Attachment 9

PaDEP Major Permit Modification for the Southeastern Realignment – Form I

SOUTHEASTERN REALIGNMENT

Volume 3 of 3 (Form I)

IESI PA
Bethlehem Landfill Corporation
Major Modification

December, 2014

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b/11623/Cover

IESI PA Bethlehem Landfill Corporation

FORM I

PADEP PERMIT #100020

SOUTHEASTERN REALIGNMENT

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Rev. 4/14

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised August, 2009
DEP USE ONLY
Date Received

FORM I
SOIL EROSION AND SEDIMENTATION CONTROLS

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form I, reference the item number and identify the date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General References: 273.151, 275.205, 277.151, 279.232, 281.132, 283.106, 288.151, 289.252, 291.205, 293.232, 295.132, 297.106

SECTION A. SITE IDENTIFIER

Applicant/permittee: **IESI BETHLEHEM LANDFILL CORPORATION**

Site Name: **BETHLEHEM LANDFILL**

Facility ID (as issued by DEP): **100020**

SECTION B. EROSION AND SEDIMENT CONTROL

Provide a plan for the control of erosion and sedimentation on land within the permit area, all borrow areas and adjacent areas to be disturbed by construction activities. Include a narrative describing the implementation of the plan, its relationship to the overall staging of earth moving activities, and detailed design and construction plans and specifications for each structure or facility used in the plan. The plan must be site specific for each phase of construction. Include design assumptions, runoff calculations, channel profiles, cross sections, channel linings, and applicable details on attached Data Sheet for all collection and interceptor ditches. Provide documentation on the capacity of existing drainage system and the effect disposal activities will have on the drainage. Show discharge points to natural drainageways and all culverts that carry drainage away from the site. Plans and maps shall contain all details necessary for construction of the structures. **FORM I, EXHIBIT I-1 & I-2** **SEE PLAN SHEETS ES1-ES16**

SECTION C. DIVERSION CONTROLS

Provide a plan for the collection and conveyance to a natural drainageway of the runoff from up slope undisturbed areas. Include design calculations, profiles, cross sections, and applicable details for each structure, ditch, or channel used for diverting runoff. The diversion control and erosion and sedimentation control plan shall be based on the requirements of Chapter 102 (Erosion and Sedimentation Control) of the Department's regulations. Calculations indicating water quantities shall be based on a 24-hour precipitation event with a frequency of once in 25 years. More stringent criteria may be required by the Department based on the most recent edition of the USDA-SCS, *Engineering Field Manual for conservation Practices,* or as otherwise determined necessary by the Department. **FORM I, EXHIBIT I-1 & I-2** **SEE PLAN SHEETS ES1-ES16**

SECTION D. ACCESS ROADS (Residual Waste Facilities Must Submit Form 23R)

Access roads shall have drainage system that is compatible with the natural contours, structurally stable, and capable of passing safely the peak flow from a 25-year, 24-hour precipitation event. **ACCESS ROAD DESIGN PER THE PREVIOUSLY APPROVED PHASE IV PLANS.**

FORM I, EXHIBIT I-1 & I-2 **SEE PLAN SHEETS ES1-ES16**

Provide the following information for each haul road to be used in the operation.

a) Show the location on the application's topographic maps;

b) Description and typical cross sections showing the construction of each access road including existing and proposed contours, grades, slopes, culvert locations, outlet protection, and other drainage control;

c) Measures to control and prevent erosion and sedimentation; include proposed spacing of sediment traps, turnouts, cross drains, culverts, check dams, stabilized ditches, erosion resistant surfacing, etc.;

d) Plan for reclamation after the operation is completed;

IESI PA BETHLEHEM LANDFILL

SOUTHEASTERN REALIGNMENT

STORMWATER MANAGEMENT NARRATIVE

Bethlehem Landfill is proposing to realign the limit of disposal at the southeastern corner of the landfill. The purpose of this realignment is to expand the disposal footprint as well as allow for the placement of municipal waste atop previous phases of the landfill. This proposal shall result in the redistribution of tributary areas to each existing sedimentation basin including adding additional acreage to the existing Sediment Basin #2 drainage basin.

In order to accomplish this realignment, Bethlehem Landfill will construct a MSE (Mechanically Stabilized Earthen) Berm along the southern boundary of Phases I and II allowing for disposal atop the previous phases. Thus this plan regrades the approved contours per the Phase IV Permit which was last revised under a 2013 grading adjustment modification and also reestablishes the grading of Cell 4-E and Phase IV to the previously approved 725 contour elevation.

The area tributary to each existing Sediment Basin onsite as a result of the realignment has been redistributed as follows:

Basin 1	-	Decreased from 21.5 acres to 21.25 acres.
Basin 2	-	Increased from 57.58 acres to 60.16 acres.
Basin 3	-	No change. (2.6 Ac.)
Basin 4	-	Decreased from 52.34 acres to 51.71 acres.
Basin 5	-	Removed – replaced with Basin 6, per current permit.
Basin 6	-	No change. (11.83 Ac.)
Basin 7	-	Eliminated – Per Cell 4F – Minor Modification Permit

The area of IESI property which flows to the Lehigh River has been reduced from 35.16 acres to 34.93 acres.

The permitted and proposed drainage boundaries and areas are shown on the following Exhibits:

1. Approved Phase IV Land Development Plans and PaDEP Permit Plans
2. Approved Cell 4F Minor Modification
3. Approved Final Grade Adjustment – Cap Removal Minor Modification
4. Proposed Southeastern Realignment – Major Modification

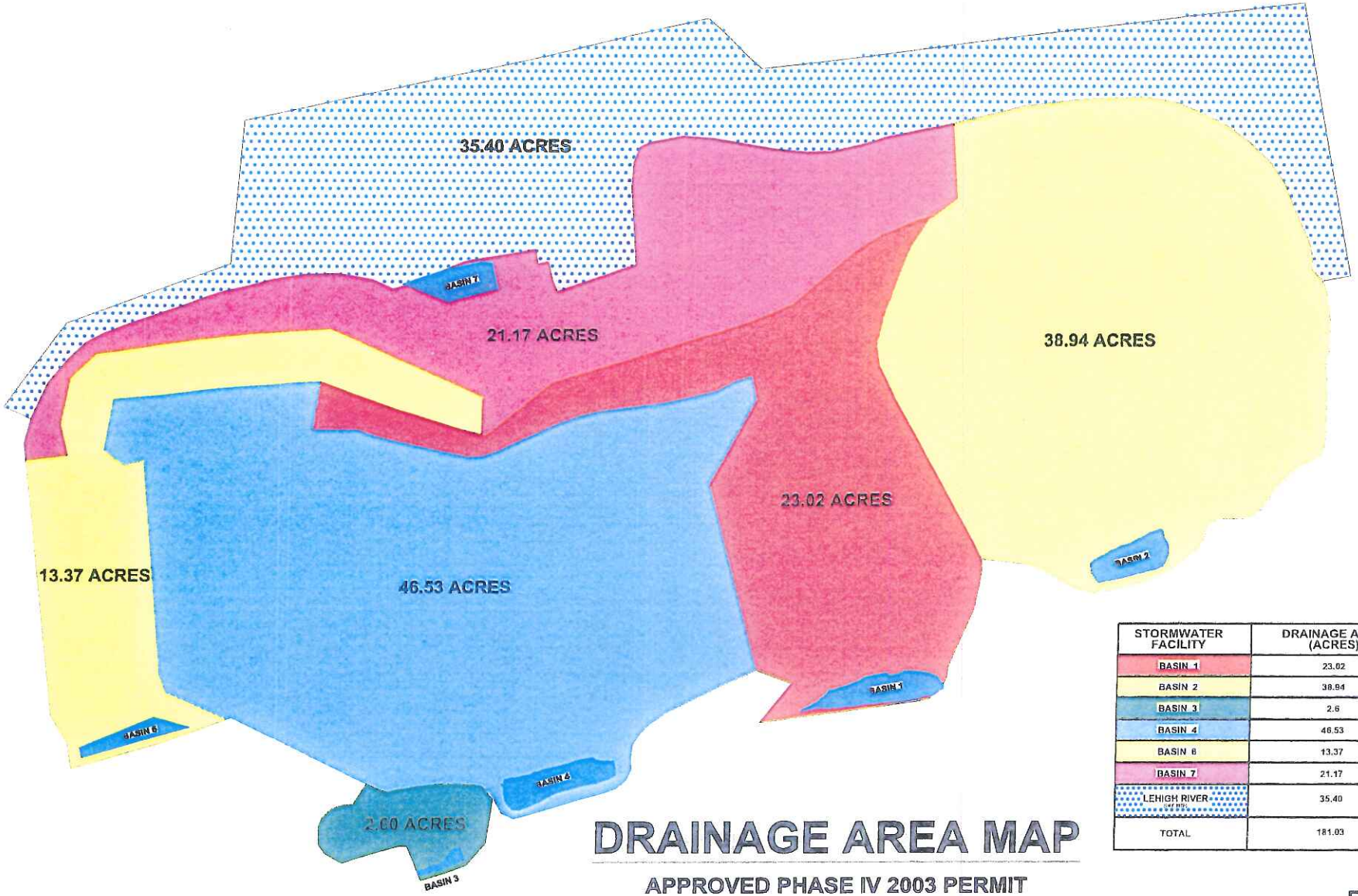
Summary of Drainage Areas

Exhibit 1 -Approved Phase IV

Exhibit 2 - Approved Phase IV – Cell 4F Minor Modification

Exhibit 3 - Approved Final Grade Adjustment - Cap Removal Minor Modification

Exhibit 4 - Proposed Southeastern Realignment – Major Modification

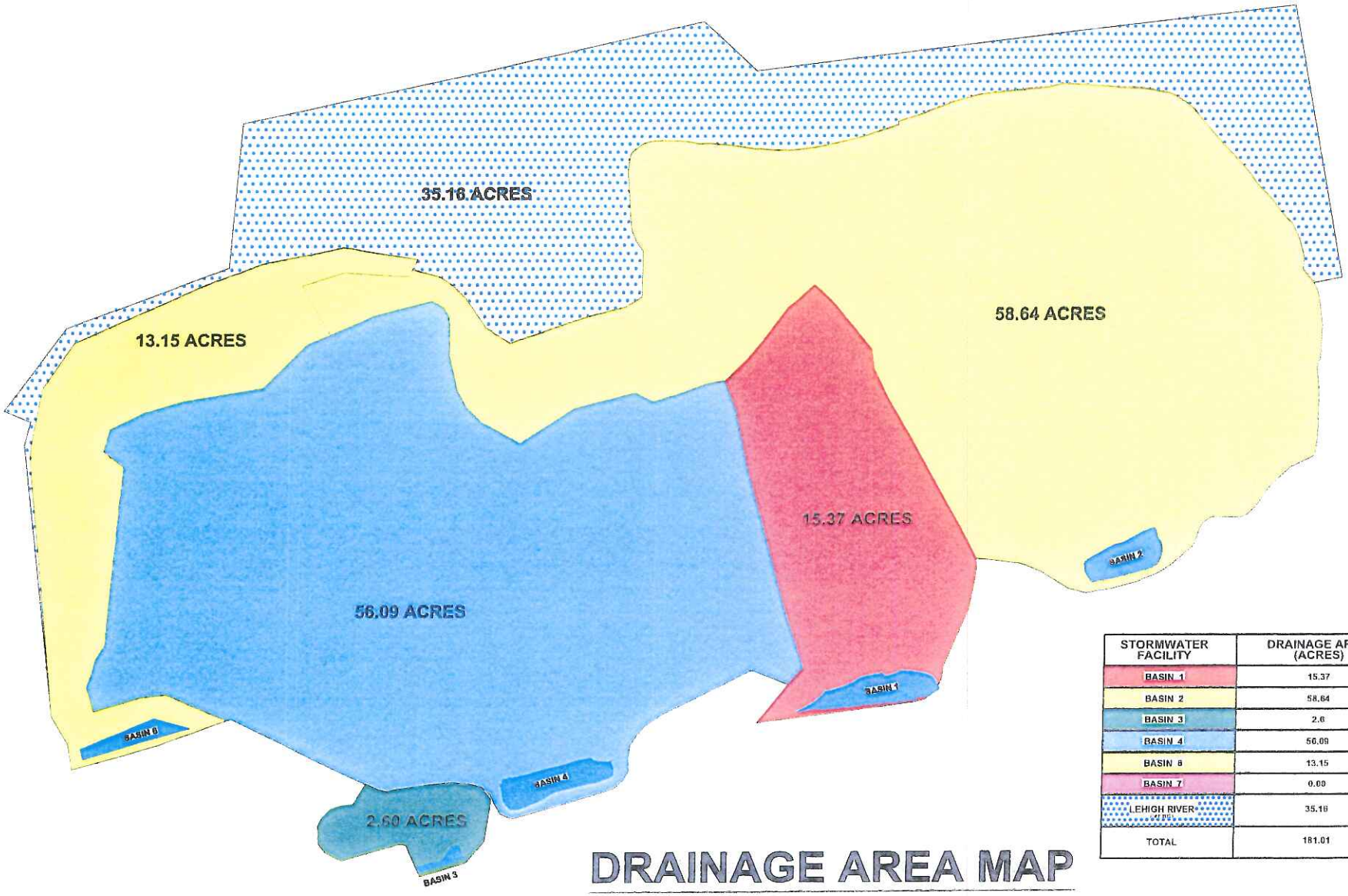


STORMWATER FACILITY	DRAINAGE AREA (ACRES)
BASIN 1	23.02
BASIN 2	38.94
BASIN 3	2.6
BASIN 4	46.53
BASIN 6	13.37
BASIN 7	21.17
LEHIGH RIVER	35.40
TOTAL	181.03

DRAINAGE AREA MAP

APPROVED PHASE IV 2003 PERMIT

EXHIBIT 1

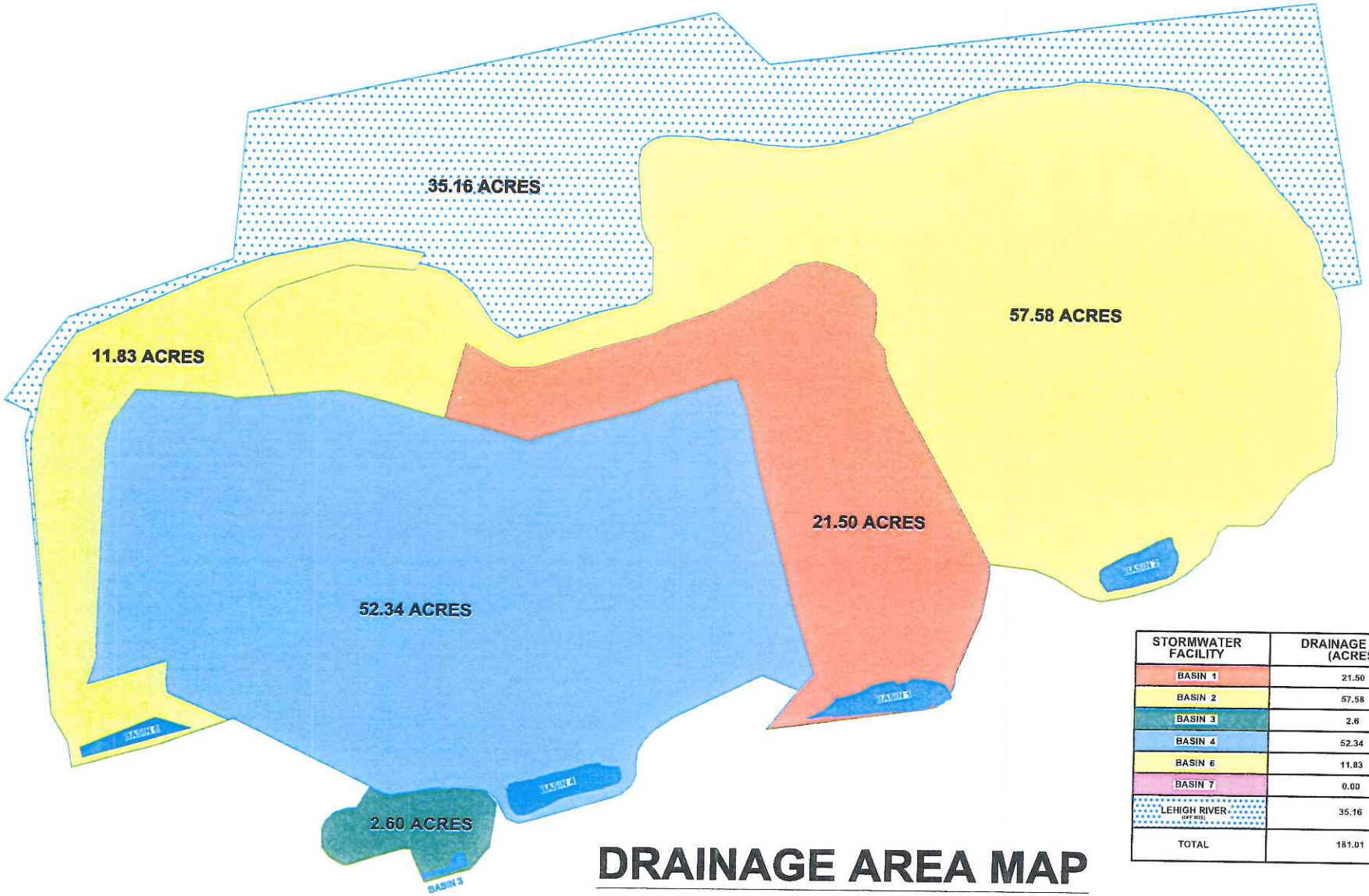


STORMWATER FACILITY	DRAINAGE AREA (ACRES)
BASIN 1	15.37
BASIN 2	58.64
BASIN 3	2.6
BASIN 4	56.09
BASIN 6	13.15
BASIN 7	0.00
LEHIGH RIVER	35.16
TOTAL	181.01

DRAINAGE AREA MAP

APPROVED CELL 4F MINOR MODIFICATION

EXHIBIT 2

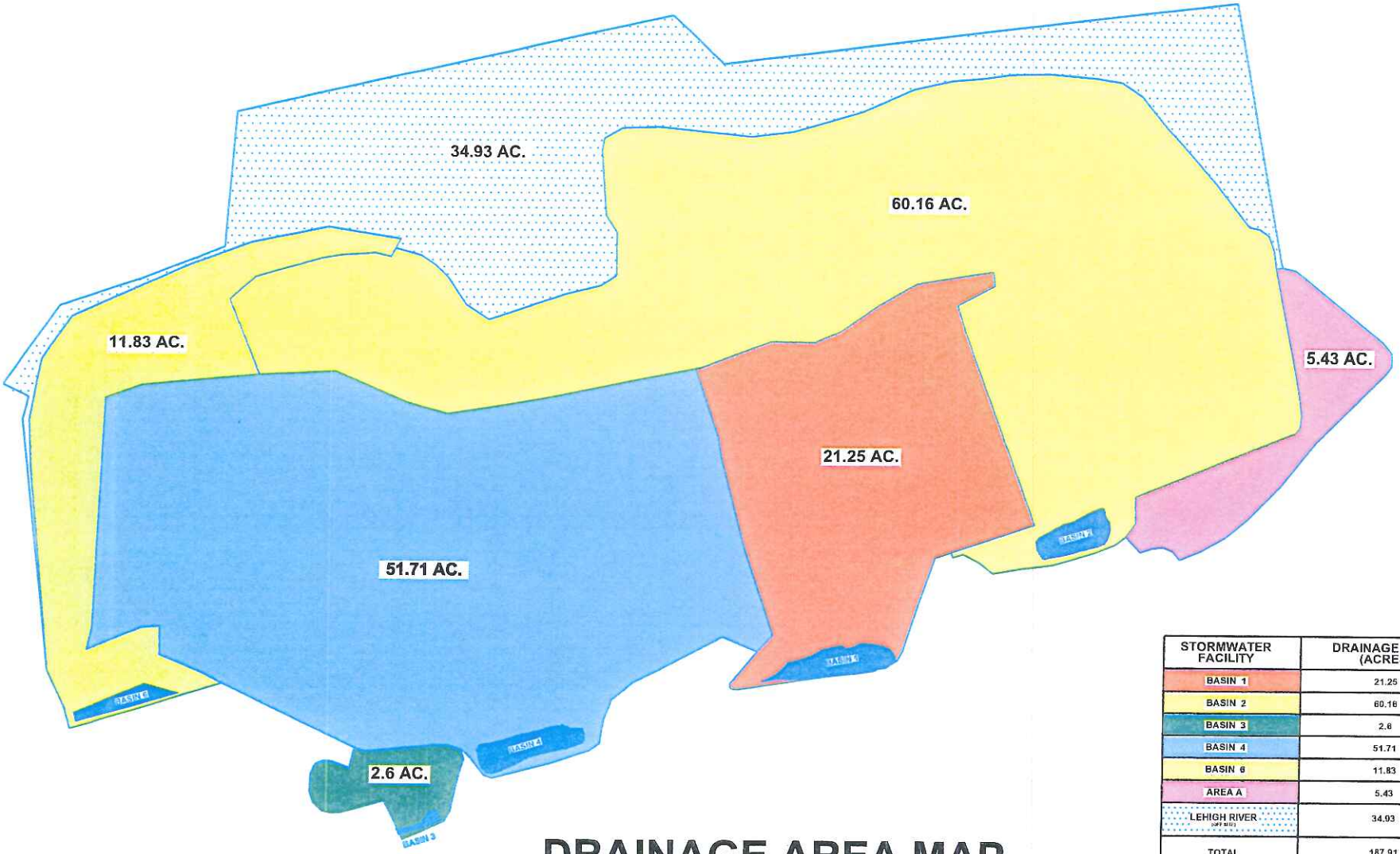


STORMWATER FACILITY	DRAINAGE AREA (ACRES)
BASIN 1	21.50
BASIN 2	57.58
BASIN 3	2.6
BASIN 4	52.34
BASIN 6	11.83
BASIN 7	0.00
LEHIGH RIVER (OFF SITE)	35.16
TOTAL	181.01

DRAINAGE AREA MAP

APPROVED FINAL GRADE ADJUSTMENT - CAP REMOVAL MINOR MODIFICATION

EXHIBIT 3



STORMWATER FACILITY	DRAINAGE AREA (ACRES)
BASIN 1	21.25
BASIN 2	60.16
BASIN 3	2.6
BASIN 4	51.71
BASIN 6	11.83
AREA A	5.43
LEHIGH RIVER (APPROX)	34.93
TOTAL	187.91

DRAINAGE AREA MAP

PROPOSED SOUTHEASTERN REALIGNMENT - MAJOR MODIFICATION

EXHIBIT 4

EXHIBIT I-1

FORM I

Soil Erosion and Sedimentation Control Plan
and Stormwater Management Plan

1.0 Narrative

This narrative provides supporting calculations regarding the Stormwater Management Plan (SWMP) and Soil Erosion and Sedimentation Control Plan for the proposed Southeastern Realignment at the IESI Bethlehem Landfill (IESI). The Soil Erosion and Sedimentation Control Plan has been prepared in accordance with PaDEP Chapter 102 Regulations to reduce accelerated runoff from the area of realignment.

The proposed southeastern realignment entails the construction of a MSE Wall along the southern edge of previous Phases I and II to allow for realignment of the landfill disposal limit as well as placement of municipal solid waste atop the previous phases of the landfill. This plan shall address Stormwater Management and Soil Erosion Facilities which are impacted by the southeastern realignment. The Stormwater Management Plan presented herein will limit stormwater discharge rates from the realignment to pre-development discharge rates, while the Soil Erosion Plan will limit soil erosion on-site and de-silt stormwater runoff prior to discharge. This Plan redistributes tributary areas to the existing sedimentation basins onsite. The impact of this redistribution is either no

change or a reduction in drainage area to each existing sediment basin except Basin #2 which has been redesigned as presented herein.

1.1 Project Description

IESI proposes to modify the final grades of Phase I and II within their existing solid waste disposal facility by constructing a MSE Berm and realigning the disposal limit at the southeastern corner. The modification area is designated as Southeastern Realignment. The Southeastern Realignment will modify the final grades and tie into the existing landfill operations of the permitted Phase III and Phase IV Areas, and reestablish the grading of 4-E (see page i-1). The area of realignment was previously analyzed for stormwater runoff for pre-development conditions. It is our intent to limit the rate of discharge from the site to that of pre-existing conditions as established and defined in the approved Phase IV Modifications.

Stormwater control will be achieved by diversion terraces and channels on the landfill area and existing detention ponds to limit discharge rates. Soil erosion and sediment control will be maintained by filtering or settling out silt from stormwater runoff prior to discharge from the site.

2.0 Topographic Features of the Project Area

Topographic features of the proposed Southeastern Realignment are provided on Plan Sheets. The Landfill Area will be constructed with 3:1 maximum slopes with terraces or benches graded every 25 feet of vertical elevation. Downdrains or steep slope channels will be provided to collect stormwater runoff from the terraces and direct it to sedimentation and stormwater control basins.

3.0 Areal Extent of Soil

The existing soils in and around the landfill facility are either the Gladstone or Urbanna series. Both of these soils belong to soil group "B".

4.0 Proposed Alterations to the Site

The proposed realignment will incorporate additional Stormwater and E & S Control Structures within the landfill facility as well as supplement existing control structures. As previously noted, all drainage areas are either maintained or reduced to each existing sediment basin except Basin #2 which has been redesigned due to an increase in tributary area. These structures will provide adequate stormwater and E & S control and are identified as follows:

4.1 Sedimentation and Stormwater Control Basins

Existing Sediment Basins #1 and #2 will be utilized to manage runoff from the proposed Southeastern Realignment. No new basins will be proposed within the landfill facility. All basins have perforated risers and the design storage capacity will be 6,000 cf/contributing drainage acre. Dewatering of the sediment basins will be from the crest of the emergency spillway to the lowest row of perforations in a time between 2 days and 7 days.

4.1a Sediment Basin #1

Sediment Basin #1 is an existing Basin constructed to collect runoff from portions of Phases I, II, III, and IV. The proposed Southeastern Realignment reduces the tributary area to Basin 1 therefore no changes are proposed for Basin #1.

4.1b Sediment Basin #2

Sediment Basin #2 is an existing Basin constructed to collect and treat approximately 57.58 acres of runoff from Phases I, II, and III plus the Phase IV stockpile area. Basin #2 will be modified to collect/control additional runoff from the proposed realignment. Calculations for the modified Basin 2 are enclosed herein.

4.1c Sediment Basin #3

Sediment Basin #3 is an existing basin constructed to collect runoff from the office/scale areas. The proposed modification will not impact this area. Therefore, no changes in Basin #3 are proposed.

4.1d Sediment Basin #4

Sediment Basin #4 was designed and constructed as part of the previously approved Phase III and Phase IV Modifications. The Basin is designed and constructed to collect and control approximately 52.34 acres of tributary runoff. The proposed Southeastern Realignment reduces the tributary area to Sediment Basin #4. Therefore no changes are proposed for Basin #4.

4.1e Sediment Basin #5

Sediment Basin #5 was constructed and designed as part of the Phase III Expansion for Soil Stockpile and Borrow Activities and in Phase IV as an interim basin to collect and treat those portions of Phase IV that lie outside the cell development areas. Basin #5 has been removed and replaced by Basin #6, as previously approved.

4.1f Sediment Basin #6

Sediment Basin #6 was constructed as part of the Phase IV expansion and designed to collect and treat sediment laden runoff from 13.5 acres of tributary land. The proposed Southeastern Realignment reduces the

tributary area to Sediment Basin #6. Therefore, no modifications to Basin 6 are proposed.

4.1g Sediment Basin #7

The Phase IV – Cell 4F modification eliminated Basin 7 from the Landfill Stormwater Management Plan.

4.2 Channels and Diversions

4.2a Permanent Channels

Several permanent channels already exist within the facility limits as part of the overall Stormwater Management Plan. Several of the existing permanent channels will remain and will be supplemented with proposed permanent channels associated with the Southeastern Realignment. The permanent channels have been designed to collect sediment laden runoff from the landfill slope and direct it to sediment control basins for desilting. All permanent channels were designed to safely pass the 25 year peak runoff from the contributing drainage shed with 1.0 foot of freeboard. Refer to the attached calculations and plan sheets for more details.

4.2b Temporary Channels

Several temporary channels already exist or are proposed within the facility. These channels will be maintained as designed. No additional temporary channels are required for the Southeastern Realignment.

4.2c Conveyance System

The conveyance system defined as that system of culverts, permanent channels, etc. conveying stormwater runoff to proposed or existing detention basins was designed to safely carry the 100-year storm event. This includes all perimeter channels and culverts but excludes benches and downdrains within the landfill foot print.

4.3 Outlet Protection Apron

Within areas of concentrated discharge, rock outlet protection aprons will be constructed to dissipate energy and return flow to overland conditions. In general, aprons will be designed in areas of minimum tail water conditions with the rip-rap lined with geotextile material. Refer to attached calculations and plan sheets for details.

4.4 Stabilized Construction Entrance

Stabilized construction entrances will be installed on site to remove soil from tires of construction equipment prior to leaving the construction area.

4.5 Silt Fence

Silt fence is proposed to be installed to filter silt from sediment laden runoff from topsoil stockpiles and small disturbed drainage sheds. Silt fencing will not be proposed within areas of concentrated flow.

4.6 Rock Filter

Rock filters are proposed within areas of small concentrated flows. These filters will reduce channel erosion, reduce velocities and filter sediment from runoff.

4.7 Level Spreader

The Southeastern Realignment plan proposes the diversion of offsite run-on around the project area within a series of channels and culverts. In order to discharge this offsite run-on one (1) level spreader is proposed to return the diverted concentrated flow back to sheet flow conditions within the landfill property.

5.0 Amount of Runoff from the Project Area

The amount of runoff from the Proposed Southeastern Realignment has been computed utilizing the soil cover complex method within the SEDCAD 4 Computer Program. In order to demonstrate that proposed discharges from the site regrading will not adversely affect the capacity of the existing off-site drainage system, an analysis of pre-development and post development peak flow rates was made for the Proposed Southeastern Realignment area.

5.1 Pre-Development

Pre-development discharge rates for the project area were established and have been obtained from the previously approved Stormwater Management Plans for the Phase III & Phase IV Expansions. The pre-development discharge rates for each Basin are listed within Table I-3. Additionally, a new drainage area designated Area "A" has been analyzed under existing conditions in order to have a direct comparison of both onsite and offsite flow rates for the area of realignment.

5.2 Post-Development

Post-development discharge rates were calculated using the soil cover complex method within the SEDCAD 4 computer program. A comparison of the post-

development flow rates to pre-development rates was analyzed to determine appropriate detention facility designs. Sediment Basins 1 and 2 will detain post-development stormwater runoff to pre-development rates for the 2 yr., 10 yr., 25 yr. and 100 yr. storm event. Additionally the post development discharge rate from Area "A" is less than calculated pre-development rates due to a reduction in overall drainage area from pre to post development. Based on this, we can conclude that proposed discharge rates from the Proposed Southeastern Realignment will not negatively affect existing downstream drainage facilities. The post development discharge rates for each basin are listed within Table I-3.

Refer to attached stormwater calculations and printouts for more details.

6.0 Construction Schedule

Refer to Table I-1 attached for construction sequences of Cell Development.

7.0 Maintenance Program

Refer to Table I-2 attached for specific maintenance requirements for each proposed improvement or control structure. During construction it shall be the sole responsibility of the contractor and owner to maintain all Temporary E & S Control Measures after each storm event. Upon completion and acceptance of each cell development, IESI will become responsible for the maintenance of the permanent E & S Control Measures of

that cell. The maintenance activities as described above are those outlined in Table I-2. At a minimum the responsible party will inspect all control structures after each rain event to determine if maintenance is required.

IESI PA BETHLEHEM LANDFILL CORPORATION

SOUTHEASTERN REALIGNMENT

TABLE I-1

CONSTRUCTION SEQUENCE

4/2014

SEQUENCE OF CONSTRUCTION

The following is a sequential order for the construction of the permanent erosion and sedimentation control features associated with the Phase IV Modification and Phase IV Cell 4F Minor Modification and Southeastern Realignment. Temporary controls will be constructed at the appropriate stage of development, in accordance with the staging drawings.

A pre -construction meeting is required prior to initiating construction of the cells. The following will be notified for attendance:

IESI
PaDEP
IESI engineering consultant
CQA representative
General Contractor
Geosynthetic Contractor
Lower Saucon Township

Following construction, a Form 37 Certification of Construction shall be prepared.

Cell 4-A Development COMPLETED

1. Install and maintain silt fence around the perimeter of all areas that are to be disturbed.
2. Install rock construction entrances as shown on the Staging Plan.
3. Provide all necessary maintenance within Sedimentation basins 4 & 5, including sediment clean out.
4. Construct Culvert TC-1 with outlet apron.
5. Construct DS-1 as shown with Inlet 1 and Culvert C-1.
6. Construct temporary Channels T-1 and T-2.
7. Begin cell excavation.
8. Upon completion of cell construction, begin disposal within cell, constructing benches every 25 feet of vertical elevation.
9. Provide permanent/temporary seeding as required.

Cell 4-B Development COMPLETED

1. Install and maintain silt fence around the perimeter of all areas that are to be disturbed.
2. Install and maintain rock construction entrances on access roadways.
3. Provide all necessary maintenance within Sedimentation Basins 4 and 5.
4. Construct temporary Channels T-3, T-4 and T-5.
5. Construct Culvert C-2 and Outfall Protection
6. Construct Culvert C-3
7. Construct Culvert C-13
8. Construct Sedimentation Basin 7 and Discharge Pipe to Culvert C-13.
9. Extend Channel DS-1 as shown on Staging Plan.

10. Construct Channel TDS-1 as shown on the Staging Plan.
11. Construct Channel E with Inlet 4 and Culvert 10 with rock apron.
12. Begin cell Excavation.
13. Upon completion of cell construction, begin disposal within cell, constructing benches every 25 feet of vertical elevation.
14. Provide permanent/temporary seeding as required.

Cell 4-C Development COMPLETED

1. Install and maintain silt fence around the perimeter of all areas that are to be disturbed.
2. Install and maintain rock construction entrances on access roadways.
3. Provide all necessary maintenance within Sedimentation Basins 4, 5 and 7.
4. Reconfigure existing Sedimentation Basin 3.
5. Reconfigure Sedimentation Basin 5 as shown on staging plans.
6. Relocate office and scale facilities.
7. Construct permanent Channel A.
8. Construct temporary Culvert #2.
9. Begin Cell 4-C excavation.
10. Upon completion of cell construction, begin disposal within cell, constructing benches every 25 feet of vertical elevation.
11. Provide permanent/temporary seeding as required.

Cell 4-D Development COMPLETED

1. Install and maintain silt fence around the perimeter of all areas that are to be disturbed.
2. Install and maintain rock construction entrances on access roadways.
3. Provide all necessary maintenance within Sedimentation Basins 3, 4 and 7, including sediment clean out.
4. Abandon Sedimentation Basin #5.
5. Construct Sedimentation Basin #6 with outfall piping and riprap apron.
6. Extend existing Channel DS-1 and abandon Channel TDS-1.
7. Extend existing Channels A and D.
8. Construct temporary Channel T-6.
9. Begin Cell 4-D excavation and maintain Basin 7 pumping, extending discharge pipe around excavation.
10. Upon completion of cell construction, begin disposal within cell, constructing benches every 25 feet of vertical elevation.

10a. Construct DS-2, Channel R and Channel R-1 as final grades are achieved.

11. Provide permanent/temporary seeding as required.

Cell 4-F Development PARTIALLY CONSTRUCTED

1. Install and maintain silt fence around the perimeter of all areas that are to be disturbed.
2. Install and maintain rock construction entrances on access roadways.
3. Install tree protection measures.

4. Provide all necessary maintenance within Sedimentation Basins 3, 4, 6, and 7 including sediment clean out.
5. Upgrade Basin 2.
6. Construct Channels O, P & Q - Culvert C-17 (MH3) - Upgrade Channel N, Construct Channel C, Culvert C-9 & Inlet 3.

6a. Set up to temporary pump Basin 7 discharge to Channel O.

7. Begin Cell 4-F construction - MSE Berm, construct C-14, C-15 & C-16 within MSE Berm, Construct Sediment Trap A and decommission Basin 7. Pump stormwater from 4F construction to Channel O.
8. Upon completion of cell construction, begin disposal within cell, constructing benches every 25 feet of vertical elevation and extend downslope drains as necessary.

8a. Construct DS-2, DS-3, Channel R and Channel R-1 as final grades are achieved.

9. Provide permanent/temporary seeding as required.

Cell 4-E Development PARTIALLY CONSTRUCTED

1. Install and maintain silt fence around the perimeter of all areas that are to be disturbed.
2. Install and maintain rock construction entrances on access roadways.
3. Provide all necessary maintenance within Sedimentation Basins 2, 3, 4, and 6 including sediment clean out.
4. Construct Channels B and upgrade Basin 4.
5. Construct Culverts C-8 and Inlet 2, Culvert C-18, MH4, Inlet 13, and Channel 5.
6. Begin cell excavation.
7. Upon completion of cell construction, begin disposal within cell, constructing benches every 25 feet of vertical elevation, extending downslope drain (DS) as necessary.
8. Provide permanent/temporary seeding as required.

Alternate Sequence
Cell 4E - Cell 4F

Cell 4-E Development PARTIALLY CONSTRUCTED

1. Install and maintain silt fence around the perimeter of all areas that are to be disturbed.
2. Install and maintain rock construction entrances on access roadways.
3. Provide all necessary maintenance within Sedimentation Basins 3, 4, 6 and 7, including sediment clean out.
4. Upgrade Basin 2. Upgrade Basin 4.
5. Extend Channel D.
6. Construct Channels B, C, F, O, P, and Q. Upgrade Channel N.
7. Construct Culverts C-8, and C-9 with inlets and rock apron. Construct Culvert C-17, MH3, Culvert C-18, Inlet 13, and MH4.

7a. Maintain pump with Basin 7 and discharge stormwater to Channel O.

8. Begin cell excavation.

9. Upon completion of cell construction, begin disposal within cell, constructing benches every 25 feet of vertical elevation, extending downslope drain (DS) as necessary.
9a. Install DS-2, Channel R and Channel R-1 as final grades are achieved.
10. Provide permanent/temporary seeding as required.

Cell 4-F Development PARTIALLY CONSTRUCTED

1. Install and maintain silt fence around the perimeter of all areas that are to be disturbed.
2. Install and maintain rock construction entrances on access roadways.
3. Provide all necessary maintenance within Sedimentation Basins 2, 3, 4, 6, and 7 including sediment clean out.
4. Begin Cell 4-F construction - MSE Berm, construct C-14, C-15 & C-16 within MSE Berm, construct sediment Trap A, and decommission Basin 7. Pump stormwater from Basin 7 and Cell 4F area to Channel O.
5. Upon completion of cell construction, begin disposal within cell, constructing benches every 25 feet of vertical elevation and extend downslope drains as necessary.
5a. Construct DS-2, DS-3, Channel R and Channel R-1 as final grades are achieved.
6. Provide permanent/temporary seeding as required.

Cell SE1-A Development

1. Install and maintain silt fence around the perimeter of all areas that are to be disturbed.
2. Install and maintain rock construction entrances on access roadways.
3. Provide all necessary maintenance within Sedimentation Basins #1 & #2, including sediment cleanout.
4. Modify existing Basin #2.
5. Begin Cell SE1-A Construction – MSE Berm, construct Channel V, perimeter road and citizen drop-off area.
6. Install a portion of Culvert C-24 including from Basin #2 to MH#12 and extend to temporary end of MSE Wall for future extension to I-16.
7. Upon completion of Cell Construction, begin disposal within cell, constructing benches every 25 feet of vertical elevation, extending downslope drain (DS) as necessary.
8. Provide permanent/temporary seeding as required.

Cell SE1-B Development

1. Install and maintain silt fence around the perimeter of all areas that are to be disturbed.
2. Install and maintain rock construction entrances on access roadways.
3. Provide all necessary maintenance within Sedimentation Basins #1 & #2, including sediment cleanout.
4. Provide all necessary maintenance on Channels O, P, Q, N and Culvert C-17.
5. Construct Channels W, X, Y including Culverts C-21 and C-21A with Inlet I-18.

6. Begin Cell SE1-B construction including perimeter road with development of Channel L ensuring Channel L "daylights" to temporary channels tributary to Basin #2.
7. Upon completion of Cell Construction, begin disposal within cell, constructing benches every 25 feet of vertical elevation, extending downslope drain (DS) as necessary.
8. Provide permanent/temporary seeding as required.

Cell SE2-A Development

1. Install and maintain silt fence around the perimeter of all areas that are to be disturbed.
2. Install and maintain rock construction entrances on access roadways.
3. Provide all necessary maintenance within Sedimentation Basins #1 & #2, including sediment cleanout.
4. Construct Channel Z with outfall level spreader and Culvert C-26 with Inlet I-19.
5. Construct Channel N along with Culvert C-25.
6. Relocate Culvert C-17 by installing Manholes #3, #10 and #11 along with Culvert C-23 outleting to Channel N.
7. Install Culvert C-22 and Inlet I-15.
8. Begin Cell SE2-A construction – MSE Berm, extending Channel V and Culvert C-24 to Inlet I-16 installing I-16. Construct Channels M and a portion of Channel L.
9. Upon completion of Cell Construction, begin disposal within cell, constructing benches every 25 feet of vertical elevation, extending downslope drain (DS) as necessary.
10. Provide permanent/temporary seeding as required.

Cell SE2-B Development

1. Install and maintain silt fence around the perimeter of all areas that are to be disturbed.
2. Install and maintain rock construction entrances on access roadways.
3. Provide all necessary maintenance within Sedimentation Basins #1 & #2, including sediment cleanout.
4. Begin Cell SE2-B construction – perimeter road extending Channel L to that portion of Channel L constructed with Cell SE1-B development.
5. Upon completion of Cell Construction, begin disposal within cell, constructing benches every 25 feet of vertical elevation, extending downslope drain (DS) as necessary.
6. Provide permanent/temporary seeding as required.

Final Closure

1. A preconstruction meeting prior to Final Closure/Basin Conversion shall be held (see reference on page I-1-1 for attendees).
2. Install and maintain silt fence around the perimeter of all areas that are to be disturbed.
3. Install and maintain rock construction entrances on access roadways.

4. Provide all necessary maintenance within Sedimentation Basins 2, 3, 4, and 6 including sediment clean out.
5. Construct DS-2, DS-3, Channel R and Channel R-1 as final grades are achieved.
6. Complete fill operations.
7. Modify Basins 2 & 4 to permanent detention basin design.
8. Remove Sediment Trap A.

IESI PA BETHLEHEM LANDFILL CORPORATION

SOUTHEASTERN REALIGNMENT

TABLE I-2

INSPECTION FREQUENCY AND MAINTENANCE PLAN

4/2014

TABLE I-2
INSPECTION FREQUENCY AND MAINTENANCE PLAN

Feature	Inspection Frequency	Maintenance
Construction Entrance	Daily and after all runoff events.	Remove any sediment at the surface of the stone construction entrance to prevent soil from tracking onto public roads.
Culverts	Daily and after all runoff events until upslope areas are stabilized (when there is at least a uniform, 70 percent vegetative cover established over the entire area).	Monitor the flow through the culverts to be sure the pipes are adequately diverting all stormwater. Flush test Basin 7 discharge pipe annually.
Proposed Channels and/or Ditches	Weekly and after all runoff events (minimum weekly), until the drainage areas are stabilized (when there is at least a uniform, 70 percent vegetative cover established over the entire area).	Remove sediment/debris as necessary to maintain the total design depth.
Silt Fence	Daily and after all runoff events (minimum weekly) until drainage areas are stabilized (when there is at least a uniform, 70 percent vegetative cover established over the entire project area).	Repair any eroded channel(s) beneath the silt fence or sags or collapses in the silt fence due to runoff flowing over the top by providing stone filter outlets. Remove any sediment from behind the silt fence when it accumulates to 1/3 to ½ the height of the fabric.
Vegetation	Weekly and after all runoff events (minimum weekly), until stabilized (when there is at least a uniform 70 percent vegetative cover established over the entire project area).	Seeding, fertilizing, and mulching as required (Refer to the revegetation measures for more information).
Dust	Minimum weekly.	Add moisture, vegetate, or apply mulch to open bare areas during dry periods.
Temporary Control Measures and Facilities	Weekly and after all runoff events (minimum weekly), until stabilized (when there is at least a uniform, 70 percent vegetative cover established over the entire project area).	Remove sediment/debris and perform repair as necessary (within 24 hours) to conform with installation specifications.
Sedimentation Basins	Weekly and after all runoff events (minimum weekly) Inspect clean-out markers	Remove sediment/debris and perform repair as necessary (within 24 hours) to conform with installation specifications.

Rev. 2/03

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SOUTHEASTERN REALIGNMENT

TABLE I-3

COMPARISON OF PRE-DEVELOPED AND POST-DEVELOPED PEAK DISCHARGE

TABLE I-3
COMPARISON OR PRE-DEVELOPMENT AND POST DEVELOPMENT PEAK DISCHARGE RATES FOR BASINS
SEDIMENTATION BASINS

Storm Event Drainage Area	**2-YR**		**10-YR**		**25-YR**		**100-YR**	
Pre-Development Basin #2	100%	30%	100%	50%	100%	50%	100%	50%
	0.3 cfs	0.1 cfs	1.2 cfs	0.6 cfs	1.6 cfs	0.8 cfs	13.1 cfs	6.5 cfs
Post(1) Development Basin #2	0.23 cfs		0.72 cfs		1.06 cfs		6.35 cfs	

(1) Includes 0.23 cfs discharge from skimmer.

TABLE I-3
COMPARISON OR PRE-DEVELOPMENT AND POST CLOSURE PEAK DISCHARGE RATES

Storm Event Drainage Area	**2-YR**		**10-YR**		**25-YR**		**100-YR**	
Pre-Development Basin #2	100%	30%	100%	50%	100%	50%	100%	50%
	0.3 cfs	0.1 cfs	1.2 cfs	0.6 cfs	1.6 cfs	0.8 cfs	13.1 cfs	6.5 cfs
Post Development Basin #2	0.31 cfs		0.72 cfs		1.35 cfs		5.85 cfs	
Pre-Development Area "A"	0.38 cfs		2.60 cfs		4.28 cfs		7.24 cfs	
Post Development Area "A"	0.33 cfs		2.22 cfs		3.65 cfs		6.17 cfs	

CALCULATION SUMMARY

STORM ROUTING AND DESIGN CALCULATIONS

IESI PA Bethlehem Landfill Corporation
Southeastern Realignment
Lower Saucon Township, Northampton County, Pennsylvania

Purpose:

Determine the peak discharge for pre-development and post-development conditions from the drainage areas for the facility for the 2-year, 10-year, 25-year, and 100-year/24-hour storm events to demonstrate that the post-development peak discharge will not exceed the pre-development peak discharge. Additionally, size all permanent erosion and sedimentation/stormwater control features using the 25-year/24-hour storm event as the design storm, size the conveyance system to each proposed basin using the 100-year / 24-hour storm event and size all temporary erosion and sedimentation/stormwater control features using 1.6 cfs/acre as the design discharge.

References:

1. The computer program SEDCAD is utilized to model surface runoff and channel flow, based on Technical Release Number 55 (TR-55), to develop peak flow rates. Version 4.0 of SEDCAD was developed by Civil Software Design in 1998.

2. "Erosion and Sediment Pollution Control Program Manual," Commonwealth of Pennsylvania Department of Environmental Protection, Bureau of Land and Water Conservation, Division of Stormwater Management and Sediment Control, March, 2012.

3. Technical Release 5, Urban Hydrology for Small Watersheds," U.S. Soil Conservation Service.

4. "Engineering Field Manual for Conservation Practices," U.S. Soil Conservation Service.

5. "Form 17, Soil Erosion and Sedimentation Controls," prepared by Gannet-Fleming, Inc., Consulting Engineers, dated April, 1994 and Form I, Soil Erosion & Sedimentation controls prepared by Martin & Martin, Inc. dated July 2000, Revised thru 2013.

6. Lower Saucon Township Subdivision and Land Development Ordinance, Chapter 145 dated October, 1999.

Assumptions:

1. To size all permanent soil erosion and sedimentation/stormwater management controls (i.e., channels, aprons, sediment basins, etc.) the design storm frequency is the 25-year, 24-hour storm event as required in Reference 2.

2. To size the proposed basin conveyance system, perimeter channels and culverts, the design storm frequency is the 100-year, 24-hour storm event as required in Reference 6.

3. To size all temporary soil erosion and sedimentation/stormwater management controls (i.e., channels, aprons, etc.) the design discharge is equal to 1.6 cfs per contributing drainage acre as required in Reference 2.

4. The following table shows the four storm events and the respective rainfall amount as found in Reference 5:

Storm Frequency	Rainfall Amount (in)
2-year/24-hour	3.20
10-year/24-hour	4.83
25-year/24-hour	5.72
100-year/24-hour	7.04

5. The curve numbers (CN's) used for pre-development and post-development conditions are as follows, based on the existing soils being within the hydrologic soil Group "B".

Woods ..... CN = 55
Grass (good) ..... CN = 61
Grass (poor) ..... CN = 79
Gravel ..... CN = 85
Impervious ..... CN = 98

Design:

Each drainage area was analyzed that contributed to a proposed or existing structure within the area of the Southeastern Realignment under pre-development and post-development conditions. Peak pre-development discharge rates were obtained from Reference #5, while post development rates of runoff were calculated using Reference #1.

Diversion of Off-Site Area

Given the topography of the proposed Southeastern Realignment off-site run-on occurs to the east of the proposed realignment. As such Area "A" has been analyzed under both pre-development and post-development conditions. Two permanent diversion channels are proposed (Channel "2 and 2-1") with an outlet level spreader. The sizing of this structure is based upon 100-year storm event as provided herein.

Pre-Development Conditions

Pre-development peak discharges were obtained from previously approved reports for various phases of developments and are listed in Table 1-3.

Post-Development Conditions

The computer program SEDCAD was used to analyze the facility under post development conditions. The facility was developed so that all stormwater runoff from the facility was discharged to a sedimentation basin, as analyzed and described below.

SEDIMENTATION BASIN 1

Sedimentation Basin 1 is an existing basin designed and constructed during the development of Phase III Expansion. Basin 1 was originally designed to treat a tributary area of 23 acres. As a result of the Southeastern Realignment only 21.25 acres will be tributary to Basin 1 therefore this proposal offers no changes to Basin 1.

SEDIMENTATION BASIN 2

Drainage Area (Basin 2)

Sedimentation Basin 2 is an existing basin originally designed and constructed as part of the Phase III expansion. Basin 2 was redesigned as part of the Cell 4F Modification to control/treat runoff from 58.63 acres. The proposed Southeastern Realignment directs runoff from 60.16 acres to Basin 2, therefore Basin 2 will be reconfigured to accommodate the increased acreage from the Southeastern Realignment.

Sediment Storage Capacity (Basin 2)

The required sediment storage capacity per Reference 2 is 1,000 cubic feet per disturbed acre (CF/Ac.). The maximum disturbed acreage to Basin 2 is 40 acres, thus the required sediment storage capacity is 40,000 cubic feet (CF) or 0.92 ac-ft. The attached SEDCAD output identifies a sediment clean-out elevation of 465.50 which corresponds to a capacity of 2.96 ac-ft.

Settling Volume (Basin 2)

The required settling volume per Reference 2 is the sediment storage capacity plus 5,000 cubic feet per contributing drainage acre. The additional volume required above the sediment storage capacity is 300,800 CF or 6.91 ac-ft. Combining this with the sediment storage volume, the sediment storage capacity required at the top of the principal spillway is 340,800 or 7.82 ac-ft. As shown on the attached SEDCAD printout, the top of the principal spillway is elevation 471.00 which corresponds to a capacity of 8.17 ac-ft.

Spillway Size (Basin 2)

Per Reference 2 the combined principal and emergency spillway must be capable of discharging 2 cfs per contributing drainage acre with two feet of freeboard available. The total discharge required is 120.3 cfs. As shown on the SEDCAD printout, the combined discharge at elevation 473.00 is 152 cfs. Berm will remain at elevation 475.00.

Anti-Seep Collar Design (Basin 2)

Anti-seep collars exist for Basin 2. No modification to the existing barrel is proposed.

Concrete Block Design (Basin 2)

A concrete block for the riser pipe exists. No modification to the existing riser is proposed.

Discharge Rates (Basin 2)

Storm Event	Peak Discharge
2 yr/24 hr	0.0 cfs
10 yr/24 hr	0.49 cfs
25 yr/24 hr	0.83 cfs
100 yr/24 hr	6.12 cfs

SEDIMENTATION BASIN 3

Basin 3 was designed and constructed for the Phase IV Expansion and treat tributary runoff from the office/scale area. The Southeastern Realignment proposes no change to this tributary area.

SEDIMENTATION BASIN 4

Drainage Area (Basin 4)

Sedimentation Basin 4 is an existing basin originally designed and constructed as part of the Phase III/IV expansion. Basin 4 was redesigned as part of the Cell 4F Modification to control/treat runoff from 56.19 acres. The maximum drainage area to Basin 4 as part of the Southeastern Realignment is 51.71 acres. Therefore this proposal offers no changes to Basin #4.

SEDIMENTATION BASIN 5

This Basin has been removed and replaced with Basin 6, per current permit.

SEDIMENTATION BASIN 6

Drainage Area

Sedimentation Basin 6 is an existing basin originally designed within the Phase IV Modification utilized to collect, treat, and detain stormwater runoff from 13.5 acres of the landfill expansion area. Basin 6 has effectively replaced Basin 5.

Per the proposed final grading of the approved Final Grade Adjustment in 2013, the drainage area to Sedimentation Basin 6 was reduced to be 11.83 acres. The proposed Southeastern Realignment proposes no changes to the drainage area, thus no changes are proposed for Basin 6.

SEDIMENTATION BASIN 7 DRAINAGE AREA

THIS BASIN WAS ELIMINATED DURING THE DEVELOPMENT OF CELL 4F.

CHANNEL DESIGN

All permanent channels were designed using the peak discharge from the contributing drainage area for the 25-year/24-hour storm event under post-development conditions. The channel designs are show on the SEDCAD printouts. In addition, the perimeter conveyance system to each proposed basin was designed to ensure conveyance of the 100-year/24-hour event to each basin. The existing conveyance system consists of Channels A thru C, E, G, H, K thru Q, S, Berm Swale, DIV#1 and DS-1 thru DS-4. **The proposed modification requires Channels L, M, and N to be reconfigured/redesigned Channels U, O, P and Q to be reviewed for adequacy and adds Channels V, W, X, Y, Z, Z-1, DS-6 and DS-7.**

Bench Capacity

The proposed modifications do not change the design of the landfill benches.

Channel A Capacity

Existing (no changes)

Proposed Channel A lies within the Basin #4 drainage shed. The channel conveys runoff from the landfill face to Basin #4 along the access road. Channel A extends from Inlet #2 to Inlet #1 and the drainage area to Channel A was determined to be 2.2 acres. The drainage area analysis was completed within the Basin 4 design in which a 100-year peak discharge rate was determined to be 10.03 cfs. The channel was analyzed using an average slope of 5% and 2%.

Channel B Capacity

Existing (no changes)

Proposed Channel B lies within the Basin #6 drainage shed. The channel conveys runoff from the landfill face to Basin 6 along the access road. Channel B extends from Inlet #3 to Inlet #2 and the drainage area to Channel B was determined to be 0.7 acres. The drainage area analysis was completed within the Basin 6 design in which a 100-year peak discharge rate was determined to be 3.8 cfs. The channel was analyzed using an average slope of 5.0%.

Channel C Capacity

Existing (no changes)

Channel C lies within the Basin #6 drainage shed. The channel conveys runoff from the landfill face to Basin 6 along the access road. Channel C extends from Culvert 16 to Inlet #3 and the drainage area to Channel C was determined to be 11.6 acres. The drainage area analysis was completed within the Basin 6 design in which a 100-year peak discharge rate was determined to be 52.8 cfs. The channel was analyzed using an average slope of 5% and 20%.

Channel D Capacity

Existing Channel D was eliminated during the construction of Cell 4F.

Channel E Capacity

A section of Channel E was removed during the construction of Cell 4F. (No Changes)

The remaining section will be directed to Inlet 14 / Sediment Trap A. Existing Channel E lies within the Sediment Trap A drainage shed consisting of approximately 4.0 acres. The channel conveys runoff from the landfill face to Sediment Trap A along the access road. The drainage area analysis was completed for Sediment Trap A, in which a 100-year peak discharge rate was determined to be 10.3 cfs. The channel was analyzed using an average slope of 1.5%.

Channel G Capacity

Existing (no changes)

Proposed Channel G lies within the proposed Basin #3 drainage shed. The channel conveys runoff from the landfill access road to Basin #3 along the toe of the access road berm. The drainage area to Channel G was determined to be 0.25 acres. The drainage area analysis was completed within the Basin 3 design in which a 100-year peak discharge rate was determined to be 1.24 cfs. The channel was analyzed using an average slope of 2.9%.

Channel H Capacity

Existing (no changes)

Proposed Channel H lies within the Basin #3 drainage shed. The channel conveys runoff from the landfill access road to Basin #3 along the toe of the access road berm. The drainage area to Channel H was determined to be 0.6 acres. The drainage area analysis was completed within the Basin #3 design in which a 100-year peak discharge rate was determined to be 2.98 cfs. The channel was analyzed using an average slope of 1.0%.

Channel K Capacity

Existing (no changes)

Proposed Channel K lies within the Basin 6 drainage shed. The channel conveys runoff from culvert C-2 to the Landfill discharge point at Wetland A. The total 100-year peak discharge rate is that of the combined Basin 6 & 7 discharge of 33.9 cfs. The channel was analyzed using an average slope of 4.00%.

Channel L Capacity

Southeastern Realignment Channel Redesigned

Proposed Channel L lies within the Basin #2 drainage shed. The channel conveys runoff from the north face of the landfill along the access road discharging to I-15. The drainage area to Channel L was determined to be 4.61 acres. The drainage area analysis was completed within the Basin #2 design in which a peak 100-year discharge rate was determined to be 14.81 cfs. The channel was analyzed using average slopes of 2.4% and 6.7%. The channel design is shown on the attached SEDCAD printout and on the plan sheets.

Channel M Capacity

Southeastern Realignment Channel Redesigned

Proposed Channel M lies within the Basin #2 drainage shed. The channel conveys runoff from the southern face of the landfill from I-15 to I-16 along the access drive. The drainage area to Channel M was determined to be 2.17 acres. The drainage area analysis was completed within the Basin #2 analysis in which a peak 100-year discharge rate was determined to be 6.56 cfs. The channel was analyzed using average slopes of 3.5% and 13.1%. The channel design is shown on the attached SEDCAD printout and on the plan sheets.

Channel N Capacity

Southeastern Realignment Channel Redesigned

Proposed Channel N lies within the Basin #2 drainage shed. The channel conveys runoff from C-23 to C-25 along the MSE Wall maintenance road. The drainage to Channel N was determined to be 45.2 acres. The drainage analysis was completed within the Basin #2 analysis

in which a peak 100-year discharge rate was determined to be 83.5 cfs. The channel was designed with an average slope of 18.2% and 25%. The channel design is shown on the attached SEDCAD printout and on the plan sheets.

Channel O Capacity

Southeastern Realignment Channel Re-evaluated

Proposed Channel O lies within the Basin #2 drainage shed. Channel "O" was originally designed as part of the Cell 4F Modification. The tributary area to Channel "O" is being modified and thus the values contained herein reflect these modifications. The channel conveys runoff from the landfill face to Basin #2 across the slope of the old landfill. Channel O extends from the landfill face to Channel P and is underlain with a textured HDPE liner. The drainage area to Channel O was determined to be 19.7 acres. The drainage area analysis was completed within the Basin 2 design in which a 100-year peak discharge rate was determined to be 59.52 cfs. The channel was analyzed using an average slope of 0.5%. The channel is shown on the attached SEDCAD printout and on the plan sheets.

Channel P Capacity

Southeastern Realignment Channel Re-evaluated

Proposed Channel P lies within the Basin #2 drainage shed. The channel conveys runoff from the landfill face to Basin #2 across the slope of the old landfill. Channel P extends from Channel O to Channel Q and is underlain with an HDPE liner. The drainage area to Channel P was determined to be 27.6 acres. The drainage area analysis was completed within the Basin #2 design in which a 100-year peak discharge rate was determined to be 65.3 cfs. The channel was

analyzed using an average slope of 0.5%. The channel design is shown on the attached SEDCAD printout and on the plan sheets.

Channel Q Capacity

Southeastern Realignment Channel Re-evaluated

Proposed Channel Q lies within the Basin #2 drainage shed. The channel conveys runoff from the landfill face to Basin #2 across the slope of the old landfill. Channel Q extends from Channel P to Culvert 17 and is underlain with an HDPE liner. The drainage area to Channel Q was determined to be 32.8 acres. The drainage area analysis was completed within the Basin #2 design in which a 100-year peak discharge rate was determined to be 69.3 cfs. The channel was analyzed using an average slope of 0.5%. The channel is shown on the attached SEDCAD printout and on the plan sheets.

Channel R and R-1 Capacity

Existing Channels R and R-1 are to be eliminated as part of the Southeastern Realignment.

Channel S Capacity

Existing (No Changes)

MSE Berm Channels Capacity

Existing (no changes)

The Berm Channel is located along the top of the MSE Berm at the north edge of the disposal area. This channel directs runoff to Inlets 10, 11, & 12 and Channel C.

The design of the Berm Channels was based on the 100-year 24-hour storm event. The Berm Channel design is based on the largest tributary area to the Berm Channel, the calculated flow depth of the flattest channel (1%) and the velocity/lining of the steepest channel (10.8%).

Channel T Capacity

Existing Channel T is to be eliminated during construction of the Southeastern Realignment.

Channel U Capacity

Existing (no changes)

Channel U lies within the Basin #2 drainage shed. The Channel conveys runoff from the landfill face extending from Channel DS-5 to Channel O. Channel U was originally designed as part of the 2013 Grading Adjustment Modification. The Southeastern Realignment revision requires the existing Channel to be reanalyzed for adequacy. The tributary area for Channel U was determined to be 8.0 acres having a peak discharge of 14.02 cfs for the 25-year storm event.

Channel V Capacity

New Channel Southeastern Realignment

Proposed Channel V lies within the Basin #1 drainage shed. The channel conveys runoff from the landfill face to an existing perimeter channel along the access road. The drainage area to Channel V was determined to be 0.6 acres. The drainage area analysis was completed within the SEDCAD computer program in which a peak 100-year rate was determined to be 1.81 cfs. The

channel was analyzed using an average slope of 1.5%. The channel and analysis is shown on the attached SEDCAD printouts and drainage mapping.

Channel W Capacity

New Channel Southeastern Realignment

Proposed Channel W lies within the Basin #2 drainage shed. The channel conveys runoff from the landfill face at the outlet of a slope bench to I-18 along an access road. The drainage area to Channel W was determined to be 1.84 acres. The drainage area analysis was completed within the Basin #2 design in which a 25-year peak discharge rate was determined to be 3.80 cfs. The channel was analyzed using an average slope of 9.0% and 12.5%. The channel is shown on the attached SEDCAD printout and plan sheets.

Channel X Capacity

New Channel Southeastern Realignment

Proposed Channel X lies within the Basin #2 drainage shed. The channel conveys runoff from the landfill face along the access road to Culvert 21. The drainage area to Channel X was determined to be 2.3 acres. The drainage area analysis was completed within the Basin #2 design in which a 100-year peak discharge rate was calculated to be 6.96 cfs. The channel was analyzed using an average slope of 6.5% and 2%. The channel is shown on the attached SEDCAD printout and on the plan sheets.

Channel Y Capacity

New Channel Southeastern Realignment

Proposed Channel Y lies within the Basin #2 drainage shed. The channel conveys runoff from Culvert 21 to Channel O. The drainage area to Channel Y was determined to be 7.83 acres. The drainage area analysis was completed within the Basin #2 design in which a 100-year peak discharge rate was calculated to be 23.7 cfs. The channel was analyzed using an average slope of 1.8% and 3.9%. The channel is shown on the attached SEDCAD printouts and plan sheets.

Channel Z and Z-1 Capacity

New Channel Southeastern Realignment

Proposed Channel Z and Z-1 lie within the Area "A" drainage shed. The channel is proposed to divert offsite run-on around the area of development. Channel Z extends from a proposed level spreader outlet approximately 270 feet while Channel Z-1 extends from I-19 approximately 270 feet. The drainage area to Channel Z and Z-1 was determined to be 2.5 acres (Area "A" upon development). The drainage area analysis was completed within the SEDCAD computer program included herein in which a 100-year peak discharge was calculated to be 5.15 cfs. Channels Z and Z-1 were analyzed using an average slope of 0.7% and 21%.

Channels DS-1 to DS-5

Existing (No Changes)

Existing Channels DS-1 to DS-5 design shall remain the same as previously approved without change except DS-3 shall be extended as depicted on the plans for the Southeastern Realignment.

Channel DS-6 Capacity

New Channel Southeastern Realignment

Proposed Channel DS-6 lies within the Basin #2 drainage shed. The channel conveys runoff from the landfill face via benches to I-16 down the slope of the landfill. The tributary area to DS-6 was determined to be 11.03 acres. The drainage area analysis was completed within the Basin #2 design in which a peak 25-year discharge rate of 22.81 cfs was calculated. The channel was analyzed using an average slope of 28%. The channel is shown on the attached SEDCAD printouts and on the plan sheets.

Channel DS-7 Capacity

New Channel Southeastern Realignment

Proposed Channel DS-7 lies within the Basin #2 drainage shed. The channel conveys runoff from the landfill face via benches to I-15 down the slope of the landfill. The tributary area to DS-7 was determined to be 7.12 acres. The drainage area analysis was completed within the Basin #2 design in which a peak 25-year discharge rate of 5.43 cfs was calculated. The channel was analyzed using an average slope of 28%. The channel is shown on the attached SEDCAD printouts and on the plan sheets.

CULVERT DESIGN

All permanent culverts were designed using the peak discharge from the maximum contributing drainage area for the 100-year/24-hour storm event under post-development conditions. The culverts were designed as described below utilizing the SEDCAD computer program. In addition, the conveyance system to each proposed basin was designed to ensure conveyance of the 100-year/24-hour event to each basin. Culverts C-1 thru C-26 shall be part of the conveyance system.

Culverts C-1 thru C-10, C-13 thru C16, C-18 thru C-20 EXISTING – no change

Culvert C-17

Culvert 17 is to be reconfigured and redesigned as part of the Southeastern Realignment. Culvert C-17 will be installed to convey the discharge from Channel Q to Stormwater Manhole #10. The peak discharge from the 100-year/24-hour storm event was calculated to be 69.3 cfs or the total flow from Channel Q. One culvert will be installed to adequately pass 69.3 cfs. The SEDCAD output is attached and the sizing of the culverts is as follows:

Design Discharge	69.3 cfs
Pipe Length	655 FT
Pipe Slope	1% and 4.6%
Manning's n	0.012
Maximum Headwater	7.0 FT
Proposed Pipe Diameter	36 inches

Culvert 21 & 21A

Culvert 21 is to be reconfigured and redesigned as part of the Southeastern Realignment. Culvert 21 will be installed to convey the combined runoff from Channels X and W to Channel Y. The peak discharge from the 100-year storm event was calculated during the Basin #2 analysis for Channel Y and is 23.7 cfs. One culvert will be installed to adequately pass 23.7 cfs. The output is attached and the sizing of the culvert is as follows:

Design Discharge	23.7 cfs
Pipe Length	113 FT
Pipe Slope	1.0%
Manning's n	0.012
Maximum Headwater	5.0 FT
Proposed Pipe Diameter	24 inches

Culvert C-22

Culvert C-22 is a new culvert as part of the Southeastern Realignment. Culvert C-22 will be installed to convey the discharge from I-15 to Stormwater Manhole #10. The peak discharge from the 100-year/24-hour storm event was calculated during the Basin #2 analysis and is 14.8 cfs. One culvert will be installed to adequately pass 14.8 cfs. The SEDCAD output is attached and the sizing of the culverts is as follows:

Design Discharge	14.8 cfs
Pipe Length	26 FT

Pipe Slope	1.0 %
Manning's n	0.012
Maximum Headwater	3.0 FT
Proposed Pipe Diameter	24 inches

Culvert C-23

Culvert C-23 will be installed to convey the discharge from Stormwater Manhole #10 to Channel N. The peak discharge from the 100-year/24-hour storm event was calculated during the Basin #2 analysis for Channel "N" and is 83.5 cfs. One culvert will be installed to adequately pass 83.5 cfs. The output is attached and the sizing of the culverts is as follows:

Design Discharge	83.5 cfs
Pipe Length	90 FT
Pipe Slope	5.29% and 1.0%
Manning's n	0.012
Maximum Headwater	6.0 FT
Proposed Pipe Diameter	48 inches

Culvert C-24

Culvert C-24 will be installed to convey the discharge from Inlet #16 to Basin #2. The peak discharge from the 100-year/24-hour storm event was calculated during the Basin #2 analysis combining rates for Channel M and DS-6 and is 39.9 cfs. One culvert will be installed to adequately pass 39.9 cfs. The output is attached and the sizing of the culverts is as follows:

Design Discharge	39.9 cfs
Pipe Length	637 FT
Pipe Slope	1.06%, 3.73%, 11.88%
Manning's n	0.012
Maximum Headwater	4.0 FT
Proposed Pipe Diameter	36 inches

Culvert C-25

Culvert C-25 will be installed to convey the discharge from Channel N to Basin #2. The peak discharge from the 100-year/24-hour storm event was calculated during the Basin #2 analysis for Channel N and is 83.5 cfs. One culvert will be installed to adequately pass 83.5 cfs. The output is attached and the sizing of the culverts is as follows:

Design Discharge	83.5 cfs
Pipe Length	30 FT
Pipe Slope	1.67%
Manning's n	0.012
Maximum Headwater	5.0 FT
Proposed Pipe Diameter	48 inches

Culvert C-26

Culvert C-26 will be installed to convey the discharge from Channel Z-1 to the level spreader. The peak discharge from the 100-year/24-hour storm event was calculated during the Area "A" analysis and is 5.15 cfs. One culvert will be installed to adequately pass 5.15 cfs. The output is attached and the sizing of the culverts is as follows:

Design Discharge	5.15 cfs
Pipe Length	220 FT
Pipe Slope	1.0%
Manning's n	0.012
Maximum Headwater	3.0 FT
Proposed Pipe Diameter	15 inches

APRON DESIGN

Riprap aprons have been designed for construction within the Southeastern Realignment to dissipate energy and prevent scour problems. The aprons have been designed as outlined below for culvert outlets within the Southeastern Realignment.

Culvert C-21A Apron

The apron for Culvert C-21A has been designed for the outfall to Channel "Y". The apron was designed as follows:

The flow from Culvert C-21A for the 100-year/24-hour storm event is 23.7 cfs with a proposed diameter of 24 inches.

Using Figure 21 of Reference #2, the following design can be determined:

Length of Apron	14 FT
Width of Apron	Width to conform to Channel "Y"
D_{50} (Riprap)	R-4
Riprap Thickness	18 inches

Culvert C-23 Apron

The flow from Culvert C-23 for the 100-year/24-hour storm event is 83.5 cfs with a proposed diameter of 48 inches. The width of the outfall is designed to conform to Channel "N".

Using Figure 9.3 of Reference #2, the following design can be determined:

Length of Apron	22 FT
Width of Apron	Width to conform to Channel "N"
D_{50} (Riprap)	R-5
Riprap Thickness	27 inches

Culvert C-24 Apron

The flow from Culvert C-24 for the 100-year/24-hour storm event is 39.9 cfs with a proposed diameter of 36 inches.

Using Figure 9.3 of Reference #2, the following design can be determined:

Length of Apron	20 FT
Width of Apron	29 FT
D_{50} (Riprap)	R-5
Riprap Thickness	27 inches

Culvert C-25 Apron

The flow from Culvert C-25 for the 100-year/24-hour storm event is 83.5 cfs with a proposed diameter of 48 inches.

Using Figure 9.3 of Reference #2, the following design can be determined:

Length of Apron	26 FT
Width of Apron	38 FT
D_{50} (Riprap)	R-6
Riprap Thickness	36 inches

Culvert C-26 Apron

The flow from Culvert C-26 for the 100-year/24-hour storm event is 5.15 cfs with a proposed diameter of 15 inches.

Using Figure 9.3 of Reference #2, the following design can be determined:

Length of Apron	8 FT
Width of Apron	Width to conform to Channel "21"
D_{50} (Riprap)	R-3
Riprap Thickness	9 inches

PERMANENT/TEMPORARY SEEDING

Seedbed Preparation

1. Temporary Seeding

   a. Roughen all areas to be seeded. Leave a loose uncompacted surface. Where hydroseeding methods are used, the surface may be left with a more irregular surface of large clods and stones.

   b. Apply lime and fertilizer evenly at rates recommended by soil tests. Both lime and fertilizer are to be incorporated into the top 6 inches of soil. If a hydraulic seeder is used, do not mix seed and fertilizer more than 30 minutes before application.

2. Permanent Seeding

   a. Remove rocks and debris that could interfere with tillage and production of a uniform seedbed.

   b. Loosen the subgrade immediately prior to spreading topsoil by disking or scarifying to a minimum depth of 2 inches.

   c. Spread topsoil to a depth of 6 inches.

d. Apply lime and fertilizer at rates recommended by soil tests. Both lime and fertilizer are to be incorporated into the top 6 inches of soil.

e. Disk or harrow and rake to produce a uniform and well-pulverized surface.

f. Loosen surface just prior to applying seed.

Seeding Methods

1. Temporary and Permanent Seeding

a. Evenly apply seed using a cyclone seeder (broadcast) or hydroseeder.

b. Broadcast seeding and hydroseeding are appropriate for steeper slopes and areas where equipment cannot be driven.

c. Hand broadcasting is not recommended.

d. Rake seed into the soil and lightly pack to establish good contact.

Mulch

1. Areas with 3:1 Slopes or Flatter

   a. Apply 3 tons/acre of grass hay or cereal straw by hand or with a mulch blower.

   b. Tack down mulch by use of netting or with 0.10 gal/yd^2 (11 gal.1,000 ft^2) emulsified asphalt.

   c. Mulch should be spread evenly to produce a loose layer 1-1/2 inches to 3 inches deep, immediately after seeding or not more than 48 hours after seeding is completed.

2. Grass-Lined Channels

   a. Prepare channel and seed.

   b. Install jute matting and mulch or an excelsior (wood fiber) blanket in the channel, extending up the sides to the top of channel elevation as shown on the plan and detail.

   c. Secure and provide overlaps in accordance with the manufacturer's specifications.

d. Seed channel shoulders, mulch and tack down as described above in Item 1.a, 1.b and 1.c.

Maintenance

1. Temporary Seeded Areas

a. Reseed and mulch areas where seeding emergence is poor.

b. In areas where erosion has occurred, repair rills and gullies, reseed and mulch. Stabilize problem areas with gravel if necessary.

c. Do not mow.

2. Permanently Seeded Areas

a. Reseed and mulch areas of inadequate cover. Consideration should be given to re-evaluating the seeding mixture. Reseed with temporary seeding mixture if outside of the season for seeding permanent mixtures.

b. Refertilize area as recommended by soil tests during the second growing season and every two to three years as needed to maintain a dense vegetative cover.

c. If rills and gullies persist, the problem area is to be lined with sod.

d. Inspect all mulched areas periodically and after each rainstorm. All washed areas will be reseeded, and mulch reapplied and anchored.

Seeding Mixtures

1. Temporary Seeding

Species in Mix	Mix Percent By Weight	Minimum Percent Purity	Minimum Percent Germination
Rygrass, Annual (Lolium Multiflorum) PennDOT Formula E-10 lbs/1,000 sy	100	98	90

2. Permanent Seeding

a. PennDOT Formula 3 – 21 lbs/1,000 sy (areas flatter than 3:1 slopes):

Species in Mix	% by Weight	Minimum Percent Purity	Minimum Percent Germination
Perennial Ryegrass	20	98	90
Kentucky 31, Tall Fescue	50	98	85
Creeping Red Fence	30	98	80

b. PennDOT Formula D – 21 lbs/1,000 sy

Species in Mix	Rate of Appl. (lbs / acre)
Tall Fescue or	70
Creeping Red Fescue or	30
Chewings Fescue	

c. Retention Basin Floor Seeding (Rate 30lbs per Acre)

% by Weight	Species List
20%	Redtop
20%	Virginia Wild Rye, PA Ecotype
20%	Nuttall's Alkaligrass
15%	Fox Sedge, PA Ecotype
10%	Creeping Bentgrass
10%	Fowl Bluegrass
2%	Autumn Bentgrass, APB
2%	Ticklegrass
1%	Path Rush, PA Ecotype

Methods for Evaluating Success of Revegetation

1. Vegetation Density

An estimate of the percentage of vegetative cover established on the site can be used to determine the success of the revegetation. Vegetation density will be measured at several study plots using a cover frame known as a "Daubenmire Frame". A sufficient number of study plots should be randomly selected from the site to obtain a representative sample. This method provides a calibrated area within the observer estimates the percent of the area within the frame that is covered by living biomass.

2. Root Mass

The ability of the vegetation to become established in a soil can be estimated by the depth and density of the root structure. Root penetration will be estimated by excavating several shallow pits or removing core samples and measuring the depth to which the rootlets and root hairs penetrated into the substage material. The greater the extent of root development in terms of vertical penetration and biomass density, the more likely the species will become strongly established. A sufficient number of samples should be selected randomly to obtain a representative sample of the site.

SEDIMENT BASIN 2

SECTION E. SEDIMENTATION PONDS

Sedimentation ponds and other impoundments must be constructed in accordance with the requirements of Chapter 102 and this permit before any earthmoving activities start in the drainage area. Each impoundment must be inspected during construction by or under the supervision of a registered professional engineer, licensed in Pennsylvania, and certified by the Department upon completion of construction.

Any enlargement, reduction in size, reconstruction, or other modification that may affect the stability or operation must be approved by the Department. Ponds must be certified and approved by the Department prior to the start of disposal activities.

Identification **Sedimentation Basin 2**

U.S.G.S. Quadrangle **Hellertown** Location: Latitude **40° 27' 39"**; Longitude **75° 18' 17"**

Or Location from Bottom Right corner of U.S.G.S. Quadrangle; inches North: **10.5** inches West: **8.5**

HYDROLOGY: Drainage area **60.16** acres; Design Storm **25 yr – 24 hr** Average Watershed Slope **30%**

Land Use **Landfill** Soil Type **3** Curve Number **70** Peak Discharge **0.83 cfs**

Embankment	Top Width (Minimum)	5'
	Outside Slope (Maximum)	2:1
	Inside Slope (Maximum)	3:1
	Top Elevation	475.0
	Upstream Toe Elevation	460.0
	Liner Material (earthen, synthetic, etc.)	Earthen
Impoundment Dimensions and Capacities	Length at Bottom	220
	Width at Bottom	65
	Length at Crest of Principal Spillway	460
	Width at Crest of Principal Spillway	100
	Depth from Crest of Principal Spillway	11.0
	Length at Crest of Emergency Spillway	480
	Width at Crest of Emergency Spillway	120
	Volume at Crest of Principle Spillway	8.175 Ac.- Ft
Principal Spillway	Time of Detention	5.5 days
	Maximum Sediment Storage Volume	2.958 Ac./foot
	Shape (Circular, semi-circular, trapezoid, etc.)	circular
	Dimensions (W x H x L)	36" cmp riser / 30" bwp
	Inlet Elevation	471.0
	Slope and Length	4.5% 100
	Discharge Elevation	455.5
	Spillway Capacity	48.13 @@473.00
	Construction Material	cmp
Dewatering Device	Type/Size	1" & 0.5" perf.
	Inlet Elevation	465.5
	Discharge Controls (i.e. self draining or valved)	self
	Discharge Capacity (maximum)	.95 cfs
	Time to Dewater Full Pond	5.5 days
Emergency Spillway	Shape	trap
	Dimensions (W x H x L)	20 x 3.5 x 10
	Slope	0.0%
	Discharge Elevation	471.5
	Type of Lining/Protection	riprap
	Spillway Capacity (provide design calculations)	103.7 cfs 473.00

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IESI Bethlehem Landfill
Southeastern Realignment

Sedimentation Basin 2

Redesign

2-Yr

JMM

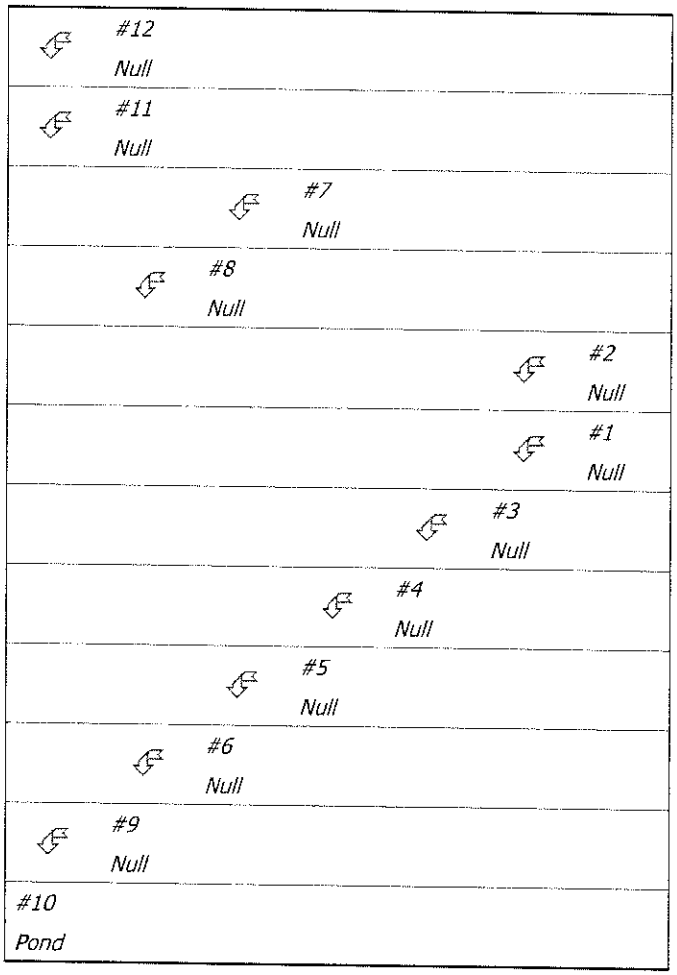
General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	2 yr - 24 hr
Rainfall Depth:	3.200 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	#3	0.000	0.000	Channel X
Null	#2	==>	#3	0.000	0.000	Channel W
Null	#3	==>	#4	0.000	0.000	Channel Y
Null	#4	==>	#5	0.000	0.000	Channel O
Null	#5	==>	#6	0.000	0.000	Channel P
Null	#6	==>	#9	0.000	0.000	Channel Q
Null	#7	==>	#8	0.000	0.000	DS-7
Null	#8	==>	#9	0.000	0.000	Channel L
Null	#9	==>	#10	0.000	0.000	Channel N
Pond	#10	==>	End	0.000	0.000	Basin #2
Null	#11	==>	#10	0.000	0.000	DS-6
Null	#12	==>	#10	0.000	0.000	Channel M



Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#12		2.170	2.170	1.10	0.08
#11		11.030	11.030	5.57	0.41
#7		7.120	7.120	0.92	0.18
#8		4.610	11.730	1.66	0.29
#2		1.840	1.840	0.93	0.07
#1		2.300	2.300	1.16	0.08
#3		3.690	7.830	3.95	0.29
#4		11.850	19.680	9.94	0.73
#5		7.880	27.560	10.25	0.92
#6		5.290	32.850	10.45	1.05
#9		0.590	45.170	11.62	1.36
#10	In	1.790	60.160	19.19	1.92
	Out			0.00	0.00

Structure Detail:

Structure #12 (Null)

Channel M

Structure #11 (Null)

DS-6

Structure #7 (Null)

DS-7

Structure #8 (Null)

Channel L

Structure #2 (Null)

Channel W

Structure #1 (Null)

Channel X

Structure #3 (Null)

Channel Y

Structure #4 (Null)

Channel O

Structure #5 (Null)

Channel P

Structure #6 (Null)

Channel Q

Structure #9 (Null)

Channel N

Structure #10 (Pond)

Basin #2

Pond Inputs:

Initial Pool Elev:	460.01 ft

Initial Pool:	0.00 ac-ft

Perforated Riser

Riser Diameter (in)	Riser Height (ft)	Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Number of Holes per Elev
36.00	11.00	30.00	100.00	4.50	0.0240	471.00	9

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
471.50	20.00	3.00:1	3.00:1	20.00

Pond Results:

Peak Elevation:	464.14 ft
Dewater Time:	0.00 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
460.00	0.272	0.000	0.000		
460.01	0.273	0.003	0.000		
460.50	0.312	0.146	0.000		
461.00	0.355	0.313	0.000		
461.50	0.400	0.501	0.000		
462.00	0.449	0.714	0.000		
462.50	0.499	0.951	0.000		
463.00	0.553	1.214	0.000		
463.50	0.610	1.504	0.000		
464.00	0.669	1.824	0.000		
464.14	0.687	1.919	0.000	0.00	Peak Stage
464.50	0.731	2.173	0.000		
465.00	0.795	2.554	0.000		
465.50	0.818	2.958	0.000		Low hole SPW #1
466.00	0.840	3.372	0.167		
466.50	0.863	3.798	0.236		
467.00	0.887	4.236	0.331		
467.50	0.911	4.685	0.393		
468.00	0.935	5.146	0.488		
468.50	0.959	5.620	0.552		

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
469.00	0.984	6.105	0.650		
469.50	1.009	6.603	0.718		
470.00	1.034	7.114	0.820		
470.50	1.058	7.637	0.892		
471.00	1.082	8.172	0.956		Spillway #1
471.50	1.107	8.719	10.330		Spillway #2
472.00	1.132	9.279	32.860		
472.50	1.157	9.851	91.363		
473.00	1.182	10.435	151.823		
473.50	1.208	11.033	230.503		
474.00	1.233	11.643	325.442		
474.50	1.260	12.266	436.892		
475.00	1.286	12.903	565.241		

Detailed Discharge Table

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
460.00	0.000	0.000	0.000
460.01	0.000	0.000	0.000
460.50	0.000	0.000	0.000
461.00	0.000	0.000	0.000
461.50	0.000	0.000	0.000
462.00	0.000	0.000	0.000
462.50	0.000	0.000	0.000
463.00	0.000	0.000	0.000
463.50	0.000	0.000	0.000
464.00	0.000	0.000	0.000
464.50	0.000	0.000	0.000
465.00	0.000	0.000	0.000
465.50	1.00>0.000	0.000	0.000
466.00	0.167	0.000	0.167
466.50	0.50>0.236	0.000	0.236
467.00	0.331	0.000	0.331
467.50	0.50>0.393	0.000	0.393
468.00	0.488	0.000	0.488
468.50	0.50>0.552	0.000	0.552
469.00	0.650	0.000	0.650
469.50	0.50>0.718	0.000	0.718

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
470.00	0.820	0.000	0.820
470.50	0.892	0.000	0.892
471.00	0.956	0.000	0.956
471.50	10.330	0.000	10.330
472.00	29.217	3.643	32.860
472.50	41.684	49.679	91.363
473.00	48.133	103.690	151.823
473.50	53.814	176.689	230.503
474.00	58.950	266.492	325.442
474.50	63.674	373.219	436.892
475.00	68.070	497.171	565.241

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#12	1	2.170	0.045	0.000	0.000	61.000	M	1.10	0.080
	Σ	**2.170**						**1.10**	**0.080**
#11	1	11.030	0.101	0.000	0.000	61.000	S	5.57	0.407
	Σ	**11.030**						**5.57**	**0.407**
#7	1	7.120	0.268	0.000	0.000	61.000	S	0.92	0.177
	Σ	**7.120**						**0.92**	**0.177**
#8	1	4.610	0.161	0.000	0.000	61.000	S	0.79	0.115
	Σ	**11.730**						**1.66**	**0.292**
#2	1	1.840	0.080	0.000	0.000	61.000	M	0.93	0.068
	Σ	**1.840**						**0.93**	**0.068**
#1	1	2.300	0.048	0.000	0.000	61.000	M	1.16	0.085
	Σ	**2.300**						**1.16**	**0.085**
#3	1	3.690	0.033	0.000	0.000	61.000	M	1.86	0.136
	Σ	**7.830**						**3.95**	**0.289**
#4	1	11.850	0.018	0.000	0.000	61.000	M	5.99	0.438
	Σ	**19.680**						**9.94**	**0.727**
#5	1	7.880	0.340	0.000	0.000	61.000	S	0.88	0.195
	Σ	**27.560**						**10.25**	**0.922**
#6	1	5.290	0.314	0.000	0.000	61.000	S	0.62	0.131
	Σ	**32.850**						**10.45**	**1.053**
#9	1	0.590	0.022	0.000	0.000	61.000	M	0.30	0.019
	Σ	**45.170**						**11.62**	**1.364**
#10	1	1.790	0.015	0.000	0.000	61.000	M	0.90	0.066
	Σ	**60.160**						**19.19**	**1.917**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	3. Short grass pasture	20.00	16.00	80.00	3.570	0.006
		6. Grassed waterway	3.00	12.00	400.00	2.590	0.042
#1	**1**	**Time of Concentration:**					**0.048**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	1	3. Short grass pasture	17.50	17.50	100.00	3.340	0.008
		6. Grassed waterway	3.00	16.50	550.00	2.590	0.058
		6. Grassed waterway	10.00	25.00	250.00	4.740	0.014
#2	**1**	**Time of Concentration:**					**0.080**
#3	1	6. Grassed waterway	5.00	20.00	400.00	3.350	0.033
#3	**1**	**Time of Concentration:**					**0.033**
#4	1	3. Short grass pasture	33.00	16.50	50.00	4.590	0.003
		8. Large gullies, diversions, and low flowing streams	5.75	23.00	400.00	7.190	0.015
#4	**1**	**Time of Concentration:**					**0.018**
#5	1	6. Grassed waterway	0.50	6.50	1,300.00	1.060	0.340
#5	**1**	**Time of Concentration:**					**0.340**
#6	1	6. Grassed waterway	0.50	6.00	1,200.00	1.060	0.314
#6	**1**	**Time of Concentration:**					**0.314**
#7	1	3. Short grass pasture	33.00	24.75	75.00	4.590	0.004
		6. Grassed waterway	3.00	73.50	2,450.00	2.590	0.262
		8. Large gullies, diversions, and low flowing streams	33.00	41.25	125.00	17.230	0.002
#7	**1**	**Time of Concentration:**					**0.268**
#8	1	3. Short grass pasture	33.00	16.50	50.00	4.590	0.003
		6. Grassed waterway	3.50	56.00	1,600.00	2.800	0.158
#8	**1**	**Time of Concentration:**					**0.161**
#9	1	6. Grassed waterway	20.00	110.00	550.00	6.700	0.022
#9	**1**	**Time of Concentration:**					**0.022**
#10	1	3. Short grass pasture	5.00	5.00	100.00	1.780	0.015
#10	**1**	**Time of Concentration:**					**0.015**
#11	1	3. Short grass pasture	33.00	33.00	100.00	4.590	0.006
		6. Grassed waterway	3.00	25.50	850.00	2.590	0.091
		8. Large gullies, diversions, and low flowing streams	33.00	90.75	275.00	17.230	0.004
#11	**1**	**Time of Concentration:**					**0.101**
#12	1	3. Short grass pasture	33.00	16.50	50.00	4.590	0.003
		6. Grassed waterway	12.00	96.00	800.00	5.190	0.042
#12	**1**	**Time of Concentration:**					**0.045**

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IESI Bethlehem Landfill
Southeastern Realignment

Sedimentation Basin 2

Redesign

10-Yr

JMM

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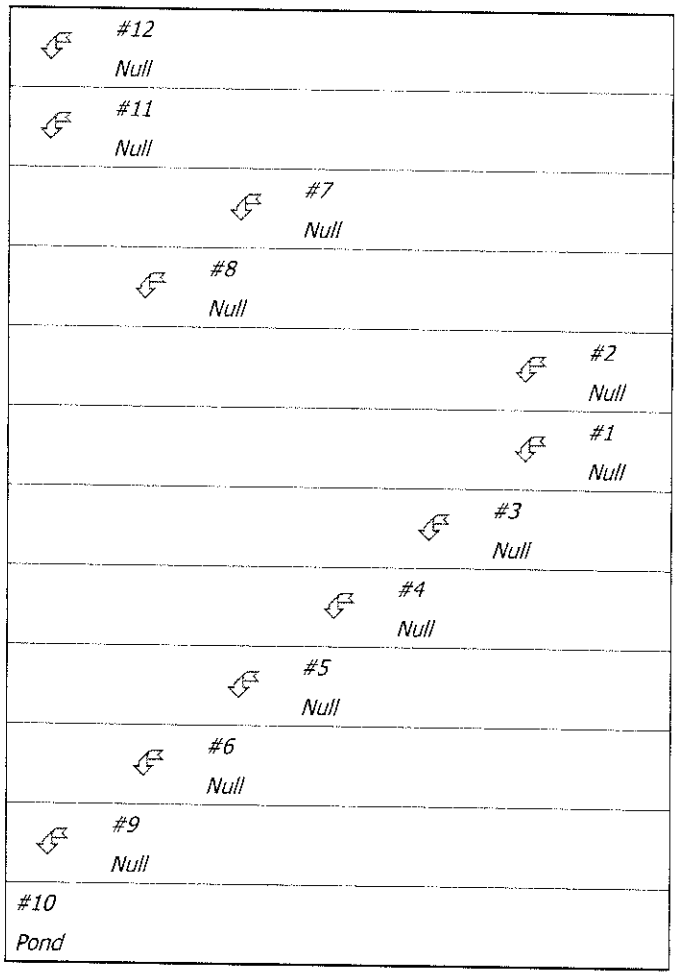
General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	10 yr - 24 hr
Rainfall Depth:	4.830 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	#3	0.000	0.000	Channel X
Null	#2	==>	#3	0.000	0.000	Channel W
Null	#3	==>	#4	0.000	0.000	Channel Y
Null	#4	==>	#5	0.000	0.000	Channel O
Null	#5	==>	#6	0.000	0.000	Channel P
Null	#6	==>	#9	0.000	0.000	Channel Q
Null	#7	==>	#8	0.000	0.000	DS-7
Null	#8	==>	#9	0.000	0.000	Channel L
Null	#9	==>	#10	0.000	0.000	Channel N
Pond	#10	==>	End	0.000	0.000	Basin #2
Null	#11	==>	#10	0.000	0.000	DS-6
Null	#12	==>	#10	0.000	0.000	Channel M



Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#12		2.170	2.170	3.18	0.23
#11		11.030	11.030	16.15	1.16
#7		7.120	7.120	3.57	0.50
#8		4.610	11.730	6.37	0.83
#2		1.840	1.840	2.69	0.19
#1		2.300	2.300	3.37	0.24
#3		3.690	7.830	11.46	0.83
#4		11.850	19.680	28.81	2.08
#5		7.880	27.560	30.88	2.63
#6		5.290	32.850	32.30	3.01
#9		0.590	45.170	37.93	3.90
#10	In	1.790	60.160	59.88	5.49
	Out			0.49	1.18

Structure Detail:

Structure #12 (Null)

Channel M

Structure #11 (Null)

DS-6

Structure #7 (Null)

DS-7

Structure #8 (Null)

Channel L

Structure #2 (Null)

Channel W

Structure #1 (Null)

Channel X

Structure #3 (Null)

Channel Y

Structure #4 (Null)

Channel O

Structure #5 (Null)

Channel P

Structure #6 (Null)

Channel Q

Structure #9 (Null)

Channel N

Structure #10 (Pond)

Basin #2

Pond Inputs:

Initial Pool Elev:	460.01 ft

Initial Pool:	0.00 ac-ft

Perforated Riser

Riser Diameter (in)	Riser Height (ft)	Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Number of Holes per Elev
36.00	11.00	30.00	100.00	4.50	0.0240	471.00	9

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
471.50	20.00	3.00:1	3.00:1	20.00

Pond Results:

Peak Elevation:	468.01 ft
Dewater Time:	3.96 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
460.00	0.272	0.000	0.000		
460.01	0.273	0.003	0.000		
460.50	0.312	0.146	0.000		
461.00	0.355	0.313	0.000		
461.50	0.400	0.501	0.000		
462.00	0.449	0.714	0.000		
462.50	0.499	0.951	0.000		
463.00	0.553	1.214	0.000		
463.50	0.610	1.504	0.000		
464.00	0.669	1.824	0.000		
464.50	0.731	2.173	0.000		
465.00	0.795	2.554	0.000		
465.50	0.818	2.958	0.000		Low hole SPW #1
466.00	0.840	3.372	0.167	30.01*	
466.50	0.863	3.798	0.236	21.80*	
467.00	0.887	4.236	0.331	15.98*	
467.50	0.911	4.685	0.393	13.82*	
468.00	0.935	5.146	0.488	12.90	
468.01	0.935	5.156	0.489	0.50	Peak Stage
468.50	0.959	5.620	0.552		

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
469.00	0.984	6.105	0.650		
469.50	1.009	6.603	0.718		
470.00	1.034	7.114	0.820		
470.50	1.058	7.637	0.892		
471.00	1.082	8.172	0.956		Spillway #1
471.50	1.107	8.719	10.330		Spillway #2
472.00	1.132	9.279	32.860		
472.50	1.157	9.851	91.363		
473.00	1.182	10.435	151.823		
473.50	1.208	11.033	230.503		
474.00	1.233	11.643	325.442		
474.50	1.260	12.266	436.892		
475.00	1.286	12.903	565.241		

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
460.00	0.000	0.000	0.000
460.01	0.000	0.000	0.000
460.50	0.000	0.000	0.000
461.00	0.000	0.000	0.000
461.50	0.000	0.000	0.000
462.00	0.000	0.000	0.000
462.50	0.000	0.000	0.000
463.00	0.000	0.000	0.000
463.50	0.000	0.000	0.000
464.00	0.000	0.000	0.000
464.50	0.000	0.000	0.000
465.00	0.000	0.000	0.000
465.50	1.00>0.000	0.000	0.000
466.00	0.167	0.000	0.167
466.50	0.50>0.236	0.000	0.236
467.00	0.331	0.000	0.331
467.50	0.50>0.393	0.000	0.393
468.00	0.488	0.000	0.488
468.50	0.50>0.552	0.000	0.552
469.00	0.650	0.000	0.650

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
469.50	0.50>0.718	0.000	0.718
470.00	0.820	0.000	0.820
470.50	0.892	0.000	0.892
471.00	0.956	0.000	0.956
471.50	10.330	0.000	10.330
472.00	29.217	3.643	32.860
472.50	41.684	49.679	91.363
473.00	48.133	103.690	151.823
473.50	53.814	176.689	230.503
474.00	58.950	266.492	325.442
474.50	63.674	373.219	436.892
475.00	68.070	497.171	565.241

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#12	1	2.170	0.045	0.000	0.000	61.000	M	3.18	0.229
	Σ	**2.170**						**3.18**	**0.229**
#11	1	11.030	0.101	0.000	0.000	61.000	S	16.15	1.164
	Σ	**11.030**						**16.15**	**1.164**
#7	1	7.120	0.268	0.000	0.000	61.000	S	3.57	0.505
	Σ	**7.120**						**3.57**	**0.505**
#8	1	4.610	0.161	0.000	0.000	61.000	S	2.86	0.329
	Σ	**11.730**						**6.37**	**0.833**
#2	1	1.840	0.080	0.000	0.000	61.000	M	2.69	0.194
	Σ	**1.840**						**2.69**	**0.194**
#1	1	2.300	0.048	0.000	0.000	61.000	M	3.37	0.243
	Σ	**2.300**						**3.37**	**0.243**
#3	1	3.690	0.033	0.000	0.000	61.000	M	5.40	0.389
	Σ	**7.830**						**11.46**	**0.826**
#4	1	11.850	0.018	0.000	0.000	61.000	M	17.35	1.251
	Σ	**19.680**						**28.81**	**2.077**
#5	1	7.880	0.340	0.000	0.000	61.000	S	3.46	0.558
	Σ	**27.560**						**30.88**	**2.635**
#6	1	5.290	0.314	0.000	0.000	61.000	S	2.43	0.374
	Σ	**32.850**						**32.30**	**3.009**
#9	1	0.590	0.022	0.000	0.000	61.000	M	0.86	0.062
	Σ	**45.170**						**37.93**	**3.905**
#10	1	1.790	0.015	0.000	0.000	61.000	M	2.62	0.189
	Σ	**60.160**						**59.88**	**5.487**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	3. Short grass pasture	20.00	16.00	80.00	3.570	0.006
		6. Grassed waterway	3.00	12.00	400.00	2.590	0.042
#1	**1**	**Time of Concentration:**					**0.048**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	1	3. Short grass pasture	17.50	17.50	100.00	3.340	0.008
		6. Grassed waterway	3.00	16.50	550.00	2.590	0.058
		6. Grassed waterway	10.00	25.00	250.00	4.740	0.014
#2	**1**	**Time of Concentration:**					**0.080**
#3	1	6. Grassed waterway	5.00	20.00	400.00	3.350	0.033
#3	**1**	**Time of Concentration:**					**0.033**
#4	1	3. Short grass pasture	33.00	16.50	50.00	4.590	0.003
		8. Large gullies, diversions, and low flowing streams	5.75	23.00	400.00	7.190	0.015
#4	**1**	**Time of Concentration:**					**0.018**
#5	1	6. Grassed waterway	0.50	6.50	1,300.00	1.060	0.340
#5	**1**	**Time of Concentration:**					**0.340**
#6	1	6. Grassed waterway	0.50	6.00	1,200.00	1.060	0.314
#6	**1**	**Time of Concentration:**					**0.314**
#7	1	3. Short grass pasture	33.00	24.75	75.00	4.590	0.004
		6. Grassed waterway	3.00	73.50	2,450.00	2.590	0.262
		8. Large gullies, diversions, and low flowing streams	33.00	41.25	125.00	17.230	0.002
#7	**1**	**Time of Concentration:**					**0.268**
#8	1	3. Short grass pasture	33.00	16.50	50.00	4.590	0.003
		6. Grassed waterway	3.50	56.00	1,600.00	2.800	0.158
#8	**1**	**Time of Concentration:**					**0.161**
#9	1	6. Grassed waterway	20.00	110.00	550.00	6.700	0.022
#9	**1**	**Time of Concentration:**					**0.022**
#10	1	3. Short grass pasture	5.00	5.00	100.00	1.780	0.015
#10	**1**	**Time of Concentration:**					**0.015**
#11	1	3. Short grass pasture	33.00	33.00	100.00	4.590	0.006
		6. Grassed waterway	3.00	25.50	850.00	2.590	0.091
		8. Large gullies, diversions, and low flowing streams	33.00	90.75	275.00	17.230	0.004
#11	**1**	**Time of Concentration:**					**0.101**
#12	1	3. Short grass pasture	33.00	16.50	50.00	4.590	0.003
		6. Grassed waterway	12.00	96.00	800.00	5.190	0.042
#12	**1**	**Time of Concentration:**					**0.045**

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IESI Bethlehem Landfill
Southeastern Realignment

Sedimentation Basin 2

Redesign

25-Yr

JMM

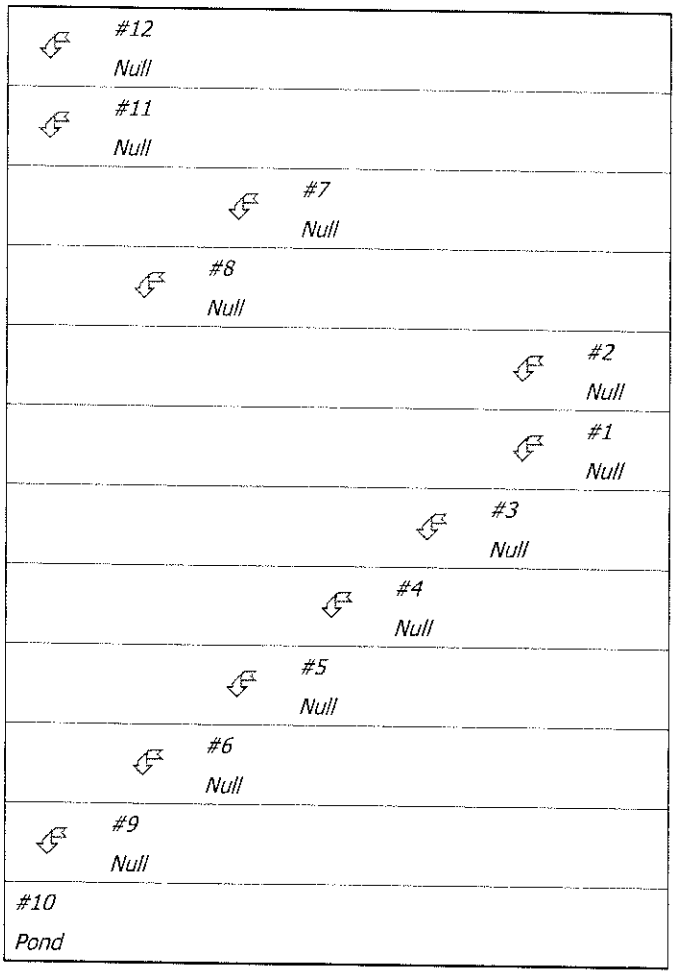
General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	25 yr - 24 hr
Rainfall Depth:	5.720 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	#3	0.000	0.000	Channel X
Null	#2	==>	#3	0.000	0.000	Channel W
Null	#3	==>	#4	0.000	0.000	Channel Y
Null	#4	==>	#5	0.000	0.000	Channel O
Null	#5	==>	#6	0.000	0.000	Channel P
Null	#6	==>	#9	0.000	0.000	Channel Q
Null	#7	==>	#8	0.000	0.000	DS-7
Null	#8	==>	#9	0.000	0.000	Channel L
Null	#9	==>	#10	0.000	0.000	Channel N
Pond	#10	==>	End	0.000	0.000	Basin #2
Null	#11	==>	#10	0.000	0.000	DS-6
Null	#12	==>	#10	0.000	0.000	Channel M



Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#12		2.170	2.170	4.49	0.33
#11		11.030	11.030	22.81	1.67
#7		7.120	7.120	5.43	0.72
#8		4.610	11.730	9.56	1.20
#2		1.840	1.840	3.80	0.28
#1		2.300	2.300	4.76	0.35
#3		3.690	7.830	16.19	1.19
#4		11.850	19.680	40.69	2.98
#5		7.880	27.560	44.15	3.78
#6		5.290	32.850	46.52	4.32
#9		0.590	45.170	55.36	5.61
#10	In	1.790	60.160	86.35	7.88
	Out			0.83	2.12

Structure Detail:

Structure #12 (Null)

Channel M

Structure #11 (Null)

DS-6

Structure #7 (Null)

DS-7

Structure #8 (Null)

Channel L

Structure #2 (Null)

Channel W

Structure #1 (Null)

Channel X

Structure #3 (Null)

Channel Y

Structure #4 (Null)

Channel O

Structure #5 (Null)

Channel P

Structure #6 (Null)

Channel Q

Structure #9 (Null)

Channel N

Structure #10 (Pond)

Basin #2

Pond Inputs:

Initial Pool Elev:	460.01 ft

Initial Pool:	0.00 ac-ft

Perforated Riser

Riser Diameter (in)	Riser Height (ft)	Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Number of Holes per Elev
36.00	11.00	30.00	100.00	4.50	0.0240	471.00	9

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
471.50	20.00	3.00:1	3.00:1	20.00

Pond Results:

Peak Elevation:	470.10 ft
Dewater Time:	5.48 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
460.00	0.272	0.000	0.000		
460.01	0.273	0.003	0.000		
460.50	0.312	0.146	0.000		
461.00	0.355	0.313	0.000		
461.50	0.400	0.501	0.000		
462.00	0.449	0.714	0.000		
462.50	0.499	0.951	0.000		
463.00	0.553	1.214	0.000		
463.50	0.610	1.504	0.000		
464.00	0.669	1.824	0.000		
464.50	0.731	2.173	0.000		
465.00	0.795	2.554	0.000		
465.50	0.818	2.958	0.000		Low hole SPW #1
466.00	0.840	3.372	0.167	30.01*	
466.50	0.863	3.798	0.236	21.80*	
467.00	0.887	4.236	0.331	15.98*	
467.50	0.911	4.685	0.393	13.82*	
468.00	0.935	5.146	0.488	11.44*	
468.50	0.959	5.620	0.552	10.38*	
469.00	0.984	6.105	0.650	9.04*	

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
469.50	1.009	6.603	0.718	8.85	
470.00	1.034	7.114	0.820	8.05	
470.10	1.038	7.223	0.835	2.10	Peak Stage
470.50	1.058	7.637	0.892		
471.00	1.082	8.172	0.956		Spillway #1
471.50	1.107	8.719	10.330		Spillway #2
472.00	1.132	9.279	32.860		
472.50	1.157	9.851	91.363		
473.00	1.182	10.435	151.823		
473.50	1.208	11.033	230.503		
474.00	1.233	11.643	325.442		
474.50	1.260	12.266	436.892		
475.00	1.286	12.903	565.241		

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
460.00	0.000	0.000	0.000
460.01	0.000	0.000	0.000
460.50	0.000	0.000	0.000
461.00	0.000	0.000	0.000
461.50	0.000	0.000	0.000
462.00	0.000	0.000	0.000
462.50	0.000	0.000	0.000
463.00	0.000	0.000	0.000
463.50	0.000	0.000	0.000
464.00	0.000	0.000	0.000
464.50	0.000	0.000	0.000
465.00	0.000	0.000	0.000
465.50	1.00>0.000	0.000	0.000
466.00	0.167	0.000	0.167
466.50	0.50>0.236	0.000	0.236
467.00	0.331	0.000	0.331
467.50	0.50>0.393	0.000	0.393
468.00	0.488	0.000	0.488
468.50	0.50>0.552	0.000	0.552
469.00	0.650	0.000	0.650

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
469.50	0.50>0.718	0.000	0.718
470.00	0.820	0.000	0.820
470.50	0.892	0.000	0.892
471.00	0.956	0.000	0.956
471.50	10.330	0.000	10.330
472.00	29.217	3.643	32.860
472.50	41.684	49.679	91.363
473.00	48.133	103.690	151.823
473.50	53.814	176.689	230.503
474.00	58.950	266.492	325.442
474.50	63.674	373.219	436.892
475.00	68.070	497.171	565.241

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#12	1	2.170	0.045	0.000	0.000	61.000	M	4.49	0.329
	Σ	**2.170**						**4.49**	**0.329**
#11	1	11.030	0.101	0.000	0.000	61.000	S	22.81	1.671
	Σ	**11.030**						**22.81**	**1.671**
#7	1	7.120	0.268	0.000	0.000	61.000	S	5.43	0.724
	Σ	**7.120**						**5.43**	**0.724**
#8	1	4.610	0.161	0.000	0.000	61.000	S	4.27	0.472
	Σ	**11.730**						**9.56**	**1.196**
#2	1	1.840	0.080	0.000	0.000	61.000	M	3.80	0.279
	Σ	**1.840**						**3.80**	**0.279**
#1	1	2.300	0.048	0.000	0.000	61.000	M	4.76	0.348
	Σ	**2.300**						**4.76**	**0.348**
#3	1	3.690	0.033	0.000	0.000	61.000	M	7.63	0.559
	Σ	**7.830**						**16.19**	**1.186**
#4	1	11.850	0.018	0.000	0.000	61.000	M	24.50	1.796
	Σ	**19.680**						**40.69**	**2.982**
#5	1	7.880	0.340	0.000	0.000	61.000	S	5.27	0.801
	Σ	**27.560**						**44.15**	**3.783**
#6	1	5.290	0.314	0.000	0.000	61.000	S	3.70	0.538
	Σ	**32.850**						**46.52**	**4.320**
#9	1	0.590	0.022	0.000	0.000	61.000	M	1.22	0.089
	Σ	**45.170**						**55.36**	**5.606**
#10	1	1.790	0.015	0.000	0.000	61.000	M	3.70	0.271
	Σ	**60.160**						**86.35**	**7.877**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	3. Short grass pasture	20.00	16.00	80.00	3.570	0.006
		6. Grassed waterway	3.00	12.00	400.00	2.590	0.042
#1	**1**	**Time of Concentration:**					**0.048**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	1	3. Short grass pasture	17.50	17.50	100.00	3.340	0.008
		6. Grassed waterway	3.00	16.50	550.00	2.590	0.058
		6. Grassed waterway	10.00	25.00	250.00	4.740	0.014
#2	**1**	**Time of Concentration:**					**0.080**
#3	1	6. Grassed waterway	5.00	20.00	400.00	3.350	0.033
#3	**1**	**Time of Concentration:**					**0.033**
#4	1	3. Short grass pasture	33.00	16.50	50.00	4.590	0.003
		8. Large gullies, diversions, and low flowing streams	5.75	23.00	400.00	7.190	0.015
#4	**1**	**Time of Concentration:**					**0.018**
#5	1	6. Grassed waterway	0.50	6.50	1,300.00	1.060	0.340
#5	**1**	**Time of Concentration:**					**0.340**
#6	1	6. Grassed waterway	0.50	6.00	1,200.00	1.060	0.314
#6	**1**	**Time of Concentration:**					**0.314**
#7	1	3. Short grass pasture	33.00	24.75	75.00	4.590	0.004
		6. Grassed waterway	3.00	73.50	2,450.00	2.590	0.262
		8. Large gullies, diversions, and low flowing streams	33.00	41.25	125.00	17.230	0.002
#7	**1**	**Time of Concentration:**					**0.268**
#8	1	3. Short grass pasture	33.00	16.50	50.00	4.590	0.003
		6. Grassed waterway	3.50	56.00	1,600.00	2.800	0.158
#8	**1**	**Time of Concentration:**					**0.161**
#9	1	6. Grassed waterway	20.00	110.00	550.00	6.700	0.022
#9	**1**	**Time of Concentration:**					**0.022**
#10	1	3. Short grass pasture	5.00	5.00	100.00	1.780	0.015
#10	**1**	**Time of Concentration:**					**0.015**
#11	1	3. Short grass pasture	33.00	33.00	100.00	4.590	0.006
		6. Grassed waterway	3.00	25.50	850.00	2.590	0.091
		8. Large gullies, diversions, and low flowing streams	33.00	90.75	275.00	17.230	0.004
#11	**1**	**Time of Concentration:**					**0.101**
#12	1	3. Short grass pasture	33.00	16.50	50.00	4.590	0.003
		6. Grassed waterway	12.00	96.00	800.00	5.190	0.042
#12	**1**	**Time of Concentration:**					**0.045**

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IESI Bethlehem Landfill
Southeastern Realignment

Sedimentation Basin 2

Redesign

100-Yr

JMM

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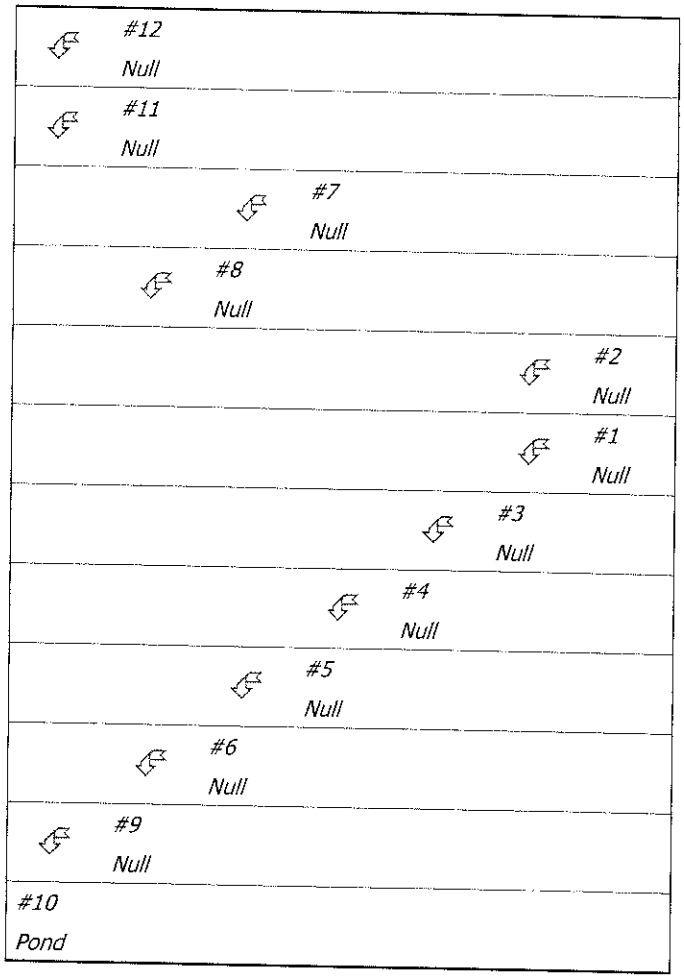
General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	100 yr - 24 hr
Rainfall Depth:	7.040 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	#3	0.000	0.000	Channel X
Null	#2	==>	#3	0.000	0.000	Channel W
Null	#3	==>	#4	0.000	0.000	Channel Y
Null	#4	==>	#5	0.000	0.000	Channel O
Null	#5	==>	#6	0.000	0.000	Channel P
Null	#6	==>	#9	0.000	0.000	Channel Q
Null	#7	==>	#8	0.000	0.000	DS-7
Null	#8	==>	#9	0.000	0.000	Channel L
Null	#9	==>	#10	0.000	0.000	Channel N
Pond	#10	==>	End	0.000	0.000	Basin #2
Null	#11	==>	#10	0.000	0.000	DS-6
Null	#12	==>	#10	0.000	0.000	Channel M



Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#12		2.170	2.170	6.56	0.49
#11		11.030	11.030	33.36	2.51
#7		7.120	7.120	8.48	1.09
#8		4.610	11.730	14.81	1.79
#2		1.840	1.840	5.56	0.42
#1		2.300	2.300	6.96	0.52
#3		3.690	7.830	23.68	1.78
#4		11.850	19.680	59.52	4.47
#5		7.880	27.560	65.32	5.67
#6		5.290	32.850	69.32	6.48
#9		0.590	45.170	83.49	8.41
#10	In	1.790	60.160	128.82	11.82
	Out			6.12	5.35

Structure Detail:

Structure #12 (Null)

Channel M

Structure #11 (Null)

DS-6

Structure #7 (Null)

DS-7

Structure #8 (Null)

Channel L

Structure #2 (Null)

Channel W

Structure #1 (Null)

Channel X

Structure #3 (Null)

Channel Y

Structure #4 (Null)

Channel O

Structure #5 (Null)

Channel P

Structure #6 (Null)

Channel Q

Structure #9 (Null)

Channel N

Structure #10 (Pond)

Basin #2

Pond Inputs:

Initial Pool Elev:	460.01 ft

Initial Pool:	0.00 ac-ft

Perforated Riser

Riser Diameter (in)	Riser Height (ft)	Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Number of Holes per Elev
36.00	11.00	30.00	100.00	4.50	0.0240	471.00	9

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
471.50	20.00	3.00:1	3.00:1	20.00

Pond Results:

Peak Elevation:	471.28 ft
Dewater Time:	6.33 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
460.00	0.272	0.000	0.000		
460.01	0.273	0.003	0.000		
460.50	0.312	0.146	0.000		
461.00	0.355	0.313	0.000		
461.50	0.400	0.501	0.000		
462.00	0.449	0.714	0.000		
462.50	0.499	0.951	0.000		
463.00	0.553	1.214	0.000		
463.50	0.610	1.504	0.000		
464.00	0.669	1.824	0.000		
464.50	0.731	2.173	0.000		
465.00	0.795	2.554	0.000		
465.50	0.818	2.958	0.000		Low hole SPW #1
466.00	0.840	3.372	0.167	30.01*	
466.50	0.863	3.798	0.236	21.80*	
467.00	0.887	4.236	0.331	15.98*	
467.50	0.911	4.685	0.393	13.82*	
468.00	0.935	5.146	0.488	11.44*	
468.50	0.959	5.620	0.552	10.38*	
469.00	0.984	6.105	0.650	9.04*	

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
469.50	1.009	6.603	0.718	8.40*	
470.00	1.034	7.114	0.820	8.05	
470.50	1.058	7.637	0.892	7.40	
471.00	1.082	8.172	0.956	7.10	Spillway #1
471.28	1.096	8.473	6.120	8.55	Peak Stage
471.50	1.107	8.719	10.330		Spillway #2
472.00	1.132	9.279	32.860		
472.50	1.157	9.851	91.363		
473.00	1.182	10.435	151.823		
473.50	1.208	11.033	230.503		
474.00	1.233	11.643	325.442		
474.50	1.260	12.266	436.892		
475.00	1.286	12.903	565.241		

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
460.00	0.000	0.000	0.000
460.01	0.000	0.000	0.000
460.50	0.000	0.000	0.000
461.00	0.000	0.000	0.000
461.50	0.000	0.000	0.000
462.00	0.000	0.000	0.000
462.50	0.000	0.000	0.000
463.00	0.000	0.000	0.000
463.50	0.000	0.000	0.000
464.00	0.000	0.000	0.000
464.50	0.000	0.000	0.000
465.00	0.000	0.000	0.000
465.50	1.00>0.000	0.000	0.000
466.00	0.167	0.000	0.167
466.50	0.50>0.236	0.000	0.236
467.00	0.331	0.000	0.331
467.50	0.50>0.393	0.000	0.393
468.00	0.488	0.000	0.488
468.50	0.50>0.552	0.000	0.552
469.00	0.650	0.000	0.650

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
469.50	0.50>0.718	0.000	0.718
470.00	0.820	0.000	0.820
470.50	0.892	0.000	0.892
471.00	0.956	0.000	0.956
471.50	10.330	0.000	10.330
472.00	29.217	3.643	32.860
472.50	41.684	49.679	91.363
473.00	48.133	103.690	151.823
473.50	53.814	176.689	230.503
474.00	58.950	266.492	325.442
474.50	63.674	373.219	436.892
475.00	68.070	497.171	565.241

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#12	1	2.170	0.045	0.000	0.000	61.000	M	6.56	0.493
	Σ	**2.170**						**6.56**	**0.493**
#11	1	11.030	0.101	0.000	0.000	61.000	S	33.36	2.507
	Σ	**11.030**						**33.36**	**2.507**
#7	1	7.120	0.268	0.000	0.000	61.000	S	8.48	1.087
	Σ	**7.120**						**8.48**	**1.087**
#8	1	4.610	0.161	0.000	0.000	61.000	S	6.57	0.708
	Σ	**11.730**						**14.81**	**1.794**
#2	1	1.840	0.080	0.000	0.000	61.000	M	5.56	0.418
	Σ	**1.840**						**5.56**	**0.418**
#1	1	2.300	0.048	0.000	0.000	61.000	M	6.96	0.523
	Σ	**2.300**						**6.96**	**0.523**
#3	1	3.690	0.033	0.000	0.000	61.000	M	11.16	0.839
	Σ	**7.830**						**23.68**	**1.780**
#4	1	11.850	0.018	0.000	0.000	61.000	M	35.84	2.694
	Σ	**19.680**						**59.52**	**4.473**
#5	1	7.880	0.340	0.000	0.000	61.000	S	8.28	1.201
	Σ	**27.560**						**65.32**	**5.675**
#6	1	5.290	0.314	0.000	0.000	61.000	S	5.81	0.806
	Σ	**32.850**						**69.32**	**6.481**
#9	1	0.590	0.022	0.000	0.000	61.000	M	1.78	0.134
	Σ	**45.170**						**83.49**	**8.409**
#10	1	1.790	0.015	0.000	0.000	61.000	M	5.41	0.407
	Σ	**60.160**						**128.82**	**11.816**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	3. Short grass pasture	20.00	16.00	80.00	3.570	0.006
		6. Grassed waterway	3.00	12.00	400.00	2.590	0.042
#1	**1**	**Time of Concentration:**					**0.048**

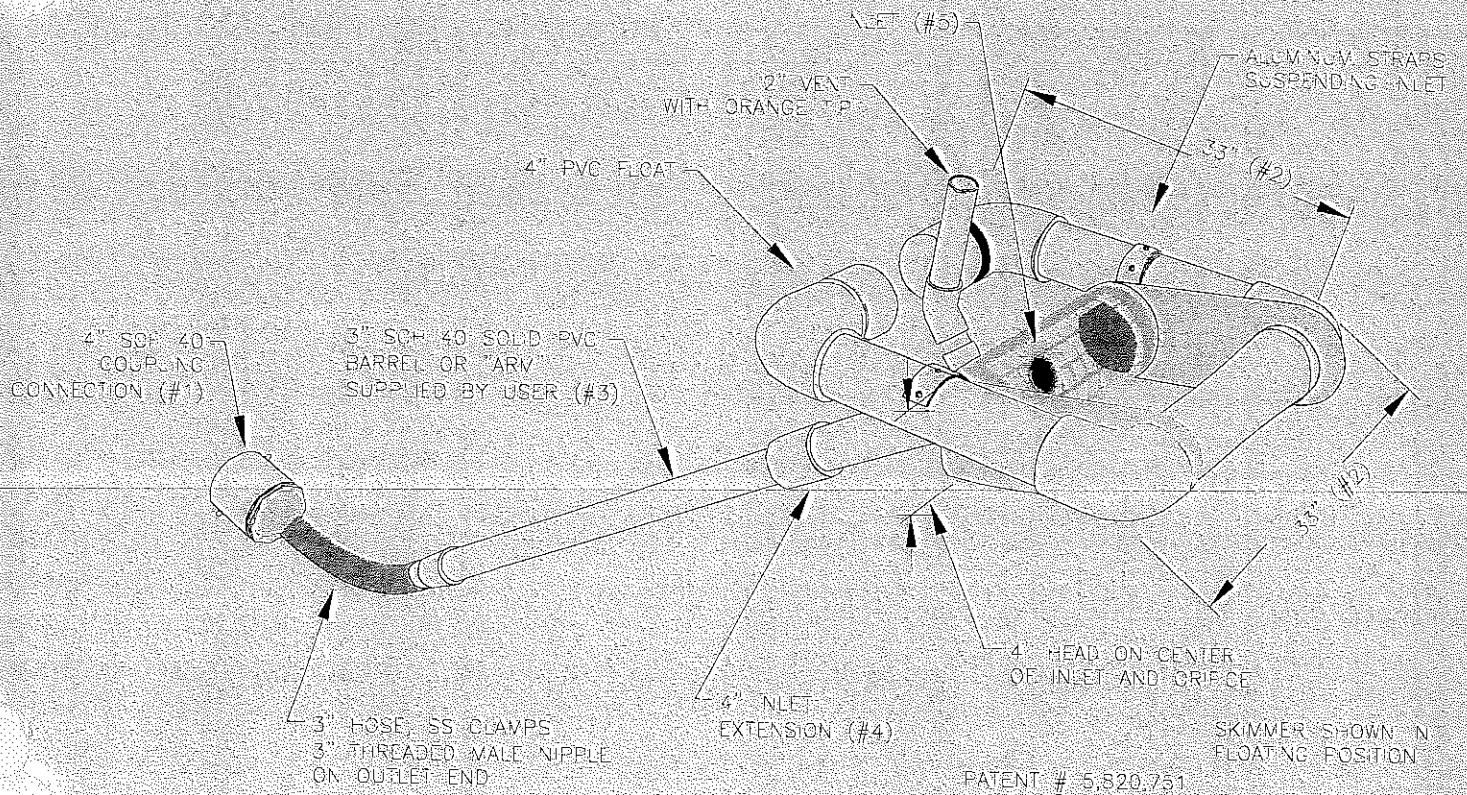
Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	1	3. Short grass pasture	17.50	17.50	100.00	3.340	0.008
		6. Grassed waterway	3.00	16.50	550.00	2.590	0.058
		6. Grassed waterway	10.00	25.00	250.00	4.740	0.014
#2	**1**	**Time of Concentration:**					**0.080**
#3	1	6. Grassed waterway	5.00	20.00	400.00	3.350	0.033
#3	**1**	**Time of Concentration:**					**0.033**
#4	1	3. Short grass pasture	33.00	16.50	50.00	4.590	0.003
		8. Large gullies, diversions, and low flowing streams	5.75	23.00	400.00	7.190	0.015
#4	**1**	**Time of Concentration:**					**0.018**
#5	1	6. Grassed waterway	0.50	6.50	1,300.00	1.060	0.340
#5	**1**	**Time of Concentration:**					**0.340**
#6	1	6. Grassed waterway	0.50	6.00	1,200.00	1.060	0.314
#6	**1**	**Time of Concentration:**					**0.314**
#7	1	3. Short grass pasture	33.00	24.75	75.00	4.590	0.004
		6. Grassed waterway	3.00	73.50	2,450.00	2.590	0.262
		8. Large gullies, diversions, and low flowing streams	33.00	41.25	125.00	17.230	0.002
#7	**1**	**Time of Concentration:**					**0.268**
#8	1	3. Short grass pasture	33.00	16.50	50.00	4.590	0.003
		6. Grassed waterway	3.50	56.00	1,600.00	2.800	0.158
#8	**1**	**Time of Concentration:**					**0.161**
#9	1	6. Grassed waterway	20.00	110.00	550.00	6.700	0.022
#9	**1**	**Time of Concentration:**					**0.022**
#10	1	3. Short grass pasture	5.00	5.00	100.00	1.780	0.015
#10	**1**	**Time of Concentration:**					**0.015**
#11	1	3. Short grass pasture	33.00	33.00	100.00	4.590	0.006
		6. Grassed waterway	3.00	25.50	850.00	2.590	0.091
		8. Large gullies, diversions, and low flowing streams	33.00	90.75	275.00	17.230	0.004
#11	**1**	**Time of Concentration:**					**0.101**
#12	1	3. Short grass pasture	33.00	16.50	50.00	4.590	0.003
		6. Grassed waterway	12.00	96.00	800.00	5.190	0.042
#12	**1**	**Time of Concentration:**					**0.045**

Basin Skimmer
Release Rates

Basin 2

4" Skimmer
Capacity: 20,109 cf/day

$$\frac{20{,}109\ \text{cf}}{1\ \text{Day}} \times \frac{1\ \text{Day}}{24\ \text{Hour}} \times \frac{1\ \text{Hour}}{60\ \text{Minute}} \times \frac{1\ \text{Minute}}{60\ \text{Second}} = 0.23\ \text{cfs}$$



1. COUPLING CAN BE REMOVED AND HOSE ATTACHED TO OUTLET USING THE THREADED 3" NIPPLE. TYPICAL METHODS USED: ON A METAL STRUCTURE A STEEL STUBOUT WELDED ON THE SIDE AT THE BOTTOM WITH A 3" THREADED COUPLIN OR REDUCERS; ON A CONCRETE STRUCTURE WITH A HOLE OR ORIFICE AT THE BOTTOM, USE A STEEL PLATE WITH A HOL CUT IN IT AND COUPLING WELDED TO IT THAT WILL FIT OVER THE HOLE IN THE CONCRETE AND BOLTED TO THE STRUCTURE WITH SEALANT. IT IS POSSIBLE TO GROUT A 4" PVC PIPE IN A HOLE IN THE CONCRETE TO CONNECT THE SKIMMER BUT THIS IS LESS SECURE THAN OTHER METHODS.
2. DIMENSIONS ARE APPROXIMATE, NOT INTENDED AS PLANS FOR CONSTRUCTION.
3. BARREL (SOLID, NOT FOAM CORE PIPE) SHOULD BE 1.4 TIMES THE DEPTH OF WATER WITH A MINIMUM LENGTH OF 8 SO THE INLET CAN BE PULLED TO THE SIDE FOR MAINTENANCE. IF MORE THAN 10' LONG WEIGHT MAY HAVE TO BE ADD TO THE INLET TO COUNTER THE INCREASED BUOYANCY.
4. INLET TAPERS DOWN FROM 4" MAXIMUM INLET TO A 3" BARREL AND HOSE. BARREL IS SMALLER TO REDUCE BUOYAN AND TENDANCY TO LIFT INLET BUT IS SUFFICIENT FOR FLOW THROUGH INLET BECAUSE OF SLOPE. THE INLET ORIFICE CA BE REDUCED USING THE PLUG AND CUTTER PROVIDED TO CONTROL THE OUTFLOW RATE.
5. INLET IS 8" PIPE BETWEEN THE STRAPS WITH SLOTS CUT IN THE INLET AND ALUMINUM SCREEN DOOR (SMALLER THAN SHOWN IN ILLUSTRATION) FOR ACCESS TO THE THE 4" INLET AND ORIFICE INSIDE.
6. CAPACITY 20,109 CUBIC FEET PER DAY MAXIMUM WITH 4" INLET AND 4" HEAD. INLET CAN BE REDUCED BY INSTALLING A SMALLER ORIFICE USING THE PLUG AND CUTTER PROVIDED TO ADJUST FLOW RATE FOR THE PARTICULAR BASIN VOLUME AND DRAWDOWN TIME REQUIRED.
7. SHIPPED ASSEMBLED. USER GLUES INLET EXTENSION AND BARREL, INSTALLS VENT, CUTS ORIFICE IN PLUG AND ATTACHES TO OUTLET PIPE OR STRUCTURE. INCLUDES FLEXIBLE HOSE, ROPE, ORIFICE CUTTER, ETC.

4" FAIRCLOTH SKIMMER

BE1HIEHEM\1162LDP\RECORD.DWGS\1162LDP-1BB.DWG LI 12/2/2010 3:54:52 PM

CHANNELS

Channel L @ 6.7%

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	2.0:1	2.0:1	6.7	1.00		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	14.81 cfs	
Depth:	0.63 ft	1.63 ft
Top Width:	5.53 ft	9.53 ft
Velocity:	5.49 fps	
X-Section Area:	2.69 sq ft	
Hydraulic Radius:	0.463 ft	
Froude Number:	1.39	
Manning's n:	0.0420	
Dmin:	2.00 in	
D50:	3.00 in	
Dmax:	4.50 in	

Channel L @ 2.4%

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	2.0:1	2.0:1	2.4	1.00		

PADER Method - Steep Slope Design

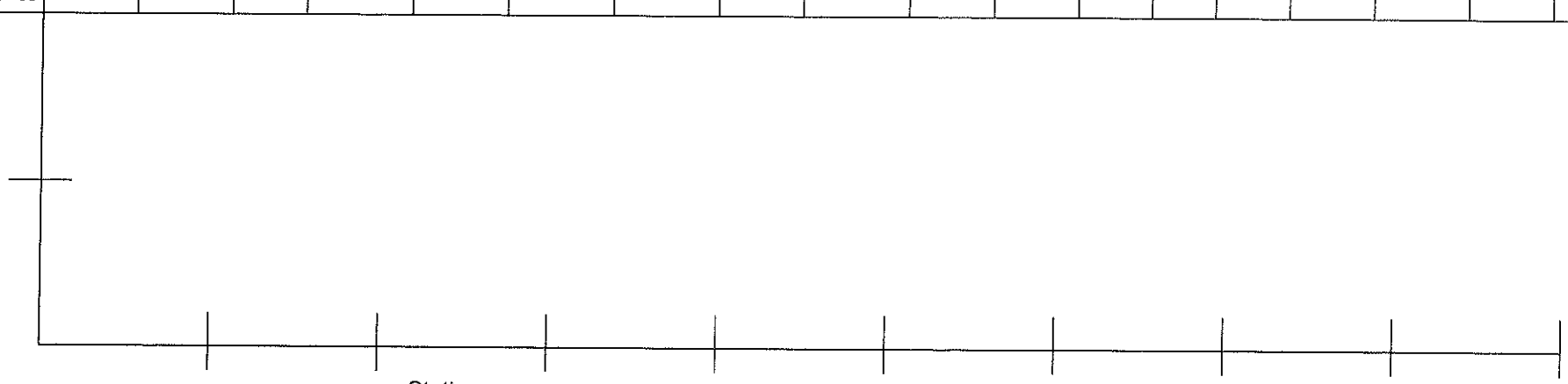
	w/o Freeboard	w/ Freeboard
Design Discharge:	14.81 cfs	
Depth:	0.73 ft	1.73 ft
Top Width:	5.93 ft	9.93 ft
Velocity:	4.53 fps	
X-Section Area:	3.27 sq ft	
Hydraulic Radius:	0.521 ft	
Froude Number:	1.07	
Manning's n:	0.0330	
Dmin:	2.00 in	
D50:	3.00 in	
Dmax:	4.50 in	

FORM I
DIVERSION/COLLECTION DITCH DATA SHEET

Title: Channel L	Site: Bethlehem Landfill SE Realignment		M&M File: b/md/1162.3/Form I.doc
Prepared by: JMM	Telephone Number:	Date: May, 2014	Sheet _____ of _____

Estimated Peak Storm Intensity: _____ **(in./hr.)** ***Design Calculations:*** _____

Station		Drainage Area (acres)	Design Storm (yrs.)	Average Watershed Slope %)	Peak Discharge Q (cfs)	Channel Bed Slope (%)	Freeboard (ft.)	Channel Lining	Manning's Coefficient (n)	Channel Bottom Width (ft.)	Channel Side Slopes (%)	Flow Area (sq. ft.)	Flow Depth (ft.)	Top Flow Width (ft.)	Flow Velocity (ft./sec.)	Q Available (cfs)	With Freeboard		
Start End	Elevation																Channel Depth (ft.)	Top Channel Width (ft.)	Q Available (cfs)
0+00 1+35	611.00	4.61	100	28	14.81	6.7	1.0	R-3	0.042	3.0	50	2.69	0.63	5.53	5.49	35.03	2.0	9.53	142.53
1+35 3+80	620.00	4.61	100	28	14.81	4.1	1.0	R-3	0.041	3.0	50	3.15	0.71	5.85	4.70	28.07	2.0	9.85	114.21
3+80 8+00	630.00	4.61	100	28	14.81	2.4	1.0	R-3	0.033	3.0	50	3.27	0.73	5.93	4.53	26.68	2.0	9.93	108.57
8+00 12+50	640.00	4.61	100	28	14.81	4.4	1.0	R-3	0.041	3.0	50	3.08	0.70	5.80	4.81	36.13	2.0	9.80	147.00
12+50 17+00	660.00	4.61	100	28	14.81	2.4	1.0	R-3	0.033	3.0	50	3.27	0.73	5.93	4.53	26.68	2.0	9.93	108.57



PROFILE **Horizontal Scale 1" = ___** Vertical Scale 1" = _____

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Channel M @ 3.5%

Material: Riprap

Triangular Channel

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
2.0:1	2.0:1	3.5	1.00		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	6.56 cfs	
Depth:	0.85 ft	1.85 ft
Top Width:	3.39 ft	7.39 ft
Velocity:	4.56 fps	
X-Section Area:	1.44 sq ft	
Hydraulic Radius:	0.379 ft	
Froude Number:	1.24	
Manning's n:	0.0320	
Dmin:	2.00 in	
D50:	3.00 in	
Dmax:	4.50 in	

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Channel M @ 13.1%

Material: Riprap

Triangular Channel

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
2.0:1	2.0:1	13.1	1.00		

PADER Method - Steep Slope Design

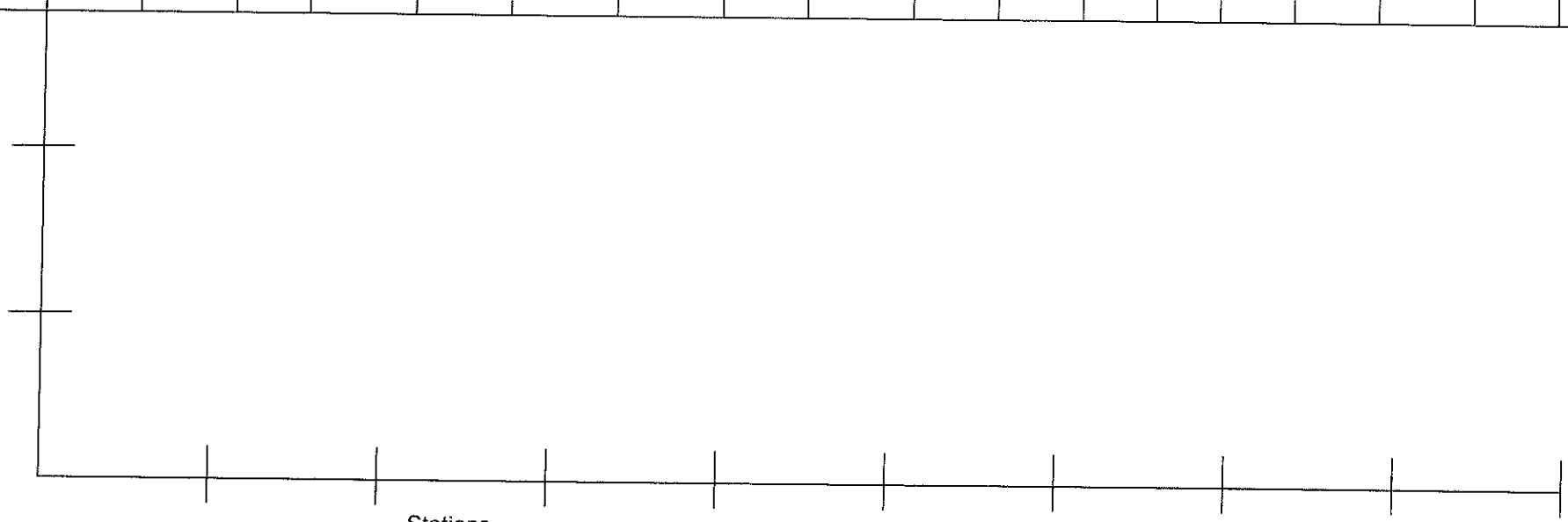
	w/o Freeboard	w/ Freeboard
Design Discharge:	6.56 cfs	
Depth:	0.72 ft	1.72 ft
Top Width:	2.88 ft	6.88 ft
Velocity:	6.33 fps	
X-Section Area:	1.04 sq ft	
Hydraulic Radius:	0.322 ft	
Froude Number:	1.86	
Manning's n:	0.0400	
Dmin:	2.00 in	
D50:	3.00 in	
Dmax:	4.50 in	

FOR I
DIVERSION/COLLECTION DITCH DATA SHEET

Title: Channel M	Site: Bethlehem Landfill SE Realignment		M&M File: b/md/1162.3/Form I.doc
Prepared by: JMM	Telephone Number:	Date: May, 2014	Sheet ____ of ____

Estimated Peak Storm Intensity: _____ **(in./hr.)** ***Design Calculations:*** _____

Station		Drainage Area (acres)	Design Storm (yrs.)	Average Watershed Slope %)	Peak Discharge Q (cfs)	Channel Bed Slope (%)	Freeboard (ft.)	Channel Lining	Manning's Coefficient (n)	Channel Bottom Width (ft.)	Channel Side Slopes (%)	Flow Area (sq. ft.)	Flow Depth (ft.)	Top Flow Width (ft.)	Flow Velocity (ft./sec.)	Q Available (cfs)	With Freeboard		
Start End	Elevation																Channel Depth (ft.)	Top Channel Width (ft.)	Q Available (cfs)
0+00 2+55	516	2.17	100	28	6.56	3.5	1.0	R-3	0.031	0.0	50	1.44	0.85	3.39	4.12	10.48	2.0	7.39	66.6
2+55 8+90	525	2.17	100	28	6.56	13.1	1.0	R-3	0.031	0.0	50	1.93	0.72	2.88	6.33	20.29	2.0	6.88	128.84



PROFILE **Horizontal Scale 1" =** ___ Vertical Scale 1" = _____

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Channel N @ 18.2%

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	2.0:1	2.0:1	18.2	1.00		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	83.49 cfs	
Depth:	1.38 ft	2.38 ft
Top Width:	8.52 ft	12.52 ft
Velocity:	10.50 fps	
X-Section Area:	7.95 sq ft	
Hydraulic Radius:	0.867 ft	
Froude Number:	1.92	
Manning's n:	0.0550	
Dmin:	5.00 in	
D50:	9.00 in	
Dmax:	12.00 in	

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Channel N @ 25.0%

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	2.0:1	2.0:1	25.0	1.00		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	83.49 cfs	
Depth:	1.29 ft	2.29 ft
Top Width:	8.15 ft	12.15 ft
Velocity:	11.65 fps	
X-Section Area:	7.17 sq ft	
Hydraulic Radius:	0.819 ft	
Froude Number:	2.19	
Manning's n:	0.0560	
Dmin:	7.00 in	
D50:	12.00 in	
Dmax:	18.00 in	

FOR I
DIVERSION/COLLECTION DITCH DATA SHEET

Title: Channel N	Site: Bethlehem Landfill SE Realignment		M&M File: b/md/1162.3/Form I.doc
Prepared by: JMM	Telephone Number:	Date: May, 2014	Sheet _____ of _____

Estimated Peak Storm Intensity: _____ **(in./hr.)** ***Design Calculations:*** _____

Station																			
																	With Freeboard		
Start End	Elevation	Drainage Area (acres)	Design Storm (yrs.)	Average Watershed Slope %)	Peak Discharge Q (cfs)	Channel Bed Slope (%)	Freeboard (ft.)	Channel Lining	Manning's Coefficient (n)	Channel Bottom Width (ft.)	Channel Side Slopes (%)	Flow Area (sq. ft.)	Flow Depth (ft.)	Top Flow Width (ft.)	Flow Velocity (ft./sec.)	Q Available (cfs)	Channel Depth (ft.)	Top Channel Width (ft.)	Q Available (cfs)
0+00 0+47	476.00	0.59	100	28	83.49	23	1.00	R-6	0.055	3.0	50	7.29	1.30	8.21	11.45	49.56	3.0	12.21	201.66
0+47 1+02	487.00	0.59	100	28	83.49	18.2	1.00	R-6	0.055	3.0	50	7.95	1.38	8.52	10.50	44.09	3.0	8.52	179.39
1+02 5+22	497.00	0.59	100	28	83.49	25	100	R-6	0.056	3.0	50	7.17	1.29	8.15	11.65	50.75	3.0	12.15	206.49

Stations

PROFILE **Horizontal Scale 1" =** ___ Vertical Scale 1" = _____

Channel O @ 0.50%

Material: Riprap

Triangular Channel

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.0:1	8.0:1	0.5	1.00		

PADER Method - Mild Slope Design

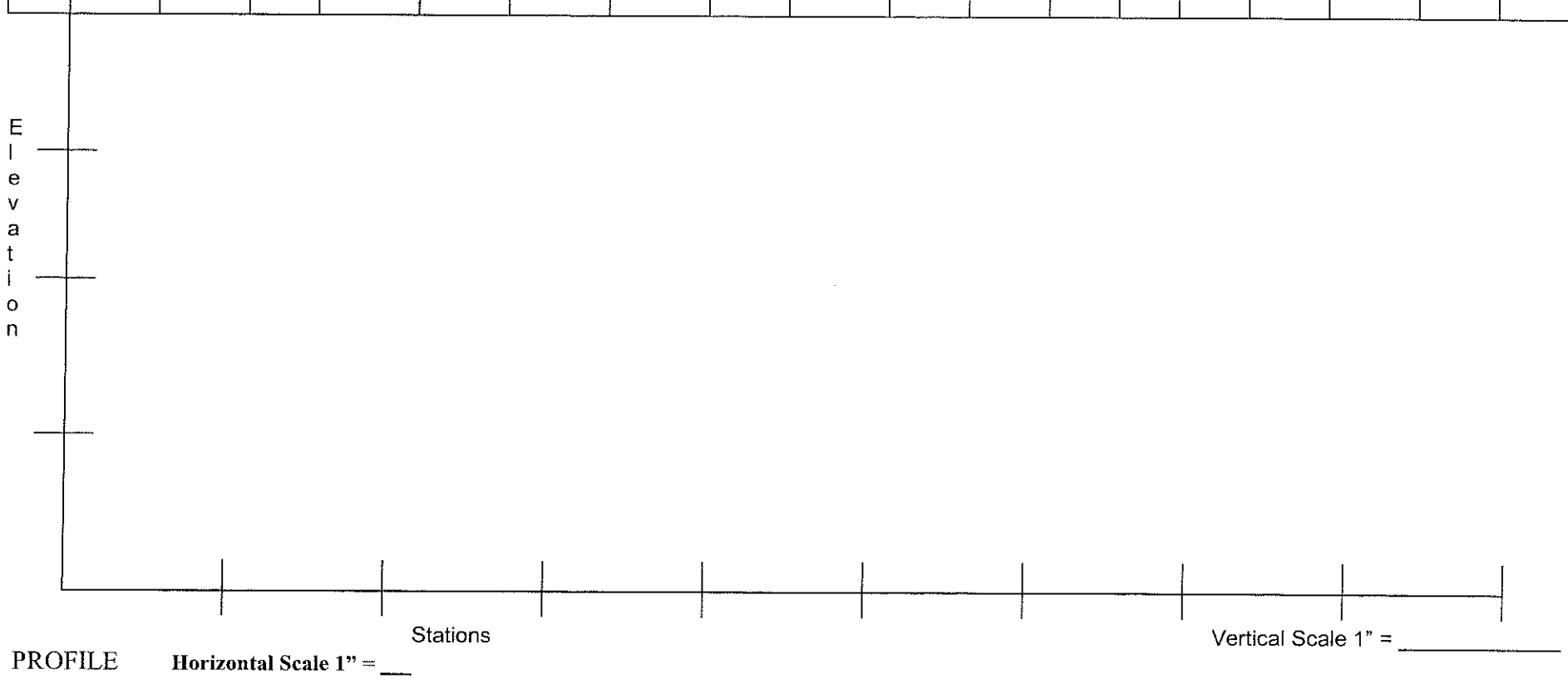
	w/o Freeboard	w/ Freeboard
Design Discharge:	59.52 cfs	
Depth:	1.80 ft	2.80 ft
Top Width:	19.78 ft	30.78 ft
Velocity:	3.35 fps	
X-Section Area:	17.78 sq ft	
Hydraulic Radius:	0.884 ft	
Froude Number:	0.62	
Manning's n:	0.0290	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

FOR I
DIVERSION/COLLECTION DITCH DATA SHEET

Title: Channel O	Site: Bethlehem Landfill SE Realignment		M&M File: b/md/1162.3/Form I.doc
Prepared by: JMM	Telephone Number:	Date: May, 2014	Sheet ____ of ____

Estimated Peak Storm Intensity: _____ **(in./hr.)** ***Design Calculations:*** _____

Station																			
																	With Freeboard		
Start End	Elevation	Drainage Area (acres)	Design Storm (yrs.)	Average Watershed Slope %)	Peak Discharge Q (cfs)	Channel Bed Slope (%)	Freeboard (ft.)	Channel Lining	Manning's Coefficient (n)	Channel Bottom Width (ft.)	Channel Side Slopes (%)	Flow Area (sq. ft.)	Flow Depth (ft.)	Top Flow Width (ft.)	Flow Velocity (ft./sec.)	Q Available (cfs)	Channel Depth (ft.)	Top Channel Width (ft.)	Q Available (cfs)
0+00 6+80	640.00	11.85	100	28	59.52	0.50	1.00	R-3	0.029	0.0	33 / 12.5	17.78	1.80	19.78	3.35	108.12	3.0	30.78	289.37



PROFILE **Horizontal Scale 1" = ___**

Channel P @ 0.50%

Material: Riprap

Triangular Channel

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.0:1	8.0:1	0.5	1.00		

PADER Method - Mild Slope Design

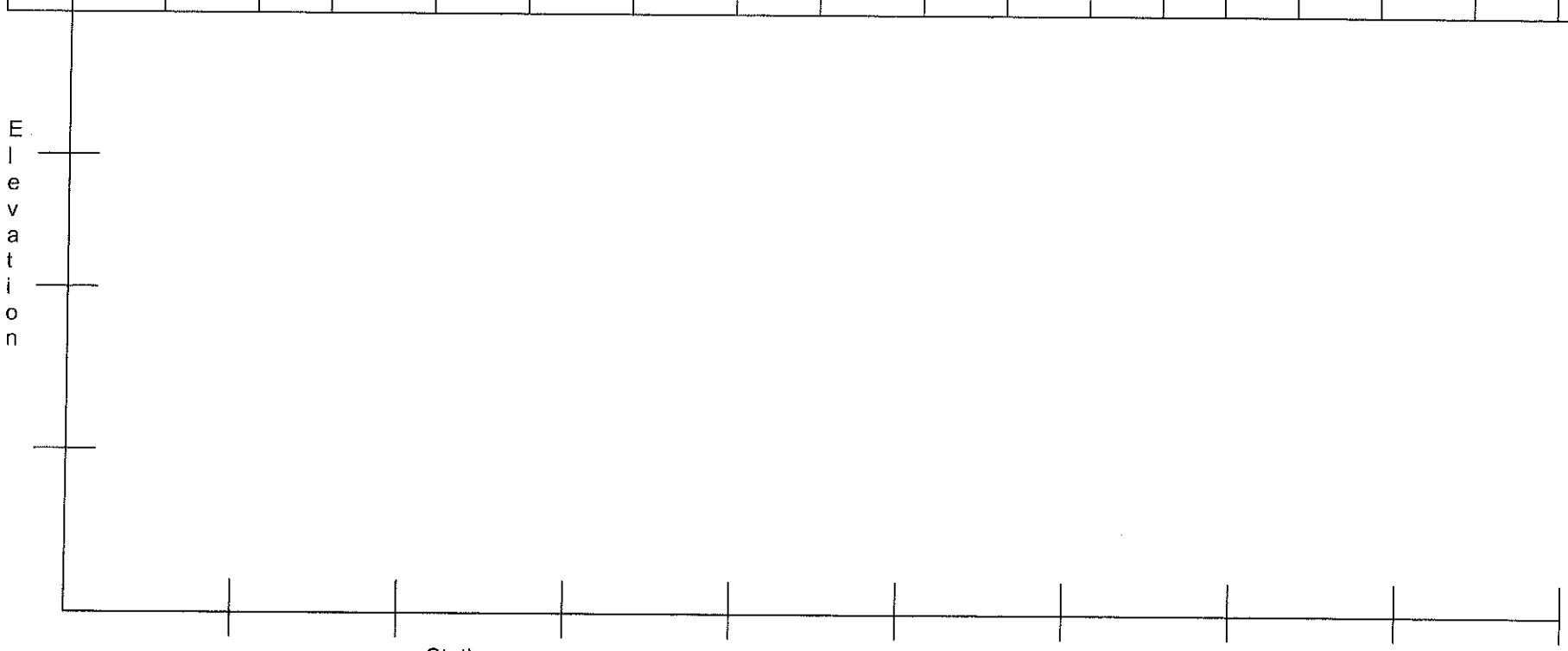
	w/o Freeboard	w/ Freeboard
Design Discharge:	65.32 cfs	
Depth:	1.86 ft	2.86 ft
Top Width:	20.48 ft	31.48 ft
Velocity:	3.43 fps	
X-Section Area:	19.06 sq ft	
Hydraulic Radius:	0.916 ft	
Froude Number:	0.63	
Manning's n:	0.0290	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

FOR I
DIVERSION/COLLECTION DITCH DATA SHEET

Title: Channel P	Site: Bethlehem Landfill SE Realignment		M&M File: b/md/1162.3/Form I.doc
Prepared by: JMM	Telephone Number:	Date: May, 2014	Sheet ____ of ____

Estimated Peak Storm Intensity: _____ **(in./hr.)** ***Design Calculations:*** _____

Station																	With Freeboard		
Start End	Elevation	Drainage Area (acres)	Design Storm (yrs.)	Average Watershed Slope %)	Peak Discharge Q (cfs)	Channel Bed Slope (%)	Freeboard (ft.)	Channel Lining	Manning's Coefficient (n)	Channel Bottom Width (ft.)	Channel Side Slopes (%)	Flow Area (sq. ft.)	Flow Depth (ft.)	Top Flow Width (ft.)	Flow Velocity (ft./sec.)	Q Available (cfs)	Channel Depth (ft.)	Top Channel Width (ft.)	Q Available (cfs)
6+80 20+10	639.0	7.88	100	20	65.32	0.50	1.00	R-3	0.029	0.00	33 / 12.5	19.06	1.86	20.48	3.43	78.64	3.0	31.48	231.87



PROFILE **Horizontal Scale 1" = ___** Vertical Scale 1" = _____

Channel Q @ 0.50%

Material: Riprap

Triangular Channel

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.0:1	8.0:1	0.5	1.00		

PADER Method - Mild Slope Design

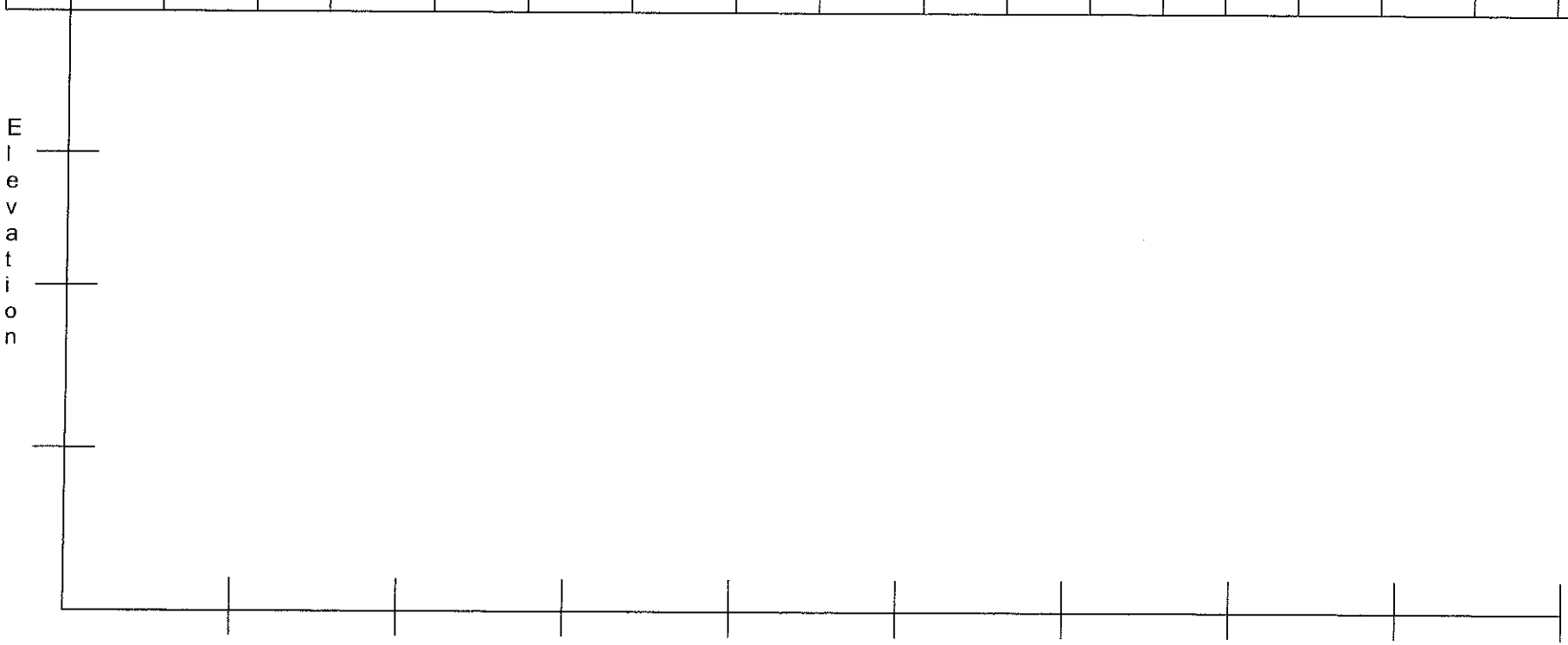
	w/o Freeboard	w/ Freeboard
Design Discharge:	69.32 cfs	
Depth:	1.90 ft	2.90 ft
Top Width:	20.94 ft	31.94 ft
Velocity:	3.48 fps	
X-Section Area:	19.93 sq ft	
Hydraulic Radius:	0.936 ft	
Froude Number:	0.63	
Manning's n:	0.0290	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

FORM I
DIVERSION/COLLECTION DITCH DATA SHEET

Title: Channel Q	Site: Bethlehem Landfill SE Realignment		M&M File: b/md/1162.3/Form I.doc
Prepared by: JMM	Telephone Number:	Date: May, 2014	Sheet _____ of _____

Estimated Peak Storm Intensity: _____ **(in./hr.)** ***Design Calculations:*** _____

Station		Drainage Area (acres)	Design Storm (yrs.)	Average Watershed Slope %)	Peak Discharge Q (cfs)	Channel Bed Slope (%)	Freeboard (ft.)	Channel Lining	Manning's Coefficient (n)	Channel Bottom Width (ft.)	Channel Side Slopes (%)	Flow Area (sq. ft.)	Flow Depth (ft.)	Top Flow Width (ft.)	Flow Velocity (ft./sec.)	Q Available (cfs)	With Freeboard		
Start End	Elevation																Channel Depth (ft.)	Top Channel Width (ft.)	Q Available (cfs)
0+00 20+10	632.0	5.29	100	15	69.32	0.50	1.00	R-3	0.029	0.00	33 / 12.5	19.93	1.90	20.94	3.48	78.64	3.0	31.94	231.87



PROFILE **Horizontal Scale 1" = ___** Vertical Scale 1" = _____

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Channel V @ 1.50%

Material: Riprap

Triangular Channel

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
2.0:1	2.0:1	1.5	1.00		

PADER Method - Steep Slope Design

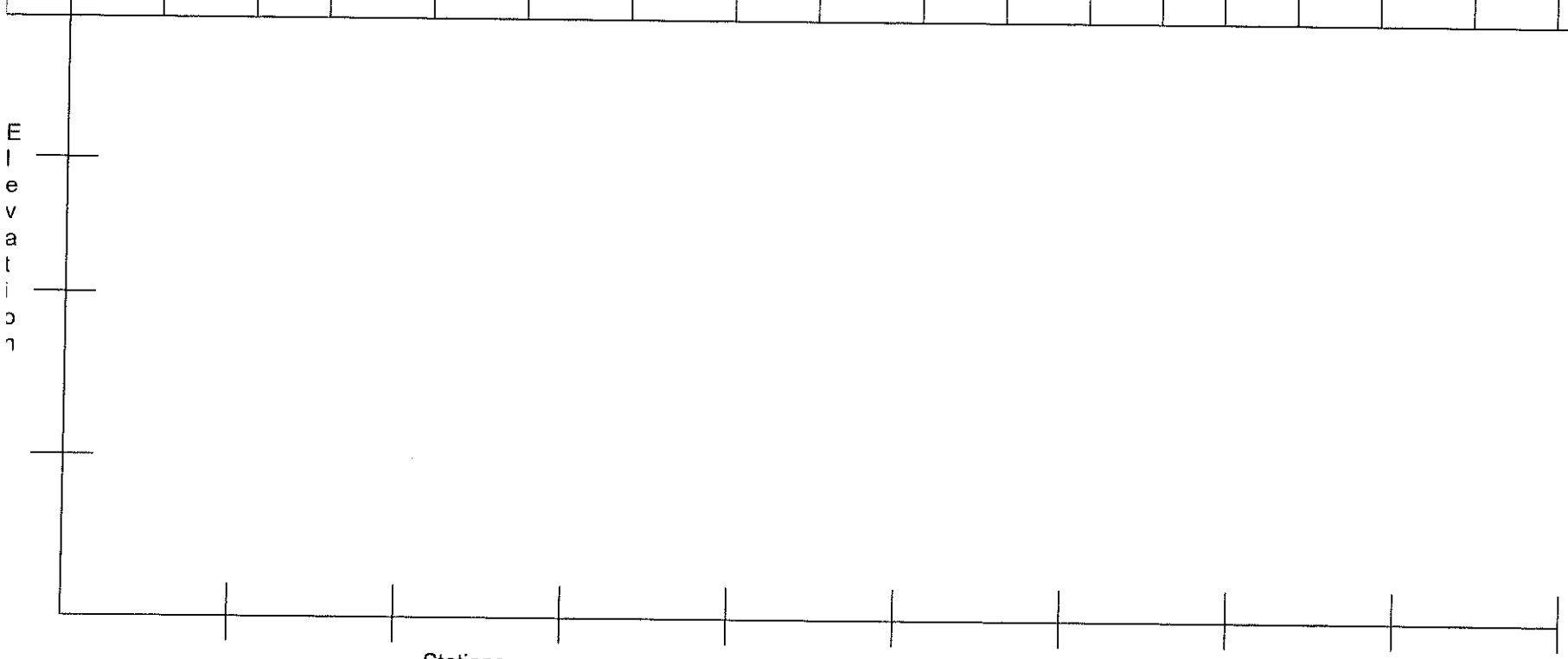
	w/o Freeboard	w/ Freeboard
Design Discharge:	1.81 cfs	
Depth:	0.60 ft	1.60 ft
Top Width:	2.39 ft	6.39 ft
Velocity:	2.53 fps	
X-Section Area:	0.72 sq ft	
Hydraulic Radius:	0.268 ft	
Froude Number:	0.81	
Manning's n:	0.0300	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

FORM I
DIVERSION/COLLECTION DITCH DATA SHEET

Title: Channel V	Site: Bethlehem Landfill SE Realignment		M&M File: b/md/1162.3/Form I.doc
Prepared by: JMM	Telephone Number:	Date: May, 2014	Sheet ____ of ____

Estimated Peak Storm Intensity: _____ **(in./hr.)** ***Design Calculations:*** _____

Station																			
																	With Freeboard		
Start End	Elevation	Drainage Area (acres)	Design Storm (yrs.)	Average Watershed Slope %)	Peak Discharge Q (cfs)	Channel Bed Slope (%)	Freeboard (ft.)	Channel Lining	Manning's Coefficient (n)	Channel Bottom Width (ft.)	Channel Side Slopes (%)	Flow Area (sq. ft.)	Flow Depth (ft.)	Top Flow Width (ft.)	Flow Velocity (ft./sec.)	Q Available (cfs)	Channel Depth (ft.)	Top Channel Width (ft.)	Q Available (cfs)
0+00 3+50	514.00	0.60	100	28	1.81	1.50	1.00	R-3	0.03	0.00	50	0.72	0.60	2.39	2.53	7.09	2.0	6.39	45.05



PROFILE **Horizontal Scale 1" =** ___ Vertical Scale 1" = _____

Channel W @ 9.0%

Material: Tall fescue

Triangular Channel

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
2.0:1	2.0:1	9.0	D, B	1.00			5.0

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	3.80 cfs		3.80 cfs	
Depth:	0.71 ft	1.71 ft	1.09 ft	2.09 ft
Top Width:	2.84 ft	6.84 ft	4.35 ft	8.35 ft
Velocity:	3.77 fps		1.61 fps	
X-Section Area:	1.01 sq ft		2.37 sq ft	
Hydraulic Radius:	0.318 ft		0.487 ft	
Froude Number:	1.11		0.38	
Roughness Coefficient:	0.0552		0.1722	

Channel W @ 12.5%

Material: Tall fescue

Triangular Channel

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
2.0:1	2.0:1	12.5	D, B	1.00			5.0

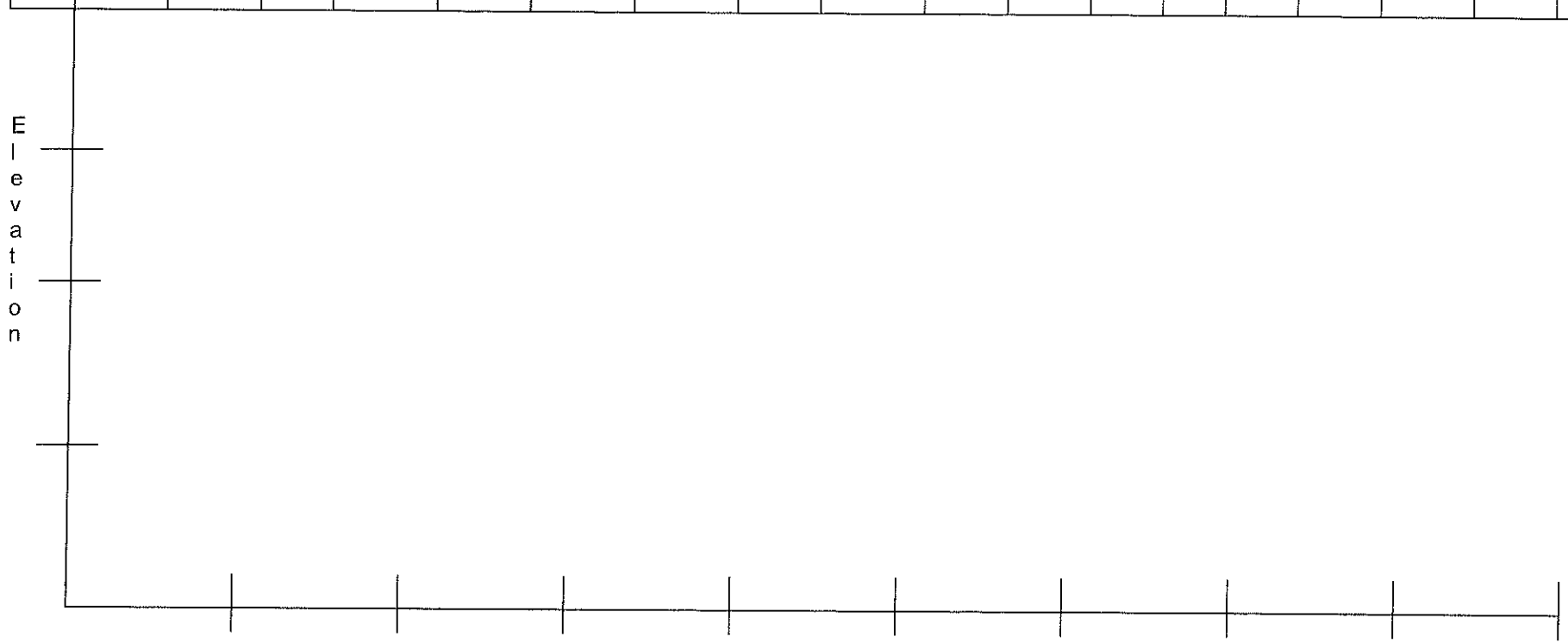
	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	3.80 cfs		3.80 cfs	
Depth:	0.66 ft	1.66 ft	1.01 ft	2.01 ft
Top Width:	2.65 ft	6.65 ft	4.03 ft	8.03 ft
Velocity:	4.32 fps		1.87 fps	
X-Section Area:	0.88 sq ft		2.03 sq ft	
Hydraulic Radius:	0.297 ft		0.451 ft	
Froude Number:	1.32		0.46	
Roughness Coefficient:	0.0541		0.1654	

FORM I
DIVERSION/COLLECTION DITCH DATA SHEET

Title: Channel W	Site: Bethlehem Landfill SE Realignment		M&M File: b/md/1162.3/Form I.doc
Prepared by: JMM	Telephone Number:	Date: May, 2014	Sheet _____ of _____

Estimated Peak Storm Intensity: _____ **(in./hr.)** ***Design Calculations:*** _____

Station																	With Freeboard		
Start End	Elevation	Drainage Area (acres)	Design Storm (yrs.)	Average Watershed Slope %)	Peak Discharge Q (cfs)	Channel Bed Slope (%)	Freeboard (ft.)	Channel Lining	Manning's Coefficient (n)	Channel Bottom Width (ft.)	Channel Side Slopes (%)	Flow Area (sq. ft.)	Flow Depth (ft.)	Top Flow Width (ft.)	Flow Velocity (ft./sec.)	Q Available (cfs)	Channel Depth (ft.)	Top Channel Width (ft.)	Q Available (cfs)
0+00 0+40	661.40	1.84	100	28	3.80	9	1.00	R-3	0.0552	0.0	50	1.01	0.71	2.84	3.77	9.44	2.00	6.84	59.97
0+40 1+60	665.00	1.84	100	28	3.80	12.5	1.00	R-3	0.042	0.0	50	0.88	0.66	2.65	4.32	11.35	2.00	2.65	72.12



Vertical Scale 1" = _____

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Channel X @ 6.5%

Material: Riprap

Triangular Channel

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
2.0:1	2.0:1	6.5	1.00		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	4.76 cfs	
Depth:	0.72 ft	1.72 ft
Top Width:	2.88 ft	6.88 ft
Velocity:	4.58 fps	
X-Section Area:	1.04 sq ft	
Hydraulic Radius:	0.322 ft	
Froude Number:	1.34	
Manning's n:	0.0390	
Dmin:	2.00 in	
D50:	3.00 in	
Dmax:	4.50 in	

Channel X @ 2.0%

Material: Riprap

Triangular Channel

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
2.0:1	2.0:1	2.0	1.00		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	4.76 cfs	
Depth:	0.83 ft	1.83 ft
Top Width:	3.34 ft	7.34 ft
Velocity:	3.41 fps	
X-Section Area:	1.39 sq ft	
Hydraulic Radius:	0.373 ft	
Froude Number:	0.93	
Manning's n:	0.0320	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

PROFIL[illegible]rizontal Scale 1" = ___

FORM I
DIVERSION/COLLECTION DITCH DATA SHEET

Title: Channel X	Site: Bethlehem Landfill SE Realignment		M&M File: b/md/1162.3/Form I.doc
Prepared by: JMM	Telephone Number:	Date: May, 2014	Sheet _____ of _____

Estimated Peak Storm Intensity: _____ **(in./hr.)** ***Design Calculations:*** _____

Station																			
																	With Freeboard		
Start End	Elevation	Drainage Area (acres)	Design Storm (yrs.)	Average Watershed Slope %)	Peak Discharge Q (cfs)	Channel Bed Slope (%)	Freeboard (ft.)	Channel Lining	Manning's Coefficient (n)	Channel Bottom Width (ft.)	Channel Side Slopes (%)	Flow Area (sq. ft.)	Flow Depth (ft.)	Top Flow Width (ft.)	Flow Velocity (ft./sec.)	Q Available (cfs)	Channel Depth (ft.)	Top Channel Width (ft.)	Q Available (cfs)
0+00 0+80	655	2.30	100	28	4.76	6.5	1.00	R-3	0.039	0	50	1.04	0.72	2.88	4.58	11.36	2.0	6.88	72.14
0+80 3+30	660	2.30	100	28	4.76	2.0	1.00	R-3	0.032	0	50	1.39	0.83	3.34	3.41	7.68	2.0	7.34	48.77
3+30 4+50	665	2.30	100	28	4.76	5.0	1.00	R-3	0.035	0	50	1.06	0.73	2.91	4.50	11.10	2.0	6.91	70.50

Stations

Vertical Scale 1" = _____

PROFILE **Horizontal Scale 1" = ___**

Channel Y @ 1.8%

Material: Riprap

Triangular Channel

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
2.0:1	2.0:1	1.8	1.00		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	23.70 cfs	
Depth:	1.61 ft	2.61 ft
Top Width:	6.43 ft	10.43 ft
Velocity:	4.58 fps	
X-Section Area:	5.17 sq ft	
Hydraulic Radius:	0.719 ft	
Froude Number:	0.90	
Manning's n:	0.0350	
Dmin:	2.00 in	
D50:	3.00 in	
Dmax:	4.50 in	

Channel Y @ 3.9%

Material: Riprap

Triangular Channel

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
2.0:1	2.0:1	3.9	1.00		

PADER Method - Steep Slope Design

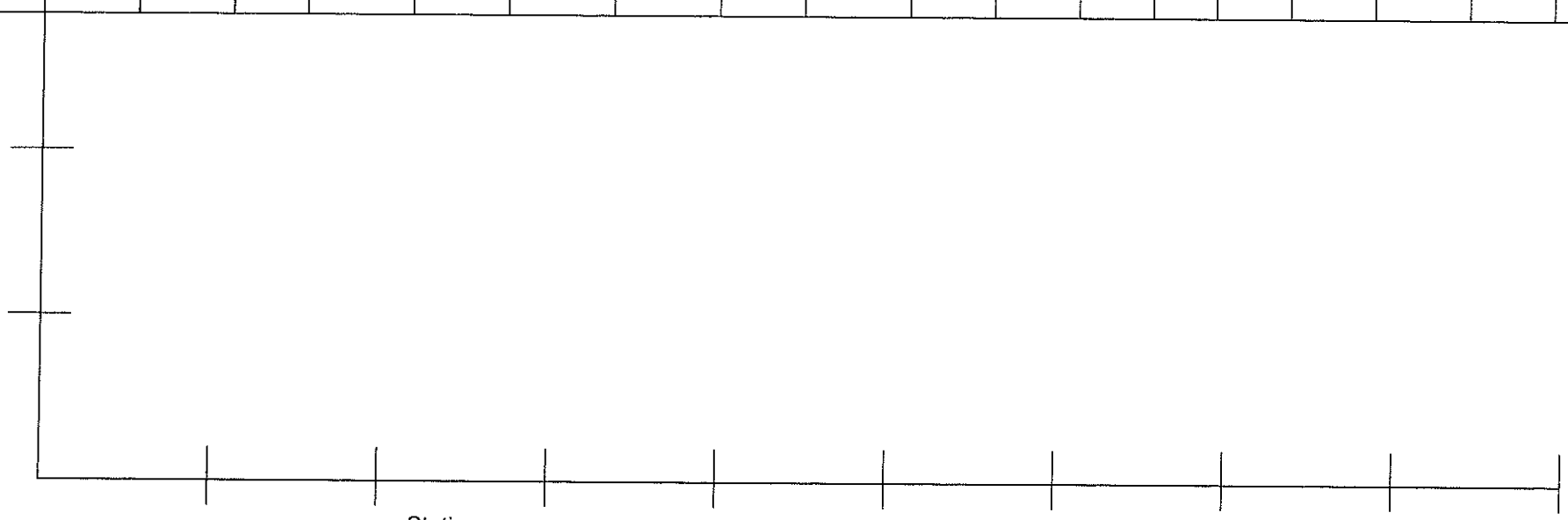
	w/o Freeboard	w/ Freeboard
Design Discharge:	23.70 cfs	
Depth:	1.41 ft	2.41 ft
Top Width:	5.62 ft	9.62 ft
Velocity:	6.00 fps	
X-Section Area:	3.95 sq ft	
Hydraulic Radius:	0.629 ft	
Froude Number:	1.26	
Manning's n:	0.0360	
Dmin:	2.00 in	
D50:	3.00 in	
Dmax:	4.50 in	

FOR I
DIVERSION/COLLECTION DITCH DATA SHEET

Title: Channel Y	Site: Bethlehem Landfill SE Realignment		M&M File: b/md/1162.3/Form I.doc
Prepared by: JMM	Telephone Number:	Date: May, 2014	Sheet _____ of _____

Estimated Peak Storm Intensity: _____ **(in./hr.)** ***Design Calculations:*** _____

Station																			
																	With Freeboard		
Start End	Elevation	Drainage Area (acres)	Design Storm (yrs.)	Average Watershed Slope %)	Peak Discharge Q (cfs)	Channel Bed Slope (%)	Freeboard (ft.)	Channel Lining	Manning's Coefficient (n)	Channel Bottom Width (ft.)	Channel Side Slopes (%)	Flow Area (sq. ft.)	Flow Depth (ft.)	Top Flow Width (ft.)	Flow Velocity (ft./sec.)	Q Available (cfs)	Channel Depth (ft.)	Top Channel Width (ft.)	Q Available (cfs)
0+00 1+13	643.00	3.69	100	28	23.70	1.8	1.00	R-3	0.036	0.00	50	3.95	1.41	5.62	6.00	9.5	3.0	9.62	60.53
1+13 3+35	645.00	3.69	100	28	23.70	3.9	1.00	R-3	0.035	0.00	50	5.17	1.61	6.43	4.58	6.66	3.0	10.43	42.30



PROFILE **Horizontal Scale 1" =** ___ Vertical Scale 1" = _____

Channel Z @ 21%

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
4.00	2.0:1	2.0:1	21.0	1.00		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	5.15 cfs	
Depth:	0.25 ft	1.25 ft
Top Width:	5.01 ft	9.01 ft
Velocity:	4.54 fps	
X-Section Area:	1.13 sq ft	
Hydraulic Radius:	0.221 ft	
Froude Number:	1.68	
Manning's n:	0.0550	
Dmin:	2.00 in	
D50:	3.00 in	
Dmax:	4.50 in	

Channel Z @ 7.1%

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
4.00	2.0:1	2.0:1	7.1	1.00		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	5.15 cfs	
Depth:	0.28 ft	1.28 ft
Top Width:	5.11 ft	9.11 ft
Velocity:	4.06 fps	
X-Section Area:	1.27 sq ft	
Hydraulic Radius:	0.242 ft	
Froude Number:	1.44	
Manning's n:	0.0380	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

FORM I
DIVERSION/COLLECTION DITCH DATA SHEET

Title: Channel Z	Site: Bethlehem Landfill SE Realignment		M&M File: b/md/1162.3/Form I.doc
Prepared by: JMM	Telephone Number:	Date: May, 2014	Sheet _____ of _____

Estimated Peak Storm Intensity: _____ **(in./hr.)** ***Design Calculations:*** _____

Station																			
																	With Freeboard		
Start End	Elevation	Drainage Area (acres)	Design Storm (yrs.)	Average Watershed Slope %)	Peak Discharge Q (cfs)	Channel Bed Slope (%)	Freeboard (ft.)	Channel Lining	Manning's Coefficient (n)	Channel Bottom Width (ft.)	Channel Side Slopes (%)	Flow Area (sq. ft.)	Flow Depth (ft.)	Top Flow Width (ft.)	Flow Velocity (ft./sec.)	Q Available (cfs)	Channel Depth (ft.)	Top Channel Width (ft.)	Q Available (cfs)
0+00 0+95	600.00	5.43	100	20	5.15	21	1.00	R-3	0.055	4.00	50	1.13	0.25	5.01	4.54	59.02	2.0	9.01	228.16
0+95 2+00	620.00	5.43	100	20	5.15	9.5	1.00	R-3	0.039	4.00	50	1.17	0.26	5.04	4.39	55.98	2.0	9.04	216.42
2+00 2+70	630.00	5.43	100	20	5.15	7.1	1.00	R-3	0.038	4.00	50	1.27	0.28	5.11	4.06	49.67	2.0	9.11	192.01

Stations

PROFILE **Horizontal Scale 1" = ___** Vertical Scale 1" = _____

Channel Z-1 @ 3.0%

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
4.00	2.0:1	2.0:1	3.0	1.00		

PADER Method - Steep Slope Design

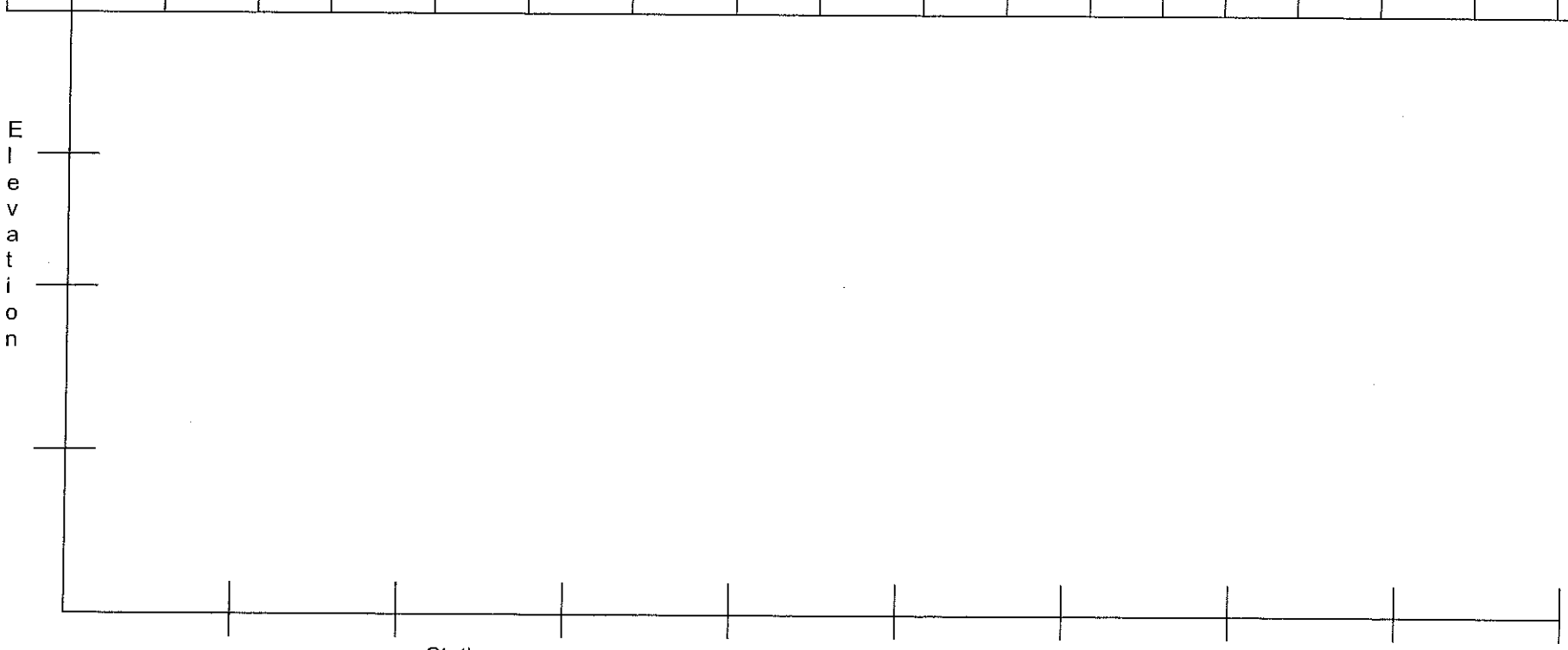
	w/o Freeboard	w/ Freeboard
Design Discharge:	5.15 cfs	
Depth:	0.35 ft	1.35 ft
Top Width:	5.39 ft	9.39 ft
Velocity:	3.16 fps	
X-Section Area:	1.63 sq ft	
Hydraulic Radius:	0.293 ft	
Froude Number:	1.01	
Manning's n:	0.0360	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

FOR I
DIVERSION/COLLECTION DITCH DATA SHEET

Title: Channel Z1	Site: Bethlehem Landfill SE Realignment		M&M File: b/md/1162.3/Form I.doc
Prepared by: JMM	Telephone Number:	Date: May, 2014	Sheet _____ of _____

Estimated Peak Storm Intensity: _____ **(in./hr.)** ***Design Calculations:*** _____

Station																			
																	With Freeboard		
Start End	Elevation	Drainage Area (acres)	Design Storm (yrs.)	Average Watershed Slope %)	Peak Discharge Q (cfs)	Channel Bed Slope (%)	Freeboard (ft.)	Channel Lining	Manning's Coefficient (n)	Channel Bottom Width (ft.)	Channel Side Slopes (%)	Flow Area (sq. ft.)	Flow Depth (ft.)	Top Flow Width (ft.)	Flow Velocity (ft./sec.)	Q Available (cfs)	Channel Depth (ft.)	Top Channel Width (ft.)	Q Available (cfs)
0+00 2+71	624.75	5.43	100	20	5.15	3.0	1.00	R-3	0.036	4.00	50	1.63	0.35	5.39	3.16	34.08	2.0	9.39	131.75



PROFILE **Horizontal Scale 1" = ___** Vertical Scale 1" = _____

Channel DS-6 @ 28%

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
8.00	0.0:1	0.0:1	28.0	1.00		

PADER Method - Steep Slope Design

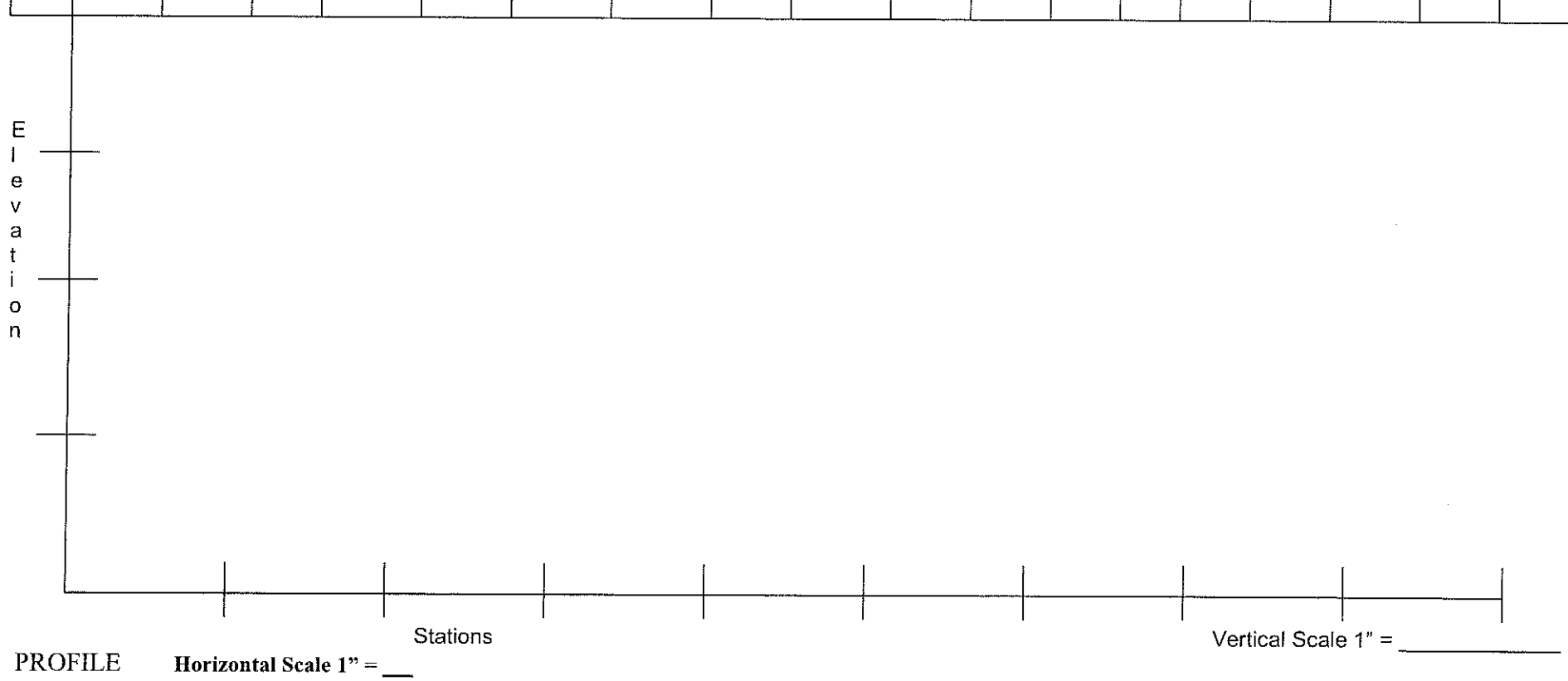
	w/o Freeboard	w/ Freeboard
Design Discharge:	22.81 cfs	
Depth:	0.44 ft	1.44 ft
Top Width:	8.01 ft	8.03 ft
Velocity:	6.52 fps	
X-Section Area:	3.50 sq ft	
Hydraulic Radius:	0.394 ft	
Froude Number:	1.74	
Manning's n:	0.0650	
Dmin:	3.00 in	
D50:	6.00 in	
Dmax:	9.00 in	

FOR
DIVERSION/COLLECTION DITCH DATA SHEET

Title: Channel DS-6	Site: Bethlehem Landfill SE Realignment		M&M File: b/md/1162.3/Form I.doc
Prepared by: JMM	Telephone Number:	Date: May, 2014	Sheet ____ of ____

Estimated Peak Storm Intensity: _____ **(in./hr.)** ***Design Calculations:*** _____

Station																			
																	With Freeboard		
Start End	Elevation	Drainage Area (acres)	Design Storm (yrs.)	Average Watershed Slope %)	Peak Discharge Q (cfs)	Channel Bed Slope (%)	Freeboard (ft.)	Channel Lining	Manning's Coefficient (n)	Channel Bottom Width (ft.)	Channel Side Slopes (%)	Flow Area (sq. ft.)	Flow Depth (ft.)	Top Flow Width (ft.)	Flow Velocity (ft./sec.)	Q Available (cfs)	Channel Depth (ft.)	Top Channel Width (ft.)	Q Available (cfs)
0+00 6+50	520.00	11.03	100	28	22.81	28	1.00	R-3	0.065	8.00	0.00	3.50	0.44	8.01	6.52	83.40	2.00	8.03	234.47



Vertical Scale 1" = _____

PROFILE **Horizontal Scale 1" = ___**

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Channel DS-7 @ 28%

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
6.00	0.0:1	0.0:1	28.0	1.00		

PADER Method - Steep Slope Design

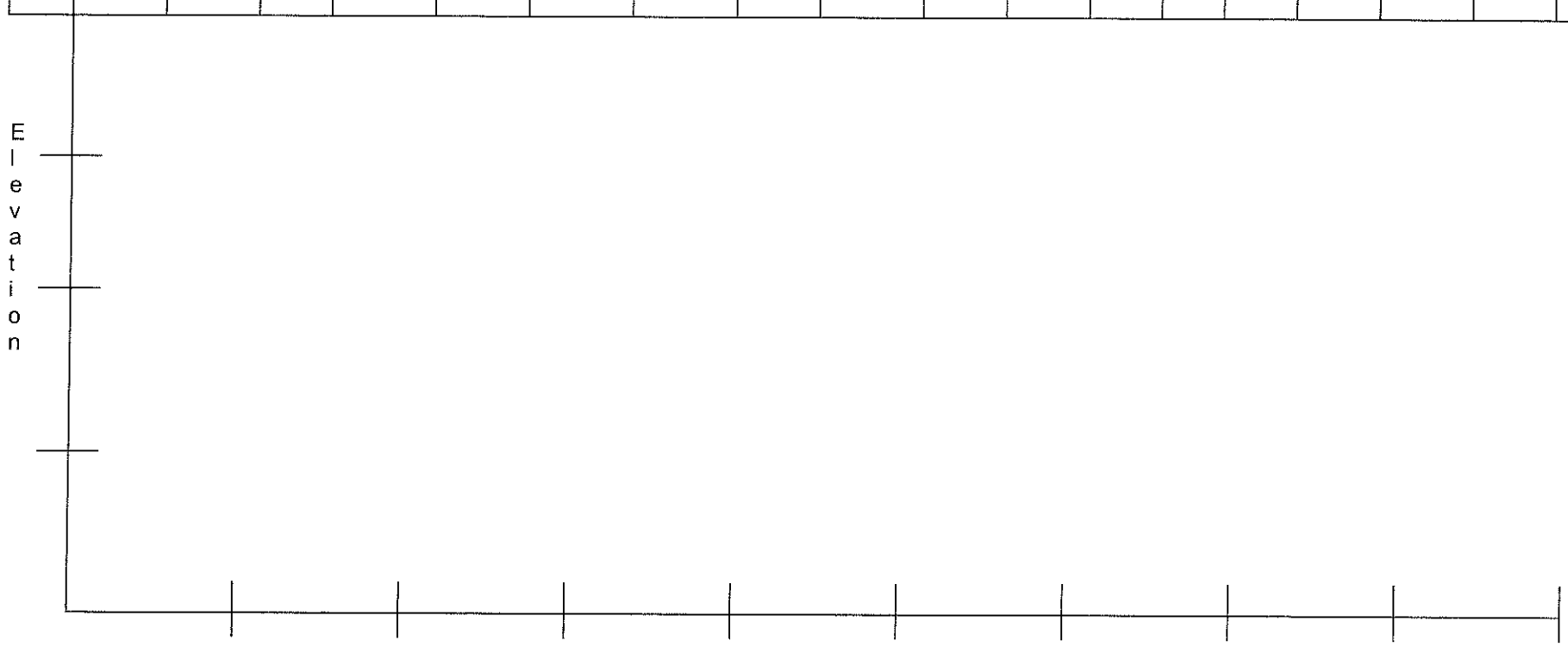
	w/o Freeboard	w/ Freeboard
Design Discharge:	5.43 cfs	
Depth:	0.20 ft	1.20 ft
Top Width:	6.00 ft	6.02 ft
Velocity:	4.53 fps	
X-Section Area:	1.20 sq ft	
Hydraulic Radius:	0.187 ft	
Froude Number:	1.79	
Manning's n:	0.0570	
Dmin:	2.00 in	
D50:	3.00 in	
Dmax:	4.50 in	

FORM I
DIVERSION/COLLECTION DITCH DATA SHEET

Title: Channel DS-7	Site: Bethlehem Landfill SE Realignment		M&M File: b/md/1162.3/Form I.doc
Prepared by: JMM	Telephone Number:	Date: May, 2014	Sheet _____ of _____

Estimated Peak Storm Intensity: _____ **(in./hr.)** ***Design Calculations:*** _____

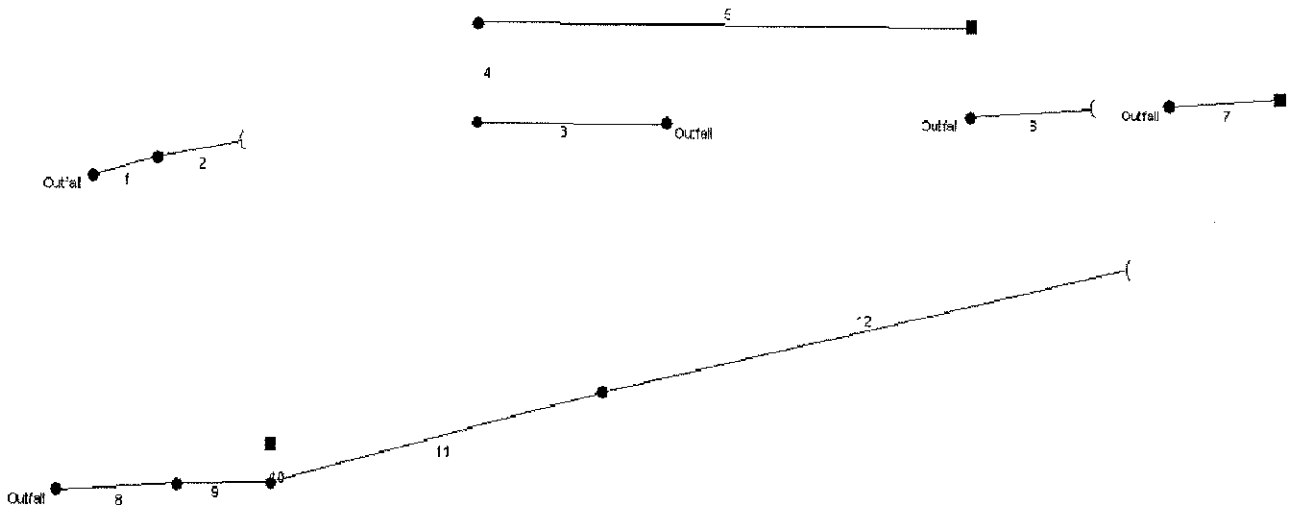
Station																			
																	With Freeboard		
Start End	Elevation	Drainage Area (acres)	Design Storm (yrs.)	Average Watershed Slope %)	Peak Discharge Q (cfs)	Channel Bed Slope (%)	Freeboard (ft.)	Channel Lining	Manning's Coefficient (n)	Channel Bottom Width (ft.)	Channel Side Slopes (%)	Flow Area (sq. ft.)	Flow Depth (ft.)	Top Flow Width (ft.)	Flow Velocity (ft./sec.)	Q Available (cfs)	Channel Depth (ft.)	Top Channel Width (ft.)	Q Available (cfs)
0+00 4+00	611.00	7.12	100	28	5.43	28	1.00	R-3	0.057	6.00	0.00	1.20	0.20	6.00	4.53	68.32	2.00	6.02	186.93



PROFILE **Horizontal Scale 1" = ___** Vertical Scale 1" = _____

CULVERTS

Hydraflow Plan View



Project file: 1162.3 Culvert Design.stm	No. Lines: 12	12-18-2014

Hydraflow Storm Sewers 2003

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	50.0	0.00	0.00	0.00	0.00	0.00	0.0	0.1	0.0	23.70	22.62	7.55	24	1.00	654.07	653.57	656.06	655.55	661.40	658.00	C-21A
2	1	63.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	23.70	22.62	7.54	24	1.00	654.80	654.17	656.89	656.20	661.40	661.40	C-21
3	End	202.0	0.00	0.00	0.00	0.00	0.00	0.0	1.3	0.0	39.90	229.9	7.91	36	11.88	494.00	470.00	496.01	472.01	511.00	475.00	C-24
4	3	67.0	0.00	0.00	0.00	0.00	0.00	0.0	1.1	0.0	39.90	128.8	10.83	36	3.73	507.50	505.00	510.99	506.15	513.00	511.00	C-24
5	4	368.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	39.90	68.66	6.78	36	1.06	511.50	507.60	513.51	511.49	516.00	513.00	C-24
6	End	30.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	83.50	185.4	9.24	48	1.67	472.50	472.00	475.20	474.70	478.00	476.00	C-25
7	End	220.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	5.15	6.46	5.39	15	1.00	622.20	620.00	623.11	620.91	624.75	625.00	C-26
8	End	20.0	0.00	0.00	0.00	0.00	0.00	0.0	0.7	0.0	84.10	143.7	9.27	48	1.00	602.20	602.00	604.91	604.71	610.00	607.00	C-23 (1.0%)
9	8	70.0	0.00	0.00	0.00	0.00	0.00	0.0	0.5	0.0	84.10	330.3	9.09	48	5.29	606.00	602.30	608.71	605.11	612.40	610.00	C-23 (5.29%)
10	9	26.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	14.80	22.62	4.71	24	1.00	607.26	607.00	610.16	610.05	611.00	612.40	C-22
11	9	255.0	0.00	0.00	0.00	0.00	0.00	0.0	0.1	0.0	69.30	143.1	10.14	36	4.60	618.74	607.00	621.40	610.05	627.20	612.40	C-17 (4.60%)
12	11	50.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	69.30	188.6	10.27	36	8.00	622.84	618.84	625.50	621.65	637.00	627.20	C-17 (1.0%)

Project File: 1162.3 Culvert Design.stm | Number of lines: 12 | Run Date: 12-18-2014

NOTES: Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82; Return period = 100 Yrs.

Culvert C-17 @ 1.0%

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
400.00	1.00	0.0120	7.00	0.00	0.50

Culvert Results:

Minimum pipe diameter: 1 - 36 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 69.30 cfs

Maximum Headwater = 7.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (30 in)	**Discharge (cfs) (36 in)**	Discharge (cfs) (42 in)
0.70	3.07	**3.68**	4.29
1.40	8.67	**10.41**	12.14
2.10	15.93	**19.12**	22.31
2.80	24.53	**29.44**	34.34
3.50	31.83	**40.98**	47.99
4.20	37.82	**50.23**	62.17
4.90	42.99	**58.21**	73.84
5.60	47.60	**65.22**	84.01
6.30	51.80	**71.55**	93.07
7.00	54.44	**77.37**	101.32
7.70	56.55	**82.78**	108.92
8.40	58.58	**87.85**	116.07
9.10	60.55	**92.47**	122.77
9.80	62.45	**95.52**	129.14
10.50	64.29	**98.45**	135.21

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Culvert C-17 @ 4.60%

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
255.00	4.60	0.0120	7.00	0.00	0.50

Culvert Results:

Minimum pipe diameter: 1 - 36 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 69.30 cfs

Maximum Headwater = 7.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (30 in)	**Discharge (cfs) (36 in)**	Discharge (cfs) (42 in)
0.70	3.07	**3.68**	4.29
1.40	8.67	**10.41**	12.14
2.10	15.93	**19.12**	22.31
2.80	24.53	**29.44**	34.34
3.50	31.83	**40.98**	47.99
4.20	37.82	**50.23**	62.17
4.90	42.99	**58.21**	73.84
5.60	47.60	**65.22**	84.01
6.30	51.80	**71.55**	93.07
7.00	55.68	**77.37**	101.32
7.70	59.32	**82.78**	108.92
8.40	62.74	**87.85**	116.07
9.10	65.98	**92.65**	122.77
9.80	69.07	**97.21**	129.14
10.50	72.03	**101.56**	135.21

Culvert C-21 & 21A @ 1.0%

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
113.00	1.00	0.0120	5.00	0.00	0.50

Culvert Results:

Minimum pipe diameter: 1 - 24 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 23.70 cfs

Maximum Headwater = 5.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (21 in)	**Discharge (cfs) (24 in)**	Discharge (cfs) (30 in)
0.50	1.30	**1.49**	1.86
1.00	3.66	**4.19**	5.24
1.50	6.73	**7.69**	9.62
2.00	10.33	**11.85**	14.81
2.50	13.32	**16.11**	20.69
3.00	15.78	**19.52**	26.85
3.50	17.91	**22.43**	31.83
4.00	19.80	**25.01**	36.21
4.50	21.54	**27.34**	40.12
5.00	23.14	**29.48**	43.68
5.50	24.64	**31.49**	46.97
6.00	26.05	**33.37**	50.04
6.50	27.39	**35.16**	52.94
7.00	28.67	**36.85**	55.69
7.50	29.88	**38.47**	58.30

Culvert C-22 @ 1.0%

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
26.00	1.00	0.0120	3.00	0.00	0.50

Culvert Results:

Minimum pipe diameter: 1 - *21 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 14.80 cfs

Maximum Headwater = 3.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (18 in)	**Discharge (cfs) (21 in)**	Discharge (cfs) (24 in)
0.30	0.54	**0.62**	0.70
0.60	1.47	**1.71**	1.95
0.90	2.68	**3.13**	3.58
1.20	4.13	**4.82**	5.51
1.50	5.77	**6.73**	7.69
1.80	7.50	**8.85**	10.11
2.10	8.88	**11.03**	12.74
2.40	10.10	**12.78**	15.48
2.70	11.19	**14.36**	17.54
3.00	12.18	**15.78**	19.52
3.30	13.10	**17.09**	21.32
3.60	13.96	**18.31**	22.97
3.90	14.76	**19.44**	24.51
4.20	15.52	**20.52**	25.96
4.50	16.26	**21.54**	27.34

* 24" PIPE PROVIDED

Culvert C-23 @ 5.29%

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
70.00	5.29	0.0120	6.00	0.00	0.90

Culvert Results:

Minimum pipe diameter: 1 - *42 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 83.50 cfs

Maximum Headwater = 6.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (36 in)	**Discharge (cfs) (42 in)**	Discharge (cfs) (45 in)
0.60	2.92	**3.41**	3.65
1.20	8.26	**9.63**	10.32
1.80	15.17	**17.70**	18.96
2.40	23.36	**27.25**	29.20
3.00	32.64	**38.08**	40.80
3.60	42.25	**50.06**	53.64
4.20	50.23	**62.17**	67.59
4.80	57.14	**72.28**	79.63
5.40	63.30	**81.23**	90.29
6.00	68.91	**89.29**	99.82
6.60	74.10	**96.69**	108.52
7.20	78.95	**103.55**	116.57
7.80	83.52	**109.99**	124.10
8.40	87.85	**116.07**	131.18
9.00	91.98	**121.85**	137.91

* 48" PIPE PROVIDED

Culvert C-23 @ 1.00%

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
20.00	1.00	0.0120	6.00	0.00	0.50

Culvert Results:

Minimum pipe diameter: 1 - *42 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 83.50 cfs

Maximum Headwater = 6.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (36 in)	**Discharge (cfs) (42 in)**	Discharge (cfs) (45 in)
0.60	2.92	**3.41**	3.65
1.20	8.26	**9.63**	10.32
1.80	15.17	**17.70**	18.96
2.40	23.36	**27.25**	29.20
3.00	32.64	**38.08**	40.80
3.60	42.25	**50.06**	53.64
4.20	50.23	**62.17**	67.59
4.80	57.14	**72.28**	79.63
5.40	63.30	**81.23**	90.29
6.00	68.91	**89.29**	99.82
6.60	74.10	**96.69**	108.52
7.20	78.95	**103.55**	116.57
7.80	83.52	**109.99**	124.10
8.40	87.85	**116.07**	131.18
9.00	91.98	**121.85**	137.91

* 48" PIPE PROVIDED

Culvert C-24 @ 1.06%

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
368.00	1.06	0.0120	4.00	0.00	0.50

Culvert Results:

Minimum pipe diameter: 1 - 36 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 39.90 cfs

Maximum Headwater = 4.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (30 in)	**Discharge (cfs) (36 in)**	Discharge (cfs) (42 in)
0.40	1.33	**1.59**	1.86
0.80	3.75	**4.50**	5.24
1.20	6.88	**8.26**	9.63
1.60	10.59	**12.71**	14.83
2.00	14.81	**17.77**	20.73
2.40	19.46	**23.36**	27.25
2.80	24.53	**29.43**	34.34
3.20	28.90	**35.96**	41.95
3.60	32.77	**42.27**	50.06
4.00	36.22	**47.70**	58.63
4.40	39.37	**52.64**	65.63
4.80	42.29	**57.14**	72.28
5.20	45.03	**61.31**	78.36
5.60	47.60	**65.22**	84.01
6.00	50.04	**68.92**	89.30

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Culvert C-24 @ 3.73%

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
67.00	3.73	0.0120	4.00	0.00	0.50

Culvert Results:

Minimum pipe diameter: 1 - 36 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 39.90 cfs

Maximum Headwater = 4.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (30 in)	**Discharge (cfs) (36 in)**	Discharge (cfs) (42 in)
0.40	1.33	**1.59**	1.86
0.80	3.75	**4.50**	5.24
1.20	6.88	**8.26**	9.63
1.60	10.59	**12.71**	14.83
2.00	14.81	**17.77**	20.73
2.40	19.46	**23.36**	27.25
2.80	24.53	**29.43**	34.34
3.20	28.90	**35.96**	41.95
3.60	32.77	**42.27**	50.06
4.00	36.22	**47.70**	58.63
4.40	39.37	**52.64**	65.63
4.80	42.29	**57.14**	72.28
5.20	45.03	**61.31**	78.36
5.60	47.60	**65.22**	84.01
6.00	50.04	**68.92**	89.30

Culvert C-24 @ 11.88%

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
202.00	11.88	0.0120	4.00	0.00	0.50

Culvert Results:

Minimum pipe diameter: 1 - 36 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 39.90 cfs

Maximum Headwater = 4.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (30 in)	**Discharge (cfs) (36 in)**	Discharge (cfs) (42 in)
0.40	1.33	**1.59**	1.86
0.80	3.75	**4.50**	5.24
1.20	6.88	**8.26**	9.63
1.60	10.59	**12.71**	14.83
2.00	14.81	**17.77**	20.73
2.40	19.46	**23.36**	27.25
2.80	24.53	**29.43**	34.34
3.20	28.90	**35.96**	41.95
3.60	32.77	**42.27**	50.06
4.00	36.22	**47.70**	58.63
4.40	39.37	**52.64**	65.63
4.80	42.29	**57.14**	72.28
5.20	45.03	**61.31**	78.36
5.60	47.60	**65.22**	84.01
6.00	50.04	**68.92**	89.30

Culvert C-25 @ 1.67%

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
30.00	1.67	0.0120	5.00	0.00	0.50

Culvert Results:

Minimum pipe diameter: 1 - 48 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 83.50 cfs

Maximum Headwater = 5.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (45 in)	**Discharge (cfs) (48 in)**	Discharge (cfs) (54 in)
0.50	2.78	**2.96**	3.33
1.00	7.85	**8.38**	9.43
1.50	14.43	**15.39**	17.31
2.00	22.21	**23.69**	26.65
2.50	31.04	**33.11**	37.24
3.00	40.80	**43.52**	48.96
3.50	51.41	**54.84**	61.70
4.00	62.82	**67.00**	75.38
4.50	74.18	**79.95**	89.95
5.00	83.34	**91.03**	105.34
5.50	91.95	**101.20**	118.96
6.00	99.82	**110.43**	131.46
6.50	107.12	**118.96**	142.87
7.00	113.95	**126.91**	153.43
7.50	120.39	**134.39**	163.31

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Culvert C-26 @ 1.00%

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
220.00	1.00	0.0120	3.00	0.00	0.50

Culvert Results:

Minimum pipe diameter: 1 - 15 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 5.15 cfs

Maximum Headwater = 3.00 ft

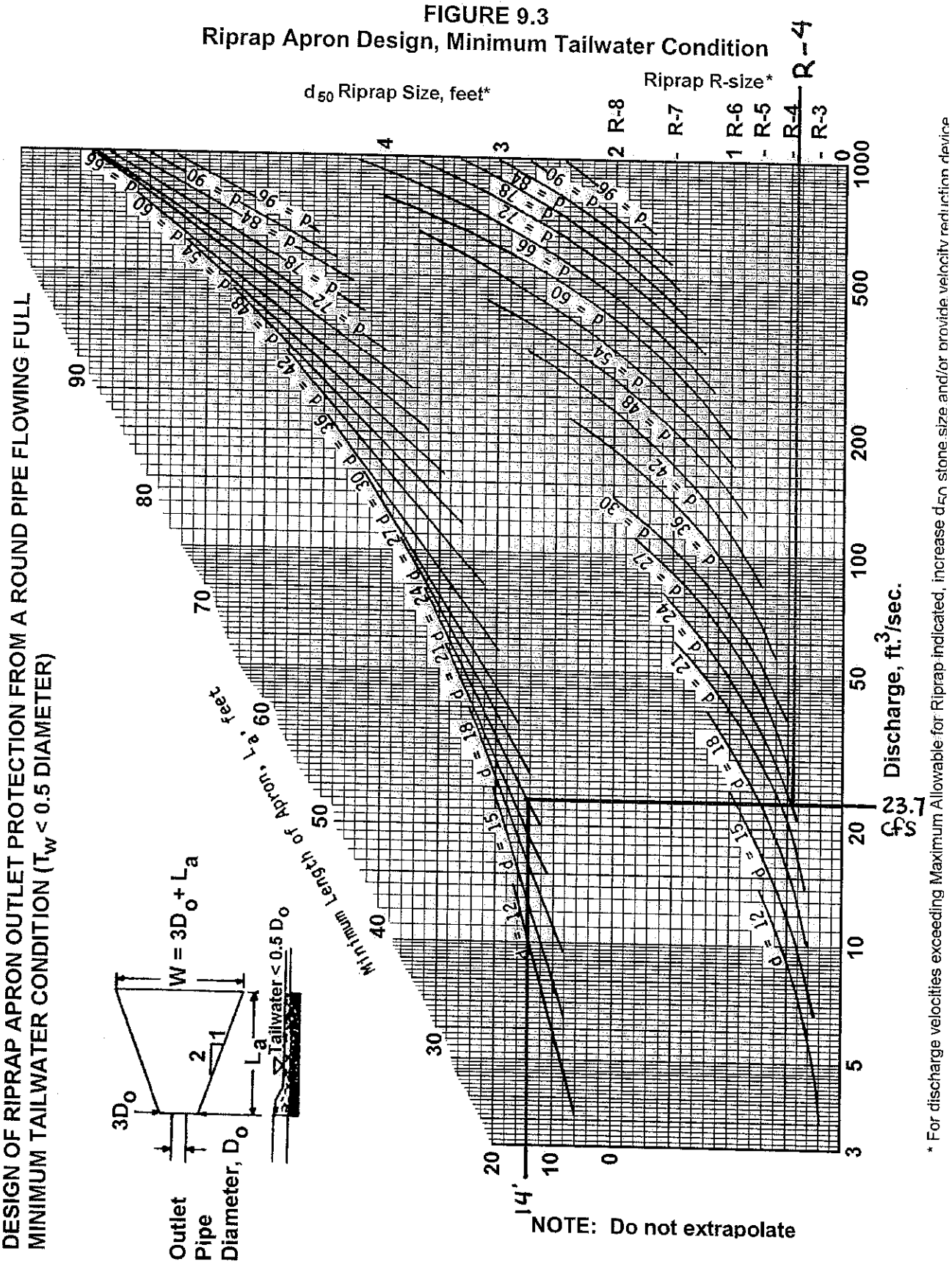
(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (12 in)	**Discharge (cfs) (15 in)**	Discharge (cfs) (18 in)
0.30	0.35	**0.45**	0.54
0.60	0.98	**1.22**	1.47
0.90	1.79	**2.24**	2.68
1.20	2.70	**3.44**	4.13
1.50	3.44	**4.73**	5.77
1.80	3.96	**5.79**	7.50
2.10	4.31	**6.69**	8.88
2.40	4.49	**7.47**	10.10
2.70	4.67	**7.97**	11.19
3.00	4.84	**8.28**	12.18
3.30	5.00	**8.57**	13.05
3.60	5.16	**8.85**	13.60
3.90	5.32	**9.13**	14.04
4.20	5.46	**9.40**	14.47
4.50	5.61	**9.66**	14.89

RIPRAP APRONS

FIGURE 9.3

FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition



Adapted from USDA - NRCS

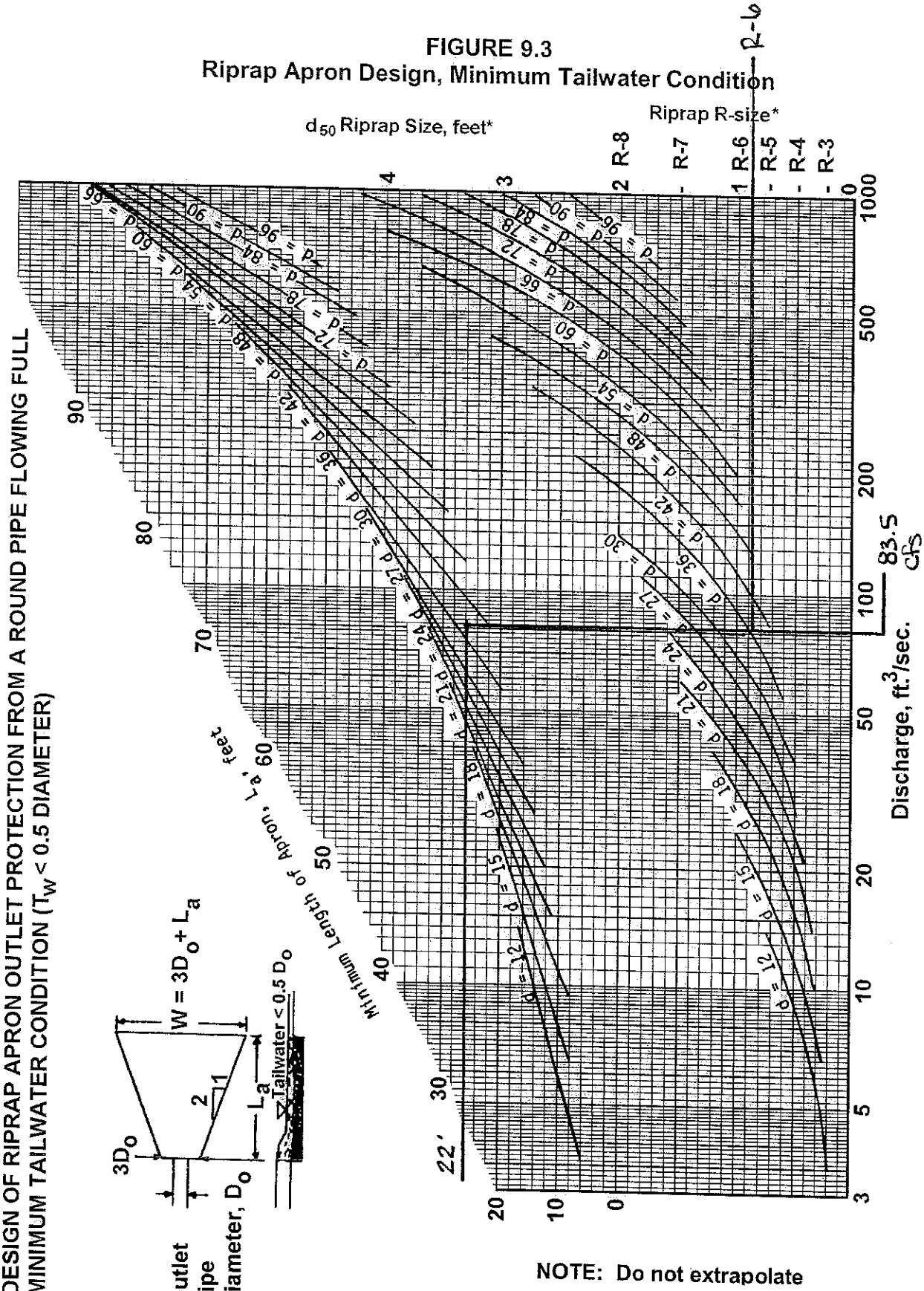
* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device

CULVERT C-21A

JESI BETHLEHEM LANDFILL SOUTHEAST REALIGNMENT

Not to be used for Box Culverts

FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition



Adapted from USDA - NRCS

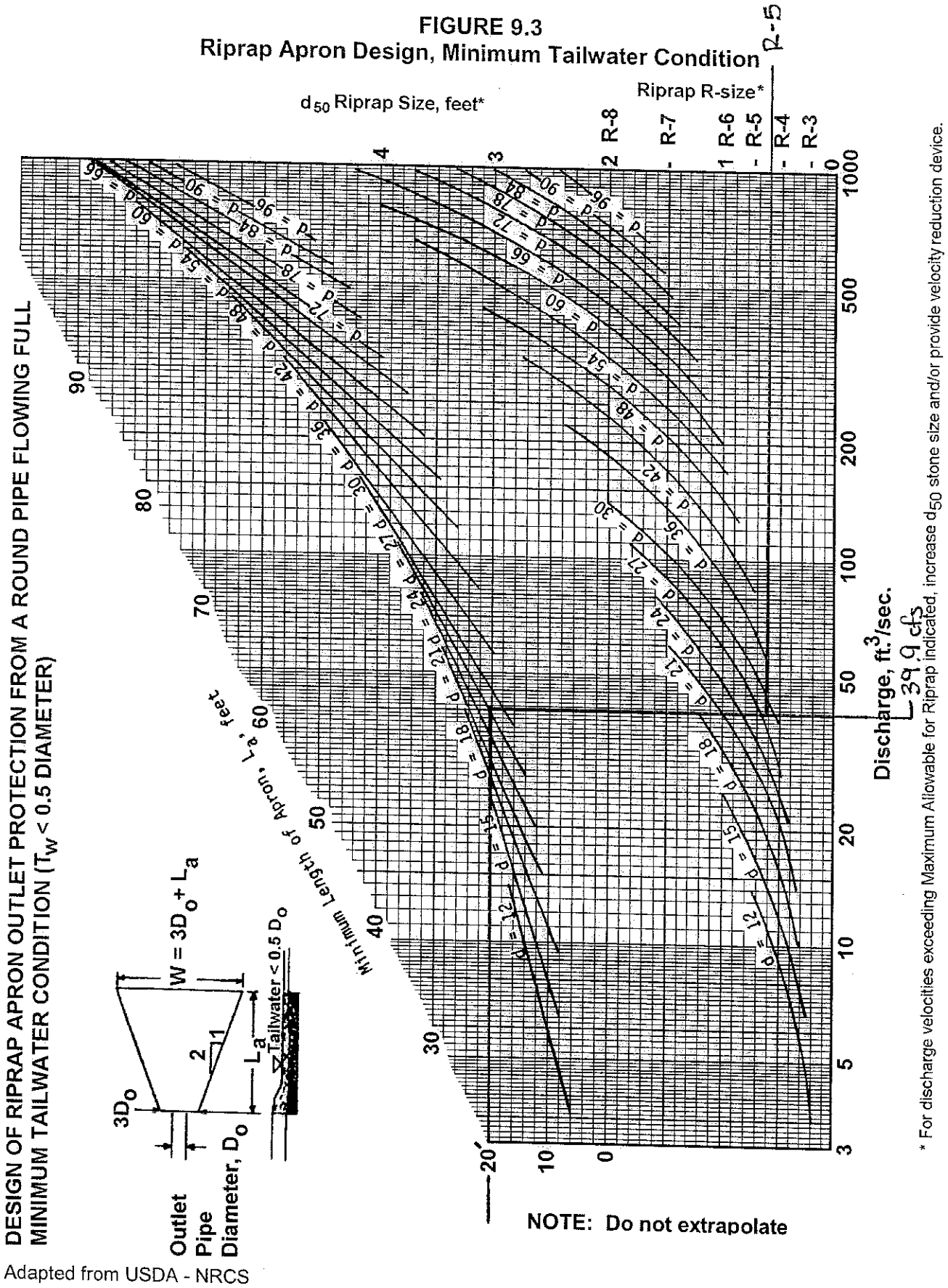
* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

CULVERT C-23

IESI BETHLEHEM LANDFILL SOUTHEAST REALIGNMENT

Not to be used for Box Culverts

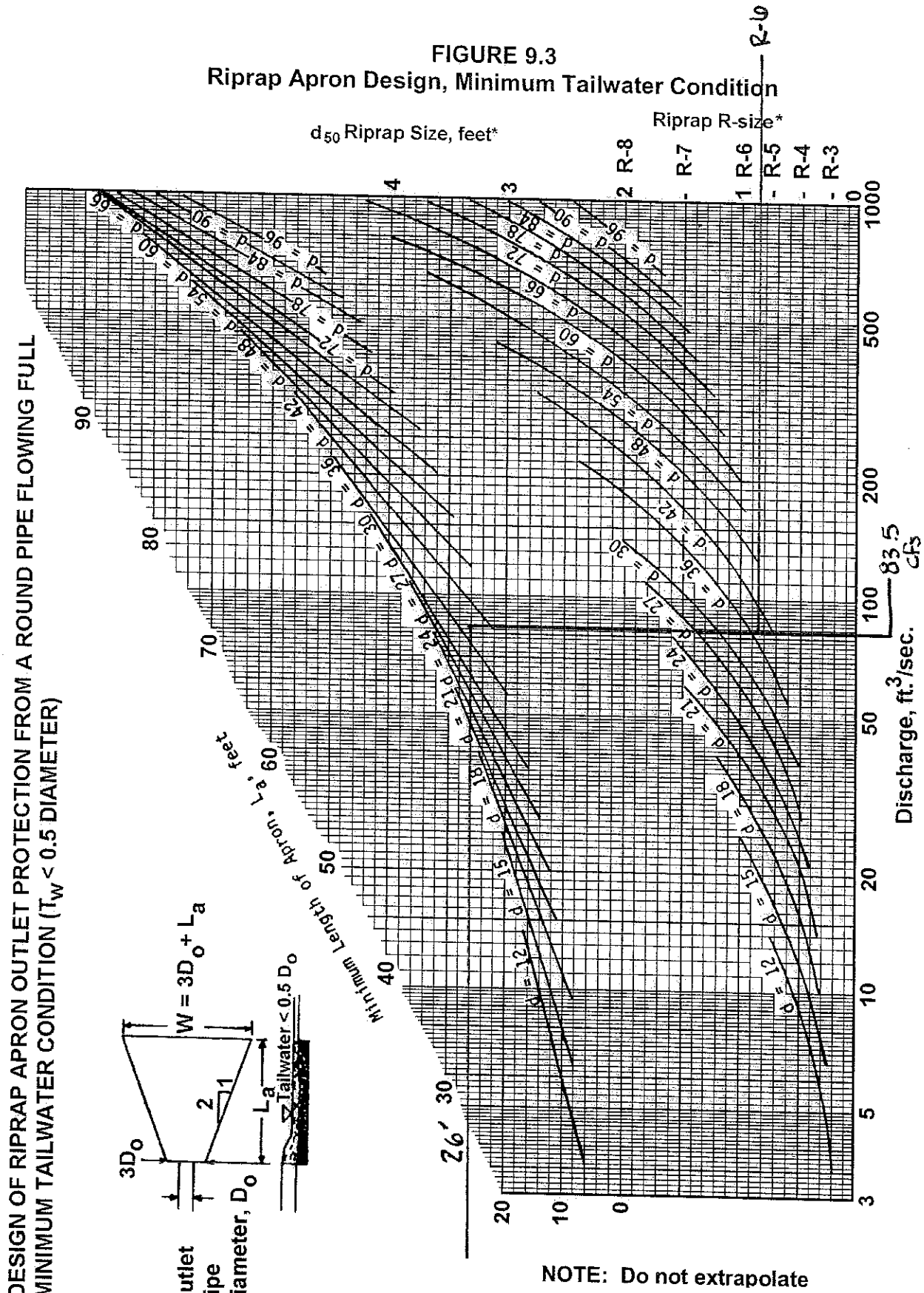
FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition



Adapted from USDA - NRCS

Not to be used for Box Culverts

FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition



Adapted from USDA - NRCS

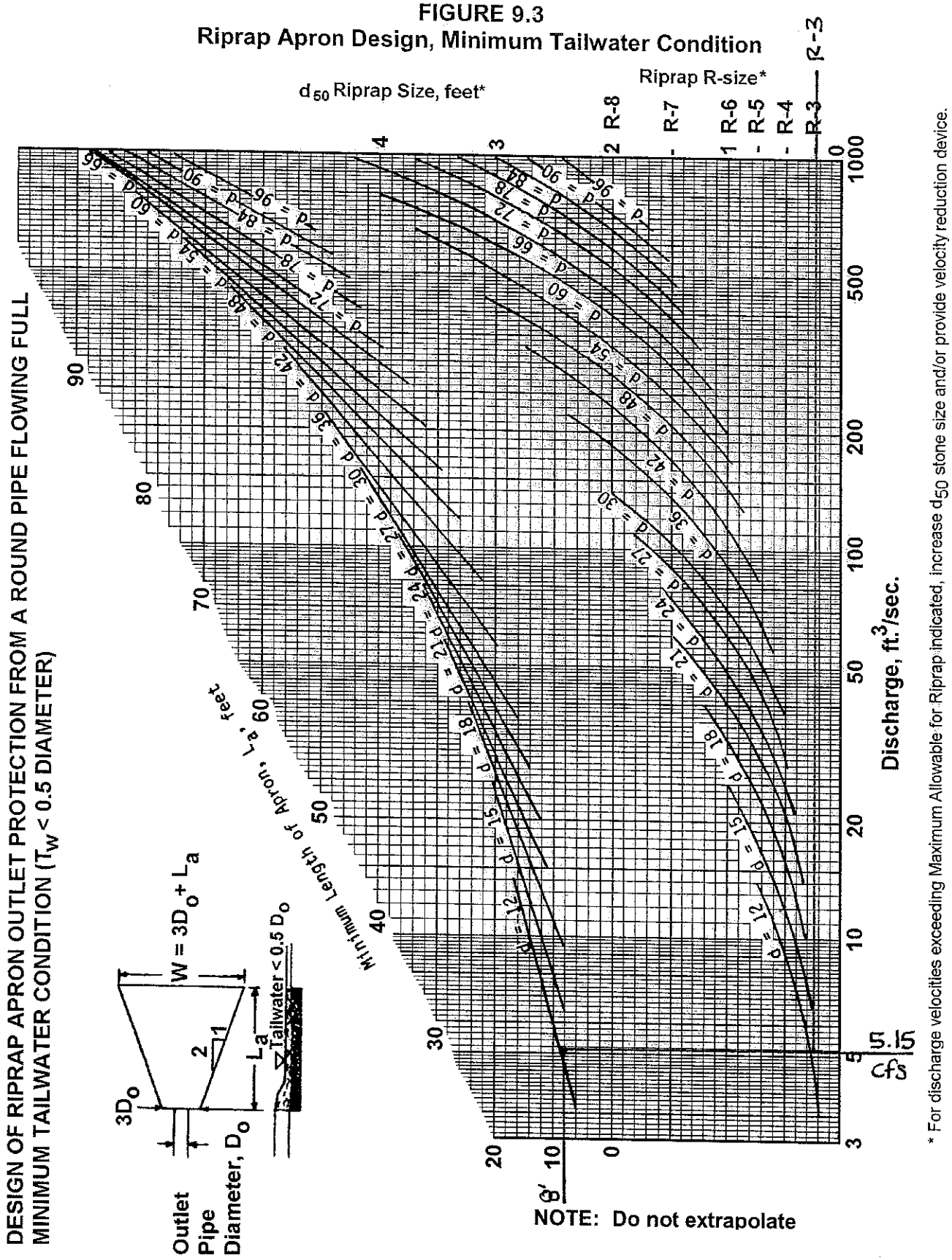
* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

CULVERT C-25

IESI BETHLEHEM LANDFILL SOUTHEAST REALIGNMENT

Not to be used for Box Culverts

FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

Adapted from USDA - NRCS

Not to be used for Box Culverts

CULVERT C-26

IESI BETHLEHEM LANDFILL SOUTHEAST REALIGNMENT

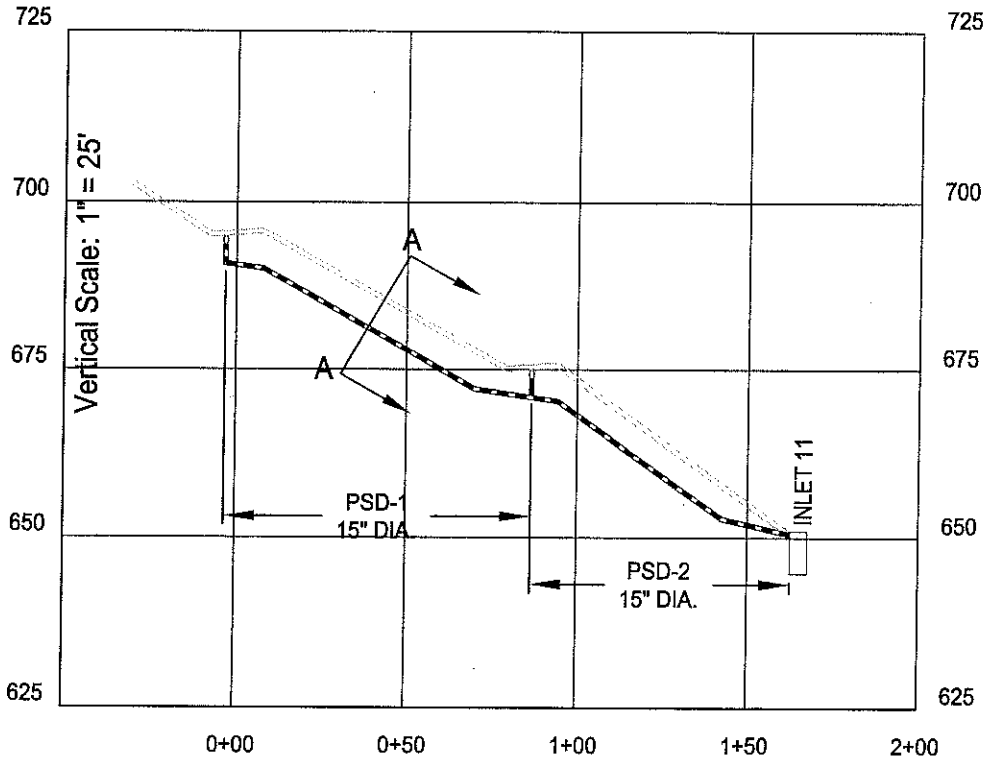
Bethlem Landfill
Pipe Slope Drain

nhb

BETHLEHEM LANDFILL
SOUTHEASTERN REALIGNMENT

PIPE SLOPE DRAIN

As an alternative to the Gabion Lined Down Slope Drains, Bethlehem Landfill is proposing down drains constructed of corrugated polyethylene piping, referred to as a Pipe Slope Drain. The pipe slope drains provide a pipe inlet at each bench and will terminate into an inlet. Calculation of pipe slope drain DS-6 and DS-7 follow with details provided on Plan Sheet ES-14.



CHANNEL DS-3 PIPE SLOPE DRAIN DIAMETERS

Not to Scale

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IESI Bethlehem Landifll Southeast Realignment

Slope Drain DS-3

JMM

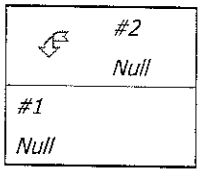
General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	25 yr - 24 hr
Rainfall Depth:	5.720 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	PSD-1
Null	#2	==>	#1	0.000	0.000	PSD-2



Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#2	0.950	0.950	3.29	0.27
#1	1.430	2.380	8.24	0.68

Structure Detail:

Structure #2 (Null)

PSD-2

Structure #1 (Null)

PSD-1

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#2	1	0.950	0.100	0.000	0.000	79.000	M	3.29	0.271
	Σ	**0.950**						**3.29**	**0.271**
#1	1	1.430	0.100	0.000	0.000	79.000	M	4.95	0.408
	Σ	**2.380**						**8.24**	**0.679**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	1. Forest with heavy ground litter	0.00	0.00	0.00	0.000	0.000
#1	**1**	**Time of Concentration:**					**0.100**

PIPE SLOPE DRAIN 1

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
85.00	33.00	0.0120	4.00	0.00	0.50

Culvert Results:

Minimum pipe diameter: 1 -*10 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 3.29 cfs

Maximum Headwater = 4.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (8 in)	**Discharge (cfs) (10 in)**	Discharge (cfs) (12 in)
0.40	0.38	**0.47**	0.55
0.80	0.96	**1.25**	1.51
1.20	1.45	**2.10**	2.74
1.60	1.83	**2.71**	3.66
2.00	2.13	**3.21**	4.41
2.40	2.39	**3.64**	5.06
2.80	2.64	**4.02**	5.63
3.20	2.86	**4.37**	6.15
3.60	3.06	**4.70**	6.63
4.00	3.25	**5.00**	7.07
4.40	3.43	**5.29**	7.49
4.80	3.60	**5.56**	7.89
5.20	3.77	**5.82**	8.27
5.60	3.92	**6.06**	8.63
6.00	4.07	**6.30**	8.98

* 15" PIPE PROVIDED

PIPE SLOPE DRAIN 2

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
80.00	33.00	0.0120	4.00	0.00	0.50

Culvert Results:

Minimum pipe diameter: 1 - 15 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 8.24 cfs

Maximum Headwater = 4.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (12 in)	**Discharge (cfs) (15 in)**	Discharge (cfs) (18 in)
0.40	0.55	**0.67**	0.80
0.80	1.51	**1.88**	2.25
1.20	2.74	**3.44**	4.13
1.60	3.66	**5.11**	6.36
2.00	4.41	**6.40**	8.43
2.40	5.06	**7.47**	10.10
2.80	5.63	**8.41**	11.53
3.20	6.15	**9.26**	12.80
3.60	6.63	**10.03**	13.95
4.00	7.07	**10.75**	15.02
4.40	7.49	**11.42**	16.01
4.80	7.89	**12.05**	16.95
5.20	8.27	**12.66**	17.84
5.60	8.63	**13.23**	18.69
6.00	8.98	**13.79**	19.50

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PIPE SLOPE DRAIN INLET

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
6.00	5.00	0.0120	2.00	0.00	0.70

Culvert Results:

Minimum pipe diameter: 1 - 15 inch pipe(s) required

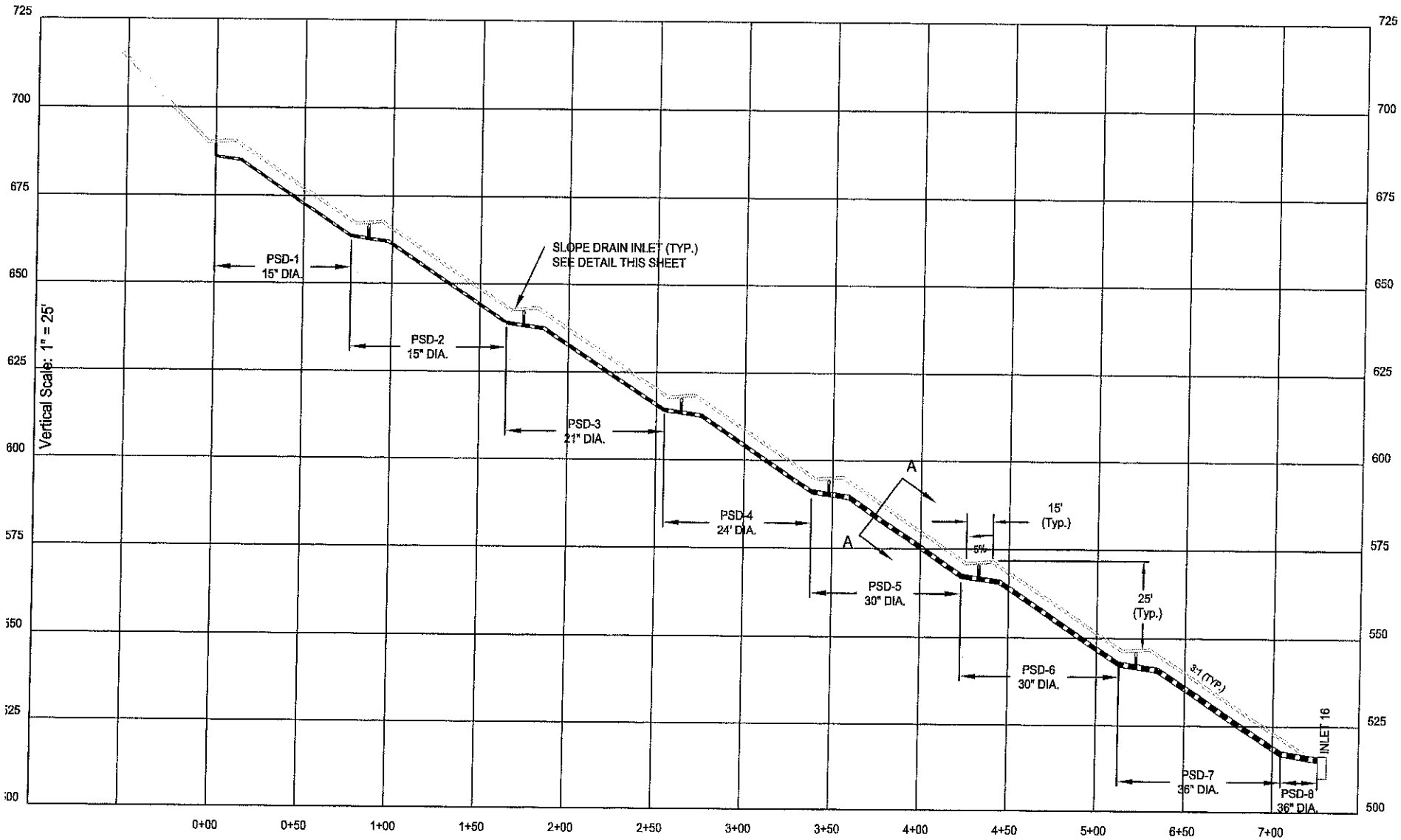
Detailed Performance Curves

Design Discharge = 4.95 cfs

Maximum Headwater = 2.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (12 in)	**Discharge (cfs) (15 in)**	Discharge (cfs) (18 in)
0.20	0.19	**0.24**	0.28
0.40	0.53	**0.68**	0.81
0.60	0.98	**1.22**	1.46
0.80	1.50	**1.88**	2.25
1.00	2.10	**2.62**	3.14
1.20	2.70	**3.44**	4.13
1.40	3.21	**4.34**	5.20
1.60	3.66	**5.10**	6.36
1.80	4.06	**5.79**	7.46
2.00	4.42	**6.40**	8.43
2.20	4.75	**6.96**	9.30
2.40	5.06	**7.48**	10.10
2.60	5.35	**7.96**	10.84
2.80	5.63	**8.41**	11.53
3.00	5.90	**8.85**	12.18



CHANNEL DS-6 PIPE SLOPE DRAIN DIAMETERS

Not to Scale

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Slope Drain DS-6

JMM

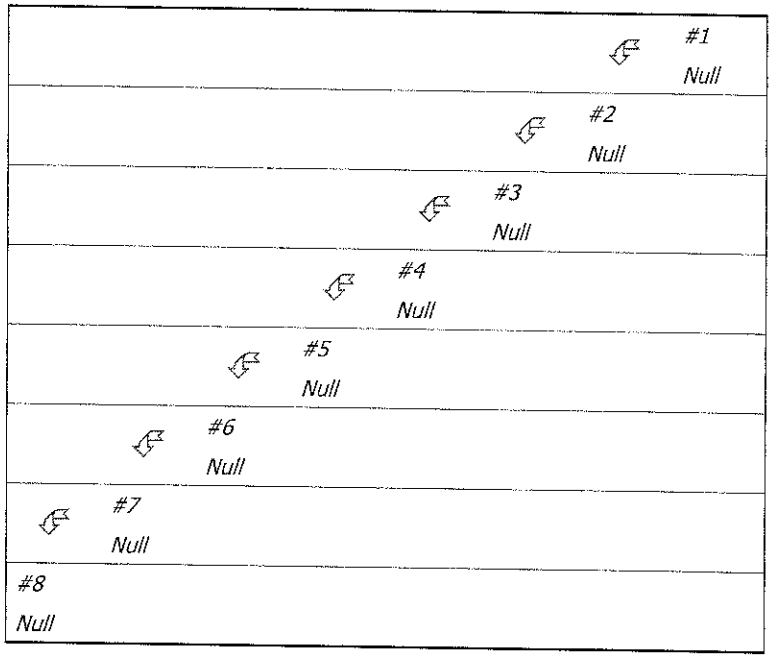
General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	25 yr - 24 hr
Rainfall Depth:	5.720 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	#2	0.000	0.000	PSD-1
Null	#2	==>	#3	0.000	0.000	PSD-2
Null	#3	==>	#4	0.000	0.000	PSD-3
Null	#4	==>	#5	0.000	0.000	PSD-4
Null	#5	==>	#6	0.000	0.000	PSD-5
Null	#6	==>	#7	0.000	0.000	PSD-6
Null	#7	==>	#8	0.000	0.000	PSD-7
Null	#8	==>	End	0.000	0.000	INLET 16



Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	1.150	1.150	3.98	0.33
#2	1.600	2.750	9.53	0.78
#3	1.600	4.350	15.07	1.24
#4	1.840	6.190	21.44	1.77
#5	1.890	8.080	27.99	2.31
#6	1.420	9.500	32.91	2.71
#7	1.060	10.560	36.58	3.01
#8	0.470	11.030	38.21	3.15

Structure Detail:

Structure #1 (Null)

PSD-1

Structure #2 (Null)

PSD-2

Structure #3 (Null)

PSD-3

Structure #4 (Null)

PSD-4

Structure #5 (Null)

PSD-5

Structure #6 (Null)

PSD-6

Structure #7 (Null)

PSD-7

Structure #8 (Null)

INLET 16

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	1.150	0.100	0.000	0.000	79.000	M	3.98	0.328
	Σ	**1.150**						**3.98**	**0.328**
#2	1	1.600	0.100	0.000	0.000	79.000	M	5.54	0.457
	Σ	**2.750**						**9.53**	**0.785**
#3	1	1.600	0.100	0.000	0.000	79.000	M	5.54	0.457
	Σ	**4.350**						**15.07**	**1.242**
#4	1	1.840	0.100	0.000	0.000	79.000	M	6.37	0.525
	Σ	**6.190**						**21.44**	**1.767**
#5	1	1.890	0.100	0.000	0.000	79.000	M	6.55	0.540
	Σ	**8.080**						**27.99**	**2.307**
#6	1	1.420	0.100	0.000	0.000	79.000	M	4.92	0.405
	Σ	**9.500**						**32.91**	**2.712**
#7	1	1.060	0.100	0.000	0.000	79.000	M	3.67	0.302
	Σ	**10.560**						**36.58**	**3.015**
#8	1	0.470	0.100	0.000	0.000	79.000	M	1.63	0.134
	Σ	**11.030**						**38.21**	**3.148**

PIPE SLOPE DRAIN 1

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
90.00	33.00	0.0120	4.00	0.00	0.50

Culvert Results:

Minimum pipe diameter: 1 - *10 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 3.98 cfs

Maximum Headwater = 4.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (8 in)	**Discharge (cfs) (10 in)**	Discharge (cfs) (12 in)
0.40	0.38	**0.47**	0.55
0.80	0.96	**1.25**	1.51
1.20	1.45	**2.10**	2.74
1.60	1.83	**2.71**	3.66
2.00	2.13	**3.21**	4.41
2.40	2.39	**3.64**	5.06
2.80	2.64	**4.02**	5.63
3.20	2.86	**4.37**	6.15
3.60	3.06	**4.70**	6.63
4.00	3.25	**5.00**	7.07
4.40	3.43	**5.29**	7.49
4.80	3.60	**5.56**	7.89
5.20	3.77	**5.82**	8.27
5.60	3.92	**6.06**	8.63
6.00	4.07	**6.30**	8.98

* 15" PIPE PROVIDED

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PIPE SLOPE DRAIN 2

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
90.00	33.00	0.0120	4.00	0.00	0.50

Culvert Results:

Minimum pipe diameter: 1 - 15 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 9.53 cfs

Maximum Headwater = 4.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (12 in)	**Discharge (cfs) (15 in)**	Discharge (cfs) (18 in)
0.40	0.55	**0.67**	0.80
0.80	1.51	**1.88**	2.25
1.20	2.74	**3.44**	4.13
1.60	3.66	**5.11**	6.36
2.00	4.41	**6.40**	8.43
2.40	5.06	**7.47**	10.10
2.80	5.63	**8.41**	11.53
3.20	6.15	**9.26**	12.80
3.60	6.63	**10.03**	13.95
4.00	7.07	**10.75**	15.02
4.40	7.49	**11.42**	16.01
4.80	7.89	**12.05**	16.95
5.20	8.27	**12.66**	17.84
5.60	8.63	**13.23**	18.69
6.00	8.98	**13.79**	19.50

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PIPE SLOPE DRAIN 3

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
90.00	33.00	0.0120	4.00	0.00	0.50

Culvert Results:

Minimum pipe diameter: 1 - 21 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 15.07 cfs

Maximum Headwater = 4.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (18 in)	**Discharge (cfs) (21 in)**	Discharge (cfs) (24 in)
0.40	0.80	**0.94**	1.07
0.80	2.25	**2.62**	3.00
1.20	4.13	**4.82**	5.51
1.60	6.36	**7.42**	8.48
2.00	8.43	**10.36**	11.85
2.40	10.10	**12.77**	15.35
2.80	11.53	**14.85**	18.22
3.20	12.80	**16.67**	20.74
3.60	13.95	**18.30**	22.97
4.00	15.02	**19.81**	25.01
4.40	16.01	**21.20**	26.89
4.80	16.95	**22.51**	28.65
5.20	17.84	**23.75**	30.31
5.60	18.69	**24.93**	31.88
6.00	19.50	**26.05**	33.38

PIPE SLOPE DRAIN 4

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
90.00	33.00	0.0120	4.00	0.00	0.50

Culvert Results:

Minimum pipe diameter: 1 - 24 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 21.44 cfs

Maximum Headwater = 4.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (21 in)	**Discharge (cfs) (24 in)**	Discharge (cfs) (30 in)
0.40	0.94	**1.07**	1.33
0.80	2.62	**3.00**	3.75
1.20	4.82	**5.51**	6.88
1.60	7.42	**8.48**	10.59
2.00	10.36	**11.85**	14.81
2.40	12.77	**15.35**	19.46
2.80	14.85	**18.22**	24.53
3.20	16.67	**20.74**	28.90
3.60	18.30	**22.97**	32.77
4.00	19.81	**25.01**	36.22
4.40	21.20	**26.89**	39.37
4.80	22.51	**28.65**	42.29
5.20	23.75	**30.31**	45.03
5.60	24.93	**31.88**	47.60
6.00	26.05	**33.38**	50.04

PIPE SLOPE DRAIN 5

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
90.00	33.00	0.0120	4.00	0.00	0.50

Culvert Results:

Minimum pipe diameter: 1 - 30 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 27.99 cfs

Maximum Headwater = 4.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (24 in)	**Discharge (cfs) (30 in)**	Discharge (cfs) (36 in)
0.40	1.07	**1.33**	1.59
0.80	3.00	**3.75**	4.50
1.20	5.51	**6.88**	8.26
1.60	8.48	**10.59**	12.71
2.00	11.85	**14.81**	17.77
2.40	15.35	**19.46**	23.36
2.80	18.22	**24.53**	29.43
3.20	20.74	**28.90**	35.96
3.60	22.97	**32.77**	42.27
4.00	25.01	**36.22**	47.70
4.40	26.89	**39.37**	52.64
4.80	28.65	**42.29**	57.14
5.20	30.31	**45.03**	61.31
5.60	31.88	**47.60**	65.22
6.00	33.38	**50.04**	68.92

PIPE SLOPE DRAIN 6

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
90.00	33.00	0.0120	4.00	0.00	0.50

Culvert Results:

Minimum pipe diameter: 1 - 30 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 32.90 cfs

Maximum Headwater = 4.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (24 in)	**Discharge (cfs) (30 in)**	Discharge (cfs) (36 in)
0.40	1.07	**1.33**	1.59
0.80	3.00	**3.75**	4.50
1.20	5.51	**6.88**	8.26
1.60	8.48	**10.59**	12.71
2.00	11.85	**14.81**	17.77
2.40	15.35	**19.46**	23.36
2.80	18.22	**24.53**	29.43
3.20	20.74	**28.90**	35.96
3.60	22.97	**32.77**	42.27
4.00	25.01	**36.22**	47.70
4.40	26.89	**39.37**	52.64
4.80	28.65	**42.29**	57.14
5.20	30.31	**45.03**	61.31
5.60	31.88	**47.60**	65.22
6.00	33.38	**50.04**	68.92

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PIPE SLOPE DRAIN 7

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
90.00	33.00	0.0120	4.00	0.00	0.50

Culvert Results:

Minimum pipe diameter: 1 - 36 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 36.58 cfs

Maximum Headwater = 4.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (30 in)	**Discharge (cfs) (36 in)**	Discharge (cfs) (42 in)
0.40	1.33	**1.59**	1.86
0.80	3.75	**4.50**	5.24
1.20	6.88	**8.26**	9.63
1.60	10.59	**12.71**	14.83
2.00	14.81	**17.77**	20.73
2.40	19.46	**23.36**	27.25
2.80	24.53	**29.43**	34.34
3.20	28.90	**35.96**	41.95
3.60	32.77	**42.27**	50.06
4.00	36.22	**47.70**	58.63
4.40	39.37	**52.64**	65.63
4.80	42.29	**57.14**	72.28
5.20	45.03	**61.31**	78.36
5.60	47.60	**65.22**	84.01
6.00	50.04	**68.92**	89.30

PIPE SLOPE DRAIN 8

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
25.00	5.00	0.0120	4.00	0.00	0.50

Culvert Results:

Minimum pipe diameter: 1 - 36 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 38.20 cfs

Maximum Headwater = 4.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (30 in)	**Discharge (cfs) (36 in)**	Discharge (cfs) (42 in)
0.40	1.33	**1.59**	1.86
0.80	3.75	**4.50**	5.24
1.20	6.88	**8.26**	9.63
1.60	10.59	**12.71**	14.83
2.00	14.81	**17.77**	20.73
2.40	19.46	**23.36**	27.25
2.80	24.53	**29.43**	34.34
3.20	28.90	**35.96**	41.95
3.60	32.77	**42.27**	50.06
4.00	36.22	**47.70**	58.63
4.40	39.37	**52.64**	65.63
4.80	42.29	**57.14**	72.28
5.20	45.03	**61.31**	78.36
5.60	47.60	**65.22**	84.01
6.00	50.04	**68.92**	89.30

PIPE SLOPE DRAIN INLET

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
6.00	5.00	0.0120	2.00	0.00	0.70

Culvert Results:

Minimum pipe diameter: 1 - 18 inch pipe(s) required

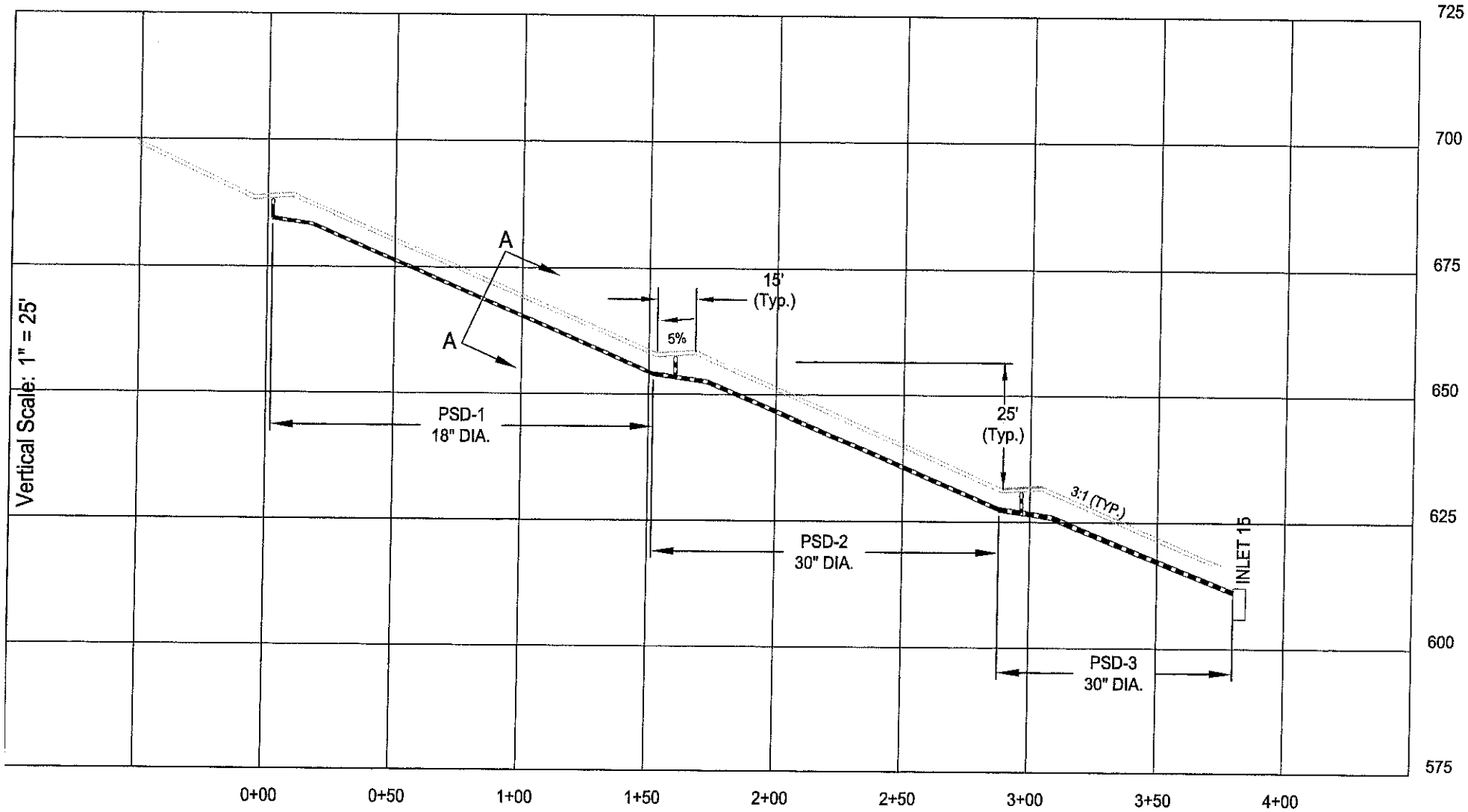
Detailed Performance Curves

Design Discharge = 6.55 cfs

Maximum Headwater = 2.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (15 in)	**Discharge (cfs) (18 in)**	Discharge (cfs) (21 in)
0.20	0.24	**0.28**	0.33
0.40	0.68	**0.81**	0.93
0.60	1.22	**1.46**	1.71
0.80	1.88	**2.25**	2.62
1.00	2.62	**3.14**	3.67
1.20	3.44	**4.13**	4.82
1.40	4.34	**5.20**	6.07
1.60	5.10	**6.36**	7.42
1.80	5.79	**7.46**	8.85
2.00	6.40	**8.43**	10.36
2.20	6.96	**9.30**	11.60
2.40	7.48	**10.10**	12.78
2.60	7.96	**10.84**	13.85
2.80	8.41	**11.53**	14.85
3.00	8.85	**12.18**	15.78



CHANNEL DS-7 PIPE SLOPE DRAIN DIAMETERS

Not to Scale

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IESI Bethlehem Landifll Southeast Realignment

Slope Drain DS-7

JMM

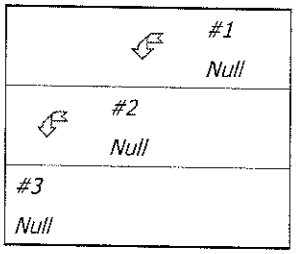
General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	25 yr - 24 hr
Rainfall Depth:	5.720 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	#2	0.000	0.000	PSD-1
Null	#2	==>	#3	0.000	0.000	PSD-2
Null	#3	==>	End	0.000	0.000	PSD-3



Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	2.370	2.370	8.21	0.68
#2	4.100	6.470	22.41	1.85
#3	0.650	7.120	24.66	2.03

Structure Detail:

Structure #1 (Null)

PSD-1

Structure #2 (Null)

PSD-2

Structure #3 (Null)

PSD-3

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	2.370	0.100	0.000	0.000	79.000	M	8.21	0.677
	Σ	**2.370**						**8.21**	**0.677**
#2	1	4.100	0.100	0.000	0.000	79.000	M	14.20	1.171
	Σ	**6.470**						**22.41**	**1.848**
#3	1	0.650	0.100	0.000	0.000	79.000	M	2.25	0.185
	Σ	**7.120**						**24.66**	**2.033**

PIPE SLOPE DRAIN 1

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
150.00	33.00	0.0120	4.00	0.00	0.50

Culvert Results:

Minimum pipe diameter: 1 - 18 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 11.33 cfs

Maximum Headwater = 4.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (15 in)	**Discharge (cfs) (18 in)**	Discharge (cfs) (21 in)
0.40	0.67	**0.80**	0.94
0.80	1.88	**2.25**	2.62
1.20	3.44	**4.13**	4.82
1.60	5.11	**6.36**	7.42
2.00	6.40	**8.43**	10.36
2.40	7.47	**10.10**	12.77
2.80	8.41	**11.53**	14.85
3.20	9.26	**12.80**	16.67
3.60	10.03	**13.95**	18.30
4.00	10.75	**15.02**	19.81
4.40	11.42	**16.01**	21.20
4.80	12.05	**16.95**	22.51
5.20	12.66	**17.84**	23.75
5.60	13.23	**18.69**	24.93
6.00	13.79	**19.50**	26.05

PIPE SLOPE DRAIN 2

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
136.00	33.00	0.0120	4.00	0.00	0.50

Culvert Results:

Minimum pipe diameter: 1 - 30 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 25.53 cfs

Maximum Headwater = 4.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (24 in)	**Discharge (cfs) (30 in)**	Discharge (cfs) (36 in)
0.40	1.07	**1.33**	1.59
0.80	3.00	**3.75**	4.50
1.20	5.51	**6.88**	8.26
1.60	8.48	**10.59**	12.71
2.00	11.85	**14.81**	17.77
2.40	15.35	**19.46**	23.36
2.80	18.22	**24.53**	29.43
3.20	20.74	**28.90**	35.96
3.60	22.97	**32.77**	42.27
4.00	25.01	**36.22**	47.70
4.40	26.89	**39.37**	52.64
4.80	28.65	**42.29**	57.14
5.20	30.31	**45.03**	61.31
5.60	31.88	**47.60**	65.22
6.00	33.38	**50.04**	68.92

PIPE SLOPE DRAIN 3

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
90.00	33.00	0.0120	4.00	0.00	0.50

Culvert Results:

Minimum pipe diameter: 1 - 30 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 27.78 cfs

Maximum Headwater = 4.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (24 in)	**Discharge (cfs) (30 in)**	Discharge (cfs) (36 in)
0.40	1.07	**1.33**	1.59
0.80	3.00	**3.75**	4.50
1.20	5.51	**6.88**	8.26
1.60	8.48	**10.59**	12.71
2.00	11.85	**14.81**	17.77
2.40	15.35	**19.46**	23.36
2.80	18.22	**24.53**	29.43
3.20	20.74	**28.90**	35.96
3.60	22.97	**32.77**	42.27
4.00	25.01	**36.22**	47.70
4.40	26.89	**39.37**	52.64
4.80	28.65	**42.29**	57.14
5.20	30.31	**45.03**	61.31
5.60	31.88	**47.60**	65.22
6.00	33.38	**50.04**	68.92

PIPE SLOPE DRAIN INLET

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
6.00	5.00	0.0120	2.00	0.00	0.70

Culvert Results:

Minimum pipe diameter: 1 - 30 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 14.20 cfs

Maximum Headwater = 2.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (24 in)	**Discharge (cfs) (30 in)**	Discharge (cfs) (36 in)
0.20	0.38	**0.47**	0.57
0.40	1.06	**1.33**	1.59
0.60	1.95	**2.43**	2.92
0.80	3.00	**3.75**	4.49
1.00	4.19	**5.24**	6.28
1.20	5.50	**6.88**	8.26
1.40	6.94	**8.67**	10.41
1.60	8.48	**10.59**	12.71
1.80	10.11	**12.64**	15.17
2.00	11.85	**14.81**	17.77
2.20	13.67	**17.08**	20.50
2.40	15.36	**19.46**	23.36
2.60	16.83	**21.95**	26.34
2.80	18.23	**24.53**	29.43
3.00	19.52	**26.80**	32.64

INLET CAPACITIES

INLET CAPACITIES

The capacity of the inlet is calculated based upon orifice flow as follows:

$$Q = CA\,(2gh)^{0.5}$$

Where: Q = discharge in cubic feet second (cfs)
C = orifice coefficient, use C = 0.6
A = cross-sectional area in square feet – Type M Inlet = $7.5ft^2$
g = acceleration due to gravity, 32.2 ft/sec^2
h = Available head in feet

$$Q = (0.6)\,(7.5)\,(2 \times 32.2 \times 2)^{0.5}$$

$$Q = (0.6)\,(7.5)\,(128.8)^{0.5}$$

$$Q = (0.6)\,(7.5)\,(11.35)$$

$$Q = 51.07 \text{ cfs}$$

Inlet 15

Inlet 15 is a proposed sump inlet, which collects runoff conveyed from Channel DS-7 and L and directs it to Culvert 22. The total flow to inlet 15 was computed during the Basin 2 analysis with a peak 100yr Q of 23.29 cfs which is less than the available capacity calculated above. Thus the proposed inlet is adequate.

Inlet 16

Inlet 16 is a proposed sump inlet, which collects runoff conveyed from Channels DS-6 and M and directs it to Culvert 24. The total flow to inlet 16 was computed during the Basin 2 analysis with a peak 100yr Q of 39.92 cfs which is less than the available capacity calculated above. Thus the proposed inlet is adequate.

Inlet 18

Inlet 18 is a proposed sump inlet, which collects runoff conveyed from Channel W and directs it to Culvert 21. The total flow to Inlet 18 was computed during the Basin 2 analysis with a peak 100yr Q of 12.52 cfs which is less than the available capacity calculated above. Thus the proposed inlet is adequate.

Inlet 19

Inlet 19 is a proposed sump inlet, which collects runoff conveyed from Channels Z and Z-1 and directs it to Culvert 26. The total flow to inlet 19 was computed during the Basin 2 analysis with a peak 100yr Q of 14.81 cfs.

FORM I

PRE-DEVELOPMENT CALCULATIONS

for

BASIN 2 AND AREA "A"

FORM I

SEDIMENTATION BASIN 2

PRE-DEVELOPMENT

MODIFIED PULS BASIN ROUTING FOR BASIN #2---BASIN #2 - PHASE III

INFLOW HYDROGRAPH FILENAME: B:B22YR.HYD
BASIN STORAGE/ELEVATION DATA FILENAME: B:BASIN2.RS
OUTLET STRUCTURE DISCHARGE/ELEVATION DATA FILENAME: B:BASIN2.EO

TIME hrs.	HYDROGRAPH INFLOW,cfs	BASIN INFLOW,cfs	STORAGE acre-ft	ELEVATION ft.ABOVE msl	BASIN OUTFLOW,cfs	OUTFLOW TOTAL,cfs	RETENTI TIME,h
%1100.00	1.30	1.30	0.000	460.00	0.00	0.00	19.1
%1100.10	1.40	1.40	0.011	460.16	0.00	0.00	17.8
%1100.20	1.60	1.60	0.024	460.34	0.00	0.00	15.7
%1100.30	1.80	1.80	0.038	460.54	0.00	0.00	14.0
%1100.40	2.10	2.10	0.054	460.77	0.00	0.00	12.1
%1100.50	2.40	2.40	0.072	461.03	0.00	0.00	10.7
%1100.60	2.70	2.70	0.093	461.33	0.00	0.00	9.8
%1100.70	7.90	7.90	0.137	461.96	0.00	0.00	3.3
%1100.80	13.10	13.10	0.224	462.20	0.00	0.00	2.1
%1100.90	18.30	18.30	0.354	462.52	0.00	0.00	1.5
%1101.00	40.00	40.00	0.595	463.10	0.00	0.00	0.8
%1101.10	66.60	66.60	1.035	464.08	0.00	0.00	0.5
%1101.20	48.60	48.60	1.511	464.70	0.00	0.00	0.8
%1101.30	22.50	22.50	1.805	465.08	0.00	0.00	2.0
%1101.40	14.00	14.00	1.956	465.27	0.00	0.00	3.4
%1101.50	10.80	10.80	2.058	465.40	0.00	0.00	4.6
%1101.60	8.90	8.90	2.139	465.51	0.05	0.05	5.7
%1101.70	7.30	7.30	2.206	465.59	0.09	0.09	7.2
%1101.80	6.40	6.40	2.262	465.67	0.12	0.12	8.3
%1101.90	5.90	5.90	2.311	465.73	0.16	0.16	9.2
%1102.00	5.50	5.50	2.357	465.79	0.18	0.18	10.0
%1102.10	5.10	5.10	2.399	465.84	0.21	0.21	10.9
%1102.20	4.80	4.80	2.438	465.89	0.23	0.23	11.7
%1102.30	4.50	4.50	2.475	465.94	0.25	0.25	12.6
%1102.40	4.30	4.30	2.509	465.99	0.27	0.27	13.2
%1102.50	4.10	4.10	2.541	466.02	0.29	0.29	14.0
%1102.60	3.90	3.90	2.572	466.05	0.31	0.31	14.7

TOTAL ROUTING MASS BALANCE DISCREPANCY= -.78 %

PEAK INFLOW = 66.60 cfs. PEAK OUTFLOW = 0.00 cfs.

ROUTING TIME STEP = 0.10 hours NUMBER OF OUTFLOW HYDROGRAPH POINTS = 26

```
*****************************************************************************
*  PSUHM: MODULE <3-B> - SCS TR-55 TABULAR METHOD                           *
*****************************************************************************
```

WATERSHED TITLE: BASIN #2

2 YR. STORM: PRECIPITATION = 3.2 in.

==========

SUMMARY OF INPUT PARAMETERS

SUBAREA	AREA (sqmi)	CURVE NUMBER	IA/P	RUNOFF (in)	TC (hrs)	ADJ. TC (hrs)	TT (hrs)	ADJ. TT (hrs)
1	0.012	80	0.156	1.40	0.190	0.200	0.000	0.000
2	0.005	80	0.156	1.40	0.100	0.100	0.000	0.000
3	0.002	80	0.156	1.40	0.180	0.200	0.000	0.000
4	0.002	80	0.156	1.40	0.070	0.100	0.000	0.000
5	0.001	80	0.156	1.40	0.050	0.100	0.000	0.000
6	0.001	80	0.156	1.40	0.070	0.100	0.000	0.000
7	0.001	80	0.156	1.40	0.040	0.100	0.000	0.000
8	0.004	80	0.156	1.40	0.070	0.100	0.000	0.000
9	0.000	80	0.156	1.40	0.030	0.100	0.000	0.000
10	0.001	80	0.156	1.40	0.090	0.100	0.000	0.000
11	0.003	80	0.156	1.40	0.080	0.100	0.000	0.000
12	0.000	80	0.156	1.40	0.040	0.100	0.000	0.000
13	0.001	80	0.156	1.40	0.060	0.100	0.000	0.000
14	0.003	80	0.156	1.40	0.080	0.100	0.000	0.000
15	0.002	80	0.156	1.40	0.100	0.100	0.000	0.000
16	0.004	80	0.156	1.40	0.120	0.100	0.000	0.020
17	0.002	80	0.156	1.40	0.080	0.100	0.000	0.000
18	0.003	80	0.156	1.40	0.120	0.100	0.000	0.020
19	0.002	80	0.156	1.40	0.090	0.100	0.000	0.000
20	0.001	80	0.156	1.40	0.080	0.100	0.000	0.000
21	0.003	80	0.156	1.40	0.110	0.100	0.000	0.010
COMPOSITE	0.053	80		1.40				

INDIVIDUAL SUBAREA & COMPOSITE HYDROGRAPHS

SUBAREA	TIME (hrs) 11.0	11.9	12.2	12.5	12.8	13.2	13.6	14.0	15.0	17.0	20.0	26.0
1	0	3	13	3	2	1	1	1	1	0	0	0
2	0	2	4	1	1	0	0	0	0	0	0	0
3	0	0	2	0	0	0	0	0	0	0	0	0
4	0	1	2	0	0	0	0	0	0	0	0	0
5	0	1	1	0	0	0	0	0	0	0	0	0
6	0	0	1	0	0	0	0	0	0	0	0	0
7	0	0	1	0	0	0	0	0	0	0	0	0
8	0	1	3	1	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	1	0	0	0	0	0	0	0	0	0
11	0	1	2	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0

~~B2-3~~ C-186

14	0	1	3	1	0	0	0	0	0	0	0	0
15	0	1	1	0	0	0	0	0	0	0	0	0
16	0	1	4	1	1	0	0	0	0	0	0	0
17	0	1	2	0	0	0	0	0	0	0	0	0
18	0	1	3	1	0	0	0	0	0	0	0	0
19	0	1	2	0	0	0	0	0	0	0	0	0
20	0	0	1	0	0	0	0	0	0	0	0	0
	0	1	2	0	0	0	0	0	0	0	0	0
COMPOSITE	1	18	49	11	6	5	4	3	2	2	1	0

THE PEAK FLOW IS 66.6 cfs - OCCURS AT 12.1 hrs

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*****************************************************************************
*  PSUHM: MODULE <3-B> - SCS TR-55 TABULAR METHOD                           *
*****************************************************************************
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WATERSHED TITLE: BASIN #2

10 YR. STORM: PRECIPITATION = 4.83 in.

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SUMMARY OF INPUT PARAMETERS

SUBAREA	AREA (sqmi)	CURVE NUMBER	IA/P	RUNOFF (in)	TC (hrs)	ADJ. TC (hrs)	TT (hrs)	ADJ. TT (hrs)
1	0.012	80	0.104	2.75	0.190	0.200	0.000	0.000
2	0.005	80	0.104	2.75	0.100	0.100	0.000	0.000
3	0.002	80	0.104	2.75	0.180	0.200	0.000	0.000
4	0.002	80	0.104	2.75	0.070	0.100	0.000	0.000
5	0.001	80	0.104	2.75	0.050	0.100	0.000	0.000
6	0.001	80	0.104	2.75	0.070	0.100	0.000	0.000
7	0.001	80	0.104	2.75	0.040	0.100	0.000	0.000
8	0.004	80	0.104	2.75	0.070	0.100	0.000	0.000
9	0.000	80	0.104	2.75	0.030	0.100	0.000	0.000
10	0.001	80	0.104	2.75	0.090	0.100	0.000	0.000
11	0.003	80	0.104	2.75	0.080	0.100	0.000	0.000
12	0.000	80	0.104	2.75	0.040	0.100	0.000	0.000
13	0.001	80	0.104	2.75	0.060	0.100	0.000	0.000
14	0.003	80	0.104	2.75	0.080	0.100	0.000	0.000
15	0.002	80	0.104	2.75	0.100	0.100	0.000	0.000
16	0.004	80	0.104	2.75	0.120	0.100	0.000	0.020
17	0.002	80	0.104	2.75	0.080	0.100	0.000	0.000
18	0.003	80	0.104	2.75	0.120	0.100	0.000	0.020
19	0.002	80	0.104	2.75	0.090	0.100	0.000	0.000
20	0.001	80	0.104	2.75	0.080	0.100	0.000	0.000
21	0.003	80	0.104	2.75	0.110	0.100	0.000	0.010
COMPOSITE	0.053	80		2.75				

INDIVIDUAL SUBAREA & COMPOSITE HYDROGRAPHS

SUBAREA	TIME (hrs) 11.0	11.9	12.2	12.5	12.8	13.2	13.6	14.0	15.0	17.0	20.0	26.0
1	1	7	26	5	3	2	2	1	1	1	0	0
2	0	5	9	2	1	1	1	1	0	0	0	0
3	0	1	4	1	0	0	0	0	0	0	0	0
4	0	2	3	1	0	0	0	0	0	0	0	0
5	0	1	2	0	0	0	0	0	0	0	0	0
	0	1	2	0	0	0	0	0	0	0	0	0
7	0	1	2	0	0	0	0	0	0	0	0	0
8	0	3	6	1	1	1	0	0	0	0	0	0
9	0	0	1	0	0	0	0	0	0	0	0	0
10	0	1	2	0	0	0	0	0	0	0	0	0
11	0	2	4	1	1	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0

~~B2-5~~ C188

14	0	[illegible]	[illegible]	1	1	[illegible]	0	0		0	0	0
15	0	2	3	1	0	0	0	0	0	0	0	0
16	0	3	8	2	1	1	1	0	0	0	0	0
17	0	2	4	1	0	0	0	0	0	0	0	0
18	0	2	6	1	1	0	0	0	0	0	0	0
19	0	2	4	1	1	0	0	0	0	0	0	0
20	0	1	1	0	0	0	0	0	0	0	0	0
	0	2	4	1	1	0	0	0	0	0	0	0
COMPOSITE	3	43	99	20	12	9	7	6	4	3	2	0

THE PEAK FLOW IS 134.5 cfs - OCCURS AT 12.1 hrs

MODIFIED PULS BASIN ROUTING FOR BASIN #2---BASIN #2 - PHASE III

INFLOW HYDROGRAPH FILENAME: B:B210YR.HYD
BASIN STORAGE/ELEVATION DATA FILENAME: B:BASIN2.ES
OUTLET STRUCTURE DISCHARGE/ELEVATION DATA FILENAME: B:BASIN2.EO

TIME hrs.	HYDROGRAPH INFLOW,cfs	BASIN INFLOW,cfs	STORAGE acre-ft	ELEVATION ft.ABOVE msl	BASIN OUTFLOW,cfs	OUTFLOW TOTAL,cfs	RETENTI TIME,h
%1100.00	3.40	3.40	0.000	460.00	0.00	0.00	7.[illegible]
%1100.10	3.80	3.80	0.030	460.43	0.00	0.00	6.[illegible]
%1100.20	4.30	4.30	0.063	460.90	0.00	0.00	5.[illegible]
%1100.30	4.70	4.70	0.100	461.43	0.00	0.00	5.[illegible]
%1100.40	5.60	5.60	0.143	462.01	0.00	0.00	4.[illegible]
%1100.50	6.50	6.50	0.193	462.13	0.00	0.00	4.[illegible]
%1100.60	7.30	7.30	0.250	462.27	0.00	0.00	3.[illegible]
%1100.70	19.10	19.10	0.359	462.53	0.00	0.00	1.[illegible]
%1100.80	30.80	30.80	0.565	463.02	0.00	0.00	1.[illegible]
%1100.90	42.60	42.60	0.869	463.76	0.00	0.00	0.[illegible]
%1101.00	83.00	83.00	1.388	464.54	0.00	0.00	0.[illegible]
%1101.10	134.50	134.50	2.286	465.70	0.14	0.14	0.[illegible]
%1101.20	99.10	99.10	3.248	466.77	0.60	0.60	0.[illegible]
%1101.30	44.10	44.10	3.834	467.38	0.77	0.77	2.[illegible]
%1101.40	26.60	26.60	4.119	467.68	0.87	0.87	3.[illegible]
%1101.50	20.20	20.20	4.305	467.88	0.93	0.93	4.[illegible]
%1101.60	16.40	16.40	4.449	468.03	0.98	0.98	6.[illegible]
%1101.70	13.40	13.40	4.564	468.13	1.01	1.01	7.[illegible]
%1101.80	11.60	11.60	4.659	468.22	1.04	1.04	8.[illegible]
%1101.90	10.80	10.80	4.742	468.30	1.06	1.06	9.[illegible]
%1102.00	9.90	9.90	4.819	468.37	1.08	1.08	10.[illegible]
%1102.10	9.20	9.20	4.889	468.44	1.10	1.10	11.[illegible]
%1102.20	8.60	8.60	4.953	468.50	1.12	1.12	12.[illegible]
%1102.30	8.10	8.10	5.013	468.56	1.14	1.14	13.[illegible]
%1102.40	7.60	7.60	5.069	468.61	1.15	1.15	14.[illegible]

TOTAL ROUTING MASS BALANCE DISCREPANCY= -.79 %

PEAK INFLOW = 134.50 cfs. PEAK OUTFLOW = 0.00 cfs.

ROUTING TIME STEP = 0.10 hours NUMBER OF OUTFLOW HYDROGRAPH POINTS = 24

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*****************************************************************************
*  PSUHM: MODULE <3-8> - SCS TR-55 TABULAR METHOD                           *
*****************************************************************************
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WATERSHED TITLE: BASIN #2

25 YR. STORM: PRECIPITATION = 5.72 in.

SUMMARY OF INPUT PARAMETERS

SUBAREA	AREA (sqmi)	CURVE NUMBER	IA/P	RUNOFF (in)	TC (hrs)	ADJ. TC (hrs)	TT (hrs)	ADJ. TT (hrs)
1	0.012	80	0.100	3.53	0.190	0.200	0.000	0.000
2	0.005	80	0.100	3.53	0.100	0.100	0.000	0.000
3	0.002	80	0.100	3.53	0.180	0.200	0.000	0.000
4	0.002	80	0.100	3.53	0.070	0.100	0.000	0.000
5	0.001	80	0.100	3.53	0.050	0.100	0.000	0.000
6	0.001	80	0.100	3.53	0.070	0.100	0.000	0.000
7	0.001	80	0.100	3.53	0.040	0.100	0.000	0.000
8	0.004	80	0.100	3.53	0.070	0.100	0.000	0.000
9	0.000	80	0.100	3.53	0.030	0.100	0.000	0.000
10	0.001	80	0.100	3.53	0.090	0.100	0.000	0.000
11	0.003	80	0.100	3.53	0.080	0.100	0.000	0.000
12	0.000	80	0.100	3.53	0.040	0.100	0.000	0.000
13	0.001	80	0.100	3.53	0.060	0.100	0.000	0.000
14	0.003	80	0.100	3.53	0.080	0.100	0.000	0.000
15	0.002	80	0.100	3.53	0.100	0.100	0.000	0.000
16	0.004	80	0.100	3.53	0.120	0.100	0.000	0.020
17	0.002	80	0.100	3.53	0.080	0.100	0.000	0.000
18	0.003	80	0.100	3.53	0.120	0.100	0.000	0.020
19	0.002	80	0.100	3.53	0.090	0.100	0.000	0.000
20	0.001	80	0.100	3.53	0.080	0.100	0.000	0.000
21	0.003	80	0.100	3.53	0.110	0.100	0.000	0.010
COMPOSITE	0.053	80		3.53				

INDIVIDUAL SUBAREA & COMPOSITE HYDROGRAPHS

SUBAREA	TIME (hrs) 11.0	11.9	12.2	12.5	12.8	13.2	13.6	14.0	15.0	17.0	20.0	26.0
1	1	9	34	7	4	3	2	2	1	1	1	0
2	0	6	11	2	1	1	1	1	1	0	0	0
3	0	1	6	1	1	0	0	0	0	0	0	0
4	0	2	4	1	1	0	0	0	0	0	0	0
5	0	2	3	1	0	0	0	0	0	0	0	0
6	0	1	2	0	0	0	0	0	0	0	0	0
7	0	1	2	0	0	0	0	0	0	0	0	0
8	0	4	8	2	1	1	1	0	0	0	0	0
9	0	0	1	0	0	0	0	0	0	0	0	0
10	0	1	2	0	0	0	0	0	0	0	0	0
11	0	3	6	1	1	1	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0

~~B2-8~~ C191

14	0	4	7	1	1	1	1	0	0		0	0
15	0	2	4	1	0	0	0	0	0	0	0	0
16	0	4	10	2	1	1	1	1	0	0	0	0
17	0	3	5	1	1	0	0	0	0	0	0	0
18	0	3	7	2	1	1	1	0	0	0	0	0
19	0	3	5	1	1	0	0	0	0	0	0	0
20	0	1	2	0	0	0	0	0	0	0	0	0
	0	3	6	1	1	1	0	0	0	0	0	0
COMPOSITE	4	55	128	26	15	11	9	7	6	4	2	0

THE PEAK FLOW IS 173.3 cfs - OCCURS AT 12.1 hrs

MODIFIED PULS BASIN ROUTING FOR BASIN #2---BASIN #2 - PHASE III

INFLOW HYDROGRAPH FILENAME: B:B225YR.HYD
BASIN STORAGE/ELEVATION DATA FILENAME: B:BASIN2.ES
OUTLET STRUCTURE DISCHARGE/ELEVATION DATA FILENAME: B:BASIN2.EO

TIME hrs.	HYDROGRAPH INFLOW,cfs	BASIN INFLOW,cfs	STORAGE acre-ft	ELEVATION ft.ABOVE msl	BASIN OUTFLOW,cfs	OUTFLOW TOTAL,cfs	RETENTI TIME,hr
%1100.00	4.40	4.40	0.000	460.00	0.00	0.00	5.6
%1100.10	5.00	5.00	0.039	460.55	0.00	0.00	5.0
%1100.20	5.60	5.60	0.083	461.18	0.00	0.00	4.8
%1100.30	6.20	6.20	0.131	461.88	0.00	0.00	4.2
%1100.40	7.30	7.30	0.187	462.11	0.00	0.00	3.7
%1100.50	8.50	8.50	0.252	462.27	0.00	0.00	3.2
%1100.60	9.60	9.60	0.327	462.45	0.00	0.00	3.0
%1100.70	24.80	24.80	0.469	462.79	0.00	0.00	1.2
%1100.80	40.10	40.10	0.738	463.44	0.00	0.00	0.8
%1100.90	55.30	55.30	1.132	464.21	0.00	0.00	0.7
%1101.00	107.10	107.10	1.803	465.07	0.00	0.00	0.4
%1101.10	173.30	173.30	2.960	466.46	0.50	0.50	0.4
%1101.20	127.70	127.70	4.198	467.77	0.89	0.89	0.7
%1101.30	56.70	56.70	4.951	468.50	1.12	1.12	2.0
%1101.40	34.10	34.10	5.317	468.84	1.23	1.23	3.6
%1101.50	25.80	25.80	5.554	469.06	1.31	1.31	4.5
%1101.60	21.00	21.00	5.736	469.24	1.36	1.36	6.2
%1101.70	17.20	17.20	5.883	469.37	1.41	1.41	7.6
%1101.80	14.90	14.90	6.003	469.49	1.45	1.45	8.8
%1101.90	13.80	13.80	6.110	469.59	1.48	1.48	9.8
%1102.00	12.60	12.60	6.207	469.68	1.50	1.50	10.8
%1102.10	11.80	11.80	6.295	469.76	1.53	1.53	11.4
%1102.20	10.90	10.90	6.376	469.84	1.55	1.55	12.3
%1102.30	10.30	10.30	6.451	469.91	1.58	1.58	13.1

TOTAL ROUTING MASS BALANCE DISCREPANCY= -.82 %

PEAK INFLOW = 173.30 cfs. PEAK OUTFLOW = 0.00 cfs.

ROUTING TIME STEP = 0.10 hours NUMBER OF OUTFLOW HYDROGRAPH POINTS = 23

MODIFIED PULS BASIN ROUTING FOR BASIN #2---BASIN #2 - PHASE III

INFLOW HYDROGRAPH FILENAME: B:B2100YR.HYD
BASIN STORAGE/ELEVATION DATA FILENAME: B:BASIN2.ES
OUTLET STRUCTURE DISCHARGE/ELEVATION DATA FILENAME: B:BASIN2.EO

TIME hrs.	HYDROGRAPH INFLOW,cfs	BASIN INFLOW,cfs	STORAGE acre-ft	ELEVATION ft.ABOVE msl	BASIN OUTFLOW,cfs	OUTFLOW TOTAL,cfs	RETENT TIME,h
%1100.00	6.00	6.00	0.000	460.00	0.00	0.00	4.
%1100.10	6.80	6.80	0.053	460.76	0.00	0.00	3.
%1100.20	7.60	7.60	0.112	461.61	0.00	0.00	3.
%1100.30	8.40	8.40	0.179	462.09	0.00	0.00	3.
%1100.40	9.90	9.90	0.254	462.28	0.00	0.00	2.
%1100.50	11.40	11.40	0.342	462.49	0.00	0.00	2.
%1100.60	12.90	12.90	0.443	462.73	0.00	0.00	2.
%1100.70	33.50	33.50	0.634	463.19	0.00	0.00	0.
%1100.80	54.10	54.10	0.996	464.03	0.00	0.00	0.
%1100.90	74.60	74.60	1.528	464.72	0.00	0.00	0.
%1101.00	144.50	144.50	2.433	465.89	0.23	0.23	0.
%1101.10	233.70	233.70	3.991	467.55	0.82	0.82	0.
%1101.20	172.20	172.20	5.659	469.16	1.34	1.34	0.
%1101.30	76.50	76.50	6.675	470.10	1.64	1.64	2.
%1101.40	46.00	46.00	7.167	470.52	1.77	1.77	3.
%1101.50	34.80	34.80	7.486	470.79	1.86	1.86	4.
%1101.60	28.40	28.40	7.731	470.99	1.92	1.92	6.
%1101.70	23.10	23.10	7.919	471.15	4.11	4.11	7.
%1101.80	20.10	20.10	8.054	471.26	6.36	6.36	7.
%1101.90	18.60	18.60	8.154	471.35	8.34	8.34	7.
%1102.00	17.00	17.00	8.225	471.41	9.92	9.92	7.
%1102.10	15.90	15.90	8.272	471.45	11.61	11.61	7.
%1102.20	14.80	14.80	8.299	471.47	12.58	12.58	7.
%1102.30	14.00	14.00	8.312	471.48	13.05	13.05	7.

TOTAL ROUTING MASS BALANCE DISCREPANCY= -.32 %

PEAK INFLOW = 233.70 cfs. PEAK OUTFLOW = 13.05 cfs.

ROUTING TIME STEP = 0.10 hours NUMBER OF OUTFLOW HYDROGRAPH POINTS = 23

B2-11

C-194

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*****************************************************************************
*  PSUHM: MODULE <3-B> - SCS TR-55 TABULAR METHOD                           *
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WATERSHED TITLE: BASIN #2

100 YR. STORM: PRECIPITATION = 7.07 in.

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SUMMARY OF INPUT PARAMETERS

SUBAREA	AREA (sqmi)	CURVE NUMBER	IA/P	RUNOFF (in)	TC (hrs)	ADJ. TC (hrs)	TT (hrs)	ADJ. TT (hrs)
1	0.012	80	0.100	4.76	0.190	0.200	0.000	0.000
2	0.005	80	0.100	4.76	0.100	0.100	0.000	0.000
3	0.002	80	0.100	4.76	0.180	0.200	0.000	0.000
4	0.002	80	0.100	4.76	0.070	0.100	0.000	0.000
5	0.001	80	0.100	4.76	0.050	0.100	0.000	0.000
6	0.001	80	0.100	4.76	0.070	0.100	0.000	0.000
7	0.001	80	0.100	4.76	0.040	0.100	0.000	0.000
8	0.004	80	0.100	4.76	0.070	0.100	0.000	0.000
9	0.000	80	0.100	4.76	0.030	0.100	0.000	0.000
0	0.001	80	0.100	4.76	0.090	0.100	0.000	0.000
11	0.003	80	0.100	4.76	0.080	0.100	0.000	0.000
12	0.000	80	0.100	4.76	0.040	0.100	0.000	0.000
13	0.001	80	0.100	4.76	0.060	0.100	0.000	0.000
14	0.003	80	0.100	4.76	0.080	0.100	0.000	0.000
15	0.002	80	0.100	4.76	0.100	0.100	0.000	0.000
16	0.004	80	0.100	4.76	0.120	0.100	0.000	0.020
17	0.002	80	0.100	4.76	0.080	0.100	0.000	0.000
18	0.003	80	0.100	4.76	0.120	0.100	0.000	0.020
19	0.002	80	0.100	4.76	0.090	0.100	0.000	0.000
20	0.001	80	0.100	4.76	0.080	0.100	0.000	0.000
21	0.003	80	0.100	4.76	0.110	0.100	0.000	0.010
COMPOSITE	0.053	80		4.76				

INDIVIDUAL SUBAREA & COMPOSITE HYDROGRAPHS

SUBAREA	TIME (hrs) 11.0	11.9	12.2	12.5	12.8	13.2	13.6	14.0	15.0	17.0	20.0	26.0
1	1	12	46	9	5	3	3	2	2	1	1	0
2	1	8	15	3	2	1	1	1	1	0	0	0
3	0	2	8	2	1	1	0	0	0	0	0	0
4	0	3	6	1	1	1	0	0	0	0	0	0
5	0	2	4	1	0	0	0	0	0	0	0	0
6	0	1	3	1	0	0	0	0	0	0	0	0
7	0	1	3	1	0	0	0	0	0	0	0	0
8	0	6	11	2	1	1	1	1	1	0	0	0
9	0	0	1	0	0	0	0	0	0	0	0	0
10	0	1	3	1	0	0	0	0	0	0	0	0
11	0	4	8	2	1	1	1	0	0	0	0	0
12	0	0	1	0	0	0	0	0	0	0	0	0

B2-12 C.195

14	0	5	10	2	1	[illegible]	1	1	0	0	0	0
15	0	3	5	1	1	0	0	0	0	0	0	0
16	0	6	13	3	2	1	1	1	1	0	0	0
17	0	3	7	1	1	1	0	0	0	0	0	0
18	0	4	10	2	1	1	1	1	0	0	0	0
19	0	4	7	1	1	1	1	0	0	0	0	0
20	0	1	2	0	0	0	0	0	0	0	0	0
	0	4	8	2	1	1	1	0	0	0	0	0
COMPOSITE	6	75	172	35	20	15	12	10	7	5	3	0

THE PEAK FLOW IS 233.7 cfs - OCCURS AT 12.1 hrs

FORM I

AREA "A"

PRE-DEVELOPMENT

Copyright 1998 -2010 Pamela L Schwab

Bethlehem Landfill Southeast Realignment

AREA "A"

Pre-Development

JMM

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	2 yr - 24 hr
Rainfall Depth:	3.200 inches

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	6.370	6.370	0.38	0.11

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	6.370	0.395	0.000	0.000	55.000	M	0.38	0.106
	Σ	**6.370**						**0.38**	**0.106**

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General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	10 yr - 24 hr
Rainfall Depth:	4.830 inches

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Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	6.370	6.370	2.60	0.38

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	6.370	0.395	0.000	0.000	55.000	M	2.60	0.380
	Σ	**6.370**						**2.60**	**0.380**

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	25 yr - 24 hr
Rainfall Depth:	5.720 inches

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	6.370	6.370	4.28	0.58

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	6.370	0.395	0.000	0.000	55.000	M	4.28	0.576
	Σ	**6.370**						**4.28**	**0.576**

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	100 yr - 24 hr
Rainfall Depth:	7.040 inches

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	6.370	6.370	7.24	0.91

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	6.370	0.395	0.000	0.000	55.000	M	7.24	0.911
	Σ	**6.370**						**7.24**	**0.911**

TR55 Tc Worksheet

Hyd. No. 1

Description		A		B		C		Totals
Sheet Flow								
Manning's n-value	=	0.800		0.011		0.011		
Flow length (ft)	=	150.0		0.0		0.0		
Two-year 24-hr precip. (in)	=	3.20		0.00		0.00		
Land slope (%)	=	17.00		0.00		0.00		
Travel Time (min)	=	**21.97**	+	**0.00**	+	**0.00**	=	**21.97**
Shallow Concentrated Flow								
Flow length (ft)	=	820.00		0.00		0.00		
Watercourse slope (%)	=	24.00		0.00		0.00		
Surface description	=	Unpaved		Paved		Paved		
Average velocity (ft/s)	=	7.90		0.00		0.00		
Travel Time (min)	=	**1.73**	+	**0.00**	+	**0.00**	=	**1.73**
Channel Flow								
X sectional flow area (sqft)	=	0.00		0.00		0.00		
Wetted perimeter (ft)	=	0.00		0.00		0.00		
Channel slope (%)	=	0.00		0.00		0.00		
Manning's n-value	=	0.015		0.015		0.015		
Velocity (ft/s)	=	0.00		0.00		0.00		
Flow length (ft)	=	0.0		0.0		0.0		
Travel Time (min)	=	**0.00**	+	**0.00**	+	**0.00**	=	**0.00**

Total Travel Time, Tc ..... **23.70 min**

STORMWATER DETENTION BASINS

POST CLOSURE

TABLE I-3
COMPARISON OR PRE-DEVELOPMENT AND POST DEVELOPMENT PEAK DISCHARGE RATES

Storm Event Drainage Area	**2-YR**		**10-YR**		**25-YR**		**100-YR**	
Pre-Development Basin #2	100%	30%	100%	50%	100%	50%	100%	50%
	0.3 cfs	0.1 cfs	1.2 cfs	0.6 cfs	1.6 cfs	0.8 cfs	13.1 cfs	6.5 cfs
Post Development Basin #2	0.31 cfs		0.72 cfs		1.35 cfs		5.85 cfs	
Pre-Development Area "A"	0.38 cfs		2.60 cfs		4.28 cfs		7.24 cfs	
Post Development Area "A"	0.33 cfs		2.22 cfs		3.65 cfs		6.17 cfs	

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Detention Basin 2

Post Closure

2-Yr

JMM

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General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	2 yr - 24 hr
Rainfall Depth:	3.200 inches

Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#12		2.170	2.170	1.10	0.08
#11		11.030	11.030	5.57	0.41
#7		7.120	7.120	0.92	0.18
#8		4.610	11.730	1.66	0.29
#2		1.840	1.840	0.93	0.07
#1		2.300	2.300	1.16	0.08
#3		3.690	7.830	3.95	0.29
#4		11.850	19.680	9.94	0.73
#5		7.880	27.560	10.25	0.92
#6		5.290	32.850	10.45	1.05
#9		0.590	45.170	11.62	1.36
#10	In	1.790	60.160	19.19	1.92
	Out			0.31	0.91

Initial Pool:	0.00 ac-ft

Perforated Riser

Riser Diameter (in)	Riser Height (ft)	Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Number of Holes per Elev
36.00	11.00	30.00	100.00	4.50	0.0240	471.00	1

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
471.50	20.00	3.00:1	3.00:1	20.00

Pond Results:

Peak Elevation:	463.69 ft
Dewater Time:	3.72 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
460.00	0.272	0.000	0.000		
460.01	0.273	0.003	0.000		Low hole SPW #1
460.50	0.312	0.146	0.115	15.09*	
461.00	0.355	0.313	0.163	12.35*	
461.50	0.400	0.501	0.200	11.40*	
462.00	0.449	0.714	0.232	11.09*	
462.50	0.499	0.951	0.259	11.07*	
463.00	0.553	1.214	0.284	11.21*	
463.50	0.610	1.504	0.307	11.95	
463.69	0.632	1.623	0.315	5.10	Peak Stage
464.00	0.669	1.824	0.328		
464.50	0.731	2.173	0.348		
465.00	0.795	2.554	0.367		
465.50	0.818	2.958	0.501		
466.00	0.840	3.372	0.566		
466.50	0.863	3.798	0.619		
467.00	0.887	4.236	0.666		
467.50	0.911	4.685	0.709		
468.00	0.935	5.146	0.748		
468.50	0.959	5.620	0.785		

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
469.00	0.984	6.105	0.820		
469.50	1.009	6.603	0.854		
470.00	1.034	7.114	1.554		
470.50	1.058	7.637	1.862		
471.00	1.082	8.172	2.104		Spillway #1
471.50	1.107	8.719	10.330		Spillway #2
472.00	1.132	9.279	32.860		
472.50	1.157	9.851	91.363		
473.00	1.182	10.435	151.823		
473.50	1.208	11.033	230.503		
474.00	1.233	11.643	325.442		
474.50	1.260	12.266	436.892		
475.00	1.286	12.903	565.241		

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
460.00	0.000	0.000	0.000
460.01	2.50>0.000	0.000	0.000
460.50	0.115	0.000	0.115
461.00	0.163	0.000	0.163
461.50	0.200	0.000	0.200
462.00	0.232	0.000	0.232
462.50	0.259	0.000	0.259
463.00	0.284	0.000	0.284
463.50	0.307	0.000	0.307
464.00	0.328	0.000	0.328
464.50	0.348	0.000	0.348
465.00	2.50>0.367	0.000	0.367
465.50	0.501	0.000	0.501
466.00	0.566	0.000	0.566
466.50	0.619	0.000	0.619
467.00	0.666	0.000	0.666
467.50	0.709	0.000	0.709
468.00	0.748	0.000	0.748
468.50	0.785	0.000	0.785
469.00	0.820	0.000	0.820

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
469.50	6.00>0.854	0.000	0.854
470.00	1.554	0.000	1.554
470.50	1.862	0.000	1.862
471.00	2.104	0.000	2.104
471.50	10.330	0.000	10.330
472.00	29.217	3.643	32.860
472.50	41.684	49.679	91.363
473.00	48.133	103.690	151.823
473.50	53.814	176.689	230.503
474.00	58.950	266.492	325.442
474.50	63.674	373.219	436.892
475.00	68.070	497.171	565.241

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Detention Basin 2

Post Closure

10-Yr

JMM

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	10 yr - 24 hr
Rainfall Depth:	4.830 inches

Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#12		2.170	2.170	3.18	0.23
#11		11.030	11.030	16.15	1.16
#7		7.120	7.120	3.57	0.50
#8		4.610	11.730	6.37	0.83
#2		1.840	1.840	2.69	0.19
#1		2.300	2.300	3.37	0.24
#3		3.690	7.830	11.46	0.83
#4		11.850	19.680	28.81	2.08
#5		7.880	27.560	30.88	2.63
#6		5.290	32.850	32.30	3.01
#9		0.590	45.170	37.93	3.90
#10	In	1.790	60.160	59.88	5.49
	Out			0.72	2.03

Initial Pool:	0.00 ac-ft

Perforated Riser

Riser Diameter (in)	Riser Height (ft)	Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Number of Holes per Elev
36.00	11.00	30.00	100.00	4.50	0.0240	471.00	1

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
471.50	20.00	3.00:1	3.00:1	20.00

Pond Results:

Peak Elevation:	467.66 ft
Dewater Time:	6.93 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
460.00	0.272	0.000	0.000		
460.01	0.273	0.003	0.000		Low hole SPW #1
460.50	0.312	0.146	0.115	15.09*	
461.00	0.355	0.313	0.163	12.35*	
461.50	0.400	0.501	0.200	11.40*	
462.00	0.449	0.714	0.232	11.09*	
462.50	0.499	0.951	0.259	11.07*	
463.00	0.553	1.214	0.284	11.21*	
463.50	0.610	1.504	0.307	11.47*	
464.00	0.669	1.824	0.328	11.79*	
464.50	0.731	2.173	0.348	12.17*	
465.00	0.795	2.554	0.367	12.58*	
465.50	0.818	2.958	0.501	9.74*	
466.00	0.840	3.372	0.566	8.86*	
466.50	0.863	3.798	0.619	8.32*	
467.00	0.887	4.236	0.666	8.25	
467.50	0.911	4.685	0.709	7.90	
467.66	0.918	4.832	0.721	2.95	Peak Stage
468.00	0.935	5.146	0.748		
468.50	0.959	5.620	0.785		

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Detention Basin 2

Post Closure

25-Yr

JMM

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	25 yr - 24 hr
Rainfall Depth:	5.720 inches

Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#12		2.170	2.170	4.49	0.33
#11		11.030	11.030	22.81	1.67
#7		7.120	7.120	5.43	0.72
#8		4.610	11.730	9.56	1.20
#2		1.840	1.840	3.80	0.28
#1		2.300	2.300	4.76	0.35
#3		3.690	7.830	16.19	1.19
#4		11.850	19.680	40.69	2.98
#5		7.880	27.560	44.15	3.78
#6		5.290	32.850	46.52	4.32
#9		0.590	45.170	55.36	5.61
#10	In	1.790	60.160	86.35	7.88
	Out			1.35	2.70

Initial Pool:	0.00 ac-ft

Perforated Riser

Riser Diameter (in)	Riser Height (ft)	Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Number of Holes per Elev
36.00	11.00	30.00	100.00	4.50	0.0240	471.00	1

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
471.50	20.00	3.00:1	3.00:1	20.00

Pond Results:

Peak Elevation:	469.85 ft
Dewater Time:	8.18 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
460.00	0.272	0.000	0.000		
460.01	0.273	0.003	0.000		Low hole SPW #1
460.50	0.312	0.146	0.115	15.09*	
461.00	0.355	0.313	0.163	12.35*	
461.50	0.400	0.501	0.200	11.40*	
462.00	0.449	0.714	0.232	11.09*	
462.50	0.499	0.951	0.259	11.07*	
463.00	0.553	1.214	0.284	11.21*	
463.50	0.610	1.504	0.307	11.47*	
464.00	0.669	1.824	0.328	11.79*	
464.50	0.731	2.173	0.348	12.17*	
465.00	0.795	2.554	0.367	12.58*	
465.50	0.818	2.958	0.501	9.74*	
466.00	0.840	3.372	0.566	8.86*	
466.50	0.863	3.798	0.619	8.32*	
467.00	0.887	4.236	0.666	7.95*	
467.50	0.911	4.685	0.709	7.67*	
468.00	0.935	5.146	0.748	7.46*	
468.50	0.959	5.620	0.785	7.29*	
469.00	0.984	6.105	0.820	7.35	

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Detention Basin 2

Post Closure

100-Yr

JMM

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	100 yr - 24 hr
Rainfall Depth:	7.040 inches

Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#12		2.170	2.170	6.56	0.49
#11		11.030	11.030	33.36	2.51
#7		7.120	7.120	8.48	1.09
#8		4.610	11.730	14.81	1.79
#2		1.840	1.840	5.56	0.42
#1		2.300	2.300	6.96	0.52
#3		3.690	7.830	23.68	1.78
#4		11.850	19.680	59.52	4.47
#5		7.880	27.560	65.32	5.67
#6		5.290	32.850	69.32	6.48
#9		0.590	45.170	83.49	8.41
#10	In	1.790	60.160	128.82	11.82
	Out			5.85	6.10

Initial Pool:	0.00 ac-ft

Perforated Riser

Riser Diameter (in)	Riser Height (ft)	Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Number of Holes per Elev
36.00	11.00	30.00	100.00	4.50	0.0240	471.00	1

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
471.50	20.00	3.00:1	3.00:1	20.00

Pond Results:

Peak Elevation:	471.23 ft
Dewater Time:	8.84 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
460.00	0.272	0.000	0.000		
460.01	0.273	0.003	0.000		Low hole SPW #1
460.50	0.312	0.146	0.115	15.09*	
461.00	0.355	0.313	0.163	12.35*	
461.50	0.400	0.501	0.200	11.40*	
462.00	0.449	0.714	0.232	11.09*	
462.50	0.499	0.951	0.259	11.07*	
463.00	0.553	1.214	0.284	11.21*	
463.50	0.610	1.504	0.307	11.47*	
464.00	0.669	1.824	0.328	11.79*	
464.50	0.731	2.173	0.348	12.17*	
465.00	0.795	2.554	0.367	12.58*	
465.50	0.818	2.958	0.501	9.74*	
466.00	0.840	3.372	0.566	8.86*	
466.50	0.863	3.798	0.619	8.32*	
467.00	0.887	4.236	0.666	7.95*	
467.50	0.911	4.685	0.709	7.67*	
468.00	0.935	5.146	0.748	7.46*	
468.50	0.959	5.620	0.785	7.29*	
469.00	0.984	6.105	0.820	7.16*	

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Detention Basin 2

Post Closure

Interim Pool - 464.00

2-Yr

JMM

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	2 yr - 24 hr
Rainfall Depth:	3.200 inches

Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#12		2.170	2.170	1.10	0.08
#11		11.030	11.030	5.57	0.41
#7		7.120	7.120	0.92	0.18
#8		4.610	11.730	1.66	0.29
#2		1.840	1.840	0.93	0.07
#1		2.300	2.300	1.16	0.08
#3		3.690	7.830	3.95	0.29
#4		11.850	19.680	9.94	0.73
#5		7.880	27.560	10.25	0.92
#6		5.290	32.850	10.45	1.05
#9		0.590	45.170	11.62	1.36
#10	In	1.790	60.160	19.19	1.92
	Out			0.50	1.59

Initial Pool:	1.82 ac-ft

Perforated Riser

Riser Diameter (in)	Riser Height (ft)	Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Number of Holes per Elev
36.00	11.00	30.00	100.00	4.50	0.0240	471.00	1

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
471.50	20.00	3.00:1	3.00:1	20.00

Pond Results:

Peak Elevation:	465.53 ft
Dewater Time:	5.53 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
460.00	0.272	0.000	0.000		
460.01	0.273	0.003	0.000		Low hole SPW #1
460.50	0.312	0.146	0.115	15.09*	
461.00	0.355	0.313	0.163	12.35*	
461.50	0.400	0.501	0.200	11.40*	
462.00	0.449	0.714	0.232	11.09*	
462.50	0.499	0.951	0.259	11.07*	
463.00	0.553	1.214	0.284	11.21*	
463.50	0.610	1.504	0.307	11.47*	
464.00	0.669	1.824	0.328	11.79*	
464.50	0.731	2.173	0.348	12.17*	
465.00	0.795	2.554	0.367	12.90	
465.50	0.818	2.958	0.501	11.40	
465.53	0.819	2.983	0.505	0.85	Peak Stage
466.00	0.840	3.372	0.566		
466.50	0.863	3.798	0.619		
467.00	0.887	4.236	0.666		
467.50	0.911	4.685	0.709		
468.00	0.935	5.146	0.748		
468.50	0.959	5.620	0.785		

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
469.00	0.984	6.105	0.820		
469.50	1.009	6.603	0.854		
470.00	1.034	7.114	1.554		
470.50	1.058	7.637	1.862		
471.00	1.082	8.172	2.104		Spillway #1
471.50	1.107	8.719	10.330		Spillway #2
472.00	1.132	9.279	32.860		
472.50	1.157	9.851	91.363		
473.00	1.182	10.435	151.823		
473.50	1.208	11.033	230.503		
474.00	1.233	11.643	325.442		
474.50	1.260	12.266	436.892		
475.00	1.286	12.903	565.241		

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
460.00	0.000	0.000	0.000
460.01	2.50>0.000	0.000	0.000
460.50	0.115	0.000	0.115
461.00	0.163	0.000	0.163
461.50	0.200	0.000	0.200
462.00	0.232	0.000	0.232
462.50	0.259	0.000	0.259
463.00	0.284	0.000	0.284
463.50	0.307	0.000	0.307
464.00	0.328	0.000	0.328
464.50	0.348	0.000	0.348
465.00	2.50>0.367	0.000	0.367
465.50	0.501	0.000	0.501
466.00	0.566	0.000	0.566
466.50	0.619	0.000	0.619
467.00	0.666	0.000	0.666
467.50	0.709	0.000	0.709
468.00	0.748	0.000	0.748
468.50	0.785	0.000	0.785
469.00	0.820	0.000	0.820

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
469.50	6.00>0.854	0.000	0.854
470.00	1.554	0.000	1.554
470.50	1.862	0.000	1.862
471.00	2.104	0.000	2.104
471.50	10.330	0.000	10.330
472.00	29.217	3.643	32.860
472.50	41.684	49.679	91.363
473.00	48.133	103.690	151.823
473.50	53.814	176.689	230.503
474.00	58.950	266.492	325.442
474.50	63.674	373.219	436.892
475.00	68.070	497.171	565.241

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IESI Bethlehem Landfill Southeastern Realignment

Detention Basin 2

Post Closure

Interim Pool - 464.00

10-Yr

JMM

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	10 yr - 24 hr
Rainfall Depth:	4.830 inches

Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#12		2.170	2.170	3.18	0.23
#11		11.030	11.030	16.15	1.16
#7		7.120	7.120	3.57	0.50
#8		4.610	11.730	6.37	0.83
#2		1.840	1.840	2.69	0.19
#1		2.300	2.300	3.37	0.24
#3		3.690	7.830	11.46	0.83
#4		11.850	19.680	28.81	2.08
#5		7.880	27.560	30.88	2.63
#6		5.290	32.850	32.30	3.01
#9		0.590	45.170	37.93	3.90
#10	In	1.790	60.160	59.88	5.49
	Out			0.83	2.72

Initial Pool:	1.82 ac-ft

Perforated Riser

Riser Diameter (in)	Riser Height (ft)	Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Number of Holes per Elev
36.00	11.00	30.00	100.00	4.50	0.0240	471.00	1

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
471.50	20.00	3.00:1	3.00:1	20.00

Pond Results:

Peak Elevation:	469.10 ft
Dewater Time:	7.79 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
460.00	0.272	0.000	0.000		
460.01	0.273	0.003	0.000		Low hole SPW #1
460.50	0.312	0.146	0.115	15.09*	
461.00	0.355	0.313	0.163	12.35*	
461.50	0.400	0.501	0.200	11.40*	
462.00	0.449	0.714	0.232	11.09*	
462.50	0.499	0.951	0.259	11.07*	
463.00	0.553	1.214	0.284	11.21*	
463.50	0.610	1.504	0.307	11.47*	
464.00	0.669	1.824	0.328	11.79*	
464.50	0.731	2.173	0.348	12.17*	
465.00	0.795	2.554	0.367	12.58*	
465.50	0.818	2.958	0.501	9.74*	
466.00	0.840	3.372	0.566	8.86*	
466.50	0.863	3.798	0.619	8.32*	
467.00	0.887	4.236	0.666	7.95*	
467.50	0.911	4.685	0.709	7.67*	
468.00	0.935	5.146	0.748	7.65	
468.50	0.959	5.620	0.785	7.45	
469.00	0.984	6.105	0.820	7.35	

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Southeastern Realignment

Detention Basin 2

Post Closure

Interim Pool - 464.00

25-Yr

JMM

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	25 yr - 24 hr
Rainfall Depth:	5.720 inches

Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#12		2.170	2.170	4.49	0.33
#11		11.030	11.030	22.81	1.67
#7		7.120	7.120	5.43	0.72
#8		4.610	11.730	9.56	1.20
#2		1.840	1.840	3.80	0.28
#1		2.300	2.300	4.76	0.35
#3		3.690	7.830	16.19	1.19
#4		11.850	19.680	40.69	2.98
#5		7.880	27.560	44.15	3.78
#6		5.290	32.850	46.52	4.32
#9		0.590	45.170	55.36	5.61
#10	In	1.790	60.160	86.35	7.88
	Out			1.94	4.15

Initial Pool:	1.82 ac-ft

Perforated Riser

Riser Diameter (in)	Riser Height (ft)	Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Number of Holes per Elev
36.00	11.00	30.00	100.00	4.50	0.0240	471.00	1

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
471.50	20.00	3.00:1	3.00:1	20.00

Pond Results:

Peak Elevation:	470.66 ft
Dewater Time:	8.43 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
460.00	0.272	0.000	0.000		
460.01	0.273	0.003	0.000		Low hole SPW #1
460.50	0.312	0.146	0.115	15.09*	
461.00	0.355	0.313	0.163	12.35*	
461.50	0.400	0.501	0.200	11.40*	
462.00	0.449	0.714	0.232	11.09*	
462.50	0.499	0.951	0.259	11.07*	
463.00	0.553	1.214	0.284	11.21*	
463.50	0.610	1.504	0.307	11.47*	
464.00	0.669	1.824	0.328	11.79*	
464.50	0.731	2.173	0.348	12.17*	
465.00	0.795	2.554	0.367	12.58*	
465.50	0.818	2.958	0.501	9.74*	
466.00	0.840	3.372	0.566	8.86*	
466.50	0.863	3.798	0.619	8.32*	
467.00	0.887	4.236	0.666	7.95*	
467.50	0.911	4.685	0.709	7.67*	
468.00	0.935	5.146	0.748	7.46*	
468.50	0.959	5.620	0.785	7.29*	
469.00	0.984	6.105	0.820	7.35	

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IESI Bethlehem Landfill
Southeastern Realignment

Detention Basin 2

Post Closure

Interim Pool - 464.00

100-Yr

JMM

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	100 yr - 24 hr
Rainfall Depth:	7.040 inches

Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#12		2.170	2.170	6.56	0.49
#11		11.030	11.030	33.36	2.51
#7		7.120	7.120	8.48	1.09
#8		4.610	11.730	14.81	1.79
#2		1.840	1.840	5.56	0.42
#1		2.300	2.300	6.96	0.52
#3		3.690	7.830	23.68	1.78
#4		11.850	19.680	59.52	4.47
#5		7.880	27.560	65.32	5.67
#6		5.290	32.850	69.32	6.48
#9		0.590	45.170	83.49	8.41
#10	In	1.790	60.160	128.82	11.82
	Out			9.62	7.93

Initial Pool:	1.82 ac-ft

Perforated Riser

Riser Diameter (in)	Riser Height (ft)	Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Number of Holes per Elev
36.00	11.00	30.00	100.00	4.50	0.0240	471.00	1

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
471.50	20.00	3.00:1	3.00:1	20.00

Pond Results:

Peak Elevation:	471.46 ft
Dewater Time:	8.92 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
460.00	0.272	0.000	0.000		
460.01	0.273	0.003	0.000		Low hole SPW #1
460.50	0.312	0.146	0.115	15.09*	
461.00	0.355	0.313	0.163	12.35*	
461.50	0.400	0.501	0.200	11.40*	
462.00	0.449	0.714	0.232	11.09*	
462.50	0.499	0.951	0.259	11.07*	
463.00	0.553	1.214	0.284	11.21*	
463.50	0.610	1.504	0.307	11.47*	
464.00	0.669	1.824	0.328	11.79*	
464.50	0.731	2.173	0.348	12.17*	
465.00	0.795	2.554	0.367	12.58*	
465.50	0.818	2.958	0.501	9.74*	
466.00	0.840	3.372	0.566	8.86*	
466.50	0.863	3.798	0.619	8.32*	
467.00	0.887	4.236	0.666	7.95*	
467.50	0.911	4.685	0.709	7.67*	
468.00	0.935	5.146	0.748	7.46*	
468.50	0.959	5.620	0.785	7.29*	
469.00	0.984	6.105	0.820	7.16*	

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
469.50	6.00>0.854	0.000	0.854
470.00	1.554	0.000	1.554
470.50	1.862	0.000	1.862
471.00	2.104	0.000	2.104
471.50	10.330	0.000	10.330
472.00	29.217	3.643	32.860
472.50	41.684	49.679	91.363
473.00	48.133	103.690	151.823
473.50	53.814	176.689	230.503
474.00	58.950	266.492	325.442
474.50	63.674	373.219	436.892
475.00	68.070	497.171	565.241

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Bethlehem Landfill Southeast Realignment

AREA "A"

Post-Development

JMM

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	2 yr - 24 hr
Rainfall Depth:	3.200 inches

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	5.430	5.430	0.33	0.09

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	5.430	0.395	0.000	0.000	55.000	M	0.33	0.091
	Σ	**5.430**						**0.33**	**0.091**

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	10 yr - 24 hr
Rainfall Depth:	4.830 inches

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	5.430	5.430	2.22	0.32

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	5.430	0.395	0.000	0.000	55.000	M	2.22	0.324
	Σ	**5.430**						**2.22**	**0.324**

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	25 yr - 24 hr
Rainfall Depth:	5.720 inches

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	5.430	5.430	3.65	0.49

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	5.430	0.395	0.000	0.000	55.000	M	3.65	0.491
	Σ	**5.430**						**3.65**	**0.491**

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	100 yr - 24 hr
Rainfall Depth:	7.040 inches

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	5.430	5.430	6.17	0.78

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	5.430	0.395	0.000	0.000	55.000	M	6.17	0.776
	Σ	**5.430**						**6.17**	**0.776**

TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

Description		A		B		C		Totals
Sheet Flow								
Manning's n-value	=	0.800		0.011		0.011		
Flow length (ft)	=	150.0		0.0		0.0		
Two-year 24-hr precip. (in)	=	3.20		0.00		0.00		
Land slope (%)	=	17.00		0.00		0.00		
Travel Time (min)	=	**21.97**	+	**0.00**	+	**0.00**	=	**21.97**
Shallow Concentrated Flow								
Flow length (ft)	=	820.00		0.00		0.00		
Watercourse slope (%)	=	24.00		0.00		0.00		
Surface description	=	Unpaved		Paved		Paved		
Average velocity (ft/s)	=	7.90		0.00		0.00		
Travel Time (min)	=	**1.73**	+	**0.00**	+	**0.00**	=	**1.73**
Channel Flow								
X sectional flow area (sqft)	=	0.00		0.00		0.00		
Wetted perimeter (ft)	=	0.00		0.00		0.00		
Channel slope (%)	=	0.00		0.00		0.00		
Manning's n-value	=	0.015		0.015		0.015		
Velocity (ft/s)	=	0.00		0.00		0.00		
Flow length (ft)	=	0.0		0.0		0.0		
Travel Time (min)	=	**0.00**	+	**0.00**	+	**0.00**	=	**0.00**

Total Travel Time, Tc ..... **23.70 min**