2-209.12

807

Department of Energy

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

MAY 5 1997

DOE-0905-97

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

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

Dear Mr. Saric and Mr. Schneider:

TRANSMITTAL OF CLARIFICATIONS TO U.S. ENVIRONMENTAL PROTECTION AGENCY AND OHIO ENVIRONMENTAL PROTECTION AGENCY COMMENTS

The U.S. Department of Energy (U.S. DOE) is pleased to transmit the Clarifications to the U.S. Environmental Protection Agency (U.S. EPA) and Ohio Environmental Protection Agency (OEPA) Comments. These clarifications were requested by the regulatory agencies. The proposed resolution for these storm water management issues at the On-Site Disposal Facility (OSDF) are enclosed.

If you or your staff have any questions regarding this transmittal, please contact Rod Warner at (513) 648-3156.

Sincerely,

Johnny W. Reising
Fernald Remedial Action
Project Manager

FEMP:Warner

Enclosure: As Stated

Recycled and Recyclable

cc w/enc:

N. Hallein, EM-42/CLOV
G. Jablonowski, USEPA-V, 5HRE-8J
R. Beaumier, TPSS/DERR, OEPA-Columbus
T. Schneider, OEPA-Dayton (3 copies total of enc.)
F. Bell, ATSDR
D. S. Ward, GeoTrans
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R. Geiger, PRC
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[redacted]

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CLARIFICATION TO U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS ON THE FINAL DESIGNS OF THE ON-SITE DISPOSAL FACILITY AND LEACHATE CONVEYANCE SYSTEM

1. Commenting Organization: U.S. EPA — Commentor: Saric
Section #: 2.8.3 — Page #: 2-90 — Line #: N/A
Original Comment #: 4

Comment: The original specific comment requests that DOE provide additional information regarding: (1) the discharge of storm water runoff from the OSDF watershed, and (2) restricting the discharge rate to the predevelopment rate. DOE's response does not address the discharge rate, only the sediment storage volume. The calculations presented in Section 2.8.3 should show the predevelopment discharge rate and how OSDF storm water runoff will be restricted to the predevelopment rate. In addition, the CFC design package should contain a drawing showing the type and size of runoff control structure to be used.

Response: The requested calculations will be performed and the information will be forwarded to OEPA within 60 days. The details as to the type and size of runoff control structures are shown on Drawing G-5C, Subgrade Grading Plan III.

Action: The requested calculation is attached for your review.

CLARIFICATION TO OHIO ENVIRONMENTAL PROTECTION AGENCY COMMENTS ON THE FINAL DESIGNS OF THE ON-SITE DISPOSAL FACILITY AND LEACHATE CONVEYANCE SYSTEM

1. Commenting Organization: Ohio EPA Commentor: DSW
Section #: Page #: Line #: Code:
Original Comment #: 70

Comment: In Revision G, Page 2-94, there is a statement, "No formal calculations are required for temporary erosion control during OSDF construction, filling, and closure." Formal calculations are required as stated in the original comment. The comment stands. The sentence should be deleted or modified to indicate the calculations are required.

Response: DOE believes that the temporary erosion controls have been adequately defined. There may be a misunderstanding of what information OEPA is requesting. It is suggested that a conference call be held to resolve this issue. DOE will contact you within the next two weeks to schedule the discussion.

Action: After discussion with OEPA, DOE agrees that the statement, "No formal calculations are required for temporary erosion control during OSDF construction, filling, and closure." It is an incorrect statement and will remove it from the Design Criteria Package.

ENVIRONMENTAL RESTORATION MANAGEMENT CORPORATION

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ENGINEERING CALCULATION

PROJECT NO. 04424321	
BY B. CATANACH	DATE 3/5/97
CHECKED BY R. HEATH	DATE 4/24/97
PAGE 1 OF 18	
REVISED:	

SUBJECT: OSDF PRE + POST DEVELOPMENT RUN OFF

FERMCO Fernald Environmental Restoration Management Corporation	Title: CALCULATION PREPARATION AND REVIEW PROCESS
	DOCUMENT NO: 12-4005 REVISION NO: 0

1 of 18

TITLE PAGE

Total No. of Pages: 18

DEPARTMENT: OSDF ORIGINATED BY: Brad Catanach DATE: 3/97

CALCULATION NO. OSDF SD-101 CHECKED BY: Rick Heath DATE: 4/24/97

AREA: Southeastern FEMP REVISED BY: _____ DATE: _____

PROJECT NO.: 04424321 APPROVED BY: [signature] DATE: 4/22/97
SECTION SUPERVISOR

_____ DATE: _____

SUBJECT: OSDF Pre+Post-Development runoff calculation

RECORD OF REVISIONS

NO.	REASON FOR REVISION	DATE	ORIG.	CHECKER	APPROVER

REGISTRATION STAMP (AS APPLICABLE) N/A

SIGNATURE: [signature]

NUMBER: _____

Figure 1 - ~~Sample of~~ Calculation Title Page

RCH 4/24/97

RSH 4/24/97

ON-SITE DISPOSAL FACILITY
SURFACE WATER MANAGEMENT

PRE-DEVELOPMENT vs. POST-DEVELOPMENT SITE DISCHARGE RATES

The following stormwater runoff calculations were performed to compare the Pre-development and Post-development storm water runoff rates at the OSDF site. The site conditions for calculating pre development and post-development discharge rates were modeled using the Soil Conservation Service TR-55 program. The model requires the user to first set-up the drainage subareas, slopes, Mannings value, and channel dimensions (if applicable); next, the subareas are given a CN number which is dependent on the soil type and hydrological condition; then, the time of concentration and travel time are calculated for each subarea using the slope, surface Mannings value, and possible channel dimensions.

The OSDF watershed hydrological soil groups were classified as type Band C, for Dana, Eden, Fincastle, Miamian-Russell, Ragsdalé, and Xenia soils. Based on the above soil types the CN value of 74 was used for, open grass land with good hydrological conditions. The Mannings number used was 0.3 for a dense bermuda grass. The CN and Mannings values were assumed the same for the pre-development and post-development conditions. The total drainage area for the pre-development conditions was approximately 214.8 acres and for the post-development conditions drainage area is 200.5 acres. This reduction drainage area is due to rerouting of drainage from north and part of the west areas of the OSDF draining into the OU1 Railyard channels.

The four tables below show the input values used in calculating the time of concentration and travel time for both pre and post development conditions. As a result of these values a hydrograph was run for the 25 year 24 hour storm, which is a total of 4.70 inches of precipitation. The peak discharge for pre-development is 114 cubic feet per second and the post-development conditions peak discharge is 112 cfs.

In summary, storm runoff calculations show that the post-development discharge rate at the OSDF is reduced compared to the pre-development discharge rate, mainly because of reduction in the drainage area.

RCH 4/24/97

RCH 4/24/97

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TABLE 1

TOTAL TIME OF CONCENTRATION FOR PRE- DEVELOPMENT CONDITIONS

		SHEET FLOW		CONC. FLOW		CHANNEL FLOW				
Sub area	Area (ac)	Length (ft)	Slope %	Length (ft)	Slope %	Channel Area,(sf)	Wetted Perm (ft)	Channel Slope %	Length (ft)	Time of Conc.(hrs)
A	58.79	300	1.08	900	1.08	16	11.3	1.45	1250	1.59
B	33.54	550	1.53	1000	1.53	16	11.3	1.0	450	1.73
C	13.66	400	3.75	NA	NA	16	11.3	0.7	2170	1.90
D	5.02	550	1.4	NA	NA	16	11.3	0.5	400	1.69
E	38.75	400	1.21	550	1.21	16	11.3	0.48	900	1.84
F	10.22	150	1.83	450	1.83	16	11.3	0.6	930	1.05
G	6.73	450	1.18	400	1.18	16	11.3	0.8	700	1.72
H	10.73	NA	NA	NA	NA	16	11.3	0.5	800	0.5
I	37.40	60	1.7	1870	1 12	NA	NA	NA	NA	0.53

TABLE 2

TOTAL TRAVEL TIME FOR PRE- DEVELOPMENT CONDITIONS

		SHEET FLOW		CONC. FLOW		CHANNEL FLOW				
Sub area	Area (ac)	Length (ft)	Slope %	Length (ft)	Slope %	Channel Area,(sf)	Wetted Perm (ft)	Channel Slope %	Length (ft)	Travel Time (hrs)
A	58.79					16	11.3	1.0	3890	1.73
B	33.54					16	11.3	1.0	2900	1.29
C	13.66					16	11.3	0.6	2740	1.57
D	5.02		N/A			16	11.3	0.5	2300	1.44
E	38.75					16	11.3	0.5	2170	1.36
F	10.22					16	11.3	0.52	1420	0.87
G	6.73					16	11.3	0.5	1350	0.85
H	10.73					16	11.3	0.5	960	0.6
I	37.40					16	11.3	0.5	650	0.41

FOR LOCATION OF PRE-DEVELOPMENT DRAINAGE SUB AREAS, SEE ATTACHED SKETCH 1

FERNALD
ENVIRONMENTAL RESTORATION
MANAGEMENT CORPORATION

ENGINEERING CALCULATION

PROJECT NUMBER 0442432 807
BY B. CATANACH DATE 2/5/97
CHECKED BY R. HEATH DATE 4/24/97
PAGE 4 OF 18
REVISED:

SUBJECT: OSDF PRE + POST DEVELOPMENT RUN OFF

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TABLE 3

TOTAL TIME OF CONCENTRATION FOR POST-DEVELOPMENT CONDITIONS

		SHEET FLOW		CONC. FLOW		CHANNEL FLOW				
Sub area	Area (ac.)	Length (ft)	Slope %	Length (ft)	Slope %	Channel Area,(sf)	Wetted Perm (ft)	Channel Slope %	Length (ft)	Time of Conc (hrs)
A	14.4	580	14.8	NA	NA	16	11.3	0.5	1325	1.41
B	14.4	580	14.8	NA	NA	16	11.3	0.5	1325	1.41
C	21.85	490	14.8	NA	NA	40.5	27.7	0.5	1500	1.43
D	19.1	490	14.8	NA	NA	40.5	27.7	0.5	1800	1.62
E	19.03	150	0.67	300	1.14	32	17.9	0.5	4700	1.64
F	28.54	350	1.5	450	2.2	32	17.9	0.5	1800	1.99
G	23.2	750	9.53	800	1.0	NA	NA	NA	NA	0.99
H	59.94	500	1.0	1400	1.0	NA	NA	NA	NA	1.76

TABLE 4

TOTAL TRAVEL TIME FOR POST-DEVELOPMENT CONDITIONS

		SHEET FLOW		CONC. FLOW		CHANNEL FLOW				
Sub area	Area (ac.)	Length (ft)	Slope %	Length (ft)	Slope %	Channel Area,(sf)	Wetted Perm (ft)	Channel Slope %	Length (ft)	Travel Time(hrs)
A	14.4	NA	NA	NA	NA	16	11.3	0.5	3145	1.97
B	14.4	NA	NA	NA	NA	16	11.3	0.5	1820	1.14
C	21.85	NA	NA	1300	1.0	16	11.3	0.5	3150	2.20
D	19.1	NA	NA	1300	1.0	16	11.3	0.5	1350	1.07
E	19.03	NA	NA	2000	1.0	16	11.3	0.5	2700	2.04
F	28.54	NA	NA	2000	1.0	16	11.3	0.5	600	0.72
G	23.2	NA	NA	NA	NA	16	11.3	0.5	1350	0.85
H	59.94	NA	NA	NA	NA	48	25.3	0.5	600	0.31

FOR LOCATION OF POST-DEVELOPMENT DRAINAGE SUB AREAS SEE ATTACHED SKETCH 2

Quick TR-55 Version: 5.46 S/N:

(OUTPUT Page 1 of 6)

Return Frequency: 25 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed:
Watershed file: --> C:\OSDF\BCOSDF .WDP
Hydrograph file: --> C:\OSDF\.HYD

RUN DATE 1/27/97

Pre-OSDF Site Conditions

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input	Ia/p used
1,2,3,4,5,8,9	58.79	74.0	1.50	2.00	4.70	2.13	.15	.10
10,11,12	33.54	74.0	1.50	1.50	4.70	2.13	.15	.10
6,7,13	13.66	74.0	2.00	1.50	4.70	2.13	.15	.10
14,15	5.02	74.0	1.50	1.50	4.70	2.13	.15	.10
20,21,22	38.75	76.0	2.00	1.00	4.70	2.29	.13	.10
16,17,18,19	10.22	74.0	1.00	1.00	4.70	2.13	.15	.10
23,24	6.73	74.0	1.50	1.00	4.70	2.13	.15	.10
25,26,27	10.73	74.0	0.50	0.50	4.70	2.13	.15	.10
28	37.40	74.0	0.50	0.40	4.70	2.13	.15	.10

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 214.84 acres or 0.3357 sq.mi
Peak discharge = 114 cfs

WARNING: Drainage areas of two or more subareas differ by a factor of 5 or greater.

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
1,2,3,4,5,8,9	1.59	1.73	1.50	2.00	No	--
10,11,12	1.73	1.29	1.50	1.50	No	--
6,7,13	1.90	1.57	2.00	1.50	No	--
14,15	1.69	1.44	1.50	1.50	No	--
20,21,22	1.84	1.36	2.00	1.00	No	--
16,17,18,19	1.05	0.87	1.00	1.00	No	--
23,24	1.72	0.85	1.50	1.00	No	--
25,26,27	0.50	0.60	0.50	0.50	No	--
28	0.53	0.41	0.50	0.40	No	--

* Travel time from subarea outfall to composite watershed outfall point.

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Quick TR-55 Version: 5.46 S/N:

(OUTPUT Page 2 of 6)

Return Frequency: 25 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed:
Watershed file: --> C:\OSDF\BCOSDF .MOP
Hydrograph file: --> C:\OSDF\.HYD

RUN DATE 1/27/97

Pre-OSDF Site Conditions

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
1,2,3,4,5,8,9	43	15.0
10,11,12	25	14.6
6,7,13	9	15.0
14,15	4	14.6
20,21,22	28	14.3
16,17,18,19	10	13.8
23,24	5	13.8
25,26,27	15	12.8
28	54	12.8
Composite Watershed	114	14.6

RAH 4/24/97

Quick TR-55 Version: 5.46 S/N:

(OUTPUT Page 3 of 6

Return Frequency: 25 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed:
Watershed file: --> C:\OSDF\BCOSDF .MOP
Hydrograph file: --> C:\OSDF\.HYD

RUN DATE 1/27/97

Pre-OSDF Site Conditions

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
1,2,3,4,5,8,9	0	0	1	1	1	1	1	1	1
10,11,12	0	0	1	1	1	1	1	1	1
6,7,13	0	0	0	0	0	0	0	0	0
14,15	0	0	0	0	0	0	0	0	0
20;21,22	0	1	1	1	1	1	1	1	2
16,17,18,19	0	0	0	0	0	0	0	1	1
23,24	0	0	0	0	0	0	0	0	0
25,26,27	0	1	1	1	1	1	2	3	4
28	1	2	3	4	4	5	7	10	13
Total (cfs)	1	4	7	8	8	9	12	17	27

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
1,2,3,4,5,8,9	1	1	2	2	2	2	3	4	7
10,11,12	1	1	1	1	2	2	4	6	11
6,7,13	0	0	0	0	1	1	1	2	3
14,15	0	0	0	0	0	0	1	1	2
20,21,22	2	2	2	2	4	6	10	15	20
16,17,18,19	1	1	1	1	2	4	6	9	10
23,24	0	0	0	0	1	1	2	3	5
25,26,27	7	10	13	15	13	10	6	4	3
28	29	41	51	54	45	30	20	13	10
Total (cfs)	41	56	70	75	70	56	53	57	71

RCH 4/24/97

Quick TR-55 Version: 5.46 S/N:

(OUTPUT Page 4 of 6)

Return Frequency: 25 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed:
Watershed file: --> C:\OSDF\BCOSDF .NOP
Hydrograph file: --> C:\OSDF\.HYD

RUN DATE 1/27/97

Pre-OSDF Site Conditions

Composite Hydrograph Summary (cfs)

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
1,2,3,4,5,8,9	11	22	34	43	37	25	16	11	8
10,11,12	16	23	25	22	15	9	6	5	4
6,7,13	4	6	8	9	7	5	4	3	2
14,15	2	3	4	3	2	1	1	1	1
20,21,22	25	28	27	22	15	11	8	6	5
16,17,18,19	9	7	5	3	2	1	1	1	1
23,24	5	5	4	3	2	1	1	1	1
25,26,27	2	2	2	1	1	1	1	1	1
28	8	6	5	4	4	3	3	3	3
Total (cfs)	82	102	114	110	85	57	41	32	26

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
1,2,3,4,5,8,9	7	5	4	3	2
10,11,12	3	3	2	2	1
6,7,13	2	1	1	1	1
14,15	0	0	0	0	0
20,21,22	4	3	3	2	1
16,17,18,19	1	1	1	0	0
23,24	1	0	0	0	0
25,26,27	1	1	1	0	0
28	2	2	2	1	0
Total (cfs)	21	16	14	9	5

RCH 4/24/97

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ENVIRONMENTAL RESTORATION
MANAGEMENT CORPORATION

ENGINEERING CALCULATION

PROJECT NUMBER 04424328 07
BY B. CATANACH DATE 2/5/97
CHECKED BY R. HEATH DATE 4/24/97
PAGE 9 OF 18
REVISED:

SUBJECT: OSDF PRE + POST DEVELOPMENT RUN OFF

Quick TR-55 Version: 5.46 S/N:

OUTPUT Page 8 of 8
Return Frequency: 25 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed:
Watershed file: --> C:\OSDF\BCOSDF .WSP
Hydrograph file: --> C:\OSDF\.HYD

RUN DATE 1/27/97

PRE - DEVELOPMENT CONDITIONS

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	1	14.8	112
11.1	2	14.9	111
11.2	3	15.0	110
11.3	4	15.1	105
11.4	5	15.2	100
11.5	6	15.3	95
11.6	7	15.4	90
11.7	7	15.5	85
11.8	8	15.6	79
11.9	8	15.7	74
12.0	8	15.8	68
12.1	9	15.9	63
12.2	12	16.0	57
12.3	17	16.1	54
12.4	27	16.2	51
12.5	41	16.3	47
12.6	56	16.4	44
12.7	70	16.5	41
12.8	75	16.6	39
12.9	73	16.7	37
13.0	70	16.8	36
13.1	63	16.9	34
13.2	56	17.0	32
13.3	55	17.1	31
13.4	53	17.2	30
13.5	55	17.3	28
13.6	57	17.4	27
13.7	64	17.5	26
13.8	71	17.6	25
13.9	77	17.7	24
14.0	82	17.8	23
14.1	89	17.9	22
14.2	95	18.0	21
14.3	102	18.1	21
14.4	106	18.2	20
14.5	110	18.3	20
14.6	114	18.4	19
14.7	113	18.5	19

RCH 4/24/97

Quick TR-55 Version: 5.46 S/N:

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Return Frequency: 25 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed:
Watershed file: --> C:\OSDF\BCOSDF .HOP
Hydrograph file: --> C:\OSDF\.HYD

RUN DATE 1/27/97

PRE-DEVELOPMENT CONDITIONS

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	18	22.4	9
18.7	18	22.5	9
18.8	17	22.6	8
18.9	17	22.7	8
19.0	16	22.8	8
19.1	16	22.9	8
19.2	16	23.0	8
19.3	15	23.1	8
19.4	15	23.2	8
19.5	15	23.3	8
19.6	15	23.4	8
19.7	15	23.5	8
19.8	14	23.6	7
19.9	14	23.7	7
20.0	14	23.8	7
20.1	14	23.9	7
20.2	14	24.0	7
20.3	13	24.1	7
20.4	13	24.2	7
20.5	13	24.3	7
20.6	13	24.4	7
20.7	12	24.5	7
20.8	12	24.6	6
20.9	12	24.7	6
21.0	12	24.8	6
21.1	11	24.9	6
21.2	11	25.0	6
21.3	11	25.1	6
21.4	11	25.2	6
21.5	10	25.3	6
21.6	10	25.4	6
21.7	10	25.5	6
21.8	10	25.6	5
21.9	9	25.7	5
22.0	9	25.8	5
22.1	9	25.9	5
22.2	9		
22.3	9		

RGH 4/24/97

Quick TR-55 Version: 5.46 S/N: (OUTPUT Page 1 of 6)
Return Frequency: 25 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed:
Watershed file: --> C:\OSDF\ACOSDF .HOP
Hydrograph file: --> C:\OSDF\.HYD

RUN DATE 2/4/97

Post-OSDF Site Conditions

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
N. Western OSDF	14.40	74.0	1.50	2.00	4.70	2.13	.15	.10
S. Western OSDF	14.40	74.0	1.50	1.00	4.70	2.13	.15	.10
N. Eastern OSDF	21.85	74.0	1.25	2.50	4.70	2.13	.15	.10
S. Eastern OSDF	19.10	74.0	1.50	1.00	4.70	2.13	.15	.10
NE of N. Rd.	19.03	74.0	1.50	2.00	4.70	2.13	.15	.10
SE of N. Rd.	28.54	74.0	2.00	0.75	4.70	2.13	.15	.10
S. Area of OSDF	23.20	74.0	1.00	0.75	4.70	2.13	.15	.10
Borrow Area	59.94	74.0	1.50	0.40	4.70	2.13	.15	.10

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 200.46 acres or 0.3132 sq.mi
Peak discharge = 112 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
N. Western OSDF	1.41	1.97	1.50	2.00	No	--
S. Western OSDF	1.41	1.14	1.50	1.00	No	--
N. Eastern OSDF	1.43	2.20	1.25	2.50	No	--
S. Eastern OSDF	1.62	1.07	1.50	1.00	No	--
NE of N. Rd.	1.64	2.04	1.50	2.00	No	--
SE of N. Rd.	1.99	0.72	2.00	0.75	No	--
S. Area of OSDF	0.99	0.85	1.00	0.75	No	--
Borrow Area	1.76	0.31	1.50	0.40	No	--

* Travel time from subarea outfall to composite watershed outfall point.

RGH 4/24/97

Quick TR-55 Version: 5.46 S/N:

(OUTPUT Page 2 of 6)
Return Frequency: 25 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed:
Watershed file: --> C:\OSDF\ACOSDF .HOP
Hydrograph file: --> C:\OSDF\.HYD

RUN DATE 2/4/97

Post-OSDF Site Conditions

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
N. Western OSDF	10	15.0
S. Western OSDF	11	14.0
N. Eastern OSDF	16	15.5
S. Eastern OSDF	15	14.0
NE of N. Rd.	14	15.0
SE of N. Rd.	19	14.0
S. Area of OSDF	23	13.6
Borrow Area	50	13.6
Composite Watershed	112	13.8

RGH 4/24/97

FERNALD
ENVIRONMENTAL RESTORATION
MANAGEMENT CORPORATION

ENGINEERING CALCULATION

PROJECT NUMBER 04424327 807
BY B. CATANACH DATE 2/5/97
CHECKED BY R. HEATH DATE 4/24/97
PAGE 13 OF 18
REVISED

SUBJECT: OSDF PRE + POST DEVELOPMENT RUN OPF

Quick TR-55 Version: 5.46 S/N: (OUTPUT Page 3 of 6)
Return Frequency: 25 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed:
Watershed file: --> C:\OSDF\ACOSDF .NOP
Hydrograph file: --> C:\OSDF\.HYD RUN DATE 2/4/97

Post-OSDF Site Conditions

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
N. Western OSDF	0	0	0	0	0	0	0	0	0
S. Western OSDF	0	0	0	0	0	0	1	1	1
N. Eastern OSDF	0	0	0	0	0	0	0	0	0
S. Eastern OSDF	0	0	0	1	1	1	1	1	1
NE of N. Rd.	0	0	0	0	0	0	0	0	0
SE of N. Rd.	0	1	1	1	1	1	1	1	1
S. Area of OSDF	1	1	1	1	1	1	1	2	2
Borrow Area	1	2	2	3	3	3	4	5	6
Total (cfs)	2	4	4	6	6	6	8	10	11

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
N. Western OSDF	0	0	0	0	0	1	1	1	2
S. Western OSDF	1	1	1	1	2	3	5	7	10
N. Eastern OSDF	0	0	0	1	1	1	1	1	1
S. Eastern OSDF	1	1	1	1	2	4	6	10	13
NE of N. Rd.	0	0	1	1	1	1	1	1	2
SE of N. Rd.	2	2	3	3	6	9	12	16	18
S. Area of OSDF	2	3	4	6	11	18	22	23	20
Borrow Area	7	10	13	18	30	41	49	50	46
Total (cfs)	13	17	23	31	53	78	97	109	112

RGH 4/24/97

Quick TR-55 Version: 5.46 S/N: (OUTPUT Page 4 of 6)

Return Frequency: 25 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed:
Watershed file: --> C:\OSDF\ACOSDF .NOP
Hydrograph file: --> C:\OSDF\.HYD

RUN DATE 2/4/97

Post-OSDF Site Conditions

Composite Hydrograph Summary (cfs)

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
N. Western OSDF	3	5	8	10	9	6	4	3	2
S. Western OSDF	11	11	9	6	4	3	2	2	1
N. Eastern OSDF	2	4	8	14	16	12	7	5	3
S. Eastern OSDF	15	15	12	9	5	4	3	2	2
NE of N. Rd.	4	7	11	14	12	8	5	4	3
SE of N. Rd.	19	18	16	12	8	6	5	4	3
S. Area of OSDF	16	11	8	5	4	3	2	2	2
Borrow Area	39	29	22	15	11	8	7	6	5
Total (cfs)	109	100	94	85	69	50	35	28	21

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
N. Western OSDF	2	1	1	1	1
S. Western OSDF	1	1	1	1	0
N. Eastern OSDF	3	2	2	1	1
S. Eastern OSDF	2	1	1	1	0
NE of N. Rd.	2	2	1	1	1
SE of N. Rd.	3	2	2	1	1
S. Area of OSDF	2	1	1	1	0
Borrow Area	4	4	3	3	1
Total (cfs)	19	14	12	10	5

RLH 4/24/97

Quick TR-55 Version: 5.46 S/N:

(OUTPUT Page 5 of 6)

Return Frequency: 25 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed:
Watershed file: --> C:\OSDF\ACOSDF .MOP
Hydrograph file: --> C:\OSDF\.HYD

RUN DATE 2/4/97

POST DEVELOPMENT CONDITIONS

Time (hrs)	Flow (cfs)
11.0	2
11.1	3
11.2	3
11.3	4
11.4	4
11.5	4
11.6	4
11.7	5
11.8	5
11.9	6
12.0	6
12.1	6
12.2	8
12.3	10
12.4	11
12.5	13
12.6	17
12.7	23
12.8	31
12.9	42
13.0	53
13.1	66
13.2	78
13.3	88
13.4	97
13.5	103
13.6	109
13.7	111
13.8	112
13.9	111
14.0	109
14.1	106
14.2	103
14.3	100
14.4	98
14.5	96
14.6	94
14.7	92

Time (hrs)	Flow (cfs)
14.8	89
14.9	87
15.0	85
15.1	82
15.2	79
15.3	75
15.4	72
15.5	69
15.6	65
15.7	61
15.8	58
15.9	54
16.0	50
16.1	47
16.2	44
16.3	41
16.4	38
16.5	35
16.6	34
16.7	32
16.8	31
16.9	29
17.0	28
17.1	27
17.2	25
17.3	24
17.4	22
17.5	21
17.6	21
17.7	20
17.8	20
17.9	19
18.0	19
18.1	19
18.2	18
18.3	18
18.4	17
18.5	17

RCH 4/24/97

Quick TR-55 Version: 5.46 S/N:

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Return Frequency: 25 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed:
Watershed file: --> C:\OSDF\ACOSDF .HOP
Hydrograph file: --> C:\OSDF\.HYD

RUN DATE 2/4/97

POST-DEVELOPMENT CONDITIONS

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	16	22.4	10
18.7	16	22.5	9
18.8	15	22.6	9
18.9	15	22.7	9
19.0	14	22.8	9
19.1	14	22.9	9
19.2	14	23.0	9
19.3	13	23.1	9
19.4	13	23.2	9
19.5	13	23.3	8
19.6	13	23.4	8
19.7	13	23.5	8
19.8	12	23.6	8
19.9	12	23.7	8
20.0	12	23.8	8
20.1	12	23.9	8
20.2	12	24.0	8
20.3	12	24.1	7
20.4	12	24.2	7
20.5	12	24.3	7
20.6	11	24.4	7
20.7	11	24.5	7
20.8	11	24.6	7
20.9	11	24.7	7
21.0	11	24.8	7
21.1	11	24.9	6
21.2	11	25.0	6
21.3	11	25.1	6
21.4	11	25.2	6
21.5	11	25.3	6
21.6	10	25.4	6
21.7	10	25.5	6
21.8	10	25.6	6
21.9	10	25.7	5
22.0	10	25.8	5
22.1	10	25.9	5
22.2	10		
22.3	10		

RCH 4/24/97

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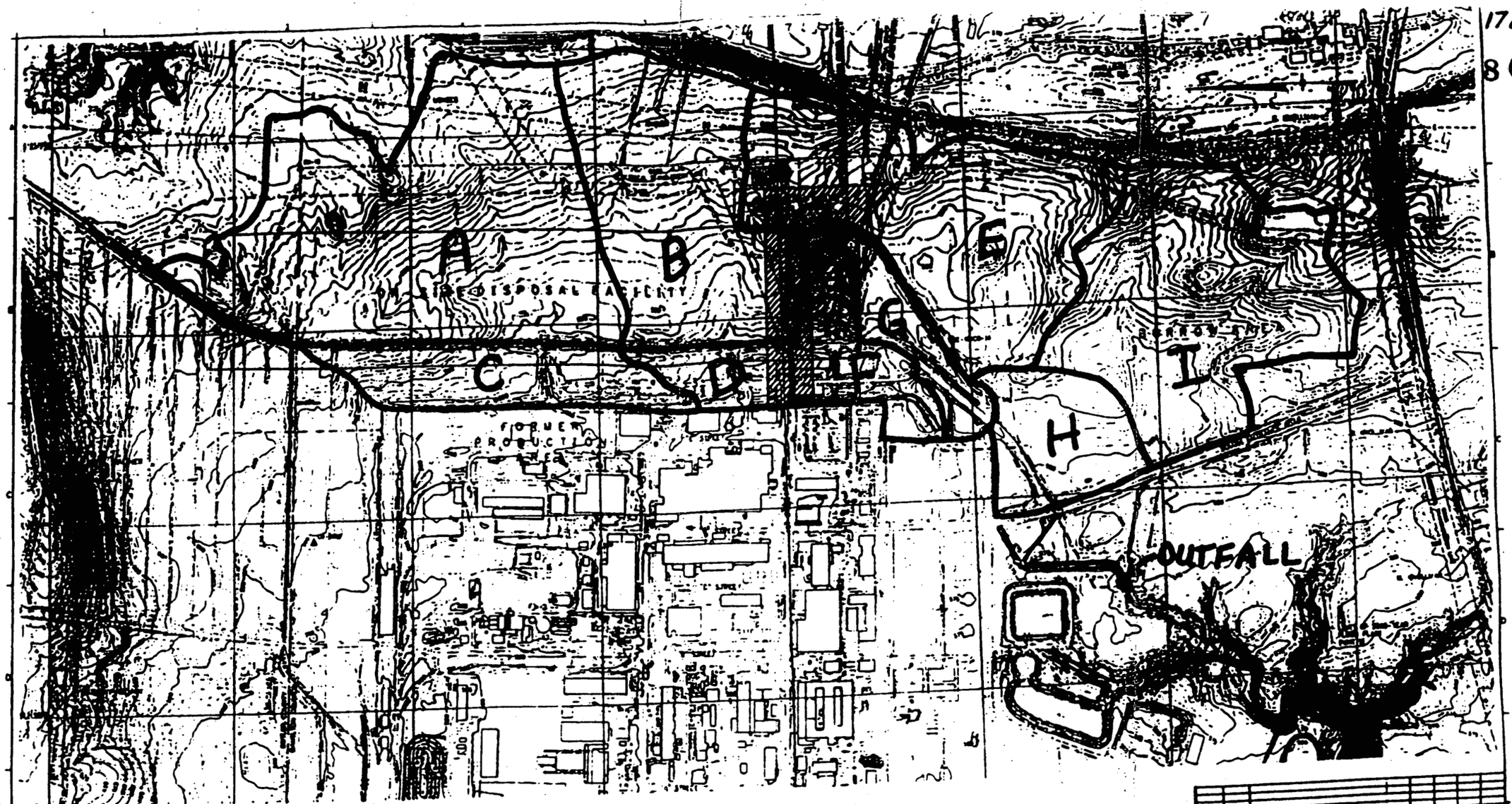

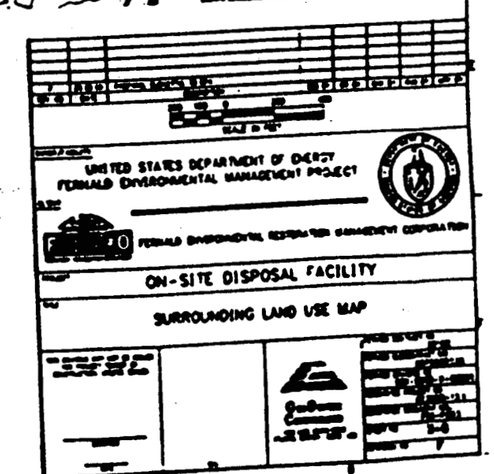

SKETCH - 1

RGJ
4/24/97

OSDF Project

Pre-Development Drainage Areas

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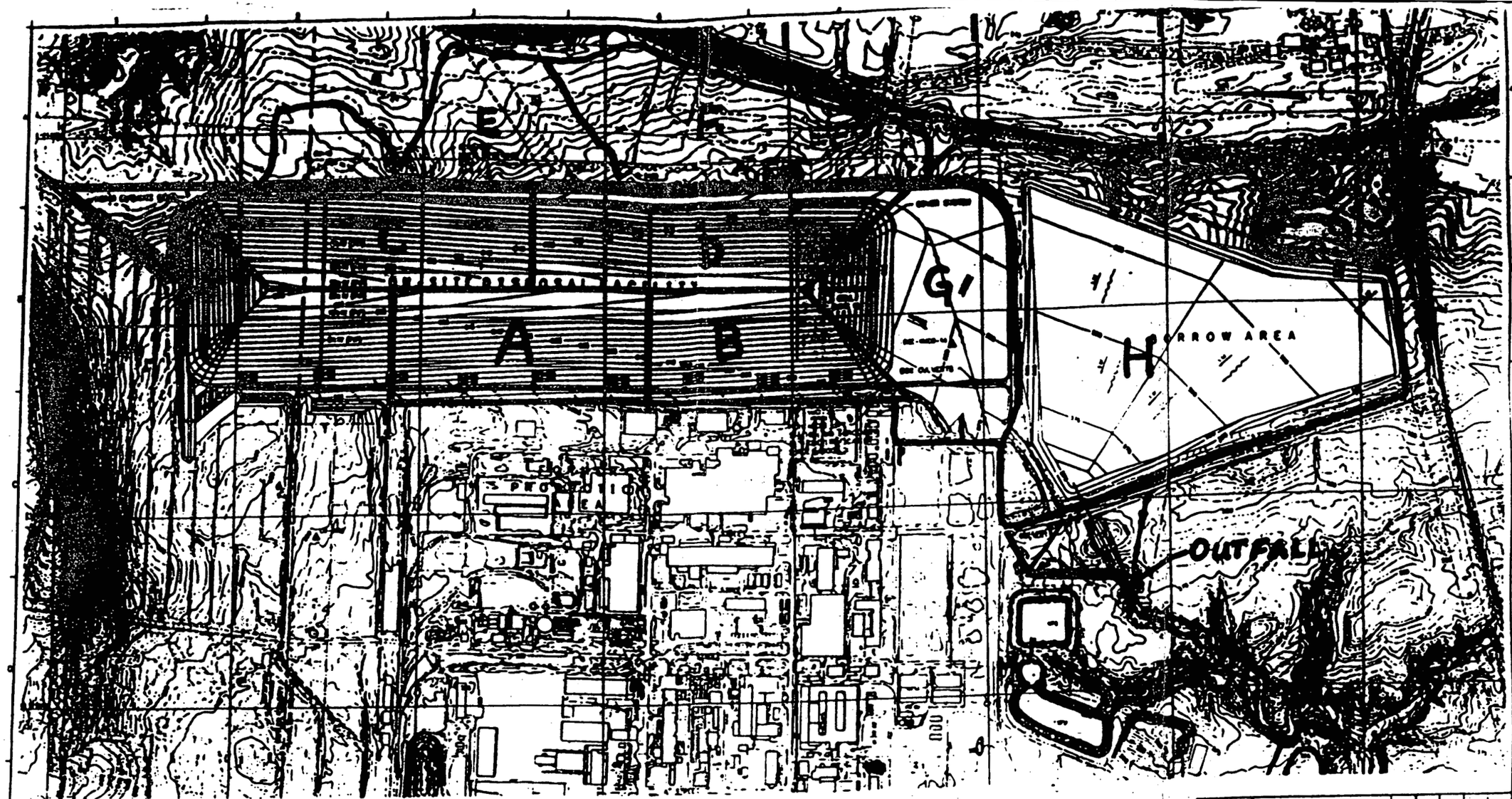

SKETCH - 2

OSDF Project

RWH
4/24/97

Pre-Development Drainage Areas

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

FERNALD ENVIRONMENTAL RESTORATION MANAGEMENT CORPORATION

ON-SITE DISPOSAL FACILITY

SITE PLAN