGINEER	J. JENKINS	5/27/99	FIRE PROTECT.	—
INSTRUMENT	—		WASTE MANAGE.	—
MECHANICAL	—		SECURITY	—
			PROJECTS	—
			QUALITY	M. GODBER
CHECKED	S. TARABUS	5/14/99	CONSTR.	L. McDANIEL
APPROVED	J. BEECH	30 April 1999		

Fernald Environmental Management Project

FLUOR DANIEL FERNALD

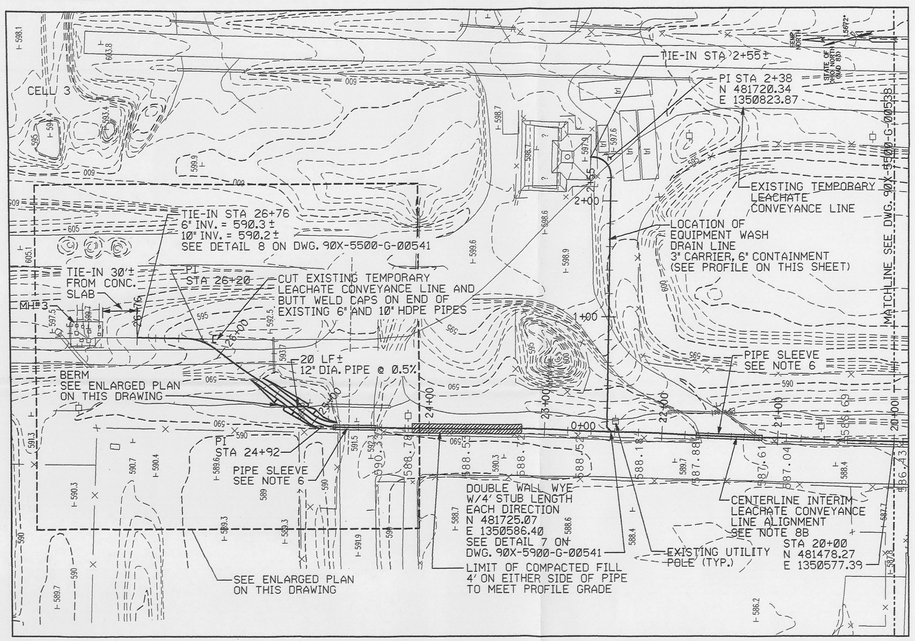
U.S. DEPARTMENT OF ENERGY

INTERIM LEACHATE CONVEYANCE SYSTEM
PLAN AND PROFILE
SHEET 2 OF 3

RES 3890
DATE 4-29-99
DRAWN D. FOX

90X-5500-G-00538 | 0

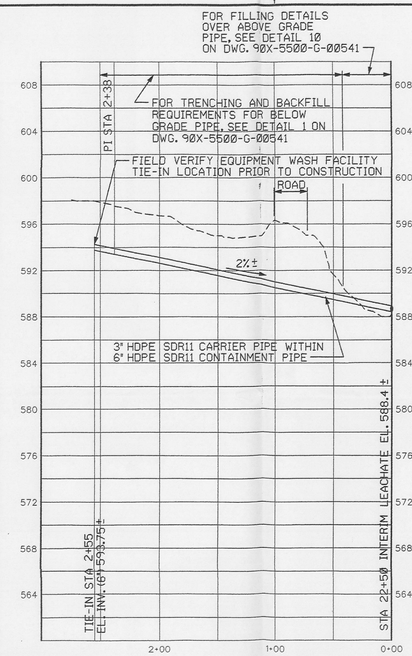
FORMAT REVISED 11/5/96 FDFS.DGN
FORMAT REVISED 6/29/98



PLAN

SCALE: 1"=50'

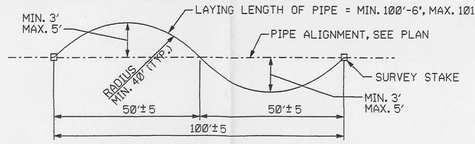
0 50 100 200
SCALE IN FEET



EQUIPMENT WASH DRAIN LINE PROFILE

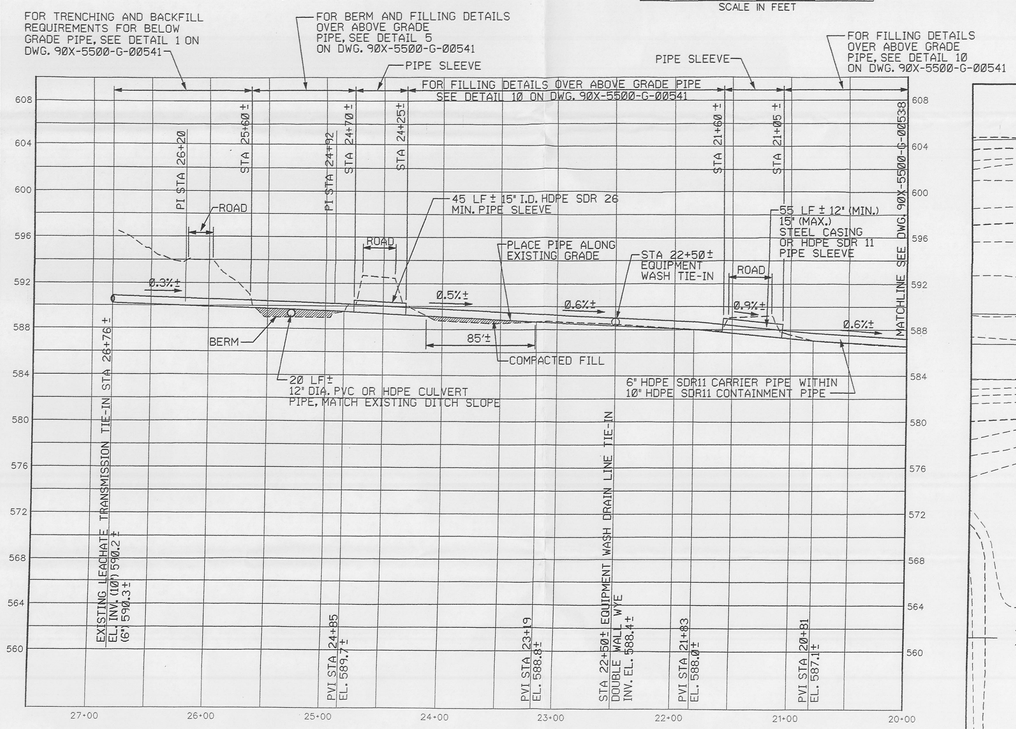
SCALE H: 1"=50'
V: 1"=5'

1. EXISTING SPOT ELEVATION INFORMATION ALONG INTERIM LEACHATE CONVEYANCE LINE PROVIDED BY HIRSCH AND ASSOCIATES. TOPOGRAPHY PROVIDED FROM AERIAL SURVEY DATED 6/25/98.
2. PVI ELEVATIONS SHOWN ON PROFILE ARE BOTTOM OF CONTAINMENT PIPE ELEVATIONS UNLESS OTHERWISE NOTED.
3. MATERIAL, INSTALLATION AND TESTING FOR INTERIM LEACHATE CONVEYANCE PIPE AND EQUIPMENT WASH DRAIN LINE SHALL BE IN ACCORDANCE WITH SPECIFICATION 02605A.
4. TRENCHING AND BACKFILL REQUIREMENTS ARE SHOWN ON DETAIL 1 ON DWG. 90X-5500-G-00541.
5. HDPE PIPE BENDS SHALL BE A MINIMUM RADIUS OF 40 FEET, UNLESS OTHERWISE APPROVED BY THE RESIDENT ENGINEER FOR TITLE III SERVICES.
6. LOCATE EXISTING UNDERGROUND AND ABOVE GRADE UTILITIES, AND STRUCTURES WITHIN WORK AREA PRIOR TO INSTALLATION OF THE INTERIM LEACHATE CONVEYANCE SYSTEM INCLUDING EQUIPMENT WASH DRAIN LINE. AVOID INTERFERENCE WITH THE EXISTING UTILITIES AND STRUCTURES.
7. FIELD ADJUST PIPE ALIGNMENT COORDINATES FOR PI'S AND LOCATION OF GUIDE POSTS TO MATCH THE EXISTING TOPOGRAPHIC CONDITIONS. IF THEY VARY BY MORE THAN ONE FOOT FROM THOSE SHOWN ON THE DRAWING, OBTAIN APPROVAL FROM THE RESIDENT ENGINEER, TITLE III SERVICES FOR FIELD ADJUSTMENT OF COORDINATES AND LOCATIONS.
8. LOCATION, ELEVATION, AND LAYING LENGTH OF INTERIM LEACHATE CONVEYANCE HDPE PIPES AND EQUIPMENT WASH DRAIN LINE:
   A. PLACE SURVEY STAKES AT EVERY 100-FT STATION ALONG PIPE ALIGNMENT SHOWN ON PLAN AND PROFILE. MAINTAIN THESE SURVEY STAKES FOR THE ABOVE GRADE PIPE TILL PIPE LINE IS OPERATIONAL.
   B. UNDERGROUND PIPE:
      PVI ELEVATIONS AND STATIONINGS AND PI ALIGNMENT LOCATIONS (STATIONING AND COORDINATES), FOR CONTAINMENT PIPE ALIGNMENT, AND LAYING LENGTHS OF PIPES BETWEEN (CONTAINMENT AND CARRIER PIPES) PI'S INCLUDING LAYING LENGTH OF PIPE THROUGH PIPE SLEEVES AND EXISTING CONCRETE CULVERT SHALL BE AS SHOWN ON THE PLAN AND PROFILE UNLESS OTHERWISE NOTED. FIELD VERIFY LOCATIONS AND ELEVATIONS OF THE EXISTING TEMPORARY LEACHATE CONVEYANCE HDPE PIPES AT THE TIE-IN POINTS PRIOR TO BUTT FUSION WELD. OBTAIN APPROVAL FROM THE RESIDENT ENGINEER, TITLE III SERVICES IF TIE-IN COORDINATES VARY BY MORE THAN 1.0 FOOT AND/OR EXISTING INVERT ELEVATIONS VARY BY MORE THAN 0.2 FOOT.
   C. ABOVE GRADE PIPE:
      PVI ELEVATIONS AND STATIONING AND PI LOCATOINS FOR CONTAINMENT PIPE ALIGNMENT SHALL BE SHOWN ON THE PLAN AND PROFILE UNLESS OTHERWISE NOTED. LAYING LENGTH OF THE ABOVE GRADE PIPES BETWEEN STA 7+21 ±AND STA 21+05 ± AND STA 21+60 ±AND STA 24+45 ±BEFORE PLACEMENT OF FILL SHALL BE INSTALLED AS FOLLOWS:
      (1) LAYING LENGTH OF THE ABOVE GRADE PIPES PER 500-FT LENGTH ALONG PIPE ALIGNMENT SHOWN ON THE PLAN AND PROFILE SHALL BE MINIMUM 503 FT AND MAXIMUM 505 FT.
      (2) LAYING LENGTH OF THE ABOVE GRADE PIPES PER 100 FT LENGTH ALONG PIPE ALIGNMENT SHOWN ON THE PLAN AND PROFILE SHALL BE MINIMUM 100-FT 6-INCH AND MAXIMUM 101-FT 6-INCH. TO ATTAIN THIS LAYING LENGTH PIPE SHALL BE INSTALLED AS SHOWN BELOW:
      (3) INSTALLED LAYING LENGTHS OF PIPES SHALL BE VERIFIED AT 100-FT AND 500-FT INTERVALS ALONG THE PIPE ALIGNMENT SHOWN ON PLAN AND PROFILE.



TYPICAL PLAN FOR LAYING ABOVE GRADE PIPE
(BEFORE PLACEMENT OF FILL)
NTS

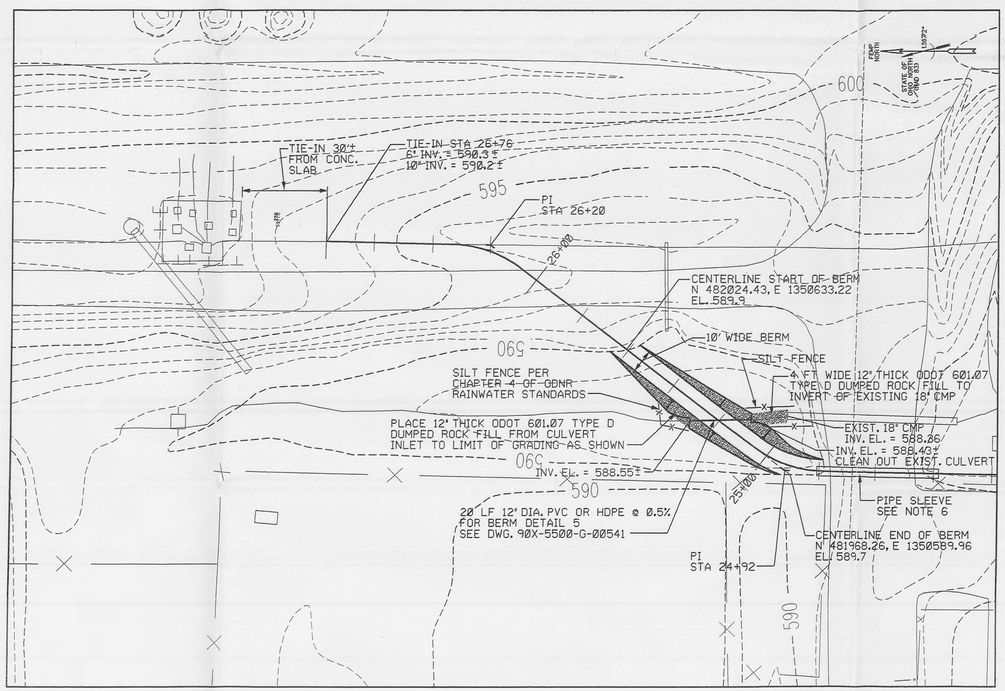
8. FOR GUIDE POST DETAIL, SEE DWG. 90X-5500-G-00541.
9. ON A WEEKLY BASIS, INSPECT GUIDE POSTS. REPAIR GUIDE POSTS IF FOUND DAMAGED. PROVIDE ADDITIONAL GUARD POST AT LOCATION(S) APPROVED BY RESIDENT ENGINEER, TITLE III SERVICES.
10. INSTALL EROSION AND SEDIMENT CONTROLS AS SHOWN ON DRAWING (E.G. SILT FENCE, ROCK CHECK, ETC.) PRIOR TO BEGINNING GRADING, TRENCHING, BACKFILLING, FILL, OR ANY OTHER EARTHWORK. MAINTAIN EROSION SEDIMENT CONTROLS DURING CONSTRUCTION AND TILL VEGETATION IS ESTABLISHED.
11. MONITORING AND MANAGEMENT OF THE INTERIM LEACHATE CONVEYANCE SYSTEM SHALL BE AS SPECIFIED IN OSDF SYSTEM PLAN.
12. MAKE TIE-IN OF EQUIPMENT WASH LATERAL TO WYE CONNECTION AFTER MAIN LINE IS INSTALLED.



PROFILE - BOTTOM OF 10" CONTAINMENT PIPE (UNLESS OTHERWISE NOTED)

SCALE H: 1"=50'
V: 1"=5'

PIPE ALIGNMENT COORDINATES		
PI STA	NORTH	EAST
24+92	481970.12	1350591.41
26+20	482071.58	1350669.50
26+76	482127.91	1350670.79



LEGEND:
- EXISTING GRADE
- EXISTING TEMPORARY LEACHATE CONVEYANCE LINE
- INTERIM LEACHATE CONVEYANCE LINE ALIGNMENT
- EXISTING FENCE
- EXISTING UTILITY POLE
- GUIDE POST

ENLARGED PLAN

SCALE: 1"=20'

000011

NO.	REVISIONS	DATE	DWN. BY	APPD.
0	ISSUED CERTIFIED FOR CONSTRUCTION (NOO-085)	4/29/99	DAVE FOX	JCG
C	PREFINAL - ISSUED FOR ILCS TEAM REVIEW	4/27/99		
B	PRELIMINARY - ISSUED FOR ILCS TEAM REVIEW	4/21/99		
A	CONCEPTUAL - ISSUED FOR ILCS TEAM REVIEW	4/18/99		

NO.	REVISIONS	DATE	DWN. BY	APPD.

REF. DWG. NO.

NOTE: FLUOR DANIEL FERNALD CADD DRAWING, DO NOT REVISE MANUALLY.

CONFIGURATION MANAGEMENT DRAWING — YES / NO
SYSTEMS, STRUCTURES OR COMPONENTS DESCRIBED ON THIS DRAWING CONTROL CONFIGURATION MANAGEMENT CONTROL SEE NOTES.

COGNIZANT ENGINEER — DATE

APPROVALS

CIVIL & STR.	J. JENKINS	SAFETY ENG.	G. JOHNSON
ELECTRICAL	—	MAINTENANCE	—
ENGINEER	J. JENKINS	FIRE. PROTECT.	—
INSTRUMENT	—	WASTE MANAGE	—
MECHANICAL	—	SECURITY	—
		PROJECTS	—
		QUALITY	M. GODBER
CHECKED	S. TARABUS	CONSTR.	L. McDANIEL
APPROVED	J. BEECH		

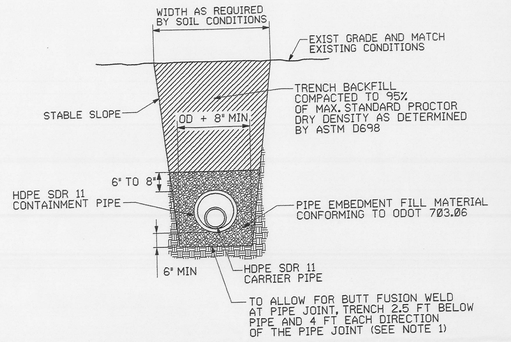
Fernald Environmental Management Project
FLUOR DANIEL FERNALD
U.S. DEPARTMENT OF ENERGY

INTERIM LEACHATE CONVEYANCE SYSTEM
PLAN AND PROFILE
SHEET 3 OF 3

RES 3890
DATE 4-29-99
DRAWN D. FOX

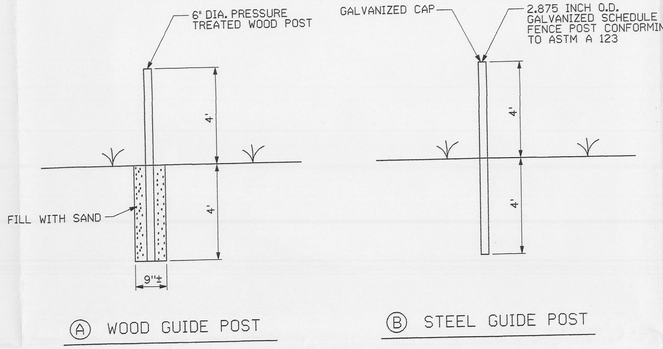
90X-5500-G-00539 | 0

FORMAT REVISED 11/5/96 FDF5.DGN

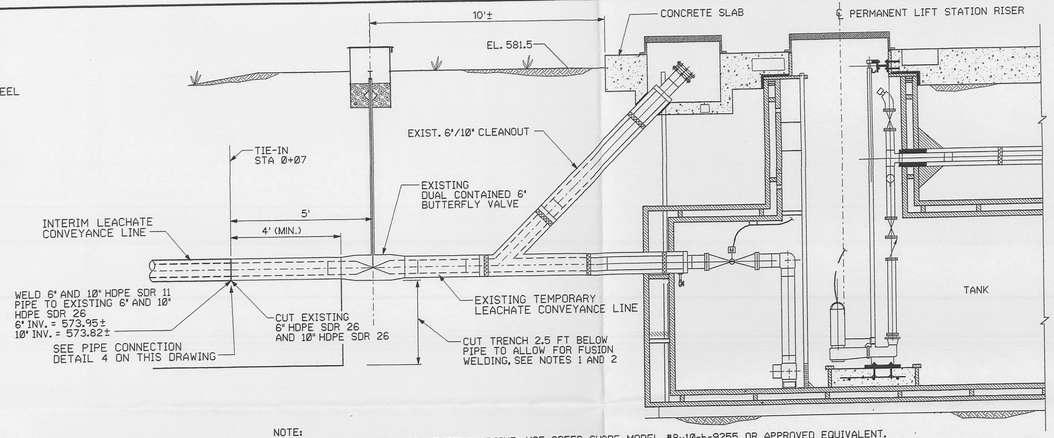


NOTE:
1. PRIOR TO ENTERING TRENCH OR PRIOR TO PERFOMING BUTT FUSION WELD IN TRENCH, CONTACT FDF SAFETY ENGINEER.

DETAIL 1 / -
TYPICAL PIPE TRENCH
NTS

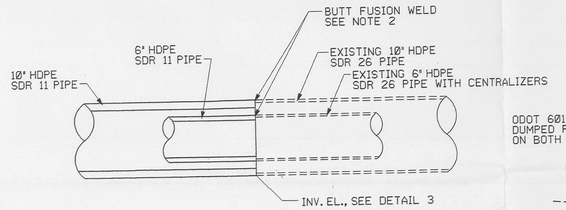


DETAIL 2 / -
GUIDE POST
NTS



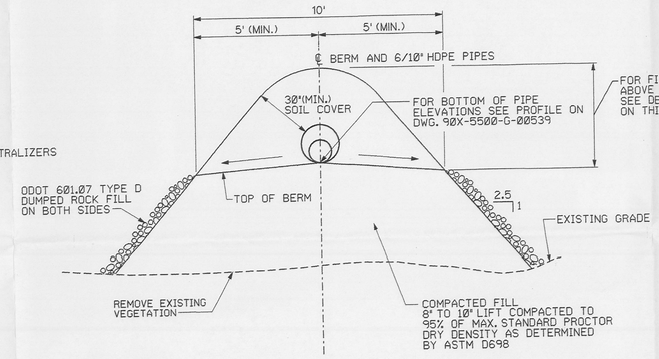
NOTE:
1. TRENCH BOX TO BE USED AT TIE-IN POINT. USE SPEED SHORE MODEL #8x10-h-9255 OR APPROVED EQUIVALENT.
2. PRIOR TO ENTERING TRENCH OR TRENCH BOX, OR PRIOR TO PERFORMING BUTT FUSION WELD IN TRENCH OR TRENCH BOX, CONTACT FDF SAFETY ENGINEER.

DETAIL 3 / -
TIE-IN AT PERMANENT LIFT STATION
NTS

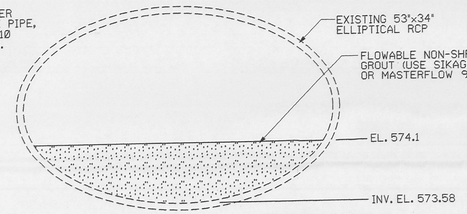


NOTE:
1. VERIFY INVERT ELEVATIONS OF EXISTING PIPES AT TIE-IN LOCATION PRIOR TO INSTALLATION.
2. BUTT FUSION WELD SHALL BE AS SPECIFIED IN SECTION 02605A.

DETAIL 4 / -
PIPE CONNECTION
NTS

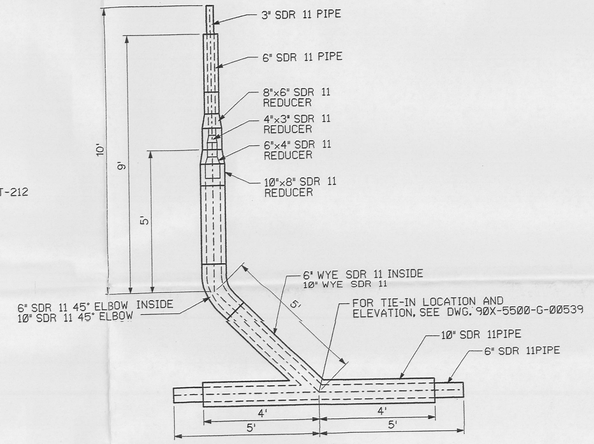


DETAIL 5 / -
TYPICAL BERM
NTS

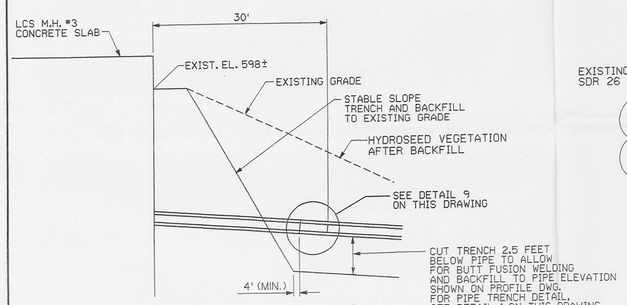


NOTE:
1. FOR LIMITS OF FLOWABLE NON-SHRINK GROUT, SEE PLAN AND PROFILE DWG. 90X-5500-G-00537.
2. PLACEMENT OF FLOWABLE NON-SHRINK GROUT SHALL BE AS RECOMMENDED BY THE GROUT MANUFACTURER.

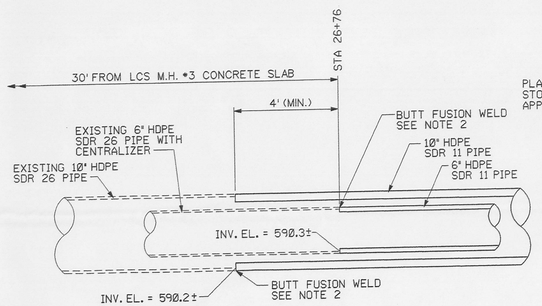
DETAIL 6 / -
SOUTH INVERT CROSS SECTION AT 53"x34" ELLIPTICAL RCP
NTS



DETAIL 7 / -
EQUIPMENT WASH DRAIN LINE WYE
NTS

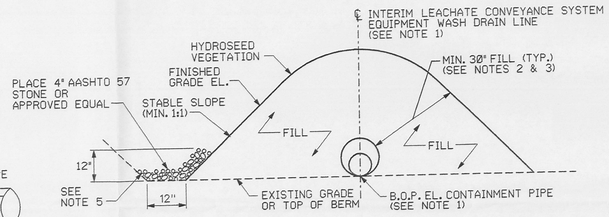


DETAIL 8 / -
TIE-IN AT M.H.#3
NTS



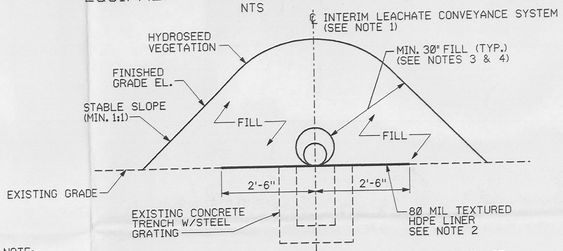
NOTE:
1. VERIFY INVERT ELEVATIONS OF EXISTING PIPES AT TIE-IN LOCATION PRIOR TO INSTALLATION.
2. BUTT FUSION WELD SHALL BE AS SPECIFIED IN SECTION 02605A.

DETAIL 9 / -
TIE-IN AT M.H.#3
NTS



NOTE:
1. FOR LOCATION OF INTERIM LEACHATE CONVEYANCE SYSTEM AND EQUIPMENT WASH DRAIN LINE AND FOR B.O.P. EL. OF CONTAINMENT PIPE, SEE PLAN AND PROFILE DRAWINGS.
2. PLACE MIN. 30-INCH FILL AROUND THE CONTAINMENT PIPE. OBTAIN FILL MATERIAL FROM THE ON SITE BORROW SOURCE(S). FILL MATERIAL SHALL BE SC, SM, ML, CL OR CH ACCORDING TO ASTM D 2487 AND SHALL BE FREE OF DEBRIS, FOREIGN OBJECTS, ROCK FRAGMENTS LARGER THAN 1½-INCH, ORGANICS AND OTHER DELETERIOUS MATERIAL. PLACE FILL TO FINISHED GRADE ELEVATION USING GRADING EQUIPMENT. DO NOT OPERATE CONSTRUCTION EQUIPMENT OVER TOP OF PIPE WITH LESS THAN 30 INCHES OF COVER WITHOUT WRITTEN APPROVAL OF RESIDENT ENGINEER TITLE III SERVICES.
3. PLACE FILL AROUND THE CONTAINMENT PIPE AFTER INTERIM LEACHATE CONVEYANCE SYSTEM AND EQUIPMENT WASH DRAIN LINE IS HYDROTESTED AND ACCEPTED FOR OPERATION.
4. PERIODICALLY INSPECT FINISHED GRADE. REPAIR SLOPES AND EROSION AND MAINTAIN FINISHED SLOPES.
5. FILL LOW AREAS ALONG THE EAST TOE OF FILL AND GRADE TO DRAIN.

DETAIL 10 / -
TYPICAL ABOVE GRADE FILL SECTION INTERIM LCS AND EQUIPMENT WASH DRAIN LINE
NTS



NOTE:
1. FOR LOCATION OF INTERIM LEACHATE CONVEYANCE SYSTEM AND FOR B.O.P. EL. OF CONTAINMENT PIPE, SEE PLAN AND PROFILE DRAWINGS.
2. PRIOR TO PLACEMENT OF 80 MIL HDPE LINER, REMOVE DEBRIS, FOREIGN OBJECTS, ROCK FRAGMENTS, DELETERIOUS MATERIAL AND OTHER SHARP OBJECTS FROM THE PLACEMENT AREA. OVERLAP HDPE LINER MIN. 2-FT. DO NOT WELD HDPE LINER.
3. PLACE MIN. 30-INCH FILL AROUND THE CONTAINMENT PIPE. OBTAIN FILL MATERIAL FROM THE ON SITE BORROW SOURCE(S). FILL MATERIAL SHALL BE SC, SM, ML, CL OR CH ACCORDING TO ASTM D 2487 AND SHALL BE FREE OF DEBRIS, FOREIGN OBJECTS, ROCK FRAGMENTS LARGER THAN 1½-INCH, ORGANICS AND OTHER DELETERIOUS MATERIAL. PLACE FILL TO FINISHED GRADE-ELEVATION USING GRADING EQUIPMENT. DO NOT OPERATE CONSTRUCTION EQUIPMENT OVER TOP OF PIPE WITH LESS THAN 30 INCHES OF COVER WITHOUT WRITTEN APPROVAL OF RESIDENT ENGINEER TITLE III SERVICES.
4. PLACE FILL AROUND THE CONTAINMENT PIPE AFTER INTERIM LEACHATE CONVEYANCE SYSTEM IS HYDROTESTED AND ACCEPTED FOR OPERATION.
5. PERIODICALLY INSPECT FINISHED GRADE. REPAIR SLOPES AND EROSION AND MAINTAIN FINISHED SLOPES.

DETAIL 11 / -
TYPICAL ABOVE GRADE FILL SECTION TOP OF EXIST. TRENCH INTERIM LCS SYSTEM
NTS

000012

NO.	REVISIONS	DATE	DWN. BY	APPD.
0	ISSUED CERTIFIED FOR CONSTRUCTION (Nov-0-65)	4/29/99	DAVE FOX	
B	PREFINAL - ISSUED FOR ICCS TEAM REVIEW	4/27/99		
A	PRELIMINARY - ISSUED FOR ICCS TEAM REVIEW	4/21/99		

NO.	REVISIONS	DATE	DWN. BY	APPD.	REF. DWG. NO.

NOTE: FLUOR DANIEL FERNALD CADD DRAWING, DO NOT REVISE MANUALLY.

CONFIGURATION MANAGEMENT DRAWING — YES X / NO
SYSTEMS STRUCTURES OR COMPONENTS REFERENCED ON THIS DRAWING ARE UNDER CONFIGURATION MANAGEMENT CONTROL. SEE NOTES.
COGNIZANT ENGINEER — DATE

APPROVALS					
CIVIL & STR.	J. JENKINS	30 April 1999	SAFETY ENG.	G. JOHNSON	
ELECTRICAL	—		MAINTENANCE	—	
ENGINEER	J. JENKINS	30 April 1999	FIRE PROTECT.	—	
INSTRUMENT	—		WASTE MANAGE	—	
MECHANICAL	—		SECURITY	—	
			PROJECTS		
			QUALITY	M. GODBER	
CHECKED	S. TARABUS	30 April 1999	CONSTR.	L. McDANIEL	
APPROVED	J. BEECH	30 April 1999			

Fernald Environmental Management Project
FLUOR DANIEL FERNALD
U.S. DEPARTMENT OF ENERGY

INTERIM LEACHATE CONVEYANCE SYSTEM
CIVIL DETAILS

RES 3890
DATE 4-29-99
DRAWN D. FOX

90X-5500-G-00541 | 0

FORMAT REQUIRED 11/5/98 FDF6.DGN

Pages 8 thru 12
ARE NOT IN ORIGINAL
DOCUMENT.

2239

RCI/DCN FORM

REQUEST FOR CLARIFICATION OF INFORMATION / DESIGN CHANGE NOTICE -

(1)WP / WO NO.:1700	(2)S/C NO.:	(5)Pg 1 OF ~~2~~ 3	(6)DATE 4/29/99
(3)S/C TITLE: LEACHATE CONVEYANCE SYSTEM		(11)RCI NO.:	
(4) RESPONSIBLE DISCIPLINE: E ☐ Mx ☐ Cc ☐ OTHER ☒	(4A)RCI/DCN TITLE: Permanent Leachate Conveyance System; Manhole #1 to Manhole#3 and Interim Leachate Conveyance System	(11)DCN NO.: 1700-087	

(7)DOCUMENTS AFFECTED	(7)DOCUMENT NOS.	(7)REV.	(8)OTHER
New Specification to be issued and added to DIVISION 2:SITE WORK: Section 02955 - PIPE LINING	OSDF 20110-TS-0002		
New Specification 02605A to be added - High Density Polyethylene (HDPE) Pipe and Fittings. LEACHATE CONVEYANCE SYSTEM SPECIFICATION PACKAGE	OSDF 20110-TS-0002		

(9) ☐ RCI - INQUIRY ☐ USQD SCREENING BY PROJECT ENGINEER

USQD not requied/see Request For Safety Analysis Support, SA-99-1039

(9)☒ DCN - JUSTIFICATION, EXISTING CONDITION & REQUESTED/PROPOSED CHANGE

Because of the leakage detected in the Permanent LCS, this DCN provides for the redesign/renovation of the pipeline from Manhole#1 to Manhole #2 and from Manhole#2 to Manhole #3.

The DCN also provides the piping spec. to be used for the Interim Leachate Conveyance System.

(10)REQUESTOR: COMPANY: James C. Jenkins DATE: 4/29/99	(12)CE / PE James C. Jenkins DATE: 4/29/99

(13)RESPONSE: FOR RCI, IS A DCN REQ'D? ☐NO ☐YES

(14) FOR DCN: ☒APPROVED ☐APPROVED AS NOTED ☐DISAPPROVED

RCI - DCN ACCEPTANCE

(15)DESIGN ORGANIZATION APPROVAL/DISAPPROVAL: Melvin Tarabulsy DATE: 5/3/99 ☐FIT ☒FORM ☐FUNCTION	(20)CHARGE NO. FOR CADD SERVICES TO INCORPORATE:

(16)FDF PE ACCEPTANCE & VERIFICATION THAT ALL REQUIRED REVIEWS ARE COMPLETE: (DCN ONLY) DATE: 5/3/99

James Jenkins James C. Jenkins

PERFORMANCE GRADE: (17) 4

(18)CONSTRUCTION CONCURRENCE: Paul R. Shaw DATE: 5/3/99 PURCHASE REQUISITION REQUIRED: ☒YES ☐NO (19)	(21)WORK COMPLETED: (SIGNOFF BY CE OR PE) DATE:

ORIGINAL

FS-F-4259
REV. 4: 02/16/98

2239

CERTIFIED FOR CONSTRUCTION
TECHNICAL SPECIFICATIONS

LEACHATE CONVEYANCE SYSTEM
Subcontract No. FSC 589

THIS DOCUMENT IS AFFECTED BY THE FOLLOWING
NCN 1700-086

20110-TS-0002

October 1996

United States Department of Energy

Fernald Environmental Management Project
Fernald, Ohio
(FERMCO Project No. 20110)

Prepared by

GeoSyntec Consultants
1100 Lake Hearn Drive, NE, Suite 200
Atlanta, GA 30342

Under

FDF — Date 05/03/99 — GeoSyntec — Date 5/3/99

Fernald Environmental Restoration Management Corporation
Subcontract 95PS005028

ORIGINAL

000014

LEACHATE CONVEYANCE SYSTEM SPECIFICATION PACKAGE ON-SITE DISPOSAL FACILITY FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

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SECTION 02110	-	CLEARING, GRUBBING AND STRIPPING	0
SECTION 02200	-	EARTHWORK	0
SECTION 02215	-	TRENCHING AND BACKFILLING	0
SECTION 02270	-	EROSION AND SEDIMENT CONTROL	0
SECTION 02300	-	BORING AND JACKING	0
SECTION 02605	-	HIGH DENSITY POLYETHYLENE (HDPE) MANHOLES, PIPES, AND FITTINGS	0
SECTION 02605A	-	HIGH DENSITY POLYETHYLENE (HDPE) MANHOLES, PIPES, AND FITTINGS (INCLUDED IN DCN 1700-087)	0
SECTION 02667	-	UTILITY LINES	0
SECTION 02831	-	CHAIN LINE FENCES AND GATES	0
SECTION 02930	-	VEGETATION	0
SECTION 02955	-	PIPE LINING (INCLUDED IN DCN 1700-087)	1

DIVISION 3: CONCRETE			
SECTION 03100	-	CONCRETE	0

DIVISION 4: SPECIAL CONSTRUCTION			
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SECTION 13401	-	PROGRAMMABLE LOGIC CONTROLLER	0
SECTION 15000	-	MECHANICAL	0
SECTION 15160	-	LIFT STATION PUMPS	0
SECTION 16050	-	BASIC ELECTRICAL MATERIALS AND METHODS	0
SECTION 16121	-	MEDIUM VOLTAGE CABLE	0
SECTION 16170	-	GROUNDING AND BONDING	0
SECTION 16370	-	OVERHEAD POWER DISTRIBUTION	0
SECTION 16461	-	DRY TYPE TRANSFORMER/PANEL BOARDS	0

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SECTION 02955

PIPE LINING

PART 1 GENERAL

1.01 SCOPE

A. This Section includes the installation and furnishing of labor, equipment, and materials necessary to complete 800 linear feet pipe lining of the existing 6.625-inch outside diameter, Standard Dimension Ratio (SDR) 26 High Density Polyethylene (HDPE) carrier pipe in the Leachate Conveyance System (LCS) between Manholes 1 to 2 and Manholes 2 to 3 as specified herein and as shown on the Reference Drawings listed in PART 7 of the Contract Documents. The existing HDPE carrier pipe was manufactured in accordance with ASTM F714 standard specifications. As shown on the Reference Drawings, the existing leachate conveyance system is a double containment system and consists of the above said HDPE carrier pipe and 10-inch nominal diameter, SDR 26, HDPE containment pipe. The carrier pipe is centered within the containment pipe with centralizers spaced approximately 4 feet on centers.

B. The work shall include, but not be limited to, the preparation of the construction site including cleaning and flushing of the existing carrier pipe; protection of existing conditions during work; inspection of the existing carrier pipe prior to pipe lining installation using a closed circuit television; installation of the pipe lining; hydrostatic testing of installed pipe lining; inspection of the installed pipe lining using a closed circuit television; and cleanup and restoration of the work site. Acceptable pipe lining shall be Fold and Form Lining or Symmetrically Reduced Lining.

1.02 RELATED SECTIONS

A. **Contract Documents:**

1. PART 6 Statement of Work
2. PART 7 Technical Specifications and Drawings
3. PART 8 Environmental Health and Safety, and Training Requirements
4. PART 9 Quality Assurance Requirements

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1.03 REFERENCES

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A. Applicable Codes and Standards: The following American Society of Testing and Materials (ASTM) test methods and standards are made a part hereof and shall be the latest edition and revision thereof.

1. D 638 Test Method for Tensile Properties of Plastics
2. D 790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating materials
3. D 1238 Standard Test Method for Flow Rates of Thermoplastic by Extrusion Plastometer
4. D 1248 Specification for Polyethylene Plastics Molding and Extrusion Materials
5. D 1505 Test Method for Density of Plastics by the Density-Gradient Technique
6. D 1603 Standard Test Method for Carbon Black in Olefin Plastics
7. D 1693 Test for Environmental Stress-Cracking of Ethylene Plastics
8. D 2122 Determining Dimensions of Thermoplastic Pipe and Fittings
9. D 2412 Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
10. D 2444 Test Method for Impact Resistance of Thermoplastic Pipe and Fittings by Means of a TUP (Falling Weight)
11. D 2657 Practice for Heating-Joining Polyolefin Pipe and Fittings
12. D 2837 Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
13. D 3350 Specification for Polyethylene Plastics Pipe and Fittings Materials
14. F 585 Practice for Insertion of Flexible Polyethylene Pipe into Existing Sewers
15. F 714 Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter (3" IPS and larger)
16. F 1533 Standard Specification for Deformed Polyethylene (PE) Liner
17. F 1606 Standard Practice Rehabilitation of Existing Sewers and Conduits with Deformed Polyethylene (PE) Liner

1.04 SUBMITTALS

Provide the following submittals to Fluor Daniel Fernald (FDF) for review and approval. Submittal due dates shall be as shown on the Contractor Submittal Register, PART 6.

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A. Pipe Lining Product Data: Submit manufacturer's technical Product Data including the following:

1. SDR, wall thickness, inside and outside diameter and type and grade of HDPE pipe lining material
2. The method of deformation
3. Method of reforming
4. The method of installation
5. The length of pipe lining and method of joining lengths of lining
6. Details of end terminations at manholes
7. Acceptance criteria for final installation
8. Installation procedures recommended by the pipe lining manufacturer
9. Contractor's method(s) and procedure(s) for verifying dimensions and lengths of the existing manholes and HDPE carrier pipe
10. Contractor's qualification as specified in this Section

B. Upon approval by FDF, the manufacturer's recommendation shall become the basis for acceptance or rejection of the actual methods of installation used in the work.

C. Resumes of Contractor's project personnel proposed for this project

D. Certification of Contractor's personnel proposed for performing thermal butt-fusion

E. Submit procedures for the following activities:

1. Method of preparing the existing carrier pipe including verification of the existing dimensions and lengths, and cleaning and flushing
2. Hydrostatic test of the pipe lining including manufacturer's acceptance of criteria

F. Videotapes and logs

1. Prior to installation of the pipe lining
2. After completion of the pipe lining installation

G. Submit certification of minimum values for the physical characteristics of the HDPE pipe lining material properties specified in this Section and corresponding test procedures. Submit values that are specific to the resin used in manufacture.

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H. Submit the following documentation on the resin used to manufacture the pipe lining:

1. Copies of quality control certificates issued by the resin supplier including the production dates and origin of the resin used to manufacture the HDPE products
2. Results of tests performed by the manufacturer to verify the quality of the resin used to manufacture the HDPE pipe lining products
3. Certification that no reclaimed polymer is added to the resin during the manufacturing of the HDPE products to be used for this project

I. Submit documentation of training and certification of personnel qualified for performing welding of the HDPE pipe lining.

J. Submit documentation showing the test gauges have been calibrated within one year of use. Calibration shall be traceable to national or industry standards where possible.

K. Submit written record of inspection for the pipe lining installed including reports of the hydrostatic tests.

1.05 CONTRACTOR'S QUALIFICATION

A. The lining contractor shall have installed a total of at least 5,000-feet pipe lining within the last 3 years on similar size projects in diameter and length. The Contractor's project personnel shall be experienced in the work of the contract and shall have successfully completed projects similar in material and extent.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver pipe lining materials to the job site as recommended by the manufacturer and bearing manufacturer's name and label, and the following information:

1. Lining diameter
2. Lining SDR
3. Manufacture lot (stock) number and date of manufacture
4. The following markings shall be stenciled outside the liner:
   A. ASTM D 1533
   B. SDR
   C. Material Code (PE 3408)
   D. Trade Name

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E. Plant Location

F. Date of Manufacture

B. Packaging: Only nonmetallic banding shall come into contact with the pipe lining. Metallic banding may be used provided a protective material is placed between the metallic banding and the pipe lining.

C. Exercise care when transporting, handling and placing pipe lining. Use rope, fabric or nylon slings and straps when handling pipe lining.

1.07 HEALTH AND SAFETY REQUIREMENTS

A. Environmental Health and Safety, and other requirements shall be as specified in PART 8 of the contract documents.

PART 2 PRODUCTS

2.01 GENERAL

A. Pipe lining shall be fold and form lining or symmetrically reduced lining

B. The pipe lining material shall be made only from High-Density Polyethylene (HDPE) with a range of SDR 32.5 to SDR 21. The pipe lining shall be fabricated to a size that, when installed, will result in a neat tight-fitting installation within the existing carrier pipe shown on the Reference Drawings. Allowance for circumference stretching during insertion shall be made and shall meet applicable ASTM standards. The Contractor shall verify the existing carrier pipe dimensions and lengths prior to fabrication of the pipe lining. The Contractor shall select outside diameter and the SDR, within the SDR range specified herein for the pipe lining, that result in a tight-fitting lining installation.

C. The minimum length of the thermally butt fusioned pipe lining shall be sufficient to span the distance from LCS manhole to LCS manhole.

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2.02 PHYSICAL REQUIREMENTS

A. The pipe lining material shall be made from a high density, high molecular weight resin that is classified as a Type III, Grade P34, Class C, Category 5, by ASTM D-1248. Its cell classification by ASTM D-3350 shall be 33434C and shall be treated as PE 3408 by the Plastic Pipe Institute, a division of the Society of the Plastics Industry, Inc.

B. Physical characteristics for the pipe lining material shall conform to the following values:

Physical Characteristics	Test Procedure	Minimum Value (unless otherwise noted)
Tensile Stress	ASTM D 638	3,200 pounds per square inch
Tensile Modulus	ASTM D 638	113,000 pounds per square inch
Flexural Modulus	ASTM D 790	136,000 pounds per square inch
Impact Resistance	ASTM D 2444	210 foot-pounds
Pipe Stiffness	ASTM D 2412	28 pounds per square inch
Specific Gravity	ASTM D 1505	0.94
Melt Flow Index	ASTM D 1238	0.15 grams per 10-minutes (*)
Environmental Stress Crack	ASTM D 1693	F_{20} > 192 hours
Hydrostatic Design Basis at 73° F	ASTM D 2837	1,600 pounds per square inch
UV Stabilizer	ASTM D 1603	2-percent Carbon Black

(*) Maximum Value

C. The pipe lining material shall be uniform in color, and opacity. There shall be no evidence of splits, cracks, crazing, kinks or breaks.

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PART 3 EXECUTION

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3.01 EXISTING CONDITIONS

A. Examine the work site including the existing carrier pipe and LCS manholes and inspect the pipe to be lined. Verify dimensions and lengths and bring any discrepancies to the immediate attention of FDF. Method(s) and procedure(s) for verifying dimension and lengths shall be approved by FDF. Report results of inspection to FDF. Do not proceed with installation until such discrepancies have been fully resolved.

3.02 INSTALLATION PREPARATION

A. Before Contractor starts the work, FDF will shut-off all inflows to the LCS manholes and will remove the existing pipes and connections within each LCS Manhole. FDF will reinstall same pipes and connections within the LCS manholes without modification upon completion of pipe lining. If any modifications shall be required to the existing pipes and connections, the additional cost for modifications shall be paid by the Contractor.

B. The Contractor shall perform work in accordance with all OSHA Part B, manufacturer's safety requirements, and PART 8. Particular attention is drawn to those safety requirements involving entering confined spaces and working with pressurized steam.

C. Prior to installation of pipe lining, Contractor shall clean and flush the existing carrier pipe with water. Water after cleaning and flushing operation will be removed from the manholes by FDF. The Contractor shall remove internal debris from the pipes to be lined in accordance with the manufacturer's requirements.

D. After cleaning and flushing the existing carrier pipe, and prior to installation of the pipe lining, a visual inspection of the carrier pipe shall be performed using a closed circuit television camera. Inspection of the pipelines shall be performed by experienced personnel trained in locating breaks, obstacles, and service connections by closed circuit television. The interior of the pipelines shall be carefully inspected to determine any condition or obstruction which may prevent proper installation of the lining into the pipelines. Any such conditions shall be brought to the immediate attention of FDF. A VHS videotape and log of the inspection shall be submitted to FDF.

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E. The Contractor shall clear the existing carrier pipe of any obstructions that will prevent the insertion of the lining. If the inspection reveals an obstruction that cannot be removed by conventional sewer cleaning equipment, the Contractor shall make a point repair excavation to uncover and remove or repair the obstruction. Such excavation shall be approved in writing by FDF prior to commencement of the work and shall be considered as added scope.

F. As required, sections of the pipe lining shall be joined together using thermal butt-fusion in accordance with ASTM D-2657. The welders performing the butt-fusion welding shall possess skill, knowledge, experience and prior formal training by a qualified instructor to consistently produce high quality thermal butt-fusion joints as identified in ASTM D-2657. The welders shall use temperature and pressure ranges for the butt fusion joints as recommended by the pipeline manufacturer and the butt fusion welding machine manufacturer. Thermally fused butt fusion joints shall be visually inspected and compared to applicable standards for good joints for the type of pipe lining installed. Electrofusion couplings shall not be used for joining sections of pipe lining.

3.03 INSTALLATION OF PIPE LINING

A. The lining shall be inserted into the existing carrier pipe through existing LCS manholes shown on the Reference Drawings.

B. The lining shall be inserted into the existing carrier pipe using a winch and cable connected to the end of the pipe. The winch shall be equipped with a dynamometer to record the pulling force required during installation. The pulling forces shall be monitored so as not to exceed the axial strain limits of the lining. After the insertion is complete, the tension from the winch shall be relieved and the lining shall be cut off at the insertion point and restrained at the termination point.

C. During lining insertion, precautions shall be taken to protect the pipe lining and the existing pipe and manholes from damage that may result during the pulling process.

D. After the lining is inserted into the existing carrier pipe, the lining shall be cut at each end and equipped with suitable fittings to allow for the introduction of steam or water and

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pressure, if required by the installation method. Grouting shall not be used between the pipe lining and the existing carrier pipe.

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E. After lining insertion is completed, the Contractor shall supply suitable heat source equipment, if required. The equipment shall be capable of delivering hot water or steam through the lining section to uniformly raise the temperature and pressure to effect forming of the lining. This required temperature and pressure ranges for forming of the lining shall be as recommended by the lining manufacturer. Symmetrically reduced lining may be expanded by relieving tension and/or hydrostatic pressure.

F. If required, any heat source shall be fitted with suitable monitors to gauge the temperature and pressure of the incoming and outgoing steam or hot water supply. Another such gauge shall be placed between the liner and the pipe invert at the remote manhole to determine the temperatures during forming. Steam or hot water temperatures and pressures in the lining during the forming period and monitoring methods shall be as recommended by the pipe lining manufacturer.

G. If pipe lining installation requires heating of the lining, the lining shall be uniformly heated to the required temperature prior to the rounding process.

H. The lining shall be expanded as recommended by the manufacturer until it is pressed tightly against the existing pipe wall.

I. Once the required temperature has been achieved, the lining shall be expanded using a rounding device that progressively forms the lining from the insertion point to the termination point if required by the installation method. Other methods of rounding as recommended by the manufacturer may be used with prior approval by FDF.

J. If required by the installation method, and after the lining is completely rounded, the Contractor shall cool the lining to a temperature as recommended by the manufacturer prior to relieving the pressure required to hold the lining against the existing pipe. This temperature shall not be in excess of 100 degree Fahrenheit unless otherwise approved by FDF.

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K. After the lining has been formed, the ends of the liner shall be cut and end terminations installed at the manholes as submitted and approved by FDF.

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L. If the lining fails to form a tight fit against the existing carrier pipe, the Contractor shall remove the lining and replace it with a new lining without additional cost to FDF.

3.04 ADDITIONAL INSTALLATION REQUIREMENTS FOR SYMMETRICALLY REDUCED LINING

A. The liner shall be symmetrically reduced by means of a reducing die or a series of rollers. The liner may be heated, at the manufacturer's recommendation, to facilitate the reduction. The liner shall not be reduced greater than 20-percent of the pipe lining diameter without the prior approval of FDF.

B. After the pipe lining is inserted into the existing carrier pipe, the pipe lining shall be cut at each end and equipped with suitable fittings to allow for the introduction of water pressure or air pressure as required to expand the pipe. The pipe lining shall be expanded until it is pressed tightly against the existing pipe walls. Grouting between the pipe lining and the existing carrier pipe is not permitted.

C. The lining shall be expanded using a hydrostatic pressure or by relieving tension applied by the winch. Other methods of expanding, as recommended by the manufacturer, may be used after FDF approval.

3.05 WORKMANSHIP AND ACCEPTANCE

A. Notify the Construction Quality Control (CQC) Consultant and FDF a minimum of 24 hours in advance of hydrostatic testing of pipe lining and inspection. Water tightness of the pipe lining shall be tested by hydrostatic pressure. The test pressure for hydrostatic test shall be 50 pounds per square inch (psi) for a minimum of 3 hours and shall show no signs of leakage. Pressure and temperature shall be monitored and recorded with certified instruments during the test.

B. The finished lining shall be continuous over the entire length between two manholes and free as practical from visual defects such as foreign inclusions, dry spots, pinholes, and delamination. It shall also meet the hydrostatic testing requirements specified herein.

Upon completion of the hydrostatic testing, a visual inspection of the pipe lining installed shall be performed using a closed circuit television camera. A VHS videotape and log of the inspection shall be submitted to FDF.

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3.06 CLEAN-UP AND RESTORATION

A. Upon completion and acceptance of the pipe lining installation, the Contractor shall clean up the entire project work site and restore the area to the existing conditions. Excess material and debris not incorporated into the installation shall be disposed of by the Contractor.

[End of Section]

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SECTION 02605A

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HIGH DENSITY POLYETHYLENE (HDPE) PIPES AND FITTINGS

PART 1 GENERAL

[X] A - Conforms to the Subcontract Requirements
[ ] B - Minor Comment - Incorporate and Resubmit
[ ] C - Revise and Resubmit
Sig: [illegible] Date: 4/28/99

1.01 SCOPE

A. This Section includes installation of high density polyethylene (HDPE) piping, fittings, and appurtenances furnished by Fluor Daniel Fernald (FDF) and installed by subcontractor for Interim Leachate Conveyance System.

B. Install above ground and below ground HDPE dual containment pipe to the lines and grades indicated on the Construction Drawings.

1.02 REFERENCES

A. Latest version of the American Society for Testing and Materials (ASTM) standards

1. ASTM D 1248	Standard Specification for Polyethylene Plastics Molding and Extrusion Materials
2. ASTM D 1505	Test Method for Density of Plastics by the Density-Gradient Technique
3. ASTM D 1603	Standard Test Method for Carbon Black in Olefin Plastics
4. ASTM D 2657	Standard Practice for Heat-Joining Polyolefin Pipe and Fittings
5. ASTM D 2837	Standard Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
6. ASTM D 3350	Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
7. ASTM F 714	Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter
8. ASTM F 1804	Standard Practice for Determining Allowable Tensile Load for Polyethylene (PE) Gas Pipe During Pull-In Installation

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1.03 SUBMITTALS

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A. Submit prior to installation, documentation of training and certification of personnel qualified for performing HDPE pipe joining operations. for dual piping system ST 4-28-99

B. Submit prior to testing, detailed hydrostatic test procedure in accordance with this Section.

C. Submit prior to welding, details of specific dual HDPE pipe joining system and proper welding procedures ST 4-28-99

SUBMITTAL ATTACHED MK 4/28/99

PART 2 PRODUCTS

2.01 HDPE DUAL CONTAINMENT PIPING SYSTEM

A. Fluor Daniel Fernald (FDF) will furnish HDPE pipe that meets the latest version of the American Society of Testing and Materials (ASTM) Standards for HDPE pipe and fittings.

Pipe sizes and Standard Dimension Ratio (SDR) are as shown on the construction drawings.

2.02 EMBEDMENT FILL AND BACKFILL MATERIALS

A. Furnish pipe embedment fill materials as shown on the Construction Drawings.

B. Furnish trench backfill and compacted fill materials as shown on the Construction Drawings.

PART 3 EXECUTION

3.01 HDPE PIPE, FITTINGS AND APPURTENANCES

A. Provide proper handling and storage of the HDPE pipe, fittings, and appurtenances at the site. Protect materials from excessive heat or cold, dirt, moisture, cutting, or other damaging or deleterious conditions. Provide any additional storage procedures required by the Manufacturer.

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B. Exercise care when transporting, handling, and placing HDPE pipe and fittings. Use rope, fabric, or nylon slings and straps when handling HDPE pipe. Do not position slings, straps, etc., at butt-fusion joints or fittings.

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C. The maximum allowable depth of cuts, gouges or scratches on the exterior surface of HDPE pipe or fittings is 10 percent of wall thickness. The interior of the pipe and fittings shall be free of cuts, gouges and scratches. Replace any HDPE pipe and fittings that become gouged, twisted, or crimped. Remove from the work area damaged pipes and fittings.

D. Whenever pipe laying is not actively in progress, close the open ends of all installed pipes using watertight plugs or other approved sealing devices.

E. Perform trenching and backfilling of all installed pipe, fittings, and appurtenances in accordance with the Construction Drawings.

F. Perform testing of all installed pipe, fittings, and appurtenances in accordance with this Section.

3.02 HDPE PIPE AND FITTINGS INSTALLATION

A. General:

1. Carefully examine HDPE pipe and fittings for cracks, damage or defects before installation. Do not use cracked, damaged, or defective material.
2. Inspect the interior of all pipe and fittings and remove any foreign material from the pipe interior before the pipe is moved into final position.
3. Perform field-cutting of pipes, where required. Make cuts carefully without damage to pipe, so as to leave a smooth end at right angles to the axis of the pipe. Flame cutting is not allowed.
4. Do not lay pipe until the Construction manager has verified the bedding conditions.
5. Install HDPE pipe and fittings in accordance with the Manufacturer's recommendations and the requirements of this Section.
6. Install pipe and fittings to the lines and grades shown on the Construction Drawings.
7. Place and compact pipe embedment fill and trench backfill material as shown on the Construction Drawings.

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3.03 HDPE PIPE JOINTS, FITTINGS, AND APPURTENANCES CONNECTIONS

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A. Qualify all personnel performing joining operations as specified in this Section.

B. Weather Conditions for Joining:

1. Do not join HDPE pipes and fittings at ambient temperatures below 40°F or above 104°F, unless authorized in writing by the Construction manager. For cold (<40°F) or hot (>104°F) weather joining, use the additional procedures authorized in writing by the Construction Manager
2. Measure ambient temperatures at fusion machine.
3. Do not join HDPE pipe and fittings during any precipitation, in the presence of heavy fog or dew, or in areas of ponded water.

C. Prior to joining, the joint area shall be clean and free of moisture, dust, dirt, debris of any kind, and foreign material.

D. Joining equipment shall be approved for the applicable field joining process which is thermal butt fusion. Electrofusion couplings shall be used only if approved by CQC. Butt-fusion-welding apparatus shall be automated devices equipped with gauges giving the applicable temperatures and pressures. Split Ring butt-fusion apparatus shall be as recommended by the manufacturer.

E. Make trial butt-fusion joints on spool pieces of HDPE pipe to verify that joining conditions are adequate. Conduct trial joints on the same material to be installed and under similar field conditions as production joints. Conduct trial joining at the beginning of each day for each fusion apparatus used that day. Also, each joiner shall make at least one trial joint each day. Conduct trial joining under the same conditions as the actual joining. Prepare trial joints that are at least 2 feet long (after seaming) with the joint at the midpoint.

F. Weld HDPE carrier and containment pipe with thermal butt-fusion joints. Fabricate joints in compliance with ASTM D 2657, the Manufacturer's recommendations, and the requirements of this Section.

G. Pipe joining operations shall be performed in the presence of the CQC Consultant (GeoSyntec) or FDF Quality Assurance

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H. Each pipe fitter shall write his initials and a unique joint identification number next to the joint which he joined using a water resistant marker. This identification number shall be traced to a weld map and Q/A inspection report. Subcontractor, CQC Consultant and FDF Quality Assurance shall all use the same joint identification number (same numbering procedure) for a particular joint.

3.04 FIELD TESTING AND INSPECTION

A. Notify the CQC Consultant a minimum of 24 hours in advance of any pipe testing or pipe inspection.

B. HDPE Pipe and Fittings Hydrostatic Testing:

1. Provide testing apparatus, including pumps, hoses, gauges, taps, plugs, drains, temporary connections, and fittings to perform testing in accordance with this Section.
2. HDPE pipe hydrostatic testing:
   a. Pressure test all installed HDPE solid wall, carrier, and containment pipe prior to placing fill over the pipes. Do not exceed specified minimum test pressures by more than 25 percent.
   b. Perform tests in the presence of the CQC Consultant and in accordance with the detailed test procedure submitted by the Subcontractor in accordance with this Section.
   c. Test HDPE solid wall and carrier pipe at 50 psi internal pressure for gravity pipe systems. Test pipes in accordance with attached procedures for hydrostatic testing dual containment pipe.
   d. Test HDPE containment pipe at 15 psi internal pressure.
   e. Test pipes at the required internal pressure for a minimum of one hour after the pressure in the pipe has stabilized. The test duration does not include the initial expansion phase after the pipe is first pressurized. The duration of the expansion phase shall be as recommended by the Manufacturer.
   f. Identify any leaks, remove the water, and make repairs to the pipe.
   g. Retest the pipe until acceptance criteria are achieved in accordance with the approved procedures for testing prior to placing backfill over the pipe.
   h. Test gauges shall be calibrated within one year of date of test. Calibration shall be traceable to national or industry standards where possible.

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i. Acceptance criteria for hydrostatic testing is zero leakage for the stabilized pressure for the minimum duration of the test.

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C. Subcontractor may substitute air testing in lieu of hydrostatic testing if authorized in writing by the Construction Manager. Submit detailed work plan and test procedure for review and approval by the Construction manager

D. HDPE Pipe Inspection

1. Inspect fusion joints for evidence of excess or insufficient bead size, contamination, offset, or any other evidence of inadequate joining. The surface of the HDPE pipe shall be clean at the time of inspection. Wipe or wash the HDPE pipe surface if surface contamination inhibits inspection.
2. Repair any pipe sections where greater than 4 percent pipe outside diameter deflection from vertical is observed.

E. Defects and Repairs:

1. Repair Procedures:
   a. Repair any portion of the HDPE pipe exhibiting a flaw, or poor quality fusion joint by removing bad joint of pipe section and replacing with a new pipe section.
   b. When making repairs, satisfy the following:
      (1) clean and dry all pipe surfaces immediately prior to repair;
      (2) only use approved fusion equipment; and
      (3) extend repairs at least 12 inches in all directions beyond the extent of the defect.
2. Repair Verification:
   a. Inspect each repair using the methods described in this Article. Repair areas that fail the inspection.

3.08 SURVEY CONTROL

A. Survey the top of HDPE containment pipe on no greater than 50-foot centers and at manhole inlets and outlets.

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3.09 TOLERANCES

A. Provide positive slope of gravity lines at all locations to within ±25 percent of the values indicated on the Construction Drawings. Any deviations must be approved by FDF Engineering and Construction Manager in writing.

[End of Section]

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Pump & Fusion Departments

Fax Transmission Sheet

TO: Floor Daniels

ATTENTION: Mike Godber

FROM: David Nucci

DATE: 4-22-99

NUMBER OF SHEETS (Including Cover): 18

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USE THIS CHART, TO DETERMINE CARRIAGE PRESSURES FOR A **STANDARD** 4" TO 12" McELROY

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Pipe Dia.	SDR									
	7	9	11	13.5	15.5	17	19	21	26	32.5
4"	80	70	63	58	54	52	52	48	45	42
6"	137	117	103	90	83	79	74	70	62	56
8"	212	177	153	132	120	112	104	97	85	74
10"	313	258	221	189	170	158	145	135	115	99
12"	428	351	299	253	226	210	192	177	150	127

USE THIS CHART, TO DETERMINE CARRIAGE PRESSURES FOR A **HIGH VELOCITY** 4" TO 12" McELROY **ORANGE CYLINDER**

Pipe Dia.	SDR									
	7	9	11	13.5	15.5	17	19	21	26	32.5
4"	127	108	96	84	78	74	70	66	59	54
6"	241	200	172	148	134	125	116	108	94	81
8"	387	318	271	230	206	191	175	162	138	117
10"	585	477	404	341	303	281	256	235	198	165
12"	810	659	557	467	415	383	348	319	266	220

Heater plate Temperature of 450° F. For all sizes

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USE THIS CHART, TO DETERMINE CARRIAGE PRESSURES FOR A STANDARD 2" TO 8" McELROY

Pipe Dia.	SDR									
	7	9	11	13.5	15.5	17	19	21	26	32.5
2"	65	58	53	49	47	46	44	43	40	38
4"	154	130	114	99	91	86	81	76	67	60
6"	299	247	211	181	163	152	139	130	111	95
8"	486	398	338	285	255	236	216	199	168	141

MC ELROY DOES NOT MAKE A 2" - 8" HIGH VELOCITY MACHINE

USE THIS CHART, TO DETERMINE CARRIAGE PRESSURES FOR A STANDARD 6" TO 18" McELROY

Pipe Dia.	SDR									
	7	9	11	13.5	15.5	17	19	21	26	32.5
6"	137	117	103	90	83	79	74	70	62	56
8"	212	177	153	132	120	112	104	97	85	74
10"	313	258	221	189	170	158	145	135	115	99
12"	428	351	299	253	226	210	192	177	150	127
14"	510	417	354	299	267	247	225	208	175	147
16"	657	536	453	381	339	313	285	262	219	183
18"	824	670	566	474	421	389	353	324	270	223

USE THIS CHART, TO DETERMINE CARRIAGE PRESSURES FOR A HIGH VELOCITY 6" TO 18" McELROY ORANGE CYLINDER

Pipe Dia.	SDR									
	7	9	11	13.5	15.5	17	19	21	26	32.5
6"	241	200	172	148	134	125	116	108	94	81
8"	387	318	271	230	206	191	175	162	138	117
10"	584	477	404	341	303	281	256	235	197	165
12"	810	659	556	467	414	383	348	319	266	220
14"	970	789	665	557	494	455	413	378	314	259
16"	1,258	1,021	859	718	635	585	530	485	401	329
18"	1,585	1,284	1,079	901	796	733	663	606	500	409

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USE THIS CHART, TO DETERMINE CARRIAGE PRESSURES FOR A **STANDARD** 4" TO 12" McELROY

Pipe Dia.	SDR									
	7	9	11	13.5	15.5	17	19	21	26	32.5
4"	80	70	63	58	54	52	52	48	45	42
6"	137	117	103	90	83	79	74	70	62	56
8"	212	177	153	132	120	112	104	97	85	74
10"	313	258	221	189	170	158	145	135	115	99
12"	428	351	299	253	226	210	192	177	150	127

USE THIS CHART, TO DETERMINE CARRIAGE PRESSURES FOR A **HIGH VELOCITY** 4" TO 12" McELROY **ORANGE CYLINDER**

Pipe Dia.	SDR									
	7	9	11	13.5	15.5	17	19	21	26	32.5
4"	127	108	96	84	78	74	70	66	59	54
6"	241	200	172	148	134	125	116	108	94	81
8"	387	318	271	230	206	191	175	162	138	117
10"	585	477	404	341	303	281	256	235	198	165
12"	810	659	557	467	415	383	348	319	266	220

000038

LEE SUPPLY CO. INC.
• DIVERSIFIED PIPE & PUMP SYSTEMS
• INDUSTRIAL • MINING • ENVIRONMENTAL PRODUCTS
Box 35, Charleroi, Pa. 15022

Butt Fusion Procedure

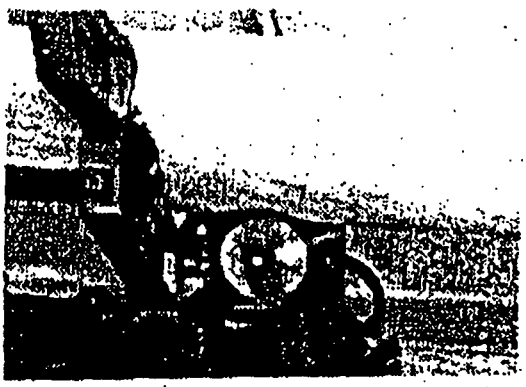
Opening Fixed Jaws

Open the fixed jaws.

TX00061-9-15-94

Raise Pipe

Raise the joined pipe using both of the pipe lifts.



TX00062-9-15-94

Position Pipe for Next Joint

Move the fusion machine to end of pipe, or pull the pipe through the jaws until the end of the pipe is protruding 1" past the jaw face of the fixed jaw.

TX00063-9-15-94

Install Next Piece of Pipe

Insert a new piece of pipe in movable jaws and repeat all previous procedures.

TX00064-10-12-96

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Butt Fusion Procedure

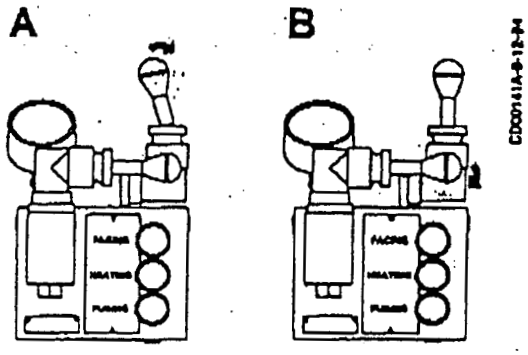
Fusing the Pipe

⚠CAUTION Failure to follow pipe manufacturer's heating time, pressure, and cooling time may result in a bad joint.

After following the pipe manufacturer's suggested heating procedure:

A) Shift carriage control valve to neutral position.

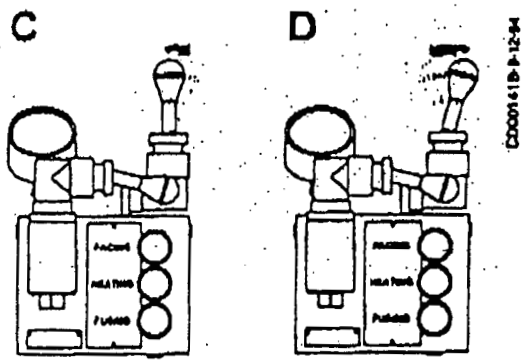
B) Shift the selector valve down to fusion position.



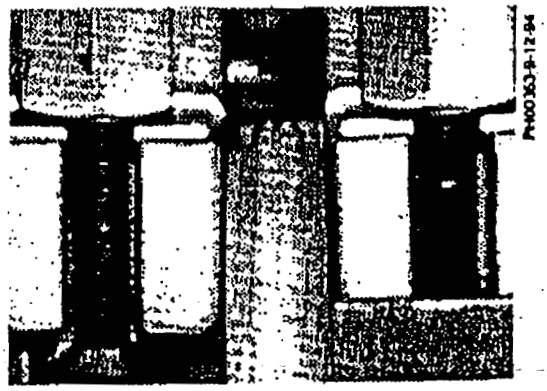
C) Move the carriage to the right just enough to remove the heater.

Quickly remove the heater.

D) Quickly move the carriage to the left, bringing the pipe ends together under the pipe manufacturer's recommended pressure.



Allow joint to cool under pressure according to pipe manufacturer's recommendation.



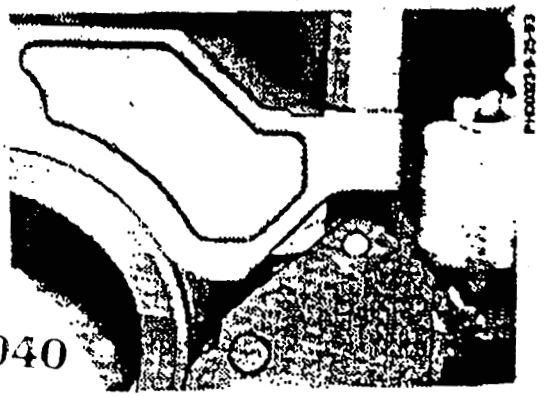
TX00379-9-13-94

Opening Movable Jaws

After the joint has cooled for the pipe manufacturer's recommended time, shift the carriage control valve to the neutral position.

Loosen all clamp knobs, and move carriage to the right far enough to open the jaw nearest the facer.

Open the movable jaws.



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TX00380-9-13-94

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Butt Fusion Procedure

Inserting Heater

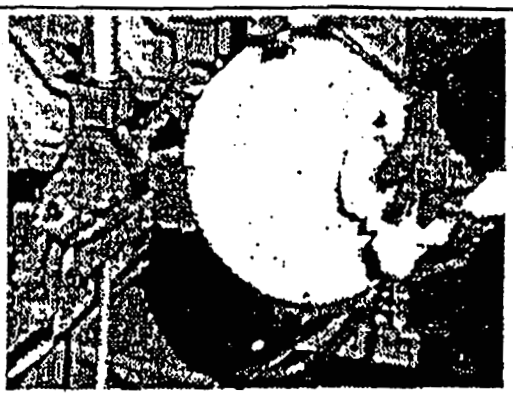
⚠ DANGER Heater Is Not Explosion Proof. This unit is not explosion proof. Operation of heater in a hazardous environment without necessary safety precautions will result in explosion and death.

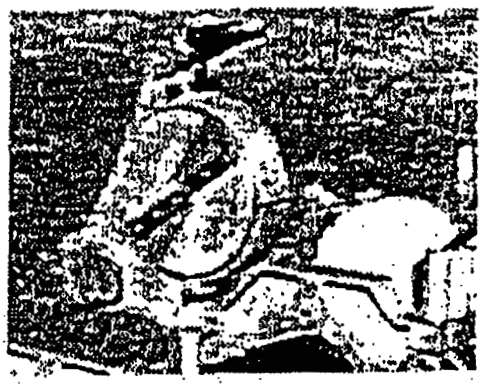
If operating in a hazardous environment, heater should be brought up to temperature in a safe environment, then unplugged before entering the hazardous atmosphere for fusion.

Use a clean non-synthetic cloth to clean the butt fusion heater adapter surfaces.

Verify heater temperature by noting the reading on the dial thermometer.

Insert heater between the pipe ends.





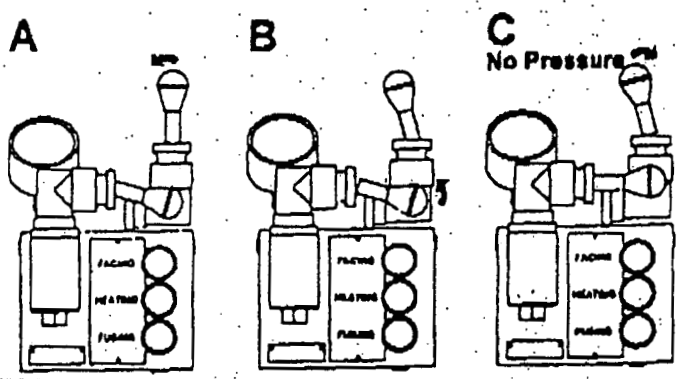
TX00377-9-15-94

Heating the Pipe

A) Move the carriage to the left, bringing the heater into contact with both pipe ends.

B) Move selector valve to center position.

C) If heating pressure is not required, allow the pressure to stabilize at the lowest setting and return carriage control valve to neutral position.



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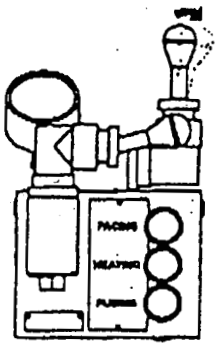
TX00378-9-15-94

Butt Fusion Procedure

Position Carriage for Heater Insertion

Move carriage to the right to open a gap large enough to insert the heater.



C0001360-4-12-94

TX00074-4-15-94

Check Heater Temperature

⚠CAUTION Incorrect heating temperature can result in questionable fusion joints. Check heater plates periodically with a pyrometer and make necessary adjustments.

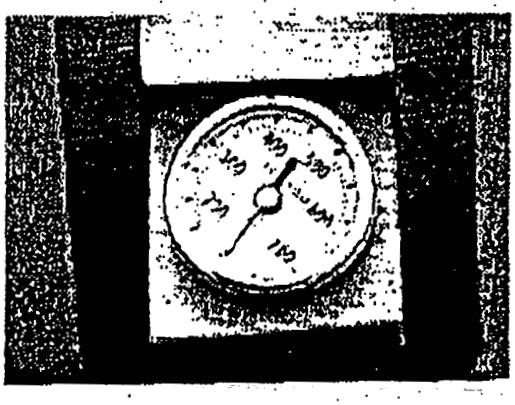
Check heater surface temperature

Refer to the pipe manufacturer's recommendations for proper heater temperature.

WP00077-4-15-93

IMPORTANT: The dial thermometer on the heater indicates internal temperature which varies from the actual surface temperature.

The dial thermometer can be used as reference once the surface temperature has been verified.

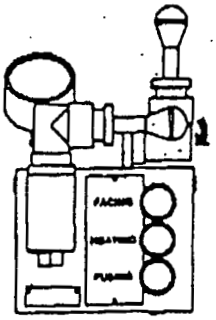


PH00420-11-1-94

TX00375-11-1-94

Select the Fusion Position

Move selector valve handle down to the fusing position.



C0001365-4-12-94

TX00376-4-15-94

Butt Fusion Procedure

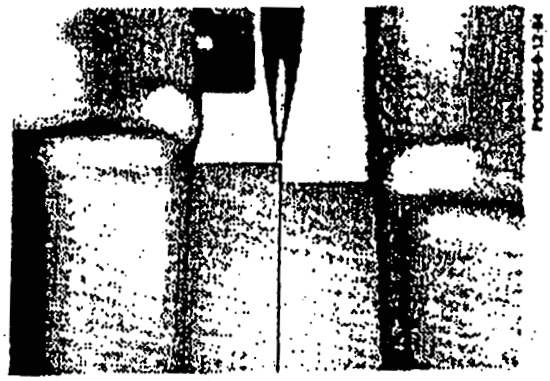
Remove Facer

Release the trigger lock, and swing the facer out to the storage position.

Remove chips from pipe ends.

Do not touch faced pipe ends.

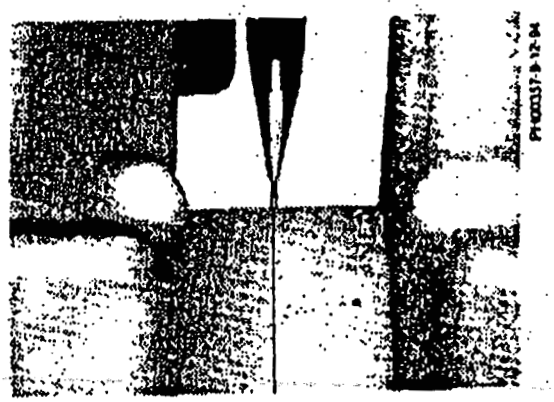
Inspect both pipe ends for complete face off. If the face off is incomplete, return to **Loading Pipe Into Machine.**



Move the carriage to the left until ends of pipe butt together.

Check pipe joint for proper alignment.

⚠WARNING Do not use finger to check for hi/lo (misalignment). The unit is under pressure, and slippage could result in crushed fingers. Always keep hands clear of the jaw area.

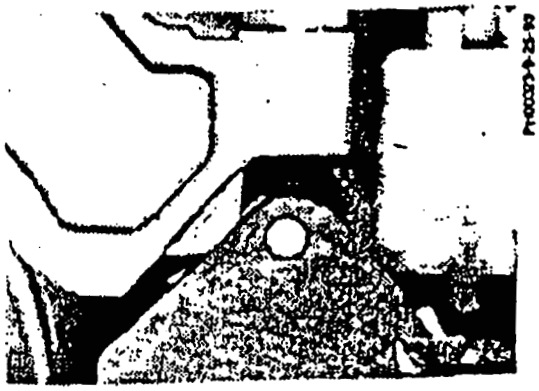


If pipe is not lined up, tighten the high side jaw to bring into alignment.

IMPORTANT: Always tighten the side that is higher, never loosen the low side.

When the pipe is properly aligned tighten outside clamps to insure against slippage.

Ensure there is no unacceptable gap between the pipe ends. If there is an unacceptable gap, return to **Loading Pipe Into Machine.**



NOTICE: When clamping, do not over tighten the clamp knobs because machine damage can result. Check to see if there is space between the upper and lower jaws. If the two jaws are touching, do not continue to tighten.

Bring the pipe ends together under fusion pressure to check for slippage. If slippage occurs, return to **Loading Pipe Into Machine.**

Butt Fusion Procedure

Loading Pipe Into Machine

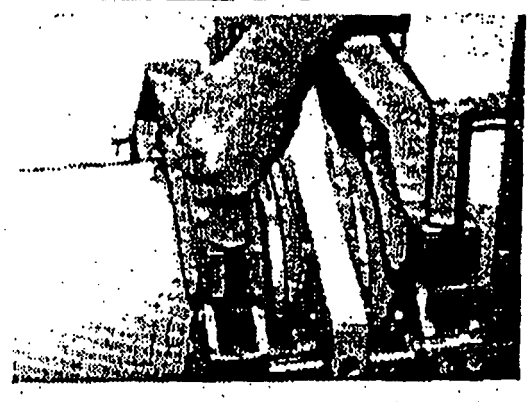
Clean the inside and outside of pipe ends that are to be fused.

Open the upper jaws and insert pipe in each pair of jaws with applicable inserts installed. Let the ends of the pipe protrude about 1" past the face of the jaws.

TX00071-9-15-94

Positioning Pipe In Machine

Swing the facer into place. With the carriage control valve lever, move the carriage toward the fixed jaws, while watching the gap at each end of the facer rest buttons. When the pipe is in contact with the facer, this gap indicates the amount of material that will be trimmed from the pipe end. Assure sufficient material will be removed for a complete face off. Tighten the clamp knobs on the outside jaws. Hand tighten the inside clamp knobs.



TX00072-9-15-94

Facing the Pipe

Move the carriage to the right.

Open the ball valve on the facer motor.

Assure the selector valve handle is up in the facing position.

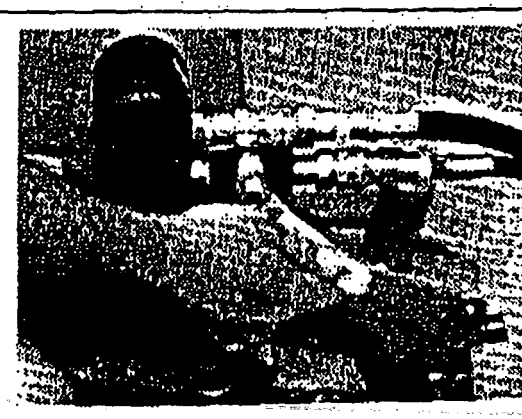
Move the carriage control valve to the left.

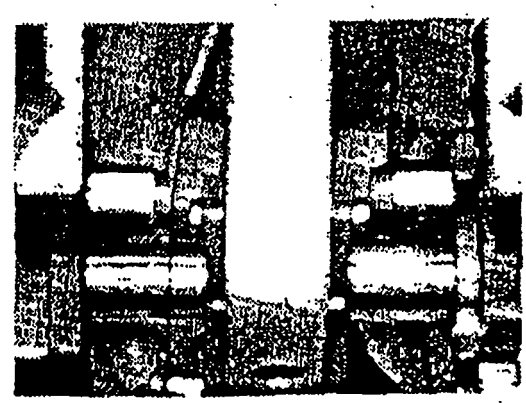
If the facer stalls, adjust the facing pressure so the facer continues to cut.

IMPORTANT: When facing heavy wall pipe, it may be necessary to increase the system pressure to 1000 psi.

IMPORTANT: When drag pressure exceeds 300 psi it is necessary to move the carriage to the left bringing the pipe ends into contact with the facer before opening the facer valve.

Let the carriage bottom out on facer stops. Turn facer off. Move the carriage to the right so the facer can be removed.





TX00072-11-3-94

Butt Fusion Procedure

Install Clamping Inserts

Select and install appropriate clamping inserts for the pipe that is being fused.

TX00368-6-15-94

Pump Motor

⚠ DANGER Pump motor is not explosion proof. Operation of pump motor in a hazardous environment without necessary safety precautions will result in explosion and death.

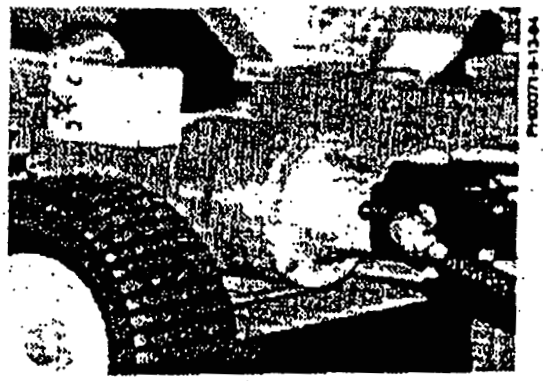
For operation in a hazardous environment consult the instructions in the "Special Operation" section of this manual.

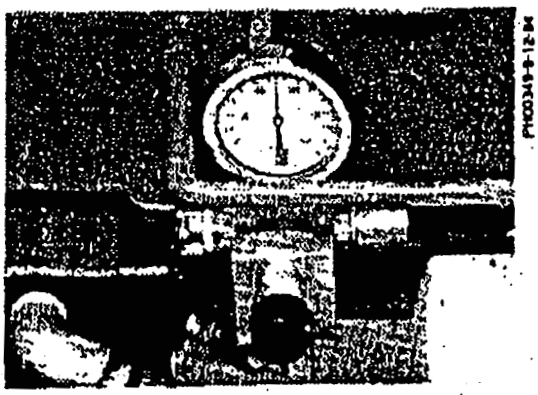
Locate pump motor in a safe environment. Plug the electrical cord into a proper power source.

Turn on hydraulic pump motor and note pressure at the relief valve.

Set the system pressure to 800 psi for most pipe sizes and SDR's. When facing heavy wall pipe, it may necessary to increase the pressure to 1000 psi. Reduce the pressure to 800 psi when facing is completed. Prolonged operation at increased pressure can over-heat the oil

IMPORTANT: Unplug heater when starting pump motor. This will reduce the load on the power supply.





TX00369-11-194

Butt Fusion Procedure

Prepare Heater

⚠ DANGER Heater Is Not Explosion Proof. Operation of heater in a hazardous environment without necessary safety precautions will result in explosion and death.

If operating in a hazardous environment, heater should be brought up to temperature in a safe environment, then unplugged before entering the hazardous atmosphere for fusion.

Install butt fusion heater adapters. Refer to the "Maintenance" section of this manual for procedure.

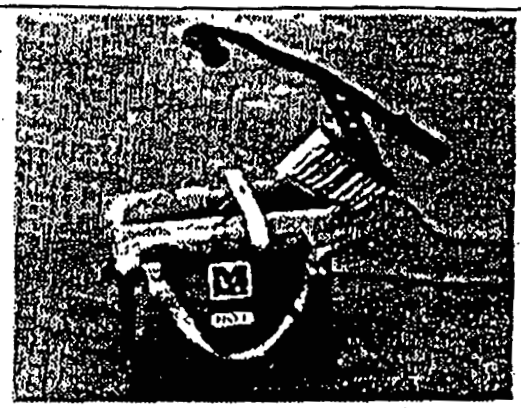
NOTICE: The heater should never be used without butt fusion heater adapters installed.

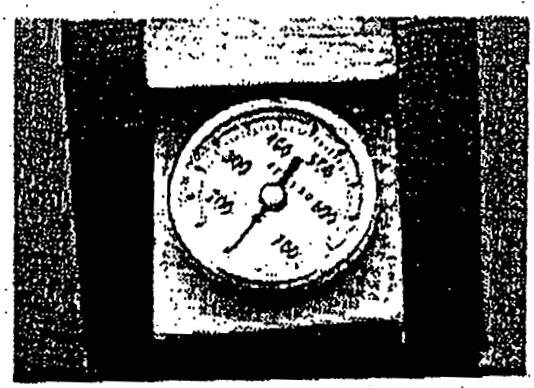
Place heater in insulated heater stand.

Plug heater into a proper power source.

Allow heater to warm-up to operating temperature.

Refer to the "Maintenance" section of this manual for instructions how to adjust heater temperature.

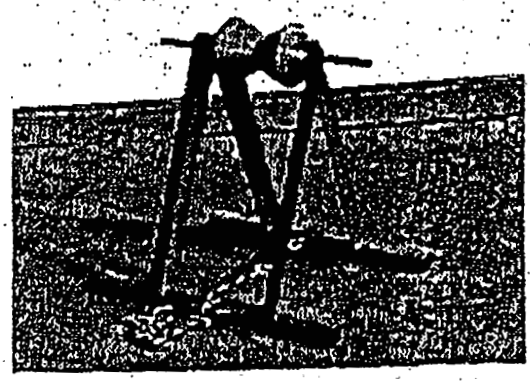




TX00366-9-16-94

Set up Pipe Supports

Set up pipe stands and adjust height so the pipe is in line with the jaws.



TX00367-9-15-94

Butt Fusion Procedure

Read Before Operating

Before operating this machine, please read this manual thoroughly, and keep a copy with the machine for future reference.

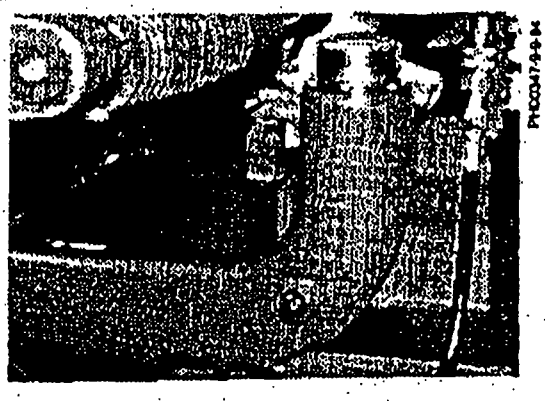
Return manual to the protective storage box when not in use.This manual is to be considered part of your machine.

TX00401-9-15-94

Check Oil Level

Check oil level in sight gauge on filler spout and add oil if necessary.

Refer to the "Hydraulic Fluids" section of this manual for hydraulic oil recommendations.

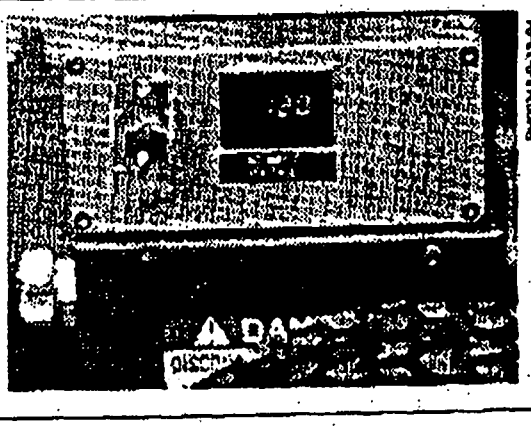


TX00364-9-15-94

Connecting machine to Power

⚠ DANGER All electrical equipment and power sources must be located in a nonhazardous location. Failure to do so can result in explosion and death.

Plug machine's electrical cord into a proper power source.



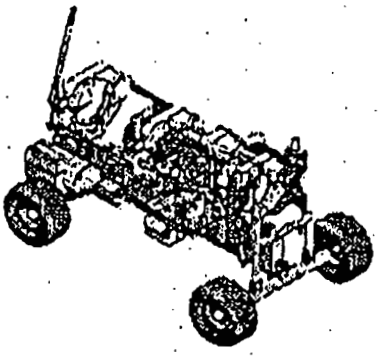
TX00668-10-10-95

2239

Overview

Introduction to the #28 CQ Fusion Machine

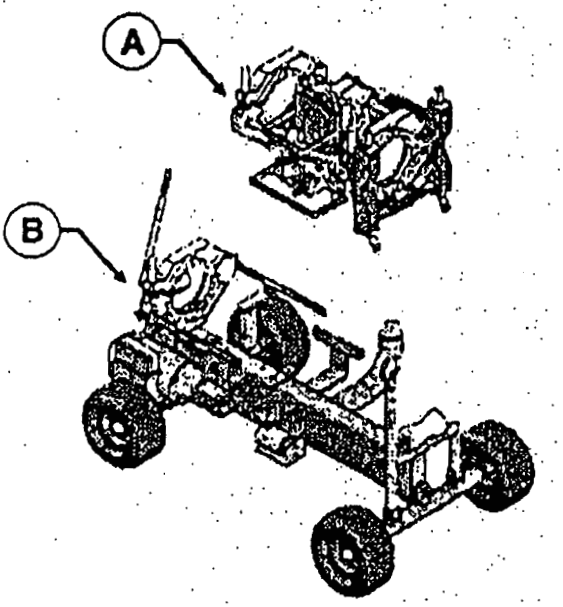
The McElroy No. 28 CQ hydraulically operated fusion machine will butt fuse all pipe sizes from 2" IPS through 8" IPS (63 mm – 200 mm). The combination unit adds saddle fusion capability of up to an 8" (200 mm) branch on any size main. The machine also allows for butt fusion of most fittings without special holders or removal of outer jaws.



TX00448-8-15-94

Carriage Assembly

The carriage assembly consists of one fixed jaw and two hydraulically operated movable jaws bolted to the chassis. The carriage assembly (A) can be unbolted from the chassis (B) and removed for remote operation. For this, optional hydraulic extension hoses are required.



TX00351-8-22-94

Butt Fusion perameters and Heater temp. of 450°F are The same for all sizes of pe pipe

DRISCOPIPE

1000 PE3408

Butt Fusion Procedure for Pipe, Tubing & Fittings

1. Clean each pipe end with a clean cloth.
2. Square (face) the end of each pipe to be fused.
3. Check the line-up of the pipe ends. Adjust the high-low. Check the heater plate for the proper surface temperature, and clean the surface with a clean, cotton* cloth.
   Surface Temperature: 375°F – 400°F**
4. Insert the heater plate between the aligned ends and bring the ends firmly into contact with the plate, but **DO NOT APPLY PRESSURE** while achieving the melt pattern. Watch for the proper melt. A melt bead of 1/16" 1/8" is sufficient for 2" pipe. Smaller pipe or tubing sizes require less melted material for proper fusion while larger sizes benefit from slightly more melt.
5. Remove the heater plate after achieving the proper melt bead and quickly examine the heated ends for completeness of melt. If the ends are not properly melted, stop the procedure, remove the melted ends and start over at Step 1.
6. Bring the melted ends together rapidly. **DO NOT SLAM. APPLY ONLY ENOUGH PRESSURE TO FORM A DOUBLE ROLL-BACK BEAD.**
7. Allow the butt fusion joint to cool properly while maintaining pressure (until your finger can remain comfortably on the bead).

Remember

Install the proper inserts in the fusion unit for the pipe, tubing or fittings being joined. A quality butt fusion joint has a double bead rolled back to the body of the pipe.

Heater plates should be double checked with a tempilstik or pyrometer for correct **surface temperature** (375°F – 400°F).

* *Avoid polyester type materials which melt and stick to heater plates.*

** *Surface Temperature of 500°F is optional but extreme care must be exercised to avoid overmelt, overpressure and cold fusions.*

PHILLIPS 66

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682-93 01

FDF SURVEILLANCE CHECKLIST

SURVEILLANCE NO.:	START DATE:	ASSESSOR:

SURVEILLANCE TITLE/DESCRIPTION: OVERVIEW OF PIPE JOINING

Surveiled DIV./DEPT./PROJECT: DIVISION: SOILS AND WATER
DEPT: ON-SITE DISPOSAL FACILITY
LEACHATE REPAIR PROJECT

Page___ of___

Item	Requirements / Results	Sat (✓)	Unsat (✓)
	JOINT NUMBER:_____ PIPE SIZE:_____ RECORD THE IDENTIFICATION OF PIPES JOINTED:_____ _____ TYPE OF JOINT: [ ] TRIAL [ ] PRODUCTION NAME OF JOINER:_____ CERTIFIED TO BUTT FUSION PROCEDURES: [ ] YES [ ] NO PERFORMED TRIAL JOINT PRIOR TO PRODUCTION JOINT: [ ] YES [ ] NO SERIAL NUMBER FUSION MACHINE:_____		
	Review the weather conditions that exist and record the results. Fog: [ ] yes [ ] no Precipitation: [ ] yes [ ] no Temperature:_____ Do not join HDPE pipe and fittings at ambient temperatures below 40 degrees F or above 104 degrees F, unless authorized in writing by the Construction Manager. For cold (<40 F) or hot (>104 F) weather joining, use additional procedures authorized in writing by the Construction Manager. Do not join HDPE pipe and fittings during any precipitation, in the presence of heavy fog or dew, or in areas of ponded water.		
1.	Requirements: Inspect the inside of the pipe and verify there are no obstructions. Note, the piping that has been fused shall be capped at the end of each day. Results:		

FS-F-4950-RV1 (02/02/98)

FDF SURVEILLANCE CHECKLIST

SURVEILLANCE NO.:	START DATE:	ASSESSOR:

SURVEILLANCE TITLE/DESCRIPTION: OVERVIEW OF PIPE JOINING

Surveiled DIV./DEPT./PROJECT: DIVISION: SOILS AND WATER
DEPT: ON-SITE DISPOSAL FACILITY
LEACHATE REPAIR PROJECT

Page___ of___

Item	Requirements / Results	Sat (✓)	Unsat (✓)
2.	Requirements: Verify the pipe is cleaned with a **clean oil free rag** prior to facing. Cleaning should extend approximately **one inch** beyond the face of the pipe. **The joint shall be free of moisture, dust, dirt, debris of any kind, and foreign material.** Note: The heater plate shall also be cleaned with a clean oil free rag. Results:		
3.	Requirements: Verify the pipe is faced. The wheel pressure for facing should be approximately 125 to 150 psi. Facing is considered complete when approximately 5 full ribbons have been cut from the pipe. After 5 full ribbons have been cut the machine should be put into neutral and the cutting wheel shall continue to rotate to cut the ribbons from the the pipe face. Note: After the pipe has been faced there shall be no further alignment. If there is realignment the pipe shall be refaced. Results: Record the facing pressure:_____		
4.	Requirements: Verify all shavings are removed from the facing of the pipe to assure these shavings are not part of the joint. The operator should use clean gloves when removing shavings. Note: Touching the pipe face is prohibited. Results:		

FDF SURVEILLANCE CHECKLIST

SURVEILLANCE NO.:	START DATE:	ASSESSOR:

SURVEILLANCE TITLE/DESCRIPTION: OVERVIEW OF PIPE JOINING

Surveiled DIV./DEPT./PROJECT: DIVISION: SOILS AND WATER
DEPT: ON-SITE DISPOSAL FACILITY
LEACHATE REPAIR PROJECT

Page___ of___

Item	Requirements / Results	Sat (✔)	Unsat (✔)
5.	**Requirements:** Verify the pipe is checked for proper alignment prior to joining. The jaw can be adjusted to assure proper alignment. **Note: After the pipe has been faced there shall be no further alignment. If there is realignment the pipe shall be refaced.** **Results:**		
6.	**Requirements:** Verify the heater plate is approximately 375 to 500 degrees F. **Note: The heater plate shall be cleaned with a clean oil free rag.** Record the temperature reading on the heater plate thermometer:_____ **Results:**		
7.	**Requirements:** Verify the pipe is inserted into the machine and the pipe ends are brought into firm contact with the plate. The pipe shall be under **zero pressure** when being heated. Record the pressure:_____ **Results:**		

FDF SURVEILLANCE CHECKLIST		
SURVEILLANCE NO.:	START DATE:	ASSESSOR:
SURVEILLANCE TITLE/DESCRIPTION: OVERVIEW OF PIPE JOINING		
Surveiled DIV./DEPT./PROJECT: DIVISION: SOILS AND WATER DEPT: ON-SITE DISPOSAL FACILITY LEACHATE REPAIR PROJECT		Page___ of___

Item	Requirements / Results	Sat (✔)	Unsat (✔)
8.	**Requirements:** While the pipe is soaking heat, verify the melt bead is approximately 1/8 to 1/4" in height prior to removing the heat plate. The heat time is dependant on the pipe diameter and SDR number. Record the soak time for the weld:_____ **Results:**		
9.	**Requirements:** Verify the pipe is joined at the required fusion pressure and allowed to cool. 10" SDR 11 FUSION PRESSURE: 404 PSI **Results:** RECORD THE FUSION PRESSURE:_____		

10.	Requirements: Verify the weld is allowed to cool prior to removing the clamps. The required cooling time is when the joined area is cool to the touch. Results:		

FS-F-4950-RV1 (02/02/98)

FDF SURVEILLANCE CHECKLIST

SURVEILLANCE NO.:	START DATE:	ASSESSOR:

SURVEILLANCE TITLE/DESCRIPTION: OVERVIEW OF PIPE JOINING

Surveiled DIV./DEPT./PROJECT: DIVISION: SOILS AND WATER
DEPT: ON-SITE DISPOSAL FACILITY
LEACHATE REPAIR PROJECT

Page___ of___

Item	Requirements / Results	Sat (✔)	Unsat (✔)
11.	Requirements: Verify the joint bead is rolled back to the body of the pipe. The flat area of the joint shall be completely rolled back to the pipe. Results:		
12.	Requirements: Verify the joiner has initialed and dated the completed joint. The joint shall be given a unique identification number which shall be traced to this surveillance and a weld map. Results:		

14	**Requirements:** **Results:**		

FS-F-4950-RV1 (02/02/98)

DOCUMENT ROUTING SHEET
ON-SITE DISPOSAL FACILITY
PROJECT NO. 20102

2239

Date: 4/28/99 Interim Leachate

Project/Contract/P.O. Name Conveyance System Project/Contract/P.O. No. FDF 20110

Document Title High Density Polyethylene (HDPE) Pipes and Fittings

Review the attached Document/Submittal/DCN and return to Jenkins DUE DATE 4/28/99

Submittal/DCN No. 02605A Date: 4/28/99 Submittal/DCN Title Spec. Sec.

Routing Sequence	Reviewing Discipline	Review To Be Completed By	Review Completed By	Document/DCN Approved	Document/DCN Disapproved	Sumittal Status "A"	"B"	"C"	"10"	Remarks
Reviewer: SELIM T.	Engineering			ST	28 Apr 99					
Reviewer:	Construction									
Reviewer:	Safety									
Reviewer: GODBER	Quality			MA	28 APRIL 99					
Reviewer:	Procurement									
Reviewer:	Project Controls									
Reviewer:	Envir. Compliance									
Reviewer:	Proj. Manager									
Reviewer:	Estimating									
Reviewer: GEOSYNTEC	Title III A-E			28 Apr 99 DB						
Reviewer:										
Reviewer:										

Special Instruction/Additional Comments:

Dcocument Originator/DCN Requester: Jenkins

Sent to ECDC: Date: _____

Submittal/DCN Sent to Contractor: Date: _____

Status	Defination
A	Reviewed
B	Reviewed , proceed with work incorporating comments. Change submittal as noted and resubmit
C	Change submittal as noted and resubmitt
10	Information only

a:Udaycard

2239

RCI/DCN FORM

REQUEST FOR CLARIFICATION OF INFORMATION / DESIGN CHANGE NOTICE -

(1)WP / WO NO.:1700	(2)S/C NO.:	(5)Pg 1 OF 1	(6)DATE 4/30/99
(3)S/C TITLE: ADDENDUM TO FINAL DESIGN CRITERIA PACKAGE, ON-SITE DISPOSAL FACILITY		(11)RCI NO.:	
(4) RESPONSIBLE DISCIPLINE: E ☐ Mx ☐ Cc ☐ OTHER ☒	(4A)RCI/DCN TITLE: Permanent Leachate Conveyance System; Manhole #1 to Manhole#3 and Interim Leachate Conveyance System	(11)DCN NO.: 1700-089	

(7)DOCUMENTS AFFECTED	(7)DOCUMENT NOS.	(7)REV.	(8)OTHER
Final Design Criteria Package,On-Site Disposal Facility,	20100-DC-0001		

(9) ☐ RCI - INQUIRY ☐ USQD SCREENING BY PROJECT ENGINEER

USQD not requied/see Request For Safety Analysis Support, SA-99-1039

(9)☒ DCN - JUSTIFICATION, EXISTING CONDITION & REQUESTED/PROPOSED CHANGE

Because of the leakage detected in the Permanent LCS, this DCN provides for the redesign/renovation of the pipeline from Manhole#1 to Manhole #2 and from Manhole#2 to Manhole #3.

(10)REQUESTOR: Uday Kumthekar COMPANY: DATE:

(12)CE / PE J. Jenkins 5/5/99 DATE:

(13)RESPONSE: FOR RCI, IS A DCN REQ'D? ☐NO ☐YES

(14) FOR DCN: ☒APPROVED ☐APPROVED AS NOTED ☐DISAPPROVED

GEOSYNTEC

RCI - DCN ACCEPTANCE

(15)DESIGN ORGANIZATION APPROVAL/DISAPPROVAL: DATE: 5/5/99

☐FIT ☒FORM ☐FUNCTION

(20)CHARGE NO. FOR CADD SERVICES TO INCORPORATE:

(16)FDF PE ACCEPTANCE & VERIFICATION THAT ALL REQUIRED REVIEWS ARE COMPLETE: (DCN ONLY) DATE: 5/5/99

James Jenkins

PERFORMANCE GRADE: (17) 4

(18)CONSTRUCTION CONCURRENCE: DATE: 5/5/99

~~R. McGuire~~ Richard L. McGuire

PURCHASE REQUISITION REQUIRED: ☒YES ☐NO (19)

(21)WORK COMPLETED: (SIGNOFF BY CE OR PE) DATE:

ORIGINAL

000057

FS-F-4259
REV. 4: 02/16/98

20100-DC-0001
Add. 1

2239

FINAL DESIGN CRITERIA PACKAGE ON-SITE DISPOSAL FACILITY

May 1997

Revision 0

United States Department of Energy

Fernald Environmental Management Project
Fernald, Ohio

Prepared by

GeoSyntec Consultants
1100 Lake Hearn Drive, NE, Suite 200
Atlanta, GA 30342

Under

FDF	Date	GeoSyntec	Date
	05/05/97		5/5/97

Fluor Daniel Fernald

Subcontract 95PS005028

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ADDENDUM TO 20100-DC-0001
FINAL DESIGN CRITERIA PACKAGE
ON-SITE DISPOSAL FACILITY

April 1999

Revision 0

FERNALD ENVIRONMENTAL MANGEMENT PROJECT,

FERNALD, OHIO

U.S. DEAPARTMENT OF ENERGY

FERNALD AREA OFFICE

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2-135

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INTERIM LEACHATE CONVEYANCE SYSTEM AND PIPE LINING DESIGN CRITERIA

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1.0 INTRODUCTION

The interim leachate conveyance system will be designed to convey leachate (and liquids in the leak detection system) from the OSDF cells to a Permanent Lift Station (PLS) at the OSDF battery limit (functional requirement). From the PLS, the leachate will be pumped through a double-wall forcemain to the Biosurge Lagoon (BSL). This Design Criteria Package (DCP) addresses design of the interim leachate conveyance system from manhole number three to, and including, connecting to the Permanent Lift Station. It also includes an interim line from the Equipment Wash Facility and a permanent pipe lining system in the 6-inch carrier pipe from LCS Manhole 1 to LCS Manhole 2 and LCS Manhole 2 to LCS Manhole 3.

2.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) AND TO BE CONSIDERED CRITERIA

ARARs relevant to the leachate conveyance system and pipe lining are contained in OAC 3745-27-08(C)(5) which states that any leachate conveyance and storage structures located outside of the limits of disposal shall be no less protective of the environment than the disposal facility, and shall:

- Be monitored, as required by EPA and OEPA ((C)(5)(a))
- For storage tanks, be provided with secondary containment ((C)(5)(b))
- For leachate lines, be provided with double containment ((C)(5)(c))
- For storage structures, have a minimum of one week of storage capacity as established by design using assumptions simulating final closure of the facility ((C)(5)(d))

Additional ARARs for the leachate conveyance system are as follows:

- If authorized, leachate may be temporarily stored within the limits of disposal until the leachate can be treated and disposed (OAC 3745-27-19(K)(4))

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The leachate conveyance system design criteria presented below have been developed to satisfy these ARARs as well as the design considerations normally associated with this type of system:

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- The interim leachate conveyance system line should consist of double-wall HDPE pipe having minimum nominal diameters of 6-inch and 10-inch for the carrier and containment pipes. The pipe SDR for both carrier and containment pipes should be 11. The factors of safety for the flow in the leachate conveyance system line under the various design flow conditions are as follows:

  - Baseline design flow rate during OSDF operations (i.e., baseline leachate flow obtained from leachate generation analysis; this baseline excludes temporary flows from stormwater runoff that is contained in the cell and allowed to percolate directly into the cell leachate collection system): the minimum acceptable factor of safety for this condition is 3.0

  - Storm design-basis flow rate during OSDF operations (i.e., baseline leachate flow plus temporary flows from stormwater runoff that is contained in the cell and allowed to percolate directly into the cell leachate collection system); the storm design-basis flow rate should be mechanically controlled during active OSDF operations to satisfy the following competing criteria: (i) rapid drainage of cell stormwater runoff; (ii) maximum acceptable discharge rate to the permanent lift station; the minimum acceptable factor of safety for pressure flow in the leachate conveyance system line for this condition is 1.0, using as a basis the manufacturer pressure rating for the carrier pipe

- The carrier pipe of the interim leachate conveyance system should be continuous over its entire length (i.e., from its upgradient end to its discharge point). The outer containment pipe should be continuous over its entire length as well.

- The interim leachate conveyance system line should be located on the west side of the OSDF (outside of the limit of impacted material disposal). The line should be bedded and or supported.

- The interim line between Manhole Number 3 and the Permanent Lift Station should be placed on or above existing ground to the extent possible and protected from traffic loads, freeze-thaw, and other stresses.

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- Layout of the interim line should avoid interference with the future cell construction and associated utilities and should be coordinated with FEMP site-wide planning activities.

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- The interim line should have adequate strength to resist internal stresses caused by system pressure.

- The pipe liner material shall be compatible with the existing HPDE pipe.

- The pipe liner should be designed in such a fashion to prevent leachate from entering the annular space between the liner and the existing pipe.

- The pipe liner should be designed to pass the design storm for the reach it is installed.

- The above grade pipe should be designed to withstand the environmental loads from the following conditions:

  - Maximum temperature differential in any 24 hour period shall be 90 degrees Fahrenheit

  - Temperature range from –25 degrees Fahrenheit to +120 degrees Fahrenheit.

- The above ground pipe should be supported to prevent excessive deflection of the pipe.

- The underground sections of the pipe should be designed for H-20 ASHTO loading where applicable.

- The underground sections of the pipe should be designed to excavation and backfilling requirements of the permanent system.

- When the interim piping system passes under existing roads it shall be protected to withstand the maximum design loads for the roads.

- If pipe sleeves are used the sleeves should be designed to install the interim piping system through the sleeve and withstand any expected traffic loads.

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- Procedures including sequence shall be developed to pressure test the following interim piping reaches: (i) the 6/10 inch reach; (ii) the drain line from the equipment wash to the interim pipe system, and (iii) the slip line from Manhole 1 to Manhole 2 and Manhole 2 to Manhole 3.

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- Design of all the components of the interim system should consider thermal butt fusion welding as the primary means of joining the pipe. Electrofusion couplings shall only be used at locations where butt fusion techniques are impractical.

- The Systems Plan for the OSDF should be modified to describe the operational and maintenance activities necessary for the Interim Leachate Collection System.

- Ensure that any wetlands affected during construction are identified and accounted.

3.0 NATIONAL AND STATE REGULATIONS, CODES, STANDARDS AND DOE ORDERS

This section presents the general regulations, codes, standards, and orders that are to be followed for the design of the interim leachate conveyance system and do not constitute ARARs / TBCs. In addition, the work will be performed in compliance with the Standards/Requirements Identification Documents as identified in the *FERMCO Policies and Requirements Manual*. This information is organized by engineering discipline.

1) American Association of State Highway and Transportation Officials (ASHTO) Interim Guide for Design of Pavement Structures, 1972, Revised 1981, by AASHTO.

2) North American Datum (NAD) of 1983.

3) National Geodetic Vertical Datum (NGVD) of 1929.

4) Topographic Map of 1997 Site Flyover.

5) Soil Conservation Service (SCS), Soil Survey of Hamilton County, Ohio.

6) American Society of Civil Engineers (ASCE), Manual 37, "Design and Construction of Sanitary and Storm Sewers," ASCE.

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7) SCS, "Water Management and Sedimentation Control to urbanizing Areas."

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8) FEMP Stormwater Pollution Prevention Plan for Construction Activities.

9) Ohio Department of Transportation (ODOT), Construction and Material Specifications, January 1997.

Environmental Safety and Health

1) 29 Code of Federal Regulations (CFR) 1910, "Occupational Safety and Health Standards."

2) 29 CFR 1926, "Safety and Health Regulations for Construction."

3) 10 CFR 835, "Occupational Radiation Protection" (this is the promulgation of DOE Order 5480.11).

4) DOE Order 5480.10 "Contractor Industrial Hygiene Program."

5) DOE/EH-0256T, Radiological Control Manual

6) DOE-EM-STD-5502-94, "Hazard Baseline Documentation.".

4.0 CALCULATIONS

Calculations should be performed to ensure that the interim leachate conveyance system can transmit the required quantity of leachate required by the design criteria. Calculations should include the following:

- The capacity of the interim leachate conveyance system should be evaluated using standard pipe capacity calculation methods to ensure that the pipe has sufficient capacity to maintain flow conditions at the required factors of safety under various design flow conditions.

- Expansion and contraction of the above ground pipe.

- Hydraulic capacity of the existing concrete culvert.

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- Pull length for the 6-inch and 10-inch HDPE pipe shall be as recommended by the pipe manufacturer.

- Surface water elevation for the design storm in the drainage structures adjacent to the interim leachate conveyance system.

2239

RCI/DCN FORM

REQUEST FOR CLARIFICATION OF INFORMATION / DESIGN CHANGE NOTICE -

(1)WP / WO NO.:1700	(2)S/C NO.:	(5)Pg 1 OF	(6)DATE 4/30/99
(3)S/C TITLE: ADDENDUM TO FINAL DESIGN CALCULATIONS PACKAGE, ON-SITE DISPOSAL FACILITY		(11)RCI NO.:	
(4) RESPONSIBLE DISCIPLINE: E ☐ Mx ☐ Cc ☐ OTHER ☒	(4A)RCI/DCN TITLE: Permanent Leachate Conveyance System; Manhole #1 to Manhole#3 and Interim Leachate Conveyance System	(11)DCN NO.: 1700-090	

(7)DOCUMENTS AFFECTED	(7)DOCUMENT NOS.	(7)REV.	(8)OTHER
Final Design Calculations Package,On-Site Disposal Facility,	20100-DC-0001		
	CA 9cg		

(9) ☐ RCI - INQUIRY ☐ USQD SCREENING BY PROJECT ENGINEER

USQD not requied/see Request For Safety Analysis Support, SA-99-1039

(9)☒ DCN - JUSTIFICATION, EXISTING CONDITION & REQUESTED/PROPOSED CHANGE

Because of the leakage detected in the Permanent LCS, this DCN provides for the redesign/renovation of the pipeline from Manhole#1 to Manhole #2 and from Manhole#2 to Manhole #3.

(10)REQUESTOR: Uday Kumthekar COMPANY: DATE:

(12)CE / PE J. Jenkins DATE: 5/5/99

(13)RESPONSE: FOR RCI, IS A DCN REQ'D? ☐NO ☐YES

(14) FOR DCN: ☒APPROVED ☐APPROVED AS NOTED ☐DISAPPROVED

GEOSYNTEC RCI/DCN ACCEPTANCE

(15)DESIGN ORGANIZATION APPROVAL/DISAPPROVAL: DATE: 5/5/99

☐FIT ☒FORM ☐FUNCTION

(20)CHARGE NO. FOR CADD SERVICES TO INCORPORATE:

(16)FDF PE ACCEPTANCE & VERIFICATION THAT ALL REQUIRED REVIEWS ARE COMPLETE: (DCN ONLY) DATE: 5/5/99

James Jenkins

PERFORMANCE GRADE: (17) 4

(18)CONSTRUCTION CONCURRENCE: ~~R. McGuire~~ Richard L McGuire DATE: 5/5/99

PURCHASE REQUISITION REQUIRED: ☒YES ☐NO (19)

(21)WORK COMPLETED: (SIGNOFF BY CE OR PE) DATE:

ORIGINAL

FS-F-4259
REV. 4: 02/16/98

20100-CA-0001
Add. 1

2239

FINAL DESIGN CALCULATION PACKAGE ON-SITE DISPOSAL FACILITY

Volume II

May 1997

Revision 0

United States Department of Energy

Fernald Environmental Management Project
Fernald, Ohio

Prepared by

GeoSyntec Consultants
1100 Lake Hearn Drive, NE, Suite 200
Atlanta, GA 30342

Under

FDF	Date	GeoSyntec	Date
	05/05/99		5/5/99

Fluor Daniel Fernald

Subcontract 95PS005028

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ADDENDUM TO 20100-CA-0001
FINAL DESIGN
CALCULATION PACKAGE
ON-SITE DISPOSAL FACILITY

April 1999
Revision 0

Fernald Environmental Management Project,
Fernald, Ohio

U.S. Department of Energy

Fernald Area Office

10.6 INTERIM LEACHATE CONVEYANCE SYSTEM DESIGN CALCULATIONS

LIST OF CALCULATIONS (continued)

10.3 LDS and LCS Manhole Design

- LCS and LCS Manhole Hydrostatic Uplift
- LCS and LCS Manhole Structural Design
- Structural Concrete Design for the Cover and Flotation Anchor

10.4 LTS Permanent Lift Station Design

- LTS Permanent Lift Station Storage Volume
- LTS Permanent Lift Station Manhole Uplift
- LTS Permanent Lift Station Structural Design

10.5 LTS Pipe Hydrograph

10.6 Interim Leachate Conveyance System – Design Calculations (Included in DCN 1700-090)

VOLUME III

11. FINAL COVER SYSTEM

11.1 Final Cover System Temporary Erosion Mat Design
11.2 Final Cover System Vegetation Design
11.3 Final Cover System Erosion resistance
11.4 Final Cover System Frost Penetration Depth
11.5 Final Cover System Granular Filter Layer Design
11.6 Al Cover System Drainage Layer Design

- Cover System Water Balance
- Cover Drainage Layer Maximum Head

11.7 Final Cover System Geosynthetics Selection

- Geotextile Cushion
- Geomembrane Cap
- Geosynthetic Clay Cap

FERNALD
ENVIRONMENTAL RESTORATION
MANAGEMENT CORPORATION

2239

ENGINEERING CALCULATION

PROJECT NUMBER:	2DSU3		
BY:	J.C.J.	DATE:	4/21/99
CHECKED BY:	D.G.B	DATE:	4/27/99
PAGE	1	OF	3
SUBJECT: INTERIM LEACHATE CONVEYANCE		REVISED:	

ESTIMATE OF FLOW(S) IN LCS FROM M.H. 1 TO MH 3 ASSUMING PIPE LINING OF EXISTING 6" SDR 26 CARRIER PIPE.

USING GEOSYNTEC FINAL DESIGN CALCULATIONS VOL. II OF IV, SECTION 10

ASSUMUMPTIONS:

1. SINCE CELL 1 IS APPROX. 30% (INTERMEDIATE STAGE) COMPLETED, PEAK DAILY LEACHATE GENERATION IS ON THE ORDER OF 7.9 GPM. (REF. SEC. 10.5) ALLOWING FOR SOME ADDITIONAL GENERATION FROM THE CELL 1 CATCHMENT WHICH IS COVERED WITH IMPACTED MATERIAL, IT IS SAFE TO ASSUME THE MAX. FLOW CONTRIBUTION FROM CELL 1 < 100 GPM. (i.e. DURING A 25 YR. STORM EVENT.)

2. CELL 2 IS CONSIDERED AN INITIAL STAGE ACTIVE CELL WHICH EQUATES TO A PEAK RATE (LEACHATE) OF ~~7.9~~ 15.8 GPM (REF. 10.5). IN ADDITION, THE CATCHMENT AREA CAN CONTRIBUTE STORM WATER.

3. SINCE THE MAXIMUM ALLOWABLE FLOW RATE TO THE PLS IS 200 GPM (FROM ANY SOURCE(S)), THE CONTROL OF SAME WILL BE ACCOMPLISHED WITH THE VALVES TO EACH CELL. THIS IS THE PRESENT METHOD AND WILL BE CONTINUED.

FERNALD
ENVIRONMENTAL RESTORATION
MANAGEMENT CORPORATION

ENGINEERING CALCULATION

PROJECT NUMBER: 2239	
BY: JCJ	DATE: 4/23/99
CHECKED BY: D.GB.	DATE: 4/27/99
PAGE 2 OF 3	
SUBJECT:	REVISED:

BASED ON MANNINGS EQUATION USING THE EXISTING HDPE LINED WITH SDR ~~25~~ 21 LINER (MAY BE AS "THIN" AS SDR 32.5)

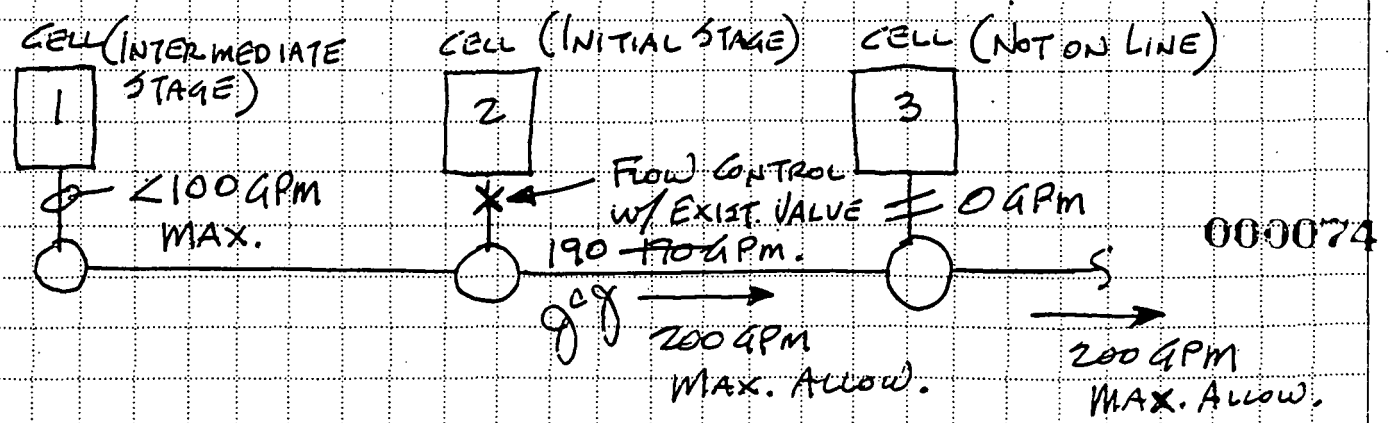
THE EXISTING 6" CARRIER PIPE FROM ~~LS~~ LCS/LDS M.H. 1 TO M.H. 2 AND MH 2 TO 3 HAS THE FOLLOWING CHARACTERISTICS

O.D. = 6.625" (6.115 ID)
I.D. = 5.5 USING SDR 21 LINER (.315 WALL)
I.D. = 5.7 USING SDR 32.5 LINER (.204 WALL)
MANNINGS n = 0.009 (HDPE)
S (SLOPE) = .39% (.0039)

USING NOMAGRAPH AND PIPE DIA OF ~~5.25~~ 5.5 g.y (INSIDE) WHICH ACCOUNTS FOR THE LINING (SEE ATTACHED)

MAX. FULL FLOW = APPROX. ~~170~~ 190 g.y GPM AND V = ~~2.4~~ 2.5 g.y'/SEC.
(GRAVITY CONDITION WITHOUT HEAD)

THEREFORE ~~IT~~ IS SAFE TO ASSUME UNDER THE CURRENT CELL 1 & CELL 2 CONFIGURATION THAT THE LINED PIPE ~~WITH~~ WILL CARRY THE DESIGN FLOWS.



000074

i.e. WITH A HEAD ON THE LCS PIPING FROM THE CATCHMENT

MANNING FORMULA PIPE FLOW CHART

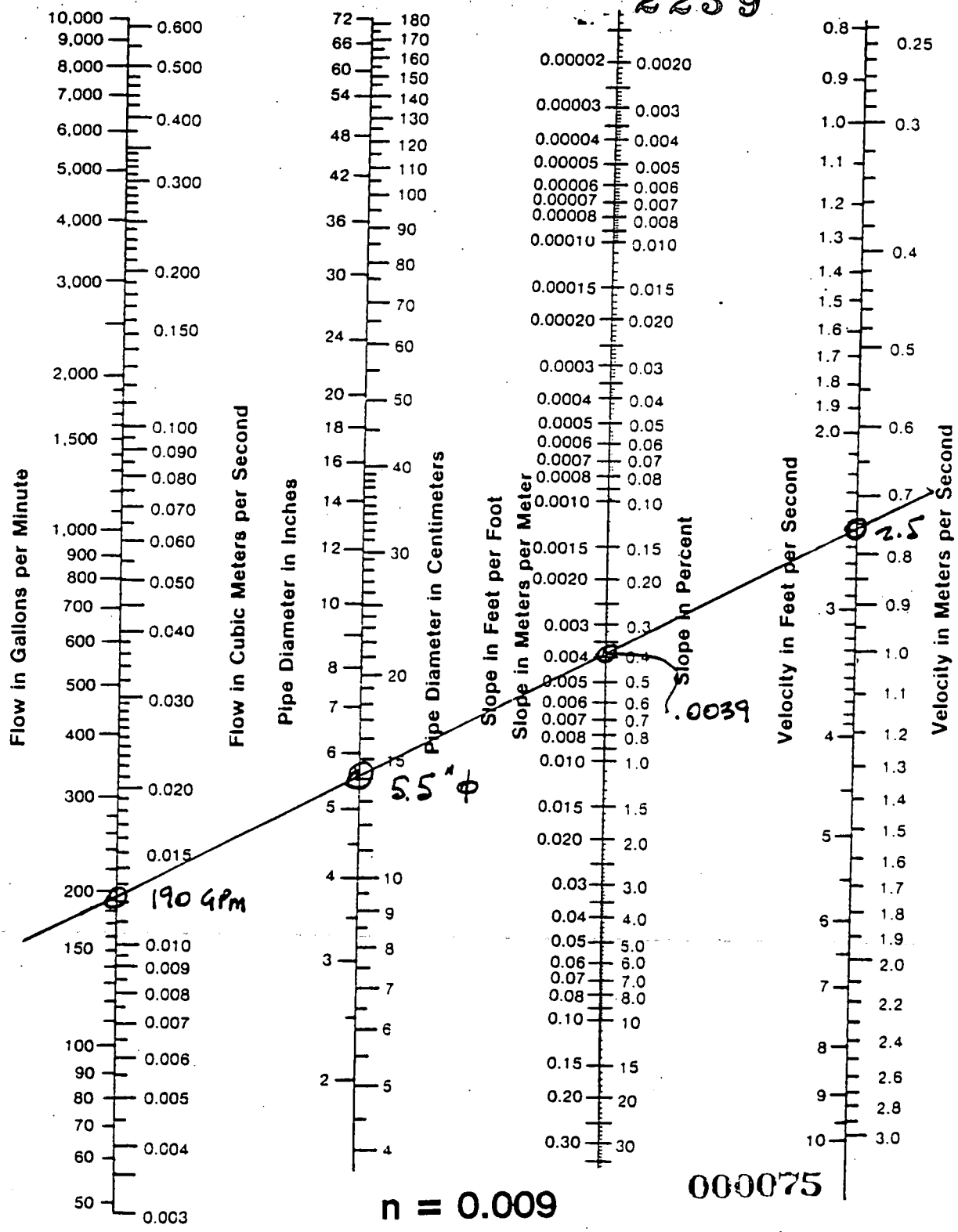
3 OF 3

CG 4/22/99

BOB 4/27/99

English/Metric Units

2239



000075

n = 0.009

Chart based on the formula $Q = \frac{1.486}{n} \times AR^{\frac{2}{3}} \times S^{\frac{1}{2}}$ for pipe flowing full.

NOMAGRAPH FROM U.S. PIPE & FOUNDRY CO.

FERNALD
ENVIRONMENTAL RESTORATION
MANAGEMENT CORPORATION

ENGINEERING CALCULATION

PROJECT NUMBER: 20110 (2D5U3)	
BY: CCV	DATE: 4/28/99
CHECKED BY: DGB	DATE: 4/29/99
PAGE 1 OF 3	
SUBJECT: ADDITIONAL PIPE FOR CONTRACTION	REVISED:

2239

OBJECTIVE

CALCULATE ADDITIONAL PIPE LENGTH TO ALLOW FOR CONTRACTION OF PIPE ABOVE GRADE AND ESTIMATE SNAKING CONFIGURATION

GIVEN

- DESCOPIPE ENGINEERING CHARACTERISTICS STATES THAT THE COEFFICIENT OF EXPANSION AND CONTRACTION IS 1.2×10^{-4} IN/IN/°F ✓
- CHANGE IN TEMPERATURE TO BE USED IS 50°F ASSUMING THE PIPE WILL BE PLACED IN DAYTIME AND COOL AT NIGHT ✓
  Pipe will eventually be covered with soil (30 in minimum)
- PIPE LENGTH ATTACHED = 1,350 LF
- AN EXISTING FENCE IS LOCATED 3' WEST OF THE INTERIM LEACHATE LINE ALIGNMENT
- FROM GEOSYNTEC CALCULATIONS FROM JAY BEECH DATED 4/28/99, ADDITIONAL LENGTH PER 500' EQUALS 3' ✓

ASSUMPTIONS

- [illegible]

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FERNALD
ENVIRONMENTAL RESTORATION
MANAGEMENT CORPORATION

ENGINEERING CALCULATION

PROJECT NUMBER: 20110	
BY: CCV	DATE: 4/29/99
CHECKED BY: DGB	DATE: 4/29/99
PAGE 2 OF	
SUBJECT:	REVISED:

2239

CALCULATIONS

- CONSIDER TWO PORTIONS OF PIPE FOR SNAKE CONFIGURATION

1) STA 7+20 THRU 21+10
34" x 53' CULVERT INLET TO PIPE SLEEVE AT OMTA HAUL ROAD

2) STA 21+70 THRU 24+40

- PORTION 1 TOTAL LENGTH = 1,390 LF

$1390/500 = 2.78$

$2.78 * 3' = 8.34'$ ADDITIONAL PIPE LENGTH

$\cong 9'$

- PORTION 2 TOTAL LENGTH = 270

$270/500 * 3 = 1.62'$

$\cong 2'$ ADDITIONAL PIPE LENGTH

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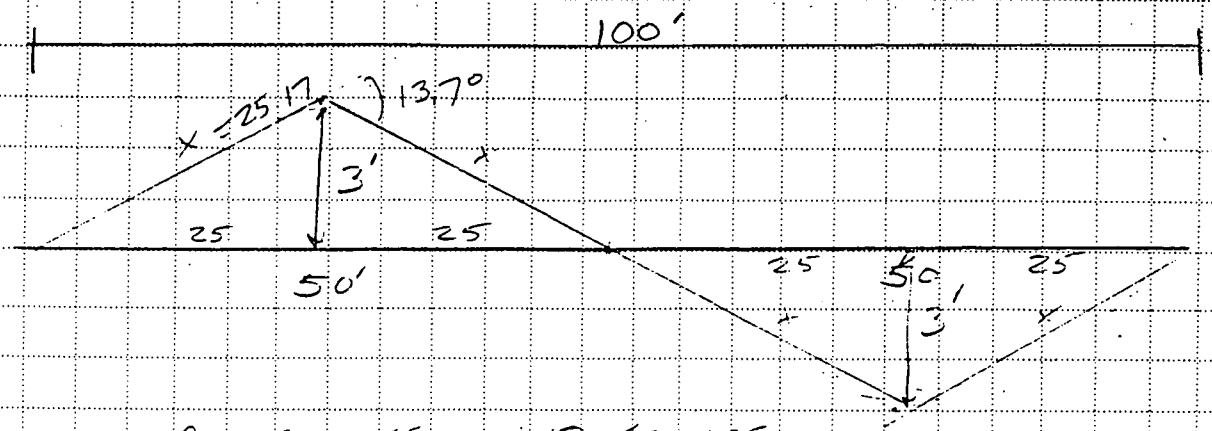
FERNALD
ENVIRONMENTAL RESTORATION
MANAGEMENT CORPORATION

ENGINEERING CALCULATION

PROJECT NUMBER: 20110	
BY: CCV	DATE: 4/29/99
CHECKED BY: KBT	DATE: 5/4/99
PAGE 3 OF	
SUBJECT:	REVISED:

2239

ASSUME PIPE SNAKE AS FOLLOWS



CALCULATE HYPOTENUSE

$\sqrt{25^2 - (3)^2} = x = 25.17'$
25.18'

OVER 100' CENTERLINE LENGTH, PIPE DISTANCE EQUALS (25.17)(4) = 100.71'
100.72

OVER 500' CENTERLINE LENGTH

PIPE DISTANCE EQUALS 100.71 * 5 =
503.5'
503.6

∴ THIS CONFIGURATION MEETS THE CONTRACTION REQUIREMENT

CHECK RADIUS

$R = \frac{T}{\tan(\Delta/2)}$ $T = 50'$ $\Delta = 13.7$

R = 416' RADIUS OK

000078

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ENVIRONMENTAL RESTORATION
MANAGEMENT CORPORATION

ENGINEERING CALCULATION

PROJECT NUMBER:	20102 (20SW3)		
BY:	CCV	DATE:	4/26/99
CHECKED BY:	CGB	DATE:	4/29/99
PAGE	1	OF	2
REVISED:			

SUBJECT: CAPACITY OF 6" HDPE CARRIER

2239

OBJECTIVE

- CALCULATE CAPACITY OF 6" DIAMETER HDPE PIPE FLOWING FULL

GIVEN

- Mannings n = 0.009 for HDPE pipe
- USE MANNING'S FORMULA

ASSUMPTIONS

- USE 0.3% SLOPE

REFERENCE

- DRISCOPIPE ENGINEERING CHARACTERISTICS

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PROJECT NUMBER:	20102		
BY:	CCV	DATE:	4/26/99
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REVISED:			

SUBJECT: CAPACITY OF 6" HDPE CARRIER

2239

CALCULATIONS

$$Q_{CAP} = \frac{1.486}{n} A R^{2/3} S^{1/2}$$

$D = 0.5'$ $R = D/4$ $S = .003$

$n = .009$

$$Q_{CAP} = 0.44 \text{ cfs} \left(7.48 \text{ gal}/\text{cf}\right)\left(\frac{60 \text{ s}}{\text{min}}\right)$$

$= 199$ gpm

6" HDPE PIPE WILL CARRY $\cong$ 200 GPM

@ 3% SLOPE

000080

2DSU3

2239

GEOSYNTEC CONSULTANTS

1100 Lake Hearn Drive, Suite 200
Atlanta, Georgia 30342-1523, USA
Telephone: (404) 705-9500
Facsimile: (404) 705-9400

FAX COVER SHEET

To: Uday K.

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Sent by: _____ Date: _____ Time: _____

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MESSAGE:

After some thought, the worst case does not exist after the pipe is buried.

copy: Jim Jenkins
Chuck VanAsdale
Uday Kumthekar
(original) Fraumi Wainwright - File 2DSU3/ICLS

Received 4/29/99 7:15 am

GEOSYNTEC CONSULTANTS

2239

Written by: _____ Date: __/__/__ (YY MM DD) Reviewed by: _____ Date: __/__/__ (YY MM DD)

Client: _____ Project: _____ Project/Proposal No.: _____ Task No.: _____

ESTIMATE OF INSTALLED LENGTH OF PIPE

THE INSTALLED LENGTH OF PIPE NEEDS TO BE LONGER THAN THE PROPOSED ALIGNMENT TO ACCOUNT FOR TEMPERATURE VARIATIONS

DESIGN CONDITION

THE WORST CASE IS WHEN THE FINAL CONNECTIONS ARE MADE & DURING HEAT OF DAY, THEN PIPE COOLS AT NIGHT.

ASSUME PIPE TEMP = 100°F DURING DAY

ASSUME PIPE TEMP = 50°F AT NIGHT

CALCULATE CONTRACTION OF PIPE

$$\Delta L = \alpha (T_2 - T_1) L$$

$$\alpha = 1.2 \times 10^{-4} \text{ in/in/°F}$$

$$L = 100 \text{ ft} = 1200 \text{ in}$$

$$\Delta L = (1.2 \times 10^{-4})(1200)(100 - 50)$$

$$\Delta L = 7.2 \text{ in / 100 ft of pipe}$$

$$\Delta L = 36 \text{ in / 500 ft of pipe}$$

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PROJECT NUMBER: 20102(2DSU3)	
BY: CCV	DATE: 4/28/99
CHECKED BY: KRT	DATE: 5/4/99
PAGE 1 OF 4	
REVISED:	

SUBJECT: 12" CULVERT CAPACITY

2239

OBJECTIVE

ESTIMATE CAPACITY OF A 12" HDPE CULVERT AND ESTIMATED RUNOFF TO ITS INVERT (CULVERT IS LOCATED NEAR ILCS TIE-IN @ MANHOLE #3)

GIVEN

- AERIAL TOPOGRAPHY DATED JUNE 1995.
- USE 25 YR STORM AS DESIGN STORM
- HDPE PIPE "n" = .009 ✓
- SLOPE OF PROPOSED CULVERT = 0.5% ✓
- DRAINAGE AREA = 0.4 AC.

ASSUMPTIONS

- USE RATIONAL METHOD TO ESTIMATE RUNOFF
- ASSUME C = 0.3
- T_C = 10 MIN. OVER GRASS

REFERENCES

- KENTUCKY BUREAU OF HIGHWAYS, INTENSITY-DURATION-FREQUENCY CURVE FOR CINCINNATI, OHIO

000083

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ENGINEERING CALCULATION

PROJECT NUMBER:			
BY: CCV		DATE: 4/28/99	
CHECKED BY: KBT		DATE: 5/4/99	
PAGE 2	OF 4		
REVISED:			

SUBJECT: 12" CULVERT CAPACITY

2239

CALCULATIONS

USE RATIONAL METHOD

$Q_{25} = C I A$ $\quad C = 0.4$

$I = 6.2$ IN/HR

$Q_{25} = (0.3)(6.2)(0.4)$ $\quad A = 0.4$ ACRES (SEE I-D-F CURVE FOR CINT'L CH)

$= 0.7$ CFS ✓

CALCULATE CAPACITY OF 12" HDPE CULVERT

USE MANNING'S EQUATION

$D_i < 12''$ DEPENDING ON SDR.

$Q_{cap} = \frac{1.486}{n} A R^{2/3} S^{1/2}$ $\quad n = .009$

$= 3.6$ CFS $\quad A = \frac{\pi D^2}{4}$ $\quad D = 1$

ACTUAL VALUE LESS, BUT STILL OK.

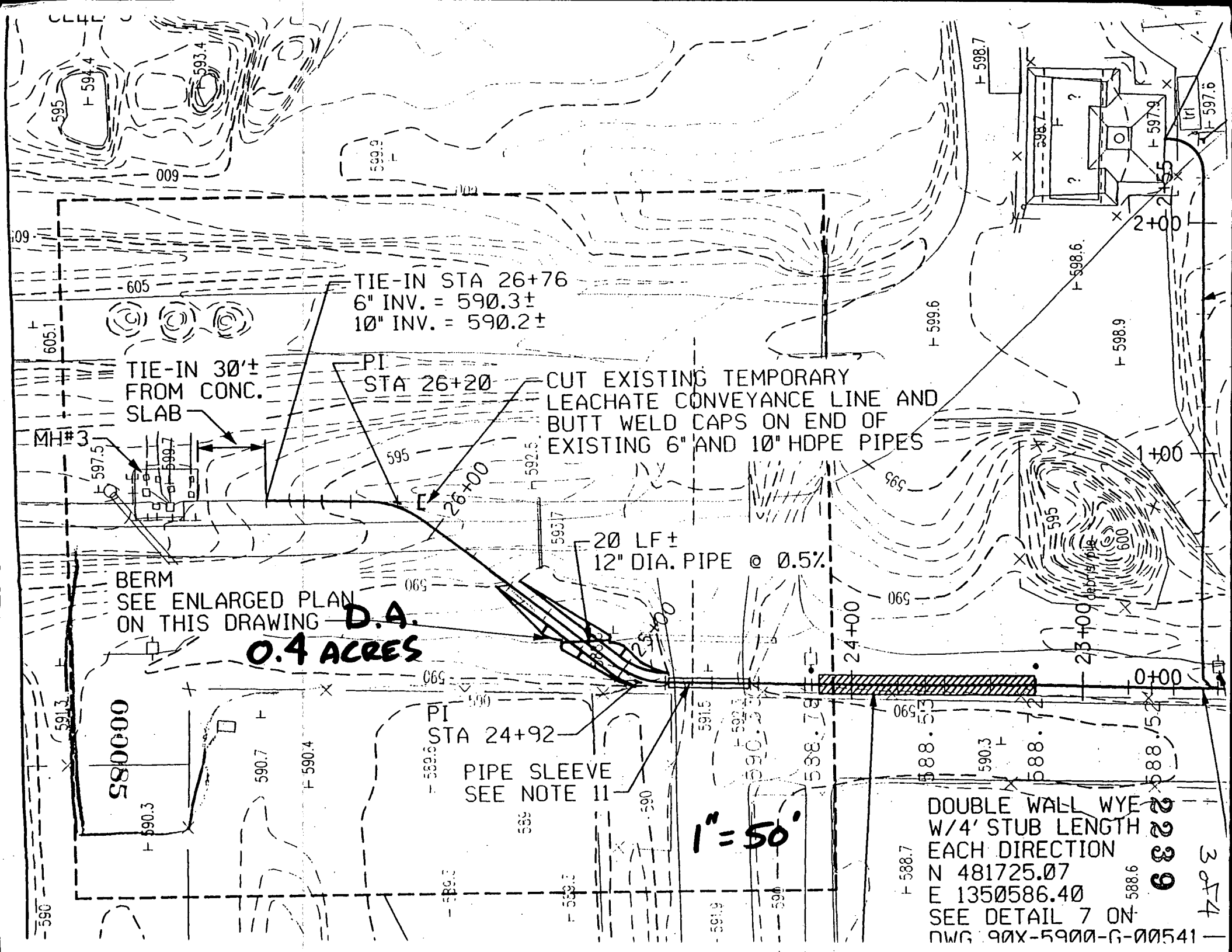
$S = 0.5\%$

$R = D/4$

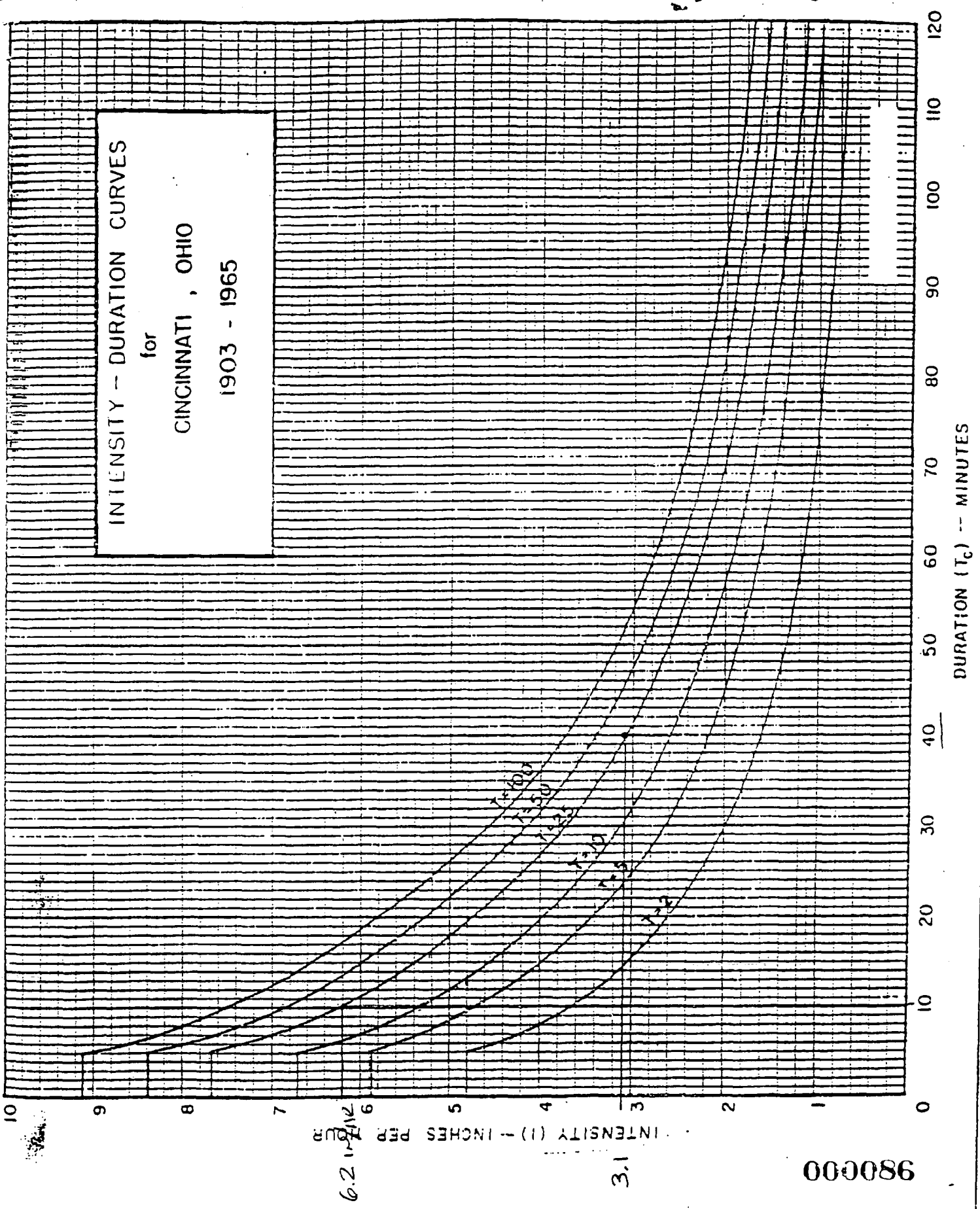
Q_{25} 0.7 CFS < Q_{cap} 3.6 CFS

∴ PIPE @ 0.5% SLOPE IS SUFFICIENT

000084


TIE-IN STA 26+76
6" INV. = 590.3±
10" INV. = 590.2±
TIE-IN 30'± FROM CONC. SLAB
MH#3
PI STA 26+20
CUT EXISTING TEMPORARY LEACHATE CONVEYANCE LINE AND BUTT WELD CAPS ON END OF EXISTING 6" AND 10" HDPE PIPES
20 LF± 12" DIA. PIPE @ 0.5%
BERM SEE ENLARGED PLAN ON THIS DRAWING
D.A. 0.4 ACRES
PI STA 24+92
PIPE SLEEVE SEE NOTE 11
1" = 50'
DOUBLE WALL WYE W/4' STUB LENGTH EACH DIRECTION
N 481725.07
E 1350586.40
SEE DETAIL 7 ON DWG 90X-5900-G-00541
580000
0+00
1+00
2+00
23+00
24+00
25+00
26+00

3 of 4



000086

Charles Kayser 3/9/77	EFFECTIVE DATE 3-77	TITLE INTENSITY-DURATION CURVES CINCINNATI, OHIO	KENTUCKY BUREAU OF HIGHWAYS	EXHIBIT NO. 2-504.5

2239

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ENVIRONMENTAL RESTORATION
MANAGEMENT CORPORATION

ENGINEERING CALCULATION

PROJECT NUMBER:	20102(2DSU3)		
BY: CCV		DATE: 4/14/99	
CHECKED BY: KBT		DATE: 5/4/99	
PAGE 1	OF 14		
SUBJECT: CAPACITY OF REMIA CULVERT		REVISED: 4/26/99	

OBJECTIVE

- CALCULATE EXISTING CAPACITY OF 34"x53" ERCP WHICH TRAVERSES FROM NORTH OF THE REMIA BUILDING, CONTINUES ACROSS THE RECEIVING AREA EAST OF THE BUILDING AND OUTLETS TO A DITCH TO THE SOUTH OF THE BUILDING. COMPARE CAPACITY OF PIPE VERSUS DRAINAGE AREA FLOW TO PIPE

GIVEN

- TOPOGRAPHY OF SITE FROM 6/93 AERIAL
- USE MANNINGS EQ. FOR PIPE CAPACITY
- CULVERT IS CONCRETE n=.013 ✓
- DETERMINE PEAK FLOW FOR 25 YR STORM
- 34"x53" ELLIPTICAL RCP IS EQUIVALENT TO A 42" ROUND DIAMETER PIPE
- SLOPE OF EXISTING PIPE = 0.6%
- DRAINAGE AREA = 37.5 AC
- AVG. SLOPE OF PIPE AFTER GROUTING TO ELEV. 574.1 = 0.38%

ASSUMPTIONS

- USE "RATIONAL" METHOD TO CALCULATE DRAINAGE PEAK FLOW Q=CIA ✓

000087

- ASSUME C = 0.4 Vegetation Type/Surface
- ASSUME Tc = 40 MIN. BASED ON NOMOGRAPHS
  1000' OVER POOR GRASS @ 2% SLOPE = 25 MIN
  500' OVER BARE SOIL @ 2% = 14 MIN
  = 40 MIN

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ENVIRONMENTAL RESTORATION
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ENGINEERING CALCULATION

PROJECT NUMBER:	20102		
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PAGE 2	OF 14		
SUBJECT: REMIA 34" x 53" CULVERT		REVISED:	

REFERENCES

- "DESIGN" - DATA BOOK FOR CIVIL ENGINEERS, SEELYE
- KENTUCKY BUREAU OF HIGHWAYS, INTENSITY-DURATION CURVES
- "HYDRAULIC CHARTS FOR THE SELECTION OF HIGHWAY CULVERTS", USDOT, FHA Hydraulic Engineering Circular No. 5

CONCLUSION

- EXISTING 34" x 53" CONCRETE CULVERT WILL SUSTAIN 25 YR STORM PEAK CAPACITY WITH INTERIM LEACHATE CONVEYANCE SYSTEM THROUGH CULVERT
- ALSO, THROUGH CULVERT ANALYSIS THE CALCULATED HEADWATER ELEVATION AT THE CULVERT INLET FOR 25 YR PEAK FLOW IS RETAINED WITHIN THE NORTHERLY DITCH

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PROJECT NUMBER:	20102		
BY:	CCV	DATE:	4/14/99
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SUBJECT: 34"×53" CULVERT CAPACITY		REVISED:	4/26/99

CALCULATIONS

CAPACITY OF 34"×53" PIPE

$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$ $n = .013$ ✓

$A = \frac{\pi D^2}{4}$ $D = 3.5' = 42'$

$R = D/4$ $S = .006$ ft/ft

$Q_{CAP} = \frac{1.486}{.013} \frac{\pi (3.5)^2}{4} \left(D/4\right)^{2/3} (0.006)^{1/2} = 78$ CFS ✓

@ 0.38% SLOPE $Q_{CAP} = 62$ CFS ✓

DRAINAGE PEAK FLOW TO PIPE

- RATIONAL METHOD

$Q_{25} = CIA$ $I = 3.1$ IN/HR ✓ FROM I-D-F CURVE

ASSUME $C = 0.4$

$A = 37.5$ AC

$Q_{25} = (0.4)(3.1)(37.5) = 46.5$ CFS ✓

000089

CHECK CAPACITY OF 34"×53" CULVERT WITH A 12" HDPE LINE THROUGH IT

HDPE PIPE IS 14 IN. OD = 10.75" CONSERVATIVE

$Q_{CAP} = \frac{1.486}{.013} \left(\frac{\pi (3.5)^2}{4} - \frac{\pi (1)^2}{4} \right) \left(R = a/p\right)^{2/3} (.006)^{1/2} = 68$ CFS

$R_H = \frac{D_i - d_o}{4}$ $\left(\frac{\pi (3.5)^2}{4} - \frac{\pi (1)^2}{4} \right)$ $= 57.2$ CFS

45.5 w/ 12" pipe
47.6 cfs w/ 12" pipe
Q_{CAP} @ 0.38% = 54 CFS

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PROJECT NUMBER:	20102		
BY:	CCV	DATE:	4/14/99
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PAGE	4	OF	14
SUBJECT:	REMIA 34"x53" CULVERT	REVISED:	4/26/99

CONCLUSION

THE 34"x53" RCP WILL BE ABLE TO HANDLE PEAK FLOWS FROM A 25 YR STORM WITH A 12" ϕ PIPE WITHIN IT ✓

Q_{25} TO PIPE = 45 CFS

Q_{CAP} CULVERT = 78 CFS USE

Q_{CAP} CULVERT W/PIPE = 54 CFS (MIN) 47.6 CFS

54 CFS > 45 CFS STILL OK.

∴ PIPE CAN HANDLE ANTICIPATED 25 YR FLOW ✓

CHECK CULVERT HYDRAULIC CONDITIONS

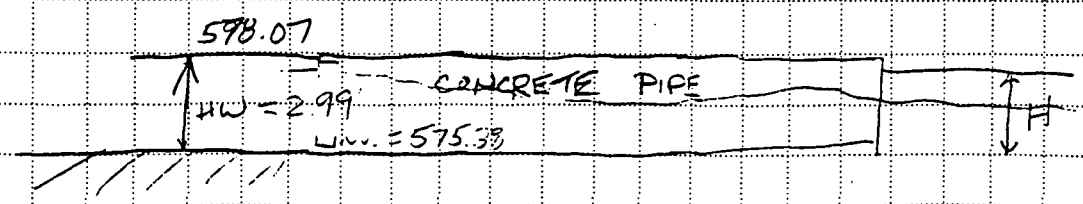
CHECK FOR INLET CONTROL

32"x49" PIPE

- USE NOMOGRAPH FROM USDOT Hydraulic Engineering Circular No. 5 FOR OVAL CONCRETE PIPES TO SIMULATE LOST AREA FROM 10" DIA CONTAINMENT PIPE

THE HEADWATER ELEV. AT TOP OF PIPE

∴ CULVERT IS OK FOR INLET CONTROL



* CHECK FOR OUTLET CONTROL

FERNALD ENVIRONMENTAL RESTORATION MANAGEMENT CORPORATION

ENGINEERING CALCULATION

PROJECT NUMBER:	2239		
BY: CCV		DATE: 4/28/99	
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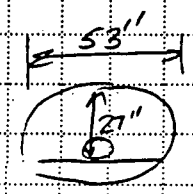
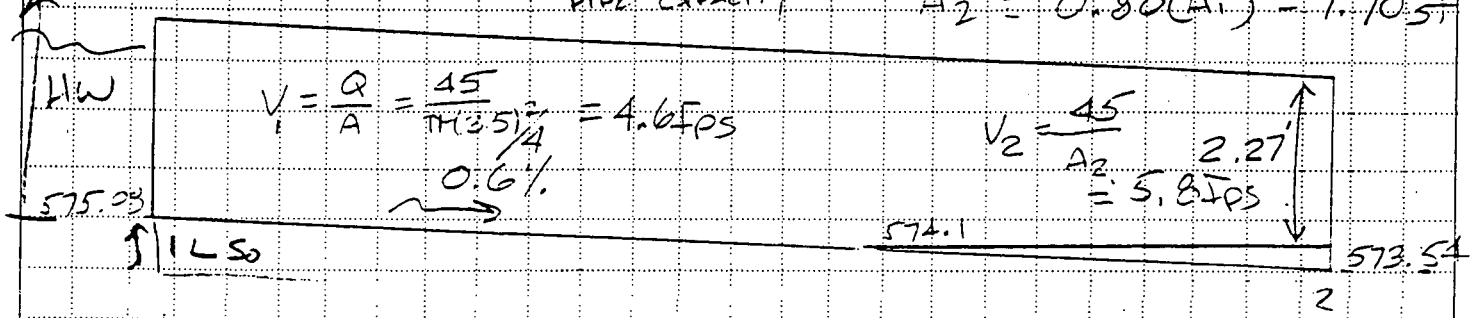
PAGE 5 OF 14			
SUBJECT: REMIA 34"x53" CULVERT		REVISED:	

OUTLET CONTROL

80% OF AREA INCLUDES LOSS OF 10" DIA PIPE CAPACITY

$A_2 =$ 

$A_2 \cong 0.80(A_1) = 7.70\,ft^2$



$V_1 = \frac{Q}{A} = \frac{45}{\pi(3.5)^2/4} = 4.6\,fps$

0.6%

$V_2 = \frac{45}{A_2} = 5.8\,fps$

$$HW = H + h_o - LS_o$$

$$h_o = TW \text{ or } \frac{d_c + D}{2}$$

FROM TW CALCS on F_ of _ TW Depth = 1.95'

CHART 17

$d_c = 1.75$

D = height of culvert opening = 2.25'

$$h_o = \frac{1.75 + 2.25}{2} = 2.0 > 1.95$$

$$LS_o = 0.98' = 575.08 - 574.1$$

$$H = \left[1 + K_e + \frac{29 n^2 L}{R^{1.33}}\right] V^2/2g$$

FROM TABLE 1 ENG CIRCULAR NO. 5

$K_e = 0.5$

$R = D/4$ for 42" DIA. PIPE $= 0.88$ ✓

$n = .013$ concrete

FROM SECTIONAL CHART 80% OF AREA IS AVAILABLE HYDRAULIC RADIUS $= (1.2)(0.88)$

$R = 1.06$

$V = 5.8\,fps$

$L = 258\,ft$

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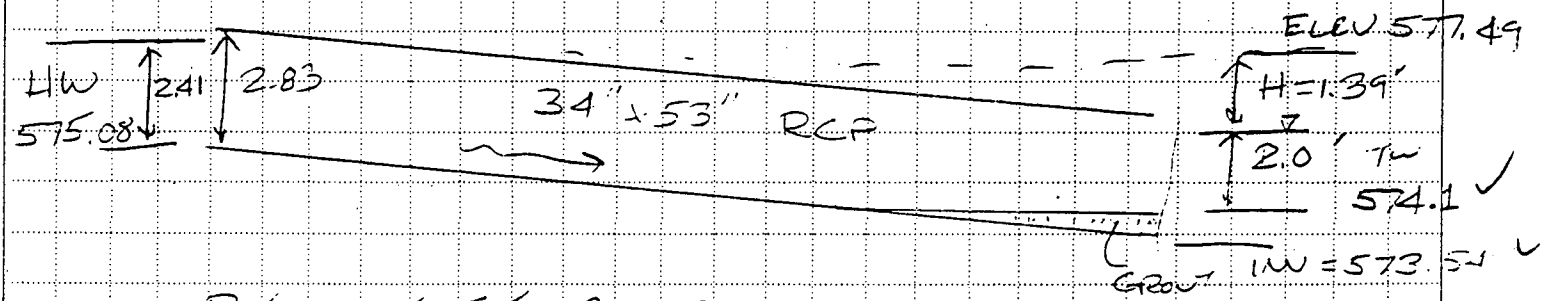
SUBJECT: REMIA 34"x53" CULVERT

$$H = \left[1 + 0.5 + \frac{29(.03)^2(258)}{(1.06)^{1.33}}\right]\frac{(5.8)^2}{2(32.2)}$$

$$= 1.39 \text{ Ft.}$$

$$HW = H + h_o - LS_o$$

$$= 1.39 + 2.0 - 0.98 = 2.41 \text{ Ft.}$$



BY OUTLET CONTROL,

THE HEADWATER ELEVATION DOES NOT

EXCEED THE CULVERT OPENING

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PROJECT NUMBER:	2239		
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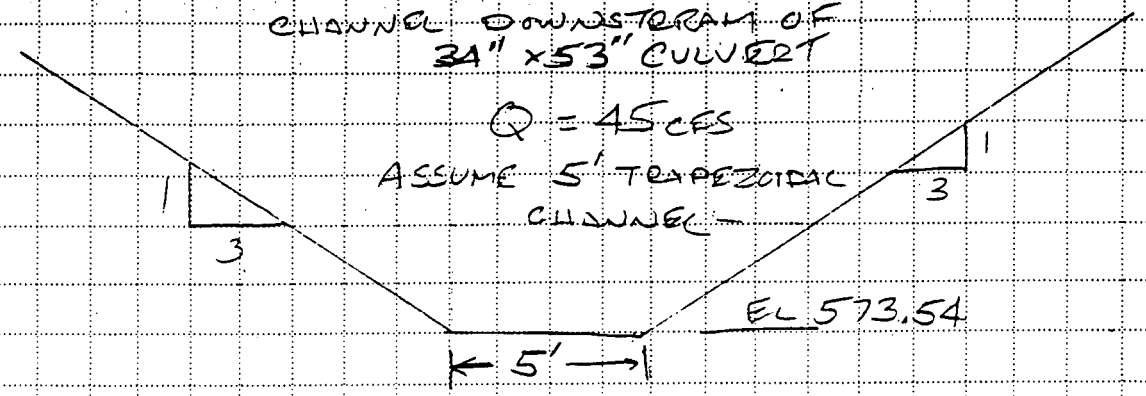
PAGE 7 OF 14			
SUBJECT: REMIA 34"×53" CULVERT		REVISED:	

CALCULATE TAILWATER ELEVATION

CHANNEL DOWNSTREAM OF 34" ×53" CULVERT

Q = 45 CFS

ASSUME 5' TRAPEZOIDAL CHANNEL



n =

S =

TRIAL & ERROR BY MANNINGS' EQUATION
SOLVE FOR DEPTH

D	A	WP	R	$R^{2/3}$	$AR^{2/3}$
1'	8	11.3	0.708	0.79	6.4
2'	22	17.6	1.24	1.16	25.5
1.9'	20.3	17.0	1.19	1.12	22.8

$AR^{2/3}$ = 23.70 @ 45 CFS ✓ using n = 0.035, S = 0.2%

TW DEPTH ≅ 1.95'

TW ELEVATION = 573.54 + 1.95 = 575.49 ✓

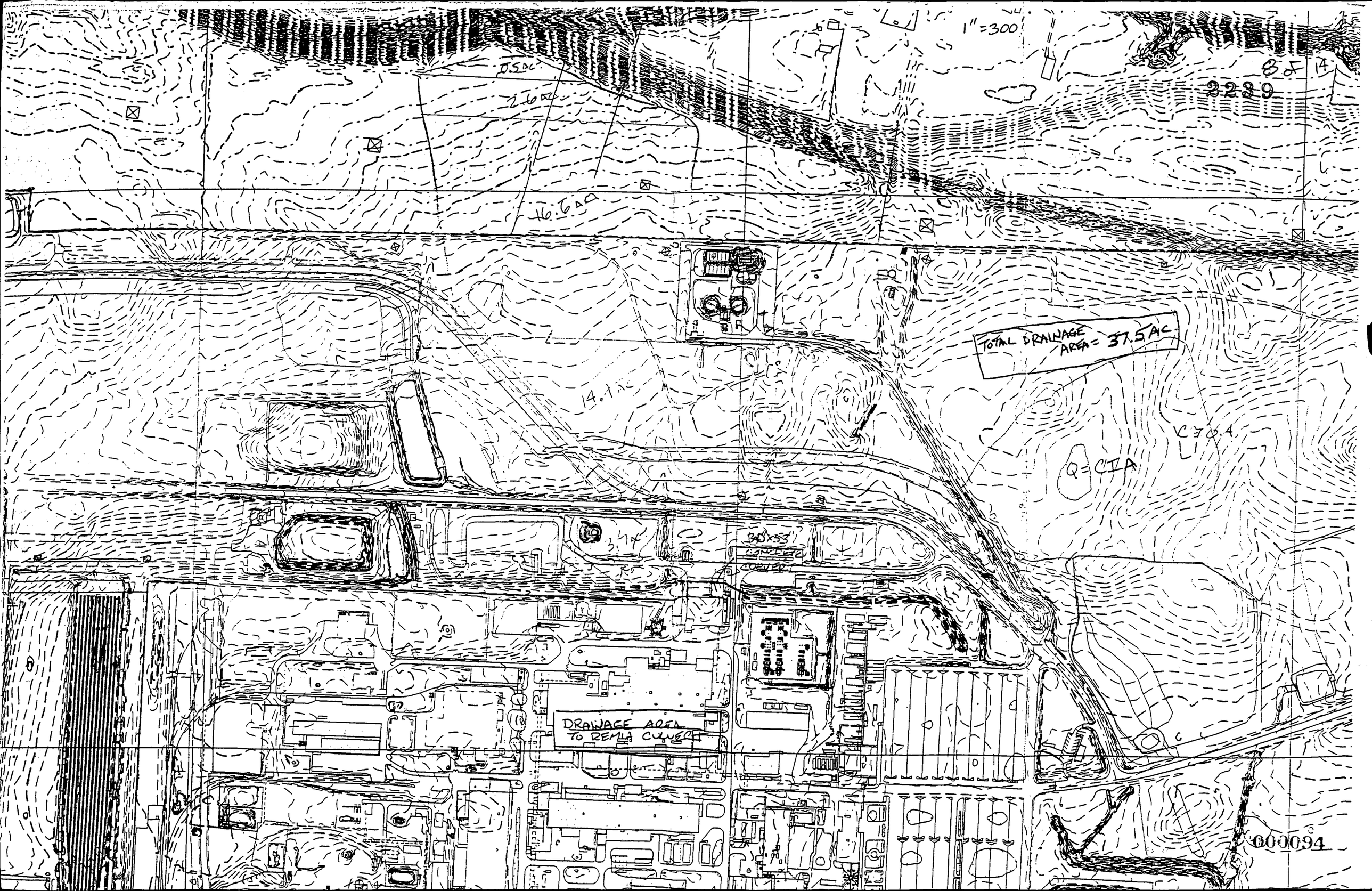
Q_{25} = 45 CFS

n = .035 Friction factor for weeded natural channel

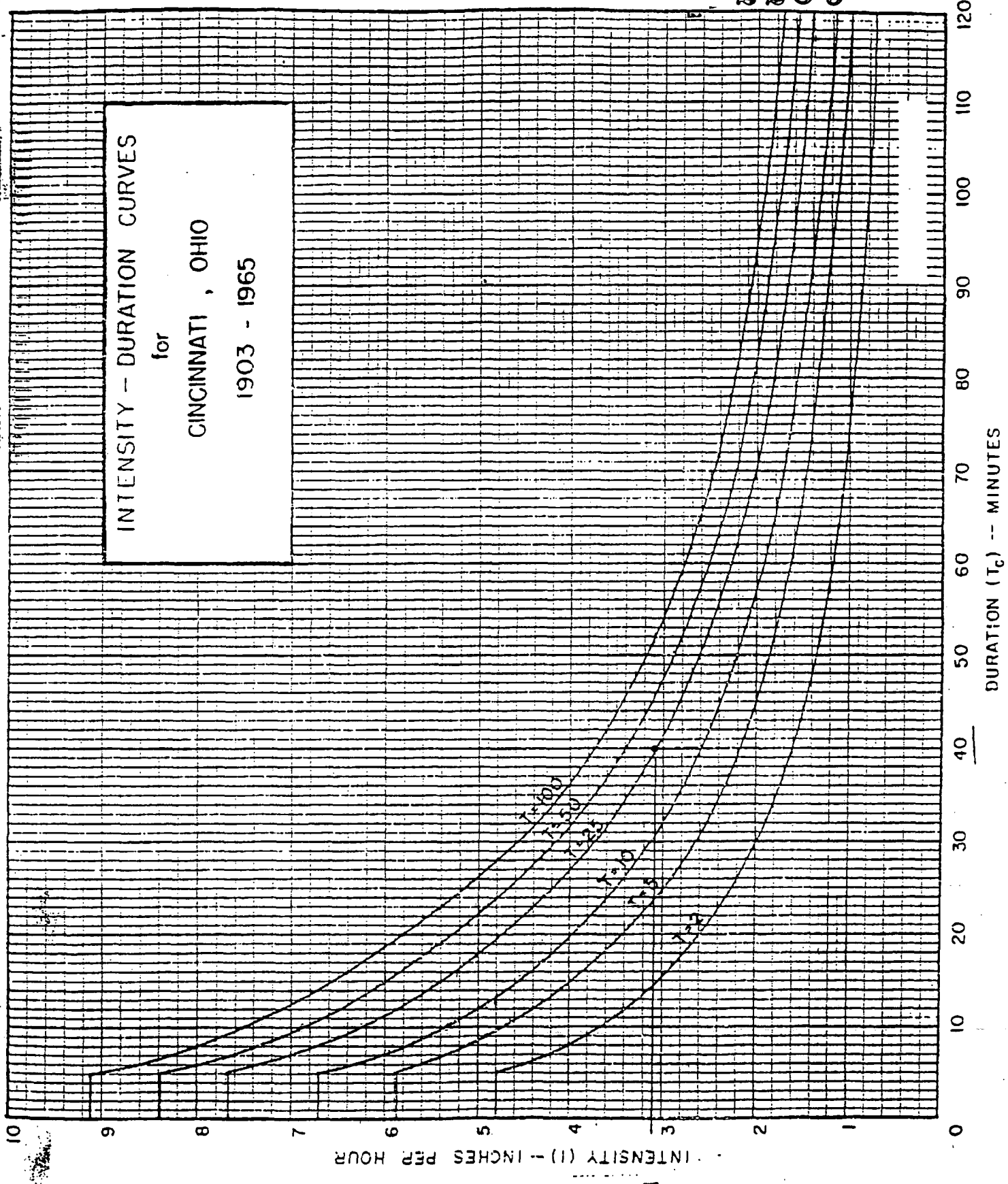
$Q = \frac{1.486}{n} AR^{2/3} S^{1/2}$ ✓

S = ASSUME 0.2%

$AR^{2/3}$ = 23.70


1" = 300
0.5 AC
2.6 AC
16.6 AC
14.1 AC
3.4
TOTAL DRAINAGE AREA = 37.5 AC
C = 0.4
Q = CIA
DRAINAGE AREA TO REMLA CULVERT
2239
000094

2239



3.1

000095

Clarence J. Rayburn 3/9/77	EFFECTIVE DATE 3-77	TITLE INTENSITY-DURATION CURVES CINCINNATI, OHIO	KENTUCKY BUREAU OF HIGHWAYS	EXHIBIT NO 2-504.5

DRAINAGE — RUNOFF — 2

Q = Aci RATIONAL FORMULA (Logical approach). 2239

Q = RUNOFF = Peak discharge of watershed in cubic feet per second (c.f.s.) due to maximum storm assumed. See Figs. A to F, Pg. 18-01 (Usually 10 – 25 years).
A = Area of watershed in acres.
C = Coefficient of runoff, Table B below (Measure of losses due to infiltration, etc.).
i = Intensity of rainfall in inches per hour based on concentration time. See Pg. 1
Concentration time = time required for rain falling at most remote point to reach discharge point. Concentration time may include Overland flow time, Fig. H, Pg. 18-01, and Chan flow time, Pg. 18-05, 18-06, 18-69 and 18-71.

TABLE A-COMPUTATION FORM FOR RATIONAL FORMULA.

LOCATION			A			TIME OF FLOW - MIN.					DESIGN					PROFILE				
STREET	FROM	TO	INCREMENT	TOTAL	C	TO INLET	IN CHANNEL	TIME OF CONC	L *	Q c.f.s.	CHANNEL OR PIPE SIZE	SLOPE ft. per ft.	n	CAPACITY FULL c.f.s.	V ft. per sec.	LENGTH ft.	FALL ft.	OTHER LOSSES ft. †	INV. ELEV. UPPER END	IN ELE LOW EN
FIRST ST.	A	B	1.8	1.8	.44	16.5	0.3	16.5	3.8	3.0	15"	.008	.015	4.6	3.9	60	0.48	0	82.00	81.5
MAIN RD.	B	C	1.9	3.7	.50		2.5	16.8	3.7	6.8	D-2	.011	.030	12.0	2.8	420	4.62	0	81.52	76.9
" – "	C	D	2.0	5.7	.50		1.8	19.3	3.5	10.0	21"	.007	.015	11.1	4.5	480	3.36	2.20	74.70	70.

* Note that the sequence of design as in example, Fig. J, Pg. 18-01 involves trial assumptions in determining i.
† Fall in manhole.

TABLE B – VALUES OF $C = \frac{RUNOFF}{RAINFALL}$

SURFACES			VALUE PROPOSED MIN.	VALUE PROPOSED MAX.	VALUE BY OTHER AUTHORITY MIN.	VALUE BY OTHER AUTHORITY MAX.
ROOFS, slag to metal.			0.90	1.00	0.70	0.95
PAVEMENTS	Concrete or Asphalt.		0.90	1.00	0.95	1.00
	Bituminous Macadam, open and closed type.		0.70	0.90	0.70	0.90
	Gravel, from clean and loose to clayey and compact.		0.25	0.70	0.15	0.30
R.R. YARDS			0.10	0.30	0.10	0.30
EARTH SURFACES	SAND, from uniform grain size, no fines, to well graded, some clay or silt.	Bare	0.15	0.50	0.01	0.55
		Light Vegetation	0.10	0.40	0.01	0.55
		Dense Vegetation	0.05	0.30	0.01	0.55
	LOAM, from sandy or gravelly to clayey.	Bare	0.20	0.60		
		Light Vegetation	0.10	0.45		
		Dense Vegetation	0.05	0.35		
	GRAVEL, from clean gravel and gravel sand mixtures, no silt or clay to high clay or silt content.	Bare	0.25	0.65		
		Light Vegetation	0.15	0.50		
		Dense Vegetation	0.10	0.40		
	CLAY, from coarse sandy or silty to pure colloidal clays.	Bare	0.30	0.75	0.10	0.70
		Light Vegetation	0.20	0.60	0.10	0.70
		Dense Vegetation	0.15	0.50	0.10	0.70
COMPOSITE AREAS	City, business areas.		0.60	0.75	0.60	0.95
	City, dense residential areas, vary as to soil and vegetation.		0.50	0.65	0.30	0.60
	Suburban residential areas. " " "		0.35	0.55	0.25	0.40
	Rural Districts, " " "		0.10	0.25	0.10	0.25
	Parks, Golf Courses, etc., " " "		0.10	0.35	0.05	0.25

NOTE: Values of "C" for earth surfaces are further varied by degree of saturation, compaction, surface irregularity and slope, by character of subsoil, and by presence of frost or glazed snow or ice.

① Bryant & Kuichling, Report, Back Bay Sewerage District, Boston, 1909.
② Metcalf and Eddy, American Sewerage Practice, 1928. Mc Graw-Hill.
③ Used by City of Boston, reported by Metcalf & Eddy.
④ Used by City of Detroit, reported by Metcalf & Eddy.
⑤ L.C. Urquhart, Civil Engineering Handbook, 1940. Mc Graw-Hill.

DRAINAGE — RUNOFF — I

2239

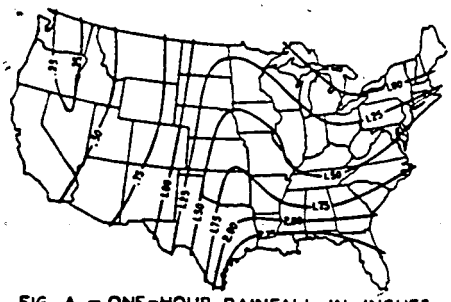


FIG. A. - ONE-HOUR RAINFALL, IN INCHES, TO BE EXPECTED ONCE IN 2 YEARS.

FIG. B. - ONE-HOUR RAINFALL, IN INCHES, TO BE EXPECTED ONCE IN 10 YEARS.

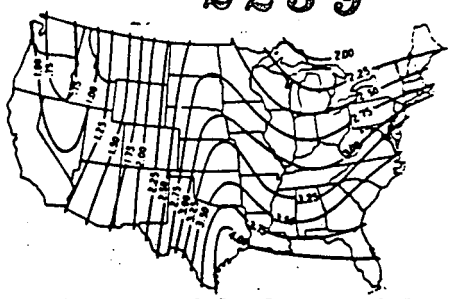


FIG. C. - ONE-HOUR RAINFALL, IN INCHES, TO BE EXPECTED ONCE IN 50 YEARS.

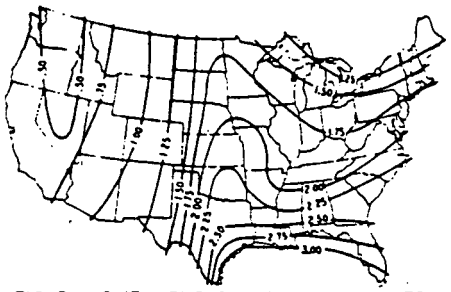


FIG. D. - ONE-HOUR RAINFALL, IN INCHES, TO BE EXPECTED ONCE IN 5 YEARS.

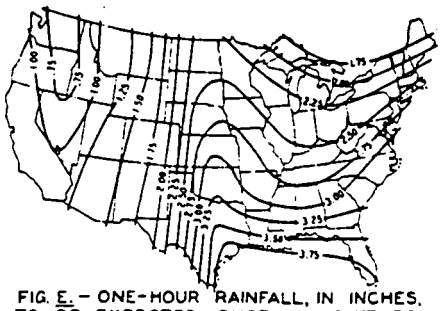


FIG. E. - ONE-HOUR RAINFALL, IN INCHES, TO BE EXPECTED ONCE IN 25 YEARS.

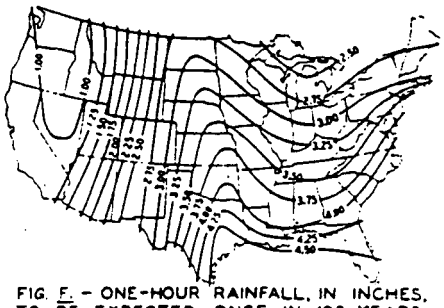


FIG. F. - ONE-HOUR RAINFALL, IN INCHES, TO BE EXPECTED ONCE IN 100 YEARS.

COMPUTATION OF i IN RATIONAL FORMULA.

EXAMPLE: Assume expectancy period = 5 years, See Fig. D. assume locality, find 1 hour intensity = 1.75 in. per hour.

FIG. G-INTENSITY EXPECTATION FOR ONE-HOUR RAINFALL.

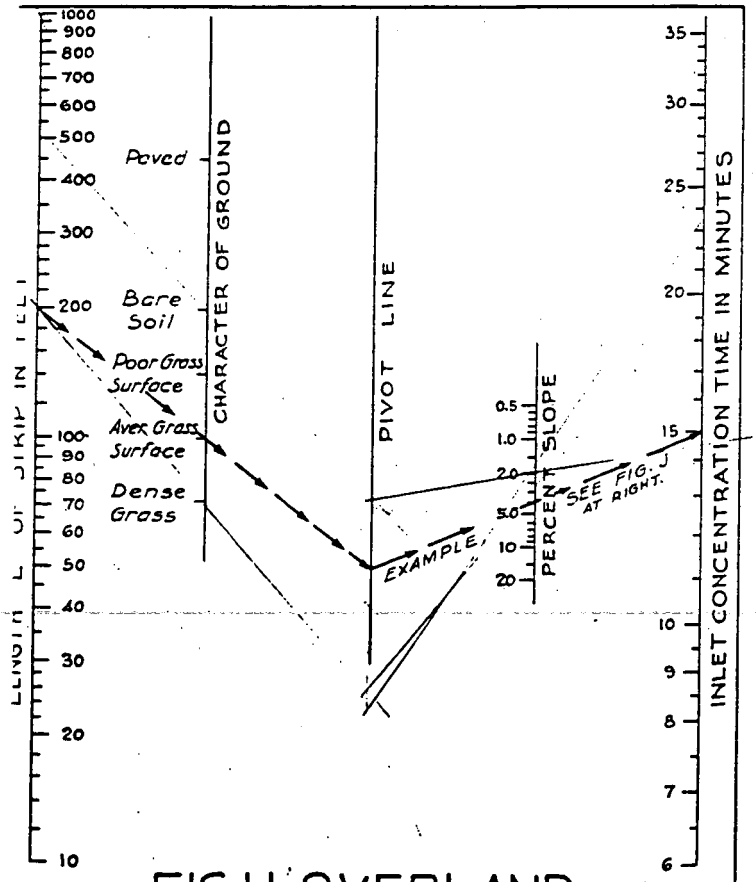


FIG. H-OVERLAND FLOW TIME.

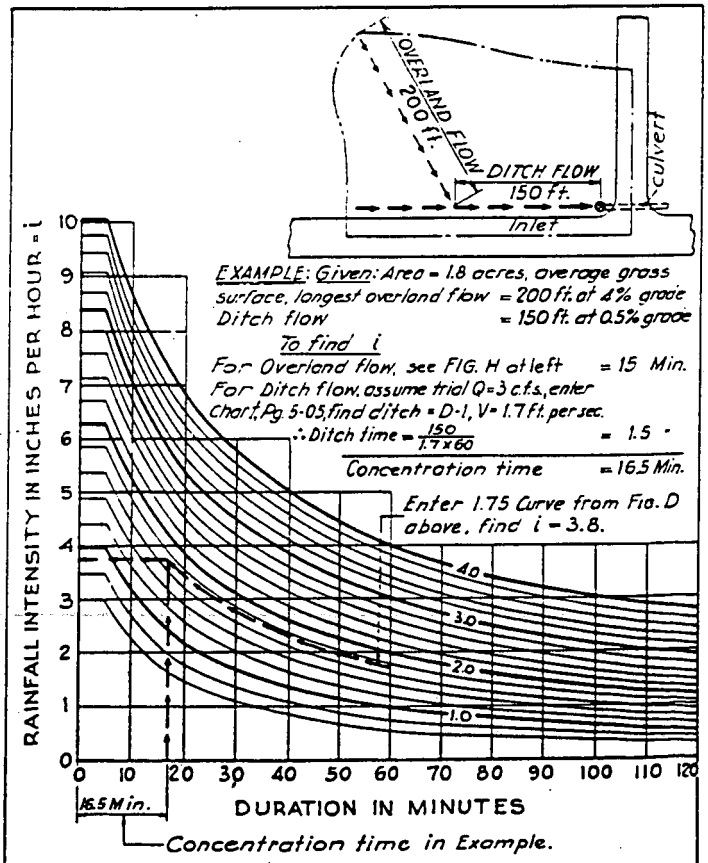


FIG. J-VALUES OF i RAINFALL INTENSITY-DURATION.

Reproduced from Miscellaneous Publication NO. 204, U.S. Dept. of Agriculture, by David L. Yarnell. Adopted from Engineering Manual of the War Department, Part XIII, Chap. I, Dec. '45.

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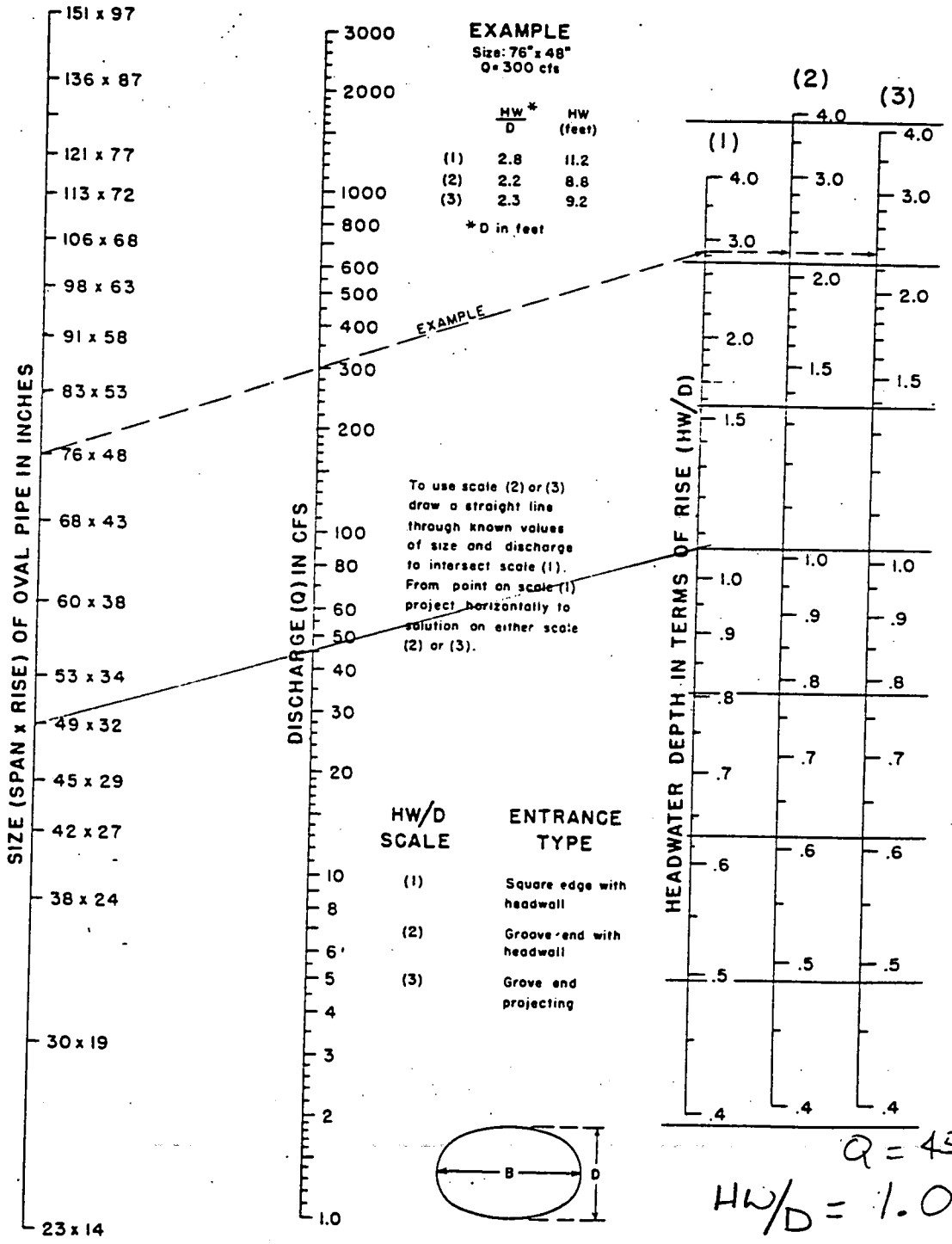
CHART 3



Q = 45 CFS

HW/D = 1.06 ✓

D = 2.83'

HEADWATER DEPTH FOR
OVAL CONCRETE PIPE CULVERTS
LONG AXIS HORIZONTAL
WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

000098

HW = 2.99'

5-23

INVERT ELEV = 575.08

OVERT ELEV. = 577.9

HW ELEV. = 578.07 ✓

PIPE FLOWING FULL & INVERT

2239

TABLE 1 - ENTRANCE LOSS COEFFICIENTS

Outlet Control, Full or Partly Full

Entrance head loss $H_e = k_e \frac{V^2}{2g}$

Type of Structure and Design of Entrance	Coefficient k_e
Pipe, Concrete	
Projecting from fill, socket end (groove-end) . . .	0.2
Projecting from fill, sq. cut end	0.5
Headwall or headwall and wingwalls	
Socket end of pipe (groove-end)	0.2
Square-edge	0.5
Rounded (radius = 1/12D)	0.2
Mitered to conform to fill slope	0.7
*End-Section conforming to fill slope	0.5
Beveled edges, 33.7° or 45° bevels	0.2
Side-or slope-tapered inlet	0.2
Pipe, or Pipe-Arch, Corrugated Metal	
Projecting from fill (no headwall)	0.9
Headwall or headwall and wingwalls square-edge . .	0.5
Mitered to conform to fill slope, paved or unpaved slope	0.7
*End-Section conforming to fill slope	0.5
Beveled edges, 33.7° or 45° bevels	0.2
Side-or slope-tapered inlet	0.2
Box, Reinforced Concrete	
Headwall parallel to embankment (no wingwalls)	
Square-edged on 3 edges	0.5
Rounded on 3 edges to radius of 1/12 barrel dimension, or beveled edges on 3 sides . . .	0.2
Wingwalls at 30° to 75° to barrel	
Square-edged at crown	0.4
Crown edge rounded to radius of 1/12 barrel dimension, or beveled top edge	0.2
Wingwall at 10° to 25° to barrel	
Square-edged at crown	0.5
Wingwalls parallel (extension of sides)	
Square-edged at crown	0.7
Side-or slope-tapered inlet	0.2

*Note: "End Section conforming to fill slope," made of either metal or concrete, are the sections commonly available from manufacturers. From limited hydraulic tests they are equivalent in operation to a headwall in both inlet and outlet control. Some end sections, incorporating a closed taper in their design have a superior hydraulic performance. These latter sections can be designed using the information given for the beveled inlet, p. 5-13.

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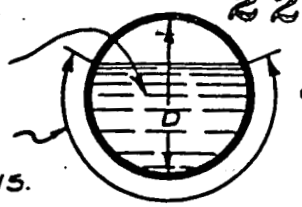
a = Cross-sectional area of waterway

p = wetted perimeter

$R = \frac{a}{p}$ = Hydraulic radius.

SECTION OF ANY OPEN CHANNEL



For pipes full or half-full

$R = \frac{D}{4}$

SECTION OF CIRCULAR PIPE

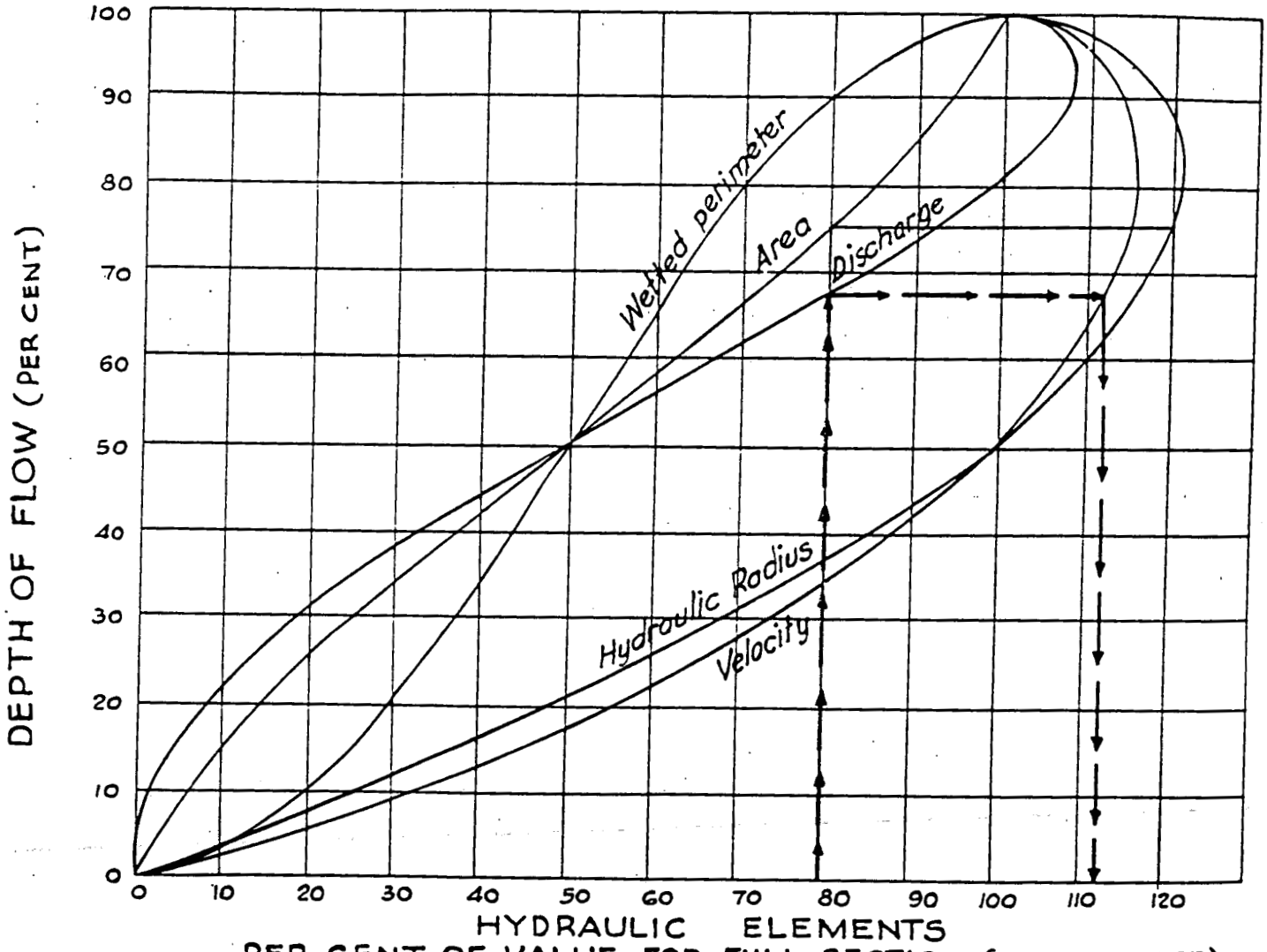
V = Average or mean velocity in feet per second.

Q = a V = Discharge of pipe or channel in cubic feet per second (c.f.s.).

n = Coefficient of roughness of pipe or channel surface, see Table A-Pg.18-68.

S = Slope of Hydraulic Gradient (water surface in open channels or pipes not under pressure, same as slope of channel or pipe invert only when flow is uniform in constant section.

FIG. A-HYDRAULIC ELEMENTS OF CHANNEL SECTIONS.



EXAMPLE: Given: Discharge = 12 c.f.s. through a pipe which has capacity flowing full of 15 c.f.s. at a velocity of 7.0 ft. per sec. Required to find V for Q = 12 c.f.s. ∴ Percentage of full discharge = $\frac{12}{15}$ = 80%. Enter chart at 80% of value for full section of Hydraulic Elements, find V = 112.5% × 7 = 7.9 ft. per sec.

FIG. B-VALUES OF HYDRAULIC ELEMENTS OF CIRCULAR SECTION FOR VARIOUS DEPTHS OF FLOW.

RCI/DCN FORM 2239

REQUEST FOR CLARIFICATION OF INFORMATION / DESIGN CHANGE NOTICE -

(1)WP / WO NO.: 20102	(2)S/C NO.: FSC-614	(5)Pg 1 OF 6	(6)DATE 5/13/99
(3)S/C TITLE: OSDF Phase II		(11)RCI NO.:	
(4) RESPONSIBLE DISCIPLINE: E ☒ M ☐ C ☐ OTHER ☐	(4A)RCI/DCN TITLE:ON-SITE DISPOSAL FACILITY PROJECT; SYSTEMS PLAN 20100-PL-008 Revision 0 May 1997	(11)DCN NO.: 1702-060	

(7)DOCUMENTS AFFECTED	(7)DOCUMENT NOS.	(7)REV.	(8)OTHER
SYSTEMS PLAN SECTION 3.0	OSDF 20100-PL-008 May 1997	0	
Leachate Conveyance and Transmission System Gravity Line and Manhole Mechanical Details I	90X6000-M-00063	0	
Leachate Conveyance and Transmission System Gravity Line and Manhole Mechanical Details II	90X6000-M-00064	0	
Leachate Conveyance and Transmission System Lift Station Mechanical Details III	90X6000-M-00067	0	

(9) RCI - INQUIRY ☐ USQD SCREENING BY PROJECT ENGINEER (9) ☒ DCN - JUSTIFICATION, EXISTING CONDITION & REQUESTED/PROPOSED CHANGE

- Systems Plan needs to be changed to reflect operation and maintenance of Leachate Collection System by FDF. ATTACHED IS REV. 1A, MAY 1999
- Systems Plan requires water level monitoring without entry into manholes. SEE ATTACHED FIGURES PAGES 2 OF 6 THRU 6 OF 6

(10)REQUESTOR: Lday Kumtheber COMPANY: FDF DATE: 5/18/99 | (12)CE / PE James C. Jenkins FDF DATE: 5/18/99

(13)RESPONSE: FOR RCI, IS A DCN REQ'D? ☐NO ☐YES (14) FOR DCN: ☒APPROVED ☐APPROVED AS NOTED ☐DISAPPROVED

GeoSyntec

RCI - DCN ACCEPTANCE

(15)DESIGN ORGANIZATION APPROVAL/DISAPPROVAL: James Burnett DATE: 5/18/99 N/A☐FIT ☐FORM ☐FUNCTION | (20)CHARGE NO. FOR CADD SERVICES TO INCORPORATE: 2DSU3

(16)FDF PE ACCEPTANCE & VERIFICATION THAT ALL REQUIRED REVIEWS ARE COMPLETE: (DCN ONLY) DATE: 5/18/99
James Jenkins
PERFORMANCE GRADE: (17) N/A James C. Jenkins

(18)CONSTRUCTION CONCURRENCE: DATE: | (21)WORK COMPLETED: (SIGNOFF BY CE OR PE) DATE:
R. Mc Guire
PURCHASE REQUISITION REQUIRED: ☐XYES ☐NO (19)
for

000101

FS-F-4259
REV. 4: 02/16/98

G:\DCNS\osdf1702-060.wpd

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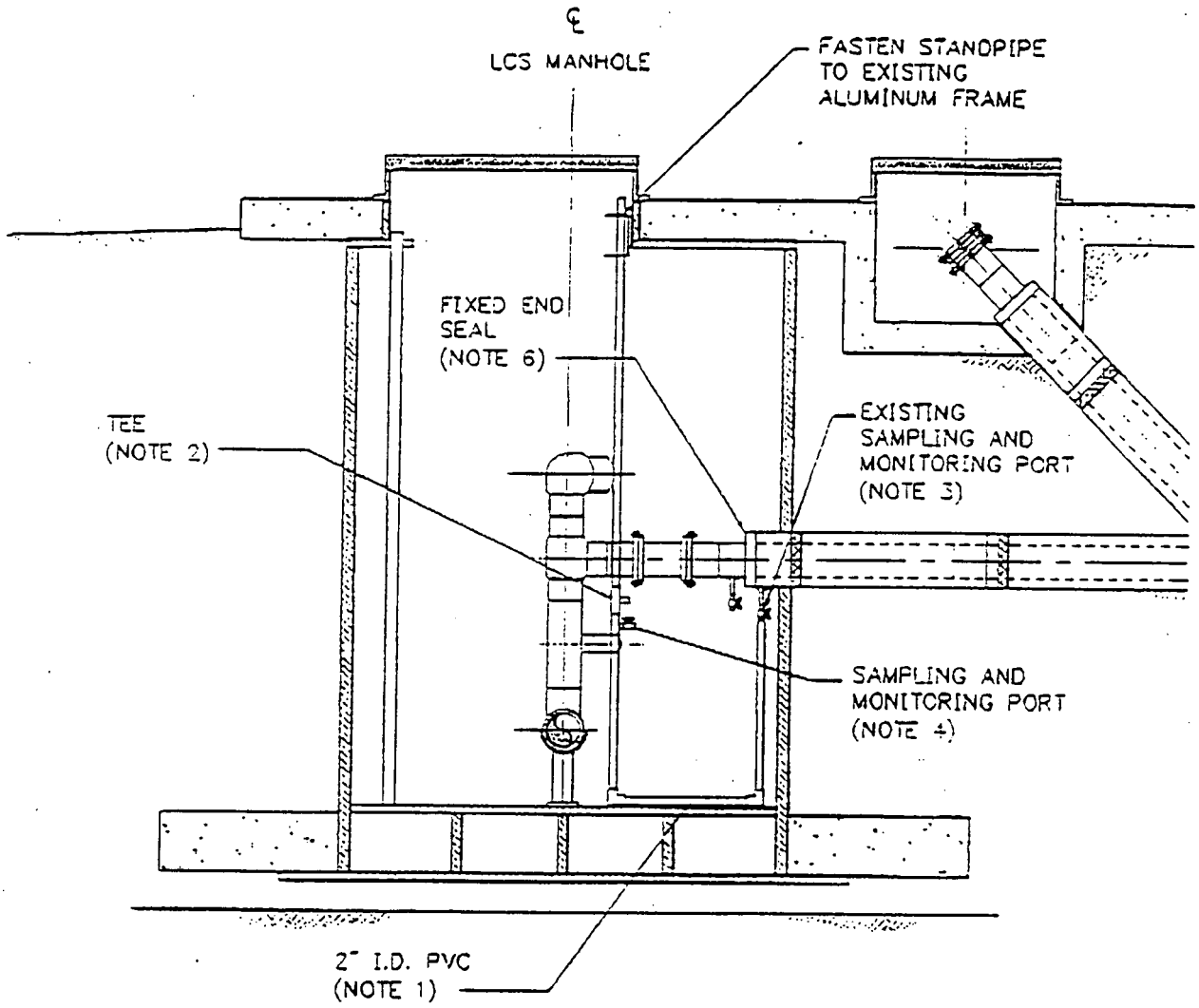
MONITORING LCS CONTAINMENT PIPE AT MANHOLE



NOTES:

1. ATTACH 2 IN. PVC STAND PIPE TO MONITORING PORT OF LCS CONTAINMENT PIPE. FASTEN STANDPIPE TO EXISTING FRAME OF ACCESS COVER. PROVIDE ADDITIONAL SUPPORT AS NEEDED.
2. INSTALL A 90 DEGREE TEE ABOVE TRIGGER ELEVATIONS FOR THE ALARM AND BELOW THE ELEVATION OF THE BOTTOM OF THE LCS CONTAINMENT PIPE.
3. EXISTING SAMPLING AND MONITORING PORTS MAY BE REMOVED.
4. INSTALL SAMPLING AND MONITORING PORT BETWEEN TEE AND CONTAINMENT PIPE. LOCATION TO BE SELECTED IN FIELD TO FACILITATE OPERATION OF SYSTEM.
5. INSTALL SIMILAR STANDPIPES ON LDS, LTS, AND REDUNDANT LCS CONTAINMENT PIPES.
6. FILL ANY PERFORATIONS IN END SEALS OF CONTAINMENT PIPE.

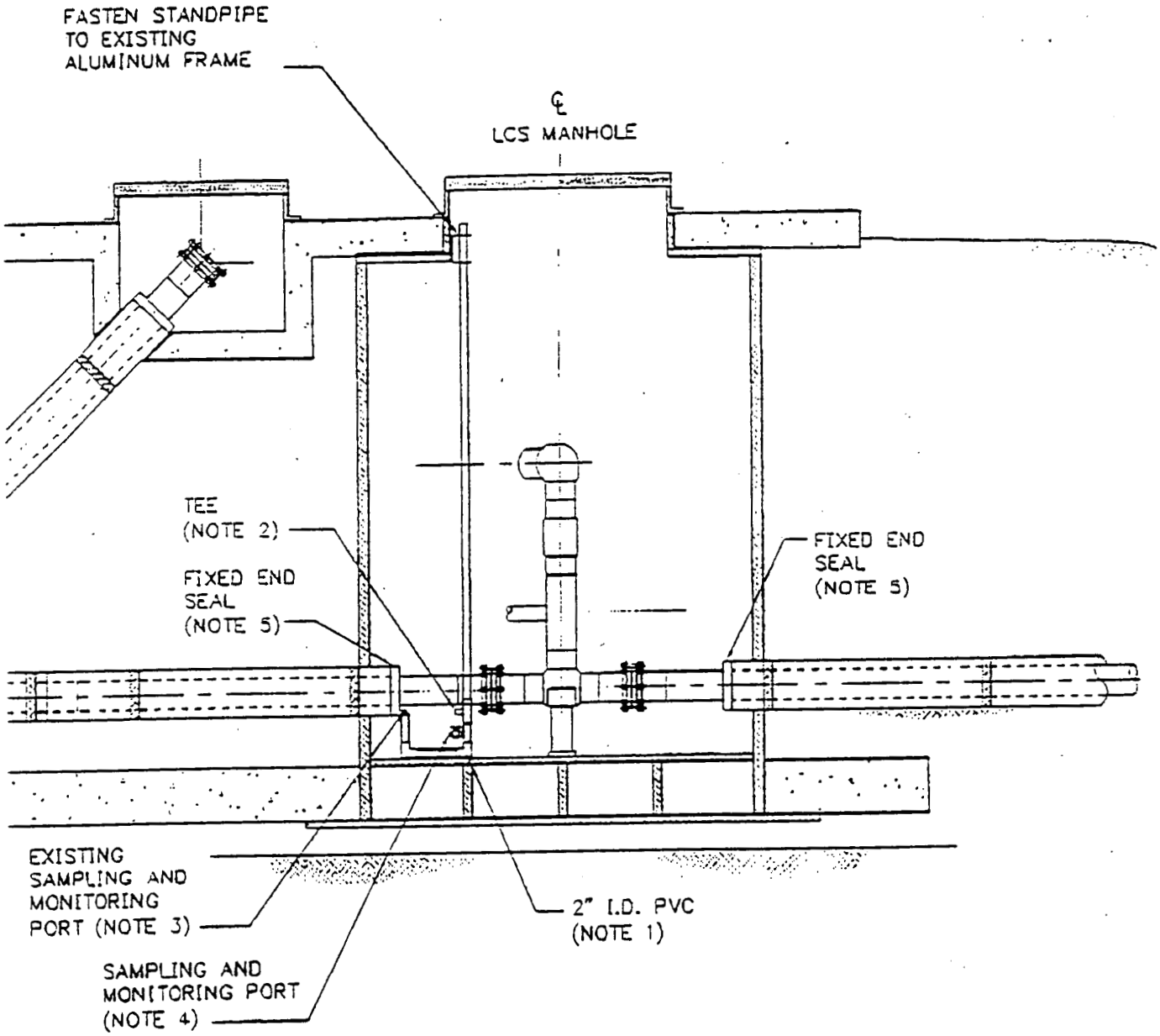
000102

SHEET 2 OF 6 DCN 1702-060

	FIGURE NO. 1
	PROJECT NO.
	DOCUMENT NO.
	FILE NO.

2239

MONITORING LTS CONTAINMENT PIPE AT MANHOLE



NOTES:

1. ATTACH 2 IN. PVC STAND PIPE TO MONITORING PORT OF LTS CONTAINMENT PIPE. FASTEN STANDPIPE TO EXISTING FRAME OF ACCESS COVER. PROVIDE ADDITIONAL SUPPORT AS NEEDED.
2. INSTALL A 90 DEGREE TEE ABOVE TRIGGER ELEVATIONS FOR THE ALARM AND BELOW THE ELEVATION OF THE BOTTOM OF THE LTS CONTAINMENT PIPE.
3. EXISTING SAMPLING AND MONITORING PORTS MAY BE REMOVED.
4. INSTALL SAMPLING AND MONITORING PORT BETWEEN TEE AND CONTAINMENT PIPE. LOCATION TO BE SELECTED IN FIELD TO FACILITATE OPERATION OF SYSTEM.
5. FILL ANY PERFORATIONS IN END SEALS OF CONTAINMENT PIPE.

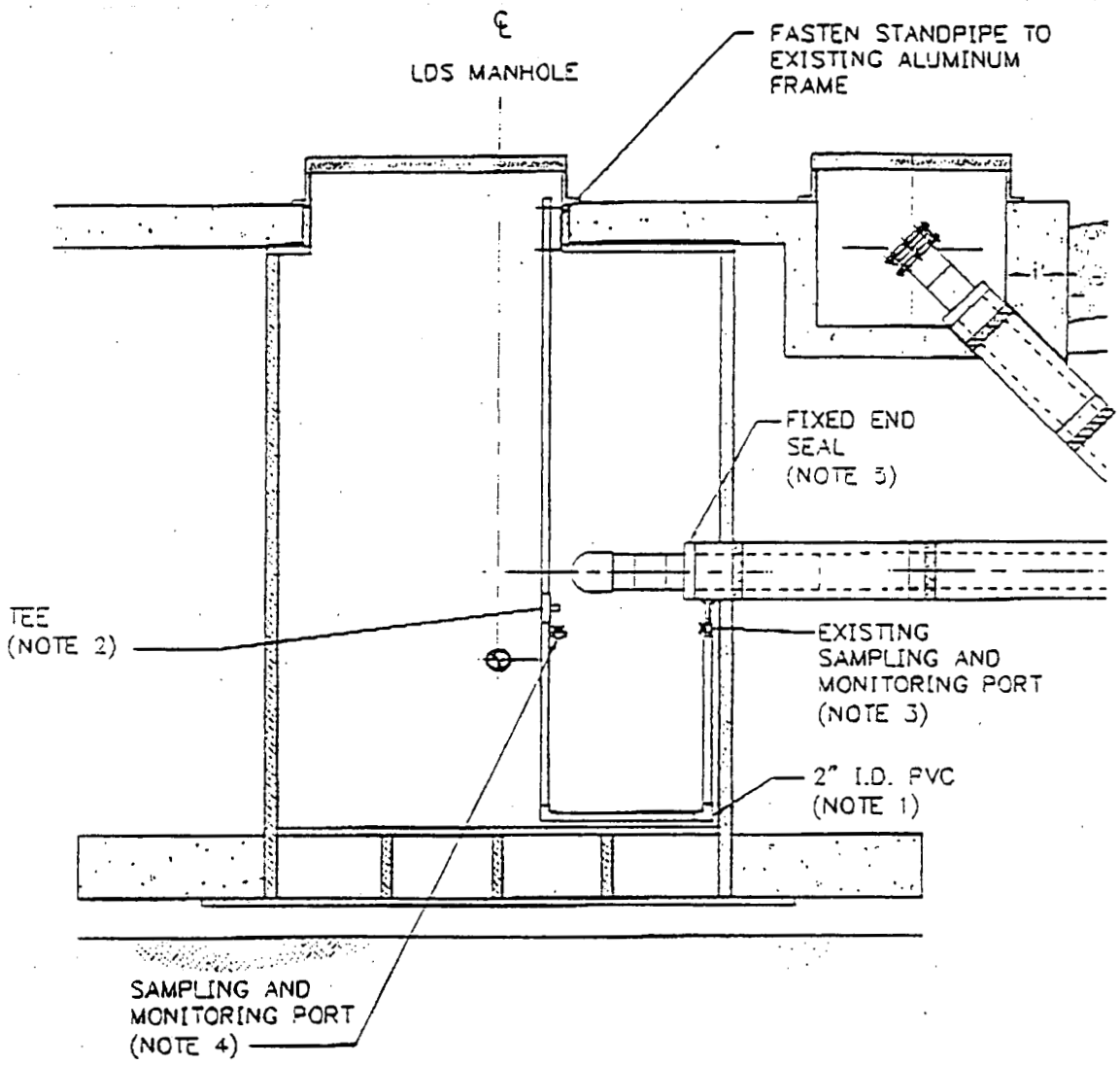
SHEET 3 OF 6 000103

DCN 1702-060

	FIGURE NO. 2
	PROJECT NO.
	DOCUMENT NO.
	FILE NO.

2239

MONITORING LDS CONTAINMENT PIPE AT MANHOLE



NOTES:

1. ATTACH 2 IN. PVC STAND PIPE TO MONITORING PORT OF LDS CONTAINMENT PIPE. FASTEN STANDPIPE TO EXISTING FRAME OF ACCESS COVER. PROVIDE ADDITIONAL SUPPORT AS NEEDED.
2. INSTALL A 90 DEGREE TEE ABOVE TRIGGER ELEVATIONS FOR THE ALARM AND BELOW THE ELEVATION OF THE BOTTOM OF THE LDS CONTAINMENT PIPE.
3. EXISTING SAMPLING AND MONITORING PORTS MAY BE REMOVED.
4. INSTALL SAMPLING AND MONITORING PORT BETWEEN TEE AND CONTAINMENT PIPE. LOCATION TO BE SELECTED IN FIELD TO FACILITATE OPERATION OF SYSTEM.
5. FILL ANY PERFORATIONS IN END SEALS OF CONTAINMENT PIPE.

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DCN 1702-060

FIGURE NO.	3
PROJECT NO.	
DOCUMENT NO.	
FILE NO.	

MONITORING LTS CONTAINMENT PIPE AT PERMANENT LIFT STATION

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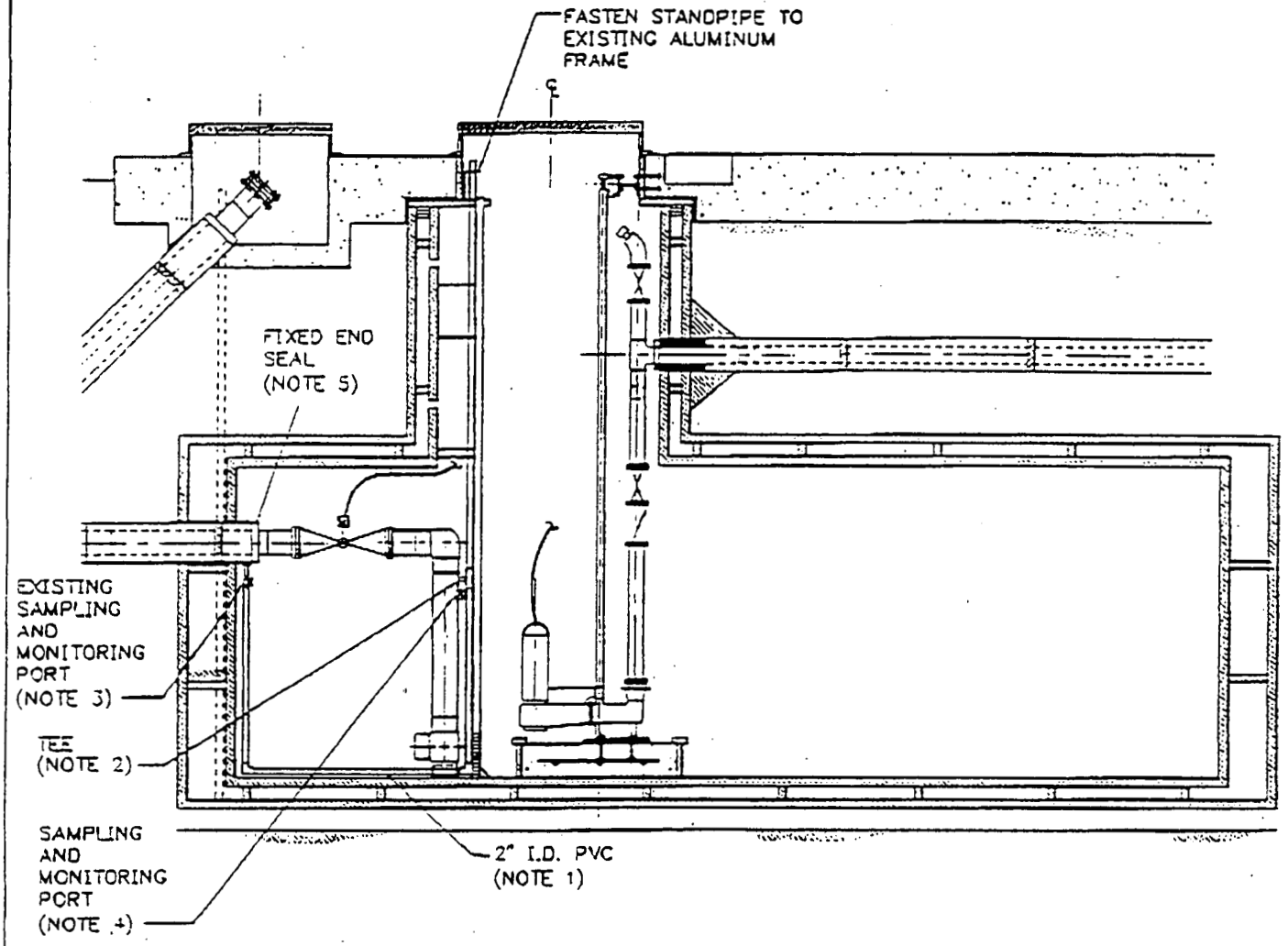


NOTES:

1. ATTACH 2 IN. PVC STAND PIPE TO MONITORING PORT OF LTS CONTAINMENT PIPE. FASTEN STANDPIPE TO EXISTING FRAME OF ACCESS COVER. PROVIDE ADDITIONAL SUPPORT AS NEEDED.
2. INSTALL A 90 DEGREE TEE ABOVE TRIGGER ELEVATIONS FOR THE ALARM AND BELOW THE ELEVATION OF THE BOTTOM OF THE LTS CONTAINMENT PIPE. INSTALL A SCREEN ON TEE.
3. EXISTING SAMPLING AND MONITORING PORTS MAY BE REMOVED.
4. INSTALL SAMPLING AND MONITORING PORT BETWEEN TEE AND CONTAINMENT PIPE. LOCATION TO BE SELECTED IN FIELD TO FACILITATE OPERATION OF SYSTEM.
5. FILL ANY PERFORATIONS IN END SEALS OF CONTAINMENT PIPE.

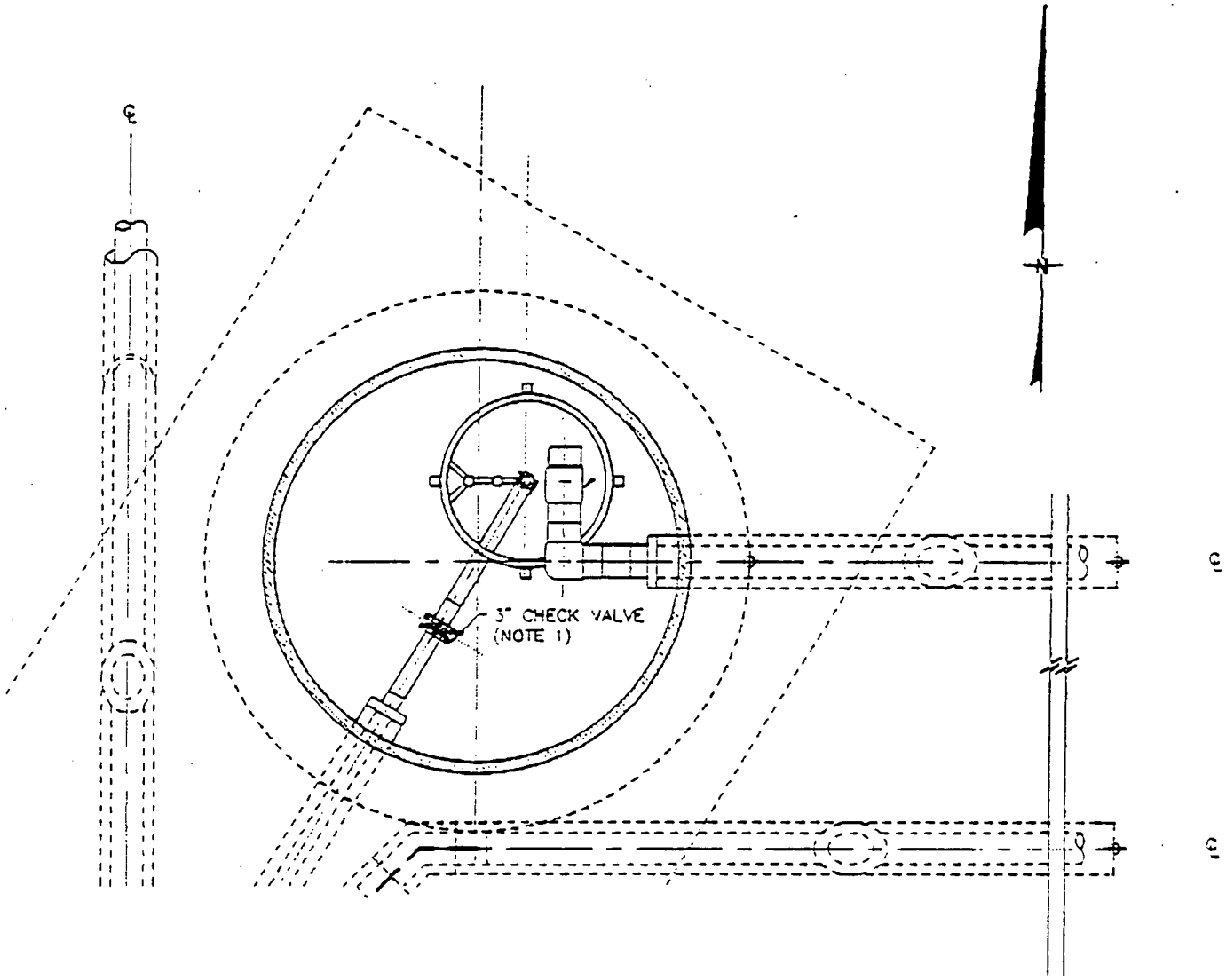
000105

SHEET 5 OF 6

PCN 1702-060

	FIGURE NO. 4
	PROJECT NO.
	DOCUMENT NO.
	FILE NO.

VALVE REPLACEMENT AT LDS MANHOLE 2239



NOTE:

1. REPLACE EXISTING 3" CHECK VALVE WITH MANUAL OPERATED BLOCK VALVE. ATTACH ROD EXTENSION TO VALVE STEM. ROD EXTENSION SHALL BE LONG ENOUGH TO BE ACCESSIBLE FROM EXTERIOR OF ACCESS PORT. FASTEN ROD EXTENSION TO EXISTING ALUMINUM FRAME OF ACCESS COVER AS NEEDED.

SHEET 6 of 000106
DCN 1702-060

	FIGURE NO. 5
	PROJECT NO.
	DOCUMENT NO.
	FILE NO.

SYSTEMS PLAN

ON-SITE DISPOSAL FACILITY PROJECT

20100-PL-008

Revision ~~0~~1A

May 19~~97~~9

Prepared By:

Fluor Daniel Fernald
Fernald, Ohio
Under Contract DE-AC05-92OR21972

United States Department of Energy

Fernald Environmental Management Project
Fernald, Ohio

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Table 6-1 Access Roads Inspection and Maintenance Activities 6-2

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Figure 1-1 OSDF Liner System and Final Cover System Design 1-2

ATTACHMENTS

ATTACHMENT A: Owner's Manuals for Leachate Management System Equipment (to be provided by the Subcontractor as Part of Construction Acceptance)

ATTACHMENT B: Owner's Manuals for Decontamination Facilities (to be Provided by the Subconstruction Contractor as Part of Construction Acceptance)

1.0 INTRODUCTION

1.1 OVERVIEW

This Systems Plan describes the inspection, monitoring, and maintenance activities that will be undertaken at the Fernald Environmental Management Project (FEMP) On-Site Disposal Facility (OSDF), Fernald, Ohio. These activities apply to the leachate management system, final cover system, temporary facilities, and access roads within the battery limit of the OSDF.

This plan addresses the systems activities to be implemented throughout construction, material placement, and closure of the OSDF. The inspection, monitoring, and maintenance activities for the 30 year post-closure monitoring period prescribed in the *Final Record of Decision for Remedial Actions at Operable Unit 2 (OU2 ROD)* [DOE, 1995a] will be addressed in the *OSDF Post-Closure Care and Inspection Plan* [FDF, 1997]. Inspection, monitoring, and maintenance activities beyond the 30 year post-closure monitoring period will be addressed through future amendments to this plan and the *OSDF Post-Closure Care and Inspection Plan.*

1.2 PROJECT DESCRIPTION

The OSDF will be constructed to contain impacted materials derived from remediation of the operable units at the FEMP. All material destined for OSDF disposal will be required to meet OSDF waste acceptance criteria (WAC). The OU2 ROD has established an initial WAC for the OSDF of 346 pico Curies/gram (pCi/g) of uranium-238 (U-238) or 1,030 parts per million (ppm) total uranium. The estimated total volume of material destined for OSDF disposal is 2.5 million cubic yards (1.9 million cubic meters) bank/unbulked. Approximately 80 percent of this material is impacted soil, with the remainder consisting of building demolition rubble, fly ash, lime sludge, municipal solid waste, and small quantities of miscellaneous other materials.

The design approach for the OSDF is presented in the document, *"Final Remedial Design Work Plan for Remedial Actions at Operable Unit 2"* [DOE, 1995b]. The design of the OSDF, as currently developed, is presented in the *"Final Design Package, On-Site Disposal Facility"* [GeoSyntec, 1997a]. The design of the OSDF includes a liner systems, placement of impacted material, final cover systems, leachate management systems, surface-water management systems, and other ancillary features. The liner and final cover systems details for the OSDF are shown in Figure 1-1.

LINER AND COVER SYSTEM DESIGN
ON-SITE DISPOSAL FACILTY

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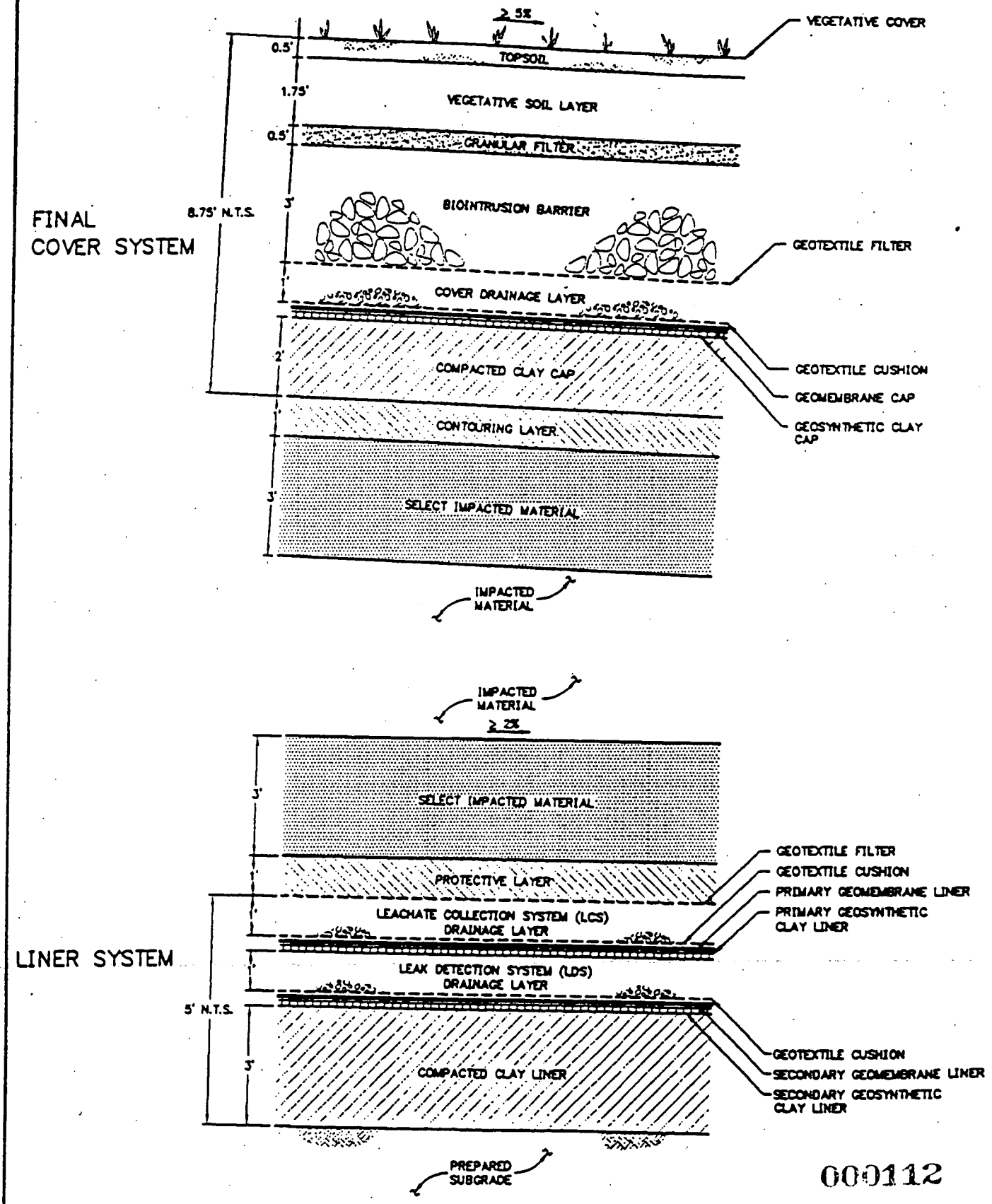

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GEOSYNTEC CONSULTANTS
ATLANTA, GEORGIA

FIGURE NO.	1-1
PROJECT NO.	GE3900-6.1
DOCUMENT NO.	F9530007.CDG
FILE NO.	F95a001.DWG

1.3 PLAN SCOPE

This OSDF Systems Plan establishes the inspection, monitoring, and maintenance activities necessary to achieve the proper performance of the OSDF. The scope of this plan includes:

- Maintaining the OSDF throughout construction, impacted material placement and closure of the OSDF. (While the Systems Plan also includes procedures to be used to maintain the OSDF in the 30 year post-closure monitoring period, those post closure activities are presented for illustrative purposes only, as post closure activities are addressed in a separate *Post-Closure Care and Inspection Plan*);
- Inspecting, and monitoring, the leachate management system;
- Stabilizing the final cover system surface with grass species that limit the erosion of topsoil, are compatible with local vegetation, and require minimal maintenance;
- Maintaining the OSDF seasonal cover, when in use;
- Monitoring temporary support facilities during construction; and
- Maintaining vehicular access around the OSDF.

This Systems Plan has been prepared for regulatory review. Prior to and during construction of the OSDF, this Systems Plan will be updated to contain equipment manuals and operating and maintenance procedures for the specific equipment and system procured and installed by the Subcontractor. This updated plan will serve as a working document that will be periodically updated during the active life and closure of the OSDF. In no case, however, will the updating result in a reduction in inspection, monitoring, maintenance and operational activities below the levels required by this plan unless approval for such reduction is formally obtained from the DOE and EPA/OEPA.

1.4 PLAN ORGANIZATION

The remainder of this Systems Plan is organized as follows:

- The requirements from the OSDF design criteria package (DCP) applicable to this plan, as well as other general requirements applicable to the plan, are presented in Section 2.0;
- Activities for the OSDF leachate management system are presented in Section 3.0;

- Activities for the OSDF final cover system are contained in Section 4.0;
- ~~Activities for the OSDF seasonal cover are described in Section 5.0;~~
- Activities for the OSDF temporary support facilities, utilities, and site security fence are addressed in Section 6~~5~~.0;
- Activities for the permanent access roads are presented in Section ~~7~~6.0; and
- Recordkeeping requirements are presented in Section ~~8~~7.0.

1.5 PLAN RESPONSIBILITIES

Implementation responsibilities for this Systems Plan are as follows:

- *Construction Manager (CM):* responsible for ensuring that OSDF maintenance, monitoring, and inspection activities are performed in accordance with this plan, on schedule, and by suitably trained personnel; responsible for receiving and reviewing reports and documentation from the Subcontractor, and requesting involvement of Resident Engineer, as required;
- *Subcontractor:* responsible for construction, impacted material placement, and closure of the OSDF facility. The Subcontractor shall implement this plan until the OSDF is fully closed.

The Subcontractor shall be responsible for preparing the necessary health and safety plan that meets all health and safety requirements identified in the FEMP Project Specific Health and Safety Requirements Matrix (PSHSRM). In addition, the H&S personnel will perform periodic audits of the Subcontractor to ensure compliance; H&S personnel will have stop-work authority (in the event of threat to worker and/or public safety) until the proper corrective action is taken. The H&S Officer assigned to the OSDF project will be the single point of contact for all safety, industrial hygiene, fire protection, and radiological issues or concerns.

The Subcontractor will be required to provide a H&S field representative who will be responsible for the Subcontractor's compliance with all H&S requirements. The Subcontractor H&S representative will be required to report all safety concerns and incidents to the H&S Officer.

Radiological Technicians will also be assigned to the OSDF project. In conjunction with the H&S Officer assigned to the project, the Radiological Technician(s) will help to ensure radiological compliance throughout the project. Radiological compliance may include the radiological monitoring of equipment, materials, soil, and air during excavation, placement and closure to help ensure proper segregation, storage, or disposition; routine inspection, monitoring, and recording of area radon monitors and/or other radiation detection monitors; and radiological monitoring of personnel. The PSHSRM will be the basis for the required monitoring and will identify the action levels that will ensure personnel safety by limiting exposure.

1.6 RELATED IMPLEMENTATION PLANS

Several other implementation plans have been prepared for the OSDF that contain information relevant to this plan. Other plans of direct relevance to this plan are listed below along with a brief statement of the relationship of the work plan to this plan:

- *OSDF Borrow Area Management and Restoration (BAMR) Plan* [GeoSyntec, 1997b]: provides procedures to strip, develop, maintain, and restore the OSDF soil borrow area;
- *OSDF Construction Quality Assurance (CQA) Plan* [GeoSyntec, 1997c]: provides testing and certification standards which are required for the OSDF construction and materials or equipment which may require replacement or repair during construction activities;
- *OSDF Impacted Materials Placement (IMP) Plan* [GeoSyntec, 1996]: outlines impacted material acceptance criteria (WAC) and provides procedures for impacted materials disposal in the OSDF;
- *OSDF Surface-Water Management and Erosion Control (SWMEC) Plan* [GeoSyntec 1997d]: provides details of temporary and permanent E&S controls for the OSDF (including maintenance requirements for channels and sediment control);
- *OSDF Post-Closure Care and Inspection Plan* [FDF, 1997]: describes post-closure inspection, operation and maintenance activities.

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2.0 APPLICABLE REQUIREMENTS

2.1 OVERVIEW

Regulatory, DOE, and other requirements applicable to this Systems Plan are contained in the Design Criteria Package (DCP) for the OSDF. The DCP is contained with the overall OSDF Design Package [GeoSyntec, 1997a]. These requirements take the form of applicable or relevant and appropriate requirements (ARARs) and to be considered criteria (TBCs) as determined by the record of decision for each of the various FEMP operable units, functional requirements, and general design criteria. The DCP requirements applicable to this Systems Plan are described below.

2.2 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

ARARs that are addressed by this Systems Plan are:

- OAC 3745-27-08(C)(4)(b): Leachate collection systems pipes shall (i) be provided with access for clean-out devices; (ii) be of a length and configuration that do not exceed the capabilities of clean-out devices; and (iii) resist damage caused by differential settlement.

- OAC 3745-27-08(C)(4)(e): Lift stations shall be equipped with automatic high level alarms located no greater than 6 ft (2.0 m) above the invert of the leachate inlet pipe. Lift station pumps shall be of adequate capacity and shall automatically commence pumping before the accumulated leachate activates the high level alarm.

- OAC 3745-27-08(C)(5): Leachate conveyance and storage structures located outside of the limits of disposal shall be no less protective of the environment than the disposal facility, and shall:

  - Be monitored, as required by EPA and OEPA;

  - For storage tanks, be provided with secondary containment;

  - For leachate lines, be provided with double containment; and

  - For storage structures, have a minimum of one week of storage capacity as established by design using assumptions simulating final closure of the facility.

- OAC 3745-27-08(C)(8): Access roads shall allow passage of vehicles during all weather conditions with minimum erosion, dust generation, and with adequate drainage. Grades are not to exceed 12 percent.

Post-closure care activities for all sanitary landfill facilities shall include, but are not limited to:

- Continuing operation and maintenance of the leachate management systems and surface-water management systems; and

- Maintaining the integrity and effectiveness of the cap systems, including making repairs to the cap systems as necessary to correct the effects of settling, dead vegetation, subsidence, erosion, leachate outbreaks, or other events, and preventing run-on and run-off from eroding or otherwise damaging the cap systems.

- OAC 3745-27-19(E)(26): The integrity of the engineered components of the landfill shall be maintained and any damage to, or failure, or the components shall be repaired.

- OAC 3745-27-19(J)(1)(4): If ponding or erosion occurs on areas of the landfill facility where solid waste is being, or has been, deposited, action will be taken to correct the conditions causing the ponding or erosion.

- OAC 3745-27-19(K)(1): If leachate is detected on the surface of the landfill facility, then the outbreak(s) shall be repaired and:

  - Leachate shall be contained and properly managed at the sanitary landfill facility;

  - If necessary, leachate shall be collected and disposed in accordance with paragraph (K)(5) and (K)(6) of OAC 3745-27-19; and

  - Actions shall be taken to minimize, control, or eliminate the conditions which contribute to the production of leachate.

- OAC 3745-27-19(K)(2): At least one lift station back-up pump shall be kept at the disposal facility at all times.

- OAC 3745-27-19(K)(3): The collection pipe network of the leachate management systems shall be inspected after placement of the initial lift of waste to ensure that crushing has not occurred and shall be inspected annually thereafter to ensure that clogging has not occurred.

- OAC 3745-68-10: After final closure, the owner or operator shall comply with all post-closure requirements, including maintenance and monitoring throughout the post-closure care period. The owner or operator shall:

  1) Maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events;

  2) Continue to operate the leachate collection and removal systems until leachate is no longer detected;

3) Maintain and monitor the leak detection systems;

4) Maintain and monitor the ground-water monitoring systems;

5) Prevent run-on and run-off from eroding or otherwise damaging the final cover; and

6) Protect and maintain surveyed benchmarks.

2.3 FUNCTIONAL REQUIREMENTS AND DESIGN CONSIDERATIONS

The DCP contains a variety of functional requirements and design considerations that have been established for the OSDF. These functional requirements are specific facility design or performance criteria required by DOE. Design considerations represent those other design, construction, or operational criteria identified by the OSDF architect/engineer (A/E) as necessary for the OSDF to successfully fulfill its intended function. Criteria relevant to the OSDF leachate management system are provided in Section 2.5 of the DCP. Criteria relevant to the final cover system are described in Section 2.6. Criteria applicable to the support facilities and utilities are presented in Section 2.9.

2.4 OTHER CRITERIA

Criteria applicable to this plan consist of those industry-standard practices that have proven effective at other waste disposal facilities. Inspection and monitoring requirements from the manufacturers and suppliers of materials and equipment to be installed at the OSDF are also criteria relevant to this plan.

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3.0 LEACHATE MANAGEMENT SYSTEM

3.1 OVERVIEW OF SYSTEM

The double-liner systems of each OSDF cell contains a leachate collection system (LCS) and a leak detection system (LDS) (see Figure 1-1). These systems are designed to convey any liquids that enter the system through pipes (i.e., the LCS pipes and the LDS pipes) to manholes located outside each cell. Liquids that enter the LCS include: (i) leachate generated by infiltration of water through the impacted material into the LCS; and (ii) impacted runoff from active portions of the OSDF which infiltrate into the LCS. Liquid that enters the LDS is primarily precipitation that percolates into the LDS prior to placement of the primary liner. Liquid that collects in the LDS manhole of a cell shall be pumped to the adjacent LCS manhole. In turn, the LCS manholes are connected by a leachate transmission system (LTS) gravity line which conveys leachate from the LCS pipes in the manholes via gravity flow to either a temporary gravity line or a permanent lift station. The temporary ~~lift~~ gravity line is a double-wall pipe which conveys flows to the permanent lift station during earlier stages of OSDF operation. Due to leakage detected in the carrier pipe of the temporary gravity line, an interim temporary gravity line called the "interim leachate collection system line" shall be installed. The interim leachate collection system line is a double-wall pipe which conveys flows to the permanent lift station during earlier stages of OSDF operation. From the permanent lift station, leachate is pumped through a permanent double-wall forcemain to the Biodenitrification Surge Lagoon (BSL). The system is operated in accordance with site procedure 43-C-365, "Leachate Conveyance System Operation."

The locations of the LCS, LDS, and LTS gravity lines manholes, temporary gravity line, interim leachate collection system line, and permanent lift stations are presented on the Construction Drawings.

This Systems Plan addresses all leachate management systems components up to the LTS gravity line, ~~or~~ temporary gravity line, or interim leachate collection system line discharge point into the permanent lift station.

3.2 BASIC SYSTEM OPERATION

The basic operation of the OSDF leachate management systems is described below.

- The LCS and LDS pipes from the liner system to the LCS and LDS manholes for each cell consist of double-wall HDPE pipes (i.e., inner carrier pipes and outer containment pipes). Each pipe drains by gravity from the OSDF cell and terminates in a LCS or LDS manhole.

- The LDS manhole allows for direct discharge of flow from the LDS carrier pipe into a primary containment vessel located inside the manhole. The LDS manhole serves as a secondary containment structure for the primary containment vessel. The LDS manhole has provisions for the monitoring of liquid in the primary containment vessel component of the manhole. The primary containment vessel has a 2 in. (50 mm) diameter liquid level pipe, a 2 in. (50 mm) diameter suction pipe, and a 2 in. (50 mm) diameter discharge pipe. The discharge pipe is connected to the LTS gravity line in the adjacent LCS manhole. The LDS containment pipe has a monitoring port and fixed end seal within the LDS manhole to verify the absence of liquid in the annular space between the carrier pipe and containment pipe.

- Each LDS manhole has a cleanout adjacent to the manhole for maintaining the LDS carrier pipe. The LDS manhole also has access provisions to install a sump pump to allow pumping of construction water that drains from the LDS prior to the placement of impacted material in the OSDF.

- The LCS manhole allows for direct discharge of flow from the LCS carrier pipe into the LTS gravity line that passes through the manhole. The LCS carrier pipe has temporary valves for regulating leachate flow into the gravity line during OSDF construction, impacted material placement, and periods of gravity line maintenance, extension, repair, etc. These valves shall be removed (and replaced with a solid-wall HDPE spool) from the LCS carrier pipe prior to final closure of the OSDF (so that, in the long term, there are no obstructions in the pipe). The LCS carrier pipe in each LCS manhole also has a sampling port for obtaining leachate samples. Each LCS manhole has an inlet for a redundant LCS carrier pipe. The redundant carrier pipe has a valve (secured in a closed position) and sampling port (for periodically confirming the absence of liquid in the pipe). The redundant carrier pipe valve is configured so that it can be opened to allow flow to the LTS gravity line at any time in the event of a failure due to clogging of the primary LCS carrier pipe. This valve shall also be removed (and replaced with solid-wall HDPE spool) after final closure of the entire OSDF. Both the primary and redundant LCS containment pipes have monitoring ports and fixed end seals within the LCS manholes to verify the absence of liquid in the annular space between the carrier pipe and the containment pipe.

- LCS manholes are equipped with liquid level alarms, consisting of a submersible liquid level sensor, logic controller, and alarm light. The liquid level sensor shall be calibrated such that the alarm is activated when the liquid level in the LCS manhole exceeds 2 in. (50 mm). The LCS and LDS manholes have pipe supports for the LTS gravity line and the LDS carrier pipe, respectively.

- The LTS gravity line and LCS and LDS manholes will be installed in stages, progressively advancing from north to south in conjunction with the progressive development of the OSDF. Each stage may involve the installation of manholes and LTS gravity line for several cells. At a given stage, the LTS gravity line will run through all of the manholes previously installed and those installed for a given stage to the southernmost manhole installed in that stage. This southernmost manhole serves as a connector point to the temporary gravity line or interim leachate collection system line.

- The LTS gravity line consists of a double-wall HDPE pipe with a 6 in. (150 mm) diameter inner carrier pipe and a 10 in. (2~~1~~50 mm) diameter outer containment pipe. The inner carrier pipe of the LTS gravity line will be continuous over its entire length (i.e., from its upgradient to its discharge point). The outer containment pipe will be continuous between the LCS manholes and joined to the manhole walls.

- The LTS gravity line will be equipped with a vent and 4 in. (100 mm) diameter quick-connect hose connection at its northern end. The purpose of the vent is to prevent pressure or vacuum buildup in the systems. The quick-connect hose allows pressure testing of the systems and jetting water in the line to clean it. The gravity line will have cleanouts on the upgradient end of each LCS manhole for maintenance.

- The butterfly valve located in each LCS manhole will be manually adjusted ~~in conjunction with the flow meter~~if necessary to maintain a balance of flow as related to the Lift Station output capacity to control the rate of flow into the temporary gravity line or interim leachate collection system line. The temporary gravity line and interim leachate collection system line control systems are designed to allow flow to the Lift Station at a rate no greater than the storm design flow rate, which has been established as 200 gallons per minute (gpm) (760 liters per minute (lpm)). This flow balance will be set to ensure the Lift Station is not overwhelmed by the incoming system flow.

- Unneeded portions of the temporary gravity line are to be taken out of service as part of each subsequent stage of construction. At that time, the LTS gravity line should be extended either to the next temporary gravity line connection location or to the permanent lift station, as appropriate.

- The temporary gravity line between the LTS gravity line and the permanent lift station consists of double-wall HDPE pipe. The inner carrier pipe is 6 in. (150 mm) in diameter and the outer containment pipe is 10 in. (25~~4~~0 mm) in diameter. The temporary gravity line will have a slope of at least 0.25 percent towards the permanent lift station. During winter months, the temporary gravity line must be covered by at least a 3 ft (0.9 m) thick soil cover for frost protection.

- The interim leachate collection system line between the LTS gravity line and the permanent lift station consists of double-wall HDPE pipe. The inner carrier pipe is 6 in. (150 mm) in diameter and the outer containment pipe is 10 in. (250 mm) in diameter. The interim leachate collection system line will have sections installed above grade and below grade and will maintain a continuous slope towards the permanent lift station.

- The permanent lift station is provided with secondary containment which is designed so that it can be monitored for the presence of leakage.

- The permanent lift station is capable of storing the quantity of leachate generated during a one-week period using design assumptions simulating final closure of the OSDF.

- Prior to the discharge of liquid into the permanent lift station, the liquid passes through a motor-operated inflow valve which closes automatically in the event of power failure or if

liquid levels in the lift station rises above the high level alarm setpoint or any level that would cause an electrical short or damage to equipment in the lift station). The lift station also has a manual means for closing the lift station motor-operated inflow valve. Therefore, this valve can be closed manually, if needed, until appropriate maintenance activities can be implemented.

- The permanent lift station will be equipped with a pumping system to transfer liquids in the lift station to the BSL.

- All inlet containment pipe drain port valves shall either be permanently open or removed and shall be fitted with containment pipe leakage devices that can be monitored without the need for confined space entry. The devices should be installed such that the quantity of liquid in the containment pipe can be measured and samples can be collected. Additionally, a method to differentiate between rain water infiltration into the manhole and actual liquid in the containment pipe should be assured by method chosen. The actions to be taken for specific quantities of water detected above that allowed for condensation shall be specified in operating procedures. In addition, those operating procedures shall specify the methodologies and related equipment utilized to conduct this monitoring prior to initiation of waste placement activities in the cells. In all cases, the devices installed shall also provide provisions for removal of accumulated liquids to an established baseline level.

Each major component of the leachate management systems will be identified (i.e., numbered) during installation. The Subcontractor will be required to provide manufacturer's equipment operating and maintenance instructions as part of Construction Acceptance Testing. Construction Acceptance Testing is the performance of all necessary testing to demonstrate that subcontractor supplied or installed equipment and system are installed satisfactorily and safely in accordance with the Construction Drawings and Specifications.

3.3 LDS AND LCS OPERATION PROCEDURES

The LDS and LCS of each OSDF cell shall be operated ~~by the Subcontractor~~ in conformance with the requirements of this section.

- Systems shall not be accepted for operation until the Construction Subcontractor has completed all the requirements of the Construction Acceptance Testing.

- Prior to the start of active operations of a cell, the Subcontractor shall maintain a sump pump in the primary containment vessel of the LDS manhole and pump accumulated water to the FEMP stormwater management system. The LDS flow rate shall be less than 10 gpm (38 lpm) (due to drainage of construction water from the LDS) prior to the start of cell operation.

- Prior to the start of active operations of a cell, ~~the subcontractor shall obtain~~ a sample of the liquids in the primary containment ~~vessel and test~~ shall be obtained and analyzed for constituents ~~that are defined by the Construction Manager~~as specified in Table 4-2 of the OSDF Groundwater/Leak Detection and Leachate Monitoring Plan, 20100-PL-009, of August 1997.

- Prior to the start of active operations of a cell, the ~~Subcontractor shall set the~~ level transmitter for the primary containment vessel of the LDS manholes shall be set to activate the alarm *i.e.*, alarm light for a liquid level ~~6 in~~12 in. (~~150 mm~~300 mm) below the top of the vessel.

- Prior to the start of active operations of a cell, the ~~Subcontractor shall set the~~ level transmitter for the secondary containment vessel of the LCS manhole shall be set to activate the alarm for a liquid level 2 in. (50 mm) above the bottom of the vessel.

- ~~If an alarm is activated, the Subcontractor personnel shall respond within one hour to assess the reasons for the alarm sounding and to take~~

- The status of the alarms will be inspected on a periodic basis not to exceed once per shift. An alarm condition will require action to access the condition and take appropriate corrective actions.

- Prior to the start of active operations of a cell, the Construction Subcontractor shall attach an auxiliary cleanout to the LTS gravity line cleanout adjacent to the cell.

- The butterfly valve on the LCS carrier pipe shall be maintained in the closed position until the start of impacted material placement in the cell. The Construction Subcontractor shall manage runoff that falls into the cell prior to the start of impacted material placement as stormwater requiring only settling prior to discharge. This water shall be pumped using a sump pump or other means to the FEMP uncontrolled (not to be treated) stormwater management system.

- Prior to start of active operations of a cell the ~~Subcontractor shall verify the~~ absence of liquids in the LCS, redundant LCS, and LDS containment pipes shall be verified by ~~opening~~activating the monitoring ports on each containment pipe ~~and visually observing for collection of any liquid present~~, removing accumulated liquid and establishing the monitoring baseline level. The monitoring log will be started concurrently.

- After impacted material placement begins in a cell, all water in the cell ~~may~~must be discharged to the controlled FEMP stormwater management system for treatment. The butterfly valve on the LCS carrier pipe shall be opened to allow discharge to the LTS gravity line, but shall be positioned (throttled) ~~such that~~ to balance the flow rate to the permanent lift station ~~does not exceed~~at approximately 200 gpm (760 lpm) as compared to the pumping capacity of the Lift Station.

- The cell impacted runoff catchment area is designed to allow impacted runoff to enter directly into the LCS collection system. If the system becomes inoperable (*e.g.*, clogging,

of the sacrificial geotextile has occurred) the Construction Ssubcontractor shall remove impacted runoff by pumping from the impacted runoff catchment area to the auxiliary cleanout.

- The valve on the redundant LCS carrier pipe shall be maintained closed at all times, unless ~~overridden~~otherwise requested by ~~conditions dictated in Section 3.4~~the cell operation subcontractor.

- The butterfly valve on the LCS carrier pipe shall not be ~~maintained open at all times~~shut during the active life, closure period, and post-closure period of the OSDF, except for those periods where the valve needs to be closed for systems maintenance and repair or in the event of an operational emergency.

- The LCS manholes are designed as a closed system; liquids should not accumulate in these manholes and thus any present should be removed as soon as practicable. The level transmitter in the secondary containment in each LCS manhole shall be set to activate the alarm light for a liquid level of more than 2 in. (50 mm) above the floor of the manhole. If the alarm is activated, ~~Subcontractor~~ personnel shall respond ~~within one hour~~ to assess the problem and to take appropriate corrective actions.

- Throughout active operations of the OSDF, ~~the Subcontractor shall daily~~ measure and record the liquid quantity in, and flow rate into, the primary containment vessel of each LDS manhole daily. A portable suction pump ~~shall~~may be used to pump this liquid through the LDS suction pipe and into the LDS discharge pipe or the liquid may be transferred to separate collection containers as required. The LDS primary containment vessel shall be evacuated as often as necessary to prevent overtopping of the vessel.

- ~~The Subcontractor shall provide the CM with whatever equipment or assistance the CM may periodically request in connection with obtaining samples of liquids from the LCS and LDS sampling or monitoring ports.~~

- If liquid is observed in any LTS manhole, establish the depth of the liquid and compare it to the trigger depth for the alarm. If the measured depth exceeds the trigger depth implement a complete system check. These trigger levels shall be established in approved operating procedures prior to initiation of waste placement activities.

- Notify the AEDO of events involving leakage from the carrier pipes to containment pipes and from other primary containments to secondary containments.

~~The Subcontractor shall follow all Occupational Safety and Health Administration (OSHA), DOE, and FEMP site requirements for confined space entry when performing monitoring and inspection activities in the LDS and LCS manholes~~

3.4 LDS AND LCS INSPECTION AND MAINTENANCE ACTIVITIES

The LCS and LDS shall be inspected and maintained in accordance with the schedule and activity requirements outlined in Table 3-1, or until leachate is no longer generated and an alternative activity schedule has been approved by EPA and OEPA. Specific details of the required inspection and maintenance activities are given below.

According to ARARs (OAC 3745-27-19(k)(3)), the LCS and LDS pipe network shall be inspected after placement of the initial lift of impacted material to ensure that crushing has not occurred, and annually thereafter to ensure that clogging has not occurred. Clogging can occur by deposition of particles within the pipe or by biological growth inside the pipe. The ~~Subcontractor shall inspect~~inspection of this pipe network shall be between the manhole and the first 100 ft (30 m) of subdrain pipe inside the cell. The portion of the pipe beyond this point inside the cell is considered to be redundant because the gradation of the LCS granular drainage material is designed to limit the level of leachate on the geomembrane liner to less than 1 ft (0.3 m) without need for a subdrain pipe.

Access to the LCS and LDS pipes for inspection shall be through HDPE cleanouts located adjacent to the LDS or LCS manholes. Inspections shall be performed using a video camera or other appropriate inspection equipment. The inspection equipment shall have the ability to monitor its location (e.g., distance counter), be sized to fit within the LCS and LDS inner carrier pipes indicated on Construction Drawings and be capable of being pushed the length to be inspected.

If an inspection indicates that a LCS or LDS pipe is obstructed, the pipe shall be flushed by pumping fresh water from a water truck through a hose inserted in the pipe cleanout. If flushing does not remove the obstruction, other methods shall be used to clean the pipe. These other methods may include blowing the obstruction out with air, vacuuming, rodding, or inserting a snake, fish tape, or other suitable device. If air or water pressure is used, the working pressure inside the pipe shall not exceed the rated pressure of the pipe.

The specific pipe maintenance procedures ~~(other than flushing)~~ to use to remove a pipe obstruction should be selected on a case by case basis. ~~Any procedure proposed by the Subcontractor other than flushing with water must be pre-approved by the CM.~~

In the event that LCS or LDS pipe obstruction cannot be dislodged, or in the very unlikely event that a pipe has undergone partial or total crushing, the following procedures should be considered in the following order:

- For the LCS or LDS, insert a new small diameter pipe within the obstructed or collapsed pipe:

- For the LCS, activate the redundant LCS pipe; and
- For the LCS or LDS pipe, if the obstruction or collapse is outside of the disposal facility containment systems, replace the pipe.

All equipment inserted into the LCS or LDS line for inspection and/or maintenance shall be decontaminated prior to removal from the OSDF battery limits.

In addition to the foregoing requirements, all mechanical and electrical equipment shall be calibrated, operated, maintained, and serviced in accordance with the manufacturer's instructions for that equipment. Manufacturer's instructions are contained in Attachment A of this Systems Plan. These instructions shall be amended to this plan once the equipment is installed by the OSDF Consultant Subcontractor and accepted by the CM. Logs will be maintained documenting compliance with this requirement.

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TABLE 3-1

LEACHATE COLLECTION AND LEAK DETECTION SYSTEMS INSPECTION AND MAINTENANCE ACTIVITIES

Component	Inspections		Conditions to Check	Remedy
	Active Period	Closure Period		
LDS	Weekly	Weekly for the first three months after cell closure, then monthly for the remainder of the first year	• condition of submersible level transmitter and appurtenances • leakage from primary containment vessel • liquid in LDS containment pipe	• check level transmitter operations (e.g., operating temperature range, accuracy, etc.), electrical connections, and alarm light. • check for source of leak; if source identified then take appropriate corrective measures (i.e., spot-seal vessel, replace vessel, etc.) • keep monitoring port drained; perform video inspection of pipe and attempt to identify source of leakage; develop plan to mitigate effects
LCS	Weekly	Weekly for the first three months after cell closure, then monthly for the remainder of the first year	• condition of submersible level transmitter and appurtenances • condition of shutoff valve • liquid in LCS containment pipe • liquid in redundant LCS carrier pipe	• check level transmitter operations (e.g., operating temperature range, accuracy, etc.), electrical connections, strobe light, and radio transmission • check valve operability; correct any deficiencies • keep monitoring port drained; perform video inspection of pipe and attempt to identify source of leakage; develop plan to mitigate effects • drain pipe into LTS gravity line
LDS & LCS Pipes	prior to the start of active operations, then annually	Annually	Video inspect for: • crushing of pipe • clogging of pipe	• flush clogged pipe with water or mechanically clean • insert small diameter pipe in crushed pipe, if possible • replace crushed pipe if crushed portion is outside of the cell • utilize redundant LCS pipe

Notes: ~~(1) Frequencies of inspection and maintenance activities are preliminary.~~
(2) Leachate collection and leak detection systems shall be inspected after the occurrence of declared major earthquakes in the vicinity of the FEMP.

3.5 LTS OPERATION PROCEDURES

The OSDF LTS shall be operated ~~by the Subcontractor~~ in conformance with the requirements of this section.

- Systems shall not be accepted for operation until the Subcontractor has completed the requirements of the Construction Acceptance Testing.

- ~~Before taking the temporary gravity line out of service, the Subcontractor shall manually turn off the inflow valve in the LCS gravity line and the required temporary portion of the gravity line shall be removed.~~

3.6 LTS INSPECTION AND MAINTENANCE ACTIVITIES

- The LTS shall be inspected and maintained in accordance with the schedule and activity requirements outlined in Tables 3-2 and 3-3, or until leachate is no longer generated and an alternative activity schedule has been approved by EPA and OEPA. Specific details of the required inspection and maintenance activities are given below.

The manholes, leachate transmission system, valves, connections, sampling ports, monitoring ports, pumps, etc., shall be routinely inspected and maintained to provide for proper OSDF operation. All mechanical and electrical equipment shall be calibrated, operated, maintained, and serviced in accordance with the manufacturer's instructions for that equipment. Manufacturer's instructions are contained in Attachment A of this OSDF Plan. In addition, the inspection and maintenance activities for the LTS shall include the following:

- Confirm that appropriate warning signs are visible (e.g., confined space entry, buried pipe and conduit);

TABLE 3-2

LDS/LCS MANHOLES AND LTS GRAVITY LINE INSPECTION AND MAINTENANCE ACTIVITIES

Component	Inspections		Conditions to Check	Remedy
	Active Period	Closure Period		
LDS Manholes	Weekly	Weekly for the first three months after cell closure, then monthly	• liquid in primary containment vessel	• evaluation and required action per operating procedures
			• overflow of primary containment vessel	• evaluation and required action per operating procedures
			• liquid in LDS containment pipe	• evaluation and required action per operating procedures
			• confirm all required signage is visible	• repair and/or replace as necessary
			• cracked, broken manhole cover	• replace manhole cover
			• leaking seal on manhole cover	• replace seal
			• general structural condition of containment vessel	• check for structural integrity; if problems are found, take appropriate measures (i.e., spot seal vessel, replace vessel, etc.) and implement permanent solution
			• odors, bacterial growth (containment vessel)	• flush and/or spray sodium hypochlorite into containment vessel
LCS Gravity Line	Weekly	Monthly	• liquid in LCS gravity line containment pipe	• keep containment pipe drained; performed video inspection of pipe and attempt to identify source of leakage; if leakage is minor, continue to operate; if leakage is significant, evaluate repair options ~~with CCM~~
			• inspection of pipe for clogging or crushing (annual only)	• flush clogged pipe with water or mechanically clean; repair as necessary
			• butterfly valve in proper position	• adjust valve to limit flow to permanent lift station to 200 gpm (760 lpm)
LDS Gravity Line	Weekly	Monthly	• liquid in LDS gravity line containment pipe	• keep containment pipe drained; performed video inspection of pipe and attempt to identify source of leakage; if leakage is minor, continue to operate; if leakage is significant, evaluate repair options ~~with CCM~~
			• inspection of pipe for clogging or crushing (annual only)	• flush clogged pipe with water or mechanically clean; repair as necessary
LTS Gravity Line	Weekly	Monthly	• liquid in LTS gravity line containment pipe	• keep containment pipe drained; performed video inspection of pipe and attempt to identify source of leakage; if leakage is minor, continue to operate; if leakage is significant, evaluate repair options ~~with CCM~~
			• inspection of pipe for clogging or crushing (annual only)	• flush clogged pipe with water or mechanically clean; repair as necessary

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LCS Manholes	Weekly	Weekly for the first three months after cell closure, then monthly	• monitor redundant LCS and LDS containment pipes for liquids • confirm all required signage is visible • cracked, broken manhole cover • leaking seal on manhole cover • completion of OSDF construction • general structural condition of manhole	• evaluation and required action per operating procedures • repair and/or replace as necessary • replace manhole cover • replace seal • remove designed valves and replace with pipe spool piece • check for structural integrity; if damage is observed, assess extent and make repair recommendations

Notes: ~~(1) Frequencies of inspection and maintenance activities are preliminary.~~
~~(2)~~ LDS/LCS manholes and LTS gravity line shall bye inspected after the occurrence of declared major earthquakes in the vicinity of the FEMP.

TABLE 3-3

GRAVITY LINE INSPECTION AND MAINTENANCE ACTIVITIES

Component	Inspections		Conditions to Check	Remedy
	Active Period	Closure Period		
~~Temporary Gravity Line~~	~~Weekly~~	~~N/A~~	• ~~record accumulated flow at disc flow meter; check that flow meter is operation (3)~~ • ~~leakage from temporary gravity line and plumbing~~ • ~~condition of liquid transmitter for temporary gravity secondary containment system~~ • ~~frost protection soil cover~~ • ~~liquid in visible portions of interim leachate collection system line~~	• ~~repair and/or replace as necessary~~ • ~~investigate source of leakage, repair as necessary~~ • ~~check sensor operations, electrical connections, and alarm light~~ • ~~increase soil cover if inadequate cover exists~~ • ~~keep containment pipe drained; perform video inspection of pipe and attempt to identify source of leakage; if leakage is minor, continue to operate; if leakage is significant, evaluate repair options with CCM~~

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Interim Leachate Collection System Line	Weekly	N/A	• leakage from visible portions of interim leachate collection system line • liquid in interim temporary gravity line containment pipe	• repair and/or replace as necessary • keep containment pipe drained; perform video inspection of pipe and attempt to identify source of leakage; if leakage is minor, continue to operate; if leakage is significant, evaluate repair options with CCM

Notes: ~~(1) Frequencies of inspection and maintenance activities are preliminary~~

~~(2)~~ LDS/LCS manholes and LTS gravity line shall b~~y~~e inspected after the occurrence of declared major earthquakes in the vicinity of the FEMP.

- Check instruments/valves (e.g., note sticking or jammed devices, corrosion, leaks, and misalignments);
- Note any temperature extremes which may exist inside the manhole (e.g., temperature outside of equipment-specific operating temperature ranges);
- Verify instrument systems status (e.g., elevation and location of automatic level switch in the lift station manhole),
- Monitor flow for pulsating, over pressure, or under pressure;
- Check for the presence of liquids in all secondary containment systems;
- Confirm pump operation/priming;
- Check hoses for physical wear and poor connections prior to each use;
- Rate condition of manhole covers;
- Note condition of concrete slab; and
- Confirm adequate protection is provided around the temporary gravity line and interim temporary gravity line. ~~Should any of the above inspections reveal systems deficiencies, the conductor shall be connected utilizing a procedure approved by the construction Manager.~~

Should any of the above inspections reveal systems deficiencies, the condition shall be corrected utilizing a procedure.

3.7 EMERGENCY PROCEDURES FOR SPILLS

The OSDF leachate management system has been designed with multiple safeguards and redundancies to prevent the accumulation of liquids in the secondary containment or the overflow of liquids from the primary containment components of the leachate management system. These safeguards and redundancies include the following:

- The LDS primary containment will be equipped with a level transmitter which activates an alarm light if the liquid level is less than ~~6 in~~12 in. (300 mm) from the top of the containment.
- The secondary containment of the LCS manholes will include level transmitters which will activate an alarm if the liquid level exceeds 2 in. (50 mm) from the bottom of the containment.
- The liquid level alarm consists of a submersible level transmitter, programmable logic controller, and alarm light. The level transmitter originates a signal which is sent to the

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programmable logic controller, and if the programmable logic controller concludes that the liquid level exceeds the maximum preset value, it activates the alarm light.

- ~~The Subcontractor p~~Personnel shall respond to the alarm ~~within one hour~~ to assess the problem and to take appropriate corrective actions. ~~A Subcontractor representative shall be "on call" 24 hours a day.~~

- Notify the AEDO of any potential release to the environment.

3.8 RECORDKEEPING

~~The Subcontractor shall maintain written records of all monitoring activities, inspections, and maintenance repairs in accordance with the recordkeeping and reporting requirements of Section 8.0 of this Plan.~~

FDF shall maintain written records of all monitoring activities, inspections, and maintenance repairs as required by this plan. All records shall be available for review upon request. In addition to the routing elements of recordkeeping discussed above, any contingency activities required associated with leachate system operation shall be fully documented with such documentation maintained and available for inspection.

4.0 FINAL COVER SYSTEM

4.1 OVERVIEW OF COVER SYSTEM

The construction, placement of impacted material, and closure of the OSDF is scheduled to occur over a 7 year period. As each cell is filled to final grade, the final cover system will be installed over that cell. Figure 1-1 of this plan presents the final cover system cross section. As seen in this figure, the topmost surface of the final cover system is vegetation. The goals of the vegetation are: (i) to stabilize the final cover systems surface with grass species that limit the erosion of topsoil; (ii) to closely follow the local vegetation; (iii) to be visually attractive; and (iv) to require minimal maintenance. The vegetation is underlain by, in turn, the topsoil layer and the vegetative soil layer.

Vegetation for newly closed cells will initially consist of selected mixes of native species. This vegetation will require inspection and maintenance in order to manage bare areas and erosion, and to intercede in the process of old field vegetation succession, which, if left unimpacted, would result in climax forest vegetation at the site within a 60 year ~~timeframe~~time frame. The topsoil and vegetative soil layer also require inspection and maintenance with respect to the potential for surface erosion, gully formation, and settlement and subsidence.

The final cover system grading plan is shown on the Construction Drawings.

4.2 FINAL COVER SYSTEM INSPECTION AND MAINTENANCE ACTIVITIES

The final cover shall be inspected and maintained in accordance with the schedule and activity requirements presented in Table 4-1 of this plan. The inspection and maintenance activities identified in this table are designed to provide a final cover system that maintains its effectiveness and performs as intended. In addition, the inspection activities are designed to detect any significant deterioration in the final cover systems components.

The inspection shall consist of a walkover survey of the entire OSDF final cover system. The visual inspection shall be conducted by traversing the cover system on a 100 ft (30 m) grid pattern. Suspect areas shall be delineated on a topographic plan of the site. The inspections shall result in evaluation of the following items, if present:

- Vegetative stress (i.e., if areas without vegetation or with dead vegetation (not just dormant) or sparse vegetation and/or undesirable plant growth are present);
- Erosion, bare spots, poor performing vegetation;

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TABLE 4-1

FINAL COVER SYSTEM
INSPECTION AND MAINTENANCE ACTIVITIES

Component	Inspections / Closure Period	Condition	Remedy	Maintenance
Vegetation[1]	Monthly for at least six months	• stressed vegetation	• evaluate cause; vegetate or remedy	• analyze soil and fertilize
		• erosion, bare spots, and poor performing vegetation	• remove sediment; reseed and mulch	• revegetate as needed
		• unwanted deep rooted plants, weeds, or saplings	• remove as necessary	• mechanically, chemically, or by controlled burn
Topsoil	Monthly for at least six months	• topsoil erosion or drainage gullies	• replace topsoil; reseed and mulch; utilize non-vegetative stabilization (e.g., jute mat) if necessary	• revegetate and refertilize
		• topsoil settlement or subsidence	• add topsoil and regrade	• reconstruct
		• burrowing animals	• implement program (e.g., catch/release) to eradicate	• fill in holes
Cover Drainage Layer	Monthly for at least six months	• seepage erosion of drainage material	• Construction Manager will evaluate placing granular "cap" over cover drainage outlet and develop corrective action plan	• replace, regrade material
		• clogging or covering of cover drainage layer outlet by topsoil	• remove topsoil, replace granular soil at outlet as necessary	• replace, regrade material

Notes:
(1) See the text of this Section for requirements related to grass mowing.
(2) Frequencies of inspection and maintenance activities are preliminary. These frequencies will be finalized as material supplier's inspection and maintenance instructions are available.
(3) Final cover system shall be inspected after the occurrence of major earthquakes.

TABLE 4-1 (continued)

FINAL COVER SYSTEM
INSPECTION AND MAINTENANCE ACTIVITIES

Component	Inspections Closure Period	Condition	Remedy	Maintenance
Final Cover System	Monthly for at least six months	• toe bulges	• notify the Construction Manager to investigate and develop corrective action plan	• cordon off affected area; maintenance/repair activities will be defined by the investigation results
		• tension cracks	• notify the Construction Manager to investigate and develop a corrective action plan	• cordon off affected area; maintenance/repair activities will be defined by the investigation results
Final Cover System	Monthly for at least six months	• leachate seep	• notify the Construction Manager to investigate and develop a corrective action plan	• contain leachate; cordon off affected area; maintenance/repair activities will be defined by the investigation results
Surveying	Monthly for at least six months	• survey monuments	• N/A	• obtain survey data

Notes: (1) Frequencies of inspection and maintenance activities are preliminary.
(2) Final cover system shall be inspected after the occurrence of major earthquakes.

- Unwanted rooted plants, weeds, or saplings;
- Topsoil erosion or drainage gullies;
- Topsoil settlement or subsidence;
- Presence of burrowing animals;
- Seepage erosion of cover drainage material;
- Clogging or covering of cover drainage layer outlet by topsoil or any other material(s);
- Tension cracks which may be indicative of the instability of cover systems;
- Toe bulges which may be indicative of the instability of cover systems; and
- Leachate seeps.

Note that the need for, and frequency of, grass cutting will depend on the final seed mix selected for the OSDF final cover system. Mowing shall occur at least once annually (in the late fall) at a time when the final cover system is reasonably dry. Mowing equipment shall not cause rutting or disturbance of topsoil. More frequent mowing will be specified if needed, in a subsequent version of this Systems Plan based on the final seed mix selected for the OSDF.

Maintenance activities for the OSDF final cover system shall include surveying of settlement monuments placed on the OSDF final cover system. These monuments shall be surveyed monthly for at least six months after installation, then semi-annually for five years, then annually.

Repairs to the OSDF final cover systems, except vegetation and topsoil, shall not be made unless approved by the CM. Any repair activity involving any component of the final cover systems shall be in full conformance with the original Project Specifications for that component.

Woody species reproduction that develops in the OSDF final cover system shall be eliminated mechanically, chemically or by fire. Many woody species maintain the root systems when cut and rapidly resprout. The root systems continues to grow through repeated cuttings and can become extensive. For this reason, chemical herbicides (spraying of individual trees and shrubs) or fire shall be preferred for control of woody species reproduction, as eradication of the whole plant including the root systems is a primary goal. A combination of mechanical and chemical treatment where cut stumps are treated with herbicide to prevent resprouting may also be considered. The most effective method for managing woody vegetation shall be evaluated for the OSDF by the Subcontractor based on available equipment, expertise, and cost.

It is noted that additional Systems requirements for the OSDF project, which the Subcontractor shall follow, are contained in the: (i) *OSDF Borrow Area Management and Restoration Plan*; and (ii) *OSDF Surface-Water Management and Erosion Control Plan*.

4.3 RECORDKEEPING

The Subcontractor shall maintain written records of all monitoring, operational activities, maintenance inspections, and maintenance repairs in accordance with recordkeeping and reporting requirements of Section ~~8.0~~ 7.0 of this Systems Plan.

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5.0 TEMPORARY SUPPORT FACILITIES, UTILITIES, AND SITE SECURITY FENCE

5.1 DESCRIPTION OF SYSTEMS

The function of the temporary support facilities and utilities is to provide support for the OSDF during construction, impacted material placement, and closure. Temporary support facilities include survey benchmarks, administrative support trailers, equipment maintenance facilities, decontamination facilities, and material storage areas. Utilities include electricity, water, wastewater, and telephone system. A site security fence will be erected during construction and will be dismantled at the end of construction.

The support facilities and utilities must be maintained to provide adequate and reliable support for the construction activities that will be performed for the OSDF. The support facilities and utilities must be maintained in a manner that is consistent with the requirements of applicable utility codes at the FEMP and with applicable health and safety requirements for the FEMP.

A site security fence, consisting of 6-ft (1.8-m) high chain linked fence with three strands of barbed wire on the top of the fence will be erected around the OSDF construction area. The fence gates will be locked with keyed-alike locks. The location of the security fence will be periodically relocated as cell construction progresses from north to south. If it is determined that a fence is to remain around the OSDF (permanently), it will be evaluated for both security and aesthetics.

5.2 TEMPORARY SUPPORT FACILITIES INSPECTION AND MAINTENANCE ACTIVITIES

Temporary support facilities, utilities, and site security fence shall be inspected and maintained in accordance with the schedule and activity requirements presented in Table 5-1. During winter shutdown, unoccupied facilities shall be inspected to detect any breach or damage to the systems contained in the facilities and to ensure the systems are functioning properly.

The permanent survey benchmarks shall be inspected for any evidence of damage or disturbance. If such evidence is observed, it should be noted and reported. The CM will then have the benchmark resurveyed and re-established if necessary.

The administrative support trailers and equipment maintenance facilities shall be inspected for the following items: (i) leaks in roof, windows and doors; (ii) structurally sound stairs, access ways and fire escapes; (iii) security of doors and windows; (iv) condition of tie-downs (for trailers only); (v) condition the heating, ventilating, and air conditioning (HVAC) systems; (vi) condition of associated storage tanks; and (vii) cleanliness.

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TABLE 5-1

TEMPORARY SUPPORT FACILITIES AND SITE SECURITY FENCE
INSPECTION AND MAINTENANCE ACTIVITIES

Component	Inspections / Closure Period	Condition	Remedy	Maintenance
Temporary Facilities (Vacant)	Semi-Annually	• inadequate and unreliable support facilities • damage or broken items	• maintain livable condition, clean, and workable equipment • replace if needed, repair	• janitorial services as needed
Utilities	Semi-Annually	• confirm utility is useable • confirm utility grounded	• replace if needed, repair	• maintain as needed; use lockout program
Storage areas/ stockpiles/ temporary decontamination facilities	Daily	• ponding of water • protection from elements • adequate storage or disposal	• regrade if needed • repair cover • clean, maintain workable equipment, fix as needed	• clean daily • provide sufficient ballast for cover • daily inspections of equipment • proper disposal of hazardous materials
Fence	Quarterly	• damaged • under fence erosion	• repair or replace as necessary • repair erosion or extend fence as necessary	• replace or repair fence • provide erosion and sedimentation control
Gates	Quarterly	• tampering/damage to locks	• repair or replace as necessary	• install proper lock
Warning Signs	Quarterly	• damaged or missing warning signs	• replace as needed	• install warning signs to fence or gates

N/A - Not applicable
Notes: (1) Frequencies of inspection and maintenance activities are preliminary.
(2) Temporary support facilities and site security fence shall be inspected after the occurrence of major earthquakes.

Equipment decontamination facilities will require routine maintenance of pumps and valves and cleaning out of sump areas. The operation, inspection, and maintenance of all electrical and mechanical equipment shall be in accordance with the manufacturer's instructions. These instructions are provided in Attachment B of this Systems Plan.

Material storage areas shall be inspected to ensure that the area is secure and trafficable. If the area is not secure, security fence shall be installed. If the area is not trafficable due to excessive rutting, poor drainage, etc., the Subcontractor shall notify the CM. The CM will evaluate the situation and issue a plan for corrective actions.

Utilities shall be inspected to ensure that no deterioration has occurred and that proper grounding of system is functioning. Utilities shall meet all applicable standards (i.e., Cincinnati Gas and Electric, NEC, ASTM, ASCE, ANSI, ACI, and FEMP site facility standards).

The construction security fence shall be inspected for the following items: (i) holes in the mesh; (ii) three strands of barbed wire on top of the fence; (iii) security of all access points; and (iv) warning signs posted on 100 ft (30 m) centers along the fence. Repair work or replacement of the security fence shall be performed in a timely manner to prevent unauthorized access to the OSDF. After closure of the OSDF, the construction security fence shall be dismantled, and disturbed areas shall be regraded and re-vegetated. A permanent fence (that is aesthetically pleasing to stakeholders) may be installed and maintained for the duration of the post-closure period. If a permanent fence is determined necessary; the details will be provided in a subsequent design submittal.

Maintenance of temporary support facilities and utilities shall include repair or replacement of items as necessary. All new materials and installation work for repair or maintenance activities shall be in full conformance with the original Project Specifications.

5.3 RECORDKEEPING

The Subcontractor shall maintain written records of all monitoring, inspections, and maintenance repairs in accordance with recordkeeping and reporting requirements of Section ~~8.0~~ 7.0 of this Systems Plan.

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6.0 OSDF ACCESS ROADS

6.1 DESCRIPTION OF ROADS

Access to the OSDF will be continuously controlled. Access to the OSDF will be provided by: (i) construction haul roads (ii) impacted material haul roads; and (iii) leachate transmission systems access corridor.

Access roads to the OSDF will be developed in phases in conjunction with the phased development of the OSDF. Access to the OSDF must be maintained to provide safe, efficient ingress and egress to the work areas and other areas. Safety and traffic control signals at critical locations (e.g., flagmen) will be utilized as needed throughout construction (e.g., intersection of the relocated north entrance road and the construction haul road) to mark potential hazard areas. Traffic will be routed and controlled in a manner that maintains an orderly flow of vehicles to minimize accidents and to avoid delays in the construction. Road maintenance and control will be the responsibility of the Subcontractor.

The layout of the roads providing access to the Construction Drawings.

6.2 ACCESS ROADS INSPECTION AND MAINTENANCE ACTIVITIES

Access roads to the OSDF shall be inspected and maintained in accordance with the schedule and activity requirements presented in Table 6-1. The Subcontractor shall be responsible for safe and efficient OSDF access road operations during OSDF construction, filling, and closure. The Subcontractor shall maintain all road signage in a clearly visible state. Road signage shall be increased if needed to achieve safe and efficient traffic operations. If necessary, the Subcontractor shall provide traffic control personnel at key locations.

Road maintenance shall be performed utilizing appropriate construction equipment. Areas of soft subgrade soil, pumping, or excessive rutting shall be improved by removing and replacing subgrade soils, installing a geotextile separation layer (if required), and replacing/increasing the road aggregate. Areas of the road that are frequently wet or inundated shall be improved by regrading adjacent areas to change stormwater runoff patterns or cutting roadside ditches to drain near-surface perched ground water.

As necessary, the Subcontractor shall maintain the OSDF access roads free of snow accumulations that would interfere with OSDF activities. The Subcontractor shall prevent the generation of excessive road dust such that fugitive emission levels remain in full compliance with

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TABLE 6-1

ACCESS ROADS INSPECTION AND MAINTENANCE ACTIVITIES

Component	Inspections		Conditions to Check	Remedy	Maintenance
	Active Period	Closure Period			
Access Roads	Weekly and following rain storms	Monthly and following rain storms	• inadequate traffic control	• improve traffic control	• install signage (e.g., stop signs, traffic flow arrows) or provide traffic control personnel
			• soft soil, pumping, or excessive rutting	• remove and replace subgrade soil, add aggregate geotextile separation layer, if necessary	• grade as necessary to provide positive drainage
			• roadway inundation	• improve storm water routing and/or eliminate perched ground water	• regrade area to change runoff patterns; cut roadside ditches to drain perched ground water
			• snow	• clear roadway	• plow snow
			• excessive road dust	• reduce dust generation	• use water truck to suppress dust; apply chemical dust suppressant (only after Construction Manager approval)

Notes: (1) Frequencies of inspection and maintenance activities are preliminary. These frequencies will be finalized as manufacturer's equipment operating and maintenance instructions are available.

FEMP Policy. Dust suppression shall be achieved by using a water truck. Alternatively, periodic application of dust suppressants, such as magnesium or calcium chloride, liquid polymer emulsion, or agglomerating chemicals may be considered, but only with approval of the CM.

Any repair activity to roadways within the OSDF battery limit shall utilize materials and procedures in full conformance with the original Project Specifications.

6.3 RECORDKEEPING

The Subcontractor shall maintain written records of all monitoring, inspection, and repairs in accordance with recordkeeping and reporting requirements of Section 7.0 of the Systems Plan.

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7.0 RECORDKEEPING AND REPORTING

The Subcontractor shall be responsible for preparing and maintaining accurate and complete records of all inspection, operation, and maintenance activities. The Subcontractor is also responsible for reporting these activities to the CM.

This section of the plan describes the general record procedures that will be followed by the personnel performing OSDF activities. These procedures will ensure that consistent and reproducible records are developed when the work is performed by various individuals. This section also addresses the Subcontractor reporting requirements.

7.1 RECORDKEEPING PROCEDURES

The Subcontractor shall be responsible for establishing the detailed procedures and requirements for the collection, storage, maintenance, and disposition of all OSDF records. Records shall be protected from damage or deterioration by being placed in lockable, fire-proof filing cabinets and by duplication and/or microfilming. Records shall be filed in accordance with a subject file index and shall be retained at the FEMP for 30 years after closure of the OSDF. Required records shall include, but not be limited to, field logbooks, other data collection forms, equipment calibration records, cost data, drawings, maintenance records, and all associated reports.

All original data collected in the field by the Subcontractor shall be considered a permanent record. This includes all field logbooks, other data forms, and photographs. All of these documents shall be authorized by the signature and date of the originator. Errors shall be corrected by crossing a single line through the error and entering the correct information. Corrections will be initialed and dated by the person making the correction.

7.2 REPORTING PROCEDURES

After each inspection and maintenance activity, a draft report that includes an executive summary, copies of field logs, photographs, checklist forms, and other pertinent data shall be submitted to the CM for review, approval, ~~the~~and forwarding to DOE. Following review and approval, final copies of the inspection report and associated documents shall be submitted to OEPA and USEPA.

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8.0 REFERENCES

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ATTACHMENT A

OWNER'S MANUALS FOR LEACHATE MANAGEMENT SYSTEM EQUIPMENT

(TO BE PROVIDED BY THE OSDF CONSTRUCTION CONTRACTOR AS PART OF CONSTRUCTION ACCEPTANCE)

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ATTACHMENT B

OWNER'S MANUALS FOR DECONTAMINATION FACILITIES

(TO BE PROVIDED BY THE OSDF CONSTRUCTION CONTRACTOR AS PART OF CONSTRUCTION ACCEPTANCE)

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HYDROSTATIC PIPE TEST PROCEDURE
LEACHATE CONVEYANCE SYSTEM
ON-SITE DISPOSAL FACILITY
FERNALD, OHIO

The following procedures are intended to supplement the requirements of Section 02605 (or 02605A): High Density Polyethylene (HDPE) Pipes and Fittings of the Technical Specifications for the OSDF project. The procedures are applicable to the components of the leachate conveyance system which drain by gravity. Refer to Part 3.07.C and Part 3.07.D of Section 02605 and 02605A of the Leachate Conveyance System Technical Specifications [FEMP LCS-SPEC-REV 0] and any applicable DCNs. The procedures are to be reviewed and accepted by the pipe supplier prior to implementation. Bring any conflicts between the following procedures and Section 02605 (or 02605A) and any applicable DCN to the immediate attention of the Construction Manager.

Carrier Pipe

The steps to be followed during hydrostatic pressure testing of the 6-in. diameter gravity carrier pipe component of the leachate conveyance system for the On-Site Disposal Facility are presented below. In addition, all FDF, Contractor, and OSHA safety protocols (e.g., trench stability, pipe supports, equipment verifications, valve opening/closing warning, worker protection, etc.) are to be followed. Each step is to be checked off as it is performed.

- Remove all blind flanges from cleanouts of the section of carrier pipe to be tested.

- Attach all necessary blind flanges, low-point drain valve, high-point drain valve, pressure gauge and fill hose connections to the section of carrier pipe to be tested. Low-point refers to the end of pipe section being tested with the lowest elevation; while high-point refers to the end with the highest elevation. Note that the pressure gauge must be installed upgradient of the low-point drain valve. Position the pressure gauge such that it is in full view of the testing operator when the valve is being turned on or off.

- Attach a fill hose to the low-point of the drain valve.

- Slowly fill the carrier pipe with water until water flows from the high-point drain valve and over the top of the cleanouts.

- Make sure any air in the pipe is completely vented, by shaking or tapping pipes gently. When all air is out of the system, shut-off high-point drain valve, replace the cleanout blind flanges, close the low-point drain valve, shut-off water source at low-point drain valve, and remove fill hose.

- Open any low-point drain valves or weep holes in the containment pipe to allow visual leak detection monitoring during the carrier pipe testing.

- Attach pressure source to the low-point drain valve of the carrier pipe, and open low-point drain valve.

- Gradually increase pressure to the 50-psi test pressure. The 50-psi pressure is the maximum pressure applied as measured at the low-point drain-valve and includes the pressure due to the hydrostatic head of water in the pipe. Close low-point valve and remove pressure source connection.

- Allow the pipe to stand without makeup pressure until equalization is reached (approximately 2 to 3 hours). Equalization is achieved if there is <u>no</u> further change in pressure over a one-hour period.

- After completion of stabilization period, repressurize the pipe to 50 psi and perform test for one hour if the pipe is not buried, and 3 hours if the pipe is buried. If a pressure decrease occurs, add makeup water to return the pipe pressure to 50 psi. A passing test is considered to require less makeup water than established from Table 1.

- Slowly relieve pressure by opening the high-point drain valve.

- If test was successful (i.e. passed) and testing of containment pipe is not desired at this time, connect a drain hose to the low-point drain valve and drain the system to an appropriate location (e.g., tank, storm sewer, etc.).

Containment Pipe

The steps to be followed during hydrostatic pressure testing of the 10-in. diameter containment pipe are presented below. In addition, all FDF, Contractor, and OSHA safety protocols (e.g., trench stability, pipe supports, equipment verifications, valve opening/closing warning, worker protection, etc.) are to be followed. Each step is to be checked off as it is performed.

- Remove vent plugs from fixed end seals at all cleanouts of the section to be tested. Drill holes in any fixed-end seals which do not have vent plugs. Tap the hole for subsequent installation of a vent plug.

- Attach all necessary blind flanges, low-point drain valve, high-point drain valve, pressure gauge and fill hose connections to the section of containment pipe to be tested. Low-point refers to the end of pipe section being tested with the lowest elevation; while high-point refers to the end with the highest elevation. Note that the pressure gauge must be installed upgradient of the low-point drain valve. Position the pressure gauge such that it is in full view of the testing operator when the valve is being turned on or off.

- Open all high-point vent valves of the containment piping system.

- Attach a fill hose to the low-point drain valve.

- Slowly fill the containment pipe with water until water flows from the high-point drain valve and over the top of the cleanouts.

- Make sure that any air in the pipe is completely vented, by shaking or tapping the pipe gently. When all air is out of the system, shut-off high-point drain valve, replace the vent plugs at the cleanout location, close the low-point drain valve, shut-off water source at low-point drain valve, and remove fill hose.

- Fill carrier pipe and pressurize to 15 psi according to the procedures described previously for the carrier pipe.

- Attach pressure source to the low-point drain valve of the containment pipe, and open the containment low-point drain valve.

- Gradually increase pressure to the 15-psi test pressure. This test pressure is the maximum pressure applied to the containment pipe as measured at the low-point drain valve and includes the pressure due to the hydrostatic head of water in the pipe.

- Visually inspect containment pipe welds, joints, and fittings as pressure is applied. Inspect other pipe sections for any signs of water. Apply soap to welds, joints, or fittings as needed.

- Close low-point valve and remove pressure source connection.

- Allow the pipe to stand without makeup pressure until equalization is reached (approximately 2 to 3 hours). Equalization is achieved if there is no further change in pressure over a one-hour period.

- After completion of stabilization period, repressurize the pipe to 15 psi and perform test for one hour if the pipe is not buried, and 3 hours if the pipe is buried. If a pressure decrease occurs, add makeup water to return the pipe pressure to 15 psi. A passing test is considered to require less makeup water than established from Table 1.

- Slowly relieve pressure by opening the high-point drain valve of the containment system. Note, always release pressure from the containment pipe before releasing pressure from carrier pipe.

- Open the carrier system high-point vent valve and slowly relieve the pressure from the system.

- If test was successful (i.e. passed) and testing of carrier pipe is not desired at this time, connect a drain hose to the low-point drain valve and drain the system to an appropriate location (e.g., tank, storm sewer, etc.).

TABLE 1: ALLOWANCE FOR EXPANSION UNDER TEST PRESSURE*

Allowance for Expansion
(U.S. Gallons / 100 Feet of Pipe)

Nominal Pipe Size (Inches)	1 Hour Test	2 Hour Test	3 Hour Test
3	0.10	0.15	0.25
4	0.13	0.25	0.40
6	0.30	0.60	0.90
8	0.50	1.0	1.5
10	0.75	1.30	2.10
11	1.0	2.0	3.0
12	1.1	2.3	3.4
14	1.4	2.8	3.2
16	1.7	3.3	5.0
18	2.2	4.3	6.5
20	2.8	5.5	8.0
22	3.5	7.0	10.5
24	4.5	8.8	13.3
28	5.5	11.1	16.8
32	7.0	14.3	21.5
36	9.0	18.0	27.0
40	11.0	22.0	33.0
48	15.0	27.0	43.0

* These allowances only apply to the test period and not to the initial expansion phase.

PNEUMATIC PIPE TEST PROCEDURE
LEACHATE CONVEYANCE SYSTEM
ON-SITE DISPOSAL FACILITY
FERNALD, OHIO

Hydrostatic testing is the approved testing procedure for the piping systems. However, if approved in writing by the Construction Manager as indicated in Section 02605, Part 3.07.D, a pneumatic test procedure may be used as an alternative or as a preliminary test for the pipes. Regardless of the approval of the Construction Manager the proposed test pressure(s) to be applied to a specific pipe are to be reviewed and accepted by the pipe supplier prior to implementation. Review and acceptance of proposed test pressure(s) by the pipe supplier only involve assessing if proposed test pressure(s) may be detrimental to the pipe (i.e., does NOT include assessing safety issues).

Carrier Pipe

The steps to be followed during pneumatic pressure testing of the 6-in. diameter gravity carrier pipe component of the leachate conveyance system for the On-Site Disposal Facility are presented below. In addition, all FDF, Contractor, and OSHA safety protocols (e.g., trench stability, pipe supports, equipment verifications, valve opening/closing warning, worker protection, danger zones, etc.) are to be followed. FDF Construction, Safety, and Quality Assurance shall verify all site safety protocols are being followed. Extra care shall be exercised when performing this test since compressed air (or the pressurized gas used as the test medium) may present hazards to workers in the vicinity of the pipelines being tested. The test medium shall be nonflammable and nontoxic. For an approved test at Fernald, the test medium shall be air. Each step is to be checked off as it is performed.

- Install blind flanges at cleanouts along the section of carrier pipe to be tested.
- Attach all necessary blind flanges, low-point drain valve, high-point drain valve, pressure gauge and fill hose connections to the section of carrier pipe to be tested. Low-point refers to the end of pipe section being tested with the lowest elevation, while high-point refers to the end with the highest elevation. Note that the pressure gauge must be installed upgradient of the low-point drain

valve. Position the pressure gauge such that it is in full view of the testing operator when the valve is being turned on or off.

- Close all high-point drain valves and low-point drain valves of both the carrier and containment piping systems. Make sure these valves are definitely closed.

- Attach a pneumatic pressure source (i.e., air compressor with pressure regulator valve) to the overall low-point drain valve of the carrier pipe.

- Turn on the pneumatic pressure source and open the carrier pipe low-point drain valve to the pressure source. Allow the pressure to rise in a gradual, step-wise manner.

- Apply a 10-psi pressure as a preliminary test to detect any possible major leaks. Detect leaks by means of soap bubble or monitoring of test gauge as described below.

- Gradually increase the pressure to one-half of the full 50-psi pneumatic test pressure (or to one-half of the 15-psi pressure for testing of the containment pipe). The test pressure must not exceed the pneumatic test pressure of any component (e.g., valve, blind flange, etc.) of the piping system. Pause to allow the pipe strains to become somewhat equalized and to detect any possible major leaks.

- For testing of the carrier pipe, gradually increase the pressure to the full 50-psi pneumatic test pressure. Pause at 40 psi to allow the pipe strains to become somewhat equalized and to detect any possible leaks. Close the low-point valve once 50-psi is reached.

- For a preliminary test, hold the pressure for a minimum of 10 minutes.

- For an alternate test, hold the pressure for one hour.

- If the internal gauge pressure of the carrier pipe does not drop below the full pneumatic test pressure, and no leaks are detected, the carrier pipe is considered to have passed the pressure/leak test.

- At the completion of the test verify the low-point drain valve is closed and disconnect the pressure source from the low-point drain valve.

- Open the high-point vent valve and slowly allow the pressure to be reduced to atmospheric pressure.

Containment Pipe

The steps to be followed during pneumatic pressure testing of the 10-in. diameter gravity containment pipe component of the leachate conveyance system for the On-Site Disposal Facility are presented below. In addition, all FDF, Contractor, and OSHA safety protocols (e.g., trench stability, pipe supports, equipment verifications, valve opening/closing warning, worker protection, danger zones, etc.) are to be followed. FDF Construction, Safety, and Quality Assurance shall verify all site safety protocols are followed. Extra care shall be exercised when performing this test since compressed air (or the pressurized gas used as the test medium) may present hazards to workers in the vicinity of the pipelines being tested. The test medium shall be nonflammable and nontoxic. For an approved test at Fernald, the test medium shall be air. Each step is to be checked off as it is performed.

- Pressurize the carrier pipe to 15 psi according to the procedures described previously for the carrier pipe.

- Close the carrier pipe system low-point drain valve, and remove the pressure source to the low-point drain valve. Note that the carrier pipe system is now a closed system, filled with compressible gas (i.e., air), under the same pressure that the containment pipe will be pneumatically tested.

- Recheck all high-point vent valves and low-point drain valves of the containment piping system. Low-point refers to the end of pipe section being tested with the lowest elevation, while high-point refers to the end with the highest elevation. Make sure that these valves are definitely closed. Close all vent plugs at the cleanouts along the section of pipe to be tested.

- Attach a source of pneumatic pressure (i.e., air compressor with pressure regulator valve) to the overall low-point drain valve of the containment pipe.

- Turn on the pneumatic pressure source and open the containment pipe low-point drain valve to the pressure source. Allow the pressure to rise in a gradual, step-wise manner.

- Raise the pressure in increments of 5 psi in a slow, gradual manner. Allow the pipe strains to become somewhat equalized between increments. Apply soapy solution to each weld, joint, or flange to detect bubbles if there are any leaks.

- Close the containment system low-point valve once the full pneumatic test pressure of 15 psi is reached.

- For a preliminary test, hold the pressure for 10 minutes.

- For alternative tests, hold the pressure for one hour.

- If the internal gauge pressure of the carrier pipe does not drop below the full pneumatic test pressure, and no leaks are detected using soap bubble, the containment pipe would have passed the pressure/leak valve.

- When the test is complete, verify the low-point drain valve is closed and disconnect the pressure source from the low-point drain valve.

- Open the containment system high-point vent valve and slowly allow the pressure to be reduced to atmospheric pressure. Note, always release pressure from the containment pipe before releasing pressure from carrier pipe.

- Open the carrier system high-point vent valve and carefully allow the pressure to be reduced to atmospheric pressure.