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SOIL EROSION AND SEDIMENT CONTROL PLAN REPORT FOR FINAL DESIGN SUBMISSION REMEDIAL ACTION AT OPERABLE UNIT 1 (OU 1) SITE 4 AND SITE 5 NWS EARLE NJ

11/1/1997

BROWN AND ROOT ENVIRONMENTAL

Soil Erosion and Sediment Control Plan Report

for

Final Design Submission Remedial Action at Operable Unit 1 (Sites 4 and 5)

Naval Weapons Station Earle

Colts Neck, New Jersey

Northern Division

Naval Facilities Engineering Command

Contract Number N62472-90-D-1298

Contract Task Order 0289

November 1997

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SOIL EROSION AND SEDIMENT CONTROL PLAN REPORT FOR

REMEDIAL ACTION AT OPERABLE UNIT 1 (SITES 4 AND 5)

NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
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1.0 INTRODUCTION

This Erosion and Sediment Control Plan Report was prepared under Subtasks 0104 and 0106 of Contract Task Order (CTO) 289 under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract Number N62472-90-D-1298. Under this CTO, Brown and Root (B&R) Environmental is performing engineering, design and construction phase services for the remedial action at Operable Unit - 1 which includes Sites 4 and 5 at the Naval Weapons Station (NWS) Earle, Colts Neck, New Jersey. A vicinity map, showing the approximate locations of Sites 4 and 5, is presented on Figure 1-1.

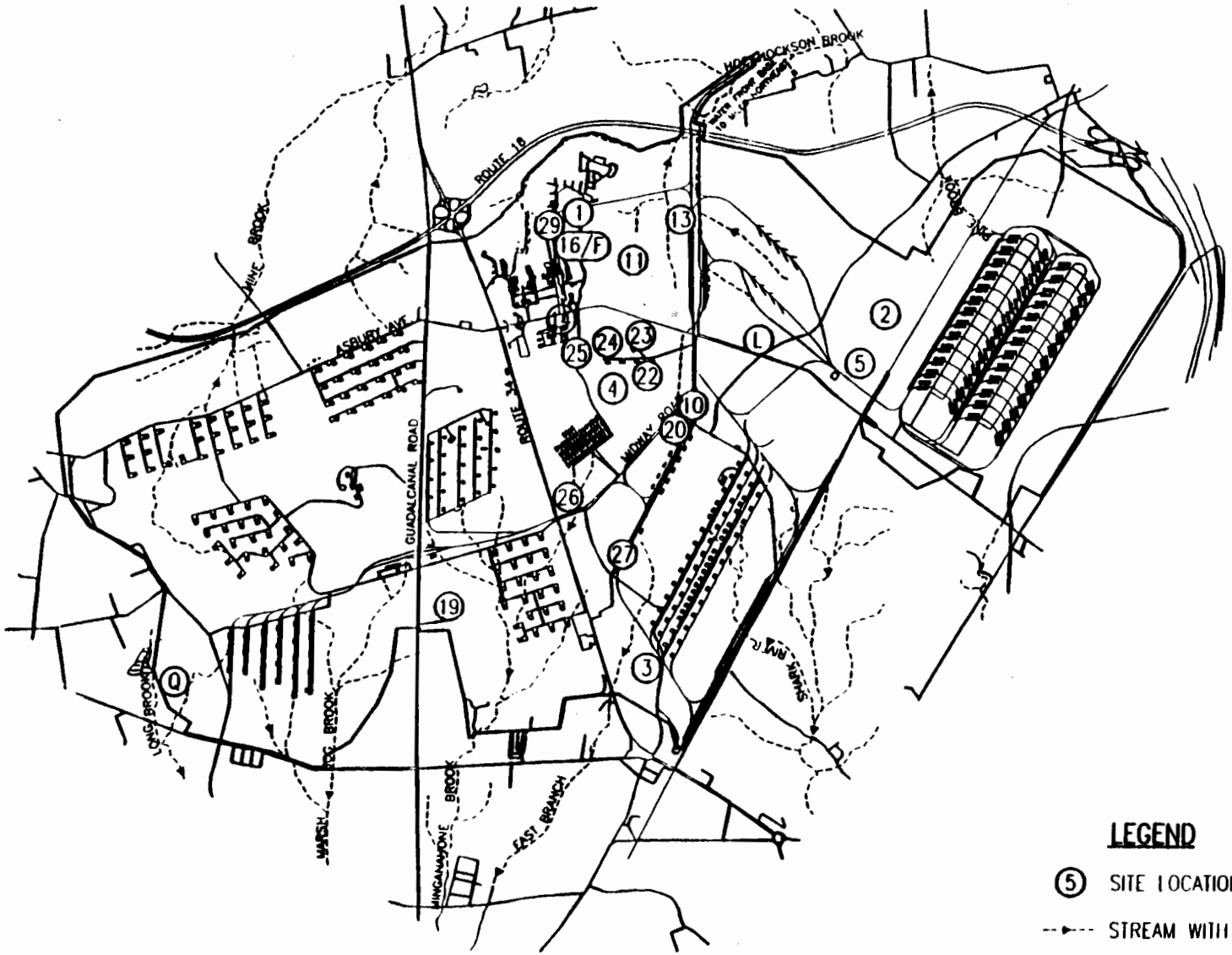
1.1 SITE HISTORY

NWS Earle is located in Monmouth County, New Jersey, approximately 47 miles south of New York City. The station consists of two areas, the 10,248-acre Main Base (Mainside) area, located inland, and the 706-acre Waterfront area. The two areas are connected by a Navy-controlled right-of-way. Commissioned in 1943, the facility's primary mission is to supply ammunition to the naval fleet. An estimated 2,500 people either work or live at the NWS Earle station.

Site 4 is a 3-acre landfill that received approximately 10,200 tons of mixed domestic and industrial wastes from 1943 until 1960. Figure 1-2 depicts the existing conditions at Site 4. Materials disposed of in the landfill include metal scrap, construction debris, pesticide and herbicide containers, paint residue, and rinse waters. It has been reported that containers of paint, paint thinners, varnishes, shellacs, acids, alcohols, caustics, and asbestos may have also been disposed of in the landfill. The landfilled materials are currently covered by a thin layer of sandy soil.

The Site 5 is an approximately 5-acre landfill that received approximately 6,600 tons of mixed domestic and industrial wastes between 1968 and 1978. Figure 1-3 depicts the existing conditions at Site 5. Wastes included paper, glass, plastic, construction debris, pesticide and herbicide containers, containers of paint, paint thinners, varnishes, shellacs, acids, alcohols, caustics, and small amounts of asbestos. The landfilled materials are currently covered by a sand and vegetated soil layer ranging in depth from 1 to 3 feet. Approximately 2.5 acres of the site are used as a skeet shooting range.

A series of investigations were conducted to determine the nature and extent of contamination and evaluate the risks to human health and the environment related to Sites 4 and 5. Unacceptable risks were identified at each site. The preferred remedial action for both sites is consolidation of the waste, construction of a cap over the existing waste, institutional controls, and long-term monitoring.



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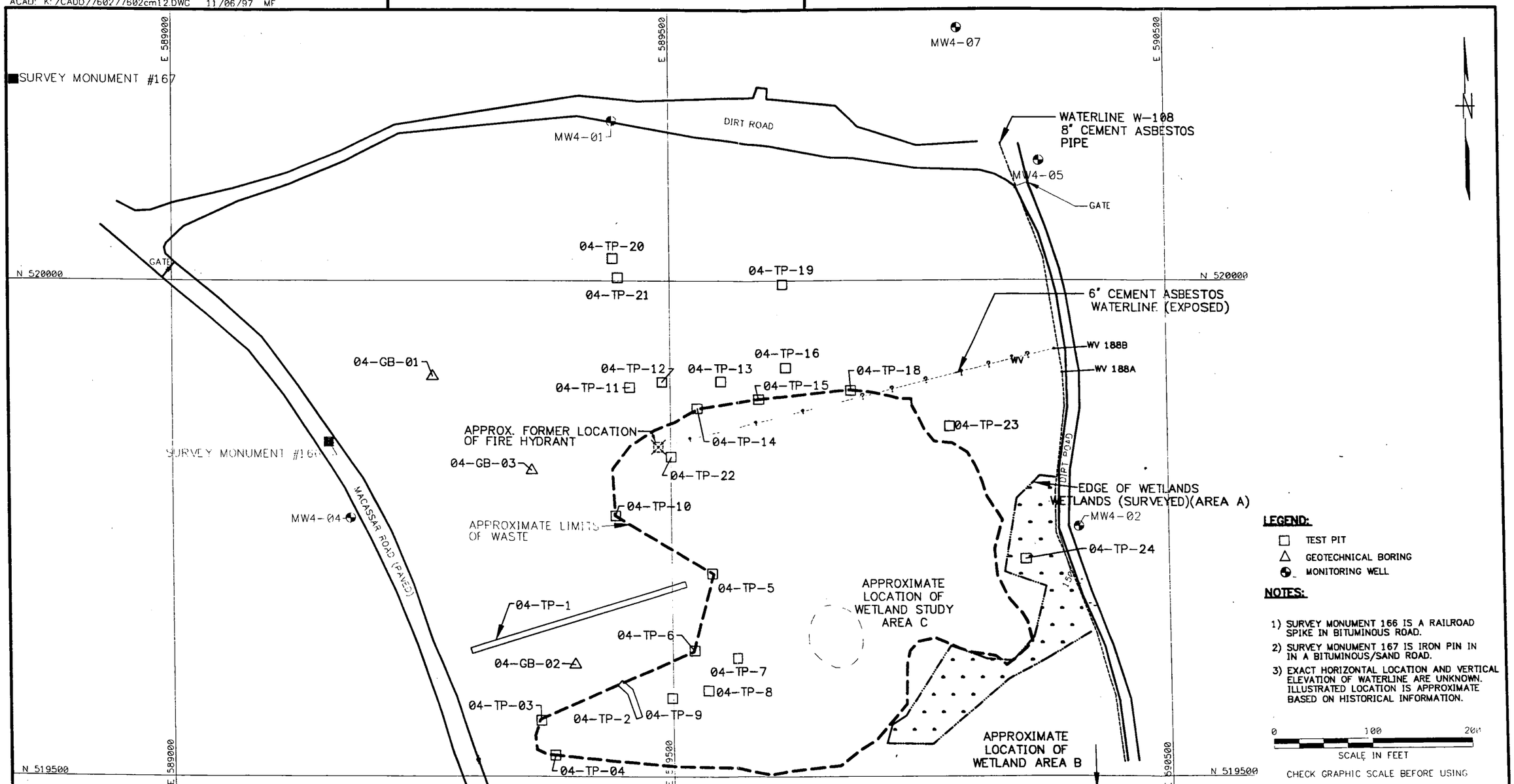

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Brown & Root Environmental

SITE 4
PRE-DESIGN INVESTIGATION
EXISTING CONDITIONS PLAN
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

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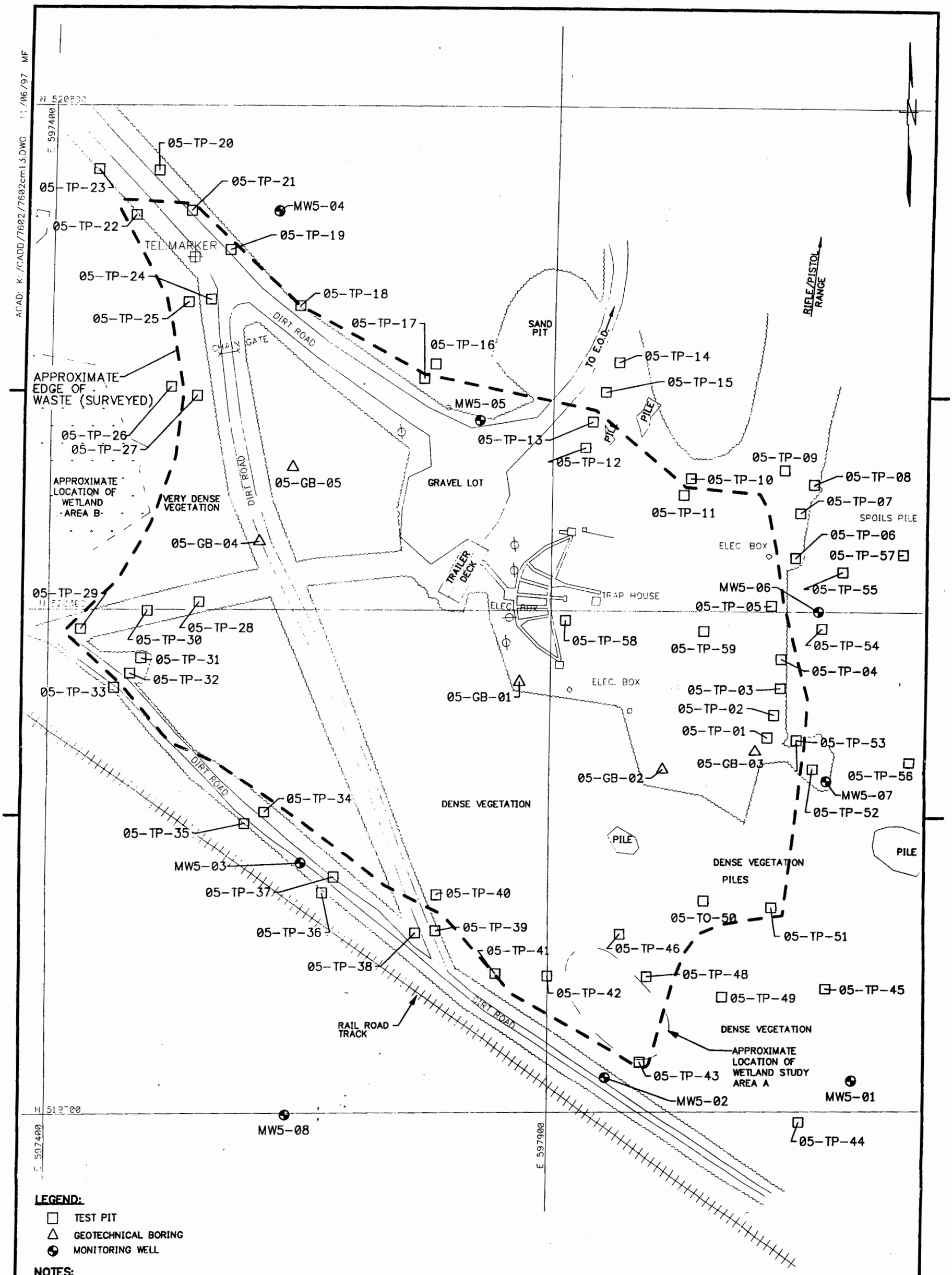

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CTO 0289

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1.2 REPORT OBJECTIVE

The objective of this report is to describe the project and present the erosion and sediment control measures that will be utilized during construction of the caps at Sites 4 and 5. The 1987 *Standards for Soil Erosion and Sediment Control in New Jersey* were used as the basis for developing the soil erosion and sediment control measures included in this report.

1.3 REPORT FORMAT

Section 1.0 of this report provides a short summary of the project and site background information. Sections 2.0 and 3.0 provide the details of the Erosion and Sediment Control Plans for Sites 4 and 5, respectively. Section 4.0 provides conclusions for the Site 4 and 5 Erosion and Sediment Control Plans. A copy of the New Jersey Guidelines for Soil Erosion and Sediment Control are included in Appendix A. Calculations to estimate storm water runoff from the two sites during three different scenarios (i.e., Pre-Construction, During-Construction, and Post-Construction) are provided in Appendix B. Calculations for the sizing of sediment basins for Site 4 are included in Appendix C. Similar calculations for Site 5 sediment and detention basins are included in Appendix D. Other miscellaneous erosion and sediment control calculations are included in Appendix E.

2.0 SITE 4 EROSION AND SEDIMENT CONTROL PLAN

2.1 PROJECT DESCRIPTION

A low permeability cap will be installed at Site 4 to reduce rainwater infiltration and associated leachate generation, promote surface water drainage, and provide isolation of the waste material from humans and the surrounding environment. Existing waste in two locations along the perimeter of the landfill will be excavated and moved toward the center of the site. A surface water diversion ditch will be installed on three sides of the Site 4 landfill. The ditch will intercept upgradient surface water runoff, collect runoff from the landfill, collect water from the drainage layer in the cap system, and convey the combined surface water around the landfill cap to one of two sediment basins. A permanent bench (diversion) will be constructed into the side slope of the landfill cap to redirect runoff from a steep slope of the cap to the sediment basins. Lastly, silt fence will be installed along the perimeter of areas not addressed by other erosion and sediment control devices.

2.2 EXISTING SITE CONDITIONS

The Site 4 landfill covers an aerial extent of approximately 3 acres. It is not currently used for military purposes and there are no structures built on the site. Figure 1-2 depicts the approximate boundary of the landfill. The boundary was determined by excavating test pits along the perimeter of the landfill.

The surface cover of the landfill is primarily wooded. The western and northern sections of the landfill are predominantly populated with pine trees. The southern and eastern portions of the landfill are less densely populated and are comprised of woods intermixed with grass. An area of bare soil/exposed debris is located within the southwestern corner of the landfill.

2.3 ADJACENT AREAS

The site is accessible by two roads. Macassar Road is a paved road and is located to the west of the site. A dirt road runs to the north and east of Site 4. An area of hardwood trees is located between the northern boundary of the landfill and the dirt road. Lake Earle is the closest surface water body to Site 4 and is located approximately 350 feet north of the site. Wetlands are located immediately to the southeast of the landfill and to the east (across the dirt road).

The landfill is located within the Hockhockson Drainage Basin. The total drainage area including upgradient areas and Site 4 is approximately 11 acres. This area is delineated in the runoff calculations

contained in Appendix B. This area is divided into two drainage basins whose boundaries run through the central portion of the landfill. Drainage Area (DA) 1 flows from an maximum elevation of 180.5 ft northwest of the landfill to a minimum elevation of 146.5 ft in the wetlands southeast of the landfill. DA 2 flows from a maximum elevation of 182.5 feet northwest of the landfill to the same wetlands location (146.5 ft in elevation).

Flood insurance maps are not available for areas within the NWS Earle property boundary. Therefore, the proximity of floodplains to the site could not be determined. There are no major watercourses in close proximity to the site.

2.4 OFFSITE AREAS

Clean fill materials, as well as materials necessary for construction of the landfill cap, will be obtained from outside of the base and transported to the site via trucks. Disturbance of other lands on the base is not anticipated.

2.5 SITE SOILS

The soils covering Site 4 are mapped as PT or Pits, sand and gravel, according to the April 1989 Soil Survey of Monmouth County, New Jersey. A soils map for Site 4 is included in Appendix B.1. This unit consists of areas that have been excavated for sand and gravel. Typically, these areas consist of sandy material and differing amounts of gravel and fragments of iron-cemented sandstone. A few abandoned pits, such as the one at Site 4, have been used as landfills or dumps. The properties and characteristics of this map unit differ greatly from place to place.

Boring logs, completed during field activities at the site, indicate that the surface and shallow subsurface soil is comprised of silty, fine-grained sand with some clay. The soil's consistency is generally loose to medium dense and the soil is orange-brown to gray-brown in color.

The soil covering areas south and west of Site 4 belong to the Atsion and Lakewood series (USDA, 1989). Atsion series soils, mapped as Atsion sand, are nearly level, poorly drained soil in depressional areas and on broad flats. These soils formed in acid, sandy, Coastal Plain sediments. Permeability of the Atsion sand is moderately rapid or rapid in the subsoil and rapid in the substratum. The available water capacity is low. Runoff is very slow and erosion is a slight hazard. Most areas with this soil are wooded. Common species of trees include pitch pine, black gum, and red maple. The surface layer of the Atsion series is approximately 8 inches thick. The layer contains 2 inches of partly decomposed organic material and roots and 6 inches of black sand. The subsurface soil is grayish brown sand 14 inches thick. These soil

characteristics generally correspond to the soil encountered during boring activities at Site 4. Atsion sand is a Type C/D soil based on the Soil Conservation Service's Hydrologic Soil Group Classifications.

The Lakewood series consists of excessively drained soils on uplands. These soils were also formed in acid, sandy, Coastal Plain sediments. The mapping unit identified within the Lakewood series adjacent to Site 4 is the Lakewood sand, 5 to 10 percent slopes (USDA, 1989). Permeability of this sand is rapid in the subsoil and moderate to rapid in the substratum. The available water capacity is low and runoff is slow. The water erosion hazard is moderate, but the wind erosion hazard is severe. Most areas with this soil are wooded. Common species of trees found in Lakewood sand include pitch pine, shortleaf pine, chestnut oak, black oak, and Virginia pine. The surface layer is 4 inches thick. The uppermost inch is dark, brown, matted, decomposed organic material, and below that is light brownish gray sand 10 inches thick. The subsurface soil of the Lakewood series is light brownish gray sand 10 inches thick. These soil characteristics generally correspond to the soil encountered during boring activities at Site 4. Lakewood sand is a Type A soil based on the Soil Conservation Service's Hydrologic Soil Group Classifications.

The areas north and east of Site 4 are classified as Udorthents (UA). This unit consists of areas of soils that have been altered by excavating or filling. Udorthents consist of well drained to somewhat poorly drained soils that have no horizonation. These soils formed in stratified or graded, sandy or loamy fill material that has as much as 35 percent gravel by volume. Slope ranges from 0 to 3 percent.

2.6 CRITICAL AREAS

Critical areas have potentially serious erosion problems due to the presence of steep slopes, poor vegetative cover, or runoff channels. Critical areas associated with Site 4 include steep slopes located on the southeast and eastern boundaries of the landfill cap. A permanent diversion (bench) will be constructed midway down the steep slope on the southeast corner of the landfill. During construction, this diversion will convey runoff to the sediment basins. This measure will minimize the amount of sediment which would reach the wetland area.

Additionally, the surface water drainage channel may be designated as a critical area due to the steep slope of the channel. Riprap will be placed atop a geotextile liner at critical sections of the surface water drainage channel to protect the surface soil from the erosive forces of water.

2.7 SOIL EROSION AND SEDIMENT CONTROL MEASURES

Soil erosion and sediment control measures will be implemented, installed, and maintained according to the standards and specifications contained in *Standards for Soil Erosion and Sediment Control in New*

Jersey, 1987, and New Jersey Administrative Code, (NJAC 2:90-1.1 et seq.) unless otherwise noted in this plan and the construction documents. Design specifications for soil erosion and sediment control structures have been obtained from *Standards for Soil Erosion and Sediment Control in New Jersey*.

2.7.1 Structural Practices

The following structural practices will be utilized during construction activities at Site 4 to control erosion and sedimentation.

Diversion Bench - A diversion bench will be installed across the southeastern and eastern slope of the landfill midway down the slope. The diversion bench will redirect surface water and sediment from the slope to one of the two sediment basins.

Stone Construction Entrance - A temporary stone construction entrance will be installed to provide access to the site from Macassar Road. Construction vehicles will be cleaned before exiting the site.

Decontamination Pad - A temporary decontamination pad will be constructed near the stone construction entrance. Construction vehicles and other construction equipment will be cleaned prior to coming to the site and before exiting the site.

Sediment Barrier (Silt Fence) - Silt fence will be installed parallel to existing contours in the locations shown on the Erosion and Sediment Control Plan in order to intercept runoff from the disturbed areas. The fence will be installed prior to clearing, grubbing, or excavation activities.

Sediment Basins - Two temporary sediment basins will be constructed to minimize offsite sediment transport during construction activities. The sediment basins are designed to provide for sediment storage capacity during construction activities plus temporary storage for a 2-year, 24-hour, Type III storm event. Additionally, the sediment basins are designed to obtain 70 percent trap efficiency at the start of the basin's useful life.

Surface Water Drainage Channel - A channel will be installed around the northern, western, and southern boundaries of the landfill cap. The channel will divert surface water to one of two sediment basins. The channel is designed to safely convey the peak discharge rate for a 25-year, 24-hour, Type III storm event. The 25-year storm event is used to comply with New Jersey regulations for sanitary landfills (NJAC 7:26-2A.7g).

Riprap - Riprap will be placed atop a geotextile fabric at the critical sections of the surface water drainage channel (as identified in Appendix E). Riprap lining was chosen as it was found to be cost-effective compared to other forms of protection (e.g., vegetated lining topsoil with erosion mat). Because of the poor nature of the existing soils at the site, topsoil would need to be placed in vegetated ditches at Site 4.

Conduit Outlet Protection - The outlets from the sediment basins will be constructed to provide a stable area at the outlet of the conduit in which the exit velocity from the conduit is reduced to a velocity consistent with a stable condition in the downstream channel.

Temporary Vegetative Cover for Soil Stabilization - All regraded areas which will be left dormant for extended periods of time shall be seeded with fast germinating temporary vegetation immediately following grading. Seeding will be done with the appropriate species of grass (i.e., Annual Ryegrass or Pearl Millet depending on the date of planting) and seeding rates (See Table 3.1-1 of the Standards).

Permanent Seeding - All regraded areas will be permanently seeded for long term protection. Seeding will be done with the appropriate species of grass (i.e., hard or Sheep Fescue or Perennial Ryegrass depending on the date of the planting) and seeding rates (See Table 3.2-1 of the Standards).

Mulching - All areas receiving temporary or permanent seeding will be mulched with an organic material to prevent erosion by protecting the soil surface from raindrop impact and reducing the velocity of overland flow.

Top Soiling - Areas which have soil types that cannot support vegetation even after fertilization will be amended with top soil. The top soil will improve the soil medium for plant establishment and maintenance.

2.7.2 Management Strategies

1. Unstabilized, disturbed areas will be minimized and construction activities will be staged.

2. Seeding or other stabilization measures will follow immediately after grading.

3. Areas which are not to be disturbed will be clearly marked by flags, signs, etc.

4. The construction superintendent will be responsible for ensuring the installation and maintenance of all erosion and sediment control practices.

5. Erosion and sediment control structures will be installed and/or constructed prior to the start of any earth disturbing activities.

6. Erosion and sediment control structures will remain in place until permanent vegetation has become established over disturbed surfaces.

7. Temporary berms will be used to direct runoff to the sediment basins as the construction progresses.

2.8 PERMANENT STABILIZATION

All areas disturbed by the remedial action will be stabilized with permanent seeding following final grading. Seeding will be done with appropriate species of grass (See Table 3.2-1 of the Standards).

Because of potentially high surface water discharge rates and velocities, segments of the surface water drainage channel will require permanent stabilization by methods other than permanent seeding. Riprap will be used in all sections of the surface water drainage channel that exceed a flow velocity of 2.0 feet per second. The details of this analysis are presented in Appendix E. Permanent stabilization other than permanent seeding is not needed for the diversion bench.

2.9 STORMWATER RUNOFF CONSIDERATIONS

Calculations were performed to determine the peak stormwater discharge rates for each drainage area covering Site 4 for three scenarios: Pre-Construction, During Construction, and Post-Construction. Runoff calculations for the 2-, 10-, and 25-year, 24-hour, Type III storms were performed for each drainage area and scenario. This range of storms covers the range of criteria required to design the various soil erosion and sediment control structures for this project. Runoff calculations for Site 4 are included in Appendix B and the results are summarized in more detail in Section 3.10.

Calculations were performed using Quick TR-55™ by Haestad Methods, Inc. The software utilizes the identical procedures provided in the Soil Conservation Service's (SCS) Technical Release 55 (TR-55). TR-55 is recommended in the *Standards for Soil Erosion and Sediment Control in New Jersey* as an appropriate method for estimating peak discharge rates for small, urban watersheds.

Based on the existing topography there are 2 drainage areas for Site 4 that both discharge to the wetlands area located southeast of the landfill. During the regrading of the waste, three drainage areas will be created; two that discharge to the two sediment basins, and one that flows towards the wetlands. After, cap construction is complete, there will be two drainage areas, but they differ slightly from Pre-

Construction scenario in configuration, size, and area. The drainage areas delineated for each scenario are provided on figures included in Appendix B.

Calculations for the Pre-Construction scenario were completed to determine baseline flow rates from each drainage area under current conditions. Peak discharge rates for the During Construction scenario were necessary to determine the capacity of the sediment basins that will be in operation during construction. Peak stormwater runoff rates and erosion potential are generally highest for this scenario because the landfill construction area less the surface water drainage channel and sediment basins was assumed to be cleared and grubbed. After construction of the landfill, the site will be restored to a grassed, pervious condition. The calculated stormwater discharge rates for each drainage basin for this scenario was slightly less than the Pre-Construction rates which indicates that permanent stormwater management structures are not required. The peak flow rates dropped during the Post-Construction scenario primarily because by placing topsoil on the site, a better growth vegetation will be established over the landfill than presently exists.

2.10 CALCULATIONS

Runoff calculations for each Site 4 drainage area and scenario discussed above are summarized in Appendices B.2, B.3 and B.4. A summary of calculated peak discharge rates is provided in Appendix B.1. All assumptions made during the calculations are provided on the calculation sheets.

For the 2- to 25-year storm events, the calculated discharge rates range from 1 to 12 cubic feet per second (cfs) for the Pre-Construction scenario, from 1 to 17 cfs for the During-Construction scenario, and from 1 to 11 cfs for the Post-Construction Scenario. Because of the size of the areas to be disturbed during construction, it was determined that sediment basins in conjunction with silt fence are necessary for each Site 4 drainage area to control soil erosion and loss. In addition, because the peak discharge rates from each area decreased between the Pre- and Post-Construction scenarios, permanent stormwater management structures (i.e., detention basins) are not required for each area.

Calculations for determining the size and capacity of the temporary sediment basins required for Site 4 are included in Appendix C. The capacity of each basin is large enough to provide for sediment storage capacity during construction activities plus temporary storage for a 2-yr, 24-hour, Type III storm event. Additionally, the sediment basins are designed to obtain 70 percent trap efficiency at the start of the basin's useful life. The size and dimensions of each basin are shown on the erosion and sediment control drawings which are part of the construction drawings. Appendix C also contains calculations for sizing the outlet structures for each of the sediment basins.

Hydraulic stability calculations for the surface water drainage channel and diversion benches are included in Appendix E. Throughout most of the surface water drainage channel, riprap is required to protect the surface of the channel. Riprap will be placed atop a geotextile filter layer. Two separate riprap sizes will be used within the channel. For the steeper-sloped sections of the channel, riprap with a median diameter of 6 inches will be used. For shallower-sloped sections, a 4-inch median diameter will be used. Riprap is not required within the diversion bench.

2.11 MAINTENANCE

In general, all erosion and sediment control measures will be checked daily and after each significant rainfall event. Any required repairs will be made immediately. The following items will be checked in particular:

- The stone construction entrance will be maintained in a condition which will minimize tracking of sediment onto roads, including the addition of stone or other repairs.

- The silt fence will be checked regularly for undermining or deterioration of the fabric. Sediment will be removed when the level of sediment deposition reaches half of the height of the fabric.

- Seeded areas will be checked regularly to ensure that a good stand is maintained. Areas shall be fertilized and reseeded as needed. The RAC is responsible for maintenance until formal acceptance by the Contracting Officer.

- Portions of the sediment basins that are embanked will be inspected for structural stability.

The sediment basins have been designed to contain the sediment erosion expected through the duration of construction activities; therefore, no maintenance of the basins is expected. However, the RAC will be responsible for inspecting the basins and removing sediment before sediment levels reach the bottom of the dewatering hole in the riser pipe.

2.12 SEQUENCE OF CONSTRUCTION

The proposed sequence of construction events are as follows. Throughout all construction events, the temporary and permanent controls shall be routinely inspected and properly maintained.

1. Construct the rock entrance from Macassar Road to the site and the decontamination pad.

2. Construct the perimeter soil erosion and sediment control devices.

3. Clear and grub a pathway to the proposed areas of both sediment basins. The pathway will follow along and include the area of the proposed surface water interception ditch.

4. Construct both sediment basins and surface water drainage channel in the locations shown on Design Drawing C-4, Erosion and Sediment Control Plan, Site 4, in accordance with applicable details. Also, install geotextile layer and riprap in the surface water drainage channel as indicated.

5. Construct temporary berms to direct surface water to the sediment basins.

6. Clear and grub the remainder of the site, taking care not to disturb ground beyond the construction work limits shown on the plans.

7. Excavate waste outside the planned perimeter of the landfill cap and consolidate within the footprint of the cap. Stabilize excavated areas with permanent vegetative cover.

8. Regrade waste and construct new temporary berms as required to direct surface water runoff to the sediment basins.

9. Clean out sediment basins, if necessary, and distribute sediment over regraded waste.

10. Construct landfill cap.

11. Spread topsoil to bring the site to final contour. Sediment that collected against the silt fence during backfilling and capping operations is clean material and is to be distributed evenly over remaining disturbed areas prior to final stabilization.

12. Seed and mulch the site.

13. After vegetation/permanent stabilization is established, remove all temporary control measures.

3.0 SITE 5 EROSION AND SEDIMENT CONTROL PLAN

3.1 PROJECT DESCRIPTION

A low permeability cap will be installed at Site 5 to reduce rainwater infiltration and associated leachate generation, promote surface water drainage, and provide isolation of the waste material from humans and the surrounding environment. Existing waste along the perimeter of the landfill will be excavated and consolidated within the footprint of the cap. In some areas, the landfill boundaries are adjacent to hillsides and excavation of wastes from specific areas will be required to allow installation of the cap and related drainage ditches along the perimeter. A drainage channel will be installed around three sides of Site 5. The channel will intercept upgradient surface water runoff, collect runoff from the landfill and the drainage layer in the cap, and convey the combined water flow around the landfill cap to discharge points west and east of the site.

3.2 EXISTING SITE CONDITIONS

The Site 5 landfill covers an aerial extent of approximately 8 acres. Figure 1-3 depicts the approximate boundary of the landfill. The boundary was determined by review of aerial photographs and other historical information.

A small drainage ditch is located approximately 100 feet west of the dirt road that borders the western edge of the site, and water is present in the ditch only after periods of heavy rainfall. The closest surface water body is a tributary of Hockhockson Brook, located approximately 1,000 feet east of Site 5. The site is located on the border of the Hockhockson Brook and Pine Brook watersheds.

The topography of the site is relatively flat with approximate maximum and minimum elevations of 115 feet and 101 feet, respectively. The topography generally slopes from east to west and surface water from the northern, central and western portion of the site follows the topography and drains to the west. There is a depressional area with a minimum elevation of 104.6 feet along the south eastern corner of the site. Surface water from the southern and eastern portions of the site drain to this location. It is likely that the surface water that collects in this depression infiltrates into the sandy soil.

As shown on Figure 1-3, a trap/skeet shooting facility (Shooters Club) is located on top of the landfill at Site 5. The Shooters Club consists of concrete walkways to shooting stations, various small structures which house target throwing equipment, wooden light standards with the associated lights for night

shooting, and other small ancillary items (gun racks, flagpole, etc.). The skeet shooting range encompasses approximately 2.5 acres of the Site 5. A majority of the skeet range is covered by grass.

Also included at the facility is a clubhouse which consists of a mobile home ("Trailer" on Figure 1-3), approximately 60 feet by 12 feet and a wooden deck approximately the same size. Two large vaults are installed within the clubhouse and are used to store guns, ammunition, and related equipment used during shooting events.

Adjacent to the clubhouse is a gravel parking area. Gravel and dirt roads are located within the landfill boundary, including the road to the trap/skeet range which turns and continues to the EOD bunker, and an access road crossing the landfill from the northwest to southeast. The areas adjacent to the access road are wooded.

3.3 ADJACENT AREAS

The total drainage area encompassing Site 5 and the upgradient and downgradient areas is approximately 16 acres. The maximum and minimum elevations in the drainage area are approximately 137 feet and 100 feet, respectively.

Wetlands are located to the southwest of the landfill and a small area is located within the boundary of the landfill in the southeast corner of the landfill. The small wetland area in the south east corner will be eliminated during the remediation. As indicated by NJDEP personnel, this wetland will not need to be replaced or restored because it lies entirely within the landfill boundaries. A stand of woods currently buffers the landfill from the wetland to the southwest.

A band of woods and a railroad border Site 5 to the south. Surface water from the southern side of the railroad tracks is conveyed under the tracks by a 24-inch pipe. The outlet of the pipe discharges near the south western corner of the site. A diversion ditch will be installed to divert this surface water around the site and any soil erosion and sediment control structures built for this site.

The EOD range is located north of Site 5 and the site falls within the safety distance arc for the EOD range. When work is being performed at the EOD range (approximately 250 feet to the north) Site 5 must be vacated. Based on site reconnaissance, a small series of hills fall between the site to the north and the EOD range.

Open areas with spoils piles border the site along the northeast corner and to the east. The maximum elevation of the spoils pile is approximately 137 feet.

Flood insurance maps are not available for areas within the NWS Earle property boundary. Therefore, the proximity of floodplains to the site could not be determined. There are no major watercourses in close proximity to the site.

3.4 OFFSITE AREAS

Clean fill materials, as well as materials necessary for construction of the landfill cap, will be obtained from outside of the base and transported to the site via trucks. Disturbance of other lands, besides Sites 4 and 5 on the base, is not anticipated.

3.5 SITE SOILS

The soils covering Site 5 belong to four different series. The series include the Atsion, Keyport, Lakehurst, and Lakewood (SCS, USDA, 1989). A soils map for Site 5 is included in Appendix B.1. Each series and the appropriate mapping unit that covers Site 5 are described in detail below.

Boring logs, completed during field activities at the site, indicate that the surface and shallow subsurface soil is comprised of silty, fine-grained sand with some clay. The soil's consistency ranges from very loose to medium dense. The color of the surface and shallow subsurface soil varies between boring locations. Some soil is orange-brown to gray-brown in color, while others are dark brown to olive-brown.

Atsion series soils, mapped as Atsion sand, are nearly level, poorly drained soils in depressional areas and on broad flats. These soils formed in acid, sandy, Coastal Plain sediments. A minor portion of Site 5 is mapped as Atsion sand. Permeability of the sand is moderately rapid or rapid in the subsoil and rapid in the substratum. The available water capacity is low. Runoff is very slow and erosion is a slight hazard. Most of the areas of this soil are wooded. Common species of trees include pitch pine, black gum, and red maple. The surface layer of the Atsion series is approximately 8 inches thick. The layer contains 2 inches of partly decomposed organic material and roots and 6 inches of black sand. The subsurface soil is grayish brown sand 14 inches thick. These soil characteristics generally correspond to the soil encountered during boring activities at Site 5. Atsion sand is a Type C/D soil based on the Soil Conservation Service's Hydrologic Soil Group classifications.

The Keyport series consists of moderately well drained soils on uplands. These soils formed in acid, clayey, Coastal Plain sediments. The mapping unit identified within the Keyport series at Site 5 is the

Keyport sandy loam, 2 to 5 percent slopes (SCS, USDA, 1989). This unit covers a western portion of Site 5. It is a gently sloping, moderately well drained soil on low divides. Permeability of this soil is slow in the subsoil and the substratum. The available water capacity is high and runoff is medium. Erosion is a moderate hazard. The most common species of tree found in Keyport soil include yellow poplar, northern red oak, and American beech. Some areas of Keyport soil have pyritic clay in the substratum. If the clay is exposed during excavation and used as top soil, it will become extremely acid (pH about 2.5-3.0) and will not support vegetation. The surface soil is brown sandy loam 8 inches thick and the subsurface soil is yellowish brown silty clay loam 18 inches thick. These soil characteristics generally correspond to the soil encountered during boring activities at Site 5. Keyport sandy loam is a Type C soil based on the Soil Conservation Service's Hydrologic Soil Group classifications.

The Lakehurst series consists of moderately well drained and somewhat poorly drained soils on uplands. These soils were formed in acid, sandy Coastal Plain sediments. The mapping unit identified within the Lakehurst series at Site 5 is the Lakehurst sand, 0 to 2 percent slopes (SCS, USDA, 1989). This unit covers a limited portion of Site 5. It is a nearly level, moderately well drained and somewhat poorly drained soil in depressional areas and on low divides. Permeability of this sand is rapid in the subsoil and the substratum. The available water capacity is low and runoff is very slow. Water erosion hazard is slight, but wind erosion is a severe hazard. Most areas of this soil are woodland. The most common species of tree found in Lakehurst sand is the pitch pine. The surface layer is gray sand 4 inches thick. The subsurface layer is light gray sand 6 inches thick. These soil characteristics generally do not correspond to the soil encountered during boring activities at Site 5. Lakehurst sand is a Type A soil based on the Soil Conservation Service's Hydrologic Soil Group classifications.

The Lakewood series consists of excessively drained soils on uplands. These soils were formed in acid, sandy, Coastal Plain sediments. The mapping unit identified within the Lakewood series at Site 5 is the Lakewood sand, 0 to 5 percent slopes (SCS, USDA, 1989). This unit covers a majority of Site 5. It is a nearly level and gently sloping, excessively drained soil on divides. Permeability of this sand is rapid in the subsoil and moderate to rapid in the substratum. The available water capacity is low and runoff is very slow. Water erosion hazard is slight, but wind erosion is a severe hazard. Common species of trees found in Lakewood sand include pitch pine, shortleaf pine, chestnut oak, black oak, and Virginia pine. The surface layer is 4 inches thick. The uppermost inch is dark brown, matted, decomposed organic material, and below that it is dark grayish brown sand. The subsurface soil of the Lakewood series is light brownish gray sand 10 inches thick. These soil characteristics generally correspond to the soil encountered during boring activities at Site 5. Lakewood sand is a Type A soil based on the Soil Conservation Service's Hydrologic Soil Group classifications.

3.6 CRITICAL AREAS

Critical areas have potentially serious erosion problems due to the presence of steep slopes, poor vegetative cover, or potentially high surface water velocities. For existing conditions the only potential critical areas at or adjacent to Site 5 are the spoils piles. Several of these piles have steep slopes and they are relatively unvegetated. Because the piles adjacent to the landfill have existed in this state for a number of years and the present design does not disturb these slopes, these areas were not designated as critical.

During and after construction of the landfill cap, the appropriate soil erosion and sediment control measures will be employed, therefore eliminating the creation of any new critical areas. A discussion of these measures is provided below.

3.7 SOIL EROSION AND SEDIMENT CONTROL MEASURES

Soil erosion and sediment control measures will be implemented, installed, and maintained according to the standards and specifications contained in *Standards for Soil Erosion and Sediment Control in New Jersey*, 1987, and New Jersey Administrative Code, (NJAC 2:90-1.1 et seq.) unless otherwise noted in this plan and the construction documents. Design specifications for soil erosion and sediment control structures have been obtained from the *Standards for Erosion and Sediment Control in New Jersey.*

3.7.1 Structural Practices

The following structural practices will be utilized during construction activities at Site 5 to control erosion and sedimentation.

Stone Construction Entrance - A temporary stone construction entrance will be installed to provide access to the site from the access road. Construction vehicles will be cleaned before exiting the site.

Decontamination Pad. A temporary decontamination pad will be constructed near the stone construction entrance. Construction vehicles and other construction equipment will be cleaned prior to coming to the site and before exiting the site.

Sediment Barrier (Silt Fence) - Silt fence will be installed parallel to existing contours in the locations shown on the Erosion and Sediment Control Plan in order to intercept runoff from the disturbed areas. The fence will be installed prior to any clearing, grubbing, or excavation activities at the site.

Sediment Basin - Three temporary sediment basins will be constructed to minimize transport of sediment offsite during construction activities. The sediment basins are designed to provide for sediment storage capacity during construction activities plus temporary storage for a 2-year, 24-hour, Type III storm event. Additionally, the sediment basins are designed to obtain 70 percent trap efficiency at the start of the basin's useful life.

Detention Basin - The three temporary Site 5 sediment basins will be converted into permanent detention basins after construction of the cap is completed. These basins are designed to have capacity for excess runoff from a 25-year, 24-hour, Type III storm event.

Surface Water Diversion Ditch. A ditch will be installed at the southwest corner of the landfill cap to divert surface runoff from south of the railroad tracks around the southern sediment/detention basin. The ditch is designed to convey the peak discharge from a 25-year, 24-hour, Type III storm event. The 25-year storm even is used in accordance with new Jersey regulations for sanitary landfills/NJAC 7:26-2A.7g).

Surface Water Drainage Channel. A channel will be installed around the northern, southern, and eastern boundaries of the landfill cap. The channel will convey surface water to one of three sediment/detention basins and is designed to safely convey the peak discharge rate for a 25-year, 24-hour, Type III storm event. The 25-year storm event is used in accordance with New Jersey regulations for sanitary landfills (NJAC 7:26-2A.7g).

Conduit Outlet Protection - The outlets from the sediment/detention basins will be constructed to provide a stable area at the outlet of the conduit in which the exit velocity from the conduit is reduced to a velocity consistent with a stable condition in the downstream channel.

Temporary Vegetative Cover for Soil Stabilization - All regraded areas which will be left dormant for extended periods of time shall be seeded with fast germinating temporary vegetation immediately following grading. Seeding will be done with the appropriate species of grass (i.e., Annual ryegrass or pearl millet depending on the date of planting) and seeding rates (See Table 3.1-1 of the Standards).

Permanent Vegetative Cover for Soil Stabilization - All regraded areas will be permanently seeded for long term protection. Seeding will be done with appropriate species of grass (i.e., hard or sheep fescue or Perennial Rye grass depending on the date of planting) and seeding rates (See Table 3.2-1 of the Standards).

Mulching - All areas receiving temporary or permanent seeding will be mulched with an organic material to prevent erosion by protecting the soil surface from raindrop impact and reducing the velocity of overland flow.

Top Soiling - Areas which have soil types that cannot support vegetation even after fertilization will be amended with top soil. The top soil will improve the soil medium for plant establishment and maintenance.

3.7.2 Management Strategies

1. Unstabilized, disturbed areas will be minimized and construction activities will be staged.

2. Seeding or other stabilization measures will follow immediately after grading.

3. Areas which are not to be disturbed will be clearly marked by flags, signs, etc.

4. The construction superintendent will be responsible for ensuring the installation and maintenance of all erosion and sediment control practices.

5. Erosion and sediment control structures will be installed and/or constructed prior to the start of any earth disturbing activities.

6. Erosion and sediment control structures will remain in place until permanent vegetation has become established over disturbed surfaces.

7. Permanent detention basins will remain in place and will be maintained for the life of the cap.

3.8 PERMANENT STABILIZATION

All areas disturbed by the remedial action will be stabilized with permanent seeding following final grading. Seeding will be done with appropriate species of grass (See Table 3.2-1 of the Standards).

In order to improve the soil texture and decrease the potential for erosion, the channels on the northern and southern boundaries of the landfill will be topsoiled prior to permanent stabilization via seeding. The remaining channel sections will be vegetated over the existing soils assumed to be sand. The diversion ditch to be installed at the southwest corner of the site will be lined with 10 inches of riprap for permanent stabilization. See Appendix E for channel and ditch lining design calculations.

3.9 STORMWATER RUNOFF CONSIDERATIONS

Calculations were performed to determine the peak stormwater discharge rates for each drainage area covering Site 5 for three scenarios: Pre-Construction, During Construction, and Post-Construction. Runoff calculations for the 2-, 10-, and 25-year, 24-hour, Type III storms were performed for each drainage area and scenario. This range of storms covers the range of criteria required to design the various soil erosion and sediment control structures for this project. Runoff calculations for Site 5 are included in Appendix B and the results are summarized in more detail below in Section 3.10.

Calculations were performed using Quick TR-55™ by Haestad Methods, Inc. The software utilizes the identical procedures provided in the Soil Conservation Service's (SCS) Technical Release 55 (TR-55). TR-55 is recommended in the *Standards for Soil Erosion and Sediment Control in New Jersey* as an appropriate method for estimating peak discharge rates for small, urban watersheds.

Based on the existing topography there are 3 drainage areas for Site 5. Two of the drainage areas discharge offsite toward the west. The topography for the other drainage area indicates that water from this area drains to a depression and the water infiltrates to the underlying aquifer. After regrading of the waste and cap construction are complete, there will still be three drainage areas, but they will be different in configuration, size and for one area, its point of discharge compared to the existing conditions. The two points of discharge to the west of the site will remain the same before and after construction. A new point of discharge will exist to the east after construction. The drainage areas delineated for each scenario are provided on figures included in Appendix B.

Calculations for the Pre-Construction scenario were completed to determine baseline flow rates from each drainage area under their current conditions. Peak discharge rates for the During Construction scenario were necessary to determine the capacity of the sediment basins that will be in operation during construction. Peak stormwater runoff rates and erosion potential are generally highest for this scenario because the entire site was assumed to be cleared and grubbed. After construction of the landfill, the site will be typically be restored to a grassed, pervious condition, except in the vicinity of the skeet range which will be paved. The calculated storm water discharge rates for each drainage basin for this scenario exceeded the Pre-Construction rates which indicates that permanent stormwater management structures are required. These stormwater management structures were designed for a 25-year, 24-hour, Type III storm which is the required storm event for designing landfill stormwater management structures.

3.10 CALCULATIONS

Runoff calculations for each Site 5 drainage area and scenario discussed above are summarized in Appendices B.5, B.6 and B.7. A summary of calculated peak discharge rates is provided in Appendix B.1. All assumptions made during the calculations are provided on the calculation sheets.

For the 2 to 25-year storm events, the calculated discharge rates range from 1 to 12 cubic feet per second (cfs) for the Pre-Construction scenario, from 3 to 35 cfs for the During-Construction scenario, and from 3 to 23 cfs for the Post-Construction Scenario. Because of the size of the areas to be disturbed during construction, it was determined that sediment basins in conjunction with silt fence are necessary for each Site 5 drainage area to control soil erosion and loss. In addition, because the peak discharge rates from each area increased between the Pre- and Post-Construction scenarios, permanent stormwater management structures (i.e., detention basins) are required for each area.

The calculations completed to determine the size and capacity of the temporary sediment basins and the permanent detention basins required for Site 5 are included in Appendix D. For simplicity and to be conservative, only one size of basin was designed for each drainage area. The capacity of each basin is large enough to accommodate sediment and storm water for the During-Construction scenario and to store the required excess storm water runoff from the Post-Construction scenario. The dimensions of each basin are shown on the drawings.

Storm hydrographs were routed through each of the detention basins. For each of the detention basins, the peak post-development peak outflow was less than the peak discharge for the 2, 10, and 25-year storm events. The peak elevation for each event did not overtop any of the detention basins. All post-development runoff will be routed through a detention basin. Therefore, there will be no undetained flow.

3.11 MAINTENANCE

In general, all erosion and sediment control measures will be checked daily and after each significant rainfall event. Any required repairs will be made immediately. The following items will be checked in particular:

- The stone construction entrance will be maintained in a condition which will minimize tracking of sediment onto roads, including the addition of stone or other repairs.

- The silt fence will be checked regularly for undermining or deterioration of the fabric. Sediment will be removed when the level of sediment deposition reaches half of the height of the fabric.

- The sediment basins have been designed to contain the sediment erosion expected through the six-month construction process and to accommodate the runoff from a 2-yr storm event. Therefore, no maintenance of the sediment basins is expected.

- The seeded areas will be checked regularly to ensure that a good stand is maintained. Areas shall be fertilized, re-top soiled and re-seeded as needed. The RAC is responsible for maintenance until formal acceptance by the Contracting Officer.

- The permanent detention basins will require long-term inspection and maintenance. They should be inspected on a regular cycle and repaired as necessary. The RAC is responsible for maintenance until formal acceptance by the Contracting Officer.

3.12 SEQUENCE OF CONSTRUCTION

The proposed sequence of construction events are as follows. Throughout all construction events, the temporary and permanent controls shall be routinely inspected and properly maintained.

1. Construct the rock entrance from the access road to the site and a decontamination pad.

2. Construct the perimeter soil erosion and sediment control devices (i.e., silt fence).

3. Clear and grub a pathway to the proposed areas of the three sediment basins. The pathway will follow along and include the area of the proposed surface water channels.

4. Construct the sediment basins and surface water interception channel in the locations shown on the Site 5 Soil Erosion and Sediment Plan in accordance with the applicable details.

5. Construct temporary diversion berms to direct stormwater to the sediment basins.

6. Clear and grub the remainder of the site, taking care not to work beyond the limits of work shown on the plans.

7. Excavate waste outside the planned perimeter of the landfill cap and consolidate within the footprint of the cap. Stabilize excavated areas with permanent vegetative cover.

8. Regrade waste and reestablish temporary diversion berms as necessary to direct stormwater to the sediment basins.

9. Clean out sediment basins, if necessary, and distribute sediment over regraded waste.

10. Construct landfill cap, the roadways over the cap and the necessary culverts for the roadways.

11. Pave the skeet range.

12. Spread topsoil to bring the site to final grade. Sediment that collected against the silt fence or in the sediment basins during backfilling and capping operations is clean material and is to be distributed evenly over remaining disturbed areas prior to final stabilization.

13. Seed and mulch the site.

14. Convert sediment basins into permanent detention basins.

15. After vegetation/permanent stabilization is established, remove all temporary soil erosion and sediment control measures.

4.0 CONCLUSIONS

4.1 SITE 4 CONCLUSIONS

The following items summarize the soil erosion and sediment control measures that are required for Site 4 during the construction and after the construction of the cap. The limitations of the plan are also noted.

- Silt fence will be installed between the two sediment basins along the southeast boundary of the limit of work during construction activities. The fence will serve to collect sediment that is not redirected by the diversion.

- Silt fence will be installed to the south of limit of work in the southwest corner of the landfill during construction activities.

- An upgradient surface water drainage channel will be installed to eliminate surface water runon to the cap from adjacent areas and to convey surface water runoff from the cap to the appropriate sediment basin. Critical sections of this channel will be lined with a geotextile fabric and riprap to protect the soil surface of the channel.

- The permanent diversion (bench) installed midway down the southeast slope of the final landfill cap will serve as an adequate permanent erosion and sediment control device.

- Sediment basins will be used to minimize offsite sediment transport during construction activities. The size of the sediment basins will adequately trap sediment erosion expected during the 6-month construction period. Additionally, the basins have adequate size to detain peak run-off during a 2-year, 24-hour, Type III storm event.

- Site 4 post-development runoff will be less than pre-development runoff. Hence, a permanent detention basin will not be constructed.

4.2 SITE 5 CONCLUSIONS

The following items summarize the soil erosion and sediment control measures that are required for Site 5 during the construction and after the construction of the cap. The limitations of the plan are also noted.

- Silt fence is required along the outside of the limit of work in areas where surface water runoff exits the site.

- An upgradient surface water interceptor trench will be installed to eliminate surface water runon to the cap from adjacent areas and to convey surface water runoff from the cap to the appropriate sediment/detention basin. Temporary diversion ditches may be required to direct surface water to the sediment basins during construction. Design calculations for ditch and channel linings, given the hydraulic conditions, are provided in Appendix E. The permanent diversion ditch routing flow around the detention basin near the southwest corner of the landfill will be lined with 10 inches of riprap stone. All other drainage ditches will be vegetated.

- Due to the size of the areas to be cleared and grubbed at one time, three sediment basins are required during construction activities at Site 5.

- Because of the changes to the cover material during construction of the cap at the site, peak stormwater discharge rates will increase. Therefore, permanent stormwater management devices (i.e., detention basins) are required and are incorporated into the design. The detention basins reduce the post-development peak discharge below pre-development conditions.

- The configuration of each of the basins are shown on the construction drawings.

REFERENCES

U.S. Department of Agriculture, Soil Conservation Service, 1986. "Technical Release 55 - Urban Hydrology for Small Watersheds."

New Jersey State Soil Conservation Committee and the New Jersey Department of Agriculture, Division of Rural Resources, 1987. "Standards for Soil Erosion and Sediment Control in New Jersey."

U.S. Department of Agriculture, Soil Conservation Service, 1989. "Soil Survey of Monmouth County."

Haestad Methods, Inc., 1989. "Quick TR-55, Urban Hydrology for Small Watersheds."

APPENDIX A

NEW JERSEY GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL

GUIDELINES

FOR SOIL EROSION AND SEDIMENT CONTROL

Effective soil erosion and sediment control planning requires careful evaluation of the following factors prior to developing the plans for the specific site. The key planning objective is to retain soil on the site and minimize delivery of sediment offsite:

I. Factors to be considered in planning:

a. erodibility of soils - information on soils characteristics may be found in the USDA "Soil Survey" available for most counties.
b. existing drainage patterns.
c. presence of steep slopes, stream corridors and other critical site factors.
d. quality of existing vegetation to act as a buffer during construction.
e. minimum area to be cleared.
f. protection of roadway access points from tracking sediments.
g. need for protecting conduit outlets with riprap.
h. stabilization of excess excavated materials to be deposited offsite.

When considering offsite impacts of the proposed project it must be demonstrated by an offsite stability analysis that a stable condition exists at all points of water discharge for the 2 and 10 year design storm. If the existing offsite conditions are currently unstable it must be demonstrated that the project will not aggravate such conditions. Where Infiltration Basins are proposed for stormwater management, a stable emergency discharge area must be provided.

II. Factors to be considered in erosion control plan design -

a. the grades, maximum slope and maximum area to be disturbed at one time should be based on:

1. soil erodibility
2. geology
3. rainfall data
4. proposed establishment of vegetation
5. proposed maintenance

b. the sequence of construction and the installation of erosion controls including:

1. site clearing
2. topsoil stripping
3. interim control installation
4. construction of structures/project phase
5. maintenance of controls, etc.

c. controls designed to achieve the following:

1. interception of runoff from long, sloping sites and delivery to stable area
2. stabilization by use of temporary vegetation
3. sediment filtration via preserving buffer strips
4. stabilized stockpiled soil
5. control soil losses at
   i. driveway entrances/exists
   ii. streams, rivers, natural drainage ways
   iii. large, cleared areas subject to wind erosion

III. Factors to be considered during construction:

a. implementation of erosion control plans in a timely manner
b. careful adherence to the construction sequence
c. frequent inspection and maintenance of erosion controls
d. timely removal of sediment from basins, removal of temporary structural controls and installation of permanent vegetation at project completion.

APPENDIX B

CALCULATIONS TO ESTIMATE STORM WATER RUNOFF RATES FROM SITES 4 AND 5

B.1 Preliminary Information for Sites 4 and 5

B.2 Pre-Construction Conditions for Site 4

B.3 During Construction Conditions for Site 4

B.4 Post-Construction Conditions for Site 4

B.5 Pre-Construction Conditions for Site 5

B.6 During Construction Conditions for Site 5

B.7 Post-Construction Conditions for Site 5

B.1 PRELIMINARY INFORMATION FOR SITES 4 AND 5

CALCULATION WORKSHEET Order No. 19116 (91-91)

PAGE ____ OF ____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

B-1

SITES 4 AND 5

PRELIMINARY INFORMATION

- OBJECTIVE
- APPROACH
- ASSUMPTIONS
- REFERENCES
- EXECUTIVE SUMMARY
- ESTIMATE OF SOIL TYPE & SCS HSG
- ESTIMATE OF RAINFALL DISTRIBUTION AND PRECIPITATION AMOUNTS

CLIENT	JOB NUMBER
NWSE - SITES 4 AND 5	7602/0104

SUBJECT: ESTIMATION OF PEAK DISCHARGE RATES

BASED ON	DRAWING NUMBER
TR-55 / TOPO	

BY	CHECKED BY	APPROVED BY	DATE
CAR 8/24/97	JJB 8/26/97		

OBJECTIVE:

THE PURPOSE FOR COMPLETING THE FOLLOWING CALCULATIONS IS TO EVALUATE PRE-, DURING-, AND POST-CONSTRUCTION CONDITIONS AT SITES 4 AND 5 SO THAT PROPER EROSION AND SEDIMENT CONTROL PLANS CAN BE DEVELOPED FOR EACH SITE. THE PRIMARY GOAL OF THE CALCULATIONS IS TO ESTIMATE THE PEAK DISCHARGE RATES FROM INDIVIDUAL DRAINAGE AREAS AT SITES 4 AND 5. THE 1987 STANDARDS FOR SOIL EROSION AND SEDIMENT CONTROL IN NEW JERSEY (NJ) BY THE NJ STATE SOIL CONSERVATION COMMITTEE AND THE DIVISION OF RURAL RESOURCES NJ DEPT. OF AGRICULTURE. WILL BE USED.

APPROACH:

USE THE METHOD SPECIFIED IN THE SOIL CONSERVATION SERVICE'S TECHNICAL RELEASE 55 (TR-55), "URBAN HYDROLOGY FOR SMALL WATERSHEDS" JUNE 1986 TO ESTIMATE THE PEAK DISCHARGE RATES FROM THE INDIVIDUAL DRAINAGE AREAS AT SITES 4 AND 5. THIS METHOD IS APPLICABLE TO SMALL WATERSHEDS SUCH AS THOSE FOUND AT SITES 4 AND 5. IT USES SIMPLIFIED PROCEDURES FOR ESTIMATING RUNOFF AND PEAK DISCHARGES IN SMALL WATERSHEDS. THE METHOD INCLUDES THE FOLLOWING STEPS: (1) DETERMINE SOIL TYPE; (2) ESTIMATE BOUNDARIES AND SIZES OF EACH DRAINAGE AREA; (3) DETERMINE COVER TYPE AND AREAL COVERAGE; (4) DETERMINE WEIGHTED CURVE NUMBERS ($\overline{CN}$); (5) ESTIMATE TIME OF CONCENTRATIONS (T_c); (6) ESTIMATE STORM-SPECIFIC 24-HOUR RAINFALL AMOUNTS; AND (7) ESTIMATE

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT	JOB NUMBER
NWSE - SITES 4 AND 5	7602/0104

SUBJECT: ESTIMATION OF PEAK DISCHARGE RATES

BASED ON	DRAWING NUMBER
TR-55 / TOPO	

BY	CHECKED BY	APPROVED BY	DATE
CAR 8/24/97	8/26/97		

PEAK DISCHARGE BY GRAPHICAL PEAK DISCHARGE METHOD.

ASSUMPTIONS:

- THE METHODS AND ASSUMPTIONS USED TO DEVELOP TR-55 ARE APPROPRIATE FOR THESE CALCULATIONS.

- 3 DESIGN STORMS WILL BE EVALUATED, THE 2-YR, 10-YR AND 25-YR. THESE STORMS WERE SELECTED BECAUSE OF THE DESIGN REQUIREMENTS SPECIFIED BY NJ REGS. FOR TEMPORARY AND PERMANENT EROSION AND SEDIMENT CONTROL STRUCTURES AND DETENSION BASINS.

- THE LIMITS OF THE EXISTING TOPOGRAPHY PROVIDE SUFFICIENT COVERAGE OF SITES 4 AND 5 TO ESTIMATE UNIQUE DRAINGE AREAS. AREAS OUTSIDE OF THESE LIMITS WERE NOT CONSIDERED TO CONTRIBUTE RUNOFF TO THE ONSITE DRAINAGE AREAS. RUNOFF FROM THESE OFF SITE AREAS WILL BE DIVERTED AROUND SEDIMENT/DETENSION BASINS.

- HAESTAD'S QUICK TR-55 COPYRIGHT © 1989 WILL BE USED IN LIEU OF MANUAL CALCULATIONS. THIS PROGRAM USES THE SAME EQUATIONS PROVIDED IN THE SCS TR-55 MANUAL.

- SITES 4 AND 5 ARE LOCATED IN MONMOUTH COUNTY NEW JERSEY.

- THE LOCATION OF SITE 4 FALLS WITHIN THE BOUNDARY OF THE MARLBORO USGS QUANDRANGLE.

CLIENT NWSE - SITES 4 AND 5	JOB NUMBER 7602/0104
SUBJECT ESTIMATION OF PEAK DISCHARGE RATES	
BASED ON TR-55 / TOPO	DRAWING NUMBER
BY CAR / CHECKED BY JJB 8/26/97	APPROVED BY / DATE

ASSUMPTIONS (CONT'D)

- THE LOCATION OF SITE 5 FALLS WITHIN THE BOUNDARY OF THE LONG BRANCH USGS QUADRANGLE.

- BASED ON TOPOGRAPHY SHOWN ON MARLBORO QUAD, SITE 4 FALLS WITHIN TWO MAJOR DRAINAGE BASINS. THESE BASINS ARE THE HOCKHOCKSON BROOK AND THE MINGAMAHONE BROOK. A MAJORITY OF THE SITE IS LOCATED IN THE HOCKHOCKSON BROOK DRAINAGE BASIN.

- BASED ON TOPOGRAPHY SHOWN ON LONG BRANCH QUAD, SITE 5 FALLS WITHIN, BUT CLOSE TO THE BOUNDARY OF, THE PINE BROOK DRAINAGE BASIN.

REFERENCES:

- HAESTAD METHODS, DECEMBER 1989, "QUICK TR-55, URBAN HYDROLOGY FOR SMALL WATERSHEDS."

- NEW JERSEY STATE SOIL CONSERVATION COMMITTEE AND THE DIVISION OF RURAL RESOURCES NEW JERSEY DEPT. OF AGRICULTURE, 1987, "STANDARDS FOR SOIL EROSION AND SEDIMENT CONTROL IN NEW JERSEY."

- SOIL CONSERVATION SERVICE, JUNE 1986, "TECHNICAL RELEASE 55 - URBAN HYDROLOGY FOR SMALL WATERSHEDS," US DEPT. OF AGRICULTURE.

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NWSE - SITES 4 AND 5	JOB NUMBER: 7602/0104
SUBJECT: ESTIMATION OF PEAK DISCHARGE RATES	
BASED ON: TR-55 / TOPO	DRAWING NUMBER:
BY: CAR 8/29/97 / CHECKED BY: JJB 8/26/97	APPROVED BY: / DATE:

EXECUTIVE SUMMARY OF CALCULATIONS:

SITE 4:

SCENARIO	DRAINAGE AREA	STORM (YR) FREQUENCY	RAINFALL (IN)	RUNOFF (IN)	PEAK DISCHARGE (CFS)
PRE-CONSTRUCTION	1	2	3.4	0.57	3
		10	5.2	1.56	8
		25	6.0	2.09	12
	2	2	3.4	0.61	1
		10	5.2	1.64	4
		25	6.0	2.18	5
DURING-CONSTRUCTION	1	2	3.4	0.95	5
		10	5.2	2.19	13
		25	6.0	2.81	17
	2	2	3.4	0.84	2
		10	5.2	2.02	5
		25	6.0	2.62	6
	3	2	3.4	0.70	0
		10	5.2	1.79	1
		25	6.0	2.35	2
POST-CONSTRUCTION	1	2	3.4	0.49	2
		10	5.2	1.42	8
		25	6.0	1.92	11
	2	2	3.4	0.57	1
		10	5.2	1.56	4
		25	6.0	2.09	5

CALCULATION WORKSHEET Order No. 19116 (91-01)

CLIENT: NWSE - SITES 4 AND 5	JOB NUMBER: 7602/0104
SUBJECT: ESTIMATION OF PEAK DISCHARGE RATES	
BASED ON: TR-55 / TOPO	DRAWING NUMBER:
BY: CAR 8/24/97 — CHECKED BY: JJB 8/27/97	APPROVED BY: — DATE:

SITE 5:

SCENARIO	DRAINAGE AREA	STORM (YR) FREQUENCY	RAINFALL (IN)	RUNOFF (IN)	PEAK DISCHARGE (CFS)
PRE-CONSTRUCTION	1	2	3.4	0.53	2
		10	5.2	1.49	7
		25	6.0	2.01	9
	2	2	3.4	0.75	3
		10	5.2	1.87	9
		25	6.0	2.44	12
	3	2	3.4	0.49	1
		10	5.2	1.42	4
		25	6.0	1.92	6
DURING-CONSTRUCTION	1	2	3.4	1.49	14
		10	5.2	2.97	28
		25	6.0	3.68	35
	2	2	3.4	1.49	3
		10	5.2	2.97	6
		25	6.0	3.68	7
	3	2	3.4	1.23	6
		10	5.2	2.61	12
		25	6.0	3.28	16
POST-CONSTRUCTION	1	2	3.4	0.70	6
		10	5.2	1.79	17
		25	6.0	2.35	23
	2	2	3.4	1.56	3
		10	5.2	3.07	5
		25	6.0	3.78	7
	3	2	3.4	0.95	4
		10	5.2	2.27	10
		25	6.0	2.90	13

NOTE: BOUNDARIES OF DRAINAGE AREAS CHANGED FROM PRE-CONSTRUCTION AND DURING / POST CONSTRUCTION.

CALCULATION WORKSHEET Order No. 19116 (01-91)

PAGE ____ OF ____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

ESTIMATE SOIL TYPES AND
SCS HYDROLOGIC SOIL GROUPS
FOR SITES 4 AND 5

CLIENT NWSE - NAVY CLEAN	JOB NUMBER 7602/0104
SUBJECT SITES 4 & 5 SOIL TYPES	
BASED ON SOIL SURVEY - MONMOUTH COUNTY	DRAWING NUMBER
BY CAR 7/22/97 / CHECKED BY JJB 8/7/97	APPROVED BY / DATE

PURPOSE:

DETERMINE THE SOIL TYPES AT SITES 4 & 5. USE THE SOIL SURVEY OF MONMOUTH COUNTY, APRIL 1989 VERSION. COPIES OF THE APPROPRIATE FIGURES FROM THE SURVEY ARE ATTACHED (SEE pp. 2-13)

① SITE 4

USING FIGURES 1-1 AND 1-2 FROM THE FS, THE LOCATION OF SITE 4 WAS APPROXIMATED ON THE APPROPRIATE FIGURES FROM THE SOIL SURVEY (SEE p. 4 of 14; p. 5 of 14; & p. 7 of 14)

SITE 4 SOIL TYPE IS PT (SEE p. 7 of 14)
FROM THE SOIL LEGEND: PT = PITS; SAND AND GRAVEL
(SEE p. 6 of 14 AND p. 13 of 14)

② SITE 5

USING FIGURES 1-1 AND 1-3 FROM THE FS, THE LOCATION OF SITE 5 WAS APPROXIMATED ON THE APPROPRIATE FIGURES FROM THE SOIL SURVEY (SEE p. 4 of 14; p. 5 of 14; AND p. 7 of 14)

SITE 5 SOIL TYPES INCLUDE LeB, KeB, LaA AND At (SEE p. 7 of 14).

FROM THE SOIL LEGEND:

LeB = Lakewood Sand, 0 to 5 percent slopes (p. 6 of 14; p. 11 of 14; AND p. 12 of 14)
KeB = Keyport Sandy loam, 2 to 5 percent slopes (p. 6 of 14; p. 10 of 14; AND p. 11 of 14).
LaA = Lakehurst Sand, 0 to 2 percent slopes (p. 6 of 14; p. 11 of 14)
At = Atsion Sand (p. 6 of 14; p. 8 of 14 AND p. 9 of 1[illegible])

United States
Department of
Agriculture

Soil
Conservation
Service

In cooperation with
New Jersey Agricultural
Experiment Station, Cook
College, Rutgers, The State
University; and the New
Jersey Department of
Agriculture, State Soil
Conservation Committee

Soil Survey of Monmouth County New Jersey

USDA, Soil Conservation Service
77 - 55 Schanck Road
Suite B-11
Freehold, NJ 07728

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LEGEND

1 — KLEJ-KEYPORT-URBAN LAND: Nearly level to moderately steep, deep, somewhat poorly drained and moderately well drained, sandy and clayey soils and Urban land, on uplands

2 — EVESBORO-KLEJ: Nearly level to steep, deep, excessively drained, moderately well drained, and somewhat poorly drained, sandy soils; on uplands

3 — FREEHOLD-URBAN LAND-COLLINGTON: Nearly level to moderately steep, deep, well drained, loamy soils and Urban land; on uplands

4 — SASSAFRAS-DOWNER-WOODSTOWN: Nearly level to steep, deep, well drained and moderately well drained, loamy soils; on uplands

5 — LAKEWOOD-LAKEHURST-EVESBORO-KLEJ: Nearly level to moderately sloping, deep, excessively drained, moderately well drained, and somewhat poorly drained, sandy soils; on uplands

6 — ATSION: Nearly level, deep, poorly drained, sandy soils; on upland flats

7 — SULFAQUENTS SULFIHEMISTS HOOKSAN: Nearly level and gently sloping, deep, poorly drained, very poorly drained, and excessively drained, mucky and sandy soils, on coastal dunes and on tidal flats

8 — HUMAQUEPTS, FREQUENTLY FLOODED MANAHAWKIN: Nearly level, deep, somewhat poorly drained to very poorly drained, mucky and sandy soils, on flood plains and on low lands

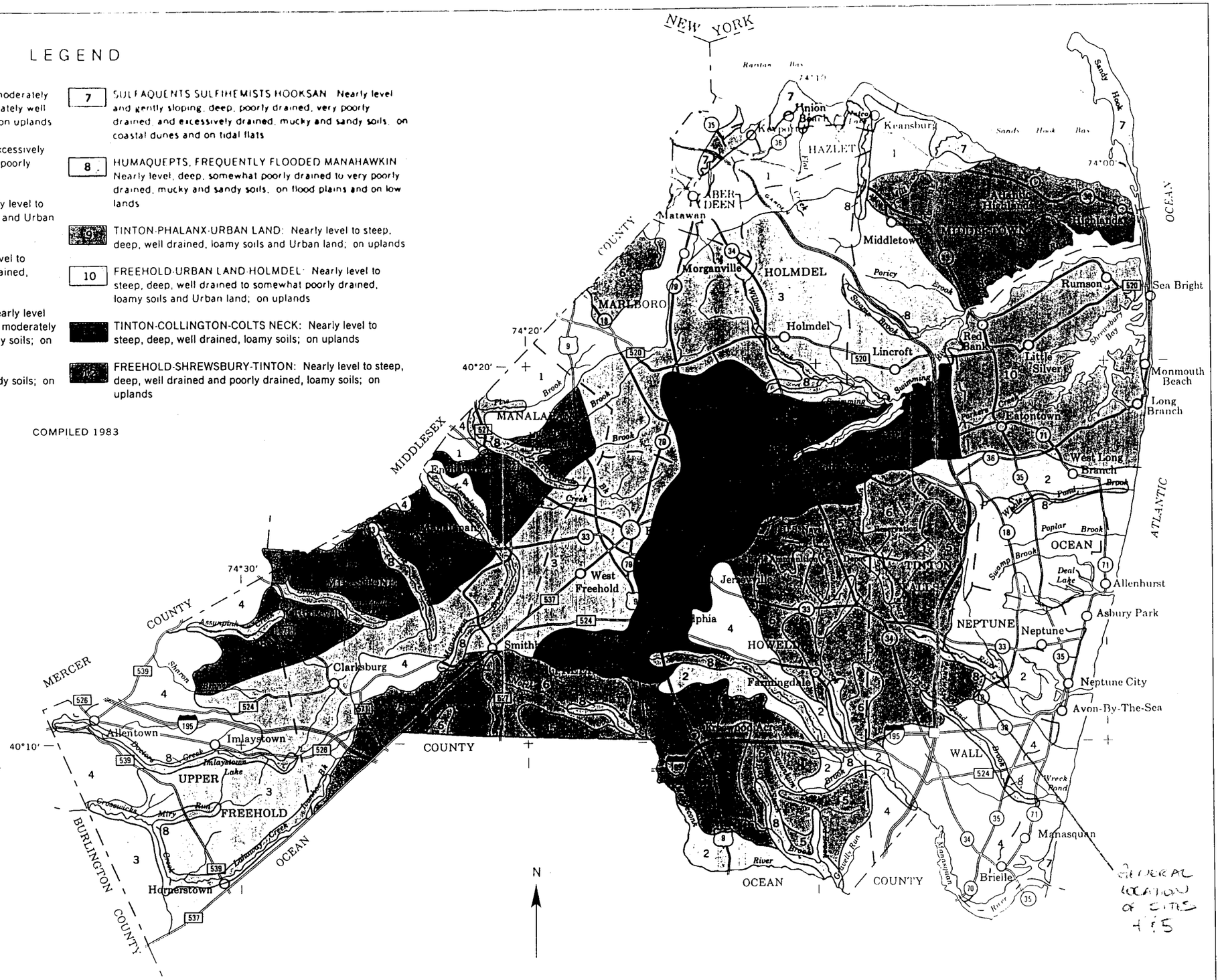
9 — TINTON-PHALANX-URBAN LAND: Nearly level to steep, deep, well drained, loamy soils and Urban land; on uplands

10 — FREEHOLD-URBAN LAND-HOLMDEL: Nearly level to steep, deep, well drained to somewhat poorly drained, loamy soils and Urban land; on uplands

TINTON-COLLINGTON-COLTS NECK: Nearly level to steep, deep, well drained, loamy soils; on uplands

FREEHOLD-SHREWSBURY-TINTON: Nearly level to steep, deep, well drained and poorly drained, loamy soils; on uplands

COMPILED 1983



U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
NEW JERSEY AGRICULTURAL EXPERIMENT STATION
COOK COLLEGE, RUTGERS AND THE STATE UNIVERSITY
THE NEW JERSEY DEPARTMENT OF AGRICULTURE,
STATE SOIL CONSERVATION COMMITTEE

GENERAL SOIL MAP

MONMOUTH COUNTY, NEW JERSEY

Scale 1:190,080

1 0 1 2 3 Miles

1 0 3 6 Km

Each area outlined on this map consists of more than one kind of soil. The map is thus useful for general planning rather than a basis for decisions on the use of specific tracts.

GENERAL LOCATION OF SITES 4 & 5

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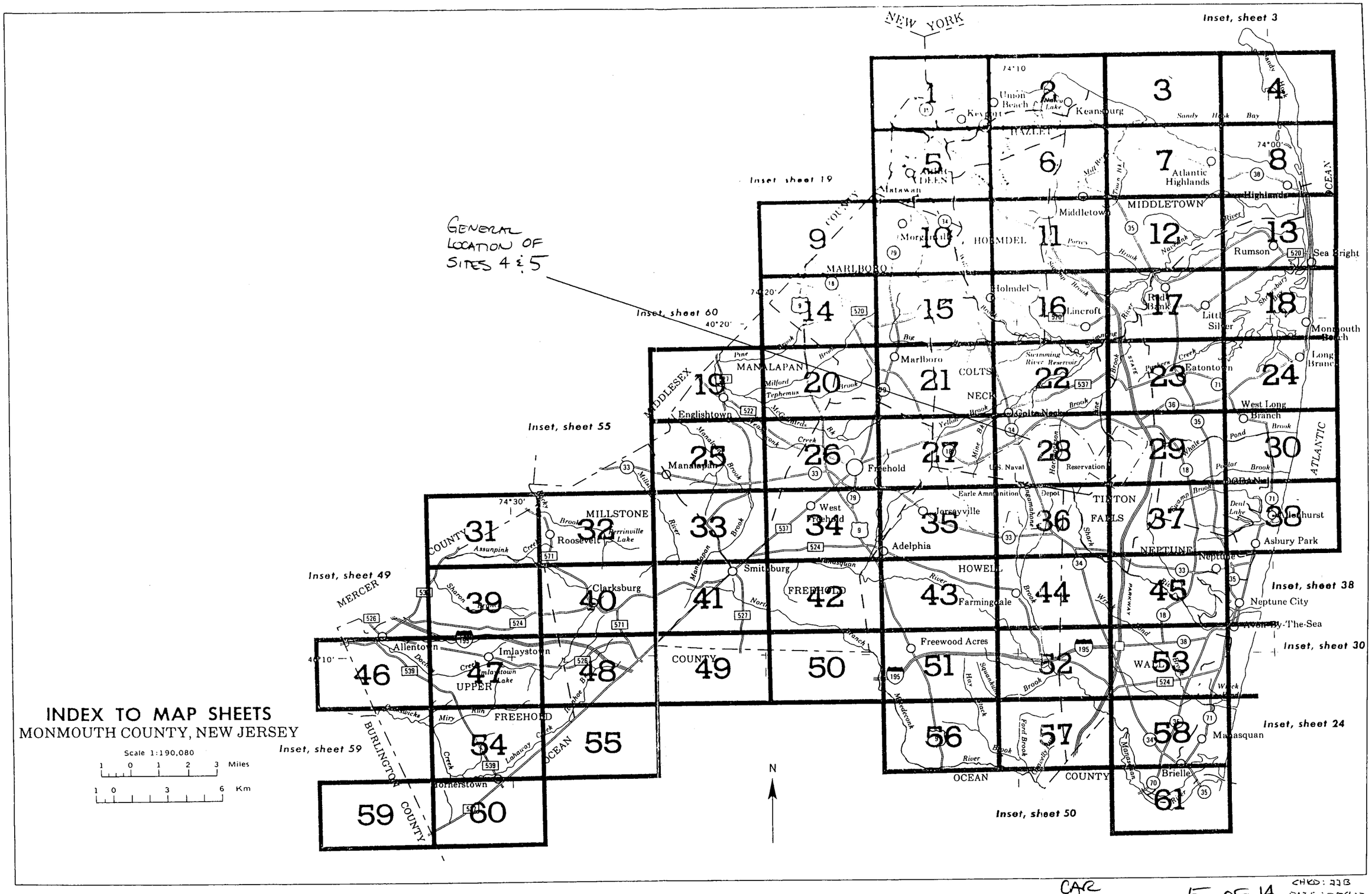

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SOIL LEGEND

Publication symbols consist of letters or a combination of letters and numbers. The initial two letters represent the kind of soil. A capital letter of A, B, C, D or E following the first two letters indicates the class of slope. Symbols without a slope letter are for nearly level soils, soils named for higher categories or for miscellaneous areas. A number following the letter represents an eroded phase.

SYMBOL	NAME
AeA	Adelphia loam, 0 to 2 percent slopes
AeB	Adelphia loam, 2 to 5 percent slopes
ALA	Adelphia loam - Urban land complex, 0 to 5 percent slopes
At	Atsion sand
Cm	Colemantown loam
CnB	Collington sandy loam, 2 to 5 percent slopes
CnC2	Collington sandy loam, 5 to 10 percent slopes, eroded
CnD3	Collington sandy loam, 10 to 15 percent slopes, severely eroded
CoA	Collington loam, 0 to 2 percent slopes
CRB	Collington sandy loam - Urban land complex, 0 to 10 percent slopes
CtB	Colts Neck sandy loam, 2 to 5 percent slopes
CtC	Colts Neck sandy loam, 5 to 10 percent slopes
CtC2	Colts Neck sandy loam, 5 to 10 percent slopes, eroded
CtD2	Colts Neck sandy loam, 10 to 15 percent slopes, eroded
CtE2	Colts Neck sandy loam, 15 to 25 percent slopes, eroded
DnA	Downer loamy sand, 0 to 5 percent slopes
DnC	Downer loamy sand, 5 to 10 percent slopes
DoA	Downer sandy loam, 0 to 2 percent slopes
DoB	Downer sandy loam, 2 to 5 percent slopes
DUB	Downer sandy loam - Urban land complex, 0 to 10 percent slopes
En	Elkton loam
EvB	Evesboro sand, 2 to 5 percent slopes
EvC	Evesboro sand, 5 to 10 percent slopes
EvD	Evesboro sand, 10 to 15 percent slopes
EvE	Evesboro sand, 15 to 25 percent slopes
EWB	Evesboro sand - Urban land complex, 0 to 10 percent slopes
Fb	Fallsington loam
FnA	Freehold loamy sand, 0 to 5 percent slopes
FnC	Freehold loamy sand, 5 to 10 percent slopes
FrB	Freehold sandy loam, 2 to 5 percent slopes
FrC	Freehold sandy loam, 5 to 10 percent slopes
FrC2	Freehold sandy loam, 5 to 10 percent slopes, eroded
FrD	Freehold sandy loam, 10 to 15 percent slopes
FrD2	Freehold sandy loam, 10 to 15 percent slopes, eroded
FrE2	Freehold sandy loam, 15 to 25 percent slopes, eroded
FsA	Freehold loam, 0 to 2 percent slopes
FUB	Freehold sandy loam - Urban land complex, 0 to 10 percent slopes
HaB	Hammonton loamy sand, 0 to 3 percent slopes
HbA	Hammonton sandy loam, 0 to 2 percent slopes
HbB	Hammonton sandy loam, 2 to 5 percent slopes
HLA	Hammonton sandy loam - Urban land complex, 0 to 3 percent slopes
HnA	Holmdel sandy loam, 0 to 2 percent slopes
HnB	Holmdel sandy loam, 2 to 5 percent slopes
HUA	Holmdel sandy loam - Urban land complex, 0 to 5 percent slopes
HwB	Hooksan sand, 0 to 5 percent slopes
HxA	Hooksan Variant sand, 0 to 2 percent slopes
HV	Humaquepts, frequently flooded
KeA	Keyport sandy loam, 0 to 2 percent slopes
KeB	Keyport sandy loam, 2 to 5 percent slopes
KeC	Keyport sandy loam, 5 to 10 percent slopes
KeD	Keyport sandy loam, 10 to 15 percent slopes
KGB	Keyport sandy loam - Urban land complex, 0 to 10 percent slopes
KlA	Klej loamy sand, 0 to 3 percent slopes
KmB	Klej loamy sand, clayey substratum, 0 to 5 percent slopes
KUA	Klej loamy sand - Urban land complex, 0 to 3 percent slopes
KvA	Kresson loam, 0 to 5 percent slopes
LaA	Lakehurst sand, 0 to 2 percent slopes
LeB	Lakewood sand, 0 to 5 percent slopes
LeC	Lakewood sand, 5 to 10 percent slopes
Ma	Manahawkin muck
MtC	Marlton sandy loam, 5 to 10 percent slopes
MtB	Marlton loam, 2 to 5 percent slopes
PeA	Pemberton loamy sand, 0 to 5 percent slopes
PhB	Phalanx loamy sand, 0 to 10 percent slopes
PhD	Phalanx loamy sand, 10 to 25 percent slopes
PT	Pits, sand and gravel
PW	Psamments, waste substratum
SaB	Sassafras sandy loam, 2 to 5 percent slopes
SaC	Sassafras sandy loam, 5 to 10 percent slopes
SaD	Sassafras sandy loam, 10 to 15 percent slopes
SaE	Sassafras sandy loam, 15 to 25 percent slopes
SgB	Sassafras gravelly sandy loam, 2 to 5 percent slopes
SgC	Sassafras gravelly sandy loam, 5 to 10 percent slopes
SlA	Sassafras loam, 0 to 2 percent slopes
Sn	Shrewsbury sandy loam
SS	Sulfaquents and Sulfihemists, frequently flooded
ToA	Tinton loamy sand, 0 to 5 percent slopes
ToC	Tinton loamy sand, 5 to 10 percent slopes
ToD	Tinton loamy sand, 10 to 25 percent slopes
TUB	Tinton loamy sand - Urban land complex, 0 to 5 percent slopes
UA	Udorthents, smoothed
UD	Udorthents - Urban land complex, 0 to 3 percent slopes
UL	Urban land
WnB	Woodstown sandy loam, 2 to 5 percent slopes
WoA	Woodstown loam, 0 to 2 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate
- Federal
- State
- County, farm or ranch

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label)
- Located object (label)
- Tank (label)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial
- Intermittent

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown)

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot

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CHKD: JJB 8/26/97

MONMOUTH COUNTY, NEW JERSEY — SHEET NUMBER 28

BY: CAR 7/22/97 7 OF 14
CHKD: JJB 8/12/97

swales, and on low divides. Areas of the soil are irregular in shape and typically range from 10 to 50 acres in size.

Typically, the surface layer is very dark grayish brown loam 8 inches thick. The subsoil is 30 inches thick. It is strong brown sandy clay loam to a depth of 31 inches. Below that, it is mottled, strong brown sandy loam to a depth of 38 inches. The substratum extends to a depth of 60 inches or more. It is mottled, strong brown sandy loam that has thin lenses of sandy clay loam.

Included with this unit in mapping are Adelphia soils that have a sandy loam surface layer. This soil, which makes up a significant portion of the map unit, is similar to the Adelphia loam in use and management. Also included are areas of Holmdel and nearly level Adelphia soils. These soils, which make up about 45 percent of the unit, are similar to the gently sloping Adelphia loam in use and management. Also included are areas of Freehold, Collington, Marlton, and Shrewsbury soils. These soils, which make up as much as 15 percent of the unit, are dissimilar to the gently sloping Adelphia loam in use and management.

Permeability of the Adelphia soil is moderately slow or moderate in the subsoil and moderate or moderately rapid in the substratum. The available water capacity is high. The apparent seasonal high water table is at a depth of 1 1/2 to 4 feet from January to April. Runoff is medium. Erosion is a slight hazard. Organic matter content is moderate. In unlimed areas reaction is extremely acid or very strongly acid.

Most areas of this soil are farmed. A small acreage is used for pasture. A few acres is woodland.

This soil is suited to common field crops, hay, sod, and vegetables. The main limitation is the seasonal high water table. The main management concern is providing drainage. The seasonal high water table limits the soil for certain crops and restricts the time when the soils can be worked. Cover crops and crop residue management help to maintain soil tilth and organic matter content.

This soil is well suited to pasture. The major management practices are proper seeding, proper stocking, liming and fertilizing, and rotation grazing. In some wetter areas improved drainage is needed.

This soil is well suited to commercial woodland production. Potential productivity for northern red oak is moderately high. The common species are northern red oak, black oak, white oak, yellow poplar, sweetgum, and red maple. The wetter areas are dominated by sweetgum and red maple.

The main limitations to use of this soil as sites for dwellings and some other types of community development are the seasonal high water table, cutbanks caving, frost action potential, and shrinking and swelling.

This soil is in capability subclass IIw; the woodland ordination symbol is 4A.

ALA—Adelphia loam-Urban land complex, 0 to 5 percent slopes. This map unit consists of nearly level and gently sloping, moderately well drained and somewhat poorly drained Adelphia loam and Urban land. Areas of each are in such an intricate pattern that it was not practical to map them separately. The mapped areas are irregular in shape and typically range from 25 to 75 acres in size.

Adelphia loam makes up about 45 percent of each mapped area. Urban land makes up 30 percent, and other soils make up 25 percent.

Typically, the surface layer of the Adelphia soil is very dark grayish brown loam 8 inches thick. The subsoil is 30 inches thick. It is strong brown sandy clay loam to a depth of 31 inches. Below that, it is mottled, strong brown sandy loam to a depth of 38 inches. The substratum extends to a depth of 60 inches or more. It is mottled, strong brown sandy loam that has thin lenses of sandy clay loam.

Urban land unit consists of areas covered by impermeable surfaces, such as dwellings, roads and streets, shopping centers, parking lots, and industrial parks.

Included with this complex in mapping are areas of Adelphia soils that have a sandy loam surface layer and Holmdel soils. These soils are similar to the Adelphia loam in use and management. Also included are areas of Udorthents and Freehold, Collington, Marlton, and Shrewsbury soils. These soils are dissimilar to the Adelphia loam in use and management. The similar and dissimilar soils make up as much as 25 percent of the complex.

Permeability of the Adelphia soil is moderately slow or moderate in the subsoil and moderate or moderately rapid in the substratum. The available water capacity is high. The apparent seasonal high water table is at a depth of 1 1/2 to 4 feet from January to April.

The open areas of this map unit are used for lawns, vacant wooded lots, gardens, and small parks.

The main limitations to use of the Adelphia soil as sites for dwellings and some other types of community development are the seasonal high water table, cutbanks caving, frost action potential, and shrinking and swelling.

This map unit is not assigned to a capability subclass; the woodland ordination symbol is 4A.

At—Atsion sand. This is a nearly level, poorly drained soil in depressional areas and on broad flats. Areas of this soil are irregular in shape and typically range from 10 to 75 acres in size.

Typically, the surface layer is 8 inches thick. The uppermost 2 inches is matted, partly decomposed organic material and roots, and below that, it is black sand. The subsurface layer is grayish brown sand 14 inches thick. The subsoil is 18 inches thick. It is dark reddish brown loamy sand to a depth of 30 inches.

Below that, it is mottled, brown sand to a depth of 40 inches. The substratum is mottled, yellowish brown fine sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of Humaquepts and Manahawkin, Lakehurst, and Klej soils. Also included, in the vicinity of Holmeson and Turkey Swamp, are areas of soils that have a glaucontic substratum. These soils, which make up as much as 25 percent of the map unit, are dissimilar to the Atsion soil in use and management.

Permeability of the Atsion soil is moderately rapid or rapid in the subsoil and rapid in the substratum. The available water capacity is low. The apparent seasonal high water table is between the surface and a depth of 1 foot from November to June. Runoff is very slow. Erosion is a slight hazard. Organic matter content is moderate. In unlimed areas reaction is extremely acid or very strongly acid.

Most areas of this soil are wooded. A few acres is used for blueberries.

This soil is suited to specialty crops, such as blueberries. For blueberries drainage and land smoothing are needed. The major limitation for most other crops is the seasonal high water table.

This soil is poorly suited to commercial woodland production. Potential productivity for pitch pine is high. The common species are pitch pine, black gum, and red maple.

The main limitation to use of this soil as sites for dwellings and some other types of community development is the seasonal high water table.

This soil is in capability subclass Vw; the woodland ordination symbol is 7W.

Cm—Colemantown loam. This is a nearly level, poorly drained soil in depressional areas and on broad flats. Areas of the soil are irregular in shape and typically range from 10 to 50 acres in size.

Typically, the surface layer is very dark brown loam 9 inches thick. The subsoil is mottled, dark greenish gray clay loam 27 inches thick. The substratum extends to a depth of 60 inches or more. It is mottled, dark greenish gray stratified sandy clay loam, sandy loam, and sandy clay to a depth of 48 inches. Below that, it is dark greenish gray sandy clay to a depth of 60 inches or more.

Included with this soil in mapping are areas of Kresson and Shrewsbury soils. These soils, which make up about 35 percent of the map unit, are similar to the Colemantown soil in use and management. Also included are areas of Adelphia soils. These soils, which make up as much as 10 percent of the map unit, are dissimilar to the Colemantown soil in use and management.

Permeability of this Colemantown soil is slow in the subsoil and moderately slow in the substratum. The available water capacity is high. The perched seasonal high water table is between the surface and a depth of 1 foot from October to June. Runoff is slow. Erosion is a slight hazard. Organic matter content is moderate to high. The soil is subject to occasional flooding. In unlimed areas reaction is extremely acid or very strongly acid.

About half the acreage of this soil is farmed. A few acres is used for pasture. The rest of the acreage is woodland.

This soil is suited to common field crops, hay, and vegetables. The main limitation is the seasonal high water table. The main management concern is providing drainage. In some areas the clayey subsoil and substratum limit the efficiency of subsurface drainage. The seasonal high water table limits the soil for certain crops and restricts the time when the soils can be worked. Cover crops and crop residue management help to maintain soil tilth and organic matter content.

This soil is suited to pasture. The major management practices are proper seeding, proper stocking, liming and fertilizing, and rotation of grazing. In some wetter areas improved drainage is needed.

This soil is suited to commercial woodland production. Potential productivity for pin oak is moderately high. During wet periods the use of equipment for harvesting trees is limited. The common species are pin oak, sweetgum, and red maple.

The main limitations to use of this soil as sites for dwellings and some other types of community development are the seasonal high water table and flooding.

This soil is in capability subclass IIIw; the woodland ordination symbol is 4W.

CnB—Collington sandy loam, 2 to 5 percent slopes. This is a gently sloping, well drained soil on divides. Areas of the soil are irregular in shape and typically range from 10 to 50 acres in size.

Typically, the surface layer is dark brown sandy loam 11 inches thick. The subsoil is 21 inches thick. It is dark brown loam and sandy clay loam to a depth of 29 inches. Below that, it is dark brown sandy loam to a depth of 32 inches. The substratum is dark brown and brown sandy loam and coarse sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are areas of Collington soils that have a loam surface layer and Freehold soils. These soils, which make up about 35 percent of the map unit, are similar to the Collington sandy loam. Also included are areas of Holmdel, Adelphia, and Marlton soils. These soils, which make up as much as 15 percent of the map unit, are dissimilar to Collington sandy loam in use and management.

Permeability of this Collington soil is moderately slow or moderate in the subsoil and moderately slow to moderately rapid in the substratum. The available water capacity is high. The seasonal high water table is at

Marlboro, Manalapan, and Aberdeen Townships. The clay is also in other parts of the county, but at greater depths and is generally not excavated. Contact the local office of the Soil Conservation Service (SCS) for information about the probable locations of this material. SCS can also provide information about the management practices needed to establish vegetation where pyritic clay has been excavated.

Permeability of this Keyport soil is slow in the subsoil and the substratum. The available water capacity is high. The high water table is at a depth of 1 1/2 to 4 feet from November to May. Runoff is slow. Erosion is a slight hazard. Organic matter content is moderate. In unlimed areas reaction is extremely acid or very strongly acid.

Most areas of this soil are farmed. A small acreage is used for pasture. A few acres is woodland.

This soil is suited to common field crops, hay, and vegetables. The main limitation for crops is the seasonal high water table. The main management concern is providing drainage. In some areas the clayey subsoil and substratum limit the efficiency of subsurface drainage. The seasonal high water table limits the soil for certain crops and restricts the time when the soil can be worked. Cover crops and crop residue management help to maintain soil tilth and organic matter content.

This soil is well suited to pasture. The suitable management practices are proper seeding, proper stocking, liming and fertilizing, and rotation grazing. In some wetter areas improved drainage is needed.

This soil is well suited to commercial woodland production. Potential productivity for yellow poplar is high. The common species are yellow poplar, northern red oak, and American beech.

The main limitation to use of this soil as sites for dwellings and some other types of community development are the seasonal high water table, shrinking and swelling, slow percolation, and the high frost action potential. If pyritic clay that is exposed during excavation is used as topsoil, it will become extremely acid and will not support vegetation.

This soil is in capability subclass IIw; the woodland ordination symbol is 6A.

KeB—Keyport sandy loam, 2 to 5 percent slopes. This is a gently sloping, moderately well drained soil on low divides. Areas of the soil are irregular in shape and typically range from 5 to 35 acres in size.

Typically, the surface layer is brown sandy loam 8 inches thick. The subsoil is 34 inches thick. It is yellowish brown silty clay loam to a depth of 18 inches. Below that, it is mottled, dark yellowish brown silty clay loam to a depth of 42 inches. The substratum is gray silty clay loam to a depth of 60 inches or more.

Included with this soil in mapping are areas of Keyport soils that have a loam surface layer and Woodstown soils. Also included are areas of Keyport soils that have a loamy sand surface layer less than 20 inches thick. These soils, which make up about 40 percent of the map unit, are similar to the Keyport sandy loam in use and management. Also included are areas of Elkton soils and Klej soils that have a clayey substratum. These soils, which make up as much as 15 percent of the map unit, are dissimilar to the Keyport sandy loam in use and management.

Some areas of this Keyport soil have pyritic clay in the substratum. If the pyritic clay that is exposed during excavation is used as topsoil, it will become extremely acid (pH about 2.5-3.0) and will not support vegetation. Pyritic clay is mainly in the vicinity of Keyport, Hazlet, Marlboro, Manalapan, and Aberdeen Townships. The clay is also in other parts of the county but at greater depths and is generally not excavated. Contact the local office of the Soil Conservation Service for information about the management practices needed to establish vegetation where pyritic clay has been excavated.

Permeability of this Keyport soil is slow in the subsoil and the substratum. The available water capacity is high. The high water table is at a depth of 1 1/2 to 4 feet from November to May. Runoff is medium. Erosion is a moderate hazard. Organic matter content is moderate. In unlimed areas reaction is extremely acid or very strongly acid.

Most areas of this soil are farmed. A small acreage is used for pasture. A few acres is woodland.

This soil is suited to common field crops, hay, and vegetables. Erosion is a hazard. The major limitation is the seasonal high water table. The main management concern is providing drainage and reducing runoff to control erosion. In some areas the clayey subsoil and substratum limit the efficiency of subsurface drainage. The seasonal high water table limits the soil for certain crops and restricts the time when the soil can be worked. Contour farming, stripcropping, grassed waterways, and cropland terraces or diversion terraces help to reduce runoff and to control erosion. Cover crops and crop residue management help to maintain soil tilth and organic matter content.

This soil is well suited to pasture. The suitable management practices are proper seeding, proper stocking, liming and fertilizing, and rotation grazing. In some wetter areas improved drainage is needed.

This soil is well suited to commercial woodland production. Potential productivity for yellow poplar is high. The common species are yellow poplar, northern red oak, and American beech.

The main limitations to use of this soil as sites for dwellings and some other types of community development are the seasonal high water table, shrinking and swelling, slow percolation, and the high frost action potential. If pyritic clay that is exposed during excavation is used as topsoil, it will become extremely acid and will not support vegetation.

This soil is in capability subclass IIe; the woodland ordination symbol is 6A.

Included with this soil in mapping are areas of Marlton and Colemantown soils. These soils, which make up about 25 percent of the map unit, are similar to the Kresson soil in use and management. Also included are areas of Adelphia and Shrewsbury soils. These soils, which make up as much as 15 percent of the map unit, are dissimilar to the Kresson soil in use and management.

Permeability of this Kresson soil is slow in the subsoil and the substratum. The available water capacity is high. The perched seasonal high water table is at a depth of 1 foot to 1 1/2 feet from December to May. Runoff is slow to medium. Erosion is a slight to moderate hazard. Organic matter content is moderate. In unlimed areas reaction is extremely acid or very strongly acid.

Most areas of this soil are farmed. A small acreage is used for pasture. A few acres is woodland.

This soil is suited to common field crops, hay, and vegetables. The main limitation for crops is the seasonal high water table. The main management concern is providing drainage. The clayey subsoil and substratum lower the efficiency of subsurface drainage. The seasonal high water table limits the soil for certain crops and restricts the time when the soil can be worked. Cover crops and crop residue management help to maintain soil tilth and organic matter content.

This soil is suited to pasture. The suitable management practices are proper seeding, proper stocking, liming and fertilizing, and rotation grazing. In some wetter areas improved drainage is needed.

This soil is suited to commercial woodland production. Potential productivity for sweetgum is high. The common species are sweetgum, white oak, pin oak, yellow poplar, and willow oak.

The main limitations to use of this soil as sites for dwellings and some other types of community development are the seasonal high water table, slow percolation, and frost action.

This soil is in capability subclass IIIw; the woodland ordination symbol is 7W.

LaA—Lakehurst sand, 0 to 2 percent slopes. This is a nearly level, moderately well drained and somewhat poorly drained soil in depressional areas and on low divides. Areas of the soil are irregular in shape and typically range from 5 to 30 acres in size.

Typically, the surface layer is gray sand 4 inches thick. The subsurface layer is light gray sand 6 inches thick. The subsoil is 26 inches thick. It is brown loamy sand to a depth of 13 inches. In the next layer it is mottled, brownish yellow sand to a depth of 24 inches. Below that, it is mottled, pale brown sand to a depth of 36 inches. The substratum is mottled, light brownish gray sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of Klej soils and soils that are similar to the Lakehurst soil but that have a bleached subsurface layer that is thinner than typical and that do not have a subsoil that in the upper part is distinct, thin, or darkened by an accumulation of organic matter. These soils, which make up about 30 percent of the map unit, are similar to the Lakehurst soil in use and management. Also included are areas of Lakewood and Atsion soils. These soils, which make up as much as 15 percent of the map unit, are dissimilar to the Lakehurst sand in use and management.

Permeability of this Lakehurst soil is rapid in the subsoil and the substratum. The available water capacity is low. The apparent seasonal high water table is at a depth of 1 1/2 to 3 1/2 feet from January to April. Runoff is very slow. Water erosion is a slight hazard. Wind erosion is a severe hazard. Organic matter content is low. In unlimed areas reaction is extremely acid to strongly acid.

Most areas of this soil are woodland. A very small acreage is used for pasture and farming.

This soil is poorly suited to common field crops, hay, and vegetables. The main limitations are the low available water capacity, the low organic matter content, rapid permeability, and the seasonal high water table. If the soil is farmed, in wet areas improved drainage is needed for certain crops. Other management concerns are irrigation and frequent applications of lime and fertilizer. Cover crops and crop residue management help to maintain soil tilth and organic matter content. Windbreaks and cover crops help to control wind erosion.

This soil is poorly suited to pasture. The suitable management practices are proper seeding, proper stocking, liming and fertilizing, and rotation grazing. In the wetter areas improved drainage is needed.

This soil is poorly suited to commercial woodland production. Potential productivity for pitch pine is high. The most common species is pitch pine.

The main limitations to use of this soil as sites for dwellings and some other types of community development are the seasonal high water table, poor filter, cutbanks caving, and sandiness.

This soil is in capability subclass IVw; the woodland ordination symbol is 6S.

LeB—Lakewood sand, 0 to 5 percent slopes. This is a nearly level and gently sloping, excessively drained soil on divides. Areas of the soil are irregular in shape and typically range from 5 to 40 acres in size.

Typically, the surface layer is 4 inches thick. The uppermost inch is dark brown, matted, decomposed organic material, and below that it is dark grayish brown sand. The subsurface layer is light brownish gray sand 10 inches thick. The subsoil is 17 inches thick. It is dark brown loamy sand to a depth of 16 inches. Below that, it is brownish yellow sand to a depth of 31 inches. The substratum is brownish yellow gravelly sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of Evesboro soils and soils that are similar to the Lakewood soil but that have a bleached subsurface layer that is thinner than typical or that does not have a dark brown subsoil. These soils, which make up as much as 30 percent of the map unit, are similar to the Lakewood soil in use and management. Also included are areas of Lakehurst, Klej, and Atsion soils. These soils, which make up as much as 15 percent of the map unit, are dissimilar to the Lakewood soil in use and management.

Permeability of this Lakewood soil is rapid in the subsoil and moderate to rapid in the substratum. The available water capacity is low. The seasonal high water table is at a depth of more than 6 feet. Runoff is very slow. Water erosion is a slight hazard. Wind erosion is a severe hazard. Organic matter content is low. In unlimed areas reaction is extremely acid or very strongly acid.

Most areas of this Lakewood soil are woodland. A very small acreage is used for farming and pasture.

This soil is poorly suited to common field crops, hay, and vegetables. The main limitations are the low available water capacity, the low organic matter content, and rapid permeability. If the soil is farmed, the main management concerns are irrigation and frequent applications of lime and fertilizer. Cover crops and crop residue management help to maintain soil tilth and organic matter content. Windbreaks and cover crops help to control wind erosion.

This soil is poorly suited to pasture. The suitable management practices are proper seeding, proper stocking, liming and fertilizing, and rotation grazing.

This soil is poorly suited to commercial woodland production. Potential productivity for pitch pine is moderately high. The common species are pitch pine, shortleaf pine, chestnut oak, black oak, and Virginia pine.

The main limitations to use of this soil as sites for dwellings and some other types of community development are poor filter, cutbanks caving, and sandiness.

This soil is in capability subclass VIIs; the woodland ordination symbol is 5S.

LeC—Lakewood sand, 5 to 10 percent slopes. This is a moderately sloping, excessively drained soil on side slopes. Areas of the soil are irregular in shape and typically range from 10 to 40 acres in size.

Typically, the surface layer is 4 inches thick. The uppermost inch is dark brown, matted, decomposed organic material, and below that it is dark grayish brown sand. The subsurface layer is light brownish gray sand 10 inches thick. The subsoil is 17 inches thick. It is dark brown loamy sand to a depth of 16 inches. Below that, it is brownish yellow sand to a depth of 31 inches. The substratum is brownish yellow gravelly sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of Evesboro soils and soils that are similar to the Lakewood soil but that have a bleached subsurface layer that is thinner than typical or that do not have a dark brown subsoil. These soils, which make up as much as 30 percent of the map unit, are similar to the Lakewood soil in use and management. Also included are areas of Lakehurst and Klej soils. These soils, which make up as much as 10 percent of the map unit, are dissimilar to the Lakewood soil in use and management.

Permeability of this Lakewood soil is rapid in the subsoil and moderate to rapid in the substratum. The available water capacity is low. The seasonal high water table is at a depth of more than 6 feet. Runoff is slow. Water erosion is a moderate hazard. Wind erosion is a severe hazard. Organic matter content is low. In unlimed areas reaction is extremely acid or very strongly acid.

Most areas of this soil are woodland. A very small acreage is used for farming and pasture.

This soil is poorly suited to common field crops, hay, and vegetables. The main limitations are the low available water capacity, the low organic matter content, and rapid permeability. If the soil is farmed, the main management concerns are irrigation and frequent applications of lime and fertilizer. Cover crops and crop residue management help to maintain soil tilth and organic matter content. Cover crops and windbreaks help to control wind erosion.

This soil is poorly suited to pasture. The suitable management practices are proper seeding, proper stocking, liming and fertilizing, and rotation grazing.

This soil is poorly suited to commercial woodland production. Potential productivity for pitch pine is moderately high. The common species are pitch pine, shortleaf pine, chestnut oak, black oak, and Virginia pine.

The main limitations to use of this soil as sites for dwellings and some other types of community development are poor filter, cutbanks caving, sandiness, and slope.

This soil is in capability subclass VIIs; the woodland ordination symbol is 5S.

Ma—Manahawkin muck. This is a nearly level and very poorly drained soil in wide depressional areas and on broad flats. Areas of the soil are irregular in shape and typically range from 15 to 30 acres in size.

Typically, the uppermost 30 inches is black and very dark gray muck. Below the muck, the substratum is mottled, dark gray loamy sand and sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of Atsion and Elkton soils and Humaquepts. Also included are soils that have a layer of muck more than 51 inches thick over mineral material. Also included are soils that have thick layers of muck and a clayey textured substratum. These soils, which make up as much as 25 percent of the map unit, are dissimilar in use and management.

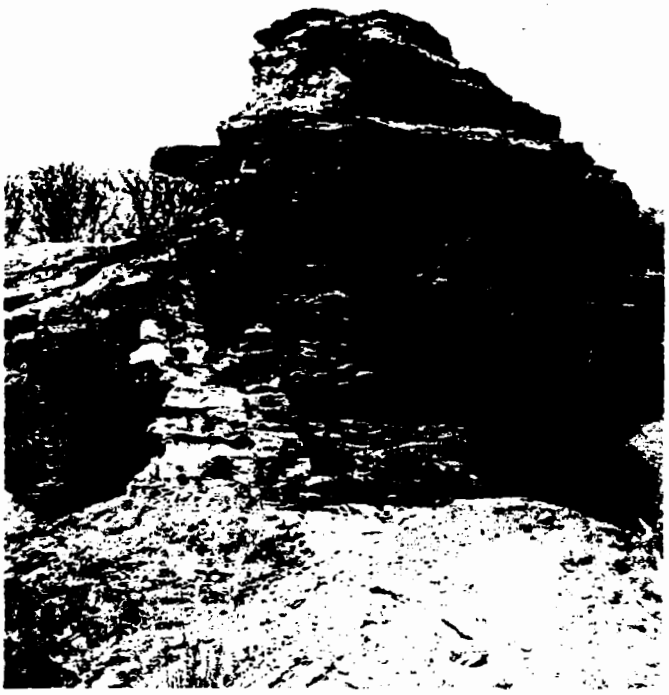


Figure 13.—An exposure of iron-cemented sandstone in an area of Phalanx loamy sand, 0 to 10 percent slopes.

Included with this soil in mapping are areas of Tinton, Evesboro, Colts Neck, Freehold, and Sassafras soils. Also included are soils that are similar to the Phalanx soil but that have layers of iron-cemented sandstone below a depth of 40 inches. These soils, which make up as much as 25 percent of the map unit, are dissimilar to the Phalanx soil in use and management.

Permeability of this Phalanx soil is moderate or moderately rapid in the subsoil and moderately rapid in the substratum. The available water capacity is moderate. The seasonal high water table is at a depth of more than 6 feet. Runoff is rapid to very rapid. Water erosion is a severe hazard. Organic matter content is low to moderate. In unlimed areas reaction is extremely acid or very strongly acid in the surface layer and in the upper part of the subsoil and strongly acid or very strongly acid in the lower part of the subsoil and the substratum.

Almost all areas of this Phalanx soil are wooded.

This soil is poorly suited to common field crops, hay, vegetables, and pasture. The main limitations are slope, the cemented pan, the restricted rooting depth, and iron-cemented sandstone channers and stones.

This soil is poorly suited to commercial woodland production. Potential productivity for chestnut oak is moderately high. The common species are chestnut oak, black oak, white oak, Virginia pine, and pitch pine.

The main limitations to use of this soil as sites for dwellings and some other types of community development are the cemented pan, cutbanks caving, and slope.

This soil is in capability subclass VIIe; the woodland ordination symbol is 4S.

PT—Pits, sand and gravel. This map unit consists of areas that have been excavated for sand and gravel. The mapped areas are irregular in shape and typically range from 25 to 250 acres in size.

Typically, these areas consist of sandy material and differing amounts of gravel and fragments of iron-cemented sandstone. Some pits have large iron-cemented sandstone boulders that range from 2 to 15 feet in diameter. A few pits have been smoothed, and others have mounds of soil and steep escarpments. Some older pits have reverted to trees.

Included with this soil in mapping are small undisturbed areas of Evesboro, Downer, Sassafras, and Phalanx soils. A few abandoned pits have been used as dump sites.

The properties and characteristics of this map unit differ greatly from place to place. For most uses onsite investigation and evaluation are needed.

This map unit is not assigned to a capability subclas

PW—Psamments, waste substratum. This map unit consists of reclaimed areas or areas used as sites for sanitary landfills. The mapped areas are generally rectangular in shape and typically range from 10 to 25 acres in size.

Typically, the landfills are areas where 24 to 48 inches of sandy fill material has been placed over refuse. The refuse consists of garbage, paper, plastic, glass, metal, rubber, building debris, and other materials.

Included with these soils in mapping are areas of Udorthents and soils that have not been covered with fill. Also included are small areas of sand and gravel pits.

The properties and characteristics of this map unit differ greatly from place to place. For most uses onsite investigation and evaluation are needed.

These soils are not assigned to a capability subclass.

SaB—Sassafras sandy loam, 2 to 5 percent slopes. This is a gently sloping, well drained soil on divides. Areas of the soil are irregular in shape and typically range from 5 to 35 acres in size.

Typically, the surface layer is dark brown sandy loam 11 inches thick. The subsoil is 25 inches thick. It is yellowish brown sandy loam and sandy clay loam to a depth of 30 inches. Below that, it is reddish yellow sandy loam to a depth of 36 inches. The substratum is reddish yellow stratified loamy sand and sandy loam to a depth of 60 inches or more.

CLIENT	JOB NUMBER
NWSE	7602/0104

SUBJECT: TR-55 HYDROLOGIC SOIL GROUP

BASED ON	DRAWING NUMBER
SOIL SURVEY / TR-55 MANUAL	

BY	CHECKED BY	APPROVED BY	DATE
CAR 7/22/97	JJB 8/26/97		

USING THE SOIL TYPES ESTIMATED FROM THE MONMOUTH COUNTY SOIL SURVEY, DETERMINE THE HYDROLOGIC SOIL GROUP (HSG) FOR EACH SITE. THE HSG IS REQUIRED TO SELECT THE APPROPRIATE RUNOFF CURVE NUMBER FOR EACH COVER TYPE. INFORMATION FROM APPENDIX A OF THE TR-55 MANUAL WAS USED TO DETERMINE THE APPROPRIATE HSG.

SITE 4 - AN HSG IS NOT LISTED FOR SOIL TYPE PT. EXISTING BORING LOGS WERE REVIEWED. THE FOLLOWING DESCRIPTIONS WERE GIVEN IN THE BORING LOGS:

WESTON: 0-2' = SAND (FINE), SOME SILT, MEDIUM SAND

B&RE: 0-2' = SILTY, FINE GRAINED SAND (SOME CLAY)

USING THIS INFORMATION ALONG WITH THE HSG DESCRIPTIONS GIVEN ON p. A-1 OF APPENDIX A, IT WAS DETERMINED THAT A HSG = B IS THE MOST APPROPRIATE FOR SITE 4.

SITE 5 - THE FOLLOWING HSGS WERE FOUND IN APPENDIX A OF THE TR-55 MANUAL.

LAKEWOOD - A
LAKEHURST - A
KEYPORT - C
ATSION - C/D

BECAUSE OF THE DIFFERENT SOIL TYPES AND FOR EASE OF CALCULATION OF CN, ASSUME HSG = B IS THE AVERAGE SOIL TYPE FOR SITE 5.

CALCULATION WORKSHEET Order No. 19116 (01-91)

PAGE _____ OF _____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

ESTIMATE RAINFALL DISTRIBUTION TYPE
AND PRECIPITATION AMOUNTS FOR
SITES 4 AND 5

CLIENT	JOB NUMBER		
NWSE	7602/0104		
SUBJECT: RAINFALL DISTRIBUTION TYPE AND PRECIP. AMOUNTS			
BASED ON: TR-55	DRAWING NUMBER		
BY: CAR 8/14/97	CHECKED BY: JJB 8/26/97	APPROVED BY	DATE

USING INFORMATION PROVIDED IN APPENDIX B OF TR-55 MANUAL, DETERMINE THE RAINFALL DISTRIBUTION TYPE AND THE APPROPRIATE 24-HOUR RAINFALL AMOUNTS FOR SITES 4 AND 5.

① RAINFALL DISTRIBUTION TYPE:

USING FIGURE B-2 FROM APPENDIX B IT WAS DETERMINED THAT THE ENTIRE STATE OF NEW JERSEY HAS A RAINFALL DISTRIBUTION TYPE OF III. (SEE ATTACHED FIGURE 1; p. 2 OF 5)

② PRECIPITATION AMOUNTS FOR 3 DESIGN STORMS

USING FIGURES B-3, B-5 AND B-6 FROM APPENDIX B THE FOLLOWING 24-HOUR RAINFALL AMOUNTS WERE ESTIMATED:

STORM FREQUENCY	FIGURE / PAGE	24-HOUR RAINFALL AMOUNT (IN)
2	2; p. 3 of 5	3.4
10	3; p. 4 of 5	5.2
25	4; p. 5 of 5	6.0

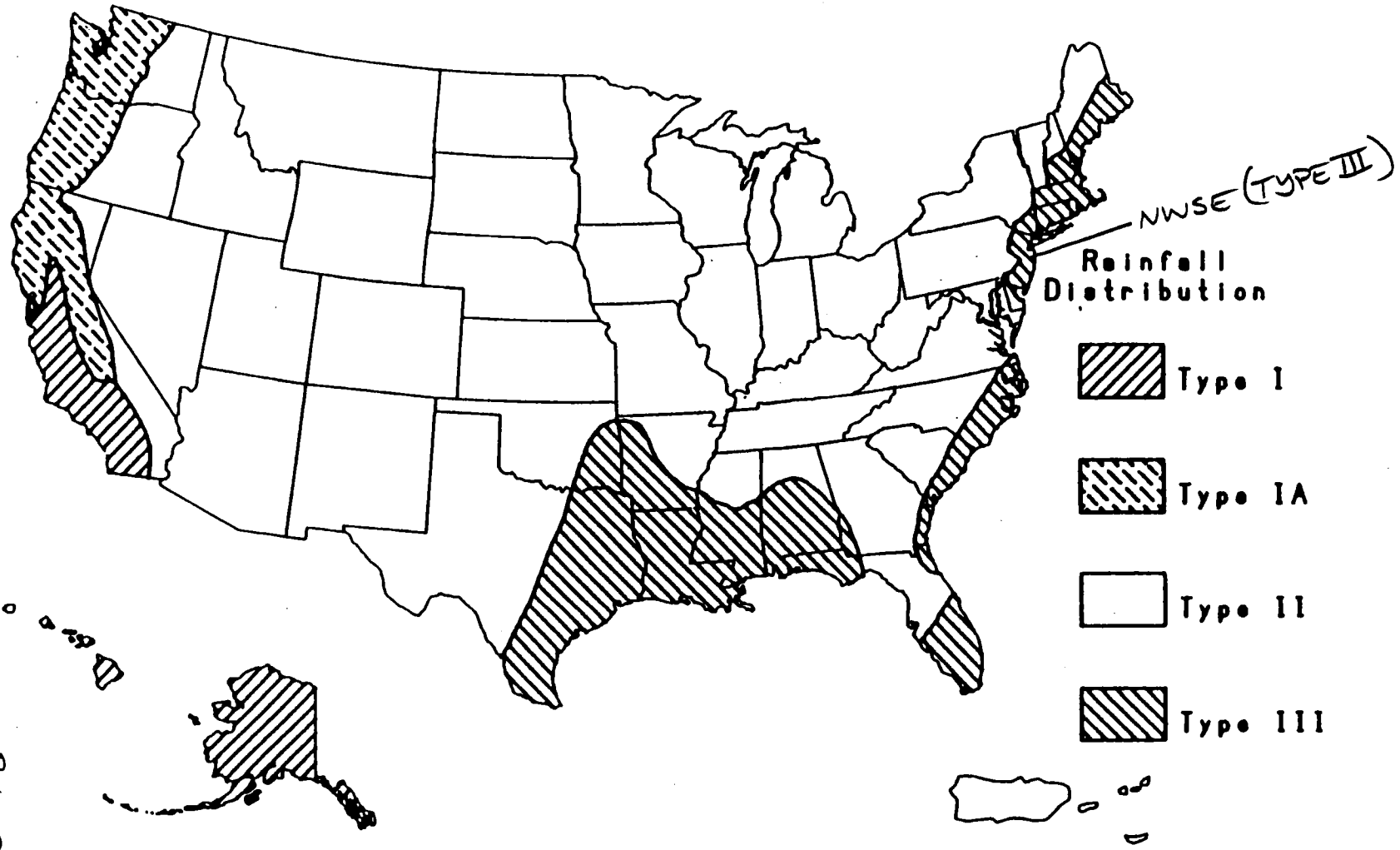


Figure B-2.—Approximate geographic boundaries for SCS rainfall distributions.

FIGURE 1

BY: CAM CHKD: JJB

DATE: 8/14/97 DATE: 8/26/97

2 OF 5

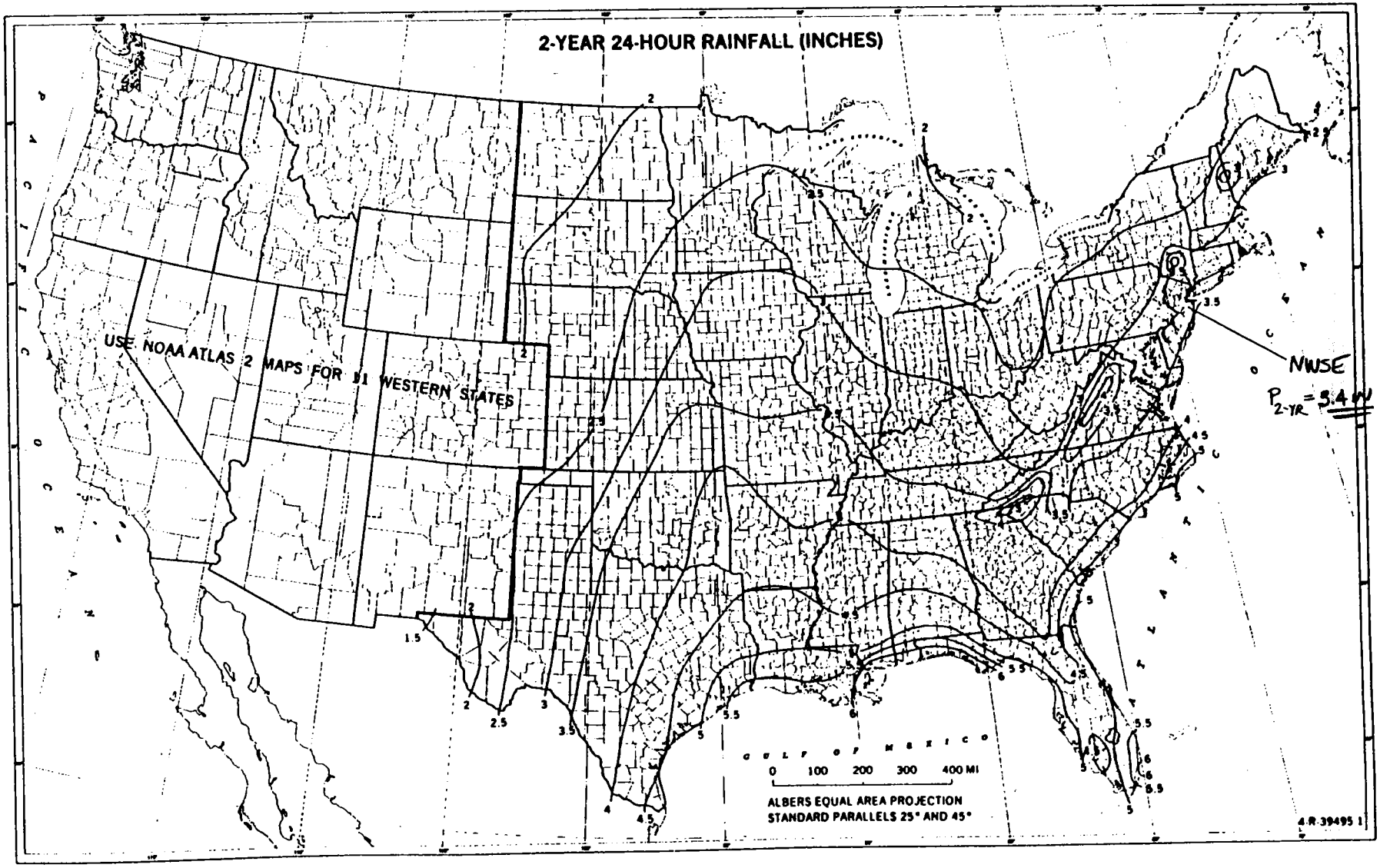


FIGURE 2

(210-VI-TR-55, Second Ed., June 1986)

BY: CAR CHKD: RJB

DATE: 8/14/97 DATE: 8/26/97

3 of 5

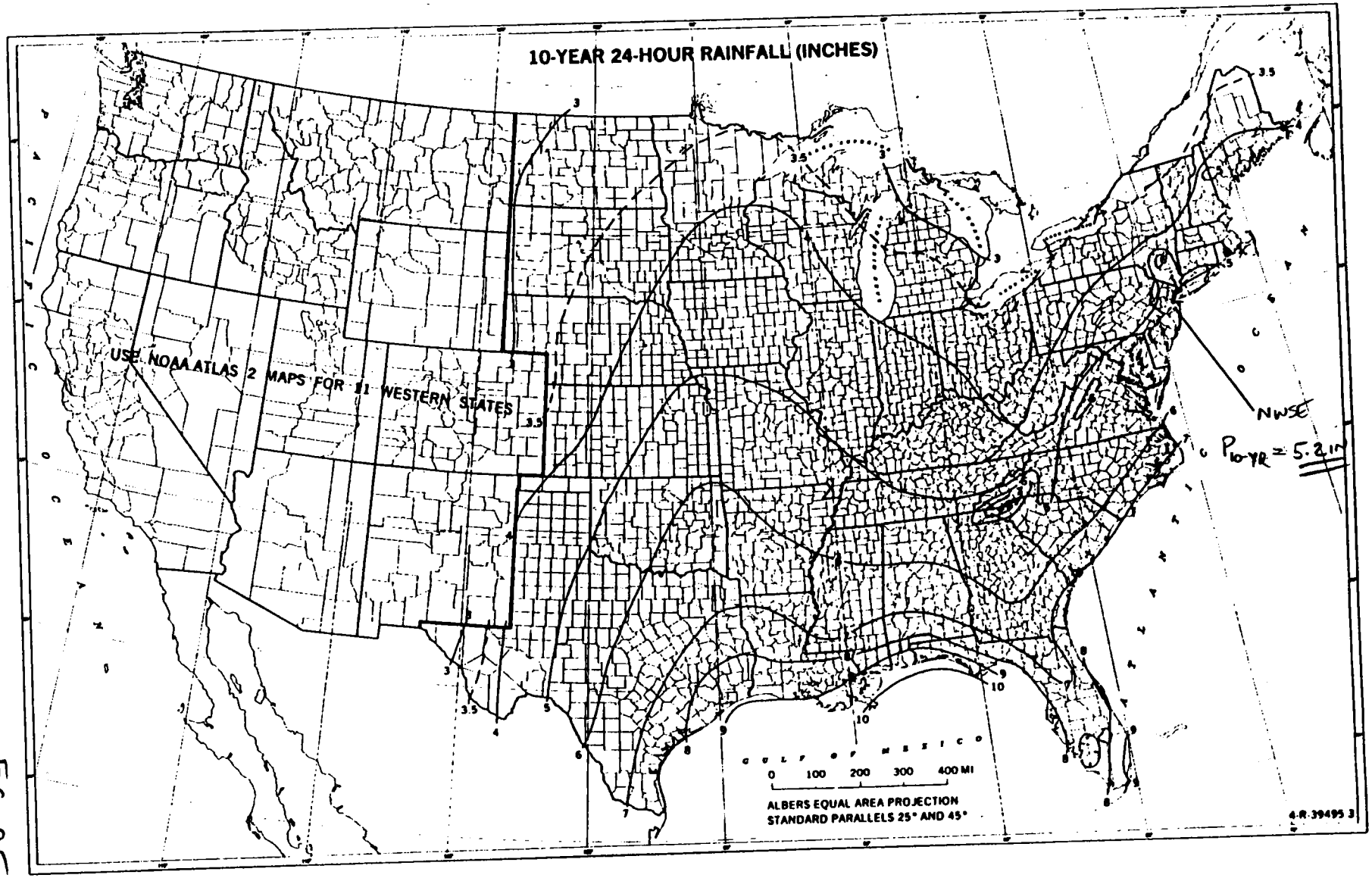
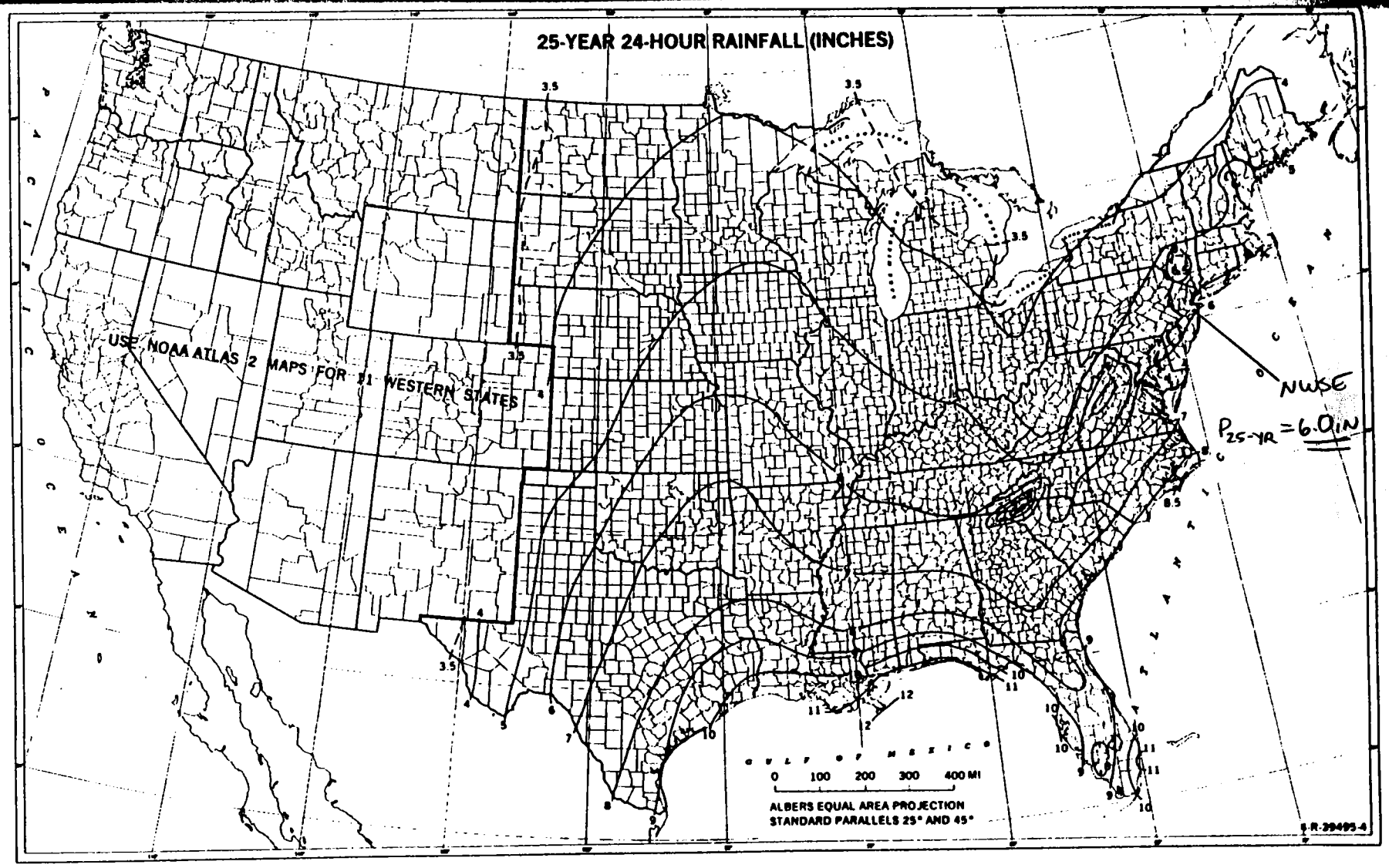


FIGURE 3

(210-VI-TR-55, Second Ed., June 1986)
BY: CAR CHKD: JJB
CHKD: 8/14/97 DATE: 3/26/97

4 of 5



(210-VI-TR-55, Second Ed., June 1986)

BY: CAR CHKD: JJB

CHKD: 8/14/97 DATE: 8/26/97

FIGURE 4

5 OF 5

Figure B-6.—Twenty-five-year, 24-hour rainfall.

B.2 PRE-CONSTRUCTION CONDITIONS FOR SITE 4

CALCULATION WORKSHEET Order No. 19116 (01-91)

PAGE _____ OF _____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

B.2

Determination of Site 4 Drainage Areas and Weighted Curve Numbers

Initial Conditions

CLIENT	JOB NUMBER
NSWE	7602/0104

SUBJECT: Drainage Areas / Weighted Curve Numbers - Pre-Construction - Site 4

BASED ON	DRAWING NUMBER
Existing Topography / TR-55	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/17/97	CAN 8/22/97		

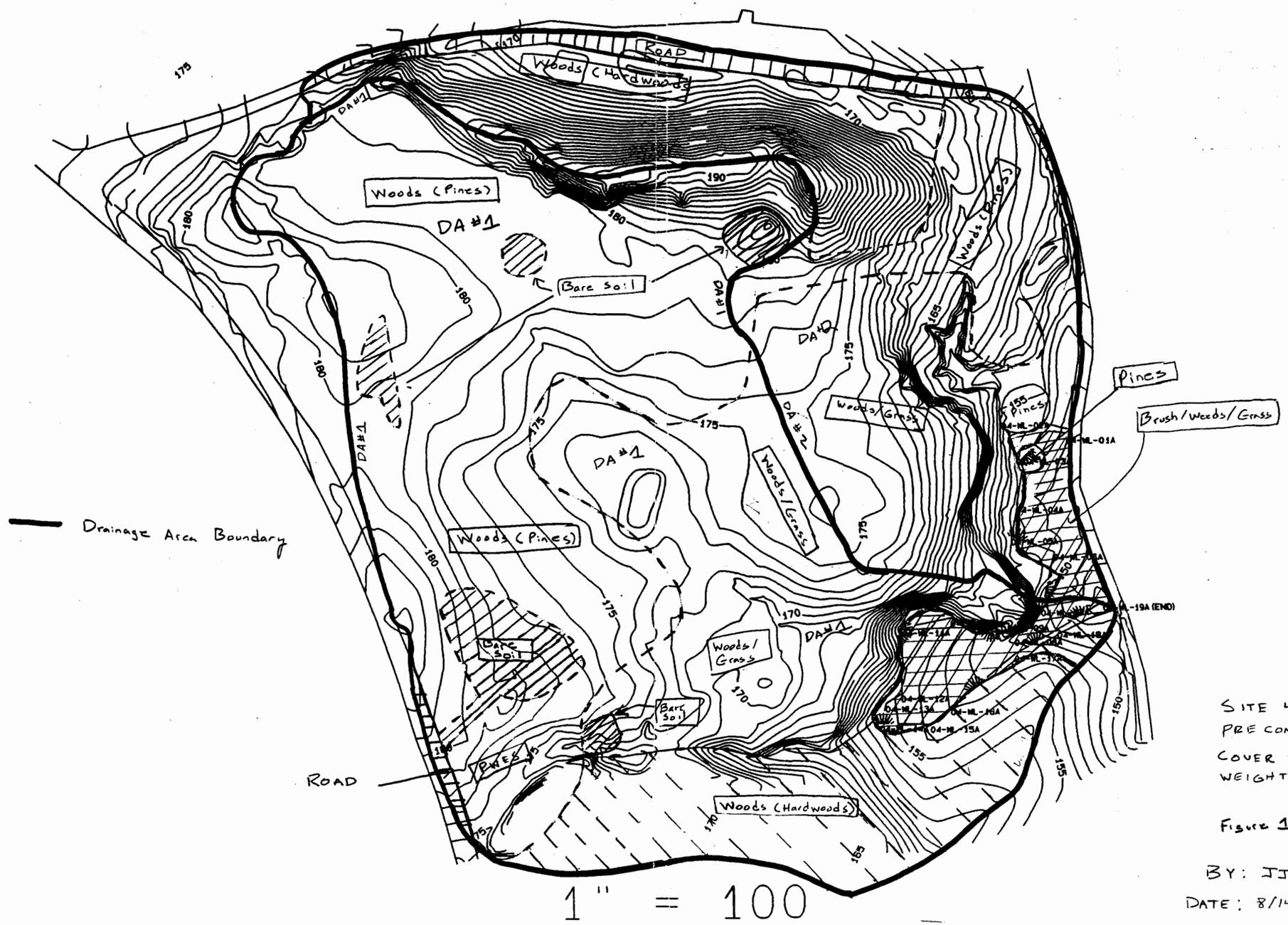
(1) The existing topography for Site 4 was used in conjunction with the Marlboro USGS Quadrangle to determine the boundaries of the drainage areas that cover Site 4. Two drainage areas were determined. They are shown on Figure 1 (p. 2 of 10)

The area of each drainage area was determined by planimeter. The measurements are shown on p. 7 of 10. The areas are summarized below.

Drainage Area	Area (acres)
1	7.55
2	3.65

(2) The type of cover material was then determined. Survey information, photographs, and personal observations were used to determine the appropriate cover type. The cover type information is summarized on Figure 1 (p. 2 of 10). The types of cover found at Site 4 include Bare soil, Dirt Roads, Woods (Pines & Hardwoods), Woods/Grassy Areas, Wetlands (Brush/Weeds/Grass).

SITE 4



SITE 4 - NWSE
PRE CONSTRUCTION CONDITIONS
COVER TYPE FOR ESTIMATING WEIGHTED CURVE NUMBERS

Figure 1

BY: JJB CHKD: CAR
DATE: 8/14/97 DATE: 8/22/97

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT	JOB NUMBER
NSWE	7602 /0104

SUBJECT: Drainage Areas / Weighted Curve Numbers: Pre-construction - Site 4

BASED ON	DRAWING NUMBER
Existing Topography / TR-55	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/17/97	CAR 8/22/97		

(3) The Area of each cover type within each drainage area was then determined by planimeter. The measurements are shown on pp. 8 of 10 through 10 of 10. The areas are summarized below.

Drainage Area	Cover Type	Area (A) (acres)
1	Bare Soil	0.36
	Woods (Pine / Hardwoods)	5.05
	Brush / weeds / Grass	0.28
	Dirt Roads	0.03
	Woods / Grass	1.83
		7.55 - Total
2	Bare Soil	0.00
	Woods (Pines / Hardwoods)	1.84
	Brush/Weeds /Grass	0.17
	Dirt Roads	0.21
	Woods / Grass	1.43
		3.65 - Total

Note:

(A) - The areas shown are the average of three measurements. If the individual measurements did not total to the measurement of the entire drainage basin, the variation was distributed, using a weighting factor, to each area.

CLIENT	JOB NUMBER
NSWE	7602 / 0104

SUBJECT: Drainage Area / Weighted Curve Numbers - Initial Conditions

BASED ON	DRAWING NUMBER
Existing Topo / TR-55	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/17/97			

(4) Runoff curve numbers were determined for each cover type. The curve numbers were taken from tables 2-2a, 2-2b, and 2-2c of the TR-55 manual. The site 4 hydraulic soil type is B. (see calculations entitled "Estimate Soil Types + SCS Hydraulic Soil Groups for Sites 4 & 5.")

Cover Type	Soil Type	CN
Bare Soil	B	86
Woods (Pines/Hardwoods) - Fair	B	60
Woods / Grass - Fair	B	65
Brush/Weeds / Grass - FAIR	B	56
Dirt Road	B	82

(5) Weighted Runoff Curve numbers were calculated for each drainage area using the estimated areas of each cover type + the appropiate curve numbers. The Haestad Quick TR-55 Program was used to calculate the weighted curve Numbers (see pp. 6 of 10) and to summarize the results (see p. 5 of 10).

Quick TR-55 Ver.5.46 S/N:
Executed: 15:49:00 08-22-1997

Initial Conditions - Site 4

RUNOFF CURVE NUMBER SUMMARY

Subarea Description	Area (acres)	CN (weighted)
Drainage Area 1	7.55	62
Drainage Area 2	3.65	63

Quick TR-55 Ver.5.46 S/N:
Executed: 15:49:00 08-22-1997

Initial Conditions - Site 4

RUNOFF CURVE NUMBER DATA

::

Composite Area: Drainage Area 1

SURFACE DESCRIPTION	AREA (acres)	CN	
Bare Soil	0.36	86	
Woods (Pines/Hardwoods)	5.05	60	
Brush/Weeds/Grass	0.28	56	
Dirt Roads	0.03	82	
Woods/Grass	1.83	65	
COMPOSITE AREA --->	7.55	62.4	(62)

::

Composite Area: Drainage Area 2

SURFACE DESCRIPTION	AREA (acres)	CN	
Bare Soil	0.00	86	
Woods (Pines/Hardwoods)	1.84	60	
Brush/Weeds/Grass	0.17	56	
Dirt Roads	0.21	82	
Woods/Grass	1.43	65	
COMPOSITE AREA --->	3.65	63.0	(63)

::

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NWSE	JOB NUMBER: 7602-010K
SUBJECT: MEASUREMENT OF AREAS (COVER TYPE) - SITE 4	
BASED ON: Existing Topo	DRAWING NUMBER:
BY: CAR 7/24/97 — CHECKED BY: JJB 8/7/97	APPROVED BY: — DATE:

① PLANIMETER -

AREA 1 (See Figure 1, p. 2 of 10) (Area 1 was subdivided for planimetering)

	M1	M2	M3	AVG
A	55.6141	55.4901	55.6141	55.5728 IN^2
B	75.9967	75.9812	76.0277	76.0019 IN^2

TOTAL AREA ① = 7.55 ac

AREA 2 (See figure 1, p. 2 of 10)

	M1	M2	M3	AVG
A	63.5346	63.4726	63.5656	63.5243

TOTAL AREA ② = 3.65 ac

CLIENT	JOB NUMBER		
NWSE	7602 - 0104		
SUBJECT: SITE 4 - Drainage Areas / Weighted Curve Nos. - Pre construction			
BASED ON: Existing Topo		DRAWING NUMBER	
BY: CAR 7/21/97	CHECKED BY: JJB 8/7/97	APPROVED BY	DATE

PLANIMETER:

(2) BARE SOIL (DA #1 is the only area with bare soil. Each area is designated A through E).

AREA	M1	M2	M3		AVG
A	0.403	0.372	0.419	=	0.398
B	3.6735	3.6890	3.6735	=	3.6787
C	0.7285	0.7130	0.7130	=	0.7182
D	0.5425	0.5735	0.5580	=	0.5580
E	0.8370	0.8525	0.8525	=	0.8473

TOTAL AREA = 6.2002 IN^2
= 15,500.5 ft^2
= 0.3558 ac

(3) ROADWAY

AREA	M1	M2	M3	AVG
1	0.4805	0.4340	0.4495	0.4547
2A	2.9760	2.9450	2.9295	2.9502
B	0.7285	0.7130	0.7285	0.7233

TOTAL AREA (2A + 2B) = 3.6735 IN^2
= 9183.75 ft^2
= 0.2108 ac

TOTAL AREA (1) = 0.4547 IN^2
= 1136.75 ft^2
= 0.0261 ac

CLIENT	JOB NUMBER
NWSE	7602/0104

SUBJECT: SITE 4 - Drainage Areas / Weighted Curve No. - Pre Construction

BASED ON	DRAWING NUMBER
Existing Topo	

BY	CHECKED BY	APPROVED BY	DATE
CAR 7/24/97	JJB 8/7/97		

(4) WOODS

AREA 1

	M1	M2	M3	AVG
PINES (A)	45.0224	45.6424	45.6889	45.4512
(B)	20.8475	20.6925	20.6615	20.7338
HARDWOODS	21.8085	21.6535	21.4675	21.6432

TOTAL = 87.8282 IN^2
= 219,570.5 ft^2
= 5.04 ac

AREA 2

	M1	M2	M3	AVG
PINES (A)	10.8810	10.6950	10.8345	10.8035
(B)	0.6510	0.6200	0.6820	0.6510
(C)	0.2170	0.2790	0.2480	0.2480
HARDWOODS	20.7080	20.6770	20.8010	20.7287

TOTAL AREA = 32.4312 IN^2
= 81,078 ft^2
= 1.86 ac

(5) BRUSH/WEEDS/GRASS

AREA 1	M1	M2	M3	AVG
	4.8670	4.9445	5.0220	4.9445 IN^2
				0.28 ac

AREA 2	M1	M2	M3	AVG
	2.9140	2.9140	2.9140	2.9140 IN^2
				0.17 ac

CALCULATION WORKSHEET Order No. 19116 (01-01)

CLIENT	JOB NUMBER
NSWE	7602 / 0104

SUBJECT: Site 4 - Drainage Areas / Weighted Curve No. - Pre Construction

BASED ON	DRAWING NUMBER
Existing Topo	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/17/97	CAR 8/22/97		

(6) Woods / Grass

	M1	M2	M3	AVG (IN²)
Area 1	31.6356	32.0230	31.9146	31.8577
				= 79,644 FT²
				= 1.83 acres
Area 2	25.1721	25.2186	25.4201	25.2703 in²
				= 63,175.75 FT²
				= 1.45 acres

(7) Totals

DA #1 (Total Area = 7.55 ac)	Area (ac)	Corrected Area (ac)
Bare Soil	0.36	0.36
Woods (Pine / Hardwood)	5.04	5.05
Brush / Weeds / Grass	0.28	0.28
Dirt Road	0.03	0.03
Woods / Grass	1.83	1.83
	7.54	7.55

DA #2 (Total Area = 3.65 ac)	Area (ac)	Corrected Area (ac)
Bare Soil	0.00	0.00
Woods (Pines / Hardwood)	1.86	1.84
Brush / Weeds / Grass	0.17	0.17
Dirt Road	0.21	0.21
Woods / Grass	1.45	1.43
	3.69	3.65

CALCULATION WORKSHEET

Order No. 19116 (01-91)

PAGE ____ OF ____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

Determine Time of Concentrations for
Each Site 4 Drainage Area
Initial Conditions

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT	JOB NUMBER
NSWE	7602/0104

SUBJECT: Travel Time (T_t) / Time of Concentration (T_c) - Pre Development. Site 4

BASED ON	DRAWING NUMBER
Figure 1 / Existing Topo	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/17/97	EAR 8/22/97		

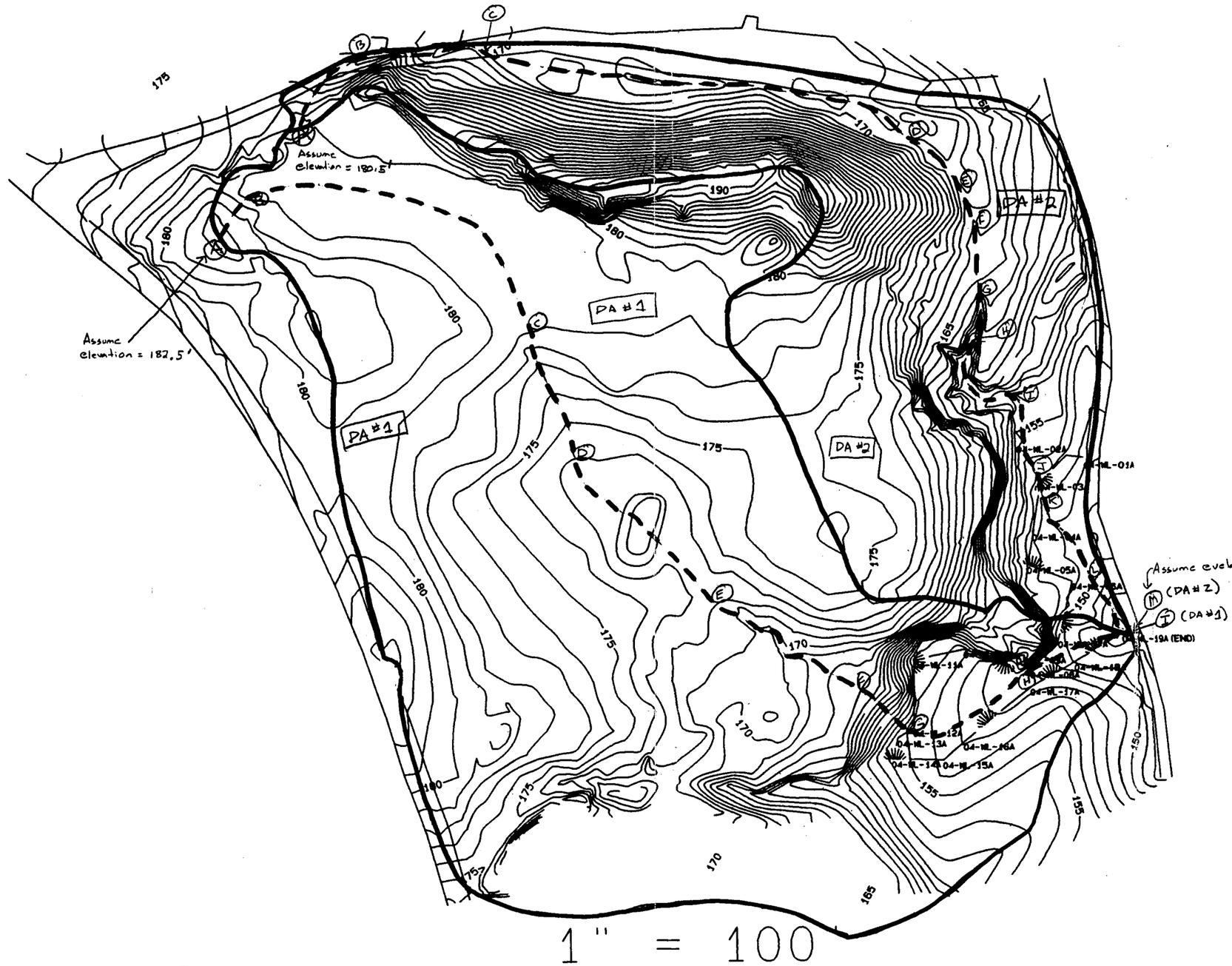
(1) A time of concentration (T_c) for each Drainage Area is required to calculate a peak discharge rate. T_c is defined as the time for runoff to travel from the hydraulically most distant point of the watershed to a point of interest within the watershed. Travel time (T_t) is a component of T_c and is defined as the time it takes to travel from one location to another in a watershed.

(2) By visual evaluation of each drainage area, the hydraulically most distant point and the discharge point for each drainage area were located. The flow path between these two points was then marked. The flow paths for drainage areas 1 and 2 are shown on Figure 1. Each flow path was then segmented using changes in slope as the guide for determining the end of each segment.

(3) The length and slope of each segment was then determined. These numbers are summarized on page 3 of 4.

(4) Flow types assumed for Site 4 Drainage areas were sheet flow and shallow concentrated flow. The USGS quad did not show any channels, so open channel flow was not evaluated. T_t and T_c calculations are on p. 4 of 4.

SITE 4



Site 4 - NWSE

PRECONSTRUCTION CONDITIONS

Flow Paths For T_t & T_c CALCULATIONS

Figure: 1

BY: JJB CHKD: CAR

DATE: 8/14/97 DATE: 8/14/97

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NWSE	JOB NUMBER: 7602 10104
SUBJECT: TRAVEL TIME – DRAINAGE AREAS 1 & 2 – SITE 4	
BASED ON: TOPO MAP & TR-55 MANUAL	DRAWING NUMBER:
BY: CAR 7/24/97	CHECKED BY: JJB 8/1/97
APPROVED BY:	DATE:

DA #1

SEGMENT	DISTANCE	MAX ELEV	MIN ELEV	SLOPE	FLOW TYPE
1AB	40	182.5	179	0.088	SF
1BC	320	179	178	0.003	SCF
1CD	120	178	173	0.042	SCF
1DE	180	173	172	0.006	SCF
1EF	150	172	167	0.033	SCF
1FG	55	167	155	0.218	SCF
1GH	125	155	151	0.032	SCF
1HI	105	151	146.5	0.043	SCF
	1,095 ft	182.5 ft msl	146.5 ft msl		

DA #2

SEGMENT	DISTANCE	MAX ELEV	MIN ELEV	SLOPE	FLOW TYPE
2AB	76	180.5	174	0.086	SF
2BC	120	174	170	0.033	SCF
2CD	390	170	169	0.003	SCF
2DE	52	169	168	0.019	SCF
2EF	39	168	166	0.051	SCF
2FG	63	166	164	0.032	SCF
2GH	45	164	159	0.111	SCF
2HI	80	159	156	0.038	SCF
2IJ	78	156	153	0.038	SCF
2JK	44	153	151	0.045	SCF
2KL	70	151	150	0.014	SCF
2LM	62	150	146.5	0.056	SCF
	1,119 ft	180.5 ft msl	146.5 ft msl		

NOTE:

SF = SHEET FLOW

SCF = SHALLOW CONC. FLOW

c:\CTO289\NSWE4-pr_tc

Project: NWSE - Site 4 - Pre-development Conditions
Task: Estimation of Drainage Area Travel Time (Tt)/ Time of Concentration (Tc)
By: JJB **Chkd: CAR**
Date: 8/19/97 **Date: 8/19/97**

Drainage Area 1

	Segment	Distance	Slope	n[2]	P2	Tt
Sheet Flow[1]	AB	40	0.088	0.4	3.4	0.092

	Segment	Distance	Slope	Surface Type	V	Tt
Shallow Conc. Flow[1]	BC	320	0.003	Unpaved	0.884	0.101
	CD	120	0.042	Unpaved	3.307	0.010
	DE	180	0.006	Unpaved	1.250	0.040
	EF	150	0.033	Unpaved	2.931	0.014
	FG	55	0.218	Unpaved	7.533	0.002
	GH	125	0.032	Unpaved	2.886	0.012
	HI	105	0.043	Unpaved	3.346	0.009
					DA #1 Tc =	0.280

Drainage Area 2

	Segment	Distance	Slope	n[2]	P2	Tt
Sheet Flow[1]	AB	76	0.086	0.4	3.4	0.156

	Segment	Distance	Slope	Surface Type	V	Tt
Shallow Conc. Flow[1]	BC	120	0.033	Unpaved	2.931	0.011
	CD	390	0.003	Unpaved	0.884	0.123
	DE	52	0.019	Unpaved	2.224	0.006
	EF	39	0.051	Unpaved	3.644	0.003
	FG	63	0.032	Unpaved	2.886	0.006
	GH	45	0.111	Unpaved	5.375	0.002
	HI	80	0.038	Unpaved	3.145	0.007
	IJ	78	0.038	Unpaved	3.145	0.007
	JK	44	0.045	Unpaved	3.423	0.004
	KL	70	0.014	Unpaved	1.909	0.010
	LM	62	0.056	Unpaved	3.818	0.005
					DA #2 Tc =	0.340

(1) Formulas taken from Chapter 3 and Appendix F, TR-55 Manual, SCS, June 1986.
(2) Manning's coefficients taken from Table 3-1, Chapter 3, TR-55 Manual, SCS, June 1986.
- Woods (light under brush) n = 0.40

CALCULATION WORKSHEET

Order No. 19116 (01-91)

PAGE _____ OF _____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

Calculation of Peak Discharge Rates
for Site 4 Drainage Areas Using the
TR-55 Graphical Peak Discharge Method
Initial Conditions

CALCULATION WORKSHEET

Order No. 19116 (01-91)

CLIENT	JOB NUMBER
NSWE	7602-0104

SUBJECT: Peak Discharge Rates - INITIAL CONDITIONS

BASED ON	DRAWING NUMBER
Quick TR-55	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/14/97	CAR 8/22/97		

(1) The Peak, initial Conditions, Discharge Rates for the Site 4 Drainage Areas were calculated by the Peak Discharge Method. Haestad's Quick TR-55 Program was used to compile the calculations. Input for the program was summarized previously. (Note: No pond/swamp factor was used for the wetlands. Travel time through the wetlands was estimated by calculation. This is a conservative assumption (i.e. peak discharge rates are higher.))

(2) The peak Discharge Rates for the drainage areas are shown on the following pages. Discharge Rates for three storm events (2-yr, 10-yr, & 25-year storms) are shown for each drainage area. The results are summarized below.

(3) Summary

Area	Storm Frequency (Yr)	Peak Discharge Rate (CFS)
1	2	3
	10	8
	25	12
2	2	1
	10	4
	25	5

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NWSE - SITE 4 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0104
DRAINAGE AREA #1

CALCULATED
DISK FILE: NSWE4PR1.GPD

Drainage Area	(acres)	7.55	--->	0.0118 sq.mi.
Runoff Curve Number	(CN)	62		
Time of Concentration,Tc	(hrs)	.280		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	2	10	25
Rainfall, P, 24-hr (in)	3.4	5.2	6.0
Initial Abstraction, Ia (in)	1.226	1.226	1.226
Ia/p Ratio	0.361	0.236	0.204
Unit Discharge, * qu (csm/in)	381	459	471
Runoff, Q (in)	0.57	1.56	2.09
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	3	8	12

Summary of Computations for qu

Ia/p	#1	0.350	0.100	0.100
C0	#1	2.355	2.473	2.473
C1	#1	-0.497	-0.518	-0.518
C2	#1	-0.120	-0.171	-0.171
qu (csm)	#1	391.828	510.030	510.030
Ia/p	#2	0.400	0.300	0.300
C0	#2	2.307	2.396	2.396
C1	#2	-0.465	-0.512	-0.512
C2	#2	-0.111	-0.132	-0.132
qu (csm)	#2	339.353	435.376	435.376
* qu (csm)		381	459	471

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NWSE - SITE 4 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0104
DRAINAGE AREA #2

CALCULATED
DISK FILE: NSWE4PR2.GPD

Drainage Area	(acres)	3.65	--->	0.0057 sq.mi.
Runoff Curve Number	(CN)	63		
Time of Concentration,Tc	(hrs)	0.340		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	2	10	25
Rainfall, P, 24-hr (in)	3.4	5.2	6.0
Initial Abstraction, Ia (in)	1.175	1.175	1.175
Ia/p Ratio	0.345	0.226	0.196
Unit Discharge, * qu (csm/in)	368	432	442
Runoff, Q (in)	0.61	1.64	2.18
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	1	4	5

Summary of Computations for qu

Ia/p	#1	0.300	0.100	0.100
C0	#1	2.396	2.473	2.473
C1	#1	-0.512	-0.518	-0.518
C2	#1	-0.132	-0.171	-0.171
qu (csm)	#1	404.667	477.078	477.078
Ia/p	#2	0.350	0.300	0.300
C0	#2	2.355	2.396	2.396
C1	#2	-0.497	-0.512	-0.512
C2	#2	-0.120	-0.132	-0.132
qu (csm)	#2	364.318	404.667	404.667
* qu (csm)		368	432	442

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

B.3 DURING CONSTRUCTION CONDITIONS FOR SITE 4

CALCULATION WORKSHEET Order No. 19116 (01-01)

PAGE ____ OF ____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

B.3

Determination of Site 4 Drainage Areas and Weighted Curve Numbers Construction Conditions

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT	JOB NUMBER
NSWE	7602-0104

SUBJECT: Drainage Areas / Weighted Curve Numbers - Construction - Site 4

BASED ON	DRAWING NUMBER
Existing Topo / TR-55 / Waste Regrade Plans	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/17/97	CAR 8/22/97		

(1) The boundaries of the drainage areas were determined by the regrade plans of the waste and the existing topography of the undisturbed areas. Three drainage areas were determined. They are illustrated on Figure 1 (p. 2 of 11).

The area of each drainage area was determined by planimeter. The measurements are shown on p. 9 of 11. The areas are summarized below.

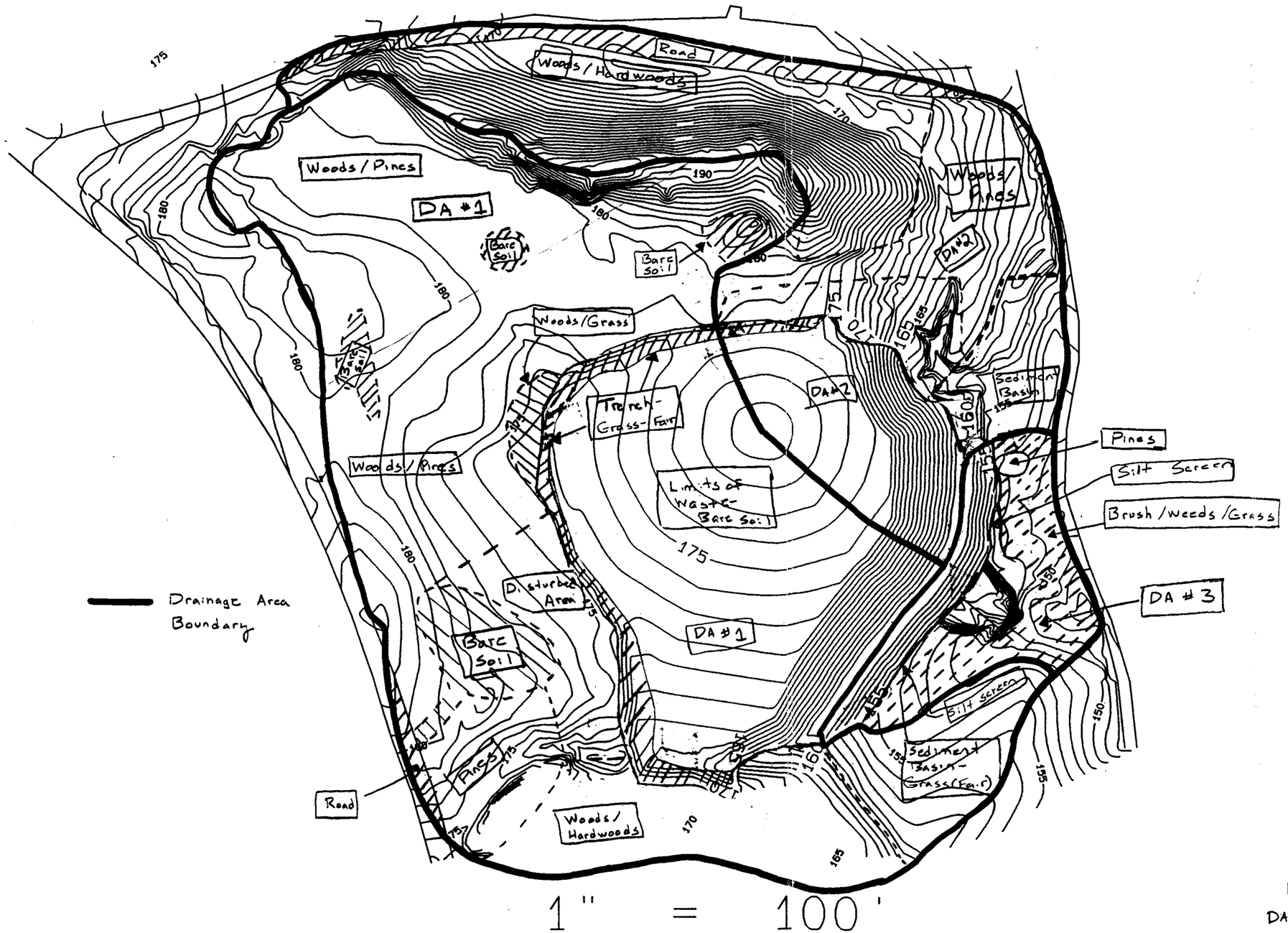
Drainage Area	Area (acres)
1	7.23
2	3.23
3	0.74
	11.20 - total

(2) The type of cover material was then determined. First, a construction sequence was assumed based on the following activities: 1) Construct Sediment Basins and surface water interception trench, 2) clear and grub remainder of landfill site, and 3) construct landfill. These calculations will estimate hydrologic conditions during the worst-case, sediment erosion scenario during construction activities. Cover types during the worst-case scenario will consist of:

1) exposed (bare) soil throughout the proposed area of cap and other disturbed areas
2) Grass (fair) seeded throughout the groundwater interception trench and sediment basin

Cover types outside of the disturbed area will remain as shown on the pre-construction calculations

SITE 4



Site 4
CONSTRUCTION CONDITIONS
COVER TYPE FOR ESTIMATING
WEIGHTED CURVE NUMBERS

Figure 1

BY: JJB CHKD: CAR
DATE: 8/21/97 DATE: 8/22/97

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NSWE	JOB NUMBER: 7602-0104
SUBJECT: Drainage / Weighted CNS - Construction - Site 4	
BASED ON: Existing Topo / Waste Regrade Plan	DRAWING NUMBER:
BY: JJB 8/26/97	CHECKED BY: CAR 8/26/97
APPROVED BY:	DATE:

(3) Assumptions:

- An upgradient surface water interception trench is in place as shown on Figure 1 (p 2 of 11). The trench drains to one of two sediment basins. The sediment basins serve as the erosion and sediment control devices for Drainage Areas 1 & 2.
- For Drainage Area 3, a silt fence will be placed along the toe of slope along the boundary of the drainage area. For erosion and sediment control purposes.
- A trench will be constructed along the downgradient slope of the regraded landfill material. The trench will route runoff and sediment to the sediment basins. Approx. Trench Flow = 160 ft.
- The size of the total drainage basin is the same during construction activities as the size during the initial conditions.
- The length of construction activities is six months.
- Top soil will be brought from an offsite source to facilitate growth of grass within the trench and within the sediment basins.

CLIENT	JOB NUMBER
NSWE	7602-0104

SUBJECT: Drainage Areas / Weighted Curve Numbers - Construction - Site 4

BASED ON	DRAWING NUMBER
Existing Topo / Regrade Plan / TR-55	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/17/97	CAR 8/22/97		

(4) The Area of each cover type within each drainage area was then determined by planimeter. The measurements are shown on pp. 9-11. The areas are summarized below.

Drainage Area	Cover Type	Area (A) (acres)
1	Bare Soil	2.59
	Woods (Pine/Hardwood)-Fair	3.87
	Woods/Grass - Fair	0.06
	Dirt Road	0.03
	Grass - Fair	0.68
		7.23 - total
2	Bare Soil	0.066
	Woods (Pine/Hardwood)-Fair	1.76
	Woods/Grass - Fair	0.28
	Dirt Road	0.21
	Grass - Fair	0.32
		3.23 - total
3	Bare Soil	0.21
	Brush/Weeds/Grass	0.53
		0.74 - total

Note:

(A) - The areas shown are the average of three measurements. If the individual measurements did not total to the measurement of the entire drainage area, the variation was distributed, using a weighting factor, to each area.

CLIENT	JOB NUMBER
NWSE	7602-0104

SUBJECT: Drainage Areas / Weighted Curve Nos - Construction - Site 4

BASED ON	DRAWING NUMBER
Existing Topo / TR-55 / Regrade Plan	

BY	CHECKED BY	APPROVED BY	DATE
JJB - 8/17/97	CAM 8/22/97		

(5) Runoff curve numbers were determined for each cover type. The curve numbers were taken from tables 2-2a, 2-2b, and 2-2c of the TR-55 manual. The site 4 hydraulic soil type is B. (see calculations entitled "Estimate Soil Types + SCS Hydraulic Soil Groups for Sites 4 & 5.")

Cover Type	Soil Type	CN
Bare Soil	B	86
Woods (Pines/Hardwoods) - Fair	B	60
Woods/Grass - Fair	B	65
Brush/Weeds/Grass - Fair	B	56
Dirt Road	B	82
Grass - Good	B	61
Grass - Fair	B	69

(6) Weighted Runoff Curve numbers were calculated for each drainage area using the estimated areas of each cover type + the appropriate curve numbers. The Haestad Quick TR-55 Program was used to calculate the weighted Curve Numbers (see pp. 7-8) and to summarize the results (p. 6).

Quick TR-55 Ver.5.46 S/N:
Executed: 08:44:29 08-22-1997

RUNOFF CURVE NUMBER SUMMARY

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Subarea Description	Area (acres)	CN (weighted)
Drainage Area 1	7.23	70
Drainage Area 2	3.23	68
Drainage Area 3	0.74	65

Quick TR-55 Ver.5.46 S/N:
Executed: 08:44:29 08-22-1997

RUNOFF CURVE NUMBER DATA

::

Composite Area: Drainage Area 1

SURFACE DESCRIPTION	AREA (acres)	CN	
Bare Soil	2.59	86	
Woods (Pines/Hardwoods) - Fair	3.87	60	
Brush/Weeds/Grass - Fair	0.00	56	
Dirt Roads	0.03	82	
Woods/Grass - Fair	0.06	65	
Grass - Fair	0.68	69	
COMPOSITE AREA --->	7.23	70.3	(70)

::

Composite Area: Drainage Area 2

SURFACE DESCRIPTION	AREA (acres)	CN	
Bare Soil	0.66	86	
Woods (Pines/Hardwoods) - Fair	1.76	60	
Brush/Weeds/Grass - Fair	0.00	56	
Dirt Roads	0.21	82	
Woods/Grass - Fair	0.28	65	
Grass - Fair	0.32	69	
COMPOSITE AREA --->	3.23	68.1	(68)

::

Quick TR-55 Ver.5.46 S/N:
Executed: 08:44:29 08-22-1997

Composite Area: Drainage Area 3

SURFACE DESCRIPTION	AREA (acres)	CN	
Bare Soil	0.21	86	
Brush/Weeds/Grass	0.53	56	
COMPOSITE AREA --->	0.74	64.5	(65)

::

CALCULATION WORKSHEET Order No. 19116 (01-01)

CLIENT	JOB NUMBER
NSWE	7602-0104

SUBJECT: Drainage Areas / CNs - Construction - Site 4

BASED ON: Existing Conditions / TR-55 / Regrade Plans

DRAWING NUMBER:

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/17/97	CAL 8/22/97		

(I) Planimeter Measurements (See Figure 1, page 2)

Total Area - Drainage Basin = 11.70 acres

Area	M1	M2	M3	AVG (in²)
DA #1	31.8681	31.7593	31.6510	31.7595
DA #2	14.2174	14.1825	14.1670	14.1870
DA #3	3.2550	3.2705	3.2860	3.2705

Area	AVG (in²)	AVG (ft²)	AVG (acres)	AVG (Corrected)[1]
DA #1	31.7595	317.595	7.29	7.23
DA #2	14.1870	141.870	3.26	3.23
DA #3	3.2705	32.705	0.75	0.74
			11.30	11.20

Note: (1) Area was normalized to correspond with the measured basin area during the initial cond. calc.

(II) DA #1 Individual Cover Sub Areas

	M1	M2	M3	AVG (in²)	
(A) Bare Soil					
- Disturbed Area	1.5345	1.5655	1.5345	1.5448	
- Cap	8.1220	8.1375	8.1220	8.1272	
- Bare Soil (from Pre Development) (1)	Use Area from Pre Development Calcs (0.34 acres)				
(B) Woods (Fair) (2)					
Pines - A	1.5190	1.5035	1.5035	1.5087	
Pines - B	7.0215	7.0060	7.0251	7.0175	
Pines - C	5.2855	5.2235	5.2545	5.2545	
Hardwoods	2.9140	2.9450	2.8951	2.9180	16.6987 - Total
(C) Woods / Grass	0.2635	0.2635	0.2635	0.2635	
(D) Road - Dirt	Use Area from Pre-Development Calcs (0.03 acres)				
(E) Grass (Fair)					
- Sed. Basin	1.7825	1.8290	1.7515	1.7877	
- Trench	1.1100	1.1160	1.1100	1.1120	2.8997

Notes:
1) This area does not include area E as measured in the pre-design calcs.
2) Woods (Fair) were subdivided to facilitate measurement.

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT	JOB NUMBER
NSWE	7602-0104

SUBJECT: Drainage Areas / CNS - Construction - Site 4

BASED ON	DRAWING NUMBER
Existing Conditions / Regrade Plan	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/19/97	CAR 8/22/97		

III DA # 1 - Average Total Area - Total Area = 7.23 acres

	AVG (IN²)	AVG (FT²)	AVG (AC)		Corrected AVG (AC)
(A) Bare Soil	9.672	96,720	2.22 + 0.34 =	2.56	2.59
(B) Woods-Fair	16.6987	166,987		3.83	3.87
(C) Woods/Grass	0.2635	2,635		0.06	0.06
(D) Dirt Road				0.03	0.03
(E) Grass (Fair)	2.8997	28,997		0.67	0.68
				7.15	7.23

IV DA #2 - Individual Cover Subareas

	M1			AVG (IN²)	Total (IN²)
(A) Bare Soil - Cap	2.8365	2.8985	2.8210	2.8520	2.8520
(B) Woods-Fair - Pines	2.5040	2.5040	2.5885	2.5322	
- Hardwoods	5.0006	5.0685	5.0840	5.0510	7.5832
(C) Woods/Grass	1.2400	1.2245	1.1780	1.2142	1.2142
(D) Dirt Road	Use area from pre-development calcs (0.2108 acres)				
(E) Grass (Fair) - Trench	0.1240	0.1395	0.1240	0.1292	
- Basin	1.2710	1.2865	1.2245	1.2607	1.3899

CALCULATION WORKSHEET

Order No. 19116 (01-91)

CLIENT	JOB NUMBER
NSWE	7602-0104

SUBJECT: Drainage Areas / CN6 - Construction - Site 4

BASED ON	DRAWING NUMBER
Existing Conditions / Regrade Plan	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/19/97	CAR 8/22/97		

V DA #2 - Average Total Area - Total Area = 3.23 acres

	AVG (IN²)	AVG (FT²)	AVG (ac)	Corrected Average (ac)
A Bare Soil	2.8520	28,520	0.65	0.66
B Woods - Fair	7.5832	75,832	1.74	1.76
C Woods/Grass	1.2142	12,142	0.28	0.28
D Dirt Road	—	—	0.21	0.21
E Grass (Fair)	1.3899	1.3899	0.32	0.32
			3.20	3.23

VI DA #3 - Individual cover subareas

	M1	M2	M3	AVG (IN²)
A Bare Soil	0.9300	0.9455	0.9300	0.9352
B Brush/Weeds/Grass	2.3715	2.4335	2.3405	2.3638

VII DA #3 - Average Total Area - Total Area = 0.74 acres

	AVG (IN²)	AVG (FT²)	AVG (ac)	AVG corrected (ac)
A Bare Soil	0.9352	9,352	0.21	0.21
B Brush/Grass/Weeds	2.3638	23,638	0.54	0.53
			0.75	0.74

CALCULATION WORKSHEET Order No. 19116 (01-91)

PAGE ____ OF ____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

Determine Time of Concentrations for Each
Site 4 Drainage Area
Construction Conditions

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NSWE	JOB NUMBER: 7602/0104
SUBJECT: Travel Time (T_t) / Time of Concentration (T_c) - Construction Conditions - Site	
BASED ON: Figure 1 / Existing Topo / Regrade Plan	DRAWING NUMBER:
BY: JJB 8/17/97	CHECKED BY: CWM 8/26/97
APPROVED BY:	DATE:

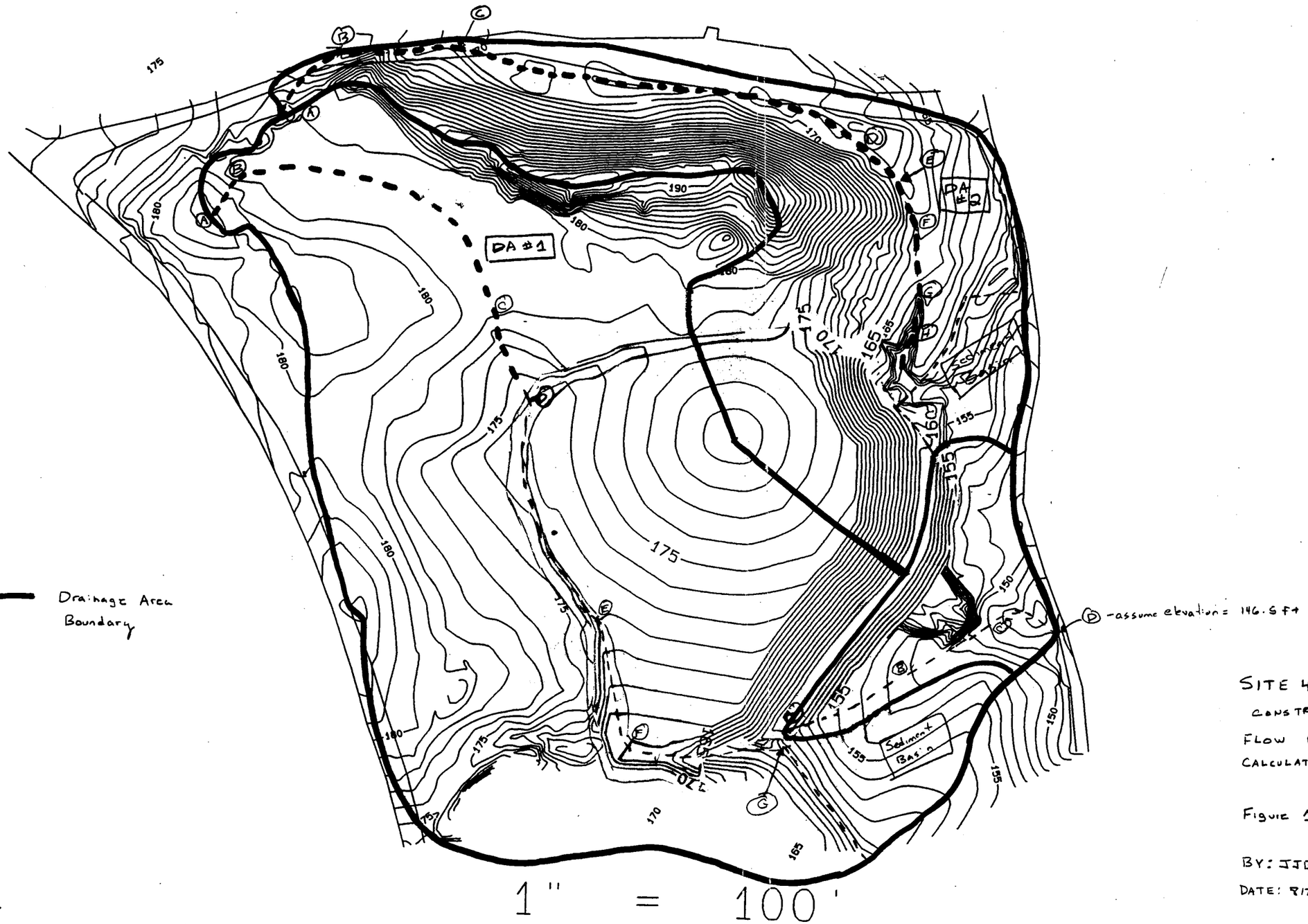
(1) A time of concentration (T_c) for each Drainage Area is required to calculate a peak discharge rate. T_c is defined as the time for runoff to travel from the hydraulically most distant point of the watershed to a point of interest within the watershed. Travel time (T_t) is a component of T_c and is defined as the time it takes to travel from one location to another in a watershed.

(2) By visual evaluation of each drainage area, the hydraulically most distant point and the discharge point for each drainage area were located. The flow path between these two points was then marked. The flow paths for drainage areas 1 & 2 & 3 are shown on Figure 1. Each flow path was then segmented using changes in slope as the guide for determining the end of each segment.

(3) The length and slope of each segment was then determined. These numbers are summarized on page 3.

(4) Flow types assumed for Site 4 Drainage areas were Sheet Flow, Shallow Concentrated Flow, and open channel flow. Open channel flow is assumed through the surface water interception trench. Sheet Flow is assumed for the first segment illustrated on Figure 1 (page 2 of 9). T_t + T_c calculations are shown on p. 4 of 4. A trapezoidal channel with 4/1 side slopes and a 4 foot base is assumed for open channel flow. A sample open-channel flow calculation is provided on page 5 of 5.

SITE 4



Drainage Area Boundary

SITE 4

CONSTRUCTION CONDITIONS

FLOW PATHS FOR T_t AND T_c CALCULATION

Figure 1

BY: JJB CHKD: CAR

DATE: 8/20/97 DATE: 8/26/97

CALCULATION WORKSHEET

Order No. 19116 (01-91)

CLIENT: NWSE	JOB NUMBER:
SUBJECT: TRAVEL TIME - DRAINAGE AREAS 1, 2, & 3 - Site 4 - Construction	
BASED ON: TOPO MAP & TR-55 MANUAL	DRAWING NUMBER:
BY: JJB 8/17/97	CHECKED BY: CAR 8/26/97
APPROVED BY:	DATE:

DA #1 SEGMENT	Distance	Max Elev.	Min Elev.	Slope	Flow Type
1 AB	40	182.5	179	0.088	SF
1 BC	320	179	178	0.003	SCF
1 CD	90	178	174	0.044	SCF
1 DE	225	174	172	0.009	OCF
1 EF	125	172	168	0.032	OCF
1 FG	145	168	160	0.055	OCF

DA #2 SEGMENT	Distance	Max Elev.	Min Elev.	Slope	Flow Type
2AB	76	180.5	174	0.086	SF
2BC	120	174	170	0.033	SCF
2CD	390	170	169	0.003	SCF
2DE	52	169	168	0.019	SCF
2EF	39	168	166	0.051	SCF
2FG	63	166	164	0.032	SCF
2GH	45	164	159	0.111	SCF
2HF	70	159	157	0.029	SCF

DA #3 Segment	Distance	Max Elev.	Min Elev.	Slope	Flow Type
3 AB	130	159	152	0.054	SF
3BC	105	152	148	0.038	SCF
3CD	60	148	146.5	0.025	SCF

c:\CTO289\NSWE4-cs_tc

Project: NWSE - Site 4 - Construction Conditions
Task: Estimation of Drainage Area Travel Time (Tt)/ Time of Concentration (Tc)
By: JJB **Chkd:** CAM
Date: 8/19/97 **Date:** 8/20/97

Drainage Area 1

	Segment	Distance	Slope	n(2)	P2	Tt
Sheet Flow(1)	AB	40	0.088	0.4	3.4	0.092

	Segment	Distance	Slope	Surface Type	V	Tt
Shallow Conc. Flow(1)	BC	320	0.003	Unpaved	0.884	0.101
	CD	90	0.044	Unpaved	3.384	0.007

Open Channel Flow(1)(3)

Segment	Distance	Slope	Depth(4)	Area	Hyd. Rad.	n(2)	V	Q	Tt
DE	225	0.009	0.617	3.990756	0.4391279	0.025	3.267	13.036	0.019
EF	125	0.032	0.441	2.541924	0.3328616	0.025	5.121	13.016	0.007
FG	145	0.055	0.381	2.104644	0.2946935	0.025	6.190	13.027	0.007
								DA #1 Tc =	**0.233**

Drainage Area 2

	Segment	Distance	Slope	n(5)	P2	Tt
Sheet Flow(1)	AB	76	0.086	0.4	3.4	0.156

	Segment	Distance	Slope	Surface Type	V	Tt
Shallow Conc. Flow(1)	BC	120	0.033	Unpaved	2.931	0.011
	CD	390	0.003	Unpaved	0.884	0.123
	DE	52	0.019	Unpaved	2.224	0.007
	EF	39	0.051	Unpaved	3.644	0.003
	FG	63	0.032	Unpaved	2.886	0.006
	GH	45	0.111	Unpaved	5.375	0.002
	HI	70	0.029	Unpaved	2.748	0.007
					DA #2 Tc =	**0.315**

Drainage Area 3

	Segment	Distance	Slope	n(2)	P2	Tt
Sheet Flow(1)	AB	130	0.054	0.011	3.4	0.016

	Segment	Distance	Slope	Surface Type	V	Tt
Shallow Conc. Flow(1)	BC	105	0.038	Unpaved	3.145	0.009
	CD	60	0.025	Unpaved	2.551	0.007
					DA #3 Tc =	**0.032**

For calculation of the graphical peak discharge using Quick TR-55, valid Tc values range from 0.1 to 10. Because the Tc value for DA #3 is less than 0.1, a 0.1 value will be assumed.

(1) Formulas taken from Chapter 3 and Appendix F, TR-55 Manual, SCS, June 1986.
(2) Manning's coefficients taken from Table 3-1, Chapter 3, TR-55 Manual, SCS, June 1986.
- Woods (light under brush), n = 0.40
- Smooth surface (bare soil), n = 0.011
(3) A trapezoidal channel is assumed with a 4 foot base, 4:1 side slopes.
A sample open channel flow calculation is shown on the following page.
(4) Depth of water during peak flow, 10-yr storm, construction conditions. Peak flow = 13 cfs.
(5) Earth Channel (Chow, 1959)

CALCULATION WORKSHEET

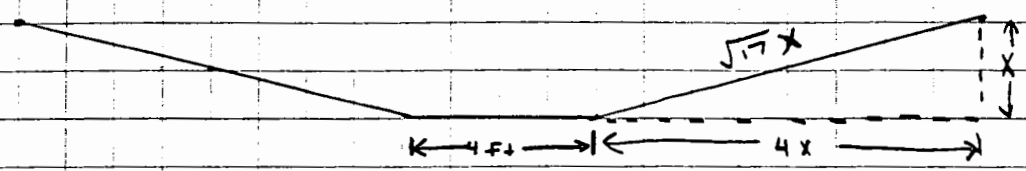
Order No. 19116 (01-91)

CLIENT	JOB NUMBER
NSWE	7602 - 0104

SUBJECT: Travel Time (T_t) / Time of Conc. (T_c) - Construction Conditions - Site 4

BASED ON	DRAWING NUMBER
Figure 1 / Existing Topo / Resource Plan	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/21/97	CMR 8/26/97		



Velocity (V) (ft/s) = $\frac{1.49\,(r^{2/3})\,s^{1/2}}{n}$ - TR-55 eq. 3-4

Flow - Q (cfs) = V A

Cross sectional Area - A (ft^2) = $(4ft)(x) + 4x^2$

Wetted perimeter - p_w (ft) = $4\ ft + 2\sqrt{17}\,(x)$

hydraulic radius - r (ft) = A / p_w

Assumptions: n (manning's coefficent) = 0.025 (Chow, 1959)

s (slope) = 0.02 ft/ft

x (depth of water) = 0.5 ft

$A = (4)(0.5) + 4(0.5)^2 = 3\ ft^2$

$p_w = 4 + 2(\sqrt{17})(0.5) = 3.123$ ft

$r = 3\,ft^2 / 3.123\ ft = 0.369$ ft

$V = \frac{1.49\,(0.369\,ft)^{2/3}\,(0.067)^{1/2}}{0.025} = 7.941$ ft/s

CALCULATION WORKSHEET Order No. 19116 (01-91)

PAGE ____ OF ____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

Calculation of Peak Discharge Rates
For Site 4 Drainage Areas Using the
TR-55 Graphical Peak Discharge Method
Construction Conditions

CLIENT	JOB NUMBER
NSWE	7602 - 0104

SUBJECT: Peak Discharge Rates - Construction Conditions

BASED ON	DRAWING NUMBER
Quick TR-55	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/18/97	CAM 8/26/97		

(1) The Peak, Initial Conditions, Discharge Rates for the Site 4 Drainage Areas were calculated by the Peak Discharge Method. Haestad's Quick TR-55 Program was used to compile the calculations. Input for the program was summarized previously.

(2) The peak Discharge Rates for the drainage areas are shown on the following pages. Discharge Rates for three storm events (2-yr, 10-yr, & 25-year storms) are shown for each drainage area. The results are summarized below.

(3) Summary

Area	Storm Frequency (Yr)	Peak Discharge Rate (CFS)
1	2	5
	10	13
	25	17
2	2	2
	10	5
	25	6
3	2	0
	10	1
	25	2

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NWSE - SITE 4 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0104
DRAINAGE AREA #1 - CONSTRUCTION CONDITIONS

CALCULATED
DISK FILE: NSWE4CS1.GPD

Drainage Area	(acres)	7.23	--->	0.0113 sq.mi.
Runoff Curve Number	(CN)	70		
Time of Concentration,Tc	(hrs)	.233		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	2	10	25
Rainfall, P, 24-hr (in)	3.4	5.2	6.0
Initial Abstraction, Ia (in)	0.857	0.857	0.857
Ia/p Ratio	0.252	0.165	0.143
Unit Discharge, * qu (csm/in)	483	516	524
Runoff, Q (in)	0.95	2.19	2.81
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	5	13	17

Summary of Computations for qu

Ia/p	#1	0.100	0.100	0.100
C0	#1	2.473	2.473	2.473
C1	#1	-0.518	-0.518	-0.518
C2	#1	-0.171	-0.171	-0.171
qu (csm)	#1	540.518	540.518	540.518
Ia/p	#2	0.300	0.300	0.300
C0	#2	2.396	2.396	2.396
C1	#2	-0.512	-0.512	-0.512
C2	#2	-0.132	-0.132	-0.132
qu (csm)	#2	464.724	464.724	464.724
* qu (csm)		483	516	524

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NWSE - SITE 4 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0104
DRAINAGE AREA #2 - CONSTRUCTION CONDITIONS

CALCULATED
DISK FILE: NSWE4CS2.GPD

Drainage Area	(acres)	3.23	--->	0.0050 sq.mi.
Runoff Curve Number	(CN)	68		
Time of Concentration,Tc	(hrs)	.315		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	2	10	25
Rainfall, P, 24-hr (in)	3.4	5.2	6.0
Initial Abstraction, Ia (in)	0.941	0.941	0.941
Ia/p Ratio	0.277	0.181	0.157
Unit Discharge, * qu (csm/in)	425	460	469
Runoff, Q (in)	0.84	2.02	2.62
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	2	5	6

Summary of Computations for qu

Ia/p	#1	0.100	0.100	0.100
C0	#1	2.473	2.473	2.473
C1	#1	-0.518	-0.518	-0.518
C2	#1	-0.171	-0.171	-0.171
qu (csm)	#1	490.105	490.105	490.105
Ia/p	#2	0.300	0.300	0.300
C0	#2	2.396	2.396	2.396
C1	#2	-0.512	-0.512	-0.512
C2	#2	-0.132	-0.132	-0.132
qu (csm)	#2	416.695	416.695	416.695
* qu (csm)		425	460	469

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NWSE - SITE 4 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0104
DRAINAGE AREA #3 - CONSTRUCTION CONDITIONS

CALCULATED
DISK FILE: NSWE4CS3.GPD

Drainage Area	(acres)	0.74	--->	0.0012 sq.mi.
Runoff Curve Number	(CN)	65		
Time of Concentration,Tc	(hrs)	0.1		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	2	10	25
Rainfall, P, 24-hr (in)	3.4	5.2	6.0
Initial Abstraction, Ia (in)	1.077	1.077	1.077
Ia/p Ratio	0.317	0.207	0.179
Unit Discharge, * qu (csm/in)	578	627	636
Runoff, Q (in)	0.70	1.79	2.35
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	0	1	2

Summary of Computations for qu

Ia/p	#1	0.300	0.100	0.100
C0	#1	2.396	2.473	2.473
C1	#1	-0.512	-0.518	-0.518
C2	#1	-0.132	-0.171	-0.171
qu (csm)	#1	596.829	661.942	661.942
Ia/p	#2	0.350	0.300	0.300
C0	#2	2.355	2.396	2.396
C1	#2	-0.497	-0.512	-0.512
C2	#2	-0.120	-0.132	-0.132
qu (csm)	#2	539.846	596.829	596.829
* qu (csm)		578	627	636

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

B.4 POST-CONSTRUCTION CONDITIONS FOR SITE 4

CALCULATION WORKSHEET Order No. 19116 (01-91)

PAGE ____ OF ____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

B-4

Determination of Site 4 Drainage Areas and Weighted Curve Numbers

Post Construction Conditions

Final Cap

CALCULATION WORKSHEET

Order No. 19116 (01-91)

CLIENT: NSWE	JOB NUMBER: 7602-0104
SUBJECT: Drainage Areas / CNs - Post Construction - Site 4	
BASED ON: CAP Existing Topo / Regrade Plan / TR-55	DRAWING NUMBER:
BY: JJB 8/20/97	CHECKED BY: CAR 8/23/97
APPROVED BY:	DATE:

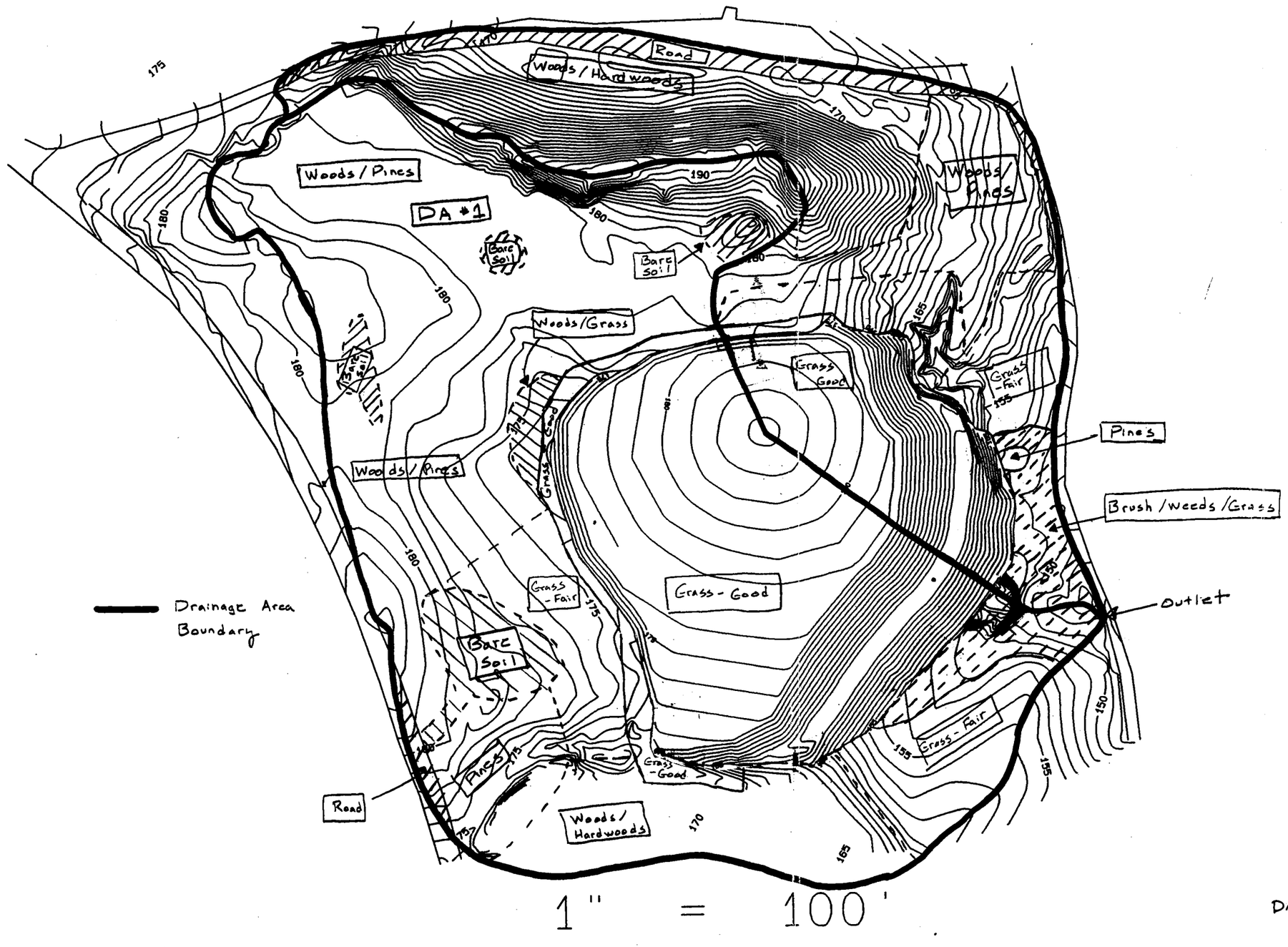
(1) The existing topography for Site 4 was used in conjunction with the Marlboro USGS quadrangle and the Final Cap Regrade Plan to determine the boundaries of the drainage areas that cover site 4. Two drainage areas were determined. They are shown on Figure 1 (p. 2 of 10).

The size of each drainage area was determined by planimeter. The measurements are shown on p. 8 of 10. The areas are summarized below.

Drainage Area	Area (acres)
1	7.65
2	3.55
	11.20 acres - Total

(2) The type of cover material was then determined. It was assumed that the landfill cap and trench would be seeded with grass (good). Additionally, disturbed areas outside of the landfill boundaries and the former sediment basins would be seed with grass (fair). All other areas will have the same cover type as indicated in the pre-construction calculations. Other assumptions are provided in Section 3.0.

SITE 4



Site 4
POST CONSTRUCTION CONDITIONS - CAP
Cover TYPE FOR ESTIMATING
WEIGHTED CURVE NUMBERS

Figure 1

BY: JJB CHKD: CAR
DATE: 8/21/97 DATE: 8/23/97

CLIENT	JOB NUMBER
NSWE	7602-0104

SUBJECT: Drainage Areas / CNs - Post Construction - Site 4

BASED ON	DRAWING NUMBER
Existing Topo / Regrade Plan / TR-55	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/20/97	CAR 8/23/97		

(3) Assumptions:

- Sediment basins have been removed & the areas that the basins occupied have been restored to their existing topography. This scenario represents the worst case drainage scenario & will produce results that can be compared to the peak runoff for pre-construction conditions.
- A trench will be constructed along the downgradient slope of the final landfill cover. The trench will route runoff to the sides of the slope.
- The size of the drainage basin is the same during post construction as the size during pre-construction.
- An upgradient surface water interception trench is in place as shown on Figure 1 (p. 2 of 10). The trench routes runoff around the landfill cap.

CLIENT NSWE	JOB NUMBER 7602-0104
SUBJECT Drainage Areas / CNs - Post Construction - Site 4	
BASED ON CAP Existing Topo / Regrade Plan / TR-55	DRAWING NUMBER
BY JJB 8/20/97 / CHECKED BY CAR 8/23/97	APPROVED BY / DATE

(4) The area of each cover type within each drainage area was then determined by planimeter. The measurements are shown on pp. 8-10. The areas are summarized below.

Drainage Area	Cover Type	Area (A) (acres)
1	Bare Soil	0.34
	Woods - Fair	3.86
	Woods/Grass - Fair	0.06
	Dirt Road	0.03
	Grass - Fair	0.76
	Grass - Good	2.38
	Brush/Weeds/Grass - Fair	0.22
		7.65 - Total
2	Bare Soil	0.00
	Woods - Fair	1.75
	Woods/Grass - Fair	0.28
	Dirt Road	0.21
	Grass - Fair	0.29
	Grass - Good	0.82
	Brush/Weeds/Grass - Fair	0.20
		3.55 - Total

Note:

(A) - The areas shown are the average of three measurements. If the individual measurements did not total to the measurement of the entire drainage area, the variation was distributed using a weighting factor to each area.

CLIENT	JOB NUMBER
NSWE	7602/0104

SUBJECT: Drainage Area / Weighted Curve Numbers

BASED ON	DRAWING NUMBER
Existing Topo / TR-55 / Cap Regrade Plan	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/17/97	CAR 8/23/97		

(5) Runoff curve numbers were determined for each cover type. The curve numbers were taken from tables 2-2a, 2-2b, and 2-2c of the TR-55 manual. The site 4 hydraulic soil type is B. (see Calculations entitled "Estimate Soil Types + SCS Hydraulic Soil Groups for Sites 4 & 5.")

Cover Type	Soil Type	CN
Bare Soil	B	86
Woods (Pines/Hardwoods) - Fair	B	60
Woods/Grass - Fair	B	65
Brush/Weeds/Grass - FAIR	B	56
Dirt Road	B	82
Grass - Fair	B	69
Grass - Good	B	61

(6) Weighted Runoff Curve numbers were calculated for each drainage area using the estimated areas of each cover type + the appropriate curve numbers. The Haested Quick TR-55 Program was used to calculate the weighted Curve Numbers (see pp. 7 of 10) and to summarize the results (see p. 6 of 10.).

Quick TR-55 Ver.5.46 S/N:
Executed: 09:15:59 08-22-1997

RUNOFF CURVE NUMBER SUMMARY

::

Subarea Description	Area (acres)	CN (weighted)
Drainage Area 1	7.65	60
Drainage Area 2	3.55	62

Quick TR-55 Ver.5.46 S/N:
Executed: 09:15:59 08-22-1997

RUNOFF CURVE NUMBER DATA

::

Composite Area: Drainage Area 1

SURFACE DESCRIPTION	AREA (acres)	CN	
Bare Soil	0.34	36	
Woods (Pines/Hardwoods) - Fair	3.86	60	
Brush/Weeds/Grass - Fair	0.22	56	
Dirt Roads	0.03	82	
Woods/Grass - Fair	0.06	65	
Grass - Good	2.38	61	
Grass - Fair	0.76	69	
COMPOSITE AREA --->	7.65	60.1	(60)

::

Composite Area: Drainage Area 2

SURFACE DESCRIPTION	AREA (acres)	CN	
Bare Soil	0.00	86	
Woods (Pines/Hardwoods)	1.75	60	
Brush/Weeds/Grass - Fair	0.20	56	
Dirt Roads	0.21	82	
Woods/Grass - Fair	0.28	65	
Grass - Good	0.82	61	
Grass - Fair	0.29	69	
COMPOSITE AREA --->	3.55	62.4	(62)

::

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NWSE	JOB NUMBER: 7602 - 0104
SUBJECT: Drainage Areas / CNs - Post Construction - Site 4	
BASED ON: Existing Topo / CAP Regrade Plan	DRAWING NUMBER:
BY: JJB 8/20/97 — CHECKED BY: CAR 8/23/97	APPROVED BY: — DATE:

Planimeter Measurements

(I)

Drainage Area	M1	M2	M3	AVG (IN²)
1	33.5716	33.4940	33.5011	33.5222
2	15.5310	15.5702	15.5460	15.5491

Drainage Area	AVG (IN²)	AV (FT²)	AVG (acres)	AVG Corrected (Ac)
1	33.5222	335,222	7.70	7.65
2	15.5491	155,491	3.57	3.55
			11.27	11.20

(II) DA #1 Sub Areas

	M1	M2	M3	AVG
(A) Bare Soil (1)	Use area	from pre-development	calcs	(0.34 acres)
(B) Woods - Fair	Use area	from construction	calcs	(3.86 acres)
(C) Woods/Grass	Use area	from construction	calcs	(0.06 acres)
(D) Road - Dirt	Use area	from pre-development	calcs	(0.03 acres
(E) Grass Fair				
- Dist. Area	Use area	from construction	calcs	(0.35 acres)
- Old Basin	Use area for sed. Basin	from constr.	calcs	(0.41 acres)
(F) Grass-Good				
- Trench + Cap	10.4935	10.4625	10.4935	10.4832
(G) Brush/Weeds/ Grass	0.9455	0.9765	0.9455	0.9558

Note: 1. This area does not include area E as measured in the pre-construction calcs.

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NWSE	JOB NUMBER: 7602-0104
SUBJECT: Drainage Area / CNs - Post Construction - Site 4	
BASED ON: Existing Topo / Cap Regrade Plan	DRAWING NUMBER:
BY: JJB 8/20/97 — CHECKED BY: CAM 8/23/97	APPROVED BY: — DATE:

III DA #1 Sub Areas - Total Area = 7.65 ac.

		AVG (IN)^2	AVG (FT^2)	AVG (Acres)	Correct AVG (Ac)
A	Bare Soil			0.34	0.34
B	Woods-Fair			3.86	3.86
C	Woods/Grass			0.06	0.06
D	Road - Dirt			0.03	0.03
E	Fair Grass			0.76	0.76
F	Good Grass	10.4832	104.832	2.41	2.38
G	Brush/Weeds/Grass	0.9558	9.558	0.22	0.22
				7.68	7.65

IV DA #2

		M1	M2	M3	Avg (n^2)
A	Bare Soil				0
B	Woods-Fair	Use area from construction calcs			(1.76 acres)
C	Woods/Grass	Use area from construction calcs			(0.28 acres)
D	Dirt Road	Use area from construction calcs			(0.21 acres)
E	Grass - Good Cap + Trench	3.5495	3.5495	3.5650	3.5547 n^2
F	Fair - Grass - Old Basin	Use area from construction calcs			(0.29 acres)
G	Brush/Weeds/Grass	0.8370	0.8990	0.8370	0.8577 n^2

CALCULATION WORKSHEET

Order No. 19116 (91-91)

CLIENT	JOB NUMBER
NWSE	7602-0104

SUBJECT: Drainage Areas / CNs - Post Construction - Site 4

BASED ON	DRAWING NUMBER
Existing Topo / Cap Regrade Plan	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/20/97	CAN 8/23/97		

(V) DA #2 - Individual Cover Sub Areas - Total Area = 3.55

	AVG (IN²)	AVG (FT²)	AVG (Acres)	Corrected AVG (Ac)
(A) Bare Soil			0	0
(B) Fair Woods			1.76	1.75
(C) Woods/Grass			0.28	0.28
(D) Dirt Roads			0.21	0.21
(E) Grass - Good	3.5547	35.547	0.82	0.82
(F) Grass Fair			0.29	0.29
(G) Brush/Weeds/Grass	0.8577	8.577	0.20	0.20
			3.56	3.55

CALCULATION WORKSHEET

Order No. 19116 (01-91)

PAGE ____ OF ____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

r

Determine Time of Construction for
Each Site & Drainage Area
Post-Construction Conditions
Final Cap

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT	JOB NUMBER
NSWE	7607 /0104

SUBJECT: Travel Time (T_t) / Time of Concentration (T_c) - Post Construction - Site

BASED ON	DRAWING NUMBER
Figure 1/ POST- Topo	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/17/97	CAR 8/23/97		

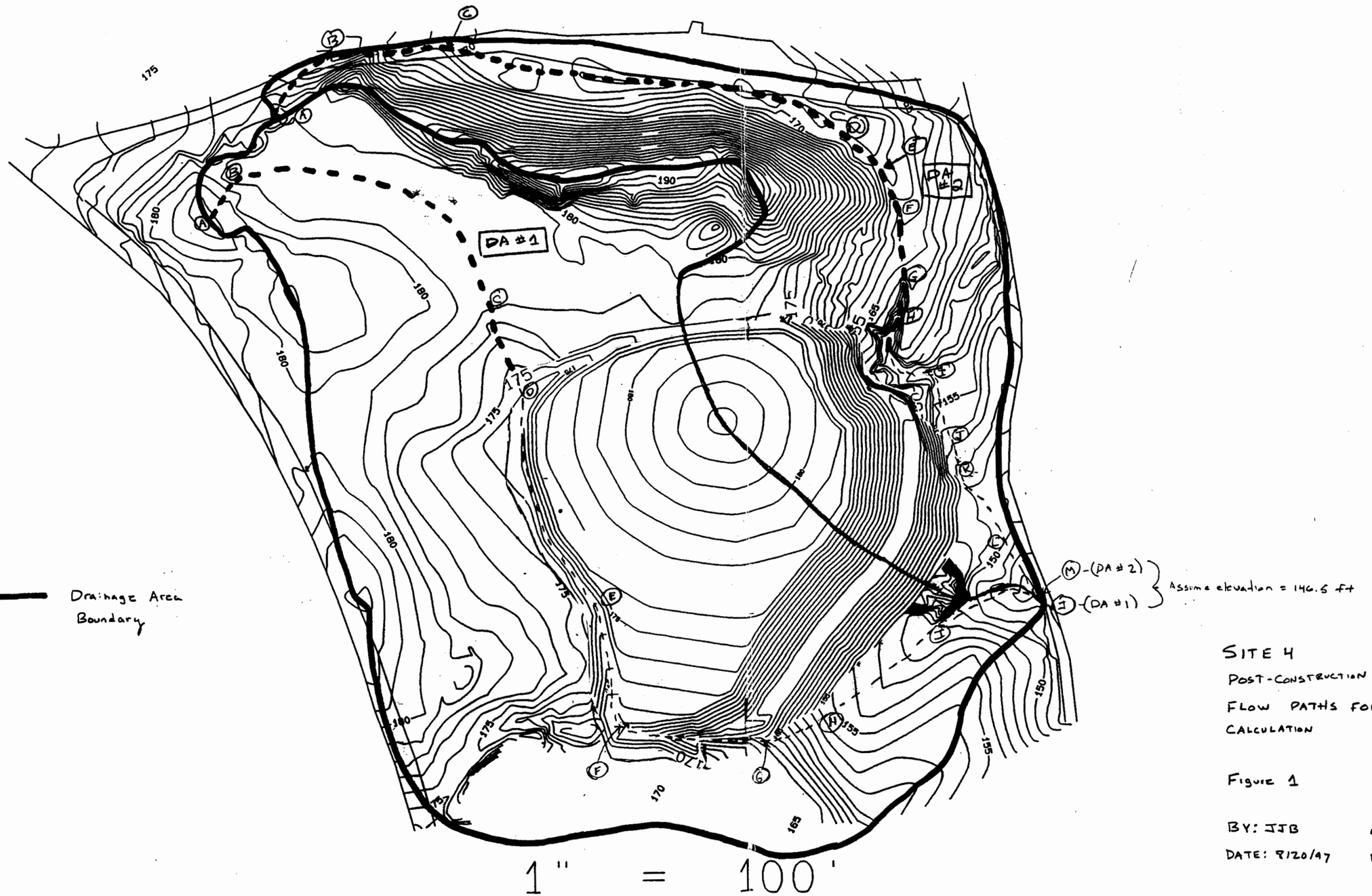
① A time of concentration (T_c) for each Drainage Area is required to calculate a peak discharge rate. T_c is defined as the time for runoff to travel from the hydraulically most distant point of the watershed to a point of interest within the watershed. Travel time (T_t) is a component of T_c and is defined as the time it takes to travel from one location to another in a watershed.

② By visual evaluation of each drainage area, the hydraulically most distant point and the discharge point for each drainage area were located. The flow path between these two points was then marked. The flow paths for drainage areas 1 & 2, are shown on Figure 1. Each flow path was then segmented using changes in slope as the guide for determining the end of each segment.

③ The length and slope of each segment was then determined. These numbers are summarized on page 3.

④ Flow types assumed for Site 4 Drainage areas were Sheet Flow, Shallow Flow, and open channel Flow. Open channel flow is assumed through the surface water interception trench. Sheet Flow is assumed for the first segment illustrated on Figure 1 (page 2 of 9). T_t + T_c calculations are shown on p. 4 of 4. A trapezoidal channel with 4:1 side slopes and a four foot base is assumed for open channel flow. A sample open channel flow calculation is provided on page 5 of 5.

SITE 4



SITE 4

POST-CONSTRUCTION CONDITIONS - CAP

FLOW PATHS FOR T_t AND T_c CALCULATION

Figure 1

BY: JJB CHKD: CAR

DATE: 8/20/97 DATE: 8/23/97

p. 2/5

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CALCULATION WORKSHEET Order No. 19116 (91-01)

CLIENT	JOB NUMBER
NSWE	7602/0104

SUBJECT: Time of Concentration - Site 41 - Post Construction

BASED ON	DRAWING NUMBER
Figure 4 / Existing Topo	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/20/97	CAR 8/23/97		

DA #1	Segment	Distance	Max Elev.	Min Elev.	Slope	Flow Type
	AB	40	182.5	179	0.088	SF
	BC	320	179	174	0.003	SCF
	CD	90	178	173	0.055	SCF
	DE	225	174	172	0.009	OCF
	EF	125	172	168	0.032	OCF
	FG	145	168	164	0.028	OCF
	GH	60	164	156	0.1333	SCF
	HI	145	156	151	0.035	SCF
	IJ	115	151	146.5	0.039	SCF

DA #2	Segment	Distance	Max Elev	Min Elevation	Slope	Flow Type
	AB	76	180.5	174	0.086	SF
	BC	120	174	170	0.0333	SCF
	CD	390	170	169	0.0003	SCF
	DE	52	169	168	0.019	SCF
	EF	39	168	166	0.051	SCF
	FG	63	166	164	0.032	SCF
	GH	45	164	159	0.111	SCF
	HI	80	159	156	0.038	SCF
	IJ	78	156	153	0.038	SCF
	JK	44	153	151	0.045	SCF
	KL	70	151	150	0.014	SCF
	LM	62	150	146.5	0.057	SCF

Project: NWSE - Site 4 - Post Construction Conditions
Task: Estimation of Drainage Area Travel Time (Tt)/ Time of Concentration (Tc)
By: JJB **Chkd:** CAR
Date: 8/22/97 **Date:** 8/23/97

Drainage Area 1

	Segment	Distance	Slope	n(2)	P2	Tt
Sheet Flow(1)	AB	40	0.088	0.4	3.4	0.092

	Segment	Distance	Slope	Surface Type	V	Tt
Shallow Conc. Flow(1)	BC	320	0.003	Unpaved	0.884	0.101
	CD	90	0.055	Unpaved	3.784	0.007
	GH	60	0.1333	Unpaved	5.891	0.003
	HI	145	0.035	Unpaved	3.018	0.013
	IJ	115	0.039	Unpaved	3.186	0.010

Open Channel Flow(1)(3)

Segment	Distance	Slope	Depth(4)	Area	Hyd. Rad.	n(~~2~~) (5)	V	Q	Tt
DE	225	0.009	0.478	2.825936	0.3558356	0.025	2.839	8.023	0.022
EF	125	0.032	0.339	1.815684	0.2671905	0.025	4.423	8.030	0.008
FG	145	0.028	0.352	1.903616	0.2757798	0.025	4.225	8.044	0.010
								DA #1 Tc =	**0.265**

Drainage Area 2

	Segment	Distance	Slope	n(2)	P2	Tt
Sheet Flow(1)	AB	76	0.086	0.4	3.4	0.156

	Segment	Distance	Slope	Surface Type	V	Tt
Shallow Conc. Flow(1)	BC	120	0.033	Unpaved	2.931	0.011
	CD	390	0.003	Unpaved	0.884	0.123
	DE	52	0.019	Unpaved	2.224	0.007
	EF	39	0.051	Unpaved	3.644	0.003
	FG	63	0.032	Unpaved	2.886	0.006
	GH	45	0.111	Unpaved	5.375	0.002
	HI	80	0.038	Unpaved	3.145	0.007
	IJ	78	0.038	Unpaved	3.145	0.007
	JK	44	0.045	Unpaved	3.423	0.004
	KL	70	0.014	Unpaved	1.909	0.010
	LM	62	0.057	Unpaved	3.852	0.005
					DA #2 Tc =	**0.340**

(1) Formulas taken from Chapter 3 and Appendix F, TR-55 Manual, SCS, June 1986.
(2) Manning's coefficients taken from Table 3-1, Chapter 3, TR-55 Manual, SCS, June 1986.
- Woods (light under brush) n = 0.40
(3) A trapezoidal channel is assumed with a 4 foot base, 4/1 side slopes.
A sample open channel flow calculation is shown on the following page.
(4) Depth of water during peak flow during 10-yr storm during post-construction conditions (8 cfs).
(5) EARTH CHANNEL (CHOW, 1959)

CALCULATION WORKSHEET

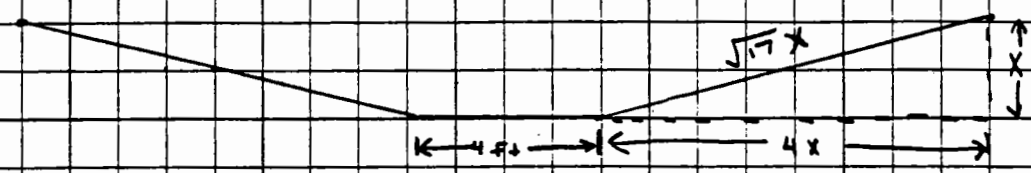
Order No. 19116 (01-91)

CLIENT	JOB NUMBER
NSWE	7602-0104

SUBJECT: Travel Time (T_t) / Time of Conc. (T_c) - Post Const. Conditions - Site 4

BASED ON	DRAWING NUMBER
Figure 1 / Existing Topo / Resource Plan	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/21/97	CAR 8/23/97		



Velocity (V) (ft/s) = $\dfrac{1.49\,(r^{2/3})\,s^{1/2}}{n}$ — TR-55 eq. 3-4

Flow - Q (cfs) = V A

Cross sectional Area - A (ft^2) = (4 ft)(X) + $4X^2$

Wetted perimeter - p_w (ft) = 4 ft + $2\sqrt{17}$ (X)

hydraulic radius - r (ft) = A/p_w

Assumptions: n (Manning's coefficient) = 0.025 (Chow, 1959)

s (slope) = 0.02 ft/ft

X (depth of water) = 0.5 ft

A = (4)(0.5) + $4(0.5)^2$ = 3 ft^2

p_w = 4 + $2(\sqrt{17})(0.5)$ = 3.123 ft

r = $3\,ft^2 / 3.123\,ft$ = 0.369 ft

V = $\dfrac{1.49\,(0.369\,ft)^{2/3}(0.067)^{1/2}}{0.025}$ = 7.941 ft/s

CALCULATION WORKSHEET Order No. 19116 (01-91)

PAGE ____ OF ____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

Calculation of Peak Discharge Rates
For Site 4 Drainage Areas Using the
TR-55 Graphical Peak Discharge Method
Post Construction Conditions
Final CAP

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT	JOB NUMBER
NSWE	7602 - 0104

SUBJECT: Peak Discharge Rates - Post Construction - Site 4

BASED ON	DRAWING NUMBER
Quick TR-55	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/22/97	CAR 8/23/97		

(1) The Peak POST-CONSTRUCTION Conditions, Discharge Rates for the Site 4 Drainage Areas were calculated by the Peak Discharge Method. Haestad's Quick TR-55 Program was used to compile the calculations. Input for the program was summarized previously. (Note: No pond/swamp factor was used for the wetlands. Travel time through the wetlands was estimated by calculation. This is a conservative assumption (i.e. peak discharge rates are higher.)

(2) The peak Discharge Rates for the drainage areas are shown on the following pages. Discharge Rates for three storm events (2-yr, 10-yr, & 25-year storms) are shown for each drainage area. The results are summarized below.

(3) Summary

Area	Storm Frequency (Yr)	Peak Discharge Rate (CFS)
1	2	2
	10	8
	25	11
2	2	1
	10	4
	25	5

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NWSE - SITE 4 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0104
DRAINAGE AREA #1 - POST CONSTRUCTION CONDITIONS

CALCULATED
DISK FILE: NSWE4PT1.GPD

Drainage Area	(acres)	7.65	--->	0.0120 sq.mi.
Runoff Curve Number	(CN)	60		
Time of Concentration,Tc	(hrs)	.265		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	2	10	25
Rainfall, P, 24-hr (in)	3.4	5.2	6.0
Initial Abstraction, Ia (in)	1.333	1.333	1.333
Ia/p Ratio	0.392	0.256	0.222
Unit Discharge, * qu (csm/in)	354	461	473
Runoff, Q (in)	0.49	1.42	1.92
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	2	8	11

Summary of Computations for qu

Ia/p	#1	0.350	0.100	0.100
C0	#1	2.355	2.473	2.473
C1	#1	-0.497	-0.518	-0.518
C2	#1	-0.120	-0.171	-0.171
qu (csm)	#1	399.716	519.254	519.254
Ia/p	#2	0.400	0.300	0.300
C0	#2	2.307	2.396	2.396
C1	#2	-0.465	-0.512	-0.512
C2	#2	-0.111	-0.132	-0.132
qu (csm)	#2	345.767	444.151	444.151
* qu (csm)		354	461	473

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NWSE - SITE 4 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0104
DRAINAGE AREA #2 - POST CONSTRUCTION CONDITIONS

CALCULATED
DISK FILE: NSWE4PT2.GPD

Drainage Area	(acres)	3.55	--->	0.0055 sq.mi.
Runoff Curve Number	(CN)	62		
Time of Concentration,Tc	(hrs)	0.34		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	2	10	25
Rainfall, P, 24-hr (in)	3.4	5.2	6.0
Initial Abstraction, Ia (in)	1.226	1.226	1.226
Ia/p Ratio	0.361	0.236	0.204
Unit Discharge, * qu (csm/in)	354	428	439
Runoff, Q (in)	0.57	1.56	2.09
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	1	4	5

Summary of Computations for qu

Ia/p	#1	0.350	0.100	0.100
C0	#1	2.355	2.473	2.473
C1	#1	-0.497	-0.518	-0.518
C2	#1	-0.120	-0.171	-0.171
qu (csm)	#1	364.318	477.078	477.078
Ia/p	#2	0.400	0.300	0.300
C0	#2	2.307	2.396	2.396
C1	#2	-0.465	-0.512	-0.512
C2	#2	-0.111	-0.132	-0.132
qu (csm)	#2	316.929	404.667	404.667
* qu (csm)		354	428	439

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

B.5 PRE-CONSTRUCTION CONDITIONS FOR SITE 5

CALCULATION WORKSHEET Order No. 19116 (01-91)

PAGE ____ OF ____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

C-5

DETERMINATON OF SITE 5
DRAINAGE AREAS AND WEIGHTED
CURVE NUMBERS.

PRECONSTRUCTION SCENARIO

CLIENT	JOB NUMBER
NWSE	7602/0104

SUBJECT: DRAINAGE AREAS / WEIGHTED CURVE NUMBERS

BASED ON	DRAWING NUMBER
EXISTING TOPOGRAPHY / TR-55	

BY	CHECKED BY	APPROVED BY	DATE
CAR	JJB 3/26/97		

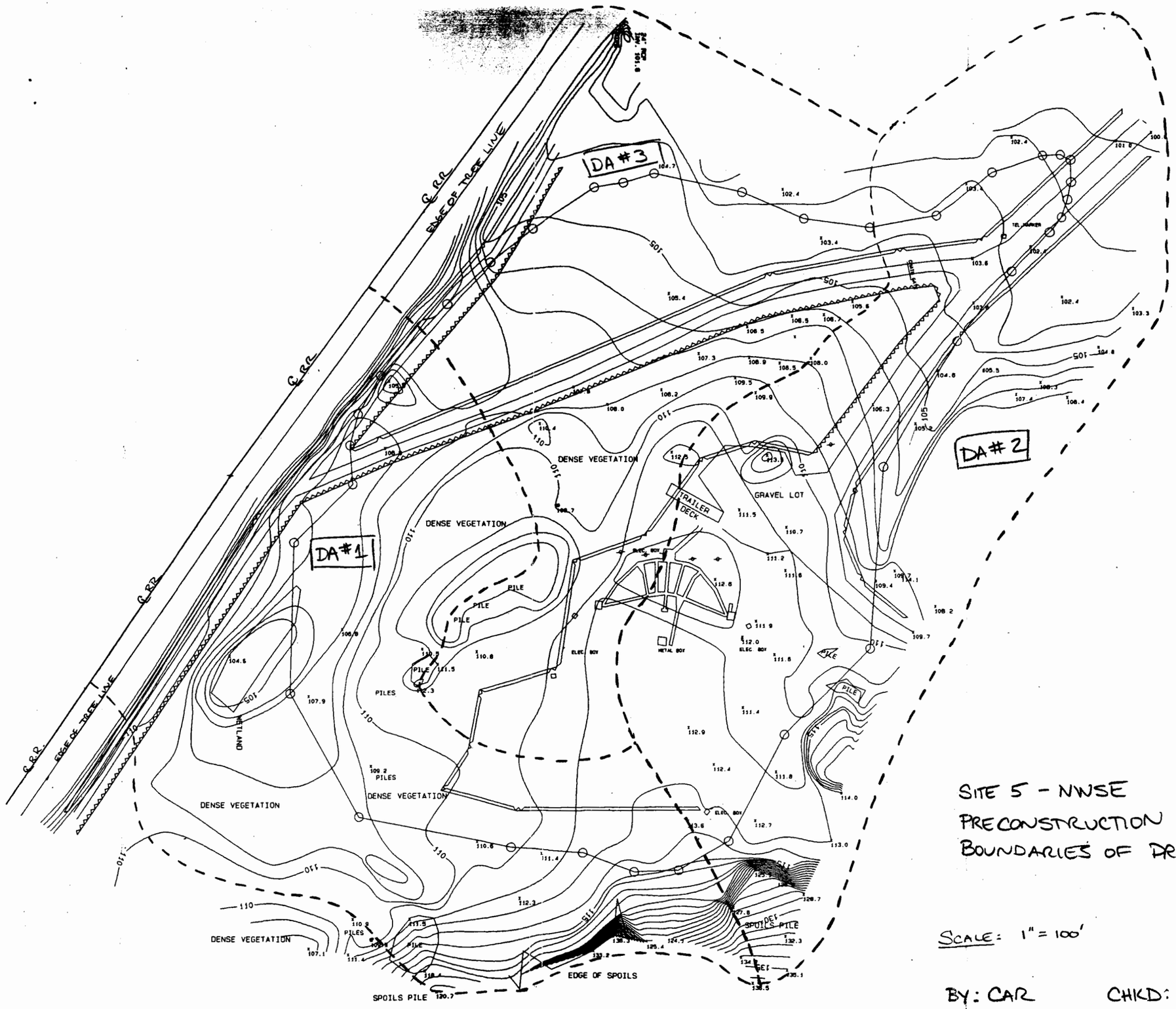
SITE 5 — DRAINAGE AREAS

(1) THE EXISTING TOPOGRAPHY FOR SITE 5 WAS USED IN CONJUNCTION WITH THE LONG BRANCH USGS QUADRANGLE TO DETERMINE THE BOUNDARIES OF THE DRAINAGE AREAS THAT COVER SITE 5. THREE DRAINAGE AREAS WERE DETERMINED. THEY ARE SHOWN ON FIGURE 1 (p. 2 of 11)

THE AREA OF EACH DRAINAGE AREA WAS DETERMINED BY PLANIMETER. THE MEASUREMENTS ARE SHOWN ON P. 9 OF 11. THE AREAS ARE SUMMARIZED BELOW.

DRAINAGE AREA	AREA (acres)
1	5.64
2	5.59
3	4.88

(2) THE TYPE OF COVER MATERIAL AND ITS BOUNDARIES WERE THEN ESTIMATED. SURVEY INFORMATION, PHOTOGRAPHS AND PERSONAL OBSERVATIONS WERE USED TO DETERMINE THE APPROPRIATE COVER TYPE. THE COVER TYPE INFORMATION IS SUMMARIZED ON FIGURE 2 (p. 3 of 11). THE TYPES OF COVER FOUND AT SITE 5 INCLUDE WOODS, DIRT ROADS, GRASSY OPEN SPACE, GRAVEL AREAS (RAILROAD TRACKS AND PARKING LOT), BARE SOIL (SPOILS PILE) AND IMPERVIOUS AREAS (BUILDINGS / SKEET RANGE).

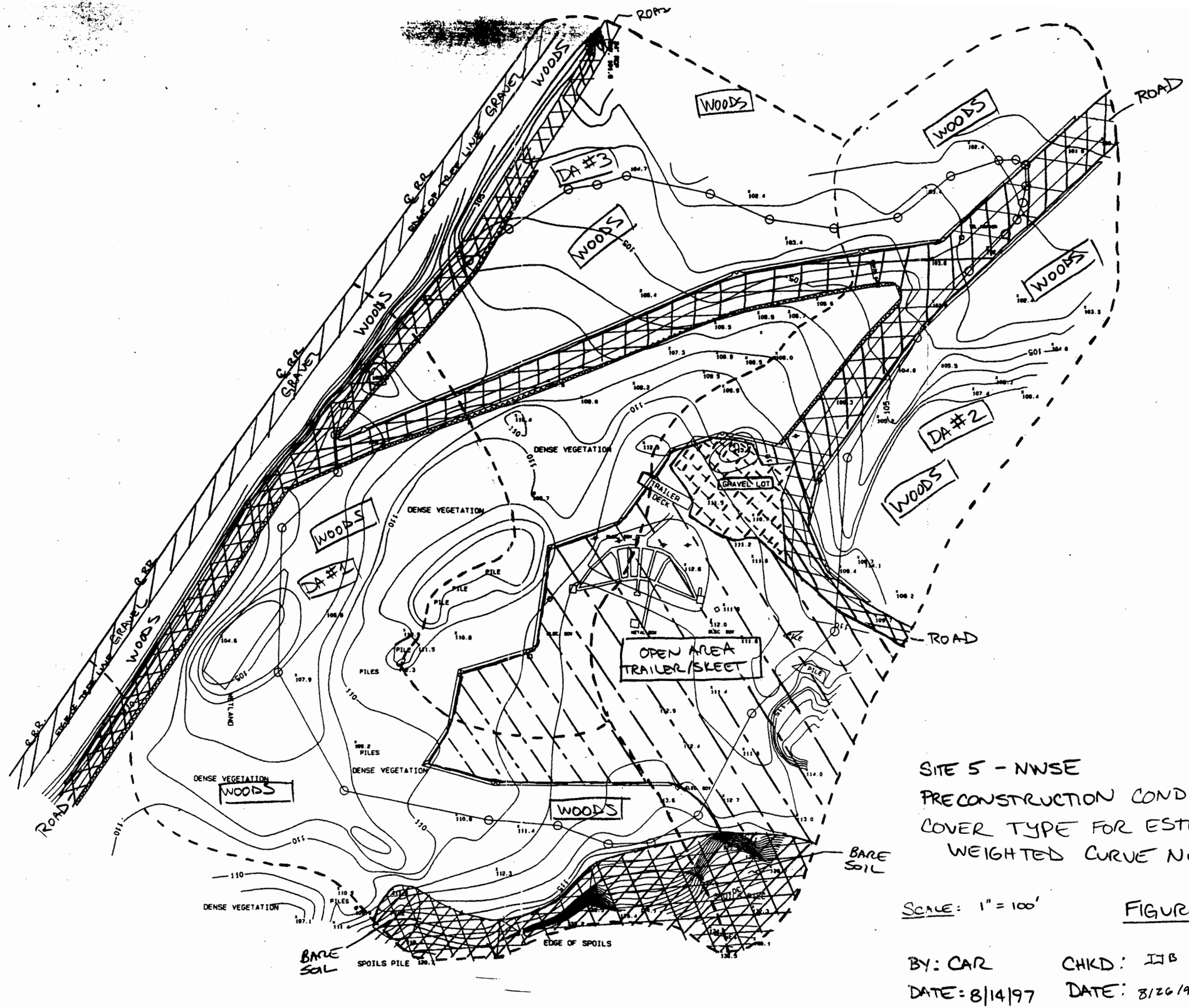


SITE 5 - NWSE
PRECONSTRUCTION CONDITIONS
BOUNDARIES OF DRAINAGE AREAS

SCALE: 1" = 100'

FIGURE 1

BY: CAR CHKD: JJB
DATE: 8/14/97 DATE: 8/26/97



SITE 5 - NWSE
PRECONSTRUCTION CONDITIONS
COVER TYPE FOR ESTIMATING
WEIGHTED CURVE NUMBERS

SCALE: 1" = 100'

FIGURE 2

BY: CAR CHKD: JJB
DATE: 8/14/97 DATE: 8/26/97

CLIENT	JOB NUMBER
NWSE	7602/0104

SUBJECT: DRAINAGE AREAS / WEIGHTED CURVE NUMBERS

BASED ON	DRAWING NUMBER
EXISTING TOPOGRAPHY / TR-55	

BY	CHECKED BY	APPROVED BY	DATE
CAR	JJB 8/26/97		

(3) THE AREA OF EACH COVER TYPE WITHIN EACH DRAINAGE AREA WAS THEN DETERMINED BY PLANIMETER. THE MEASUREMENTS ARE SHOWN ON pp. 9 OF 11 THROUGH 11 OF 11. THE AREAS ARE SUMMARIZED BELOW.

DRAINAGE AREA	COVER TYPE	AREA[A] (ACRES)
1	OPEN SPACE	0.28
	ROAD	0.41
	GRAVEL AREA	0.23
	BARE SOIL	0.46
	WOODS	4.26
	IMPERVIOUS AREA	0.00
2	OPEN SPACE	1.63
	ROAD	0.75
	GRAVEL AREA	0.22
	BARE SOIL	0.28
	WOODS	2.65
	IMPERVIOUS AREA	0.06
3	OPEN SPACE	0.43
	ROAD	0.55
	GRAVEL AREA	0.15
	BARE SOIL	0.00
	WOODS	3.73
	IMPERVIOUS AREA	0.02

NOTE:

(A)- THE AREAS SHOWN ARE THE AVERAGE OF THREE MEASUREMENTS. IN ADDITION, IF INDIVIDUAL MEASUREMENTS DID NOT TOTAL UP TO THE TOTAL MEASURED AREA, THE DIFF. WAS DISTRIBUTED USING A WEIGHTING FACTOR, TO EACH AREA

CLIENT	JOB NUMBER
NWSE	7602/0104

SUBJECT: DRAINAGE AREAS / WEIGHTED CURVE NUMBERS

BASED ON	DRAWING NUMBER
EXISTING TOPOGRAPHY / TR-55	

BY	CHECKED BY	APPROVED BY	DATE
CAR	JJB 3/26/97		

(4) RUNOFF CURVE NUMBERS WERE DETERMINED FOR EACH COVER TYPE. THE CURVE NUMBERS WERE TAKEN FROM TABLES 2-2a, 2-2b, and 2-2c OF THE TR-55 MANUAL. THE SITE 5 HYDROLOGIC SOIL TYPE IS B (SEE PREVIOUS CALCULATIONS)

COVER TYPE	SOIL TYPE	CN
OPEN SPACE (FAIR)	B	69
ROAD (DIRT)	B	82
GRAVEL AREA (RR & PKING LOT)	B	85
BARE SOIL (SPOILS PILE)	B	86
WOODS (GOOD)	B	55
IMPERVIOUS (TRAILER/SKEET AREA)	B	98

(5) WEIGHTED RUNOFF CURVE NUMBERS WERE CALCULATED FOR EACH DRAINAGE AREA USING THE ESTIMATED AREAS OF EACH COVER TYPE AND THE APPROPRIATE CURVE NUMBERS. THE HAESTAD QUICK TR-55 PROGRAM WAS USED TO CALCULATE THE WEIGHTED CURVE NUMBERS (SEE pp. 7 OF 11 AND 8 OF 11) AND TO SUMMARIZE THE RESULTS (SEE p. 6 OF 11).

Quick TR-55 Ver.5.46 S/N:
Executed: 16:31:31 08-01-1997

NWSE - SITE 5 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0104

RUNOFF CURVE NUMBER SUMMARY

Subarea Description	Area (acres)	CN (weighted)
DRAINAGE AREA 1	5.64	61
DRAINAGE AREA 2	5.59	66
DRAINAGE AREA 3	4.88	60

Quick TR-55 Ver.5.46 S/N:
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NWSE - SITE 5 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0104

RUNOFF CURVE NUMBER DATA

::

Composite Area: DRAINAGE AREA 1

SURFACE DESCRIPTION	AREA (acres)	CN	
B - OPEN SPACE (FAIR)	0.28	69	
B - ROAD (DIRT)	0.41	82	
B - GRAVEL AREA (RR & PKING LT)	0.23	85	
B - BARE SOIL (SPOILS PILE)	0.46	86	
B - WOODS (GOOD)	4.26	55	
B - TRAILER/SKEET AREA	0.00	98	
COMPOSITE AREA --->	5.64	61.4	(61)

::

Composite Area: DRAINAGE AREA 2

SURFACE DESCRIPTION	AREA (acres)	CN	
B - OPEN SPACE (FAIR)	1.63	69	
B - ROAD (DIRT)	0.75	82	
B - GRAVEL AREA (RR & PKING LT)	0.22	85	
B - BARE SOIL (SPOILS PILE)	0.28	86	
B - WOODS (GOOD)	2.65	55	
B - TRAILER/SKEET AREA	0.06	98	
COMPOSITE AREA --->	5.59	65.9	(66)

::

Quick TR-55 Ver.5.46 S/N:
Executed: 16:31:31 08-01-1997

Composite Area: DRAINAGE AREA 3

SURFACE DESCRIPTION	AREA (acres)	CN	
B - OPEN SPACE (FAIR)	0.43	69	
B - ROAD (DIRT)	0.55	82	
B - GRAVEL AREA (RR & PKING LT)	0.15	85	
B - BARE SOIL (SPOILS PILE)	0.00	86	
B - WOODS (GOOD)	3.73	55	
B - TRAILER/SKEET AREA	0.02	98	
COMPOSITE AREA --->	4.88	60.4	(60)

::

CLIENT	JOB NUMBER
NWSE	7602 / 0104

SUBJECT: DRAINAGE AREAS/COVER TYPE PLANIMETER MEASUR.

BASED ON	DRAWING NUMBER
FIGURES 1 AND 2	

BY	CHECKED BY	APPROVED BY	DATE
CAR 8/1/97	JJB 8/26/97		

(6) PLANIMETER MEASUREMENTS:

(I)

AREA	M1	M2	M3	AVG	TOTAL (IN^2)
1 - A	39.6026	39.6181	39.4631	39.5613	
- B	58.5126	59.1171	58.3576	58.6624	98.2237
2 - A	45.4616	45.5236	45.5546	45.5133	
- B	51.7391	51.8631	51.8166	51.8063	97.3196
3 - A	28.3496	28.3650	28.3961	28.3702	
- B	56.7301	56.6371	56.6371	56.6681	85.0383

AREA	AVG (IN^2)	AVG (ft^2)	AVG (ac)
1	98.2237	245,559	5.64
2	97.3196	243,299	5.59
3	85.0383	212,596	4.88

(1 IN = 50 ft ; $1 IN^2 = 2500 ft^2$; $43,560 ft^2 = 1 ac$)

(II) AREA 1 - INDIVIDUAL SUBAREAS

	M1	M2	M3	AVG (IN^2)
(A) OPEN SPACE (FAIR) -	4.9600	4.8360	4.8980	4.8980
(B) ROAD (DIRT) -	7.0525	7.0835	6.9595	7.0318
(C) GRAVEL AREA (RR & PARKING LOT) -	3.9835	4.0765	4.0300	4.0300
(D) BARE SOIL (SPOILS PILE) -	8.0910	8.0135	8.1685	8.091
(E) WOODS (GOOD) (I) -	7.5795	7.6725	7.6570	7.6363
(II) -	3.007	3.007	2.9605	2.9915
(III) -	20.8515	20.5220	20.5220	20.4652
(IV) -	42.7646	42.2376	42.4081	42.4701

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NWSE	JOB NUMBER: 7602/0104
SUBJECT: DRAINAGE AREAS/COVER TYPE PLANIMETER MEASUREMENTS	
BASED ON: FIGURES 1 AND 2	DRAWING NUMBER:
BY: CAR 8/1/97 — CHECKED BY:	APPROVED BY: — DATE:

(III) AREA 1 – AVG TOTAL AREAS

	AVG (IN²)	AVG (FT²)	AVG (ac)	CORRECTED AVG (ac)
(A)	4.8980	12,245.00	0.28	0.28
(B)	7.0318	17,579.50	0.40	0.41
(C)	4.0300	10,075.00	0.23	0.23
(D)	8.0910	20,227.50	0.46	0.46
(E)	73.5631	183,907.75	4.22	4.26
			5.59	5.64

(TOTAL AREA (5.64) – IND. AREA (5.59) = 0.05
DIST. AREA SO THAT IND. ADD TO TOTAL)

(IV) AREA 2 – INDIVIDUAL SUBAREAS

		m1	m2	m3	AVG (IN²)
(A)	OPEN SPACE (FAIR)	28.3186	28.6131	28.4891	28.4736
(B)	ROAD (DIRT)	12.8650	13.0510	13.1130	13.0097
(C)	GRAVEL AREA (RR & PARKING LOT)	3.8905	3.7975	3.8440	3.8440
(D)	BARE SOIL (SPOILS PILE)	4.9910	4.8670	4.9290	4.9290
(E)	WOODS (GOOD) I	6.7115	6.6340	6.7735	6.7063
	II	14.6010	14.7250	14.6785	14.6682
	III	24.0560	23.8235	23.9165	23.9320
	IV	0.8835	0.8680	0.8990	0.8835
(F)	TRAILER/SKEET AREA	—	—	—	1.085

(V) AREA 2 – AVG. TOTAL AREAS

	AVG (IN²)	AVG (FT²)	AVG (ac)	CORRECTED AVG (ac)
A	28.4736	71,184.00	1.63	1.63
B	13.0097	32,524.25	0.75	0.75
C	3.8440	9,610.00	0.22	0.22
D	4.9290	12,322.50	0.28	0.28
E	46.1900	115,475.00	2.65	2.65
F	1.085	2,712.50	0.06	0.06

5.59 ac = TOTAL (NO CORRECTION NECESSARY)

CLIENT	JOB NUMBER
NWSE	7602/0104

SUBJECT: DRAINAGE AREAS / COVER TYPE PLANIMETER MEASUREMENT

BASED ON	DRAWING NUMBER
FIGURES 1 AND 2	

BY	CHECKED BY	APPROVED BY	DATE
CAR 8/1/97	JJB 8/26/97		

VI AREA 3 — INDIVIDUAL SUBAREAS

		M1	M2	M3	AVG (IN²)
A	OPEN SPACE (FAIR)	7.5640	7.5640	7.5485	7.5588
B	ROAD (DIRT) I	3.7975	3.8285	3.9525	3.8595
	II	5.7660	5.7660	5.7970	5.7763
C	GRAVEL AREA (RR & PARKING LOT)	2.5420	2.5575	2.5110	2.5368
D	BARE SOIL (SPOILS PILE)	0.00	0.00	0.00	0.00
E	WOODS (GOOD) I	5.2855	5.3940	5.5180	5.3992
	II	38.0836	38.0691	38.0216	38.0578
	III	21.2350	21.3435	21.3280	21.3022
F	TRAILER/ SKEET AREA	—	—	—	0.3620

VII AREA 3 — AVG. TOTAL AREAS

	AVG (IN²)	AVG (FT²)	AVG (ac)	CORRECTED AVG (ac)
A	7.5588	18,897.00	0.43	0.43
B	9.6358	24,089.50	0.55	0.55
C	2.5368	6,342.00	0.15	0.15
D	0.00	0.00	0.00	0.00
E	64.7592	161,898.00	3.72	3.73
F	0.3620	905.00	0.02	0.02
			4.87	4.88

CALCULATION WORKSHEET Order No. 19116 (01-91)

PAGE ____ OF ____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

DETERMINE TIME OF CONCENTRATIONS
FOR EACH SITE 5 DRAINAGE AREA

PRE CONSTRUCTION SCENARIO

CALCULATION WORKSHEET Order No. 19116 (01-91)

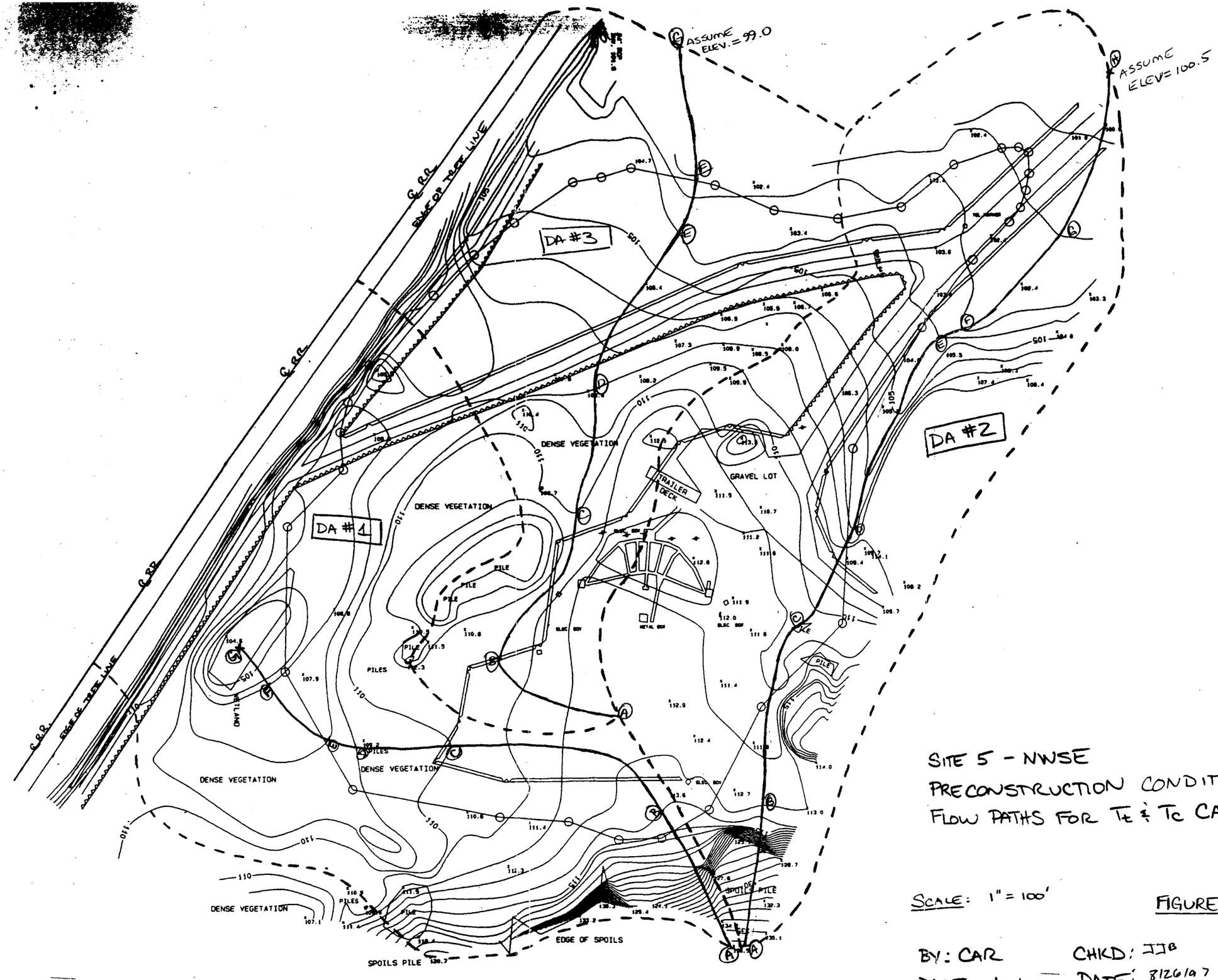
CLIENT	JOB NUMBER		
NWSE	7602/0104		
SUBJECT: TRAVEL TIME (T_t) / TIME OF CONCENTRATION (T_c)			
BASED ON: FIGURE 1 / EXISTING TOPO		DRAWING NUMBER	
BY: CAR 8/14/97	CHECKED BY: JJB 8/20/97	APPROVED BY	DATE

(1) A TIME OF CONCENTRATION (T_c) FOR EACH DRAINAGE AREA IS REQUIRED TO CALCULATE A PEAK DISCHARGE RATE. T_c IS DEFINED AS THE TIME FOR RUNOFF TO TRAVEL FROM THE HYDRAULICALLY MOST DISTANT POINT OF THE WATERSHED TO A POINT OF INTEREST WITHIN THE WATERSHED. TRAVEL TIME (T_t) IS A COMPONENT OF T_c AND IS DEFINED AS THE TIME IT TAKES TO TRAVEL FROM ONE LOCATION TO ANOTHER IN A WATERSHED.

(2) BY VISUAL EVALUATION OF EACH DRAINAGE AREA, THE HYDRAULICALLY MOST DISTANT POINT AND THE DISCHARGE POINT FOR EACH DRAINAGE AREA WERE LOCATED. THE FLOW PATH BETWEEN THESE TWO POINTS WAS THEN MARKED. THE FLOW PATHS FOR DRAINAGE AREAS 1 THROUGH 3 ARE SHOWN ON FIGURE 1 (p. 2 OF 4). THE FLOW PATH WAS THEN SEGMENTED, USING CHANGES IN SLOPE AS THE GUIDE FOR DETERMINING THE END OF EACH SEGMENT.

(3) THE LENGTH AND SLOPE OF EACH SEGMENT WAS THEN DETERMINED. THESE NUMBERS ARE SUMMARIZED ON p. 3 OF 4.

(4) FLOW TYPES ASSUMED FOR SITE 5 DRAINAGE AREES WERE SHEET FLOW AND SHALLOW CONCENTRATED FLOW. THE USGS QUAD DID NOT SHOW ANY CHANNELS, SO OPEN CHANNEL FLOW WAS NOT EVALUTED. T_t AND T_c CALCS ARE ON p. 4 OF 4.



SITE 5 - NWSE
PRECONSTRUCTION CONDITIONS
FLOW PATHS FOR T_t & T_c CALCULATION

SCALE: 1" = 100'

FIGURE 1

BY: CAR CHKD: JJB
DATE: 8/14/97 DATE: 8/26/97

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NWSE	JOB NUMBER: 7602/0104
SUBJECT: TRAVEL TIME (T_t) / TIME OF CONCENTRATION (T_c)	
BASED ON: FIGURE 1 / EXISTING TOPO	DRAWING NUMBER:
BY: CAR 8/14/97 — CHECKED BY: JJB 8/26/97	APPROVED BY: — DATE:

T_t / T_c ESTIMATION

DA #1

SEGMENT	DISTANCE	MAX ELEV	MIN ELEV	SLOPE	FLOW TYPE
AB	159	136.5	114	0.144	SF
BC	248	114	110	0.016	SCF
CD	97	110	109	0.010	SCF
DE	35	109	108	0.029	SCF
EF	84	108	107	0.012	SCF
FG	47	107	104.5	0.053	SCF

DA #2

SEGMENT	DISTANCE	MAX ELEV	MIN ELEV	SLOPE	FLOW TYPE
AB	150	136.5	113	0.157	SF
BC	204	113	111	0.010	SCF
CD	109	111	107	0.037	SCF
DE	225	107	104	0.013	SCF
EF	25	104	103	0.040	SCF
FG	138	103	102	0.007	SCF
GH	185	102	100.5	0.008	SCF

DA #3

SEGMENT	DISTANCE	MAX ELEV	MIN ELEV	SLOPE	FLOW TYPE
AB	123	113.2	110.7	0.020	SF
BC	175	110.7	110	0.004	SCF
CD	130	110	108	0.015	SCF
DE	183	108	104	0.022	SCF
EF	73	104	102	0.028	SCF
FG	178	102	99	0.017	SCF

Project: NWSE - Site 5
Task: Estimation of Drainage Area Travel Time (Tt)/Time of Concentration (Tc)
By: CAR **Chkd:** JJB
Date: 8/14/97 **Date:** 8/26/97

Drainage Area 1

	Segment	Distance	Slope	n(2)	P2	Tt
Sheet Flow (1)	AB	120	0.171	0.011	3.4	0.010
	A'B'	39	0.056	0.4	3.4	0.108
	Segment	Distance	Slope	Surface Type	V	Tt
Shallow Conc. Flow (1)	BC	248	0.016	Unpaved	2.041	0.034
	CD	97	0.01	Unpaved	1.613	0.017
	DE	35	0.029	Unpaved	2.748	0.004
	EF	84	0.012	Unpaved	1.767	0.013
	FG	47	0.053	Unpaved	3.714	0.004
					DA #1 Tc =	0.189

Drainage Area 2

	Segment	Distance	Slope	n(2)	P2	Tt
Sheet Flow (1)	AB	140	0.161	0.011	3.4	0.011
	A'B'	10	0.1	0.4	3.4	0.029
	Segment	Distance	Slope	Surface Type	V	Tt
Shallow Conc. Flow (1)	BC	204	0.01	Unpaved	1.613	0.035
	CD	109	0.037	Unpaved	3.104	0.010
	DE	225	0.013	Unpaved	1.840	0.034
	EF	25	0.04	Unpaved	3.227	0.002
	FG	138	0.007	Unpaved	1.350	0.028
	GH	185	0.008	Unpaved	1.443	0.036
					DA #2 Tc =	0.185

Drainage Area 3

	Segment	Distance	Slope	n(2)	P2	Tt
Sheet Flow (1)	AB	123	0.02	0.24	3.4	0.272
	Segment	Distance	Slope	Surface Type	V	Tt
Shallow Conc. Flow (1)	BC	175	0.004	Unpaved	1.020	0.048
	CD	130	0.015	Unpaved	1.976	0.018
	DE	183	0.022	Unpaved	2.393	0.021
	EF	73	0.028	Unpaved	2.700	0.008
	FG	178	0.017	Unpaved	2.104	0.024
					DA #3 Tc =	0.390

(1) Formulas taken from Chapter 3 and Appendix F, TR-55 Manual, SCS, June 1986.
(2) Manning's coefficients taken from Table 3-1, Chapter 3, TR-55 Manual, SCS, June 1986.
- Smooth Surfaces (bare soil) n = 0.011
- Woods (light under brush) n = 0.40
- Dense Grass n = 0.24

CALCULATION WORKSHEET Order No. 19116 (01-91)

PAGE ____ OF ____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

CALCULATION OF PEAK DISCHARGE RATES
FOR SITE 5 DRAINAGE AREAS USING
THE TR-55 GRAPHICAL PEAK DISCHARGE METHOD

PRECONSTRUCTION SCENARIO

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NWSE	JOB NUMBER: 7602/0104
SUBJECT: PEAK DISCHARGE RATES (EXISTING CONDITIONS)	
BASED ON: QUICK TR-55	DRAWING NUMBER:
BY: CAR	CHECKED BY: JJB 8/26/97
APPROVED BY:	DATE:

(1) THE PEAK, EXISTING CONDITIONS, DISCHARGE RATES FOR THE THREE SITE 5 DRAINAGE AREAS WERE CALCULATED BY THE TR-55 GRAPHICAL PEAK DISCHARGE METHOD. HAESTAD'S QUICK TR-55 PROGRAM WAS USED TO COMPLETE THE CALCULATIONS. INPUT FOR THE PROGRAM WAS SUMMARIZED PREVIOUSLY.

(2) THE PEAK DISCHARGE RATES FOR DRAINAGE AREAS 1 THROUGH 3 ARE SHOWN ON pp. 2 OF 4 THROUGH 3 OF 4. DISCHARGE RATES FOR THREE DESIGN STORMS (2, 10, 25) ARE SHOWN FOR EACH DRAINAGE AREA.

(3) SUMMARY

AREA	STORM FREQUENCY (YR)	PEAK DISCHARGE RATE (CFS)
1	2	2
	10	7
	25	9
2	2	3
	10	9
	25	12
3	2	1
	10	4
	25	6

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NWSE - SITE 5 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0104
DRAINAGE AREA #1

CALCULATED
DISK FILE: NWSEST51.GPD

Drainage Area	(acres)	5.64	--->	0.0088 sq.mi.
Runoff Curve Number	(CN)	61		
Time of Concentration,Tc	(hrs)	0.189		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	2	10	25
Rainfall, P, 24-hr (in)	3.4	5.2	6.0
Initial Abstraction, Ia (in)	1.279	1.279	1.279
Ia/p Ratio	0.376	0.246	0.213
Unit Discharge, * qu (csm/in)	416	519	531
Runoff, Q (in)	0.53	1.49	2.01
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	2	7	9

Summary of Computations for qu

Ia/p	#1	0.350	0.100	0.100
C0	#1	2.355	2.473	2.473
C1	#1	-0.497	-0.518	-0.518
C2	#1	-0.120	-0.171	-0.171
qu (csm)	#1	448.621	573.957	573.957
Ia/p	#2	0.400	0.300	0.300
C0	#2	2.307	2.396	2.396
C1	#2	-0.465	-0.512	-0.512
C2	#2	-0.111	-0.132	-0.132
qu (csm)	#2	385.411	498.204	498.204
* qu (csm)		416	519	531

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NWSE - SITE 5 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0104
DRAINAGE AREA #2

CALCULATED
DISK FILE: NWSEST52.GPD

Drainage Area	(acres)	5.59	--->	0.0087 sq.mi.
Runoff Curve Number	(CN)	66		
Time of Concentration,Tc	(hrs)	0.185		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	2	10	25
Rainfall, P, 24-hr (in)	3.4	5.2	6.0
Initial Abstraction, Ia (in)	1.030	1.030	1.030
Ia/p Ratio	0.303	0.198	0.172
Unit Discharge, * qu (csm/in)	499	540	550
Runoff, Q (in)	0.75	1.87	2.44
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	3	9	12

Summary of Computations for qu

Ia/p	#1	0.300	0.100	0.100
C0	#1	2.396	2.473	2.473
C1	#1	-0.512	-0.518	-0.518
C2	#1	-0.132	-0.171	-0.171
qu (csm)	#1	501.617	577.278	577.278
Ia/p	#2	0.350	0.300	0.300
C0	#2	2.355	2.396	2.396
C1	#2	-0.497	-0.512	-0.512
C2	#2	-0.120	-0.132	-0.132
qu (csm)	#2	451.729	501.617	501.617
* qu (csm)		499	540	550

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NWSE - SITE 5 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0104
DRAINAGE AREA #3

CALCULATED
DISK FILE: NWSEST53.GPD

Drainage Area	(acres)	4.88	--->	0.0076 sq.mi.
Runoff Curve Number	(CN)	60		
Time of Concentration,Tc	(hrs)	0.390		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	2	10	25
Rainfall, P, 24-hr (in)	3.4	5.2	6.0
Initial Abstraction, Ia (in)	1.333	1.333	1.333
Ia/p Ratio	0.392	0.256	0.222
Unit Discharge, * qu (csm/in)	308	399	411
Runoff, Q (in)	0.49	1.42	1.92
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	1	4	6

Summary of Computations for qu

Ia/p	#1	0.350	0.100	0.100
C0	#1	2.355	2.473	2.473
C1	#1	-0.497	-0.518	-0.518
C2	#1	-0.120	-0.171	-0.171
qu (csm)	#1	345.233	453.552	453.552
Ia/p	#2	0.400	0.300	0.300
C0	#2	2.307	2.396	2.396
C1	#2	-0.465	-0.512	-0.512
C2	#2	-0.111	-0.132	-0.132
qu (csm)	#2	301.322	383.278	383.278
* qu (csm)		308	399	411

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

B.6 DURING CONSTRUCTION CONDITIONS FOR SITE 5

CALCULATION WORKSHEET Order No. 19116 (01-01)

PAGE ____ OF ____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

B.6

DETERMINATION OF SITE 5
DRAINAGE AREAS AND WEIGHTED
CURVE NUMBERS

DURING CONSTRUCTION SCENARIO
REGRADED WASTE.

CLIENT NWSE	JOB NUMBER 7602/0106
SUBJECT DRAINAGE AREAS / CNs – POST CONSTRUCTION SITE 5	
BASED ON EXISTING TOPO / WASTE REGRADE PLAN	DRAWING NUMBER
BY CAR 8/23/97 / CHECKED BY JJB 8/27/97	APPROVED BY / DATE

(I) THE EXISTING TOPOGRAPHY FOR SITE 5 AND THE FINAL WASTE REGRADE PLAN WERE USED TO DETERMINE THE BOUNDARIES OF THE DRAINAGE AREAS THAT COVER SITE 5. THREE DRAINAGE AREAS WERE DETERMINED. THEY ARE SHOWN ON FIGURE 1 (p. 3 OF 13)

THE SIZE OF EACH DRAINAGE AREA WAS DETERMINED BY PLANIMETER. THE MEASUREMENTS ARE SHOWN ON p. 4 OF 13. THE AREAS ARE SUMMARIZED BELOW.

DRAINAGE AREA	AREA (ac)
1	9.56
2	1.92
3	4.63

(II) ASSUMPTIONS:

- THE SEDIMENT / DETENTION BASINS ARE NOT WORKING. THE RESULTS OF THESE CALCULATIONS WILL BE USED TO DETERMINE THE SIZE OF THE BASINS.
- A TRENCH WILL BE CONSTRUCTED ALONG THE UPGRADIENT SIDE AND PARALLEL TO THE CAP TO CONVEY POTENTIAL SURFACE WATER RUNON AND RUNOFF TO THE PROPOSED SEDIMENT / DETENTION BASINS.
- THE OVERALL SIZE OF THE DRAINAGE BASIN IS THE SAME DURING CONSTRUCTION AS THE SIZE DURING PRE-CONSTRUCTION (EXISTING)
- DRAINAGE AREA 1 → FLOW FROM CULVERT UNDER RAILROAD WILL BE DIVERTED AROUND DETENSION BASIN.

CALCULATION WORKSHEET Order No. 10116 (01-01)

CLIENT	JOB NUMBER
NWSE	7602/0106

SUBJECT: DRAINAGE AREAS / CNs - CONSTRUCTION SITE 5

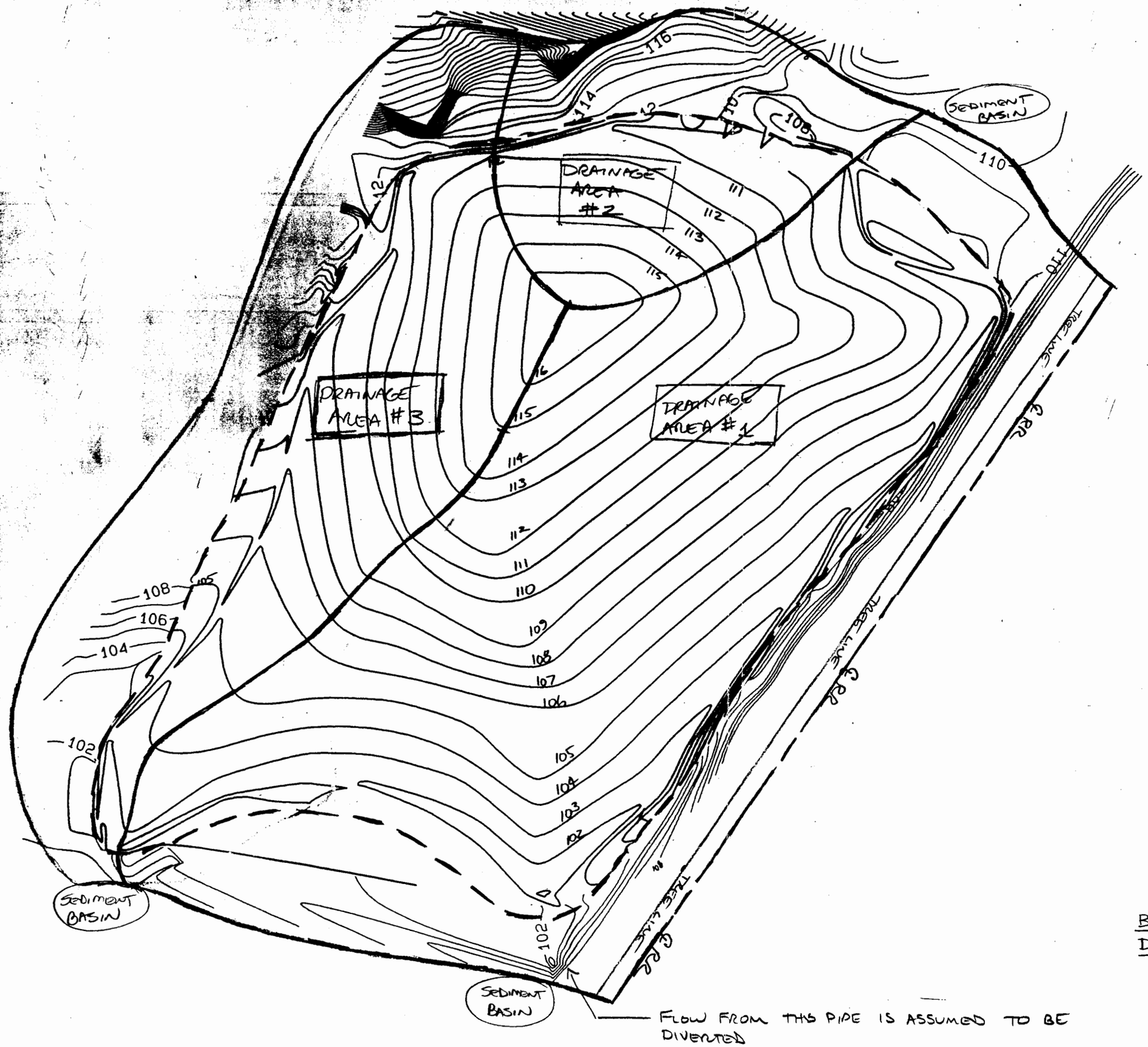
BASED ON	DRAWING NUMBER
EXISTING TOPO / WASTE REGRADE PLAN	

BY	CHECKED BY	APPROVED BY	DATE
CAR 8/23/97	JJB 8/27/97		

ASSUMPTIONS (CONT'D):

- DRAINAGE AREA 3 → THE OUTSIDE BOUNDARY OF THIS DRAINAGE AREA APPROXIMATELY FOLLOWS A SMALL RIDGE LINE. THE RIDGE LINE WAS DETERMINED BY VISUAL INSPECTION BY THE PROJECT MANAGER.
- THE WORKING COPY OF THE FINAL WASTE REGRADE WILL PROVIDE SUFFICIENT INFORMATION TO CALCULATE RUNOFF FROM EACH AREA.
- A MAJORITY OF THE WASTE WILL BE UNCOVERED, BARE SOIL. IT WAS ALSO ASSUMED THAT THE SEDIMENT / DETENSION BASINS WILL ALSO BE UNCOVERED, BARE SOIL.
- SEDIMENT BASINS WILL BE DESIGNED TO ACCOMODATE SEDIMENT LOADING AND TEMPORARY STORM WATER DETENSION FROM A 2-YR, 24-HOUR STORM. OR TO ACCOMODATE SEDIMENT CAPACITY FOR TRAP EFFICIENCY. A TOTAL OF 3 SEDIMENT BASINS WILL BE DESIGNED, ONE FOR EACH DRAINAGE BASIN.

(WHICHEVER IS GREATER)



LEGEND:

- - - LIMIT OF EXCAVATION

━━━ DRAINAGE AREA BOUNDARY

SCALE 1" = 100'

SITE 5

PROPOSED CONDITIONS – FINAL GRADE OF WASTE DRAINAGE AREAS

BY: CAR CHKD:

DATE: 8/21/97 DATE:

FIGURE 1

CLIENT	JOB NUMBER
NWSE	7602/0106

SUBJECT: DRAINAGE AREAS FOR PROPOSED CONDITIONS - FINAL GRADE OF WASTE

BASED ON	DRAWING NUMBER
FINAL GRADING OF WASTE	

BY	CHECKED BY	APPROVED BY	DATE
CAR 8/21/97	JJB 8/27/97		

PLANIMETER MEASUREMENTS:

(III) ESTIMATE THE SIZE OF THE DRAINAGE AREAS FOR SITE 5 UNDER THE PROPOSED GRADING CONDITIONS. USE FIGURE 1

DRAINAGE AREA	MEASUREMENTS (IN^2) m1	m2	m3	AVG
1	41.4006	41.2766	41.3541	41.3438
2	8.2925	8.3235	8.3700	8.3287
3	20.0880	19.9175	19.9795	19.9950

(IV) CONVERT TO ACRES: SCALE: 1" = 100'

AREA (IN^2)	AREA (FT^2)	AREA (ACRES)
41.3438	413,438	9.49
8.3287	83,287	1.91
19.9950	199,950	4.59

(V) ESTIMATE THE AMOUNT OF EACH DRAINAGE AREA THAT WILL BE DISTURBED DURING GRADING ACTIVITIES. THIS AREA IS DELINEATED AS THE LIMIT OF EXCAVATION ON FIGURE 1 (P. 3 OF 13)

DRAINAGE AREA	DISTURBED AREA	m1	m2	m3	AVG
1	1	29.0006	29.0316	29.0316	29.0213
2	2	4.7740	4.6190	4.6655	4.6862
3	3	10.9430	10.9275	11.0670	10.9792

CLIENT	JOB NUMBER
NWSE	7602/0106

SUBJECT: ESTIMATE WEIGHTED CURVE NUMBER FOR ALL DRAINAGE AREAS

BASED ON	DRAWING NUMBER
FINAL GRADING OF WASTE	

BY	CHECKED BY	APPROVED BY	DATE
CAR 8/21/97	JJB 8/27/97		

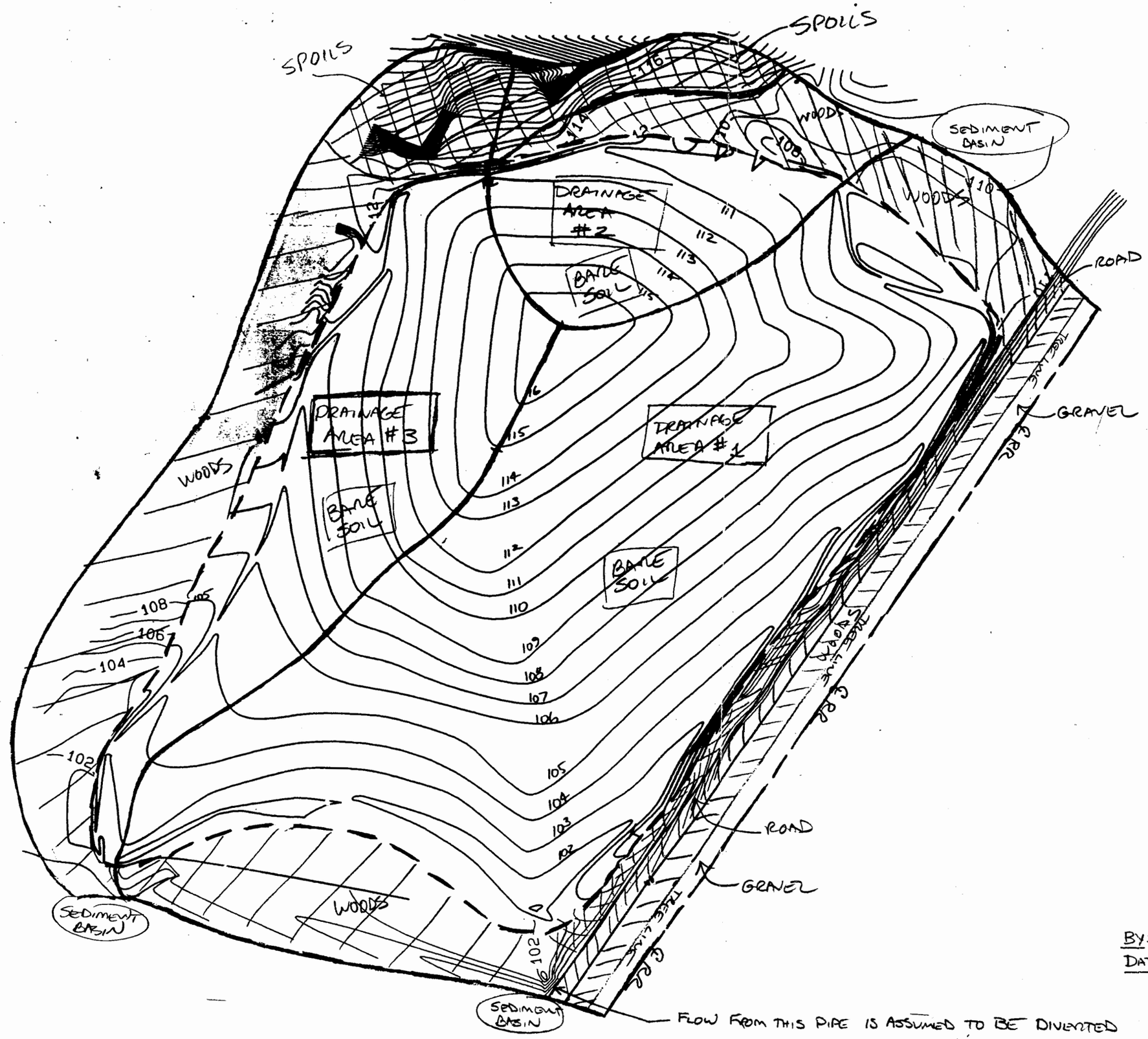
VIII THE COVER TYPES DURING GRADING ACTIVITIES AT SITE 5 INCLUDE THE FOLLOWING:

WOODS
BARE SOIL
SPOILS
GRAVEL
ROADS (DIRT)

IX THE BOUNDARIES OF EACH COVER TYPE ARE SHOWN ON FIGURE 2. CURVE NUMBERS FOR EACH COVER TYPE ARE SUMMARIZED BELOW. THE NUMBERS WERE TAKEN FROM TABLES 2a - 2c OF THE TR-55 MANUAL (SCS, JUNE 1986).

COVER TYPE	CN
WOODS (GOOD)	55
BARE SOIL	86
SPOILS	86
GRAVEL	85
ROADS (DIRT)	82

- ASSUME SOIL TYPE OF B (SAME AS WAS USED FOR EXISTING CONDITIONS).



LEGEND:

- - - LIMIT OF EXCAVATION

▬▬ DRAINAGE AREA BOUNDARY

SCALE 1" = 100'

SITE 5

PROPOSED CONDITIONS – FINAL GRADE OF WASTE COVER TYPE

BY: CAR CHKD: JJB

DATE: 8/21/97 DATE: 8/27/97

FIGURE 2

CLIENT	JOB NUMBER
NWSE	7602/0106

SUBJECT: DRAINAGE AREAS FOR PROPOSED CONDITIONS - FINAL GRADE OF WASTE

BASED ON	DRAWING NUMBER
FINAL GRADE OF WASTE	

BY	CHECKED BY	APPROVED BY	DATE
CAR 8/21/97	JJB 8/27/97		

X WEIGHTED CURVE NUMBERS WERE CALCULATED FOR EACH DRAINAGE AREA. HAESTAD'S QUICK TR-55 PROGRAM WAS USED TO CALCULATE $\overline{CN}$s (SEE pp. 10 AND 11) AND TO SUMMARIZE THE $\overline{CN}$s (SEE p. 9).

XI AREAS OF EACH COVER TYPE WERE MEASURED BY PLANIMETER. THE MEASUREMENTS ARE SUMMARIZED ON pp. 12 AND 13.

XII THE WEIGHTED RUNOFF CURVE NUMBERS ESTIMATED IN THESE CALCULATIONS ARE APPLICABLE ONLY TO THE "DURING CONSTRUCTION" SCENARIO. THEY WILL BE USED TO ESTIMATE PEAK RUNOFF RATES FROM EACH DRAINAGE AREA FOR THE "DURING CONSTRUCTION SCENARIO", WHICH REPRESENTS THE WORST-CASE SEDIMENT EROSION SCENARIO.

Quick TR-55 Ver.5.46 S/N:
Executed: 13:03:10 08-21-1997

CAR 8/21/97 JJD 8/27/97

NWSE - SITE 5 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0106
PROPOSED CONDITIONS - REGRADED WASTE

RUNOFF CURVE NUMBER SUMMARY

::

Subarea Description	Area (acres)	CN (weighted)
DRAINAGE AREA 1	9.49	79
DRAINAGE AREA 2	1.91	79
DRAINAGE AREA 3	4.52	75

Quick TR-55 Ver.5.46 S/N:
Executed: 13:03:10 08-21-1997

CAR 8/21/97 JJB 8/27/97

NWSE - SITE 5 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0106
PROPOSED CONDITIONS - REGRADED WASTE

RUNOFF CURVE NUMBER DATA

::

Composite Area: DRAINAGE AREA 1

SURFACE DESCRIPTION	AREA (acres)	CN	
WOODS (GOOD)	2.15	55	
BARE SOIL (REGRADED AREA)	6.75	86	
BARE SOIL (SPOILS)	0.00	86	
GRAVEL (RAILROAD)	0.39	85	
ROADS (DIRT)	0.20	82	
COMPOSITE AREA --->	9.49	78.9	(79)

::

Composite Area: DRAINAGE AREA 2

SURFACE DESCRIPTION	AREA (acres)	CN	
WOODS (GOOD)	0.45	55	
BARE SOIL (REGRADED AREA)	1.10	86	
BARE SOIL (SPOILS)	0.36	86	
GRAVEL (RAILROAD)	0.00	85	
ROADS (DIRT)	0.00	82	
COMPOSITE AREA --->	1.91	78.7	(79)

::

Quick TR-55 Ver.5.46 S/N:
Executed: 13:03:10 08-21-1997

CAR JJB
8/21/97 8/27/97

Composite Area: DRAINAGE AREA 3

SURFACE DESCRIPTION	AREA (acres)	CN	
WOODS (GOOD)	1.61	55	
BARE SOIL (REGRADED AREA)	2.48	86	
BARE SOIL (SPOILS)	0.43	86	
GRAVEL (RAILROAD)	0.00	85	
ROADS (DIRT)	0.00	82	
COMPOSITE AREA --->	4.52	75.0	(75)

CLIENT	JOB NUMBER
NWSE	7602/0106

SUBJECT: ESTIMATE WEIGHTED CURVE NUMBER FOR ALL DRAINAGE AREAS

BASED ON	DRAWING NUMBER
FINAL GRADING OF WASTE	

BY	CHECKED BY	APPROVED BY	DATE
CMR 8/21/97	JJB 8/27/97		

XIII ESTIMATE AREAS OF EACH COVER TYPE.
USE FIGURE 2 (P. 7) AND PLANIMETER.

DRAINAGE AREA	COVER TYPE	M1	M2	M3	AVG.
1	WOODS (GOOD)	9.0520	9.1605	9.4550	9.2225
	BARE SOIL	—	—	—	29.0213
	SPOILS	—	—	—	0
	GRAVEL	1.5810	1.7515	1.6275	1.6533
	ROADS (DIRT)	0.8035	0.9525	0.8990	0.8783
2	WOODS (GOOD)	1.7825	1.9685	2.046	1.9323
	BARE SOIL	—	—	—	4.6862
	SPOILS	1.5345	1.5655	1.5500	1.5500
	GRAVEL	—	—	—	0
	ROADS (DIRT)	—	—	—	0
3	WOODS (GOOD)	7.0525	7.3005	7.0525	7.1352
	BARE SOIL	—	—	—	10.9792
	SPOILS	1.9530	1.9220	1.9375	1.9375
	GRAVEL	—	—	—	0
	ROADS (DIRT)	—	—	—	0

CONVERT TO ACRES SCALE: 1" = 100'

DRAINAGE AREA	COVER TYPE	AREA (IN^2)	AREA (FT^2)	AREA (ACRE)
1	WOODS	9.2225	92,225	2.12
	BARE SOIL	29.0213	290,213	6.66
	SPOILS	0	0	0
	GRAVEL	1.6533	16,533	0.38
	ROADS	0.8783	8,783	0.20
2	WOODS	1.9323	19,323	0.44
	BARE SOIL	4.6862	46,862	1.08
	SPOILS	1.5500	15,500	0.36
	GRAVEL	0	0	0
	ROADS	0	0	0

CLIENT	JOB NUMBER
NWSE	7602 10106

SUBJECT: ESTIMATE WEIGHTED CURVE NUMBER FOR ALL DRAINAGE AREA

BASED ON	DRAWING NUMBER
FINAL GRADING OF WASTE	

BY	CHECKED BY	APPROVED BY	DATE
CAR 8/21/97	JJB 8/27/97		

CONVERT TO ACRES (CONT'D)

DRAINAGE AREA	COVER TYPE	AREA (IN²)	AREA (FT²)	AREA (ACRE)
3	WOODS	7.1352	71,352	1.64
	BARE SOIL	10.9792	109,792	2.52
	SPOILS	1.9375	19,375	0.44
	GRAVEL	0	0	0
	ROADS	0	0	0

CORRECT AREAS SO THAT TOTAL AREA IS EQUAL TO MEASURED TOTAL AREA. DISTRIBUTE DIFFERENCE PROPORTIONALLY.

DRAINAGE AREA	MEASURED AREA (ac)	CORRECTED AREA (ac)
1	2.12	2.15
(TOTAL AREA = 9.49 ac)	6.66	6.75
	0	0
	0.38	0.39
	0.20	0.20
2	0.44	0.45
	1.08	1.10
(TOTAL AREA = 1.92 ac)	0.36	0.36
	0	0
	0	0
3	1.64	1.61
	2.52	2.48
(TOTAL AREA = 4.52 ac)	0.44	0.43
	0	0
	0	0

CALCULATION WORKSHEET Order No. 19116 (91-91)

PAGE ____ OF ____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

DETERMINE TIME OF CONCENTRATIONS
FOR
SITE 5 DRAINAGE AREAS

DURING CONSTRUCTION
SCENARIO
REGRADED WASTE

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NWSE – SITE 5	JOB NUMBER: 7602/0106
SUBJECT: TRAVEL TIME (T_t) / TIME OF CONCENTRATION (T_c)	
BASED ON: FIGURE 1 / DURING CONSTRUCTION TOPO	DRAWING NUMBER:
BY: CAR 8/23/97	CHECKED BY: JJO 8/27/97
APPROVED BY:	DATE:

① A TIME OF CONCENTRATION (T_c) IS REQUIRED FOR EACH DRAINAGE AREA TO CALCULATE A PEAK DISCHARGE RATE. T_c IS DEFINED AS THE TIME FOR RUNOFF TO TRAVEL FROM THE HYDRAULICALLY MOST DISTANT POINT OF THE WATERSHED TO A POINT OF INTEREST WITHIN THE WATERSHED. TRAVEL TIME (T_t) IS A COMPONENT OF T_c AND IS DEFINED AS THE TIME IT TAKES TO TRAVEL FROM ONE LOCATION TO ANOTHER IN A WATERSHED.

② BY VISUAL EVALUATION OF EACH DRAINAGE AREA, THE HYDRAULICALLY MOST DISTANT POINT AND THE DISCHARGE POINT FOR EACH DRAINAGE AREA WERE LOCATED. THE FLOW PATH BETWEEN THESE TWO POINTS WAS THEN MARKED. THE FLOW PATHS FOR FOR DRAINAGE AREAS 1, 2 & 3 ARE SHOWN ON FIGURE 1. EACH FLOW PATH WAS THEN SEGMENTED USING CHANGES IN FLOW TYPE & SLOPE AS THE GUIDE FOR DETERMINING THE END OF EACH SEGMENT.

③ THE LENGTH AND SLOPE OF EACH SEGMENT WAS THEN DETERMINED. THESE NUMBERS ARE SUMMARIZED ON p. 3.

④ FLOW TYPES ASSUMED FOR SITE 5 WERE SHEET FLOW, SHALLOW CONCENTRATED FLOW, AND OPEN CHANNEL FLOW. OPEN CHANNEL FLOW IS ASSUMED THROUGH THE SURFACE WATER INTERCEPTOR TRENCHS. A TRAPEZOIDAL CHANNEL WAS ASSUMED FOR OPEN CHANNEL FLOW. DIMENSIONS OF THE CHANNEL ARE SHOWN ON p. 3.

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT	JOB NUMBER
NWSE	7602/0106

SUBJECT: TIME OF CONCENTRATION

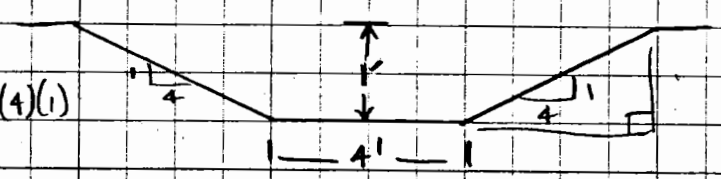
BASED ON	DRAWING NUMBER
FINAL GRADE OF WASTE	

BY	CHECKED BY	APPROVED BY	DATE
CAR 8/21/97	JJB 8/27/97		

DRAINAGE AREA	FLOW TYPE	SEGMENT	LENGTH (FT)	TOP ELEV	BOTTOM ELEV	SLOPE
1	SF	AB	120	116.5	115	0.013
	SCF	BC	215	115	109	0.028
	OCF	CD	960	109	101	0.008
	OCF	DE	85	101	100	0.012
2	SF	AB	65	116.5	115	0.023
	SCF	BC	100	115	112	0.030
	OCF	CD	445	112	109.5	0.006
3	SF	AB	85	116.5	115	0.018
	SCF	BC	105	115	112	0.029
	OCF	CD	870	112	101	0.013

SF = SHEET FLOW
SCF = SHALLOW CONC. FLOW
OCF = OPEN CHANNEL FLOW

ASSUME: FOR OPEN CHANNEL FLOW, THE CHANNEL WILL HAVE THE FOLLOWING DIMENSIONS



$A = 4(1) + 2(\frac{1}{2})(4)(1)$
$= 8\ ft^2$

$P = 12.25\ ft$

USE: $n = 0.025$ (EARTH CHANNEL CHOW, 1959)

(NTS)

CLIENT	JOB NUMBER
NWSE - SITE 5	7602/0106

SUBJECT T_t / T_c

BASED ON	DRAWING NUMBER
REGRADED WASTE	

BY	CHECKED BY	APPROVED BY	DATE
CAR 8/23/97	JJB 8/27/97		

THE HYDRAULIC INFORMATION WAS THEN USED WITH THE APPROPRIATE FORMULAS TO DETERMINE TIME OF CONCENTRATIONS. THE SPREADSHEET USED TO SUMMARIZE THE T_t & T_c CALCULATIONS IS SHOWN ON p. 5 of 5. THE CALCULATED T_cs ARE SUMMARIZED BELOW.

DRAINAGE AREA	T_c (hrs)
1	0.120
2	* 0.059 → 0.1
3	* 0.076 → 0.1

NOTE:

* — THE MINIMUM T_c USED IN TR-55 IS 0.1 HR. USE 0.1 HR INSTEAD OF ESTIMATED T_c.

Project: NWSE - Site 5 - FINAL GRADE OF WASTE
Task: Estimation of Drainage Area Travel Time (Tt)/Time of Concentration (Tc)
By: CAR **Chkd:** JJD
Date: 8/21/97 **Date:** 8/27/97

Drainage Area 1

	Segment	Distance	Slope	n(2)	P2	Tt
Sheet Flow (1)	AB	120	0.013	0.011	3.4	0.027
	Segment	Distance	Slope	Surface Type	V	Tt
Shallow Conc. Flow (1)	BC	215	0.028	Unpaved	2.700	0.022
	Segment	R	S	V	D	Tt
Open Channel Flow (1),3)	CD	0.653	0.008	4.012	960.000	0.066
	DE	0.653	0.012	4.913	85.000	0.005
					DA #1 Tc =	0.120

Drainage Area 2

	Segment	Distance	Slope	n(2)	P2	Tt
Sheet Flow (1)	AB	65	0.023	0.011	3.4	0.013
	Segment	Distance	Slope	Surface Type	V	Tt
Shallow Conc. Flow (1)	BC	100	0.03	Unpaved	2.795	0.010
	Segment	R	S	V	D	Tt
Open Channel Flow (1),3)	CD	0.653	0.006	3.474	445.000	0.036
					DA #2 Tc =	0.059

Drainage Area 3

	Segment	Distance	Slope	n(2)	P2	Tt
Sheet Flow (1)	AB	85	0.018	0.011	3.4	0.018
	Segment	Distance	Slope	Surface Type	V	Tt
Shallow Conc. Flow (1)	BC	105	0.029	Unpaved	2.748	0.011
	Segment	R	S	V	D	Tt
Open Channel Flow (1),3)	CD	0.653	0.013	5.114	870.000	0.047
					DA #3 Tc =	0.076

(1) Formulas taken from Chapter 3 and Appendix F, TR-55 Manual, SCS, June 1986.
(2) Manning's coefficients taken from Table 3-1, Chapter 3, TR-55 Manual, SCS, June 1986.
- Smooth Surfaces (bare soil) n = 0.011

(3) n = 0.025 (Chow, 1959)

CALCULATION WORKSHEET Order No. 19116 (01-91)

PAGE ____ OF ____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

DETERMINE PEAK DISCHARGE RATES

SITE 5

DURING CONSTRUCTION SCENARIO
REGRADED WASTE

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NWSE - SITE 5	JOB NUMBER: 7602/0106
SUBJECT: PEAK DISCHARGE RATES — "DURING CONSTRUCTION"	
BASED ON: QUICK TR-55	DRAWING NUMBER:
BY: CAR 8/23/97	CHECKED BY: JJB 8/27/97
APPROVED BY:	DATE:

(I) THE PEAK, DURING CONSTRUCTION CONDITIONS, DISCHARGE RATES FOR SITE 5 DRAINAGE AREAS WERE CALCULATED BY THE GRAPHICAL PEAK DISCHARGE METHOD. HAESTAD'S QUICK TR-55 PROGRAM WAS USED TO COMPILE THE CALCULATIONS. INPUT FOR THE PROGRAM WAS SUMMARIZED PREVIOUSLY.

(II) THE OUTPUT FROM QUICK-TR55 IS SHOWN ON THE FOLLOWING PAGES. DISCHARGE RATES FOR THREE STORM EVENTS (2-YR 10YR & 25-YR) ARE SHOWN FOR EACH DRAINAGE AREA. THE RESULTS ARE SUMMARIZED BELOW.

(III) SUMMARY:

AREA	STORM FREQUENCY (YR)	PEAK DISCHARGE RATE (CFS)
1	2	14
	10	28
	25	35
2	2	3
	10	6
	25	7
3	2	6
	10	12
	25	16

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NWSE - SITE 5 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0106
DRAINAGE AREA 1 - REGRADED WASTE

CALCULATED
DISK FILE: NWSEPG51.GPD

Drainage Area	(acres)	9.56	--->	0.0149 sq.mi.
Runoff Curve Number	(CN)	79		
Time of Concentration,Tc	(hrs)	0.120		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0.0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	2	10	25
Rainfall, P, 24-hr (in)	3.4	5.2	6.0
Initial Abstraction, Ia (in)	0.532	0.532	0.532
Ia/p Ratio	0.156	0.102	0.089
Unit Discharge, * qu (csm/in)	620	639	639
Runoff, Q (in)	1.49	2.97	3.68
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	14	28	35

Summary of Computations for qu

Ia/p	#1	0.100	0.100	0.100
C0	#1	2.473	2.473	2.473
C1	#1	-0.518	-0.518	-0.518
C2	#1	-0.171	-0.171	-0.171
qu (csm)	#1	639.364	639.364	639.364
Ia/p	#2	0.300	0.300	0.100
C0	#2	2.396	2.396	2.473
C1	#2	-0.512	-0.512	-0.518
C2	#2	-0.132	-0.132	-0.171
qu (csm)	#2	569.446	569.446	639.364
* qu (csm)		620	639	639

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NWSE - SITE 5 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0106
DRAINAGE AREA 2 - REGRADED WASTE

CALCULATED
DISK FILE: NWSEPG52.GPD

Drainage Area	(acres)	1.92	--->	0.0030 sq.mi.
Runoff Curve Number	(CN)	79		
Time of Concentration,Tc	(hrs)	0.100		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0.0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	2	10	25
Rainfall, P, 24-hr (in)	3.4	5.2	6.0
Initial Abstraction, Ia (in)	0.532	0.532	0.532
Ia/p Ratio	0.156	0.102	0.089
Unit Discharge, * qu (csm/in)	644	661	662
Runoff, Q (in)	1.49	2.97	3.68
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	3	6	7

Summary of Computations for qu

Ia/p	#1	0.100	0.100	0.100
C0	#1	2.473	2.473	2.473
C1	#1	-0.518	-0.518	-0.518
C2	#1	-0.171	-0.171	-0.171
qu (csm)	#1	661.942	661.942	661.942
Ia/p	#2	0.300	0.300	0.100
C0	#2	2.396	2.396	2.473
C1	#2	-0.512	-0.512	-0.518
C2	#2	-0.132	-0.132	-0.171
qu (csm)	#2	596.829	596.829	661.942
* qu (csm)		644	661	662

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NWSE - SITE 5 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0106
DRAINAGE AREA 3 - REGRADED WASTE

CALCULATED
DISK FILE: NWSEPG53.GPD

Drainage Area	(acres)	4.63	--->	0.0072 sq.mi.
Runoff Curve Number	(CN)	75		
Time of Concentration,Tc	(hrs)	0.100		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0.0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	2	10	25
Rainfall, P, 24-hr (in)	3.4	5.2	6.0
Initial Abstraction, Ia (in)	0.667	0.667	0.667
Ia/p Ratio	0.196	0.128	0.111
Unit Discharge, * qu (csm/in)	631	653	658
Runoff, Q (in)	1.23	2.61	3.28
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	6	12	16

Summary of Computations for qu

Ia/p	#1	0.100	0.100	0.100
C0	#1	2.473	2.473	2.473
C1	#1	-0.518	-0.518	-0.518
C2	#1	-0.171	-0.171	-0.171
qu (csm)	#1	661.942	661.942	661.942
Ia/p	#2	0.300	0.300	0.300
C0	#2	2.396	2.396	2.396
C1	#2	-0.512	-0.512	-0.512
C2	#2	-0.132	-0.132	-0.132
qu (csm)	#2	596.829	596.829	596.829
* qu (csm)		631	653	658

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

B.7 POST-CONSTRUCTION CONDITIONS FOR SITE 5

CALCULATION WORKSHEET Order No. 19116 (01-91)

PAGE ____ OF ____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

DETERMINE TIME OF CONCENTRATIONS

FOR EACH SITE 5 DRAINAGE AREA

POST-CONSTRUCTION
SCENARIO

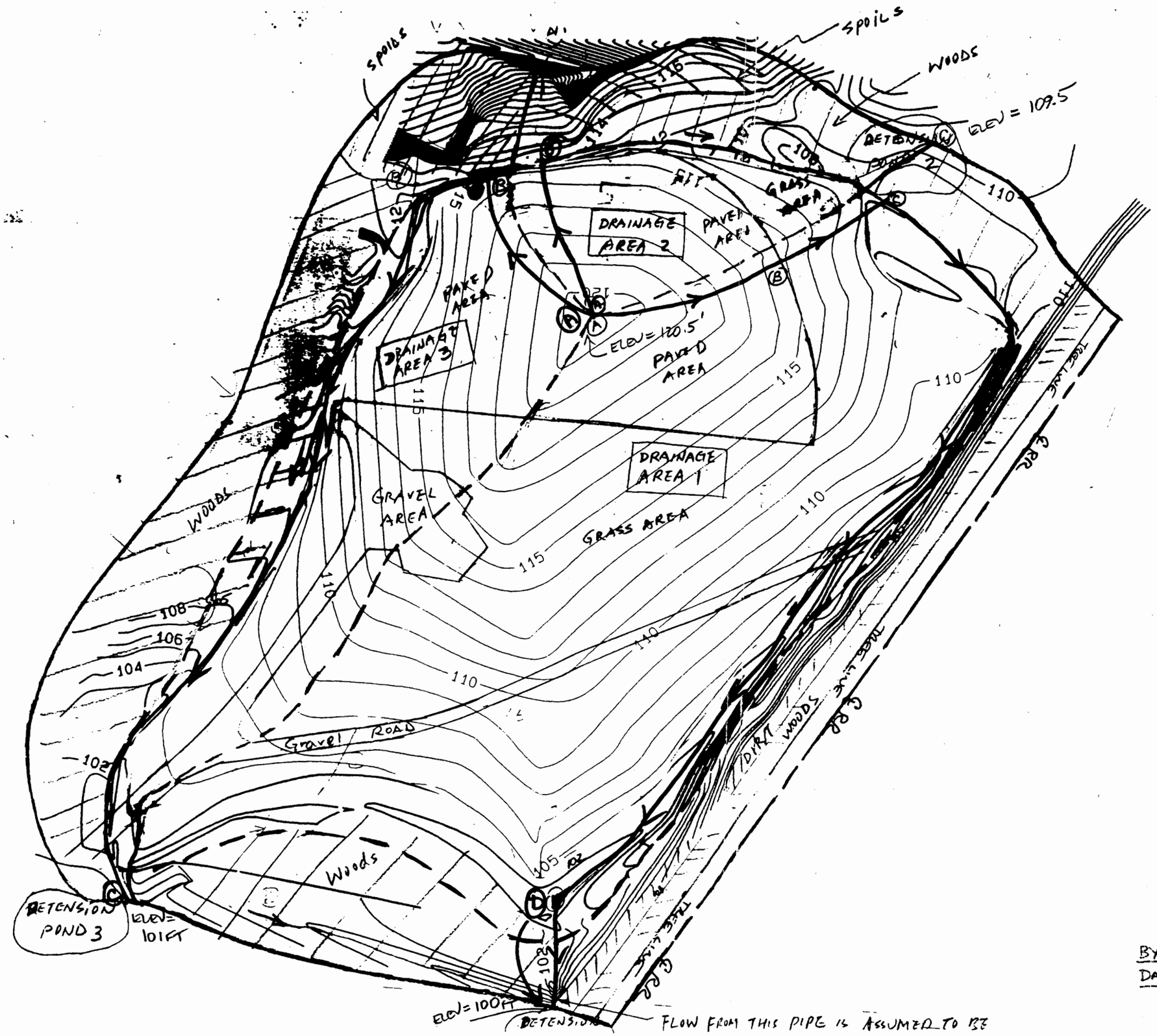
CLIENT NWSE – SITE 5	JOB NUMBER 7602/0106
SUBJECT TRAVEL TIME (T_t) / TIME OF CONCENTRATION (T_c)	
BASED ON FIGURE 1 / POST-CONSTRUCTION TOPO	DRAWING NUMBER
BY CAR 8/23/97 / CHECKED BY JJB 3/27/97	APPROVED BY / DATE

(1) A TIME OF CONCENTRATION (T_c) IS REQUIRED FOR EACH DRAINAGE AREA TO CALCULATE A PEAK DISCHARGE RATE. T_c IS DEFINED AS THE TIME FOR RUNOFF TO TRAVEL FROM THE HYDRAULICALLY MOST DISTANT POINT OF THE WATERSHED TO A POINT OF INTEREST WITHIN THE WATERSHED. TRAVEL TIME (T_t) IS A COMPONENT OF T_c AND IS DEFINED AS THE TIME IT TAKES TO TRAVEL FROM ONE LOCATION TO ANOTHER IN A WATERSHED.

(2) BY VISUAL EVALUATION OF EACH DRAINAGE AREA, THE HYDRAULICALLY MOST DISTANT POINT AND THE DISCHARGE POINT FOR EACH DRAINAGE AREA WERE LOCATED. THE FLOW PATH BETWEEN THESE TWO POINTS WAS THEN MARKED. THE FLOW PATHS FOR FOR DRAINAGE AREAS 1, 2 & 3 ARE SHOWN ON FIGURE 1. EACH FLOW PATH WAS THEN SEGMENTED USING CHANGES IN FLOW TYPE AS THE GUIDE FOR DETERMINING THE END OF EACH SEGMENT.

(3) THE LENGTH AND SLOPE OF EACH SEGMENT WAS THEN DETERMINED. THESE NUMBERS ARE SUMMARIZED ON P. 3.

(4) FLOW TYPES ASSUMED FOR SITE 5 WERE SHEET FLOW, SHALLOW CONCENTRATED FLOW, AND OPEN CHANNEL FLOW. OPEN CHANNEL FLOW IS ASSUMED THROUGH THE SURFACE WATER INTERCEPTOR TRENCHS. A TRAPEZOIDAL CHANNEL WAS ASSUMED FOR OPEN CHANNEL FLOW. DIMENSIONS OF THE CHANNEL ARE SHOWN ON P. 3.



NOTE. PERIMETER DITCH IN THIS WORKING COPY DRAWING HAS NOT BEEN TIED CORRECTLY.

LEGEND:

- - - - LIMIT OF EXCAVATION

▬▬ DRAINAGE AREA BOUNDARY

SCALE 1" = 100'

SITE 5

POST DEVELOPMENT CONDITIONS
FINAL GRADE OF LANDFILL CAP

T_t/T_c CALCULATIONS

BY: LK CHKD: JJB
DATE: 8-22-97 DATE: 8/27/97

P2/7

FIGURE 1

CALCULATION WORKSHEET Order No. 19116 (01-91)

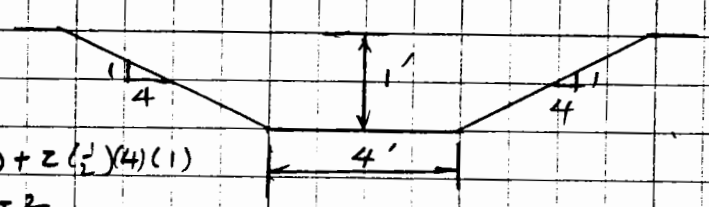
CLIENT: NWSE - SITE 5	JOB NUMBER: 7602/0106
SUBJECT: TIME OF CONCENTRATION	
BASED ON: POST DEVELOPMENT CONDITION	DRAWING NUMBER:
BY: LK 8/22/97	CHECKED BY: SJB 8/27/97
APPROVED BY:	DATE:

DRAINAGE AREA	FLOW TYPE	SEGMENT	LENGTH (FT)	TOP ELE	BOTTOM ELE	SLOPE
1	SF	AB	210	120.5	115	0.026
	SCF	BC	125	115	110	0.040
	OCF	CD	950	110	100	0.011
2	SF	AB	160	120.5	112	0.053
	OCF	BC	390	112	109.5	0.006
3	SF	AB	100	120.5	112	0.047
	OCF	BC	860	112	101	0.012

SF = SHEET FLOW
SCF = SHALLOW CONC. FLOW
OCF = OPEN CHANNEL FLOW

ASSUME:

FOR OPEN CHANNEL FLOW, THE CHANNEL WILL HAVE THE FOLLOWING DIMENSIONS



USE $n = 0.021$ (EARTH CHANNEL CHOW, 1959)

Area = $4(1) + 2(\frac{1}{2})(4)(1)$
= 8 FT²

P = 12.25 Ft

CLIENT	JOB NUMBER
NWSE – SITE 5	7602/0106

SUBJECT: T_t / T_c

BASED ON	DRAWING NUMBER
POST - DEVELOPMENT CONDITIONS	

BY	CHECKED BY	APPROVED BY	DATE
CAL 8/23/97	JJB 8/27/97		

THE HYDRAULIC INFORMATION WAS THEN USED AS INPUT TO THE HAESTAD'S QUICK TR-55 PROGRAM TO DETERMINE TIME OF CONCENTRATIONS. THE OUTPUT FROM THE PROGRAM IS SHOWN ON PP. 5 THROUGH 7. THE CALCULATED T_cs ARE SUMMARIZED BELOW.

DRAINAGE AREA	T_c (hrs)
1	0.10
2	0.05(*) → 0.1
3	0.07(*) → 0.1

NOTE:

* – THE MINIMUM T_c USED IS TR-55 IS 0.1 HR. USE 0.1 HR INSTEAD OF ESTIMATED T_c.

```
Quick TR-55 Ver.5.46   S/N:
Executed: 15:53:17   08-27-1997     NWSE5DA1.TCT

                    NWSE - SITE 5 LANDFILL
                     COLTSNECK, NEW JERSEY
                     CTO 289 - 7602/0106
                  POST-CONSTRUCTION CONDITIONS

                 Tt COMPUTATIONS FOR: DRAINAGE AREA 1

SHEET FLOW (Applicable to Tc only)
    Segment ID                                    AB
    Surface description                      PAVED
    Manning's roughness coeff., n                 0.0110
    Flow length, L (total < or = 300)    ft     210.0
    Two-yr 24-hr rainfall, P2             in     3.400
    Land slope, s                       ft/ft   0.0260
                      0.8
         .007 * (n*L)
    T =  --------------                 hrs      0.03              =  0.03
            0.5    0.4
          P2   *   s

SHALLOW CONCENTRATED FLOW
    Segment ID                                   BC
    Surface (paved or unpaved)?                  Unpaved
    Flow length, L                        ft     125.0
    Watercourse slope, s                ft/ft   0.0400

                        0.5
    Avg.V =  Csf *  (s)                 ft/s    3.2269
    where:   Unpaved Csf = 16.1345
             Paved   Csf = 20.3282

    T = L / (3600*V)                    hrs      0.01              =  0.01


CHANNEL FLOW
    Segment ID                                   CD
    Cross Sectional Flow Area, a       sq.ft     8.00
    Wetted perimeter, Pw                  ft    12.25
    Hydraulic radius, r = a/Pw            ft    0.653
    Channel slope, s                    ft/ft   0.0110
    Manning's roughness coeff., n               0.0250

                 2/3    1/2
         1.49  *  r   *  s
    V =  --------------------           ft/s    4.7052
                  n

    Flow length, L                        ft      950

    T = L / (3600*V)                    hrs      0.06              =  0.06

  ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
                                         TOTAL TIME (hrs)          0.10
```

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Quick TR-55 Ver.5.46   S/N:
Executed: 15:53:17   08-27-1997    NWSE5DA1.TCT

                        NWSE - SITE 5 LANDFILL
                         COLTSNECK, NEW JERSEY
                         CTO 289 - 7602/0106
                      POST-CONSTRUCTION CONDITIONS

                   Tt COMPUTATIONS FOR: DRAINAGE AREA 2

 SHEET FLOW (Applicable to Tc only)
    Segment ID                                   AB
    Surface description                      PAVED
    Manning's roughness coeff., n              0.0110
    Flow length, L (total < or = 300)    ft     160.0
    Two-yr 24-hr rainfall, P2            in     3.400
    Land slope, s                      ft/ft   0.0530
                      0.8
        .007 * (n*L)
    T = -------------                    hrs     0.02          =  0.02
           0.5     0.4
         P2   *   s

 SHALLOW CONCENTRATED FLOW
    Segment ID
    Surface (paved or unpaved)?
    Flow length, L                        ft       0.0
    Watercourse slope, s               ft/ft   0.0000

                        0.5
    Avg.V =  Csf *  (s)                 ft/s   0.0000
    where:   Unpaved Csf = 16.1345
             Paved   Csf = 20.3282

    T = L / (3600*V)                     hrs     0.00          =  0.00


 CHANNEL FLOW
    Segment ID                                   BC
    Cross Sectional Flow Area, a       sq.ft     8.00
    Wetted perimeter, Pw                  ft    12.25
    Hydraulic radius, r = a/Pw            ft    0.653
    Channel slope, s                   ft/ft   0.0064
    Manning's roughness coeff., n              0.0250

                   2/3    1/2
        1.49  *  r   *  s
    V = --------------------            ft/s   3.5890
                  n

    Flow length, L                        ft      390

    T = L / (3600*V)                     hrs     0.03          =  0.03

   :::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
                                                TOTAL TIME (hrs)     0.05
```

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Quick TR-55 Ver.5.46   S/N:
Executed: 15:53:17   08-27-1997    NWSE5DA1.TCT

                        NWSE - SITE 5 LANDFILL
                         COLTSNECK, NEW JERSEY
                         CTO 289 - 7602/0106
                       POST-CONSTRUCTION CONDITIONS

                     Tt COMPUTATIONS FOR: DRAINAGE AREA 3

SHEET FLOW (Applicable to Tc only)
    Segment ID                                     AB
    Surface description                       PAVED
    Manning's roughness coeff., n                  0.0110
    Flow length, L (total < or = 300)      ft      180.0
    Two-yr 24-hr rainfall, P2              in      3.400
    Land slope, s                        ft/ft     0.0470
                      0.8
         .007 * (n*L)
    T =  --------------                   hrs      0.02             =  0.02
            0.5     0.4
          P2    *   s

SHALLOW CONCENTRATED FLOW
    Segment ID
    Surface (paved or unpaved)?
    Flow length, L                         ft      0.0
    Watercourse slope, s                 ft/ft     0.0000

                         0.5
    Avg.V =  Csf *  (s)                   ft/s     0.0000
    where:   Unpaved Csf = 16.1345
             Paved   Csf = 20.3282

    T = L / (3600*V)                      hrs      0.00             =  0.00


CHANNEL FLOW
    Segment ID                                     BC
    Cross Sectional Flow Area, a         sq.ft     8.00
    Wetted perimeter, Pw                   ft      12.25
    Hydraulic radius, r = a/Pw             ft      0.653
    Channel slope, s                     ft/ft     0.0120
    Manning's roughness coeff., n                  0.0250

                    2/3     1/2
         1.49  *   r    *   s
    V =  --------------------            ft/s     4.9144
                   n

    Flow length, L                         ft      860

    T = L / (3600*V)                      hrs      0.05             =  0.05

  :::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
                                           TOTAL TIME (hrs)          0.07
```

CALCULATION WORKSHEET Order No. 19116 (01-91)

PAGE ____ OF ____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

B.7

DETERMINATION OF SITE 5
DRAINAGE AREAS AND
WEIGHTED CURVE NUMBERS

POST-CONSTRUCTION SCENARIO
FINAL CAP

CALCULATION WORKSHEET Order No. 19116 (01-01)

CLIENT: NWSE	JOB NUMBER: 7602/0106
SUBJECT: DRAINAGE AREAS / CNs – POST CONSTRUCTION SITE 5	
BASED ON: EXISTING TOPO / CAP REGRADE PLAN	DRAWING NUMBER:
BY: CAR 8/23/97	CHECKED BY: JJB 8/27/97
APPROVED BY:	DATE:

(I) THE EXISTING TOPOGRAPHY FOR SITE 5 AND THE FINAL CAP REGRADE PLAN WERE USED TO DETERMINE THE BOUNDARIES OF THE DRAINAGE AREAS THAT COVER SITE 5. THREE DRAINAGE AREAS WERE DETERMINED. THEY ARE SHOWN ON FIGURE 1 (p. 4 OF 11)

THE SIZE OF EACH DRAINAGE AREA WAS DETERMINED BY PLANIMETER. THE MEASUREMENTS ARE SHOWN ON p. 3 OF 11. THE AREAS ARE SUMMARIZED BELOW.

DRAINAGE AREA	AREA (ac)
1	9.72
2	1.70
3	4.69

(II) ASSUMPTIONS:

- THE SEDIMENT / DETENTION BASINS ARE NOT WORKING. THE RESULTS OF THESE CALCULATIONS WILL BE USED TO DETERMINE THE SIZE OF THE BASINS.
- A TRENCH WILL BE CONSTRUCTED ALONG THE UPGRADIENT SIDE AND PARALLEL TO THE CAP TO CONVEY POTENTIAL SURFACE WATER RUNON AND RUNOFF TO THE PROPOSED SEDIMENT / DETENTION BASINS.
- THE OVERALL SIZE OF THE DRAINAGE BASIN IS THE SAME DURING POST CONSTRUCTION AS THE SIZE DURING PRE-CONSTRUCTION.
- DRAINAGE AREA 1 → FLOW FROM CULVERT UNDER RAILROAD WILL BE DIVERTED AROUND DETENSION BASIN

CLIENT	JOB NUMBER
NWSE	7602/0106

SUBJECT: DRAINAGE AREAS / CNs - POST CONSTRUCTION SITE 5

BASED ON	DRAWING NUMBER
EXISTING TOPO / CAP REGRADE PLAN	

BY	CHECKED BY	APPROVED BY	DATE
CAR 8/23/97	JJB 8/27/97		

ASSUMPTIONS (CONT'D):

- DRAINAGE AREA 3 → THE OUTSIDE BOUNDARY OF THIS DRAINAGE AREA APPROXIMATELY FOLLOWS A SMALL RIDGE LINE. THE RIDGE LINE WAS DETERMINED BY VISUAL INSPECTION BY THE PROJECT MANAGER.
- THE WORKING COPY OF THE FINAL CAP WILL PROVIDE SUFFICIENT INFORMATION TO CALCULATE RUNOFF FROM EACH AREA.
- A MAJORITY OF THE CAP WILL BE COVERED WITH GRASS. THE TRENCH AND SEDIMENT / DETENSION BASINS WILL ALSO BE GRASS COVERED.
- A PORTION OF DRAINAGE AREAS 1-3 WILL BE PAVED. THIS AREA WILL BE USED FOR THE SKEET RANGE.
- THE DIRT ROADWAYS THAT WERE REMOVED DURING CONSTRUCTION OF THE CAP WILL BE REPLACED BY GRAVEL ROADWAYS.
- THE DRAINAGE AREAS "DURING CONSTRUCTION" AND "POST CONSTRUCTION" ARE SLIGHTLY DIFFERENT DUE TO MINOR CHANGES IN TOPOGRAPHY.

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT	JOB NUMBER
NWSE - SITE 5	7602/0106

SUBJECT: DRAINAGE AREAS FOR POST DEVELOPMENT CONDITIONS

BASED ON	DRAWING NUMBER
FINAL CAP / FIGURE 1	

BY	CHECKED BY	APPROVED BY	DATE
LK 8/22/97	JJB 8/27/97		

PLANIMETER MEASUREMENTS:

(III) ESTIMATE THE SIZE OF THE DRAINAGE AREAS FOR SITE 5 UNDER THE POST-DEVELOPMENT CONDITIONS.
USE FIGURE 1 (p. 4 of 11)

DRAINAGE AREA	MEASUREMENT (IN^2) m_1	m_2	m_3	AVG
1	42.07	41.88	42.08	42.01
2	7.30	7.42	7.37	7.36
3	20.19	20.39	20.16	20.25

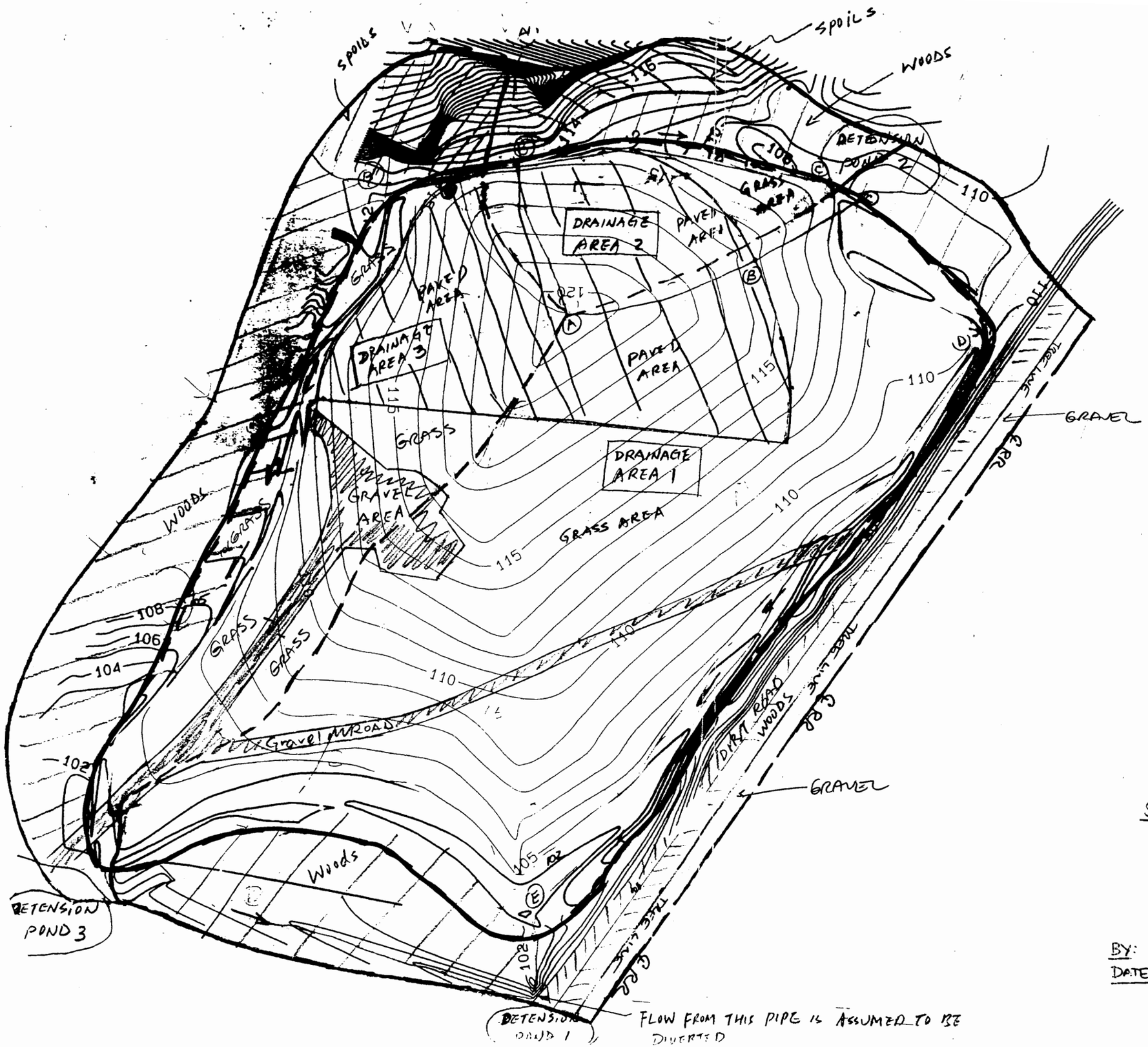
(IV) CONVERT TO ACRES: SCALE: 1" = 100'

AREA (in^2)	AREA (FT^2)	AREA (ACRES)
42.01	420,100	9.64
7.36	73600	1.69
20.25	202,500	4.65

(V) COMPARE EXISTING CONDITIONS DRAINAGE AREAS VERSUS POST-DEVELOPMENT CONDITIONS DRAINAGE AREAS

EXISTING CONDITIONS DRAINAGE AREA	AREA (Acres)	POST-DEVELOPMENT CONDITIONS DRAINAGE AREA	AREA (Acre)
1	5.64	1	9.64
2	5.59	2	1.69
3	4.88	3	4.65
TOTAL	16.11 acres	TOTAL	15.98 acres

DIFFERENCE IN AREA = 16.11 − 15.98 = 0.13 acres



NOTE. PERIMETER DITCH IN THIS WORKING COPY DRAWING HAS NOT BEEN TIED CORRECTLY.

LEGEND:

LIMIT OF EXCAVATION

DRAINAGE AREA BOUNDARY

SCALE 1" = 100'

SITE 5

POST DEVELOPMENT CONDITIONS
FINAL GRADE OF LANDFILL CAP
DRAINAGE AREAS & COVER TYPES

BY: LK CHKD: DDD
DATE: 8-22-97 DATE: 8/27/97

P4/11

FIGURE 1

CLIENT	NWSE SITE 5
JOB NUMBER	7602/0106
SUBJECT	FINAL ESTIMATED AREAS
BASED ON	POST-DEVELOPMENT CONDITIONS
DRAWING NUMBER	
BY	LK 8/22/97
CHECKED BY	JJB 8/27/97
APPROVED BY	
DATE	

BECAUSE THE ENTIRE SITE 5 DRAINAGE AREA DID NOT CHANGE BECAUSE OF LANDFILL CAP CONSTRUCTION, DISTRIBUTE THE DIFFERENCE PROPORTIONALLY TO EACH OF THE POST-DEVELOPMENT CONDITIONS DRAINAGE AREAS. THE FINAL ACRES ARE

9.64 + 0.078 = 9.72 Acre
1.69 + 0.014 = 1.70 Acre
4.65 + 0.038 = 4.69 Acre

VI WEIGHTED CURVE NUMBERS WERE DETERMINED FOR EACH DRAINAGE AREA. THE RESULTING CURVE NUMBERS ARE SUMMARIZED BELOW. THE CALCULATIONS FOR THE WEIGHTED CURVE NUMBERS ARE ON THE FOLLOWING PAGES.

DRAINAGE AREA	WEIGHTED CURVE NUMBER
1	65
2	80
3	70

CLIENT	JOB NUMBER
NWSE - SITE 5	7602 / 0106

SUBJECT: Curve Number for EACH COVER TYPE - WEIGHTED CURVE N.

BASED ON: POST DEVELOPMENT CONDITIONS

DRAWING NUMBER:

BY	CHECKED BY	APPROVED BY	DATE
VK 8/22/97	JJD 8/27/97		

VII THE COVER TYPES DURING CONSTRUCTION OF CAP AT SITE 5 INCLUDE THE FOLLOWING:

WOODS (GOOD)
SPOILS
PAVED AREA
GRAVEL
ROAD (DIRT)
GRASS (GOOD)

VIII THE BOUNDARIES OF EACH COVER TYPE ARE SHOWN ON FIGURE 1 (p. 4 of 11) CURVE NUMBERS FOR EACH COVER TYPE ARE SUMMARIZED BELOW. THE NUMBERS WERE TAKEN FROM TABLES 2a - 2c OF THE TR-55 MANUAL. (SCS, June 1986)

COVER TYPE	CN
WOOD (Good)	55
SPOILS	86
PAVED AREA	98
GRAVEL	85
ROAD (DIRT)	82
GRASS (GOOD)	61

- ASSUME SOIL TYPE OF B (SAME AS WAS USED FOR EXISTING CONDITIONS)

IX WEIGHTED RUNOFF CURVE NUMBERS WERE CALCULATED FOR EACH DRAINAGE AREA. HAESTAD'S QUICK TR-55 PROGRAM WAS USED TO CALCULATE THE $\overline{CN}$s (SEE pp. 7 OF 11 THROUGH 9 OF 11). MEASUREMENTS FOR EACH COVER TYPE ARE SUMMARIZED ON PP. 10 OF 11 THROUGH 11 OF 11.

Quick TR-55 Ver.5.46 S/N:
Executed: 14:18:40 08-22-1997

NWSE - SITE 5 LANDFILL-POST DEVELOPMENT
DRAINAGE AREA 1
SOIL GROUP B

RUNOFF CURVE NUMBER DATA

Composite Area:

SURFACE DESCRIPTION	AREA (acres)	CN	
WOODS (GOOD)	2.14	55	
PAVED AREA	0.87	98	
GRAVEL	0.53	85	
ROAD (DIRT)	0.20	82	
GRASS (~~FAIR~~ GOOD)	5.98	61	
COMPOSITE AREA --->	9.72	64.7	(65)

Quick TR-55 Ver.5.46 S/N:
Executed: 14:31:35 08-22-1997

SITE5 LANDFILL- POST DEVELOPMENT CONDIT
DRAINAGE AREA 2
SOIL GROUP B

RUNOFF CURVE NUMBER DATA

::

Composite Area:

SURFACE DESCRIPTION	AREA (acres)	CN	
WOODS (GOOD)	0.44	55	
SPOILS PILE	0.36	86	
PAVED AREA	0.71	98	
GRASS (~~FAIR~~ GOOD)	0.19	61	
COMPOSITE AREA --->	1.70	80.2	(80)

::

Quick TR-55 Ver.5.46 S/N:
Executed: 13:56:05 08-27-1997

NWSE - SITE 5 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0106
POST CONSTRUCTION CONDITIONS - FINAL CAP

RUNOFF CURVE NUMBER DATA

Composite Area: DRAINAGE AREA 3

SURFACE DESCRIPTION	AREA (acres)	CN	
WOODS (GOOD)	1.65	55	
SPOILS PILE	0.45	86	
PAVED AREA	0.83	98	
GRAVEL AREA	0.42	85	
GRASS (GOOD)	1.34	61	
COMPOSITE AREA --->	4.69	70.0	(70)

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT	JOB NUMBER
NWSZ - SITE 5	7802/0106

SUBJECT: WEIGHTED CN

BASED ON	DRAWING NUMBER
POST-DEVELOPMENT CONDITIONS	

BY	CHECKED BY	APPROVED BY	DATE
LK/CAR 8/22/97	JJB 8/27/97		

VIII ESTIMATED AREA OF EACH COVER TYPE (PLANIMETER MEASUREMENT)

DRAINAGE AREA	COVER TYPE	m1	m2	m3	AVG	CONVERT TO AREA (AC)
1	WOODS (GOOD)	9.05	9.16	9.46	9.22	2.12
	SPOILS	—	—	—	—	—
	PAVED AREA	3.84	3.71	3.66	3.73	0.86
	GRAVEL	2.33	2.30	2.31	2.31	0.53
	ROAD (DIRT)	0.89	0.85	0.90	0.88	0.202
	GRASS (GOOD)	25.96	25.86	25.78	25.86	5.94

DRAINAGE AREA	COVER TYPE	m1	m2	m3	AVG	CONVERT TO AREA (AC)
2	WOODS (GOOD)	1.78	1.97	2.05	1.93	0.44
	SPOILS	1.53	1.57	1.55	1.55	0.36
	PAVED AREA	3.09	3.12	2.96	3.06	0.70
	GRAVEL	—	—	—	—	—
	ROAD (DIRT)	—	—	—	—	—
	GRASS (GOOD)	0.87	0.81	0.79	0.82	0.19

DRAINAGE AREA	COVER TYPE	m1	m2	m3	AVG	CONVERT TO AREA (AC)
3	WOODS (GOOD)	7.05	7.30	7.05	7.14	1.64
	SPOILS	1.95	1.92	1.94	1.94	0.45
	PAVED AREA	3.55	3.69	3.60	3.61	0.83
	GRAVEL	1.81	1.86	1.78	1.82	0.42
	ROAD	—	—	—	—	—
	GRASS (GOOD)	5.70	6.05	5.69	5.81	1.33

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NWSE - SITE 5	JOB NUMBER: 7602/0/06
SUBJECT: FINAL ADJUSTED DRAINAGE AREAS	
BASED ON: POST DEVELOPMENT CONDITIONS	DRAWING NUMBER:
BY: LK/CAR 8/22/97	CHECKED BY: JJS 8/27/97
APPROVED BY:	DATE:

(IV) CORRECT AREAS SO THAT TOTAL AREA IS EQUAL TO MEASURED TOTAL AREA. DISTRIBUTE DIFFERENCE PROPORTIONALLY.

DRAINAGE AREA	MEASURED AREA (ac)	CORRECTED AREA (ac)
1	2.12	2.14
TOTAL AREA = 9.72 ac	—	—
	0.86	0.87
	0.53	0.53
	0.202	0.20
	5.94	5.98
	TOTAL	9.72 ac
2	0.44	0.44
TOTAL AREA = 1.70 ac	0.36	0.36
	0.70	0.71
	—	—
	—	—
	0.19	0.19
	TOTAL	1.70 ac
	1.64	1.65
	0.45	0.45
3	0.83	0.83
TOTAL AREA = 4.69 ac	0.42	0.42
	—	—
	1.33	1.34
	TOTAL	4.69 ac

CALCULATION WORKSHEET Order No. 19116 (01-91)

PAGE _____ OF _____

CLIENT NWSE SITE 5	JOB NUMBER 7602/0106
SUBJECT PEAK DISCHARGE RATES	
BASED ON	DRAWING NUMBER

BY	CHECKED BY	APPROVED BY	DATE

NWSE - SITE 5

CALCULATION OF PEAK DISCHARGE RATES FOR SITE 5 DRAINAGE AREAS USING THE TR-55 GRAPHICAL PEAK DISCHARGE METHOD

— POST DEVELOPMENT CONDITIONS —

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT	JOB NUMBER
NWSE – SITE 5	7602/0104

SUBJECT: PEAK DISCHARGE RATES – POST-CONSTRUCTION

BASED ON	DRAWING NUMBER
QUICK TR-55	

BY	CHECKED BY	APPROVED BY	DATE
CAR 8/23/97	JJB 8/27/97		

(I) THE PEAK, POST-CONSTRUCTION CONDITIONS, DISCHARGE RATES FOR SITE 5 DRAINAGE AREAS WERE CALCULATED BY THE GRAPHICAL PEAK DISCHARGE METHOD. HAESTAD'S QUICK TR-55 PROGRAM WAS USED TO COMPILE THE CALCULATIONS. INPUT FOR THE PROGRAM WAS SUMMARIZED PREVIOUSLY.

(II) THE OUTPUT FROM QUICK-TR-55 IS SHOWN ON THE FOLLOWING PAGES. DISCHARGE RATES FOR THREE STORM EVENTS (2-YR, 10-YR, & 25-YR) ARE SHOWN FOR EACH DRAINAGE AREA. THE RESULTS ARE SUMMARIZED BELOW.

(III) SUMMARY:

AREA	STORM FREQUENCY (YR)	PEAK DISCHARGE RATE (CFS)
1	2	6
	10	17
	25	23
2	2	3
	10	5
	25	7
3	2	4
	10	10
	25	13

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NWSE - SITE 5 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0106
DRAINAGE AREA 1 - POST-DEVELOPMENT CONDITIONS

CALCULATED
DISK FILE: NWSECG51.GPD

Drainage Area	(acres)	9.72	--->	0.0152 sq.mi.
Runoff Curve Number	(CN)	65		
Time of Concentration,Tc	(hrs)	0.10		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	2	10	25
Rainfall, P, 24-hr (in)	3.4	5.2	6
Initial Abstraction, Ia (in)	1.077	1.077	1.077
Ia/p Ratio	0.317	0.207	0.179
Unit Discharge, * qu (csm/in)	578	627	636
Runoff, Q (in)	0.70	1.79	2.35
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	6	17	23

Summary of Computations for qu

Ia/p	#1	0.300	0.100	0.100
C0	#1	2.396	2.473	2.473
C1	#1	-0.512	-0.518	-0.518
C2	#1	-0.132	-0.171	-0.171
qu (csm)	#1	596.829	661.942	661.942
Ia/p	#2	0.350	0.300	0.300
C0	#2	2.355	2.396	2.396
C1	#2	-0.497	-0.512	-0.512
C2	#2	-0.120	-0.132	-0.132
qu (csm)	#2	539.846	596.829	596.829
* qu (csm)		578	627	636

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NWSE - SITE 5 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0106
DRAINAGE AREA 2 - POST-DEVELOPMENT CONDITIONS

CALCULATED
DISK FILE: NWSECG52.GPD

Drainage Area	(acres)	1.70	--->	0.0027 sq.mi.
Runoff Curve Number	(CN)	80		
Time of Concentration,Tc	(hrs)	0.10		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	2	10	25
Rainfall, P, 24-hr (in)	3.4	5.2	6
Initial Abstraction, Ia (in)	0.500	0.500	0.500
Ia/p Ratio	0.147	0.096	0.083
Unit Discharge, * qu (csm/in)	647	662	662
Runoff, Q (in)	1.56	3.07	3.78
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	3	5	7

Summary of Computations for qu

Ia/p	#1	0.100	0.100	0.100
C0	#1	2.473	2.473	2.473
C1	#1	-0.518	-0.518	-0.518
C2	#1	-0.171	-0.171	-0.171
qu (csm)	#1	661.942	661.942	661.942
Ia/p	#2	0.300	0.100	0.100
C0	#2	2.396	2.473	2.473
C1	#2	-0.512	-0.518	-0.518
C2	#2	-0.132	-0.171	-0.171
qu (csm)	#2	596.829	661.942	661.942
* qu (csm)		647	662	662

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NWSE - SITE 5 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0106
DRAINAGE AREA 3 - POST-DEVELOPMENT CONDITIONS

CALCULATED
DISK FILE: NWSECG53.GPD

Drainage Area	(acres)	4.69	--->	0.0073 sq.mi.
Runoff Curve Number	(CN)	70		
Time of Concentration,Tc	(hrs)	0.10		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	2	10	25
Rainfall, P, 24-hr (in)	3.4	5.2	6.0
Initial Abstraction, Ia (in)	0.857	0.857	0.857
Ia/p Ratio	0.252	0.165	0.143
Unit Discharge, * qu (csm/in)	612	641	648
Runoff, Q (in)	0.95	2.19	2.81
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	4	10	13

Summary of Computations for qu

Ia/p	#1	0.100	0.100	0.100
C0	#1	2.473	2.473	2.473
C1	#1	-0.518	-0.518	-0.518
C2	#1	-0.171	-0.171	-0.171
qu (csm)	#1	661.942	661.942	661.942
Ia/p	#2	0.300	0.300	0.300
C0	#2	2.396	2.396	2.396
C1	#2	-0.512	-0.512	-0.512
C2	#2	-0.132	-0.132	-0.132
qu (csm)	#2	596.829	596.829	596.829
* qu (csm)		612	641	648

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

APPENDIX C

CALCULATIONS TO SIZE SEDIMENT BASINS FOR SITE 4

C.1 Preliminary Calculations for Determining Capacity and Size of Sediment Basins

C.2 Overview and Summary of Final Calculations for Determining Capacity and Size of Sediment Basins

C.3 Basin Inflow Hydrographs

C.4 Elevation-Storage Matrix

C.5 Outlet Structure Design

C.6 Hydrograph Routings and Outflow Calculations

C.7 Anti-Seep Collar Design

C.1 PRELIMINARY CALCULATIONS FOR DETERMINING CAPACITY AND SIZE OF SEDIMENT BASINS

CLIENT	JOB NUMBER
NSWE	7002-0106

SUBJECT: Determine Size + Depth of Sediment Basin #1 + 2 - Site 4

BASED ON	DRAWING NUMBER
Sediment Capacity Calcs / NJ Regs	

BY	CHECKED BY	APPROVED BY	DATE
JAB 8/25/97	CAR 8/27/97		

III, B (Continued)

The design criteria for sediment Basin #2 is as follows:

W_0 = 10 ft

W_1 = 35.2 ft

L_0 = 60 ft

L_1 = 81 ft

D = 4.2 ft

V = 6,692 ft^3

F = 0.42 ft

NSWE
Site 4
Sediment Basin #2

W_o = 10 ft
L_o = 60 ft

D (ft)	L_1 (ft)	W_1 (ft)	L_{avg}	W_{avg}	V (cfs)
0.2	61	11.2	60.5	10.6	128
0.4	62	12.4	61	11.2	273
0.6	63	13.6	61.5	11.8	435
0.8	64	14.8	62	12.4	615
1	65	16	62.5	13	813
1.2	66	17.2	63	13.6	1,028
1.4	67	18.4	63.5	14.2	1,262
1.6	68	19.6	64	14.8	1,516
1.8	69	20.8	64.5	15.4	1,788
2	70	22	65	16	2,080
2.2	71	23.2	65.5	16.6	2,392
2.4	72	24.4	66	17.2	2,724
2.6	73	25.6	66.5	17.8	3,078
2.8	74	26.8	67	18.4	3,452
3	75	28	67.5	19	3,848
3.2	76	29.2	68	19.6	4,265
3.4	77	30.4	68.5	20.2	4,705
3.6	78	31.6	69	20.8	5,167
3.8	79	32.8	69.5	21.4	5,652
4	80	34	70	22	6,160
4.2	81	35.2	70.5	22.6	6,692
4.4	82	36.4	71	23.2	7,248
4.6	83	37.6	71.5	23.8	7,828
4.8	84	38.8	72	24.4	8,433
4.9	84.5	39.4	72.25	24.7	8,744
5	85	40	72.5	25	9,063
5.2	86	41.2	73	25.6	9,718
5.4	87	42.4	73.5	26.2	10,399
5.6	88	43.6	74	26.8	11,106

BY: JJB CKKD: CAR
DATE: 8/26/97 DATE: 8/27/97

NSWE
Site 4
Sediment Basin #1

W_o = 17 ft
L_o = 100 ft

D (ft)	L_1 (ft)	W_1 (ft)	L_{avg}	W_{avg}	V (cfs)
0.2	101	18.2	100.5	17.6	354
0.4	102	19.4	101	18.2	735
0.6	103	20.6	101.5	18.8	1,145
0.8	104	21.8	102	19.4	1,583
1	105	23	102.5	20	2,050
1.2	106	24.2	103	20.6	2,546
1.4	107	25.4	103.5	21.2	3,072
1.6	108	26.6	104	21.8	3,628
1.8	109	27.8	104.5	22.4	4,213
2	110	29	105	23	4,830
2.2	111	30.2	105.5	23.6	5,478
2.4	112	31.4	106	24.2	6,156
2.6	113	32.6	106.5	24.8	6,867
2.8	114	33.8	107	25.4	7,610
3	115	35	107.5	26	8,385
3.2	116	36.2	108	26.6	9,193
3.4	117	37.4	108.5	27.2	10,034
3.6	118	38.6	109	27.8	10,909
3.8	119	39.8	109.5	28.4	11,817
4	120	41	110	29	12,760
4.2	121	42.2	110.5	29.6	13,737
4.3	121.5	42.8	110.75	29.9	14,239
4.4	122	43.4	111	30.2	14,750
4.6	123	44.6	111.5	30.8	15,797
4.8	124	45.8	112	31.4	16,881
5	125	47	112.5	32	18,000
5.2	126	48.2	113	32.6	19,156
5.4	127	49.4	113.5	33.2	20,348
5.6	128	50.6	114	33.8	21,578

BY: JJB
DATE: 8/26/97

CHKD: CAR
DATE: 8/27/97

CLIENT	JOB NUMBER
NSWE	7602-0106

SUBJECT: Determine Size + Depth of Sediment Basins # 1 & 2

BASED ON	DRAWING NUMBER
Sediment Capacity / NJ Regs	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/26/97	CAR 8/27/97		

III. A (continued)

Given the cross section shown on pages 6 & 7, the storage capacity for a given depth is as follows:

$$V = \left(\frac{L_0 + L_1}{2}\right)\left(\frac{W_0 + W_1}{2}\right)(D)$$

The spreadsheet on the following page illustrates volume capacity for a given depth.

The required $V = 14{,}375\ ft^3$; therefore, the design criteria for sediment basin # 1 is as follows.

$W_0 = 17\ ft$

$W_1 = 43.4\ ft$

$D = 4.4\ ft$

$F = 0.44\ ft$

$L_0 = 100\ ft$

$L_1 = 122\ ft$

$V = 14{,}750\ ft^3$

(B) Drainage Area # 2 - Sediment Basin # 2

Assumptions

- $4\ ft \leq D \leq 5\ ft$
- $V \geq 6{,}534\ ft^3$
- $L_0 = 60\ ft$
- $W_1 > 17.3\ ft$

The spreadsheet on page 9 of 11, illustrates volume capacity for a given depth.

CALCULATION WORKSHEET Order No. 19116 (01-91)

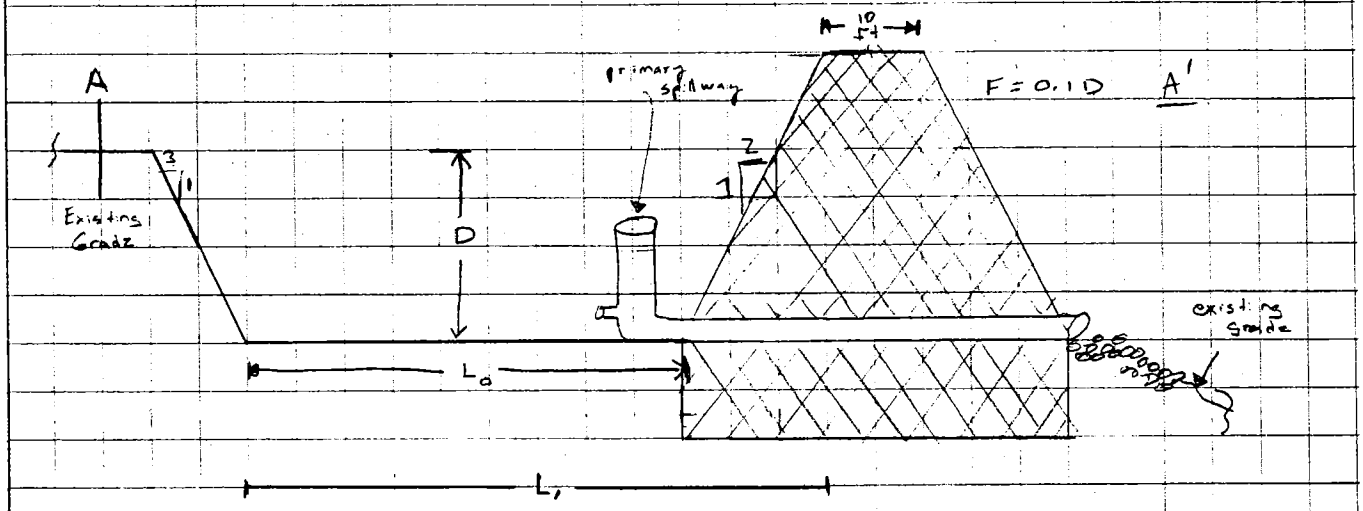
CLIENT	JOB NUMBER
NSWF	7602-0106

SUBJECT: Determine Size & Depth of Sediment Basin #1 & 2

BASED ON	DRAWING NUMBER
Sed. Capacity Calcs, NJ Regs	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/26/97	GAR 8/27/97		

Figure 3 - Cross Section A-A'

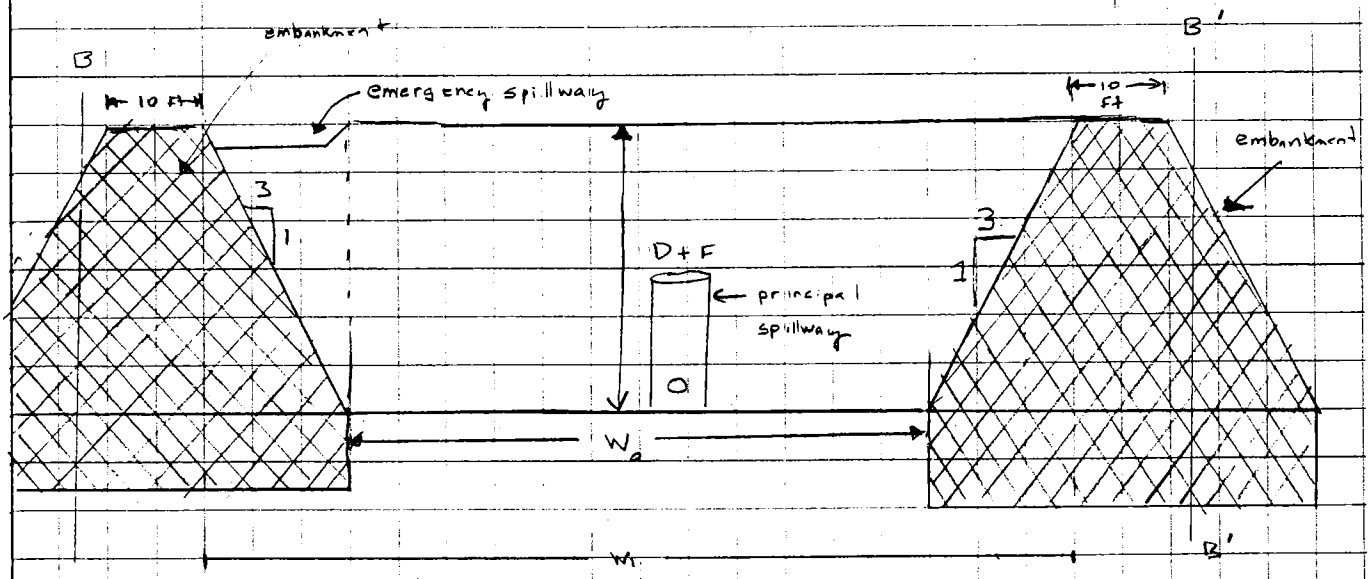


$L_1 = L_o + 5D$

Not to Scale

Figure 4

Cross section B + B'



$W_1 = W_o + 6D$

Not to Scale

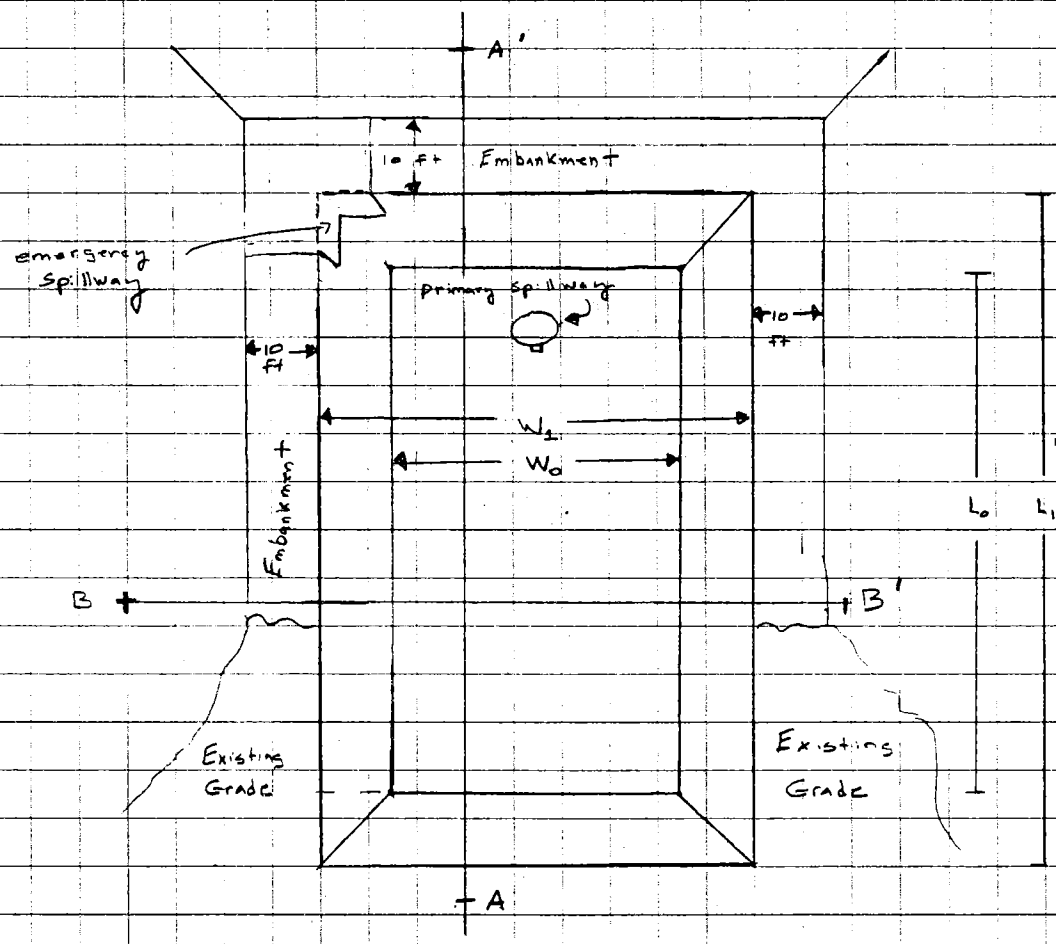
CLIENT	JOB NUMBER
NSWE	7602-0106

SUBJECT
Determine Size + Depth of Sediment Basin's #1 & #2

BASED ON	DRAWING NUMBER
Sediment Capacity Calcs / NJ Regs	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/26/97	CAR 8/27/97		

Figure 2 - Plan View



Not to scale

CLIENT	JOB NUMBER		
NSWE	7602-0106		
SUBJECT: Determine Size & Depth of Sediment Basin #1 & 2			
BASED ON: Sediment Capacity / NJ Regs	DRAWING NUMBER		
BY: JJB 8-25-97	CHECKED BY: CAM 8/27/97	APPROVED BY	DATE

II Calculate min width

DA #1 : $W_1 = 10\sqrt{Q_5} = 10\sqrt{9\ cfs} = 30\ ft$

DA #2 : $W_1 = 10\sqrt{3\ cfs} = 17.3\ ft$

III Determine Dimensions of Basin

Assumptions

- The sediment basin is rectangular in shape
- The downgradient (headwall) sideslope of the basin is 2:1
- The remaining sideslopes are 3:1
- The cross section of the sediment basins are as presented in Figures 2 - 4 (page 6 of 11 and 7 of 11)
- Both sediment basins will be constructed partially by excavation (upgradient end of basin) and partially by construction of barriers or dams (downgradient end). The sediment basin will be classified as "Embankment Sediment Basins" as defined in the NJ Regs.
- The minimum top width of the embankment will be 10 ft.
- A 10 % freeboard will be added to the embankment height

A Drainage Area #1 - Sediment Basin #1

Assumptions:

- $W_1 > 30$ ft
- Assume Depth < 5 ft so as not to trip the NJ regulations for dams > 5 ft
- $L_b = 100$ (due to space limitations)

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NWSE - SITE 4 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0104
DRAINAGE AREA #2 - CONSTRUCTION CONDITIONS

CALCULATED
DISK FILE: NSWE4CS2.GPD

Drainage Area	(acres)	3.23	--->	0.0050 sq.mi.
Runoff Curve Number	(CN)	68		
Time of Concentration,Tc	(hrs)	.315		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	5	10	25
Rainfall, P, 24-hr (in)	4.4	5.2	6.0
Initial Abstraction, Ia (in)	0.941	0.941	0.941
Ia/p Ratio	0.214	0.181	0.157
Unit Discharge, * qu (csm/in)	448	460	469
Runoff, Q (in)	1.47	2.02	2.62
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	3	5	6

Summary of Computations for qu

Ia/p	#1	0.100	0.100	0.100
C0	#1	2.473	2.473	2.473
C1	#1	-0.518	-0.518	-0.518
C2	#1	-0.171	-0.171	-0.171
qu (csm)	#1	490.105	490.105	490.105
Ia/p	#2	0.300	0.300	0.300
C0	#2	2.396	2.396	2.396
C1	#2	-0.512	-0.512	-0.512
C2	#2	-0.132	-0.132	-0.132
qu (csm)	#2	416.695	416.695	416.695
* qu (csm)		448	460	469

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

BY: JJB DATE: 8/26/97 CHKD: CAR DATE: 8/27/97

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NWSE - SITE 4 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0104
DRAINAGE AREA #1 - CONSTRUCTION CONDITIONS

CALCULATED
DISK FILE: NSWE4CS1.GPD

Drainage Area	(acres)	7.23	--->	0.0113 sq.mi.
Runoff Curve Number	(CN)	70		
Time of Concentration,Tc	(hrs)	.233		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	5	10	25
Rainfall, P, 24-hr (in)	4.4	5.2	6.0
Initial Abstraction, Ia (in)	0.857	0.857	0.857
Ia/p Ratio	0.195	0.165	0.143
Unit Discharge, * qu (csm/in)	505	516	524
Runoff, Q (in)	1.60	2.19	2.81
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	9	13	17

Summary of Computations for qu

Ia/p	#1	0.100	0.100	0.100
C0	#1	2.473	2.473	2.473
C1	#1	-0.518	-0.518	-0.518
C2	#1	-0.171	-0.171	-0.171
qu (csm)	#1	540.518	540.518	540.518
Ia/p	#2	0.300	0.300	0.300
C0	#2	2.396	2.396	2.396
C1	#2	-0.512	-0.512	-0.512
C2	#2	-0.132	-0.132	-0.132
qu (csm)	#2	464.724	464.724	464.724
* qu (csm)		505	516	524

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

BY: JJB
DATE: 8/28/97

CHKD: CAR
DATE: 8/27/97

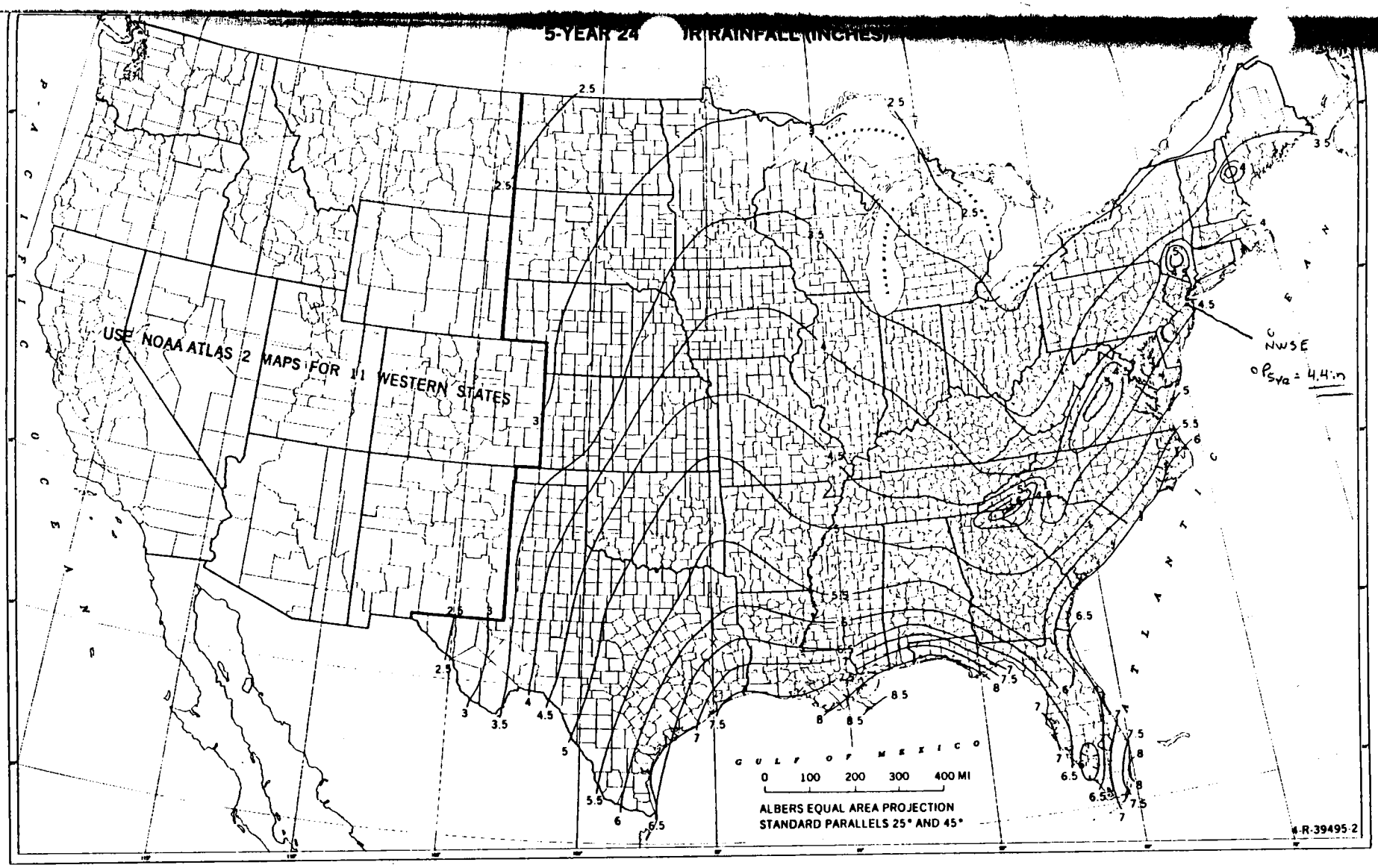


Figure B-4.—Five-year, 24-hour rainfall.

Figure 1:

(210-VI-TR-55, Second Ed., June 1986)

BY: IJB CHKD: [illegible] B-5

DATE: 8/25/97 DATE: 8/27/97

2/11

CLIENT	JOB NUMBER
NSWE	7602-0106

SUBJECT: Determine Size and Depth of Sediment Basin #1 & 2 - Site 4

BASED ON	DRAWING NUMBER
Sediment Capacity Calculations / NJ Regs	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/25/97	CAR 8/27/97		

Determine the size and depth of the sediment basins based on the following NJ criteria & design parameters calculated previously.

1. $W = 10\sqrt{Q_s}$ where

   W = width (ft)

   Q_s = peak discharge from a five-yr storm

2. $L \geq 2W$ where L = length (ft)
3. $D \geq 4$ ft where D = depth (ft.)
4. $V_{s\text{-}DA\#1} = 0.33$ ac. ft ; $V_{s\text{-}DA\#2} = 0.15$ ac. ft
   $= 14{,}375$ ft^3 $= 6{,}534$ ft^3

I. Estimate Q_s

- From Figure 1 (page 2 of 11), Rainfall, 24-hr interval, 5-year storm = 4.4 in.

DA #1

From previous calculations: $T_c = 0.233$ hr
CN = 70
DA = 7.23 acres

∴ Q = 9 cfs (see page 3 of 11)

DA #2

From previous calculations: $T_c = 0.315$ hr
CN = 68
DA = 3.23 acres

∴ Q = 3 cfs (see page 4 of 11)

CALCULATION WORKSHEET

Order No. 19116 (01-91)

PAGE _____ OF _____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

Determine Dimensions of Site 4
Sediment Basins # 1 + 2

Input requirements and procedures

Use figure 6-1 to estimate storage volume (V_s) required or peak outflow discharge (q_o). The most frequent application is to estimate V_s, for which the required inputs are runoff volume (V_r), q_o, and peak inflow discharge (q_i). To estimate q_o, the required inputs are V_r, V_s, and q_i.

Estimating V_s

Use worksheet 6a to estimate V_s, storage volume required, by the following procedure.

1. Determine q_o. Many factors may dictate the selection of peak outflow discharge. The most common is to limit downstream discharges to a desired level, such as predevelopment discharge. Another factor may be that the outflow device has already been selected.
2. Estimate q_i by procedures in chapters 4 or 5. Do not use peak discharges developed by any other procedure. When using the Tabular Hydrograph method to estimate q_i for a subarea, only use

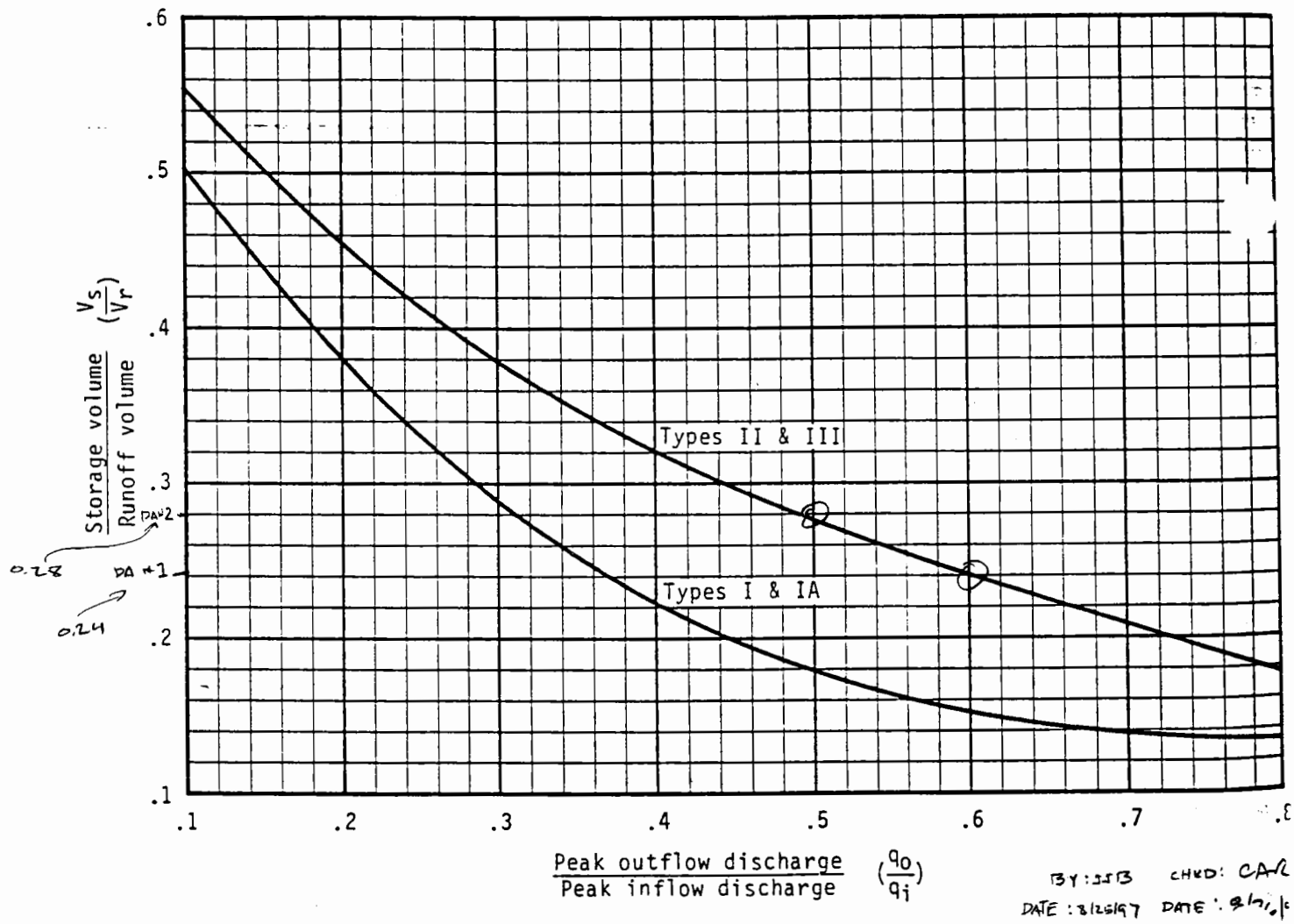


Figure 6-1.—Approximate detention basin routing for rainfall types I, IA, II, and III.

CLIENT	JOB NUMBER
NSWE	7602-0106
SUBJECT: Estimation of Sediment Basin Storage Capacity	
BASED ON: Standard for Sed. Basin - NJ Regs	DRAWING NUMBER
BY: JJB - 8/25/97 / CHECKED BY: CAR 8/26/97	APPROVED BY / DATE

(3) Determine V_s

Using Figure 6-1 from Chapter 6 of the TR-55 manual and the calculated q_o/q_i values, determine the required volume of storage for each drainage basin.

DA #1

$q_o/q_i = 0.6 \Rightarrow V_s/V_R = 0.24$

$V_{s-2YR} = (0.24)(0.572 \text{ ac.ft}) = 0.14 \text{ ac.ft}$

DA #2

$q_o/q_i = 0.5 \Rightarrow V_s/V_R = 0.28$

$V_{s-2YR} = (0.28)(0.226 \text{ ac.ft}) = 0.06 \text{ ac.ft}$

(C) Volume of storage for sediment and 2-yr storm

$V_{Total} = V_s$ (see section II.E) + V_{s-2YR} (see section II.F)

$V_{Total-DA\#1} = (0.003 + 0.14) \text{ ac.ft} = 0.14 \text{ ac.ft}$

$V_{Total-DA\#2} = (0.03 + 0.06) \text{ ac.ft} = 0.09 \text{ ac.ft}$

CLIENT	JOB NUMBER
NSWE	7602 - 0104

SUBJECT: Estimate Sed. Basin. Storage Capacity

BASED ON	DRAWING NUMBER
Standard for Sediment Basin - NJ Regs	

BY	CHECKED BY	APPROVED BY	DATE
JJB 3/25/97	CMR 9/26/97		

(2) Determine q_o/q_i

Peak Discharges for these same areas and storms:

STORM	DA	Q (cfs)
2-yr	1	5
	2	2
	3	0

From Pre-construction Conditions, the estimated Peak Discharge Rates are:

STORM	DA	Q (cfs)
2-yr	1	3
	2	1

Regrading of waste alters the drainage patterns of site 4 and creates 3 DAs from the initial 2 DAs. However, for the purposes of calculating q_o/q_i, it is assumed that DA #1 (pre-const) corresponds to DA #1 (const) & DA #2 (pre-const) corresponds to DA #2 (const)

Assume: $q_{o\ DA\#1} = 3$ $q_{i\ DA\#1} = 5$

$q_{o\ DA\#2} = 1$ $q_{i\ DA\#2} = 2$

DA #1: $\frac{q_o}{q_i} = 3/5 = 0.6$

DA #2: $\frac{q_o}{q_i} = 1/2 = 0.5$

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NWSE - SITE 4 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0104
DRAINAGE AREA #3 - CONSTRUCTION CONDITIONS

CALCULATED
DISK FILE: NSWE4CS3.GPD

Drainage Area	(acres)	0.74	--->	0.0012 sq.mi.
Runoff Curve Number	(CN)	65		
Time of Concentration,Tc	(hrs)	0.1		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	2	10	25
Rainfall, P, 24-hr (in)	3.4	5.2	6.0
Initial Abstraction, Ia (in)	1.077	1.077	1.077
Ia/p Ratio	0.317	0.207	0.179
Unit Discharge, * qu (csm/in)	578	627	636
Runoff, Q (in)	0.70	1.79	2.35
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	0	1	2

Summary of Computations for qu

Ia/p	#1	0.300	0.100	0.100
C0	#1	2.396	2.473	2.473
C1	#1	-0.512	-0.518	-0.518
C2	#1	-0.132	-0.171	-0.171
qu (csm)	#1	596.829	661.942	661.942
Ia/p	#2	0.350	0.300	0.300
C0	#2	2.355	2.396	2.396
C1	#2	-0.497	-0.512	-0.512
C2	#2	-0.120	-0.132	-0.132
qu (csm)	#2	539.846	596.829	596.829
* qu (csm)		578	627	636

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NWSE - SITE 4 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0104
DRAINAGE AREA #2 - CONSTRUCTION CONDITIONS

CALCULATED
DISK FILE: NSWE4CS2.GPD

Drainage Area	(acres)	3.23	--->	0.0050 sq.mi.
Runoff Curve Number	(CN)	68		
Time of Concentration,Tc	(hrs)	.315		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	2	10	25
Rainfall, P, 24-hr (in)	3.4	5.2	6.0
Initial Abstraction, Ia (in)	0.941	0.941	0.941
Ia/p Ratio	0.277	0.181	0.157
Unit Discharge, * qu (csm/in)	425	460	469
Runoff, Q (in)	0.84	2.02	2.62
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	2	5	6

Summary of Computations for qu

Ia/p	#1	0.100	0.100	0.100
C0	#1	2.473	2.473	2.473
C1	#1	-0.518	-0.518	-0.518
C2	#1	-0.171	-0.171	-0.171
qu (csm)	#1	490.105	490.105	490.105
Ia/p	#2	0.300	0.300	0.300
C0	#2	2.396	2.396	2.396
C1	#2	-0.512	-0.512	-0.512
C2	#2	-0.132	-0.132	-0.132
qu (csm)	#2	416.695	416.695	416.695
* qu (csm)		425	460	469

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NWSE - SITE 4 LANDFILL
COLTSNECK, NEW JERSEY
CTO 289 - 7602/0104
DRAINAGE AREA #1 - CONSTRUCTION CONDITIONS

CALCULATED
DISK FILE: NSWE4CS1.GPD

Drainage Area	(acres)	7.23	--->	0.0113 sq.mi.
Runoff Curve Number	(CN)	70		
Time of Concentration,Tc	(hrs)	.233		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	2	10	25
Rainfall, P, 24-hr (in)	3.4	5.2	6.0
Initial Abstraction, Ia (in)	0.857	0.857	0.857
Ia/p Ratio	0.252	0.165	0.143
Unit Discharge, * qu (csm/in)	483	516	524
Runoff, Q (in)	0.95	2.19	2.81
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	5	13	17

Summary of Computations for qu

Ia/p	#1	0.100	0.100	0.100
C0	#1	2.473	2.473	2.473
C1	#1	-0.518	-0.518	-0.518
C2	#1	-0.171	-0.171	-0.171
qu (csm)	#1	540.518	540.518	540.518
Ia/p	#2	0.300	0.300	0.300
C0	#2	2.396	2.396	2.396
C1	#2	-0.512	-0.512	-0.512
C2	#2	-0.132	-0.132	-0.132
qu (csm)	#2	464.724	464.724	464.724
* qu (csm)		483	516	524

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

CLIENT	JOB NUMBER		
NWSE	7602 / 01060		
SUBJECT: Estimate Sediment Basin Storage Capacity			
BASED ON: Standard for Sediment Basin - NJ Regs	DRAWING NUMBER		
BY: JJB 3/22/97	CHECKED BY	APPROVED BY	DATE

(E) Calculate Volume of Trapped Sediment

$$V_1 = (132.5 \text{ ton/yr})(0.37)(0.70)\left(\frac{1}{90 \text{ lb/ft}^3}\right)(2000)\left(\frac{1}{43,560}\right)\left(\frac{6 \text{ months}}{12 \text{ months/yr}}\right)$$

$$= 0.01 \text{ ac·ft}$$

$$V_2 = (44.2 \text{ ton/yr})(0.37)(0.70)\left(\frac{1}{90 \text{ lb/ft}^3}\right)(2000)\left(\frac{1}{43,560}\right)\left(\frac{6 \text{ months}}{12 \text{ months/yr}}\right)$$

$$= 0.003 \text{ ac·ft}$$

(F) Determine total volume of storage for 2-yr storm

(1) Determine total runoff volume from each drainage basin during the 2-yr storm for during construction conditions.

DA #1: $R_{2\text{-yr}} = 0.95$ in (see page 6 of 11)
Area = 7.23 acres

$$V_{R\text{-}2YR} = (0.95 \text{ in})\left(\frac{1 \text{ ft}}{12 \text{ in}}\right)(7.23 \text{ acres}) = 0.572 \text{ ac·ft}$$

DA #2: $R_{2\text{-yr}} = 0.84$ in (see page 7 of 11)
Area = 3.23 ac.

$$V_{R\text{-}2YR} = (0.84/12)(3.23) = 0.226 \text{ ac·ft}$$

DA #3: $R_{2\text{-}YR} = 0.70$ in (see page 8 of 11)
= 0.74 ac

$$V_{R\text{-}2YR} = (0.70/12)(0.74) = 0.043 \text{ ac·ft}$$

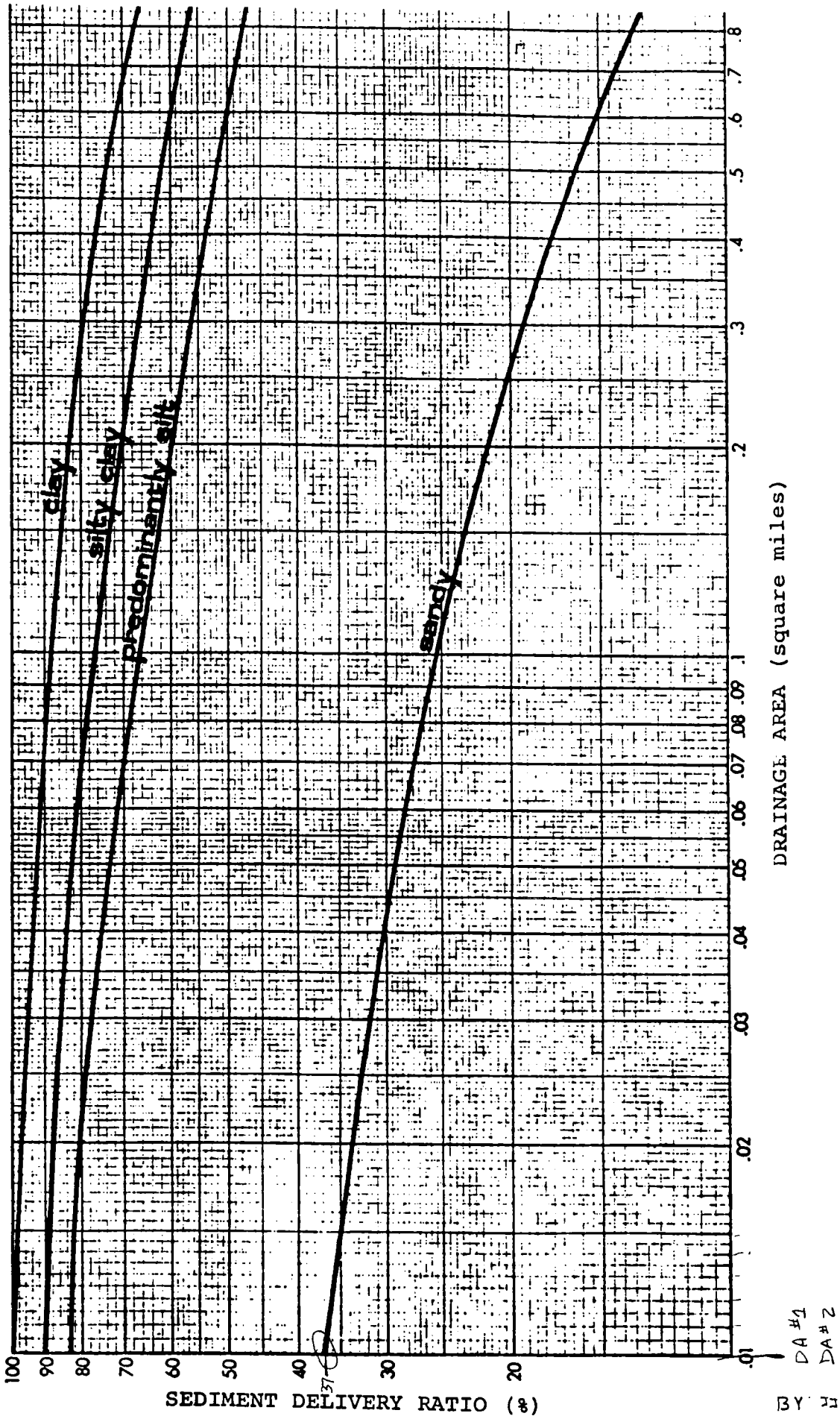


FIGURE 4.4-2
SEDIMENT DELIVERY RATIO VS. DRAINAGE AREA

BY: JJB
DATE: 8/25/97
CHKD: CAM
DATE: 8/26/97

CLIENT	JOB NUMBER		
NSWE	7602 - 0106		
SUBJECT: Estimation of Sediment Basin Storage Capacity			
BASED ON: Standard for Sediment Basin - ND Regs	DRAWING NUMBER		
BY: JJB 8/22/97	CHECKED BY: CAR 8/26/97	APPROVED BY	DATE

(C) Determine the total sediment Load for each drainage Area.

DA #1: $DA_{1(wood)}\ A_{wood} = (3.93\ ac)(0.2\ ton/ac/yr) = 0.786\ ton/yr$

$DA_{1(const)}\ A_{const} = (2.62\ ac)(50\ ton/ac/yr) = 131\ ton/yr$

$DA_{1(grass)}\ A_{grass} = (0.68\ ac)(1.0\ ton/ac/yr) = 0.68\ ton/yr$

DA #2: $DA_{2(wood)}\ A_{wood} = (2.04\ ac)(0.2\ ton/ac/yr) = 0.408\ ton/yr$

$DA_{2(const)}\ A_{const} = (0.87\ ac)(50\ ton/ac/yr) = 43.5\ ton/yr$

$DA_{2(grass)}\ A_{grass} = (0.32\ ac)(1.0\ ton/ac/yr) = 0.32\ ton/yr$

Total DA 1 = 132.5 ton/yr

Total DA 2 = 44.2 ton/yr

(D) Determine the Delivery Ratio (DA) using Figure 4.4-2, p. 4.4.10 (see page 4 of 11)

DA #1 = 37 %

DA #2 = 37 %

Assumptions:

- The trap efficiency for both Areas is 70 %
- Sediments will be mainly sand and will be typically dry.
- Aerated density (γ_a) = 90 lbs/ft^3

CLIENT	JOB NUMBER
NSWE	7602/0106

SUBJECT	
Estimation of Sediment Basin Capacity	

BASED ON	DRAWING NUMBER
Standard for Sediment Basin - NJ Regs	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/22/97	CAL 8/26/97		

II Estimate required sediment capacity by method #2

$$V = (DA)(A)(DR)(TE)(1/\gamma_s)(2000)(1/43560)$$

V = Vol. of Sediment
DA = Total drainage area
A = Average Annual Erosion
DR = Delivery Ratio
TE = Trap Efficiency
γ_s = Submerged Sediment Density
γ_a = Aerated Density

A Determine A (Avg. Anual Erosion). Assume 3 cover types: 1) wooded areas, 2) grass areas, and 3) construction areas. From Table on p. 4.4.3

A_{grass} = 1.0 ton/ac/yr
A_{wood} = 0.2 ton/ac/yr
A_{const} = 50 ton/ac/yr

B Determine Total drainage Area (DA) during construction activities. From previous measurements

DA_1 = 7.23 ac = 0.0113 sq. miles
$DA_{1(wood)}$ = 3.93 ac
$DA_{1(const)}$ (1) = 2.62 ac
$DA_{1(grass)}$ = 0.68 ac

DA_2 = 3.23 ac = 0.005 sq miles
$DA_{2(wood)}$ = 2.04 ac
$DA_{2(const)}$ (1) = 0.87 ac
$DA_{2(grass)}$ = 0.32 ac

Note: 1) The DA_1 during construction consists of bare soil, disturbed areas, and dirt road.

CLIENT	JOB NUMBER
NWSE	7602 - 0106

SUBJECT: Estimation of Sediment Basin Storage Capacity

BASED ON	DRAWING NUMBER
Standard for Sediment Basin - NJ Ress	

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/25/97	CAR 8/26/97		

Sediment Storage Capacity

Use approach and equations specified in "Standard for Sediment Basin," Section 4.4, Revised April 1987, to determine Site 4 Sediment Basin Size.

Assumptions

- Construction activities will occur over a six month period.
- Sedimen Basin #1 will serve as the E&SC device for DA #1. Sediment Basin #2 will serve as the E&SC device for DA #2.
- DA #3 does not contribute to the sediment loading of Sediment Basins 1 & 2. Silt Fence will be used to control sediment loading from DA #3.

3 of 3

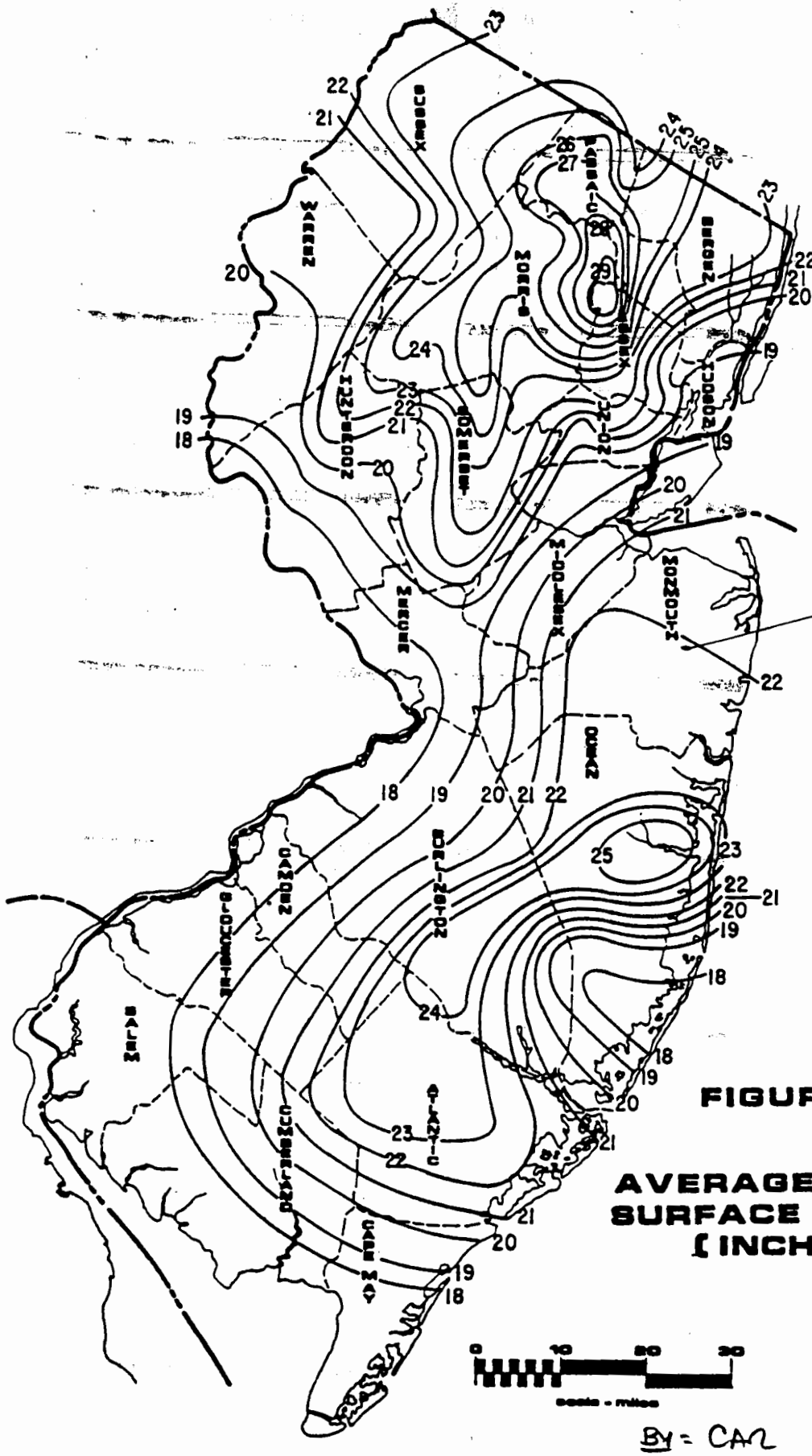
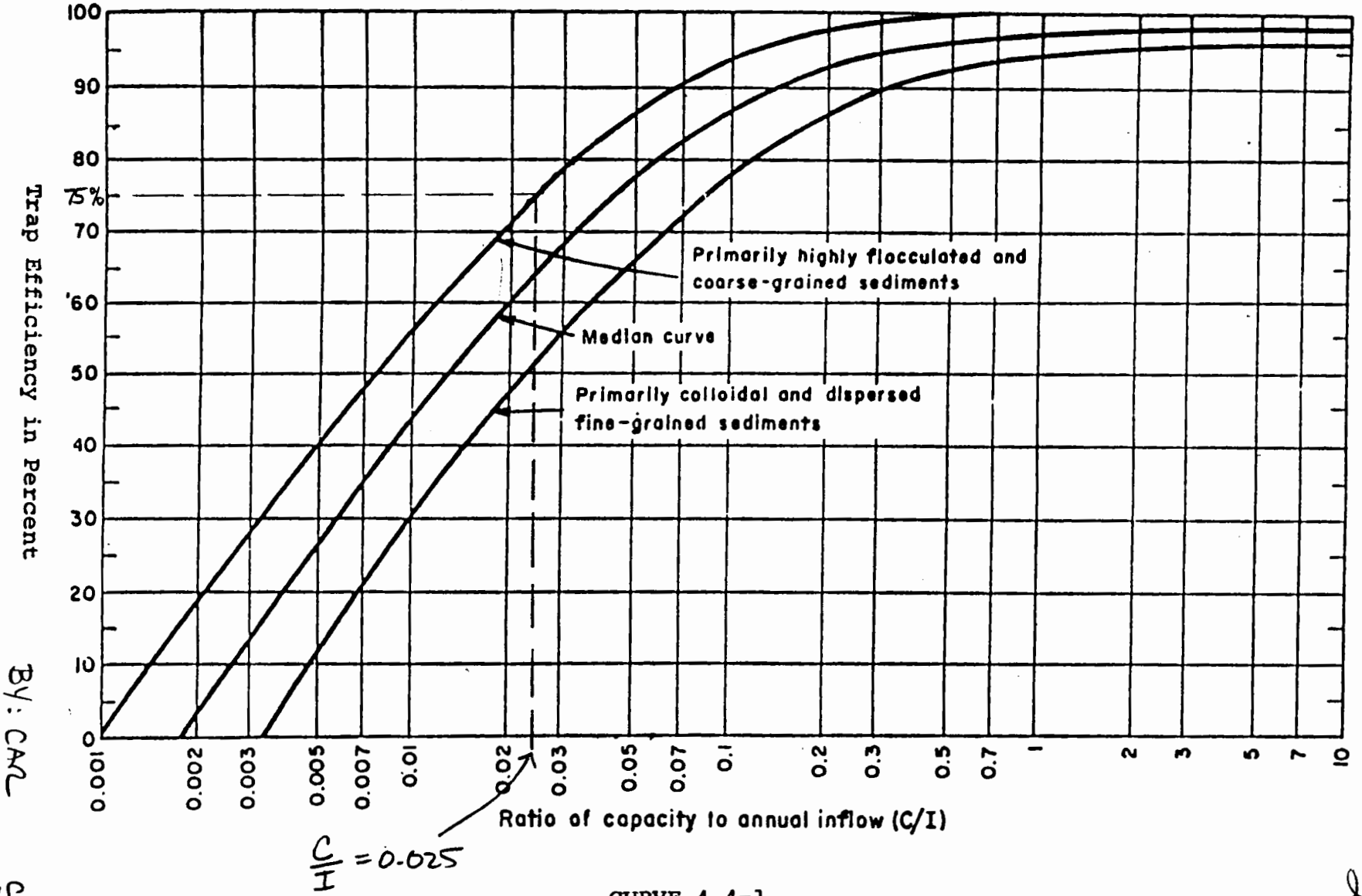


FIGURE 4.4-1

AVERAGE ANNUAL SURFACE RUNOFF (INCHES)

BY = CAR CHKD: JJB
DATE = 8/22/97 DATE: 8/25/97



BY: CAR
DATE: 8/22/97

CHKD: JJB
DATE: 8/25/97

CURVE 4.4-1

TRAP EFFICIENCY OF RESERVOIRS

Reference: Brune, Gunnar M., "Trap Efficiency of Reservoirs", Trans. AGU, Vol. 34, No.3, pp 407-418, June 1953.

2 of 3

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NSWE	JOB NUMBER: 7602-0106
SUBJECT: Capacity of Sediment Basins - Site 4	
BASED ON: Trap Efficiency - NJ Regs	DRAWING NUMBER:
BY: III 8/24/97 / CHECKED BY: CAR 8/26/97	APPROVED BY: / DATE:

Estimate the sizes of sediment basins that have an adequate volume below the crest of the emergency spillway to have an actual trap efficiency of at least 70 % at the start of its useful life. Use curve 4.4-1 where:

C = Total capacity of the sediment basin up to the crest elevation of the emergency spillway (ac. ft)

I = Average annual surface runoff from Figure 4.4-1 converted to ac. ft.

- Assume that the incoming sediment is sand; therefore, use a trap efficiency of 75 % for curve 4.4-1

From curve 4.4-1 (see p. 2): $\frac{C}{I} = 0.025$

From Figure 4.4-1 (see page 3): R = 22.1 in.

$$I_{DA\#1} = \frac{(22.1\text{ in})(7.23\text{ ac})}{(12\text{ in/ft})} = 13.315\text{ ac. ft}$$

$$I_{DA\#2} = \frac{(22.1\text{ in})(3.23\text{ ac})}{(12\text{ in/ft})} = 5.949\text{ ac. ft}$$

Calculate C

$$C_{DA\#1} = (0.025)(13.315) = 0.33\text{ ac. ft}$$

$$C_{DA\#2} = (0.025)(5.949) = 0.15\text{ ac. ft}$$

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NSWE	JOB NUMBER: 7602-0106
SUBJECT: CAPACITY OF SEDIMENT BASINS - Summary of CALCULATIONS	
BASED ON: Sediment Basin Standards - NJ Regs	DRAWING NUMBER:

BY	CHECKED BY	APPROVED BY	DATE
JJB 8/25/97	CAR 8/26/97		

Based on the standards for Sediment Basin Design, the volume in the sediment basins (Sediment Basins #1 & 2) below the crest elevation of the emergency spillway shall be the larger of:

(1) The volume necessary to obtain 70% trap efficiency at the start of it's useful life, or

(2) The volume necessary to provide for sediment storage capacity and for temporary stormwater runoff storage for a 2-yr, 24 hour type III storm.

Calculations were completed for (1) and (2). The capacities estimated by 1 & 2 are summarized below.

Drainage Area	(1) Trap Efficiency	(2) Sediment + Runoff Storage	Required Storage
1	0.33 ac·ft	0.14 ac·ft	0.33 ac·ft
2	0.15 ac·ft	0.09 ac·ft	0.15 ac·ft

∴ Use the required storage capacities to complete the design calculations for the site 4 sediment basins (#1 & 2).

CALCULATION WORKSHEET

Order No. 19116 (01-91)

PAGE _____ OF _____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

SITE 4

CALCULATION FOR CAPACITY
AND SIZE OF SEDIMENT BASINS
BASED ON NJ REGULATIONS

C.2 OVERVIEW AND SUMMARY OF FINAL CALCULATIONS FOR DETERMINING CAPACITY AND SIZE OF SEDIMENT BASINS

CALCULATION WORKSHEET

Order No. 19116 (01-91)

PAGE _____ OF _____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

Site 4

SEDIMENT BASIN DESIGN
BASED ON NJ REGULATIONS

CALCULATION WORKSHEET Order No. 19116 (01-91)

Summary

PAGE ___ OF ___

CLIENT: NSWE

JOB NUMBER: 7602-0106

SUBJECT: Site 4 - Sed Basin Design

DRAWING NUMBER:

BASED ON: NJ Texts

APPROVED BY:

BY: CSF

CHECKED BY: BEK

DATE: 11/4/97

DATE: 11/6/97

Summary of Sediment Basin Design for Site 4

Sed Basin	Top Elevation	Bottom Elevation	Available Volume
1	162 ft	155.5 ft	0.50 ac-ft
2	160 ft	153.75 ft	0.23 ac-ft

Sed Basin	Trapezoidal Weir Crest Elev	Trap Weir Crest Width	Riser Pipe Crest Elev	Riser Pipe Diameter	4-in Orifice Elevation
1	161 ft	15 ft	160 ft	18 in	159 ft
2	159 ft	10 ft	158 ft	12 in	157 ft

Sed Basin	Peak Inflow 10-yr Storm	Peak Outflow 10-yr Storm	Peak Storage 10-yr Storm	Peak Elevation 10-yr Storm
1	14 cfs	8.62 cfs	0.43 ac-ft	161.50 ft
2	5 cfs	3.29 cfs	0.17 ac-ft	159.09 ft

* Bottom width of sed basin 2 (6.5 ft) does not conform with the NJ Regulation minimum width requirement of 10 ft.

CLIENT	JOB NUMBER		
NSWE	7602 - 0106		
SUBJECT: Site 4 - Sed Basin Design			
BASED ON: NJ Regs	DRAWING NUMBER		
BY: CSF	CHECKED BY: BER 11/6/97	APPROVED BY	DATE: 11/4/97

REGULATIONS GOVERNING SED BASIN DESIGN

Sediment basins sized for Site 4 must satisfy the following requirements as given in the New Jersey regulations (Revised April 1987):

1. Available volume in Sed basin #1 & #2 below the crest elevation of the emergency spillway must achieve 70% trap efficiency at the start of its useful life.

From calculations prepared earlier (pg 1 of 1, 8/25/97) these values are:

Sed Basin	Trap Efficiency	Equiv Volume
1	0.33 ac ft	14750 ft^3
2	0.15 ac ft	6692 ft^3

2. Crest of the principal spillways for sed basins 1 & 2 must be located at the lesser of:

a) 1 ft below the emergency spillway crest

b) an elevation that provides between the crest of the principal spillway & the crest of the emergency spillway the required temporary floodwater storage for a 2-yr, 24-hr Type III storm

CLIENT	JOB NUMBER
NSWE	7602 - 0106

SUBJECT: Site 4 - Sed Basin Design

BASED ON	DRAWING NUMBER
NJ Regs	

BY	CHECKED BY	APPROVED BY	DATE
CSF	BER 11/6/97		11/4/97

From earlier calcs (pg 6 of 11 & pg 7 of 11, 8/25/97) the following data is given:

Drainage Area	Peak Discharge (2-yr, 24-hr)	Rainfall
1	5 cfs	3.4 (in)
2	2 cfs	3.4 (in)

3. From the crest of the principal spillway:

a) the average sed basin depth ≥ 4 ft

b) min sed basin width ≥ $10\sqrt{Q_5}$

Q_5 = peak discharge 5-yr storm

c) minimum sed basin length ≥ 2 x sed basin width

From earlier calcs (pg 3 of 11, pg 4 of 11, 8/25/97) the following data is given:

Drainage Area	Peak Discharge (5yr-24hr)	Rainfall	Min Basin Width (ft)
1	9 cfs	4.4 in	30
2	3 cfs	4.4 in	17

CLIENT	JOB NUMBER
NSWC	7602-0106

SUBJECT: Site 4 - Sed Basin Design

BASED ON	DRAWING NUMBER
NJ Regs	

BY	CHECKED BY	APPROVED BY	DATE
CJF	BER 11/6/97		11/4/97

4. Minimum capacity of the emergency spillway for each sed basin will be capable of accommodating peak flow generated for a 10-yr, 24-hr storm**

From earlier calcs (pg 7 of 11, pg 8 of 11, 8/27/97) the following data was found:

Drainage Area	Peak Discharge (10-yr, 24-hr)	Rainfall
1	13 cfs	5.2 in
2	5 cfs	5.2 in

** Less any reduction creditable to conduit discharge + detention storage

5. Maximum flow velocity from the emergency spillway must be ≤ 4 ft/sec

6. Maxim sed basin sideslope is 2:1 with a minimum 10 ft bottom width

7. Minimum diameter for a stick up pipe used for the primary sed basin outlet:

8 in - CMP
6 in - smooth material

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NSWE	JOB NUMBER: 7602-0106
SUBJECT: Site 4 - Sed Basin Design	
BASED ON: NJ Regs	DRAWING NUMBER:
BY: CSF / CHECKED BY: BER 11/6/97	APPROVED BY: / DATE: 11/4/97

8. A maximum 4-in diameter hole must be located in the stick-up to promote sed basin drainage.

The vertical location of the drainage hole on the stick-up will allow for 50% drain efficiency with regards to sediment capture

CLIENT	JOB NUMBER
NSWC	7602-0106
SUBJECT: Site 4 - Sed Basin Design	
BASED ON: NJ Regs	DRAWING NUMBER

BY	CHECKED BY	APPROVED BY	DATE
CJF	BER 11/6/97		11/4/97

SEDIMENT BASIN SIZING BASED ON PRECEEDING REGULATIONS

- Use Haestad Methods TR-55 and POND-2 modeling packages to evaluate runoff flow through the sediment ponds proposed for Site 4 and to size outlet structures.

- Using TR-55, the hydrographs for the 2-yr and 10-yr storms are calculated (see pp 6 → 30)

TR-55 Hydrograph Computation Summary

Sed Basin	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
1 - 2yr Storm	5	12.3
1 - 10yr storm	14	12.3
2 - 2yr storm	2	12.4
2 - 10yr storm	5	12.4

C.3 BASIN INFLOW HYDROGRAPHS

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

Executed: 10-31-1997 09:17:51
Watershed file: --> DA1-2YR .WSD
Hydrograph file: --> DA1-2YR .HYD

Hydrograph for 2yr, 24hr storm through Drainage Area 1
of Site 4.

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
Drainage Area 1	7.23	70.0	0.20	0.00	3.40	0.95	.25	.30

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 7.23 acres or 0.01130 sq.mi
Peak discharge = 5 cfs

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

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Drainage Area 1	0.23	0.00	0.20	0.00	No	--

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

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

Executed: 10-31-1997 09:17:51
Watershed file: --> DA1-2YR .WSD
Hydrograph file: --> DA1-2YR .HYD

Hydrograph for 2yr, 24hr storm through Drainage Area 1
of Site 4.

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Drainage Area 1	5	12.3
Composite Watershed	5	12.3

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

Executed: 10-31-1997 09:17:51
Watershed file: --> DA1-2YR .WSD
Hydrograph file: --> DA1-2YR .HYD

Hydrograph for 2yr, 24hr storm through Drainage Area 1
of Site 4.

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Drainage Area 1	0	0	0	0	1	1	3	5	5
Total (cfs)	0	0	0	0	1	1	3	5	5

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Drainage Area 1	4	3	2	2	1	1	1	1	1
Total (cfs)	4	3	2	2	1	1	1	1	1

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Drainage Area 1	1	1	1	1	1	0	0	0	0
Total (cfs)	1	1	1	1	1	0	0	0	0

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Drainage Area 1	0	0	0	0	0
Total (cfs)	0	0	0	0	0

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

Executed: 10-31-1997 09:17:51
Watershed file: --> DA1-2YR .WSD
Hydrograph file: --> DA1-2YR .HYD

Hydrograph for 2yr, 24hr storm through Drainage Area 1
of Site 4.

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	1
11.1	0	14.9	1
11.2	0	15.0	1
11.3	0	15.1	1
11.4	0	15.2	1
11.5	0	15.3	1
11.6	0	15.4	1
11.7	0	15.5	1
11.8	0	15.6	1
11.9	0	15.7	1
12.0	1	15.8	0
12.1	1	15.9	0
12.2	3	16.0	0
12.3	5	16.1	0
12.4	5	16.2	0
12.5	4	16.3	0
12.6	3	16.4	0
12.7	2	16.5	0
12.8	2	16.6	0
12.9	2	16.7	0
13.0	1	16.8	0
13.1	1	16.9	0
13.2	1	17.0	0
13.3	1	17.1	0
13.4	1	17.2	0
13.5	1	17.3	0
13.6	1	17.4	0
13.7	1	17.5	0
13.8	1	17.6	0
13.9	1	17.7	0
14.0	1	17.8	0
14.1	1	17.9	0
14.2	1	18.0	0
14.3	1	18.1	0
14.4	1	18.2	0
14.5	1	18.3	0
14.6	1	18.4	0

14.7	1	18.5	0	10

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

Executed: 10-31-1997 09:17:51
Watershed file: --> DA1-2YR .WSD
Hydrograph file: --> DA1-2YR .HYD

Hydrograph for 2yr, 24hr storm through Drainage Area 1
of Site 4.

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	0	22.4	0
18.7	0	22.5	0
18.8	0	22.6	0
18.9	0	22.7	0
19.0	0	22.8	0
19.1	0	22.9	0
19.2	0	23.0	0
19.3	0	23.1	0
19.4	0	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0
22.1	0	25.9	0
22.2	0		
22.3	0		

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

Executed: 10-31-1997 09:11:56
Watershed file: --> DA110YR .WSD
Hydrograph file: --> DA110YR .HYD

Hydrograph for 10-yr, 24-hr event within Drainage Area 1
of Site 4.

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
Drainage Area 1	7.23	70.0	0.20	0.00	5.20	2.19	.16	.10

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 7.23 acres or 0.01130 sq.mi
Peak discharge = 14 cfs

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

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Drainage Area 1	0.23	0.00	0.20	0.00	No	--

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

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

Executed: 10-31-1997 09:11:56
Watershed file: --> DA110YR .WSD
Hydrograph file: --> DA110YR .HYD

Hydrograph for 10-yr, 24-hr event within Drainage Area 1
of Site 4.

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Drainage Area 1	14	12.3
Composite Watershed	14	12.3

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

Executed: 10-31-1997 09:11:56
Watershed file: --> DA110YR .WSD
Hydrograph file: --> DA110YR .HYD

Hydrograph for 10-yr, 24-hr event within Drainage Area 1
of Site 4.

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Drainage Area 1	1	1	1	3	4	6	11	14	12
Total (cfs)	1	1	1	3	4	6	11	14	12

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Drainage Area 1	9	7	5	3	2	2	2	1	1
Total (cfs)	9	7	5	3	2	2	2	1	1

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Drainage Area 1	1	1	1	1	1	1	1	1	0
Total (cfs)	1	1	1	1	1	1	1	1	0

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Drainage Area 1	0	0	0	0	0
T 1 (cfs)	0	0	0	0	0

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

Executed: 10-31-1997 09:11:56
Watershed file: --> DA110YR .WSD
Hydrograph file: --> DA110YR .HYD

Hydrograph for 10-yr, 24-hr event within Drainage Area 1
of Site 4.

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	1	14.8	1
11.1	1	14.9	1
11.2	1	15.0	1
11.3	1	15.1	1
11.4	1	15.2	1
11.5	1	15.3	1
11.6	1	15.4	1
11.7	2	15.5	1
11.8	2	15.6	1
11.9	3	15.7	1
12.0	4	15.8	1
12.1	6	15.9	1
12.2	11	16.0	1
12.3	14	16.1	1
12.4	12	16.2	1
12.5	9	16.3	1
12.6	7	16.4	1
12.7	5	16.5	1
12.8	3	16.6	1
12.9	2	16.7	1
13.0	2	16.8	1
13.1	2	16.9	1
13.2	2	17.0	1
13.3	2	17.1	1
13.4	2	17.2	1
13.5	2	17.3	0
13.6	1	17.4	0
13.7	1	17.5	0
13.8	1	17.6	0
13.9	1	17.7	0
14.0	1	17.8	0
14.1	1	17.9	0
14.2	1	18.0	0
14.3	1	18.1	0
14.4	1	18.2	0
14.5	1	18.3	0
14.6	1	18.4	0

14.7	1	18.5	0

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

Executed: 10-31-1997 09:11:56
Watershed file: --> DA110YR .WSD
Hydrograph file: --> DA110YR .HYD

Hydrograph for 10-yr, 24-hr event within Drainage Area 1
of Site 4.

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	0	22.4	0
18.7	0	22.5	0
18.8	0	22.6	0
18.9	0	22.7	0
19.0	0	22.8	0
19.1	0	22.9	0
19.2	0	23.0	0
19.3	0	23.1	0
19.4	0	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0
22.1	0	25.9	0
22.2	0		
22.3	0		

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

Executed: 10-31-1997 09:20:12
Watershed file: --> DA2-2YR .WSD
Hydrograph file: --> DA2-2YR .HYD

Hydrograph for 2-yr, 24 hr storm in Drainage Area 2
for Site 4.

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
Drainage Area 2	3.23	68.0	0.30	0.00	3.40	0.84	.28 .30

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 3.23 acres or 0.00505 sq.mi
Peak discharge = 2 cfs

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

Subarea Description	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Drainage Area 2	0.31	0.00	0.30	0.00	No	--

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

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

Executed: 10-31-1997 09:20:12
Watershed file: --> DA2-2YR .WSD
Hydrograph file: --> DA2-2YR .HYD

Hydrograph for 2-yr, 24 hr storm in Drainage Area 2
for Site 4.

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Drainage Area 2	2	12.4
Composite Watershed	2	12.4

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

Executed: 10-31-1997 09:20:12
Watershed file: --> DA2-2YR .WSD
Hydrograph file: --> DA2-2YR .HYD

Hydrograph for 2-yr, 24 hr storm in Drainage Area 2
for Site 4.

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Drainage Area 2	0	0	0	0	0	0	1	1	2
Total (cfs)	0	0	0	0	0	0	1	1	2

ubarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Drainage Area 2	2	2	1	1	1	0	0	0	0
Total (cfs)	2	2	1	1	1	0	0	0	0

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Drainage Area 2	0	0	0	0	0	0	0	0	0
Total (cfs)	0	0	0	0	0	0	0	0	0

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Drainage Area 2	0	0	0	0	0
T l (cfs)	0	0	0	0	0

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

Executed: 10-31-1997 09:20:12
Watershed file: --> DA2-2YR .WSD
Hydrograph file: --> DA2-2YR .HYD

Hydrograph for 2-yr, 24 hr storm in Drainage Area 2
for Site 4.

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	0
11.1	0	14.9	0
11.2	0	15.0	0
11.3	0	15.1	0
11.4	0	15.2	0
11.5	0	15.3	0
11.6	0	15.4	0
11.7	0	15.5	0
11.8	0	15.6	0
11.9	0	15.7	0
12.0	0	15.8	0
12.1	0	15.9	0
12.2	1	16.0	0
12.3	1	16.1	0
12.4	2	16.2	0
12.5	2	16.3	0
12.6	2	16.4	0
12.7	1	16.5	0
12.8	1	16.6	0
12.9	1	16.7	0
13.0	1	16.8	0
13.1	0	16.9	0
13.2	0	17.0	0
13.3	0	17.1	0
13.4	0	17.2	0
13.5	0	17.3	0
13.6	0	17.4	0
13.7	0	17.5	0
13.8	0	17.6	0
13.9	0	17.7	0
14.0	0	17.8	0
14.1	0	17.9	0
14.2	0	18.0	0
14.3	0	18.1	0
14.4	0	18.2	0
14.5	0	18.3	0
14.6	0	18.4	0

14.7	0	18.5	0

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

Executed: 10-31-1997 09:20:12
Watershed file: --> DA2-2YR .WSD
Hydrograph file: --> DA2-2YR .HYD

Hydrograph for 2-yr, 24 hr storm in Drainage Area 2
for Site 4.

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	0	22.4	0
18.7	0	22.5	0
18.8	0	22.6	0
18.9	0	22.7	0
19.0	0	22.8	0
19.1	0	22.9	0
19.2	0	23.0	0
19.3	0	23.1	0
19.4	0	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0
22.1	0	25.9	0
22.2	0		
22.3	0		

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

Executed: 10-31-1997 09:13:58
Watershed file: --> DA210YR .WSD
Hydrograph file: --> DA210YR .HYD

Hydrograph for 10-yr,24-hr storm event for Drainage Area 2
of Site 4.

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
Drainage Area 2	3.23	68.0	0.30	0.00	5.20	2.02	.18	.10

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 3.23 acres or 0.00505 sq.mi
Peak discharge = 5 cfs

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

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Drainage Area 2	0.31	0.00	0.30	0.00	No	--

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

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

Executed: 10-31-1997 09:13:58
Watershed file: --> DA210YR .WSD
Hydrograph file: --> DA210YR .HYD

Hydrograph for 10-yr,24-hr storm event for Drainage Area 2 of Site 4.

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Drainage Area 2	5	12.4
Composite Watershed	5	12.4

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

Executed: 10-31-1997 09:13:58
Watershed file: --> DA210YR .WSD
Hydrograph file: --> DA210YR .HYD

Hydrograph for 10-yr,24-hr storm event for Drainage Area 2 of Site 4.

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Drainage Area 2	0	0	0	1	1	2	3	4	5
Total (cfs)	0	0	0	1	1	2	3	4	5

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Drainage Area 2	5	4	3	2	1	1	1	1	1
Total (cfs)	5	4	3	2	1	1	1	1	1

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Drainage Area 2	1	0	0	0	0	0	0	0	0
Total (cfs)	1	0	0	0	0	0	0	0	0

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Drainage Area 2	0	0	0	0	0
Total (cfs)	0	0	0	0	0

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

Executed: 10-31-1997 09:13:58
Watershed file: --> DA210YR .WSD
Hydrograph file: --> DA210YR .HYD

Hydrograph for 10-yr,24-hr storm event for Drainage Area 2 of Site 4.

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	0
11.1	0	14.9	0
11.2	0	15.0	0
11.3	0	15.1	0
11.4	0	15.2	0
11.5	0	15.3	0
11.6	0	15.4	0
11.7	0	15.5	0
11.8	1	15.6	0
11.9	1	15.7	0
12.0	1	15.8	0
12.1	2	15.9	0
12.2	3	16.0	0
12.3	4	16.1	0
12.4	5	16.2	0
12.5	5	16.3	0
12.6	4	16.4	0
12.7	3	16.5	0
12.8	2	16.6	0
12.9	2	16.7	0
13.0	1	16.8	0
13.1	1	16.9	0
13.2	1	17.0	0
13.3	1	17.1	0
13.4	1	17.2	0
13.5	1	17.3	0
13.6	1	17.4	0
13.7	1	17.5	0
13.8	1	17.6	0
13.9	1	17.7	0
14.0	1	17.8	0
14.1	1	17.9	0
14.2	0	18.0	0
14.3	0	18.1	0
14.4	0	18.2	0
14.5	0	18.3	0
14.6	0	18.4	0

14.7	0	18.5	0

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

Executed: 10-31-1997 09:13:58
Watershed file: --> DA210YR .WSD
Hydrograph file: --> DA210YR .HYD

Hydrograph for 10-yr,24-hr storm event for Drainage Area 2 of Site 4.

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	0	22.4	0
18.7	0	22.5	0
18.8	0	22.6	0
18.9	0	22.7	0
19.0	0	22.8	0
19.1	0	22.9	0
19.2	0	23.0	0
19.3	0	23.1	0
19.4	0	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0
22.1	0	25.9	0
22.2	0		
22.3	0		

C.4 ELEVATION-STORAGE MATRIX

CLIENT	JOB NUMBER
NSWC	7602 - 0106
SUBJECT: Site 4 Sed Basin Design	
BASED ON: NJ Regs	DRAWING NUMBER

BY	CHECKED BY	APPROVED BY	DATE
CSF	BER 11/6/97		11/4/97

SEDIMENT BASIN SIZING

- Assume the following preliminary sed basin dimensions:

Sed Basin	Elev Basin Top (ft)	Elev Basin Bottom (ft)	Basin Volume
1	162	155.50	0.50 ac-ft 21780 ft^3
2	160	153.75	0.23 ac-ft 10020 ft^3

- Berm width along the top of each sed basin will be 10 ft

- Use POND-2 to calculate incremental sed basin volumes at 1 ft vertical intervals within each basin
  See POND-2 volume calculations (p 32 & 33)

POND-2 Version: 5.17
S/N:

32

Computes available storage volume in Detention Pond 1 for Site 4.

CALCULATED 10-31-1997 11:10:45
DISK FILE: DA1 .VOL

Planimeter scale: 1 inch = 0.083333 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	* Volume (acre-ft)	Volume Sum (acre-ft)
155.50	0.00	0.00	0.00	0.00	0.00
156.00	183,648.00	0.03	0.03	0.00	0.00
157.00	279,702.00	0.04	0.11	0.04	0.04
158.00	385,858.00	0.06	0.16	0.05	0.09
159.00	502,115.00	0.08	0.21	0.07	0.16
160.00	628,476.00	0.10	0.27	0.09	0.25
161.00	764,936.00	0.12	0.33	0.11	0.37
162.00	911,501.00	0.15	0.40	0.13	0.50

AVG 0.31

$$IA = (sq.rt(Area1) + ((Ei-E1)/(E2-E1))*(sq.rt(Area2)-sq.rt(Area1)))^2$$

where: E1, E2 = Closest two elevations with planimeter data
Ei = Elevation at which to interpolate area
Area1,Area2 = Areas computed for E1, E2, respectively
IA = Interpolated area for Ei

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

POND-2 Version: 5.17
S/N:

Computes available storage volume in Detention Pond 2 of Site 4.

CALCULATED 11-02-1997 17:06:43
DISK FILE: DA2 .VOL

Planimeter scale: 1 inch = 0.083333 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	* Volume (acre-ft)	Volume Sum (acre-ft)
153.75	0.00	0.00	0.00	0.00	0.00
154.00	36,331.00	0.01	0.01	0.00	0.00
155.00	96,566.00	0.02	0.03	0.01	0.01
156.00	156,571.00	0.02	0.06	0.02	0.03
157.00	227,088.00	0.04	0.09	0.03	0.06
158.00	307,296.00	0.05	0.13	0.04	0.10
159.00	399,600.00	0.06	0.17	0.06	0.16
160.00	501,552.00	0.08	0.22	0.07	0.23

AVG 0.13

$$IA = (sq.rt(Area1) + ((Ei-E1)/(E2-E1))*(sq.rt(Area2)-sq.rt(Area1)))^2$$

where: E1, E2 = Closest two elevations with planimeter data
Ei = Elevation at which to interpolate area
Area1,Area2 = Areas computed for E1, E2, respectively
IA = Interpolated area for Ei

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

C.5 OUTLET STRUCTURE DESIGN

CLIENT	JOB NUMBER
NSWE	7602-0106
SUBJECT: Site 4 - Sed Basin Design	
BASED ON: NJ Regs	DRAWING NUMBER

BY	CHECKED BY	APPROVED BY	DATE
CSF	BER 11/6/97		11/4/97

OUTLET STRUCTURE SIZING

Assume the location of the crest of the principal spillways for sed basin 1 & 2 are located 1ft below the crest of emergency spillways.

Assume:

Sed Basin	Principal Spillway Type*	Size (in)*	Elev (ft)
1	smooth riser	18 dia	160
2	smooth riser	12 dia	158

Sed Basin	Emergency Spillway Type	Size (ft)	Elev (ft)
1	Trapez. (3:1 sideslope)	15 bottom	161
2	Trapez (3:1 sideslope)	10 bottom	159

- According to requirement #8 (p 4) a 4-in drainage hole must be installed in each primary spillway riser pipe

Sed Basin	Drainage Hole Size	Elev (ft)
1	4 in dia	159
2	4 in dia	157

* Use same size & type of pipe to convey stormwater to wetlands outlet

CLIENT	JOB NUMBER
NSWE	7602 - 0106
SUBJECT: Site 4 - Sed Basin Design	
BASED ON: NJ Regs	DRAWING NUMBER
BY: CSF / CHECKED BY: BER 11/6/97	APPROVED BY / DATE: 11/4/97

CHECK EACH SED. BASIN DESIGN (p5 → 34)
FOR COMPLIANCE WITH LISTED REGULATIONS (p1 → 4)

1. Each sed basin must achieve 70% trap efficiency to crest of emergency spillway (regulation #1 p 1)

From p1 of earlier calculations (p 1 of 1 8/24/97)

Sed Basin	70% Trap Efficiency Equivalent Volume (ft³)
1	14750
2	6692

From Pond-2 Storage Volume Calc (see p 32 & 33)

Sed Basin	Elev to Emergency Spillway Crest (ft)	Available Volume to E.S. Crest (ft³)	
1	161	16117	OK
2	159	6970	OK

CLIENT	JOB NUMBER
NSWC	7602-00106
SUBJECT: S:6 4 - Sed Basin Design	
BASED ON: NJ Regs	DRAWING NUMBER

BY	CHECKED BY	APPROVED BY	DATE
CSF	BER 11/6/97		11/4/97

2. Each sed basin must achieve 50% trap efficiency to crest of 4-in orifice (regulations #8 p)

- Calculate the elevation of the 4-in diameter drainage hole to provide sufficient sed basin volume to achieve 50% trap efficiency

- Following guidance of earlier calcs (p 1 of 3, 8/24/97) use equation:

$$\text{Trap efficiency} = C/I$$

From earlier calcs (p 1 of 3, 8/24/97)

$$I_{DA_1} = 13.315 \text{ ac-ft}$$

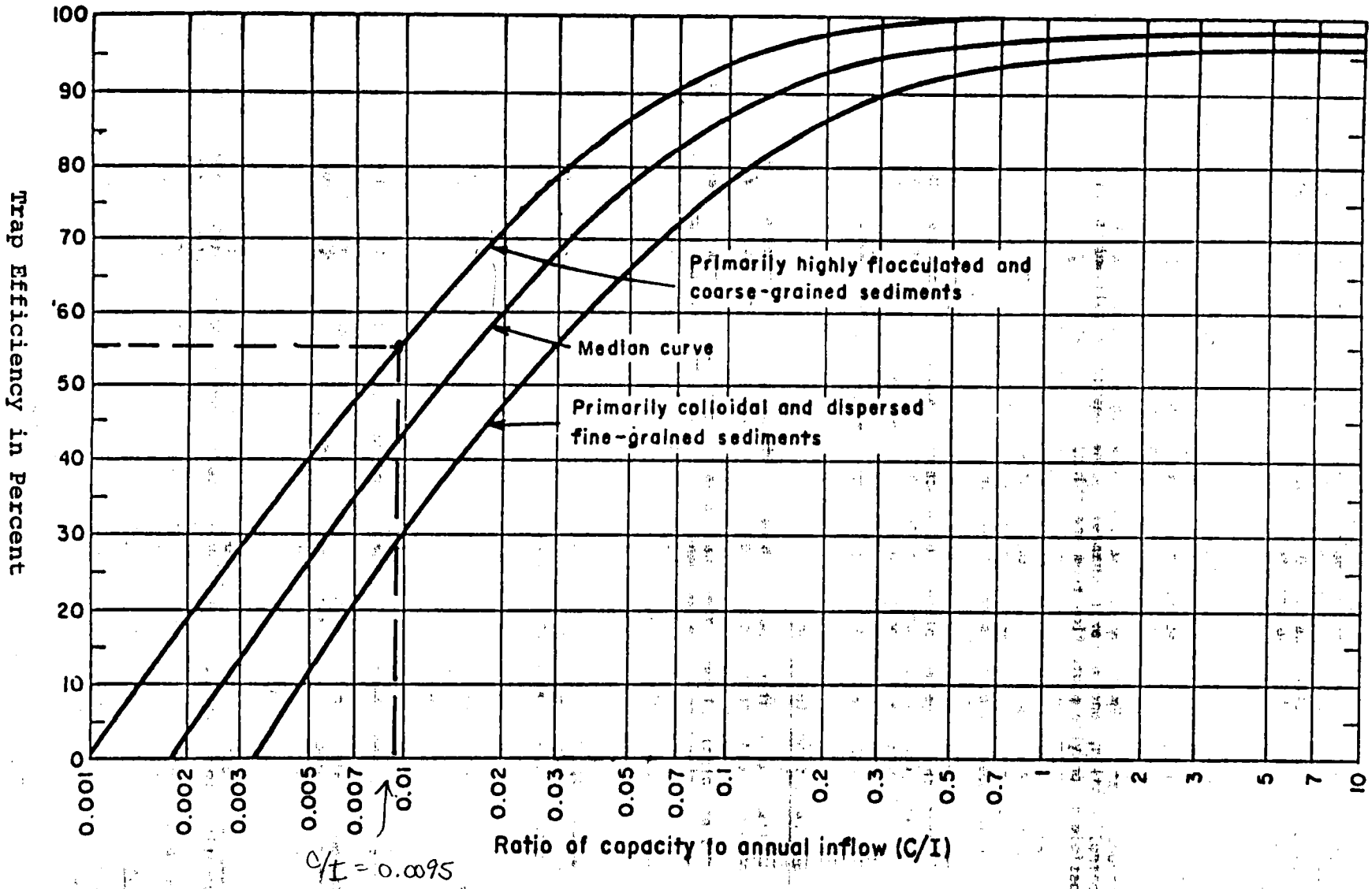
$$I_{DA_2} = 5.949 \text{ ac-ft}$$

From curve 4.4-1 (see p 37)

$$\text{Trap efficiency}_{55\%} = C/I = 0.0095 \checkmark$$

$$\Rightarrow C_{DA_1} = (0.0095)(13.315 \text{ ac-ft}) = 0.126 \text{ ac-ft} = 5510 \text{ ft}^3 \checkmark$$

$$\Rightarrow C_{DA_2} = (0.0095)(5.949 \text{ ac-ft}) = 0.0565 \text{ ac-ft} = 2462 \text{ ft}^3 \checkmark$$



37

CURVE 4.4-1

TRAP EFFICIENCY OF RESERVOIRS

Reference: Brune, Gunnar M., "Trap Efficiency of Reservoirs", Trans. AGU, Vol. 34, No.3, pp 407-418, June 1953.

CLIENT	JOB NUMBER
NSWC	7602 - 0106
SUBJECT: S. & 4 - Sed Basin Design	
BASED ON: NJ Regs	DRAWING NUMBER
BY: CSF / CHECKED BY: BER 11/6/97	APPROVED BY / DATE: 11/4/97

- Examine POND-2 volume calcs to find corresponding sed basin elevation that will provide the required 50% trap efficiency volume:

Sed Basin	Required Volume 50% Trap Efficiency	Sed Basin Volume	Corresponding Sed Basin Elev	
1	0.126 Ac-ft (p 36)	0.16 Ac-ft (p 32)	159 ft	OK
2	0.0565 Ac-ft (p 36)	0.06 Ac-ft (p 33)	157 ft	OK

3. The minimum capacity of the emergency spillway must be capable of handling 10-yr, 24 hr storm (including discharge from primary spillways) (reg #4 p 3) ✓

- Use POND-2 to produce composite outflow summaries for the outflow structures proposed for each sed basin (p 41 → 54)

- Use POND-2 to route 10-yr, 24-hr storm hydrographs (p 12 → 17, 25 → 30) through proposed sediment ponds & outlet structures (p 55 → 70)

Outlet Structure File: DA2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
Multi drainage outlet design calculations for Settlement Pond 2
for Site 4.

****

***** COMPOSITE OUTFLOW SUMMARY ****

Elevation (ft)	Q (cfs)	Contributing Structures
153.75	0.0	
154.75	0.0	
155.75	0.0	
156.75	0.0	
157.75	0.4	1
158.00	0.4	2 +1
158.75	1.8	2 +1
159.00	2.5	3 +2 +1
159.75	8.9	3 +2 +1
160.00	0.0	

NOTE: Composite outflow calcs reflect rectangular cross-section for emergency spillway as required by POND-2 model. Trapezoidal spillway will offer greater capacity.

Outlet Structure File: DA2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
Multi drainage outlet design calculations for Settlement Pond 2
for Site 4.

****

Outlet Structure File: DA2 .STR
Planimeter Input File: DA2 .VOL
Rating Table Output File: DA2 .PND

Min. Elev.(ft) = 153.75 Max. Elev.(ft) = 160 Incr.(ft) = 1

Additional elevations (ft) to be included in table:
* *
159 158

****
SYSTEM CONNECTIVITY
****

Structure	No.	Q Table		Q Table
WEIR-VR	3		->	3
STAND PIPE	2		->	2
ORIFICE	1		->	1

Outflow rating table summary was stored in file:
DA2 .PND

Outlet Structure File: DA2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
Multi drainage outlet design calculations for Settlement Pond 2
for Site 4.

****

>>>>>> Structure No. 3 <<<<<<
(Input Data)

WEIR-VR
Weir - Vertical Rectangular

E1 elev.(ft)?	159
E2 elev.(ft)?	160
Weir coefficient?	.6
Weir elev.(ft)?	159
Length (ft)?	10
Contracted/Suppressed (C/S)?	C

Outlet Structure File: DA2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
Multi drainage outlet design calculations for Settlement Pond 2
for Site 4.

****

>>>>>> Structure No. 2 <<<<<<
(Input Data)

STAND PIPE
Stand Pipe with weir or orifice flow

E1 elev.(ft)? 158
E2 elev.(ft)? 160
Crest elev.(ft)? 158
Diameter (ft)? 1.0
Weir coefficient? .6
Orifice coefficient? .73
Start transition elev.(ft) @ ?
Transition height (ft)? 1

Outlet Structure File: DA2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
Multi drainage outlet design calculations for Settlement Pond 2
for Site 4.

****

>>>>>> Structure No. 1 <<<<<<
(Input Data)

ORIFICE
Orifice - Based on Area and Datum Elevation

E1 elev.(ft)?	157.00
E2 elev.(ft)?	160
Orifice coeff.?	.61
Invert elev.(ft)?	157
Datum elev.(ft) ?	157
Orifice area (sq ft)?	0.0873

Outlet Structure File: DA2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
Multi drainage outlet design calculations for Settlement Pond 2
for Site 4.

****

Outflow Rating Table for Structure #3
WEIR-VR Weir - Vertical Rectangular

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
153.75	0.0	E < Inv.El.= 159
154.75	0.0	E < Inv.El.= 159
155.75	0.0	E < Inv.El.= 159
156.75	0.0	E < Inv.El.= 159
157.75	0.0	E < Inv.El.= 159
158.00	0.0	E < Inv.El.= 159
158.75	0.0	E < Inv.El.= 159
159.00	0.0	H =0.0
159.75	3.8	H =.750
160.00	0.0	E = or > E2=160

C = .6 L (ft) = 10
H (ft) = Table elev. - Invert elev. (159 ft)
Q (cfs) = C * (L-.2H) * (H**1.5) -- Contracted Weir

Outlet Structure File: DA2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
Multi drainage outlet design calculations for Settlement Pond 2
for Site 4.

****

Outflow Rating Table for Structure #2
STAND PIPE Stand Pipe with weir or orifice flow

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
153.75	0.0	E < Inv.El.= 158
154.75	0.0	E < E1=158
155.75	0.0	E < E1=158
156.75	0.0	E < E1=158
157.75	0.0	E < E1=158
158.00	0.0	Weir: H =0.0
158.75	1.2	Weir: H =.750
159.00	1.9	Weir: H =1.0
159.75	4.4	Weir: H =1.75
160.00	0.0	E = or > E2=160

Weir Cw = .6 Weir length = 3.141593 ft
Orifice Co = .73 Orifice area = .7853982 sq.ft.
Q (cfs) = (Cw * L * H**1.5) or (Co * A * sqr(2*g*H))
Transition interpolated between elev. 159.9409 and 160.9409 ft
Weir equation = Orifice equation @ elev.= 160.4409 ft

Outlet Structure File: DA2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
Multi drainage outlet design calculations for Settlement Pond 2
for Site 4.

****

Outflow Rating Table for Structure #1
ORIFICE Orifice - Based on Area and Datum Elevation

Elevation (ft)	Q (cfs)	Computation Messages
153.75	0.0	E < E1=157.00
154.75	0.0	E < E1=157.00
155.75	0.0	E < E1=157.00
156.75	0.0	E < E1=157.00
157.75	0.4	H =.750
158.00	0.4	H =1.0
158.75	0.6	H =1.75
159.00	0.6	H =2.0
159.75	0.7	H =2.75
160.00	0.0	E = or > E2=160

C = .61 A = .0873 sq.ft.
H (ft) = Table elev. - Datum elev. (157 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: DA1 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
Multi drainage outlet design calculations for Settlement Pond 1
for Site 4.

****

***** COMPOSITE OUTFLOW SUMMARY ****

Elevation (ft)	Q (cfs)	Contributing Structures
155.50	0.0	
156.50	0.0	
157.50	0.0	
158.50	0.0	
159.50	0.3	1
160.00	0.4	2 +1
160.50	1.5	2 +1
161.00	3.4	3 +2 +1
161.50	9.0	3 +2 +1
162.00	17.6	3 +2 +1

NOTE: Composite outflow calcs reflect rectangular cross-section for emergency spillway as required by POND-2 model. Trapezoidal spillway will offer greater available capacity.

Outlet Structure File: DA1 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
Multi drainage outlet design calculations for Settlement Pond 1
for Site 4.

****

Outlet Structure File: DA1 .STR
Planimeter Input File: DA1 .VOL
Rating Table Output File: DA1 .PND

Min. Elev.(ft) = 155.5 Max. Elev.(ft) = 162 Incr.(ft) = 1

Additional elevations (ft) to be included in table:
* *
161.0 160.0

****
SYSTEM CONNECTIVITY
****

Structure	No.	Q Table		Q Table
WEIR-VR	3		->	3
STAND PIPE	2		->	2
ORIFICE	1		->	1

Outflow rating table summary was stored in file:
DA1 .PND

Outlet Structure File: DA1 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
Multi drainage outlet design calculations for Settlement Pond 1
for Site 4.

****

>>>>>> Structure No. 3 <<<<<<
(Input Data)

WEIR-VR
Weir - Vertical Rectangular

E1 elev.(ft)? 161
E2 elev.(ft)? 162.001
Weir coefficient? .6
Weir elev.(ft)? 161
Length (ft)? 15
Contracted/Suppressed (C/S)? C

Outlet Structure File: DA1 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
Multi drainage outlet design calculations for Settlement Pond 1
for Site 4.

****

>>>>>> Structure No. 2 <<<<<<
(Input Data)

STAND PIPE
Stand Pipe with weir or orifice flow

E1 elev.(ft)? 160
E2 elev.(ft)? 162.001
Crest elev.(ft)? 160
Diameter (ft)? 1.5
Weir coefficient? 0.6
Orifice coefficient? 0.73
Start transition elev.(ft) @ ?
Transition height (ft)? 1

Outlet Structure File: DA1 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
Multi drainage outlet design calculations for Settlement Pond 1
for Site 4.

****

>>>>>> Structure No. 1 <<<<<<
(Input Data)

ORIFICE
Orifice - Based on Area and Datum Elevation

E1 elev.(ft)?	159.0
E2 elev.(ft)?	162.001
Orifice coeff.?	.61
Invert elev.(ft)?	159.0
Datum elev.(ft) ?	159.0
Orifice area (sq ft)?	0.0873

Outlet Structure File: DA1 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
Multi drainage outlet design calculations for Settlement Pond 1
for Site 4.

****

Outflow Rating Table for Structure #3
WEIR-VR Weir - Vertical Rectangular

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
155.50	0.0	E < Inv.El.= 161
156.50	0.0	E < Inv.El.= 161
157.50	0.0	E < Inv.El.= 161
158.50	0.0	E < Inv.El.= 161
159.50	0.0	E < Inv.El.= 161
160.00	0.0	E < Inv.El.= 161
160.50	0.0	E < Inv.El.= 161
161.00	0.0	H =0.0
161.50	3.2	H =.5
162.00	8.9	H =1.0

C = .6 L (ft) = 15
H (ft) = Table elev. - Invert elev. (161 ft)
Q (cfs) = C * (L-.2H) * (H**1.5) -- Contracted Weir

Outlet Structure File: DA1 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
Multi drainage outlet design calculations for Settlement Pond 1
for Site 4.

****

Outflow Rating Table for Structure #2
STAND PIPE Stand Pipe with weir or orifice flow

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
155.50	0.0	E < Inv.El.= 160
156.50	0.0	E < El= 160
157.50	0.0	E < El= 160
158.50	0.0	E < El= 160
159.50	0.0	E < El= 160
160.00	0.0	Weir: H =0.0
160.50	1.0	Weir: H =.5
161.00	2.8	Weir: H =1.0
161.50	5.2	Weir: H =1.5
162.00	8.0	Weir: H =2.0

Weir Cw = .6 Weir length = 4.712389 ft
Orifice Co = .73 Orifice area = 1.767146 sq.ft.
Q (cfs) = (Cw * L * H**1.5) or (Co * A * sqr(2*g*H))
Transition interpolated between elev. 163.1614 and 164.1614 ft
Weir equation = Orifice equation @ elev.= 163.6614 ft

Outlet Structure File: DA1 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
Multi drainage outlet design calculations for Settlement Pond 1
for Site 4.

****

Outflow Rating Table for Structure #1
ORIFICE Orifice - Based on Area and Datum Elevation

Elevation (ft)	Q (cfs)	Computation Messages
155.50	0.0	E < E1=159.0
156.50	0.0	E < E1=159.0
157.50	0.0	E < E1=159.0
158.50	0.0	E < E1=159.0
159.50	0.3	H =.5
160.00	0.4	H =1.0
160.50	0.5	H =1.5
161.00	0.6	H =2.0
161.50	0.7	H =2.5
162.00	0.7	H =3.0

C = .61 A = .0873 sq.ft.
H (ft) = Table elev. - Datum elev. (159 ft)
Q (cfs) = C * A * sqr(2g * H)

C.6 HYDROGRAPH ROUTINGS AND OUTFLOW CALCULATIONS

POND-2 Version: 5.17 S/N:
EXECUTED: 11-03-1997 13:33:44


```
*********************************************************************
*                                                                   *
* Multi drainage outlet design calculations for Settlement Pond 1   *
*                          for Site 4.                              *
*                                                                   *
*                                                                   *
*                                                                   *
*********************************************************************
```

Inflow Hydrograph: DA110YR .HYD
Rating Table file: DA1 .PND

----INITIAL CONDITIONS----
Elevation = 155.50 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
155.50	0.0	0.000
156.50	0.0	0.021
157.50	0.0	0.066
158.50	0.0	0.127
159.50	0.3	0.207
160.00	0.4	0.255
160.50	1.5	0.308
161.00	3.4	0.366
161.50	9.0	0.430
162.00	17.6	0.499

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
5.2	5.2
15.9	15.9
30.8	30.8
50.2	50.5
61.7	62.1
74.4	75.9
88.5	91.9
104.0	113.0
120.8	138.4

Time increment (t) = 0.100 hrs.

POND-2 Version: 5.17 S/N:
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Pond File: DA1 .PND
Inflow Hydrograph: DA110YR .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	1.00	-----	0.0	0.0	0.00	155.50
11.100	1.00	2.0	2.0	2.0	0.00	155.89
11.200	1.00	2.0	4.0	4.0	0.00	156.28
11.300	1.00	2.0	6.0	6.0	0.00	156.58
11.400	1.00	2.0	8.0	8.0	0.00	156.76
11.500	1.00	2.0	10.0	10.0	0.00	156.95
11.600	1.00	2.0	12.0	12.0	0.00	157.14
11.700	2.00	3.0	15.0	15.0	0.00	157.41
11.800	2.00	4.0	19.0	19.0	0.00	157.71
11.900	3.00	5.0	24.0	24.0	0.00	158.04
12.000	4.00	7.0	31.0	31.0	0.00	158.51
12.100	6.00	10.0	40.7	41.0	0.16	159.02
12.200	11.00	17.0	57.0	57.7	0.36	159.81
12.300	14.00	25.0	77.5	82.0	2.22	160.69
12.400	12.00	26.0	90.5	103.5	6.49	161.28
12.500	9.00	21.0	94.3	111.5	8.62	161.47
12.600	7.00	16.0	93.7	110.3	8.29	161.44
12.700	5.00	12.0	91.6	105.7	7.07	161.33
12.800	3.00	8.0	88.7	99.6	5.44	161.18
12.900	2.00	5.0	85.9	93.7	3.87	161.04
13.000	2.00	4.0	83.6	89.9	3.17	160.94
13.100	2.00	4.0	81.8	87.6	2.89	160.87
13.200	2.00	4.0	80.5	85.8	2.68	160.81
13.300	2.00	4.0	79.5	84.5	2.52	160.77
13.400	2.00	4.0	78.7	83.5	2.39	160.74
13.500	2.00	4.0	78.1	82.7	2.30	160.71
13.600	1.00	3.0	76.8	81.1	2.11	160.66
13.700	1.00	2.0	75.2	78.8	1.85	160.59
13.800	1.00	2.0	73.9	77.2	1.64	160.54
13.900	1.00	2.0	72.9	75.9	1.49	160.50
14.000	1.00	2.0	72.0	74.9	1.42	160.46
14.100	1.00	2.0	71.3	74.0	1.35	160.43
14.200	1.00	2.0	70.8	73.3	1.29	160.41
14.300	1.00	2.0	70.3	72.8	1.25	160.39
14.400	1.00	2.0	69.8	72.3	1.21	160.37
14.500	1.00	2.0	69.5	71.8	1.18	160.35
14.600	1.00	2.0	69.2	71.5	1.15	160.34
14.700	1.00	2.0	69.0	71.2	1.12	160.33
14.800	1.00	2.0	68.7	71.0	1.10	160.32
14.900	1.00	2.0	68.6	70.7	1.09	160.31
15.000	1.00	2.0	68.4	70.6	1.07	160.31
15.100	1.00	2.0	68.3	70.4	1.06	160.30
15.200	1.00	2.0	68.2	70.3	1.05	160.30
15.300	1.00	2.0	68.1	70.2	1.04	160.29
15.400	1.00	2.0	68.0	70.1	1.04	160.29

POND-2 Version: 5.17 S/N:
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d File: DA1 .PND
Inflow Hydrograph: DA110YR .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	1.00	2.0	68.0	70.0	1.03	160.29
15.600	1.00	2.0	67.9	70.0	1.03	160.28
15.700	1.00	2.0	67.9	69.9	1.02	160.28
15.800	1.00	2.0	67.8	69.9	1.02	160.28
15.900	1.00	2.0	67.8	69.8	1.02	160.28
16.000	1.00	2.0	67.8	69.8	1.01	160.28
16.100	1.00	2.0	67.8	69.8	1.01	160.28
16.200	1.00	2.0	67.7	69.8	1.01	160.28
16.300	1.00	2.0	67.7	69.7	1.01	160.28
16.400	1.00	2.0	67.7	69.7	1.01	160.28
16.500	1.00	2.0	67.7	69.7	1.01	160.28
16.600	1.00	2.0	67.7	69.7	1.00	160.27
16.700	1.00	2.0	67.7	69.7	1.00	160.27
16.800	1.00	2.0	67.7	69.7	1.00	160.27
16.900	1.00	2.0	67.7	69.7	1.00	160.27
17.000	1.00	2.0	67.7	69.7	1.00	160.27
17.100	1.00	2.0	67.7	69.7	1.00	160.27
17.200	1.00	2.0	67.7	69.7	1.00	160.27
17.300	0.00	1.0	66.8	68.7	0.92	160.24
17.400	0.00	0.0	65.3	66.8	0.78	160.17
17.500	0.00	0.0	64.0	65.3	0.65	160.11
17.600	0.00	0.0	62.9	64.0	0.55	160.07
17.700	0.00	0.0	61.9	62.9	0.46	160.03
17.800	0.00	0.0	61.1	61.9	0.40	159.99
17.900	0.00	0.0	60.4	61.1	0.39	159.96
18.000	0.00	0.0	59.6	60.4	0.39	159.93
18.100	0.00	0.0	58.8	59.6	0.38	159.89
18.200	0.00	0.0	58.1	58.8	0.37	159.86
18.300	0.00	0.0	57.4	58.1	0.37	159.83
18.400	0.00	0.0	56.6	57.4	0.36	159.80
18.500	0.00	0.0	55.9	56.6	0.35	159.77
18.600	0.00	0.0	55.2	55.9	0.35	159.73
18.700	0.00	0.0	54.6	55.2	0.34	159.70
18.800	0.00	0.0	53.9	54.6	0.34	159.68
18.900	0.00	0.0	53.2	53.9	0.33	159.65
19.000	0.00	0.0	52.6	53.2	0.32	159.62
19.100	0.00	0.0	51.9	52.6	0.32	159.59
19.200	0.00	0.0	51.3	51.9	0.31	159.56
19.300	0.00	0.0	50.7	51.3	0.31	159.54
19.400	0.00	0.0	50.1	50.7	0.30	159.51
19.500	0.00	0.0	49.5	50.1	0.29	159.48
19.600	0.00	0.0	48.9	49.5	0.29	159.45
19.700	0.00	0.0	48.4	48.9	0.28	159.42
19.800	0.00	0.0	47.9	48.4	0.27	159.39
19.900	0.00	0.0	47.3	47.9	0.26	159.37
20.000	0.00	0.0	46.8	47.3	0.25	159.34

POND-2 Version: 5.17 S/N:
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Pond File: DA1 .PND
Inflow Hydrograph: DA110YR .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	0.00	0.0	46.3	46.8	0.24	159.31
20.200	0.00	0.0	45.9	46.3	0.24	159.29
20.300	0.00	0.0	45.4	45.9	0.23	159.26
20.400	0.00	0.0	45.0	45.4	0.22	159.24
20.500	0.00	0.0	44.5	45.0	0.22	159.22
20.600	0.00	0.0	44.1	44.5	0.21	159.20
20.700	0.00	0.0	43.7	44.1	0.20	159.18
20.800	0.00	0.0	43.3	43.7	0.20	159.16
20.900	0.00	0.0	42.9	43.3	0.19	159.14
21.000	0.00	0.0	42.6	42.9	0.18	159.12
21.100	0.00	0.0	42.2	42.6	0.18	159.10
21.200	0.00	0.0	41.9	42.2	0.17	159.08
21.300	0.00	0.0	41.5	41.9	0.17	159.06
21.400	0.00	0.0	41.2	41.5	0.16	159.04
21.500	0.00	0.0	40.9	41.2	0.16	159.03
21.600	0.00	0.0	40.6	40.9	0.15	159.01
21.700	0.00	0.0	40.3	40.6	0.15	159.00
21.800	0.00	0.0	40.0	40.3	0.14	158.98
21.900	0.00	0.0	39.7	40.0	0.14	158.97
22.000	0.00	0.0	39.4	39.7	0.14	158.95
22.100	0.00	0.0	39.2	39.4	0.13	158.94
22.200	0.00	0.0	38.9	39.2	0.13	158.92
22.300	0.00	0.0	38.7	38.9	0.12	158.91
22.400	0.00	0.0	38.4	38.7	0.12	158.90
22.500	0.00	0.0	38.2	38.4	0.12	158.89
22.600	0.00	0.0	38.0	38.2	0.11	158.88
22.700	0.00	0.0	37.8	38.0	0.11	158.86
22.800	0.00	0.0	37.5	37.8	0.11	158.85
22.900	0.00	0.0	37.3	37.5	0.10	158.84
23.000	0.00	0.0	37.1	37.3	0.10	158.83
23.100	0.00	0.0	36.9	37.1	0.10	158.82
23.200	0.00	0.0	36.8	36.9	0.09	158.81
23.300	0.00	0.0	36.6	36.8	0.09	158.80
23.400	0.00	0.0	36.4	36.6	0.09	158.79
23.500	0.00	0.0	36.2	36.4	0.09	158.78
23.600	0.00	0.0	36.1	36.2	0.08	158.78
23.700	0.00	0.0	35.9	36.1	0.08	158.77
23.800	0.00	0.0	35.8	35.9	0.08	158.76
23.900	0.00	0.0	35.6	35.8	0.08	158.75
24.000	0.00	0.0	35.5	35.6	0.07	158.74
24.100	0.00	0.0	35.3	35.5	0.07	158.74
24.200	0.00	0.0	35.2	35.3	0.07	158.73
24.300	0.00	0.0	35.0	35.2	0.07	158.72
24.400	0.00	0.0	34.9	35.0	0.06	158.71
24.500	0.00	0.0	34.8	34.9	0.06	158.71
24.600	0.00	0.0	34.7	34.8	0.06	158.70

POND-2 Version: 5.17 S/N:
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1 File: DA1 .PND
Inflow Hydrograph: DA110YR .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH

TIME (hrs)	INFLOW (cfs)
24.700	0.00
24.800	0.00
24.900	0.00
25.000	0.00
25.100	0.00
25.200	0.00
25.300	0.00
25.400	0.00
25.500	0.00
25.600	0.00
25.700	0.00
25.800	0.00
25.900	0.00

ROUTING COMPUTATIONS

I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.0	34.6	34.7	0.06	158.70
0.0	34.4	34.6	0.06	158.69
0.0	34.3	34.4	0.06	158.68
0.0	34.2	34.3	0.05	158.68
0.0	34.1	34.2	0.05	158.67
0.0	34.0	34.1	0.05	158.67
0.0	33.9	34.0	0.05	158.66
0.0	33.8	33.9	0.05	158.66
0.0	33.7	33.8	0.05	158.65
0.0	33.6	33.7	0.04	158.65
0.0	33.6	33.6	0.04	158.64
0.0	33.5	33.6	0.04	158.64
0.0	33.4	33.5	0.04	158.64

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: DA1 .PND
Inflow Hydrograph: DA110YR .HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 155.50 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 14.00 cfs
Peak Outflow = 8.62 cfs
Peak Elevation = 161.47 ft

***** Summary of Approximate Peak Storage *****

Initial Storage = 0.00 ac-ft
Peak Storage From Storm = 0.43 ac-ft

Total Storage in Pond = 0.43 ac-ft

Warning: Inflow hydrograph truncated on left side.

Pond File: DA1 .PND
Inflow Hydrograph: DA110YR .HYD
Outflow Hydrograph: OUT .HYD

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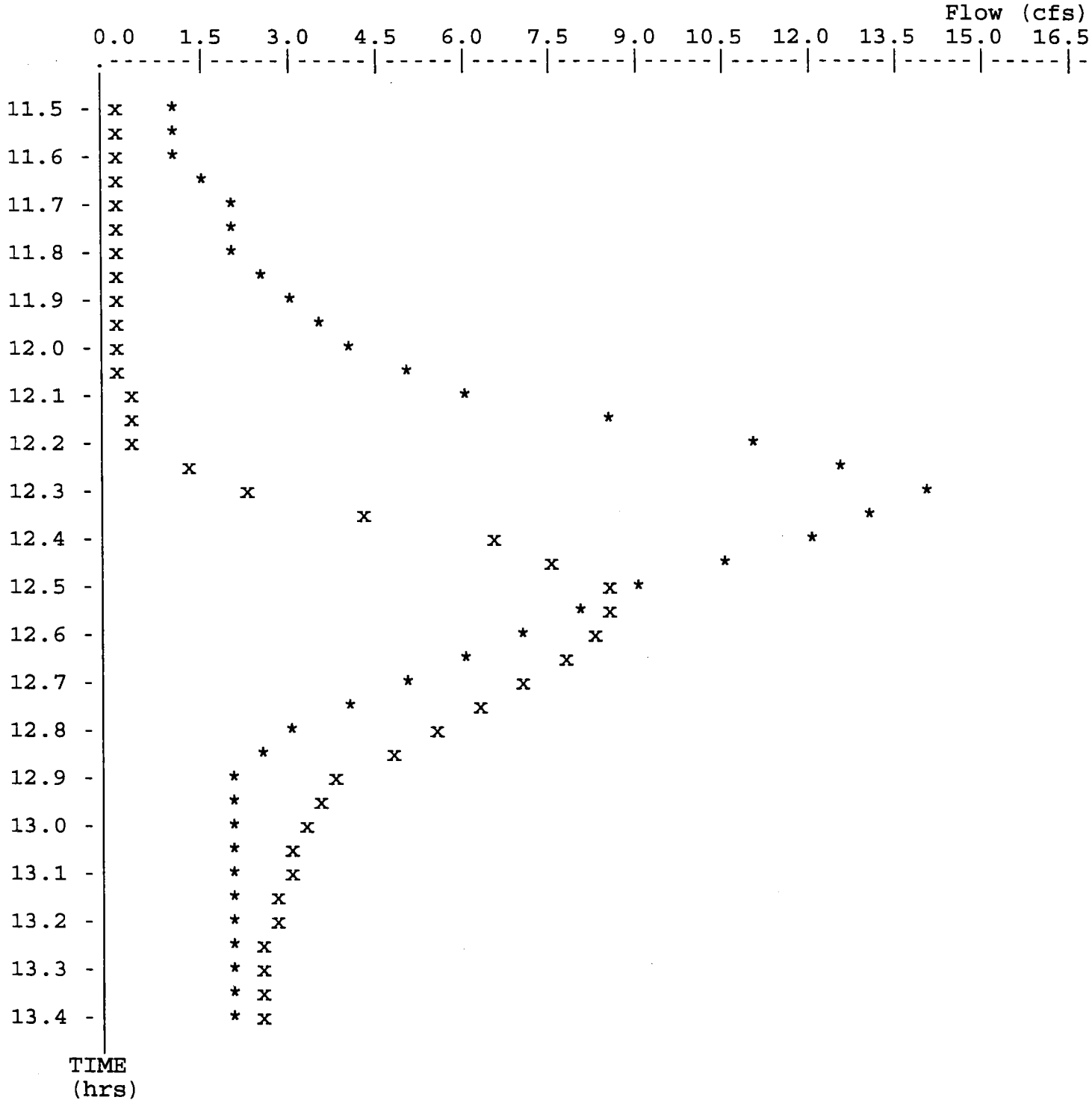
Peak Inflow = 14.00 cfs
Peak Outflow = 8.62 cfs
Peak Elevation = 161.47 ft



* File: DA110YR .HYD Qmax = 14.0 cfs
x File: OUT .HYD Qmax = 8.6 cfs

POND-2 Version: 5.17 S/N:
EXECUTED: 11-03-1997 13:35:03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*********************************************************************
*                                                                   *
* Multi drainage outlet design calculations for Settlement Pond 2   *
*                          for Site 4.                              *
*                                                                   *
*                                                                   *
*                                                                   *
*********************************************************************
```

Inflow Hydrograph: DA210YR .HYD
Rating Table file: DA2 .PND

----INITIAL CONDITIONS----
Elevation = 153.75 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
153.75	0.0	0.000	0.0	0.0
154.75	0.0	0.007	1.7	1.7
155.75	0.0	0.025	6.0	6.0
156.75	0.0	0.052	12.7	12.7
157.75	0.4	0.092	22.2	22.6
158.00	0.4	0.104	25.1	25.5
158.75	1.8	0.144	34.9	36.7
159.00	2.5	0.160	38.6	41.1
159.75	8.9	0.212	51.3	60.2

Time increment (t) = 0.100 hrs.

POND-2 Version: 5.17 S/N:
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Pond File: DA2 .PND
Inflow Hydrograph: DA210YR .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	0.00	-----	0.0	0.0	0.00	153.75
11.100	0.00	0.0	0.0	0.0	0.00	153.75
11.200	0.00	0.0	0.0	0.0	0.00	153.75
11.300	0.00	0.0	0.0	0.0	0.00	153.75
11.400	0.00	0.0	0.0	0.0	0.00	153.75
11.500	0.00	0.0	0.0	0.0	0.00	153.75
11.600	0.00	0.0	0.0	0.0	0.00	153.75
11.700	0.00	0.0	0.0	0.0	0.00	153.75
11.800	1.00	1.0	1.0	1.0	0.00	154.32
11.900	1.00	2.0	3.0	3.0	0.00	155.05
12.000	1.00	2.0	5.0	5.0	0.00	155.52
12.100	2.00	3.0	8.0	8.0	0.00	156.05
12.200	3.00	5.0	13.0	13.0	0.01	156.78
12.300	4.00	7.0	19.4	20.0	0.29	157.49
12.400	5.00	9.0	26.9	28.4	0.76	158.20
12.500	5.00	10.0	33.2	36.9	1.82	158.76
12.600	4.00	9.0	36.5	42.2	2.86	159.04
12.700	3.00	7.0	36.9	43.5	3.29	159.09
12.800	2.00	5.0	36.4	41.9	2.76	159.03
12.900	2.00	4.0	35.6	40.4	2.38	158.96
13.000	1.00	3.0	34.4	38.6	2.10	158.86
13.100	1.00	2.0	32.9	36.4	1.76	158.73
13.200	1.00	2.0	31.8	34.9	1.57	158.63
13.300	1.00	2.0	30.9	33.8	1.43	158.55
13.400	1.00	2.0	30.2	32.9	1.32	158.50
13.500	1.00	2.0	29.8	32.2	1.24	158.45
13.600	1.00	2.0	29.4	31.8	1.18	158.42
13.700	1.00	2.0	29.1	31.4	1.14	158.40
13.800	1.00	2.0	28.9	31.1	1.10	158.38
13.900	1.00	2.0	28.7	30.9	1.08	158.36
14.000	1.00	2.0	28.6	30.7	1.06	158.35
14.100	1.00	2.0	28.5	30.6	1.04	158.34
14.200	0.00	1.0	27.7	29.5	0.91	158.27
14.300	0.00	0.0	26.4	27.7	0.68	158.15
14.400	0.00	0.0	25.3	26.4	0.51	158.06
14.500	0.00	0.0	24.5	25.3	0.40	157.99
14.600	0.00	0.0	23.7	24.5	0.40	157.92
14.700	0.00	0.0	22.9	23.7	0.40	157.85
14.800	0.00	0.0	22.1	22.9	0.40	157.78
14.900	0.00	0.0	21.4	22.1	0.38	157.70
15.000	0.00	0.0	20.7	21.4	0.35	157.63
15.100	0.00	0.0	20.0	20.7	0.32	157.56
15.200	0.00	0.0	19.4	20.0	0.30	157.49
15.300	0.00	0.0	18.9	19.4	0.27	157.43
15.400	0.00	0.0	18.4	18.9	0.25	157.38

POND-2 Version: 5.17 S/N:
EXECUTED: 11-03-1997 13:35:03

d File: DA2 .PND
...flow Hydrograph: DA210YR .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH / ROUTING COMPUTATIONS

TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	0.00	0.0	17.9	18.4	0.23	157.33
15.600	0.00	0.0	17.5	17.9	0.21	157.28
15.700	0.00	0.0	17.1	17.5	0.19	157.24
15.800	0.00	0.0	16.8	17.1	0.18	157.20
15.900	0.00	0.0	16.4	16.8	0.16	157.16
16.000	0.00	0.0	16.1	16.4	0.15	157.13
16.100	0.00	0.0	15.8	16.1	0.14	157.10
16.200	0.00	0.0	15.6	15.8	0.13	157.07
16.300	0.00	0.0	15.4	15.6	0.12	157.04
16.400	0.00	0.0	15.1	15.4	0.11	157.02
16.500	0.00	0.0	14.9	15.1	0.10	157.00
16.600	0.00	0.0	14.8	14.9	0.09	156.98
16.700	0.00	0.0	14.6	14.8	0.08	156.96
16.800	0.00	0.0	14.4	14.6	0.08	156.94
16.900	0.00	0.0	14.3	14.4	0.07	156.93
17.000	0.00	0.0	14.2	14.3	0.07	156.91
17.100	0.00	0.0	14.0	14.2	0.06	156.90
.200	0.00	0.0	13.9	14.0	0.06	156.89
17.300	0.00	0.0	13.8	13.9	0.05	156.88
17.400	0.00	0.0	13.7	13.8	0.05	156.87
17.500	0.00	0.0	13.7	13.7	0.04	156.86
17.600	0.00	0.0	13.6	13.7	0.04	156.85
17.700	0.00	0.0	13.5	13.6	0.04	156.84
17.800	0.00	0.0	13.4	13.5	0.03	156.83
17.900	0.00	0.0	13.4	13.4	0.03	156.83
18.000	0.00	0.0	13.3	13.4	0.03	156.82
18.100	0.00	0.0	13.3	13.3	0.03	156.81
18.200	0.00	0.0	13.2	13.3	0.02	156.81
18.300	0.00	0.0	13.2	13.2	0.02	156.80
18.400	0.00	0.0	13.1	13.2	0.02	156.80
18.500	0.00	0.0	13.1	13.1	0.02	156.80
18.600	0.00	0.0	13.1	13.1	0.02	156.79
18.700	0.00	0.0	13.0	13.1	0.02	156.79
18.800	0.00	0.0	13.0	13.0	0.01	156.79
18.900	0.00	0.0	13.0	13.0	0.01	156.78
19.000	0.00	0.0	13.0	13.0	0.01	156.78
19.100	0.00	0.0	12.9	13.0	0.01	156.78
19.200	0.00	0.0	12.9	12.9	0.01	156.78
19.300	0.00	0.0	12.9	12.9	0.01	156.77
19.400	0.00	0.0	12.9	12.9	0.01	156.77
19.500	0.00	0.0	12.9	12.9	0.01	156.77
19.600	0.00	0.0	12.8	12.9	0.01	156.77
.700	0.00	0.0	12.8	12.8	0.01	156.77
.800	0.00	0.0	12.8	12.8	0.01	156.77
19.900	0.00	0.0	12.8	12.8	0.01	156.76
20.000	0.00	0.0	12.8	12.8	0.01	156.76

POND-2 Version: 5.17 S/N:
EXECUTED: 11-03-1997 13:35:03

Pond File: DA2 .PND
Inflow Hydrograph: DA210YR .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	0.00	0.0	12.8	12.8	0.00	156.76
20.200	0.00	0.0	12.8	12.8	0.00	156.76
20.300	0.00	0.0	12.8	12.8	0.00	156.76
20.400	0.00	0.0	12.8	12.8	0.00	156.76
20.500	0.00	0.0	12.8	12.8	0.00	156.76
20.600	0.00	0.0	12.8	12.8	0.00	156.76
20.700	0.00	0.0	12.7	12.8	0.00	156.76
20.800	0.00	0.0	12.7	12.7	0.00	156.76
20.900	0.00	0.0	12.7	12.7	0.00	156.76
21.000	0.00	0.0	12.7	12.7	0.00	156.76
21.100	0.00	0.0	12.7	12.7	0.00	156.76
21.200	0.00	0.0	12.7	12.7	0.00	156.75
21.300	0.00	0.0	12.7	12.7	0.00	156.75
21.400	0.00	0.0	12.7	12.7	0.00	156.75
21.500	0.00	0.0	12.7	12.7	0.00	156.75
21.600	0.00	0.0	12.7	12.7	0.00	156.75
21.700	0.00	0.0	12.7	12.7	0.00	156.75
21.800	0.00	0.0	12.7	12.7	0.00	156.75
21.900	0.00	0.0	12.7	12.7	0.00	156.75
22.000	0.00	0.0	12.7	12.7	0.00	156.75
22.100	0.00	0.0	12.7	12.7	0.00	156.75
22.200	0.00	0.0	12.7	12.7	0.00	156.75
22.300	0.00	0.0	12.7	12.7	0.00	156.75
22.400	0.00	0.0	12.7	12.7	0.00	156.75
22.500	0.00	0.0	12.7	12.7	0.00	156.75
22.600	0.00	0.0	12.7	12.7	0.00	156.75
22.700	0.00	0.0	12.7	12.7	0.00	156.75
22.800	0.00	0.0	12.7	12.7	0.00	156.75
22.900	0.00	0.0	12.7	12.7	0.00	156.75
23.000	0.00	0.0	12.7	12.7	0.00	156.75
23.100	0.00	0.0	12.7	12.7	0.00	156.75
23.200	0.00	0.0	12.7	12.7	0.00	156.75
23.300	0.00	0.0	12.7	12.7	0.00	156.75
23.400	0.00	0.0	12.7	12.7	0.00	156.75
23.500	0.00	0.0	12.7	12.7	0.00	156.75
23.600	0.00	0.0	12.7	12.7	0.00	156.75
23.700	0.00	0.0	12.7	12.7	0.00	156.75
23.800	0.00	0.0	12.7	12.7	0.00	156.75
23.900	0.00	0.0	12.7	12.7	0.00	156.75
24.000	0.00	0.0	12.7	12.7	0.00	156.75
24.100	0.00	0.0	12.7	12.7	0.00	156.75
24.200	0.00	0.0	12.7	12.7	0.00	156.75
24.300	0.00	0.0	12.7	12.7	0.00	156.75
24.400	0.00	0.0	12.7	12.7	0.00	156.75
24.500	0.00	0.0	12.7	12.7	0.00	156.75
24.600	0.00	0.0	12.7	12.7	0.00	156.75

POND-2 Version: 5.17 S/N:
EXECUTED: 11-03-1997 13:35:03

d File: DA2 .PND
Inflow Hydrograph: DA210YR .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	0.00	0.0	12.7	12.7	0.00	156.75
24.800	0.00	0.0	12.7	12.7	0.00	156.75
24.900	0.00	0.0	12.7	12.7	0.00	156.75
25.000	0.00	0.0	12.7	12.7	0.00	156.75
25.100	0.00	0.0	12.7	12.7	0.00	156.75
25.200	0.00	0.0	12.7	12.7	0.00	156.75
25.300	0.00	0.0	12.7	12.7	0.00	156.75
25.400	0.00	0.0	12.7	12.7	0.00	156.75
25.500	0.00	0.0	12.7	12.7	0.00	156.75
25.600	0.00	0.0	12.7	12.7	0.00	156.75
25.700	0.00	0.0	12.7	12.7	0.00	156.75
25.800	0.00	0.0	12.7	12.7	0.00	156.75
25.900	0.00	0.0	12.7	12.7	0.00	156.75

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: DA2 .PND
Inflow Hydrograph: DA210YR .HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 153.75 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 5.00 cfs
Peak Outflow = 3.29 cfs
Peak Elevation = 159.09 ft

***** Summary of Approximate Peak Storage *****

Initial Storage = 0.00 ac-ft
Peak Storage From Storm = 0.17 ac-ft

Total Storage in Pond = 0.17 ac-ft

POND-2 Version: 5.17 S/N:

Pond File: DA2 .PND
Inflow Hydrograph: DA210YR .HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 11-03-1997
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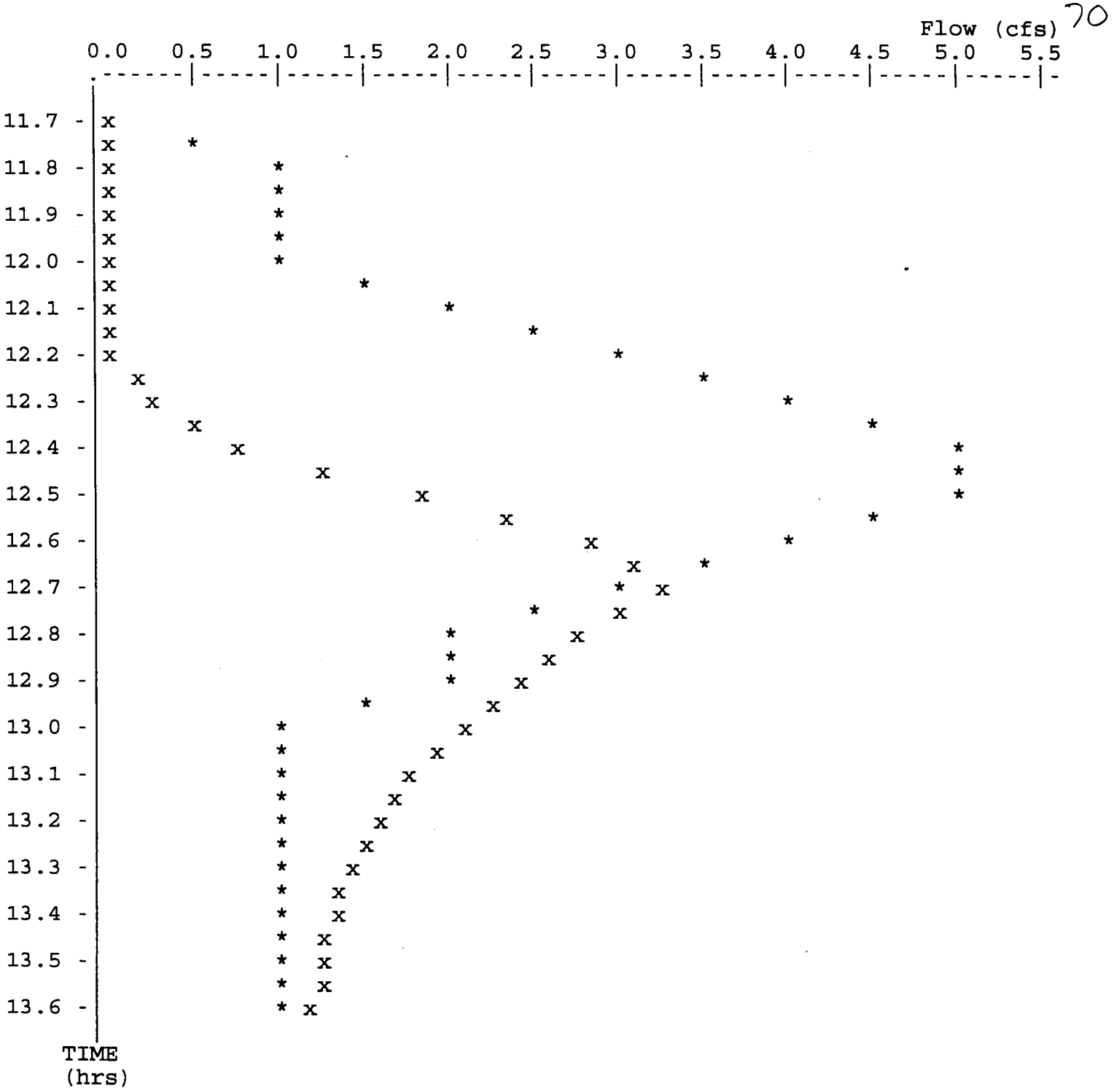
Peak Inflow = 5.00 cfs
Peak Outflow = 3.29 cfs
Peak Elevation = 159.09 ft

70



* File: DA210YR .HYD Qmax = 5.0 cfs
x File: OUT .HYD Qmax = 3.3 cfs

CLIENT	JOB NUMBER
NSWE	7602-0106
SUBJECT: Site 4 - Seal Basin Design	
BASED ON: NJ Regs	DRAWING NUMBER
BY: CSF / CHECKED BY: BER 11/6/97	APPROVED BY / DATE: 11/4/97

- From p 60 & 68 of the POND-2 routing calculations for the 10-yr storm:

Seal Basin	Peak Inflow	Peak Outflow*	Peak Elev*	Peak Storage
1	14 cfs	8.62 cfs	161.47 ft	0.43 ac-ft
2	5 cfs	3.29 cfs	159.09 ft	0.17 ac-ft

- Compare this data to composite outflow data (p 39 & 47)

Seal Basin	Peak Composite Outflow*	Elev to top of Emergency Spillway	
1	17.6 cfs	162 ft	OK
2	8.9 cfs	159.75 ft	OK

* Assuming rectangular cross-section shape for emergency spillway as required by POND-2 model. Trapezoidal spillway will actually offer more available capacity

CLIENT	JOB NUMBER
NSWC	7602-0106

SUBJECT: Site 4 - Sed Basin Design

BASED ON	DRAWING NUMBER
NJ Reqs	

BY	CHECKED BY	APPROVED BY	DATE
CSF	BER 11/6/97		11/4/97

4. The maximum flow velocity from the emergency spillway must be < 4 ft/s (Req # 5 p. 3)

From the POND-2 hydrograph routing calcs for the 10-yr, 24-hr storm:

Sed Basin	Peak Outflow (cfs)	Peak Elevation (ft)
1	8.62	161.47
2	3.29	159.09

- Calculating the cross-section area for each trapezoidal emergency spillway up to peak elevation:

Sed Basin	Spillway Bottom width (ft)	*Wetted Spillway Area (1 ft high) (3:1 side slopes)
1	15 @ Elev 161	8.91 ft^2
2	10 @ Elev 159	5.27 ft^2

* Use $A = \frac{1}{2}(a+b)h$

$A_1 = \frac{1}{2}\{15 + ([161.47-161] \times 2 \times 3)\}(1) = 8.91\ ft^2$

$A_2 = \frac{1}{2}\{10 + ([159.09-159] \times 2 \times 3)\}(1) = 5.27\ ft^2$

CLIENT	JOB NUMBER
NSWC	7602-0106
SUBJECT: Site 4 - Sed Basin Design	
BASED ON: NJ Regs	DRAWING NUMBER

BY	CHECKED BY	APPROVED BY	DATE
CSF	BER 11/6/97		11/4/97

- Assuming entire peak outflow is passed through the emergency spillway:

$V_1 = Q_1 / A_1 = 8.62\ ft^3/s / 8.91\ ft^2 \cong 1\ ft/s < 4\ ft/s$ OK

$V_2 = Q_2 / A_2 = 3.29\ ft^3/s / 5.27\ ft^2 \cong 0.7\ ft/s < 4\ ft/s$ OK

5. The available sed basin volume between the crest of the principal spillway and the crest of the emergency spillway must be capable of containing the 2-yr, 24-hrs storm event. (reg #2 p 1)

- Assume spillway locations (outlet calcs p 34):

Sed Basin	Basin top Elev	Prin Spill Elev	Emergency Spillway Elev
1	162 ft	160 ft	161 ft
2	160 ft	158 ft	159 ft

CLIENT	JOB NUMBER
NSWC	7602 - 0106

SUBJECT: Sib 4 - Scd Basin Design

BASED ON: NJ Regs | DRAWING NUMBER:

BY	CHECKED BY	APPROVED BY	DATE
CSF	BER 11/6/97		11/4/97

- Using the routing data generated for the 10-yr storm, determine the minimum outflow conditions (most conservative) at the primary spillways when no flow is passing through the emergency spillway:

Scd Basin	Min. P.S. Outflow	Corresponding Water Elev
1	2.72 cfs	160.69 (p 56)
2	0.76 cfs	158.20 (p 64)

Use POND-2 to calculate maximum storage requirements generated by a 2-yr, 24-hr storm event, given the above-listed outflow condition

Scd Basin	Max Hydrograph Inflow	Max Required Storage
1	5.0 cfs (p 7)	0.1 Ac-ft (p 75)
2	20 cfs (p 19)	0.1 Ac-ft (p 77)

Compare Max Required Storage to Available scd basin storage between crest of principal spillway & crest of emergency spillway

Scd Basin	Max Required Storage	Available Storage
1	0.1 Ac-ft	0.31 Ac-ft (p 32) OK
2	0.1 Ac ft	0.13 Ac-ft (p 33) OK

>>>>> OUTFLOW HYDROGRAPH ESTIMATOR <<<<<

Inflow Hydrograph: DA1-2YR .HYD
Qpeak = 5.0 cfs

Estimated Outflow: ESTIMATE.EST
Qpeak = 2.2 cfs

Approximate Storage Volume
(computed from t= 11.90 to 12.68 hrs)

0.1 acre-ft

POND-2 Version: 5.17 S/N:
Plotted: 11-03-1997

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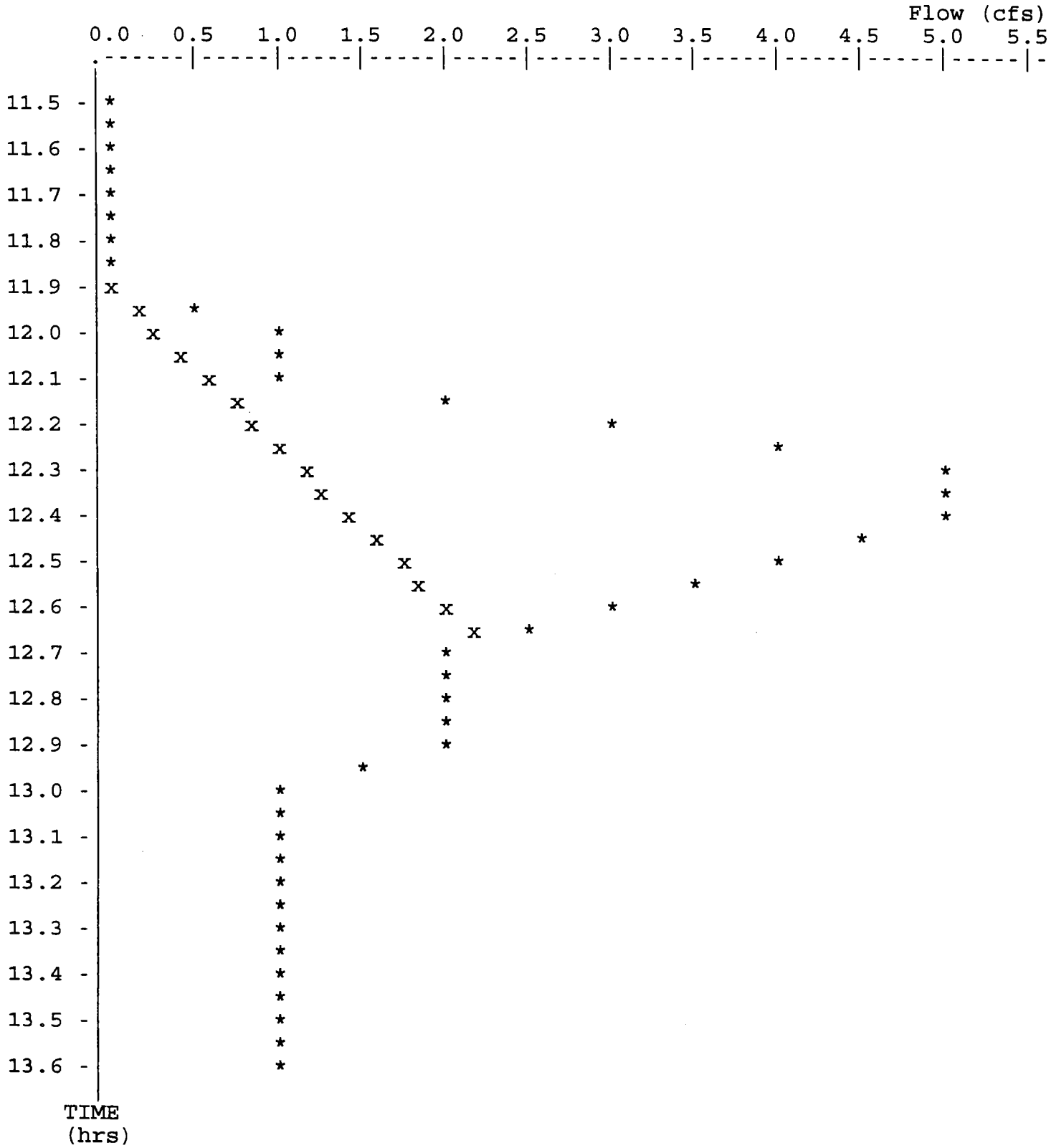


* File: DA1-2YR .HYD Qmax = 5.0 cfs
x File: ESTIMATE.EST Qmax = 2.2 cfs

>>>>> OUTFLOW HYDROGRAPH ESTIMATOR <<<<<

Inflow Hydrograph: DA2-2YR .HYD
Qpeak = 2.0 cfs

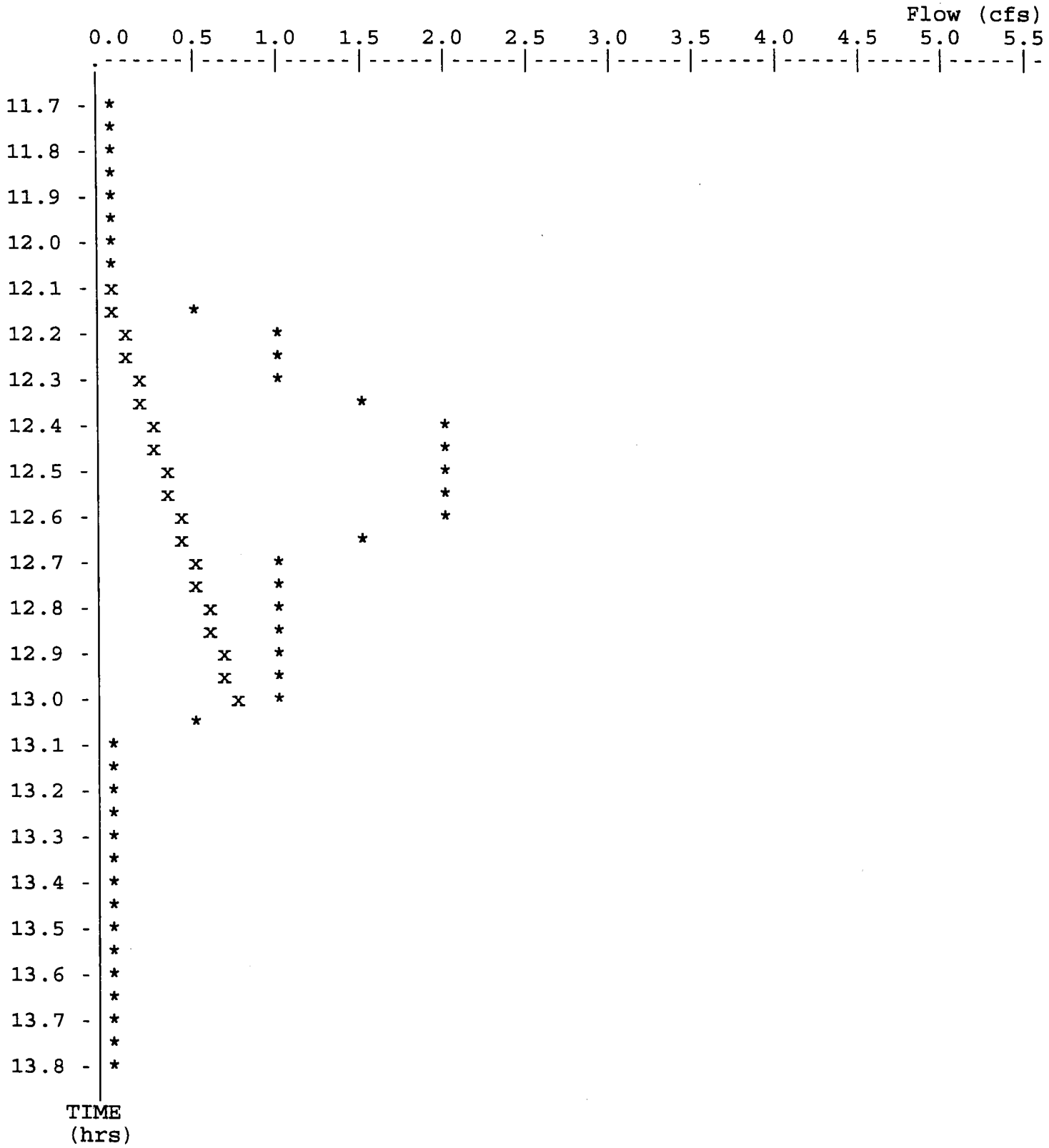
Estimated Outflow: ESTIMATE.EST
Qpeak = 0.8 cfs

Approximate Storage Volume
(computed from t= 12.10 to 13.02 hrs)

0.1 acre-ft

POND-2 Version: 5.17 S/N:
Plotted: 11-05-1997

78



* File: DA2-2YR .HYD Qmax = 2.0 cfs
x File: ESTIMATE.EST Qmax = 0.8 cfs

CLIENT: NSWC	JOB NUMBER: 7602 - 0106
SUBJECT: S-64 - Sed Basin Design	
BASED ON: NJ Regs	DRAWING NUMBER:
BY: CSF / CHECKED BY: BER 11/6/97	APPROVED BY: / DATE: 11/4/97

6. From crest of principal spillway (a through c below):

a) Avg sed basin depth ≥ 4 ft (reg 3 p 2)
b) min sed basin width ≥ 10 $\sqrt{Q_5}$ (reg 3 p 2)
c) min sed basin length ≥ 2 x sed basin width (reg 3 p 2)
d) max sed basin sideslope = 2:1 (reg 6 p 3)
e) min sed basin bottom width = 10 ft (reg 6 p 3)
f) min diameter for spillway riser pipe = 6 in (reg 7 p 3)

- From the enclosed sizing calculations:

Sed Basin	Bottom Sed Basin	Top Riser Pipe	Depth	Riser Pipe Diameter
1	155.50 (p 31)	160 (p 34)	4.5 ft (OK)	18 in (p 34) (OK)
2	153.75 (p 31)	158 (p 34)	4.25 ft (OK)	12 in (p 34) (OK)

- Scaling from the design drawings:

Sed Basin	Basin width @ Riser	Basin Length @ Riser	Sed Basin Bottom width	Max Sideslope
1	37 ft (OK)	103 ft (OK)	14 ft (OK)	3:1 (OK)
2	33 ft (OK)	77 ft (OK)	6.5 ft (NO)	3:1 (OK)

C.7 ANTI-SEEP COLLAR DESIGN

CLIENT	JOB NUMBER
NSWE	7602-0106
SUBJECT: Site 4 - Seal Basin Design	
BASED ON	DRAWING NUMBER

BY	CHECKED BY	APPROVED BY	DATE
C&F	BER 11/6/97		11/4/97

- Find the size & number of antiseep collars for seal basin 1 and 2 of Site 4

- Use equation:

$$L_s = y\,(z + 4)\left[1 + \frac{\text{pipe slope}}{0.25\text{-pipe slope}}\right]$$

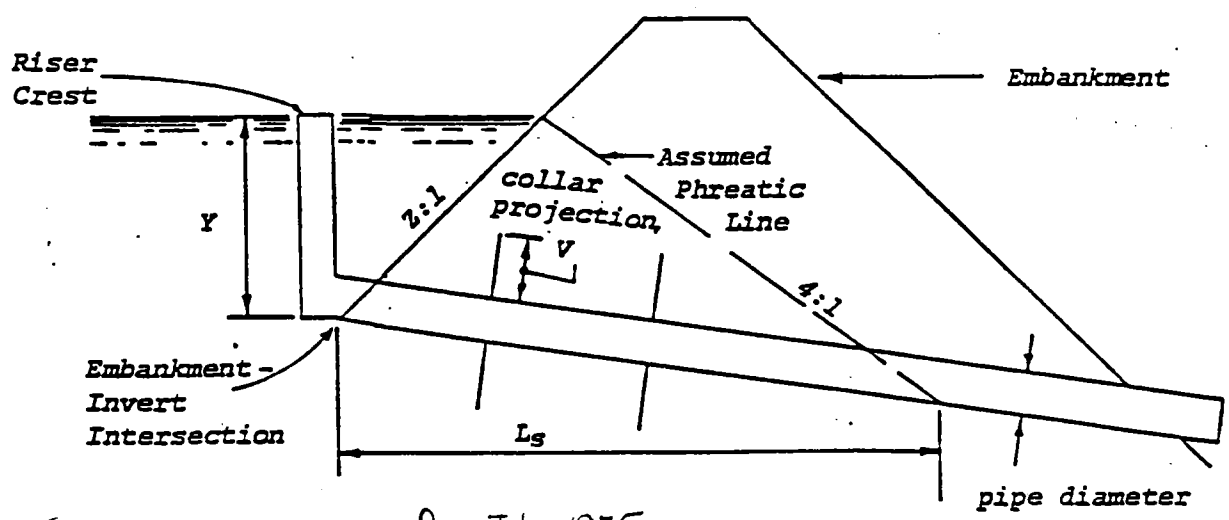
where: L_s = length of pipe in the saturated zone (ft.)

y = distance in feet from upstream invert of pipe to highest normal water level expected to occur during the life of the structure usually the top of the riser.

z = slope of upstream embankment as a ratio of z ft. horizontal to one ft. vertical.

pipe slope = slope of pipe in feet per foot.

This procedure is based on the approximation of the phreatic line as shown in the drawing below:



Source: USDA-SCS-MD, July 1975

RECEIVED

CLIENT	JOB NUMBER
NSUE	7602 - 0106

SUBJECT: S:64 - Sed Basin Design

BASED ON	DRAWING NUMBER

BY	CHECKED BY	APPROVED BY	DATE
CSF	BER 11/6/97		11/4/97

- Measuring from drawings:

Sed Basin	y*	z	Base Riser Elev *	Wetland Outlet Elev	Slope
1	6 ft	3	154 ft	153.0 ft	0.016
2	5.25 ft	3	152.75 ft	152.0 ft	0.007

* Allow depth for elbow diameter @ base of riser

$$Ls_1 = 6 \times (3+4)\left[1 + \frac{0.016}{0.25 - 0.016}\right] \cong 45 \text{ ft out of 48ft run}$$

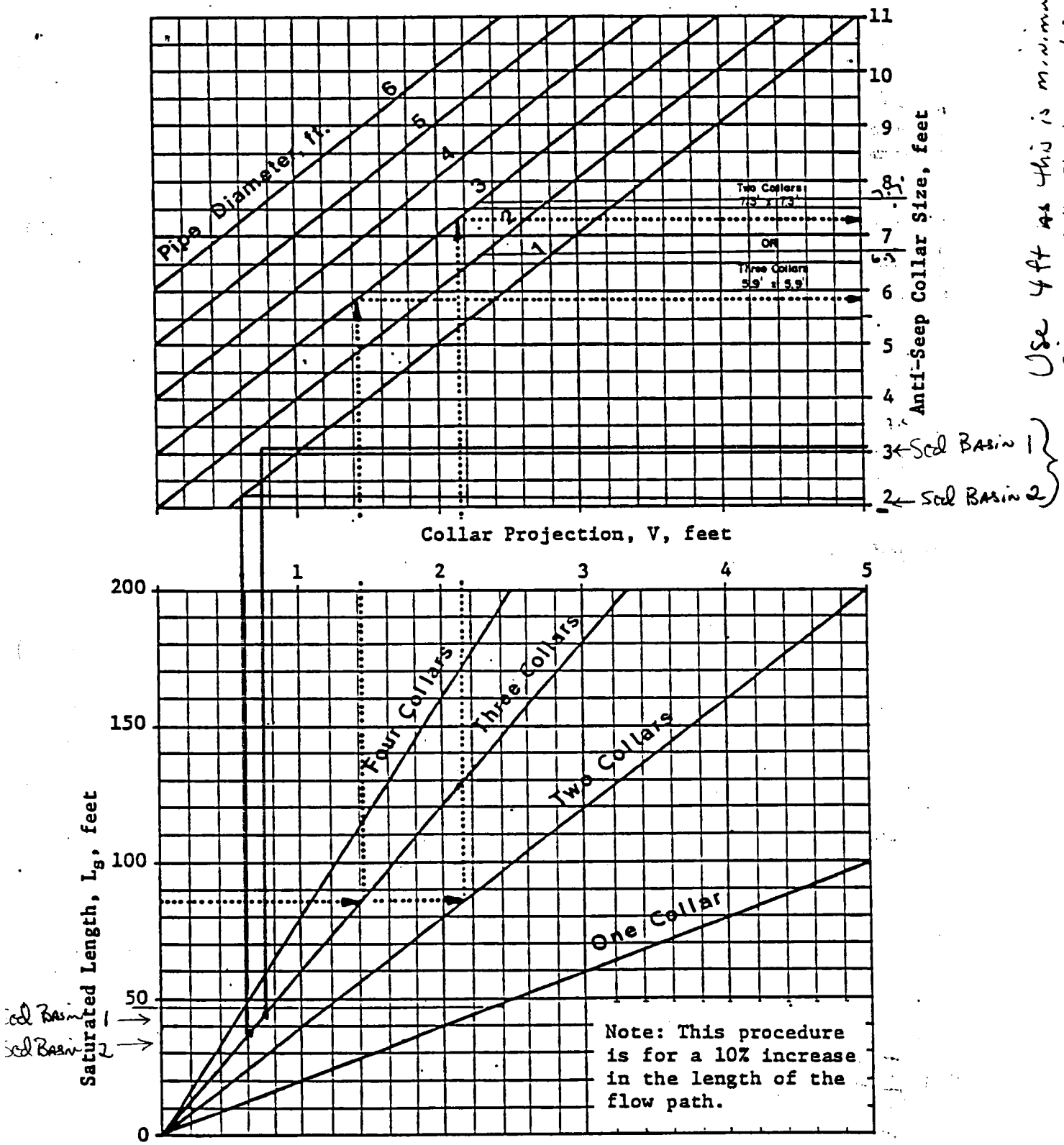
$$Ls_2 = 5.25 \times (3+4)\left[1 + \frac{0.007}{0.25 - 0.007}\right] \cong 38 \text{ ft out of 40ft run}$$

- Using the figure on p A-19.24 below & assuming 2 collars / basin

Sed Basin	Ls ft	Collar Size **
1	45 ft	4 ft
2	38 ft	4 ft

** Use 2 collars / basin as 1 collar requirement is larger than can be purchased

ANTI-SEEP COLLAR DESIGN



Use 4 ft as this is minimum size seep collar that can be purchased.

APPENDIX D

CALCULATIONS TO SIZE SEDIMENT/DETENTION BASINS FOR SITE 5

D.1 Overview/Conclusions

D.2 Preliminary Calculations for Determining Capacity and Size of Sediment/Detention Basins

D.3 Basin Inflow Hydrographs

D.4 Elevation-Storage Matrix

D.5 Outlet Structure Design

D.6 Hydrograph Routings

D.7 Emergency Spillway Calculations

D.8 Anti-Seep Collar Design

D.1 OVERVIEW/CONCLUSIONS

Sediment Basin # 1 Conclusions :

Due to topographical constraints, sediment basin # 1 has a depth of only 4 feet due to inadequate fall from the basin bottom to an existing point of elevation outside the basin. The principal spillway is only 2 feet high in order to provide a 1 foot transition zone between the top of the principal spillway and the crest of the emergency spillway. The peak elevation calculated for the 10-year storm routing is 99.96 feet. The crest of the emergency spillway is at 100.0 feet. Therefore, the basin has adequate storage for the 10-year storm and the associated sediment.

Detention Basin # 1 Conclusions :

Detention Basin # 1 has the same outlet structure and configuration as Sediment Basin # 1. The post development peak outflows were all less than the pre-development peak discharges. The peak elevation for each event did not overtop the basin.

Pre-Development peak discharges:

Storm Event:	Q peak:
2-year	2.0 cfs
10-year	7.0 cfs
25-year	9.0 cfs

Post-Development peak discharges:

Storm Event:	Q peak:
2-year	0.78 cfs
10-year	1.90 cfs
25-year	4.46 cfs

Detention Basin # 2 Conclusions :

Detention Basin # 2 has the same outlet structure and configuration as Sediment Basin # 2. The post development peak outflows were all less than the pre-development peak discharges. The peak elevation for each event did not overtop the basin.

Pre-Development peak discharges:

Storm Event:	Q peak:
2-year	3.0 cfs
10-year	9.0 cfs
25-year	12.0 cfs

Post-Development peak discharges:

Storm Event:	Q peak:
2-year	0.50 cfs
10-year	1.44 cfs
25-year	1.97 cfs

Detention Basin # 3 Conclusions :

Detention Basin # 3 has the same outlet structure and configuration as Sediment Basin # 3. The post development peak outflows were all less than the pre-development peak discharges. The peak elevation for each event did not overtop the basin.

Pre-Development peak discharges:

Storm Event:	Q peak:
2-year	1.0 cfs
10-year	4.0 cfs
25-year	6.0 cfs

Post-Development peak discharges:

Storm Event:	Q peak:
2-year	0.43 cfs
10-year	1.03 cfs
25-year	1.78 cfs

D.2 PRELIMINARY CALCULATIONS FOR DETERMINING CAPACITY AND SIZE OF SEDIMENT/DETENTION BASINS

CALCULATION WORKSHEET Order No. 19116 (01-01)

PAGE ____ OF ____

CLIENT	JOB NUMBER
SUBJECT	
BASED ON	DRAWING NUMBER

BY	CHECKED BY	APPROVED BY	DATE

SITE 5

CALCULATIONS FOR

CAPACITY AND SIZE

OF SEDIMENT BASINS

BASED ON NJ REGS.

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NWSE - SITE 5	JOB NUMBER: 7602/0106
SUBJECT: CAPACITY OF SEDIMENT BASINS	
BASED ON: SEDIMENT BASIN STANDARDS	DRAWING NUMBER:
BY: CAR 8/24/97 — CHECKED BY: JJB 8/27/97	APPROVED BY: — DATE:

BASED ON THE STANDARDS FOR SEDIMENT BASIN DESIGN, THE VOLUME IN THE SEDIMENT BASIN BELOW THE CREST ELEVATION OF THE EMERGENCY SPILLWAY SHALL BE THE LARGER OF:

1. VOLUME NECESSARY TO OBTAIN 70% TRAP EFFICIENCY AT THE START OF ITS USEFUL LIFE OR
2. THE VOLUME NECESSARY TO PROVIDE FOR SEDIMENT STORAGE CAPACITY AND FOR TEMPORARY STORM-WATER RUNOFF STORAGE FOR A 2-YR, 24-HOUR TYPE III STORM.

CALCULATIONS WERE COMPLETED FOR 1 AND 2 AND THEY FOLLOW THIS SUMMARY PAGE. THE CAPACITIES ESTIMATED BY 1 AND 2 ARE SUMMARIZED BELOW

DRAINAGE AREA	1 TRAP EFFICIENCY	2 SEDIMENT + RUNOFF STORAGE	REQUIRED STORAGE (MAX OF 1 & 2)
1	0.44 ac-ft	0.67 ac-ft	0.67 ac-ft
2	0.09 ac-ft	0.11 ac-ft	0.11 ac-ft
3	0.21 ac-ft	0.14 ac-ft	0.21 ac-ft

∴ USE THE REQUIRED STORAGE CAPACITIES TO COMPLETE THE DESIGN CALCULATIONS FOR THE SITE 5 SEDIMENT BASINS.

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NWSE - SITE 5	JOB NUMBER: 7602/0106
SUBJECT: CAPACITY OF SEDIMENT BASINS	
BASED ON: TRAP EFFICIENCY	DRAWING NUMBER:
BY: CAR 8/22/97 — CHECKED BY: JJD 8/27/97	APPROVED BY: — DATE:

ESTIMATE THE SIZES OF SEDIMENT BASINS THAT HAVE ADEQUATE VOLUME BELOW THE CREST OF THE EMERGENCY SPILLWAY TO HAVE ANY ACTUAL TRAP EFFICIENCY OF AT LEAST 70% AT THE START OF ITS USEFUL LIFE. USE CURVE 4.4-1.

WHERE: C = TOTAL CAPACITY OF THE SEDIMENT BASIN UP TO THE CREST ELEVATION OF THE EMERGENCY SPILLWAY (ac-ft)

I = AVG. ANNUAL SURFACE RUNOFF FROM FIGURE 4.4-1 CONVERTED TO (ac-ft).

- ASSUME THE INCOMING SEDIMENT IS SAND; THEREFORE USE A TRAP EFFICIENCY OF 75% FOR CURVE 4.4-1

FROM CURVE 4.4-1: $\frac{C}{I} = 0.025$
(SEE p. 2-4)

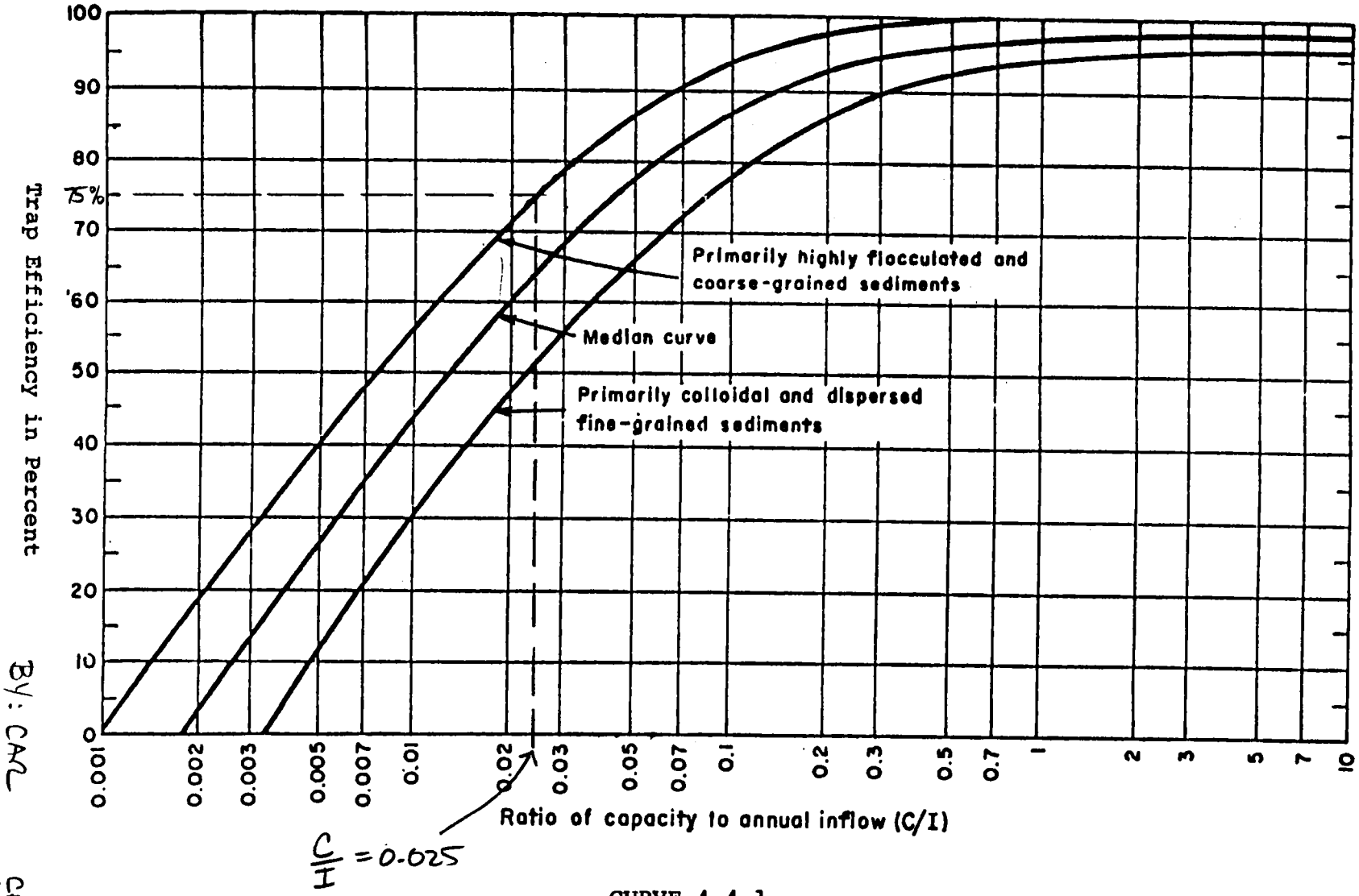
FROM FIGURE 4.4-1: R = 22.1 IN
(SEE p. 3-4)

$I = (R)(\text{DRAINAGE AREA})$

$I_{DA\#1} = \frac{(22.1\ IN)(9.56\ ac)}{(12\ IN/FT)} = 17.6\ ac\text{-}ft$

$I_{DA\#2} = \frac{(22.1\ IN)(1.92\ ac)}{(12\ IN/FT)} = 3.5\ ac\text{-}ft$

$I_{DA\#3} = \frac{(22.1\ IN)(4.63\ ac)}{(12\ IN/FT)} = 8.5\ ac\text{-}ft$



BY: CAC
DATE: 8/22/97
CHKD: JJB
DATE: 8/27/97

CURVE 4.4-1

TRAP EFFICIENCY OF RESERVOIRS

Reference: Brune, Gunnar M., "Trap Efficiency of Reservoirs", Trans. AGU, Vol. 34, No.3, pp 407-418, June 1953.

2 OF 4

3 OF 4

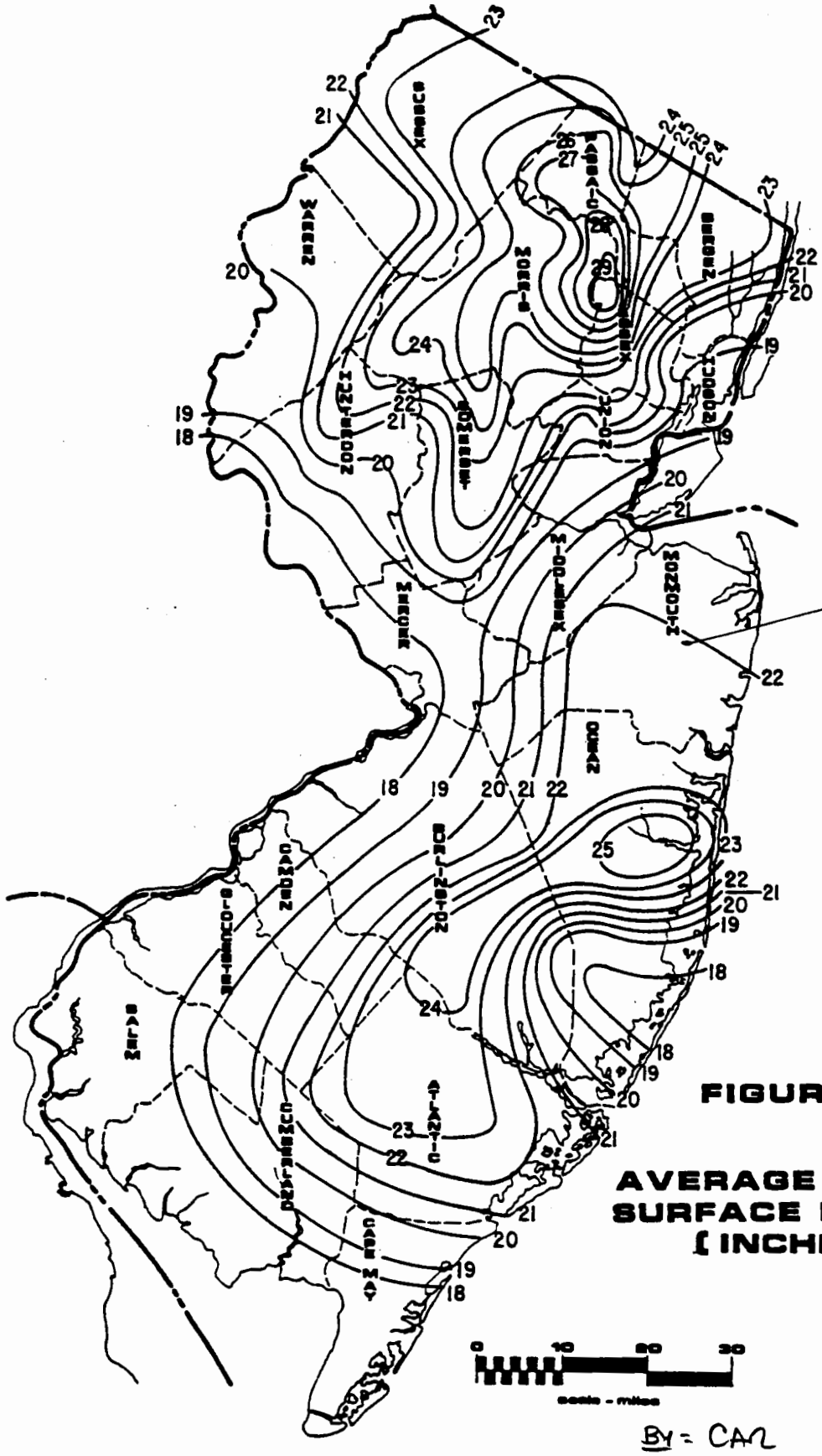


FIGURE 4.4-1

AVERAGE ANNUAL SURFACE RUNOFF (INCHES)

BY = CAR CHKD: JJB
DATE = 8/22/97 DATE: 8/27/97

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NWSE - SITE 5	JOB NUMBER: 7602/0104
SUBJECT: CAPACITY OF SEDIMENT BASINS	
BASED ON: TRAP EFFICIENCY	DRAWING NUMBER:
BY: CAR 8/22/97 / CHECKED BY: DJB 8/27/97	APPROVED BY: / DATE:

CALCULATE C:

$C_{DA\#1} = (0.025)(17.6\ ac\text{-}ft) = 0.44\ ac\text{-}ft$

$C_{DA\#2} = (0.025)(3.5\ ac\text{-}ft) = 0.09\ ac\text{-}ft$

$C_{DA\#3} = (0.025)(8.5\ ac\text{-}ft) = 0.21\ ac\text{-}ft$

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NWSE - SITE 5	JOB NUMBER: 7602/0106
SUBJECT: ESTIMATION OF SEDIMENT BASIN STORAGE CAPACITY	
BASED ON: "DURING-CONSTRUCTION" SCENARIO	DRAWING NUMBER:
BY: CAR 8/24/97 / CHECKED BY: JSB 8/27/97	APPROVED BY: / DATE:

- SEDIMENT STORAGE CAPACITY:

USE APPROACH AND EQUATIONS SPECIFIED IN "STANDARD FOR SEDIMENT BASIN," SECTION 4.4, REVISED, APRIL 1987. TO DETERMINE THE CAPACITY AND SIZE OF THE 3 SITE 5 SEDIMENT BASINS.

(1) ESTIMATE SEDIMENT CAPACITY STORAGE BY METHOD #1

- PROVIDE 0.07 ac-ft OF SEDIMENT STORAGE VOLUME PER ACRE OF TOTAL DRAINAGE AREA PER YEAR OF PLANNED LIFE.

[NOTE: THIS IS A VERY CONSERVATIVE APPROACH AND THE RESULTS WILL BE COMPARED TO METHOD #2]

DA #1: $V_{s_1} = \left(0.07 \frac{ac\text{-}ft}{ac\text{-}yr}\right)(9.56\,ac)\left(\frac{6\,\text{MONTHS}}{1}\right)\left(\frac{1\,yr}{12\,\text{MONTHS}}\right)$

$= \underline{0.33\ ac\text{-}ft}$

DA #2: $V_{s_2} = (0.07)(1.92)(6/12) = \underline{0.07\ ac\text{-}ft}$

DA #3: $V_{s_3} = (0.07)(4.63)(6/12) = \underline{0.16\ ac\text{-}ft}$

ASSUMPTION: LANDFILL AREA WILL BE CLEARED AND GRUBBED AND UNCOVERED FOR 4 MONTHS. AFTER THAT TIME, CAP CONSTRUCTION WILL BEGIN. ENTIRE AREA WILL BE COVERED IN 2 MONTHS. TOTAL TIME WHEN EROSION POSSIBLE = 6 MONTHS.

CLIENT	JOB NUMBER
NWSE - SITE 5	7602/0106

SUBJECT: ESTIMATION OF SEDIMENT BASIN STORAGE CAPACITY

BASED ON	DRAWING NUMBER
"DURING CONSTRUCTION" SCENARIO	

BY	CHECKED BY	APPROVED BY	DATE
CAR 8/24/97	SJB 8/27/97		

(2) ESTIMATE SEDIMENT CAPACITY STORAGE BY METHOD #2

$$V = (DA)(A)(DR)(TE)(1/\gamma_s)(2000)(1/43560)$$

V = VOL. OF SEDIMENT
DA = TOTAL DRAINAGE AREA
A = AVG. ANNUAL EROSION
DR = DELIVERY RATIO
TE = TRAP EFFICIENCY
γ_s = SUBMERGED SEDIMENT DENSITY
γ_a = AERATED DENSITY

(NOTE: THIS IS A MORE REALISTIC, LESS CONSERVATIVE APPROACH.)

(I) DETERMINE DA AND A. ASSUME 2 COVER TYPES (A) WOODED AREAS AND (B) CONSTRUCTION AREAS. FROM TABLE ON p. 4.4.3

A_{WOOD} = 0.2 TON/AC/YR
$A_{CONST.}$ = 50 TON/AC/YR

(II) FROM PREVIOUS MEASUREMENTS:

DA_1 = 9.56 ac = 0.015 sq mi
$DA_{1\,WOOD}$ = 2.15 ac
$DA_{1\,CONST.}$ = 7.41 ac

[SEE CALCULATIONS LABELED - "DETERMINATION OF SITE 5 DRAINAGE AREAS AND WEIGHTED CURVE NUMBERS - DURING CONSTRUCTION CONDITIONS REGRADED WASTE."]

DA_2 = 1.92 ac = 0.003 sq mi
$DA_{2\,WOOD}$ = 0.45 ac
$DA_{2\,CONST.}$ = 1.47 ac

DA_3 = 4.63 ac = 0.007 sq mi
$DA_{3\,WOOD}$ = 1.61 ac
$DA_{3\,CONST.}$ = 3.02 ac

CLIENT	JOB NUMBER
NWSE – SITE 5	7602/0106

SUBJECT: ESTIMATION OF SEDIMENT BASIN STORAGE CAPACITY

BASED ON	DRAWING NUMBER
"DURING CONSTRUCTION" SCENARIO	

BY	CHECKED BY	APPROVED BY	DATE
CAR 8/24/97	JOB 8/27/97		

(III) DETERMINE THE TOTAL SEDIMENT LOAD FOR EACH DRAINAGE AREA.

DA #1: $DA_1 \cdot A_{WOOD}$ = 2.15 ac × 0.2 TON/AC/YR = 0.43 TON/YR
$DA_1 \cdot A_{CONST}$ = 7.41 ac × 50 TON/AC/YR = 371 TON/YR

DA #2: $DA_2 \cdot A_{WOOD}$ = 0.45 ac × 0.2 TON/AC/YR = 0.09 TON/YR
$DA_2 \cdot A_{CONST}$ = 1.47 ac × 50 TON/AC/YR = 73.5 TON/YR

DA #3: $DA_3 \cdot A_{WOOD}$ = 1.61 ac × 0.2 TON/AC/YR = 0.32 TON/YR
$DA_3 \cdot A_{CONST}$ = 3.02 ac × 50 TON/AC/YR = 151 TON/YR

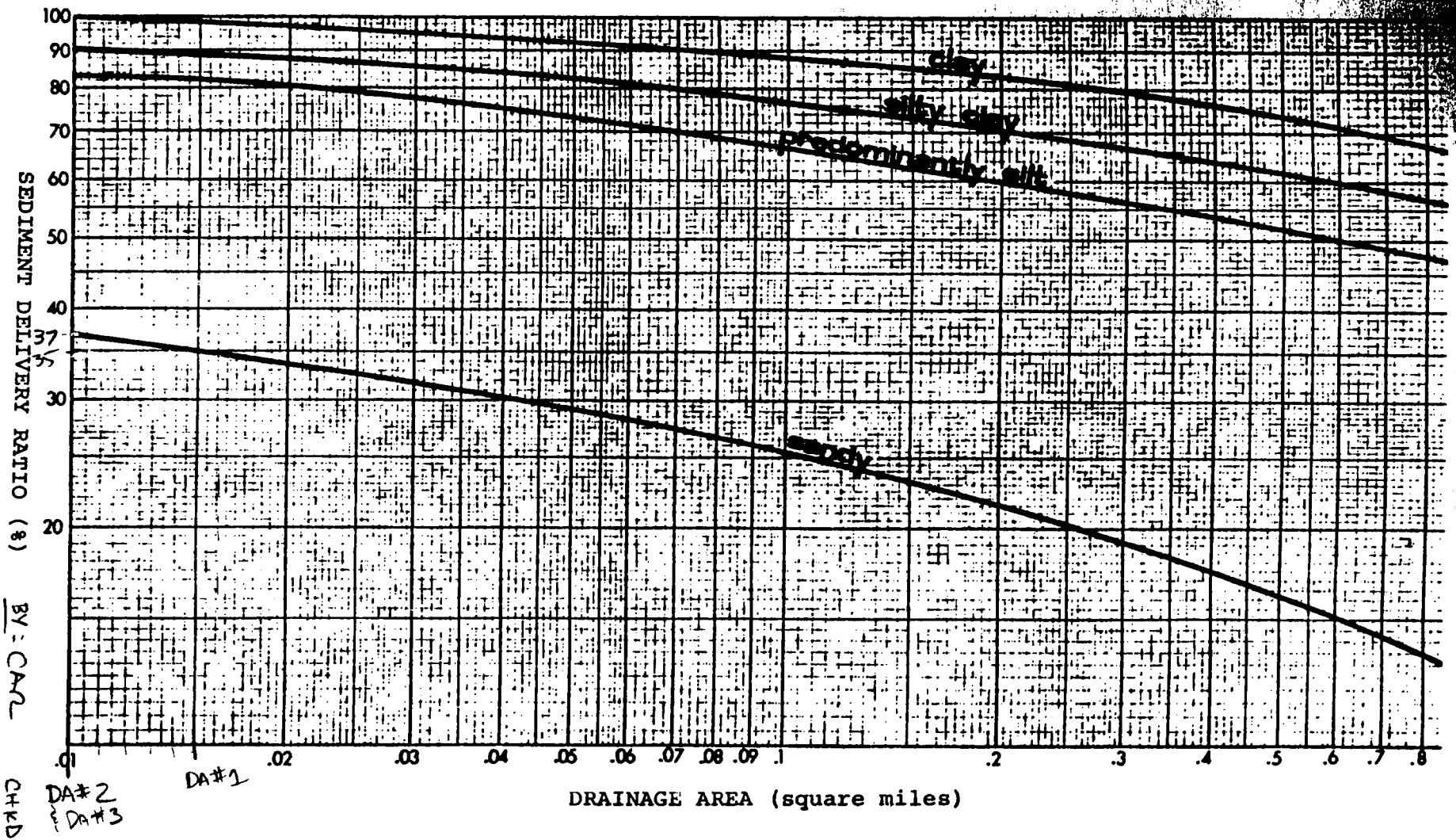
TOTAL 1 = 371.43 TON/YR
TOTAL 2 = 73.59 TON/YR
TOTAL 3 = 151.32 TON/YR

(IV) DETERMINE THE DELIVERY RATIO USING FIGURE 4.4-2, p. 4.4.10 (SEE p. 4 OF 11)

DA #1 = 35
DA #2 = 37
DA #3 = 37

ASSUME: – THE TRAP EFFICIENCY FOR BOTH AREAS IS 70%

– THE SEDIMENTS WILL BE MAINLY SAND AND WILL BE TYPICALLY DRY. USE AN AERATED DENSITY OF 90 lbs/ft³.



DA#1 ; DELIVERY RATIO = 35%

DA#2 & #3 ; DELIVERY RATIO = 37%

FIGURE 4.4-2

SEDIMENT DELIVERY RATIO VS. DRAINAGE AREA

BY: CAR DATE 8/24/97

CHKD: HB DATE: 8/27/97

Sediment Basin

4 of 11

CLIENT: NWSE - SITES	JOB NUMBER: 7602 / 0106
SUBJECT: ESTIMATION OF SEDIMENT BASIN STORAGE CAPACITY	
BASED ON: "DURING CONSTRUCTION" SCENARIO	DRAWING NUMBER:
BY: CAR 8/24/97 — CHECKED BY: DJD 8/27/97	APPROVED BY: — DATE:

(V) CALCULATE VOLUME OF TRAPPED SEDIMENT

$$V_1 = \left(371.43 \frac{TON}{YR}\right)(0.35)(0.70)\left(\frac{1}{90 \frac{lb}{ft^3}}\right)(2000)\left(\frac{1}{43560}\right)$$

$$= \left(0.046 \frac{ac \cdot ft}{YR}\right)\left(\frac{6 \text{ MONTHS}}{12 \text{ MONTHS/YR}}\right) = \underline{\underline{0.023 \text{ ac-ft}}}$$

$$V_2 = \left(73.59 \frac{TON}{YR}\right)(0.37)(0.70)\left(\frac{1}{90 \frac{lb}{ft^3}}\right)(2000)\left(\frac{1}{43560}\right)$$

$$= \left(0.010 \frac{ac-ft}{YR}\right)\left(\frac{6 \text{ MONTHS}}{12 \text{ MONTHS/YR}}\right) = \underline{\underline{0.005 \text{ ac-ft}}}$$

$$V_3 = \left(151.32 \frac{TON}{YR}\right)(0.37)(0.70)\left(\frac{1}{90 lb/ft^3}\right)(2000)\left(\frac{1}{43560}\right)$$

$$= \left(0.020 \frac{ac \cdot ft}{YR}\right)\left(\frac{6 \text{ MONTHS}}{12 \text{ MONTHS/YR}}\right) = \underline{\underline{0.010 \text{ ac-ft}}}$$

NOTE: USE THE SEDIMENT CAPACITY ESTIMATES BY METHOD #2 FOR THE REMAINDER OF THE CALCULATIONS.

(3) DETERMINE THE REQUIRED VOLUME OF STORAGE FOR THE RUNOFF FROM A 2-YR STORM FOR EACH DRAINAGE BASIN. USE THE GRAPHICAL PEAK DISCHARGE ESTIMATES CALCULATED FOR PRE-CONSTRUCTION AND DURING CONSTRUCTION CONDITIONS ALONG WITH THE EQUATIONS OF CHAPTER 6.0 OF THE TR-55 MANUAL TO COMPLETE THE CALCULATIONS.

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT	JOB NUMBER
NWSE - SITE 5	7602/0106

SUBJECT: VOLUME OF STORAGE FOR 2-YR STORM

BASED ON	DRAWING NUMBER
PRE- AND DURING CONSTRUCTION.	

BY	CHECKED BY	APPROVED BY	DATE
CAR 8/24/97	JJD 8/27/97		

(4) FOR THE "DURING CONSTRUCTION" SCENARIO DETERMINE TOTAL RUNOFF VOLUME FROM EACH DRAINAGE BASIN FOR A 2-YR STORM. USE RESULTS FROM TR-55:

DRAINAGE AREA #1

$R_{2\text{-}YR} = 1.49$ IN

AREA = 9.56 ac

$V_{R^1_{2\text{-}YR}} = 1.19$ ac-ft

DRAINAGE AREA #2

$R_{2\text{-}YR} = 1.49$ IN

AREA = 1.92 ac

$V_{R^2_{2\text{-}YR}} = 0.24$ ac-ft

DRAINAGE AREA #3

$R_{2\text{-}YR} = 1.23$ IN

AREA = 4.63 ac

$V_{R^3_{2\text{-}YR}} = 0.47$ ac-ft

(5) PEAK DISCHARGE RATES FOR THESE SAME AREAS AND STORMS ARE:

STORM	DA	qi (CFS)
2-YR	1	14
	2	3
	3	6

CLIENT	JOB NUMBER
NWSE - SITE 5	7602/0106

SUBJECT: VOLUME OF STORAGE FOR 2-YR STORM

BASED ON	DRAWING NUMBER
PRE- AND DURING CONSTRUCTION	

BY	CHECKED BY	APPROVED BY	DATE
CAR 8/28/97	JJD 8/27/97		

(6) FROM PRE-CONSTRUCTION CONDITIONS, THE ESTIMATED PEAK DISCHARGE RATES WERE:

DRAINAGE AREA (PRE-CONSTRUCTION)	Q(2-YR) (CFS)
1	2
2	3
3	1

(7) BECAUSE OF REGRADING OF THE WASTE, DRAINAGE AREAS FROM "PRE-CONSTRUCTION" TO "DURING CONSTRUCTION" HAVE CHANGED AND WERE LABELED DIFFERENTLY. THE FOLLOWING TABLE PROVIDES A CROSS-REFERENCE:

DRAINAGE AREA "DURING CONSTRUCTION"		DRAINAGE AREA "PRE-CONSTRUCTION"
1	→	1, 3
2	→	1
3	→	2

(8) ASSUME:

(I) - RUNOFF FROM "D-C" DA # 1 = RUNOFF FROM "P-C" DA # 3

(II) - RUNOFF FROM "D-C" DA # 2 = $\left(\frac{1.92\ ac}{5.64\ ac}\right)$ · RUNOFF FROM "P-C" DA # 1

(III) - RUNOFF FROM "D-C" DA # 3 = RUNOFF FROM "P-C" DA # 2

CLIENT	JOB NUMBER
NWSE - SITE 5	7602/0106

SUBJECT: VOLUME OF STORAGE FOR 2-YR STORM

BASED ON	DRAWING NUMBER
PRE- AND DURING CONSTRUCTION	

BY	CHECKED BY	APPROVED BY	DATE
CAR 8/24/97	JAB 8/27/97		

(9) WITH THESE ASSUMPTIONS AND NOTATIONS OF CHAPTER 6.0 TR-55:

$q_{o_{DA\#1}} = 1$ CFS (PRE-CONSTRUCTION ZONE 3)

$q_{o_{DA\#2}} = 0.7$ CFS (PRE-CONSTRUCTION ZONE 1)

$q_{o_{DA\#3}} = 3$ CFS (PRE-CONSTRUCTION ZONE 2)

$q_{i_{DA\#1}} = 14$ CFS (POST-CONST., ZONE 1)

$q_{i_{DA\#2}} = 3$ CFS (POST-CONST., ZONE 2)

$q_{i_{DA\#3}} = 6$ CFS (POST-CONST., ZONE 3)

(10) CALCULATE THE RATIO OF q_o/q_i

$$\frac{q_o}{q_{i_1}} = \frac{1}{14} = \underline{\underline{0.07}}$$

$$\frac{q_o}{q_{i_2}} = \frac{0.7}{3} = \underline{\underline{0.23}}$$

$$\frac{q_o}{q_{i_3}} = \frac{3}{6} = \underline{\underline{0.50}}$$

CLIENT	JOB NUMBER
NWSE - SITE 5	7602 / 0106

SUBJECT: VOLUME OF STORAGE FOR 2-YR STORM

BASED ON	DRAWING NUMBER
PRE- AND DURING CONSTRUCTION	

BY	CHECKED BY	APPROVED BY	DATE
CAR 8/24/97	JJB 8/27/97		

(III) USING FIGURE 61 (SEE p. 10 OF 11) AND THE CALCULATED q_o/q_i VALUES, DETERMINE THE RATIO OF VOLUME OF STORAGE TO VOLUME OF RUNOFF. THEN CALCULATE THE VOLUME OF STORAGE (V_S) USING V_R FROM p. 6 OF 11.

(I) DRAINAGE AREA #1

$$\frac{q_o}{q_i} = 0.07 \Rightarrow \text{USE } 0.1 \Rightarrow \frac{V_S}{V_R} = 0.55$$

(TYPE III CURVE)

$$V_{S_{2YR}} = (0.55)(1.19 \text{ ac-ft})$$

$$= \underline{0.65 \text{ ac-ft}}$$

(II) DRAINAGE AREA #2

$$\frac{q_o}{q_i} = 0.23 \Rightarrow \frac{V_S}{V_R} = 0.43$$

$$V_{S_{2YR}} = (0.43)(0.24 \text{ ac-ft}) = \underline{0.10 \text{ ac-ft}}$$

(III) DRAINAGE AREA #3

$$\frac{q_o}{q_i} = 0.50 \Rightarrow \frac{V_S}{V_R} = 0.275$$

$$V_{S_{2YR}} = (0.275)(0.47 \text{ ac-ft}) = \underline{0.13 \text{ ac-ft}}$$

BY: CAL CHKD: JJB
DATE: 8/24/97 DATE: 8/27/97

Input requirements and procedures

Use figure 6-1 to estimate storage volume (V_s) required or peak outflow discharge (q_o). The most frequent application is to estimate V_s, for which the required inputs are runoff volume (V_r), q_o, and peak inflow discharge (q_i). To estimate q_o, the required inputs are V_r, V_s, and q_i.

Estimating V_s

Use worksheet 6a to estimate V_s, storage volume required, by the following procedure.

1. Determine q_o. Many factors may dictate the selection of peak outflow discharge. The most common is to limit downstream discharges to a desired level, such as predevelopment discharge. Another factor may be that the outflow device has already been selected.
2. Estimate q_i by procedures in chapters 4 or 5. Do not use peak discharges developed by any other procedure. When using the Tabular Hydrograph method to estimate q_i for a subarea, only use

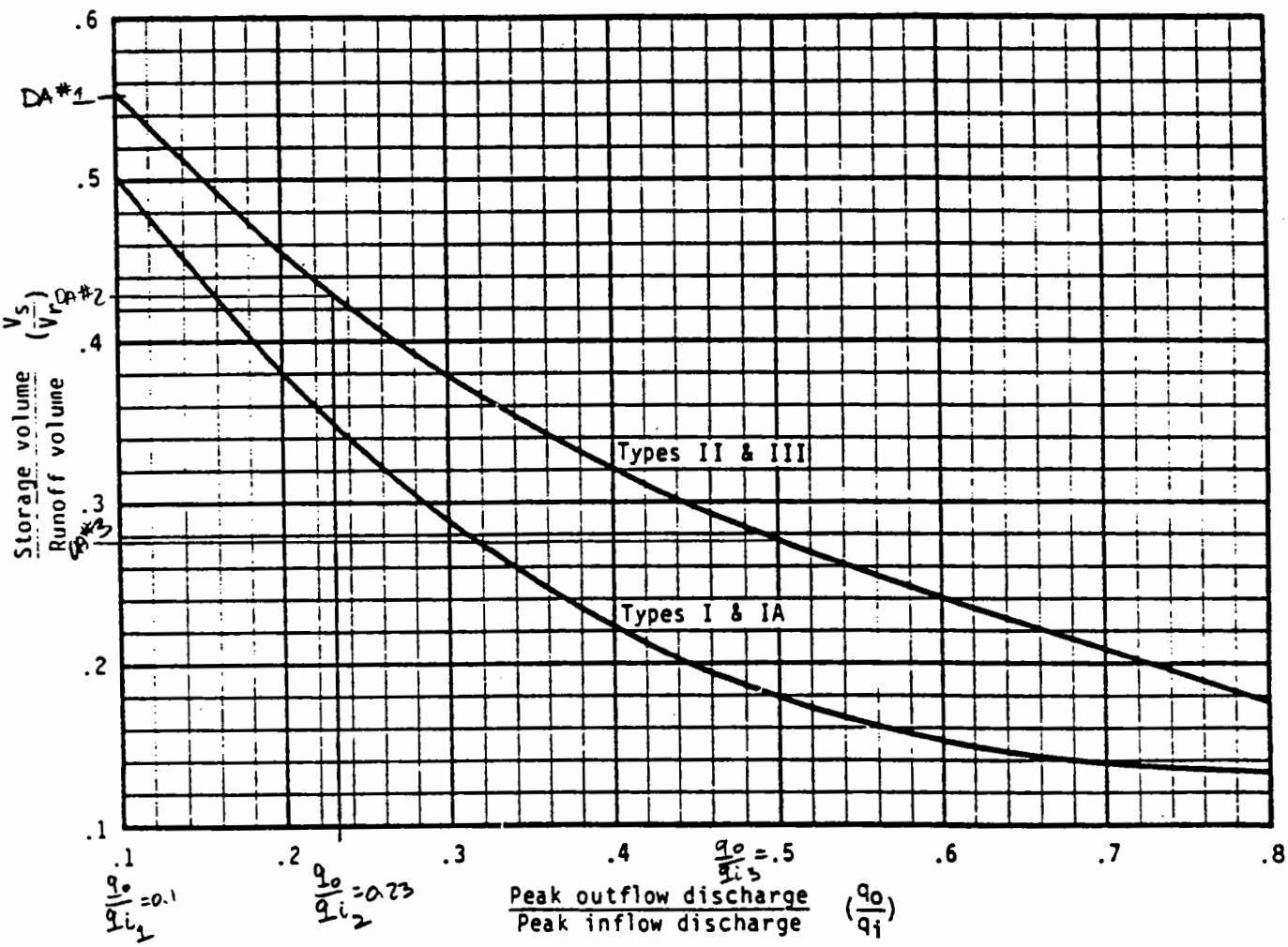


Figure 6-1.—Approximate detention basin routing for rainfall types I, IA, II, and III.

CLIENT	JOB NUMBER
NWSE - SITE 5	7602/0106

SUBJECT: CAPACITY OF SEDIMENT BASIN → SEDIMENT + 2 YR STORM

BASED ON	DRAWING NUMBER
CHP #6 - TR-55	

BY	CHECKED BY	APPROVED BY	DATE
CAR 8/24/97	JJB 8/27/97		

(12) DETERMINE TOTAL, REQUIRED CAPACITY OF SEDIMENT BASINS.

DRAINAGE AREA #1

$$\text{TOTAL VOLUME}_1 = V^1_{SED} + V^1_{2\text{-}YR}$$

$$= 0.023 \text{ ac-ft} + 0.65 \text{ ac-ft}$$

$$V_{T_1} = \underline{\underline{0.67 \text{ ac-ft}}}$$

DRAINAGE AREA #2

$$\text{TOTAL VOLUME}_2 = V^2_{SED} + V^2_{2\text{-}YR}$$

$$= 0.005 \text{ ac-ft} + 0.10 \text{ ac-ft}$$

$$= \underline{\underline{0.11 \text{ ac-ft}}}$$

DRAINAGE AREA #3

$$\text{TOTAL VOLUME}_3 = V^3_{SED} + V^3_{2\text{-}YR}$$

$$= 0.01 \text{ ac-ft} + 0.13 \text{ ac-ft}$$

$$= \underline{\underline{0.14 \text{ ac-ft}}}$$

CALCULATION WORKSHEET Order No. 19119 (01-91)

PAGE ____ OF ____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

DETERMINE DIMENSIONS
OF SITE 5 SEDIMENT/DETENTION
BASINS FOR
DRAINAGE AREAS 1, 2 & 3.

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NWSE	JOB NUMBER: 7602/0106
SUBJECT: SITE 5 - SEDIMENT/DETENTION BASIN DIMENSIONS	
BASED ON: NJ REGS	DRAWING NUMBER:
BY: CAR 8/27/97	CHECKED BY: JJB 9/27/97
APPROVED BY:	DATE:

(I) PURPOSE:

(1) ESTIMATE THE REQUIRED CAPACITY OF DETENTION BASINS

(2) DETERMINE DIMENSIONS OF BASINS THAT WILL WORK FOR BOTH TRAPPING SEDIMENT AND STORING EXCESS STORM WATER RUNOFF

(II) APPROACH:

(1) USE RESULTS OF PRE-CONSTRUCTION AND POST-CONSTRUCTION RUNOFF CALCULATIONS WITH TR-55 DETENTION BASIN ROUTING TECHNIQUES (CHAPTER 6) TO DETERMINE THE REQUIRED VOLUME OF STORAGE FOR DRAINAGE AREAS 1, 2 & 3 FOR A 25-YR STORM.

(2) USE SEDIMENT BASIN SIZING EQUATIONS OF NJ REGS TO DETERMINE AN INITIAL SIZE OF BASIN REQUIRED FOR EACH DRAINAGE AREA. DETERMINE IF IT IS ADEQUATE FOR BOTH SEDIMENT STORAGE AND STORM-WATER DETENTION.

(III) BECAUSE THE PEAK DISCHARGE RATES FOR POST-CONSTRUCTION CONDITIONS EXCEED THOSE FROM PRE-CONSTRUCTION CONDITIONS, PERMANENT DETENTION BASINS ARE REQUIRED FOR EACH DRAINAGE AREA.

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NWSE	JOB NUMBER: 7602/0106
SUBJECT: SITE 5 - SEDIMENT / DETENTION BASIN DIMENSIONS	
BASED ON: NJ REGS	DRAWING NUMBER:
BY: CAR 8/27/97 — CHECKED BY: JJB 8/27/97	APPROVED BY: — DATE:

(IV) FOR THE POST-CONSTRUCTION SCENARIO DETERMINE THE TOTAL RUNOFF VOLUME FROM EACH DRAINAGE AREA FOR A 25-YR STORM. USE RESULTS FROM TR-55.

DA#1 R_{25yr} = 2.35 IN

AREA = 9.72 ac

$V^1_{R_{25YR}}$ = 1.90 ac-ft

DA#2 R_{25YR} = 3.78 IN

AREA = 1.70 ac

$V^2_{R_{25YR}}$ = 0.54 ac-ft

DA#3 R_{25YR} = 2.81 IN

AREA = 4.69 ac

$V^2_{R_{25YR}}$ = 1.10 ac-ft

(V) PEAK DISCHARGE RATES FOR THESE SAME AREAS AND STORMS ARE:

STORM	DA	q_p (CFS)
25-YR	1	23
	2	7
	3	13

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NWSE	JOB NUMBER: 7602/0106
SUBJECT: SITE 5 - SEDIMENT/DETENTION BASIN DIMENSIONS	
BASED ON: NJ REGS	DRAWING NUMBER:
BY: CAM 8/27/97 — CHECKED BY: JJB 8/27/97	APPROVED BY: — DATE:

VI FROM PRE-CONSTRUCTION CONDITIONS, THE ESTIMATED PEAK DISCHARGE RATES FOR THE CORRESPONDING POST-CONSTRUCTION CONDITIONS DRAINAGE AREAS ARE THE FOLLOWING

DA (POST-CONST)	q_o 25 YR (CFS)	
1	6	(DA #3 PC)
2	$\left(\frac{1.20}{5.64}\right)(9) = 2.7$	(PORTION OF DA #1 PC)
3	12	(DA #2 PC)

VII CALCULATE q_o/q_i

DA	q_o/q_i
1	6/23 = 0.26
2	2.7/7 = 0.39
3	12/13 = 0.92

VIII FROM FIGURE 6-1 (SEE P. 4 OF 9) OF TR-55 FOR TYPE III

DA	q_o/q_i	V_s/V_R	V_R (ac-ft)	V_s (ac-ft)
1	0.26	0.41	1.90	0.78
2	0.39	0.33	0.54	0.18
3	0.92	0.17	1.13	0.19

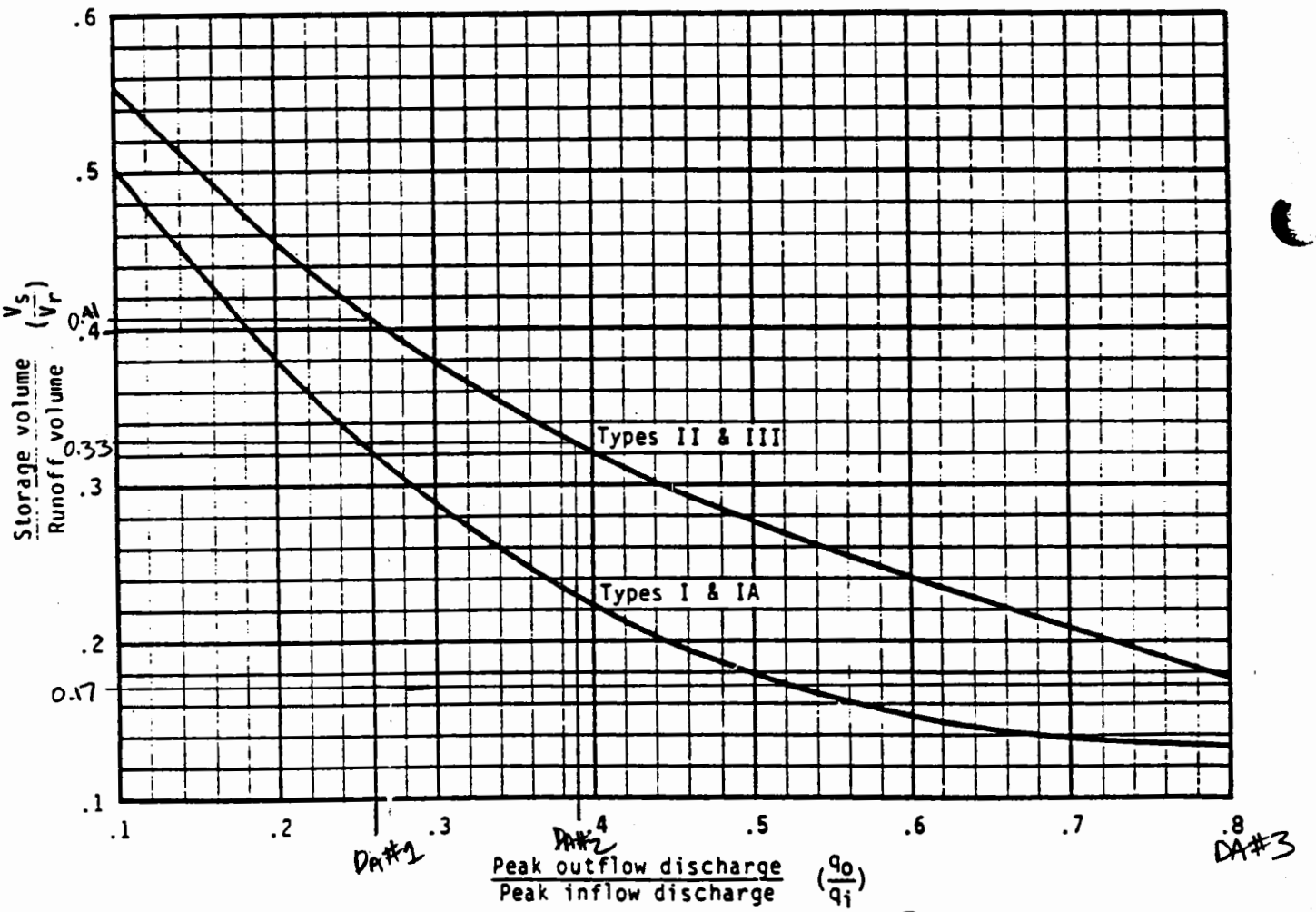
Input requirements and procedures

Use figure 6-1 to estimate storage volume (V_s) required or peak outflow discharge (q_o). The most frequent application is to estimate V_s, for which the required inputs are runoff volume (V_r), q_o, and peak inflow discharge (q_i). To estimate q_o, the required inputs are V_r, V_s, and q_i.

Estimating V_s

Use worksheet 6a to estimate V_s, storage volume required, by the following procedure.

1. Determine q_o. Many factors may dictate the selection of peak outflow discharge. The most common is to limit downstream discharges to a desired level, such as predevelopment discharge. Another factor may be that the outflow device has already been selected.
2. Estimate q_i by procedures in chapters 4 or 5. Do not use peak discharges developed by any other procedure. When using the Tabular Hydrograph method to estimate q_i for a subarea, only use



BY: CAK
DATE 8/27/97

Figure 6-1.—Approximate detention basin routing for rainfall types I, IA, II, and III.

CHKD: JJB
DATE: 8/27/97

CLIENT NWSE	JOB NUMBER 7602/0106
SUBJECT SITE 5 - SEDIMENT/DETENTION BASIN DIMENSIONS	
BASED ON NJ REGS	DRAWING NUMBER
BY CAL 8/27/97 / CHECKED BY JJB 8/27/97	APPROVED BY / DATE

(IX) COMPARE VOLUME REQUIREMENTS FOR SEDIMENT BASINS AND DETENTION BASINS.

DA	SEDIMENT BASIN (+) Vs (ac-ft)	DETENTION BASIN Vs (ac-ft)
1	0.67	0.78 (*)
2	0.11	0.18 (*)
3	0.21 (*)	0.19

+ - FROM CALCULATIONS LABELED "CALCULATIONS FOR CAPACITY AND SIZE OF SEDIMENT BASINS BASED ON NJ REGS."

* - MAXIMUM VOLUME REQUIRED

NOTE:

- USE THE MAXIMUM STORAGE VOLUME REQUIRED TO SIZE THE SEDIMENT/DETENTION BASINS FOR THE 3 DRAINAGE AREAS.

- USE THE APPROACH PROVIDED IN THE NJ REGS FOR SIZING OF SEDIMENT BASINS TO COME UP WITH AN INITIAL SIZE OF THE BASINS.

CLIENT	JOB NUMBER
NSW EARLE	7602-0106

SUBJECT: SITE 5 - SEDIMENT / DETENTION BASIN DIMENSIONS

BASED ON	DRAWING NUMBER
NJ REGS	

BY	CHECKED BY	APPROVED BY	DATE
BER / CAR 8/27/97	JJB 8/27/97		

(X) Calculate Minimum Width : $W = 10\sqrt{Q_5}$

Use Q_{25} to be conservative.

∴ DA #1 : $W_{min} = 10\sqrt{35} = 59.16$ FT = 60 FT

DA #2 : $W_{min} = 10\sqrt{7} = 26.46$ FT = 27 FT

DA #3 : $W_{min} = 10\sqrt{16} = 40.0$ FT

(XI) Length :

According to New Jersey regulations, the effective flow length is equal to at least two (2) times the effective flow width.

∴ DA#1 : $L = 2W = 2(60) = 120$ FT

DA#2 : $L = 2W = 2(27) = 54$ FT

DA#3 : $L = 2W = 2(40) = 80$ FT

(XII) Depth :

The average depth shall be 4 feet.

NOTE: THESE LENGTHS, WIDTHS AND DEPTHS ARE MEASURED AT THE PRINCIPAL SPILLWAY CREST ELEVATION.

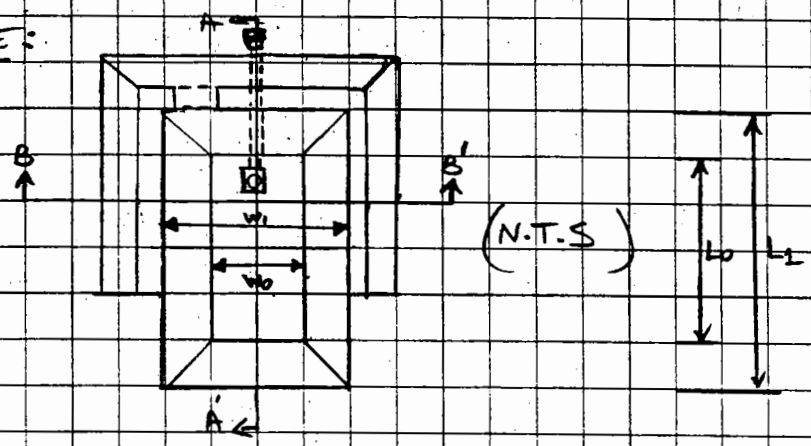
CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NWSE	JOB NUMBER: 7602/0106
SUBJECT: SITE 5 — SEDIMENT/DETENTION BASIN DIMENSIONS	
BASED ON: NJ REGS	DRAWING NUMBER:
BY: CAR 8/27/97	CHECKED BY: JJB 8/27/97
APPROVED BY:	DATE:

(XIII) LIMITED TOPOGRAPHY IN THE AREAS WHERE THE SEDIMENT/DETENTION BASINS WILL BE CONSTRUCTED FOR DA# 1, 2 & 3 WILL NOT ALLOW FOR COMPLETE DESIGN OF THE BASINS. FOR ESTIMATION PURPOSES ASSUME THE SEDIMENT BASINS FOR DAs # 1, 2 & 3 WILL BE EXCAVATED TYPE.

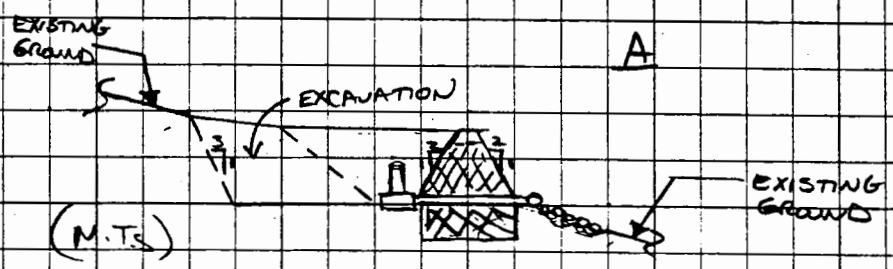
EXCAVATED TYPE:

PLAN VIEW



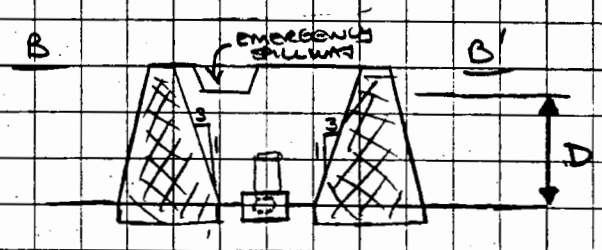
(N.T.S)

X-SECT A-A'



(N.T.S)

X-SECT B-B'



(NTS)

CLIENT NWSE	JOB NUMBER 7602/0106
SUBJECT SITE 5 - SEDIMENT/DETENTION BASIN DIMENSIONS	
BASED ON NJ REGS	DRAWING NUMBER
BY CAR 8/27/97 / CHECKED BY JJD 8/27/97	APPROVED BY / DATE

(XIV) THE VOLUME OF THE SEDIMENT/DETENTION BASINS CAN BE CALCULATED WITH THE FOLLOWING FORMULA:

$$V = \left\{\left(\frac{L_0 + L_1}{2}\right) * \left(\frac{W_0 + W_1}{2}\right)\right\} D$$

ASSUME: LENGTHS AND WIDTHS CALCULATED BY NJ REGS FOR SEDIMENT BASINS ARE THE BOTTOM DIMENSIONS TO BE CONSERVATIVE. USE D = 4 FT.

DA#1:

$$L_1 = L_0 + 4(3) + 4(2)$$
$$= 120 + 12 + 8 = \underline{140 \text{ FT}}$$

$$W_1 = W_0 + 4(3) + 4(3)$$
$$= 60 + 12 + 12 = \underline{84 \text{ FT}}$$

$$V_1 = \left(\frac{120 + 140}{2}\right) * \left(\frac{60 + 84}{2}\right) \cdot 4$$
$$= 37{,}440 \text{ FT}^3$$
$$= \underline{0.86 \text{ ac-ft}}$$

DA#2:

$$L_1 = 54 + 4(3) + 4(2) = \underline{74 \text{ ft}}$$
$$W_1 = 27 + 4(3) + 4(3) = \underline{51 \text{ FT}}$$

$$V_2 = \left(\left(\frac{54 + 74}{2}\right) * \left(\frac{27 + 51}{2}\right)\right) 4 = \underline{9984 \text{ FT}^3}$$
$$= \underline{0.23 \text{ ac-ft}}$$

CLIENT	JOB NUMBER
NWSE	7602/0106

SUBJECT: SITE 5 — SEDIMENT/DETENTION BASIN DIMENSIONS

BASED ON	DRAWING NUMBER
NJ REGS	

BY	CHECKED BY	APPROVED BY	DATE
CAR 8/27/97	JJB 8/27/97		

DA#3

$L_1 = 80 + 4(3) + 4(2) = \underline{100 \text{ FT}}$

$W_1 = 40 + 4(3) + 4(3) = \underline{64 \text{ FT}}$

$$V_3 = \left(\frac{80+100}{2}\right)\left(\frac{40+64}{2}\right)(4)$$

$$= \underline{18{,}720 \text{ FT}^3}$$

$$= \underline{0.43 \text{ ac-ft}}$$

(XV) COMPARE REQUIRED VOLUMES WITH CALCULATED VOLUMES TO DETERMINE IF THE ESTIMATED SIZES ARE ADEQUATE

DA	REQUIRED VOLUME (ac-ft)		CALCULATED VOLUME (ac-ft)
1	0.78	<	0.86
2	0.18	<	0.23
3	0.21	<	0.43

∴ THE ESTIMATED DIMENSIONS FOR EACH DRAINAGE BASIN ARE ADEQUATE AND CONSERVATIVE.

NOTE: ADDITIONAL CALCULATIONS WILL BE NECESSARY AT A LATER TIME TO REFINE THE DIMENSIONS OF EACH BASIN AND TO SIZE THE OUTLET STRUCTURES. THESE CALCULATIONS WILL BE PERFORMED ONCE ADDITIONAL TOPOGRAPHY INFORMATION IS AVAILABLE.

D.3 BASIN INFLOW HYDROGRAPHS

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

Executed: 11-04-1997 18:12:51
Watershed file: --> 5-SB1 .WSD
Hydrograph file: --> 5-SB1 .HYD

Earle - Site 5
Sediment Basin # 1

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
Drainage Area 1	9.56	79.0	0.10	0.10	5.20	2.97	.1	.10

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 9.56 acres or 0.01494 sq.mi
Peak discharge = 25 cfs

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

Subarea Description	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Drainage Area 1	0.10	0.10	**	**	No	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

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

Executed: 11-04-1997 18:12:51
Watershed file: --> 5-SB1 .WSD
Hydrograph file: --> 5-SB1 .HYD

Earle - Site 5
Sediment Basin # 1

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Drainage Area 1	25	12.3
Composite Watershed	25	12.3

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

Executed: 11-04-1997 18:12:51
Watershed file: --> 5-SB1 .WSD
Hydrograph file: --> 5-SB1 .HYD

Earle - Site 5
Sediment Basin # 1

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Drainage Area 1	1	1	2	4	7	9	16	25	24
Total (cfs)	1	1	2	4	7	9	16	25	24

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Drainage Area 1	18	14	10	7	4	4	3	3	3
Total (cfs)	18	14	10	7	4	4	3	3	3

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Drainage Area 1	2	2	2	2	2	1	1	1	1
Total (cfs)	2	2	2	2	2	1	1	1	1

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Drainage Area 1	1	1	1	0	0
Total (cfs)	1	1	1	0	0

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

Executed: 11-04-1997 18:12:51
Watershed file: --> 5-SB1 .WSD
Hydrograph file: --> 5-SB1 .HYD

Earle - Site 5
Sediment Basin # 1

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	1	14.8	2
11.1	1	14.9	2
11.2	1	15.0	2
11.3	1	15.1	2
11.4	1	15.2	2
11.5	2	15.3	2
11.6	2	15.4	2
11.7	3	15.5	2
11.8	3	15.6	2
11.9	4	15.7	2
12.0	7	15.8	1
12.1	9	15.9	1
12.2	16	16.0	1
12.3	25	16.1	1
12.4	24	16.2	1
12.5	18	16.3	1
12.6	14	16.4	1
12.7	10	16.5	1
12.8	7	16.6	1
12.9	5	16.7	1
13.0	4	16.8	1
13.1	4	16.9	1
13.2	4	17.0	1
13.3	4	17.1	1
13.4	3	17.2	1
13.5	3	17.3	1
13.6	3	17.4	1
13.7	3	17.5	1
13.8	3	17.6	1
13.9	2	17.7	1
14.0	2	17.8	1
14.1	2	17.9	1
14.2	2	18.0	1
14.3	2	18.1	1
14.4	2	18.2	1
14.5	2	18.3	1
14.6	2	18.4	1
14.7	2	18.5	1

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

Executed: 11-04-1997 18:12:51
Watershed file: --> 5-SB1 .WSD
Hydrograph file: --> 5-SB1 .HYD

Earle - Site 5
Sediment Basin # 1

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	1	22.4	0
18.7	1	22.5	0
18.8	1	22.6	0
18.9	1	22.7	0
19.0	1	22.8	0
19.1	1	22.9	0
19.2	1	23.0	0
19.3	1	23.1	0
19.4	1	23.2	0
19.5	1	23.3	0
19.6	1	23.4	0
19.7	1	23.5	0
19.8	1	23.6	0
19.9	1	23.7	0
20.0	1	23.8	0
20.1	1	23.9	0
20.2	1	24.0	0
20.3	1	24.1	0
20.4	1	24.2	0
20.5	1	24.3	0
20.6	1	24.4	0
20.7	1	24.5	0
20.8	1	24.6	0
20.9	1	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0
22.1	0	25.9	0
22.2	0		
22.3	0		

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

Executed: 11-06-1997 09:40:05
Watershed file: --> 5-DB1-2 .WSD
Hydrograph file: --> 5-DB1-2 .HYD

EARLE - SITE 5
DETENTION BASIN # 1
2 YEAR STORM

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
Drainage Area 1	9.72	65.0	0.10	0.10	3.40	0.70	.32	.30

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 9.72 acres or 0.01519 sq.mi
Peak discharge = 5 cfs

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

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Drainage Area 1	0.10	0.10	**	**	No	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

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

Executed: 11-06-1997 09:40:05
Watershed file: --> 5-DB1-2 .WSD
Hydrograph file: --> 5-DB1-2 .HYD

EARLE - SITE 5
DETENTION BASIN # 1
2 YEAR STORM

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Drainage Area 1	5	12.2
Composite Watershed	5	12.2

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

Executed: 11-06-1997 09:40:05
Watershed file: --> 5-DB1-2 .WSD
Hydrograph file: --> 5-DB1-2 .HYD

EARLE - SITE 5
DETENTION BASIN # 1
2 YEAR STORM

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Drainage Area 1	0	0	0	0	1	2	5	5	4
Total (cfs)	0	0	0	0	1	2	5	5	4

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Drainage Area 1	4	3	2	2	1	1	1	1	1
Total (cfs)	4	3	2	2	1	1	1	1	1

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Drainage Area 1	1	1	1	1	1	0	0	0	0
Total (cfs)	1	1	1	1	1	0	0	0	0

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Drainage Area 1	0	0	0	0	0
Total (cfs)	0	0	0	0	0

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

Executed: 11-06-1997 09:40:05
Watershed file: --> 5-DB1-2 .WSD
Hydrograph file: --> 5-DB1-2 .HYD

EARLE - SITE 5
DETENTION BASIN # 1
2 YEAR STORM

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	1
11.1	0	14.9	1
11.2	0	15.0	1
11.3	0	15.1	1
11.4	0	15.2	1
11.5	0	15.3	1
11.6	0	15.4	1
11.7	0	15.5	1
11.8	0	15.6	1
11.9	0	15.7	1
12.0	1	15.8	0
12.1	2	15.9	0
12.2	5	16.0	0
12.3	5	16.1	0
12.4	4	16.2	0
12.5	4	16.3	0
12.6	3	16.4	0
12.7	2	16.5	0
12.8	2	16.6	0
12.9	2	16.7	0
13.0	1	16.8	0
13.1	1	16.9	0
13.2	1	17.0	0
13.3	1	17.1	0
13.4	1	17.2	0
13.5	1	17.3	0
13.6	1	17.4	0
13.7	1	17.5	0
13.8	1	17.6	0
13.9	1	17.7	0
14.0	1	17.8	0
14.1	1	17.9	0
14.2	1	18.0	0
14.3	1	18.1	0
14.4	1	18.2	0
14.5	1	18.3	0
14.6	1	18.4	0
14.7	1	18.5	0

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

Executed: 11-06-1997 09:40:05
Watershed file: --> 5-DB1-2 .WSD
Hydrograph file: --> 5-DB1-2 .HYD

EARLE - SITE 5
DETENTION BASIN # 1
2 YEAR STORM

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	0	22.4	0
18.7	0	22.5	0
18.8	0	22.6	0
18.9	0	22.7	0
19.0	0	22.8	0
19.1	0	22.9	0
19.2	0	23.0	0
19.3	0	23.1	0
19.4	0	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0
22.1	0	25.9	0
22.2	0		
22.3	0		

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

Executed: 11-06-1997 09:41:29
Watershed file: --> 5-DB1 .WSD
Hydrograph file: --> 5-DB1 .HYD

EARLE SITE 5
DETENTION BASIN # 1
10 YEAR STORM

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
Drainage Area 1	9.72	65.0	0.10	0.10	5.20	1.79	.21	.30

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 9.72 acres or 0.01519 sq.mi
Peak discharge = 13 cfs

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

Subarea Description	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Drainage Area 1	0.10	0.10	**	**	No	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

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

Executed: 11-06-1997 09:41:29
Watershed file: --> 5-DB1 .WSD
Hydrograph file: --> 5-DB1 .HYD

EARLE SITE 5
DETENTION BASIN # 1
10 YEAR STORM

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Drainage Area 1	13	12.2
Composite Watershed	13	12.2

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

Executed: 11-06-1997 09:41:29
Watershed file: --> 5-DB1 .WSD
Hydrograph file: --> 5-DB1 .HYD

EARLE SITE 5
DETENTION BASIN # 1
10 YEAR STORM

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Drainage Area 1	0	0	0	1	2	6	13	13	11
Total (cfs)	0	0	0	1	2	6	13	13	11

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Drainage Area 1	9	7	5	4	3	3	2	2	2
Total (cfs)	9	7	5	4	3	3	2	2	2

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Drainage Area 1	2	2	2	1	1	1	1	1	1
Total (cfs)	2	2	2	1	1	1	1	1	1

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Drainage Area 1	1	1	1	0	0
Total (cfs)	1	1	1	0	0

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

Executed: 11-06-1997 09:41:29
Watershed file: --> 5-DB1 .WSD
Hydrograph file: --> 5-DB1 .HYD

EARLE SITE 5
DETENTION BASIN # 1
10 YEAR STORM

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	2
11.1	0	14.9	1
11.2	0	15.0	1
11.3	0	15.1	1
11.4	0	15.2	1
11.5	0	15.3	1
11.6	0	15.4	1
11.7	0	15.5	1
11.8	1	15.6	1
11.9	1	15.7	1
12.0	2	15.8	1
12.1	6	15.9	1
12.2	13	16.0	1
12.3	13	16.1	1
12.4	11	16.2	1
12.5	9	16.3	1
12.6	7	16.4	1
12.7	5	16.5	1
12.8	4	16.6	1
12.9	4	16.7	1
13.0	3	16.8	1
13.1	3	16.9	1
13.2	3	17.0	1
13.3	2	17.1	1
13.4	2	17.2	1
13.5	2	17.3	1
13.6	2	17.4	1
13.7	2	17.5	1
13.8	2	17.6	1
13.9	2	17.7	1
14.0	2	17.8	1
14.1	2	17.9	1
14.2	2	18.0	1
14.3	2	18.1	1
14.4	2	18.2	1
14.5	2	18.3	1
14.6	2	18.4	1
14.7	2	18.5	1

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

Executed: 11-06-1997 09:41:29
Watershed file: --> 5-DB1 .WSD
Hydrograph file: --> 5-DB1 .HYD

EARLE SITE 5
DETENTION BASIN # 1
10 YEAR STORM

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	1	22.4	0
18.7	1	22.5	0
18.8	1	22.6	0
18.9	1	22.7	0
19.0	1	22.8	0
19.1	1	22.9	0
19.2	1	23.0	0
19.3	1	23.1	0
19.4	1	23.2	0
19.5	1	23.3	0
19.6	1	23.4	0
19.7	1	23.5	0
19.8	1	23.6	0
19.9	1	23.7	0
20.0	1	23.8	0
20.1	1	23.9	0
20.2	1	24.0	0
20.3	1	24.1	0
20.4	1	24.2	0
20.5	1	24.3	0
20.6	1	24.4	0
20.7	1	24.5	0
20.8	1	24.6	0
20.9	1	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0
22.1	0	25.9	0
22.2	0		
22.3	0		

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

Executed: 11-06-1997 09:42:31
Watershed file: --> 5-DB125 .WSD
Hydrograph file: --> 5-DB125 .HYD

EARLE - SITE 5
DETENTION BASIN # 1
25 YEAR STORM

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
Drainage Area 1	9.72	65.0	0.10	0.10	6.00	2.35	.18	.10

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 9.72 acres or 0.01519 sq.mi
Peak discharge = 20 cfs

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

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Drainage Area 1	0.10	0.10	**	**	No	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

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

Executed: 11-06-1997 09:42:31
Watershed file: --> 5-DB125 .WSD
Hydrograph file: --> 5-DB125 .HYD

EARLE - SITE 5
DETENTION BASIN # 1
25 YEAR STORM

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Drainage Area 1	20	12.3
Composite Watershed	20	12.3

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

Executed: 11-06-1997 09:42:31
Watershed file: --> 5-DB125 .WSD
Hydrograph file: --> 5-DB125 .HYD

EARLE - SITE 5
DETENTION BASIN # 1
25 YEAR STORM

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Drainage Area 1	1	1	2	3	5	7	13	20	19
Total (cfs)	1	1	2	3	5	7	13	20	19

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Drainage Area 1	15	11	8	6	4	3	2	2	2
Total (cfs)	15	11	8	6	4	3	2	2	2

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Drainage Area 1	2	2	2	1	1	1	1	1	1
Total (cfs)	2	2	2	1	1	1	1	1	1

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Drainage Area 1	1	0	0	0	0
Total (cfs)	1	0	0	0	0

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

Executed: 11-06-1997 09:42:31
Watershed file: --> 5-DB125 .WSD
Hydrograph file: --> 5-DB125 .HYD

EARLE - SITE 5
DETENTION BASIN # 1
25 YEAR STORM

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	1	14.8	2
11.1	1	14.9	1
11.2	1	15.0	1
11.3	1	15.1	1
11.4	1	15.2	1
11.5	2	15.3	1
11.6	2	15.4	1
11.7	2	15.5	1
11.8	3	15.6	1
11.9	3	15.7	1
12.0	5	15.8	1
12.1	7	15.9	1
12.2	13	16.0	1
12.3	20	16.1	1
12.4	19	16.2	1
12.5	15	16.3	1
12.6	11	16.4	1
12.7	8	16.5	1
12.8	6	16.6	1
12.9	5	16.7	1
13.0	4	16.8	1
13.1	4	16.9	1
13.2	3	17.0	1
13.3	2	17.1	1
13.4	2	17.2	1
13.5	2	17.3	1
13.6	2	17.4	1
13.7	2	17.5	1
13.8	2	17.6	1
13.9	2	17.7	1
14.0	2	17.8	1
14.1	2	17.9	1
14.2	2	18.0	1
14.3	2	18.1	1
14.4	2	18.2	1
14.5	2	18.3	1
14.6	2	18.4	1
14.7	2	18.5	0

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

Executed: 11-06-1997 09:42:31
Watershed file: --> 5-DB125 .WSD
Hydrograph file: --> 5-DB125 .HYD

EARLE - SITE 5
DETENTION BASIN # 1
25 YEAR STORM

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	0	22.4	0
18.7	0	22.5	0
18.8	0	22.6	0
18.9	0	22.7	0
19.0	0	22.8	0
19.1	0	22.9	0
19.2	0	23.0	0
19.3	0	23.1	0
19.4	0	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0
22.1	0	25.9	0
22.2	0		
22.3	0		

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

Executed: 11-04-1997 14:27:12
Watershed file: --> 5-SB2 .WSD
Hydrograph file: --> 5-SB2 .HYD

Earle - Site 5
Sediment Basin #2

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
Drainage Area 2	1.92	79.0	0.10	0.10	5.20	2.97	.1 .10

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 1.92 acres or 0.00300 sq.mi
Peak discharge = 5 cfs

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

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Drainage Area 2	0.10	0.10	**	**	No	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

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

Executed: 11-04-1997 14:27:12
Watershed file: --> 5-SB2 .WSD
Hydrograph file: --> 5-SB2 .HYD

Earle - Site 5
Sediment Basin #2

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Drainage Area 2	5	12.3
Composite Watershed	5	12.3

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

Executed: 11-04-1997 14:27:12
Watershed file: --> 5-SB2 .WSD
Hydrograph file: --> 5-SB2 .HYD

Earle - Site 5
Sediment Basin #2

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Drainage Area 2	0	0	0	1	1	2	3	5	5
Total (cfs)	0	0	0	1	1	2	3	5	5

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Drainage Area 2	4	3	2	1	1	1	1	1	1
Total (cfs)	4	3	2	1	1	1	1	1	1

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Drainage Area 2	0	0	0	0	0	0	0	0	0
Total (cfs)	0	0	0	0	0	0	0	0	0

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Drainage Area 2	0	0	0	0	0
Total (cfs)	0	0	0	0	0

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

Executed: 11-04-1997 14:27:12
Watershed file: --> 5-SB2 .WSD
Hydrograph file: --> 5-SB2 .HYD

Earle - Site 5
Sediment Basin #2

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	0
11.1	0	14.9	0
11.2	0	15.0	0
11.3	0	15.1	0
11.4	0	15.2	0
11.5	0	15.3	0
11.6	0	15.4	0
11.7	0	15.5	0
11.8	1	15.6	0
11.9	1	15.7	0
12.0	1	15.8	0
12.1	2	15.9	0
12.2	3	16.0	0
12.3	5	16.1	0
12.4	5	16.2	0
12.5	4	16.3	0
12.6	3	16.4	0
12.7	2	16.5	0
12.8	1	16.6	0
12.9	1	16.7	0
13.0	1	16.8	0
13.1	1	16.9	0
13.2	1	17.0	0
13.3	1	17.1	0
13.4	1	17.2	0
13.5	1	17.3	0
13.6	1	17.4	0
13.7	1	17.5	0
13.8	1	17.6	0
13.9	0	17.7	0
14.0	0	17.8	0
14.1	0	17.9	0
14.2	0	18.0	0
14.3	0	18.1	0
14.4	0	18.2	0
14.5	0	18.3	0
14.6	0	18.4	0
14.7	0	18.5	0

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

Executed: 11-04-1997 14:27:12
Watershed file: --> 5-SB2 .WSD
Hydrograph file: --> 5-SB2 .HYD

Earle - Site 5
Sediment Basin #2

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	0	22.4	0
18.7	0	22.5	0
18.8	0	22.6	0
18.9	0	22.7	0
19.0	0	22.8	0
19.1	0	22.9	0
19.2	0	23.0	0
19.3	0	23.1	0
19.4	0	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0
22.1	0	25.9	0
22.2	0		
22.3	0		

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

Executed: 11-06-1997 09:44:29
Watershed file: --> 5-DB2-2 .WSD
Hydrograph file: --> 5-DB2-2 .HYD

EARLE - SITE 5
DETENTION BASIN # 2
2 YEAR STORM

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
Drainage Area 2	1.70	80.0	0.10	0.10	3.40	1.56	.15	.10

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 1.70 acres or 0.00266 sq.mi
Peak discharge = 2 cfs

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

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Drainage Area 2	0.10	0.10	**	**	No	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

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

Executed: 11-06-1997 09:44:29
Watershed file: --> 5-DB2-2 .WSD
Hydrograph file: --> 5-DB2-2 .HYD

EARLE - SITE 5
DETENTION BASIN # 2
2 YEAR STORM

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Drainage Area 2	2	12.3
Composite Watershed	2	12.3

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

Executed: 11-06-1997 09:44:29
Watershed file: --> 5-DB2-2 .WSD
Hydrograph file: --> 5-DB2-2 .HYD

EARLE - SITE 5
DETENTION BASIN # 2
2 YEAR STORM

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Drainage Area 2	0	0	0	0	1	1	1	2	2
Total (cfs)	0	0	0	0	1	1	1	2	2

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Drainage Area 2	2	1	1	1	0	0	0	0	0
Total (cfs)	2	1	1	1	0	0	0	0	0

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Drainage Area 2	0	0	0	0	0	0	0	0	0
Total (cfs)	0	0	0	0	0	0	0	0	0

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Drainage Area 2	0	0	0	0	0
Total (cfs)	0	0	0	0	0

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

Executed: 11-06-1997 09:44:29
Watershed file: --> 5-DB2-2 .WSD
Hydrograph file: --> 5-DB2-2 .HYD

EARLE - SITE 5
DETENTION BASIN # 2
2 YEAR STORM

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	0
11.1	0	14.9	0
11.2	0	15.0	0
11.3	0	15.1	0
11.4	0	15.2	0
11.5	0	15.3	0
11.6	0	15.4	0
11.7	0	15.5	0
11.8	0	15.6	0
11.9	0	15.7	0
12.0	1	15.8	0
12.1	1	15.9	0
12.2	1	16.0	0
12.3	2	16.1	0
12.4	2	16.2	0
12.5	2	16.3	0
12.6	1	16.4	0
12.7	1	16.5	0
12.8	1	16.6	0
12.9	0	16.7	0
13.0	0	16.8	0
13.1	0	16.9	0
13.2	0	17.0	0
13.3	0	17.1	0
13.4	0	17.2	0
13.5	0	17.3	0
13.6	0	17.4	0
13.7	0	17.5	0
13.8	0	17.6	0
13.9	0	17.7	0
14.0	0	17.8	0
14.1	0	17.9	0
14.2	0	18.0	0
14.3	0	18.1	0
14.4	0	18.2	0
14.5	0	18.3	0
14.6	0	18.4	0
14.7	0	18.5	0

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

Executed: 11-06-1997 09:44:29
Watershed file: --> 5-DB2-2 .WSD
Hydrograph file: --> 5-DB2-2 .HYD

EARLE - SITE 5
DETENTION BASIN # 2
2 YEAR STORM

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	0	22.4	0
18.7	0	22.5	0
18.8	0	22.6	0
18.9	0	22.7	0
19.0	0	22.8	0
19.1	0	22.9	0
19.2	0	23.0	0
19.3	0	23.1	0
19.4	0	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0
22.1	0	25.9	0
22.2	0		
22.3	0		

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

Executed: 11-06-1997 09:45:38
Watershed file: --> 5-DB2 .WSD
Hydrograph file: --> 5-DB2 .HYD

EARLE - SITE 5
DETENTION BASIN # 2
10 YEAR STORM

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
Drainage Area 2	1.70	80.0	0.10	0.10	5.20	3.07	.1	.10

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 1.70 acres or 0.00266 sq.mi
Peak discharge = 5 cfs

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

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Drainage Area 2	0.10	0.10	**	**	No	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

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

Executed: 11-06-1997 09:45:38
Watershed file: --> 5-DB2 .WSD
Hydrograph file: --> 5-DB2 .HYD

EARLE - SITE 5
DETENTION BASIN # 2
10 YEAR STORM

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Drainage Area 2	5	12.3
Composite Watershed	5	12.3

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

Executed: 11-06-1997 09:45:38
Watershed file: --> 5-DB2 .WSD
Hydrograph file: --> 5-DB2 .HYD

EARLE - SITE 5
DETENTION BASIN # 2
10 YEAR STORM

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Drainage Area 2	0	0	0	1	1	2	3	5	4
Total (cfs)	0	0	0	1	1	2	3	5	4

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Drainage Area 2	3	3	2	1	1	1	1	0	0
Total (cfs)	3	3	2	1	1	1	1	0	0

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Drainage Area 2	0	0	0	0	0	0	0	0	0
Total (cfs)	0	0	0	0	0	0	0	0	0

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Drainage Area 2	0	0	0	0	0
Total (cfs)	0	0	0	0	0

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

Executed: 11-06-1997 09:45:38
Watershed file: --> 5-DB2 .WSD
Hydrograph file: --> 5-DB2 .HYD

EARLE - SITE 5
DETENTION BASIN # 2
10 YEAR STORM

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	0
11.1	0	14.9	0
11.2	0	15.0	0
11.3	0	15.1	0
11.4	0	15.2	0
11.5	0	15.3	0
11.6	0	15.4	0
11.7	0	15.5	0
11.8	1	15.6	0
11.9	1	15.7	0
12.0	1	15.8	0
12.1	2	15.9	0
12.2	3	16.0	0
12.3	5	16.1	0
12.4	4	16.2	0
12.5	3	16.3	0
12.6	3	16.4	0
12.7	2	16.5	0
12.8	1	16.6	0
12.9	1	16.7	0
13.0	1	16.8	0
13.1	1	16.9	0
13.2	1	17.0	0
13.3	1	17.1	0
13.4	1	17.2	0
13.5	1	17.3	0
13.6	0	17.4	0
13.7	0	17.5	0
13.8	0	17.6	0
13.9	0	17.7	0
14.0	0	17.8	0
14.1	0	17.9	0
14.2	0	18.0	0
14.3	0	18.1	0
14.4	0	18.2	0
14.5	0	18.3	0
14.6	0	18.4	0
14.7	0	18.5	0

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

Executed: 11-06-1997 09:45:38
Watershed file: --> 5-DB2 .WSD
Hydrograph file: --> 5-DB2 .HYD

EARLE - SITE 5
DETENTION BASIN # 2
10 YEAR STORM

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	0	22.4	0
18.7	0	22.5	0
18.8	0	22.6	0
18.9	0	22.7	0
19.0	0	22.8	0
19.1	0	22.9	0
19.2	0	23.0	0
19.3	0	23.1	0
19.4	0	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0
22.1	0	25.9	0
22.2	0		
22.3	0		

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

Executed: 11-06-1997 09:46:40
Watershed file: --> 5-DB225 .WSD
Hydrograph file: --> 5-DB225 .HYD

EARLE - SITE 5
DETENTION BASIN # 2
25 YEAR STORM

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
Drainage Area 2	1.70	80.0	0.10	0.10	6.00	3.78	.08	.10

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 1.70 acres or 0.00266 sq.mi
Peak discharge = 6 cfs

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

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Drainage Area 2	0.10	0.10	**	**	No	Computed Ia/p < .1

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

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

Executed: 11-06-1997 09:46:40
Watershed file: --> 5-DB225 .WSD
Hydrograph file: --> 5-DB225 .HYD

EARLE - SITE 5
DETENTION BASIN # 2
25 YEAR STORM

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Drainage Area 2	6	12.3
Composite Watershed	6	12.3

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

Executed: 11-06-1997 09:46:40
Watershed file: --> 5-DB225 .WSD
Hydrograph file: --> 5-DB225 .HYD

EARLE - SITE 5
DETENTION BASIN # 2
25 YEAR STORM

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Drainage Area 2	0	0	0	1	1	2	4	6	5
Total (cfs)	0	0	0	1	1	2	4	6	5

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Drainage Area 2	4	3	2	2	1	1	1	1	1
Total (cfs)	4	3	2	2	1	1	1	1	1

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Drainage Area 2	1	0	0	0	0	0	0	0	0
Total (cfs)	1	0	0	0	0	0	0	0	0

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Drainage Area 2	0	0	0	0	0
Total (cfs)	0	0	0	0	0

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

Executed: 11-06-1997 09:46:40
Watershed file: --> 5-DB225 .WSD
Hydrograph file: --> 5-DB225 .HYD

EARLE - SITE 5
DETENTION BASIN # 2
25 YEAR STORM

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	0
11.1	0	14.9	0
11.2	0	15.0	0
11.3	0	15.1	0
11.4	0	15.2	0
11.5	0	15.3	0
11.6	0	15.4	0
11.7	0	15.5	0
11.8	1	15.6	0
11.9	1	15.7	0
12.0	1	15.8	0
12.1	2	15.9	0
12.2	4	16.0	0
12.3	6	16.1	0
12.4	5	16.2	0
12.5	4	16.3	0
12.6	3	16.4	0
12.7	2	16.5	0
12.8	2	16.6	0
12.9	2	16.7	0
13.0	1	16.8	0
13.1	1	16.9	0
13.2	1	17.0	0
13.3	1	17.1	0
13.4	1	17.2	0
13.5	1	17.3	0
13.6	1	17.4	0
13.7	1	17.5	0
13.8	1	17.6	0
13.9	1	17.7	0
14.0	1	17.8	0
14.1	1	17.9	0
14.2	0	18.0	0
14.3	0	18.1	0
14.4	0	18.2	0
14.5	0	18.3	0
14.6	0	18.4	0
14.7	0	18.5	0

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

Executed: 11-06-1997 09:46:40
Watershed file: --> 5-DB225 .WSD
Hydrograph file: --> 5-DB225 .HYD

EARLE - SITE 5
DETENTION BASIN # 2
25 YEAR STORM

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	0	22.4	0
18.7	0	22.5	0
18.8	0	22.6	0
18.9	0	22.7	0
19.0	0	22.8	0
19.1	0	22.9	0
19.2	0	23.0	0
19.3	0	23.1	0
19.4	0	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0
22.1	0	25.9	0
22.2	0		
22.3	0		

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

Executed: 11-04-1997 14:28:38
Watershed file: --> 5-SB3 .WSD
Hydrograph file: --> 5-SB3 .HYD

Earle - Site 5
Sediment Basin # 3

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
Drainage Area 3	4.63	75.0	0.10	0.10	5.20	2.61	.13	.10

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 4.63 acres or 0.00723 sq.mi
Peak discharge = 11 cfs

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

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Drainage Area 3	0.10	0.10	**	**	No	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

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

Executed: 11-04-1997 14:28:38
Watershed file: --> 5-SB3 .WSD
Hydrograph file: --> 5-SB3 .HYD

Earle - Site 5
Sediment Basin # 3

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Drainage Area 3	11	12.3
Composite Watershed	11	12.3

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

Executed: 11-04-1997 14:28:38
Watershed file: --> 5-SB3 .WSD
Hydrograph file: --> 5-SB3 .HYD

Earle - Site 5
Sediment Basin # 3

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Drainage Area 3	0	1	1	2	3	4	7	11	10
Total (cfs)	0	1	1	2	3	4	7	11	10

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Drainage Area 3	8	6	4	3	2	2	1	1	1
Total (cfs)	8	6	4	3	2	2	1	1	1

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Drainage Area 3	1	1	1	1	1	1	0	0	0
Total (cfs)	1	1	1	1	1	1	0	0	0

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Drainage Area 3	0	0	0	0	0
Total (cfs)	0	0	0	0	0

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

Executed: 11-04-1997 14:28:38
Watershed file: --> 5-SB3 .WSD
Hydrograph file: --> 5-SB3 .HYD

Earle - Site 5
Sediment Basin # 3

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	1
11.1	0	14.9	1
11.2	1	15.0	1
11.3	1	15.1	1
11.4	1	15.2	1
11.5	1	15.3	1
11.6	1	15.4	1
11.7	1	15.5	1
11.8	2	15.6	1
11.9	2	15.7	1
12.0	3	15.8	1
12.1	4	15.9	1
12.2	7	16.0	1
12.3	11	16.1	1
12.4	10	16.2	1
12.5	8	16.3	0
12.6	6	16.4	0
12.7	4	16.5	0
12.8	3	16.6	0
12.9	2	16.7	0
13.0	2	16.8	0
13.1	2	16.9	0
13.2	2	17.0	0
13.3	2	17.1	0
13.4	1	17.2	0
13.5	1	17.3	0
13.6	1	17.4	0
13.7	1	17.5	0
13.8	1	17.6	0
13.9	1	17.7	0
14.0	1	17.8	0
14.1	1	17.9	0
14.2	1	18.0	0
14.3	1	18.1	0
14.4	1	18.2	0
14.5	1	18.3	0
14.6	1	18.4	0
14.7	1	18.5	0

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

Executed: 11-04-1997 14:28:38
Watershed file: --> 5-SB3 .WSD
Hydrograph file: --> 5-SB3 .HYD

Earle - Site 5
Sediment Basin # 3

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	0	22.4	0
18.7	0	22.5	0
18.8	0	22.6	0
18.9	0	22.7	0
19.0	0	22.8	0
19.1	0	22.9	0
19.2	0	23.0	0
19.3	0	23.1	0
19.4	0	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0
22.1	0	25.9	0
22.2	0		
22.3	0		

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

Executed: 11-06-1997 09:47:45
Watershed file: --> 5-DB3-2 .WSD
Hydrograph file: --> 5-DB3-2 .HYD

EARLE - SITE 5
DETENTION BASIN # 3
2 YEAR STORM

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
Drainage Area 3	4.69	70.0	0.10	0.10	3.40	0.95	.25	.30

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 4.69 acres or 0.00733 sq.mi
Peak discharge = 3 cfs

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

Subarea Description	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Drainage Area 3	0.10	0.10	**	**	No	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

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

Executed: 11-06-1997 09:47:45
Watershed file: --> 5-DB3-2 .WSD
Hydrograph file: --> 5-DB3-2 .HYD

EARLE - SITE 5
DETENTION BASIN # 3
2 YEAR STORM

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Drainage Area 3	3	12.2
Composite Watershed	3	12.2

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

Executed: 11-06-1997 09:47:45
Watershed file: --> 5-DB3-2 .WSD
Hydrograph file: --> 5-DB3-2 .HYD

EARLE - SITE 5
DETENTION BASIN # 3
2 YEAR STORM

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Drainage Area 3	0	0	0	0	1	2	3	3	3
Total (cfs)	0	0	0	0	1	2	3	3	3

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Drainage Area 3	2	2	1	1	1	1	1	1	1
Total (cfs)	2	2	1	1	1	1	1	1	1

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Drainage Area 3	0	0	0	0	0	0	0	0	0
Total (cfs)	0	0	0	0	0	0	0	0	0

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Drainage Area 3	0	0	0	0	0
Total (cfs)	0	0	0	0	0

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

Executed: 11-06-1997 09:47:45
Watershed file: --> 5-DB3-2 .WSD
Hydrograph file: --> 5-DB3-2 .HYD

EARLE - SITE 5
DETENTION BASIN # 3
2 YEAR STORM

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	0
11.1	0	14.9	0
11.2	0	15.0	0
11.3	0	15.1	0
11.4	0	15.2	0
11.5	0	15.3	0
11.6	0	15.4	0
11.7	0	15.5	0
11.8	0	15.6	0
11.9	0	15.7	0
12.0	1	15.8	0
12.1	2	15.9	0
12.2	3	16.0	0
12.3	3	16.1	0
12.4	3	16.2	0
12.5	2	16.3	0
12.6	2	16.4	0
12.7	1	16.5	0
12.8	1	16.6	0
12.9	1	16.7	0
13.0	1	16.8	0
13.1	1	16.9	0
13.2	1	17.0	0
13.3	1	17.1	0
13.4	1	17.2	0
13.5	1	17.3	0
13.6	1	17.4	0
13.7	1	17.5	0
13.8	1	17.6	0
13.9	0	17.7	0
14.0	0	17.8	0
14.1	0	17.9	0
14.2	0	18.0	0
14.3	0	18.1	0
14.4	0	18.2	0
14.5	0	18.3	0
14.6	0	18.4	0
14.7	0	18.5	0

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

Executed: 11-06-1997 09:47:45
Watershed file: --> 5-DB3-2 .WSD
Hydrograph file: --> 5-DB3-2 .HYD

EARLE - SITE 5
DETENTION BASIN # 3
2 YEAR STORM

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	0	22.4	0
18.7	0	22.5	0
18.8	0	22.6	0
18.9	0	22.7	0
19.0	0	22.8	0
19.1	0	22.9	0
19.2	0	23.0	0
19.3	0	23.1	0
19.4	0	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0
22.1	0	25.9	0
22.2	0		
22.3	0		

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

Executed: 11-06-1997 09:48:58
Watershed file: --> 5-DB3 .WSD
Hydrograph file: --> 5-DB3 .HYD

EARLE - SITE 5
DETENTION BASIN # 3
10 YEAR STORM

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
Drainage Area 3	4.69	70.0	0.10	0.10	5.20	2.19	.16	.10

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 4.69 acres or 0.00733 sq.mi
Peak discharge = 9 cfs

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

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Drainage Area 3	0.10	0.10	**	**	No	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

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

Executed: 11-06-1997 09:48:58
Watershed file: --> 5-DB3 .WSD
Hydrograph file: --> 5-DB3 .HYD

EARLE - SITE 5
DETENTION BASIN # 3
10 YEAR STORM

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Drainage Area 3	9	12.3
Composite Watershed	9	12.3

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

Executed: 11-06-1997 09:48:58
Watershed file: --> 5-DB3 .WSD
Hydrograph file: --> 5-DB3 .HYD

EARLE - SITE 5
DETENTION BASIN # 3
10 YEAR STORM

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Drainage Area 3	0	1	1	2	2	3	6	9	9
Total (cfs)	0	1	1	2	2	3	6	9	9

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Drainage Area 3	7	5	4	3	2	1	1	1	1
Total (cfs)	7	5	4	3	2	1	1	1	1

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Drainage Area 3	1	1	1	1	1	0	0	0	0
Total (cfs)	1	1	1	1	1	0	0	0	0

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Drainage Area 3	0	0	0	0	0
Total (cfs)	0	0	0	0	0

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

Executed: 11-06-1997 09:48:58
Watershed file: --> 5-DB3 .WSD
Hydrograph file: --> 5-DB3 .HYD

EARLE - SITE 5
DETENTION BASIN # 3
10 YEAR STORM

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	1
11.1	0	14.9	1
11.2	1	15.0	1
11.3	1	15.1	1
11.4	1	15.2	1
11.5	1	15.3	1
11.6	1	15.4	1
11.7	1	15.5	1
11.8	2	15.6	1
11.9	2	15.7	1
12.0	2	15.8	0
12.1	3	15.9	0
12.2	6	16.0	0
12.3	9	16.1	0
12.4	9	16.2	0
12.5	7	16.3	0
12.6	5	16.4	0
12.7	4	16.5	0
12.8	3	16.6	0
12.9	2	16.7	0
13.0	2	16.8	0
13.1	2	16.9	0
13.2	1	17.0	0
13.3	1	17.1	0
13.4	1	17.2	0
13.5	1	17.3	0
13.6	1	17.4	0
13.7	1	17.5	0
13.8	1	17.6	0
13.9	1	17.7	0
14.0	1	17.8	0
14.1	1	17.9	0
14.2	1	18.0	0
14.3	1	18.1	0
14.4	1	18.2	0
14.5	1	18.3	0
14.6	1	18.4	0
14.7	1	18.5	0

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

Executed: 11-06-1997 09:48:58
Watershed file: --> 5-DB3 .WSD
Hydrograph file: --> 5-DB3 .HYD

EARLE - SITE 5
DETENTION BASIN # 3
10 YEAR STORM

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	0	22.4	0
18.7	0	22.5	0
18.8	0	22.6	0
18.9	0	22.7	0
19.0	0	22.8	0
19.1	0	22.9	0
19.2	0	23.0	0
19.3	0	23.1	0
19.4	0	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0
22.1	0	25.9	0
22.2	0		
22.3	0		

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

Executed: 11-06-1997 09:49:54
Watershed file: --> 5-DB325 .WSD
Hydrograph file: --> 5-DB325 .HYD

EARLE - SITE 5
DETENTION BASIN # 3
25 YEAR STORM

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
Drainage Area 3	4.69	70.0	0.10	0.10	6.00	2.81	.14	.10

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 4.69 acres or 0.00733 sq.mi
Peak discharge = 12 cfs

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

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Drainage Area 3	0.10	0.10	**	**	No	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

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

Executed: 11-06-1997 09:49:54
Watershed file: --> 5-DB325 .WSD
Hydrograph file: --> 5-DB325 .HYD

EARLE - SITE 5
DETENTION BASIN # 3
25 YEAR STORM

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Drainage Area 3	12	12.3
Composite Watershed	12	12.3

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

Executed: 11-06-1997 09:49:54
Watershed file: --> 5-DB325 .WSD
Hydrograph file: --> 5-DB325 .HYD

EARLE - SITE 5
DETENTION BASIN # 3
25 YEAR STORM

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Drainage Area 3	1	1	1	2	3	4	7	12	11
Total (cfs)	1	1	1	2	3	4	7	12	11

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Drainage Area 3	8	6	5	3	2	2	1	1	1
Total (cfs)	8	6	5	3	2	2	1	1	1

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Drainage Area 3	1	1	1	1	1	1	0	0	0
Total (cfs)	1	1	1	1	1	1	0	0	0

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Drainage Area 3	0	0	0	0	0
Total (cfs)	0	0	0	0	0

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

Executed: 11-06-1997 09:49:54
Watershed file: --> 5-DB325 .WSD
Hydrograph file: --> 5-DB325 .HYD

EARLE - SITE 5
DETENTION BASIN # 3
25 YEAR STORM

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	1	14.8	1
11.1	1	14.9	1
11.2	1	15.0	1
11.3	1	15.1	1
11.4	1	15.2	1
11.5	1	15.3	1
11.6	1	15.4	1
11.7	1	15.5	1
11.8	2	15.6	1
11.9	2	15.7	1
12.0	3	15.8	1
12.1	4	15.9	1
12.2	7	16.0	1
12.3	12	16.1	1
12.4	11	16.2	1
12.5	8	16.3	0
12.6	6	16.4	0
12.7	5	16.5	0
12.8	3	16.6	0
12.9	2	16.7	0
13.0	2	16.8	0
13.1	2	16.9	0
13.2	2	17.0	0
13.3	2	17.1	0
13.4	1	17.2	0
13.5	1	17.3	0
13.6	1	17.4	0
13.7	1	17.5	0
13.8	1	17.6	0
13.9	1	17.7	0
14.0	1	17.8	0
14.1	1	17.9	0
14.2	1	18.0	0
14.3	1	18.1	0
14.4	1	18.2	0
14.5	1	18.3	0
14.6	1	18.4	0
14.7	1	18.5	0

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

Executed: 11-06-1997 09:49:54
Watershed file: --> 5-DB325 .WSD
Hydrograph file: --> 5-DB325 .HYD

EARLE - SITE 5
DETENTION BASIN # 3
25 YEAR STORM

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	0	22.4	0
18.7	0	22.5	0
18.8	0	22.6	0
18.9	0	22.7	0
19.0	0	22.8	0
19.1	0	22.9	0
19.2	0	23.0	0
19.3	0	23.1	0
19.4	0	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0
22.1	0	25.9	0
22.2	0		
22.3	0		

Outlet Structure File: SB3 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 3

****

***** COMPOSITE OUTFLOW SUMMARY ****

Elevation (ft)	Q (cfs)	Contributing Structures
98.00	0.0	
98.90	0.0	1
99.00	0.1	1
100.00	0.4	1
101.00	0.6	1
102.00	0.8	2 +1
103.00	2.8	3 +2 +1
104.00	0.0	

D.4 ELEVATION-STORAGE MATRIX

POND-2 Version: 5.17
S/N:

EARLE - SITE 5
SEDIMENT BASIN # 1

CALCULATED 11-05-1997 14:53:14
DISK FILE: SB1-RA .VOL

Planimeter scale: 1 inch = 50 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	* Volume (acre-ft)	Volume Sum (acre-ft)
97.00	4.88	0.28	0.00	0.00	0.00
98.00	5.40	0.31	0.88	0.29	0.29
99.00	6.10	0.35	0.99	0.33	0.62
100.00	6.80	0.39	1.11	0.37	0.99
101.00	7.32	0.42	1.22	0.41	1.40

* Incremental volume computed by the Conic Method for Reservoir Volumes.

POND-2 Version: 5.17
S/N:

EARLE - SITE 5
DETENTION BASIN # 1

CALCULATED 11-05-1997 15:04:29
DISK FILE: DB1 .VOL

Planimeter scale: 1 inch = 50 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	* Volume (acre-ft)	Volume Sum (acre-ft)
97.00	4.88	0.28	0.00	0.00	0.00
98.00	5.40	0.31	0.88	0.29	0.29
99.00	6.10	0.35	0.99	0.33	0.62
100.00	6.80	0.39	1.11	0.37	0.99
101.00	7.32	0.42	1.22	0.41	1.40

* Incremental volume computed by the Conic Method for Reservoir Volumes.

POND-2 Version: 5.17
S/N:

EARLE - SITE 5
SEDIMENT BASIN # 2

CALCULATED 10-30-1997 14:38:04
DISK FILE: E-S5-SB2.VOL

Planimeter scale: 1 inch = 50 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	* Volume (acre-ft)	Volume Sum (acre-ft)
104.00	0.25	0.01	0.00	0.00	0.00
105.00	0.31	0.02	0.05	0.02	0.02
106.00	0.43	0.02	0.06	0.02	0.04
107.00	0.99	0.06	0.12	0.04	0.08
108.00	1.13	0.06	0.18	0.06	0.14
109.00	1.35	0.08	0.21	0.07	0.21
110.00	1.74	0.10	0.27	0.09	0.30

* Incremental volume computed by the Conic Method for Reservoir Volumes.

POND-2 Version: 5.17
S/N:

EARLE - SITE 5
DETENTION BASIN # 2

CALCULATED 11-05-1997 15:22:13
DISK FILE: DB2 .VOL

Planimeter scale: 1 inch = 50 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	* Volume (acre-ft)	Volume Sum (acre-ft)
104.00	0.25	0.01	0.00	0.00	0.00
105.00	0.31	0.02	0.05	0.02	0.02
106.00	0.43	0.02	0.06	0.02	0.04
107.00	0.99	0.06	0.12	0.04	0.08
108.00	1.13	0.06	0.18	0.06	0.14
109.00	1.35	0.08	0.21	0.07	0.21
110.00	1.74	0.10	0.27	0.09	0.30

* Incremental volume computed by the Conic Method for Reservoir Volumes.

POND-2 Version: 5.17
S/N:

EARLE - SITE 5
SEDIMENT BASIN # 3

CALCULATED 11-01-1997 16:29:46
DISK FILE: E-S5-SB3.VOL

Planimeter scale: 1 inch = 50 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	* Volume (acre-ft)	Volume Sum (acre-ft)
98.00	1.10	0.06	0.00	0.00	0.00
99.00	1.53	0.09	0.23	0.08	0.08
100.00	1.92	0.11	0.30	0.10	0.17
101.00	2.39	0.14	0.37	0.12	0.30
102.00	2.85	0.16	0.45	0.15	0.45
103.00	3.39	0.19	0.54	0.18	0.63
104.00	3.98	0.23	0.63	0.21	0.84

* Incremental volume computed by the Conic Method for Reservoir Volumes.

POND-2 Version: 5.17
S/N:

EARLE - SITE 5
DETENTION BASIN # 3

CALCULATED 11-05-1997 15:25:15
DISK FILE: DB3 .VOL

Planimeter scale: 1 inch = 50 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	* Volume (acre-ft)	Volume Sum (acre-ft)
98.00	1.10	0.06	0.00	0.00	0.00
99.00	1.53	0.09	0.23	0.08	0.08
100.00	1.92	0.11	0.30	0.10	0.17
101.00	2.39	0.14	0.37	0.12	0.30
102.00	2.85	0.16	0.45	0.15	0.45
103.00	3.39	0.19	0.54	0.18	0.63
104.00	3.98	0.23	0.63	0.21	0.84

* Incremental volume computed by the Conic Method for Reservoir Volumes.

D.5 OUTLET STRUCTURE DESIGN

Outlet Structure File: SB1-RA .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 1

****

***** COMPOSITE OUTFLOW SUMMARY ****

Elevation (ft)	Q (cfs)	Contributing Structures
97.00	0.0	2 +1
98.00	0.8	4 +3 +2 +1
99.00	2.0	5 +4 +3 +2 +1
100.00	6.4	6 +5 +4 +3 +2 +1
101.00	0.0	

Outlet Structure File: SB1-RA .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 1

****

Outlet Structure File: SB1-RA .STR
Planimeter Input File: SB1-RA .VOL
Rating Table Output File: SB1-RA .PND

Min. Elev.(ft) = 97 Max. Elev.(ft) = 101 Incr.(ft) = 1

Additional elevations (ft) to be included in table:
* *

****
SYSTEM CONNECTIVITY
****

Structure	No.	Q Table		Q Table
WEIR-VR	6		->	6
STAND PIPE	5		->	5
ORIFICE	4		->	4
ORIFICE	3		->	3
ORIFICE	2		->	2
ORIFICE	1		->	1

Outflow rating table summary was stored in file:
SB1-RA .PND

Outlet Structure File: SB1-RA .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 1

****

>>>>>> Structure No. 6 <<<<<<
(Input Data)

WEIR-VR
Weir - Vertical Rectangular

E1 elev.(ft)?	100.0
E2 elev.(ft)?	101.0
Weir coefficient?	0.6
Weir elev.(ft)?	100.0
Length (ft)?	25
Contracted/Suppressed (C/S)?	C

Outlet Structure File: SB1-RA .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 1

****

>>>>>> Structure No. 5 <<<<<<
(Input Data)

STAND PIPE
Stand Pipe with weir or orifice flow

E1 elev.(ft)?	99.0
E2 elev.(ft)?	101.0
Crest elev.(ft)?	99.0
Diameter (ft)?	2
Weir coefficient?	0.6
Orifice coefficient?	0.73
Start transition elev.(ft) @ ?	
Transition height (ft)?	1.0

Outlet Structure File: SB1-RA .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5'
SEDIMENT BASIN # 1

****

>>>>>> Structure No. 4 <<<<<<
(Input Data)

ORIFICE
Orifice - Based on Area and Datum Elevation

E1 elev.(ft)?	98.0
E2 elev.(ft)?	101.0
Orifice coeff.?	0.6
Invert elev.(ft)?	98.0
Datum elev.(ft) ?	98.0
Orifice area (sq ft)?	.0873

Outlet Structure File: SB1-RA .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 1

****

>>>>>> Structure No. 3 <<<<<<
(Input Data)

ORIFICE
Orifice - Based on Area and Datum Elevation

E1 elev.(ft)?	98.0
E2 elev.(ft)?	101.0
Orifice coeff.?	0.6
Invert elev.(ft)?	98.0
Datum elev.(ft) ?	98.0
Orifice area (sq ft)?	.0873

Outlet Structure File: SB1-RA .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 1

****

>>>>>> Structure No. 2 <<<<<<
(Input Data)

ORIFICE
Orifice - Based on Area and Datum Elevation

E1 elev.(ft)?	97.0
E2 elev.(ft)?	101.0
Orifice coeff.?	0.6
Invert elev.(ft)?	97.0
Datum elev.(ft) ?	97.0
Orifice area (sq ft)?	.0873

Outlet Structure File: SB1-RA .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 1

****

>>>>>> Structure No. 1 <<<<<<
(Input Data)

ORIFICE
Orifice - Based on Area and Datum Elevation

E1 elev.(ft)?	97.0
E2 elev.(ft)?	101
Orifice coeff.?	0.6
Invert elev.(ft)?	97.0
Datum elev.(ft) ?	97.0
Orifice area (sq ft)?	.0873

Outlet Structure File: SB1-RA .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 1

****

Outflow Rating Table for Structure #6
WEIR-VR Weir - Vertical Rectangular

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
97.00	0.0	E < Inv.El.= 100
98.00	0.0	E < Inv.El.= 100
99.00	0.0	E < Inv.El.= 100
100.00	0.0	H =0.0
101.00	0.0	E = or > E2=101.0

C = .6 L (ft) = 25
H (ft) = Table elev. - Invert elev. (100 ft)
Q (cfs) = C * (L-.2H) * (H**1.5) -- Contracted Weir

Outlet Structure File: SB1-RA .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 1

****

Outflow Rating Table for Structure #5
STAND PIPE Stand Pipe with weir or orifice flow

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
97.00	0.0	E < Inv.El.= 99
98.00	0.0	E < El=99.0
99.00	0.0	Weir: H =0.0
100.00	3.8	Weir: H =1.0
101.00	0.0	E = or > E2=101.0

Weir Cw = .6 Weir length = 6.283186 ft
Orifice Co = .73 Orifice area = 3.141593 sq.ft.
Q (cfs) = (Cw * L * H**1.5) or (Co * A * sqr(2*g*H))
Transition interpolated between elev. 103.3819 and 104.3819 ft
Weir equation = Orifice equation @ elev.= 103.8819 ft

Outlet Structure File: SB1-RA .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 1

****

Outflow Rating Table for Structure #4
ORIFICE Orifice - Based on Area and Datum Elevation

Elevation (ft)	Q (cfs)	Computation Messages
97.00	0.0	E < E1=98.0
98.00	0.0	H =0.0
99.00	0.4	H =1.0
100.00	0.6	H =2.0
101.00	0.0	E = or > E2=101.0

C = .6 A = .0873 sq.ft.
H (ft) = Table elev. - Datum elev. (98 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: SB1-RA .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 1

****

Outflow Rating Table for Structure #3
ORIFICE Orifice - Based on Area and Datum Elevation

Elevation (ft)	Q (cfs)	Computation Messages
97.00	0.0	E < E1=98.0
98.00	0.0	H =0.0
99.00	0.4	H =1.0
100.00	0.6	H =2.0
101.00	0.0	E = or > E2=101.0

C = .6 A = .0873 sq.ft.
H (ft) = Table elev. - Datum elev. (98 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: SB1-RA .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 1

****

Outflow Rating Table for Structure #2
ORIFICE Orifice - Based on Area and Datum Elevation

Elevation (ft)	Q (cfs)	Computation Messages
97.00	0.0	H =0.0
98.00	0.4	H =1.0
99.00	0.6	H =2.0
100.00	0.7	H =3.0
101.00	0.0	E = or > E2=101.0

C = .6 A = .0873 sq.ft.
H (ft) = Table elev. - Datum elev. (97 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: SB1-RA .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 1

****

Outflow Rating Table for Structure #1
ORIFICE Orifice - Based on Area and Datum Elevation

Elevation (ft)	Q (cfs)	Computation Messages
97.00	0.0	H =0.0
98.00	0.4	H =1.0
99.00	0.6	H =2.0
100.00	0.7	H =3.0
101.00	0.0	E = or > E2=101

C = .6 A = .0873 sq.ft.
H (ft) = Table elev. - Datum elev. (97 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: SB2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 2

****

***** COMPOSITE OUTFLOW SUMMARY ****

Elevation (ft)	Q (cfs)	Contributing Structures
104.00	0.0	
105.00	0.0	
105.50	0.0	1
106.00	0.3	1
107.00	0.5	1
108.00	0.7	2 +1
109.00	2.7	3 +2 +1
110.00	0.0	

Outlet Structure File: SB2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 2

****

Outlet Structure File: SB2 .STR
Planimeter Input File: E-S5-SB2.VOL
Rating Table Output File: SB2 .PND

Min. Elev.(ft) = 104 Max. Elev.(ft) = 110 Incr.(ft) = 1

Additional elevations (ft) to be included in table:
* *
105.5

****
SYSTEM CONNECTIVITY
****

Structure	No.	Q Table		Q Table
WEIR-VR	3		->	3
STAND PIPE	2		->	2
ORIFICE	1		->	1

Outflow rating table summary was stored in file:
SB2 .PND

Outlet Structure File: SB2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 2

****

>>>>>> Structure No. 3 <<<<<<
(Input Data)

WEIR-VR
Weir - Vertical Rectangular

E1 elev.(ft)?	109.0
E2 elev.(ft)?	110.0
Weir coefficient?	0.6
Weir elev.(ft)?	109.0
Length (ft)?	10
Contracted/Suppressed (C/S)?	C

Outlet Structure File: SB2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 2

****

>>>>>> Structure No. 2 <<<<<<
(Input Data)

STAND PIPE
Stand Pipe with weir or orifice flow

E1 elev.(ft)?	108.0
E2 elev.(ft)?	110.0
Crest elev.(ft)?	108.0
Diameter (ft)?	1
Weir coefficient?	0.6
Orifice coefficient?	0.73
Start transition elev.(ft) @ ?	
Transition height (ft)?	1.0

Outlet Structure File: SB2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 2

****

>>>>>> Structure No. 1 <<<<<<
(Input Data)

ORIFICE
Orifice - Based on Area and Datum Elevation

E1 elev.(ft)?	105.5
E2 elev.(ft)?	110.0
Orifice coeff.?	0.61
Invert elev.(ft)?	105.5
Datum elev.(ft) ?	105.5
Orifice area (sq ft)?	.0873

Outlet Structure File: SB2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 2

****

Outflow Rating Table for Structure #3
WEIR-VR Weir - Vertical Rectangular

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
104.00	0.0	E < Inv.El.= 109
105.00	0.0	E < Inv.El.= 109
105.50	0.0	E < Inv.El.= 109
106.00	0.0	E < Inv.El.= 109
107.00	0.0	E < Inv.El.= 109
108.00	0.0	E < Inv.El.= 109
109.00	0.0	H =0.0
110.00	0.0	E = or > E2=110.0

C = .6 L (ft) = 10
H (ft) = Table elev. - Invert elev. (109 ft)
Q (cfs) = C * (L-.2H) * (H**1.5) -- Contracted Weir

Outlet Structure File: SB2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 2

****

Outflow Rating Table for Structure #2
STAND PIPE Stand Pipe with weir or orifice flow

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
104.00	0.0	E < Inv.El.= 108
105.00	0.0	E < El=108.0
105.50	0.0	E < El=108.0
106.00	0.0	E < El=108.0
107.00	0.0	E < El=108.0
108.00	0.0	Weir: H =0.0
109.00	1.9	Weir: H =1.0
110.00	0.0	E = or > E2=110.0

Weir Cw = .6 Weir length = 3.141593 ft
Orifice Co = .73 Orifice area = .7853982 sq.ft.
Q (cfs) = (Cw * L * H**1.5) or (Co * A * sqr(2*g*H))
Transition interpolated between elev. 109.9409 and 110.9409 ft
Weir equation = Orifice equation @ elev.= 110.4409 ft

Outlet Structure File: SB2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 2

****

Outflow Rating Table for Structure #1
ORIFICE Orifice - Based on Area and Datum Elevation

Elevation (ft)	Q (cfs)	Computation Messages
104.00	0.0	E < E1=105.5
105.00	0.0	E < E1=105.5
105.50	0.0	H =0.0
106.00	0.3	H =.5
107.00	0.5	H =1.5
108.00	0.7	H =2.5
109.00	0.8	H =3.5
110.00	0.0	E = or > E2=110.0

C = .61 A = .0873 sq.ft.
H (ft) = Table elev. - Datum elev. (105.5 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: SB3 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 3

****

***** COMPOSITE OUTFLOW SUMMARY ****

Elevation (ft)	Q (cfs)	Contributing Structures
98.00	0.0	
98.90	0.0	1
99.00	0.1	1
100.00	0.4	1
101.00	0.6	1
102.00	0.8	2 +1
103.00	2.8	3 +2 +1
104.00	0.0	

Outlet Structure File: SB3 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 3

****

Outlet Structure File: SB3 .STR
Planimeter Input File: E-S5-SB3.VOL
Rating Table Output File: SB3 .PND

Min. Elev.(ft) = 98 Max. Elev.(ft) = 104 Incr.(ft) = 1

Additional elevations (ft) to be included in table:
* *
98.9

****
SYSTEM CONNECTIVITY
****

Structure	No.	Q Table		Q Table
WEIR-VR	3		->	3
STAND PIPE	2		->	2
ORIFICE	1		->	1

Outflow rating table summary was stored in file:
SB3 .PND

Outlet Structure File: SB3 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 3

****

>>>>>> Structure No. 3 <<<<<<
(Input Data)

WEIR-VR
Weir - Vertical Rectangular

E1 elev.(ft)?	103.0
E2 elev.(ft)?	104.0
Weir coefficient?	0.6
Weir elev.(ft)?	103.0
Length (ft)?	10
Contracted/Suppressed (C/S)?	C

Outlet Structure File: SB3 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 3

****

>>>>>> Structure No. 2 <<<<<<
(Input Data)

STAND PIPE
Stand Pipe with weir or orifice flow

E1 elev.(ft)?	102.0
E2 elev.(ft)?	104.0
Crest elev.(ft)?	102.0
Diameter (ft)?	1
Weir coefficient?	0.6
Orifice coefficient?	0.73
Start transition elev.(ft) @ ?	
Transition height (ft)?	1.0

Outlet Structure File: SB3 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 3

****

>>>>>> Structure No. 1 <<<<<<
(Input Data)

ORIFICE
Orifice - Based on Area and Datum Elevation

E1 elev.(ft)?	98.9
E2 elev.(ft)?	104.0
Orifice coeff.?	0.61
Invert elev.(ft)?	98.9
Datum elev.(ft) ?	98.9
Orifice area (sq ft)?	.0873

Outlet Structure File: SB3 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 3

****

Outflow Rating Table for Structure #3
WEIR-VR Weir - Vertical Rectangular

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
98.00	0.0	E < Inv.El.= 103
98.90	0.0	E < Inv.El.= 103
99.00	0.0	E < Inv.El.= 103
100.00	0.0	E < Inv.El.= 103
101.00	0.0	E < Inv.El.= 103
102.00	0.0	E < Inv.El.= 103
103.00	0.0	H =0.0
104.00	0.0	E = or > E2=104.0

C = .6 L (ft) = 10
H (ft) = Table elev. - Invert elev. (103 ft)
Q (cfs) = C * (L-.2H) * (H**1.5) -- Contracted Weir

Outlet Structure File: SB3 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 3

****

Outflow Rating Table for Structure #2
STAND PIPE Stand Pipe with weir or orifice flow

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
98.00	0.0	E < Inv.El.= 102
98.90	0.0	E < El=102.0
99.00	0.0	E < El=102.0
100.00	0.0	E < El=102.0
101.00	0.0	E < El=102.0
102.00	0.0	Weir: H =0.0
103.00	1.9	Weir: H =1.0
104.00	0.0	E = or > E2=104.0

Weir Cw = .6 Weir length = 3.141593 ft
Orifice Co = .73 Orifice area = .7853982 sq.ft.
Q (cfs) = (Cw * L * H**1.5) or (Co * A * sqr(2*g*H))
Transition interpolated between elev. 103.9409 and 104.9409 ft
Weir equation = Orifice equation @ elev.= 104.4409 ft

Outlet Structure File: SB3 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****

EARLE - SITE 5
SEDIMENT BASIN # 3

****

Outflow Rating Table for Structure #1
ORIFICE Orifice - Based on Area and Datum Elevation

Elevation (ft)	Q (cfs)	Computation Messages
98.00	0.0	E < E1=98.9
98.90	0.0	H =0.0
99.00	0.1	H =.1
100.00	0.4	H =1.1
101.00	0.6	H =2.1
102.00	0.8	H =3.1
103.00	0.9	H =4.1
104.00	0.0	E = or > E2=104.0

C = .61 A = .0873 sq.ft.
H (ft) = Table elev. - Datum elev. (98.9 ft)
Q (cfs) = C * A * sqr(2g * H)

D.6 HYDROGRAPH ROUTINGS

```
*************************
*                       *
*                       *
*    EARLE - SITE 5     *
*  SEDIMENT BASIN # 1   *
*                       *
*                       *
*************************
```

Inflow Hydrograph: 5-SB1 .HYD
Rating Table file: SB1-RA .PND

----INITIAL CONDITIONS----
Elevation = 97.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
97.00	0.0	0.000
98.00	0.8	0.295
99.00	2.0	0.625
100.00	6.4	0.995

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
71.4	72.2
151.2	153.2
240.7	247.1

Time increment (t) = 0.100 hrs.

POND-2 Version: 5.17 S/N:
EXECUTED: 11-05-1997 09:12:26

Pond File: SB1-RA .PND
Inflow Hydrograph: 5-SB1 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	1.00	-----	0.0	0.0	0.00	97.00
11.100	1.00	2.0	2.0	2.0	0.02	97.03
11.200	1.00	2.0	3.9	4.0	0.04	97.05
11.300	1.00	2.0	5.7	5.9	0.07	97.08
11.400	1.00	2.0	7.6	7.7	0.09	97.11
11.500	2.00	3.0	10.3	10.6	0.12	97.15
11.600	2.00	4.0	14.0	14.3	0.16	97.20
11.700	3.00	5.0	18.6	19.0	0.21	97.26
11.800	3.00	6.0	24.0	24.6	0.27	97.34
11.900	4.00	7.0	30.4	31.0	0.34	97.43
12.000	7.00	11.0	40.4	41.4	0.46	97.57
12.100	9.00	16.0	55.2	56.4	0.63	97.78
12.200	16.00	25.0	78.4	80.2	0.92	98.10
12.300	25.00	41.0	116.4	119.4	1.50	98.58
12.400	24.00	49.0	160.2	165.4	2.57	99.13
12.500	18.00	42.0	193.6	202.2	4.30	99.52
12.600	14.00	32.0	214.8	225.6	5.39	99.77
12.700	10.00	24.0	226.8	238.8	6.01	99.91
12.800	7.00	17.0	231.3	243.8	6.25	99.96
12.900	5.00	12.0	230.9	243.3	6.22	99.96
13.000	4.00	9.0	227.8	239.9	6.06	99.92
13.100	4.00	8.0	224.0	235.8	5.87	99.88
13.200	4.00	8.0	220.6	232.0	5.69	99.84
13.300	4.00	8.0	217.6	228.6	5.53	99.80
13.400	3.00	7.0	213.9	224.6	5.34	99.76
13.500	3.00	6.0	209.6	219.9	5.12	99.71
13.600	3.00	6.0	205.8	215.6	4.93	99.66
13.700	3.00	6.0	202.3	211.8	4.74	99.62
13.800	3.00	6.0	199.1	208.3	4.58	99.59
13.900	2.00	5.0	195.3	204.1	4.39	99.54
14.000	2.00	4.0	191.0	199.3	4.16	99.49
14.100	2.00	4.0	187.1	195.0	3.96	99.45
14.200	2.00	4.0	183.5	191.1	3.78	99.40
14.300	2.00	4.0	180.3	187.5	3.61	99.37
14.400	2.00	4.0	177.4	184.3	3.46	99.33
14.500	2.00	4.0	174.8	181.4	3.32	99.30
14.600	2.00	4.0	172.4	178.8	3.20	99.27
14.700	2.00	4.0	170.2	176.4	3.09	99.25
14.800	2.00	4.0	168.2	174.2	2.98	99.22
14.900	2.00	4.0	166.4	172.2	2.89	99.20
15.000	2.00	4.0	164.8	170.4	2.81	99.18
15.100	2.00	4.0	163.4	168.8	2.73	99.17
15.200	2.00	4.0	162.0	167.4	2.66	99.15
15.300	2.00	4.0	160.8	166.0	2.60	99.14
15.400	2.00	4.0	159.7	164.8	2.55	99.12

Pond File: SB1-RA .PND
Inflow Hydrograph: 5-SB1 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	2.00	4.0	158.7	163.7	2.49	99.11
15.600	2.00	4.0	157.8	162.7	2.45	99.10
15.700	2.00	4.0	157.0	161.8	2.41	99.09
15.800	1.00	3.0	155.4	160.0	2.32	99.07
15.900	1.00	2.0	153.0	157.4	2.20	99.04
16.000	1.00	2.0	150.8	155.0	2.09	99.02
16.100	1.00	2.0	148.8	152.8	1.99	99.00
16.200	1.00	2.0	146.9	150.8	1.97	98.97
16.300	1.00	2.0	145.0	148.9	1.94	98.95
16.400	1.00	2.0	143.2	147.0	1.91	98.92
16.500	1.00	2.0	141.4	145.2	1.88	98.90
16.600	1.00	2.0	139.7	143.4	1.86	98.88
16.700	1.00	2.0	138.1	141.7	1.83	98.86
16.800	1.00	2.0	136.5	140.1	1.81	98.84
16.900	1.00	2.0	134.9	138.5	1.78	98.82
17.000	1.00	2.0	133.4	136.9	1.76	98.80
17.100	1.00	2.0	131.9	135.4	1.74	98.78
17.200	1.00	2.0	130.5	133.9	1.71	98.76
17.300	1.00	2.0	129.1	132.5	1.69	98.74
17.400	1.00	2.0	127.7	131.1	1.67	98.73
17.500	1.00	2.0	126.4	129.7	1.65	98.71
17.600	1.00	2.0	125.2	128.4	1.63	98.69
17.700	1.00	2.0	123.9	127.2	1.61	98.68
17.800	1.00	2.0	122.7	125.9	1.60	98.66
17.900	1.00	2.0	121.6	124.7	1.58	98.65
18.000	1.00	2.0	120.5	123.6	1.56	98.63
18.100	1.00	2.0	119.4	122.5	1.55	98.62
18.200	1.00	2.0	118.3	121.4	1.53	98.61
18.300	1.00	2.0	117.3	120.3	1.51	98.59
18.400	1.00	2.0	116.3	119.3	1.50	98.58
18.500	1.00	2.0	115.3	118.3	1.48	98.57
18.600	1.00	2.0	114.4	117.3	1.47	98.56
18.700	1.00	2.0	113.5	116.4	1.46	98.55
18.800	1.00	2.0	112.6	115.5	1.44	98.53
18.900	1.00	2.0	111.7	114.6	1.43	98.52
19.000	1.00	2.0	110.9	113.7	1.42	98.51
19.100	1.00	2.0	110.1	112.9	1.40	98.50
19.200	1.00	2.0	109.3	112.1	1.39	98.49
19.300	1.00	2.0	108.6	111.3	1.38	98.48
19.400	1.00	2.0	107.8	110.6	1.37	98.47
19.500	1.00	2.0	107.1	109.8	1.36	98.46
19.600	1.00	2.0	106.4	109.1	1.35	98.46
19.700	1.00	2.0	105.7	108.4	1.34	98.45
19.800	1.00	2.0	105.1	107.7	1.33	98.44
19.900	1.00	2.0	104.4	107.1	1.32	98.43
20.000	1.00	2.0	103.8	106.4	1.31	98.42

Pond File: SB1-RA .PND
Inflow Hydrograph: 5-SB1 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH

TIME (hrs)	INFLOW (cfs)
20.100	1.00
20.200	1.00
20.300	1.00
20.400	1.00
20.500	1.00
20.600	1.00
20.700	1.00
20.800	1.00
20.900	1.00
21.000	0.00
21.100	0.00
21.200	0.00
21.300	0.00
21.400	0.00
21.500	0.00
21.600	0.00
21.700	0.00
21.800	0.00
21.900	0.00
22.000	0.00
22.100	0.00
22.200	0.00
22.300	0.00
22.400	0.00
22.500	0.00
22.600	0.00
22.700	0.00
22.800	0.00
22.900	0.00
23.000	0.00
23.100	0.00
23.200	0.00
23.300	0.00
23.400	0.00
23.500	0.00
23.600	0.00
23.700	0.00
23.800	0.00
23.900	0.00
24.000	0.00
24.100	0.00
24.200	0.00
24.300	0.00
24.400	0.00
24.500	0.00
24.600	0.00

ROUTING COMPUTATIONS

I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
2.0	103.2	105.8	1.30	98.42
2.0	102.7	105.2	1.29	98.41
2.0	102.1	104.7	1.28	98.40
2.0	101.5	104.1	1.27	98.39
2.0	101.0	103.5	1.26	98.39
2.0	100.5	103.0	1.26	98.38
2.0	100.0	102.5	1.25	98.37
2.0	99.5	102.0	1.24	98.37
2.0	99.0	101.5	1.23	98.36
1.0	97.6	100.0	1.21	98.34
0.0	95.3	97.6	1.18	98.31
0.0	93.0	95.3	1.14	98.29
0.0	90.8	93.0	1.11	98.26
0.0	88.6	90.8	1.08	98.23
0.0	86.5	88.6	1.04	98.20
0.0	84.5	86.5	1.01	98.18
0.0	82.5	84.5	0.98	98.15
0.0	80.6	82.5	0.95	98.13
0.0	78.8	80.6	0.93	98.10
0.0	77.0	78.8	0.90	98.08
0.0	75.2	77.0	0.87	98.06
0.0	73.5	75.2	0.85	98.04
0.0	71.9	73.5	0.82	98.02
0.0	70.3	71.9	0.80	98.00
0.0	68.8	70.3	0.78	97.97
0.0	67.2	68.8	0.76	97.95
0.0	65.7	67.2	0.75	97.93
0.0	64.3	65.7	0.73	97.91
0.0	62.9	64.3	0.71	97.89
0.0	61.5	62.9	0.70	97.87
0.0	60.1	61.5	0.68	97.85
0.0	58.8	60.1	0.67	97.83
0.0	57.5	58.8	0.65	97.81
0.0	56.2	57.5	0.64	97.80
0.0	54.9	56.2	0.62	97.78
0.0	53.7	54.9	0.61	97.76
0.0	52.5	53.7	0.60	97.74
0.0	51.4	52.5	0.58	97.73
0.0	50.2	51.4	0.57	97.71
0.0	49.1	50.2	0.56	97.70
0.0	48.0	49.1	0.54	97.68
0.0	47.0	48.0	0.53	97.67
0.0	45.9	47.0	0.52	97.65
0.0	44.9	45.9	0.51	97.64
0.0	43.9	44.9	0.50	97.62
0.0	42.9	43.9	0.49	97.61

Pond File: SB1-RA .PND
Inflow Hydrograph: 5-SB1 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	0.00	0.0	42.0	42.9	0.48	97.59
24.800	0.00	0.0	41.0	42.0	0.47	97.58
24.900	0.00	0.0	40.1	41.0	0.46	97.57
25.000	0.00	0.0	39.2	40.1	0.45	97.56
25.100	0.00	0.0	38.4	39.2	0.44	97.54
25.200	0.00	0.0	37.5	38.4	0.43	97.53
25.300	0.00	0.0	36.7	37.5	0.42	97.52
25.400	0.00	0.0	35.9	36.7	0.41	97.51
25.500	0.00	0.0	35.1	35.9	0.40	97.50
25.600	0.00	0.0	34.3	35.1	0.39	97.49
25.700	0.00	0.0	33.5	34.3	0.38	97.48
25.800	0.00	0.0	32.8	33.5	0.37	97.46
25.900	0.00	0.0	32.1	32.8	0.36	97.45

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: SB1-RA .PND
Inflow Hydrograph: 5-SB1 .HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 97.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 25.00 cfs
Peak Outflow = 6.25 cfs
Peak Elevation = 99.96 ft

***** Summary of Approximate Peak Storage *****

Initial Storage = 0.00 ac-ft
Peak Storage From Storm = 0.98 ac-ft

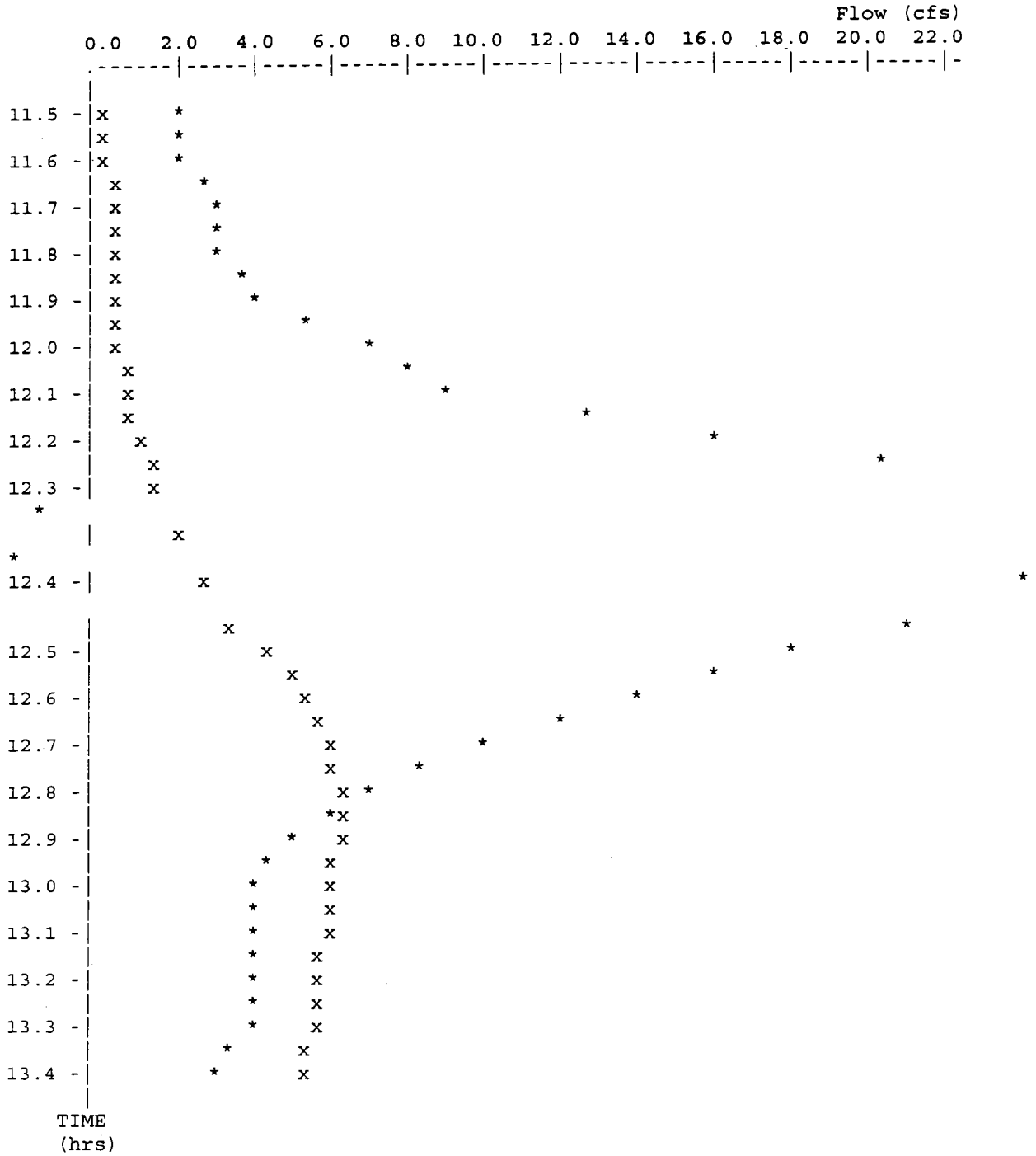
Total Storage in Pond = 0.98 ac-ft

Warning: Inflow hydrograph truncated on left side.

Pond File: SB1-RA .PND
Inflow Hydrograph: 5-SB1 .HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 11-05-1997
09:12:26

Peak Inflow = 25.00 cfs
Peak Outflow = 6.25 cfs
Peak Elevation = 99.96 ft



* File: 5-SB1 .HYD Qmax = 25.0 cfs
x File: OUT .HYD Qmax = 6.3 cfs

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*************************
*                       *
*                       *
*    EARLE - SITE 5     *
* DETENTION BASIN # 1   *
*     2 YEAR STORM      *
*                       *
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Inflow Hydrograph: 5-DB1-2 .HYD
Rating Table file: SB1-RA .PND

----INITIAL CONDITIONS----
Elevation = 97.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
97.00	0.0	0.000
98.00	0.8	0.295
99.00	2.0	0.625
100.00	6.4	0.995

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
71.4	72.2
151.2	153.2
240.7	247.1

Time increment (t) = 0.100 hrs.

Pond File: SB1-RA .PND
Inflow Hydrograph: 5-DB1-2 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH / ROUTING COMPUTATIONS

TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	0.00	-----	0.0	0.0	0.00	97.00
11.100	0.00	0.0	0.0	0.0	0.00	97.00
11.200	0.00	0.0	0.0	0.0	0.00	97.00
11.300	0.00	0.0	0.0	0.0	0.00	97.00
11.400	0.00	0.0	0.0	0.0	0.00	97.00
11.500	0.00	0.0	0.0	0.0	0.00	97.00
11.600	0.00	0.0	0.0	0.0	0.00	97.00
11.700	0.00	0.0	0.0	0.0	0.00	97.00
11.800	0.00	0.0	0.0	0.0	0.00	97.00
11.900	0.00	0.0	0.0	0.0	0.00	97.00
12.000	1.00	1.0	1.0	1.0	0.01	97.01
12.100	2.00	3.0	3.9	4.0	0.04	97.06
12.200	5.00	7.0	10.6	10.9	0.12	97.15
12.300	5.00	10.0	20.2	20.6	0.23	97.29
12.400	4.00	9.0	28.5	29.2	0.32	97.40
12.500	4.00	8.0	35.7	36.5	0.41	97.51
12.600	3.00	7.0	41.8	42.7	0.47	97.59
12.700	2.00	5.0	45.7	46.8	0.52	97.65
12.800	2.00	4.0	48.6	49.7	0.55	97.69
12.900	2.00	4.0	51.5	52.6	0.58	97.73
13.000	1.00	3.0	53.3	54.5	0.60	97.75
13.100	1.00	2.0	54.0	55.3	0.61	97.77
13.200	1.00	2.0	54.8	56.0	0.62	97.78
13.300	1.00	2.0	55.5	56.8	0.63	97.79
13.400	1.00	2.0	56.3	57.5	0.64	97.80
13.500	1.00	2.0	57.0	58.3	0.65	97.81
13.600	1.00	2.0	57.7	59.0	0.65	97.82
13.700	1.00	2.0	58.3	59.7	0.66	97.83
13.800	1.00	2.0	59.0	60.3	0.67	97.84
13.900	1.00	2.0	59.7	61.0	0.68	97.85
14.000	1.00	2.0	60.3	61.7	0.68	97.85
14.100	1.00	2.0	60.9	62.3	0.69	97.86
14.200	1.00	2.0	61.5	62.9	0.70	97.87
14.300	1.00	2.0	62.1	63.5	0.70	97.88
14.400	1.00	2.0	62.7	64.1	0.71	97.89
14.500	1.00	2.0	63.2	64.7	0.72	97.90
14.600	1.00	2.0	63.8	65.2	0.72	97.90
14.700	1.00	2.0	64.3	65.8	0.73	97.91
14.800	1.00	2.0	64.9	66.3	0.74	97.92
14.900	1.00	2.0	65.4	66.9	0.74	97.93
15.000	1.00	2.0	65.9	67.4	0.75	97.93
15.100	1.00	2.0	66.4	67.9	0.75	97.94
15.200	1.00	2.0	66.9	68.4	0.76	97.95
15.300	1.00	2.0	67.3	68.9	0.76	97.95
15.400	1.00	2.0	67.8	69.3	0.77	97.96

Pond File: SB1-RA .PND
Inflow Hydrograph: 5-DB1-2 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	1.00	2.0	68.3	69.8	0.77	97.97
15.600	1.00	2.0	68.7	70.3	0.78	97.97
15.700	1.00	2.0	69.1	70.7	0.78	97.98
15.800	0.00	1.0	68.6	70.1	0.78	97.97
15.900	0.00	0.0	67.1	68.6	0.76	97.95
16.000	0.00	0.0	65.6	67.1	0.74	97.93
16.100	0.00	0.0	64.1	65.6	0.73	97.91
16.200	0.00	0.0	62.7	64.1	0.71	97.89
16.300	0.00	0.0	61.3	62.7	0.70	97.87
16.400	0.00	0.0	59.9	61.3	0.68	97.85
16.500	0.00	0.0	58.6	59.9	0.66	97.83
16.600	0.00	0.0	57.3	58.6	0.65	97.81
16.700	0.00	0.0	56.0	57.3	0.64	97.79
16.800	0.00	0.0	54.8	56.0	0.62	97.78
16.900	0.00	0.0	53.6	54.8	0.61	97.76
17.000	0.00	0.0	52.4	53.6	0.59	97.74
17.100	0.00	0.0	51.2	52.4	0.58	97.73
17.200	0.00	0.0	50.1	51.2	0.57	97.71
17.300	0.00	0.0	49.0	50.1	0.56	97.69
17.400	0.00	0.0	47.9	49.0	0.54	97.68
17.500	0.00	0.0	46.8	47.9	0.53	97.66
17.600	0.00	0.0	45.8	46.8	0.52	97.65
17.700	0.00	0.0	44.8	45.8	0.51	97.63
17.800	0.00	0.0	43.8	44.8	0.50	97.62
17.900	0.00	0.0	42.8	43.8	0.49	97.61
18.000	0.00	0.0	41.9	42.8	0.47	97.59
18.100	0.00	0.0	40.9	41.9	0.46	97.58
18.200	0.00	0.0	40.0	40.9	0.45	97.57
18.300	0.00	0.0	39.1	40.0	0.44	97.55
18.400	0.00	0.0	38.3	39.1	0.43	97.54
18.500	0.00	0.0	37.4	38.3	0.42	97.53
18.600	0.00	0.0	36.6	37.4	0.42	97.52
18.700	0.00	0.0	35.8	36.6	0.41	97.51
18.800	0.00	0.0	35.0	35.8	0.40	97.50
18.900	0.00	0.0	34.2	35.0	0.39	97.49
19.000	0.00	0.0	33.5	34.2	0.38	97.47
19.100	0.00	0.0	32.7	33.5	0.37	97.46
19.200	0.00	0.0	32.0	32.7	0.36	97.45
19.300	0.00	0.0	31.3	32.0	0.35	97.44
19.400	0.00	0.0	30.6	31.3	0.35	97.43
19.500	0.00	0.0	29.9	30.6	0.34	97.42
19.600	0.00	0.0	29.3	29.9	0.33	97.41
19.700	0.00	0.0	28.6	29.3	0.32	97.41
19.800	0.00	0.0	28.0	28.6	0.32	97.40
19.900	0.00	0.0	27.3	28.0	0.31	97.39
20.000	0.00	0.0	26.7	27.3	0.30	97.38

Pond File: SB1-RA .PND
Inflow Hydrograph: 5-DB1-2 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH

TIME (hrs)	INFLOW (cfs)
20.100	0.00
20.200	0.00
20.300	0.00
20.400	0.00
20.500	0.00
20.600	0.00
20.700	0.00
20.800	0.00
20.900	0.00
21.000	0.00
21.100	0.00
21.200	0.00
21.300	0.00
21.400	0.00
21.500	0.00
21.600	0.00
21.700	0.00
21.800	0.00
21.900	0.00
22.000	0.00
22.100	0.00
22.200	0.00
22.300	0.00
22.400	0.00
22.500	0.00
22.600	0.00
22.700	0.00
22.800	0.00
22.900	0.00
23.000	0.00
23.100	0.00
23.200	0.00
23.300	0.00
23.400	0.00
23.500	0.00
23.600	0.00
23.700	0.00
23.800	0.00
23.900	0.00
24.000	0.00
24.100	0.00
24.200	0.00
24.300	0.00
24.400	0.00
24.500	0.00
24.600	0.00

ROUTING COMPUTATIONS

I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.0	26.1	26.7	0.30	97.37
0.0	25.6	26.1	0.29	97.36
0.0	25.0	25.6	0.28	97.35
0.0	24.4	25.0	0.28	97.35
0.0	23.9	24.4	0.27	97.34
0.0	23.4	23.9	0.27	97.33
0.0	22.9	23.4	0.26	97.32
0.0	22.3	22.9	0.25	97.32
0.0	21.9	22.3	0.25	97.31
0.0	21.4	21.9	0.24	97.30
0.0	20.9	21.4	0.24	97.30
0.0	20.4	20.9	0.23	97.29
0.0	20.0	20.4	0.23	97.28
0.0	19.5	20.0	0.22	97.28
0.0	19.1	19.5	0.22	97.27
0.0	18.7	19.1	0.21	97.26
0.0	18.3	18.7	0.21	97.26
0.0	17.9	18.3	0.20	97.25
0.0	17.5	17.9	0.20	97.25
0.0	17.1	17.5	0.19	97.24
0.0	16.7	17.1	0.19	97.24
0.0	16.3	16.7	0.19	97.23
0.0	16.0	16.3	0.18	97.23
0.0	15.6	16.0	0.18	97.22
0.0	15.3	15.6	0.17	97.22
0.0	14.9	15.3	0.17	97.21
0.0	14.6	14.9	0.17	97.21
0.0	14.3	14.6	0.16	97.20
0.0	14.0	14.3	0.16	97.20
0.0	13.6	14.0	0.15	97.19
0.0	13.3	13.6	0.15	97.19
0.0	13.0	13.3	0.15	97.18
0.0	12.8	13.0	0.14	97.18
0.0	12.5	12.8	0.14	97.18
0.0	12.2	12.5	0.14	97.17
0.0	11.9	12.2	0.14	97.17
0.0	11.7	11.9	0.13	97.17
0.0	11.4	11.7	0.13	97.16
0.0	11.2	11.4	0.13	97.16
0.0	10.9	11.2	0.12	97.15
0.0	10.7	10.9	0.12	97.15
0.0	10.4	10.7	0.12	97.15
0.0	10.2	10.4	0.12	97.14
0.0	10.0	10.2	0.11	97.14
0.0	9.7	10.0	0.11	97.14
0.0	9.5	9.7	0.11	97.14

Pond File: SB1-RA .PND
Inflow Hydrograph: 5-DB1-2 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	0.00	0.0	9.3	9.5	0.11	97.13
24.800	0.00	0.0	9.1	9.3	0.10	97.13
24.900	0.00	0.0	8.9	9.1	0.10	97.13
25.000	0.00	0.0	8.7	8.9	0.10	97.12
25.100	0.00	0.0	8.5	8.7	0.10	97.12
25.200	0.00	0.0	8.3	8.5	0.09	97.12
25.300	0.00	0.0	8.1	8.3	0.09	97.12
25.400	0.00	0.0	8.0	8.1	0.09	97.11
25.500	0.00	0.0	7.8	8.0	0.09	97.11
25.600	0.00	0.0	7.6	7.8	0.09	97.11
25.700	0.00	0.0	7.4	7.6	0.08	97.11
25.800	0.00	0.0	7.3	7.4	0.08	97.10
25.900	0.00	0.0	7.1	7.3	0.08	97.10

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: SB1-RA .PND
Inflow Hydrograph: 5-DB1-2 .HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 97.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 5.00 cfs
Peak Outflow = 0.78 cfs
Peak Elevation = 97.98 ft

***** Summary of Approximate Peak Storage *****

Initial Storage = 0.00 ac-ft
Peak Storage From Storm = 0.29 ac-ft

Total Storage in Pond = 0.29 ac-ft

Pond File: SB1-RA .PND
Inflow Hydrograph: 5-DB1-2 .HYD
Outflow Hydrograph: OUT .HYD

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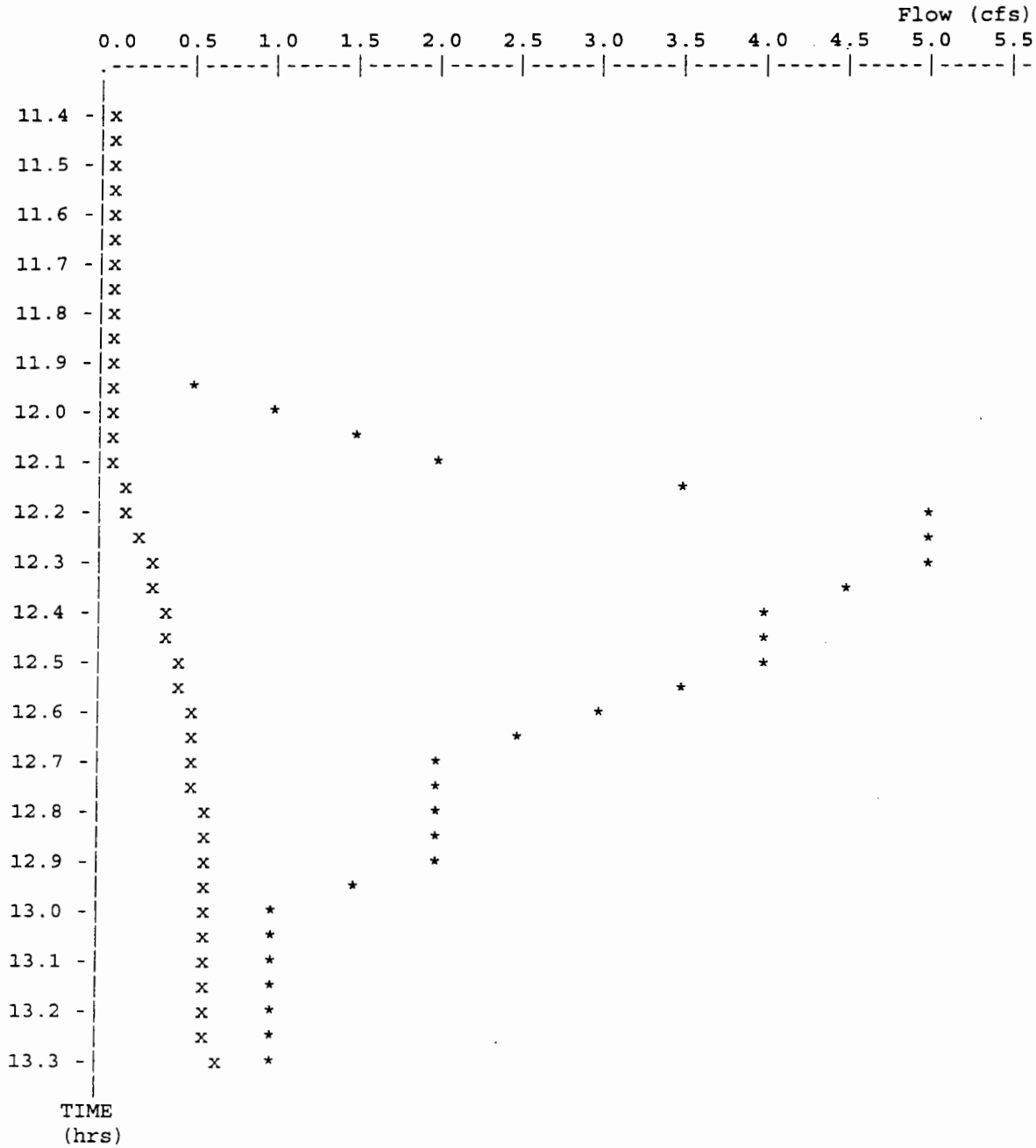
10:03:27

Peak Inflow = 5.00 cfs
Peak Outflow = 0.78 cfs
Peak Elevation = 97.98 ft



* File: 5-DB1-2 .HYD Qmax = 5.0 cfs
x File: OUT .HYD Qmax = 0.8 cfs

```
*************************
*                       *
*                       *
*    EARLE - SITE 5     *
* DETENTION BASIN # 1   *
*     10 YEAR STORM     *
*                       *
*************************
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Inflow Hydrograph: 5-DB1 .HYD
Rating Table file: SB1-RA .PND

----INITIAL CONDITIONS----
Elevation = 97.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
97.00	0.0	0.000
98.00	0.8	0.295
99.00	2.0	0.625
100.00	6.4	0.995

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
71.4	72.2
151.2	153.2
240.7	247.1

Time increment (t) = 0.100 hrs.

POND-2 Version: 5.17 S/N:
EXECUTED: 11-06-1997 09:59:52

Pond File: SB1-RA .PND
Inflow Hydrograph: 5-DB1 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	0.00	-----	0.0	0.0	0.00	97.00
11.100	0.00	0.0	0.0	0.0	0.00	97.00
11.200	0.00	0.0	0.0	0.0	0.00	97.00
11.300	0.00	0.0	0.0	0.0	0.00	97.00
11.400	0.00	0.0	0.0	0.0	0.00	97.00
11.500	0.00	0.0	0.0	0.0	0.00	97.00
11.600	0.00	0.0	0.0	0.0	0.00	97.00
11.700	0.00	0.0	0.0	0.0	0.00	97.00
11.800	1.00	1.0	1.0	1.0	0.01	97.01
11.900	1.00	2.0	2.9	3.0	0.03	97.04
12.000	2.00	3.0	5.8	5.9	0.07	97.08
12.100	6.00	8.0	13.5	13.8	0.15	97.19
12.200	13.00	19.0	31.8	32.5	0.36	97.45
12.300	13.00	26.0	56.5	57.8	0.64	97.80
12.400	11.00	24.0	78.6	80.5	0.92	98.10
12.500	9.00	20.0	96.2	98.6	1.19	98.33
12.600	7.00	16.0	109.5	112.2	1.39	98.49
12.700	5.00	12.0	118.4	121.5	1.53	98.61
12.800	4.00	9.0	124.2	127.4	1.62	98.68
12.900	4.00	8.0	128.8	132.2	1.69	98.74
13.000	3.00	7.0	132.3	135.8	1.74	98.79
13.100	3.00	6.0	134.7	138.3	1.78	98.82
13.200	3.00	6.0	137.1	140.7	1.82	98.85
13.300	2.00	5.0	138.4	142.1	1.84	98.86
13.400	2.00	4.0	138.8	142.4	1.84	98.87
13.500	2.00	4.0	139.1	142.8	1.85	98.87
13.600	2.00	4.0	139.4	143.1	1.85	98.88
13.700	2.00	4.0	139.7	143.4	1.85	98.88
13.800	2.00	4.0	139.9	143.7	1.86	98.88
13.900	2.00	4.0	140.2	143.9	1.86	98.89
14.000	2.00	4.0	140.5	144.2	1.87	98.89
14.100	2.00	4.0	140.7	144.5	1.87	98.89
14.200	2.00	4.0	141.0	144.7	1.87	98.90
14.300	2.00	4.0	141.2	145.0	1.88	98.90
14.400	2.00	4.0	141.5	145.2	1.88	98.90
14.500	2.00	4.0	141.7	145.5	1.89	98.90
14.600	2.00	4.0	141.9	145.7	1.89	98.91
14.700	2.00	4.0	142.1	145.9	1.89	98.91
14.800	2.00	4.0	142.3	146.1	1.90	98.91
14.900	1.00	3.0	141.6	145.3	1.88	98.90
15.000	1.00	2.0	139.8	143.6	1.86	98.88
15.100	1.00	2.0	138.2	141.8	1.83	98.86
15.200	1.00	2.0	136.6	140.2	1.81	98.84
15.300	1.00	2.0	135.0	138.6	1.78	98.82
15.400	1.00	2.0	133.5	137.0	1.76	98.80

Pond File: SB1-RA .PND
Inflow Hydrograph: 5-DB1 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	1.00	2.0	132.0	135.5	1.74	98.78
15.600	1.00	2.0	130.6	134.0	1.72	98.76
15.700	1.00	2.0	129.2	132.6	1.69	98.75
15.800	1.00	2.0	127.8	131.2	1.67	98.73
15.900	1.00	2.0	126.5	129.8	1.65	98.71
16.000	1.00	2.0	125.3	128.5	1.63	98.70
16.100	1.00	2.0	124.0	127.3	1.62	98.68
16.200	1.00	2.0	122.8	126.0	1.60	98.66
16.300	1.00	2.0	121.7	124.8	1.58	98.65
16.400	1.00	2.0	120.5	123.7	1.56	98.64
16.500	1.00	2.0	119.4	122.5	1.55	98.62
16.600	1.00	2.0	118.4	121.4	1.53	98.61
16.700	1.00	2.0	117.4	120.4	1.51	98.60
16.800	1.00	2.0	116.4	119.4	1.50	98.58
16.900	1.00	2.0	115.4	118.4	1.48	98.57
17.000	1.00	2.0	114.5	117.4	1.47	98.56
17.100	1.00	2.0	113.5	116.5	1.46	98.55
17.200	1.00	2.0	112.7	115.5	1.44	98.54
17.300	1.00	2.0	111.8	114.7	1.43	98.52
17.400	1.00	2.0	111.0	113.8	1.42	98.51
17.500	1.00	2.0	110.2	113.0	1.40	98.50
17.600	1.00	2.0	109.4	112.2	1.39	98.49
17.700	1.00	2.0	108.6	111.4	1.38	98.48
17.800	1.00	2.0	107.9	110.6	1.37	98.47
17.900	1.00	2.0	107.2	109.9	1.36	98.47
18.000	1.00	2.0	106.5	109.2	1.35	98.46
18.100	1.00	2.0	105.8	108.5	1.34	98.45
18.200	1.00	2.0	105.1	107.8	1.33	98.44
18.300	1.00	2.0	104.5	107.1	1.32	98.43
18.400	1.00	2.0	103.9	106.5	1.31	98.42
18.500	1.00	2.0	103.3	105.9	1.30	98.42
18.600	1.00	2.0	102.7	105.3	1.29	98.41
18.700	1.00	2.0	102.1	104.7	1.28	98.40
18.800	1.00	2.0	101.6	104.1	1.27	98.39
18.900	1.00	2.0	101.0	103.6	1.27	98.39
19.000	1.00	2.0	100.5	103.0	1.26	98.38
19.100	1.00	2.0	100.0	102.5	1.25	98.37
19.200	1.00	2.0	99.5	102.0	1.24	98.37
19.300	1.00	2.0	99.1	101.5	1.24	98.36
19.400	1.00	2.0	98.6	101.1	1.23	98.36
19.500	1.00	2.0	98.2	100.6	1.22	98.35
19.600	1.00	2.0	97.7	100.2	1.22	98.35
19.700	1.00	2.0	97.3	99.7	1.21	98.34
19.800	1.00	2.0	96.9	99.3	1.20	98.34
19.900	1.00	2.0	96.5	98.9	1.20	98.33
20.000	1.00	2.0	96.2	98.5	1.19	98.33

Pond File: SB1-RA .PND
Inflow Hydrograph: 5-DB1 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH

TIME (hrs)	INFLOW (cfs)
20.100	1.00
20.200	1.00
20.300	1.00
20.400	1.00
20.500	1.00
20.600	1.00
20.700	1.00
20.800	1.00
20.900	1.00
21.000	0.00
21.100	0.00
21.200	0.00
21.300	0.00
21.400	0.00
21.500	0.00
21.600	0.00
21.700	0.00
21.800	0.00
21.900	0.00
22.000	0.00
22.100	0.00
22.200	0.00
22.300	0.00
22.400	0.00
22.500	0.00
22.600	0.00
22.700	0.00
22.800	0.00
22.900	0.00
23.000	0.00
23.100	0.00
23.200	0.00
23.300	0.00
23.400	0.00
23.500	0.00
23.600	0.00
23.700	0.00
23.800	0.00
23.900	0.00
24.000	0.00
24.100	0.00
24.200	0.00
24.300	0.00
24.400	0.00
24.500	0.00
24.600	0.00

ROUTING COMPUTATIONS

I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
2.0	95.8	98.2	1.19	98.32
2.0	95.4	97.8	1.18	98.32
2.0	95.1	97.4	1.17	98.31
2.0	94.7	97.1	1.17	98.31
2.0	94.4	96.7	1.16	98.30
2.0	94.1	96.4	1.16	98.30
2.0	93.8	96.1	1.15	98.30
2.0	93.5	95.8	1.15	98.29
2.0	93.2	95.5	1.15	98.29
1.0	91.9	94.2	1.13	98.27
0.0	89.8	91.9	1.09	98.24
0.0	87.6	89.8	1.06	98.22
0.0	85.6	87.6	1.03	98.19
0.0	83.6	85.6	1.00	98.17
0.0	81.6	83.6	0.97	98.14
0.0	79.8	81.6	0.94	98.12
0.0	77.9	79.8	0.91	98.09
0.0	76.2	77.9	0.89	98.07
0.0	74.4	76.2	0.86	98.05
0.0	72.8	74.4	0.83	98.03
0.0	71.2	72.8	0.81	98.01
0.0	69.6	71.2	0.79	97.99
0.0	68.0	69.6	0.77	97.96
0.0	66.5	68.0	0.75	97.94
0.0	65.1	66.5	0.74	97.92
0.0	63.6	65.1	0.72	97.90
0.0	62.2	63.6	0.71	97.88
0.0	60.8	62.2	0.69	97.86
0.0	59.5	60.8	0.67	97.84
0.0	58.2	59.5	0.66	97.82
0.0	56.9	58.2	0.64	97.81
0.0	55.6	56.9	0.63	97.79
0.0	54.4	55.6	0.62	97.77
0.0	53.2	54.4	0.60	97.75
0.0	52.0	53.2	0.59	97.74
0.0	50.8	52.0	0.58	97.72
0.0	49.7	50.8	0.56	97.70
0.0	48.6	49.7	0.55	97.69
0.0	47.5	48.6	0.54	97.67
0.0	46.5	47.5	0.53	97.66
0.0	45.4	46.5	0.52	97.64
0.0	44.4	45.4	0.50	97.63
0.0	43.4	44.4	0.49	97.62
0.0	42.5	43.4	0.48	97.60
0.0	41.5	42.5	0.47	97.59
0.0	40.6	41.5	0.46	97.58

Pond File: SB1-RA .PND
Inflow Hydrograph: 5-DB1 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	0.00	0.0	39.7	40.6	0.45	97.56
24.800	0.00	0.0	38.8	39.7	0.44	97.55
24.900	0.00	0.0	38.0	38.8	0.43	97.54
25.000	0.00	0.0	37.1	38.0	0.42	97.53
25.100	0.00	0.0	36.3	37.1	0.41	97.51
25.200	0.00	0.0	35.5	36.3	0.40	97.50
25.300	0.00	0.0	34.7	35.5	0.39	97.49
25.400	0.00	0.0	34.0	34.7	0.38	97.48
25.500	0.00	0.0	33.2	34.0	0.38	97.47
25.600	0.00	0.0	32.5	33.2	0.37	97.46
25.700	0.00	0.0	31.7	32.5	0.36	97.45
25.800	0.00	0.0	31.0	31.7	0.35	97.44
25.900	0.00	0.0	30.3	31.0	0.34	97.43

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: SB1-RA .PND
Inflow Hydrograph: 5-DB1 .HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 97.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 13.00 cfs
Peak Outflow = 1.90 cfs
Peak Elevation = 98.91 ft

***** Summary of Approximate Peak Storage *****

Initial Storage = 0.00 ac-ft
Peak Storage From Storm = 0.60 ac-ft

Total Storage in Pond = 0.60 ac-ft

Pond File: SB1-RA .PND
Inflow Hydrograph: 5-DB1 .HYD
Outflow Hydrograph: OUT .HYD

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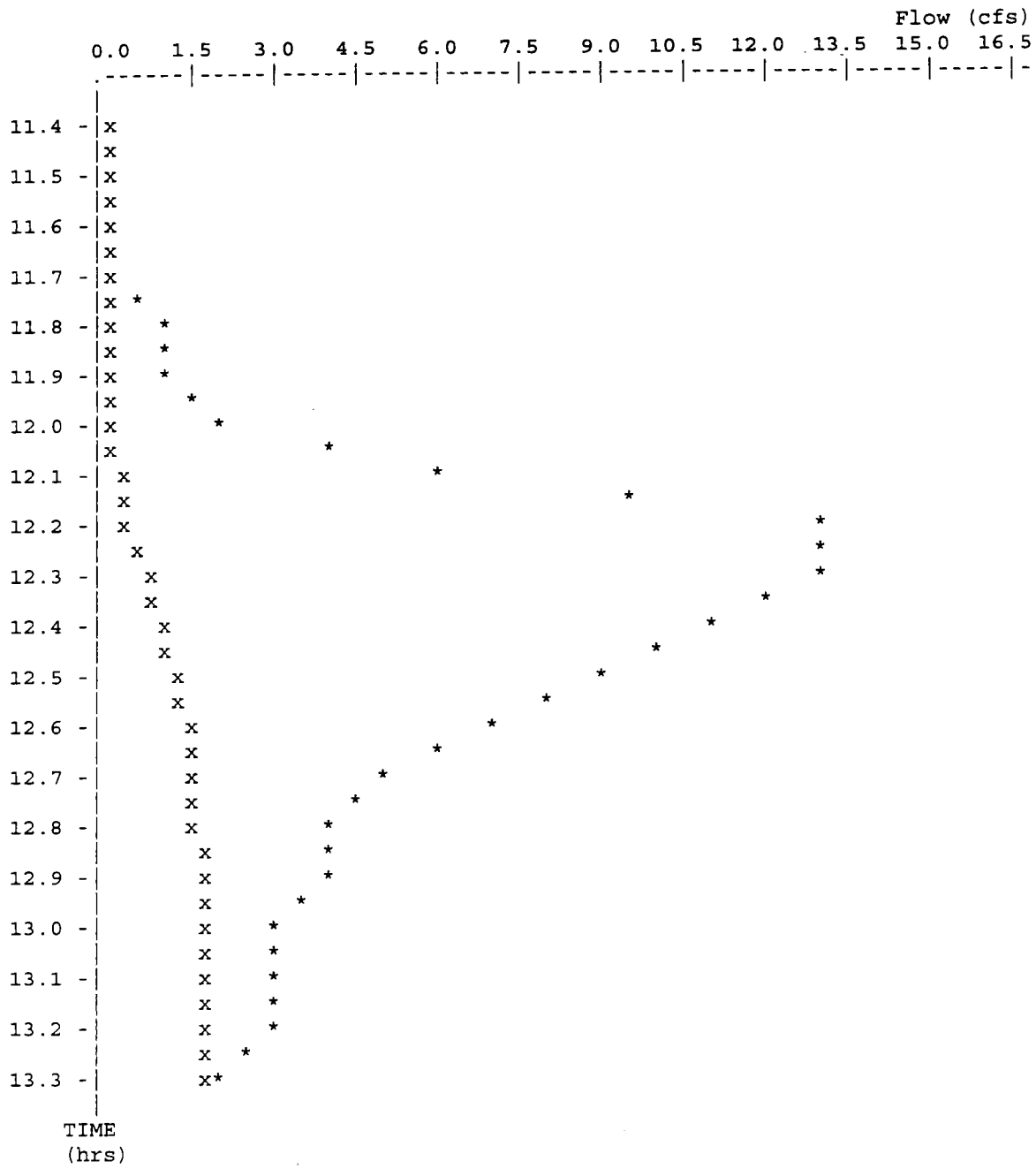
09:59:52

Peak Inflow = 13.00 cfs
Peak Outflow = 1.90 cfs
Peak Elevation = 98.91 ft



* File: 5-DB1 .HYD Qmax = 13.0 cfs
x File: OUT .HYD Qmax = 1.9 cfs

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*************************
*                       *
*                       *
*    EARLE - SITE 5     *
* DETENTION BASIN # 1   *
*     25 YEAR STORM     *
*                       *
*************************
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Inflow Hydrograph: 5-DB125 .HYD
Rating Table file: SB1-RA .PND

----INITIAL CONDITIONS----
Elevation = 97.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
97.00	0.0	0.000
98.00	0.8	0.295
99.00	2.0	0.625
100.00	6.4	0.995

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
71.4	72.2
151.2	153.2
240.7	247.1

Time increment (t) = 0.100 hrs.

POND-2 Version: 5.17 S/N:
EXECUTED: 11-06-1997 10:05:07

Pond File: SB1-RA .PND
Inflow Hydrograph: 5-DB125 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH / ROUTING COMPUTATIONS

TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	1.00	-----	0.0	0.0	0.00	97.00
11.100	1.00	2.0	2.0	2.0	0.02	97.03
11.200	1.00	2.0	3.9	4.0	0.04	97.05
11.300	1.00	2.0	5.7	5.9	0.07	97.08
11.400	1.00	2.0	7.6	7.7	0.09	97.11
11.500	2.00	3.0	10.3	10.6	0.12	97.15
11.600	2.00	4.0	14.0	14.3	0.16	97.20
11.700	2.00	4.0	17.6	18.0	0.20	97.25
11.800	3.00	5.0	22.1	22.6	0.25	97.31
11.900	3.00	6.0	27.5	28.1	0.31	97.39
12.000	5.00	8.0	34.7	35.5	0.39	97.49
12.100	7.00	12.0	45.7	46.7	0.52	97.65
12.200	13.00	20.0	64.2	65.7	0.73	97.91
12.300	20.00	33.0	94.9	97.2	1.17	98.31
12.400	19.00	39.0	130.4	133.9	1.71	98.76
12.500	15.00	34.0	159.4	164.4	2.53	99.12
12.600	11.00	26.0	178.4	185.4	3.51	99.34
12.700	8.00	19.0	189.2	197.4	4.07	99.47
12.800	6.00	14.0	194.5	203.2	4.34	99.53
12.900	5.00	11.0	196.6	205.5	4.45	99.56
13.000	4.00	9.0	196.7	205.6	4.46	99.56
13.100	4.00	8.0	195.9	204.7	4.41	99.55
13.200	3.00	7.0	194.2	202.9	4.33	99.53
13.300	2.00	5.0	190.9	199.2	4.16	99.49
13.400	2.00	4.0	187.0	194.9	3.96	99.44
13.500	2.00	4.0	183.5	191.0	3.77	99.40
13.600	2.00	4.0	180.2	187.5	3.61	99.37
13.700	2.00	4.0	177.3	184.2	3.46	99.33
13.800	2.00	4.0	174.7	181.3	3.32	99.30
13.900	2.00	4.0	172.3	178.7	3.20	99.27
14.000	2.00	4.0	170.1	176.3	3.08	99.25
14.100	2.00	4.0	168.2	174.1	2.98	99.22
14.200	2.00	4.0	166.4	172.2	2.89	99.20
14.300	2.00	4.0	164.8	170.4	2.81	99.18
14.400	2.00	4.0	163.3	168.8	2.73	99.17
14.500	2.00	4.0	162.0	167.3	2.66	99.15
14.600	2.00	4.0	160.8	166.0	2.60	99.14
14.700	2.00	4.0	159.7	164.8	2.54	99.12
14.800	2.00	4.0	158.7	163.7	2.49	99.11
14.900	1.00	3.0	156.9	161.7	2.40	99.09
15.000	1.00	2.0	154.4	158.9	2.27	99.06
15.100	1.00	2.0	152.1	156.4	2.15	99.03
15.200	1.00	2.0	150.0	154.1	2.04	99.01
15.300	1.00	2.0	148.0	152.0	1.98	98.99
15.400	1.00	2.0	146.1	150.0	1.95	98.96

Pond File: SB1-RA .PND
Inflow Hydrograph: 5-DB125 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	1.00	2.0	144.3	148.1	1.93	98.94
15.600	1.00	2.0	142.5	146.3	1.90	98.91
15.700	1.00	2.0	140.7	144.5	1.87	98.89
15.800	1.00	2.0	139.0	142.7	1.85	98.87
15.900	1.00	2.0	137.4	141.0	1.82	98.85
16.000	1.00	2.0	135.8	139.4	1.80	98.83
16.100	1.00	2.0	134.3	137.8	1.77	98.81
16.200	1.00	2.0	132.8	136.3	1.75	98.79
16.300	1.00	2.0	131.3	134.8	1.73	98.77
16.400	1.00	2.0	129.9	133.3	1.71	98.75
16.500	1.00	2.0	128.5	131.9	1.68	98.74
16.600	1.00	2.0	127.2	130.5	1.66	98.72
16.700	1.00	2.0	125.9	129.2	1.64	98.70
16.800	1.00	2.0	124.7	127.9	1.63	98.69
16.900	1.00	2.0	123.4	126.7	1.61	98.67
17.000	1.00	2.0	122.3	125.4	1.59	98.66
17.100	1.00	2.0	121.1	124.3	1.57	98.64
17.200	1.00	2.0	120.0	123.1	1.55	98.63
17.300	1.00	2.0	118.9	122.0	1.54	98.62
17.400	1.00	2.0	117.9	120.9	1.52	98.60
17.500	1.00	2.0	116.9	119.9	1.51	98.59
17.600	1.00	2.0	115.9	118.9	1.49	98.58
17.700	1.00	2.0	114.9	117.9	1.48	98.56
17.800	1.00	2.0	114.0	116.9	1.46	98.55
17.900	1.00	2.0	113.1	116.0	1.45	98.54
18.000	1.00	2.0	112.2	115.1	1.44	98.53
18.100	1.00	2.0	111.4	114.2	1.42	98.52
18.200	1.00	2.0	110.6	113.4	1.41	98.51
18.300	1.00	2.0	109.8	112.6	1.40	98.50
18.400	1.00	2.0	109.0	111.8	1.39	98.49
18.500	0.00	1.0	107.3	110.0	1.36	98.47
18.600	0.00	0.0	104.6	107.3	1.32	98.43
18.700	0.00	0.0	102.1	104.6	1.28	98.40
18.800	0.00	0.0	99.6	102.1	1.24	98.37
18.900	0.00	0.0	97.2	99.6	1.21	98.34
19.000	0.00	0.0	94.8	97.2	1.17	98.31
19.100	0.00	0.0	92.6	94.8	1.14	98.28
19.200	0.00	0.0	90.4	92.6	1.10	98.25
19.300	0.00	0.0	88.2	90.4	1.07	98.22
19.400	0.00	0.0	86.1	88.2	1.04	98.20
19.500	0.00	0.0	84.1	86.1	1.01	98.17
19.600	0.00	0.0	82.2	84.1	0.98	98.15
19.700	0.00	0.0	80.3	82.2	0.95	98.12
19.800	0.00	0.0	78.4	80.3	0.92	98.10
19.900	0.00	0.0	76.7	78.4	0.89	98.08
20.000	0.00	0.0	74.9	76.7	0.87	98.06

Pond File: SB1-RA .PND
Inflow Hydrograph: 5-DB125 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	0.00	0.0	73.2	74.9	0.84	98.03
20.200	0.00	0.0	71.6	73.2	0.82	98.01
20.300	0.00	0.0	70.0	71.6	0.79	97.99
20.400	0.00	0.0	68.5	70.0	0.78	97.97
20.500	0.00	0.0	66.9	68.5	0.76	97.95
20.600	0.00	0.0	65.5	66.9	0.74	97.93
20.700	0.00	0.0	64.0	65.5	0.73	97.91
20.800	0.00	0.0	62.6	64.0	0.71	97.89
20.900	0.00	0.0	61.2	62.6	0.69	97.87
21.000	0.00	0.0	59.8	61.2	0.68	97.85
21.100	0.00	0.0	58.5	59.8	0.66	97.83
21.200	0.00	0.0	57.2	58.5	0.65	97.81
21.300	0.00	0.0	56.0	57.2	0.63	97.79
21.400	0.00	0.0	54.7	56.0	0.62	97.78
21.500	0.00	0.0	53.5	54.7	0.61	97.76
21.600	0.00	0.0	52.3	53.5	0.59	97.74
21.700	0.00	0.0	51.2	52.3	0.58	97.72
21.800	0.00	0.0	50.0	51.2	0.57	97.71
21.900	0.00	0.0	48.9	50.0	0.55	97.69
22.000	0.00	0.0	47.8	48.9	0.54	97.68
22.100	0.00	0.0	46.8	47.8	0.53	97.66
22.200	0.00	0.0	45.7	46.8	0.52	97.65
22.300	0.00	0.0	44.7	45.7	0.51	97.63
22.400	0.00	0.0	43.7	44.7	0.50	97.62
22.500	0.00	0.0	42.8	43.7	0.48	97.61
22.600	0.00	0.0	41.8	42.8	0.47	97.59
22.700	0.00	0.0	40.9	41.8	0.46	97.58
22.800	0.00	0.0	40.0	40.9	0.45	97.57
22.900	0.00	0.0	39.1	40.0	0.44	97.55
23.000	0.00	0.0	38.2	39.1	0.43	97.54
23.100	0.00	0.0	37.4	38.2	0.42	97.53
23.200	0.00	0.0	36.5	37.4	0.41	97.52
23.300	0.00	0.0	35.7	36.5	0.41	97.51
23.400	0.00	0.0	34.9	35.7	0.40	97.50
23.500	0.00	0.0	34.2	34.9	0.39	97.48
23.600	0.00	0.0	33.4	34.2	0.38	97.47
23.700	0.00	0.0	32.7	33.4	0.37	97.46
23.800	0.00	0.0	31.9	32.7	0.36	97.45
23.900	0.00	0.0	31.2	31.9	0.35	97.44
24.000	0.00	0.0	30.5	31.2	0.35	97.43
24.100	0.00	0.0	29.9	30.5	0.34	97.42
24.200	0.00	0.0	29.2	29.9	0.33	97.41
24.300	0.00	0.0	28.6	29.2	0.32	97.40
24.400	0.00	0.0	27.9	28.6	0.32	97.40
24.500	0.00	0.0	27.3	27.9	0.31	97.39
24.600	0.00	0.0	26.7	27.3	0.30	97.38

Pond File: SB1-RA .PND
Inflow Hydrograph: 5-DB125 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	0.00	0.0	26.1	26.7	0.30	97.37
24.800	0.00	0.0	25.5	26.1	0.29	97.36
24.900	0.00	0.0	25.0	25.5	0.28	97.35
25.000	0.00	0.0	24.4	25.0	0.28	97.35
25.100	0.00	0.0	23.9	24.4	0.27	97.34
25.200	0.00	0.0	23.3	23.9	0.26	97.33
25.300	0.00	0.0	22.8	23.3	0.26	97.32
25.400	0.00	0.0	22.3	22.8	0.25	97.32
25.500	0.00	0.0	21.8	22.3	0.25	97.31
25.600	0.00	0.0	21.3	21.8	0.24	97.30
25.700	0.00	0.0	20.9	21.3	0.24	97.30
25.800	0.00	0.0	20.4	20.9	0.23	97.29
25.900	0.00	0.0	19.9	20.4	0.23	97.28

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: SB1-RA .PND
Inflow Hydrograph: 5-DB125 .HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 97.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 20.00 cfs
Peak Outflow = 4.46 cfs
Peak Elevation = 99.56 ft

***** Summary of Approximate Peak Storage *****

Initial Storage = 0.00 ac-ft
Peak Storage From Storm = 0.83 ac-ft

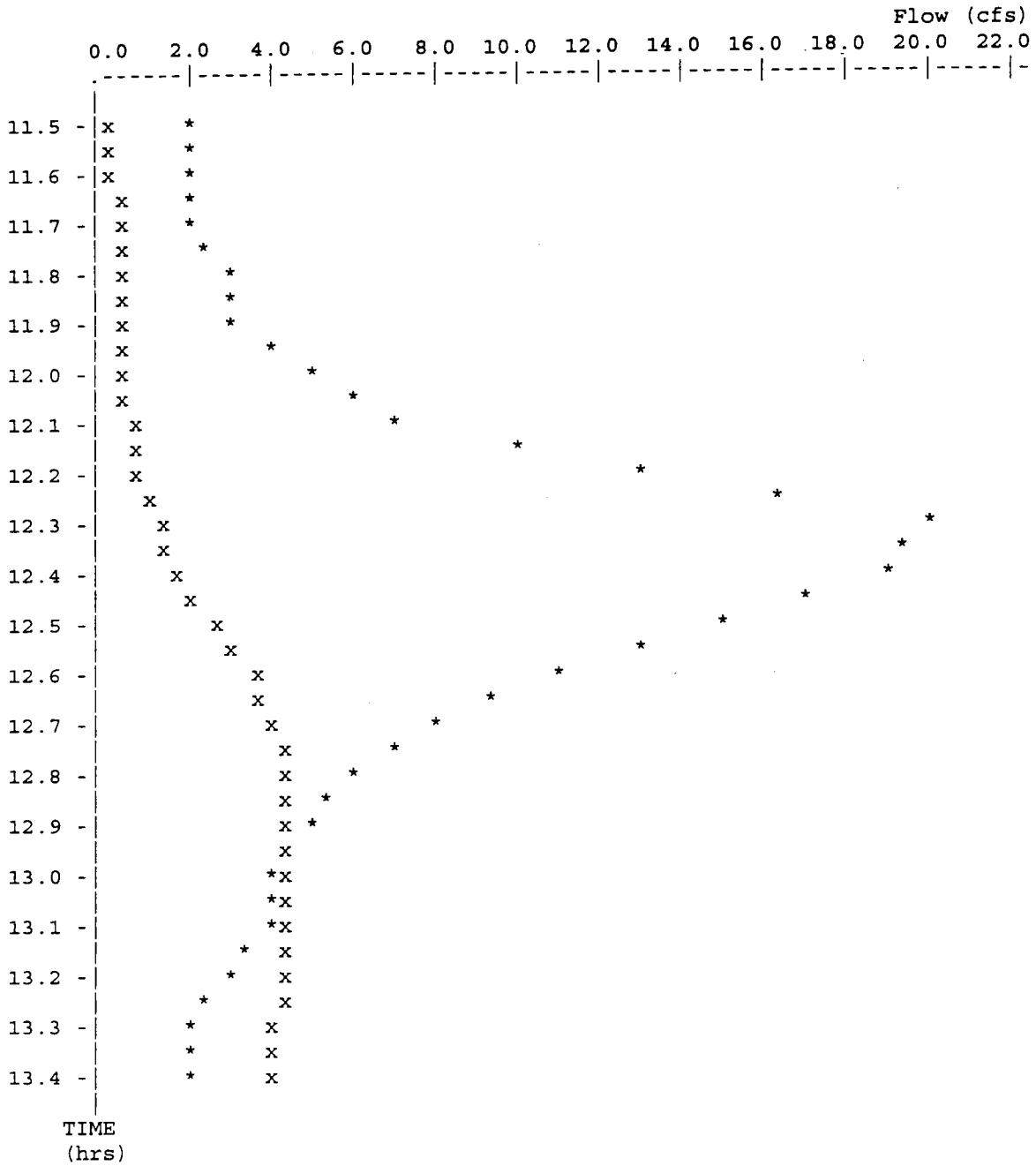
Total Storage in Pond = 0.83 ac-ft

Warning: Inflow hydrograph truncated on left side.

Pond File: SB1-RA .PND
Inflow Hydrograph: 5-DB125 .HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 11-06-1997
10:05:07

Peak Inflow = 20.00 cfs
Peak Outflow = 4.46 cfs
Peak Elevation = 99.56 ft



* File: 5-DB125 .HYD Qmax = 20.0 cfs
x File: OUT .HYD Qmax = 4.5 cfs

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************************
*                      *
*                      *
*    EARLE - SITE 5    *
*  SEDIMENT BASIN # 2  *
*                      *
*                      *
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Inflow Hydrograph: 5-SB2 .HYD
Rating Table file: SB2 .PND

----INITIAL CONDITIONS----
Elevation = 104.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
104.00	0.0	0.000
105.00	0.0	0.016
105.50	0.0	0.026
106.00	0.3	0.037
107.00	0.5	0.077
108.00	0.7	0.138
109.00	2.7	0.209

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
3.9	3.9
6.2	6.2
9.0	9.3
18.7	19.2
33.4	34.1
50.6	53.3

Time increment (t) = 0.100 hrs.

POND-2 Version: 5.17 S/N:
EXECUTED: 11-04-1997 18:26:08

Pond File: SB2 .PND
Inflow Hydrograph: 5-SB2 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	0.00	-----	0.0	0.0	0.00	104.00
11.100	0.00	0.0	0.0	0.0	0.00	104.00
11.200	0.00	0.0	0.0	0.0	0.00	104.00
11.300	0.00	0.0	0.0	0.0	0.00	104.00
11.400	0.00	0.0	0.0	0.0	0.00	104.00
11.500	0.00	0.0	0.0	0.0	0.00	104.00
11.600	0.00	0.0	0.0	0.0	0.00	104.00
11.700	0.00	0.0	0.0	0.0	0.00	104.00
11.800	1.00	1.0	1.0	1.0	0.00	104.26
11.900	1.00	2.0	3.0	3.0	0.00	104.77
12.000	1.00	2.0	5.0	5.0	0.00	105.24
12.100	2.00	3.0	7.7	8.0	0.17	105.79
12.200	3.00	5.0	11.9	12.7	0.37	106.34
12.300	5.00	8.0	18.9	19.9	0.51	107.05
12.400	5.00	10.0	27.6	28.9	0.63	107.65
12.500	4.00	9.0	34.7	36.6	0.97	108.13
12.600	3.00	7.0	38.7	41.7	1.49	108.40
12.700	2.00	5.0	40.3	43.7	1.70	108.50
12.800	1.00	3.0	40.0	43.3	1.66	108.48
12.900	1.00	2.0	38.9	42.0	1.52	108.41
13.000	1.00	2.0	38.1	40.9	1.41	108.36
13.100	1.00	2.0	37.5	40.1	1.33	108.31
13.200	1.00	2.0	36.9	39.5	1.26	108.28
13.300	1.00	2.0	36.5	38.9	1.21	108.25
13.400	1.00	2.0	36.2	38.5	1.16	108.23
13.500	1.00	2.0	35.9	38.2	1.13	108.21
13.600	1.00	2.0	35.7	37.9	1.10	108.20
13.700	1.00	2.0	35.6	37.7	1.08	108.19
13.800	1.00	2.0	35.5	37.6	1.06	108.18
13.900	0.00	1.0	34.6	36.5	0.95	108.12
14.000	0.00	0.0	33.1	34.6	0.75	108.02
14.100	0.00	0.0	31.7	33.1	0.69	107.93
14.200	0.00	0.0	30.4	31.7	0.67	107.84
14.300	0.00	0.0	29.1	30.4	0.65	107.75
14.400	0.00	0.0	27.8	29.1	0.63	107.66
14.500	0.00	0.0	26.6	27.8	0.62	107.58
14.600	0.00	0.0	25.4	26.6	0.60	107.50
14.700	0.00	0.0	24.2	25.4	0.58	107.42
14.800	0.00	0.0	23.1	24.2	0.57	107.34
14.900	0.00	0.0	22.0	23.1	0.55	107.26
15.000	0.00	0.0	20.9	22.0	0.54	107.19
15.100	0.00	0.0	19.8	20.9	0.52	107.12
15.200	0.00	0.0	18.8	19.8	0.51	107.04
15.300	0.00	0.0	17.8	18.8	0.49	106.96
15.400	0.00	0.0	16.9	17.8	0.47	106.86

Pond File: SB2 .PND
Inflow Hydrograph: 5-SB2 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	0.00	0.0	16.0	16.9	0.45	106.77
15.600	0.00	0.0	15.1	16.0	0.44	106.68
15.700	0.00	0.0	14.3	15.1	0.42	106.59
15.800	0.00	0.0	13.5	14.3	0.40	106.50
15.900	0.00	0.0	12.7	13.5	0.38	106.42
16.000	0.00	0.0	12.0	12.7	0.37	106.34
16.100	0.00	0.0	11.3	12.0	0.35	106.27
16.200	0.00	0.0	10.6	11.3	0.34	106.20
16.300	0.00	0.0	9.9	10.6	0.33	106.13
16.400	0.00	0.0	9.3	9.9	0.31	106.06
16.500	0.00	0.0	8.7	9.3	0.30	106.00
16.600	0.00	0.0	8.2	8.7	0.24	105.90
16.700	0.00	0.0	7.8	8.2	0.19	105.82
16.800	0.00	0.0	7.5	7.8	0.16	105.76
16.900	0.00	0.0	7.3	7.5	0.13	105.71
17.000	0.00	0.0	7.1	7.3	0.10	105.67
17.100	0.00	0.0	6.9	7.1	0.08	105.64
17.200	0.00	0.0	6.8	6.9	0.07	105.61
17.300	0.00	0.0	6.7	6.8	0.05	105.59
17.400	0.00	0.0	6.6	6.7	0.04	105.57
17.500	0.00	0.0	6.5	6.6	0.03	105.56
17.600	0.00	0.0	6.5	6.5	0.03	105.55
17.700	0.00	0.0	6.4	6.5	0.02	105.54
17.800	0.00	0.0	6.4	6.4	0.02	105.53
17.900	0.00	0.0	6.4	6.4	0.01	105.52
18.000	0.00	0.0	6.3	6.4	0.01	105.52
18.100	0.00	0.0	6.3	6.3	0.01	105.52
18.200	0.00	0.0	6.3	6.3	0.01	105.51
18.300	0.00	0.0	6.3	6.3	0.01	105.51
18.400	0.00	0.0	6.3	6.3	0.00	105.51
18.500	0.00	0.0	6.3	6.3	0.00	105.51
18.600	0.00	0.0	6.3	6.3	0.00	105.51
18.700	0.00	0.0	6.3	6.3	0.00	105.50
18.800	0.00	0.0	6.3	6.3	0.00	105.50
18.900	0.00	0.0	6.3	6.3	0.00	105.50
19.000	0.00	0.0	6.2	6.3	0.00	105.50
19.100	0.00	0.0	6.2	6.2	0.00	105.50
19.200	0.00	0.0	6.2	6.2	0.00	105.50
19.300	0.00	0.0	6.2	6.2	0.00	105.50
19.400	0.00	0.0	6.2	6.2	0.00	105.50
19.500	0.00	0.0	6.2	6.2	0.00	105.50
19.600	0.00	0.0	6.2	6.2	0.00	105.50
19.700	0.00	0.0	6.2	6.2	0.00	105.50
19.800	0.00	0.0	6.2	6.2	0.00	105.50
19.900	0.00	0.0	6.2	6.2	0.00	105.50
20.000	0.00	0.0	6.2	6.2	0.00	105.50

Pond File: SB2 .PND
Inflow Hydrograph: 5-SB2 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	0.00	0.0	6.2	6.2	0.00	105.50
20.200	0.00	0.0	6.2	6.2	0.00	105.50
20.300	0.00	0.0	6.2	6.2	0.00	105.50
20.400	0.00	0.0	6.2	6.2	0.00	105.50
20.500	0.00	0.0	6.2	6.2	0.00	105.50
20.600	0.00	0.0	6.2	6.2	0.00	105.50
20.700	0.00	0.0	6.2	6.2	0.00	105.50
20.800	0.00	0.0	6.2	6.2	0.00	105.50
20.900	0.00	0.0	6.2	6.2	0.00	105.50
21.000	0.00	0.0	6.2	6.2	0.00	105.50
21.100	0.00	0.0	6.2	6.2	0.00	105.50
21.200	0.00	0.0	6.2	6.2	0.00	105.50
21.300	0.00	0.0	6.2	6.2	0.00	105.50
21.400	0.00	0.0	6.2	6.2	0.00	105.50
21.500	0.00	0.0	6.2	6.2	0.00	105.50
21.600	0.00	0.0	6.2	6.2	0.00	105.50
21.700	0.00	0.0	6.2	6.2	0.00	105.50
21.800	0.00	0.0	6.2	6.2	0.00	105.50
21.900	0.00	0.0	6.2	6.2	0.00	105.50
22.000	0.00	0.0	6.2	6.2	0.00	105.50
22.100	0.00	0.0	6.2	6.2	0.00	105.50
22.200	0.00	0.0	6.2	6.2	0.00	105.50
22.300	0.00	0.0	6.2	6.2	0.00	105.50
22.400	0.00	0.0	6.2	6.2	0.00	105.50
22.500	0.00	0.0	6.2	6.2	0.00	105.50
22.600	0.00	0.0	6.2	6.2	0.00	105.50
22.700	0.00	0.0	6.2	6.2	0.00	105.50
22.800	0.00	0.0	6.2	6.2	0.00	105.50
22.900	0.00	0.0	6.2	6.2	0.00	105.50
23.000	0.00	0.0	6.2	6.2	0.00	105.50
23.100	0.00	0.0	6.2	6.2	0.00	105.50
23.200	0.00	0.0	6.2	6.2	0.00	105.50
23.300	0.00	0.0	6.2	6.2	0.00	105.50
23.400	0.00	0.0	6.2	6.2	0.00	105.50
23.500	0.00	0.0	6.2	6.2	0.00	105.50
23.600	0.00	0.0	6.2	6.2	0.00	105.50
23.700	0.00	0.0	6.2	6.2	0.00	105.50
23.800	0.00	0.0	6.2	6.2	0.00	105.50
23.900	0.00	0.0	6.2	6.2	0.00	105.50
24.000	0.00	0.0	6.2	6.2	0.00	105.50
24.100	0.00	0.0	6.2	6.2	0.00	105.50
24.200	0.00	0.0	6.2	6.2	0.00	105.50
24.300	0.00	0.0	6.2	6.2	0.00	105.50
24.400	0.00	0.0	6.2	6.2	0.00	105.50
24.500	0.00	0.0	6.2	6.2	0.00	105.50
24.600	0.00	0.0	6.2	6.2	0.00	105.50

Pond File: SB2 .PND
Inflow Hydrograph: 5-SB2 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	0.00	0.0	6.2	6.2	0.00	105.50
24.800	0.00	0.0	6.2	6.2	0.00	105.50
24.900	0.00	0.0	6.2	6.2	0.00	105.50
25.000	0.00	0.0	6.2	6.2	0.00	105.50
25.100	0.00	0.0	6.2	6.2	0.00	105.50
25.200	0.00	0.0	6.2	6.2	0.00	105.50
25.300	0.00	0.0	6.2	6.2	0.00	105.50
25.400	0.00	0.0	6.2	6.2	0.00	105.50
25.500	0.00	0.0	6.2	6.2	0.00	105.50
25.600	0.00	0.0	6.2	6.2	0.00	105.50
25.700	0.00	0.0	6.2	6.2	0.00	105.50
25.800	0.00	0.0	6.2	6.2	0.00	105.50
25.900	0.00	0.0	6.2	6.2	0.00	105.50

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: SB2 .PND
Inflow Hydrograph: 5-SB2 .HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 104.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 5.00 cfs
Peak Outflow = 1.70 cfs
Peak Elevation = 108.50 ft

***** Summary of Approximate Peak Storage *****

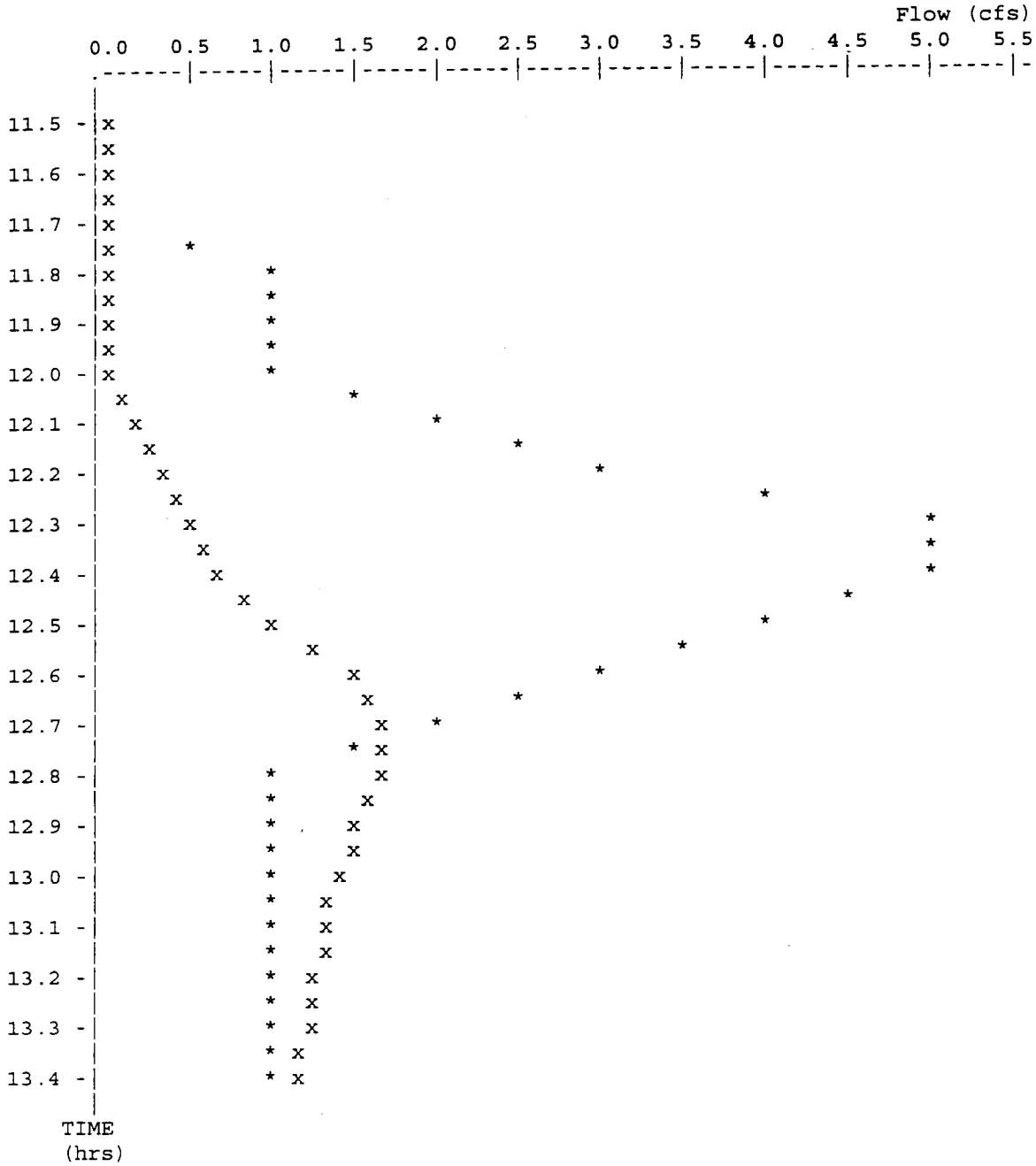
Initial Storage = 0.00 ac-ft
Peak Storage From Storm = 0.17 ac-ft

Total Storage in Pond = 0.17 ac-ft

Pond File: SB2 .PND
Inflow Hydrograph: 5-SB2 .HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 11-04-1997
18:26:08

Peak Inflow = 5.00 cfs
Peak Outflow = 1.70 cfs
Peak Elevation = 108.50 ft



* File: 5-SB2 .HYD Qmax = 5.0 cfs
x File: OUT .HYD Qmax = 1.7 cfs

```
*************************
*                       *
*                       *
*    EARLE - SITE 5     *
* DETENTION BASIN # 2   *
*     2 YEAR STORM      *
*                       *
*************************
```

Inflow Hydrograph: 5-DB2-2 .HYD
Rating Table file: SB2 .PND

----INITIAL CONDITIONS----
Elevation = 104.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
104.00	0.0	0.000
105.00	0.0	0.016
105.50	0.0	0.026
106.00	0.3	0.037
107.00	0.5	0.077
108.00	0.7	0.138
109.00	2.7	0.209

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
3.9	3.9
6.2	6.2
9.0	9.3
18.7	19.2
33.4	34.1
50.6	53.3

Time increment (t) = 0.100 hrs.

Pond File: SB2 .PND
Inflow Hydrograph: 5-DB2-2 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	0.00	-----	0.0	0.0	0.00	104.00
11.100	0.00	0.0	0.0	0.0	0.00	104.00
11.200	0.00	0.0	0.0	0.0	0.00	104.00
11.300	0.00	0.0	0.0	0.0	0.00	104.00
11.400	0.00	0.0	0.0	0.0	0.00	104.00
11.500	0.00	0.0	0.0	0.0	0.00	104.00
11.600	0.00	0.0	0.0	0.0	0.00	104.00
11.700	0.00	0.0	0.0	0.0	0.00	104.00
11.800	0.00	0.0	0.0	0.0	0.00	104.00
11.900	0.00	0.0	0.0	0.0	0.00	104.00
12.000	1.00	1.0	1.0	1.0	0.00	104.26
12.100	1.00	2.0	3.0	3.0	0.00	104.77
12.200	1.00	2.0	5.0	5.0	0.00	105.24
12.300	2.00	3.0	7.7	8.0	0.17	105.79
12.400	2.00	4.0	11.0	11.7	0.35	106.24
12.500	2.00	4.0	14.1	15.0	0.41	106.57
12.600	1.00	3.0	16.2	17.1	0.46	106.79
12.700	1.00	2.0	17.3	18.2	0.48	106.90
12.800	1.00	2.0	18.3	19.3	0.50	107.01
12.900	0.00	1.0	18.2	19.3	0.50	107.01
13.000	0.00	0.0	17.3	18.2	0.48	106.91
13.100	0.00	0.0	16.4	17.3	0.46	106.81
13.200	0.00	0.0	15.5	16.4	0.44	106.72
13.300	0.00	0.0	14.6	15.5	0.43	106.63
13.400	0.00	0.0	13.8	14.6	0.41	106.54
13.500	0.00	0.0	13.0	13.8	0.39	106.46
13.600	0.00	0.0	12.3	13.0	0.38	106.38
13.700	0.00	0.0	11.6	12.3	0.36	106.30
13.800	0.00	0.0	10.9	11.6	0.35	106.23
13.900	0.00	0.0	10.2	10.9	0.33	106.16
14.000	0.00	0.0	9.6	10.2	0.32	106.09
14.100	0.00	0.0	9.0	9.6	0.30	106.02
14.200	0.00	0.0	8.4	9.0	0.26	105.94
14.300	0.00	0.0	8.0	8.4	0.21	105.86
14.400	0.00	0.0	7.7	8.0	0.17	105.79
14.500	0.00	0.0	7.4	7.7	0.14	105.73
14.600	0.00	0.0	7.2	7.4	0.11	105.69
14.700	0.00	0.0	7.0	7.2	0.09	105.65
14.800	0.00	0.0	6.8	7.0	0.07	105.62
14.900	0.00	0.0	6.7	6.8	0.06	105.60
15.000	0.00	0.0	6.6	6.7	0.05	105.58
15.100	0.00	0.0	6.6	6.6	0.04	105.56
15.200	0.00	0.0	6.5	6.6	0.03	105.55
15.300	0.00	0.0	6.4	6.5	0.02	105.54
15.400	0.00	0.0	6.4	6.4	0.02	105.53

POND-2 Version: 5.17 S/N:
EXECUTED: 11-06-1997 10:07:00

Pond File: SB2 .PND
Inflow Hydrograph: 5-DB2-2 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	0.00	0.0	6.4	6.4	0.02	105.53
15.600	0.00	0.0	6.3	6.4	0.01	105.52
15.700	0.00	0.0	6.3	6.3	0.01	105.52
15.800	0.00	0.0	6.3	6.3	0.01	105.51
15.900	0.00	0.0	6.3	6.3	0.01	105.51
16.000	0.00	0.0	6.3	6.3	0.01	105.51
16.100	0.00	0.0	6.3	6.3	0.00	105.51
16.200	0.00	0.0	6.3	6.3	0.00	105.51
16.300	0.00	0.0	6.3	6.3	0.00	105.50
16.400	0.00	0.0	6.3	6.3	0.00	105.50
16.500	0.00	0.0	6.3	6.3	0.00	105.50
16.600	0.00	0.0	6.2	6.3	0.00	105.50
16.700	0.00	0.0	6.2	6.2	0.00	105.50
16.800	0.00	0.0	6.2	6.2	0.00	105.50
16.900	0.00	0.0	6.2	6.2	0.00	105.50
17.000	0.00	0.0	6.2	6.2	0.00	105.50
17.100	0.00	0.0	6.2	6.2	0.00	105.50
17.200	0.00	0.0	6.2	6.2	0.00	105.50
17.300	0.00	0.0	6.2	6.2	0.00	105.50
17.400	0.00	0.0	6.2	6.2	0.00	105.50
17.500	0.00	0.0	6.2	6.2	0.00	105.50
17.600	0.00	0.0	6.2	6.2	0.00	105.50
17.700	0.00	0.0	6.2	6.2	0.00	105.50
17.800	0.00	0.0	6.2	6.2	0.00	105.50
17.900	0.00	0.0	6.2	6.2	0.00	105.50
18.000	0.00	0.0	6.2	6.2	0.00	105.50
18.100	0.00	0.0	6.2	6.2	0.00	105.50
18.200	0.00	0.0	6.2	6.2	0.00	105.50
18.300	0.00	0.0	6.2	6.2	0.00	105.50
18.400	0.00	0.0	6.2	6.2	0.00	105.50
18.500	0.00	0.0	6.2	6.2	0.00	105.50
18.600	0.00	0.0	6.2	6.2	0.00	105.50
18.700	0.00	0.0	6.2	6.2	0.00	105.50
18:800	0.00	0.0	6.2	6.2	0.00	105.50
18.900	0.00	0.0	6.2	6.2	0.00	105.50
19.000	0.00	0.0	6.2	6.2	0.00	105.50
19.100	0.00	0.0	6.2	6.2	0.00	105.50
19.200	0.00	0.0	6.2	6.2	0.00	105.50
19.300	0.00	0.0	6.2	6.2	0.00	105.50
19.400	0.00	0.0	6.2	6.2	0.00	105.50
19.500	0.00	0.0	6.2	6.2	0.00	105.50
19.600	0.00	0.0	6.2	6.2	0.00	105.50
19.700	0.00	0.0	6.2	6.2	0.00	105.50
19.800	0.00	0.0	6.2	6.2	0.00	105.50
19.900	0.00	0.0	6.2	6.2	0.00	105.50
20.000	0.00	0.0	6.2	6.2	0.00	105.50

Pond File: SB2 .PND
Inflow Hydrograph: 5-DB2-2 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	0.00	0.0	6.2	6.2	0.00	105.50
20.200	0.00	0.0	6.2	6.2	0.00	105.50
20.300	0.00	0.0	6.2	6.2	0.00	105.50
20.400	0.00	0.0	6.2	6.2	0.00	105.50
20.500	0.00	0.0	6.2	6.2	0.00	105.50
20.600	0.00	0.0	6.2	6.2	0.00	105.50
20.700	0.00	0.0	6.2	6.2	0.00	105.50
20.800	0.00	0.0	6.2	6.2	0.00	105.50
20.900	0.00	0.0	6.2	6.2	0.00	105.50
21.000	0.00	0.0	6.2	6.2	0.00	105.50
21.100	0.00	0.0	6.2	6.2	0.00	105.50
21.200	0.00	0.0	6.2	6.2	0.00	105.50
21.300	0.00	0.0	6.2	6.2	0.00	105.50
21.400	0.00	0.0	6.2	6.2	0.00	105.50
21.500	0.00	0.0	6.2	6.2	0.00	105.50
21.600	0.00	0.0	6.2	6.2	0.00	105.50
21.700	0.00	0.0	6.2	6.2	0.00	105.50
21.800	0.00	0.0	6.2	6.2	0.00	105.50
21.900	0.00	0.0	6.2	6.2	0.00	105.50
22.000	0.00	0.0	6.2	6.2	0.00	105.50
22.100	0.00	0.0	6.2	6.2	0.00	105.50
22.200	0.00	0.0	6.2	6.2	0.00	105.50
22.300	0.00	0.0	6.2	6.2	0.00	105.50
22.400	0.00	0.0	6.2	6.2	0.00	105.50
22.500	0.00	0.0	6.2	6.2	0.00	105.50
22.600	0.00	0.0	6.2	6.2	0.00	105.50
22.700	0.00	0.0	6.2	6.2	0.00	105.50
22.800	0.00	0.0	6.2	6.2	0.00	105.50
22.900	0.00	0.0	6.2	6.2	0.00	105.50
23.000	0.00	0.0	6.2	6.2	0.00	105.50
23.100	0.00	0.0	6.2	6.2	0.00	105.50
23.200	0.00	0.0	6.2	6.2	0.00	105.50
23.300	0.00	0.0	6.2	6.2	0.00	105.50
23.400	0.00	0.0	6.2	6.2	0.00	105.50
23.500	0.00	0.0	6.2	6.2	0.00	105.50
23.600	0.00	0.0	6.2	6.2	0.00	105.50
23.700	0.00	0.0	6.2	6.2	0.00	105.50
23.800	0.00	0.0	6.2	6.2	0.00	105.50
23.900	0.00	0.0	6.2	6.2	0.00	105.50
24.000	0.00	0.0	6.2	6.2	0.00	105.50
24.100	0.00	0.0	6.2	6.2	0.00	105.50
24.200	0.00	0.0	6.2	6.2	0.00	105.50
24.300	0.00	0.0	6.2	6.2	0.00	105.50
24.400	0.00	0.0	6.2	6.2	0.00	105.50
24.500	0.00	0.0	6.2	6.2	0.00	105.50
24.600	0.00	0.0	6.2	6.2	0.00	105.50

Pond File: SB2 .PND
Inflow Hydrograph: 5-DB2-2 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	0.00	0.0	6.2	6.2	0.00	105.50
24.800	0.00	0.0	6.2	6.2	0.00	105.50
24.900	0.00	0.0	6.2	6.2	0.00	105.50
25.000	0.00	0.0	6.2	6.2	0.00	105.50
25.100	0.00	0.0	6.2	6.2	0.00	105.50
25.200	0.00	0.0	6.2	6.2	0.00	105.50
25.300	0.00	0.0	6.2	6.2	0.00	105.50
25.400	0.00	0.0	6.2	6.2	0.00	105.50
25.500	0.00	0.0	6.2	6.2	0.00	105.50
25.600	0.00	0.0	6.2	6.2	0.00	105.50
25.700	0.00	0.0	6.2	6.2	0.00	105.50
25.800	0.00	0.0	6.2	6.2	0.00	105.50
25.900	0.00	0.0	6.2	6.2	0.00	105.50

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: SB2 .PND
Inflow Hydrograph: 5-DB2-2 .HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 104.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 2.00 cfs
Peak Outflow = 0.50 cfs
Peak Elevation = 107.01 ft

***** Summary of Approximate Peak Storage *****

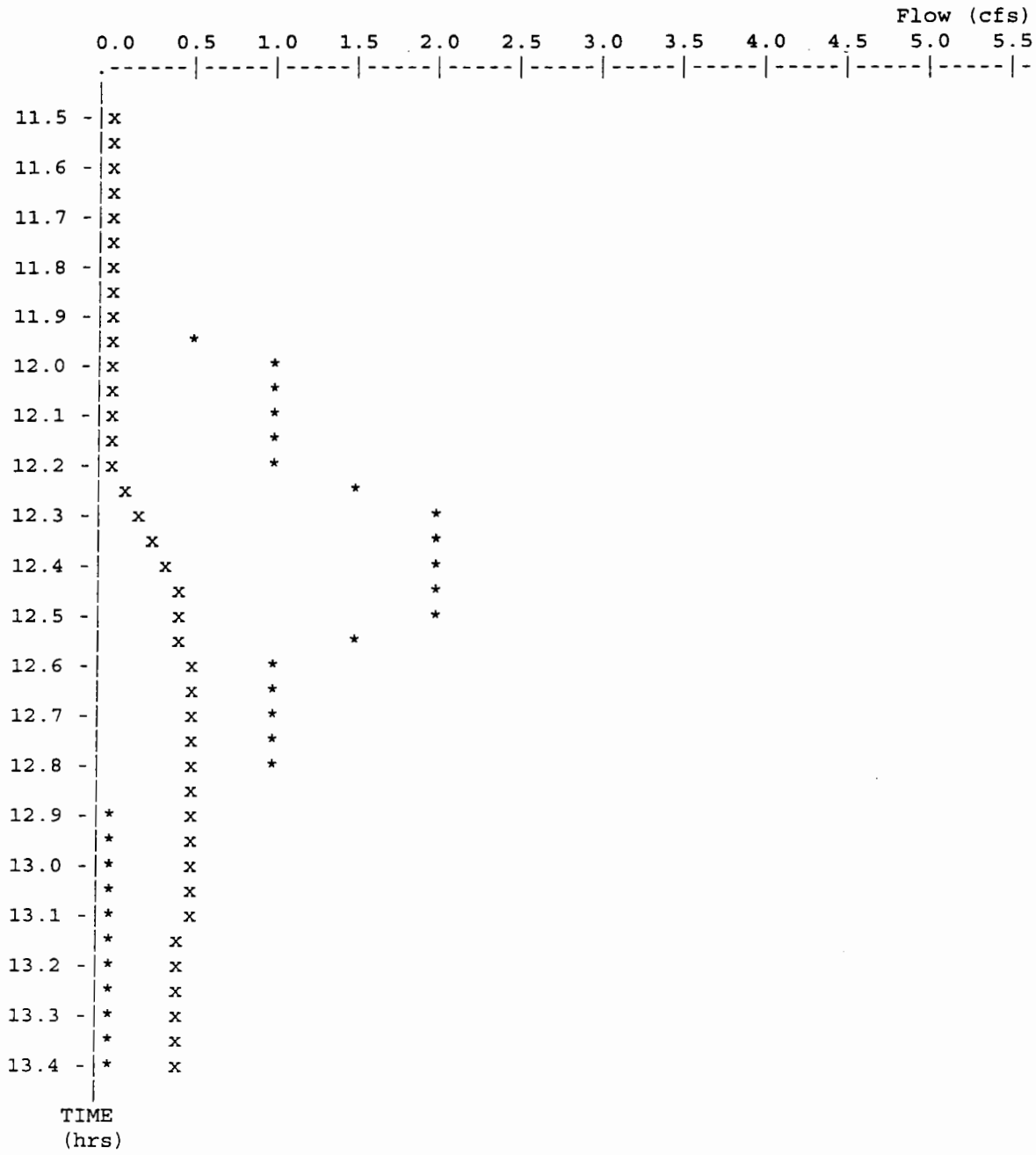
Initial Storage = 0.00 ac-ft
Peak Storage From Storm = 0.08 ac-ft

Total Storage in Pond = 0.08 ac-ft

Pond File: SB2 .PND
Inflow Hydrograph: 5-DB2-2 .HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 11-06-1997
10:07:00

Peak Inflow = 2.00 cfs
Peak Outflow = 0.50 cfs
Peak Elevation = 107.01 ft



* File: 5-DB2-2 .HYD Qmax = 2.0 cfs
x File: OUT .HYD Qmax = 0.5 cfs

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*************************
*                       *
*                       *
*    EARLE - SITE 5     *
* DETENTION BASIN # 2   *
*     10 YEAR STORM     *
*                       *
*************************
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Inflow Hydrograph: 5-DB2 .HYD
Rating Table file: SB2 .PND

----INITIAL CONDITIONS----
Elevation = 104.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
104.00	0.0	0.000
105.00	0.0	0.016
105.50	0.0	0.026
106.00	0.3	0.037
107.00	0.5	0.077
108.00	0.7	0.138
109.00	2.7	0.209

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
3.9	3.9
6.2	6.2
9.0	9.3
18.7	19.2
33.4	34.1
50.6	53.3

Time increment (t) = 0.100 hrs.

POND-2 Version: 5.17 S/N:
EXECUTED: 11-06-1997 10:15:50

Pond File: SB2 .PND
Inflow Hydrograph: 5-DB2 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH / ROUTING COMPUTATIONS

TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	0.00	-----	0.0	0.0	0.00	104.00
11.100	0.00	0.0	0.0	0.0	0.00	104.00
11.200	0.00	0.0	0.0	0.0	0.00	104.00
11.300	0.00	0.0	0.0	0.0	0.00	104.00
11.400	0.00	0.0	0.0	0.0	0.00	104.00
11.500	0.00	0.0	0.0	0.0	0.00	104.00
11.600	0.00	0.0	0.0	0.0	0.00	104.00
11.700	0.00	0.0	0.0	0.0	0.00	104.00
11.800	1.00	1.0	1.0	1.0	0.00	104.26
11.900	1.00	2.0	3.0	3.0	0.00	104.77
12.000	1.00	2.0	5.0	5.0	0.00	105.24
12.100	2.00	3.0	7.7	8.0	0.17	105.79
12.200	3.00	5.0	11.9	12.7	0.37	106.34
12.300	5.00	8.0	18.9	19.9	0.51	107.05
12.400	4.00	9.0	26.7	27.9	0.62	107.59
12.500	3.00	7.0	32.3	33.7	0.69	107.97
12.600	3.00	6.0	36.0	38.3	1.14	108.22
12.700	2.00	5.0	38.2	41.0	1.42	108.36
12.800	1.00	3.0	38.3	41.2	1.44	108.37
12.900	1.00	2.0	37.6	40.3	1.35	108.32
13.000	1.00	2.0	37.1	39.6	1.27	108.29
13.100	1.00	2.0	36.6	39.1	1.22	108.26
13.200	1.00	2.0	36.3	38.6	1.17	108.24
13.300	1.00	2.0	36.0	38.3	1.14	108.22
13.400	1.00	2.0	35.8	38.0	1.11	108.20
13.500	1.00	2.0	35.6	37.8	1.09	108.19
13.600	0.00	1.0	34.7	36.6	0.96	108.13
13.700	0.00	0.0	33.2	34.7	0.76	108.03
13.800	0.00	0.0	31.8	33.2	0.69	107.94
13.900	0.00	0.0	30.5	31.8	0.67	107.85
14.000	0.00	0.0	29.1	30.5	0.65	107.76
14.100	0.00	0.0	27.9	29.1	0.63	107.67
14.200	0.00	0.0	26.6	27.9	0.62	107.58
14.300	0.00	0.0	25.4	26.6	0.60	107.50
14.400	0.00	0.0	24.3	25.4	0.58	107.42
14.500	0.00	0.0	23.1	24.3	0.57	107.34
14.600	0.00	0.0	22.0	23.1	0.55	107.27
14.700	0.00	0.0	21.0	22.0	0.54	107.19
14.800	0.00	0.0	19.9	21.0	0.52	107.12
14.900	0.00	0.0	18.9	19.9	0.51	107.05
15.000	0.00	0.0	17.9	18.9	0.49	106.97
15.100	0.00	0.0	17.0	17.9	0.47	106.87
15.200	0.00	0.0	16.0	17.0	0.46	106.78
15.300	0.00	0.0	15.2	16.0	0.44	106.68
15.400	0.00	0.0	14.3	15.2	0.42	106.59

Pond File: SB2 .PND
Inflow Hydrograph: 5-DB2 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	0.00	0.0	13.5	14.3	0.40	106.51
15.600	0.00	0.0	12.8	13.5	0.39	106.43
15.700	0.00	0.0	12.0	12.8	0.37	106.35
15.800	0.00	0.0	11.3	12.0	0.35	106.27
15.900	0.00	0.0	10.6	11.3	0.34	106.20
16.000	0.00	0.0	10.0	10.6	0.33	106.13
16.100	0.00	0.0	9.3	10.0	0.31	106.07
16.200	0.00	0.0	8.7	9.3	0.30	106.00
16.300	0.00	0.0	8.3	8.7	0.24	105.91
16.400	0.00	0.0	7.9	8.3	0.20	105.83
16.500	0.00	0.0	7.5	7.9	0.16	105.76
16.600	0.00	0.0	7.3	7.5	0.13	105.71
16.700	0.00	0.0	7.1	7.3	0.10	105.67
16.800	0.00	0.0	6.9	7.1	0.08	105.64
16.900	0.00	0.0	6.8	6.9	0.07	105.61
17.000	0.00	0.0	6.7	6.8	0.05	105.59
17.100	0.00	0.0	6.6	6.7	0.04	105.57
17.200	0.00	0.0	6.5	6.6	0.03	105.56
17.300	0.00	0.0	6.5	6.5	0.03	105.55
17.400	0.00	0.0	6.4	6.5	0.02	105.54
17.500	0.00	0.0	6.4	6.4	0.02	105.53
17.600	0.00	0.0	6.4	6.4	0.01	105.52
17.700	0.00	0.0	6.3	6.4	0.01	105.52
17.800	0.00	0.0	6.3	6.3	0.01	105.52
17.900	0.00	0.0	6.3	6.3	0.01	105.51
18.000	0.00	0.0	6.3	6.3	0.01	105.51
18.100	0.00	0.0	6.3	6.3	0.00	105.51
18.200	0.00	0.0	6.3	6.3	0.00	105.51
18.300	0.00	0.0	6.3	6.3	0.00	105.51
18.400	0.00	0.0	6.3	6.3	0.00	105.50
18.500	0.00	0.0	6.3	6.3	0.00	105.50
18.600	0.00	0.0	6.3	6.3	0.00	105.50
18.700	0.00	0.0	6.2	6.3	0.00	105.50
18.800	0.00	0.0	6.2	6.2	0.00	105.50
18.900	0.00	0.0	6.2	6.2	0.00	105.50
19.000	0.00	0.0	6.2	6.2	0.00	105.50
19.100	0.00	0.0	6.2	6.2	0.00	105.50
19.200	0.00	0.0	6.2	6.2	0.00	105.50
19.300	0.00	0.0	6.2	6.2	0.00	105.50
19.400	0.00	0.0	6.2	6.2	0.00	105.50
19.500	0.00	0.0	6.2	6.2	0.00	105.50
19.600	0.00	0.0	6.2	6.2	0.00	105.50
19.700	0.00	0.0	6.2	6.2	0.00	105.50
19.800	0.00	0.0	6.2	6.2	0.00	105.50
19.900	0.00	0.0	6.2	6.2	0.00	105.50
20.000	0.00	0.0	6.2	6.2	0.00	105.50

Pond File: SB2 .PND
Inflow Hydrograph: 5-DB2 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	0.00	0.0	6.2	6.2	0.00	105.50
20.200	0.00	0.0	6.2	6.2	0.00	105.50
20.300	0.00	0.0	6.2	6.2	0.00	105.50
20.400	0.00	0.0	6.2	6.2	0.00	105.50
20.500	0.00	0.0	6.2	6.2	0.00	105.50
20.600	0.00	0.0	6.2	6.2	0.00	105.50
20.700	0.00	0.0	6.2	6.2	0.00	105.50
20.800	0.00	0.0	6.2	6.2	0.00	105.50
20.900	0.00	0.0	6.2	6.2	0.00	105.50
21.000	0.00	0.0	6.2	6.2	0.00	105.50
21.100	0.00	0.0	6.2	6.2	0.00	105.50
21.200	0.00	0.0	6.2	6.2	0.00	105.50
21.300	0.00	0.0	6.2	6.2	0.00	105.50
21.400	0.00	0.0	6.2	6.2	0.00	105.50
21.500	0.00	0.0	6.2	6.2	0.00	105.50
21.600	0.00	0.0	6.2	6.2	0.00	105.50
21.700	0.00	0.0	6.2	6.2	0.00	105.50
21.800	0.00	0.0	6.2	6.2	0.00	105.50
21.900	0.00	0.0	6.2	6.2	0.00	105.50
22.000	0.00	0.0	6.2	6.2	0.00	105.50
22.100	0.00	0.0	6.2	6.2	0.00	105.50
22.200	0.00	0.0	6.2	6.2	0.00	105.50
22.300	0.00	0.0	6.2	6.2	0.00	105.50
22.400	0.00	0.0	6.2	6.2	0.00	105.50
22.500	0.00	0.0	6.2	6.2	0.00	105.50
22.600	0.00	0.0	6.2	6.2	0.00	105.50
22.700	0.00	0.0	6.2	6.2	0.00	105.50
22.800	0.00	0.0	6.2	6.2	0.00	105.50
22.900	0.00	0.0	6.2	6.2	0.00	105.50
23.000	0.00	0.0	6.2	6.2	0.00	105.50
23.100	0.00	0.0	6.2	6.2	0.00	105.50
23.200	0.00	0.0	6.2	6.2	0.00	105.50
23.300	0.00	0.0	6.2	6.2	0.00	105.50
23.400	0.00	0.0	6.2	6.2	0.00	105.50
23.500	0.00	0.0	6.2	6.2	0.00	105.50
23.600	0.00	0.0	6.2	6.2	0.00	105.50
23.700	0.00	0.0	6.2	6.2	0.00	105.50
23.800	0.00	0.0	6.2	6.2	0.00	105.50
23.900	0.00	0.0	6.2	6.2	0.00	105.50
24.000	0.00	0.0	6.2	6.2	0.00	105.50
24.100	0.00	0.0	6.2	6.2	0.00	105.50
24.200	0.00	0.0	6.2	6.2	0.00	105.50
24.300	0.00	0.0	6.2	6.2	0.00	105.50
24.400	0.00	0.0	6.2	6.2	0.00	105.50
24.500	0.00	0.0	6.2	6.2	0.00	105.50
24.600	0.00	0.0	6.2	6.2	0.00	105.50

Pond File: SB2 .PND
Inflow Hydrograph: 5-DB2 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	0.00	0.0	6.2	6.2	0.00	105.50
24.800	0.00	0.0	6.2	6.2	0.00	105.50
24.900	0.00	0.0	6.2	6.2	0.00	105.50
25.000	0.00	0.0	6.2	6.2	0.00	105.50
25.100	0.00	0.0	6.2	6.2	0.00	105.50
25.200	0.00	0.0	6.2	6.2	0.00	105.50
25.300	0.00	0.0	6.2	6.2	0.00	105.50
25.400	0.00	0.0	6.2	6.2	0.00	105.50
25.500	0.00	0.0	6.2	6.2	0.00	105.50
25.600	0.00	0.0	6.2	6.2	0.00	105.50
25.700	0.00	0.0	6.2	6.2	0.00	105.50
25.800	0.00	0.0	6.2	6.2	0.00	105.50
25.900	0.00	0.0	6.2	6.2	0.00	105.50

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: SB2 .PND
Inflow Hydrograph: 5-DB2 .HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 104.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 5.00 cfs
Peak Outflow = 1.44 cfs
Peak Elevation = 108.37 ft

***** Summary of Approximate Peak Storage *****

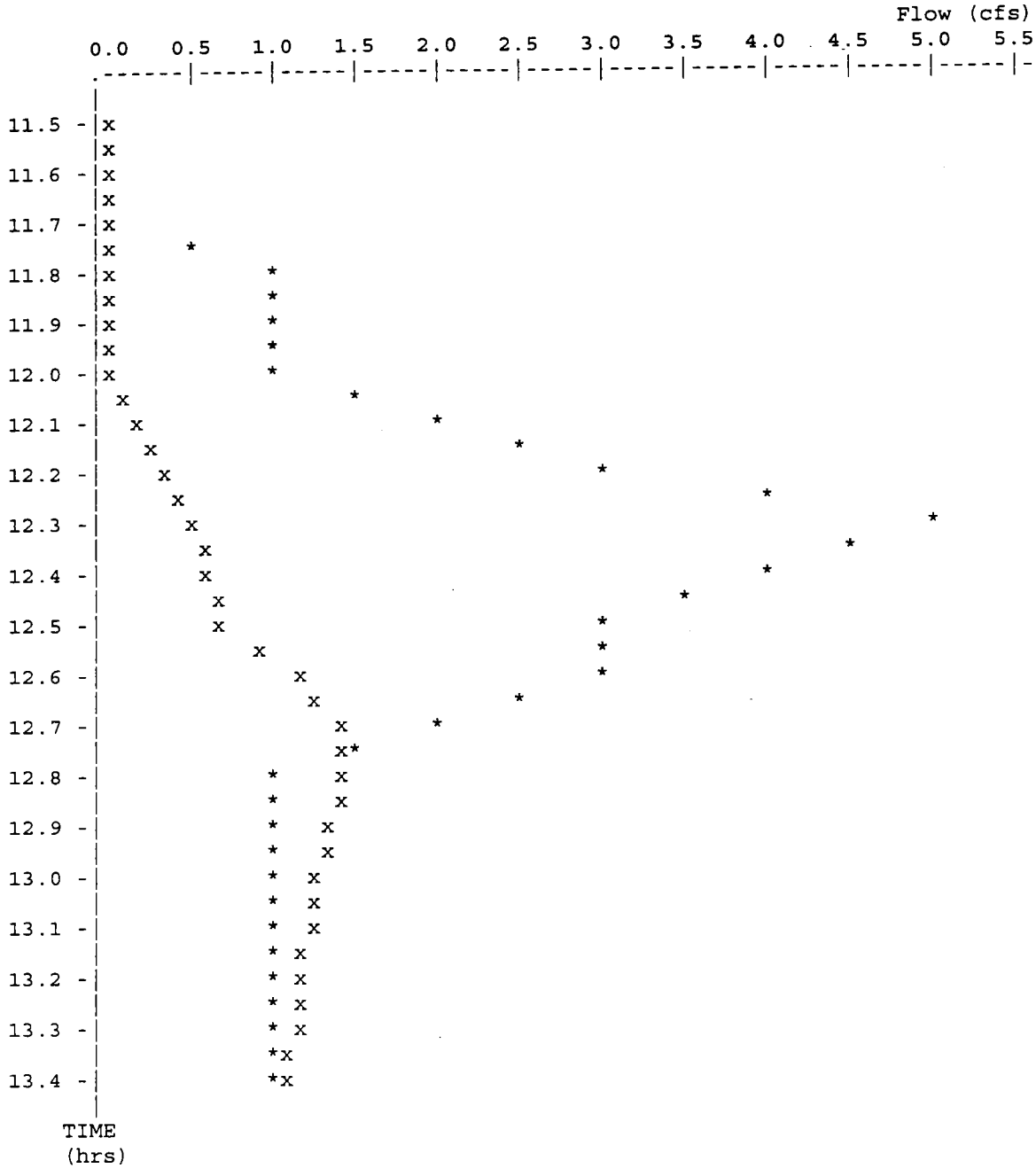
Initial Storage = 0.00 ac-ft
Peak Storage From Storm = 0.16 ac-ft

Total Storage in Pond = 0.16 ac-ft

Pond File: SB2 .PND
Inflow Hydrograph: 5-DB2 .HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 11-06-1997
10:15:50

Peak Inflow = 5.00 cfs
Peak Outflow = 1.44 cfs
Peak Elevation = 108.37 ft



* File: 5-DB2 .HYD Qmax = 5.0 cfs
x File: OUT .HYD Qmax = 1.4 cfs

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*************************
*                       *
*                       *
*    EARLE - SITE 5     *
* DETENTION BASIN # 2   *
*     25 YEAR STORM     *
*                       *
*************************
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Inflow Hydrograph: 5-DB225 .HYD
Rating Table file: SB2 .PND

----INITIAL CONDITIONS----
Elevation = 104.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
104.00	0.0	0.000
105.00	0.0	0.016
105.50	0.0	0.026
106.00	0.3	0.037
107.00	0.5	0.077
108.00	0.7	0.138
109.00	2.7	0.209

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
3.9	3.9
6.2	6.2
9.0	9.3
18.7	19.2
33.4	34.1
50.6	53.3

Time increment (t) = 0.100 hrs.

Pond File: SB2 .PND
Inflow Hydrograph: 5-DB225 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	0.00	-----	0.0	0.0	0.00	104.00
11.100	0.00	0.0	0.0	0.0	0.00	104.00
11.200	0.00	0.0	0.0	0.0	0.00	104.00
11.300	0.00	0.0	0.0	0.0	0.00	104.00
11.400	0.00	0.0	0.0	0.0	0.00	104.00
11.500	0.00	0.0	0.0	0.0	0.00	104.00
11.600	0.00	0.0	0.0	0.0	0.00	104.00
11.700	0.00	0.0	0.0	0.0	0.00	104.00
11.800	1.00	1.0	1.0	1.0	0.00	104.26
11.900	1.00	2.0	3.0	3.0	0.00	104.77
12.000	1.00	2.0	5.0	5.0	0.00	105.24
12.100	2.00	3.0	7.7	8.0	0.17	105.79
12.200	4.00	6.0	12.9	13.7	0.39	106.44
12.300	6.00	10.0	21.8	22.9	0.55	107.25
12.400	5.00	11.0	31.4	32.8	0.68	107.91
12.500	4.00	9.0	37.7	40.4	1.36	108.33
12.600	3.00	7.0	41.1	44.7	1.81	108.55
12.700	2.00	5.0	42.2	46.1	1.95	108.62
12.800	2.00	4.0	42.3	46.2	1.96	108.63
12.900	2.00	4.0	42.3	46.3	1.97	108.63
13.000	1.00	3.0	41.6	45.3	1.87	108.59
13.100	1.00	2.0	40.2	43.6	1.69	108.49
13.200	1.00	2.0	39.1	42.2	1.55	108.42
13.300	1.00	2.0	38.3	41.1	1.43	108.37
13.400	1.00	2.0	37.6	40.3	1.34	108.32
13.500	1.00	2.0	37.0	39.6	1.27	108.29
13.600	1.00	2.0	36.6	39.0	1.21	108.26
13.700	1.00	2.0	36.3	38.6	1.17	108.23
13.800	1.00	2.0	36.0	38.3	1.13	108.22
13.900	1.00	2.0	35.8	38.0	1.11	108.20
14.000	1.00	2.0	35.6	37.8	1.08	108.19
14.100	1.00	2.0	35.5	37.6	1.07	108.18
14.200	0.00	1.0	34.6	36.5	0.95	108.12
14.300	0.00	0.0	33.1	34.6	0.75	108.03
14.400	0.00	0.0	31.7	33.1	0.69	107.93
14.500	0.00	0.0	30.4	31.7	0.67	107.84
14.600	0.00	0.0	29.1	30.4	0.65	107.75
14.700	0.00	0.0	27.8	29.1	0.63	107.66
14.800	0.00	0.0	26.6	27.8	0.62	107.58
14.900	0.00	0.0	25.4	26.6	0.60	107.50
15.000	0.00	0.0	24.2	25.4	0.58	107.42
15.100	0.00	0.0	23.1	24.2	0.57	107.34
15.200	0.00	0.0	22.0	23.1	0.55	107.26
15.300	0.00	0.0	20.9	22.0	0.54	107.19
15.400	0.00	0.0	19.8	20.9	0.52	107.12

POND-2 Version: 5.17 S/N:
EXECUTED: 11-06-1997 10:18:27

Pond File: SB2 .PND
Inflow Hydrograph: 5-DB225 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	0.00	0.0	18.8	19.8	0.51	107.05
15.600	0.00	0.0	17.8	18.8	0.49	106.97
15.700	0.00	0.0	16.9	17.8	0.47	106.87
15.800	0.00	0.0	16.0	16.9	0.45	106.77
15.900	0.00	0.0	15.1	16.0	0.44	106.68
16.000	0.00	0.0	14.3	15.1	0.42	106.59
16.100	0.00	0.0	13.5	14.3	0.40	106.50
16.200	0.00	0.0	12.7	13.5	0.38	106.42
16.300	0.00	0.0	12.0	12.7	0.37	106.34
16.400	0.00	0.0	11.3	12.0	0.35	106.27
16.500	0.00	0.0	10.6	11.3	0.34	106.20
16.600	0.00	0.0	9.9	10.6	0.33	106.13
16.700	0.00	0.0	9.3	9.9	0.31	106.06
16.800	0.00	0.0	8.7	9.3	0.30	106.00
16.900	0.00	0.0	8.2	8.7	0.24	105.90
17.000	0.00	0.0	7.8	8.2	0.19	105.82
17.100	0.00	0.0	7.5	7.8	0.16	105.76
17.200	0.00	0.0	7.3	7.5	0.13	105.71
17.300	0.00	0.0	7.1	7.3	0.10	105.67
17.400	0.00	0.0	6.9	7.1	0.08	105.64
17.500	0.00	0.0	6.8	6.9	0.07	105.61
17.600	0.00	0.0	6.7	6.8	0.05	105.59
17.700	0.00	0.0	6.6	6.7	0.04	105.57
17.800	0.00	0.0	6.5	6.6	0.03	105.56
17.900	0.00	0.0	6.5	6.5	0.03	105.55
18.000	0.00	0.0	6.4	6.5	0.02	105.54
18.100	0.00	0.0	6.4	6.4	0.02	105.53
18.200	0.00	0.0	6.4	6.4	0.01	105.52
18.300	0.00	0.0	6.3	6.4	0.01	105.52
18.400	0.00	0.0	6.3	6.3	0.01	105.52
18.500	0.00	0.0	6.3	6.3	0.01	105.51
18.600	0.00	0.0	6.3	6.3	0.01	105.51
18.700	0.00	0.0	6.3	6.3	0.00	105.51
18.800	0.00	0.0	6.3	6.3	0.00	105.51
18.900	0.00	0.0	6.3	6.3	0.00	105.51
19.000	0.00	0.0	6.3	6.3	0.00	105.50
19.100	0.00	0.0	6.3	6.3	0.00	105.50
19.200	0.00	0.0	6.3	6.3	0.00	105.50
19.300	0.00	0.0	6.2	6.3	0.00	105.50
19.400	0.00	0.0	6.2	6.2	0.00	105.50
19.500	0.00	0.0	6.2	6.2	0.00	105.50
19.600	0.00	0.0	6.2	6.2	0.00	105.50
19.700	0.00	0.0	6.2	6.2	0.00	105.50
19.800	0.00	0.0	6.2	6.2	0.00	105.50
19.900	0.00	0.0	6.2	6.2	0.00	105.50
20.000	0.00	0.0	6.2	6.2	0.00	105.50

Pond File: SB2 .PND
Inflow Hydrograph: 5-DB225 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	0.00	0.0	6.2	6.2	0.00	105.50
20.200	0.00	0.0	6.2	6.2	0.00	105.50
20.300	0.00	0.0	6.2	6.2	0.00	105.50
20.400	0.00	0.0	6.2	6.2	0.00	105.50
20.500	0.00	0.0	6.2	6.2	0.00	105.50
20.600	0.00	0.0	6.2	6.2	0.00	105.50
20.700	0.00	0.0	6.2	6.2	0.00	105.50
20.800	0.00	0.0	6.2	6.2	0.00	105.50
20.900	0.00	0.0	6.2	6.2	0.00	105.50
21.000	0.00	0.0	6.2	6.2	0.00	105.50
21.100	0.00	0.0	6.2	6.2	0.00	105.50
21.200	0.00	0.0	6.2	6.2	0.00	105.50
21.300	0.00	0.0	6.2	6.2	0.00	105.50
21.400	0.00	0.0	6.2	6.2	0.00	105.50
21.500	0.00	0.0	6.2	6.2	0.00	105.50
21.600	0.00	0.0	6.2	6.2	0.00	105.50
21.700	0.00	0.0	6.2	6.2	0.00	105.50
21.800	0.00	0.0	6.2	6.2	0.00	105.50
21.900	0.00	0.0	6.2	6.2	0.00	105.50
22.000	0.00	0.0	6.2	6.2	0.00	105.50
22.100	0.00	0.0	6.2	6.2	0.00	105.50
22.200	0.00	0.0	6.2	6.2	0.00	105.50
22.300	0.00	0.0	6.2	6.2	0.00	105.50
22.400	0.00	0.0	6.2	6.2	0.00	105.50
22.500	0.00	0.0	6.2	6.2	0.00	105.50
22.600	0.00	0.0	6.2	6.2	0.00	105.50
22.700	0.00	0.0	6.2	6.2	0.00	105.50
22.800	0.00	0.0	6.2	6.2	0.00	105.50
22.900	0.00	0.0	6.2	6.2	0.00	105.50
23.000	0.00	0.0	6.2	6.2	0.00	105.50
23.100	0.00	0.0	6.2	6.2	0.00	105.50
23.200	0.00	0.0	6.2	6.2	0.00	105.50
23.300	0.00	0.0	6.2	6.2	0.00	105.50
23.400	0.00	0.0	6.2	6.2	0.00	105.50
23.500	0.00	0.0	6.2	6.2	0.00	105.50
23.600	0.00	0.0	6.2	6.2	0.00	105.50
23.700	0.00	0.0	6.2	6.2	0.00	105.50
23.800	0.00	0.0	6.2	6.2	0.00	105.50
23.900	0.00	0.0	6.2	6.2	0.00	105.50
24.000	0.00	0.0	6.2	6.2	0.00	105.50
24.100	0.00	0.0	6.2	6.2	0.00	105.50
24.200	0.00	0.0	6.2	6.2	0.00	105.50
24.300	0.00	0.0	6.2	6.2	0.00	105.50
24.400	0.00	0.0	6.2	6.2	0.00	105.50
24.500	0.00	0.0	6.2	6.2	0.00	105.50
24.600	0.00	0.0	6.2	6.2	0.00	105.50

Pond File: SB2 .PND
Inflow Hydrograph: 5-DB225 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	0.00	0.0	6.2	6.2	0.00	105.50
24.800	0.00	0.0	6.2	6.2	0.00	105.50
24.900	0.00	0.0	6.2	6.2	0.00	105.50
25.000	0.00	0.0	6.2	6.2	0.00	105.50
25.100	0.00	0.0	6.2	6.2	0.00	105.50
25.200	0.00	0.0	6.2	6.2	0.00	105.50
25.300	0.00	0.0	6.2	6.2	0.00	105.50
25.400	0.00	0.0	6.2	6.2	0.00	105.50
25.500	0.00	0.0	6.2	6.2	0.00	105.50
25.600	0.00	0.0	6.2	6.2	0.00	105.50
25.700	0.00	0.0	6.2	6.2	0.00	105.50
25.800	0.00	0.0	6.2	6.2	0.00	105.50
25.900	0.00	0.0	6.2	6.2	0.00	105.50

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: SB2 .PND
Inflow Hydrograph: 5-DB225 .HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 104.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 6.00 cfs
Peak Outflow = 1.97 cfs
Peak Elevation = 108.63 ft

***** Summary of Approximate Peak Storage *****

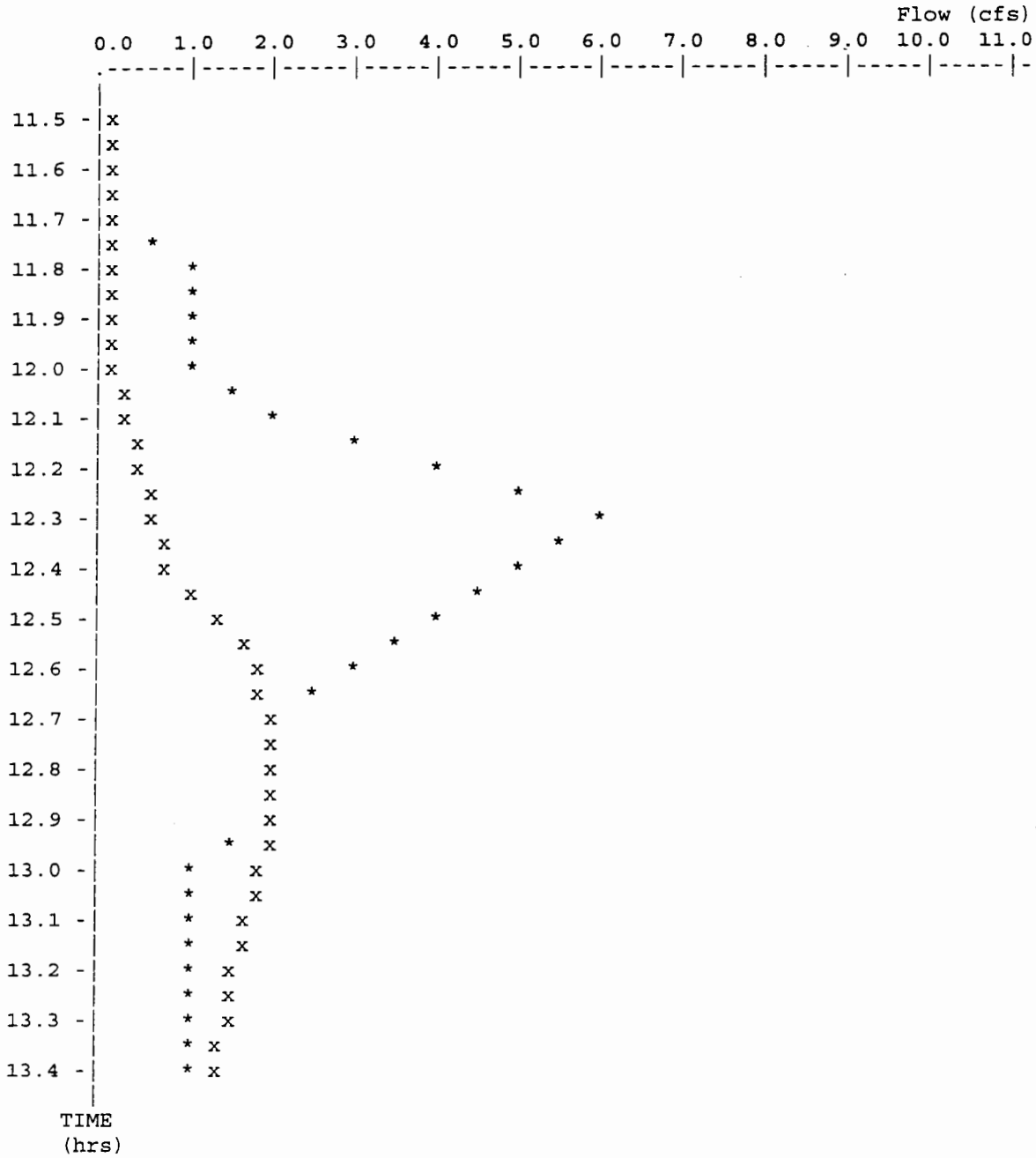
Initial Storage = 0.00 ac-ft
Peak Storage From Storm = 0.18 ac-ft

Total Storage in Pond = 0.18 ac-ft

Pond File: SB2 .PND
Inflow Hydrograph: 5-DB225 .HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 11-06-1997
10:18:27

Peak Inflow = 6.00 cfs
Peak Outflow = 1.97 cfs
Peak Elevation = 108.63 ft



* File: 5-DB225 .HYD Qmax = 6.0 cfs
x File: OUT .HYD Qmax = 2.0 cfs

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************************
*                      *
*                      *
*    EARLE - SITE 5    *
*  SEDIMENT BASIN # 3  *
*                      *
*                      *
************************
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Inflow Hydrograph: 5-SB3 .HYD
Rating Table file: SB3 .PND

----INITIAL CONDITIONS----
Elevation = 98.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
98.00	0.0	0.000
98.90	0.0	0.066
99.00	0.1	0.075
100.00	0.4	0.174
101.00	0.6	0.297
102.00	0.8	0.448
103.00	2.8	0.626

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
16.1	16.1
18.2	18.3
42.1	42.5
72.0	72.6
108.3	109.1
151.6	154.4

Time increment (t) = 0.100 hrs.

POND-2 Version: 5.17 S/N:
EXECUTED: 11-04-1997 18:39:23

Pond File: SB3 .PND
Inflow Hydrograph: 5-SB3 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	0.00	-----	0.0	0.0	0.00	98.00
11.100	0.00	0.0	0.0	0.0	0.00	98.00
11.200	1.00	1.0	1.0	1.0	0.00	98.06
11.300	1.00	2.0	3.0	3.0	0.00	98.17
11.400	1.00	2.0	5.0	5.0	0.00	98.28
11.500	1.00	2.0	7.0	7.0	0.00	98.39
11.600	1.00	2.0	9.0	9.0	0.00	98.50
11.700	1.00	2.0	11.0	11.0	0.00	98.62
11.800	2.00	3.0	14.0	14.0	0.00	98.78
11.900	2.00	4.0	17.8	18.0	0.09	98.99
12.000	3.00	5.0	22.5	22.8	0.16	99.19
12.100	4.00	7.0	29.0	29.5	0.24	99.46
12.200	7.00	11.0	39.3	40.0	0.37	99.90
12.300	11.00	18.0	56.3	57.3	0.50	100.49
12.400	10.00	21.0	76.0	77.3	0.63	101.13
12.500	8.00	18.0	92.6	94.0	0.72	101.59
12.600	6.00	14.0	105.0	106.6	0.79	101.93
12.700	4.00	10.0	112.9	115.0	1.06	102.13
12.800	3.00	7.0	117.4	119.9	1.28	102.24
12.900	2.00	5.0	119.6	122.4	1.39	102.29
13.000	2.00	4.0	120.7	123.6	1.44	102.32
13.100	2.00	4.0	121.7	124.7	1.49	102.34
13.200	2.00	4.0	122.7	125.7	1.53	102.37
13.300	2.00	4.0	123.5	126.7	1.58	102.39
13.400	1.00	3.0	123.4	126.5	1.57	102.38
13.500	1.00	2.0	122.3	125.4	1.52	102.36
13.600	1.00	2.0	121.4	124.3	1.47	102.34
13.700	1.00	2.0	120.5	123.4	1.43	102.32
13.800	1.00	2.0	119.7	122.5	1.39	102.30
13.900	1.00	2.0	119.0	121.7	1.36	102.28
14.000	1.00	2.0	118.4	121.0	1.33	102.26
14.100	1.00	2.0	117.8	120.4	1.30	102.25
14.200	1.00	2.0	117.2	119.8	1.27	102.24
14.300	1.00	2.0	116.7	119.2	1.25	102.22
14.400	1.00	2.0	116.3	118.7	1.23	102.21
14.500	1.00	2.0	115.9	118.3	1.21	102.20
14.600	1.00	2.0	115.5	117.9	1.19	102.19
14.700	1.00	2.0	115.2	117.5	1.17	102.19
14.800	1.00	2.0	114.8	117.2	1.16	102.18
14.900	1.00	2.0	114.6	116.8	1.14	102.17
15.000	1.00	2.0	114.3	116.6	1.13	102.16
15.100	1.00	2.0	114.1	116.3	1.12	102.16
15.200	1.00	2.0	113.9	116.1	1.11	102.15
15.300	1.00	2.0	113.7	115.9	1.10	102.15
15.400	1.00	2.0	113.5	115.7	1.09	102.14

Pond File: SB3 .PND
Inflow Hydrograph: 5-SB3 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	1.00	2.0	113.3	115.5	1.08	102.14
15.600	1.00	2.0	113.2	115.3	1.07	102.14
15.700	1.00	2.0	113.0	115.2	1.07	102.13
15.800	1.00	2.0	112.9	115.0	1.06	102.13
15.900	1.00	2.0	112.8	114.9	1.06	102.13
16.000	1.00	2.0	112.7	114.8	1.05	102.13
16.100	1.00	2.0	112.6	114.7	1.05	102.12
16.200	1.00	2.0	112.5	114.6	1.04	102.12
16.300	0.00	1.0	111.5	113.5	0.99	102.10
16.400	0.00	0.0	109.7	111.5	0.91	102.05
16.500	0.00	0.0	108.1	109.7	0.83	102.01
16.600	0.00	0.0	106.5	108.1	0.79	101.97
16.700	0.00	0.0	104.9	106.5	0.79	101.93
16.800	0.00	0.0	103.3	104.9	0.78	101.88
16.900	0.00	0.0	101.8	103.3	0.77	101.84
17.000	0.00	0.0	100.3	101.8	0.76	101.80
17.100	0.00	0.0	98.8	100.3	0.75	101.76
17.200	0.00	0.0	97.3	98.8	0.74	101.72
17.300	0.00	0.0	95.8	97.3	0.74	101.68
17.400	0.00	0.0	94.4	95.8	0.73	101.64
17.500	0.00	0.0	92.9	94.4	0.72	101.60
17.600	0.00	0.0	91.5	92.9	0.71	101.56
17.700	0.00	0.0	90.1	91.5	0.70	101.52
17.800	0.00	0.0	88.7	90.1	0.70	101.48
17.900	0.00	0.0	87.3	88.7	0.69	101.44
18.000	0.00	0.0	86.0	87.3	0.68	101.40
18.100	0.00	0.0	84.6	86.0	0.67	101.37
18.200	0.00	0.0	83.3	84.6	0.67	101.33
18.300	0.00	0.0	82.0	83.3	0.66	101.29
18.400	0.00	0.0	80.7	82.0	0.65	101.26
18.500	0.00	0.0	79.4	80.7	0.64	101.22
18.600	0.00	0.0	78.1	79.4	0.64	101.19
18.700	0.00	0.0	76.8	78.1	0.63	101.15
18.800	0.00	0.0	75.6	76.8	0.62	101.12
18.900	0.00	0.0	74.4	75.6	0.62	101.08
19.000	0.00	0.0	73.1	74.4	0.61	101.05
19.100	0.00	0.0	71.9	73.1	0.60	101.02
19.200	0.00	0.0	70.7	71.9	0.60	100.98
19.300	0.00	0.0	69.6	70.7	0.59	100.94
19.400	0.00	0.0	68.4	69.6	0.58	100.90
19.500	0.00	0.0	67.3	68.4	0.57	100.86
19.600	0.00	0.0	66.1	67.3	0.56	100.82
19.700	0.00	0.0	65.0	66.1	0.56	100.79
19.800	0.00	0.0	63.9	65.0	0.55	100.75
19.900	0.00	0.0	62.8	63.9	0.54	100.71
20.000	0.00	0.0	61.8	62.8	0.54	100.68

Pond File: SB3 .PND
Inflow Hydrograph: 5-SB3 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	0.00	0.0	60.7	61.8	0.53	100.64
20.200	0.00	0.0	59.7	60.7	0.52	100.61
20.300	0.00	0.0	58.6	59.7	0.51	100.57
20.400	0.00	0.0	57.6	58.6	0.51	100.54
20.500	0.00	0.0	56.6	57.6	0.50	100.50
20.600	0.00	0.0	55.6	56.6	0.49	100.47
20.700	0.00	0.0	54.7	55.6	0.49	100.44
20.800	0.00	0.0	53.7	54.7	0.48	100.40
20.900	0.00	0.0	52.7	53.7	0.47	100.37
21.000	0.00	0.0	51.8	52.7	0.47	100.34
21.100	0.00	0.0	50.9	51.8	0.46	100.31
21.200	0.00	0.0	50.0	50.9	0.46	100.28
21.300	0.00	0.0	49.1	50.0	0.45	100.25
21.400	0.00	0.0	48.2	49.1	0.44	100.22
21.500	0.00	0.0	47.3	48.2	0.44	100.19
21.600	0.00	0.0	46.4	47.3	0.43	100.16
21.700	0.00	0.0	45.6	46.4	0.43	100.13
21.800	0.00	0.0	44.8	45.6	0.42	100.10
21.900	0.00	0.0	43.9	44.8	0.42	100.08
22.000	0.00	0.0	43.1	43.9	0.41	100.05
22.100	0.00	0.0	42.3	43.1	0.40	100.02
22.200	0.00	0.0	41.5	42.3	0.40	99.99
22.300	0.00	0.0	40.7	41.5	0.39	99.96
22.400	0.00	0.0	40.0	40.7	0.38	99.93
22.500	0.00	0.0	39.2	40.0	0.37	99.90
22.600	0.00	0.0	38.5	39.2	0.36	99.87
22.700	0.00	0.0	37.8	38.5	0.35	99.84
22.800	0.00	0.0	37.1	37.8	0.34	99.81
22.900	0.00	0.0	36.5	37.1	0.33	99.78
23.000	0.00	0.0	35.8	36.5	0.33	99.75
23.100	0.00	0.0	35.2	35.8	0.32	99.72
23.200	0.00	0.0	34.6	35.2	0.31	99.70
23.300	0.00	0.0	34.0	34.6	0.30	99.67
23.400	0.00	0.0	33.4	34.0	0.29	99.65
23.500	0.00	0.0	32.8	33.4	0.29	99.62
23.600	0.00	0.0	32.2	32.8	0.28	99.60
23.700	0.00	0.0	31.7	32.2	0.27	99.58
23.800	0.00	0.0	31.2	31.7	0.27	99.55
23.900	0.00	0.0	30.6	31.2	0.26	99.53
24.000	0.00	0.0	30.1	30.6	0.25	99.51
24.100	0.00	0.0	29.6	30.1	0.25	99.49
24.200	0.00	0.0	29.2	29.6	0.24	99.47
24.300	0.00	0.0	28.7	29.2	0.23	99.45
24.400	0.00	0.0	28.2	28.7	0.23	99.43
24.500	0.00	0.0	27.8	28.2	0.22	99.41
24.600	0.00	0.0	27.3	27.8	0.22	99.39

Pond File: SB3 .PND
Inflow Hydrograph: 5-SB3 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	0.00	0.0	26.9	27.3	0.21	99.37
24.800	0.00	0.0	26.5	26.9	0.21	99.36
24.900	0.00	0.0	26.1	26.5	0.20	99.34
25.000	0.00	0.0	25.7	26.1	0.20	99.32
25.100	0.00	0.0	25.3	25.7	0.19	99.31
25.200	0.00	0.0	24.9	25.3	0.19	99.29
25.300	0.00	0.0	24.6	24.9	0.18	99.28
25.400	0.00	0.0	24.2	24.6	0.18	99.26
25.500	0.00	0.0	23.9	24.2	0.17	99.25
25.600	0.00	0.0	23.5	23.9	0.17	99.23
25.700	0.00	0.0	23.2	23.5	0.17	99.22
25.800	0.00	0.0	22.9	23.2	0.16	99.20
25.900	0.00	0.0	22.6	22.9	0.16	99.19

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: SB3 .PND
Inflow Hydrograph: 5-SB3 .HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 98.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 11.00 cfs
Peak Outflow = 1.58 cfs
Peak Elevation = 102.39 ft

***** Summary of Approximate Peak Storage *****

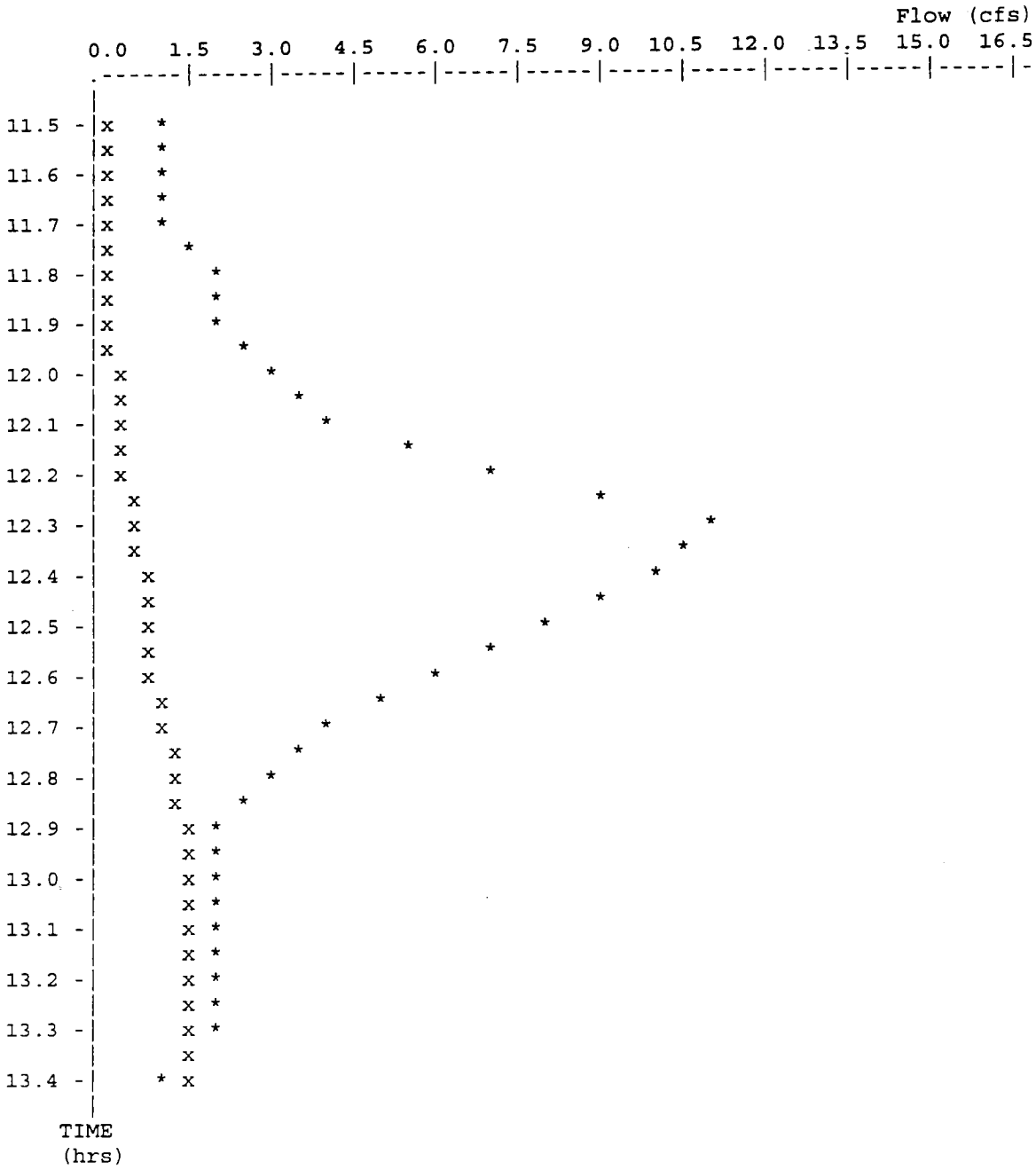
Initial Storage = 0.00 ac-ft
Peak Storage From Storm = 0.52 ac-ft

Total Storage in Pond = 0.52 ac-ft

Pond File: SB3 .PND
Inflow Hydrograph: 5-SB3 .HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 11-04-1997
18:39:23

Peak Inflow = 11.00 cfs
Peak Outflow = 1.58 cfs
Peak Elevation = 102.39 ft



* File: 5-SB3 .HYD Qmax = 11.0 cfs
x File: OUT .HYD Qmax = 1.6 cfs

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*************************
*                       *
*                       *
*    EARLE - SITE 5     *
* DETENTION BASIN # 3   *
*     2 YEAR STORM      *
*                       *
*************************
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Inflow Hydrograph: 5-DB3-2 .HYD
Rating Table file: SB3 .PND

----INITIAL CONDITIONS----
Elevation = 98.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
98.00	0.0	0.000
98.90	0.0	0.066
99.00	0.1	0.075
100.00	0.4	0.174
101.00	0.6	0.297
102.00	0.8	0.448
103.00	2.8	0.626

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
16.1	16.1
18.2	18.3
42.1	42.5
72.0	72.6
108.3	109.1
151.6	154.4

Time increment (t) = 0.100 hrs.

POND-2 Version: 5.17 S/N:
EXECUTED: 11-06-1997 10:20:03

Pond File: SB3 .PND
Inflow Hydrograph: 5-DB3-2 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH / ROUTING COMPUTATIONS

TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	0.00	-----	0.0	0.0	0.00	98.00
11.100	0.00	0.0	0.0	0.0	0.00	98.00
11.200	0.00	0.0	0.0	0.0	0.00	98.00
11.300	0.00	0.0	0.0	0.0	0.00	98.00
11.400	0.00	0.0	0.0	0.0	0.00	98.00
11.500	0.00	0.0	0.0	0.0	0.00	98.00
11.600	0.00	0.0	0.0	0.0	0.00	98.00
11.700	0.00	0.0	0.0	0.0	0.00	98.00
11.800	0.00	0.0	0.0	0.0	0.00	98.00
11.900	0.00	0.0	0.0	0.0	0.00	98.00
12.000	1.00	1.0	1.0	1.0	0.00	98.06
12.100	2.00	3.0	4.0	4.0	0.00	98.22
12.200	3.00	5.0	9.0	9.0	0.00	98.50
12.300	3.00	6.0	15.0	15.0	0.00	98.84
12.400	3.00	6.0	20.7	21.0	0.13	99.11
12.500	2.00	5.0	25.3	25.7	0.19	99.31
12.600	2.00	4.0	28.9	29.3	0.24	99.46
12.700	1.00	3.0	31.3	31.9	0.27	99.56
12.800	1.00	2.0	32.8	33.3	0.29	99.62
12.900	1.00	2.0	34.2	34.8	0.30	99.68
13.000	1.00	2.0	35.5	36.2	0.32	99.74
13.100	1.00	2.0	36.8	37.5	0.34	99.79
13.200	1.00	2.0	38.1	38.8	0.35	99.85
13.300	1.00	2.0	39.4	40.1	0.37	99.90
13.400	1.00	2.0	40.6	41.4	0.39	99.95
13.500	1.00	2.0	41.8	42.6	0.40	100.00
13.600	1.00	2.0	43.0	43.8	0.41	100.04
13.700	1.00	2.0	44.2	45.0	0.42	100.08
13.800	1.00	2.0	45.3	46.2	0.42	100.12
13.900	0.00	1.0	45.5	46.3	0.43	100.13
14.000	0.00	0.0	44.6	45.5	0.42	100.10
14.100	0.00	0.0	43.8	44.6	0.41	100.07
14.200	0.00	0.0	43.0	43.8	0.41	100.04
14.300	0.00	0.0	42.2	43.0	0.40	100.02
14.400	0.00	0.0	41.4	42.2	0.40	99.99
14.500	0.00	0.0	40.6	41.4	0.39	99.95
14.600	0.00	0.0	39.9	40.6	0.38	99.92
14.700	0.00	0.0	39.1	39.9	0.37	99.89
14.800	0.00	0.0	38.4	39.1	0.36	99.86
14.900	0.00	0.0	37.7	38.4	0.35	99.83
15.000	0.00	0.0	37.0	37.7	0.34	99.80
15.100	0.00	0.0	36.4	37.0	0.33	99.77
15.200	0.00	0.0	35.7	36.4	0.32	99.75
15.300	0.00	0.0	35.1	35.7	0.32	99.72
15.400	0.00	0.0	34.5	35.1	0.31	99.69

POND-2 Version: 5.17 S/N:
EXECUTED: 11-06-1997 10:20:03

Pond File: SB3 .PND
Inflow Hydrograph: 5-DB3-2 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	0.00	0.0	33.9	34.5	0.30	99.67
15.600	0.00	0.0	33.3	33.9	0.29	99.64
15.700	0.00	0.0	32.7	33.3	0.29	99.62
15.800	0.00	0.0	32.1	32.7	0.28	99.60
15.900	0.00	0.0	31.6	32.1	0.27	99.57
16.000	0.00	0.0	31.1	31.6	0.27	99.55
16.100	0.00	0.0	30.6	31.1	0.26	99.53
16.200	0.00	0.0	30.0	30.6	0.25	99.51
16.300	0.00	0.0	29.6	30.0	0.25	99.49
16.400	0.00	0.0	29.1	29.6	0.24	99.47
16.500	0.00	0.0	28.6	29.1	0.23	99.45
16.600	0.00	0.0	28.2	28.6	0.23	99.43
16.700	0.00	0.0	27.7	28.2	0.22	99.41
16.800	0.00	0.0	27.3	27.7	0.22	99.39
16.900	0.00	0.0	26.9	27.3	0.21	99.37
17.000	0.00	0.0	26.4	26.9	0.21	99.35
17.100	0.00	0.0	26.0	26.4	0.20	99.34
17.200	0.00	0.0	25.6	26.0	0.20	99.32
17.300	0.00	0.0	25.3	25.6	0.19	99.30
17.400	0.00	0.0	24.9	25.3	0.19	99.29
17.500	0.00	0.0	24.5	24.9	0.18	99.27
17.600	0.00	0.0	24.2	24.5	0.18	99.26
17.700	0.00	0.0	23.8	24.2	0.17	99.24
17.800	0.00	0.0	23.5	23.8	0.17	99.23
17.900	0.00	0.0	23.2	23.5	0.16	99.22
18.000	0.00	0.0	22.8	23.2	0.16	99.20
18.100	0.00	0.0	22.5	22.8	0.16	99.19
18.200	0.00	0.0	22.2	22.5	0.15	99.18
18.300	0.00	0.0	21.9	22.2	0.15	99.16
18.400	0.00	0.0	21.6	21.9	0.15	99.15
18.500	0.00	0.0	21.3	21.6	0.14	99.14
18.600	0.00	0.0	21.1	21.3	0.14	99.13
18.700	0.00	0.0	20.8	21.1	0.13	99.12
18.800	0.00	0.0	20.5	20.8	0.13	99.10
18.900	0.00	0.0	20.3	20.5	0.13	99.09
19.000	0.00	0.0	20.0	20.3	0.12	99.08
19.100	0.00	0.0	19.8	20.0	0.12	99.07
19.200	0.00	0.0	19.6	19.8	0.12	99.06
19.300	0.00	0.0	19.3	19.6	0.12	99.05
19.400	0.00	0.0	19.1	19.3	0.11	99.04
19.500	0.00	0.0	18.9	19.1	0.11	99.03
19.600	0.00	0.0	18.7	18.9	0.11	99.02
19.700	0.00	0.0	18.5	18.7	0.10	99.02
19.800	0.00	0.0	18.2	18.5	0.10	99.01
19.900	0.00	0.0	18.1	18.2	0.10	99.00
20.000	0.00	0.0	17.9	18.1	0.09	98.99

Pond File: SB3 .PND
Inflow Hydrograph: 5-DB3-2 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	0.00	0.0	17.7	17.9	0.08	98.98
20.200	0.00	0.0	17.6	17.7	0.07	98.97
20.300	0.00	0.0	17.4	17.6	0.07	98.97
20.400	0.00	0.0	17.3	17.4	0.06	98.96
20.500	0.00	0.0	17.2	17.3	0.06	98.96
20.600	0.00	0.0	17.1	17.2	0.05	98.95
20.700	0.00	0.0	17.0	17.1	0.05	98.95
20.800	0.00	0.0	16.9	17.0	0.04	98.94
20.900	0.00	0.0	16.8	16.9	0.04	98.94
21.000	0.00	0.0	16.8	16.8	0.03	98.93
21.100	0.00	0.0	16.7	16.8	0.03	98.93
21.200	0.00	0.0	16.7	16.7	0.03	98.93
21.300	0.00	0.0	16.6	16.7	0.03	98.93
21.400	0.00	0.0	16.6	16.6	0.02	98.92
21.500	0.00	0.0	16.5	16.6	0.02	98.92
21.600	0.00	0.0	16.5	16.5	0.02	98.92
21.700	0.00	0.0	16.4	16.5	0.02	98.92
21.800	0.00	0.0	16.4	16.4	0.02	98.92
21.900	0.00	0.0	16.4	16.4	0.01	98.91
22.000	0.00	0.0	16.4	16.4	0.01	98.91
22.100	0.00	0.0	16.3	16.4	0.01	98.91
22.200	0.00	0.0	16.3	16.3	0.01	98.91
22.300	0.00	0.0	16.3	16.3	0.01	98.91
22.400	0.00	0.0	16.3	16.3	0.01	98.91
22.500	0.00	0.0	16.3	16.3	0.01	98.91
22.600	0.00	0.0	16.2	16.3	0.01	98.91
22.700	0.00	0.0	16.2	16.2	0.01	98.91
22.800	0.00	0.0	16.2	16.2	0.01	98.91
22.900	0.00	0.0	16.2	16.2	0.01	98.91
23.000	0.00	0.0	16.2	16.2	0.01	98.91
23.100	0.00	0.0	16.2	16.2	0.00	98.90
23.200	0.00	0.0	16.2	16.2	0.00	98.90
23.300	0.00	0.0	16.2	16.2	0.00	98.90
23.400	0.00	0.0	16.2	16.2	0.00	98.90
23.500	0.00	0.0	16.2	16.2	0.00	98.90
23.600	0.00	0.0	16.1	16.2	0.00	98.90
23.700	0.00	0.0	16.1	16.1	0.00	98.90
23.800	0.00	0.0	16.1	16.1	0.00	98.90
23.900	0.00	0.0	16.1	16.1	0.00	98.90
24.000	0.00	0.0	16.1	16.1	0.00	98.90
24.100	0.00	0.0	16.1	16.1	0.00	98.90
24.200	0.00	0.0	16.1	16.1	0.00	98.90
24.300	0.00	0.0	16.1	16.1	0.00	98.90
24.400	0.00	0.0	16.1	16.1	0.00	98.90
24.500	0.00	0.0	16.1	16.1	0.00	98.90
24.600	0.00	0.0	16.1	16.1	0.00	98.90

Pond File: SB3 .PND
Inflow Hydrograph: 5-DB3-2 .HYD
Outflow Hydrograph: OUT .HYD

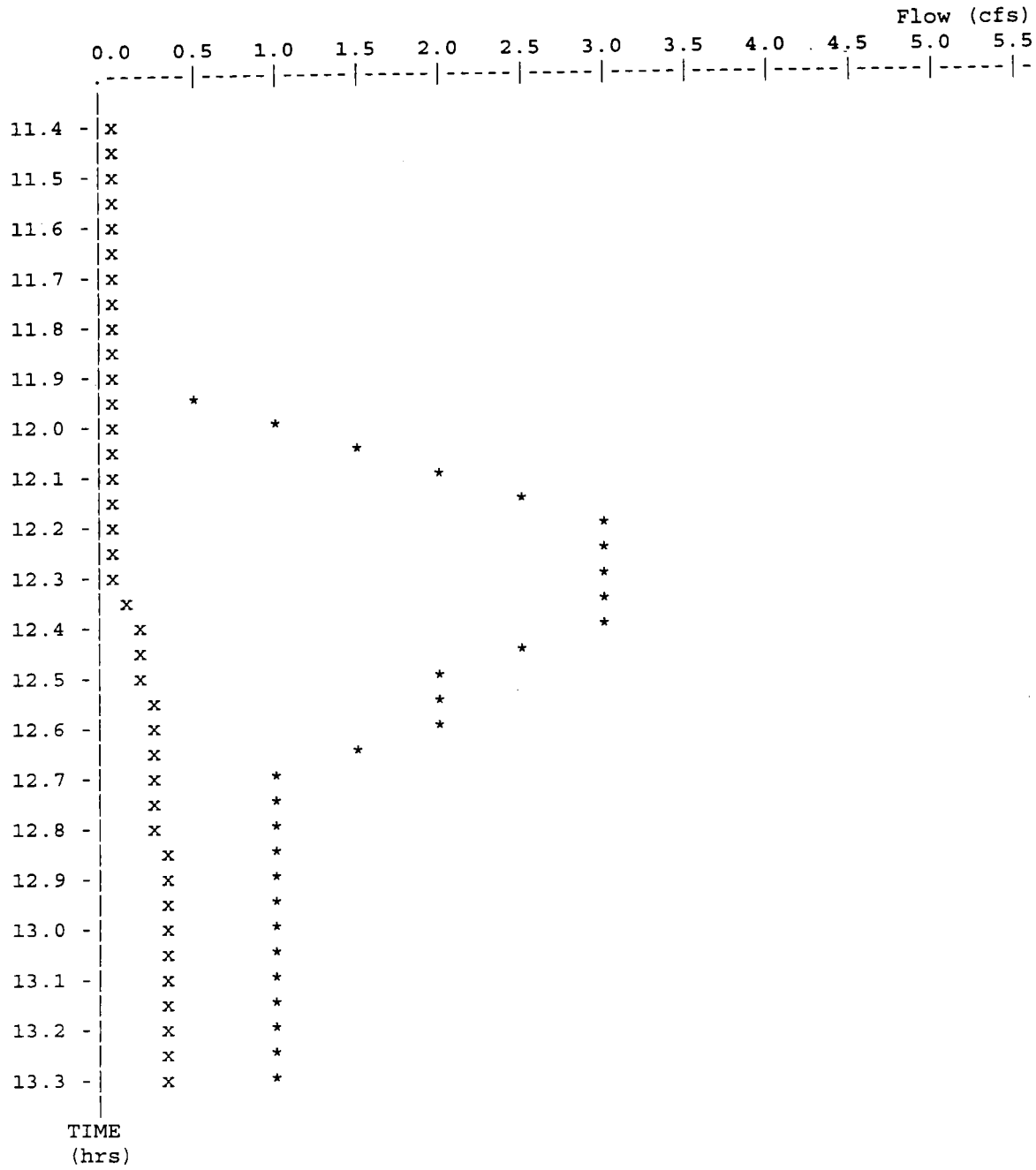
INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	0.00	0.0	16.1	16.1	0.00	98.90
24.800	0.00	0.0	16.1	16.1	0.00	98.90
24.900	0.00	0.0	16.1	16.1	0.00	98.90
25.000	0.00	0.0	16.1	16.1	0.00	98.90
25.100	0.00	0.0	16.1	16.1	0.00	98.90
25.200	0.00	0.0	16.1	16.1	0.00	98.90
25.300	0.00	0.0	16.1	16.1	0.00	98.90
25.400	0.00	0.0	16.1	16.1	0.00	98.90
25.500	0.00	0.0	16.1	16.1	0.00	98.90
25.600	0.00	0.0	16.1	16.1	0.00	98.90
25.700	0.00	0.0	16.1	16.1	0.00	98.90
25.800	0.00	0.0	16.1	16.1	0.00	98.90
25.900	0.00	0.0	16.1	16.1	0.00	98.90

```
****************** SUMMARY OF ROUTING COMPUTATIONS ******************

Pond File:           SB3      .PND
Inflow Hydrograph:   5-DB3-2  .HYD
Outflow Hydrograph:  OUT      .HYD

Starting Pond W.S. Elevation =    98.00 ft

        ***** Summary of Peak Outflow and Peak Elevation *****

                    Peak Inflow    =     3.00 cfs
                    Peak Outflow   =     0.43 cfs
                    Peak Elevation =   100.13 ft

         ***** Summary of Approximate Peak Storage *****

             Initial Storage          =     0.00 ac-ft
             Peak Storage From Storm  =     0.19 ac-ft
                                      ---------------
             Total Storage in Pond    =     0.19 ac-ft
```

Pond File: SB3 .PND
Inflow Hydrograph: 5-DB3-2 .HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 11-06-1997
10:20:03

Peak Inflow = 3.00 cfs
Peak Outflow = 0.43 cfs
Peak Elevation = 100.13 ft



* File: 5-DB3-2 .HYD Qmax = 3.0 cfs
x File: OUT .HYD Qmax = 0.4 cfs

```
*************************
*                       *
*                       *
*    EARLE - SITE 5     *
* DETENTION BASIN # 3   *
*     10 YEAR STORM     *
*                       *
*************************
```

Inflow Hydrograph: 5-DB3 .HYD
Rating Table file: SB3 .PND

----INITIAL CONDITIONS----
Elevation = 98.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
98.00	0.0	0.000
98.90	0.0	0.066
99.00	0.1	0.075
100.00	0.4	0.174
101.00	0.6	0.297
102.00	0.8	0.448
103.00	2.8	0.626

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
16.1	16.1
18.2	18.3
42.1	42.5
72.0	72.6
108.3	109.1
151.6	154.4

Time increment (t) = 0.100 hrs.

POND-2 Version: 5.17 S/N:
EXECUTED: 11-06-1997 10:28:26

Pond File: SB3 .PND
Inflow Hydrograph: 5-DB3 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	0.00	-----	0.0	0.0	0.00	98.00
11.100	0.00	0.0	0.0	0.0	0.00	98.00
11.200	1.00	1.0	1.0	1.0	0.00	98.06
11.300	1.00	2.0	3.0	3.0	0.00	98.17
11.400	1.00	2.0	5.0	5.0	0.00	98.28
11.500	1.00	2.0	7.0	7.0	0.00	98.39
11.600	1.00	2.0	9.0	9.0	0.00	98.50
11.700	1.00	2.0	11.0	11.0	0.00	98.62
11.800	2.00	3.0	14.0	14.0	0.00	98.78
11.900	2.00	4.0	17.8	18.0	0.09	98.99
12.000	2.00	4.0	21.5	21.8	0.14	99.15
12.100	3.00	5.0	26.1	26.5	0.20	99.34
12.200	6.00	9.0	34.5	35.1	0.31	99.70
12.300	9.00	15.0	48.6	49.5	0.45	100.23
12.400	9.00	18.0	65.5	66.6	0.56	100.80
12.500	7.00	16.0	80.2	81.5	0.65	101.24
12.600	5.00	12.0	90.8	92.2	0.71	101.54
12.700	4.00	9.0	98.3	99.8	0.75	101.75
12.800	3.00	7.0	103.7	105.3	0.78	101.90
12.900	2.00	5.0	107.1	108.7	0.80	101.99
13.000	2.00	4.0	109.4	111.1	0.89	102.04
13.100	2.00	4.0	111.4	113.4	0.99	102.09
13.200	1.00	3.0	112.3	114.4	1.03	102.12
13.300	1.00	2.0	112.3	114.3	1.03	102.12
13.400	1.00	2.0	112.2	114.3	1.03	102.11
13.500	1.00	2.0	112.1	114.2	1.03	102.11
13.600	1.00	2.0	112.1	114.1	1.02	102.11
13.700	1.00	2.0	112.1	114.1	1.02	102.11
13.800	1.00	2.0	112.0	114.1	1.02	102.11
13.900	1.00	2.0	112.0	114.0	1.02	102.11
14.000	1.00	2.0	112.0	114.0	1.02	102.11
14.100	1.00	2.0	111.9	114.0	1.01	102.11
14.200	1.00	2.0	111.9	113.9	1.01	102.11
14.300	1.00	2.0	111.9	113.9	1.01	102.11
14.400	1.00	2.0	111.9	113.9	1.01	102.11
14.500	1.00	2.0	111.8	113.9	1.01	102.10
14.600	1.00	2.0	111.8	113.8	1.01	102.10
14.700	1.00	2.0	111.8	113.8	1.01	102.10
14.800	1.00	2.0	111.8	113.8	1.01	102.10
14.900	1.00	2.0	111.8	113.8	1.01	102.10
15.000	1.00	2.0	111.8	113.8	1.01	102.10
15.100	1.00	2.0	111.7	113.8	1.01	102.10
15.200	1.00	2.0	111.7	113.7	1.01	102.10
15.300	1.00	2.0	111.7	113.7	1.00	102.10
15.400	1.00	2.0	111.7	113.7	1.00	102.10

POND-2 Version: 5.17 S/N:
EXECUTED: 11-06-1997 10:28:26

Pond File: SB3 .PND
Inflow Hydrograph: 5-DB3 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	1.00	2.0	111.7	113.7	1.00	102.10
15.600	1.00	2.0	111.7	113.7	1.00	102.10
15.700	1.00	2.0	111.7	113.7	1.00	102.10
15.800	0.00	1.0	110.8	112.7	0.96	102.08
15.900	0.00	0.0	109.0	110.8	0.87	102.04
16.000	0.00	0.0	107.4	109.0	0.80	102.00
16.100	0.00	0.0	105.9	107.4	0.79	101.95
16.200	0.00	0.0	104.3	105.9	0.78	101.91
16.300	0.00	0.0	102.7	104.3	0.77	101.87
16.400	0.00	0.0	101.2	102.7	0.77	101.83
16.500	0.00	0.0	99.7	101.2	0.76	101.78
16.600	0.00	0.0	98.2	99.7	0.75	101.74
16.700	0.00	0.0	96.7	98.2	0.74	101.70
16.800	0.00	0.0	95.3	96.7	0.73	101.66
16.900	0.00	0.0	93.8	95.3	0.72	101.62
17.000	0.00	0.0	92.4	93.8	0.72	101.58
17.100	0.00	0.0	91.0	92.4	0.71	101.54
17.200	0.00	0.0	89.6	91.0	0.70	101.50
17.300	0.00	0.0	88.2	89.6	0.69	101.47
17.400	0.00	0.0	86.8	88.2	0.69	101.43
17.500	0.00	0.0	85.4	86.8	0.68	101.39
17.600	0.00	0.0	84.1	85.4	0.67	101.35
17.700	0.00	0.0	82.8	84.1	0.66	101.32
17.800	0.00	0.0	81.5	82.8	0.66	101.28
17.900	0.00	0.0	80.2	81.5	0.65	101.24
18.000	0.00	0.0	78.9	80.2	0.64	101.21
18.100	0.00	0.0	77.6	78.9	0.63	101.17
18.200	0.00	0.0	76.4	77.6	0.63	101.14
18.300	0.00	0.0	75.1	76.4	0.62	101.10
18.400	0.00	0.0	73.9	75.1	0.61	101.07
18.500	0.00	0.0	72.7	73.9	0.61	101.04
18.600	0.00	0.0	71.5	72.7	0.60	101.00
18.700	0.00	0.0	70.3	71.5	0.59	100.96
18.800	0.00	0.0	69.1	70.3	0.58	100.92
18.900	0.00	0.0	68.0	69.1	0.58	100.89
19.000	0.00	0.0	66.8	68.0	0.57	100.85
19.100	0.00	0.0	65.7	66.8	0.56	100.81
19.200	0.00	0.0	64.6	65.7	0.55	100.77
19.300	0.00	0.0	63.5	64.6	0.55	100.73
19.400	0.00	0.0	62.4	63.5	0.54	100.70
19.500	0.00	0.0	61.4	62.4	0.53	100.66
19.600	0.00	0.0	60.3	61.4	0.53	100.63
19.700	0.00	0.0	59.3	60.3	0.52	100.59
19.800	0.00	0.0	58.2	59.3	0.51	100.56
19.900	0.00	0.0	57.2	58.2	0.50	100.52
20.000	0.00	0.0	56.2	57.2	0.50	100.49

Pond File: SB3 .PND
Inflow Hydrograph: 5-DB3 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	0.00	0.0	55.3	56.2	0.49	100.46
20.200	0.00	0.0	54.3	55.3	0.48	100.42
20.300	0.00	0.0	53.3	54.3	0.48	100.39
20.400	0.00	0.0	52.4	53.3	0.47	100.36
20.500	0.00	0.0	51.5	52.4	0.47	100.33
20.600	0.00	0.0	50.5	51.5	0.46	100.30
20.700	0.00	0.0	49.6	50.5	0.45	100.27
20.800	0.00	0.0	48.7	49.6	0.45	100.24
20.900	0.00	0.0	47.8	48.7	0.44	100.21
21.000	0.00	0.0	47.0	47.8	0.44	100.18
21.100	0.00	0.0	46.1	47.0	0.43	100.15
21.200	0.00	0.0	45.3	46.1	0.42	100.12
21.300	0.00	0.0	44.4	45.3	0.42	100.09
21.400	0.00	0.0	43.6	44.4	0.41	100.06
21.500	0.00	0.0	42.8	43.6	0.41	100.04
21.600	0.00	0.0	42.0	42.8	0.40	100.01
21.700	0.00	0.0	41.2	42.0	0.39	99.98
21.800	0.00	0.0	40.4	41.2	0.38	99.95
21.900	0.00	0.0	39.7	40.4	0.37	99.91
22.000	0.00	0.0	39.0	39.7	0.37	99.88
22.100	0.00	0.0	38.2	39.0	0.36	99.85
22.200	0.00	0.0	37.5	38.2	0.35	99.82
22.300	0.00	0.0	36.9	37.5	0.34	99.80
22.400	0.00	0.0	36.2	36.9	0.33	99.77
22.500	0.00	0.0	35.6	36.2	0.32	99.74
22.600	0.00	0.0	34.9	35.6	0.31	99.71
22.700	0.00	0.0	34.3	34.9	0.31	99.69
22.800	0.00	0.0	33.7	34.3	0.30	99.66
22.900	0.00	0.0	33.1	33.7	0.29	99.64
23.000	0.00	0.0	32.6	33.1	0.28	99.61
23.100	0.00	0.0	32.0	32.6	0.28	99.59
23.200	0.00	0.0	31.5	32.0	0.27	99.57
23.300	0.00	0.0	31.0	31.5	0.26	99.55
23.400	0.00	0.0	30.4	31.0	0.26	99.52
23.500	0.00	0.0	29.9	30.4	0.25	99.50
23.600	0.00	0.0	29.4	29.9	0.24	99.48
23.700	0.00	0.0	29.0	29.4	0.24	99.46
23.800	0.00	0.0	28.5	29.0	0.23	99.44
23.900	0.00	0.0	28.1	28.5	0.23	99.42
24.000	0.00	0.0	27.6	28.1	0.22	99.40
24.100	0.00	0.0	27.2	27.6	0.22	99.39
24.200	0.00	0.0	26.8	27.2	0.21	99.37
24.300	0.00	0.0	26.3	26.8	0.21	99.35
24.400	0.00	0.0	25.9	26.3	0.20	99.33
24.500	0.00	0.0	25.6	25.9	0.20	99.32
24.600	0.00	0.0	25.2	25.6	0.19	99.30

Pond File: SB3 .PND
Inflow Hydrograph: 5-DB3 .HYD
Outflow Hydrograph: OUT .HYD

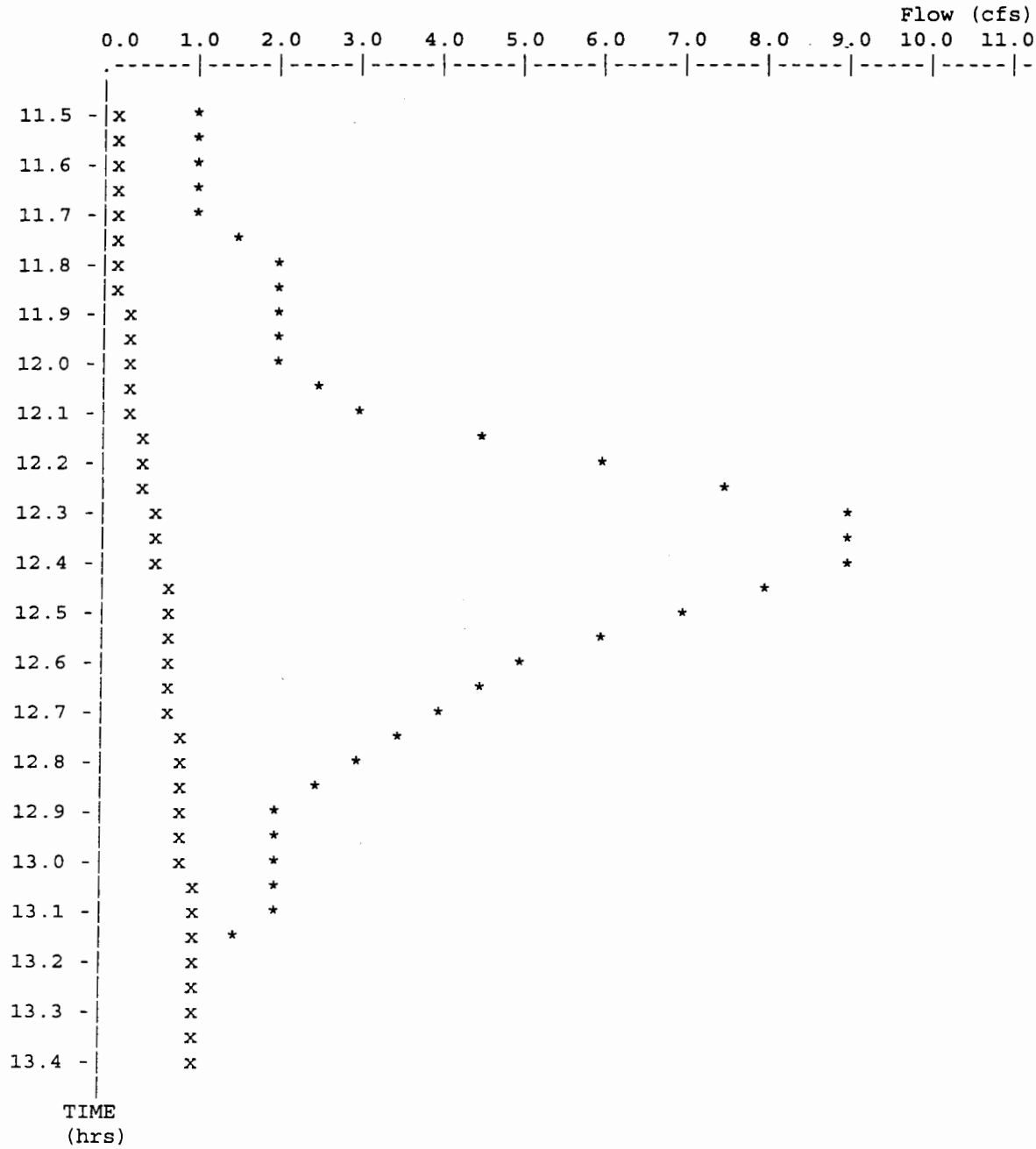
INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	0.00	0.0	24.8	25.2	0.19	99.28
24.800	0.00	0.0	24.4	24.8	0.18	99.27
24.900	0.00	0.0	24.1	24.4	0.18	99.25
25.000	0.00	0.0	23.7	24.1	0.17	99.24
25.100	0.00	0.0	23.4	23.7	0.17	99.23
25.200	0.00	0.0	23.1	23.4	0.16	99.21
25.300	0.00	0.0	22.8	23.1	0.16	99.20
25.400	0.00	0.0	22.5	22.8	0.16	99.19
25.500	0.00	0.0	22.2	22.5	0.15	99.17
25.600	0.00	0.0	21.9	22.2	0.15	99.16
25.700	0.00	0.0	21.6	21.9	0.14	99.15
25.800	0.00	0.0	21.3	21.6	0.14	99.14
25.900	0.00	0.0	21.0	21.3	0.14	99.12

```
****************** SUMMARY OF ROUTING COMPUTATIONS ******************

Pond File:            SB3      .PND
Inflow Hydrograph:    5-DB3    .HYD
Outflow Hydrograph:   OUT      .HYD

Starting Pond W.S. Elevation =    98.00 ft

         ***** Summary of Peak Outflow and Peak Elevation *****

                    Peak Inflow    =     9.00 cfs
                    Peak Outflow   =     1.03 cfs
                    Peak Elevation =   102.12 ft

           ***** Summary of Approximate Peak Storage *****

               Initial Storage          =     0.00 ac-ft
               Peak Storage From Storm  =     0.47 ac-ft
                                        ---------------
               Total Storage in Pond    =     0.47 ac-ft
```

Pond File: SB3 .PND
Inflow Hydrograph: 5-DB3 .HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 11-06-1997
10:28:26

Peak Inflow = 9.00 cfs
Peak Outflow = 1.03 cfs
Peak Elevation = 102.12 ft



* File: 5-DB3 .HYD Qmax = 9.0 cfs
x File: OUT .HYD Qmax = 1.0 cfs

```
*************************
*                       *
*                       *
*    EARLE - SITE 5     *
* DETENTION BASIN # 3   *
*     25 YEAR STORM     *
*                       *
*************************
```

Inflow Hydrograph: 5-DB325 .HYD
Rating Table file: SB3 .PND

----INITIAL CONDITIONS----
Elevation = 98.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
98.00	0.0	0.000
98.90	0.0	0.066
99.00	0.1	0.075
100.00	0.4	0.174
101.00	0.6	0.297
102.00	0.8	0.448
103.00	2.8	0.626

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
16.1	16.1
18.2	18.3
42.1	42.5
72.0	72.6
108.3	109.1
151.6	154.4

Time increment (t) = 0.100 hrs.

Pond File: SB3 .PND
Inflow Hydrograph: 5-DB325 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	1.00	-----	0.0	0.0	0.00	98.00
11.100	1.00	2.0	2.0	2.0	0.00	98.11
11.200	1.00	2.0	4.0	4.0	0.00	98.22
11.300	1.00	2.0	6.0	6.0	0.00	98.34
11.400	1.00	2.0	8.0	8.0	0.00	98.45
11.500	1.00	2.0	10.0	10.0	0.00	98.56
11.600	1.00	2.0	12.0	12.0	0.00	98.67
11.700	1.00	2.0	14.0	14.0	0.00	98.78
11.800	2.00	3.0	16.9	17.0	0.04	98.94
11.900	2.00	4.0	20.7	20.9	0.13	99.11
12.000	3.00	5.0	25.3	25.7	0.19	99.30
12.100	4.00	7.0	31.7	32.3	0.27	99.58
12.200	7.00	11.0	41.9	42.7	0.40	100.01
12.300	12.00	19.0	59.9	60.9	0.52	100.61
12.400	11.00	23.0	81.6	82.9	0.66	101.28
12.500	8.00	19.0	99.1	100.6	0.75	101.77
12.600	6.00	14.0	111.1	113.1	0.97	102.09
12.700	5.00	11.0	119.4	122.1	1.37	102.29
12.800	3.00	8.0	124.1	127.4	1.61	102.40
12.900	2.00	5.0	125.8	129.1	1.69	102.44
13.000	2.00	4.0	126.3	129.8	1.71	102.46
13.100	2.00	4.0	126.9	130.3	1.74	102.47
13.200	2.00	4.0	127.3	130.9	1.76	102.48
13.300	2.00	4.0	127.8	131.3	1.78	102.49
13.400	1.00	3.0	127.3	130.8	1.76	102.48
13.500	1.00	2.0	125.9	129.3	1.69	102.45
13.600	1.00	2.0	124.6	127.9	1.63	102.41
13.700	1.00	2.0	123.5	126.6	1.57	102.39
13.800	1.00	2.0	122.4	125.5	1.52	102.36
13.900	1.00	2.0	121.5	124.4	1.48	102.34
14.000	1.00	2.0	120.6	123.5	1.43	102.32
14.100	1.00	2.0	119.8	122.6	1.40	102.30
14.200	1.00	2.0	119.1	121.8	1.36	102.28
14.300	1.00	2.0	118.4	121.1	1.33	102.26
14.400	1.00	2.0	117.8	120.4	1.30	102.25
14.500	1.00	2.0	117.3	119.8	1.27	102.24
14.600	1.00	2.0	116.8	119.3	1.25	102.22
14.700	1.00	2.0	116.3	118.8	1.23	102.21
14.800	1.00	2.0	115.9	118.3	1.21	102.20
14.900	1.00	2.0	115.5	117.9	1.19	102.19
15.000	1.00	2.0	115.2	117.5	1.17	102.19
15.100	1.00	2.0	114.9	117.2	1.16	102.18
15.200	1.00	2.0	114.6	116.9	1.14	102.17
15.300	1.00	2.0	114.3	116.6	1.13	102.17
15.400	1.00	2.0	114.1	116.3	1.12	102.16

Pond File: SB3 .PND
Inflow Hydrograph: 5-DB325 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	1.00	2.0	113.9	116.1	1.11	102.15
15.600	1.00	2.0	113.7	115.9	1.10	102.15
15.700	1.00	2.0	113.5	115.7	1.09	102.15
15.800	1.00	2.0	113.3	115.5	1.08	102.14
15.900	1.00	2.0	113.2	115.3	1.08	102.14
16.000	1.00	2.0	113.0	115.2	1.07	102.13
16.100	1.00	2.0	112.9	115.0	1.06	102.13
16.200	1.00	2.0	112.8	114.9	1.06	102.13
16.300	0.00	1.0	111.8	113.8	1.01	102.10
16.400	0.00	0.0	110.0	111.8	0.92	102.06
16.500	0.00	0.0	108.3	110.0	0.84	102.02
16.600	0.00	0.0	106.7	108.3	0.80	101.98
16.700	0.00	0.0	105.1	106.7	0.79	101.93
16.800	0.00	0.0	103.6	105.1	0.78	101.89
16.900	0.00	0.0	102.0	103.6	0.77	101.85
17.000	0.00	0.0	100.5	102.0	0.76	101.81
17.100	0.00	0.0	99.0	100.5	0.75	101.76
17.200	0.00	0.0	97.5	99.0	0.74	101.72
17.300	0.00	0.0	96.0	97.5	0.74	101.68
17.400	0.00	0.0	94.6	96.0	0.73	101.64
17.500	0.00	0.0	93.1	94.6	0.72	101.60
17.600	0.00	0.0	91.7	93.1	0.71	101.56
17.700	0.00	0.0	90.3	91.7	0.70	101.52
17.800	0.00	0.0	88.9	90.3	0.70	101.49
17.900	0.00	0.0	87.5	88.9	0.69	101.45
18.000	0.00	0.0	86.2	87.5	0.68	101.41
18.100	0.00	0.0	84.8	86.2	0.67	101.37
18.200	0.00	0.0	83.5	84.8	0.67	101.34
18.300	0.00	0.0	82.2	83.5	0.66	101.30
18.400	0.00	0.0	80.8	82.2	0.65	101.26
18.500	0.00	0.0	79.6	80.8	0.65	101.23
18.600	0.00	0.0	78.3	79.6	0.64	101.19
18.700	0.00	0.0	77.0	78.3	0.63	101.16
18.800	0.00	0.0	75.8	77.0	0.62	101.12
18.900	0.00	0.0	74.5	75.8	0.62	101.09
19.000	0.00	0.0	73.3	74.5	0.61	101.05
19.100	0.00	0.0	72.1	73.3	0.60	101.02
19.200	0.00	0.0	70.9	72.1	0.60	100.98
19.300	0.00	0.0	69.7	70.9	0.59	100.95
19.400	0.00	0.0	68.6	69.7	0.58	100.91
19.500	0.00	0.0	67.4	68.6	0.57	100.87
19.600	0.00	0.0	66.3	67.4	0.57	100.83
19.700	0.00	0.0	65.2	66.3	0.56	100.79
19.800	0.00	0.0	64.1	65.2	0.55	100.75
19.900	0.00	0.0	63.0	64.1	0.54	100.72
20.000	0.00	0.0	61.9	63.0	0.54	100.68

POND-2 Version: 5.17 S/N:
EXECUTED: 11-06-1997 10:22:42

Pond File: SB3 .PND
Inflow Hydrograph: 5-DB325 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	0.00	0.0	60.9	61.9	0.53	100.65
20.200	0.00	0.0	59.8	60.9	0.52	100.61
20.300	0.00	0.0	58.8	59.8	0.52	100.58
20.400	0.00	0.0	57.8	58.8	0.51	100.54
20.500	0.00	0.0	56.8	57.8	0.50	100.51
20.600	0.00	0.0	55.8	56.8	0.49	100.47
20.700	0.00	0.0	54.8	55.8	0.49	100.44
20.800	0.00	0.0	53.8	54.8	0.48	100.41
20.900	0.00	0.0	52.9	53.8	0.48	100.38
21.000	0.00	0.0	51.9	52.9	0.47	100.35
21.100	0.00	0.0	51.0	51.9	0.46	100.31
21.200	0.00	0.0	50.1	51.0	0.46	100.28
21.300	0.00	0.0	49.2	50.1	0.45	100.25
21.400	0.00	0.0	48.3	49.2	0.44	100.22
21.500	0.00	0.0	47.4	48.3	0.44	100.19
21.600	0.00	0.0	46.6	47.4	0.43	100.16
21.700	0.00	0.0	45.7	46.6	0.43	100.14
21.800	0.00	0.0	44.9	45.7	0.42	100.11
21.900	0.00	0.0	44.0	44.9	0.42	100.08
22.000	0.00	0.0	43.2	44.0	0.41	100.05
22.100	0.00	0.0	42.4	43.2	0.40	100.02
22.200	0.00	0.0	41.6	42.4	0.40	100.00
22.300	0.00	0.0	40.8	41.6	0.39	99.96
22.400	0.00	0.0	40.1	40.8	0.38	99.93
22.500	0.00	0.0	39.3	40.1	0.37	99.90
22.600	0.00	0.0	38.6	39.3	0.36	99.87
22.700	0.00	0.0	37.9	38.6	0.35	99.84
22.800	0.00	0.0	37.2	37.9	0.34	99.81
22.900	0.00	0.0	36.6	37.2	0.33	99.78
23.000	0.00	0.0	35.9	36.6	0.33	99.75
23.100	0.00	0.0	35.3	35.9	0.32	99.73
23.200	0.00	0.0	34.6	35.3	0.31	99.70
23.300	0.00	0.0	34.0	34.6	0.30	99.68
23.400	0.00	0.0	33.4	34.0	0.30	99.65
23.500	0.00	0.0	32.9	33.4	0.29	99.63
23.600	0.00	0.0	32.3	32.9	0.28	99.60
23.700	0.00	0.0	31.8	32.3	0.27	99.58
23.800	0.00	0.0	31.2	31.8	0.27	99.56
23.900	0.00	0.0	30.7	31.2	0.26	99.53
24.000	0.00	0.0	30.2	30.7	0.25	99.51
24.100	0.00	0.0	29.7	30.2	0.25	99.49
24.200	0.00	0.0	29.2	29.7	0.24	99.47
24.300	0.00	0.0	28.7	29.2	0.24	99.45
24.400	0.00	0.0	28.3	28.7	0.23	99.43
24.500	0.00	0.0	27.8	28.3	0.22	99.41
24.600	0.00	0.0	27.4	27.8	0.22	99.39

POND-2 Version: 5.17 S/N:
EXECUTED: 11-06-1997 10:22:42

Pond File: SB3 .PND
Inflow Hydrograph: 5-DB325 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	0.00	0.0	27.0	27.4	0.21	99.38
24.800	0.00	0.0	26.6	27.0	0.21	99.36
24.900	0.00	0.0	26.2	26.6	0.20	99.34
25.000	0.00	0.0	25.8	26.2	0.20	99.33
25.100	0.00	0.0	25.4	25.8	0.19	99.31
25.200	0.00	0.0	25.0	25.4	0.19	99.29
25.300	0.00	0.0	24.6	25.0	0.18	99.28
25.400	0.00	0.0	24.3	24.6	0.18	99.26
25.500	0.00	0.0	23.9	24.3	0.17	99.25
25.600	0.00	0.0	23.6	23.9	0.17	99.23
25.700	0.00	0.0	23.3	23.6	0.17	99.22
25.800	0.00	0.0	22.9	23.3	0.16	99.21
25.900	0.00	0.0	22.6	22.9	0.16	99.19

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: SB3 .PND
Inflow Hydrograph: 5-DB325 .HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 98.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 12.00 cfs
Peak Outflow = 1.78 cfs
Peak Elevation = 102.49 ft

***** Summary of Approximate Peak Storage *****

Initial Storage = 0.00 ac-ft
Peak Storage From Storm = 0.54 ac-ft

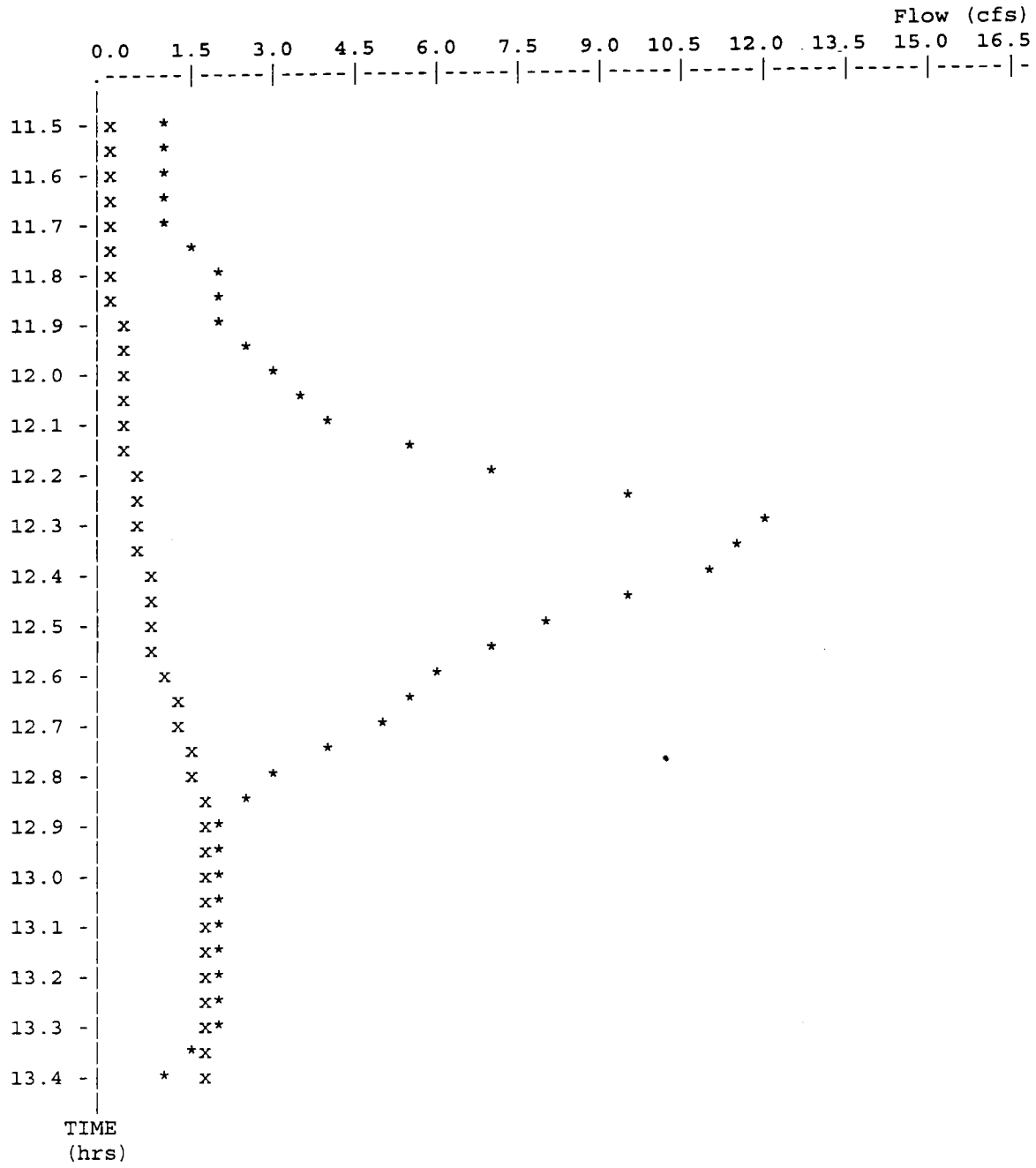
Total Storage in Pond = 0.54 ac-ft

Warning: Inflow hydrograph truncated on left side.

Pond File: SB3 .PND
Inflow Hydrograph: 5-DB325 .HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 11-06-1997
10:22:42

Peak Inflow = 12.00 cfs
Peak Outflow = 1.78 cfs
Peak Elevation = 102.49 ft



* File: 5-DB325 .HYD Qmax = 12.0 cfs
x File: OUT .HYD Qmax = 1.8 cfs

D.7 EMERGENCY SPILLWAY CALCULATIONS

Sediment/Detention Basin # 1
Worksheet for Trapezoidal Channel

Project Description	
Project File	untitled
Worksheet	Sediment/Detention Basin # 1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Channel Slope	0.005000	ft/ft
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	25.00	ft
Discharge	20.00	ft^3/s

Results		
Depth	0.45	ft
Flow Area	11.80	ft^2
Wetted Perimeter	27.83	ft
Top Width	27.69	ft
Critical Depth	0.27	ft
Critical Slope	0.028091	ft/ft
Velocity	1.69	ft/s
Velocity Head	0.04	ft
Specific Energy	0.49	ft
Froude Number	0.46	
Flow is subcritical.		

Sediment/Detention Basin # 2
Worksheet for Trapezoidal Channel

Project Description	
Project File	untitled
Worksheet	Sediment/Detention Basin # 2
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Channel Slope	0.005000	ft/ft
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	10.00	ft
Discharge	6.00	ft^3/s

Results		
Depth	0.37	ft
Flow Area	4.14	ft^2
Wetted Perimeter	12.36	ft
Top Width	12.24	ft
Critical Depth	0.22	ft
Critical Slope	0.030477	ft/ft
Velocity	1.45	ft/s
Velocity Head	0.03	ft
Specific Energy	0.41	ft
Froude Number	0.44	
Flow is subcritical.		

Sediment/Detention Basin # 3
Worksheet for Trapezoidal Channel

Project Description	
Project File	untitled
Worksheet	Sediment/Detention Basin # 3
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Channel Slope	0.005000	ft/ft
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	10.00	ft
Discharge	12.00	ft^3/s

Results		
Depth	0.56	ft
Flow Area	6.51	ft^2
Wetted Perimeter	13.53	ft
Top Width	13.35	ft
Critical Depth	0.34	ft
Critical Slope	0.026601	ft/ft
Velocity	1.84	ft/s
Velocity Head	0.05	ft
Specific Energy	0.61	ft
Froude Number	0.47	
Flow is subcritical.		

D.8 ANTI-SEEP COLLAR DESIGN

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT	JOB NUMBER
NWSE EARLE	7602 - 0202

SUBJECT: ANTI-SEEP COLLAR CALCULATIONS FOR SEDIMENT/DETENTION BASINS AT SITES

BASED ON	DRAWING NUMBER

BY	CHECKED BY	APPROVED BY	DATE
BER	KMS		11/5/97

$$L_s = y(z+4)\left[1 + \frac{\text{pipe slope}}{0.25 - \text{pipe slope}}\right]$$

L_s = length of pipe in the saturated zone (ft.)

y = distance in feet from upstream invert of pipe to highest normal water level expected to occur during the life of the structure usually the top of the riser.

z = slope of upstream embankment as a ratio of z ft. horizontal to one foot vertical.

Sediment Basin #1 :

$$L_s = (99.96 - 97)(3+4)\left[1 + \frac{.005}{0.25 - .005}\right]$$

$L_s = 21.13 \sim 21$ feet

Sediment Basin #2 :

$$L_s = (108.5 - 104)(3+4)\left[1 + \frac{.005}{0.25 - .005}\right]$$

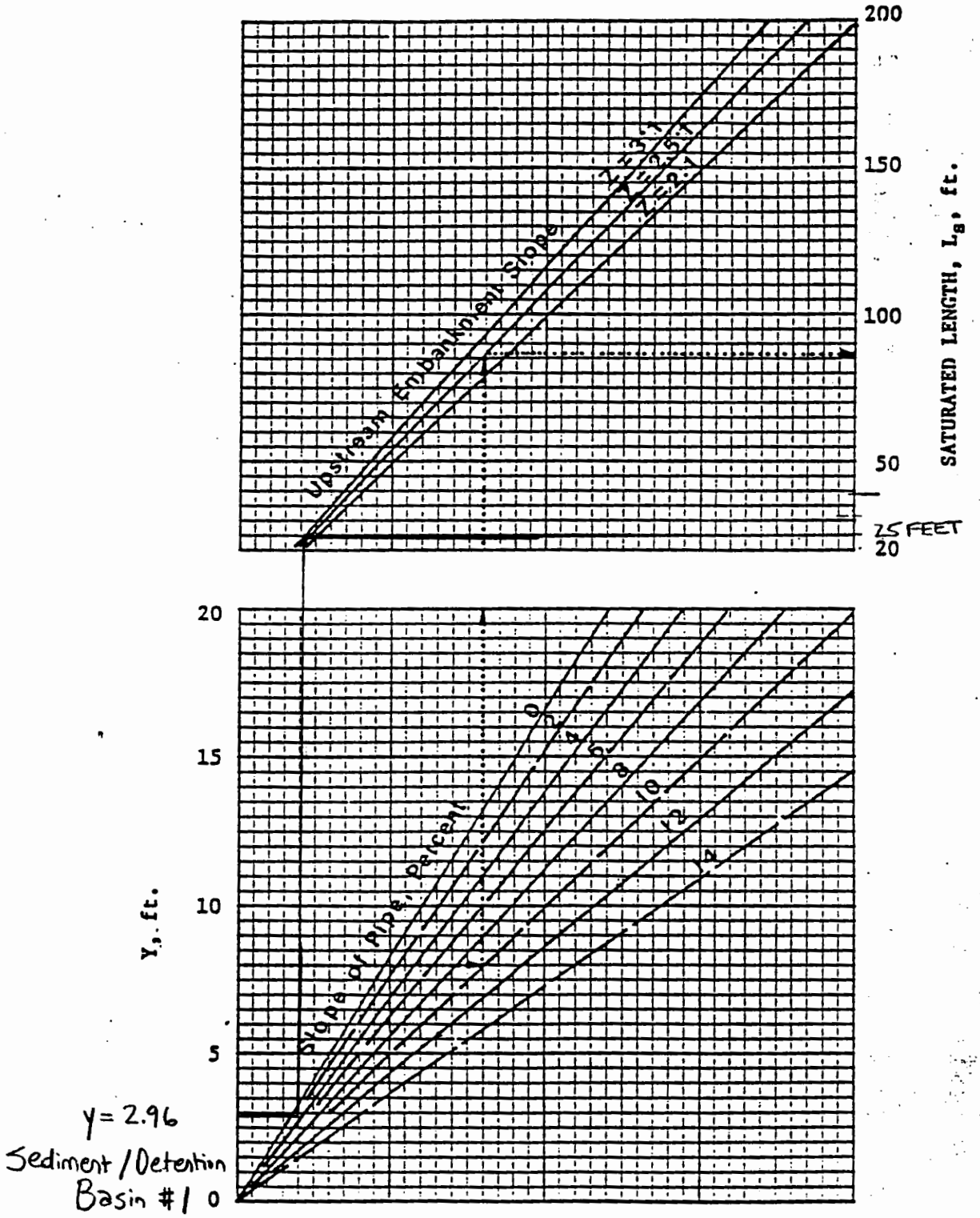
$L_s = 32.13 \sim 32$ feet

Sediment Basin #3 :

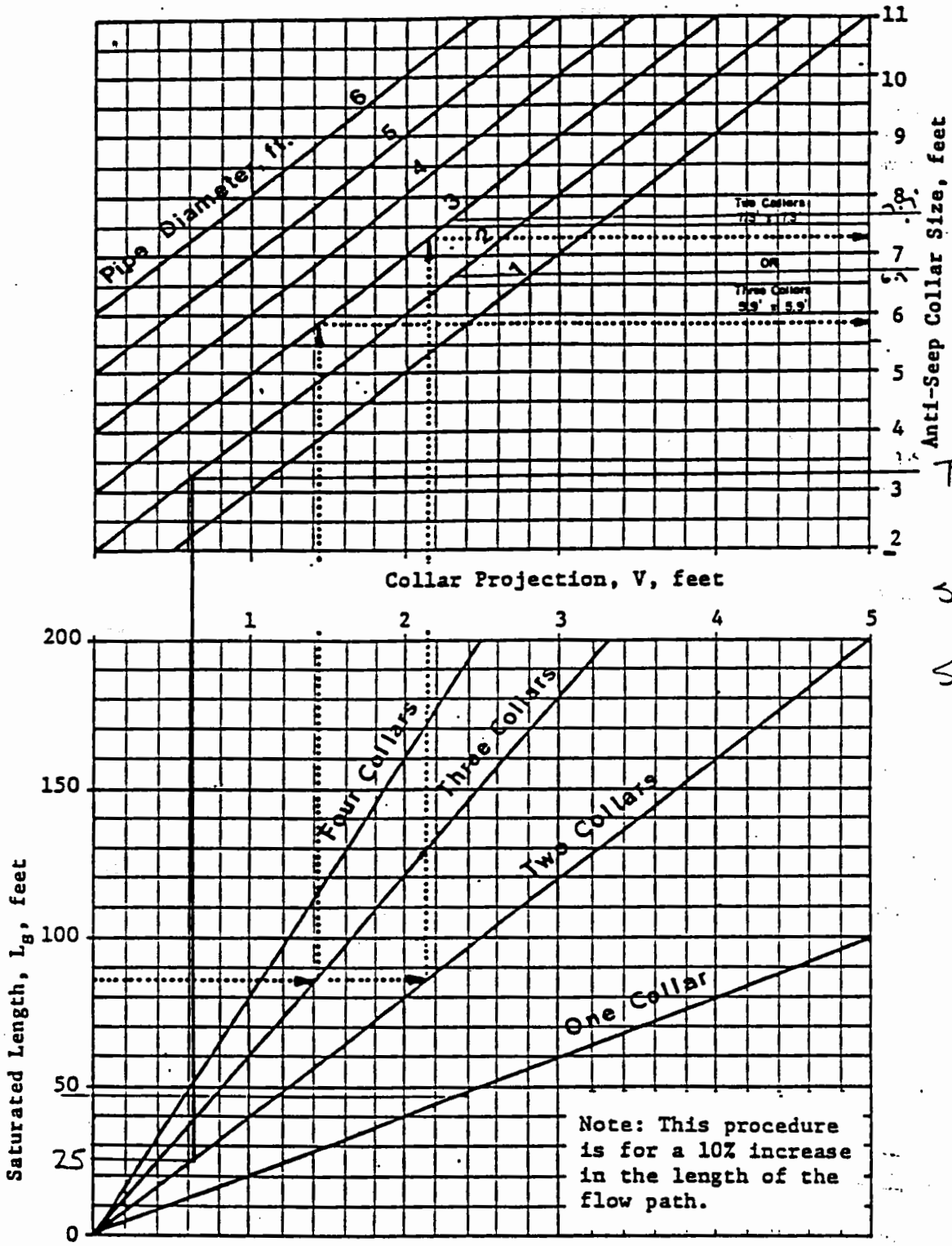
$$L_s = (102.39 - 98)(3+4)\left[1 + \frac{.005}{0.25 - .005}\right]$$

$L_s = 31.34 \sim 31$ feet

PIPE LENGTH IN SATURATED ZONE

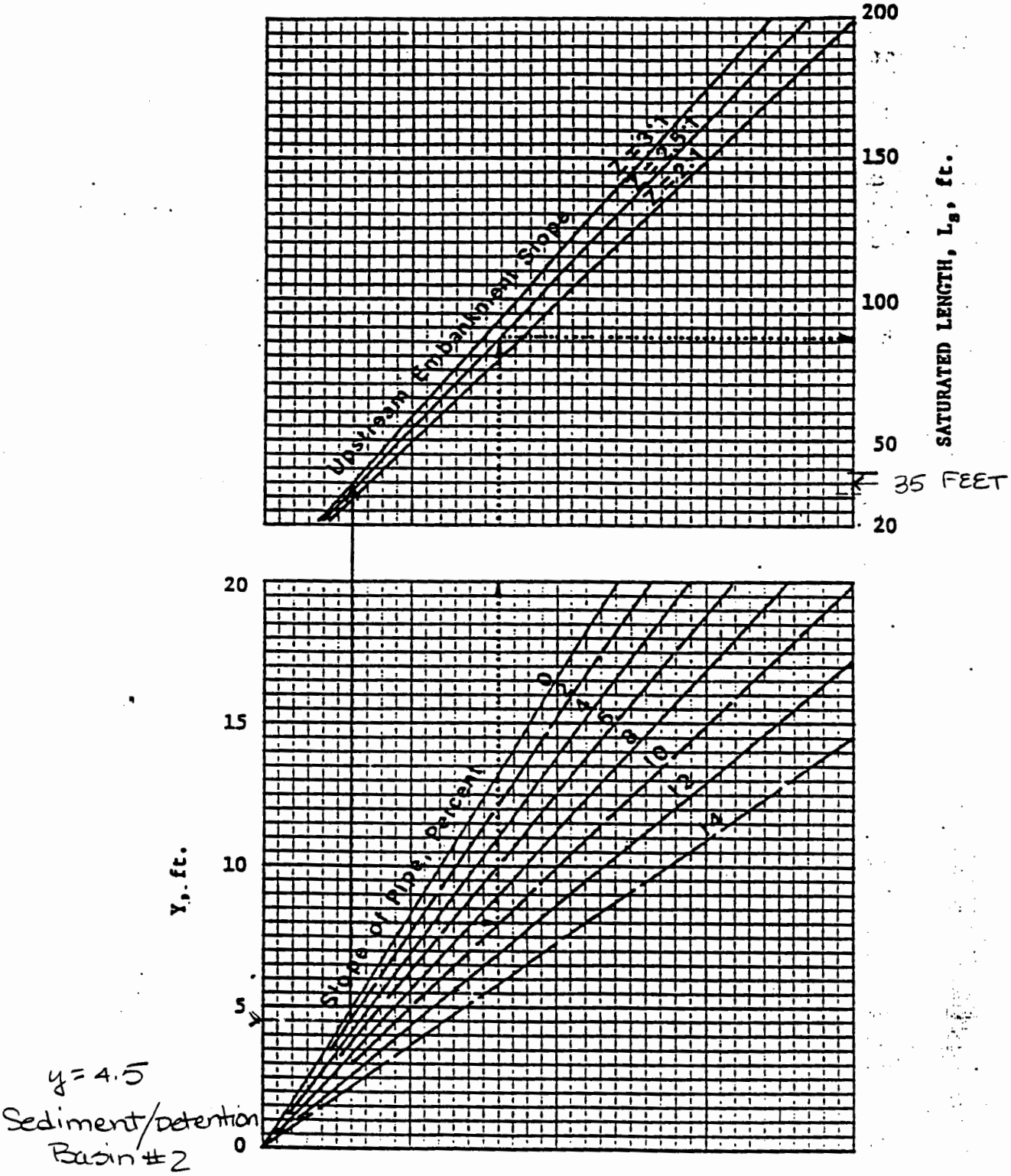


ANTI-SEEP COLLAR DESIGN

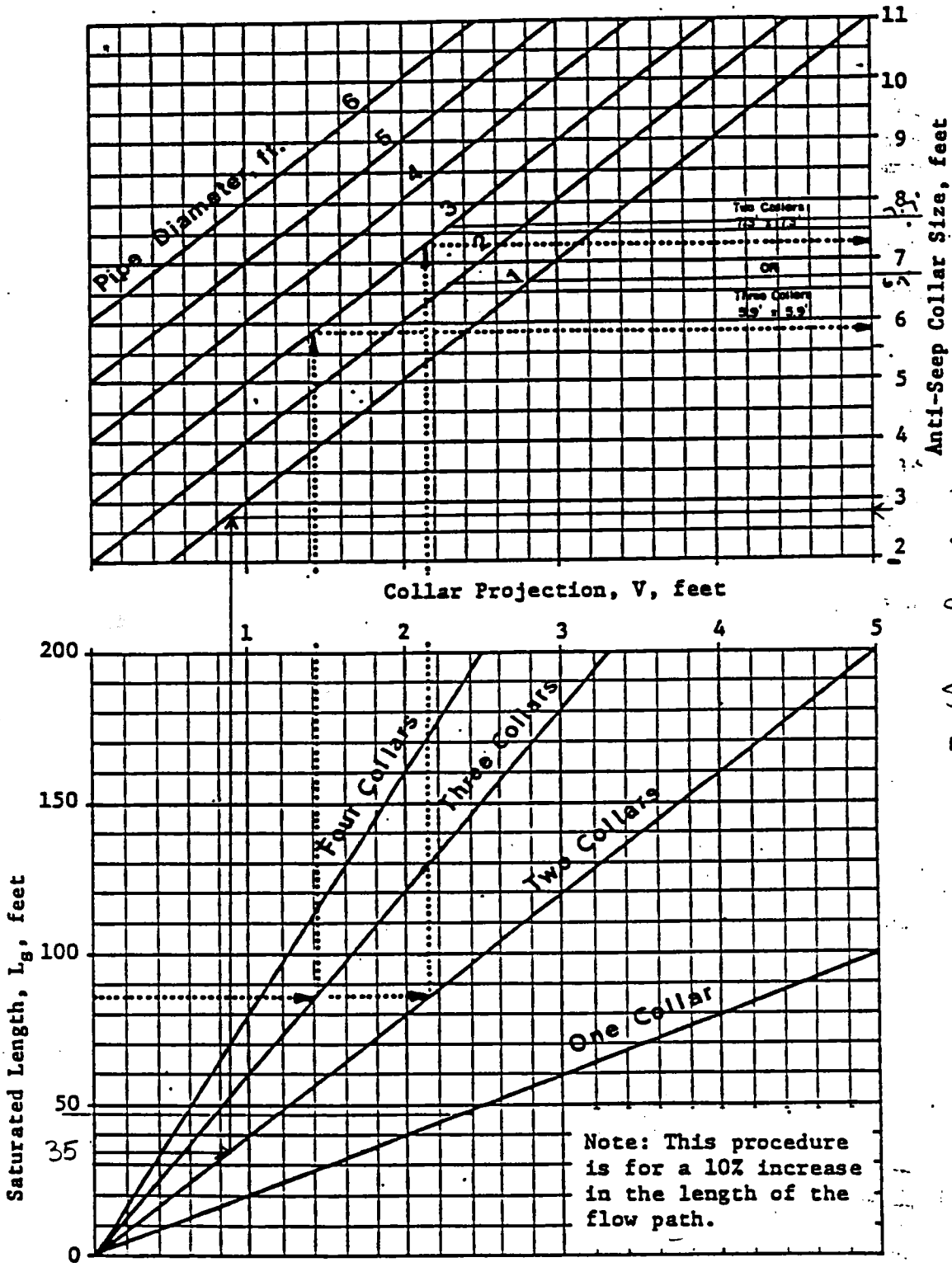


Two Collars 3.3'x3.3' FOR SEDIMENT/DETENT BASIN #1 SINCE THE MINIMUM SIZE IS 4'x4', USE 4'x4'.

PIPE LENGTH IN SATURATED ZONE



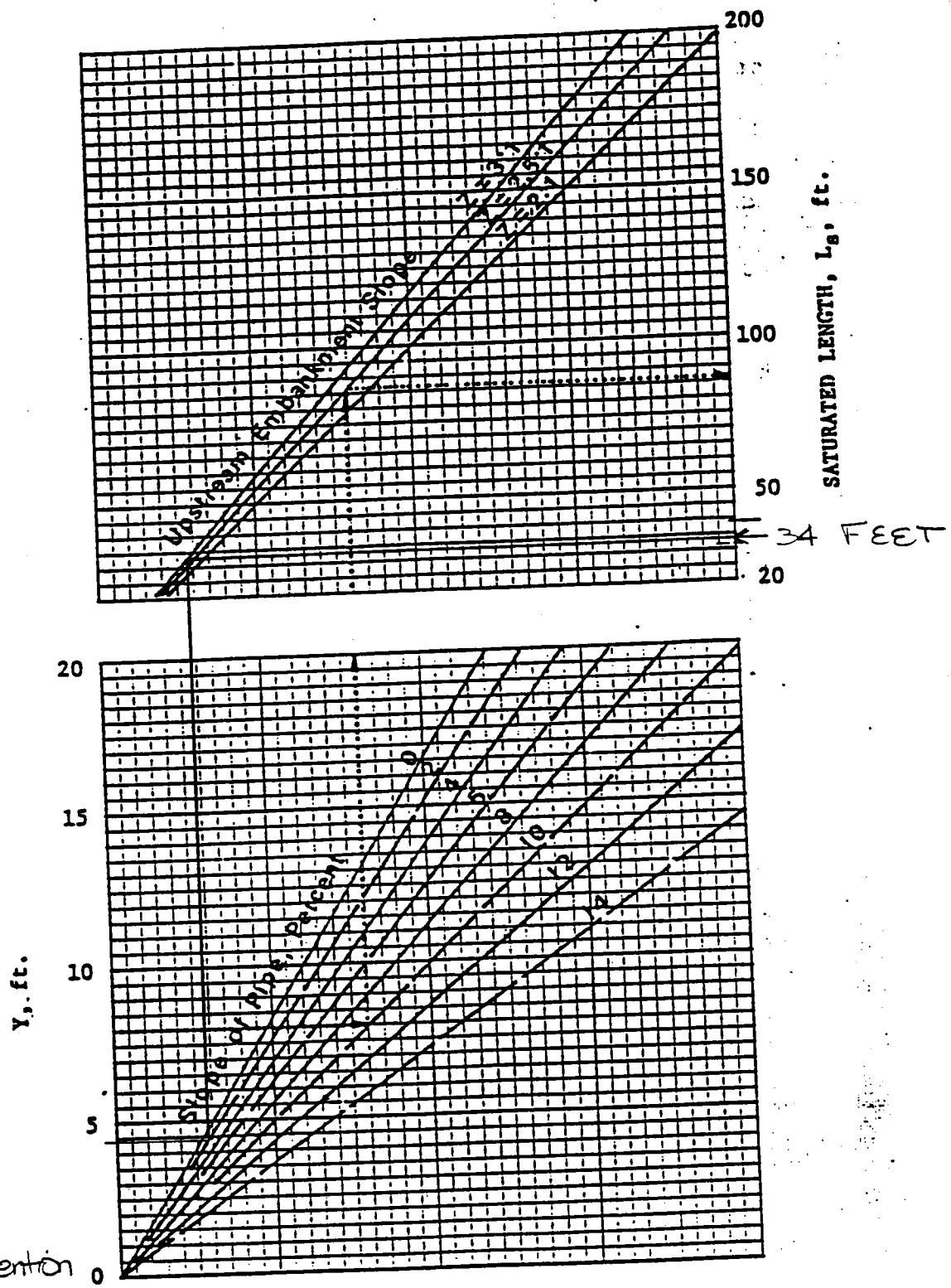
ANTI-SEEP COLLAR DESIGN



Two Collars 2.8' x 2.8' FOR SEDIMENT/DEBRIS BASIN #2

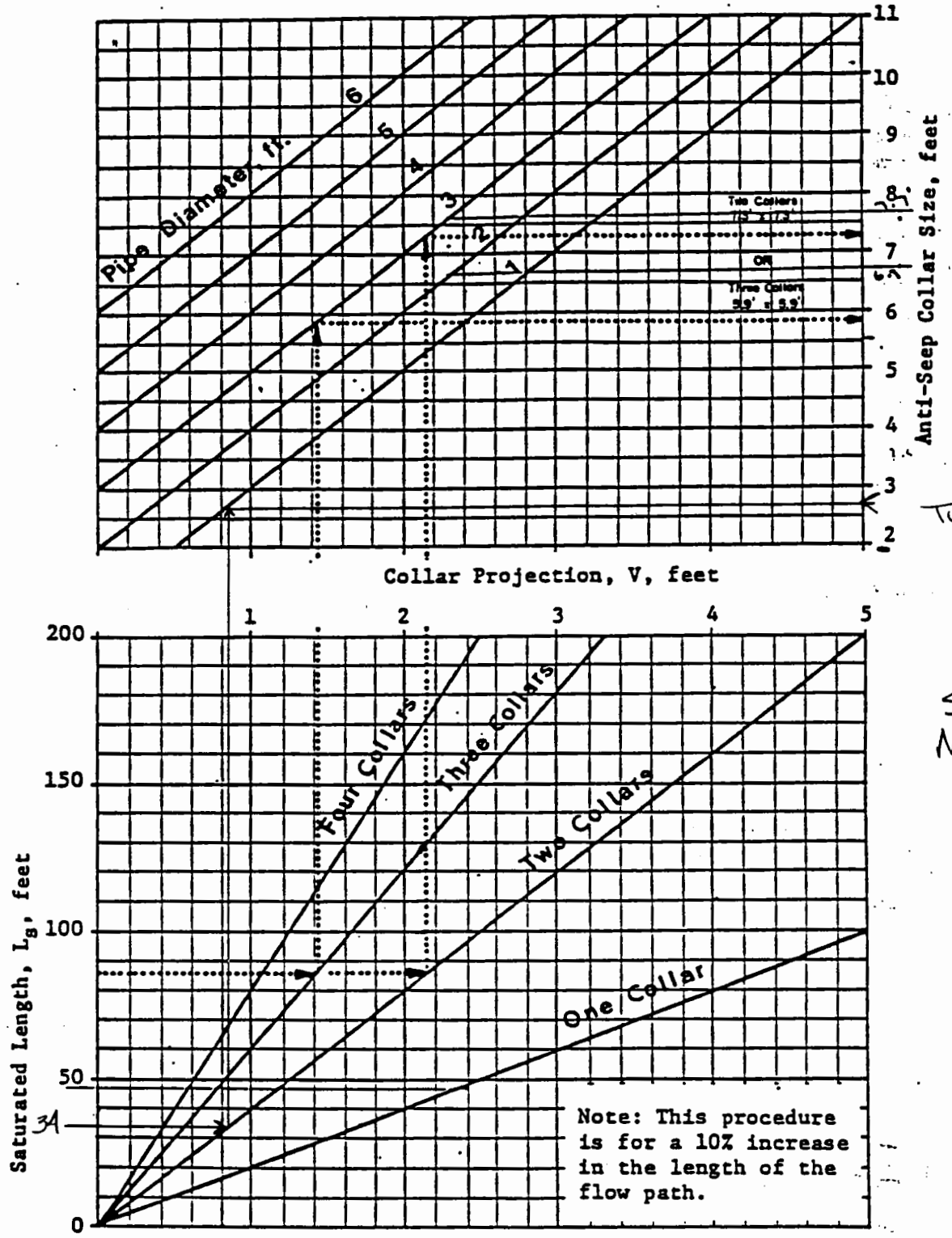
SINCE THE MINIMUM SIZE IS 4'x4', USE 4'x4'.

PIPE LENGTH IN SATURATED ZONE



y=4.4
Sediment/Detention
Basin #3

ANTI-SEEP COLLAR DESIGN



Two Collars 2.7' x 2.7' For Sediment/Deteri Basin #3

SINCE THE MINIMUM SIZE IS 4'x4', USE 4'x4'.

APPENDIX E

OTHER MISCELLANEOUS EROSION AND SEDIMENT CONTROL CALCULATIONS

E.1 Hydraulic Stability Calculations and Riprap Evaluation for Site 4 Channels

E.2 Hydraulic Stability Calculations and Riprap Evaluation for Site 5 Channels

E.3 Inlet Grate Capacity Calculations - Site 5

E.1 HYDRAULIC STABILITY CALCULATIONS AND RIPRAP EVALUATION FOR SITE 4 CHANNELS

CLIENT	JOB NUMBER
NSWE	7602 - 0104
SUBJECT: Determine Rip Rap sizing requirements	
BASED ON: NJ Regs + previous calcs	DRAWING NUMBER
BY: JJB 10/22/97 / CHECKED BY: KMS 11/03/97	APPROVED BY / DATE

I. Purpose: To determine the required riprap sizing requirements to protect DC 1 & 2 from the erosive forces of water.

II. Approach: Based on previous calculations and NJ's E+SC Standard for Rip rap, determine the appropriate design criteria. Critical sections of the waterway will be sized for rip rap as follows:

- DC 1 will be broken into 2 sections (segment AK and KP). For each section, the segment that has the highest slope will be used as the basis of design.
- DC 1 possesses two bends (IK & DE). IK will be evaluated because it is farther downstream & will subsequently convey more flow than DE.
- The larger of the two design parameters calculated for DC1's segments AK & KP will be used for DC2 segment QS. Although the slope of segment QS exceeds 10 %, the flow expected to be conveyed during the 25-yr storm event is 1 cfs which does not warrant a concrete-lined channel. Rip rap is viewed as an appropriate E&SC device for this segment.

III. Assumptions:

- A filter layer will be used per NJ regs.
- Angular rip rap will be used

CLIENT	JOB NUMBER
NSWE	7002-0104

SUBJECT: Determine Rip Rap Size Requirements

BASED ON	DRAWING NUMBER
NJ regs & previous calcs.	

BY	CHECKED BY	APPROVED BY	DATE
JJB 10/22/97	KMS 11/03/97		

IV. Calculations

(A) DC-1 design parameters:

Q = 10 cfs — base of channel = 4 ft

Slope(HI) = 0.037 — side slopes of channel = 4:1 = Z = 4

$R_{o(IK)}$ = 45 ft — channel depths + other data are

Slope(NO) = 0.10 — presented on p. 3 of 9

Straight channel (segment HI)

base / depth = 4 / 0.405 = 9.877

From curve 4.12-2 (page 4 of 9), P/R ≅ 24

From curve 4.12-3 (page 5 of 9), d_{50} ≅ 3.5 inches

From curve 4.12-1 (page 6 of 9), n = 0.032

d_{max} = 1.5 (d_{50}) = (1.5)(3.5) = 5.25 in

riprap thickness = 2 · d_{50} = 7.0 in

Channel Bend (segment IK)

B_s = base + 2(Z)(d) = 4 + (2)(4)(0.465) = 7.72

B_s/R_o = 7.72 / 45 = 0.172

From Curve 4.12-4 (see page 7 of 9), F_b = 1.02 < 1.1

∴ no bend factor needed. No bend factor will be applied to segment DE as well.

Straight Channel (segment NO)

b/d = 4/0.309 = 12.94

From curve 4.12-2, P/R = 26.5

From curve 4.12-3, d_{50} = 6 in

From curve 4.12-1, n = 0.035

d_{max} = (1.5)(6) = 9 in

rip rap thickness = (2)(6) = 12 in

Project: NWSE - Site 4 - Post Construction Conditions
Task: Estimation of Site 4 Channel Velocities
By: JJB **Chkd:** KMS
Date: 10/21/97 **Date:** 11/03/97

DC 1

Segment	Distance (ft)	Δ Elevation (ft)	Slope (%)	Q (cfs)	Depth (ft)(1)	Area (ft^2)(2)	Hyd. Rad. (ft)	n(3)	V (ft/s)
AB	65	0.5	0.77%	10.0	0.615	3.97	0.438	0.03	2.512
BC	48	1	2.08%	10.0	0.473	2.79	0.353	0.03	3.6
CD	36	1	2.78%	10.0	0.438	2.52	0.331	0.03	4.0
DE	70	1	1.43%	10.0	0.524	3.19	0.384	0.03	3.1
EF	190	1	0.53%	10.0	0.68	4.57	0.476	0.03	2.2
FG	30	1	3.33%	10.0	0.417	2.36	0.318	0.03	4.2
GH	35	1	2.86%	10.0	0.435	2.50	0.329	0.03	4.0
HI	27	1	3.70%	10.0	0.405	2.28	0.310	0.03	4.4
IJ	40	1	2.50%	10.0	0.45	2.61	0.338	0.03	3.8
JK	50	1	2.00%	10.0	0.48	2.84	0.357	0.03	3.5
KL	10	1	10.00%	10.0	0.309	1.62	0.247	0.03	6.2
LM	15	1	6.67%	10.0	0.345	1.86	0.271	0.03	5.4
MN	85	4	4.71%	10.0	0.38	2.10	0.294	0.03	4.8
NO	30	3	10.00%	10.0	0.309	1.62	0.247	0.03	6.2
OP	30	2	6.67%	11.0	0.364	1.99	0.284	0.03	5.5

DC 2

Segment	Distance (ft)	Δ Elevation (ft)	Slope (%)	Q (cfs)	Depth (ft)(1)	Area (ft^2)(2)	Hyd. Rad. (ft)	n(3)	V (ft/s)
AQ	80	0.5	0.63%	1.0	0.18	0.85	0.155	0.03	1.1
QR	75	11	14.67%	1.0	0.075	0.32	0.070	0.03	3.2
RS	35	6	17.14%	1.0	0.07	0.30	0.065	0.03	3.3

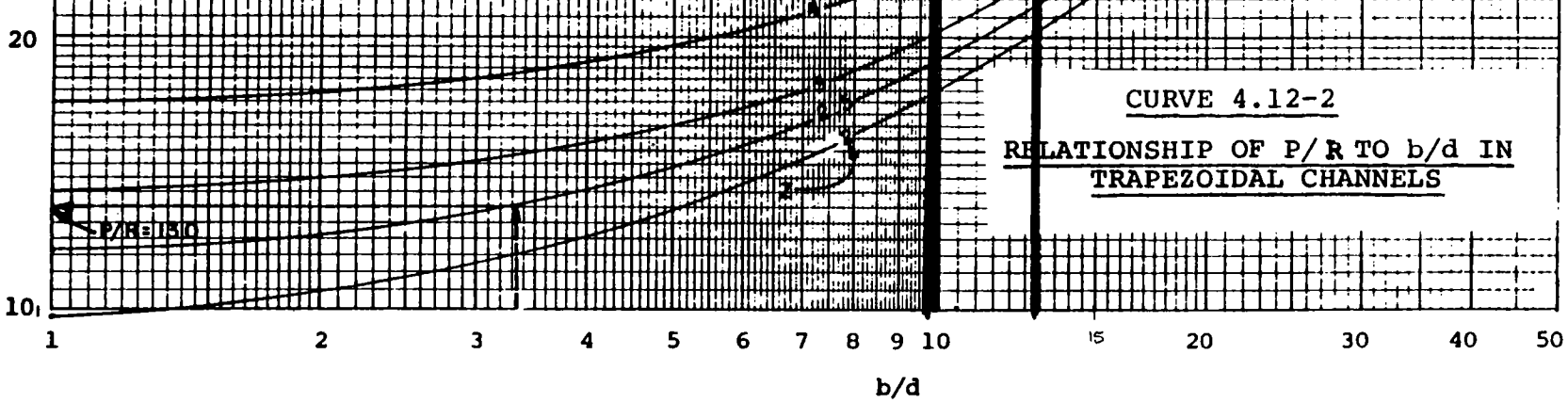
DC 3

Segment	Distance (ft)	Δ Elevation (ft)	Slope (%)	Q (cfs)	Depth (ft)(1)	Area (ft^2)(4)	Hyd. Rad. (ft)	n(3)	V (ft/s)
TS	200	4	2.00%	1.0	0.31	0.48	0.152	0.03	2.0

DC 4

Segment	Distance (ft)	Δ Elevation (ft)	Slope (%)	Q (cfs)	Depth (ft)(1)	Area (ft^2)(4)	Hyd. Rad. (ft)	n(3)	V (ft/s)
TO	200	4	2.00%	1.0	0.31	0.48	0.152	0.03	2.0

(1) Depth of water during peak flow during 25-yr storm during post-construction conditions.
(2) A trapezoidal channel is assumed with a 4 foot base, 4:1 side slopes.
(3) Manning's Coeficient = 0.03, as given for a earth channel, winding, grass with some weeds. Chow, 1959. Open-Channel Hydraulics.
(4) A triangle channel is assumed with 4:1 and 6:1 side slopes.

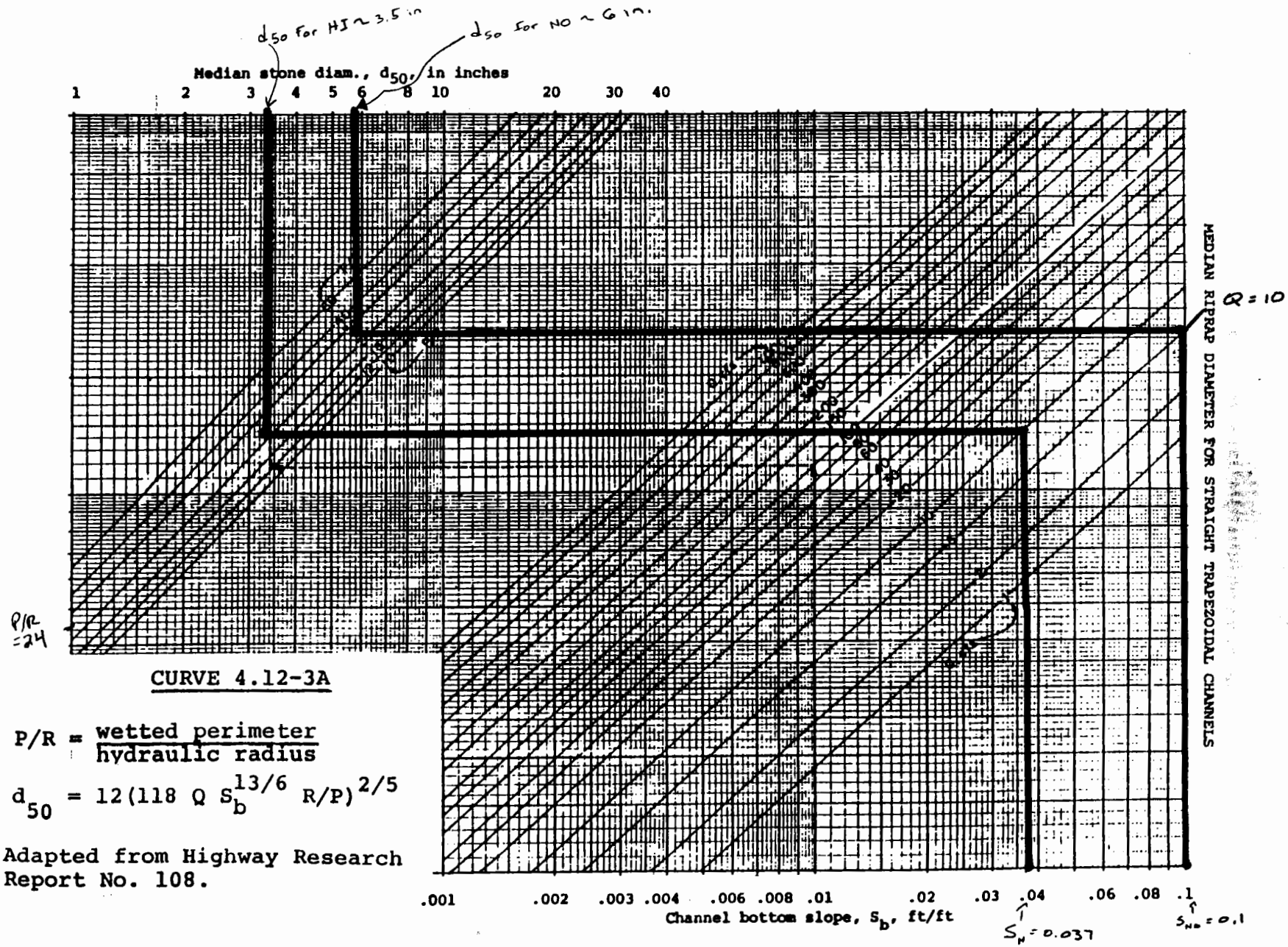


CURVE 4.12-2

RELATIONSHIP OF P/R TO b/d IN TRAPEZOIDAL CHANNELS

BY: JJB
DATE: 10/22/97

CHKD: KMS
DATE: 11/03/97



MEDIAN RIPRAP DIAMETER FOR STRAIGHT TRAPEZOIDAL CHANNELS

CURVE 4.12-3A

$$P/R = \frac{\text{wetted perimeter}}{\text{hydraulic radius}}$$

$$d_{50} = 12(118\ Q\ S_b^{13/6}\ R/P)^{2/5}$$

Adapted from Highway Research Report No. 108.

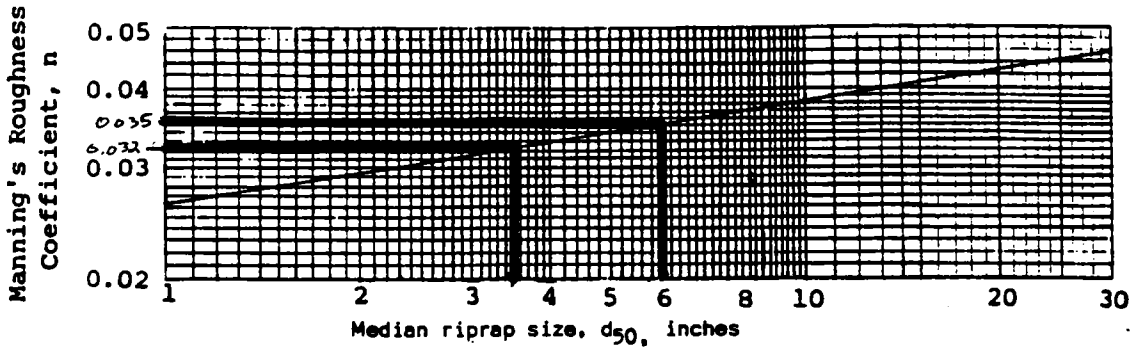
BY: JJB DATE: 10/12/97

CHKD: KNS DATE: 11/03/97

This procedure is based on the assumption that the channel is already designed and the remaining problem is to determine the riprap size that would be stable in the channel. The designer would first determine the channel dimensions by the use of Manning's equation. The "n" value for use in Manning's equation is obtained by estimating a riprap size and then determining the corresponding "n" value for the riprapped channel from $n = 0.0395\ d_{50}^{\ 1/6}$, where d_{50} is in feet, or by using Curve 4.12-1, below, where d_{50} is in inches.

CURVE 4.12-1

MANNING'S "n" FOR RIPRAP-LINED CHANNELS



When the channel dimensions are known, the riprap can be designed (or an already completed design may be checked) as follows:

Trapezoidal Channels

1. Calculate the b/d ratio and enter Curve 4.12-2 to find the P/R ratio.

2. Enter Curve 4.12-3 with S_b, Q, and P/R to find median riprap diameter, d_{50}, for straight channels.

3. Enter Curve 4.12-1 to find the actual "n" value corresponding to the d_{50} from step 2. If the estimated and actual "n" values do not reasonably agree, another trial must be made.

4. For channels with bends, calculate the ratio B_s/R_o, where B_s is the channel surface width and R_o is the radius of the bend. Enter Curve 4.12-4 and find the bend factor, F_B. Multiply the d_{50} for straight channels by the bend factor to determine riprap size to be used in bends. If the d_{50} for the bend is less than 1.1 times the d_{50} for the straight channel, then the size for straight channel may be used in the bend; otherwise, the larger stone size calculated for the bend shall be used. The riprap shall extend across the full channel section and shall extend upstream and downstream from the ends of the curve a distance equal to five times the bottom width.

5. Enter Curve 4.12-5 to determine maximum stable side slope of riprap surface. In Curve 4.12-5, the side slope is established so that the riprap on the side slope is as stable as that on the bottom. If for any reason it is desirable to make the side slopes steeper than what is given by Curve 4.12-5, the size of the riprap can be increased and the side slopes made steeper by using the following procedures:

   a. Compute d_{50} and maximum stable side slope as above.

   b. Enter Curve 4.12-6 with the computed side slope to determine K for that side slope.

   c. Enter Curve 4.12-6 with the desired side slope to determine K'.

   d. Compute riprap size for desired slope by the formula:

$$d_{50}' = d_{50}\frac{K}{K'}$$

6. Maximum side slopes, 2:1.

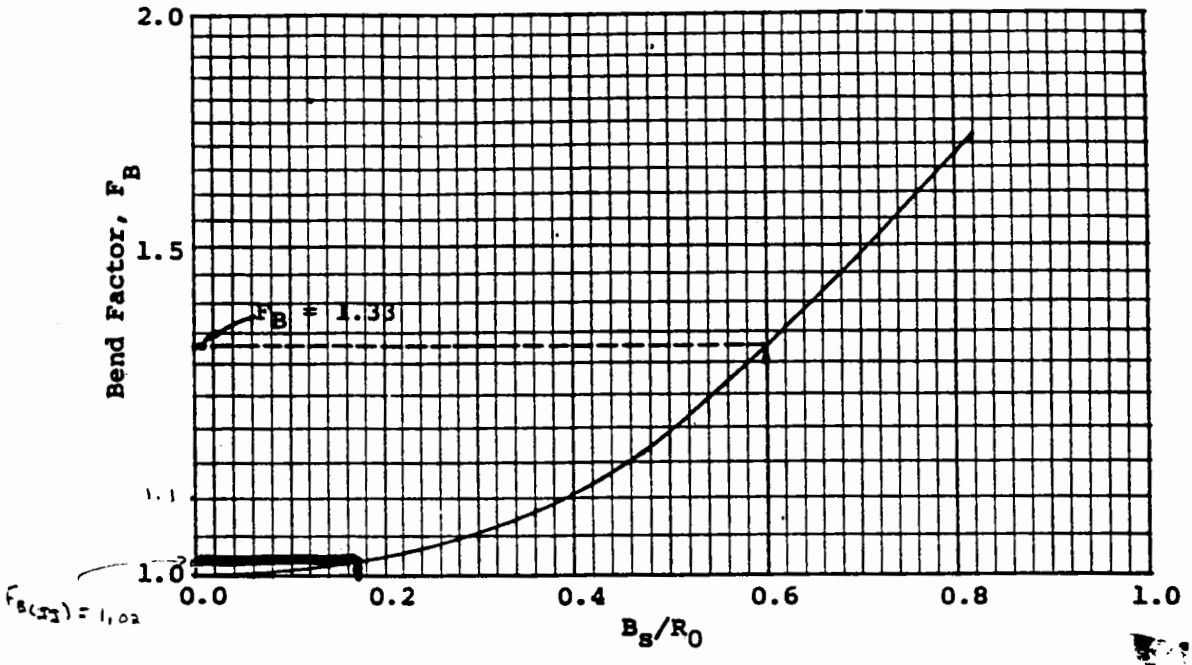
BY: JJB CHKD: KNS
DATE: 10/27/17 DATE: 11/0

CURVE 4.12-4

RIPRAP SIZE CORRECTION FACTOR FOR FLOW IN CHANNEL BENDS

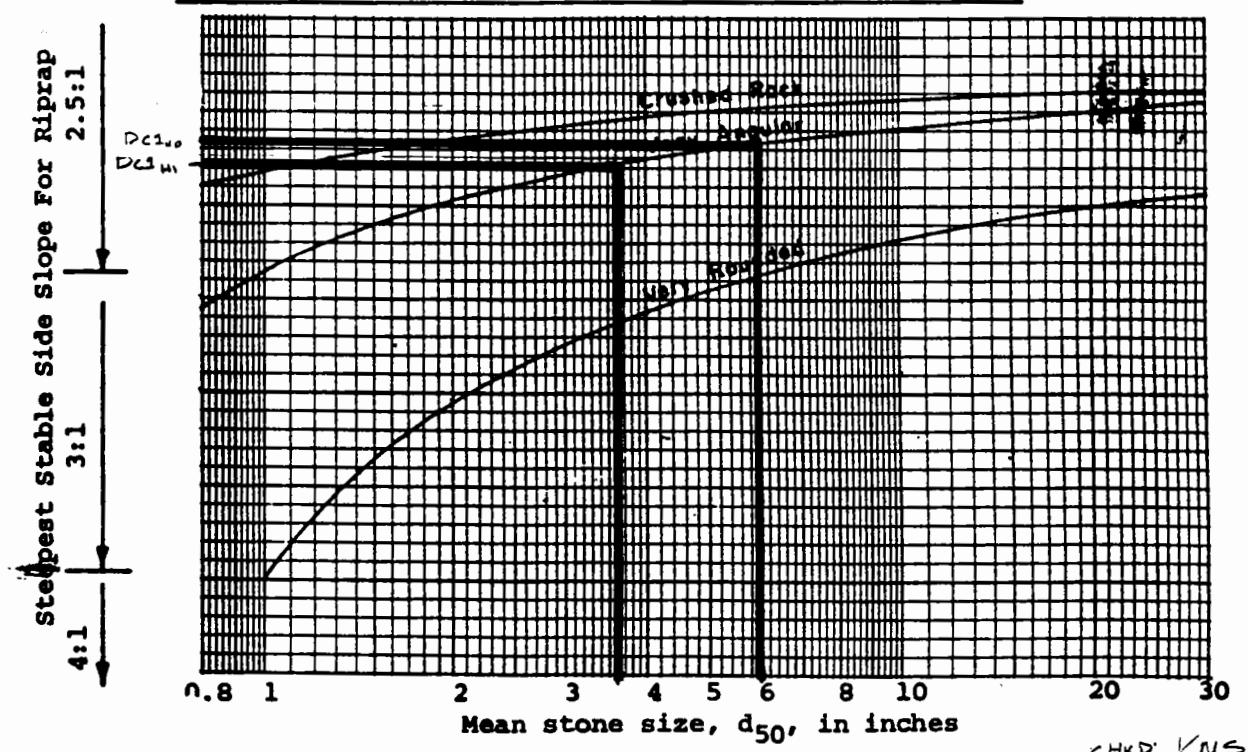
d_{50}(for bend) = d_{50}(for straight) X F_B
B_s = channel surface width
R_o = mean radius of bend

Adapted from Highway Research Report No. 108.



CURVE 4.12-5

MAXIMUM RIPRAP SIDE SLOPE WITH RESPECT TO RIPRAP SIZE



BY: JJB
DATE: 10/22/97
CHKD: KNS
DATE: 11/03/97

CLIENT	JOB NUMBER		
NWSE	7602-0104		
SUBJECT: Determine Riprap Sizing Requirements			
BASED ON: NJ Regs & prev. calcs	DRAWING NUMBER		
BY: JJB 10/22/97	CHECKED BY: KMS 11/03/97	APPROVED BY	DATE

IV Calculations (cont)

Slope Stability.

From curve 4.12-5 (p. 7 of 9), rip rap of $d_{50} = 3.5$ to 6 in will be stable on 4:1 side slope.

Filter Layer

- Use a filter layer that meets the requirements of a geotextile riprap filter (Standard Specification 919.06-2) in NJ DOT Standard Specifications for Road & Bridge Construction, 1996.

V Conclusions:

- For DC 1, two sizes of riprap will be used. For segment AK①, riprap will meet the following specifications
  - d_{50} = 3.5 inches
  - d_{max} = 5.25 inches
  - thickness of riprap = 7.0 inches

  For segment KP, riprap will meet the following specifications
  - d_{50} = 6.0 in
  - d_{max} = 9.0 in
  - thickness of riprap = 12 inches

- For DC 2 - segment QS, riprap will meet the specifications of segment KP of DC-1.

- No bend factor is required for bends of DC 1 & 2

- A geotextile riprap filter will be used

① Refer to page 2 of 10 of Waterway Evaluation, Appendix E.1

CLIENT	JOB NUMBER
NSWE	7602-0104

SUBJECT: Determine Riprap Sizing Requirements

BASED ON	DRAWING NUMBER

BY	CHECKED BY	APPROVED BY	DATE
JJB 10/22/97	KWS 11/03/97		

VI References

- Refer to the references provided in Attachment B.1.
- Waterway Evaluation calcs, Attachment E.1

CLIENT	JOB NUMBER		
NWSE	7602 - 0104		
SUBJECT: Waterway Evaluations			
BASED ON: Quick TR-55 + Open channel Flow Eq.	DRAWING NUMBER		
BY: JJB 10/21/97	CHECKED BY: KMS 10/31/97	APPROVED BY	DATE

I. Purpose: To evaluate the need for erosion & sediment control practices within the diversion channels at site 4.

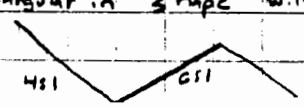
II. Approach: - Four channels will be evaluated and are as follows:

- Drainage channel (DC) 1 & DC2 consist of the surface water diversion ditches constructed around the perimeter of the landfill cap. (see page 2 of 9)
- DC 3 & DC4 consist of the diversion bench constructed across the SE slope of the landfill.

- Using Quick TR-55, the estimated flow at the outlet of each drainage basin will be calculated. The 25-yr storm event will be used as the basis of design
- Based on the peak flow of the 25-yr storm event, the peak velocity of the flow in each DC will be estimated.

III. Assumptions:

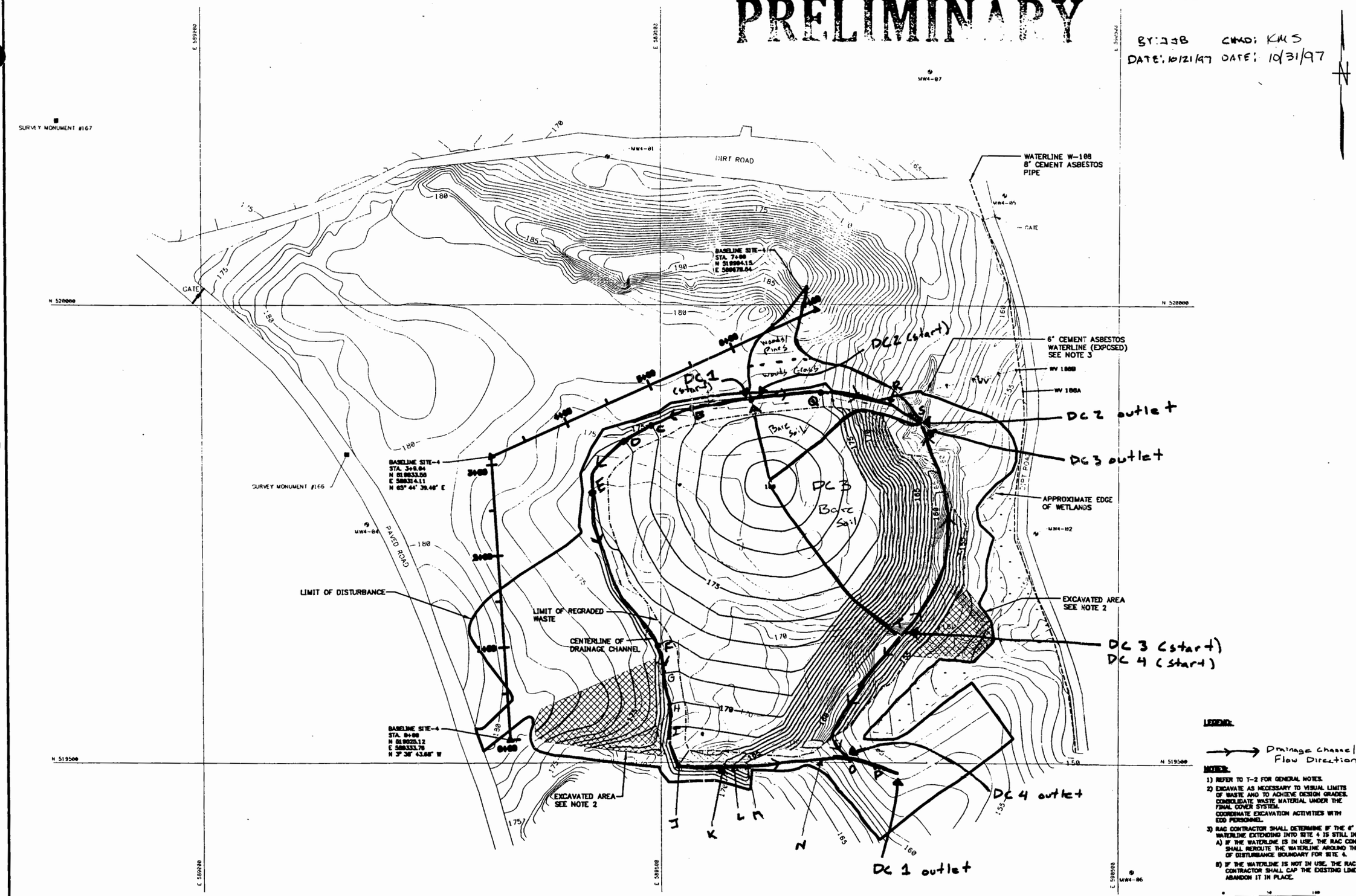
- Curve numbers for the areas draining to each DC will be calculated for the post-construction scenario.
- DCs 1 & 2 will be vegetated in native soil. Some weed growth will occur.
- DCs 3 & 4 will be vegetated in topsoil.
- The native soil at site 4 is primarily composed of sand & gravel.
- DCs 1 & 2 are trapezoidal in shape, with a 4-ft base & 4:1 side slopes.
- DCs 3 & 4 are triangular in shape with the following features:



PRELIMINARY

PAGE 2 of 10

BY: JJB CHKD: KMS
DATE: 10/21/97 DATE: 10/31/97



LEGEND:

→ Drainage Channel Flow Direction

NOTES:

1) REFER TO T-2 FOR GENERAL NOTES.
2) EXCAVATE AS NECESSARY TO VISUAL LIMITS OF WASTE AND TO ACHIEVE DESIGN GRADES. CONSOLIDATE WASTE MATERIAL UNDER THE FINAL COVER SYSTEM.
   COORDINATE EXCAVATION ACTIVITIES WITH EOD PERSONNEL.
3) RAC CONTRACTOR SHALL DETERMINE IF THE 6" WATERLINE EXTENDING INTO SITE 4 IS STILL IN USE.
   A) IF THE WATERLINE IS IN USE, THE RAC CONTRACTOR SHALL REROUTE THE WATERLINE AROUND THE LIMIT OF DISTURBANCE BOUNDARY FOR SITE 4.
   B) IF THE WATERLINE IS NOT IN USE, THE RAC CONTRACTOR SHALL CAP THE EXISTING LINE AND ABANDON IT IN PLACE.

0 50 100
SCALE IN FEET
CHECK GRAPHIC SCALE BEFORE USING

REV	DESCRIPTION	PREP BY	DATE	APPRVD

DEPARTMENT OF THE NAVY
NORTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
PHILADELPHIA, PENNSYLVANIA
NAVAL WEAPONS STATION EARLE, COLTS NECK, NEW JERSEY

LANDFILL CAPS FOR SITES 4 AND 5
EXCAVATION AND REGRADING PLAN, SITE 4

SEAL AREA

SAT ID DA
CODE I.D. NO. 8005
SCALE:
SPEC. NO 84 -
CONSTRN. CONTR. NO. N62472- -C-
NAVFAC DRAWING NO.
SHEET 7 OF 32
SIZE: D1

00570717

CLIENT	JOB NUMBER
NSWE	7602-0104
SUBJECT: Waterway Evaluation	
BASED ON: Quick TR-55 & Open Channel Flow Eq.	DRAWING NUMBER

BY	CHECKED BY	APPROVED BY	DATE
JJB 10/21/97	KMS 10/31/97		

Assumptions Cont.: • The maximum allowable velocity for a sandy soil waterway - vegetated is 2.0 ft/s & 3.0 for a clay, clay loam, sandy clay, or silty clay type of soil.

IV. Calculations: A. Estimate Flow

1. DC 1: Assume peak flow is equivalent to that calculated for Drainage Area 1 in previous calculations. (see Attachment B.4)

Q_{DC1} = 17 cfs

2. DC 2: Calculate curve no. for area draining to DC 2. See page 2 of 9 for DC areas)

Planimeter scale: 1 inch = 100 ft.

Cover type	Area (in²)	Area (acres)	CN
Grass - Good	0.6405	0.139	61
Woods/Grass - fair	0.5735	0.132	65
Woods/Pines - Fair	0.2635	0.060	60
		0.331 ⇒ Total Area	

Assume T_c = 0.1 hr (minimum time allowed for flow calc).

Q_{DC2} = 1 cfs (see p 4 of 9 and page 5 of 9 for TR-55 Spreadsheets) - Based on 25-yr storm

3. DC3: Calculate curve no. for DC 3 (area = 0.09 acres)

• There is only one cover type for the drainage area to DC 3 (grass-good). Therefore, CN = 61.

Q_{DC3} = 1 cfs (see page 6 of 9 for TR-55 spreadsheets) - Based on 25-yr storm.

Quick TR-55 Ver.5.46 S/N:
Executed: 10:11:59 10-22-1997

NWSE
Site 4

RUNOFF CURVE NUMBER DATA

::

Composite Area: DC 2

SURFACE DESCRIPTION	AREA (acres)	CN	
Grass - Good	0.14	61	
Woods/Grass - Fair	0.13	65	
Woods/Pines - Fair	0.06	60	
COMPOSITE AREA --->	0.33	62.4	(62)

::

Composite Area: DC 3

SURFACE DESCRIPTION	AREA (acres)	CN	
Grass - Good	0.69	61	
COMPOSITE AREA --->	0.69	61.0	(61)

::

BY: JJB CHKD: KMS
DATE: 10/21/97 DATE: 10/31/97

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NSWE - Site 4 Landfill
Coltsneck, New Jersey
CTO 289: 7602-0104
Drainage Channel 2

CALCULATED
DISK FILE: DC2 .GPD

Drainage Area	(acres)	0.331 --->	0.0005 sq.mi.
Runoff Curve Number	(CN)	62	
Time of Concentration,Tc	(hrs)	.1	
☆ Rainfall Distribution	(Type)	III	
Pond and Swamp Areas	(%)	0 --->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	2	10	25
☆ Rainfall, P, 24-hr (in)	3.4	5.2	6.0
Initial Abstraction, Ia (in)	1.226	1.226	1.226
Ia/p Ratio	0.361	0.236	0.204
Unit Discharge, * qu (csm/in)	523	618	628
Runoff, Q (in)	0.57	1.56	2.09
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	0	0	1

Summary of Computations for qu

Ia/p	#1	0.350	0.100	0.100
C0	#1	2.355	2.473	2.473
C1	#1	-0.497	-0.518	-0.518
C2	#1	-0.120	-0.171	-0.171
qu (csm)	#1	539.846	661.942	661.942
Ia/p	#2	0.400	0.300	0.300
C0	#2	2.307	2.396	2.396
C1	#2	-0.465	-0.512	-0.512
C2	#2	-0.111	-0.132	-0.132
qu (csm)	#2	458.913	596.829	596.829
* qu (csm)		523	618	628

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$
$$qp\ (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond\ \&\ Swamp\ Adj.)$$

BY: JJB
DATE: 10/21/97

CHKD: KNS
DATE: 10/21/97

☆ Reference Attachment B.4, Preliminary Information for Sites 4 + 5, for Rainfall Estimates + Distribution Type.

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NSWE - Site 4 Landfill
Coltsneck, New Jersey
CTO 289: 7602/0104
Drainage Channel 3

CALCULATED
DISK FILE: DC3 .GPD

Drainage Area	(acres)	.69	--->	0.0011 sq.mi.
☆ Runoff Curve Number	(CN)	61		
Time of Concentration,Tc	(hrs)	.1		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	2	10	25
☆ Rainfall, P, 24-hr (in)	3.4	5.2	6
Initial Abstraction, Ia (in)	1.279	1.279	1.279
Ia/p Ratio	0.376	0.246	0.213
Unit Discharge, * qu (csm/in)	498	614	625
Runoff, Q (in)	0.53	1.49	2.01
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	0	1	1

Summary of Computations for qu

Ia/p	#1	0.350	0.100	0.100
C0	#1	2.355	2.473	2.473
C1	#1	-0.497	-0.518	-0.518
C2	#1	-0.120	-0.171	-0.171
qu (csm)	#1	539.846	661.942	661.942
Ia/p	#2	0.400	0.300	0.300
C0	#2	2.307	2.396	2.396
C1	#2	-0.465	-0.512	-0.512
C2	#2	-0.111	-0.132	-0.132
qu (csm)	#2	458.913	596.829	596.829
* qu (csm)		498	614	625

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$
$$qp\ (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond\ \&\ Swamp\ Adj.)$$

☆ Reference Attachment B.1.; Preliminary Information for Sites 4 & 5, for Rainfall Estimates & Distribution Type.

BY: JJB DATE: 10/21/97

CHKD: KNS DATE: 10/21/97

CLIENT	JOB NUMBER		
NSWE	7602-0104		
SUBJECT: Waterway Evaluations			
BASED ON: Quick TR-55 - Open Channel Flow Ea		DRAWING NUMBER	
BY: JJB - 10/21/97	CHECKED BY: KMS 10/31/97	APPROVED BY	DATE

IV. Calculations (cont.)

4. DC4: Assume $Q_{DC4} = Q_{DC3} = 1$ cfs (Note: Q_{DC1} includes the flow that is contributed by DC4. 1 cfs is the flow that is anticipated along the bench)

B. Calculate Velocities in Drainage

Estimate velocities based on manning's equation for open channel flow.

Assume the following flows:

$Q_{DC1\,(A \to D)}$ = 11 cfs − Q_{DC4} = 11 − 1 = 10 cfs (for the drainage channel before its junction with DC4)

$Q_{DC1\,(OP)}$ = 11 cfs

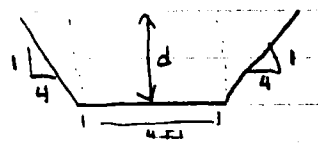
Q_{DC2} = 1 cfs

Q_{DC3} = 1 cfs

Q_{DC4} = 1 cfs

The spreadsheet on p. 8 of 9 presents the calculation of channel velocities. A sample calculation of channel velocity is presented as follows.

1. Trapezoidal Channel



Assume d = 0.615 ft
S = 0.77 %
n = 0.03

$$\text{Area} = 4(d) + (1/2)(4d)(d) \cdot 2$$
$$= 4(0.615) + (1/2)(4)(0.615)^2 \cdot 2 = 3.97 \text{ ft}^2$$

$$\text{Hydraulic Radius} = A / \text{wetted Perimeter}$$
$$= A / (4 + 2\sqrt{(4d)^2 + d^2}) = 3.97 / (4 + 2\sqrt{17(0.615)^2})$$
$$= 0.438 \text{ ft}$$

Project: NWSE - Site 4 - Post Construction Conditions
Task: Estimation of Site 4 Channel Velocities
By: JJB **Chkd:** KNS
Date: 10/21/97 **Date:** 10/21/97

DC 1

Segment	Distance (ft)	Δ Elevation (ft)	Slope (%)	Q (cfs)	Depth (ft)(1)	Area (ft^2)(2)	Hyd. Rad. (ft)	n(3)	V (ft/s)
AB	65	0.5	0.77%	10.0	0.615	3.97	0.438	0.03	2.512
BC	48	1	2.08%	10.0	0.473	2.79	0.353	0.03	3.6
CD	36	1	2.78%	10.0	0.438	2.52	0.331	0.03	4.0
DE	70	1	1.43%	10.0	0.524	3.19	0.384	0.03	3.1
EF	190	1	0.53%	10.0	0.68	4.57	0.476	0.03	2.2
FG	30	1	3.33%	10.0	0.417	2.36	0.318	0.03	4.2
GH	35	1	2.86%	10.0	0.435	2.50	0.329	0.03	4.0
HI	27	1	3.70%	10.0	0.405	2.28	0.310	0.03	4.4
IJ	40	1	2.50%	10.0	0.45	2.61	0.338	0.03	3.8
JK	50	1	2.00%	10.0	0.48	2.84	0.357	0.03	3.5
KL	10	1	10.00%	10.0	0.309	1.62	0.247	0.03	6.2
LM	15	1	6.67%	10.0	0.345	1.86	0.271	0.03	5.4
MN	85	4	4.71%	10.0	0.38	2.10	0.294	0.03	4.8
NO	30	3	10.00%	10.0	0.309	1.62	0.247	0.03	6.2
OP	30	2	6.67%	11.0	0.364	1.99	0.284	0.03	5.5

DC 2

Segment	Distance (ft)	Δ Elevation (ft)	Slope (%)	Q (cfs)	Depth (ft)(1)	Area (ft^2)(2)	Hyd. Rad. (ft)	n(3)	V (ft/s)
AQ	80	0.5	0.63%	1.0	0.18	0.85	0.155	0.03	1.1
QR	75	11	14.67%	1.0	0.075	0.32	0.070	0.03	3.2
RS	35	6	17.14%	1.0	0.07	0.30	0.065	0.03	3.3

DC 3

Segment	Distance (ft)	Δ Elevation (ft)	Slope (%)	Q (cfs)	Depth (ft)(1)	Area (ft^2)(4)	Hyd. Rad. (ft)	n(3)	V (ft/s)
TS	200	4	2.00%	1.0	0.31	0.48	0.152	0.03	2.0

DC 4

Segment	Distance (ft)	Δ Elevation (ft)	Slope (%)	Q (cfs)	Depth (ft)(1)	Area (ft^2)(4)	Hyd. Rad. (ft)	n(3)	V (ft/s)
TO	200	4	2.00%	1.0	0.31	0.48	0.152	0.03	2.0

(1) Depth of water during peak flow during 25-yr storm during post-construction conditions.
(2) A trapezoidal channel is assumed with a 4 foot base, 4:1 side slopes.
(3) Manning's Coeficient = 0.03, as given for a earth channel, winding, grass with some weeds. Chow, 1959. Open-Channel Hydraulics.
(4) A triangle channel is assumed with 4:1 and 6:1 side slopes.

CALCULATION WORKSHEET

Order No. 19116 (01-91)

CLIENT	JOB NUMBER
NSWE	7602-0109

SUBJECT: Waterway Evaluations

BASED ON: Quick TR-55 + Open channel Flow Eq.

DRAWING NUMBER:

BY	CHECKED BY	APPROVED BY	DATE
JTB 10/21/97	KMS 10/31/97		

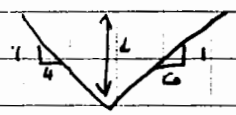
Mannings Equation

$$V = 1.49 (r_h)^{2/3} (\text{slope})^{1/2} / n = 1.49 (0.438)^{2/3} (0.077)^{1/2} / 0.03$$

$$= 2.51 \text{ ft/s}$$

$$Q = V \cdot A = (3.97 \text{ ft}^2)(2.5 \text{ ft/s}) = 9.96 \text{ ft}^3/\text{s}$$

2. Triangular Channel



Assume:
$d = 0.31$
$n = 0.03$
$S = 2\%$

$$\text{Area} = \tfrac{1}{2}(d)(4d) + \tfrac{1}{2}(d)(6d)$$

$$= \tfrac{1}{2}(0.31)^2(4) + (\tfrac{1}{2})(6)(0.31)^2 = 0.48 \text{ ft}^2$$

$$\text{Wetted Perimeter} = \sqrt{(4d)^2 + (d)^2} + \sqrt{(6d)^2 + d^2}$$

$$= 1.278 + 1.886 = 3.164$$

$$r_H = 0.48 / 3.164 = 0.152 \text{ ft}$$

$$V = \frac{1.49 (r_h)^{2/3} (s)^{1/2}}{n} = \frac{1.49 (0.152)^{2/3} (0.02)^{1/2}}{0.03}$$

$$= 2.0 \text{ ft/s}$$

$$Q = VA = (2.0 \text{ ft/s})(0.48 \text{ ft}^2) = 0.96 \text{ ft}^3/\text{s}$$

CLIENT	JOB NUMBER
NSWE	7602-0104
SUBJECT: Waterway Evaluations	
BASED ON: Quick TR-55 & Open Channel Flow	DRAWING NUMBER

BY	CHECKED BY	APPROVED BY	DATE
JJB 10/21/97	KMS 10/31/97		

V Conclusions

Based on a maximum allowable velocity of 2.0 ft/s & 3.0 ft/s for sandy and silty/clay type of soil, respectively, and based on the presented calculations, the following conclusions are made:

- DC 1 - The 2.0 ft/s velocity is exceeded in all locations. Other forms of E&SC practices are required for this sandy soil.

- DC2 - Riprap is recommended for segment QS because these segments exceed the allowable velocity for sandy soils. Although the slope of this segment exceeds the allowable slope for riprip (>10 %), the flow of the channel is minimal (1 cfs). Riprap is deemed appropriate for this circumstance.

- DC 3 & 4 - Flow does not exceed the 3.0 ft/s criteria. No other E&SC practice is required.

References:

- Please refer to the references provided in Attachment B.1, Preliminary Information for Sites 4 & 5.

- The following information was obtained from previous calculations
  - Rainfall Distribution & Rainfall Quantity - Attachment B.1
  - Assumptions regarding native soil - Attachment B.1
  - Drainage Area 1 peak flow - Attachment B.4

E.2 HYDRAULIC STABILITY CALCULATIONS AND RIPRAP EVALUATION FOR SITE 5 CHANNELS

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT	JOB NUMBER
NWS EARLE	7602

SUBJECT: SITES - DRAINAGE CHANNEL EVALUATIONS

BASED ON	DRAWING NUMBER
NJ REGULATIONS & PREVIOUS CALCS	

BY	CHECKED BY	APPROVED BY	DATE
LMShipley 11/5/97	KMS 11/6/97		

Purpose: - To determine suitable lining materials (vegetation, riprap) for the drainage channels surrounding Sites based on anticipated flow rates and velocities

Guidance Document: Standards for Soil Erosion and Sediment Control in New Jersey, April 1987, NJ State Soil Conservation Committee

Approach: Cap was divided into drainage areas to determine peak flows for individual channel segments. Peak flows were calculated using Pond Pack by Haestad methods.

CLIENT	JOB NUMBER		
NWS EARLE	71602		
SUBJECT: SITE 5 - DRAINAGE CHANNEL EVALUATIONS			
BASED ON: NJ REGS & PREV CALCS		DRAWING NUMBER	
BY: LMS 11/5/97	CHECKED BY: 11/6/97	APPROVED BY	DATE

I. Calculation of Peak Discharges

The cap was divided into six drainage areas as shown on Attachment #1

Flow calculations for Areas 4 & 5 can be found in the design calculations associated with the culverts which drain these areas. The flows calc were

Area 4: 9 cfs
Area 5: 2 cfs

These flows become additive with those calculated for Areas 3 and 2 respectively.

There is no channel associated with Area 6, so flow calculations were not performed.

Area	Planimeter Reading	Scale	Area
Area 1	5.70	1" = 100'	1.31 ac
Area 2	14.95	1" = 100'	3.43 ac
Area 3	5.50	1" = 100'	1.26 ac

CN = 98 for impervious surfaces
CN = 61 for good/grassed area
See page 3/10 for calculation of curve numbers for each drainage area by PondPack

Assume t_c for all drainage areas is 0.1 hr (minimum time allowed for flow calculation)

For the 25-year storm event, the rainfall is 6"
Peak flows are provided on pages 4, 5, 6/10 for areas 1, 2, 3 respectively.

Quick TR-55 Ver.5.46 S/N:
Executed: 11:53:13 11-05-1997

NWS EARLE
NEW JERSEY
SITE 5

RUNOFF CURVE NUMBER DATA

::

Composite Area: DRAINAGE AREA 1

SURFACE DESCRIPTION	AREA (acres)	CN	
ASPHALT, IMPERVIOUS	1.31	98	
COMPOSITE AREA --->	1.31	98.0	(98)

::

Composite Area: DRAINAGE AREA 2

SURFACE DESCRIPTION	AREA (acres)	CN	
GRASS, GOOD	3.43	61	
COMPOSITE AREA --->	3.43	61.0	(61)

::

Composite Area: DRAINAGE AREA 3

SURFACE DESCRIPTION	AREA (acres)	CN	
GRASS, GOOD	1.26	61	
COMPOSITE AREA --->	1.26	61.0	(61)

::

By: LMS
Date: 11/5/97

Checked: KMS
Date: 11/6/97

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NWS EARLE
NEW JERSEY
SITE 5
DRAINAGE AREA 1

CALCULATED
DISK FILE: EARLE5 .GPD

Drainage Area	(acres)	1.31	--->	0.0020 sq.mi.
Runoff Curve Number	(CN)	98		
Time of Concentration,Tc	(hrs)	0.1		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	25		
Rainfall, P, 24-hr (in)	6		
Initial Abstraction, Ia (in)	0.041	0.041	0.041
Ia/p Ratio	0.007	0.000	0.000
Unit Discharge, * qu (csm/in)	662	0	0
Runoff, Q (in)	5.76	0.00	0.00
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	8	0	0

Summary of Computations for qu

Ia/p	#1	0.100	0.000	0.000
C0	#1	2.473	0.000	0.000
C1	#1	-0.518	0.000	0.000
C2	#1	-0.171	0.000	0.000
qu (csm)	#1	661.942	0.000	0.000
Ia/p	#2	0.100	0.000	0.000
C0	#2	2.473	0.000	0.000
C1	#2	-0.518	0.000	0.000
C2	#2	-0.171	0.000	0.000
qu (csm)	#2	661.942	0.000	0.000
* qu (csm)		662	0	0

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

By: LMS
Date: 11/5/97

Checked:

5|10

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NWS EARLE
NEW JERSEY
SITE 5
DRAINAGE AREA 2

CALCULATED
DISK FILE: EARLE5 .GPD

Drainage Area	(acres)	3.43	--->	0.0054 sq.mi.
Runoff Curve Number	(CN)	61		
Time of Concentration,Tc	(hrs)	0.1		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	25		
Rainfall, P, 24-hr (in)	6		
Initial Abstraction, Ia (in)	1.279	1.279	1.279
Ia/p Ratio	0.213	0.000	0.000
Unit Discharge, * qu (csm/in)	625	0	0
Runoff, Q (in)	2.01	0.00	0.00
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	7	0	0

Summary of Computations for qu

Ia/p	#1	0.100	0.000	0.000
C0	#1	2.473	0.000	0.000
C1	#1	-0.518	0.000	0.000
C2	#1	-0.171	0.000	0.000
qu (csm)	#1	661.942	0.000	0.000
Ia/p	#2	0.300	0.000	0.000
C0	#2	2.396	0.000	0.000
C1	#2	-0.512	0.000	0.000
C2	#2	-0.132	0.000	0.000
qu (csm)	#2	596.829	0.000	0.000
* qu (csm)		625	0	0

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

By: LMS Checked: KMS
Date: 11/5/97 Date: 11/6/97

6|10

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NWS EARLE
NEW JERSEY
SITE 5
DRAINAGE AREA 3

CALCULATED
DISK FILE: EARLE5 .GPD

Drainage Area	(acres)	1.26	--->	0.0020 sq.mi.
Runoff Curve Number	(CN)	61		
Time of Concentration,Tc	(hrs)	0.1		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	25		
Rainfall, P, 24-hr (in)	6		
Initial Abstraction, Ia (in)	1.279	1.279	1.279
Ia/p Ratio	0.213	0.000	0.000
Unit Discharge, * qu (csm/in)	625	0	0
Runoff, Q (in)	2.01	0.00	0.00
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	2	0	0

Summary of Computations for qu

Ia/p	#1	0.100	0.000	0.000
C0	#1	2.473	0.000	0.000
C1	#1	-0.518	0.000	0.000
C2	#1	-0.171	0.000	0.000
qu (csm)	#1	661.942	0.000	0.000
Ia/p	#2	0.300	0.000	0.000
C0	#2	2.396	0.000	0.000
C1	#2	-0.512	0.000	0.000
C2	#2	-0.132	0.000	0.000
qu (csm)	#2	596.829	0.000	0.000
* qu (csm)		625	0	0

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

By: LMS Checked: KMS
Date: 11/5/97 Date:

CLIENT	JOB NUMBER		
NWS EARLE	7602		
SUBJECT: SITE 5 - DRAINAGE CHANNEL EVALUATIONS			
BASED ON: NJ REGS & PREV CALCS		DRAWING NUMBER	
BY: KMS 11/5/97	CHECKED BY: KMS 11/6/97	APPROVED BY	DATE

Velocity of flow in each channel can be calculated from Manning's Equation.

$$V = \frac{1.49(R)^{2/3}(S)^{1/2}}{N} \quad (ft/s)$$

where

R = Hydraulic Radius
S = Channel Slope
N = Manning's Constant

Areas 1 & 4 are surrounded by a curb which forces all runoff into catch basins which outlet at the end of the respective channel sections. As such, flow through these two channels is minimal, and calculations of velocity for purposes of designing a channel lining need not be performed. Channels 1 & 4 will be vegetated with stone only at the discharge of the catch basin.

Velocity calculations for Areas 2, 3, 5 are summarized on the spread sheet provided on page 9/10. Values used were obtained as follows:

Channel Slopes were determined during cap design and are as follows:

Area 2	0.82%
Area 3	1.20%
Area 5	0.82%

CLIENT	JOB NUMBER
NWS EARLE	7602
SUBJECT: SITE 5 - DRAINAGE CHANNEL EVALUATIONS	
BASED ON: NJREGS & PREV CALCS	DRAWING NUMBER
BY: KMS 11/5/97 / CHECKED BY: KMS 11/6/97	APPROVED BY / DATE

Flowrates were previously calculated, but for areas 2 & 3 the flows from the culverts draining 5 & 4, respectively, were added

Channel	Contributing Drainage Areas	Q
#2	#2 (7cfs) & #5 (2cfs)	9
#3	#3 (2cfs) & #5 (9cfs)	11
#5	#5 (2cfs)	2

For areas 4 and 5 See calculations dated 11/3/97 by KMS

Typically, Manning's n = 0.03 for grass maintained channels, however, due to shallow depth of flow expected, the channel lining will have a greater impact as far as retarding flow. This increased retardance results in n values being greater than 0.03.

In order to determine the n values shown in the spreadsheet, several iterations of the calculations were performed using nomographs to determine n. (See Attachment 2 for these iterations - method from Appendix A6 of the NJ Regulations)

The flow velocities resulting from the 25-year storm event are:

Channel	Velocity (ft/sec)
#2	2.23
#3	2.71
#5	0.80

Project: NWSE - Site 5 - Post Construction Conditions
Task: Estimation of Site 5 Channel Velocities
By: LMS **Chkd:** KMS
Date: 11/5/97 **Date:** 11/6/97

Channel	Distance (ft)	Slope (%)	Q (cfs)	Depth (ft)(1)	Area (ft^2)(2)	Wetted Perim (ft)	Hyd. Rad. (ft)	n	V (ft/s)
#2	731	0.82%	9	0.620	4.030	9.130	0.441	0.035	2.23
#3	571	1.20%	11	0.630	4.060	9.160	0.443	0.035	2.71
#5	430	0.82%	2	0.043	2.500	7.590	0.329	0.08	0.80

(1) Depth of water during peak flow during 25-yr storm during post-construction conditions.
(2) A trapezoidal channel is assumed with a 4 foot base, 4:1 side slopes.

CLIENT	JOB NUMBER
NWS EARLE	7102
SUBJECT: SITE 5 - DRAINAGE CHANNEL EVALUATIONS	
BASED ON: NJREGS & PREV CALCS	DRAWING NUMBER
BY: LMS 11/5/97 / CHECKED BY: KMS 11/6/97	APPROVED BY / DATE

Section 4.3.1 (NJSESC) provides maximum permissible flow velocities as a function of the most erodible soil texture exposed in the channel and the type of vegetation expected

Native Site Material/vegetated 2.0 ft/sec

Imported Topsoil/vegetated 2.5 ft/sec

(See Attachment #3, Ref 1 page 4.3.1)

Conclusions:

Channel #2 can be topsoiled to improve the soil and vegetated

Channel #5 can be vegetated utilizing native site material

Channel #3 will require rip rap lining.

References

1. Standards for Soil Erosion and Sediment Control in New Jersey, New Jersey State Soil Conservation Committee, April 1987.

2. Pond Pack, Haestad Methods, 1989.

Attachment #1

PRELIMINARY

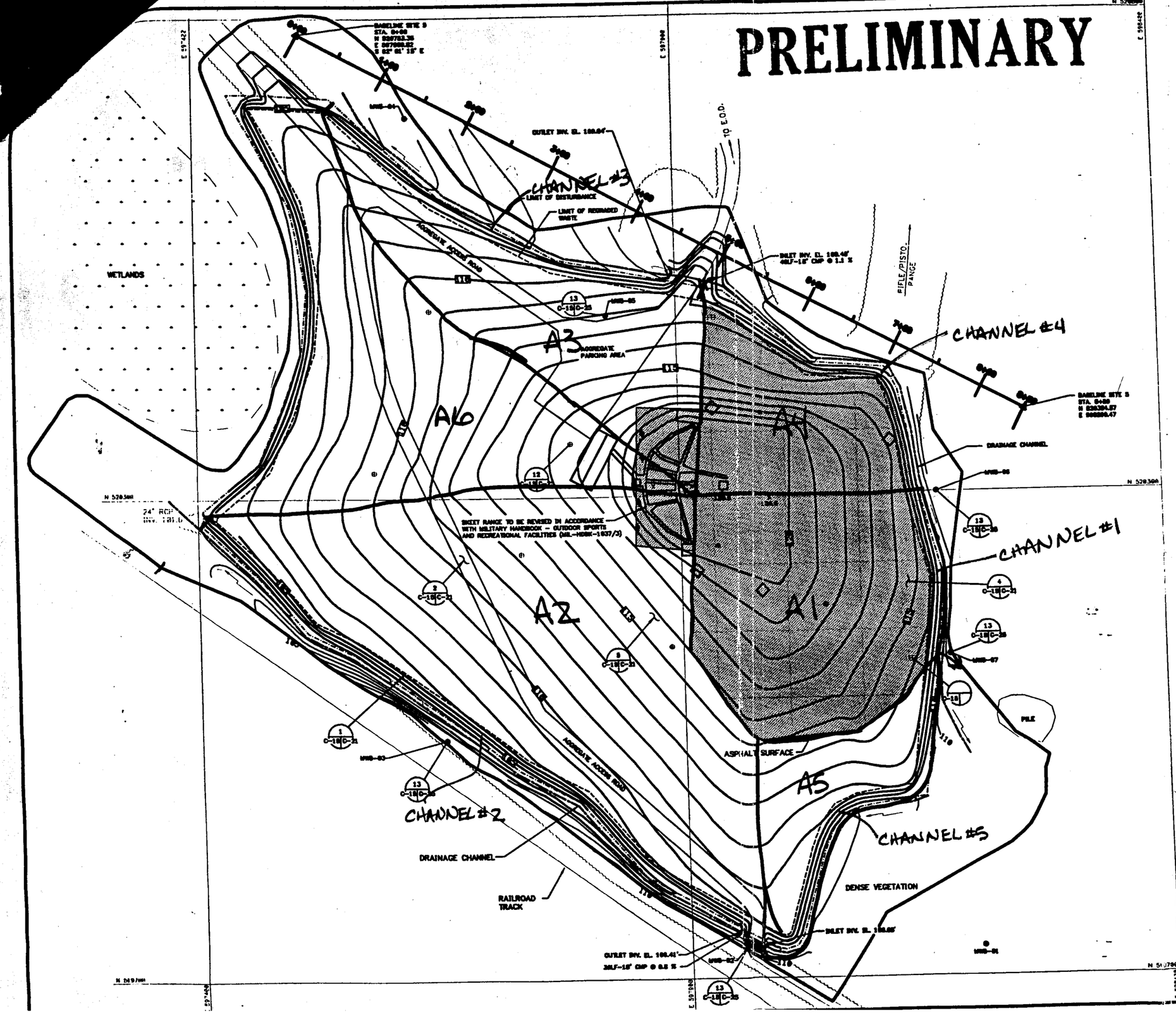


TABLE 1
EXISTING MONITORING WELLS
TO BE MODIFIED

MONITORING WELL ID	EXISTING TYPE	MODIFICATION
MWS-02	STICK-UP	FLUSH MOUNT
MWS-03	STICK-UP	FLUSH MOUNT
MWS-05	STICK-UP	FLUSH MOUNT
MWS-06	STICK-UP	FLUSH MOUNT
MWS-07	STICK-UP	FLUSH MOUNT

By: LMS · Checked: KMS
Date: 11/5/97 Date: 11/6/97

LEGEND
REFER TO T-2 FOR GENERAL LEGEND.

NOTES
REFER TO T-2 FOR GENERAL NOTES.

0 50 100
SCALE IN FEET
CHECK GRAPHIC SCALE BEFORE USING

NAVAL FACILITIES ENGINEERING COMMAND
NORTHERN DIVISION
DEPARTMENT OF THE NAVY
PHILADELPHIA PENNS LVANIA
NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY
LANDFILL CAPS FOR SITES 4 AND 5
FINAL GRADING PLAN, SITE 5

REV. DESCRIPTION PREP BY DATE APPRVD

SAT TO
CODE I.D. NO. 8005
SCALE :
SPEC. NO. 84 -
CONS'RUCT. CONTR. NO. N62472- -C-
NAVFAC DRAWING NO

SHEET 17 OF 37
C-

A0570C272

Project: NWSE - Site 5 - Post Construction Conditions **Page 8 of**
Task: Estimation of Site 5 Channel Velocities
By: LMS **Chkd:**
Date: 11/4/97 **Date:**

Channel	Distance (ft)	Slope (%)	Q (cfs)	Depth (ft)(1)	Area (ft^2)(2)	Wetted Perim (ft)	Hyd. Rad. (ft)	n	V (ft/s)
#2	731	0.82%	9	0.570	3.610	8.730	0.414	0.03	2.50
#3	571	1.20%	11	0.580	3.640	8.760	0.416	0.03	3.03
#5	430	0.82%	2	0.250	1.270	6.090	0.209	0.03	1.58

(1) Depth of water during peak flow during 25-yr storm during post-construction conditions.
(2) A trapezoidal channel is assumed with a 4 foot base, 4:1 side slopes.

Iteration #1

n=0.03

Channel #5 is off the scale, so recalc w/ n=0.1

Recalc #2 w/ n= 0.035
#3 w/ n= ~~0.039~~ 0.035
based on Fig A6-4

By: LMS
Date: 11/5/97

Checked: KWS
Date: 11/6/97

Attachment #2

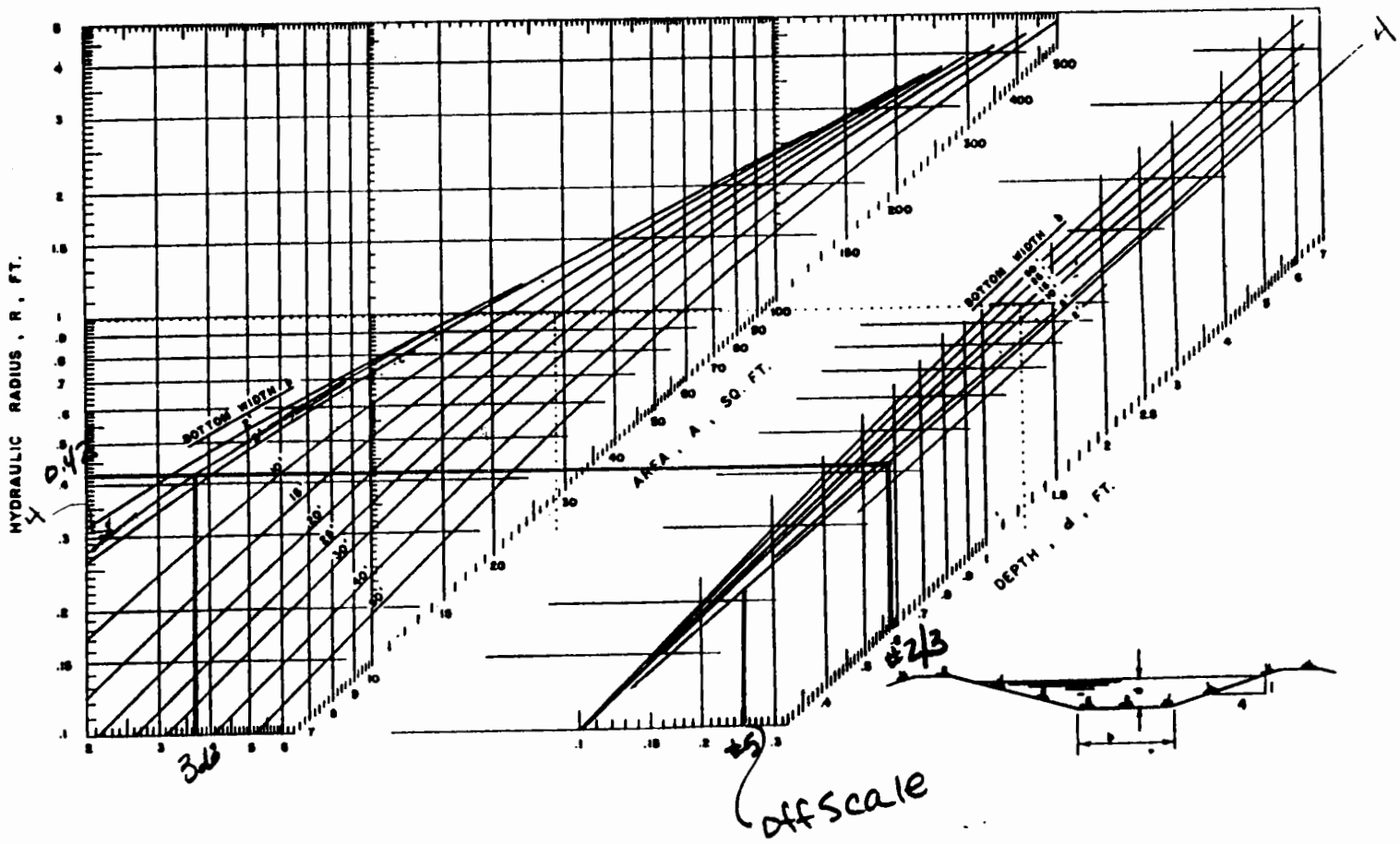
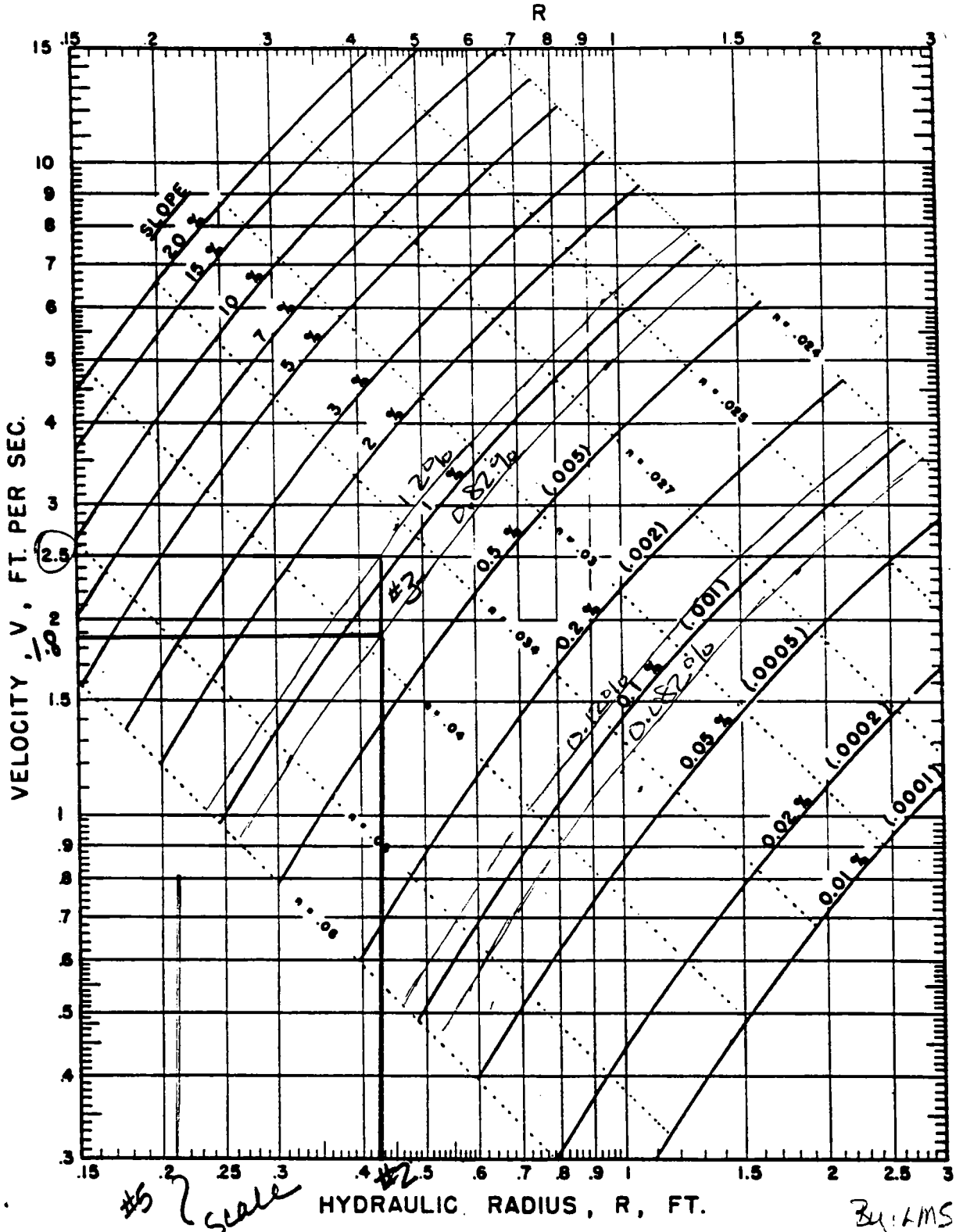


FIGURE A6-7

DIMENSIONS OF TRAPEZOIDAL CHANNELS WITH 4 TO 1 SIDE SLOPES



By: LMS Checked
Date: 11/5/97 Date

FIGURE A6-4

SOLUTION OF THE MANNING FORMULA FOR RETARDANCE E (VERY LOW VEGETAL RETARDANCE)

Project: NWSE - Site 5 - Post Construction Conditions
Task: Estimation of Site 5 Channel Velocities
By: LMS **Chkd:** KMS
Date: 11/4/97 **Date:** 11/6/97

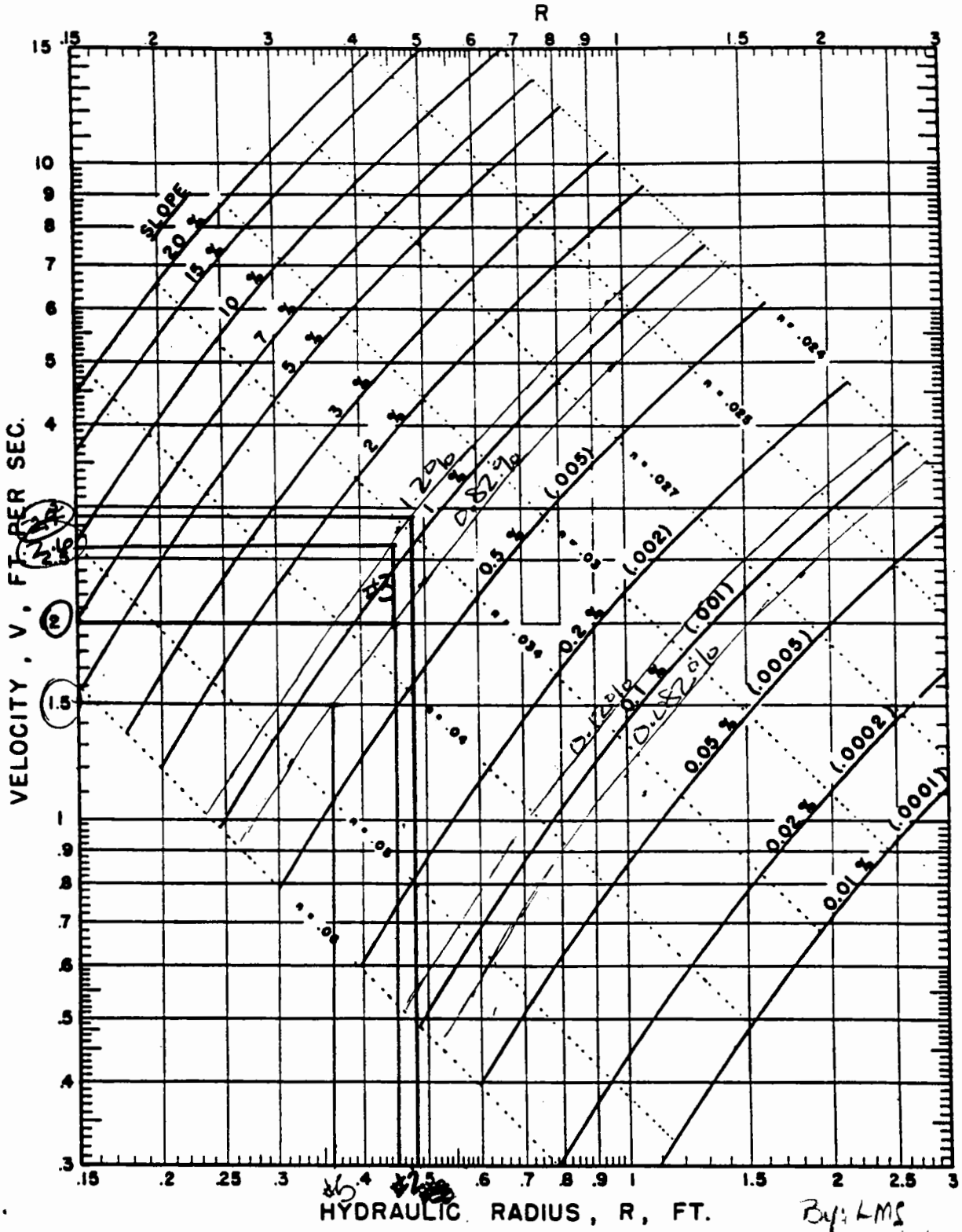
Channel	Distance (ft)	Slope (%)	Q (cfs)	Depth (ft)(1)	Area (ft^2)(2)	Wetted Perim (ft)	Hyd. Rad. (ft)	n	V (ft/s)	
#2	731	0.82%	9	0.620	4.030	9.130	0.441	0.035	2.23	(2)
#3	571	1.20%	11	0.630	4.060	9.160	0.443	0.035	2.71	(2.4)
#5	430	0.82%	2	0.49	2.92	8.041	0.363	0.1	0.69	(1.5)

(1) Depth of water during peak flow during 25-yr storm during post-construction conditions.
(2) A trapezoidal channel is assumed with a 4 foot base, 4:1 side slopes.

Iteration #2

Differences in V calc for channels 2 & 3 is insignificant & probably due to rounding.

Recalc #5 w/ n = 0.08



By: LMS
Date: 11/5/97

Checked: K
Date: 11/

FIGURE A6-4

SOLUTION OF THE MANNING FORMULA FOR RETARDANCE E (VERY LOW VEGETAL RETARDANCE)

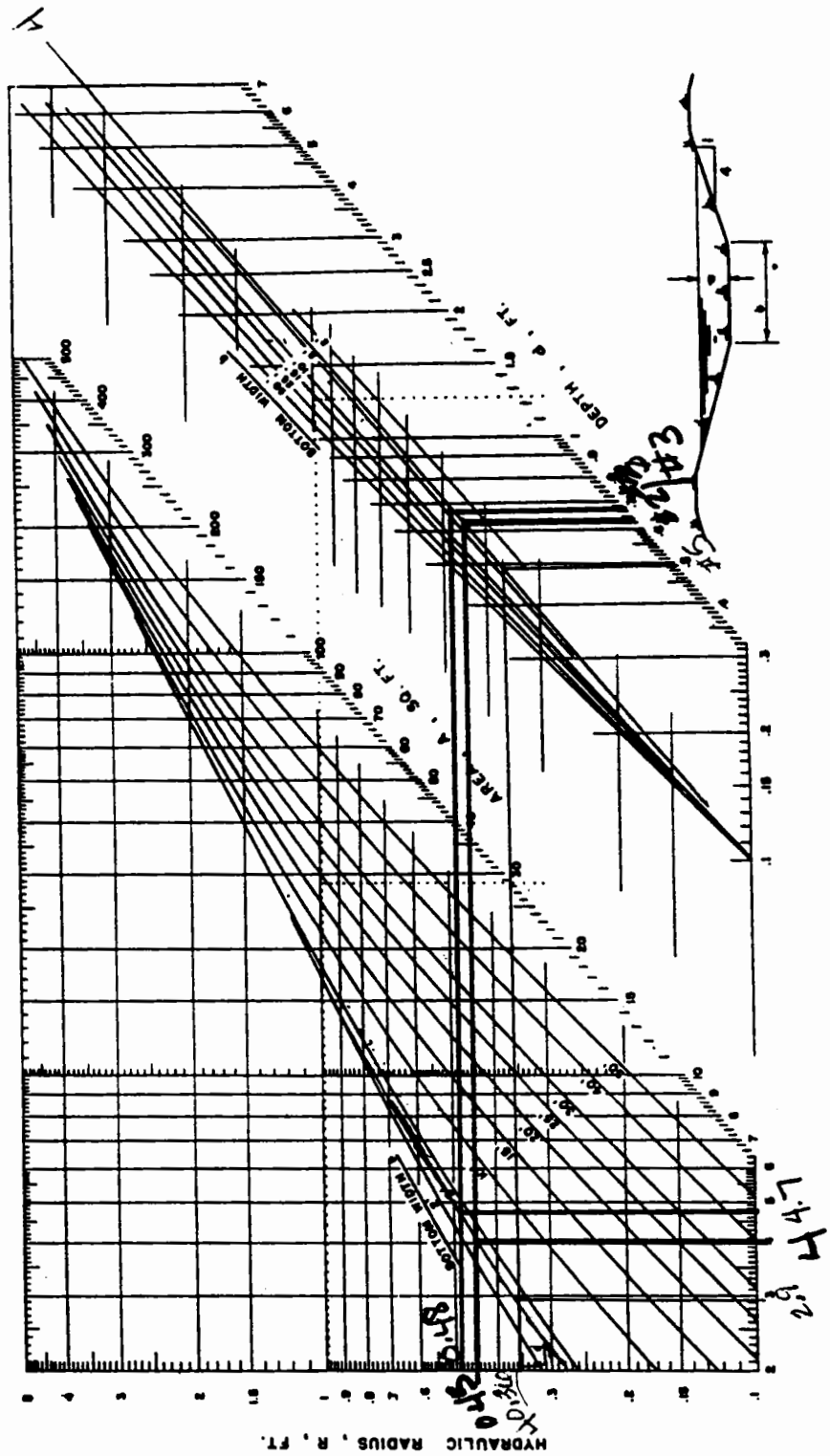


FIGURE A6-7

DIMENSIONS OF TRAPEZOIDAL CHANNELS WITH 4 TO 1 SIDE SLOPES

By: LMS Checked:
Date: 11/5/87 Date:

Project: NWSE - Site 5 - Post Construction Conditions
Task: Estimation of Site 5 Channel Velocities
By: LMS **Chkd:**
Date: 11/4/97 **Date:**

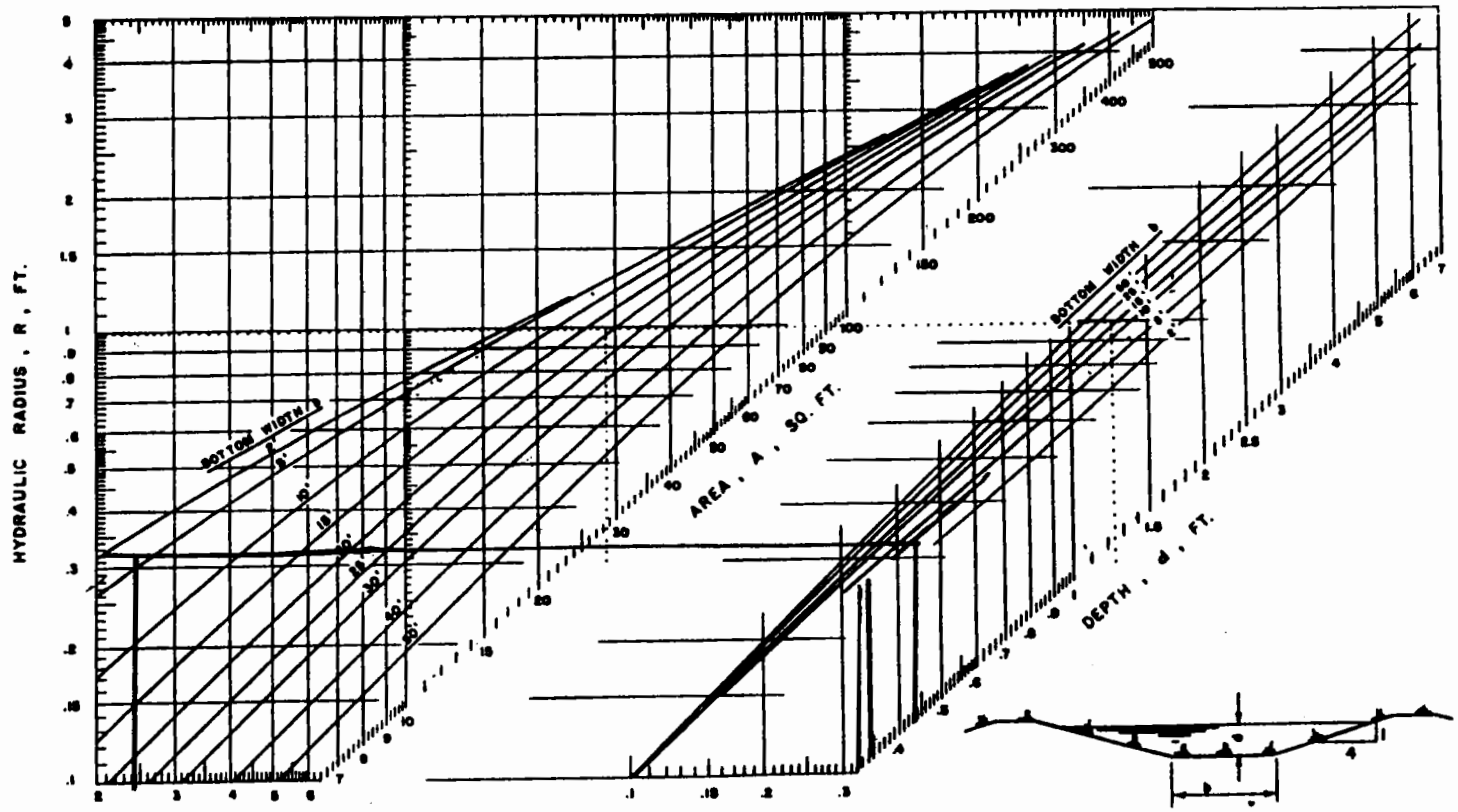
Channel	Distance (ft)	Slope (%)	Q (cfs)	Depth (ft)(1)	Area (ft^2)(2)	Wetted Perim (ft)	Hyd. Rad. (ft)	n	V (ft/s)
#2	731	0.82%	0						#DIV/0!
#3	571	1.20%	0						#DIV/0!
#5	430	0.82%	2	0.43	2.50	7.590	0.329	0.08	0.80

(1) Depth of water during peak flow during 25-yr storm during post-construction conditions.
(2) A trapezoidal channel is assumed with a 4 foot base, 4:1 side slopes.

Iteration #3 n=0.08

(Even though Iteration #2 showed an n value btw 0.04 & 0.05 for channel #5, when any of these values were used, the corresponding R value was off the scale. ~~There~~ Resulting in the use of n=0.08

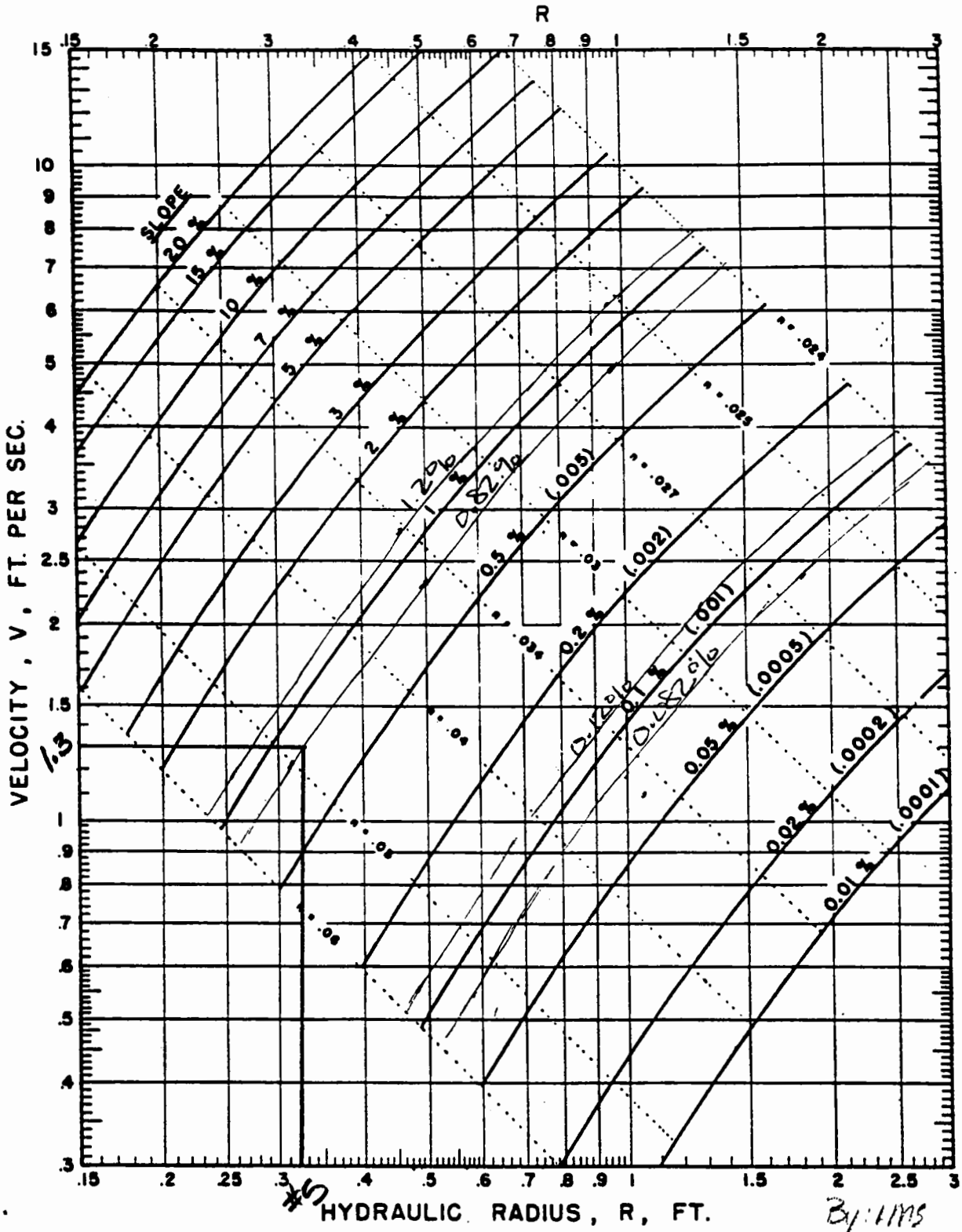
By: LMS Checked.
Date: 11/5/97 Date:



By: LMG Checked: K
Date: 11/5/87 Date: 11/6

FIGURE A6-7

DIMENSIONS OF TRAPEZOIDAL CHANNELS WITH 4 TO 1 SIDE SLOPES



By: LMS Checked.
Date: [illegible] Date: [illegible]

FIGURE A6-4

SOLUTION OF THE MANNING FORMULA FOR RETARDANCE E (VERY LOW VEGETAL RETARD[illegible]

Attachment #3

STANDARD FOR GRASSED WATERWAY

Definition

A natural or constructed watercourse shaped or graded in earth materials and stabilized with suitable vegetation for the safe conveyance of runoff water.

Purpose

To provide for the conveyance of excess surface water without damage by erosion or flooding.

Conditions Where Practice Applies

This practice applies to sites with drainage areas less than 200 acres where concentrated runoff requires vegetative protection or stone center lining to control erosion. Slope of waterway must be less than 10%. Some of the other practices that may be required with this practice are: (1) grade control structures, (2) subsurface drainage to permit the growth of suitable vegetation and to eliminate wet spots, (3) a section stabilized with stone or other material within the waterway, or (4) buried storm drain to handle frequently occurring storm runoff, base flow, or snowmelt.

Design Criteria

Capacity

Peak discharge values shall be determined by the following:

1. Rational Method - for peak discharge of uniform drainage areas as outlined in Technical Manual for Stream Encroachment, Trenton, N.J., Bureau of Flood Plain Management, August 1984.

2. SCS Technical Release No. 55.

The minimum capacity shall be that required to convey the peak runoff expected from a 10-year frequency storm.

25 yr - [illegible]

Velocity

The maximum permissible velocity for design flow will be determined by the most erodible so texture exposed and the type of vegetation expected and maintained in the channel. The following table will be used in selecting the maximum permissible velocities:

SOIL TEXTURE	MAXIMUM PERMISSIBLE VELOCITY† (ft./sec.) CHANNEL VEGETATION: Vegetated*	Sod**
Sand, silt loam, sandy loam, loamy sand, loam, and muck	2.0	3.0
Silty clay loam, sandy clay loam	2.5	4.0
Clay, clay loam, sandy clay, silty clay	3.0	5.0

†Maximum Permissible Velocities are based on flow of clear water.

*Maximum permissible velocities for vegetated channels may be increased by 3 ft./sec. except for sands for sections where erosion control mat is installed according to manufacturer's recommendations. Erosion control mat is defined as a flexible mat of synthetic monofilaments bonded together to form a three dimensional web, highly resistant to environmental and chemical degradation.

**On well to excessively drained soils, the use of most cool season sod types will not survive without continued irrigation. Placement of sod in such areas must be approved by the District.

Vegetative Retardance Factors and Manning's "n" Value

The minimum capacity and maximum velocity shall be determined by using the appropriate vegetative retardance factors listed below. See Appendix A6 for example and charts for use in design.

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT	JOB NUMBER
NWS EARLE	7602

SUBJECT: SITE 5 - DETERMINE RIP RAP SIZE FOR CHANNEL LINING

BASED ON	DRAWING NUMBER
NJREGS & PREV CALCS	

BY	CHECKED BY	APPROVED BY	DATE
LMS 11/6/97	KMS 11/6/97		

Purpose: Determine size, gradation and depth of riprap lining for channel #3 at Site 5.

Guidance Document: Standards for Soil Erosion and Sediment Control in New Jersey, April 1987, NJ State Soil Conservation Committee (NJSESC) (Reference #1)

Approach: Utilizing flow rates and velocities previously calculated, determine the appropriate riprap. (See Site 5 - Drainage Channel Evaluations by L. Shipley 11/5/97)

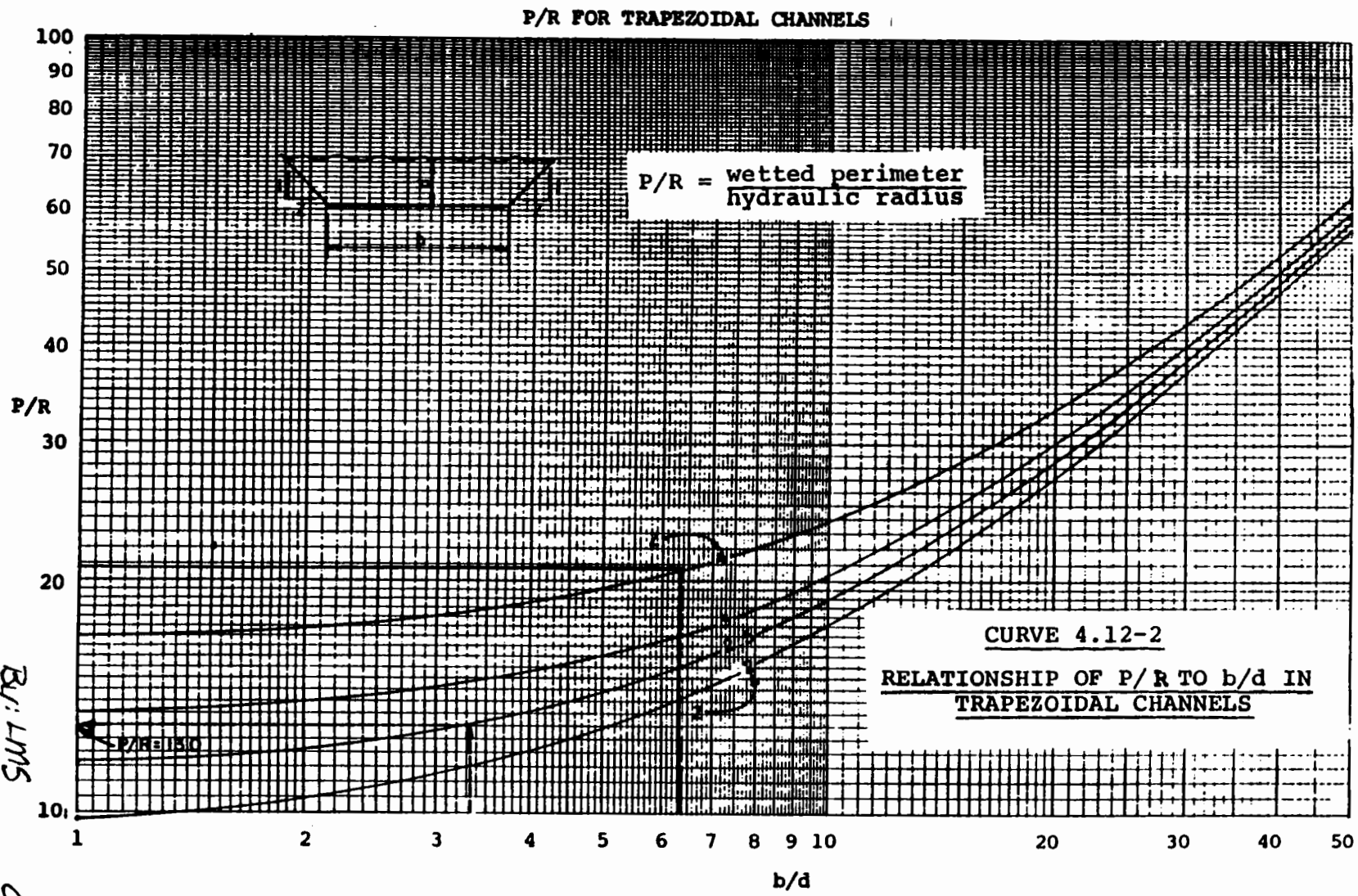
Assumptions: Angular RipRap will be used
A filter layer will be used

Shape: Trapezoidal
Bottom Width: 4' (b)
Side Slopes: 4H:1V (z)
Bottom Slope: 1.20% (S_o)
Flow: 11 cfs (Q)
Velocity: 2.71 ft/sec (V)
Depth of water: 0.63 ft (d)

Given: b/d = 6.35 Find P/R (curve 4.12-2, page 2/6)
= 20.8

Given: S_o, Q, P/R Find d_{50} (Curve 4.12-3, page 3/6)
= 1.3" use 1.5"

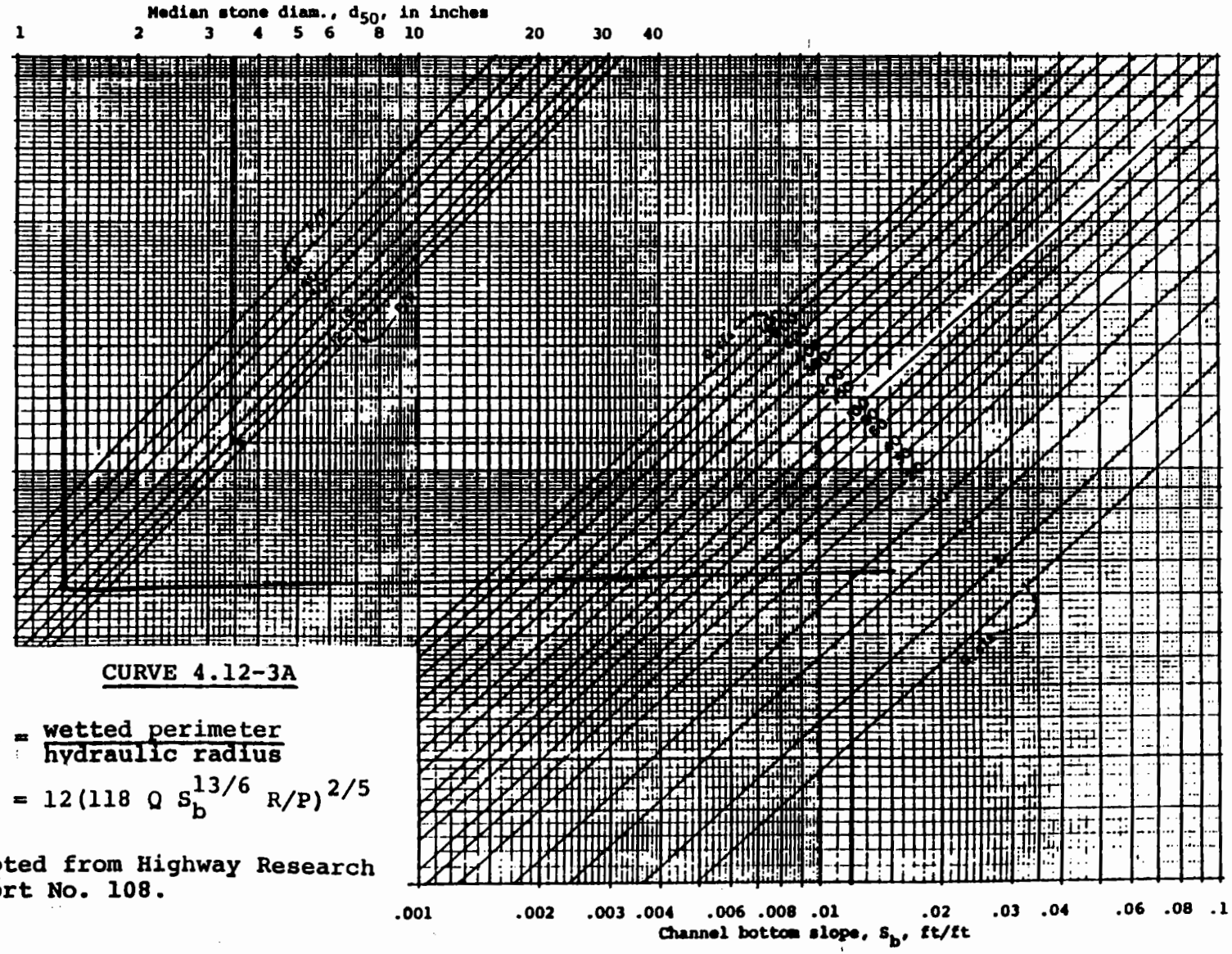
Given: d_{50} Find n (curve 4.12-1, page 4/6)
n = 0.028



By: LMS
Date: 11/5/97
Checked: K
Date: "

Reference #1

2/6



MEDIAN RIPRAP DIAMETER FOR STRAIGHT TRAPEZOIDAL CHANNELS

CURVE 4.12-3A

$$P/R = \frac{\text{wetted perimeter}}{\text{hydraulic radius}}$$

$$d_{50} = 12(118\ Q\ S_b^{13/6}\ R/P)^{2/5}$$

Adapted from Highway Research Report No. 108.

By: LMS Date: 11/5/97

Checked: K Date: 11/

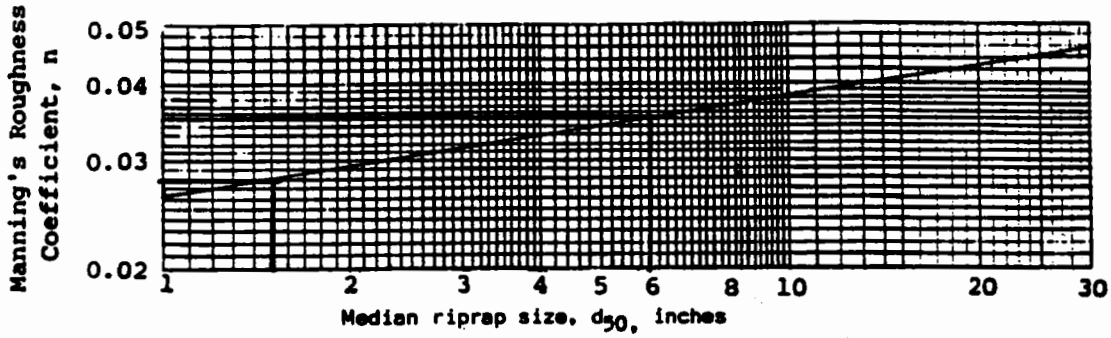
Reference #1

3/6

This procedure is based on the assumption that the channel is already designed and the remaining problem is to determine the riprap size that would be stable in the channel. The designer would first determine the channel dimensions by the use of Manning's equation. The "n" value for use in Manning's equation is obtained by estimating a riprap size and then determining the corresponding "n" value for the riprapped channel from $n = 0.0395\ d_{50}^{\ 1/6}$, where d_{50} is in feet, or by using Curve 4.12-1, below, where d_{50} is in inches.

CURVE 4.12-1

MANNING'S "n" FOR RIPRAP-LINED CHANNELS



When the channel dimensions are known, the riprap can be designed (or an already completed design may be checked) as follows:

Trapezoidal Channels

1. Calculate the b/d ratio and enter Curve 4.12-2 to find the P/R ratio.

2. Enter Curve 4.12-3 with S_b, Q, and P/R to find median riprap diameter, d_{50}, for straight channels.

3. Enter Curve 4.12-1 to find the actual "n" value corresponding to the d_{50} from step 2. If the estimated and actual "n" values do not reasonably agree, another trial must be made.

4. For channels with bends, calculate the ratio B_s/R_o, where B_s is the channel surface width and R_o is the radius of the bend. Enter Curve 4.12-4 and find the bend factor, F_B. Multiply the d_{50} for straight channels by the bend factor to determine riprap size to be used in bends. If the d_{50} for the bend is less than 1.1 times the d_{50} for the straight channel, then the size for straight channel may be used in the bend; otherwise, the larger stone size calculated for the bend shall be used. The riprap shall extend across the full channel section and shall extend upstream and downstream from the ends of the curve a distance equal to five times the bottom width.

5. Enter Curve 4.12-5 to determine maximum stable side slope of riprap surface. In Curve 4.12-5, the side slope is established so that the riprap on the side slope is as stable as that on the bottom. If for any reason it is desirable to make the side slopes steeper than what is given by Curve 4.12-5, the size of the riprap can be increased and the side slopes made steeper by using the following procedures:

   a. Compute d_{50} and maximum stable side slope as above.

   b. Enter Curve 4.12-6 with the computed side slope to determine K for that side slope.

   c. Enter Curve 4.12-6 with the desired side slope to determine K'.

   d. Compute riprap size for desired slope by the formula:

$$d_{50}' = d_{50}\frac{K}{K'}$$

6. Maximum side slopes, 2:1.

By: LMS Checked:
Date: 11/6/97 Date: 11/6

Reference #1

CLIENT	JOB NUMBER
NWS EARLE	7602

SUBJECT: SITE 5 - DETERMINE RIP RAP SIZE FOR CHANNEL LINING

BASED ON	DRAWING NUMBER
NJDEGS & PREV CALCS	

BY	CHECKED BY	APPROVED BY	DATE
LMS 11/5/97	KMS 11/6/97		

Given d_{50} Find Maximum Allowable Slope for channel side slopes to maintain stability

Curve 4.12-5 (See page 6/6)

max Allowable Slope 2.5:1

Current Design of 4:1 will remain stable.

Determine Maximum Stone Size

$d_{max} = 1.5 d_{50}$ (Reference 1, pg 4.12.1)

$= 1.5 (1.5")$

$d_{max} = 2.25"$

Determine depth of riprap given that a filter fabric will be used at the stone/soil interface. Min allowable thickness is 6" (Reference 1, pg 4.12.2)

depth $= 2 d_{50} = 3"$

$\therefore$ depth $= 6"$

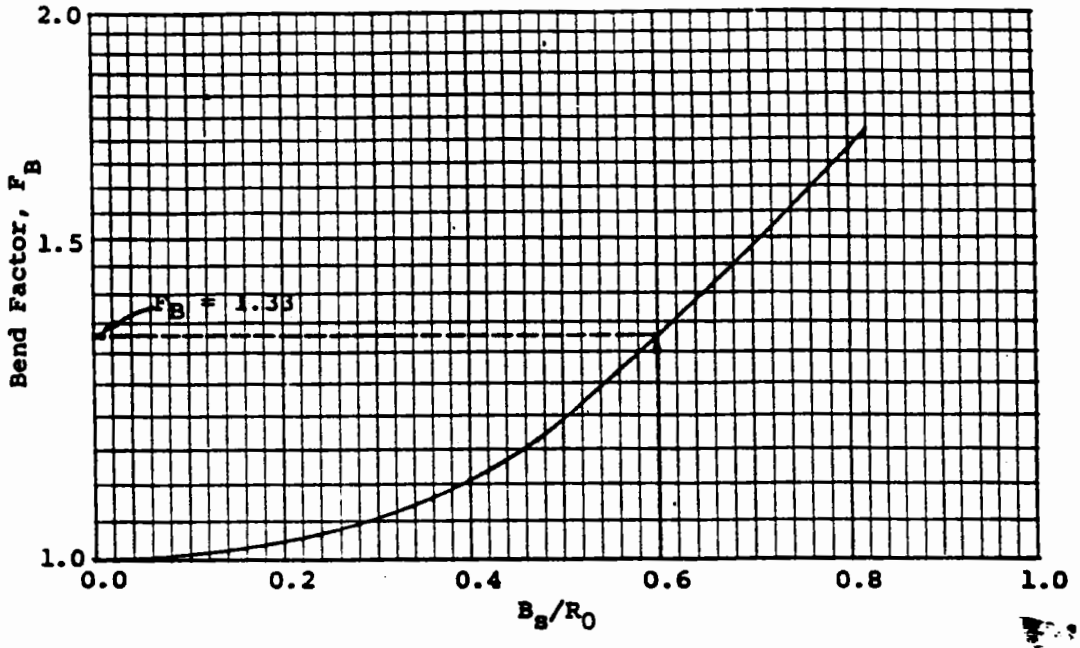
Due to the small riprap size calculated through this design, and based on engineering judgement, this channel will be top soiled and seeded, as this will bring the max permissible flow velocity up to 2.5 ft/sec and the peak 25-year flow velocity is 2.7 ft/sec. The value added by riprapping the channel was felt to be minimal.

CURVE 4.12-4

RIPRAP SIZE CORRECTION FACTOR FOR FLOW IN CHANNEL BENDS

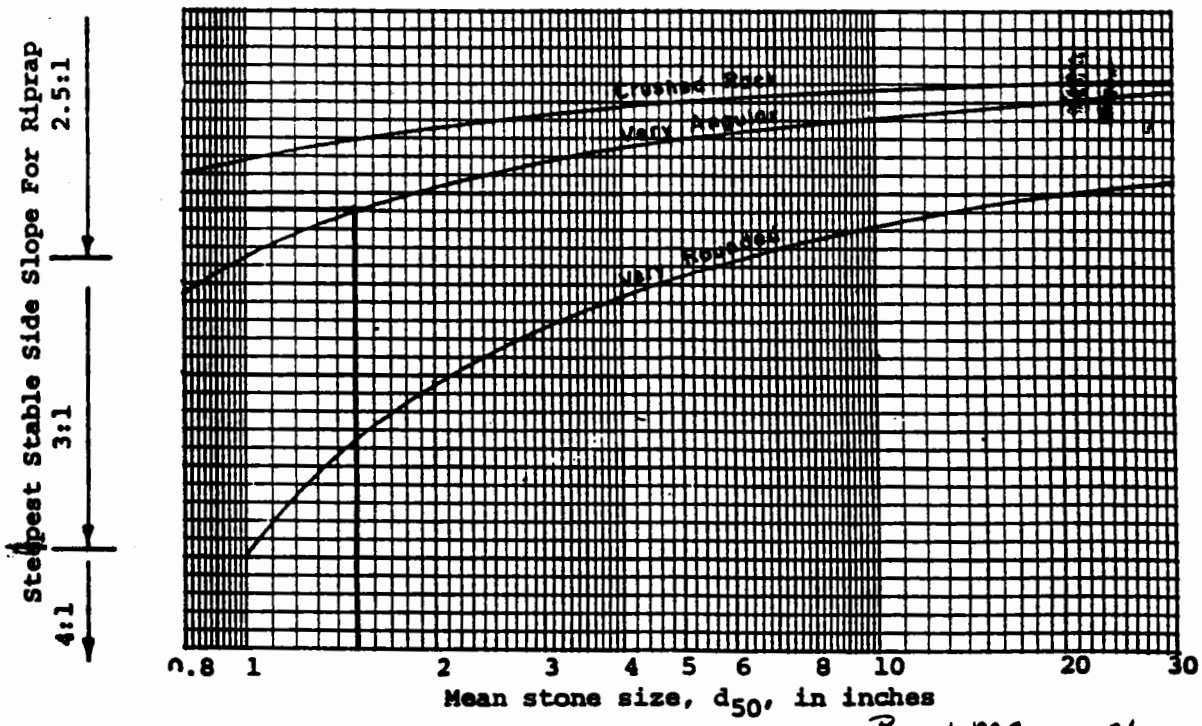
d_{50}(for bend) = d_{50}(for straight) X F_B
B_s = channel surface width
R_o = mean radius of bend

Adapted from Highway Research Report No. 108.



CURVE 4.12-5

MAXIMUM RIPRAP SIDE SLOPE WITH RESPECT TO RIPRAP SIZE



By: LMS Checked
Date: 11/5/97 Date: 11/

Reference #1

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT	JOB NUMBER
NWS Earle	71002
SUBJECT: Site 5 - RipRap Sizing for Diversion Channel	
BASED ON: NS Regs & previous calcs	DRAWING NUMBER:
BY: L. Shipley 11/4/97 / CHECKED BY: KMS 11/06/97	APPROVED BY: / DATE:

Purpose: Determine the required riprap size to protect the diversion channel from the erosive forces of water

Approach: Based on velocity of flow in the channel from a 25 year storm event, and the channel geometry, the size, gradation, and depth of riprap were determined for a straight channel.

Assume: A filter layer will be used in channel const.
Angular rip rap will be used

$\text{base/depth} = \frac{3'}{0.5'} = 6 \qquad z = 3$

From curve 4.12-2 (page 2 of 6) : $P/R \cong 17.5$

From curve 4.12-3A (page 3 of 6) : $d_{50} \cong 5.3$ in

given $S_b = 0.05$ ft/ft

$Q = 11$ cfs

$P/R \cong$ [illegible]

Use $d_{50} = 5.5$ in

From curve 4.12-1 (page 4 of 6) : $n = 0.034$

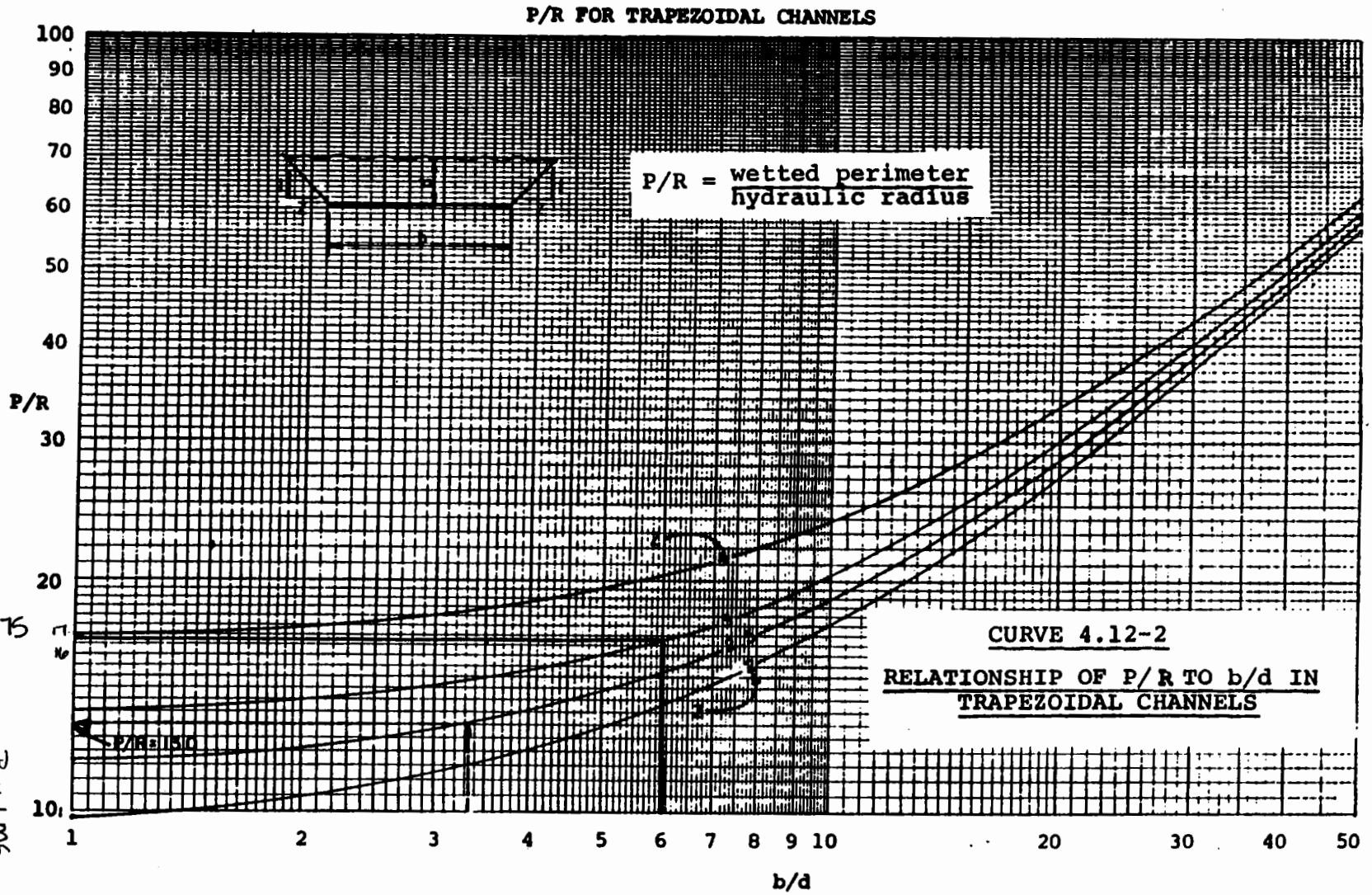
Use curve 4.12-5 (page 5 of 6) to verify that 3:1 side slope will be stable with rip rap surface. Max permissible slope is 2.5:1, Design slope is stable.

Determine RipRap Gradation:

$d_{max} = (1.5)\, d_{50}$ (Reference #1, page 4.12.1)

$= 1.5(5.5)$

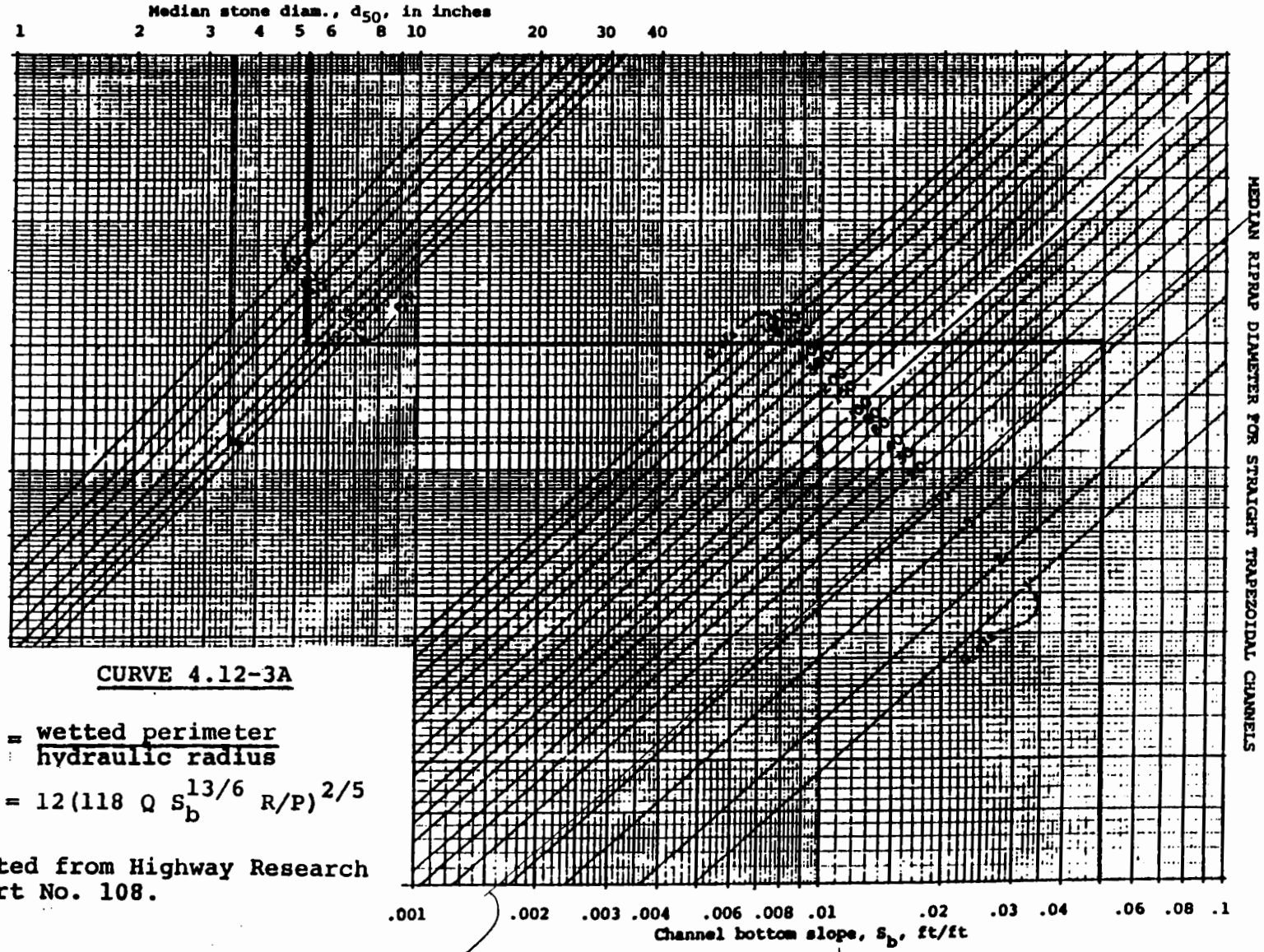
$d_{max} = 8.25$



By: LMS
Date: 11/4/97
CHKD: KMS
Date: 11/06/97

Reference #1

Pg 2 of 6



≅ Q = 11cfs

CURVE 4.12-3A

$$P/R = \frac{\text{wetted perimeter}}{\text{hydraulic radius}}$$

$$d_{50} = 12(118\ Q\ S_b^{13/6}\ R/P)^{2/5}$$

Adapted from Highway Research Report No. 108.

By: LMS Date: 11/4/97 Chkd: KCM Date: 11/6

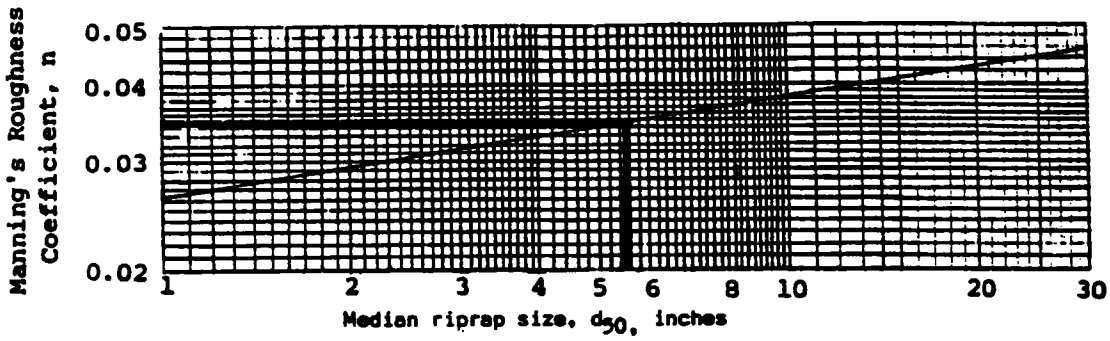
Reference #1

Pg 3 of 6

This procedure is based on the assumption that the channel is already designed and the remaining problem is to determine the riprap size that would be stable in the channel. The designer would first determine the channel dimensions by the use of Manning's equation. The "n" value for use in Manning's equation is obtained by estimating a riprap size and then determining the corresponding "n" value for the riprapped channel from $n = 0.0395\ d_{50}^{\ 1/6}$, where d_{50} is in feet, or by using Curve 4.12-1, below, where d_{50} is in inches.

CURVE 4.12-1

MANNING'S "n" FOR RIPRAP-LINED CHANNELS



When the channel dimensions are known, the riprap can be designed (or an already completed design may be checked) as follows:

Trapezoidal Channels

1. Calculate the b/d ratio and enter Curve 4.12-2 to find the P/R ratio.

2. Enter Curve 4.12-3 with S_b, Q, and P/R to find median riprap diameter, d_{50}, for straight channels.

3. Enter Curve 4.12-1 to find the actual "n" value corresponding to the d_{50} from step 2. If the estimated and actual "n" values do not reasonably agree, another trial must be made.

4. For channels with bends, calculate the ratio B_s/R_o, where B_s is the channel surface width and R_o is the radius of the bend. Enter Curve 4.12-4 and find the bend factor, F_B. Multiply the d_{50} for straight channels by the bend factor to determine riprap size to be used in bends. If the d_{50} for the bend is less than 1.1 times the d_{50} for the straight channel, then the size for straight channel may be used in the bend; otherwise, the larger stone size calculated for the bend shall be used. The riprap shall extend across the full channel section and shall extend upstream and downstream from the ends of the curve a distance equal to five times the bottom width.

5. Enter Curve 4.12-5 to determine maximum stable side slope of riprap surface. In Curve 4.12-5, the side slope is established so that the riprap on the side slope is as stable as that on the bottom. If for any reason it is desirable to make the side slopes steeper than what is given by Curve 4.12-5, the size of the riprap can be increased and the side slopes made steeper by using the following procedures:

   a. Compute d_{50} and maximum stable side slope as above.

   b. Enter Curve 4.12-6 with the computed side slope to determine K for that side slope.

   c. Enter Curve 4.12-6 with the desired side slope to determine K'.

   d. Compute riprap size for desired slope by the formula:

$$d_{50}' = d_{50}\frac{K}{K'}$$

6. Maximum side slopes, 2:1.

By: LMS Chkd: KM
Date: 11/4/97 Date: 11/7

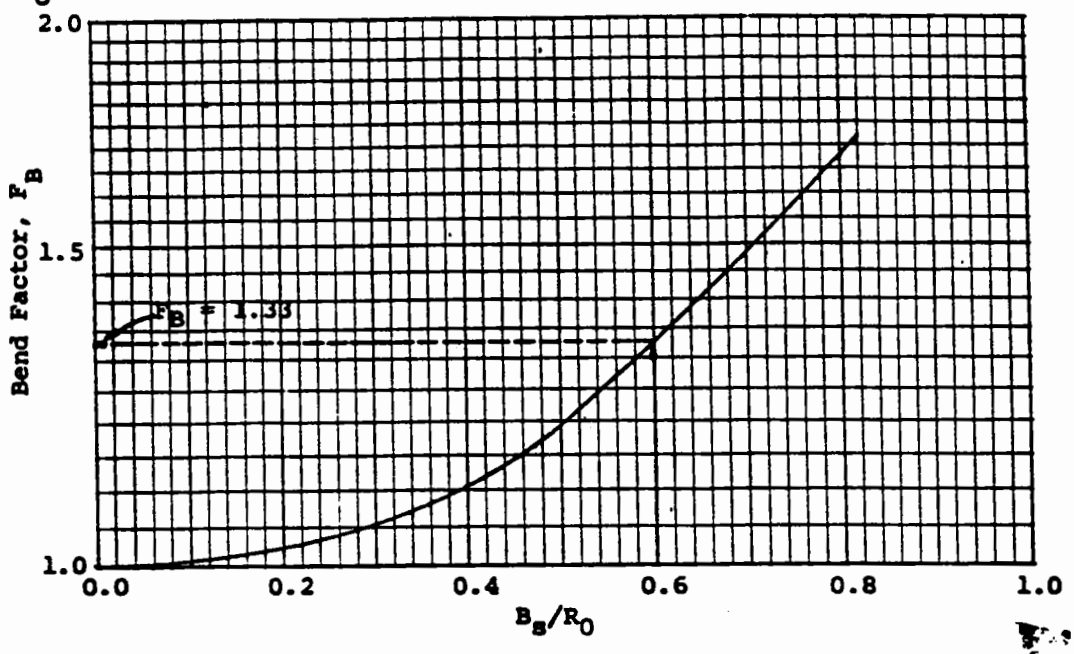
Reference #1

CURVE 4.12-4

RIPRAP SIZE CORRECTION FACTOR FOR FLOW IN CHANNEL BENDS

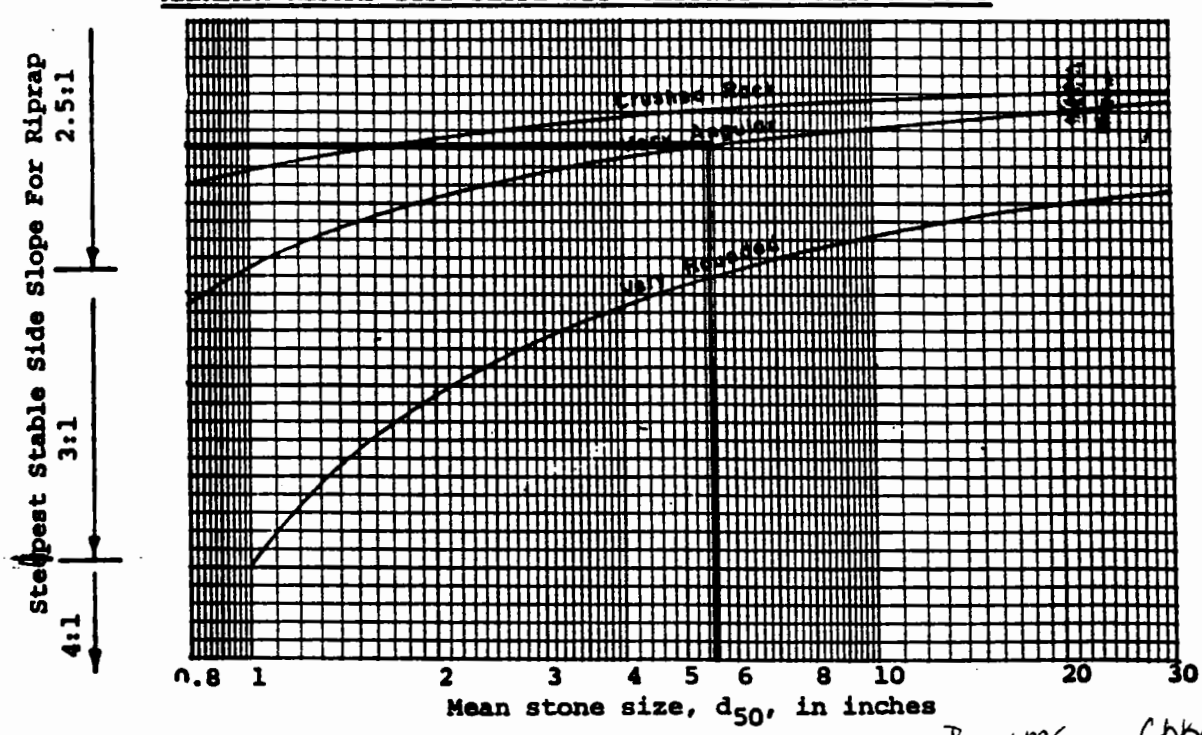
d_{50}(for bend) = d_{50}(for straight) X F_B
B_s = channel surface width
R_o = mean radius of bend

Adapted from Highway Research Report No. 108.



CURVE 4.12-5

MAXIMUM RIPRAP SIDE SLOPE WITH RESPECT TO RIPRAP SIZE



By: LMS Chkd: K
Date: 11/4/97 Date: 11/

Reference #1

CLIENT	JOB NUMBER		
NWS Earle	7602		
SUBJECT: Site 5 - Rip Rap Sizing for Diversion Channel			
BASED ON: NJ Regulations		DRAWING NUMBER	
BY: LS 11/4/97	CHECKED BY: KMS 11/6/97	APPROVED BY	DATE

Determine depth of riprap

Given the presence of a filter layer

$d_{riprap} \geq 2 d_{50}$ Reference #1, page 4.12.2

$\geq 2 (5.5)$

≥ 10 inches

Taking the gradation as a minimum requirement, riprap for the diversion channel must have:

$d_{50} \geq 5.5$ in

$d_{max} \geq 8.25$ in

dependent on what is commercially available.

Reference:

1. Standards for Soil Erosion and Sediment Control in New Jersey. New Jersey State Soil Conservation Committee, April 1987

CLIENT NWSE	JOB NUMBER 7624
SUBJECT PEAK DISCHARGE FROM WATERSHED AREA UPGRADIENT OF SITE 5	
BASED ON URBAN HYDROLOGY FOR SMALL WATERSHEDS	DRAWING NUMBER
BY KMS 10/31/97 / CHECKED BY BER 11/3/97	APPROVED BY / DATE

OBJECTIVE: TO DETERMINE THE 25-YEAR STORM PEAK DISCHARGE FROM THE WATERSHED AREA SHOWN ON PAGE 2 OF 15.

APPROACH: The TR-55 velocity method will be used to determine the flow of a 25-year rainfall event on the watershed area.

Assumptions:
- BASED ON AERIAL PHOTOGRAPHS (SEE PAGE 3 OF 15), THE COVER DESCRIPTION IS ASSUMED TO BE WOODS IN GOOD CONDITION. ✓
- BASED ON PREVIOUS CALCULATION THE RAINFALL FOR A 2 YEAR STORM EVENT IS 3.4 inches and FOR A 25 YEAR STORM EVENT IS 6 inches. ✓

CALCULATIONS:

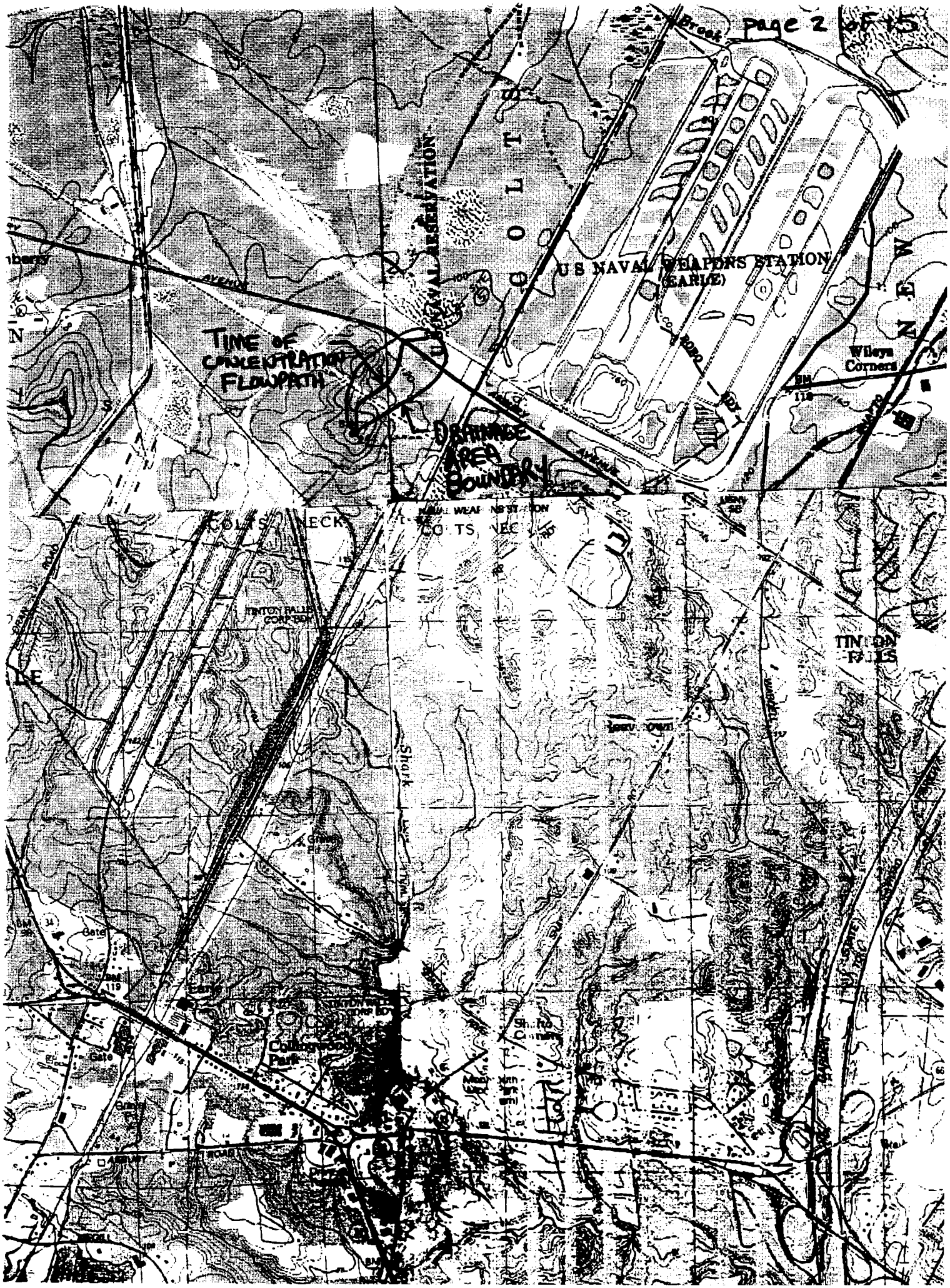
A. WATERSHED AREA

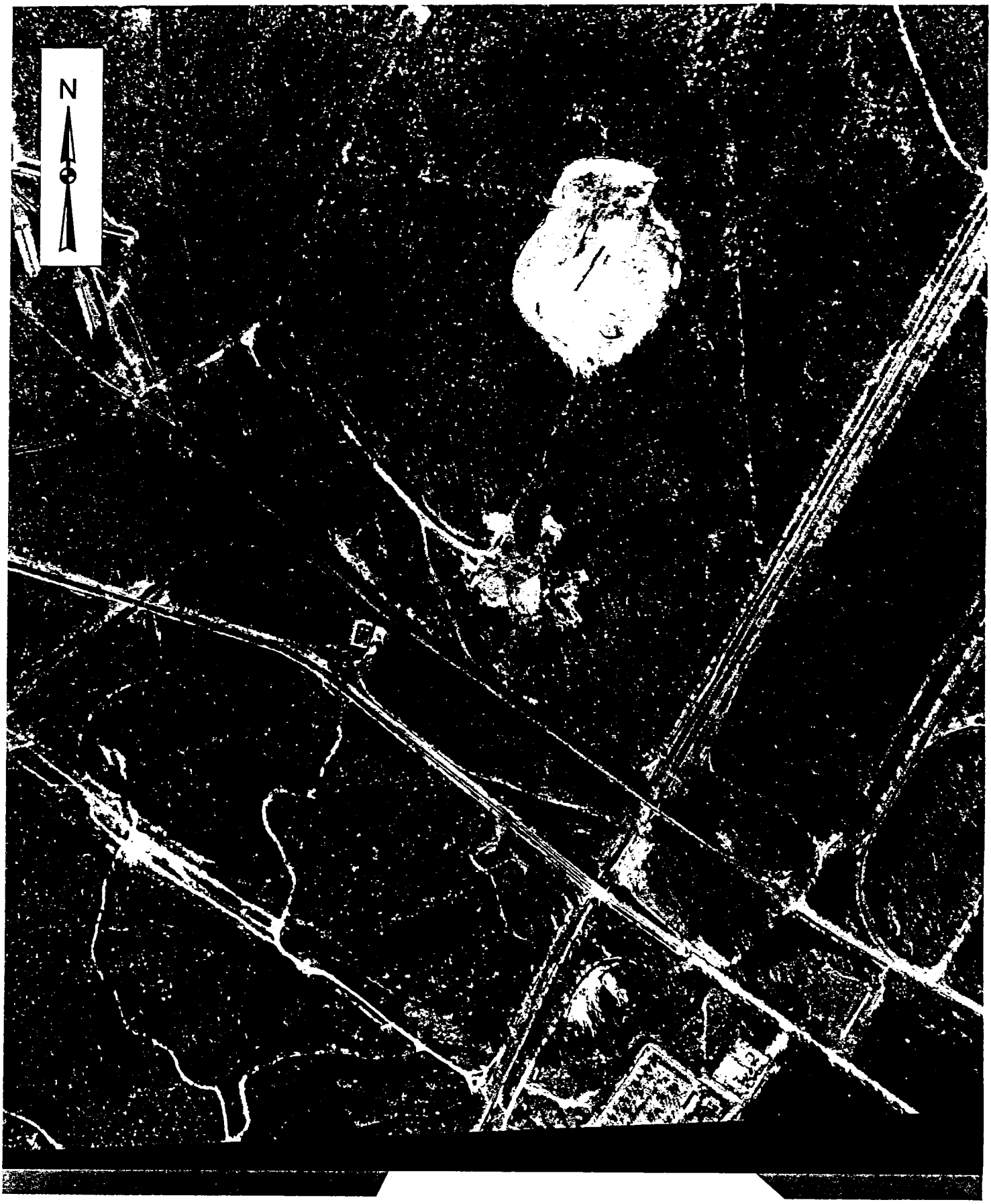
BASED ON USGS MAP (see page 2 of 15)
SCALE 1" = 2000'

AREA 0.465 m^2 = 42.7 ACRES ✓

B. SOIL TYPES

BASED ON SOIL SURVEY OF Monmouth County New Jersey (see page 4 of 15)


TIME OF CONCENTRATION FLOWPATH
DRAINAGE AREA BOUNDARY
U S NAVAL WEAPONS STATION (EARLE)
U S NAVAL RESERVATION
COLTS NECK
TINTON FALLS CORP BDY
Wileys Corners
Shark
Collingwood Park
Gate



600 0 600 1200 Feet

NUMBER 28

REFERENCE 1

CLIENT NWSE	JOB NUMBER
SUBJECT PEAK DISCHARGE	
BASED ON TR-55	DRAWING NUMBER
BY KMS 10/31/97 / CHECKED BY BER 11/3/97	APPROVED BY / DATE

B. Soil types con't

			HYDROLOGIC GROUP
LaA	Lakehurst Sand	=	A ✓
En	Elkton Loam	=	C/D (Assume D) ✓
EvD	Evesboro Sand	=	A ✓
Av	–		ASSUME D ✓

Approximately: 32 acres of hydrologic group A
10.7 acres of hydrologic group D

C. CALCULATE RUNOFF CURVE NUMBER

BASED ON the assumed cover type the CN for each area is:

CN = 30 for Group A
77 for Group D
(See page 6 OF 15 Table 2-2)

CN weighted is Determined in Worksheet 2 (page 7 OF 15)

CN (weighted) = 42 ✓

D. RUNOFF FOR 25-YEAR STORM

DETERMINED ON WORKSHEET 2 (page 7)

Q = 0.6 in ✓

By: KMS DATE: 10/31/97
Checked: BER DATE: 11/3/97

Table 2-2c.—Runoff curve numbers for other agricultural lands[1]

Cover description		Curve numbers for hydrologic soil group—			
Cover type	Hydrologic condition	A	B	C	D
Pasture, grassland, or range—continuous forage for grazing.[2]	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay.	—	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element.[3]	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	[4]30	48	65	73
Woods—grass combination (orchard or tree farm).[5]	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods.[6]	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	[4]30	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots.	—	59	74	82	86

[1]Average runoff condition, and $I_a = 0.2S$.

[2]*Poor:* <50% ground cover or heavily grazed with no mulch.
Fair: 50 to 75% ground cover and not heavily grazed.
Good: >75% ground cover and lightly or only occasionally grazed.

[3]*Poor:* <50% ground cover.
Fair: 50 to 75% ground cover.
Good: >75% ground cover.

[4]Actual curve number is less than 30; use CN = 30 for runoff computations.

[5]CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.

[6]*Poor:* Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
Fair: Woods are grazed but not burned, and some forest litter covers the soil.
Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

REFERENCE 2

Worksheet 2: Runoff curve number and runoff

Project NWSE By KMS Date 10/31/97

Location SITE 5 Checked BER Date 11/3/97

Circle one: (Present) Developed

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area ☒ acres ☐ mi² ☐ %	Product of CN x area
Sand, A	Woods, good cond.	30			32	960
Loam, D	Woods, good cond.	77			10.7	823.9
					Totals = 42.7	1783.9

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{1783.9}{42.7} = 41.7$; Use CN = 42

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency ..... yr	25		
Rainfall, P (24-hour) ..... in	6.0		
Runoff, Q ..... in (Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)	0.6		

REFERENCE 2

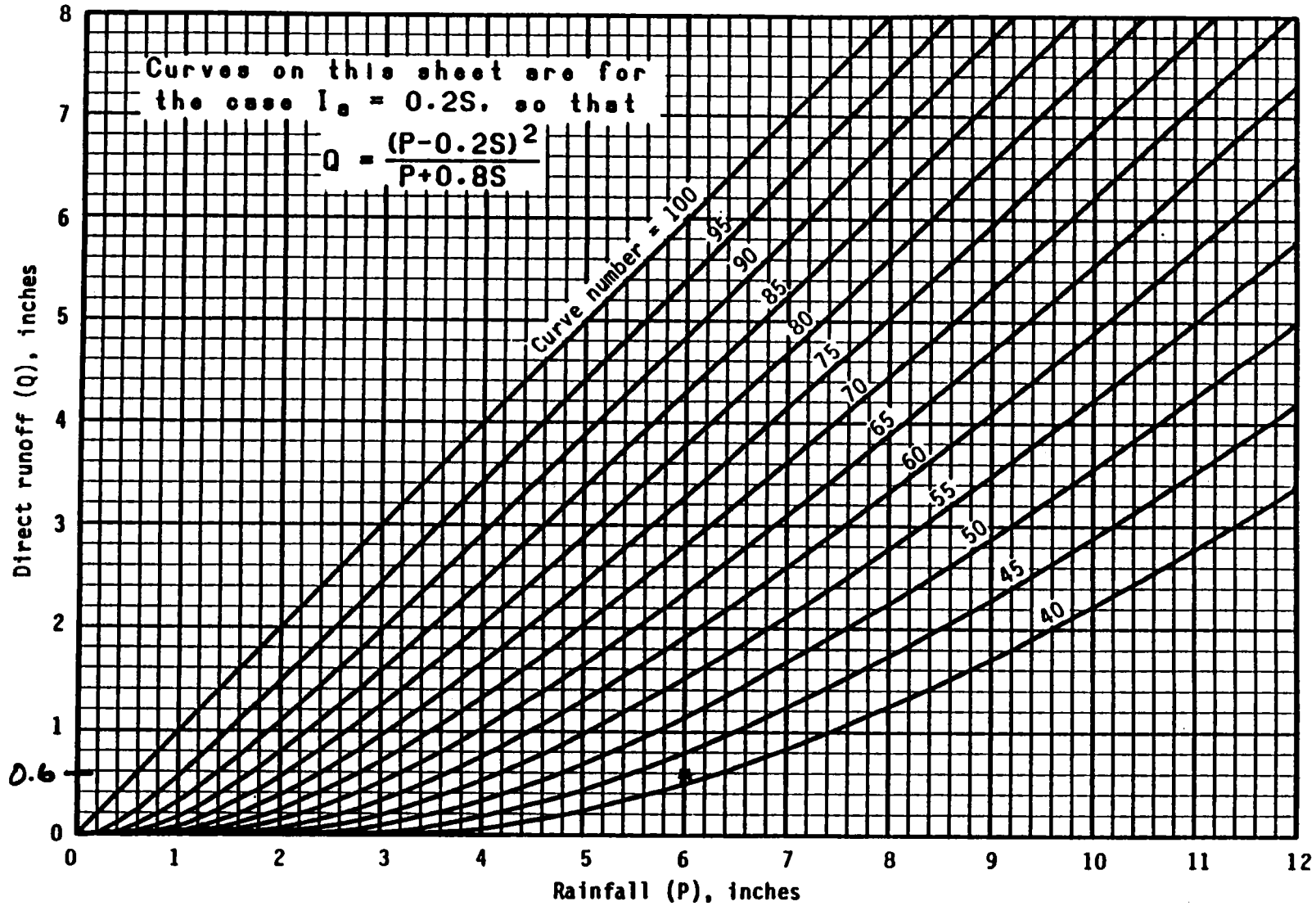


Figure 2-1.—Solution of runoff equation.

REFERENCE 2

BY: KMS DATE: 10/31/97 PAGE 8 OF
CHECKED: BER DATE: 11/3/97

CLIENT NWSE	JOB NUMBER
SUBJECT PEAK DISCHARGE	
BASED ON TR-55	DRAWING NUMBER
BY KMS 10/31/97 / CHECKED BY BER 11/3/97	APPROVED BY / DATE

E. CALCULATE Time of Concentration (T_c)

BASED ON THE USGS MAP (page 2 OF 15) The Shallow, Sheet and channel flow of the segments are calculated on Worksheet 3 (page 10/11 OF 15)

T_c = 0.33 hours ✓

F. CALCULATE PEAK Discharge (q_p)

BASED ON WORKSHEET 4 (page 13 OF 15)

Q_p = 10.05 cfs ✓

CONCLUSION

FOR CONSERVATIVE ASSUMPTIONS IN FUTURE CALCULATIONS USE

Q_p = 11 CFS ✓

REFERENCES:

1. SOIL SURVEY OF Monmouth County, New Jersey

2. URBAN Hydrology for Small Watersheds, United States Department of Agriculture, 2nd edition June 1986. (TR-55)

Worksheet 3: Time of concentration (T_c) or travel time (T_t)

Project NWSE By KMS Date 10/31/97

Location SITE 5 Checked BER Date 11/3/97

Circle one: (Present) Developed

Circle one: T_c T_t through subarea

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c only)	Segment ID	AB		
1. Surface description (table 3-1)		Woods light		
2. Manning's roughness coeff., n (table 3-1) ..		0.4		
3. Flow length, L (total L ≤ 300 ft)	ft	100		
4. Two-yr 24-hr rainfall, P_2	in	3.4		
5. Land slope, s	ft/ft	0.1		
6. $T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr	0.18	+ 0	= 0.18

Shallow concentrated flow	Segment ID	BC	CD
7. Surface description (paved or unpaved)		Unpaved	Unpaved
8. Flow length, L	ft	~~1000~~ 600	1000
9. Watercourse slope, s	ft/ft	0.13	0.06
10. Average velocity, V (figure 3-1)	ft/s	5.8	4
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr	0.03	+ 0.07 = 0.1

Channel flow	Segment ID		
12. Cross sectional flow area, a	ft^2		
13. Wetted perimeter, p_w	ft		
14. Hydraulic radius, $r = \frac{a}{p_w}$ Compute r	ft		
15. Channel slope, s	ft/ft		
16. Manning's roughness coeff., n			
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V	ft/s		
18. Flow length, L	ft		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr	+	=
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)	hr		0.33

REFERENCE 2

:t 3: Time of concentration (T_c) or travel time (T_t)

By KMS Date 10/31/97

Checked BER Date 11/3/97

) Developed

T_t through subarea

s many as two segments per flow type can be used for each

ap, schematic, or description of flow segments.

ble to T_c only)	Segment ID			
ption (table 3-1)				
hness coeff., n (table 3-1) ..				
. (total L ≤ 300 ft)	ft			
ainfall, P_2	in			
.....	ft/ft			
$\frac{)^{0.8}}{.4}$ Compute T_t	hr		+	=

d flow	Segment ID	DE		
pr'on (paved or unpaved)		Unpaved		
.....	ft	400		
ope, s	ft/ft	0.02		
ty, V (figure 3-1)	ft/s	2.25		
Compute T_t	hr	0.05	+	= 0.05

	Segment ID			
l flow area, a	ft^2			
er, p_w	ft			
us, $r = \frac{a}{p_w}$ Compute r	ft			
s	ft/ft			
hness coeff., n				
$\frac{}{s^{1/2}}$ Compute V	ft/s			
.....	ft			
Compute T_t	hr		+	=

subarea T_c or T_t (add T_t in steps 6, 11, and 19) ..... hr

REFERENCE 2

By: KMS DATE: 10/31/97
Checked: BER DATE: 11/3/97

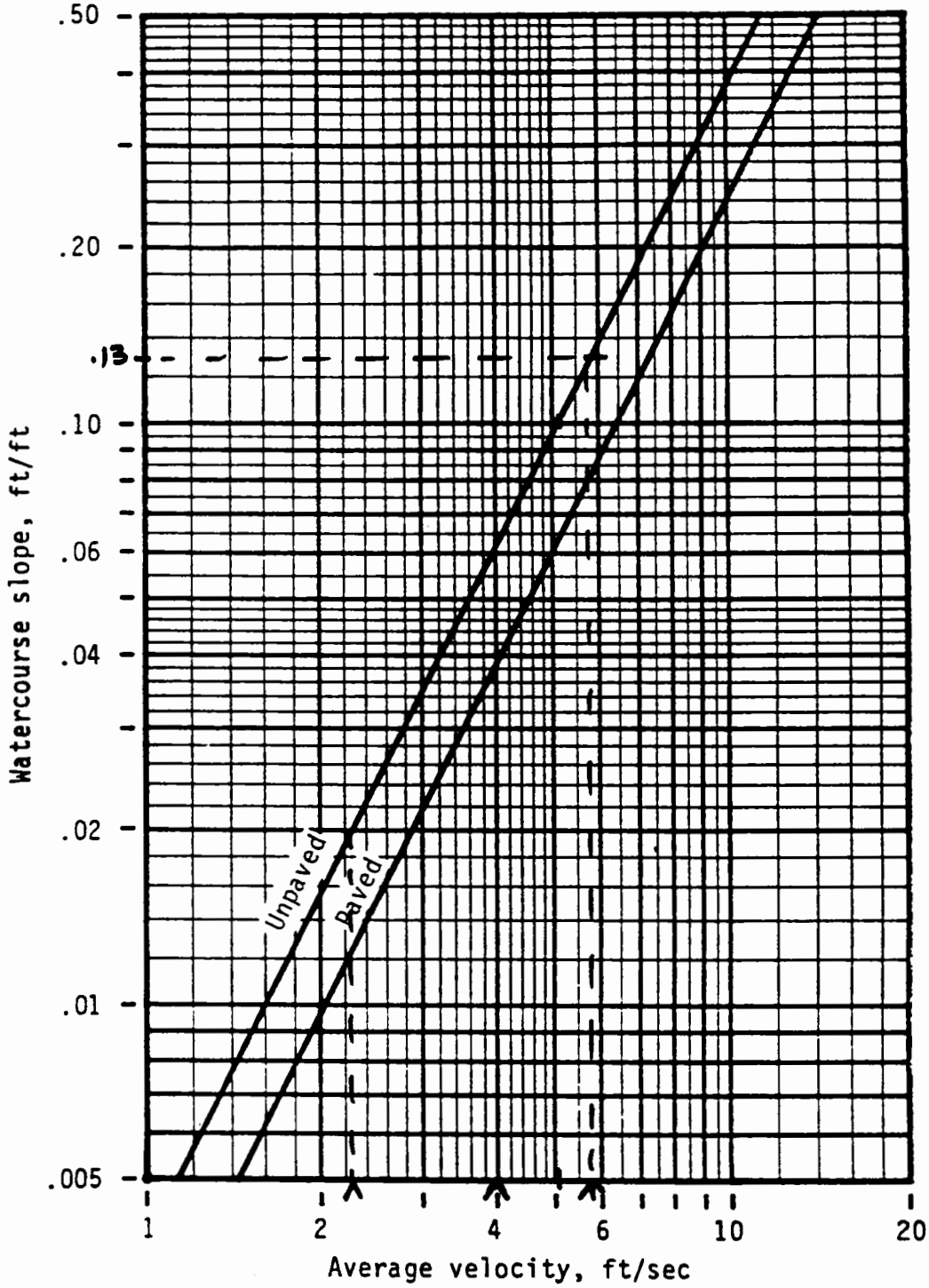


Figure 3-1.—Average velocities for estimating travel time for shallow concentrated flow.

REFERENCE 2

Worksheet 4: Graphical Peak Discharge method

Project NWSE By KMS Date 10/31/97

Location SITE 5 Checked BER Date 11/3/97

Circle one: (Present) Developed

1. Data:

Drainage area ..... A_m = 0.067 mi^2 (acres/640)

Runoff curve number .... CN = 42 (From worksheet 2)

Time of concentration .. T_c = 0.33 hr (From worksheet 3)

Rainfall distribution type = III (I, IA, II, III)

Pond and swamp areas spread throughout watershed ..... = 0 percent of A_m (0.0 acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3
2. Frequency	yr	25		
3. Rainfall, P (24-hour)	in	6.0		
4. Initial abstraction, I_a ..... (Use CN with table 4-1.)	in	2.762		
5. Compute I_a/P		0.46		
6. Unit peak discharge, q_u ..... (Use T_c and I_a/P with exhibit 4-III)	csm/in	250		
7. Runoff, Q ..... (From worksheet 2).	in	0.6		
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.0		
9. Peak discharge, q_p ..... (Where $q_p = q_u A_m Q F_p$)	cfs	10.05		

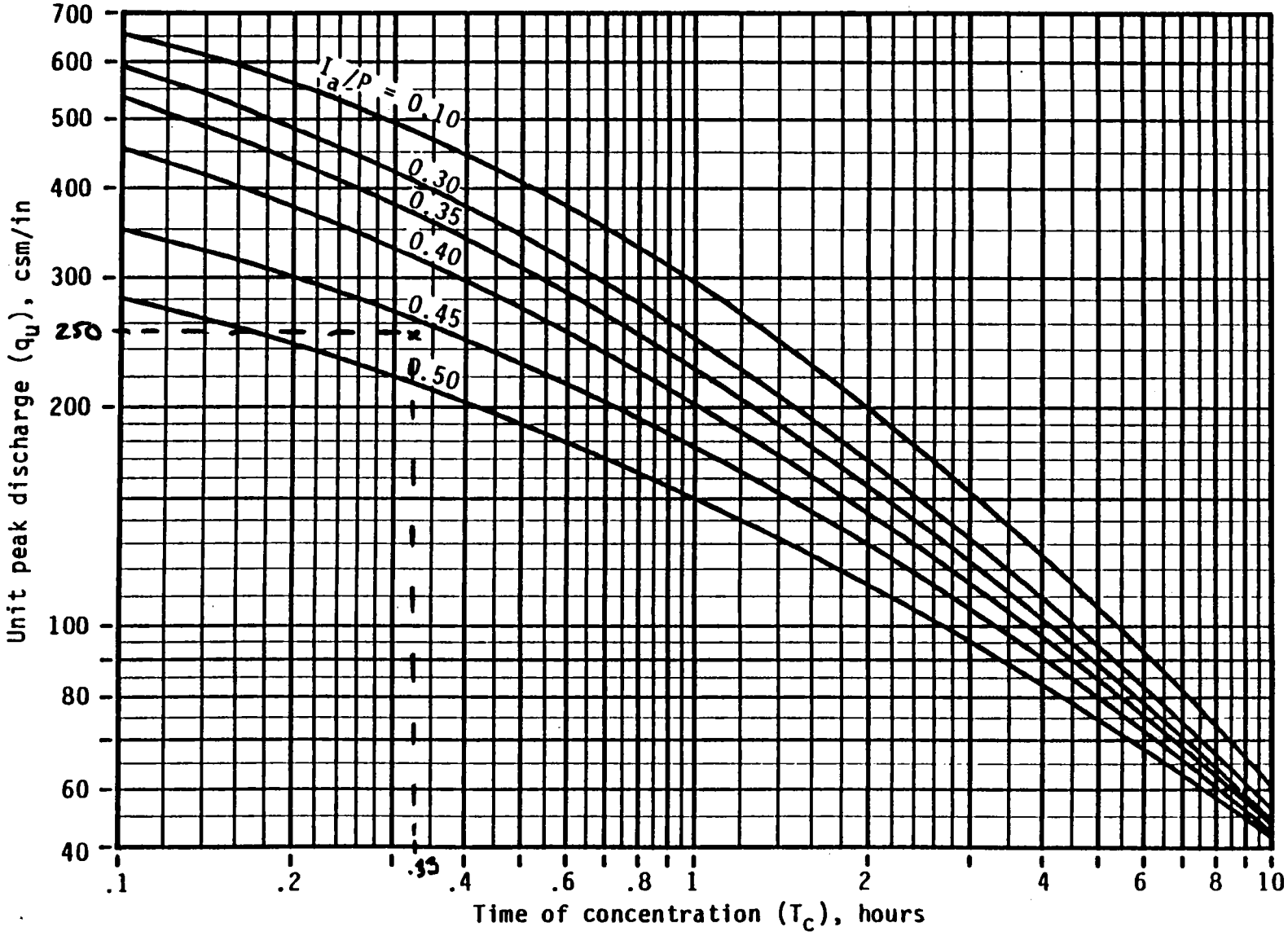
REFERENCE 2

Table 4-1.—I_a values for runoff curve numbers

Curve number	I_a (in)	Curve number	I_a (in)
40	3.000	70	0.857
41	2.878	71	0.817
42	2.762	72	0.778
43	2.651	73	0.740
44	2.545	74	0.703
45	2.444	75	0.667
46	2.348	76	0.632
47	2.255	77	0.597
48	2.167	78	0.564
49	2.082	79	0.532
50	2.000	80	0.500
51	1.922	81	0.469
52	1.846	82	0.439
53	1.774	83	0.410
54	1.704	84	0.381
55	1.636	85	0.353
56	1.571	86	0.326
57	1.509	87	0.299
58	1.448	88	0.273
59	1.390	89	0.247
60	1.333	90	0.222
61	1.279	91	0.198
62	1.226	92	0.174
63	1.175	93	0.151
64	1.125	94	0.128
65	1.077	95	0.105
66	1.030	96	0.083
67	0.985	97	0.062
68	0.941	98	0.041
69	0.899		

REFERENCE 2

Exhibit 4-III: Unit peak discharge (q_u) for SCS type III rainfall distribution



BY: KMS DATE: 10/31/97

CHECKED: BCR DATE: 11/3/97

PAGE 15 OF 15

REFERENCE 2

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT NSWC	JOB NUMBER 7602
SUBJECT DIVERSION CHANNEL SITE 5	
BASED ON FLOWMASTER	DRAWING NUMBER
BY KMS / CHECKED BY BER 11/5/97	APPROVED BY / DATE

OBJECTIVE: TO DETERMINE THE FLOW DEPTH AND REQUIRED DEPTH OF THE DIVERSION CHANNEL BASED ON CALCULATED FLOWS FROM DRAINAGE AREA.

APPROACH: BASED ON CALCULATED FLOW OF A 25 YEAR STORM FROM THE WATERSHED FLOW DEPTHS WERE DETERMINED USING FLOWMASTER. CALCULATION USED MANNINGS FORMULA FOR OPEN CHANNEL FLOW:

$$V = \frac{1.49}{n} R^{2/3} S^{1/2}$$

WHERE V = the mean velocity (ft/sec)
R = the hydraulic radius (ft)
S = the friction slope
n = manning's n

Conditions:
- THE CHANNEL IS TRAPEZOIDAL AND COMPOSED OF A STONY BOTTOM WITH 3:1 SIDE SLOPES.
- The channel has a 0.5 ft/ft slope
- The channel will carry a discharge of 11 ft^3/sec during a 25 year storm event.

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT NSWC	JOB NUMBER 7602
SUBJECT DIVERSION CHANNEL SITE 5	
BASED ON FLOWMASTER	DRAWING NUMBER
BY KMS / CHECKED BY BER 11/5/97	APPROVED BY / DATE

Analysis: THE Depth of flow was determined USING FLOWMASTER.

FLOWMASTER CALCULATED A DEPTH OF 0.50 Feet GIVEN THE 25 YEAR STORM EVENT DISCHARGE OF 11 ft^3/sec.

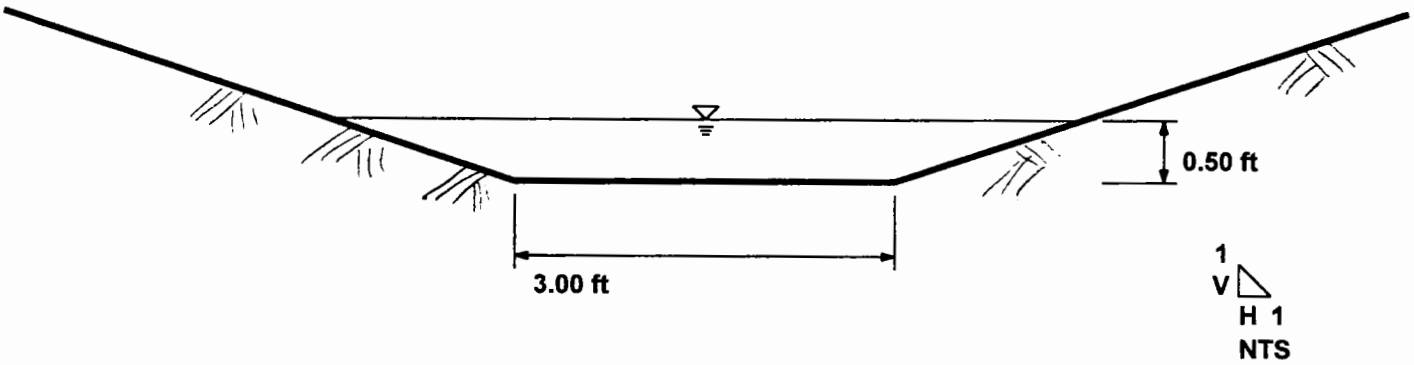
Conclusion

THE PROPOSED CONFIGURATION IS SHOWN ON THE FOLLOWING PAGE. VELOCITIES WERE DETERMINED TO BE 4.86 ft/sec AT A DEPTH OF 0.5 feet. A 0.5 foot free board IS DESIGNED FOR THE CHANNEL.

Diversion Channel for Earle Site 5
Cross Section for Trapezoidal Channel

Project Description	
Project File	n:\data\bbrf780\files\earle1.fm2
Worksheet	Diversion Swale for Site 5
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.035	
Channel Slope	0.050000	ft/ft
Depth	0.50	ft
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	3.00	ft
Discharge	11.00	ft^3/s



Diversion Channel Earle Site 5
Worksheet for Trapezoidal Channel

Project Description	
Project File	n:\data\bbrf780\files\earle1.fm2
Worksheet	Diversion Swale for Site 5
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Channel Slope	0.050000	ft/ft
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	3.00	ft
Discharge	11.00	ft^3/s

Results		
Depth	0.50	ft
Flow Area	2.26	ft^2
Wetted Perimeter	6.18	ft
Top Width	6.01	ft
Critical Depth	0.61	ft
Critical Slope	0.024397	ft/ft
Velocity	4.86	ft/s
Velocity Head	0.37	ft
Specific Energy	0.87	ft
Froude Number	1.40	
Flow is supercritical.		

Diversion Channel Earle Site 5
Worksheet for Trapezoidal Channel

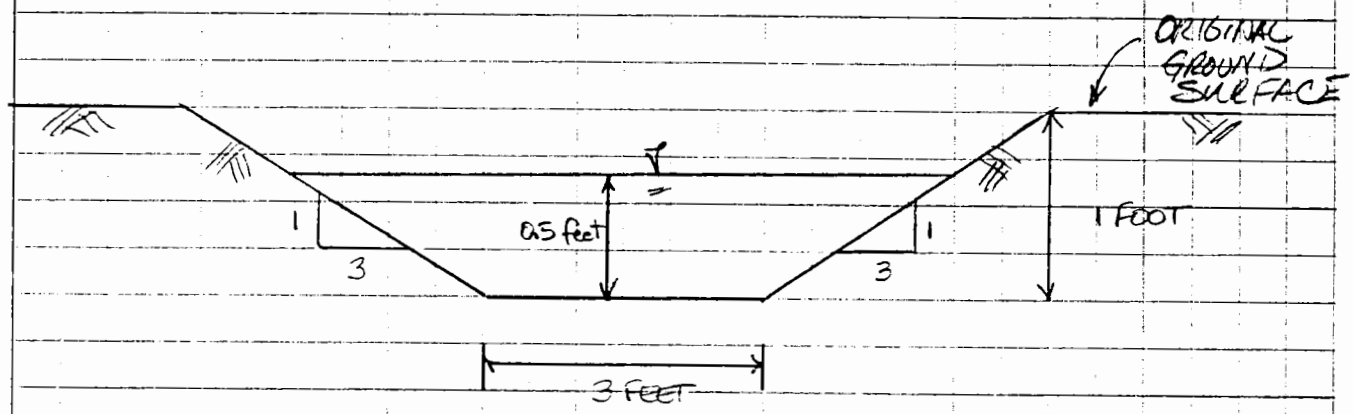
Project Description	
Project File	n:\data\bbrf780\files\earle1.fm2
Worksheet	Diversion Swale for Site 5
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.035	
Channel Slope	0.050000	ft/ft
Depth	1.00	ft
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	3.00	ft

Results		
Discharge	42.45	ft^3/s
Flow Area	6.00	ft^2
Wetted Perimeter	9.32	ft
Top Width	9.00	ft
Critical Depth	1.24	ft
Critical Slope	0.020225	ft/ft
Velocity	7.08	ft/s
Velocity Head	0.78	ft
Specific Energy	1.78	ft
Froude Number	1.53	
Flow is supercritical.		

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT NSWC	JOB NUMBER 7602
SUBJECT DIVERSION CHANNEL SITE 5	
BASED ON FLOW MASTER	DRAWING NUMBER
BY KMS / CHECKED BY BER 11/5/97	APPROVED BY / DATE



CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT NSWE	JOB NUMBER 7602
SUBJECT CALCULATION OF FLOW FROM AREAS AT SITE 5 TO CULVERTS	
BASED ON TR-55	DRAWING NUMBER

BY	CHECKED BY	APPROVED BY	DATE
KMS 11/03/97	BER 11/4/97		

OBJECTIVE: TO DETERMINE IF THE FLOW FROM A 25-YEAR STORM EVENT OFF THE LANDFILL WILL BE HANDLED BY THE TWO CULVERTS LOCATED AT SITE 5.

APPROACH: BASED ON CALCULATED FLOW FROM WATERSHED AREAS DETERMINE WHETHER THE CAPACITIES OF THE CULVERTS CAN HANDLE THE 25-YEAR STORM EVENT.

CONDITIONS:

CAPACITIES OF CULVERTS

SEE PREVIOUS CALCULATIONS "CULVERTS AT SITE 5", 11/03/97, BY KMS. →

CULVERT A $Q_A = 11.10$ ft³/sec ✓

CULVERT B $Q_B = 13.02$ ft³/sec ✓

COVER DESCRIPTIONS

GRAY AREAS: IMPERVIOUS / ASPHALT

WHITE AREAS: OPEN GRASS

CN FOR POST CONSTRUCTION = 61
(SOIL TYPE B / OPEN GRASS-GOOD CONDITION)

t_c = 5 minutes for Both Areas

Q based on a 25-year storm

Rainfall 6 inches

CLIENT NSWC	JOB NUMBER 7602		
SUBJECT			
BASED ON	DRAWING NUMBER		
BY KMS 11/03/97	CHECKED BY BER 11/4/97	APPROVED BY	DATE

ANALYSIS

ESTIMATE FLOW:

	AREA	SCALE	AREA
AREA X (p3/6)	6.60 in²	1" = 100'	1.51 Acres
ALL ASPHALT IN AREA X			CN = 98
AREA Z (p4/6)	2.17 m²	1" = 100'	0.50 Acres
ALL OPEN GRASS IN AREA Z			CN = 61

∴ AREA X 1.51 ACRES CN = 98 ✓

AREA Z 0.50 ACRES CN = 61 ✓

Assume t_c = 0.08 hours ✓

USING TR-55:

Q_X = 9 ft³/sec (see page 5/6) ✓

Q_Z = 2 ft³/sec (see page 6/6) ✓

Conclusion:

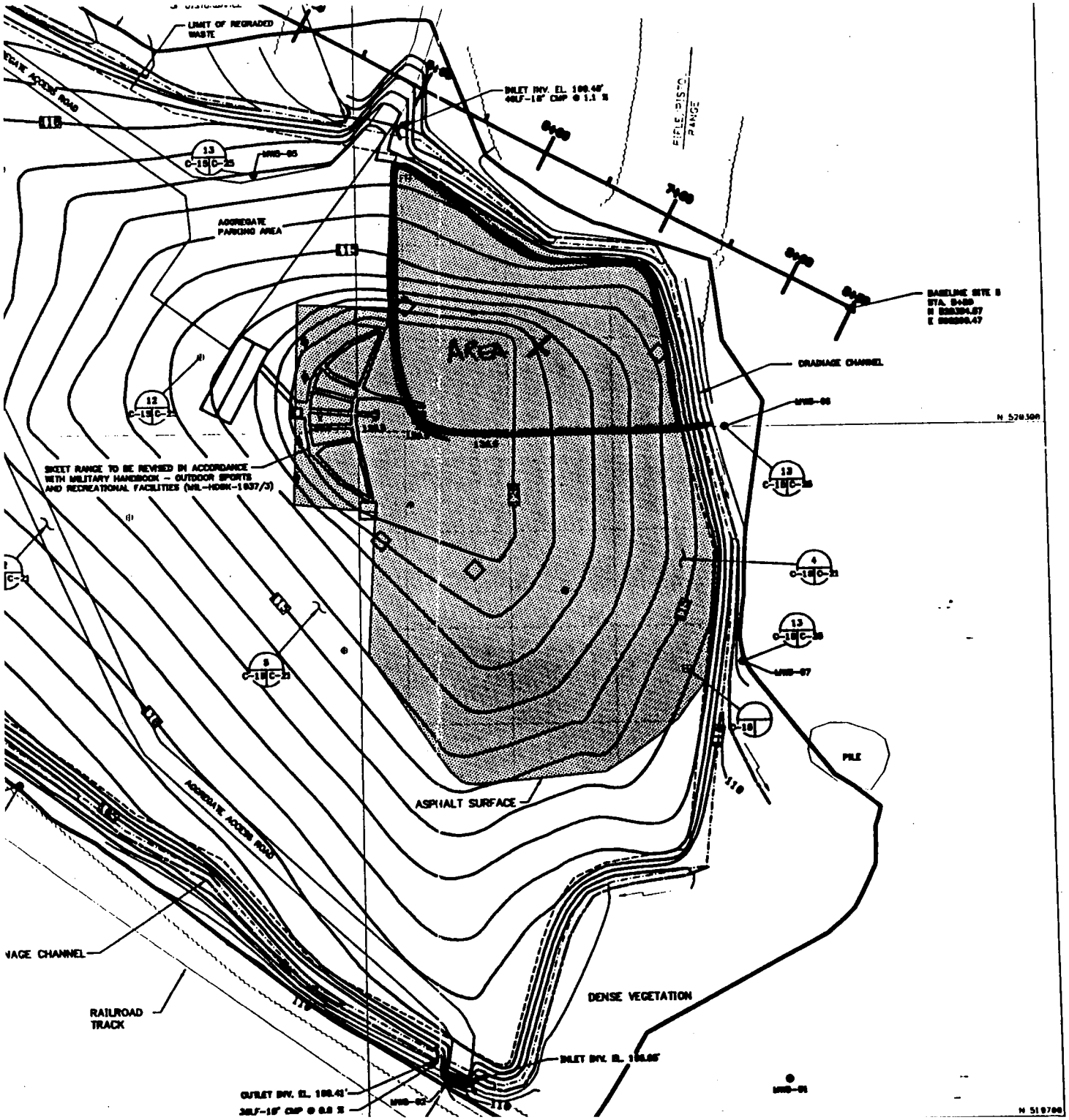
BASED ON CALCULATIONS THE CAPACITIES OF THE CULVERTS COMPARED TO THE PEAK FLOW DURING A 25-YEAR STORM ARE:

Q_A = 11.10 ft³/sec ✓ Q_X = 9 ft³/sec ✓

Q_B = 13.02 ft³/sec ✓ Q_Z = 2 ft³/sec ✓

REFERENCES:

1. HAESTAD METHODS - QUICK TR-55



LEGEND:
REFER TO T-2 FOR GENERAL LEGEND.

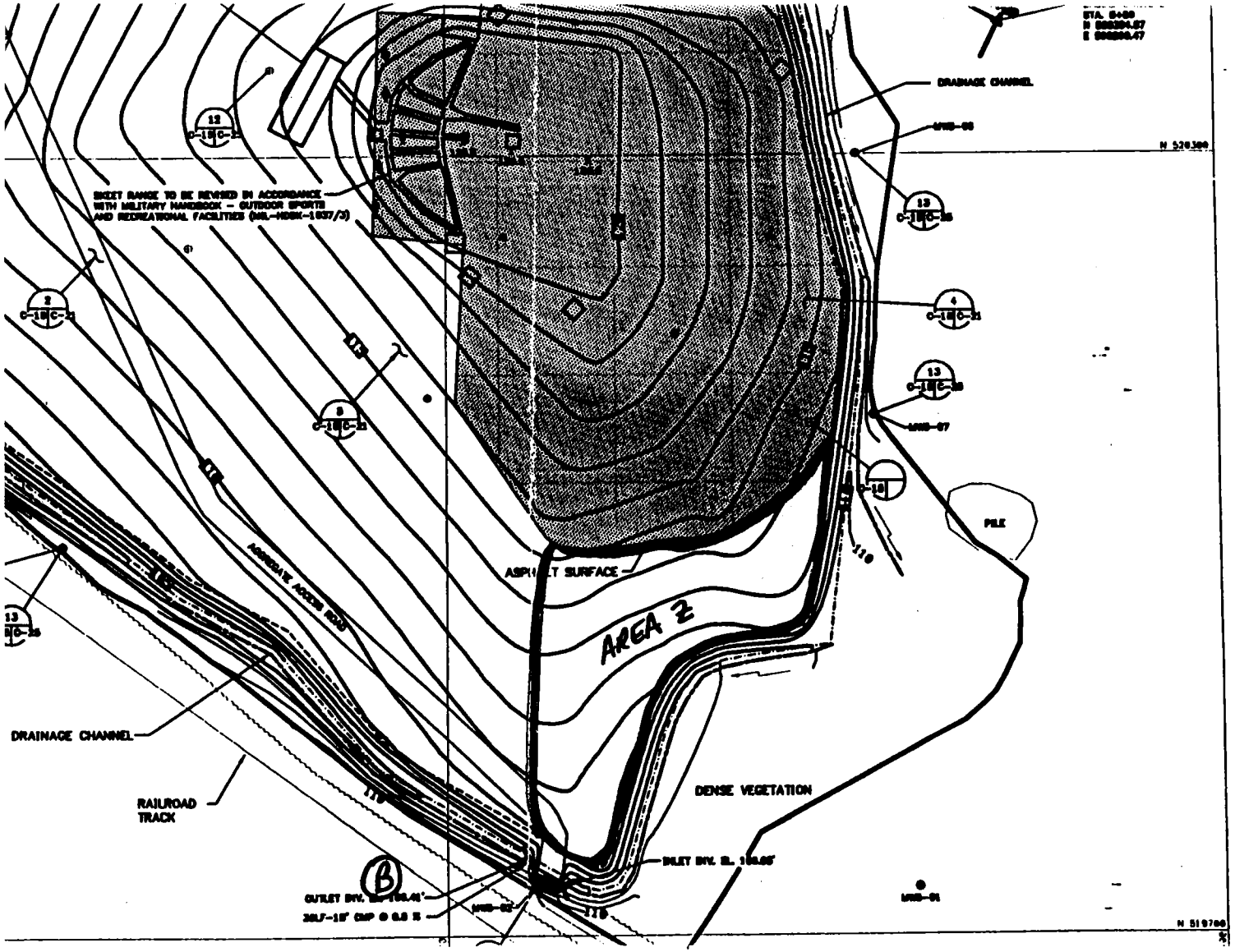
NOTES:
REFER TO T-2 FOR GENERAL NOTES.

SCALE IN FEET

REV	DESCRIPTION	PREP BY	DATE	APPRVD

By: KMS
DATE: 11/04/97
CHECKED: BER
DATE: 11/4/97

P 3/6



By KMS
Date 11/05/97

Checked: BER
Date: 11/5/97

Page 4 of 6

LEGEND
REFER TO T-2 FOR GENERAL LEGEND.

NOTES
REFER TO T-2 FOR GENERAL NOTES.

0 50 100
SCALE IN FEET
CHECK GRAPHIC SCALE BEFORE USING

By: KMS Checked: BER P 5/6
DATE: 11/04/97 DATE: 11/4/97

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NSWE Site 5 Area X

CALCULATED
DISK FILE: EARLE1 .GPD

Drainage Area	(acres)	1.51	--->	0.0024 sq.mi.
Runoff Curve Number	(CN)	98		
Time of Concentration, Tc	(hrs)	0.08		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	25		
Rainfall, P, 24-hr (in)	6		
Initial Abstraction, Ia (in)	0.041	0.041	0.041
Ia/p Ratio	0.007	0.000	0.000
Unit Discharge, * qu (csm/in)	686	0	0
Runoff, Q (in)	5.76	0.00	0.00
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	9	0	0

Summary of Computations for qu

Ia/p	#1	0.100	0.000	0.000
C0	#1	2.473	0.000	0.000
C1	#1	-0.518	0.000	0.000
C2	#1	-0.171	0.000	0.000
qu (csm)	#1	686.043	0.000	0.000
Ia/p	#2	0.100	0.000	0.000
C0	#2	2.473	0.000	0.000
C1	#2	-0.518	0.000	0.000
C2	#2	-0.171	0.000	0.000
qu (csm)	#2	686.043	0.000	0.000
* qu (csm)		686	0	0

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$
qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

REFERENCE #1

BY: KMS CHECKED: BER PAGE 9
DATE: 11/05/97 DATE: 11/5/97

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NSWE Site 5 Area Z

CALCULATED
DISK FILE: EARLE2 .GPD

Drainage Area	(acres)	0.5	--->	0.0008 sq.mi.
Runoff Curve Number	(CN)	80		
Time of Concentration,Tc	(hrs)	0.08		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	25		
Rainfall, P, 24-hr (in)	6		
Initial Abstraction, Ia (in)	0.500	0.500	0.500
Ia/p Ratio	0.083	0.000	0.000
Unit Discharge, * qu (csm/in)	686	0	0
Runoff, Q (in)	3.78	0.00	0.00
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
⇒ PEAK DISCHARGE, qp (cfs)	2	0	0

Summary of Computations for qu

Ia/p	#1	0.100	0.000	0.000
C0	#1	2.473	0.000	0.000
C1	#1	-0.518	0.000	0.000
C2	#1	-0.171	0.000	0.000
qu (csm)	#1	686.043	0.000	0.000
Ia/p	#2	0.100	0.000	0.000
C0	#2	2.473	0.000	0.000
C1	#2	-0.518	0.000	0.000
C2	#2	-0.171	0.000	0.000
qu (csm)	#2	686.043	0.000	0.000
* qu (csm)		686	0	0

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$
qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

REFERENCE #1

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT NSWE	JOB NUMBER 7602
SUBJECT CULVERTS AT SITE 5	
BASED ON FLOWMASTER	DRAWING NUMBER
BY KMS 11/03/97 / CHECKED BY BER 11/4/97	APPROVED BY / DATE

OBJECTIVE: CALCULATE CAPACITY OF 2 CULVERTS AT SITE 5.

APPROACH: BASED ON SIZE OF CULVERT PIPES DETERMINE CAPACITY USING FLOWMASTER (MANNING'S EQUATION)

CONDITIONS: 40 FOOT 18" PLASTIC PIPE WITH 1.1% SLOPE

30 FOOT 18" PLASTIC PIPE WITH 0.8% SLOPE

FOR PLASTIC PIPE $n = 0.011$

ANALYSIS: USING FLOWMASTER DETERMINE Q for each culvert at maximum flow depth = 1.5'

Conclusion:

$Q_A = 11.10$ ft³/sec for 30 LF Culvert ✓

$Q_B = 13.02$ ft³/sec for 40 LF Culvert ✓

REFERENCE:

USER'S GUIDE FOR FLOWMASTER, HAESTAD METHODS, INC., WATERBURY, CONNECTICUT, 1994.

p 2/3

BY: KMS DATE: 11/03/97
Checked: BER DATE: 11/

30 LF Culvert for Site 5
Worksheet for Circular Channel

Project Description	
Project File	n:\data\bbrf780\files\earle1.fm2
Worksheet	30LF 18" Culvert
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Input Data		
Mannings Coefficient	0.011	✓
Channel Slope	0.008000 ft/ft	✓
Diameter	1.50 ft	✓

Results		
Depth	1.50	ft
Discharge	11.10	ft^3/s
Flow Area	1.77	ft^2
Wetted Perimeter	4.71	ft
Top Width	0.00	ft
Critical Depth	1.28	ft
Percent Full	100.00	%
Critical Slope	0.007534	ft/ft
Velocity	6.28	ft/s
Velocity Head	0.61	ft
Specific Energy	FULL	ft
Froude Number	FULL	
Maximum Discharge	11.94	ft^3/s
Full Flow Capacity	11.10	ft^3/s
Full Flow Slope	0.008000	ft/ft

By: KMS DATE: 10/03
CHECKED: BER DATE: 11/4

40 LF Culvert Site 5
Worksheet for Circular Channel

Project Description	
Project File	n:\data\bbrf780\files\earle1.fm2
Worksheet	Culvert for Site 5
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Input Data		
Mannings Coefficient	0.011	
Channel Slope	0.011000	ft/ft
Diameter	1.50	ft

Results		
Depth	1.50	ft
Discharge	13.02	ft^3/s
Flow Area	1.77	ft^2
Wetted Perimeter	4.71	ft
Top Width	0.00	ft
Critical Depth	1.35	ft
Percent Full	100.00	%
Critical Slope	0.009673	ft/ft
Velocity	7.37	ft/s
Velocity Head	0.84	ft
Specific Energy	FULL	ft
Froude Number	FULL	
Maximum Discharge	14.01	ft^3/s
Full Flow Capacity	13.02	ft^3/s
Full Flow Slope	0.011000	ft/ft

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT NSWC	JOB NUMBER 7602
SUBJECT CULVERT DESIGN	
BASED ON HYDRAULIC DESIGN	DRAWING NUMBER
BY KMS 11/04/97 / CHECKED BY BER 11/5/97	APPROVED BY / DATE

OBJECTIVE: TO DETERMINE IF A 25-YEAR STORM EVENT WILL OVERTOP THE CULVERTS SPILLING ONTO THE ROAD.

APPROACH: CALCULATE THE CONTROL HEADWATER ELEVATION OF EACH CULVERT AND COMPARE TO THE ELEVATION OF THE ROADWAY. BASED ON HYDRAULIC DESIGN OF HIGHWAY CULVERTS BY THE U.S. DEPARTMENT OF TRANSPORTATION (DOT), SEPTEMBER 1985.

CONDITIONS:

CULVERT A
- 18" DIAMETER
- 40 LF
- OUTLET Elevation 109.04'
- INLET Elevation 109.48'
- FLOW 9 CFS

CULVERT B
- 18" DIAMETER
- 30 LF
- OUTLET ELEVATION 106.41'
- INLET ELEVATION 106.65'
- FLOW 2 CFS

ANALYSIS

USING CULVET DESIGN FORM FROM DOT, SEPTEMBER 1985.
PAGE 2 OF 8

PROJECT: NSWE - SITE 5

STATION: Culverts A / B

SHEET 1 OF

CULVERT DESIGN FORM

DESIGNER / DATE: KMS / 11/03/97

REVIEWER / DATE: BEK / 11/5/97

HYDROLOGICAL DATA

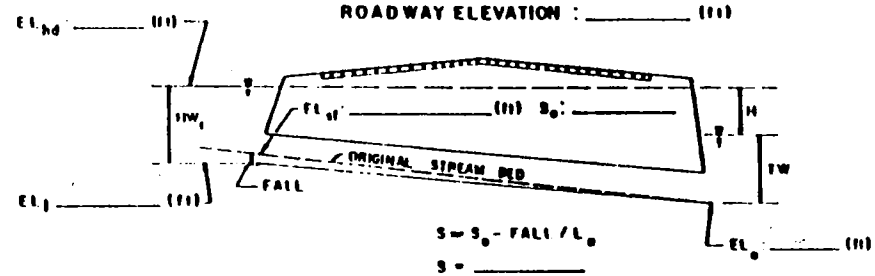
SEE ADD'L SHTS.

- [ ] METHOD RATIONAL
- [ ] DRAINAGE AREA: X [ ] STREAM SLOPE
- [ ] CHANNEL SHAPE
- [ ] ROUTING [ ] OTHER

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)
25	9	0
25	4	0

ROADWAY ELEVATION: (ft)



$S = S_o - FALL / L_o$

$S =$

$L_o =$

CULVERT DESCRIPTION: MATERIAL · SHAPE · SIZE ENTRANCE	TOTAL FLOW Q (cfs)	FLOW PER BARREL Q/N (1)	HEADWATER CALCULATIONS: INLET CONTROL HW i/D (2)	HW i	FALL (3)	EL hi (4)	OUTLET CONTROL TW (5)	dc	(dc+D)/2	ho (6)	ho	H (7)	EL ho (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
A: CIRCULAR PIPE 18"-D	9	9	—	0.85	0	110.33	0	1.2	1.35	1.35	0.5	0.85	111.2	111.2	5.08	
B: CIRCULAR PIPE 18"-D	2	2	—	0.4	0	107.05	0	0.6	1.05	1.05	0.5	0.04	107.5	107.5	1.13	

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) $HW_i/D = HW/D$ OR HW_i/D FROM DESIGN CHARTS

(3) $FALL = HW_i - (EL_{hd} - EL_{of})$; FALL IS ZERO FOR CULVERTS ON GRADE

(4) $EL_{hi} = HW_i + EL_i$ (INVERT OF INLET CONTROL SECTION)

(5) TW BASED ON DOWN STREAM CONTROL OR FLOW DEPTH IN CHANNEL.

(6) $h_o = TW$ or $(d_c + D/2)$ (WHICHEVER IS GREATER)

(7) $H = \left[1 + h_o + (29n^2 L)/R^{1.33}\right] V^2/2g$

(8) $EL_{ho} = EL_o + H + h_o$

SUBSCRIPT DEFINITIONS:

- a APPROXIMATE
- f CULVERT FACE
- hd DESIGN HEADWATER
- hi HEADWATER IN INLET CONTROL
- ho HEADWATER IN OUTLET CONTROL
- i INLET CONTROL SECTION
- o OUTLET
- of STREAMBED AT CULVERT FACE
- tw TAILWATER

COMMENTS / DISCUSSION:

CULVERT BARREL SELECTED:

SIZE:

SHAPE:

MATERIAL: n

ENTRANCE:

By: KMS Checked: BEK

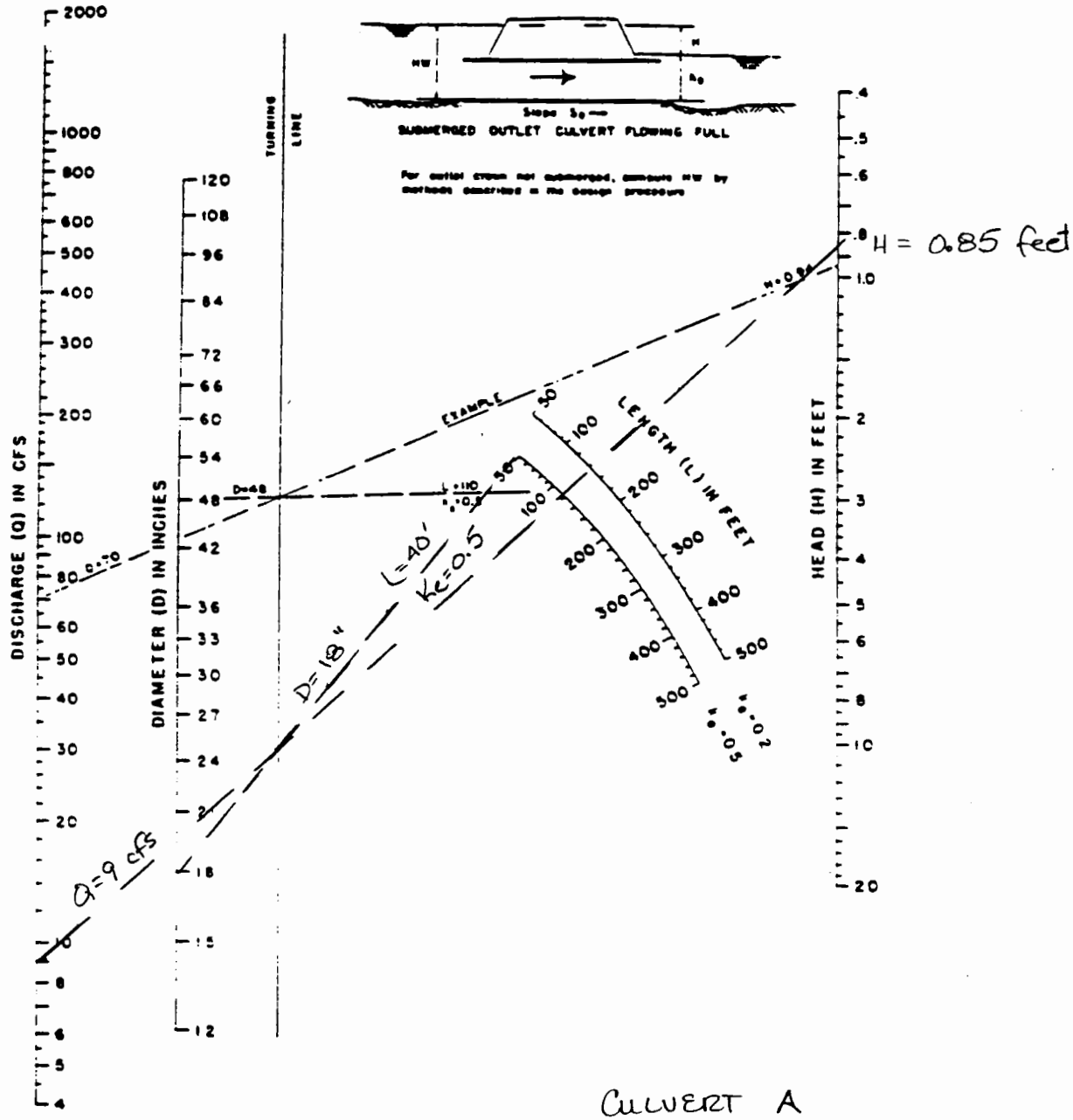
DATE: 11/04/97 DATE: 11/5/97

Page 2/8

REFERENCE #1

By: KMS Checked: BEK
DATE: 11/04/97 DATE: 11/5/97

CHART 5



CULVERT A

HEAD FOR
CONCRETE PIPE CULVERTS
FLOWING FULL
n = 0.012

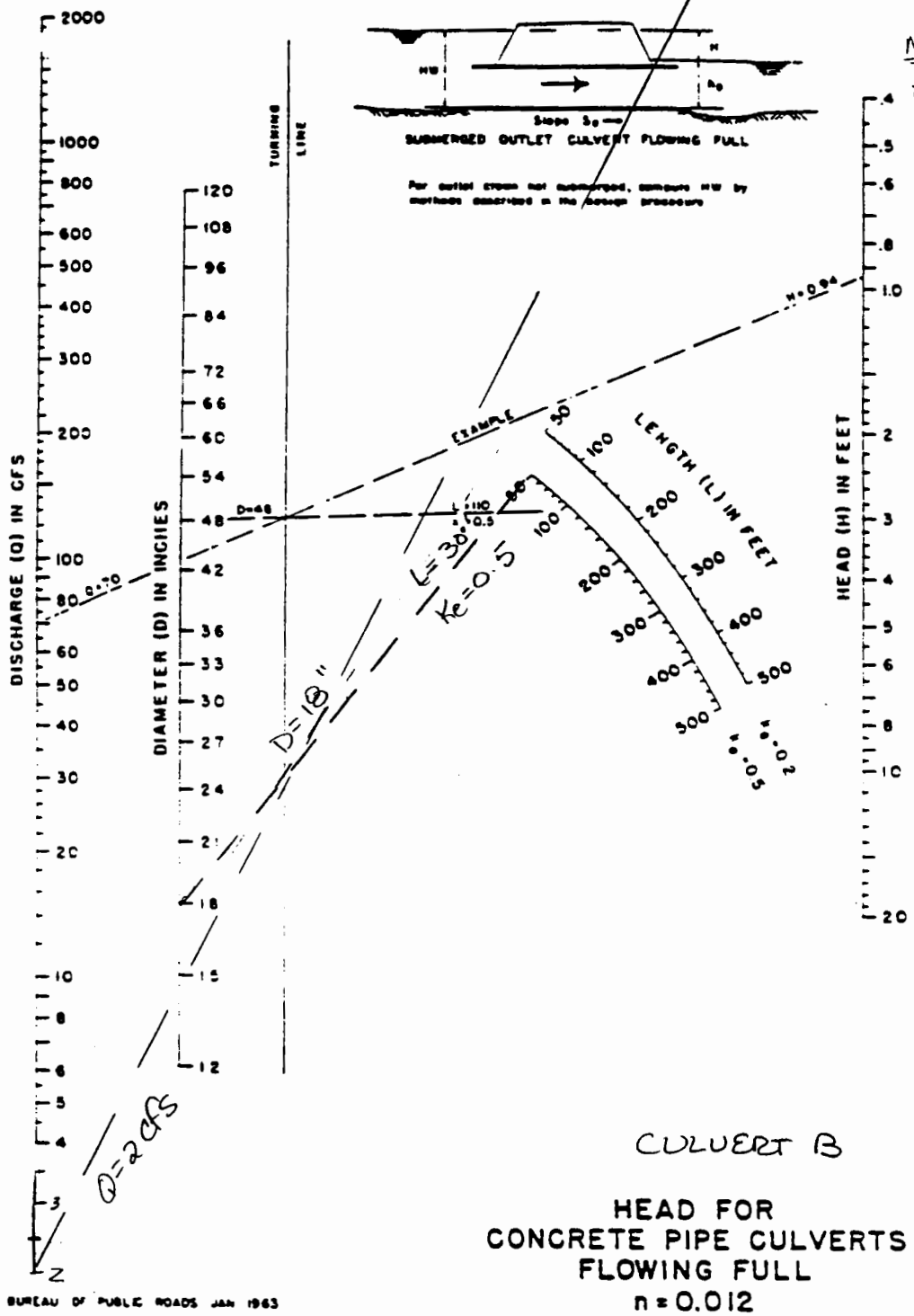
BUREAU OF PUBLIC ROADS JAN 1963

REFERENCE #1

By: KMS Checked: BER
DATE: 11/04/97 Date: 11/5/97

CHART 5

MIN:
H = 0.4 feet



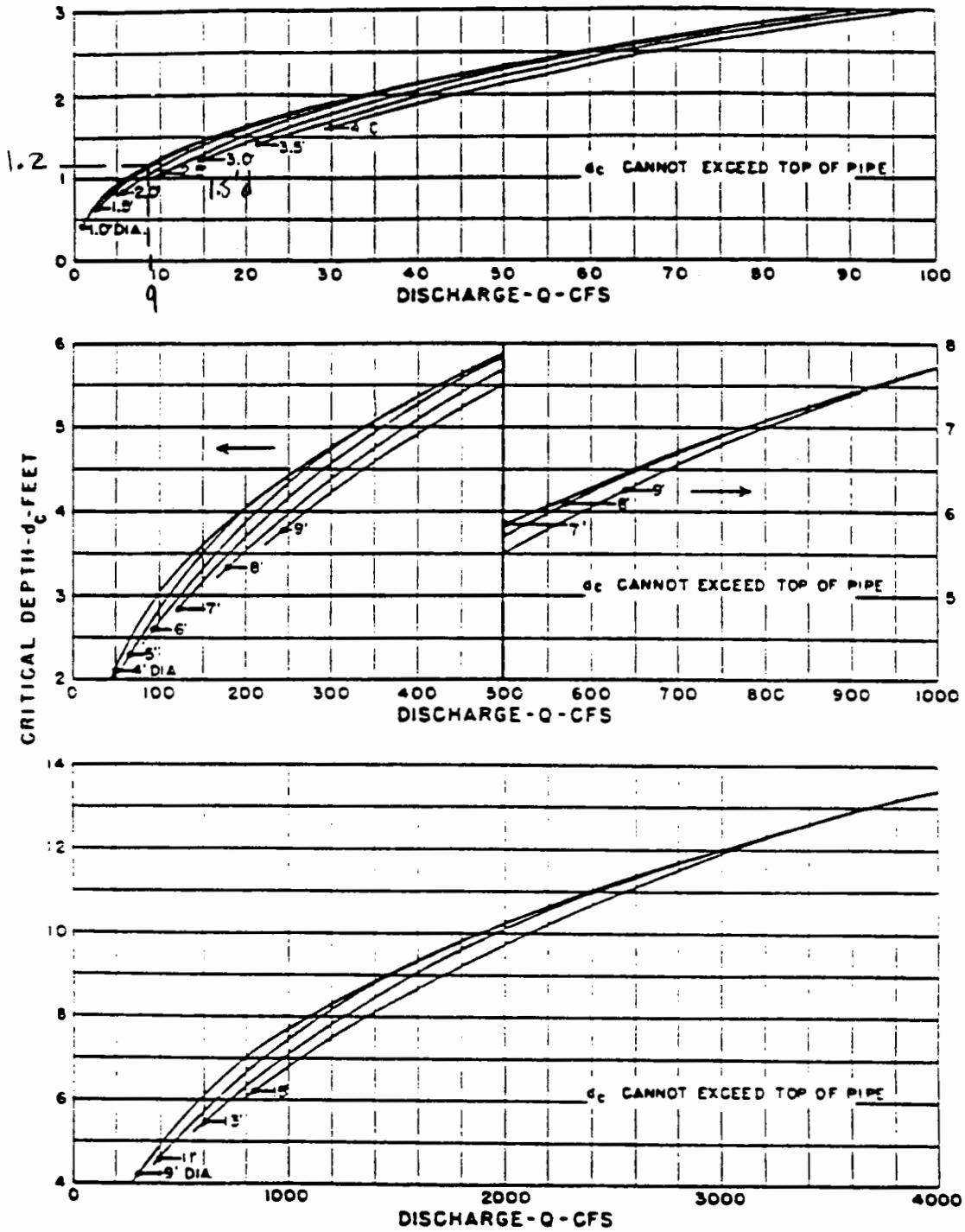
CULVERT B

HEAD FOR
CONCRETE PIPE CULVERTS
FLOWING FULL
n = 0.012

REFERENCE #1

By: KMS DATE: 11/04/97 CHECKED: BEK DATE: 11/5/97 page 5/8

CHART 4



BUREAU OF PUBLIC ROADS

JAN. 1964

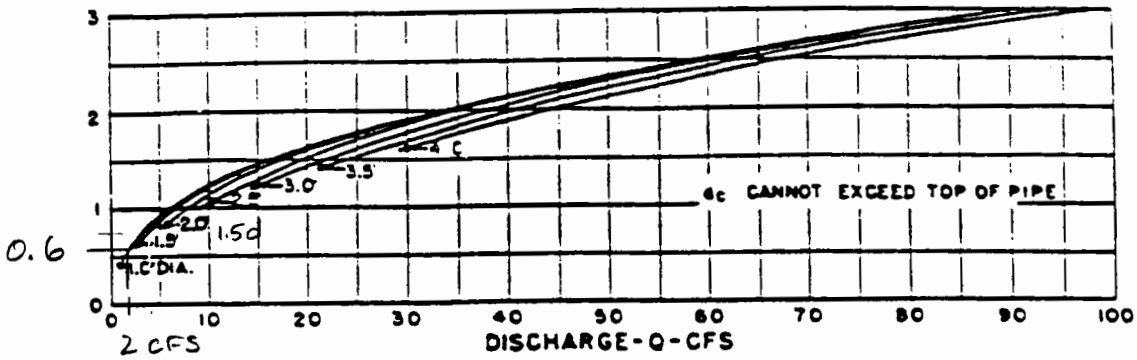
CULVERT A

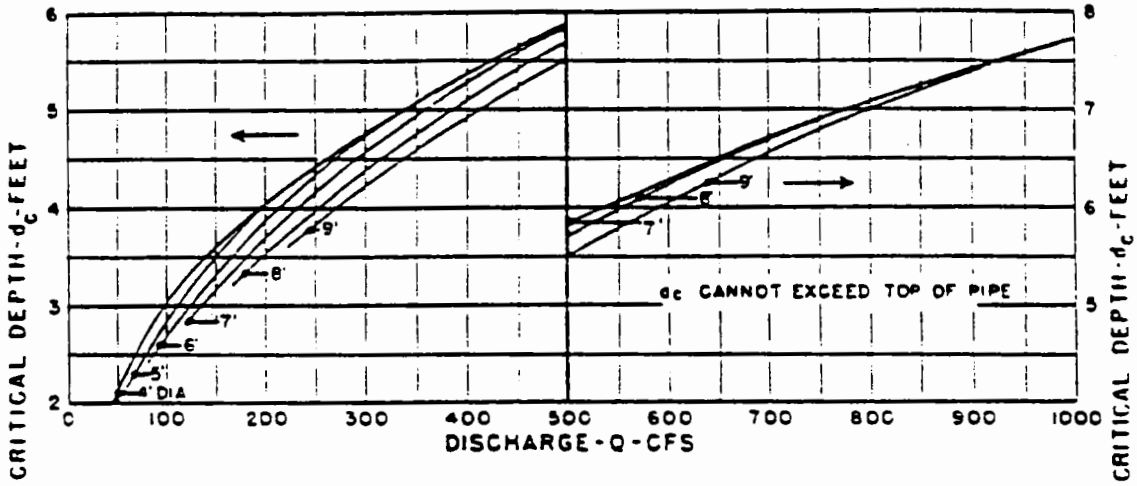
CRITICAL DEPTH
CIRCULAR PIPE

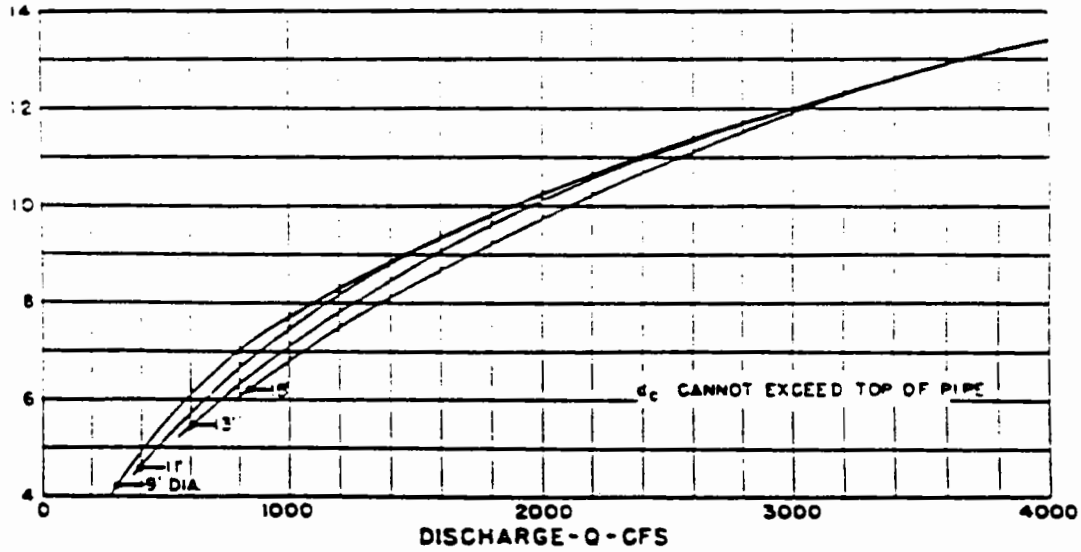
REFERENCE #1

BY. KMS CHECKED BER page 6/8
DATE 11/04/91 DATE: 11/5/97

CHART 4







BUREAU OF PUBLIC ROADS
JAN. 1964

CULVERT B

CRITICAL DEPTH
CIRCULAR PIPE

REFERENCE #1

BY: KMS CHECKED: BEK page 7/8
DATE: 11/04/97 DATE: 11/5/97

TABLE 12 - ENTRANCE LOSS COEFFICIENTS

Outlet Control, Full or Partly Full Entrance head loss

$$H_e = k_e \left(\frac{V^2}{2g} \right)$$

Type of Structure and Design of Entrance	Coefficient k_e
Pipe, Concrete	
Projecting from fill, socket end (groove-end)	0.2
Projecting from fill, sq. cut end	0.5
Headwall or headwall and wingwalls	
Socket end of pipe (groove-end)	0.2
Square-edge	0.5
Rounded (radius = 1/12D)	0.2
Mitered to conform to fill slope	0.7
*End-Section conforming to fill slope	0.5
Beveled edges, 33.7° or 45° bevels	0.2
Side-or slope-tapered inlet	0.2
Pipe, or Pipe-Arch, Corrugated Metal	
Projecting from fill (no headwall)	0.9 -.505
Headwall or headwall and wingwalls square-edge	0.5
Mitered to conform to fill slope, paved or unpaved slope	0.7
*End-Section conforming to fill slope	0.5
Beveled edges, 33.7° or 45° bevels	0.2
Side-or slope-tapered inlet	0.2
Box, Reinforced Concrete	
Headwall parallel to embankment (no wingwalls)	
Square-edged on 3 edges	0.5
Rounded on 3 edges to radius of 1/12 barrel dimension, or beveled edges on 3 sides	0.2
Wingwalls at 30° to 75° to barrel	
Square-edged at crown	0.4
Crown edge rounded to radius of 1/12 barrel dimension, or beveled top edge	0.2
Wingwall at 10° to 25° to barrel	
Square-edged at crown	0.5
Wingwalls parallel (extension of sides)	
Square-edged at crown	0.7
Side-or slope-tapered inlet	0.2

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

REFERENCE #1

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT NSWE	JOB NUMBER 7602
SUBJECT CULVERT DESIGN	
BASED ON HYDRAULIC DESIGN	DRAWING NUMBER
BY KMS 11/04/97 / CHECKED BY BER 11/5/97	APPROVED BY / DATE

Conclusion:

THE CONTROL HEADWATER ELEVATIONS FOR EACH CULVERT ARE:

CULVERT A 111.2 FEET

CULVERT B 107.5 FEET

THE ELEVATION OF THE ACCESS ROADS AT EACH CULVERT ARE:

AT CULVERT A: ELEVATION 112 FEET

AT CULVERT B: ELEVATION 109 FEET

THEREFORE, DURING A 25-YEAR STORM EVENT THE RAINFALL RUNOFF WOULD NOT FLOW OVER THE ROAD AT EITHER CULVERT A OR B.

REFERENCES

1.) HYDRAULIC DESIGN OF HIGHWAY CULVERTS, U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL HIGHWAY ADMINISTRATION, SEPTEMBER 1985

E.3 INLET GRATE CAPACITY CALCULATIONS - SITE 5

CLIENT NSWC	JOB NUMBER 7602
SUBJECT INLET GRATE CAPACITIES AT SITE 5	
BASED ON TR-55	DRAWING NUMBER
BY KMS 11/04/97 / CHECKED BY BER 11/5/97	APPROVED BY / DATE

OBJECTIVE: TO CALCULATE THE INLET GRATE CAPACITIES AT THE SITE 5 PARKING AREA.

APPROACH: FIRST, CALCULATE DRAINAGE AREAS TO EACH INLET FROM THE ASPHALT AREA. THEN, CALCULATE Q_{25} TO EACH INLET USING TR-55. FINALLY, CALCULATE WEIR FLOW AND ORIFICE FLOW FOR EACH INLET.

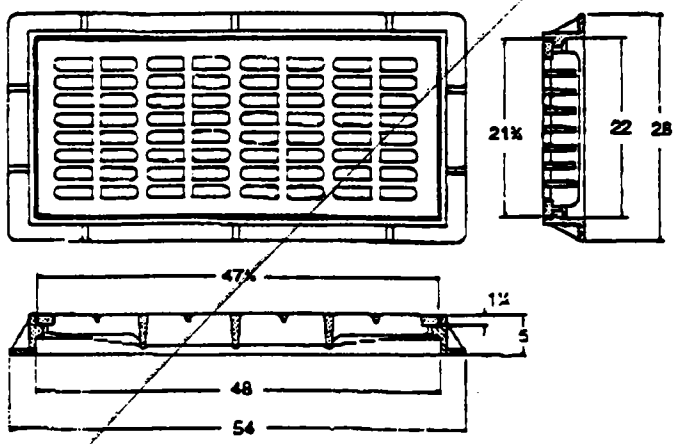
CONDITIONS:

- ASPHALT COVER CN = 98. ✓
- TIME OF Concentration T_c = 5 min. ✓
- ASSUME A HEAD OF 0.5 FEET. ✓
- DIMENSIONS OF INLET BASED ON STATE OF NEW JERSEY DEPARTMENT OF TRANSPORTATION PATTERN NUMBER 3432 (see page 2 of 8)
- HEIGHT OF CURB AROUND PARKING AREA IS 8 inches.
- FREQUENCY OF STORM = 25 YEARS ✓
- Rainfall (P) is 6 inches for 25 YEAR ✓
- Rainfall Distribution = TYPE III ✓

State of New Jersey
Department of Transportation

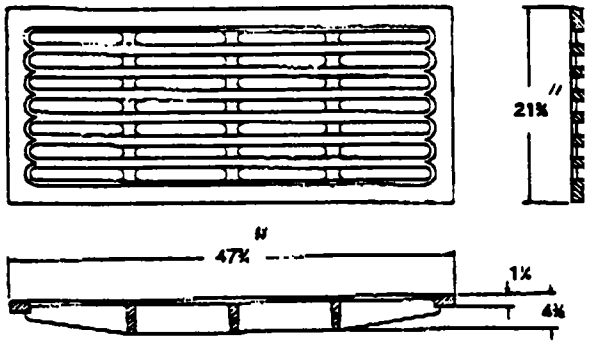
TYPE A INLET

BICYCLE GRATE



PATTERN NUMBER 3405

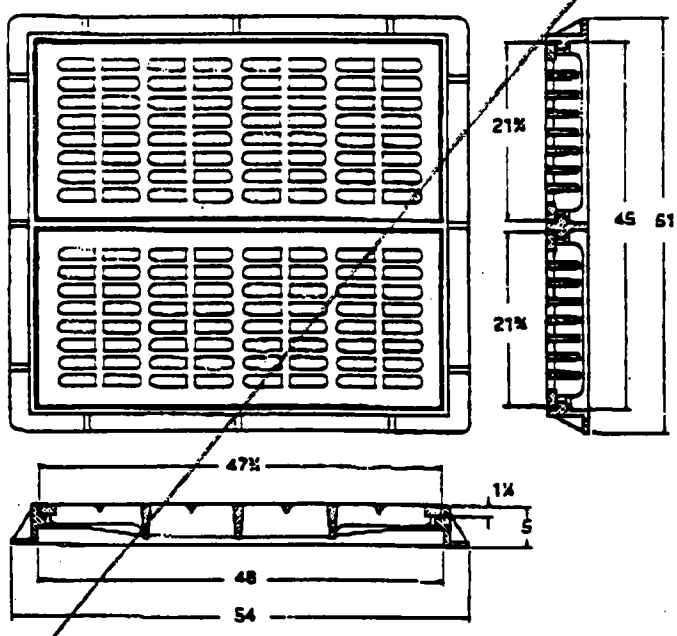
STREAM FLOW GRATE



PATTERN NUMBER 3432

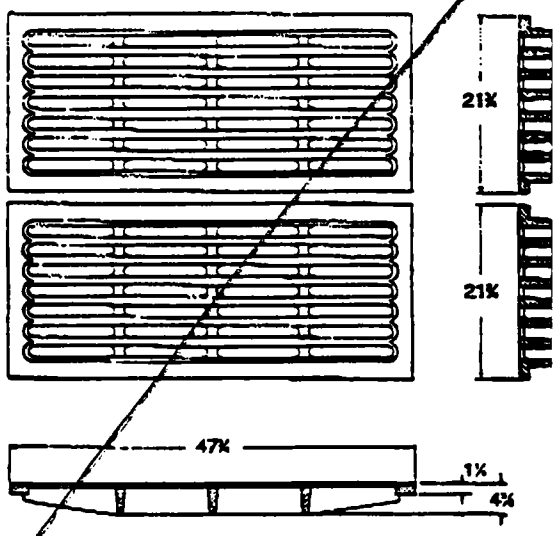
TYPE E INLET

BICYCLE GRATE



PATTERN NUMBER 3425

STREAM FLOW GRATE



PATTERN NUMBER 3440

CLIENT NSWC	JOB NUMBER 7602
SUBJECT INLET GRATE CAPACITIES AT SITE 5	
BASED ON TR-55	DRAWING NUMBER
BY KMS 11/04/97 / CHECKED BY BER 11/5/97	APPROVED BY / DATE

CALCULATIONS:

A. ESTIMATE FLOW. DETERMINE DRAINAGE AREAS

AREA A: 18.34 in² scale 1"=40' ⇒ 0.67 acres ✓
(see page 4 of 8 for Area)

AREA B: 32.77 in² scale 1"=40' ⇒ 1.2 acres ✓
(see page 4 of 8 for Area)

Assumed CN = 98 for an impervious layer ✓
T_C = 0.083 hours ✓

DETERMINE 25-YEAR STORM FLOWS FOR EACH AREA:
Q_A = 4 cfs ✓ (see page 5 AND 6 for TR-55
Q_B = 7 cfs ✓ spreadsheets)

B. CALCULATE WEIR FLOW AND ORIFICE FLOW.

INLET GRATE CAPACITIES ARE CALCULATED USING THE FOLLOWING EQUATIONS:

WEIR FLOW: $Q = CLH^{1.5}$

C = PAVED WEIR Coefficient = 3.1
L = Length of inlet frame exposed to flow (ft)
H = head (ft)

ORIFICE FLOW: $Q = CA(2gH)^{0.5}$

C = orifice coefficient = 0.60
A = open area of inlet grate (ft²)
g = gravitational constant H = head (ft)

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NSWE - Site 5 Landfill
Coltsneck, New Jersey
CTO 289: 7624
Parking Lot Drainage Area A

CALCULATED
DISK FILE: EARLE3 .GPD

Drainage Area	(acres)	0.67	--->	0.0010 sq.mi.
Runoff Curve Number	(CN)	98		
Time of Concentration,Tc	(hrs)	0.083		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	25		
Rainfall, P, 24-hr (in)	6		
Initial Abstraction, Ia (in)	0.041	0.041	0.041
Ia/p Ratio	0.007	0.000	0.000
Unit Discharge, * qu (csm/in)	682	0	0
Runoff, Q (in)	5.76	0.00	0.00
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs) $Q_A =$	$\boxed{4}$	0	0

Summary of Computations for qu

Ia/p	#1	0.100	0.000	0.000
C0	#1	2.473	0.000	0.000
C1	#1	-0.518	0.000	0.000
C2	#1	-0.171	0.000	0.000
qu (csm)	#1	682.355	0.000	0.000
Ia/p	#2	0.100	0.000	0.000
C0	#2	2.473	0.000	0.000
C1	#2	-0.518	0.000	0.000
C2	#2	-0.171	0.000	0.000
qu (csm)	#2	682.355	0.000	0.000
* qu (csm)		682	0	0

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$
$$qp\ (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond\ \&\ Swamp\ Adj.)$$

By: KMS Checked: BER
DATE: 11/04/97 DATE: 11/5/97

Quick TR-55 Version: 5.46 S/N:

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

NSWE - Site 5
Coltsneck, New Jersey
CTO 289: 7624
Parking Lot Drainage Area B

CALCULATED
DISK FILE: EARLE4 .GPD

Drainage Area	(acres)	1.2	--->	0.0019 sq.mi.
Runoff Curve Number	(CN)	98		
Time of Concentration,Tc	(hrs)	0.083		
Rainfall Distribution	(Type)	III		
Pond and Swamp Areas	(%)	0	--->	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	25		
Rainfall, P, 24-hr (in)	6		
Initial Abstraction, Ia (in)	0.041	0.041	0.041
Ia/p Ratio	0.007	0.000	0.000
Unit Discharge, * qu (csm/in)	682	0	0
Runoff, Q (in)	5.76	0.00	0.00
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	Q_B = 7	0	0

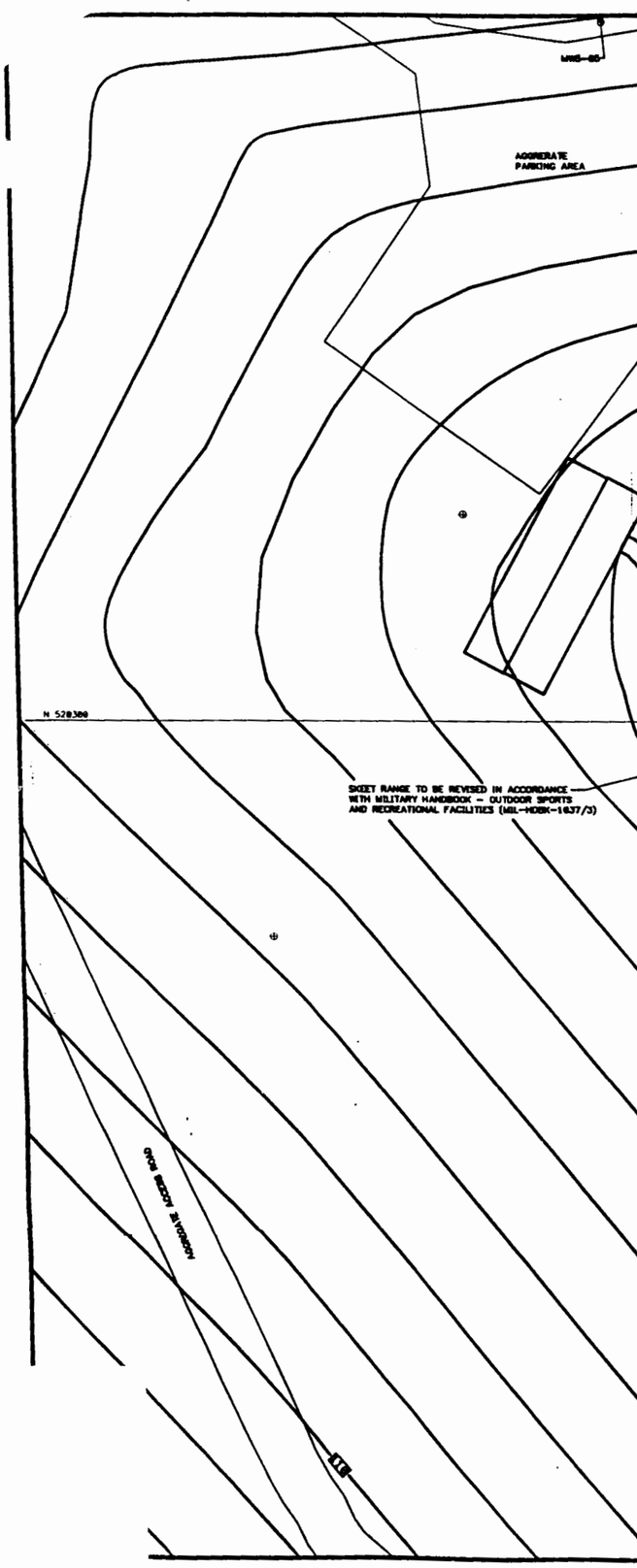
Summary of Computations for qu

Ia/p	#1	0.100	0.000	0.000
C0	#1	2.473	0.000	0.000
C1	#1	-0.518	0.000	0.000
C2	#1	-0.171	0.000	0.000
qu (csm)	#1	682.355	0.000	0.000
Ia/p	#2	0.100	0.000	0.000
C0	#2	2.473	0.000	0.000
C1	#2	-0.518	0.000	0.000
C2	#2	-0.171	0.000	0.000
qu (csm)	#2	682.355	0.000	0.000
* qu (csm)		682	0	0

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$
qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

By: KMS CHECKED: BEK
DATE: 11/04/97 DATE: 11/5/9


AGGREGATE
PARKING AREA
N 520300
SKEET RANGE TO BE REVISED IN ACCORDANCE
WITH MILITARY HANDBOOK - OUTDOOR SPORTS
AND RECREATIONAL FACILITIES (MIL-HDBK-1637/3)
ASPHALT ACCESS ROAD

CLIENT NSWE	JOB NUMBER 7602
SUBJECT INLET GRATE CAPACITIES AT SITE 5	
BASED ON TR-55	DRAWING NUMBER
BY KMS 11/04/97 / CHECKED BY BER 11/5/97	APPROVED BY / DATE

INLET 1:

25 YEAR PEAK DISCHARGE TO INLET 1 FROM AREA A = 4 cfs.

INLET GRATE CAPACITY

WIER FLOW: $Q = CLH^{1.5}$

$L = 47.75'' + 21.75'' + 21.75''$
$= 91.25'' = 7.6'$

$= (3.1)(7.6')(0.5')^{1.5}$

$Q = 8.3$ cfs $> Q_A$ 25 YR $= 4$ cfs

ORIFICE FLOW: $Q = CA(2gH)^{1/2}$

$A = \left(\frac{47.75}{12}\right)\left(\frac{21.75}{12}\right)$

$A = 7.2\ ft^2$

$= (0.6)(7.2)(2 \times 32.2 \times 0.5)^{1/2}$

$Q = 24.5$ cfs

INLET 2:

25 year PEAK DISCHARGE TO INLET 2 FROM AREA B = 7 CFS

INLET GRATE CAPACITY

WIER FLOW $Q = CLH^{1.5}$
$= 8.3$ cfs $>$ 7 CFS Q_B

ORIFICE FLOW $Q = CA(2gH)^{1/2}$
$= 24.5$ cfs

CLIENT NSWE	JOB NUMBER
SUBJECT INLET GRATE CAPACITIES AT SITE 5	
BASED ON TR-55	DRAWING NUMBER
BY KMS 11/04/97 / CHECKED BY BER 11/5/97	APPROVED BY / DATE

CONCLUSION

- INLET 1 IS IN WEIR OPERATION WITH A CAPACITY OF 8.3 cfs WHICH IS GREATER THAN THE PEAK DISCHARGE OF 4 cfs.
- INLET 2 IS IN WEIR OPERATION WITH A CAPACITY OF 8.3 cfs WHICH IS GREATER THAN THE PEAK DISCHARGE OF 7 cfs.