Canyon Fuel Company, LLC
A Subsidiary of Bowie Resource Holdings LLC

Dugout Canyon Mine
P.O. Box 1029
Wellington, Utah 84542
(435) 637-8360
Fax (435) 636-2697

June 1, 2015

Mr. Ken Hoffman
Permits & Compliance Section
Division of Water Quality
Utah Department of Environmental Quality
PO Box 144870
Salt Lake City, UT 84114-4870

Re: ADR Application

Dear Mr. Hoffman:

Please find Dugout's Antidegradation review form from the Utah Division of Water Quality.

If you have any questions or require further information, please contact me at (435) 636-2898.

Sincerely,

William King
Mining Engineer

Attachments

Document Date 6/5/2015
DWQ-2015-006804

ANTIDEGRADATION REVIEW FORM
UTAH DIVISION OF WATER QUALITY

Instructions

The objective of antidegradation rules and policies is to protect existing high quality waters and set forth a process for determining where and how much degradation is allowable for socially and/or economically important reasons. In accordance with Utah Administrative Code (UAC R317-2-3), an antidegradation review (ADR) is a permit requirement for any project that will increase the level of pollutants in waters of the state. The rule outlines requirements for both Level I and Level II ADRs, as well as public comment procedures. This review form is intended to assist the applicant and Division of Water Quality (DWQ) staff in complying with the rule but is not a substitute for the complete rule in R317-2-3.5. Additional details can be found in the *Utah Antidegradation Implementation Guidance* and relevant sections of the guidance are cited in this review form.

ADRs should be among the first steps of an application for a UPDES permit because the review helps establish treatment expectations. The level of effort and amount of information required for the ADR depends on the nature of the project and the characteristics of the receiving water. To avoid unnecessary delays in permit issuance, the Division of Water Quality (DWQ) recommends that the process be initiated at least one year prior to the date a final approved permit is required.

DWQ will determine if the project will impair beneficial uses (Level I ADR) using information provided by the applicant and whether a Level II ADR is required. The applicant is responsible for conducting the Level II ADR. For the permit to be approved, the Level II ADR must document that all feasible measures have been undertaken to minimize pollution for socially, environmentally or economically beneficial projects resulting in an increase in pollution to waters of the state.

For permits requiring a Level II ADR, this antidegradation form must be completed and approved by DWQ before any UPDES permit can be issued. Typically, the ADR form is completed in an iterative manner in consultation with DWQ. The applicant should first complete the statement of social, environmental and economic importance (SEEI) in Part C and determine the parameters of concern (POC) in Part D. Once the POCs are agreed upon by DWQ, the alternatives analysis and selection of preferred alternative in Part E can be conducted based on minimizing degradation resulting from discharge of the POCs. Once the applicant and DWQ agree upon the preferred alternative, the review is considered complete, and the form must be signed, dated, and submitted to DWQ.

For additional clarification on the antidegradation review process and procedures, please contact Nicholas von Stackelberg (801-536-4374) or Jeff Ostermiller (801-536-4370).

Antidegradation Review Form

Part A: Applicant Information

Facility Name: Dugout Canyon Mine

Facility Owner: Canyon Fuel Company, LLC

Facility Location: P.O. Box 1029, Wellinton, Utah, 84542

Form Prepared By: William King, Mining Engineer

Outfall Number: 007

Receiving Water: Unnamed Tributary to Grassy Trail Creek

What Are the Designated Uses of the Receiving Water (R317-2-6)?
Domestic Water Supply: None
Recreation: 2B - Secondary Contact
Aquatic Life: 3C - Nongame Fish
Agricultural Water Supply: 4
Great Salt Lake: None

Category of Receiving Water (R317-2-3.2, -3.3, and -3.4): Category 3

UPDES Permit Number (if applicable): UT0025593

Effluent Flow Reviewed: The sediment pond will be designed for a 100 year 24-hour event. Any discharge would be from an excessive event.
Typically, this should be the maximum daily discharge at the design capacity of the facility. Exceptions should be noted.

What is the application for? (check all that apply)

☒ A UPDES permit for a new facility, project, or outfall.

☐ A UPDES permit renewal with an expansion or modification of an existing wastewater treatment works.

☐ A UPDES permit renewal requiring limits for a pollutant not covered by the previous permit and/or an increase to existing permit limits.

☐ A UPDES permit renewal with no changes in facility operations.

Part B. Is a Level II ADR required?

This section of the form is intended to help applicants determine if a Level II ADR is required for specific permitted activities. In addition, the Executive Secretary may require a Level II ADR for an activity with the potential for major impact on the quality of waters of the state (R317-2-3.5a.1).

B1. The receiving water or downstream water is a Class 1C drinking water source.

☐ **Yes** A Level II ADR is required (Proceed to Part C of the Form)

☒ **No** (Proceed to Part B2 of the Form)

B2. The UPDES permit is new or is being renewed and the proposed effluent concentration and loading limits are higher than the concentration and loading limits in the previous permit and any previous antidegradation review(s).

☒ **Yes** (Proceed to Part B3 of the Form)

☐ **No** No Level II ADR is required and there is no need to proceed further with review questions.

B3. Will any pollutants use assimilative capacity of the receiving water, i.e. do the pollutant concentrations in the effluent exceed those in the receiving waters at critical conditions? For most pollutants, effluent concentrations that are higher than the ambient concentrations require an antidegradation review? For a few pollutants such as dissolved oxygen, an antidegradation review is required if the effluent concentrations are less than the ambient concentrations in the receiving water. (Section 3.3.3 of Implementation Guidance)

☒ **Yes** (Proceed to Part B4 of the Form)

☐ **No** No Level II ADR is required and there is no need to proceed further with review questions.

B4. Are water quality impacts of the proposed project temporary and limited (Section 3.3.4 of Implementation Guidance)? Proposed projects that will have temporary and limited effects on water quality can be exempted from a Level II ADR.

☐ **Yes** Identify the reasons used to justify this determination in Part B4.1 and proceed to Part G. No Level II ADR is required.

☒ **No** A Level II ADR is required (Proceed to Part C)

B4.1 Complete this question only if the applicant is requesting a Level II review exclusion for temporary and limited projects (see R317-2-3.5(b)(3) and R317-2-3.5(b)(4)). For projects requesting a temporary and limited exclusion please indicate the factor(s) used to justify this determination (check all that apply and provide details as appropriate) (Section 3.3.4 of Implementation Guidance):

☐ Water quality impacts will be temporary and related exclusively to sediment or turbidity and fish spawning will not be impaired.

Factors to be considered in determining whether water quality impacts will be temporary and limited:

a) The length of time during which water quality will be lowered:
b) The percent change in ambient concentrations of pollutants:
c) Pollutants affected:
d) Likelihood for long-term water quality benefits:
e) Potential for any residual long-term influences on existing uses:
f) Impairment of fish spawning, survival and development of aquatic fauna excluding fish removal efforts:

Additional justification, as needed:

Level II ADR

Part C, D, E, and F of the form constitute the Level II ADR Review. The applicant must provide as much detail as necessary for DWQ to perform the antidegradation review. Questions are provided for the convenience of applicants; however, for more complex permits it may be more effective to provide the required information in a separate report. Applicants that prefer a separate report should record the report name here and proceed to Part G of the form.

Optional Report Name:

Part C. Is the degradation from the project socially and economically necessary to accommodate important social or economic development in the area in which the waters are located?

The applicant must provide as much detail as necessary for DWQ to concur that the project is socially and economically necessary when answering the questions in this section. More information is available in Section 6.2 of the Implementation Guidance.

C1. Describe the social and economic benefits that would be realized through the proposed project, including the number and nature of jobs created and anticipated tax revenues.

The social and economic benefits realized through Dugout's Waste Rock Expansion are extensive. This Waste Rock Site receives waste refuse from Canyon Fuel Company's Castle Valley Preparation Plant. The Castle Valley Preparation Plant washes coal from all three Canyon Fuel Mines. In today's market coal quality is becoming increasingly important and essential to Canyon Fuel's success. Therefore the expansion of Dugout's Waste Rock Site directly effects all Canyon Fuel Mines at about 800 jobs.

C2. Describe any environmental benefits to be realized through implementation of the proposed project.

C3. Describe any social and economic losses that may result from the project, including impacts to recreation or commercial development.

We are unaware of any social or economic losses due to Dugout's Waste Rock Site Expansion.

C4. Summarize any supporting information from the affected communities on preserving assimilative capacity to support future growth and development.

Canyon Fuel Company's current workforce has and will continue to have a positive overall impact on affected communities. With the coal mining industry slowing down and shutting doors it has negatively affected many communities.

Canyon Fuel Company has remained strong and increased capacity providing the jobs necessary to support the affected communities. Overall, impacts to existing infrastructure from added employees will be neutral since our workforce expansion is primarily from existing residents. Without the jobs provided by Canyon Fuel Company, the unemployment rate would be worse than it is currently, adding to the strain of the state and local resources.

C5. Please describe any structures or equipment associated with the project that will be placed within or adjacent to the receiving water.

The new outfall in our permit will have an adjacent sediment treatment pond designed for a 100 year 24 hour event.

Part D. Identify and rank (from increasing to decreasing potential threat to designated uses) the parameters of concern. *Parameters of concern are parameters in the effluent at concentrations greater than ambient concentrations in the receiving water. The applicant is responsible for identifying parameter concentrations in the effluent and DWQ will provide parameter concentrations for the receiving water. More information is available in Section 3.3.3 of the Implementation Guidance.*

Parameters of Concern:

Rank	Pollutant	Ambient Concentration	Effluent Concentration
1	TDS		<2,400 mg/l/day
2	TSS		<70 mg/l/day
3	PH		between 6.5-9
4	Oil & Grease		<10 mg/l/day
5			

Pollutants Evaluated that are not Considered Parameters of Concern:

Pollutant	Ambient Concentration	Effluent Concentration	Justification

Part E. Alternative Analysis Requirements of a Level II Antidegradation Review.

Level II ADRs require the applicant to determine whether there are feasible less-degrading alternatives to the proposed project. More information is available in Section 5.5 and 5.6 of the Implementation Guidance.

E1. The UPDES permit is being renewed without any changes to flow or concentrations. Alternative treatment and discharge options including changes to operations and maintenance were considered and compared to the current processes. No economically feasible treatment or discharge alternatives were identified that were not previously considered for any previous antidegradation review(s).

☐ **Yes** (Proceed to Part F)

☒ **No or Does Not Apply** (Proceed to E2)

E2. Attach as an appendix to this form a report that describes the following factors for all alternative treatment options (see 1) a technical description of the treatment process, including construction costs and continued operation and maintenance expenses, 2) the mass and concentration of discharge constituents, and 3) a description of the reliability of the system, including the frequency where recurring operation and maintenance may lead to temporary increases in discharged pollutants. Most of this information is typically available from a Facility Plan, if available.

Report Name: *Appendix A and B*

E3. Describe the proposed method and cost of the baseline treatment alternative. The baseline treatment alternative is the minimum treatment required to meet water quality based effluent limits (WQBEL) as determined by the preliminary or final wasteload analysis (WLA) and any secondary or categorical effluent limits.

Report Name: Appendix A and B

E4. Were any of the following alternatives feasible and affordable?

Alternative	Feasible	Reason Not Feasible/Affordable
Pollutant Trading	Yes	Participating in Colorado Salinity Project
Water Recycling/Reuse	No	Remote Location
Land Application	No	Infeasible due to storm events
Connection to Other Facilities	No	Location remote not feasible
Upgrade to Existing Facility	No	The current facility is being upgraded
Total Containment	No	Not feasible due to unpredictible storm events
Improved O&M of Existing Systems	No	Project is an upgrade to existing facility
Seasonal or Controlled Discharge	No	Existing project is a seasonal project for discharge
New Construction	No	The project is new contruction
No Discharge	No	Not feasible due to possible large strom events

E5. From the applicant's perspective, what is the preferred treatment option?

The perferred treatment option is to provide a sediment pond for a 100 year 24 hour event. This would be the least degrading alternative.

E6. Is the preferred option also the least polluting feasible alternative?

☒ **Yes**

☐ **No**

If no, what were less degrading feasible alternative(s)? ☐

If no, provide a summary of the justification for not selecting the least polluting feasible alternative and if appropriate, provide a more detailed justification as an attachment.

☐

Part F. Optional Information

F1. Does the applicant want to conduct optional public review(s) in addition to the mandatory public review? Level II ADRs are public noticed for a thirty day comment period. More information is available in Section 3.7.1 of the Implementation Guidance.

☒ **No**

☐ **Yes**

F2. Does the project include an optional mitigation plan to compensate for the proposed water quality degradation?

☐ **No**

☒ **Yes**

Report Name: As Part of UPDES UT0025593, Dugout Canyon Mine participates in a Colorado River Salinity Offset program administered by the Utah Division of Water Quality (DWQ). Dugout Canyon Mine contributes monies through the DWQ to a fund established by the Colorado River Basin Salinity Control Forum for the purpose of defraying the cost of construction and operation of specific salinity offset project within the Colorado River Basin. The amount of the contribution to the Salinity Offset program is based on the concept of offsetting the net discharge of TDS (salt) from the Dugout Canyon Mine (total number of tons of TDS (salt) minus the permitted TDS tons Dugout anticipated discharging on a daily basis) against a "bank" of tons of TDS determined by the cost of removal of a similar number of tons of TDS from the Colorado River system. The cost per ton allocated to the bank is based on the cost of removing a ton of salt from the Price River Drainage through the construction and implementation of improved irrigation and irrigation water delivery systems.

Part G. Certification of Antidegradation Review

G1. Applicant Certification

The form should be signed by the same responsible person who signed the accompanying permit application or certification.

Based on my inquiry of the person(s) who manage the system or those persons directly responsible for gathering the information, the information in this form and associated documents is, to the best of my knowledge and belief, true, accurate, and complete.

Print Name: David Spillman

Signature: David Spillman

Date: 6/1/15

G2. DWQ Approval

To the best of my knowledge, the ADR was conducted in accordance with the rules and regulations outlined in UAC R-317-2-3.

Water Quality Management Section

Print Name: _____

Signature: _____

Date: _____

Appendix A

E2.

The treatment process considered are a sediment pond for a 25 year 6 hour event, a sediment pond for a 100 year 6 hour event and a sediment pond for a 100 year 24 hour event. Dugout has chosen to provide a sediment pond designed for a 100 year 24 hour event. See Appendix B for the technical description, treatment process and the mass and concentration of the discharge constituents to the pond and the reliability of the system for all three options. The new sediment pond will receive quarterly inspections and one annual pond certification.

E3.

The baseline treatment would be to provide a sediment pond (Appendix B) for a 25 year 6 hour event. Discharges of water from disturbed areas will be in compliance with all Utah and federal water quality laws and regulations and with effluent limitations for coal mining contained in the 40 CFR part 434. All sediment control measures, impoundments and discharge structures will be located, maintained, constructed and reclaimed according to plans and designs presented in Sections 732, 742 and 760 of the approved M & RP.

Appendix B

Dugout Canyon Mine
Refuse Pile
Runoff and Sediment Control Design Report
DRAFT

Canyon Fuel Company
Dugout Mine
Wellington, Utah

August 2013

EarthFax EarthFax Engineering, Inc.

Engineers / Scientists
www.earthfax.com

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DUGOUT CANYON MINE
REFUSE PILE
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CHAPTER 1
INTRODUCTION

Canyon Fuel Company is planning the expansion of and existing refuse pile to service the Dugout Canyon Mine and other Canyon Fuel Company facilities. The refuse pile is located on Dugout Canyon Road 8 miles northwest of Wellington, Utah. To prevent adverse hydrologic impacts to the surrounding area, the mine will add to the existing runoff and sediment control system with additional berms, ditches, a swale, and a sedimentation pond.

The purpose of this document is to present design information for the runoff and sediment controls. A ditch and swale system will be installed around the perimeter of the refuse pile to contain sediment and runoff discharges from the disturbed areas and direct runoff into sedimentation ponds. Additionally a berm system will be installed to divert upstream runoff and sediment around the site. The runoff and sediment controls have been designed to conform to the applicable criteria outlined in the Utah Administrative Code Titles R645-300 and 301. However, Dugout Mine has requested that the berms, ditches, swales, and sedimentation ponds be designed to safely convey and detain a 100 year, 24 hour event and not the required 100 year, 6 hour event. This document has been prepared for Canyon Fuel Company by EarthFax Engineering Group, LLC, and contains the following information:

- Location and background information;
- Hydrologic analyses to determine runoff and sediment discharge for both the regulator design storm event and the requested design storm event;
- Sediment control design criteria;
- Berms, ditches, swale, and sedimentation pond construction drawings.

Engineering calculations are included as an attachment to this document.

CHAPTER 2
LOCATION AND BACKGROUND INFORMATION

The general layout of the proposed operational refuse pile is shown on Sheet 1. The total developed watershed includes the boundary of the refuse pile, approximately 19.976 acres. An existing ditch along the west and north side of the refuse pile will divert all upstream runoff around the refuse pile. An existing sedimentation pond (SP-1) has been evaluated to insure it will safely control a 100-year, 24-hour event for the proposed refuse pile layout. The access road for SP-1 and drainage ditch 5 (DD-5) will be moved to allow for expansion of the refuse pile. Due to grading and elevations at the site a proposed operational secondary sedimentation pond (SP-2) will need to be constructed. SP-2 and the proposed operational ditches along the north and east side (DD-1 through DD-4 and DS-1) will be constructed to safely convey and detain the 100-year, 24-hour event. During the first stages of expansion the area contributing runoff to SP-2 will be larger than the final stages; due to this several watersheds will appear to overlap. Two constructed berms north and west of SP-2 will direct undisturbed runoff around the pond. Some of the area to be developed for the expansion of the refuse pile has not been previously developed. The topsoil will be removed and stockpiled on-site. Some of the material will be used to provide contemporaneous remediation along the northeast side of the refuse pile.

The storm water runoff and sedimentation system has been designed to safely convey site runoff as specified in the Utah Administrative Code Titles R645-301-742 and 751. Thus, the conveyance systems have been designed to comply with the following criteria:

- The conveyance system will safely convey and detain the runoff from a 100-year, 24-hour storm event due to a design request from Dugout Canyon Mine.
- The conveyance system will be evaluated for compliance to 100-year, 6-hour event.
- All of the side slopes of the refuse pile along the berm have been designed to prevent degradation and erosion of the refuse pile.
- Sedimentation ponds, berms, ditches, and swale will be installed according to engineering specifications.

CHAPTER 3
OPERATIONAL HYDROLOGY

3.1 Hydrology Introduction

Storm water discharge for the area was calculated using HydroCAD version 10.00. The curve number (CN) value used was assigned for the site soil types and type of development. According to Natural Resources Conservation Service a majority of the native soil types are categorized as Hydrologic Soil Group B soils. Due to the site being a refuse pile no vegetation is assumed to be left in the developed areas. Although some contemporaneous reclamation will occur as the site is developed, the operational hydrological design assumes that no contemporaneous reclamation will occur. Due to this all non-pond disturbed areas are assumed to have a CN value of 86 and pond areas have a CN value of 98. Undeveloped and reclaimed areas have or will have Pinyon and Juniper forested areas with sage brush in poor condition. Therefore, a conservative CN value of 71 was used within these areas.

Design storm magnitudes were taken from the National Oceanic and Atmospheric Administration (NOAA) ATLAS 14, Point Precipitation Frequency Estimates web page (http://hdsc.nws.noaa.gov/hdsc/pfds/sa/ut_pfds.html). Site watershed areas and average slopes were calculated from 1-foot contour interval topographic map provided by Dugout Canyon Mine using AutoCAD 2014 software. All storm runoff calculations are included in Attachment A.

3.2 Drainage Area Characteristics

The drainage area contributing to the refuse pile watershed is delineated in Sheet 6 for operational watersheds and Sheet 10 for reclaimed watersheds. The area draining to the sedimentation ponds, ditches and swale will include all of the refuse pile. In addition the unpaved portions of the haul road, SP-1 access road, and approximately 0.05 acres of

undisturbed area that cannot be reasonably diverted will also contribute runoff and sediment to the sedimentation ponds.

Developed Watershed-1 (DW-1) consists of the 0.535 acres at the northwest corner of the refuse pile that drains into Drainage Ditch 1(DD-1) and includes a portion the SP-1 access road. The slopes within DW-1 range from 1-50% with a majority of the slopes at 50%.

DW-2 consists of the 2.270 acres at the northwest corner of the refuse pile that drains into DD-2 and includes the haul road from the top of the refuse pile to the intersection with the SP-1 access road. The slopes within DW-2 range from 5-50% with a majority of the slopes at 50%.

DW-3 consists of the 5.527 acres along the west side of the refuse pile that drains into DD-5 and includes a majority of the SP-1 access road to the top of the refuse pile. The slopes within DW-3 range from 1-50% with a majority of the slopes at 50%.

DW-4 consists of the 6.083 acres along the northeast corner of the refuse pile that drains into DD-3 and DD-4. The slopes within DW-4 range from 5-50% with a majority of the slopes at 50%.

DW-5 consists of the 4.686 acres along the southeast corner of the refuse pile that drains directly into SP-2. During the first stages of expansion the area contributing to SP-2 will include a portion of what will later become DW-3 and DW-6. The slopes within DW-5 range from 5-50% with a majority of the slopes at 50%.

DW-6 consists of the 0.626 acres along the south side of the refuse pile that drains directly into SP-1. The slopes within DW-6 range from 33-50% with a majority of the slopes at 50%.

DW-7 consists of the 0.606 acres included in SP-2 assuming the pond is full to capacity.

DW-8 consists of the 0.207 acres west, south, and east of SP-2 that drains directly into SP-2 and includes the SP-2 access road. The slopes within DW-8 range from 1-50%.

DW-9 consists of the 0.604 acres included in SP-1 assuming the pond is full to capacity.

DW-10 consists of the 0.303 acres along the west and south side of SP-1 that drain directly into SP-1. The slopes within DW-10 range from 5-33%.

Undisturbed Watershed 1 (UW-1) consists of the 17.785 acres north of the site that drains into Undisturbed Ditch 1 (UD-1). The slopes within UW-1 range from 1-50%, with poor vegetation.

UW-2 consists of the 0.135 acres at the northeast end of SP-2 that drains into Undeveloped Berm 1(UB-1). The slopes within UW-2 range from 15-50%, with poor vegetation.

UW-3 consists of the 0.143 acres at the southwest end of SP-2 that drains into UB-2. The slopes within UW-3 range from 20-50%, with poor vegetation.

Runoff from DW-1 will flow into DD-1 and east to Diversion Swale 1 (DS-1). DS-1 will convey runoff across the lower section of the haul road and into DD-3. Runoff from DW-2 will flow north and then east through DD-2 where runoff will be conveyed into DD-3. Runoff from DW-4 will flow into DD-3 along the east side of the refuse pile and then into DD-4. From DD-4 runoff will flow into SP-2. Runoff from DW-5 will drain directly into SP-2. As the refuse pile is expanded the contributing runoff from DW-5 will decrease as DW-5's area decreases.

Overflow from SP-2 will flow out of the emergency spillway (SPO-2) and into an existing drainage ditch.

Runoff from DW-3 will flow into DD-5 and south into DD-6. From DD-6 runoff will flow east into SP-1. Runoff from DW-6, DW-10 will flow directly into SP-1. Overflow from SP-1 will flow south through an existing emergency spillway (SPO-1) and then into an existing drainage ditch.

Reclaimed Watershed 1 (RW-1) consists of the 21.689 acres along the north of the site that drains into Reclaimed Ditch 1 (RD-1). The slopes within RW-1 range from 1-50%, with poor vegetation.

RW-2 consists of the 0.512 acres along the northeast corner of the refuse pile that drains into the reclaimed section of DD-3. The slopes within RW-2 range from 5-50% with a majority of the slopes at 50%.

RW-3 consists of the 1.540 acres along the south end of the refuse pile that drains into the reclaimed portions of SP-1 and through SPO-1. The slopes within RW-3 range from 2-50%.

3.3 Runoff Volume Calculations

Results of the runoff calculations are provided in Attachment A. HydroCAD was used in conjunction with precipitation data from The National Oceanic and Atmospheric Administration Atlas 14 to calculate runoff for the site. The runoff volumes are presented in the HydroCAD worksheets. Total runoff volume discharge within DW-3, DW-6, DW-9, and DW-10 which drain to SP-1 resulting from the 100-year, 24-hour storm event is 30,806 cubic feet. Total discharge from the 100-year, 6-hour event is 20,840 cubic feet. Total runoff volume discharge within DW-1, DW-2, DW-4, DW-5, DW-7, and DW-8 which drain to SP-2 resulting from the

100-year, 24-hour storm event is 60,392 cubic feet. Total discharge from the 100-year, 6-hour event is 40,452 cubic feet. Total runoff volume discharge within UW-1 and UW-2 resulting from the 100-year, 24-hour storm event are 218 cubic feet for both watersheds. Total discharge from the 100-year, 6-hour event for UW-1 and UW-2 are 87 cubic feet and 131 cubic feet, respectively.

Reclaimed runoff volumes for RW-1 are 32,583 cubic feet for the 100-year, 24-hour storm event and 16,422 cubic feet for the 100-year, 6-hour storm event. RW-2 runoff volumes are 784 cubic feet for the 100-year, 24-hour storm event and 392 cubic feet for the 100-year, 6-hour storm event. RW-3 runoff volumes are 2,352 cubic feet for the 100-year, 24-hour storm event and 1,176 cubic feet for the 100-year, 6-hour storm event.

3.4 Sediment Volume Calculations

The average annual anticipated sediment yield from the refuse pile was calculated using an assumed value of 0.05 acre-feet per acre per year from section 742.200 of the Refuse Pile Amendment for the Dugout Canyon Mine NOI Permit.

The average annual sediment yield in acre-feet per acre for each watershed was multiplied by that watershed's area to find the annual volume of sediment participated from the area. Finally, the volumes for each watershed were summed to determine the total annual yield of the area draining into SP-1 and SP-2. The maximum calculated annual sediment yield for the area draining to SP-1 and SP-2 is 15,377 cubic feet and 31,335 cubic feet, respectively.

CHAPTER 4
SEDIMENT CONTROL DESIGN

4.1 Sedimentation Pond Capacities

SP-1 is an existing sedimentation pond that will have the access road and the contributing ditch moved west to allow for more material to be placed on the refuse pile. Additionally, portions of the north side of the pond will be filled in to allow for construction of an access road and ditch. SP-1 has been evaluated and will safely detain runoff from a 100-year, 24-hour storm event from contributing watersheds, 30,806 cubic feet, and five years of predicted sediment yield, 76,885 cubic feet, for a total of 107,691 cubic feet. Sediment will be removed when the four year sediment capacity of 61,508 cubic feet or approximately 5,899.5 feet elevation is reached. The stage-capacity curve for SP-1 is shown in Table 1.

SP-2 has been designed to safely detain runoff from a 100-year, 24-hour storm event from contributing watersheds, 60,392 cubic feet, and one year of predicted sediment yield, 31,335 cubic feet, for a total of 91,727 cubic feet. Sediment will be removed when the 60% sediment capacity of 18,801 cubic feet or approximately 5,862.0 feet elevation is reached. The stage-capacity curve for SP-2 is shown in Table 2.

4.2 Runoff Conveyance System Details

Peak flows for the berms, ditches, and swale were calculated using HydroCAD version 10.00 and FlowMaster version 6.0. The results of these calculations are presented in Attachment A. For design details, see Sheets 4 and 9. The conveyance system was designed to safely convey the runoff volume resulting from a 100-year, 24-hour event. To insure compliance with Utah Administrative Code Titles R645-301-742 the conveyance system was evaluated using the 100-year, 6-hour event. The 100-year, 24-hour event velocities, depths, and flows are greater

than the 100-year, 6-hour event velocities, depths, and flows. Therefore, the 100-year, 24-hour event was used for the design. Velocities above 5.00 fps require rock lining according to the attached U.S. Department of Transportation Table in Attachment A. For conveyance system capacities for the velocities, depths, and freeboard for both storm events, see Table 4 and 5 and Attachment A.

The peak discharge along DD-1 was calculated to be 1.22 cfs with a maximum velocity of 3.27 fps and a maximum depth of 0.63 ft. DD-1 will be constructed with a minimum height of 1 foot and 2 horizontal to 1 vertical side slopes with available fill material that is non-deleterious.

The peak discharge along DD-2 was calculated to be 4.91 cfs with a maximum velocity of 5.51 fps and a maximum depth of 0.81 ft. DD-2 will be constructed with a minimum height of 1.33 feet and 1.5 horizontal to 1 vertical side slopes with 2 inch diameter rock.

The peak discharge along DD-3 was calculated to be 17.93 cfs with a maximum velocity of 4.12 fps and a maximum depth of 1.36 ft. DD-3 will be constructed with a minimum height of 2.5 feet and 3 horizontal to 1 vertical side slopes with available fill material that is non-deleterious.

The peak discharge along DD-4 was calculated to be 17.93 cfs with a maximum velocity of 8.72 fps and a maximum depth of 0.31 ft. DD-4 will be constructed with a minimum height of 1 foot and 2 horizontal to 1 vertical side slopes and an 8 foot wide bottom. Due to the velocity 9 inch diameter rock will be used to line the ditch.

The peak discharge along DD-5 was calculated to be 12.06 cfs with a maximum velocity of 6.03 fps and a maximum depth of 1.36 ft. DD-5 will be constructed with a minimum height of 3 feet and 2 horizontal to 1 vertical side slopes with 3 inch diameter rock.

The peak discharge along DD-6 was calculated to be 12.06 cfs with a maximum velocity of 7.74 fps and a maximum depth of 0.95 ft. DD-6 will be constructed with a minimum height of 1.5 feet and 2 horizontal to 1 vertical side slopes and a 6 inch diameter rock lining.

The peak discharge along DS-1 was calculated to be 1.22 cfs with a maximum velocity of 1.51 fps and a maximum depth of 0.09 ft. DS-1 will be constructed with a minimum height of 0.5 feet and 20 horizontal to 1 vertical side slopes and a bottom width of 10 feet. Although no rock lining is required the swale will cross the haul road and will be constructed of road base or other suitable road material.

The peak discharge along UB-1 was calculated to be 0.10 cfs with a maximum velocity of 2.21 fps and a maximum depth of 0.14 ft. UB-1 will be constructed with a minimum height of 0.5 feet and 2 horizontal to 1 vertical side slopes with available fill material that is non-deleterious.

The peak discharge along UB-2 was calculated to be 0.11 cfs with a maximum velocity of 2.26 fps and a maximum depth of 0.15 ft. UB-2 will be constructed with a minimum height of 0.5 feet and 2 horizontal to 1 vertical side slopes with available fill material that is non-deleterious.

SPO-1 is an existing spillway and was evaluated with a peak discharge of 4.84 cfs with a maximum velocity of 5.53 fps and a maximum depth of 0.20 ft. SPO-1 has been constructed with a minimum height of 0.5 feet and 2 horizontal to 1 vertical side slopes and a 6 foot bottom. SPO-1 is currently constructed with rock larger than the required 2 inch diameter. Therefore, SPO-1 will not need to be altered.

The peak discharge along SPO-2 was calculated to be 7.42 cfs with a maximum velocity of 8.39 fps and a maximum depth of 0.39 ft. SPO-2 will be constructed with a minimum height

of 1 foot and 2 horizontal to 1 vertical side slopes and a 4 foot wide bottom. 6 inch diameter rock will be used to line the spillway to prevent erosion.

The peak discharge along RD-1 was calculated to be 6.34 cfs with a maximum velocity of 6.91 fps and a maximum depth of 1.14 ft. RD-1 will be constructed with a minimum height of 2 feet and 2 horizontal to 1 vertical side slopes. In sections of RD-1 that are steeper than 10% 4 inch diameter rock will line the ditch.

The peak discharge along RD-2 was calculated to be 0.38 cfs with a maximum velocity of 1.13 fps and a maximum depth of 0.08 ft. RD-2 will be constructed with a minimum height of 2 feet, 2 horizontal to 1 vertical side slopes, and an 8-foot bottom section.

The peak discharge along RD-3 was calculated to be 1.13 cfs with a maximum velocity of 3.43 fps and a maximum depth of 0.11 ft. RD-3 will be constructed with a minimum height of 2 feet, 2 horizontal to 1 vertical side slopes, and a 6-foot bottom section.

CHAPTER 5
RECLAMATION HYDROLOGY

Reclamation of the refuse pile will be performed according to specifications and standards outlined in the Dugout Canyon Mine NOI Permit. As topsoil and subsoil are removed from the expansion to the south the topsoil and subsoil will be placed along the northeast side of the refuse pile. For reclamation layout, see Sheet 7. During reclamation DD-3 will be filled in with subsoil and topsoil. However, even when filled some sections of DD-3 will remain. Portions of the outside side slope of DD-3 will be removed as indicated on Sheet 7 to allow runoff to flow away from the reclaimed refuse pile. RW-2 represents the largest contributing watersheds to DD-3. For this reason RW-2 was used to model the maximum flow rate through (RD-2) one of these side slope removal areas, see the narrative above, Table 4 and 5, and Sheet 9 for details.

CHAPTER 6
REFERENCES

Heastad Methods, Inc. 1998. FlowMaster I Computer Program, Version 6.0 Waterbury, Connecticut.

HydroCAD Software Solutions LLC. 2013. HydroCAD Version 10.00 Chocorua, New Hampshire.

National Oceanic and Atmospheric Administration, 2013. *Point Precipitation Frequency Estimates from NOAA ATLAS 14.* http://hdsc.nws.noaa.gov/hdsc /index.html

Natural Resources Conservation Service, Web Soil Survey, Carbon Area, Utah, Parts of Carbon and Emery Counties Ver. 4, 2013, http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

U.S. Department of Transportation. 1978. Use of Riprap for Bank Protection. Hydrology Engineering Circular No. 11. Federal Highway Administration. Washington, D.C.

TABLE 1

Sedimentation Pond-1 Staged Capacities

Elevation	Surface Area (sq ft)	Incremental (cf)	Cumulative Volume (cf)
5,894.50	0		
5,895.00	4,583	1,146	1,146
5,896.00	10,205	7,394	8,540
5,897.00	13,585	11,895	20,435
5,898.00	15,653	14,619	35,054
5,899.00	17,740	16,697	51,750
5,900.00	19,849	18,795	70,545
5,901.00	21,972	20,911	91,455
5,902.00	24,114	23,043	114,498
Total			**114,498**

Surface area at given elevations based on AutoCAD topography of site.

TABLE 2

Sedimentation Pond-2 Staged Capacities

Elevation	Surface Area (sq ft)	Incremental (cf)	Cumulative Volume (cf)
5,859.90	0		
5,860.00	6,718	336	336
5,861.00	9,106	7,912	8,248
5,862.00	11,806	10,456	18,704
5,863.00	14,494	13,150	31,854
5,864.00	17,310	15,902	47,756
5,865.00	20,258	18,784	66,540
5,866.00	23,306	21,782	88,322
5,866.25	24,092	5,925	94,247
5,867.00	26,413	18,939	113,186
Total			**113,186**

Surface area at given elevations based on AutoCAD topography of site.

TABLE 3

Overflow Structure Depths, Velocities, and Rock Lining Size

Emergency Spillway	25-Yr, 6-Hr Event Maximum Depth (ft)	25-Yr, 6-Hr Event Maximum Velocity (fps)	Rock Size (Dia. in)
SPO-1	0.20	5.53	2
SPO-2	0.39	8.39	9

Depths and velocities based on FlowMaster and assumed elevations from AutoCAD topography of site.
Rock sizing based on U.S. Department of Transportation Table.

TABLE 4

Diversion Structure Velocities and Rock Lining Sizing

Diversion Structure	100-Yr, 6-Hr Event Maximum Velocity (fps)	100-Yr, 24-Hr Event Maximum Velocity (fps)	100-Yr, 6-Hr Event Rock Size (Dia. in)	100-Yr, 24-Hr Event Rock Size (Dia. in)
DD-1	3.24	3.27	Not Required	Not Required
DD-2	5.26	5.51	2	2
DD-3	4.38	4.12	Not Required	Not Required
DD-4	8.57	8.72	9	9
DD-5	5.98	6.03	3	3
DD-6	7.68	7.74	6	6
DS-1	1.49	1.51	Not Required	Not Required
RD-1	6.12	6.91	4	4
RD-2	1.00	1.13	Not Required	Not Required
RD-3	2.72	3.43	Not Required	Not Required
UB-1	2.02	2.21	Not Required	Not Required
UB-2	2.09	2.26	Not Required	Not Required
UD-1	5.51	6.18	3	4

Velocities based on FlowMaster and assumed elevations from AutoCAD topography of site.
Rock sizing based on U.S. Department of Transportation Table.

TABLE 5

Diversion Structure Depths

Diversion Structure	100-Yr, 6-Hr Event Maximum Depth (ft)	100-Yr, 24-Hr Event Maximum Depth (ft)	100-Yr, 6-Hr Event Freeboard (ft)	100-Yr, 24-Hr Event Freeboard (ft)
DD-1	0.62	0.63		
DD-2	0.70	0.81		
DD-3	1.59	1.36		
DD-4	0.30	0.31		
DD-5	1.34	1.35		
DD-6	0.87	0.95		
DS-1	0.09	0.09		
RD-1	0.95	1.14		
RD-2	0.07	0.08		
RD-3	0.10	0.11		
UB-1	0.13	0.14		
UB-2	0.13	0.15		
UD-1	0.81	0.97		

Depths based on FlowMaster and assumed elevations from AutoCAD topography of site.

NOAA Atlas 14, Volume 1, Version 5
Location name: Utah, US*
Coordinates: 39.6141, -110.6110
Elevation: 5926ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval(years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.124 (0.107-0.149)	0.159 (0.138-0.191)	0.218 (0.187-0.261)	0.271 (0.232-0.324)	0.354 (0.294-0.423)	0.428 (0.347-0.513)	0.514 (0.408-0.618)	0.614 (0.471-0.745)	0.773 (0.565-0.953)	0.917 (0.645-1.15)
10-min	0.189 (0.163-0.226)	0.242 (0.210-0.290)	0.333 (0.285-0.397)	0.413 (0.352-0.493)	0.539 (0.447-0.643)	0.651 (0.528-0.780)	0.783 (0.620-0.940)	0.935 (0.716-1.13)	1.18 (0.860-1.45)	1.39 (0.981-1.75)
15-min	0.235 (0.202-0.280)	0.300 (0.260-0.360)	0.412 (0.353-0.492)	0.512 (0.437-0.611)	0.668 (0.554-0.798)	0.807 (0.654-0.967)	0.970 (0.769-1.17)	1.16 (0.888-1.41)	1.46 (1.07-1.80)	1.73 (1.22-2.17)
30-min	0.316 (0.272-0.377)	0.404 (0.350-0.484)	0.555 (0.475-0.662)	0.689 (0.588-0.823)	0.899 (0.746-1.07)	1.09 (0.881-1.30)	1.31 (1.04-1.57)	1.56 (1.20-1.89)	1.97 (1.44-2.42)	2.33 (1.64-2.92)
60-min	0.391 (0.336-0.466)	0.500 (0.434-0.599)	0.687 (0.588-0.819)	0.852 (0.728-1.02)	1.11 (0.923-1.33)	1.35 (1.09-1.61)	1.62 (1.28-1.94)	1.93 (1.48-2.34)	2.43 (1.78-3.00)	2.88 (2.03-3.61)
2-hr	0.456 (0.397-0.536)	0.575 (0.500-0.674)	0.782 (0.660-0.892)	0.935 (0.801-1.09)	1.21 (1.01-1.42)	1.46 (1.19-1.72)	1.75 (1.39-2.07)	2.08 (1.61-2.49)	2.63 (1.93-3.21)	3.13 (2.21-3.89)
3-hr	0.509 (0.447-0.590)	0.637 (0.559-0.740)	0.821 (0.720-0.953)	0.990 (0.862-1.15)	1.25 (1.07-1.46)	1.48 (1.24-1.73)	1.77 (1.44-2.08)	2.10 (1.67-2.50)	2.65 (2.02-3.22)	3.15 (2.31-3.93)
6-hr	0.631 (0.560-0.717)	0.780 (0.696-0.892)	0.975 (0.864-1.11)	1.14 (1.01-1.30)	1.38 (1.20-1.58)	1.59 (1.36-1.83)	1.85 (1.56-2.15)	2.16 (1.79-2.53)	2.69 (2.16-3.25)	3.18 (2.48-3.97)
12-hr	0.769 (0.695-0.859)	0.949 (0.857-1.06)	1.16 (1.04-1.30)	1.34 (1.20-1.50)	1.59 (1.40-1.78)	1.79 (1.56-2.02)	2.00 (1.72-2.28)	2.27 (1.93-2.61)	2.75 (2.29-3.28)	3.21 (2.61-4.01)
24-hr	0.971 (0.882-1.08)	1.20 (1.09-1.34)	1.46 (1.32-1.63)	1.66 (1.50-1.85)	1.93 (1.74-2.15)	2.14 (1.91-2.39)	2.35 (2.09-2.63)	2.56 (2.26-2.87)	2.83 (2.46-3.31)	3.24 (2.62-4.05)
2-day	1.13 (1.02-1.26)	1.39 (1.26-1.55)	1.68 (1.52-1.88)	1.92 (1.73-2.14)	2.22 (1.99-2.48)	2.46 (2.19-2.75)	2.69 (2.38-3.02)	2.93 (2.56-3.29)	3.23 (2.80-3.66)	3.46 (2.96-4.09)
3-day	1.22 (1.11-1.36)	1.51 (1.37-1.68)	1.83 (1.65-2.03)	2.08 (1.87-2.31)	2.42 (2.16-2.69)	2.67 (2.37-2.98)	2.93 (2.58-3.28)	3.18 (2.78-3.58)	3.52 (3.03-3.98)	3.77 (3.22-4.37)
4-day	1.32 (1.20-1.47)	1.63 (1.48-1.81)	1.97 (1.78-2.19)	2.24 (2.02-2.49)	2.61 (2.33-2.90)	2.88 (2.56-3.21)	3.16 (2.79-3.54)	3.44 (3.00-3.86)	3.81 (3.27-4.30)	4.08 (3.47-4.64)
7-day	1.54 (1.39-1.74)	1.90 (1.71-2.15)	2.31 (2.07-2.59)	2.62 (2.35-2.95)	3.05 (2.72-3.44)	3.37 (2.99-3.81)	3.70 (3.25-4.19)	4.02 (3.50-4.58)	4.44 (3.82-5.10)	4.75 (4.04-5.49)
10-day	1.76 (1.59-1.95)	2.18 (1.97-2.42)	2.64 (2.39-2.93)	3.00 (2.71-3.33)	3.48 (3.12-3.85)	3.84 (3.42-4.26)	4.19 (3.71-4.66)	4.54 (4.00-5.06)	4.98 (4.34-5.60)	5.31 (4.58-6.01)
20-day	2.17 (1.97-2.42)	2.70 (2.45-3.01)	3.30 (2.99-3.68)	3.77 (3.41-4.19)	4.38 (3.94-4.88)	4.85 (4.33-5.40)	5.31 (4.70-5.93)	5.76 (5.06-6.46)	6.35 (5.50-7.17)	6.78 (5.81-7.70)
30-day	2.59 (2.36-2.87)	3.21 (2.92-3.56)	3.88 (3.54-4.29)	4.40 (3.99-4.85)	5.06 (4.57-5.59)	5.55 (4.98-6.13)	6.02 (5.38-6.68)	6.48 (5.74-7.22)	7.05 (6.18-7.92)	7.47 (6.48-8.43)
45-day	3.12 (2.85-3.45)	3.87 (3.53-4.27)	4.65 (4.26-5.16)	5.30 (4.81-5.84)	6.09 (5.51-6.71)	6.66 (6.00-7.35)	7.22 (6.47-7.97)	7.74 (6.90-8.57)	8.39 (7.41-9.33)	8.84 (7.76-9.87)
60-day	3.65 (3.33-4.03)	4.52 (4.13-5.00)	5.49 (5.00-6.05)	6.22 (5.65-6.84)	7.15 (6.46-7.88)	7.82 (7.04-8.64)	8.48 (7.58-9.38)	9.10 (8.08-10.1)	9.86 (8.67-11.0)	10.4 (9.07-11.7)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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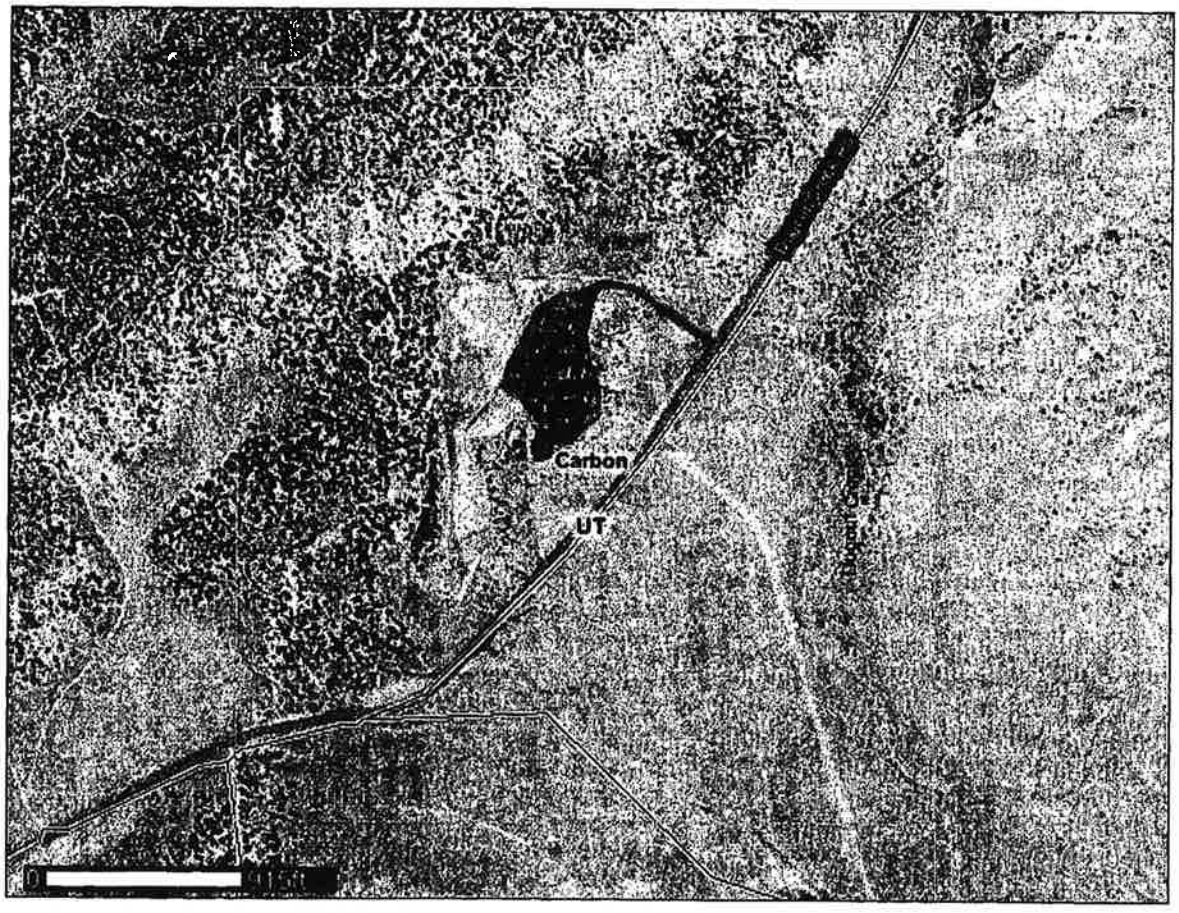
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Carbon Area, Utah, Parts of Carbon and Emery Counties



February 25, 2013

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

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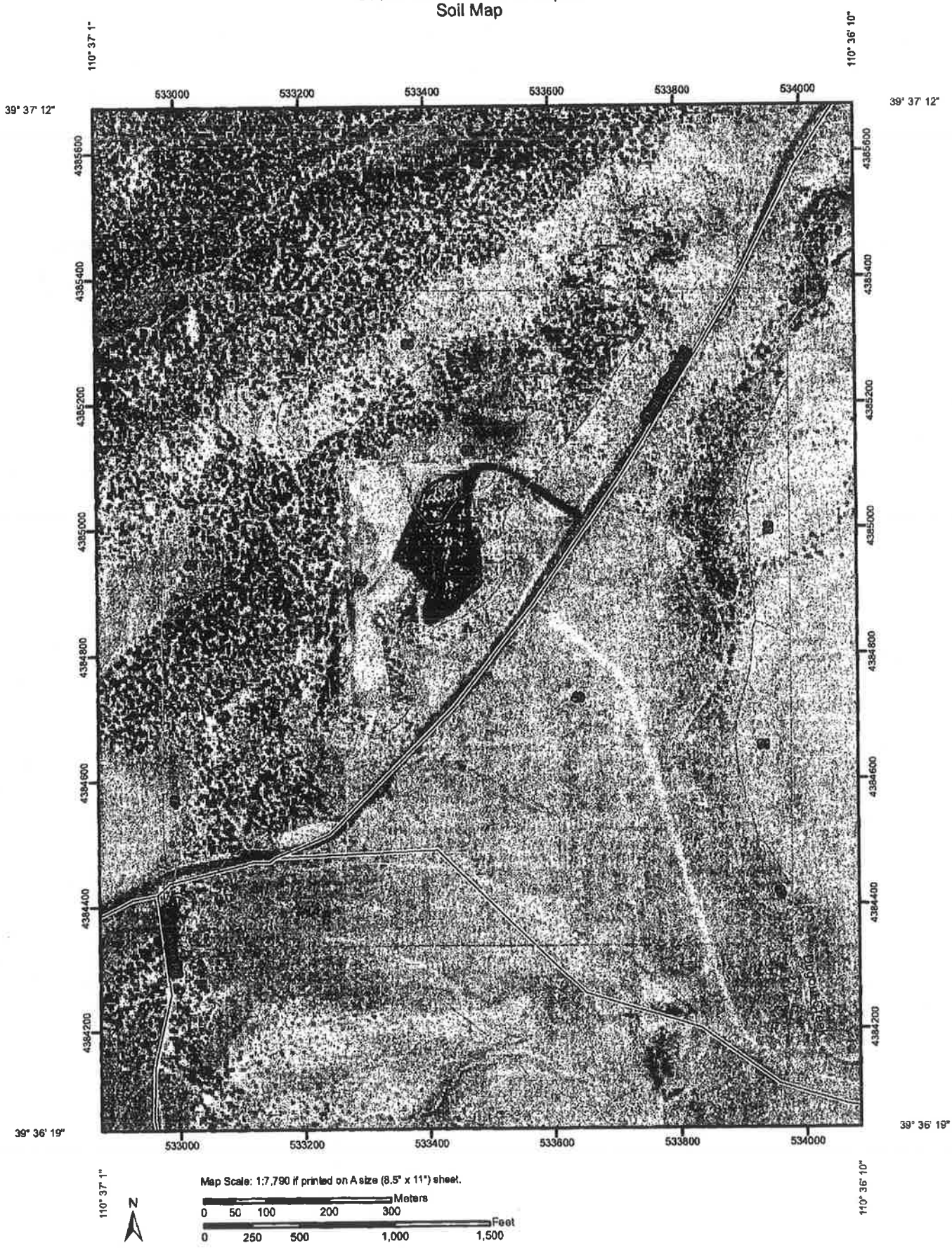
Contents

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:7,790 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Carbon Area, Utah, Parts of Carbon and Emery Counties
Survey Area Data: Version 5, Sep 3, 2009

Date(s) aerial images were photographed: 8/29/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Soil Erosion

This folder contains a collection of tabular reports that present soil erosion factors and groupings. The reports (tables) include all selected map units and components for each map unit. Soil erosion factors are soil properties and interpretations used in evaluating the soil for potential erosion. Example soil erosion factors can include K factor for the whole soil or on a rock free basis, T factor, wind erodibility group and wind erodibility index. .

RUSLE2 Related Attributes

This report summarizes those soil attributes used by the Revised Universal Soil Loss Equation Version 2 (RUSLE2) for the map units in the selected area. The report includes the map unit symbol, the component name, and the percent of the component in the map unit. Soil property data for each map unit component include the hydrologic soil group, erosion factors Kf for the surface horizon, erosion factor T, and the representative percentage of sand, silt, and clay in the surface horizon.

Report—RUSLE2 Related Attributes

RUSLE2 Related Attributes– Carbon Area, Utah, Parts of Carbon and Emery Counties								
Map symbol and soil name	Pct. of map unit	Slope length (ft)	Hydrologic group	Kf	T factor	Representative value		
						% Sand	% Silt	% Clay
33—Gerst-Badland-Rubbleland complex, 15 to 50 percent slopes								
Gerst	40	—	D	.28	2	41.6	37.4	21.0
Badland	25	—	D	—	—	—	—	0.0
Rubbleland	20	—	A	—	5	—	—	0.0
Rock outcrop	12	—	—	—	—	—	—	—
Strych	3	—	—	—	—	—	—	—
35—Gerst-Badland-Stormitt complex								
Gerst	55	—	D	.37	2	41.6	37.4	21.0
Badland	20	—	D	—	—	—	—	0.0
Stormitt	15	—	B	.17	2	58.7	17.8	23.5
Gerst	8	—	—	—	—	—	—	—
Rock outcrop	2	—	—	—	—	—	—	—
48—Haverdad loam, 1 to 8 percent slopes								
Haverdad	85	—	B	.28	5	42.4	38.1	19.5
Glenburg	5	—	—	—	—	—	—	—
Ravola	5	—	—	—	—	—	—	—
Billings	3	—	—	—	—	—	—	—
Haverdad, alkali, 0 to 3 percent slopes	2	—	—	—	—	—	—	—
49—Haverdad loam, alkali, 0 to 3 percent slopes								
Haverdad	90	—	B	.28	5	43.0	38.5	18.5
Glenberg	5	—	—	—	—	—	—	—
Haverdad	5	—	—	—	—	—	—	—
50—Haverdad loam, moist, 1 to 5 percent slopes								
Haverdad	90	—	B	.28	5	42.4	38.1	19.5
Glanberg	5	—	—	—	—	—	—	—
Haverdad, colder	5	—	—	—	—	—	—	—
66—Mivida gravelly fine sandy loam, 3 to 8 percent slopes								
Mivida	85	—	B	.24	2	69.2	16.3	14.5
Gerst	5	—	—	—	—	—	—	—
Haverdad	5	—	—	—	—	—	—	—
Strych	5	—	—	—	—	—	—	—

RUSLE2 Related Attributes– Carbon Area, Utah, Parts of Carbon and Emery Counties								
Map symbol and soil name	Pct. of map unit	Slope length (ft)	Hydrologic group	Kf	T factor	Representative value		
						% Sand	% Silt	% Clay
91—Ravola loam, 1 to 6 percent slopes, eroded								
Ravola	80	279	B	.28	5	37.4	42.6	20.0
Billings	5	—	—	—	—	—	—	—
Kilpack	5	—	—	—	—	—	—	—
Persayo	5	—	—	—	—	—	—	—
Ravola, 1 to 3 percent slopes	5	—	—	—	—	—	—	—
93—Ravola-Slickspots complex								
Ravola	70	351	B	.28	5	37.4	42.6	20.0
Slickspots	20	—	D	—	—	—	—	—
Billings	10	—	—	—	—	—	—	—

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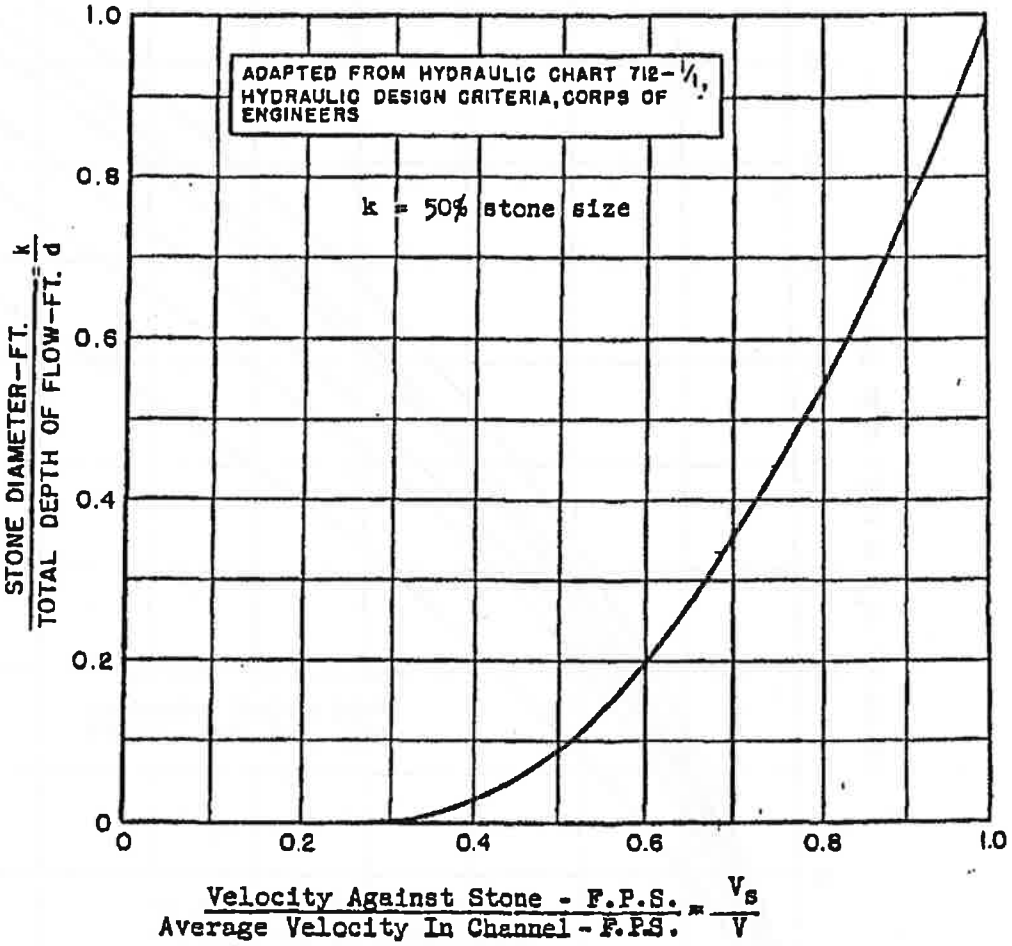


FIGURE 5-1 Velocity Against Stone on Channel Bottom (U.S. Department of Transportation, 1978).

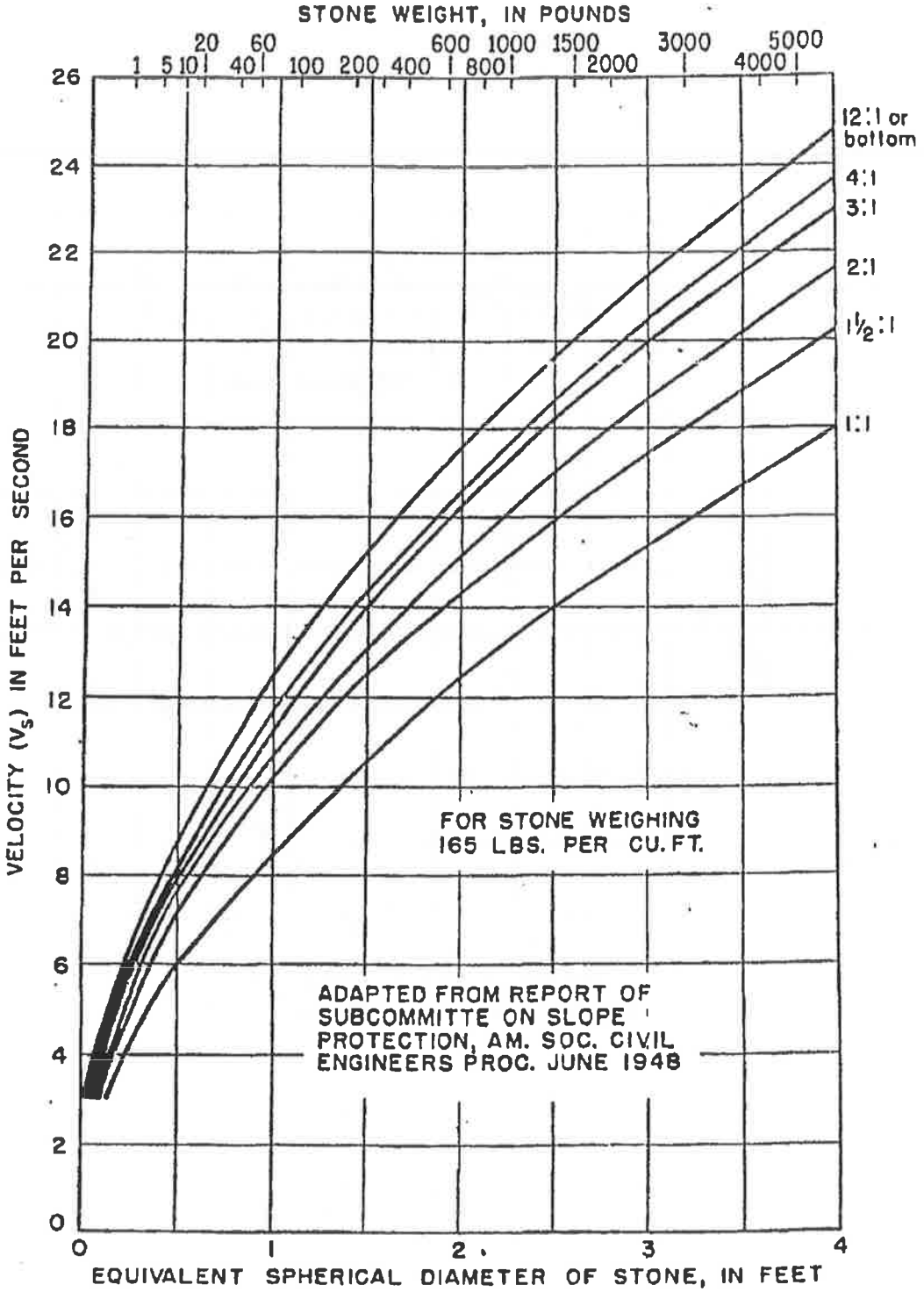


FIGURE 5-2 Size of Stone that will Resist Displacement for Various Velocities and Side Slopes (U.S. Department of Transportation, 1978).

100-year, 6-hour Event

Label	Discharge (cfs)	Slope (ft/ft)	Depth (ft)	Velocity (ft/s)
DD-1 Max. Depth	1.18	0.007	0.62	1.52
DD-1 Max. Velocity	1.18	0.053	0.43	3.24
DD-2 Max. Depth	4.74	0.080	0.70	4.84
DD-2 Max. Velocity	4.74	0.100	0.67	5.26
DD-3 Max. Depth	17.08	0.010	1.59	3.38
DD-3 Max. Velocity	17.08	0.020	1.40	4.38
DD-4 Max. Depth	17.08	0.167	0.30	6.50
DD-4 Max. Velocity	17.08	0.400	0.24	8.57
DD-5 Max. Depth	11.70	0.015	1.34	3.24
DD-5 Max. Velocity	11.70	0.077	0.99	5.98
DD-6 Max. Depth	11.70	0.150	0.87	7.68
DD-6 Max. Velocity	11.70	0.100	0.94	6.60
DS-1 Max. Depth	1.18	0.020	0.09	1.10
DS-1 Max. Velocity	1.18	0.050	0.07	1.49
RD-1 Max. Depth	3.90	0.008	0.95	2.15
RD-1 Max. Velocity	3.90	0.170	0.56	6.12
RD-2 Max. Depth	0.28	0.005	0.07	0.50
RD-2 Max. Velocity	0.28	0.050	0.03	1.00
RD-3 Max. Depth	0.77	0.030	0.10	1.31
RD-3 Max. Velocity	0.77	0.330	0.05	2.72
UB-1 Max. Depth	0.07	0.025	0.13	1.03
UB-1 Max. Velocity	0.07	0.150	0.09	2.02
UB-2 Max. Depth	0.08	0.025	0.13	1.07
UB-2 Max. Velocity	0.08	0.150	0.09	2.09
UD-1 Max. Depth	2.56	0.008	0.81	1.93
UD-1 Max. Velocity	2.56	0.170	0.48	5.51

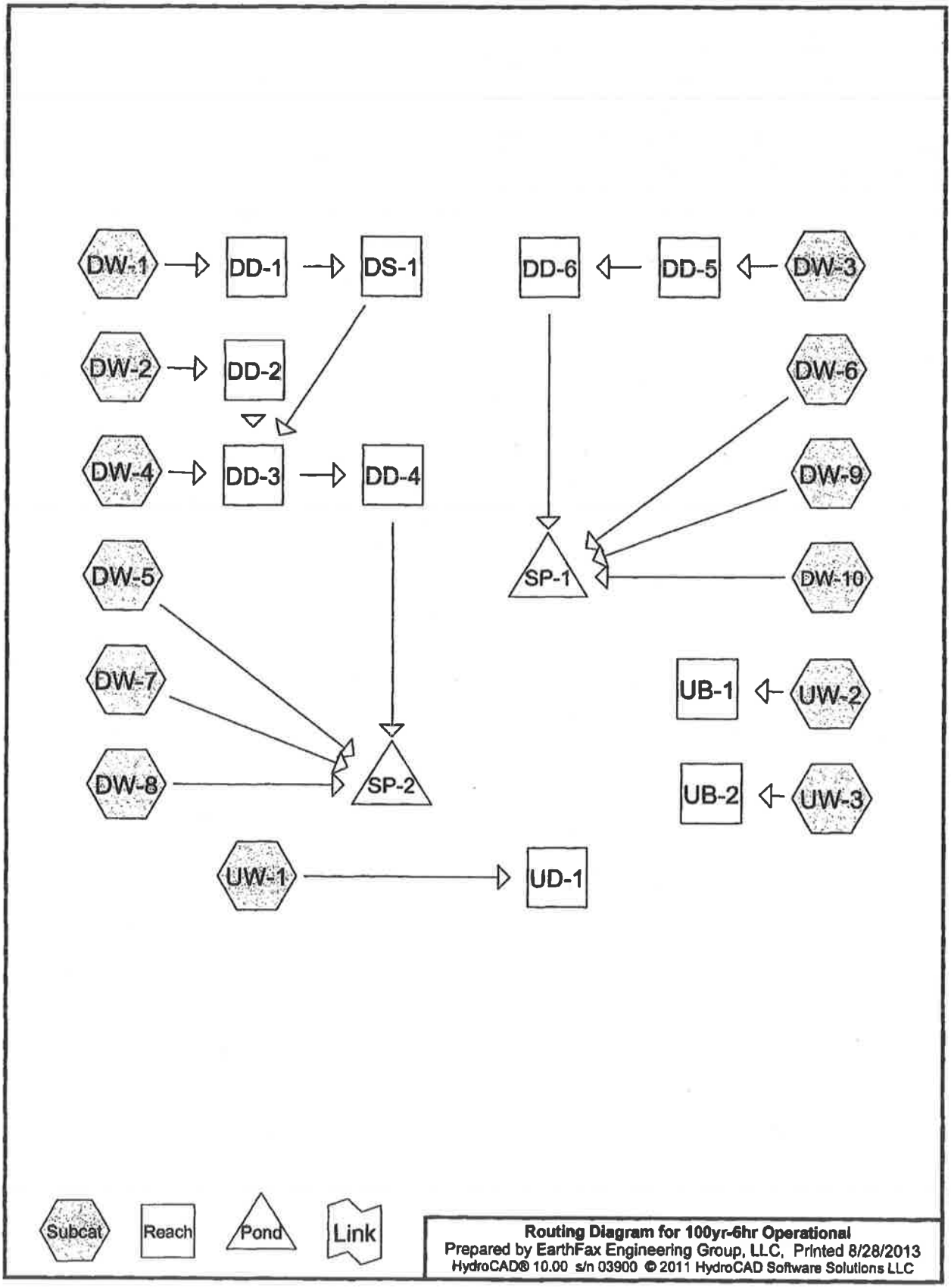
100-year, 24-hour Event

Label	Discharge (cfs)	Slope (ft/ft)	Depth (ft)	Velocity (ft/s)
DD-1 Max. Depth	1.22	0.007	0.63	1.53
DD-1 Max. Velocity	1.22	0.053	0.43	3.27
DD-2 Max. Depth	4.91	0.080	0.81	5.07
DD-2 Max. Velocity	4.91	0.100	0.77	5.51
DD-3 Max. Depth	17.93	0.010	1.36	3.18
DD-3 Max. Velocity	17.93	0.020	1.20	4.12
DD-4 Max. Depth	17.93	0.167	0.31	6.62
DD-4 Max. Velocity	17.93	0.400	0.24	8.72
DD-5 Max. Depth	12.06	0.015	1.36	3.26
DD-5 Max. Velocity	12.06	0.077	1.00	6.03
DD-6 Max. Depth	12.06	0.100	0.95	6.65
DD-6 Max. Velocity	12.06	0.150	0.88	7.74
DS-1 Max. Depth	1.22	0.020	0.09	1.11
DS-1 Max. Velocity	1.22	0.050	0.07	1.51
RD-1 Max. Depth	6.34	0.008	1.14	2.43
RD-1 Max. Velocity	6.34	0.170	0.68	6.91
RD-2 Max. Depth	0.38	0.005	0.08	0.56
RD-2 Max. Velocity	0.38	0.050	0.04	1.13
RD-3 Max. Depth	1.13	0.030	0.11	1.64
RD-3 Max. Velocity	1.13	0.330	0.05	3.43
UB-1 Max. Depth	0.10	0.025	0.14	1.13
UB-1 Max. Velocity	0.10	0.150	0.10	2.21
UB-2 Max. Depth	0.11	0.025	0.15	1.16
UB-2 Max. Velocity	0.11	0.150	0.11	2.26
UD-1 Max. Depth	4.06	0.008	0.97	2.17
UD-1 Max. Velocity	4.06	0.170	0.57	6.18

EarthFax Engineering Inc
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

25-year, 6-hour Event

Label	Discharge (cfs)	Slope (ft/ft)	Depth (ft)	Velocity (ft/s)
SPO-1 Max. Depth	4.84	0.100	0.20	3.81
SPO-1 Max. Velocity	4.84	0.330	0.14	5.53
SPO-2 Max. Depth	7.42	0.050	0.39	3.94
SPO-2 Max. Velocity	7.42	0.500	0.20	8.39


DW-1
DD-1
DS-1
DD-6
DD-5
DW-3
DW-2
DD-2
DW-6
DW-4
DD-3
DD-4
DW-9
SP-1
DW-10
DW-5
DW-7
UB-1
UW-2
DW-8
SP-2
UB-2
UW-3
UW-1
UD-1
Subcat
Reach
Pond
Link
Routing Diagram for 100yr-6hr Operational
Prepared by EarthFax Engineering Group, LLC, Printed 8/28/2013
HydroCAD® 10.00 s/n 03900 © 2011 HydroCAD Software Solutions LLC

Summary for Subcatchment DW-1:

Runoff = 1.18 cfs @ 2.90 hrs, Volume= 0.033 af, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.85"

Area (ac)	CN	Description
0.535	86	Newly graded area, HSG B
0.535		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	90	0.5000	2.80		**Lag/CN Method,**

Summary for Subcatchment DW-10:

Runoff = 0.67 cfs @ 2.90 hrs, Volume= 0.019 af, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.85"

Area (ac)	CN	Description
0.303	86	Newly graded area, HSG B
0.303		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	60	0.1900	1.59		**Lag/CN Method,**

Summary for Subcatchment DW-2:

Runoff = 4.74 cfs @ 2.94 hrs, Volume= 0.139 af, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.85"

Area (ac)	CN	Description
2.270	86	Newly graded area, HSG B
2.270		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	285	0.0880	1.48		**Lag/CN Method,**

Summary for Subcatchment DW-3:

Runoff = 11.70 cfs @ 2.94 hrs, Volume= 0.340 af, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.85"

Area (ac)	CN	Description
5.527	86	Newly graded area, HSG B
5.527		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	340	0.2000	2.31		**Lag/CN Method,**

Summary for Subcatchment DW-4:

Runoff = 12.82 cfs @ 2.94 hrs, Volume= 0.374 af, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.85"

Area (ac)	CN	Description
6.083	86	Newly graded area, HSG B
6.083		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	380	0.1900	2.30		**Lag/CN Method,**

Summary for Subcatchment DW-5:

Runoff = 8.80 cfs @ 2.98 hrs, Volume= 0.288 af, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.85"

Area (ac)	CN	Description
4.686	86	Newly graded area, HSG B
4.686		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	820	0.1500	2.39		**Lag/CN Method,**

Summary for Subcatchment DW-6:

Runoff = 1.35 cfs @ 2.91 hrs, Volume= 0.038 af, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.85"

Area (ac)	CN	Description
0.626	86	Newly graded area, HSG B
0.626		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	190	0.5000	3.25		**Lag/CN Method,**

Summary for Subcatchment DW-7:

Runoff = 2.48 cfs @ 2.89 hrs, Volume= 0.082 af, Depth= 1.63"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.85"

Area (ac)	CN	Description
0.606	98	Water Surface, HSG B
0.606		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	10	0.3300	2.53		**Lag/CN Method,**

Summary for Subcatchment DW-8:

Runoff = 0.46 cfs @ 2.90 hrs, Volume= 0.013 af, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.85"

Area (ac)	CN	Description
0.207	86	Newly graded area, HSG B
0.207		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	20	0.3300	1.68		**Lag/CN Method,**

Summary for Subcatchment DW-9:

Runoff = 2.47 cfs @ 2.89 hrs, Volume= 0.082 af, Depth= 1.63"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.85"

Area (ac)	CN	Description
0.604	98	Water Surface, HSG B
0.604		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	10	0.3300	2.53		**Lag/CN Method,**

Summary for Subcatchment UW-1:

Runoff = 2.56 cfs @ 3.48 hrs, Volume= 0.309 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.85"

	Area (ac)	CN	Description
*	17.785	71	Pinyon/juniper range, Poor, HSG B
	17.785		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
37.5	1,760	0.0300	0.78		**Lag/CN Method,**

Summary for Subcatchment UW-2:

Runoff = 0.07 cfs @ 2.95 hrs, Volume= 0.002 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.85"

	Area (ac)	CN	Description
*	0.135	71	Pinyon/juniper range, Poor, HSG B
	0.135		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	150	0.3000	1.51		**Lag/CN Method,**

Summary for Subcatchment UW-3:

Runoff = 0.08 cfs @ 2.95 hrs, Volume= 0.002 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.85"

	Area (ac)	CN	Description
*	0.143	71	Pinyon/juniper range, Poor, HSG B
	0.143		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	150	0.2000	1.24		**Lag/CN Method,**

Summary for Reach DD-1:

Inflow Area = 0.535 ac, 0.00% Impervious, Inflow Depth = 0.74"
Inflow = 1.18 cfs @ 2.90 hrs, Volume= 0.033 af
Outflow = 1.01 cfs @ 2.99 hrs, Volume= 0.033 af, Atten= 14%, Lag= 5.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.24 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 0.85 fps, Avg. Travel Time= 7.5 min

Peak Storage= 176 cf @ 2.94 hrs
Average Depth at Peak Storage= 0.48'
Bank-Full Depth= 1.00' Flow Area= 2.0 sf, Capacity= 7.34 cfs

0.00' x 1.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 4.00'
Length= 385.0' Slope= 0.0286 '/'
Inlet Invert= 5,949.00', Outlet Invert= 5,938.00'

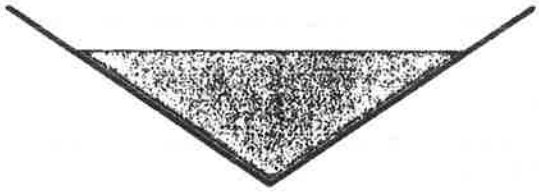
Summary for Reach DD-2:

Inflow Area = 2.270 ac, 0.00% Impervious, Inflow Depth = 0.74"
Inflow = 4.74 cfs @ 2.94 hrs, Volume= 0.139 af
Outflow = 4.17 cfs @ 3.00 hrs, Volume= 0.139 af, Atten= 12%, Lag= 3.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.04 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 1.96 fps, Avg. Travel Time= 4.7 min

Peak Storage= 475 cf @ 2.96 hrs
Average Depth at Peak Storage= 0.76'
Bank-Full Depth= 1.00' Flow Area= 1.5 sf, Capacity= 9.13 cfs

0.00' x 1.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 1.5 '/' Top Width= 3.00'
Length= 550.0' Slope= 0.0864 '/'
Inlet Invert= 5,985.00', Outlet Invert= 5,937.50'



Summary for Reach DD-3:

Inflow Area = 8.888 ac, 0.00% Impervious, Inflow Depth = 0.74"
Inflow = 17.08 cfs @ 2.95 hrs, Volume= 0.546 af
Outflow = 12.12 cfs @ 3.12 hrs, Volume= 0.546 af, Atten= 29%, Lag= 10.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.03 fps, Min. Travel Time= 6.6 min
Avg. Velocity = 0.87 fps, Avg. Travel Time= 22.9 min

Peak Storage= 4,927 cf @ 3.01 hrs
Average Depth at Peak Storage= 1.17'
Bank-Full Depth= 2.50' Flow Area= 18.8 sf, Capacity= 94.24 cfs

0.00' x 2.50' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 3.0 '/' Top Width= 15.00'
Length= 1,200.0' Slope= 0.0146 '/'
Inlet Invert= 5,937.50', Outlet Invert= 5,920.00'

Summary for Reach DD-4:

Inflow Area = 8.888 ac, 0.00% Impervious, Inflow Depth = 0.74"
Inflow = 12.12 cfs @ 3.12 hrs, Volume= 0.546 af
Outflow = 11.83 cfs @ 3.13 hrs, Volume= 0.546 af, Atten= 2%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.71 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.68 fps, Avg. Travel Time= 1.8 min

Peak Storage= 330 cf @ 3.12 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 1.00' Flow Area= 10.0 sf, Capacity= 171.61 cfs

8.00' x 1.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 12.00'
Length= 185.0' Slope= 0.2865 '/'
Inlet Invert= 5,920.00', Outlet Invert= 5,867.00'

‡

Summary for Reach DD-5:

Inflow Area = 5.527 ac, 0.00% Impervious, Inflow Depth = 0.74"
Inflow = 11.70 cfs @ 2.94 hrs, Volume= 0.340 af
Outflow = 9.12 cfs @ 3.04 hrs, Volume= 0.340 af, Atten= 22%, Lag= 6.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.31 fps, Min. Travel Time= 4.2 min
Avg. Velocity = 1.40 fps, Avg. Travel Time= 12.8 min

Peak Storage= 2,351 cf @ 2.98 hrs
Average Depth at Peak Storage= 1.04'
Bank-Full Depth= 3.00' Flow Area= 18.0 sf, Capacity= 158.49 cfs

0.00' x 3.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 12.00'
Length= 1,080.0' Slope= 0.0380 '/'
Inlet Invert= 5,949.00', Outlet Invert= 5,908.00'

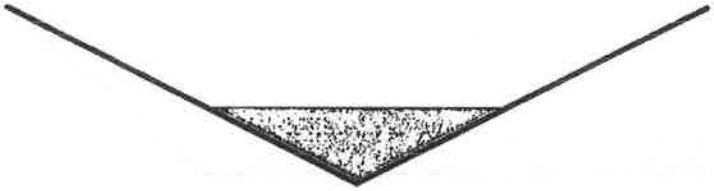
Summary for Reach DD-6:

Inflow Area = 5.527 ac, 0.00% Impervious, Inflow Depth = 0.74"
Inflow = 9.12 cfs @ 3.04 hrs, Volume= 0.340 af
Outflow = 8.97 cfs @ 3.05 hrs, Volume= 0.340 af, Atten= 2%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.00 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.94 fps, Avg. Travel Time= 1.0 min

Peak Storage= 182 cf @ 3.05 hrs
Average Depth at Peak Storage= 0.87'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 83.53 cfs

0.00' x 2.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 120.0' Slope= 0.0917 '/'
Inlet Invert= 5,908.00', Outlet Invert= 5,897.00'



Summary for Reach DS-1:

Inflow Area =	0.535 ac,	0.00% Impervious,	Inflow Depth =	0.74"
Inflow =	1.01 cfs @	2.99 hrs, Volume=	0.033 af	
Outflow =	1.00 cfs @	2.99 hrs, Volume=	0.033 af,	Atten= 2%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.03 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 0.32 fps, Avg. Travel Time= 1.1 min

Peak Storage= 20 cf @ 2.99 hrs
Average Depth at Peak Storage= 0.08'
Bank-Full Depth= 0.50' Flow Area= 10.0 sf, Capacity= 28.22 cfs

10.00' x 0.50' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 20.0 '/' Top Width= 30.00'
Length= 20.0' Slope= 0.0250 '/'
Inlet Invert= 5,938.00', Outlet Invert= 5,937.50'

‡

Summary for Reach UB-1:

Inflow Area =	0.135 ac,	0.00% Impervious,	Inflow Depth =	0.21"
Inflow =	0.07 cfs @	2.95 hrs, Volume=	0.002 af	
Outflow =	0.07 cfs @	2.96 hrs, Volume=	0.002 af,	Atten= 7%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.15 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.19 fps, Avg. Travel Time= 0.8 min

Peak Storage= 2 cf @ 2.96 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 0.50' Flow Area= 0.6 sf, Capacity= 3.56 cfs

0.00' x 0.50' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 2.0 '/' Top Width= 2.50'
Length= 60.0' Slope= 0.0500 '/'
Inlet Invert= 5,875.00', Outlet Invert= 5,872.00'

Summary for Reach UB-2:

Inflow Area = 0.143 ac, 0.00% Impervious, Inflow Depth = 0.21"
Inflow = 0.08 cfs @ 2.95 hrs, Volume= 0.002 af
Outflow = 0.07 cfs @ 2.97 hrs, Volume= 0.002 af, Atten= 12%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.11 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.17 fps, Avg. Travel Time= 1.2 min

Peak Storage= 3 cf @ 2.96 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 0.50' Flow Area= 0.6 sf, Capacity= 3.45 cfs

0.00' x 0.50' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 2.0 '/' Top Width= 2.50'
Length= 85.0' Slope= 0.0471 '/'
Inlet Invert= 5,876.00', Outlet Invert= 5,872.00'

Summary for Reach UD-1:

Inflow Area = 17.785 ac, 0.00% Impervious, Inflow Depth = 0.21"
Inflow = 2.56 cfs @ 3.48 hrs, Volume= 0.309 af
Outflow = 2.48 cfs @ 3.65 hrs, Volume= 0.309 af, Atten= 3%, Lag= 10.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.51 fps, Min. Travel Time= 5.5 min
Avg. Velocity = 1.59 fps, Avg. Travel Time= 12.1 min

Peak Storage= 814 cf @ 3.56 hrs
Average Depth at Peak Storage= 0.60'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 63.02 cfs

0.00' x 2.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 1,150.0' Slope= 0.0522 '/'
Inlet Invert= 5,943.00', Outlet Invert= 5,883.00'

Summary for Pond SP-1:

Inflow Area = 7.060 ac, 8.56% Impervious, Inflow Depth = 0.81"
Inflow = 9.56 cfs @ 3.05 hrs, Volume= 0.478 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Peak Elev= 5,897.03' @ 12.00 hrs Surf.Area= 13,647 sf Storage= 20,840 cf

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	5,894.50'	114,498 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
5,894.50	0	0	0
5,895.00	4,583	1,146	1,146
5,896.00	10,205	7,394	8,540
5,897.00	13,585	11,895	20,435
5,898.00	15,653	14,619	35,054
5,899.00	17,740	16,697	51,750
5,900.00	19,849	18,795	70,545
5,901.00	21,972	20,911	91,455
5,902.00	24,114	23,043	114,498

Summary for Pond SP-2:

Inflow Area = 14.387 ac, 4.21% Impervious, Inflow Depth = 0.77"
Inflow = 14.37 cfs @ 3.10 hrs, Volume= 0.929 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

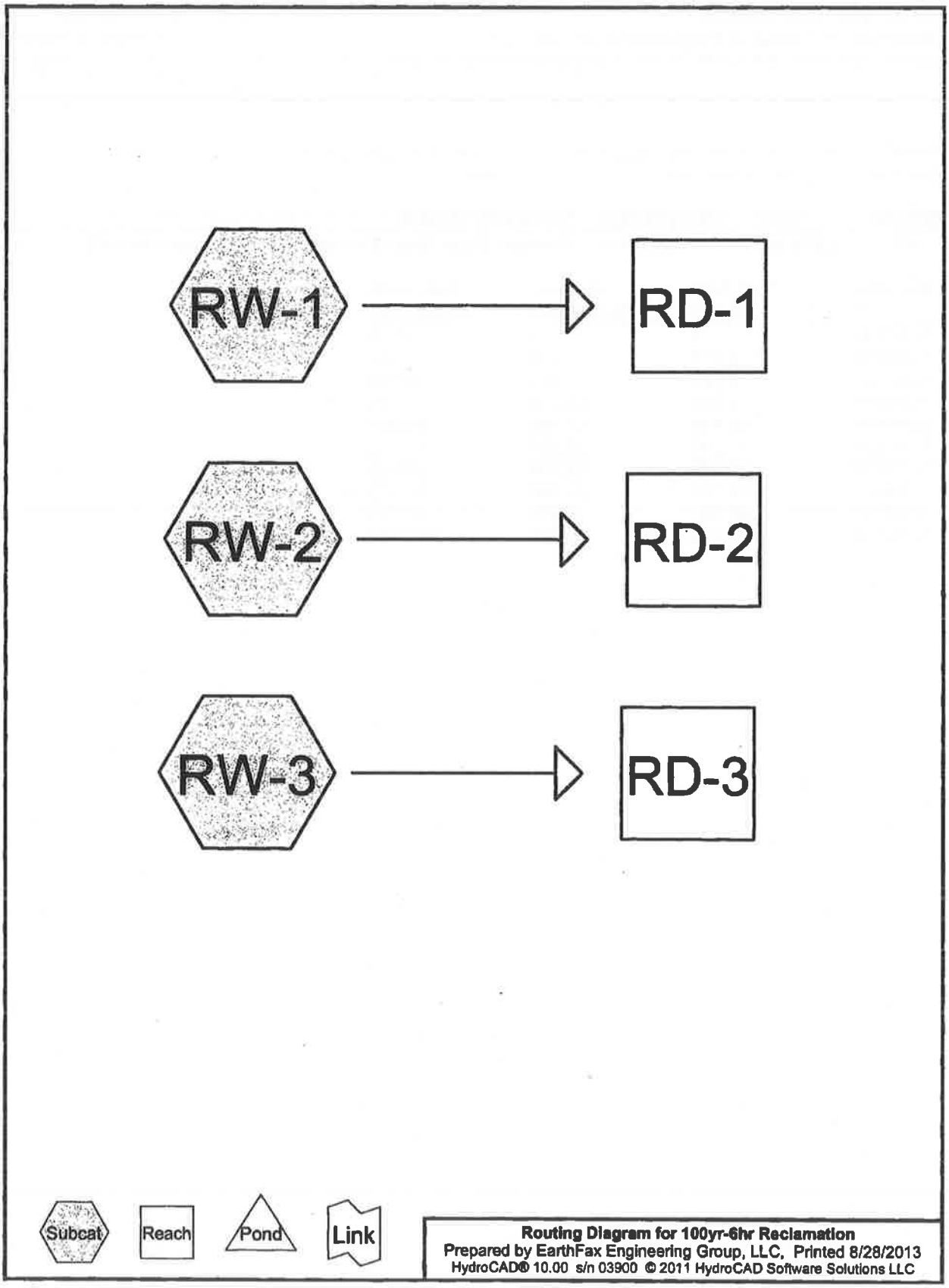
Routing by Stor-Ind method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs

Peak Elev= 5,863.56' @ 12.00 hrs Surf.Area= 16,078 sf Storage= 40,452 cf

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	5,859.90'	113,184 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
5,859.90	0	0	0
5,860.00	6,718	336	336
5,861.00	9,106	7,912	8,248
5,862.00	11,806	10,456	18,704
5,863.00	14,494	13,150	31,854
5,864.00	17,310	15,902	47,756
5,865.00	20,258	18,784	66,540
5,866.00	23,302	21,780	88,320
5,866.25	24,092	5,924	94,244
5,867.00	26,413	18,939	113,184



Routing Diagram for 100yr-6hr Reclamation
Prepared by EarthFax Engineering Group, LLC, Printed 8/28/2013

Summary for Subcatchment RW-1:

Runoff = 3.90 cfs @ 3.30 hrs, Volume= 0.377 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.85"

	Area (ac)	CN	Description
*	21.689	71	Pinyon/juniper range, Poor, HSG B
	21.689		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.6	1,150	0.0300	0.72		**Lag/CN Method,**

Summary for Subcatchment RW-2:

Runoff = 0.28 cfs @ 2.94 hrs, Volume= 0.009 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.85"

	Area (ac)	CN	Description
*	0.512	71	Pinyon/juniper range, Poor, HSG B
	0.512		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	120	0.5000	1.87		**Lag/CN Method,**

Summary for Subcatchment RW-3:

Runoff = 0.77 cfs @ 2.97 hrs, Volume= 0.027 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.85"

	Area (ac)	CN	Description
*	1.540	71	Pinyon/juniper range, Poor, HSG B
	1.540		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	330	0.2850	1.73		**Lag/CN Method,**

Summary for Reach RD-1:

Inflow Area = 21.689 ac, 0.00% Impervious, Inflow Depth = 0.21"
Inflow = 3.90 cfs @ 3.30 hrs, Volume= 0.377 af
Outflow = 3.67 cfs @ 3.46 hrs, Volume= 0.377 af, Atten= 6%, Lag= 9.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.87 fps, Min. Travel Time= 5.0 min
Avg. Velocity = 1.65 fps, Avg. Travel Time= 11.6 min

Peak Storage= 1,097 cf @ 3.37 hrs
Average Depth at Peak Storage= 0.69'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 63.02 cfs

0.00' x 2.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 1,150.0' Slope= 0.0522 '/'
Inlet Invert= 5,943.00', Outlet Invert= 5,883.00'

Summary for Reach RD-2:

Inflow Area = 0.512 ac, 0.00% Impervious, Inflow Depth = 0.21"
Inflow = 0.28 cfs @ 2.94 hrs, Volume= 0.009 af
Outflow = 0.21 cfs @ 3.03 hrs, Volume= 0.009 af, Atten= 23%, Lag= 5.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.55 fps, Min. Travel Time= 3.0 min
Avg. Velocity = 0.32 fps, Avg. Travel Time= 5.2 min

Peak Storage= 40 cf @ 2.97 hrs
Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 145.64 cfs

8.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 5,931.00', Outlet Invert= 5,930.00'

‡

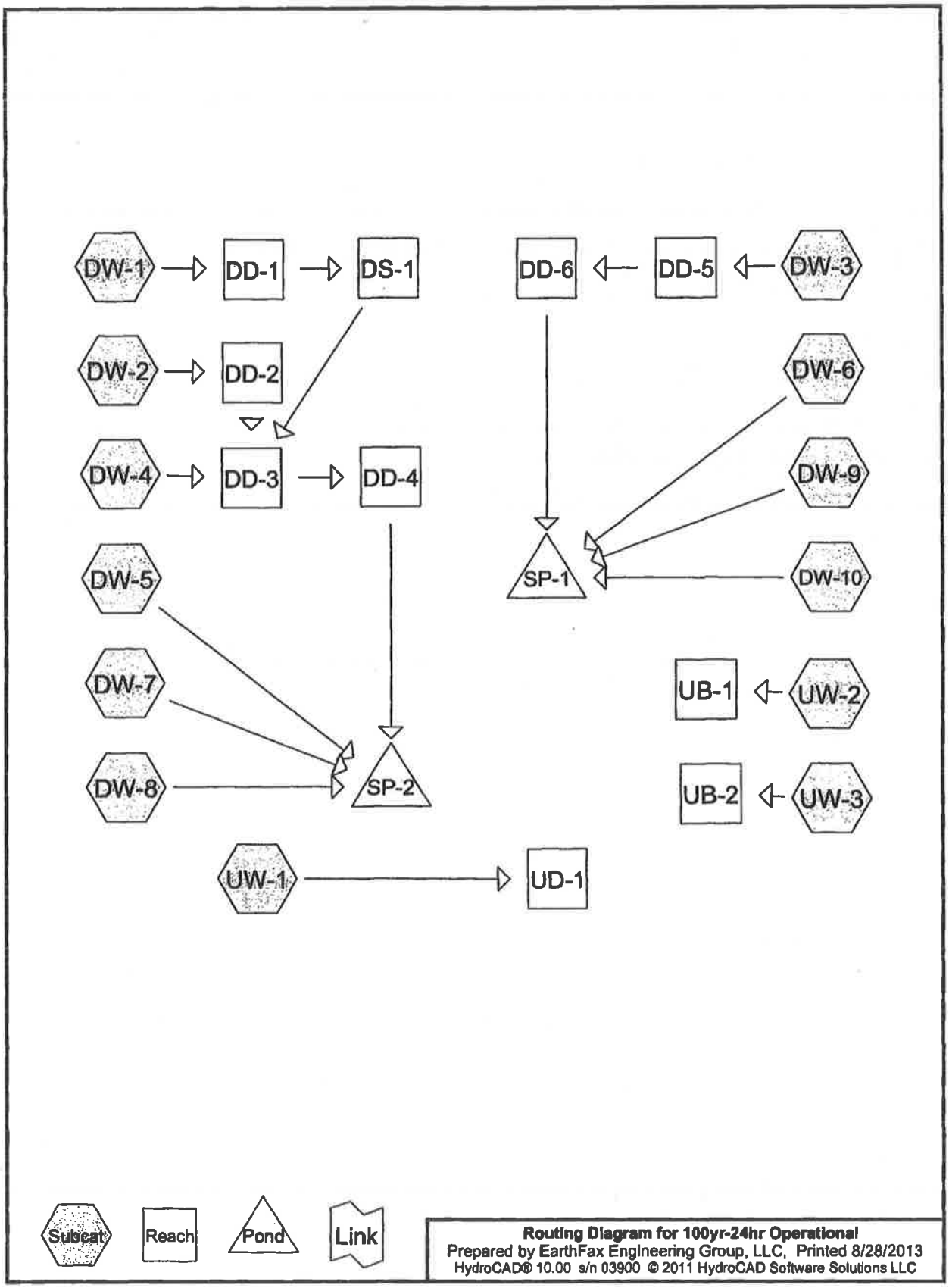
Summary for Reach RD-3:

Inflow Area = 1.540 ac, 0.00% Impervious, Inflow Depth = 0.21"
Inflow = 0.77 cfs @ 2.97 hrs, Volume= 0.027 af
Outflow = 0.70 cfs @ 3.00 hrs, Volume= 0.027 af, Atten= 10%, Lag= 2.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.39 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.33 fps, Avg. Travel Time= 1.8 min

Peak Storage= 43 cf @ 2.99 hrs
Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 424.60 cfs

6.00' x 2.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 14.00'
Length= 140.0' Slope= 0.2214 '/'
Inlet Invert= 5,902.00', Outlet Invert= 5,871.00'


DW-1
DD-1
DS-1
DD-6
DD-5
DW-3
DW-2
DD-2
DW-6
DW-4
DD-3
DD-4
DW-9
DW-5
SP-1
DW-10
DW-7
UB-1
UW-2
DW-8
SP-2
UB-2
UW-3
UW-1
UD-1
Subcat
Reach
Pond
Link
Routing Diagram for 100yr-24hr Operational
Prepared by EarthFax Engineering Group, LLC, Printed 8/28/2013
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Summary for Subcatchment DW-1:

Runoff = 1.22 cfs @ 11.90 hrs, Volume= 0.050 af, Depth> 1.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=2.35"

Area (ac)	CN	Description
0.535	86	Newly graded area, HSG B
0.535		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	90	0.5000	2.80		**Lag/CN Method,**

Summary for Subcatchment DW-10:

Runoff = 0.69 cfs @ 11.90 hrs, Volume= 0.028 af, Depth> 1.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=2.35"

Area (ac)	CN	Description
0.303	86	Newly graded area, HSG B
0.303		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	60	0.1900	1.59		**Lag/CN Method,**

Summary for Subcatchment DW-2:

Runoff = 4.91 cfs @ 11.94 hrs, Volume= 0.212 af, Depth> 1.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=2.35"

Area (ac)	CN	Description
2.270	86	Newly graded area, HSG B
2.270		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	285	0.0880	1.48		**Lag/CN Method,**

Summary for Subcatchment DW-3:

Runoff = 12.06 cfs @ 11.93 hrs, Volume= 0.517 af, Depth> 1.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=2.35"

Area (ac)	CN	Description
5.527	86	Newly graded area, HSG B
5.527		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	340	0.2000	2.31		**Lag/CN Method,**

Summary for Subcatchment DW-4:

Runoff = 13.25 cfs @ 11.94 hrs, Volume= 0.569 af, Depth> 1.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=2.35"

Area (ac)	CN	Description
6.083	86	Newly graded area, HSG B
6.083		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	380	0.1900	2.30		**Lag/CN Method,**

Summary for Subcatchment DW-5:

Runoff = 9.18 cfs @ 11.97 hrs, Volume= 0.438 af, Depth> 1.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=2.35"

Area (ac)	CN	Description
4.686	86	Newly graded area, HSG B
4.686		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	820	0.1500	2.39		**Lag/CN Method,**

Summary for Subcatchment DW-6:

Runoff = 1.40 cfs @ 11.90 hrs, Volume= 0.059 af, Depth> 1.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=2.35"

Area (ac)	CN	Description
0.626	86	Newly graded area, HSG B
0.626		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	190	0.5000	3.25		**Lag/CN Method,**

Summary for Subcatchment DW-7:

Runoff = 2.25 cfs @ 11.89 hrs, Volume= 0.107 af, Depth> 2.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=2.35"

Area (ac)	CN	Description
0.606	98	Water Surface, HSG B
0.606		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	10	0.3300	2.53		**Lag/CN Method,**

Summary for Subcatchment DW-8:

Runoff = 0.48 cfs @ 11.90 hrs, Volume= 0.019 af, Depth> 1.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=2.35"

Area (ac)	CN	Description
0.207	86	Newly graded area, HSG B
0.207		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	20	0.3300	1.68		**Lag/CN Method,**

Summary for Subcatchment DW-9:

Runoff = 2.24 cfs @ 11.89 hrs, Volume= 0.107 af, Depth> 2.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=2.35"

Area (ac)	CN	Description
0.604	98	Water Surface, HSG B
0.604		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	10	0.3300	2.53		**Lag/CN Method,**

Summary for Subcatchment UW-1:

Runoff = 4.06 cfs @ 12.41 hrs, Volume= 0.610 af, Depth> 0.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=2.35"

	Area (ac)	CN	Description
*	17.785	71	Pinyon/juniper range, Poor, HSG B
	17.785		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
37.5	1,760	0.0300	0.78		**Lag/CN Method,**

Summary for Subcatchment UW-2:

Runoff = 0.10 cfs @ 11.94 hrs, Volume= 0.005 af, Depth> 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=2.35"

	Area (ac)	CN	Description
*	0.135	71	Pinyon/juniper range, Poor, HSG B
	0.135		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	150	0.3000	1.51		**Lag/CN Method,**

Summary for Subcatchment UW-3:

Runoff = 0.11 cfs @ 11.94 hrs, Volume= 0.005 af, Depth> 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=2.35"

	Area (ac)	CN	Description
*	0.143	71	Pinyon/juniper range, Poor, HSG B
	0.143		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	150	0.2000	1.24		**Lag/CN Method,**

Summary for Reach DD-1:

Inflow Area = 0.535 ac, 0.00% Impervious, Inflow Depth > 1.12"
Inflow = 1.22 cfs @ 11.90 hrs, Volume= 0.050 af
Outflow = 1.06 cfs @ 11.98 hrs, Volume= 0.050 af, Atten= 13%, Lag= 4.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.25 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 0.85 fps, Avg. Travel Time= 7.5 min

Peak Storage= 182 cf @ 11.93 hrs
Average Depth at Peak Storage= 0.49'
Bank-Full Depth= 1.00' Flow Area= 2.0 sf, Capacity= 7.34 cfs

0.00' x 1.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 4.00'
Length= 385.0' Slope= 0.0286 '/'
Inlet Invert= 5,949.00', Outlet Invert= 5,938.00'

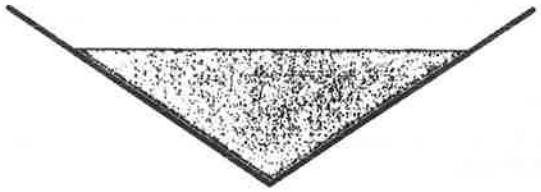
Summary for Reach DD-2:

Inflow Area = 2.270 ac, 0.00% Impervious, Inflow Depth > 1.12"
Inflow = 4.91 cfs @ 11.94 hrs, Volume= 0.212 af
Outflow = 4.38 cfs @ 11.99 hrs, Volume= 0.212 af, Atten= 11%, Lag= 2.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.12 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 1.91 fps, Avg. Travel Time= 4.8 min

Peak Storage= 492 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.77'
Bank-Full Depth= 1.00' Flow Area= 1.5 sf, Capacity= 9.13 cfs

0.00' x 1.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 1.5 '/' Top Width= 3.00'
Length= 550.0' Slope= 0.0864 '/'
Inlet Invert= 5,985.00', Outlet Invert= 5,937.50'



Summary for Reach DD-3:

Inflow Area =	8.888 ac,	0.00% Impervious,	Inflow Depth >	1.12"
Inflow =	17.93 cfs @	11.94 hrs, Volume=	0.830 af	
Outflow =	13.54 cfs @	12.11 hrs, Volume=	0.824 af, Atten= 25%, Lag= 9.7 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.11 fps, Min. Travel Time= 6.4 min
Avg. Velocity = 1.23 fps, Avg. Travel Time= 16.2 min

Peak Storage= 5,312 cf @ 12.00 hrs
Average Depth at Peak Storage= 1.21'
Bank-Full Depth= 2.50' Flow Area= 18.8 sf, Capacity= 94.24 cfs

0.00' x 2.50' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 3.0 '/' Top Width= 15.00'
Length= 1,200.0' Slope= 0.0146 '/'
Inlet Invert= 5,937.50', Outlet Invert= 5,920.00'

Summary for Reach DD-4:

Inflow Area =	8.888 ac,	0.00% Impervious,	Inflow Depth >	1.11"
Inflow =	13.54 cfs @	12.11 hrs, Volume=	0.824 af	
Outflow =	13.30 cfs @	12.12 hrs, Volume=	0.823 af, Atten= 2%, Lag= 0.7 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.06 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.83 fps, Avg. Travel Time= 1.7 min

Peak Storage= 354 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 1.00' Flow Area= 10.0 sf, Capacity= 171.61 cfs

8.00' x 1.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 12.00'
Length= 185.0' Slope= 0.2865 '/'
Inlet Invert= 5,920.00', Outlet Invert= 5,867.00'

‡

Summary for Reach DD-5:

Inflow Area = 5.527 ac, 0.00% Impervious, Inflow Depth > 1.12"
Inflow = 12.06 cfs @ 11.93 hrs, Volume= 0.517 af
Outflow = 9.77 cfs @ 12.03 hrs, Volume= 0.514 af, Atten= 19%, Lag= 6.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.41 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 1.69 fps, Avg. Travel Time= 10.7 min

Peak Storage= 2,471 cf @ 11.97 hrs
Average Depth at Peak Storage= 1.07'
Bank-Full Depth= 3.00' Flow Area= 18.0 sf, Capacity= 158.49 cfs

0.00' x 3.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 12.00'
Length= 1,080.0' Slope= 0.0380 '/'
Inlet Invert= 5,949.00', Outlet Invert= 5,908.00'

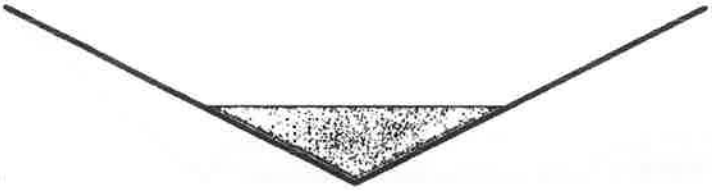
Summary for Reach DD-6:

Inflow Area = 5.527 ac, 0.00% Impervious, Inflow Depth > 1.12"
Inflow = 9.77 cfs @ 12.03 hrs, Volume= 0.514 af
Outflow = 9.64 cfs @ 12.04 hrs, Volume= 0.514 af, Atten= 1%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.10 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.35 fps, Avg. Travel Time= 0.8 min

Peak Storage= 192 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.89'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 83.53 cfs

0.00' x 2.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 120.0' Slope= 0.0917 '/'
Inlet Invert= 5,908.00', Outlet Invert= 5,897.00'



Summary for Reach DS-1:

Inflow Area =	0.535 ac,	0.00% Impervious,	Inflow Depth >	1.12"
Inflow =	1.06 cfs @	11.98 hrs, Volume=	0.050 af	
Outflow =	1.05 cfs @	11.99 hrs, Volume=	0.050 af,	Atten= 1%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.04 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 0.26 fps, Avg. Travel Time= 1.3 min

Peak Storage= 20 cf @ 11.98 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 0.50' Flow Area= 10.0 sf, Capacity= 28.22 cfs

10.00' x 0.50' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 20.0 '/' Top Width= 30.00'
Length= 20.0' Slope= 0.0250 '/'
Inlet Invert= 5,938.00', Outlet Invert= 5,937.50'

‡

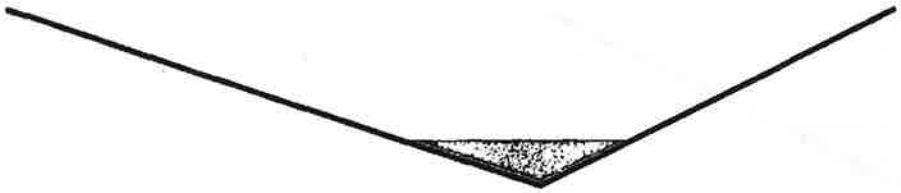
Summary for Reach UB-1:

Inflow Area =	0.135 ac,	0.00% Impervious,	Inflow Depth >	0.42"
Inflow =	0.10 cfs @	11.94 hrs, Volume=	0.005 af	
Outflow =	0.10 cfs @	11.95 hrs, Volume=	0.005 af,	Atten= 4%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.34 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 0.99 fps, Avg. Travel Time= 1.0 min

Peak Storage= 3 cf @ 11.94 hrs
Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 0.50' Flow Area= 0.6 sf, Capacity= 3.56 cfs

0.00' x 0.50' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 2.0 '/' Top Width= 2.50'
Length= 60.0' Slope= 0.0500 '/'
Inlet Invert= 5,875.00', Outlet Invert= 5,872.00'



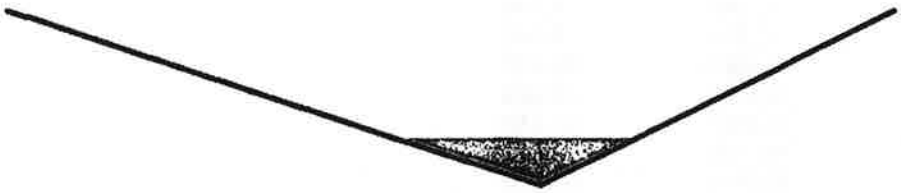
Summary for Reach UB-2:

Inflow Area = 0.143 ac, 0.00% Impervious, Inflow Depth > 0.42"
Inflow = 0.11 cfs @ 11.94 hrs, Volume= 0.005 af
Outflow = 0.10 cfs @ 11.95 hrs, Volume= 0.005 af, Atten= 6%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.31 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 0.98 fps, Avg. Travel Time= 1.4 min

Peak Storage= 4 cf @ 11.95 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 0.50' Flow Area= 0.6 sf, Capacity= 3.45 cfs

0.00' x 0.50' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 2.0 '/' Top Width= 2.50'
Length= 85.0' Slope= 0.0471 '/'
Inlet Invert= 5,876.00', Outlet Invert= 5,872.00'



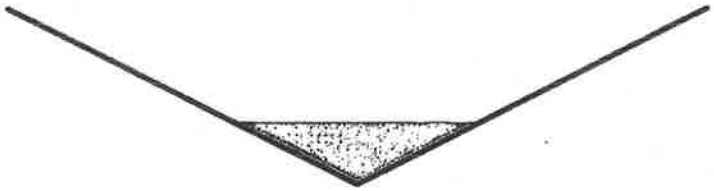
Summary for Reach UD-1:

Inflow Area = 17.785 ac, 0.00% Impervious, Inflow Depth > 0.41"
Inflow = 4.06 cfs @ 12.41 hrs, Volume= 0.610 af
Outflow = 3.93 cfs @ 12.56 hrs, Volume= 0.605 af, Atten= 3%, Lag= 9.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.94 fps, Min. Travel Time= 4.9 min
Avg. Velocity = 2.28 fps, Avg. Travel Time= 8.4 min

Peak Storage= 1,151 cf @ 12.48 hrs
Average Depth at Peak Storage= 0.71'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 63.02 cfs

0.00' x 2.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 1,150.0' Slope= 0.0522 '/'
Inlet Invert= 5,943.00', Outlet Invert= 5,883.00'



Summary for Pond SP-1:

Inflow Area = 7.060 ac, 8.56% Impervious, Inflow Depth > 1.20"
Inflow = 10.27 cfs @ 12.04 hrs, Volume= 0.708 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 5,897.72' @ 24.00 hrs Surf.Area= 15,081 sf Storage= 30,806 cf

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	5,894.50'	114,498 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
5,894.50	0	0	0
5,895.00	4,583	1,146	1,146
5,896.00	10,205	7,394	8,540
5,897.00	13,585	11,895	20,435
5,898.00	15,653	14,619	35,054
5,899.00	17,740	16,697	51,750
5,900.00	19,849	18,795	70,545
5,901.00	21,972	20,911	91,455
5,902.00	24,114	23,043	114,498

Summary for Pond SP-2:

Inflow Area = 14.387 ac, 4.21% Impervious, Inflow Depth > 1.16"
Inflow = 16.64 cfs @ 12.02 hrs, Volume= 1.387 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

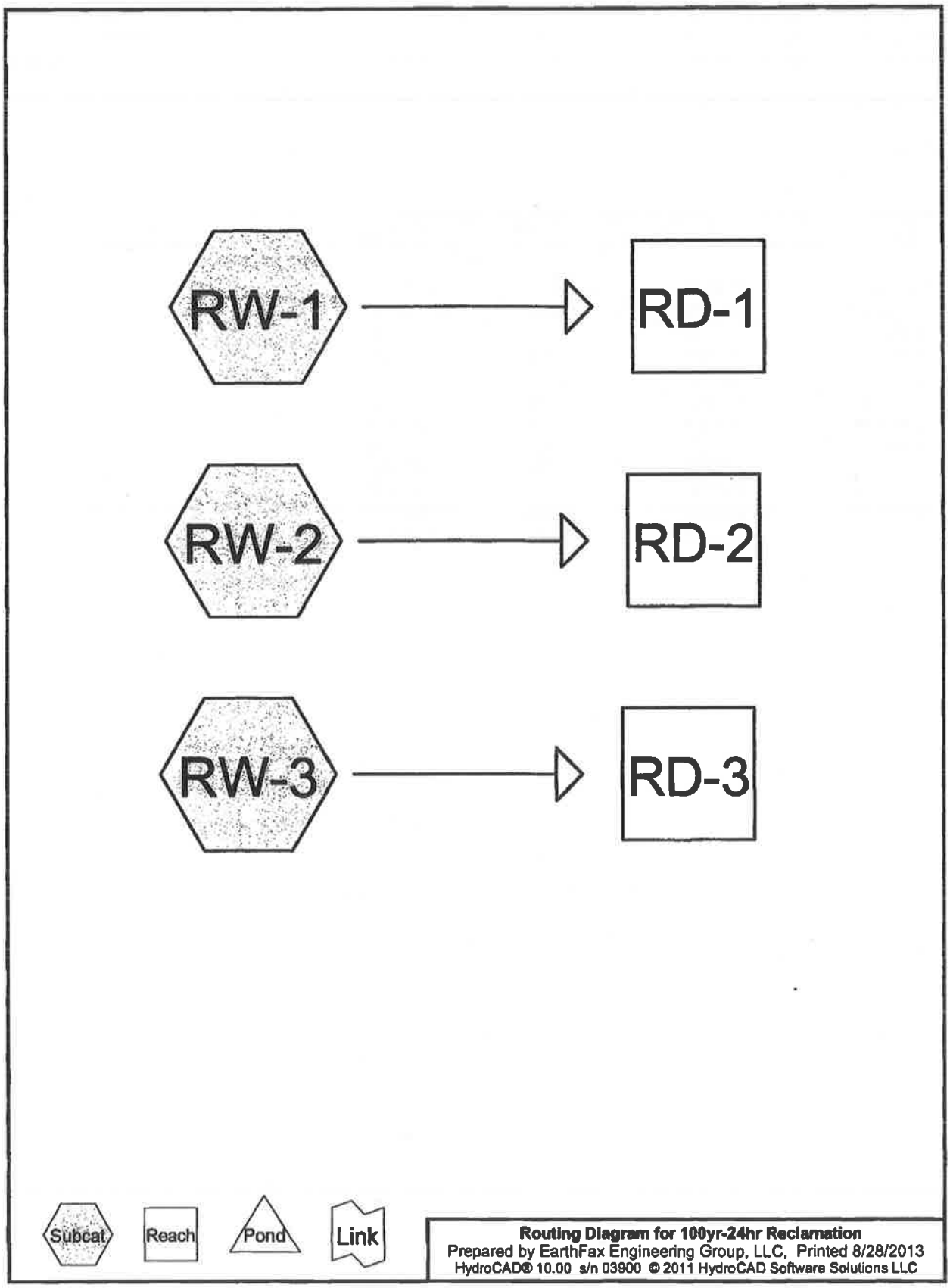
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 5,864.69' @ 24.00 hrs Surf.Area= 19,343 sf Storage= 60,392 cf

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	5,859.90'	113,186 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
5,859.90	0	0	0
5,860.00	6,718	336	336
5,861.00	9,106	7,912	8,248
5,862.00	11,806	10,456	18,704
5,863.00	14,494	13,150	31,854
5,864.00	17,310	15,902	47,756
5,865.00	20,258	18,784	66,540
5,866.00	23,306	21,782	88,322
5,866.25	24,092	5,925	94,247
5,867.00	26,413	18,939	113,186



Routing Diagram for 100yr-24hr Reclamation
Prepared by EarthFax Engineering Group, LLC, Printed 8/28/2013

Summary for Subcatchment RW-1:

Runoff = 6.34 cfs @ 12.26 hrs, Volume= 0.748 af, Depth> 0.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=2.35"

Area (ac)	CN	Description
* 21.689	71	Pinyon/juniper range, Poor, HSG B
21.689		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.6	1,150	0.0300	0.72		**Lag/CN Method,**

Summary for Subcatchment RW-2:

Runoff = 0.38 cfs @ 11.92 hrs, Volume= 0.018 af, Depth> 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=2.35"

Area (ac)	CN	Description
* 0.512	71	Pinyon/juniper range, Poor, HSG B
0.512		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	120	0.5000	1.87		**Lag/CN Method,**

Summary for Subcatchment RW-3:

Runoff = 1.13 cfs @ 11.95 hrs, Volume= 0.054 af, Depth> 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=2.35"

Area (ac)	CN	Description
* 1.540	71	Pinyon/juniper range, Poor, HSG B
1.540		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	330	0.2850	1.73		**Lag/CN Method,**

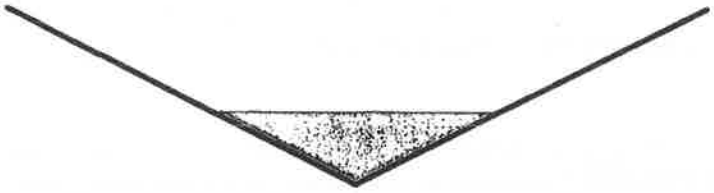
Summary for Reach RD-1:

Inflow Area = 21.689 ac, 0.00% Impervious, Inflow Depth > 0.41"
Inflow = 6.34 cfs @ 12.26 hrs, Volume= 0.748 af
Outflow = 5.99 cfs @ 12.39 hrs, Volume= 0.742 af, Atten= 6%, Lag= 8.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.38 fps, Min. Travel Time= 4.4 min
Avg. Velocity = 2.39 fps, Avg. Travel Time= 8.0 min

Peak Storage= 1,586 cf @ 12.32 hrs
Average Depth at Peak Storage= 0.83'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 63.02 cfs

0.00' x 2.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 1,150.0' Slope= 0.0522 '/'
Inlet Invert= 5,943.00', Outlet Invert= 5,883.00'



Summary for Reach RD-2:

Inflow Area = 0.512 ac, 0.00% Impervious, Inflow Depth > 0.42"
Inflow = 0.38 cfs @ 11.92 hrs, Volume= 0.018 af
Outflow = 0.34 cfs @ 12.00 hrs, Volume= 0.018 af, Atten= 11%, Lag= 4.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.67 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 0.32 fps, Avg. Travel Time= 5.3 min

Peak Storage= 53 cf @ 11.95 hrs
Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 145.64 cfs

8.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 5,931.00', Outlet Invert= 5,930.00'

‡

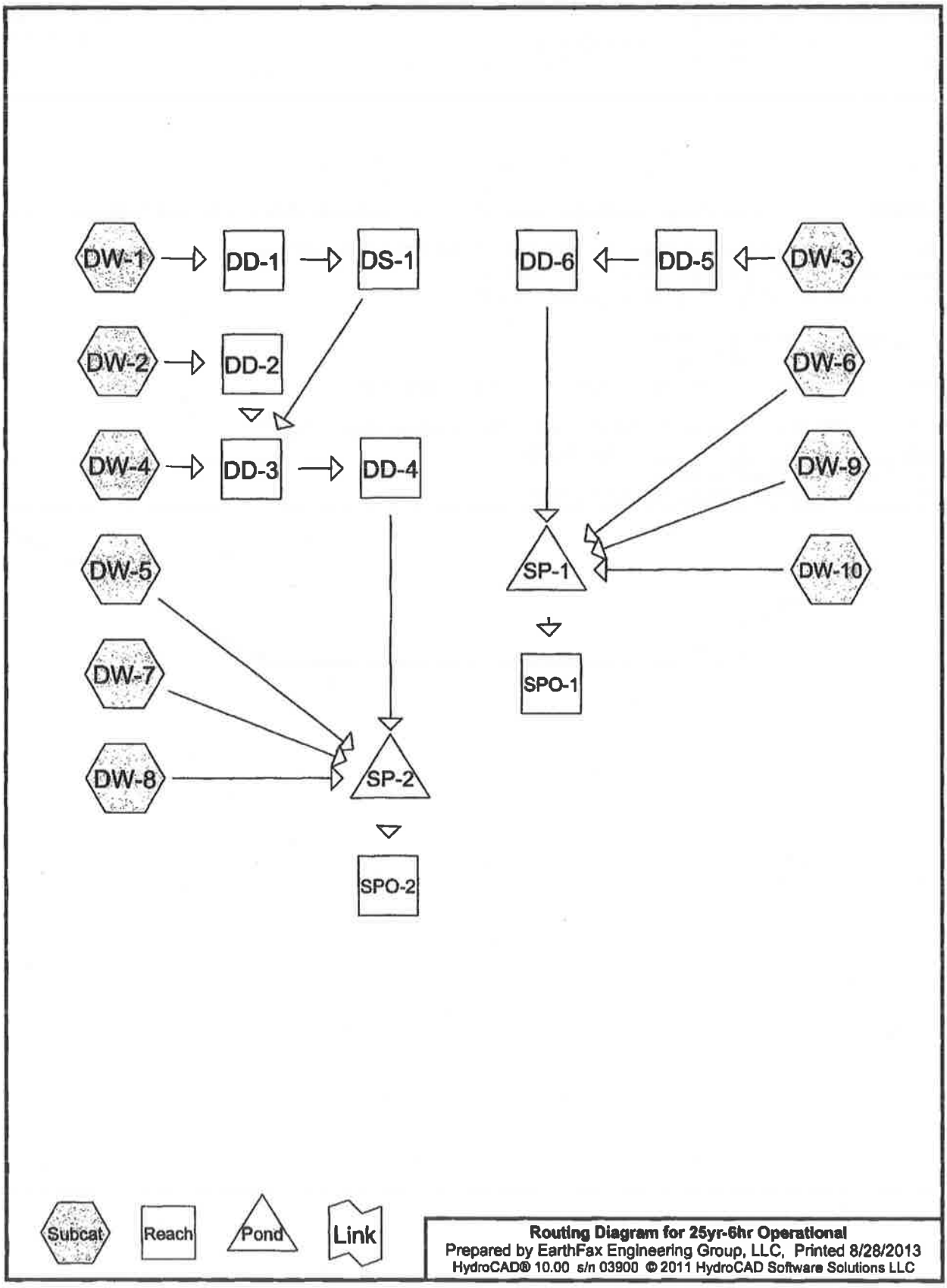
Summary for Reach RD-3:

Inflow Area = 1.540 ac, 0.00% Impervious, Inflow Depth > 0.42"
Inflow = 1.13 cfs @ 11.95 hrs, Volume= 0.054 af
Outflow = 1.02 cfs @ 11.98 hrs, Volume= 0.054 af, Atten= 9%, Lag= 1.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.75 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.30 fps, Avg. Travel Time= 1.8 min

Peak Storage= 55 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 424.60 cfs

6.00' x 2.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 14.00'
Length= 140.0' Slope= 0.2214 '/'
Inlet Invert= 5,902.00', Outlet Invert= 5,871.00'



Routing Diagram for 25yr-6hr Operational
Prepared by EarthFax Engineering Group, LLC, Printed 8/28/2013
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Summary for Subcatchment DW-1:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.67 cfs @ 2.91 hrs, Volume= 0.018 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.38"

Area (ac)	CN	Description
0.535	86	Newly graded area, HSG B
0.535		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	90	0.5000	2.80		**Lag/CN Method,**

Summary for Subcatchment DW-10:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.38 cfs @ 2.91 hrs, Volume= 0.010 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.38"

Area (ac)	CN	Description
0.303	86	Newly graded area, HSG B
0.303		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	60	0.1900	1.59		**Lag/CN Method,**

Summary for Subcatchment DW-2:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 2.68 cfs @ 2.95 hrs, Volume= 0.078 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.38"

Area (ac)	CN	Description
2.270	86	Newly graded area, HSG B
2.270		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	285	0.0880	1.48		**Lag/CN Method,**

Summary for Subcatchment DW-3:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 6.65 cfs @ 2.94 hrs, Volume= 0.191 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.38"

Area (ac)	CN	Description
5.527	86	Newly graded area, HSG B
5.527		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	340	0.2000	2.31		**Lag/CN Method,**

Summary for Subcatchment DW-4:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 7.27 cfs @ 2.94 hrs, Volume= 0.210 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.38"

Area (ac)	CN	Description
6.083	86	Newly graded area, HSG B
6.083		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	380	0.1900	2.30		**Lag/CN Method,**

Summary for Subcatchment DW-5:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 5.65 cfs @ 2.94 hrs, Volume= 0.162 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.38"

Area (ac)	CN	Description
4.686	86	Newly graded area, HSG B
4.686		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	390	0.3300	3.05		**Lag/CN Method,**

Summary for Subcatchment DW-6:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.76 cfs @ 2.91 hrs, Volume= 0.022 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.38"

Area (ac)	CN	Description
0.626	86	Newly graded area, HSG B
0.626		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	190	0.5000	3.25		**Lag/CN Method,**

Summary for Subcatchment DW-7:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.82 cfs @ 2.89 hrs, Volume= 0.059 af, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.38"

Area (ac)	CN	Description
0.606	98	Water Surface, HSG B
0.606		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	10	0.3300	2.53		**Lag/CN Method,**

Summary for Subcatchment DW-8:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.26 cfs @ 2.90 hrs, Volume= 0.007 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.38"

Area (ac)	CN	Description
0.207	86	Newly graded area, HSG B
0.207		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	20	0.3300	1.68		**Lag/CN Method,**

Summary for Subcatchment DW-9:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.81 cfs @ 2.89 hrs, Volume= 0.059 af, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Type II 6-hr Rainfall=1.38"

Area (ac)	CN	Description
0.605	98	Water Surface, HSG B
0.605		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	10	0.3300	2.53		**Lag/CN Method,**

Summary for Reach DD-1:

Inflow Area = 0.535 ac, 0.00% Impervious, Inflow Depth = 0.41"
Inflow = 0.67 cfs @ 2.91 hrs, Volume= 0.018 af
Outflow = 0.55 cfs @ 3.00 hrs, Volume= 0.018 af, Atten= 18%, Lag= 5.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.93 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 0.77 fps, Avg. Travel Time= 8.3 min

Peak Storage= 112 cf @ 2.95 hrs
Average Depth at Peak Storage= 0.38'
Bank-Full Depth= 1.00' Flow Area= 2.0 sf, Capacity= 7.34 cfs

0.00' x 1.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 4.00'
Length= 385.0' Slope= 0.0286 '/'
Inlet Invert= 5,949.00', Outlet Invert= 5,938.00'

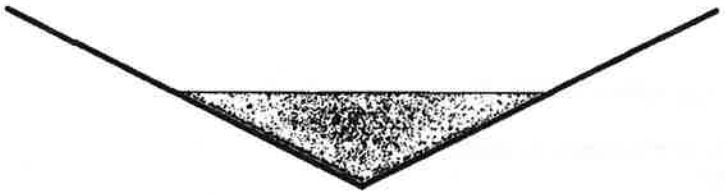
Summary for Reach DD-2:

Inflow Area = 2.270 ac, 0.00% Impervious, Inflow Depth = 0.41"
Inflow = 2.68 cfs @ 2.95 hrs, Volume= 0.078 af
Outflow = 2.31 cfs @ 3.01 hrs, Volume= 0.078 af, Atten= 14%, Lag= 3.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.16 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 1.68 fps, Avg. Travel Time= 5.5 min

Peak Storage= 314 cf @ 2.98 hrs
Average Depth at Peak Storage= 0.54'
Bank-Full Depth= 1.00' Flow Area= 2.0 sf, Capacity= 12.77 cfs

0.00' x 1.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 4.00'
Length= 550.0' Slope= 0.0864 '/'
Inlet Invert= 5,985.00', Outlet Invert= 5,937.50'



Summary for Reach DD-3:

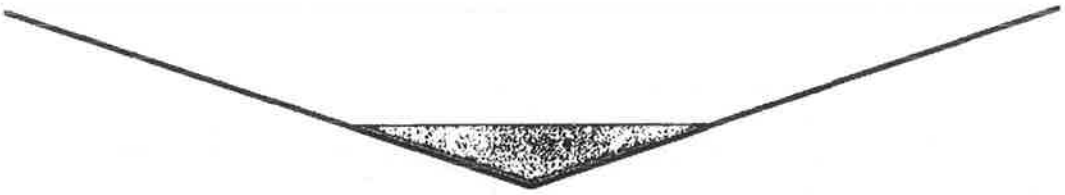
[62] Hint: Exceeded Reach DD-2 OUTLET depth by 0.49' @ 3.10 hrs
[63] Warning: Exceeded Reach DS-1 INLET depth by 0.33' @ 3.05 hrs

Inflow Area = 8.888 ac, 0.00% Impervious, Inflow Depth = 0.41"
Inflow = 9.31 cfs @ 2.95 hrs, Volume= 0.307 af
Outflow = 5.97 cfs @ 3.16 hrs, Volume= 0.307 af, Atten= 36%, Lag= 12.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.52 fps, Min. Travel Time= 7.9 min
Avg. Velocity = 0.79 fps, Avg. Travel Time= 25.3 min

Peak Storage= 2,867 cf @ 3.03 hrs
Average Depth at Peak Storage= 0.89'
Bank-Full Depth= 2.50' Flow Area= 18.8 sf, Capacity= 94.24 cfs

0.00' x 2.50' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 3.0 '/' Top Width= 15.00'
Length= 1,200.0' Slope= 0.0146 '/'
Inlet Invert= 5,937.50', Outlet Invert= 5,920.00'



Summary for Reach DD-4:

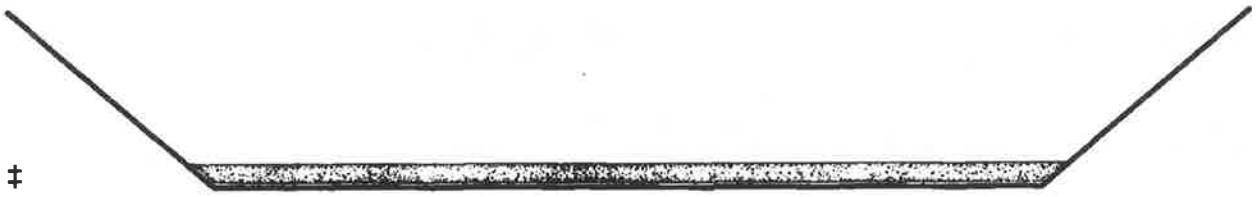
[61] Hint: Exceeded Reach DD-3 outlet invert by 0.14' @ 3.15 hrs

Inflow Area = 8.888 ac, 0.00% Impervious, Inflow Depth = 0.41"
Inflow = 5.97 cfs @ 3.16 hrs, Volume= 0.307 af
Outflow = 5.79 cfs @ 3.18 hrs, Volume= 0.307 af, Atten= 3%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.16 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.48 fps, Avg. Travel Time= 2.1 min

Peak Storage= 213 cf @ 3.17 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 1.00' Flow Area= 10.0 sf, Capacity= 171.61 cfs

8.00' x 1.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 12.00'
Length= 185.0' Slope= 0.2865 '/'
Inlet Invert= 5,920.00', Outlet Invert= 5,867.00'



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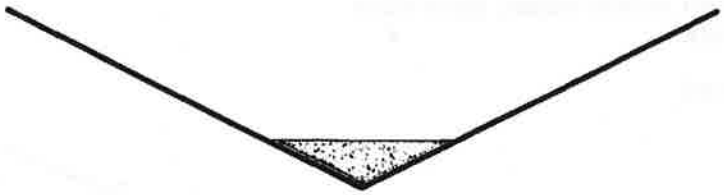
Summary for Reach DD-5:

Inflow Area = 5.527 ac, 0.00% Impervious, Inflow Depth = 0.41"
Inflow = 6.65 cfs @ 2.94 hrs, Volume= 0.191 af
Outflow = 4.80 cfs @ 3.07 hrs, Volume= 0.191 af, Atten= 28%, Lag= 7.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.71 fps, Min. Travel Time= 4.9 min
Avg. Velocity = 1.27 fps, Avg. Travel Time= 14.2 min

Peak Storage= 1,462 cf @ 2.99 hrs
Average Depth at Peak Storage= 0.82'
Bank-Full Depth= 3.00' Flow Area= 18.0 sf, Capacity= 158.49 cfs

0.00' x 3.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 12.00'
Length= 1,080.0' Slope= 0.0380 '/'
Inlet Invert= 5,949.00', Outlet Invert= 5,908.00'



Summary for Reach DD-6:

[62] Hint: Exceeded Reach DD-5 OUTLET depth by 0.05' @ 3.10 hrs

Inflow Area = 5.527 ac, 0.00% Impervious, Inflow Depth = 0.41"
Inflow = 4.80 cfs @ 3.07 hrs, Volume= 0.191 af
Outflow = 4.68 cfs @ 3.08 hrs, Volume= 0.191 af, Atten= 3%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.06 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.76 fps, Avg. Travel Time= 1.1 min

Peak Storage= 112 cf @ 3.07 hrs
Average Depth at Peak Storage= 0.69'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 83.53 cfs

0.00' x 2.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 120.0' Slope= 0.0917 '/'
Inlet Invert= 5,908.00', Outlet Invert= 5,897.00'

Summary for Reach DS-1:

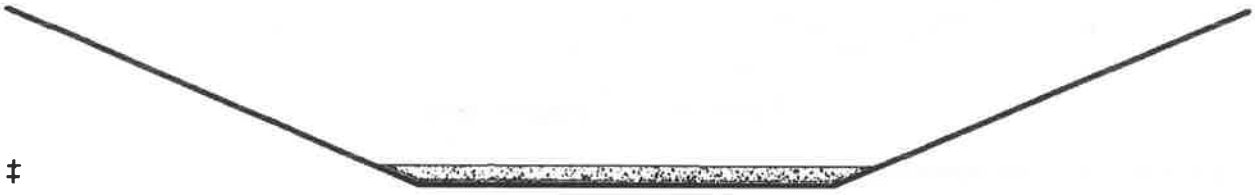
[61] Hint: Exceeded Reach DD-1 outlet invert by 0.06' @ 3.00 hrs

Inflow Area = 0.535 ac, 0.00% Impervious, Inflow Depth = 0.41"
Inflow = 0.55 cfs @ 3.00 hrs, Volume= 0.018 af
Outflow = 0.53 cfs @ 3.01 hrs, Volume= 0.018 af, Atten= 3%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.83 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 0.28 fps, Avg. Travel Time= 1.2 min

Peak Storage= 13 cf @ 3.00 hrs
Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 0.50' Flow Area= 10.0 sf, Capacity= 28.22 cfs

10.00' x 0.50' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 20.0 '/' Top Width= 30.00'
Length= 20.0' Slope= 0.0250 '/'
Inlet Invert= 5,938.00', Outlet Invert= 5,937.50'



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Summary for Reach SPO-1:

[78] Warning: Submerged Pond SP-1 Primary device # 1 by 0.16'
[81] Warning: Exceeded Pond SP-1 by 0.01' @ 6.05 hrs

Inflow Area =	7.061 ac,	8.57% Impervious,	Inflow Depth =	0.48"
Inflow =	5.06 cfs @	3.08 hrs, Volume=	0.282 af	
Outflow =	5.00 cfs @	3.09 hrs, Volume=	0.282 af,	Atten= 1%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.96 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.73 fps, Avg. Travel Time= 1.3 min

Peak Storage= 143 cf @ 3.09 hrs
Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 424.60 cfs

6.00' x 2.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 14.00'
Length= 140.0' Slope= 0.2214 '/'
Inlet Invert= 5,902.00', Outlet Invert= 5,871.00'

Summary for Reach SPO-2:

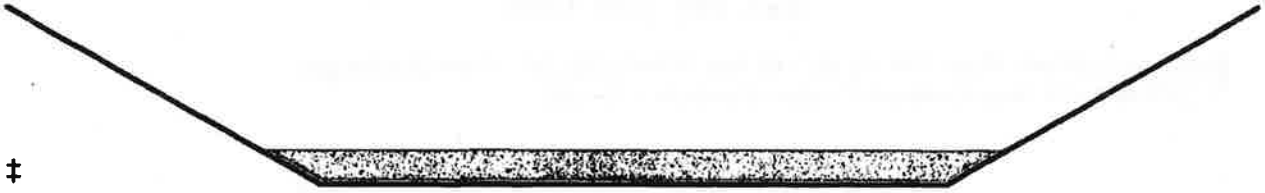
[78] Warning: Submerged Pond SP-2 Primary device # 1 by 0.19'
[81] Warning: Exceeded Pond SP-2 by 0.04' @ 3.65 hrs

Inflow Area = 14.387 ac, 4.21% Impervious, Inflow Depth = 0.45"
Inflow = 7.42 cfs @ 2.93 hrs, Volume= 0.535 af
Outflow = 7.41 cfs @ 2.93 hrs, Volume= 0.535 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.49 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.43 fps, Avg. Travel Time= 0.0 min

Peak Storage= 5 cf @ 2.93 hrs
Average Depth at Peak Storage= 0.20'
Bank-Full Depth= 1.00' Flow Area= 6.0 sf, Capacity= 130.34 cfs

4.00' x 1.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 6.0' Slope= 0.5417 '/'
Inlet Invert= 5,866.25', Outlet Invert= 5,863.00'



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Summary for Pond SP-1:

[62] Hint: Exceeded Reach DD-6 OUTLET depth by 5.04' @ 2.70 hrs

Inflow Area = 7.061 ac, 8.57% Impervious, Inflow Depth = 0.48"
Inflow = 5.06 cfs @ 3.08 hrs, Volume= 0.282 af
Outflow = 5.06 cfs @ 3.08 hrs, Volume= 0.282 af, Atten= 0%, Lag= 0.0 min
Primary = 5.06 cfs @ 3.08 hrs, Volume= 0.282 af

Routing by Stor-Ind method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Peak Elev= 5,902.30' @ 3.08 hrs Surf.Area= 24,788 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (215.6 - 215.6)

Volume	Invert	Avail.Storage	Storage Description
#1	5,894.50'	0 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 139,723 cf Overall x 0.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
5,894.50	0	0	0
5,895.00	4,583	1,146	1,146
5,896.00	10,205	7,394	8,540
5,897.00	13,585	11,895	20,435
5,898.00	15,653	14,619	35,054
5,899.00	17,740	16,697	51,750
5,900.00	19,849	18,795	70,545
5,901.00	21,972	20,911	91,455
5,902.00	24,114	23,043	114,498
5,903.00	26,335	25,225	139,723

Device	Routing	Invert	Outlet Devices
#1	Primary	5,902.00'	**Special & User-Defined** Head (feet) 0.00 0.29 Disch. (cfs) 0.000 4.840

Primary OutFlow Max=4.92 cfs @ 3.08 hrs HW=5,902.29' (Free Discharge)
└**1=Special & User-Defined** (Custom Controls 4.92 cfs)

Summary for Pond SP-2:

Inflow Area = 14.387 ac, 4.21% Impervious, Inflow Depth = 0.45"
Inflow = 7.42 cfs @ 2.93 hrs, Volume= 0.535 af
Outflow = 7.42 cfs @ 2.93 hrs, Volume= 0.535 af, Atten= 0%, Lag= 0.0 min
Primary = 7.42 cfs @ 2.93 hrs, Volume= 0.535 af

Routing by Stor-Ind method, Time Span= 0.00-12.00 hrs, dt= 0.05 hrs
Peak Elev= 5,866.45' @ 2.93 hrs Surf.Area= 0 sf Storage= 0 cf

Plug-Flow detention time= 0.0 min calculated for 0.535 af (100% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	5,859.90'	0 cf	**Custom Stage Data**Listed below 113,177 cf Overall x 0.0% Voids

Elevation (feet)	Cum.Store (cubic-feet)
5,859.90	0
5,860.00	336
5,861.00	8,248
5,862.00	18,704
5,863.00	31,854
5,864.00	47,756
5,865.00	66,540
5,866.00	88,320
5,866.25	94,247
5,867.00	113,177

Device	Routing	Invert	Outlet Devices
#1	Primary	5,866.25'	**Special & User-Defined** Head (feet) 0.00 0.20 Disch. (cfs) 0.000 7.420

Primary OutFlow Max=7.07 cfs @ 2.93 hrs HW=5,866.44' (Free Discharge)
↑—**1=Special & User-Defined** (Custom Controls 7.07 cfs)