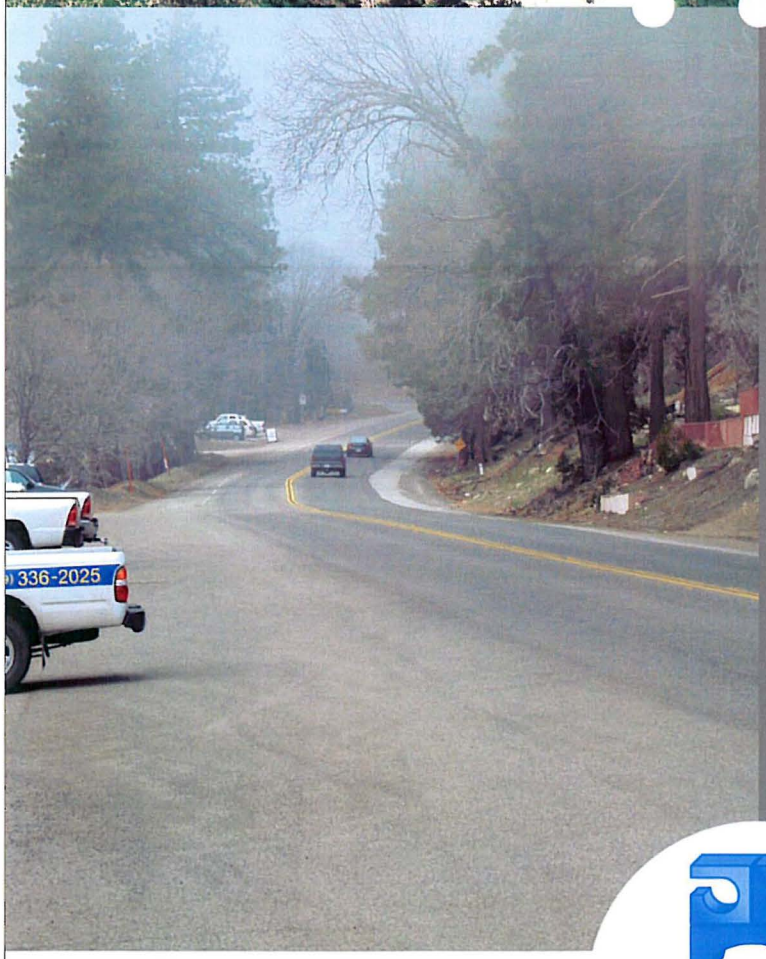
FINAL
Drainage Feasibility Study
Volume I (Hydrology & Hydraulics Component)

Community of Rimforest
County of San Bernardino, CA

Prepared For:

San Bernardino County Department of Public Works
Flood Control District
825 East Third Street
San Bernardino, CA 92415
Phone: (909) 387-7918
Fax: (909) 387-8130

November 8, 2010



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JOSEPH E.
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& ASSOCIATES, INC.

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November 8, 2010

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JOSEPH E. BONADIMAN, P.E. 1903-1990
CHARLES F. BONADIMAN, L.S. 1898-1986
69 Years OF PROFESSIONAL SERVICE

November 8, 2010

Re: Rimforest Drainage Feasibility Study

Executive Summary

Over the last several decades, the southern portion of the community of Rimforest has experienced significant erosion of property that has been a substantial concern to the community. The County of San Bernardino engaged the services of our firm through a Request for Proposal (RFP) to examine the erosion and discuss potential remedies to the problem.

Our study confirms that the erosion is the result of several contributing factors. Amongst them are the geology of the mountains, earthquakes, surface waters, and subsurface waters. The study also revealed a previously unknown, potentially active earthquake fault.

Similar to all earthquake faults, the extent of movement along the fault and onset of quake activity is almost totally unpredictable with the science and instruments currently available to us. Also, without further studies, it is not known if there is any reasonable measure that could be taken to decrease the amount of subsurface water in the area. It is possible that these contributing factors could cause further erosion even in the absence of surface water.

Based on past topographic maps, there was a drainage area that historically flowed southerly near the current alignment of Blackfoot Trail West. During development of the Rimforest community, two storm drain catch basins and pipes were installed on Apache Trail to direct that surface water off the road and over the cliff.

The proposed plan of action addresses the possibility of minimizing the amount of surface water reaching the southern portion of Rimforest. The potential action is to install a trench, pipes and a lift station (indicated as Option 1 in the study) to intercept the majority of the surface water, thereby diverting such water away from the southern portion of the community. This plan would require the expenditure of substantial funds and have to meet environmental and jurisdictional reviews. While we believe that the plan will help slow the rate of failure along the cliff, it will not stop every eventual failure.

Sincerely,

Joseph E. Bonadiman & Associates, Inc.

Joseph S.C. Bonadiman, P.E.
C.E.O.

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FINAL Rimforest Drainage Feasibility Study

1.1 Summary

Drainage Options

The village of Rimforest has eroding cliff-side property and bluff retreat in the Southern part of the village. This problem is primarily caused by storm runoff from either rainstorms or snowmelt after winter storms. The runoff flows to the south side of Rimforest and is discharged over the cliff at two principal locations. This study report evaluated a number of options to re-direct the majority of the runoff to other discharge locations for the purpose of reducing and mostly eliminating the cliff-side erosion. Two options presented in this study appear to be feasible if new conventional storm drain systems are installed.

The improved drainage options only differ in the runoff discharge locations:

Option Number 1 would divert the runoff into Little Bear Creek, which flows through Blue Jay and into Lake Arrowhead (Mojave Watershed).

Option Number 2 would divert the runoff southerly into a canyon east of Rimforest and south of Hightway 18. This is shown on the USGS map as the blue line stream immediately east of a trail marked Daley Road, which joins City Creek two miles south of Highway 18. The blue line stream will be referred to as is named "West Fork City Creek" in the remainder of this report.

Both options consist of **3 phases** of construction:

Phase 1 would be to intercept the largest part of the runoff from north of Highway 18 of 51 Acres (64% Reduction)

Phase 2 would be to drain runoff from 16 acres of the interior part of Rimforest (30% Reduction).

Phase 3 would be to install a lift pump station to drain an additional 4 acres nearby the southern most discharge point at Apache Trail and Blackfoot Trail West (5% Reduction).

Both options require construction of storm drain systems along Highway 18 and inside the village of Rimforest. Option 1 would require construction of retarding basin(s) to avert runoff damage to Blue Jay and structures along Little Bear Creek. Option 2 would discharge runoff through a weir outlet structure into West Fork City Creek and require permission from the U.S. Forest Service. Option 2 would cause erosion at and below the discharge point, however no structures would be affected. The flow would cross the existing Daley trail approximately 1,000 feet below the discharge point.

Option 1 would divert approximately 47 Acre-Feet per year from the Santa Ana River watershed to the Mojave basin watershed, requiring some negotiation on water rights issues. Option 2 would divert runoff from the Strawberry Creek watershed into the West Fork City Creek watershed. It appears that water rights would not be an issue with Option 2 since both creeks ultimately lead to the Santa Ana River, where all

water rights are claimed by the San Bernardino Valley Municipal Water District.

Options	Estimated Cost	Percent Runoff Reduction
Option 1 – Drain into Little Bear Creek -Phase 1	$2,836,199	64%
Option 1 – Phase 2	$908,822	30%
Option 1 – Phase 3	$241,643	5%
Option 1 Total	$3,986,664	99%
Option 2 – Drain to West Fork City Creek Phase 1	$2,424,556	64%
Option 2 – Phase 2 (Same Scope as Option 1 – Phase 2)	$908,822	30%
Option 2 – Phase 3 (Same Scope as Option 1 – Phase 3)	$241,643	5%
Option 2 Total	$3,575,021	99%

Geological/Geotechnical Summary:

The Report of Geological Investigation and Feasibility Evaluation of Proposed Mitigation Procedures (Geological Report) revised January 2010 and prepared by Hilltop Geotechnical, Inc. makes the following recommendations with respect to the aforementioned Options 1 and 2:

Option 1

Page 56 of the Geological Report states "From a geotechnical / geologic stand point, construction of the proposed three (3) basins should not present any adverse condition on the Church of the Woods and/or the adjoining properties. However, additional geotechnical / geologic studies should be performed on the Church of the Woods property to properly design the retention basin facilities. Additionally, as part of the future investigation, more information with respect to actual groundwater depths, groundwater flow direction, and groundwater gradient should be determined to further evaluate the potential impact of developing the basin system with respect to slope conditions south and east of the town of Rimforest. At this time, it is assumed that the groundwater gradient follows existing drainage and is towards the north. However, prior to development of this property, this condition should be verified by future studies."

Option 2

Page 58 of the Geological Report states that "Because of the high probability that runoff redirected to flow along the base of the subject slope would destabilize the slope, and because of the potentially serious consequences of triggering a new retrogressing landslide area, Option 2 is not considered to be feasible from a geotechnical standpoint."

Therefore, pursuant to the Geological Report, only Option 1 is found to be viable from a geotechnical standpoint.

Environmental Summary:

The Environmental Determination found in Section 3 of the Drainage Feasibility Study (Environmental Report) revised January 2010 and prepared by Michael Brandman Associates states the following regarding Options 1 and 2:

"Development of **Option 2** will create significant impacts associated with erosion at the toe of slope immediately east of Rimforest. Because of the high probability that runoff redirected to flow along the base of the subject slope would destabilize the slope, and because of the potentially serious consequences of triggering a new retrogressing landslide area, Option 2 is not considered to be feasible from a geotechnical standpoint. Thus, pursuance of Option 2 may potentially elicit analysis of the potentially significant impacts within an Environmental Impact Analysis (EIR)."

"However, the slope stability evaluations for **Option 1**, from both a soil and rock perspective, indicated that nearly all of the analyses show current conditions below today's standards (>1.1 F.S.) and with implementation of the Geotechnical Report's recommendations, impacts are reduced to less than significant levels. Thus, pursuance of Option 1 may potentially elicit analysis of the potentially significant impacts within an Initial Study Mitigated Negative Declaration (IS/MND). Consequently, based on this feasibility study prepared for the proposed project, Option 1 is the preferred alternative."

Therefore, pursuant to the Environmental Report, Option 1 is the preferred alternative from an environmental impact standpoint.

1.2 References

The following documents have been made a part of this Study by reference:

Report of Geological Investigation & Feasibility Evaluation of Proposed Mitigation Procedures for Active Landslide Community of Rimforest, revised January 2010, prepared by Hilltop Geotechnical, Inc.

Drainage Feasibility Study, revised January 2010, prepared by Michael Brandman Associates.

1.3 Overview

The purpose of the following Drainage Feasibility Study is to investigate storm drain improvements with the potential to stop or significantly reduce runoff over the cliff(s) in the south side of Rimforest village. This will assist in reducing the slow erosion of the cliffs, which has caused the loss of property in the past. In addition, reduction of runoff will lessen infiltration into the underlying soil of Rimforest and thereby reduce soil saturation and pore pressure, which may contribute to the erosion and loss of cliff side property. Refer to Exhibit "A" for a USGS Quadrangle of the project watershed location; refer to Exhibit "B" for an Aerial Orthophoto/Site Photos for the project. The following view shows the existing cliff erosion problem:

Photo No. 1 – Aerial View of Rimforest Community (Source: Google Earth)

1.4 Discussion - Existing Drainage Conditions

Currently, runoff from 51 acres of the area north of Highway 18 crosses the highway and enters Rimforest Village. The largest crossing point with approximately 30 acres of offsite runoff is shown in the following picture:

Photo No. 2 – State Highway 18 Crossing Location (Source: Field Investigation)

The runoff of the property flows into a Nursery south of Highway 18, then south to Pine Avenue, then easterly to a low point on Pine Avenue (see next page):

Photo No. 3 – Highway 18 Crossing Point (Source: Field Investigation)

Photo No. 4 – Existing Nursery & Pipe (Source: Field Investigation)

Three additional culverts direct the runoff from north of Highway 18 under the road and into Rimforest village. The following picture shows the westerly crossing where a "mountain inlet" is installed to capture runoff for a crossing pipe into Rimforest Village:

Photo No. 5 – Westerly Crossing/"Mountain Inlet" (Source: Field Investigation)

Most of the off-site runoff and some of the on-site runoff flows to the easterly portion of Pine Avenue and Blackfoot Trail:

Photo No. 6 – Pine Avenue & Blackfoot Trail (Source: Field Investigation)

At the intersection of Pine Street and Blackfoot Trail, a drainage ditch, street inlet, and parking lot drain pipe have been installed to carry the flow to the main drainage ditch and discharge point into Strawberry Creek. According to the San Bernardino County Flood Control Hydrology Report, the peak flow rate at this intersection for a 100-year storm event is 265 CFS. The following pictures show the drainage pipes are woefully undersized. In talking to Mr. Butch Baumann, owner of the Lumber Yard on Pine Street, the ponding depth at this intersection is 3 – 4 feet during heavy rainstorms.

Photos No. 7 & 8 – Pine Avenue & Blackfoot Trail Drainage Pipes (Source: Field Investigation)

The following pictures show the largest drainage channel outlet from Rimforest into the headwater of Strawberry Creek. Approximately 68 acres are tributary to this outlet.

Photo No. 9 – Drainage Channel Outlet to Strawberry Creek (Source: Field Investigation)

View over the cliff from channel:

Photo No. 10 – Drainage Channel Outlet to Strawberry Creek – Cliff View (Source: Field Investigation)

Looking at the residence immediately west of this outlet:

Photo No. 11 – Cliff View of Residence West of Outlet (Source: Field Investigation)

This is the smaller channel outlet from a drainage area of approximately 9 acres from the western part of Rimforest at the intersection of Apache Trail and Blackfoot Trail West.

Photo No. 12 – Smaller Channel Outlet (Source: Field Investigation)

A mountain type inlet collects runoff for this pipe outlet:

Photo No. 13 – Small Drainage Channel Inlet (Source: Field Investigation)

Noting the lack of vegetation the smaller drainage area appears to be causing greater damage to the cliff side property:

Photos No. 14 & 15 – Drainage Discharge Location (Source: Field Investigation)

1.5 Discussion – Drainage Mitigation Options

To reduce the runoff over the cliff(s), the runoff must be diverted to another path. This new path could be either to the Santa Ana watershed by construction of a channel to carry the runoff to the east of Rimforest and then southerly to West Fork City creek, or, construct drainage channel(s) to divert the runoff into Little Bear Creek. This diversion of flow has two major impacting factors to be considered. The first consideration is that the increased runoff and greater flow rate will affect the new downstream channels. The second is the diversion will change Water Rights to the existing runoff pattern.

The increased flow rate impact to Little Bear Creek cannot be handled by the existing Little Bear Creek drainage system. This could be alleviated by either the installation of a retarding basin system, or enlargement of the Little Bear Creek storm drain system. The increased flow rate impact to West Fork City Creek would cause increased erosion at the discharge point with unknown effect. This could be reduced by selection of the discharge point and outlet structure.

If the Little Bear Creek diversion option is selected, the 100-Year storm event peak flow rate will increase from the existing 167 CFS to 470 CFS. The existing downstream channel system is inadequate. As shown in the following pictures, the first storm drain below Rimforest in Little Bear Creek is the San Bernardino County Blue Jay maintenance yard where a three-foot diameter pipe is expected to carry all of the flow. A Jersey barrier and dirt mound helps control the existing flow:

Photo No. 16 – Jersey Barrier & Dirt Mound (Source: Field Investigation)

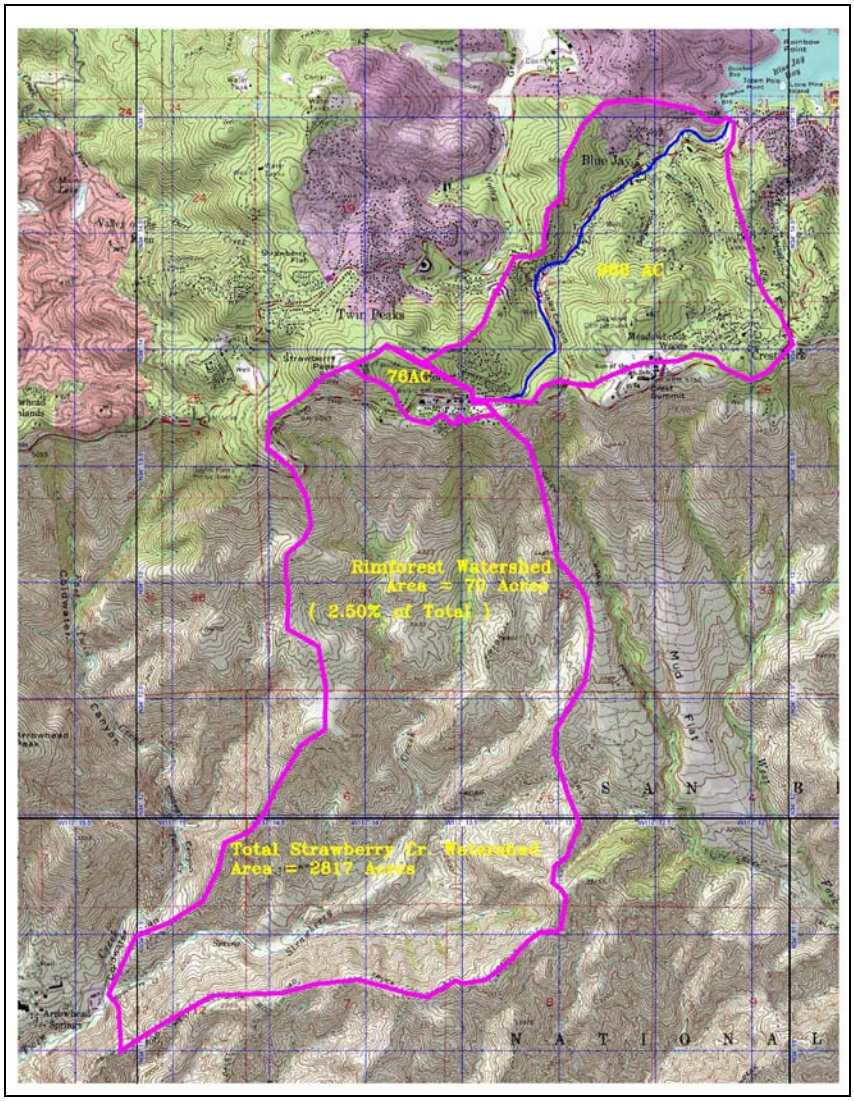
Photo No. 17 – San Bernardino County Blue Jay Maintenance Yard (Source: Field Investigation)

Flow in excess of channel capacity will drain through the maintenance yard and flood existing streets. There are numerous cabins and structures downstream of this yard and nearby Little Bear Creek.

Photo No. 18 – San Bernardino County Blue Jay Maintenance Yard (Source: Field Investigation)

The community of Rimforest, is situated in the vicinity of the headwaters of Strawberry Creek. Strawberry Creek eventually runs into City Creek, which in turn outlets into the Santa Ana River. (See figure 1). Strawberry Creek watershed is a totally of 2817 acres. The runoff that affects Rimforest is about 77 acres. This drainage area is part of the overall watershed of the Santa Ana River, which is considered the safe yield of the San Bernardino Municipal Water District (SBVMWD).

Figure 1 – Watershed Division (See Exhibit "E")



There does not appear to be any appropriative water rights appurtenant to Strawberry Creek itself, however there well could be some rights riparian and over lying rights.

The water runoff from the 77 acres has caused the loss of property, structures, roadways, and utilities in the past and those losses will continue into the future if not mitigated. Also there is a real possibility of

the loss of life if there isn't a solution to the drainage. It would appear that the best solution to protect Rimforest would be to divert the flow from the 77 acres away from Strawberry Creek and into Little Bear Creek. Even though this appears to be the best solution many problems would be encountered.

First and maybe the most difficult would be the diversion of water from the Santa Ana River basin into the Mohave River basin. This would need to be approved by the State Water Resources Control Board as well as SBVMWD and possibly additional minor water rights claimants. However if these problems could be solved would benefit to the community of Rimforest as well as the community of Lake Arrowhead.

Presently the water supplier for Lake Arrowhead is the Lake Arrowhead Community Services District (LACSD). LACSD is presently purchasing Feather River water from the SBVMWD, which is then wheeled through Crestline Lake Arrowhead Water Agency (CLAWA). The cost of this water to LACSD is approximately $2500 per acre-foot which cost includes treatment. Based upon conversations between engineers of our firm and some of the potential interested parties there appears to be a real possibility of an economic and physical agreement of being reached.

The average annual volume runoff water diversion is calculated to be 47 acre-feet (refer to Attachment No. 14 of this report.

Option 1 is to divert runoff to Little Bear Creek. The proposal is to accomplish this in three phases:

Phase 1 (Reduce Runoff Tributary Area by 64% - 50.35 AC)

- Construct an improved channel, approximately 2,700 feet long, on the north side of Highway 18 to transport mountainside runoff from an additional 51 acres to Little Bear Creek. The upper western part of the channel would be designed to intercept the mountainside runoff and at the same time filter any debris into the street. Then, a 5 to 6 foot RCP would be connected to carry the runoff to Little Bear Creek. The current runoff into this creek is from a tract north of Highway 18 from an area of approximately 41 acres, with a 100-year flow rate of approximately 167 CFS. The added flow rate from 51 acres north of Highway 18 would be 225 CFS for a total flow rate of 393 CFS. The channel size and shape have been completely evaluated; a 4-foot wide, 6-foot high rectangular channel is adequate for the upper 1060 feet of the channel, with numerous grate inlets to filter debris from the channel and onto Highway 18. The lower 1615 feet of the channel would be either 5 or 6-foot diameter concrete pipe, with street inlets.
- Construct retarding basin (2) as part of the proposed Church of the Woods development. Preliminary analysis shows a single 10 Acre-Foot basin with 2 – 24" discharge pipes will reduce the peak outflow to 139 CFS, less than the existing 100-year flow rate of 167 CFS. Because of the inadequate drainage structures in Little Bear Creek, it may be desirable to install larger basin(s), to alleviate future flooding problems. The hydrology study map of this report show the area covered by three interconnected basins immediately northwest of the Church of the Woods proposed development.

The following picture shows a portion of the existing Church of the Woods proposed site:

Photo No. 19 – Proposed Church of the Woods Site – Existing Conditions (Source: Field Investigation)

Phase 2 (Reduce Runoff Tributary Area by 30% - 23.79 AC)

Install a 48" RCP storm drain from Pine Avenue under Highway 18 to Little Bear Creek. This will require a trench with depths up to 22 feet over a total distance of 1,176 feet. The added flow rate from 24 Acres of onsite area would be 106 CFS from the pipe. After a confluence with the Phase 1 flow the peak 100-year flow of 454 CFS, if the Phase 3 option described on the following page is included, then the peak flow rate would be 470 CFS.

This option also requires additional storm drains inside the Rimforest Village to intercept the flow along Pine Avenue with street inlets and a smaller drain from the southwest through the Lumber Yard to the Pine Avenue main pipe. (See Exhibit "F" for pipe and inlet locations). The following picture shows where some of the additional street inlets are proposed to divert flow away from the western Rimforest cliff discharge point. Grate inlets would also be installed in the Lumber Yard off of Pine Avenue.

Photo No. 20 – Location of Proposed Additional Street Inlets (Source: Field Investigation)

Phase 3 (Reduce Runoff Tributary Area by 5% - 3.99 AC)

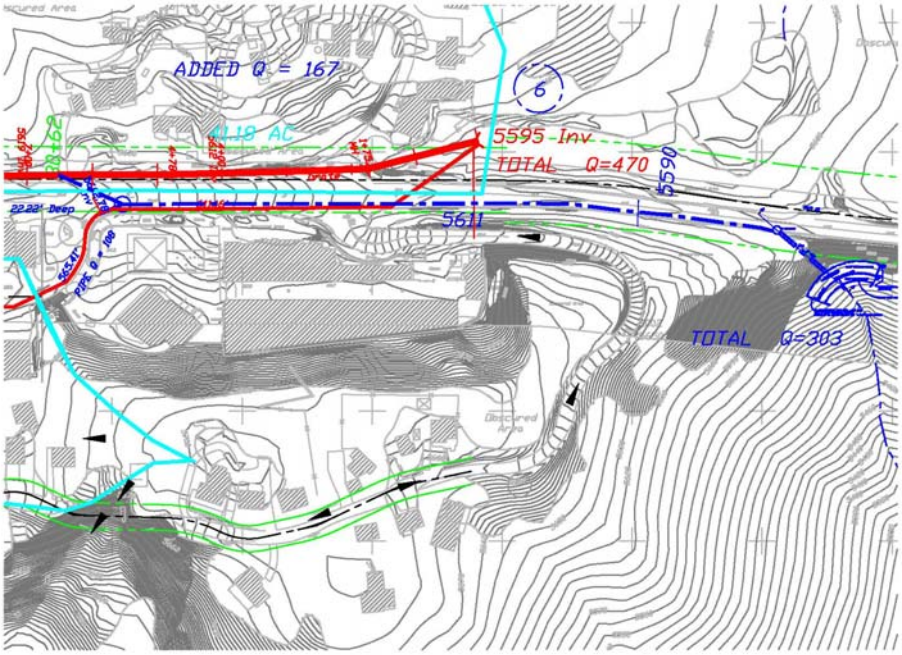
Install a lift/pump station at the intersection of Apache Trail and Blackfoot Trail West to divert flow to the Phase 2 proposed 30-inch drain pipe through the Lumber Yard. This would add approximately 16 CFS during a 100-Year storm event to the Phase 2 pipe. Phase 3 may be necessary regardless of any other options to divert this flow away from this cliff area of Rimforest where the most severe landslide damage is taking place. The runoff could be pumped to the existing primary discharge channel south of Pine Street. This would require a combination lift pump for low flow rates, and a 30 horsepower turbine pump when the peak flow rate occurs. A 24" PVC pipe approximately 405 feet long is required to transport peak flow rate to the proposed 30" storm drain. The following picture shows the location of the proposed lift pump system:

Photo No. 21 – Location of Proposed Lift Pump System (Source: Field Investigation)

Option 2 is to divert runoff to the West Fork City Creek watershed. This option would divert the same area flows in three phases as Option 1. The existing Tract runoff from North of Highway 18 would remain draining into Little Bear Creek (167 CFS from 41 Acres). The diverted flow rate of 303 CFS from the Village of Rim Forest, including the 51 Acres north of Highway 18, (which currently flows into the village), would be routed to an existing valley location immediately south of Highway 18, which connects to West Fork City Creek. Refer to Exhibit "F" for the Option 2 Study Map.

The below drawing, not to scale, shows proposed Option 1 discharge point in RED, and the Option 2 outlet point in BLUE.

Figure No. 2 – Option 1 vs. Option 2 Discharge Locations

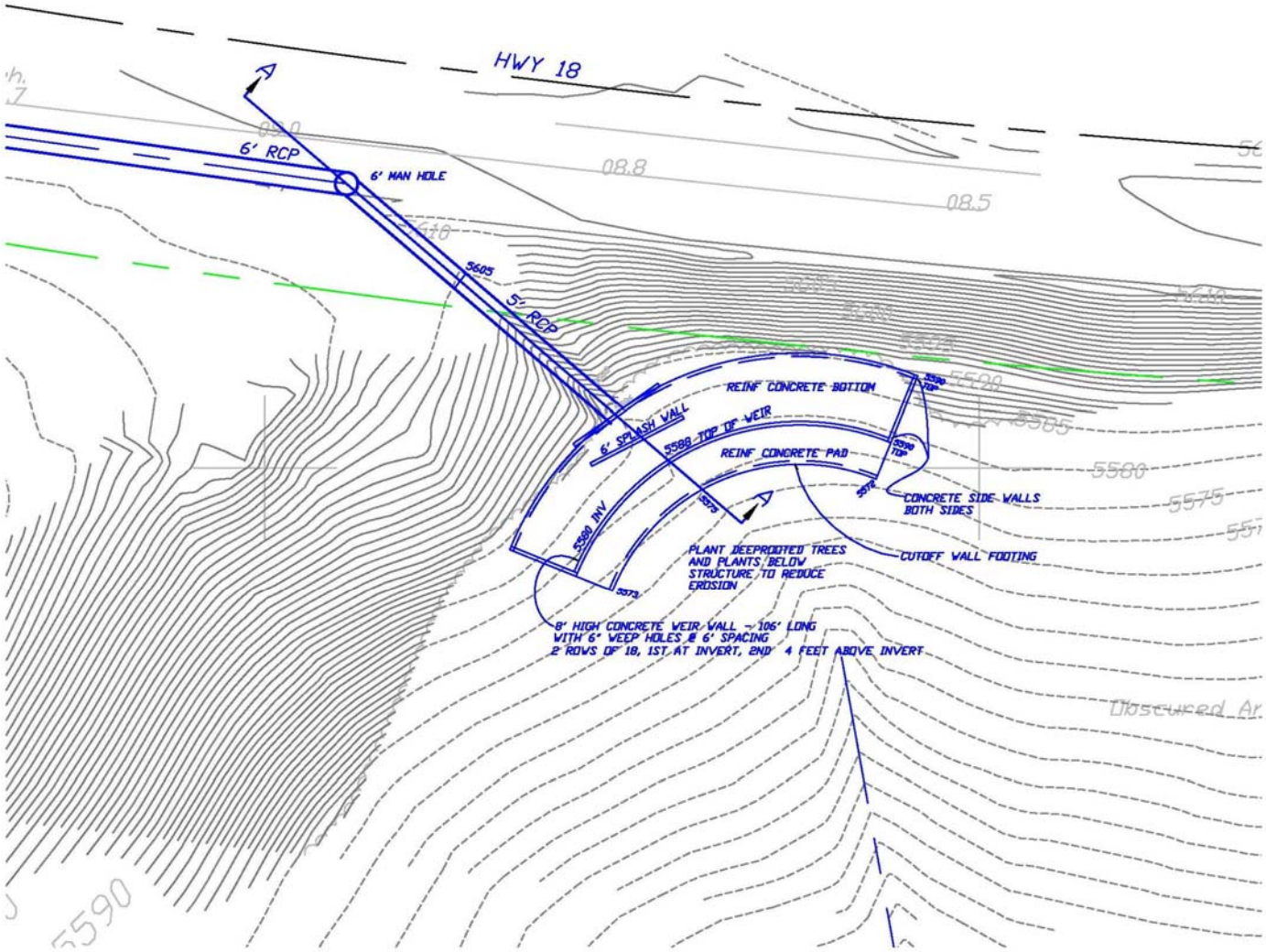


The proposed Option 2 discharge point is shown in the following pictures looking southeast from Highway 18:

Photos No. 22 & 23 – Location of Proposed Option 2 Discharge Point (Source: Field Investigation)

The following drawing shows a possible outlet structure and location for Option 2 Phase 1. Depending on the nature of the soil at the site, the structure would be anchored to the hillside with either deep cutoff walls or pilings if necessary. See Soils/Geotechnical report.

Figure No. 3 – Proposed Option 2 Outlet Structure



Other Options Considered

Several other options were looked at but were considered impractical because of cost and maintenance problems:

1.) Drain Runoff To The West of Rimforest by Boring Underground Pipe

The collection point for most of the runoff under concern is near the east end of Pine Avenue at an elevation of 5610 (invert of storm drain). To direct this flow in a conduit to the west, an elevation of 5680 along the Highway 18 would be encountered, making it nearly impossible to trench and bury a pipe. The option of boring to install the pipe was also looked at, but the length of the bore would have to be over 2,500 feet long. Construction and ongoing maintenance of such an option would be impractical. As no storm drain manholes are installed for in a boxed pipe system for maintenance, an extensive filtering system would be required before the pipe inlet(s).

According to a reference sources, the maximum Horizontal Auger Boring (HAB) Method for gravity flow RCP or Steel pipe is 1500 feet. Horizontal Directional Drilling (HDD) with 24”-48” steel pipe is possible up to 6000 feet, however, this is only recommended for pressure pipe.

2.) Install Containment / Retarding Basins

The original proposal envisioned the possibility of installing retarding basins to reduce the peak flow rates and serve as an impervious storage location to prevent infiltration. However, it does not appear that the small drainage area is contributing to any substantial percolation.

Option 1 of this study recommends retarding basin(s) after discharge into Little Bear Creek which are necessary to reduce the peak flow rates into an already undersized storm drain system.

3.) Install Impervious Cover On Hillsides To Prevent Infiltration

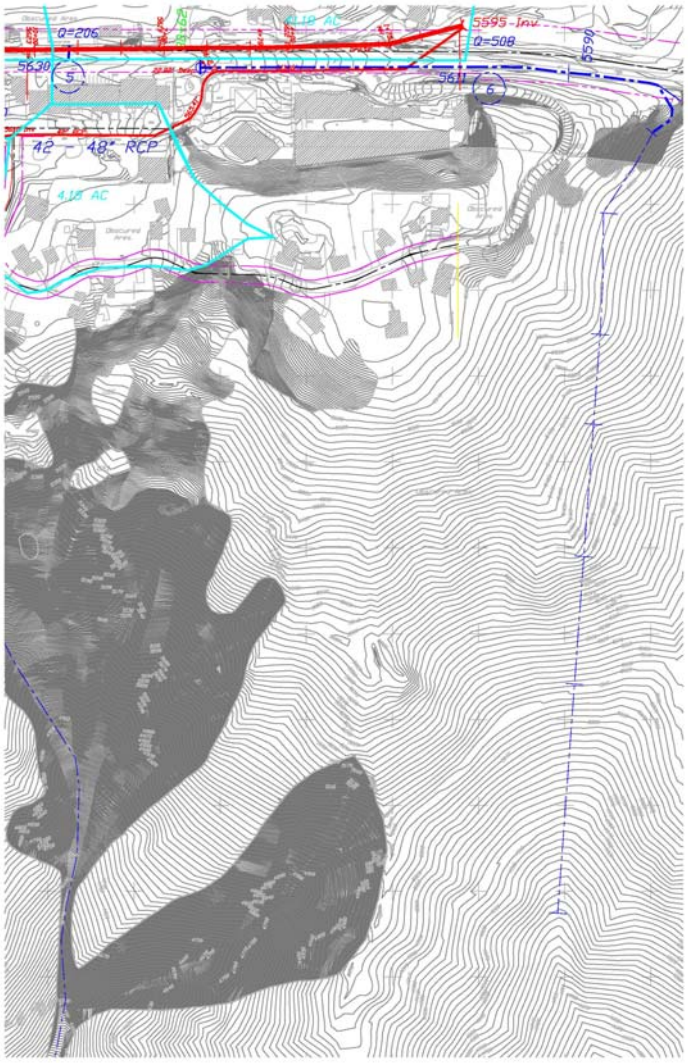
The hillside Soil Group is “D”, resulting in rapid rainfall runoff on relatively steep slopes and little infiltration. There may be greater infiltration under snow melt conditions. As stated in the previous comments, the benefit of the installation of an impervious soil cover such as soil cement, is questionable (See Soils Report).

4.) Drain Runoff In A Bypass Pipe to Strawberry Creek

To drain the runoff into Strawberry Creek, at a discharge point, where further erosion would not cause problems, would require a pipe installed approximately 1900 feet south of Highway 18. If a pipe were installed to this drainage point, the cost of construction would be significant. With an elevation drop of 800 feet, the average pipe slope would be 42%, and, in some places the slope is 100 % or a 45-degree downward angle.

If reinforced concrete pipe were installed, velocity control rings would be required at each 8-foot interval to keep maximum velocity within acceptable limits. In addition, the pipe would require soil anchors at frequent intervals to stabilize the installation. Because pipe freezing would be a consideration during cold temperatures, the pipe should be installed underground. To trench and install such a storm drain system would probably be cost prohibitive. The following drawing shows a north/south blue line where the least expensive drain to a canyon leading to Strawberry Creek could be installed:

Figure No. 4 – Drain to Strawberry Creek (in Blue)



1.6 Discussion – Early-Warning System Implementation

The County of San Bernardino could consider the implementation of an early-warning system in the area of the Rimforest Community under the most immediate threat of catastrophic landslides, to protect the lives and property most at risk. One possible scenario would be the installation of ultrasonic vibration or radar sensors in a stable location aimed at target(s) located in the slide area. This would allow for the tracking of any ground movement. In the event that this movement increases to a predetermined rate threshold, an alarm and/or reverse 9-1-1 emergency call could be implemented to warn the residents within the slide zones to leave their homes immediately.

HydroLynx Systems, Inc. is a real-time data telemetry equipment manufacturer based in Sacramento, CA. Their equipment, software and services may be suitable for the scenario described above.

Refer to *Attachment 15* for documentation and specifications for early-warning system sensors and management software provided by HydroLynx Systems, Inc.

1.7 Information on Historic Drainage Patterns

As discussed in *Attachment 13*, historic topographic maps dated prior to the construction of Highway 18 (Rim of the World Highway) indicate that a sizable portion of the Rimforest area north of what is now the Highway and east of Strawberry Peak followed a drainage course that flowed in a southeasterly (near the current alignment of Blackfoot Trail West) and then curved in a northeasterly direction within the Mojave Watershed (towards Lake Arrowhead). The maps (also included in *Attachment 13*) examined were:

- 1939 U.S. Department of the Interior Redlands Quadrangle (reprint of the August 1901 edition)*.
- 1905 Hydrologic Map of San Bernardino, Redlands, & Vicinity*.
- 1929 California Department of Transportation As-Built Plans (Document No. 80000357).

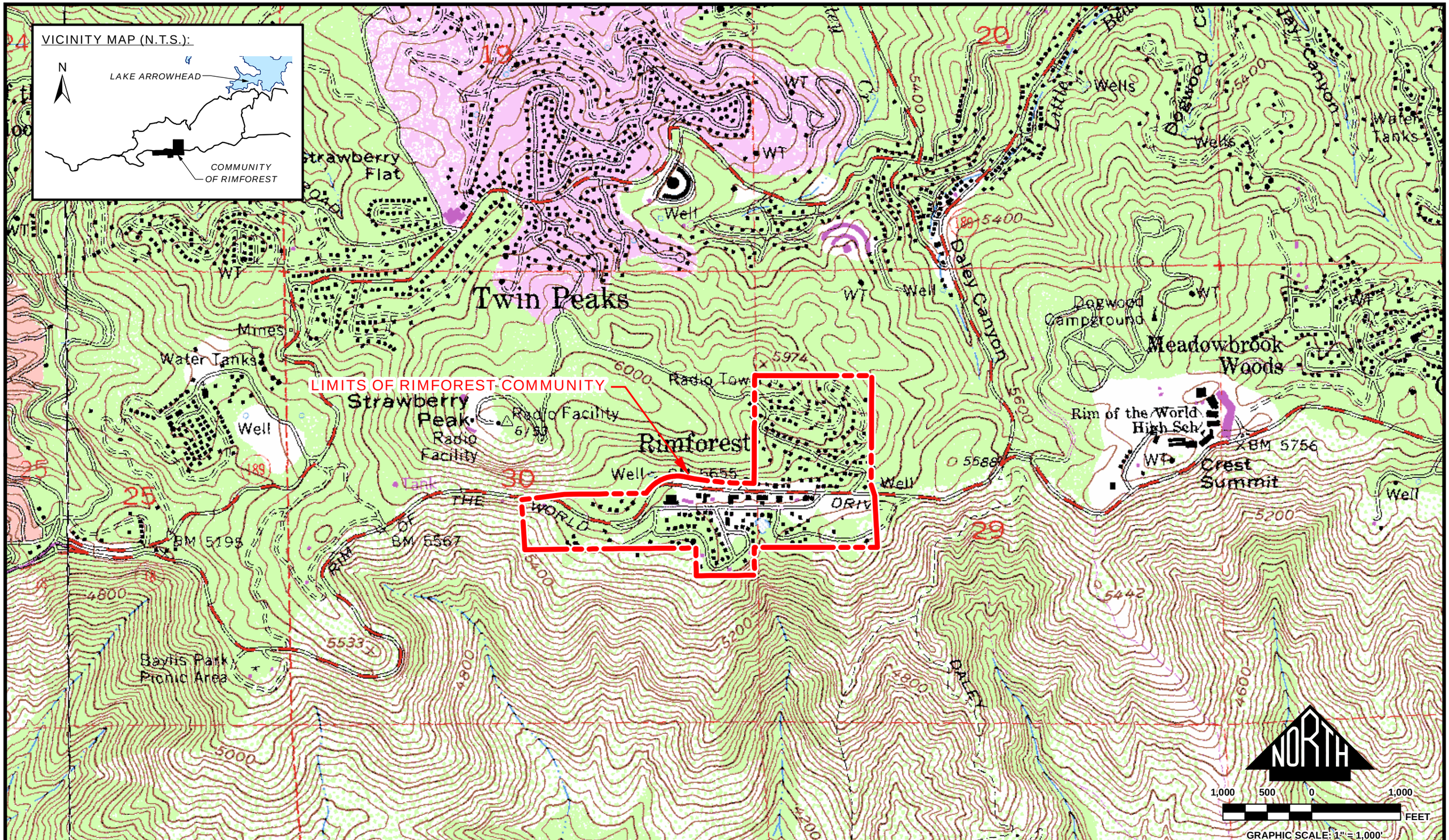
During the development of the Rimforest community, two storm drain catch basins and pipes were installed on Apache Trail to direct surface water off the road and over the cliff.

(End)

* Note that these maps appear to have identical topographic data.

EXHIBIT “A”

Project Watershed
USGS Quadrangle Map



PROJECT WATERSHED - USGS QUADRANGLE

VICINITY OF THE COMMUNITY OF RIMFOREST

IN THE COUNTY OF SAN BERNARDINO, CA

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Michael Brandman Associates

BY	MARK	REVISION DESCRIPTION	DATE
JDN	1	ENTIRE EXHIBIT	07-27-09

PREPARED FOR:	SBCFCD
JOB NO:	093458
PREPARED BY:	JDN
CHECKED BY:	DWJ

NOTE: *Joseph E. Bonadiman & Associates, Inc. does not warranty the accuracy of the G.I.S. data presented in this Exhibit. This Exhibit may contain information copyrighted to the County of San Bernardino.*

PROJECT WATERSHED - USGS QUADRANGLE
VICINITY OF THE COMMUNITY OF RIMFOREST
IN THE COUNTY OF SAN BERNARDINO, CA

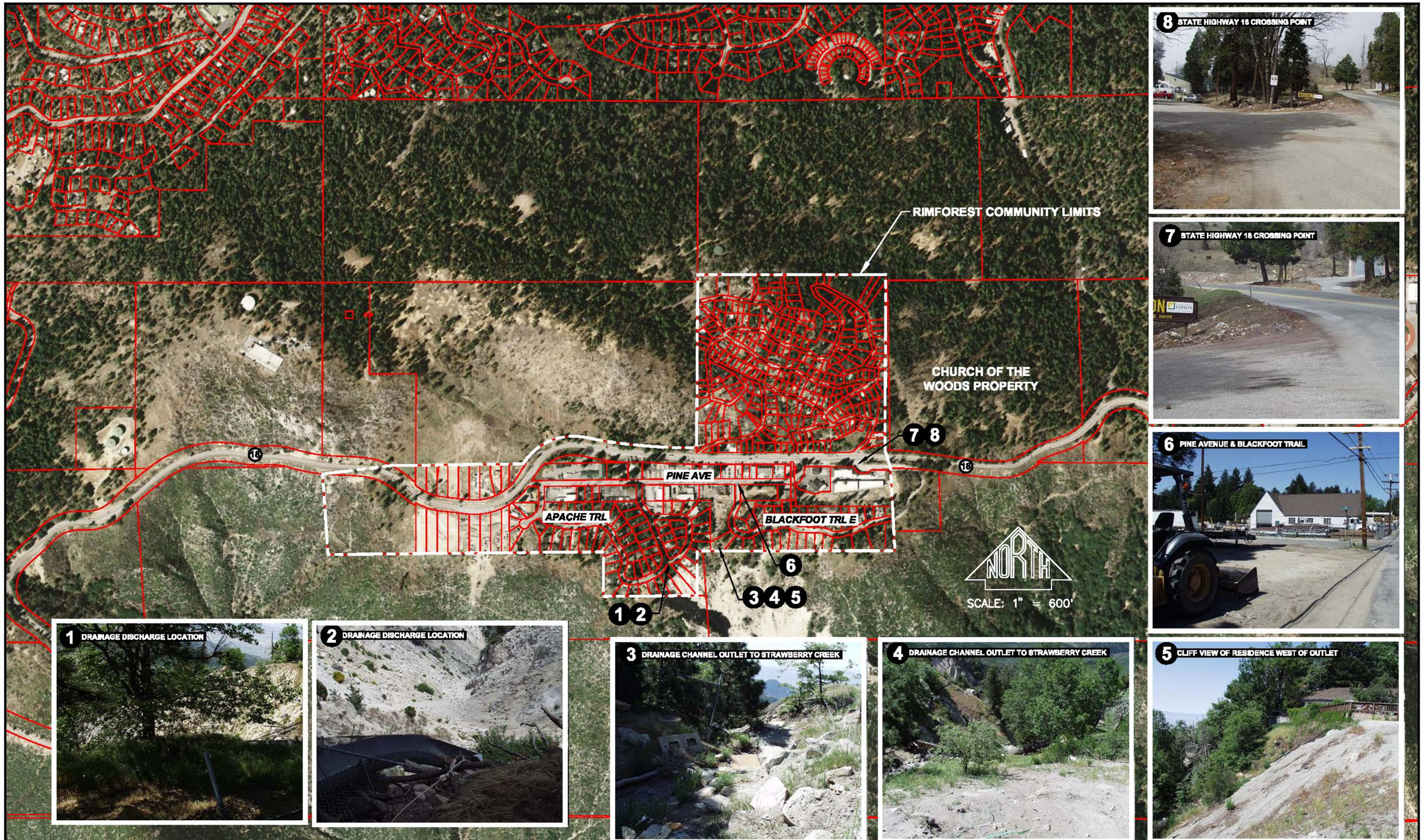
DISREGARD PRINTS BEARING EARLIER REVISION DATES → 07-27-09

A

SHEET: 1 OF 1

EXHIBIT “B”

Project Watershed
Aerial & Site Photos



PROJECT WATERSHED - AERIAL & SITE PHOTOS

VICINITY OF THE COMMUNITY OF RIMFOREST

IN THE COUNTY OF SAN BERNARDINO, CA

JOSEPH E. BONADIMAN & ASSOCIATES, INC.
CIVIL ENGINEERING · G.I.S. · LAND SURVEYING

HILLTOP GEOTECHNICAL INCORPORATED

Michael Brandman Associates

BY	MARK	REVISION DESCRIPTION	DATE
JDN	1	ENTIRE EXHIBIT	07-27-09

PREPARED FOR:	SBCFCD
JOB NO:	093458
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PROJECT WATERSHED - AERIAL & SITE PHOTOS
VICINITY OF THE COMMUNITY OF RIMFOREST
IN THE COUNTY OF SAN BERNARDINO, CA

DISREGARD PRINTS BEARING EARLIER REVISION DATES → 07-27-09

B

SHEET: 1 OF 1

EXHIBIT “C”

Applicable Isohyetal Maps

EXHIBIT "C-1" - 10 YEAR 1-HOUR RAINFALL

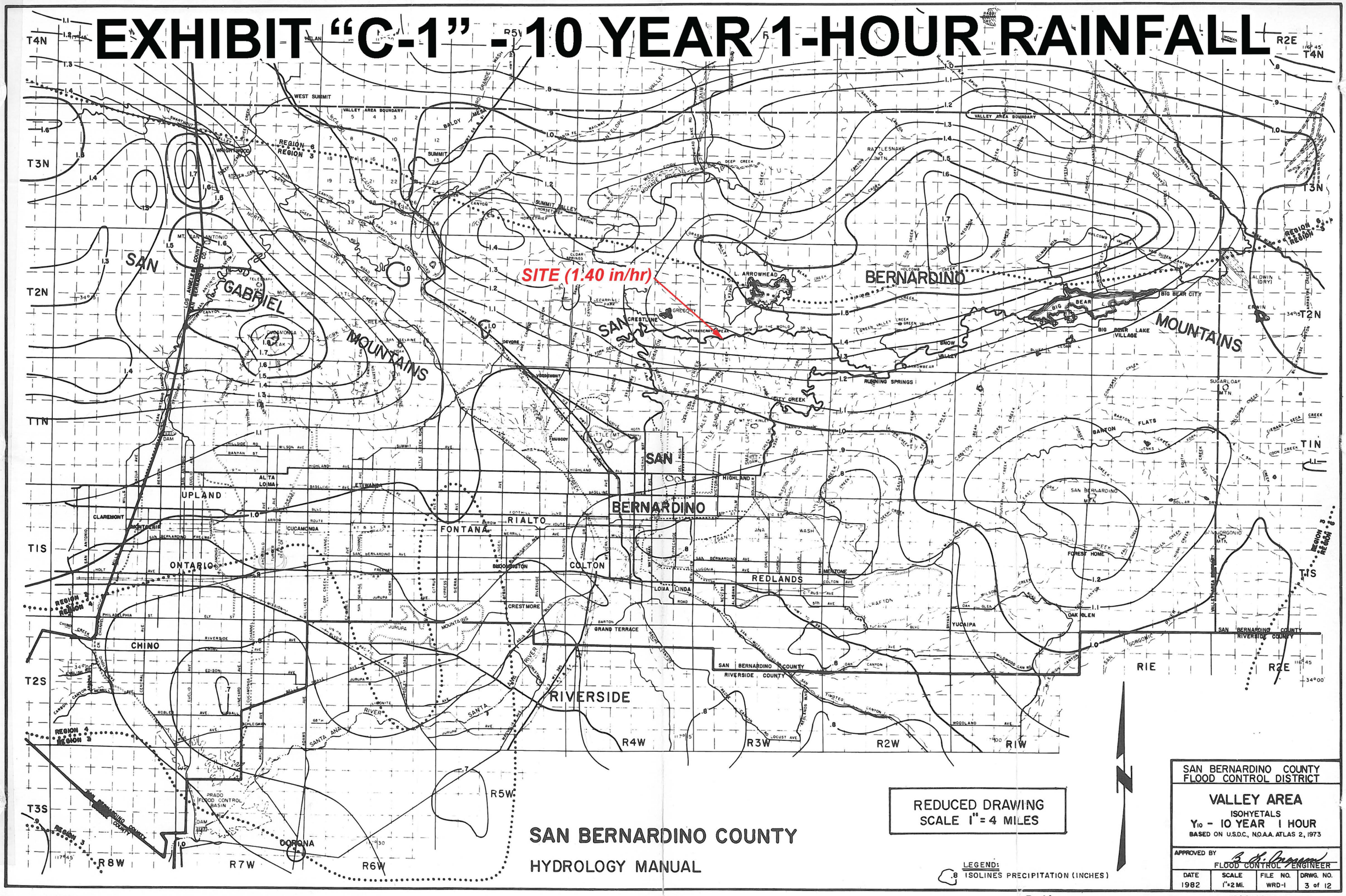
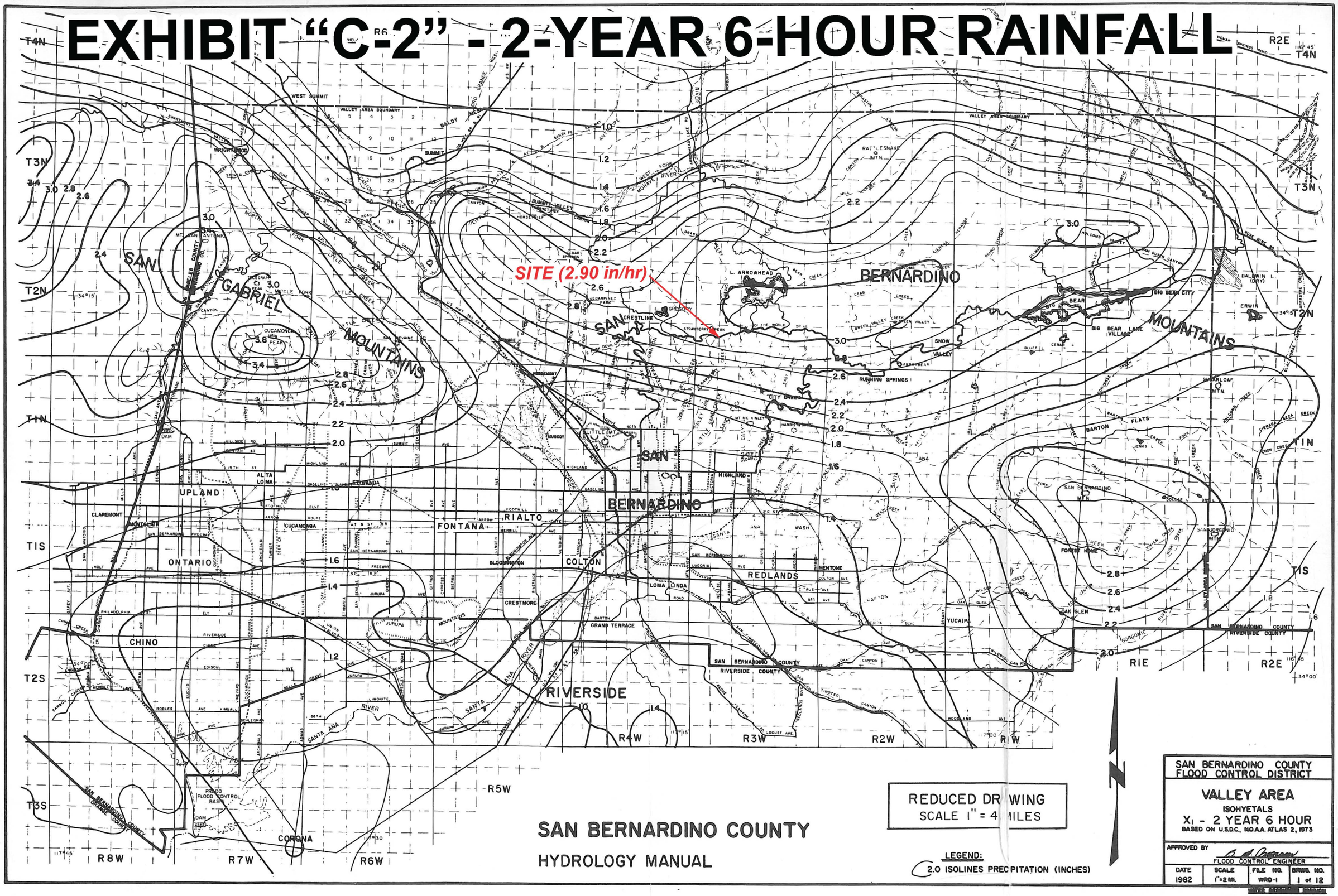


FIGURE B-7

EXHIBIT "C-2" - 2-YEAR 6-HOUR RAINFALL



REDUCED DRAWING
SCALE 1" = 4 MILES

LEGEND:
2.0 ISOLINES PRECIPITATION (INCHES)

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

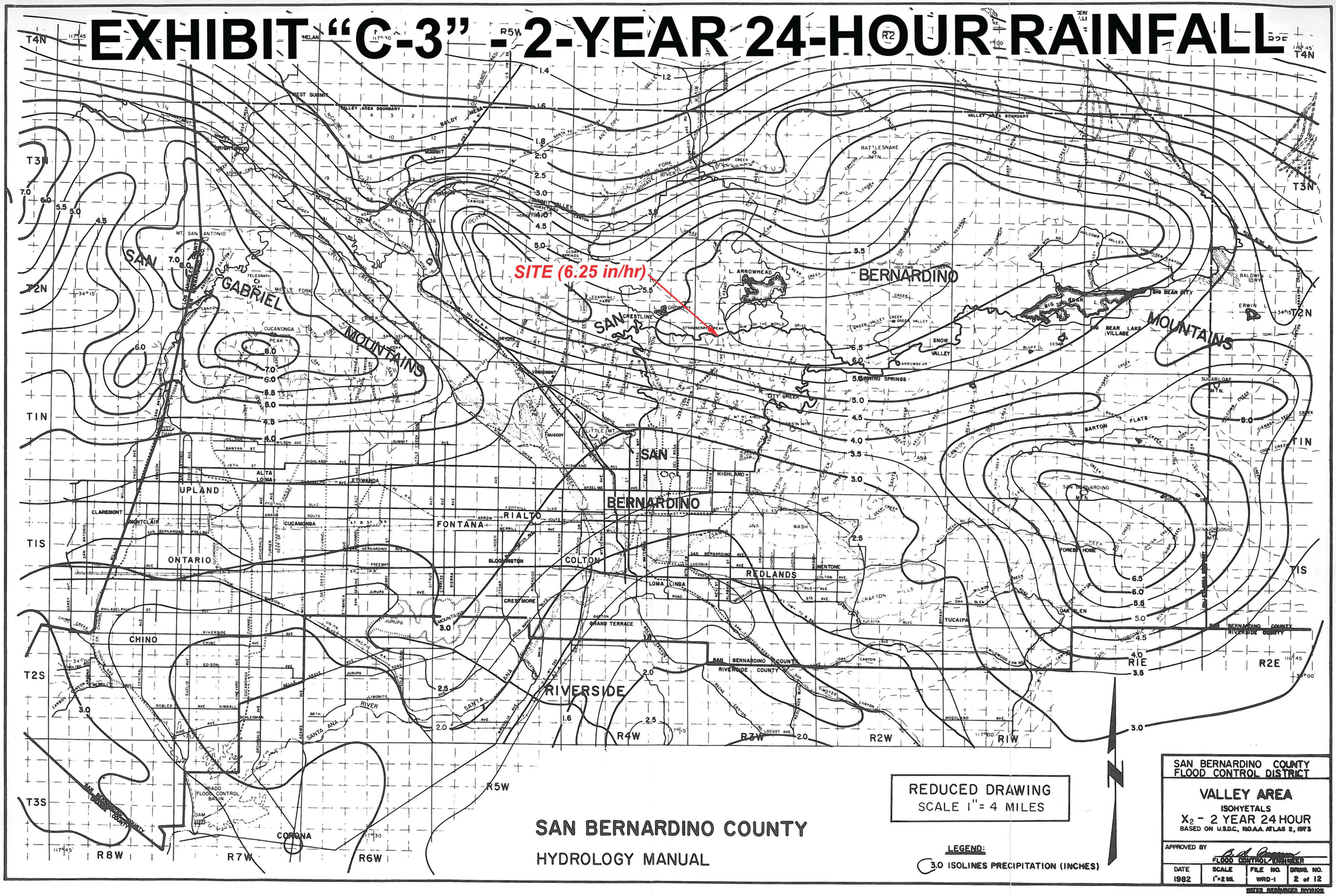
VALLEY AREA
ISOHYETALS
X_1 - 2 YEAR 6 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973

APPROVED BY
FLOOD CONTROL ENGINEER

DATE	SCALE	FILE NO.	DRWG. NO.
1982	1"=2 MI.	WRD-1	1 of 12

FIGURE B-1

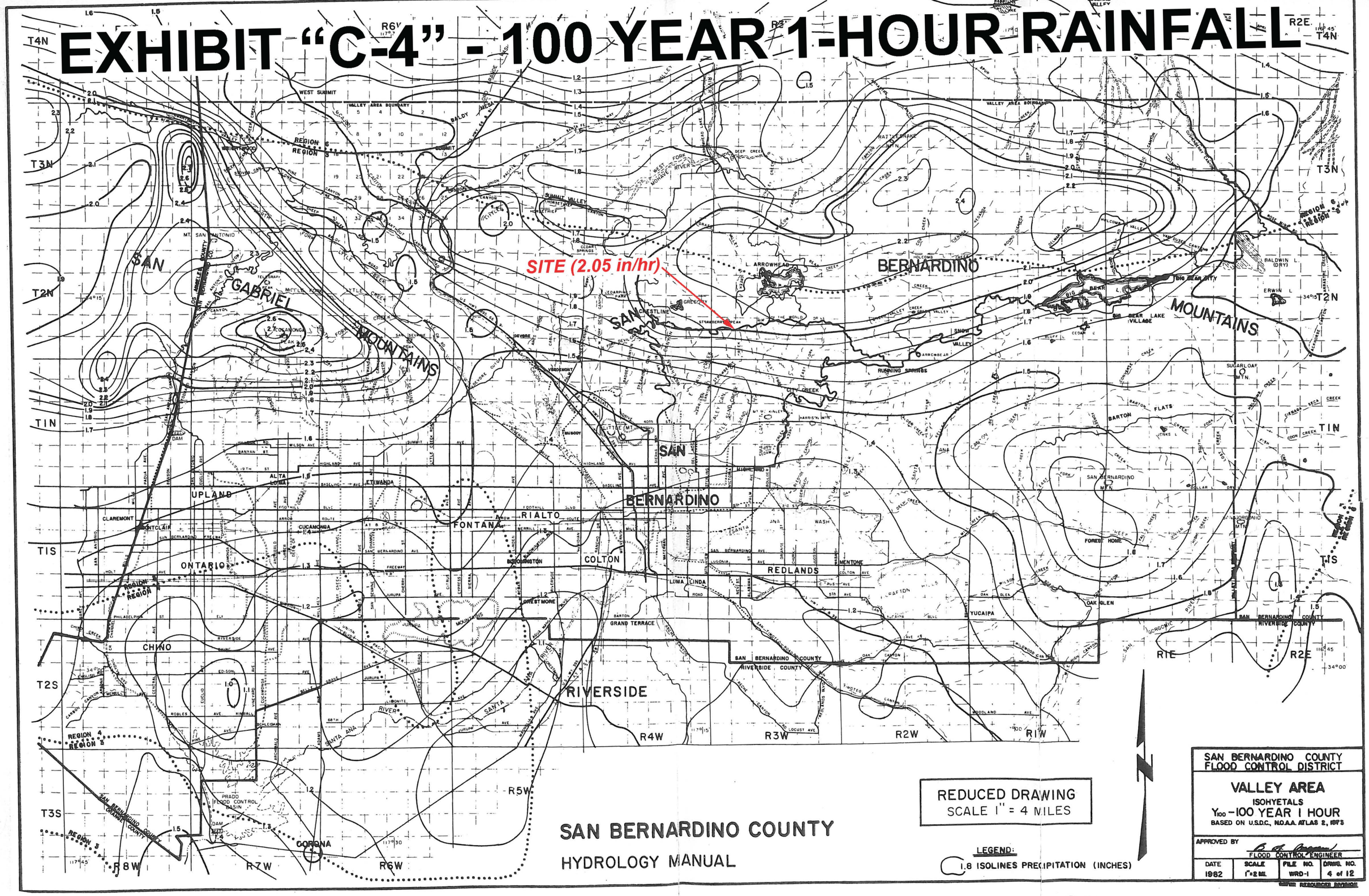
EXHIBIT "C-3" - 2-YEAR 24-HOUR RAINFALL



SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

FIGURE B-2

EXHIBIT "C-4" - 100 YEAR 1-HOUR RAINFALL



REDUCED DRAWING
SCALE 1" = 4 MILES

LEGEND:
1.8 ISOLINES PRECIPITATION (INCHES)

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

VALLEY AREA
ISOHYETALS
Y_{100} - 100 YEAR 1 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973

APPROVED BY
FLOOD CONTROL ENGINEER

DATE	SCALE	FILE NO.	DRWG. NO.
1982	1"=2 MI.	WRD-1	4 of 12

SEE REDUCED DRAWING

EXHIBIT "C-5" - 100 YEAR 6-HOUR RAINFALL

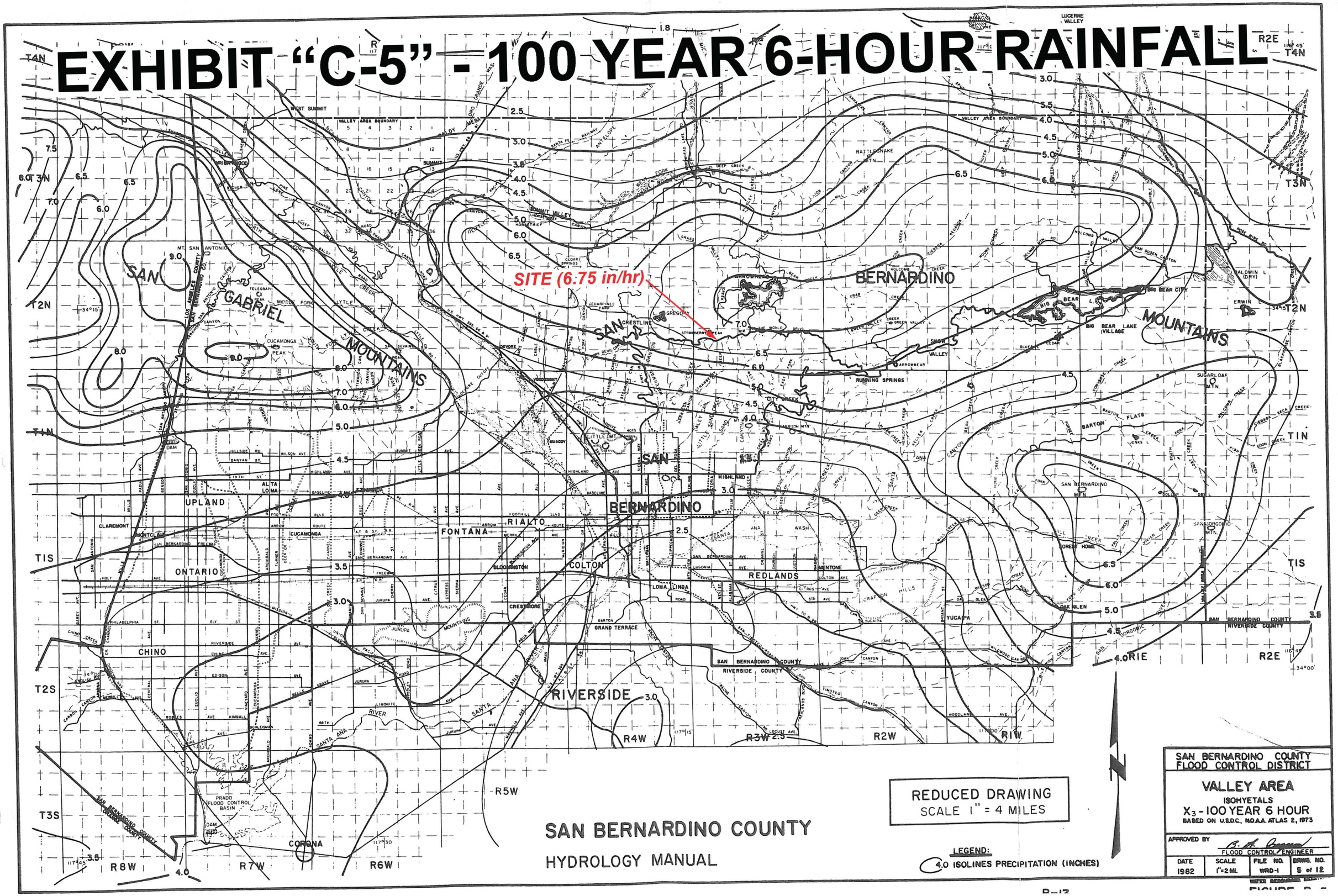


EXHIBIT "C-6" - 100 YEAR 24-HOUR RAINFALL

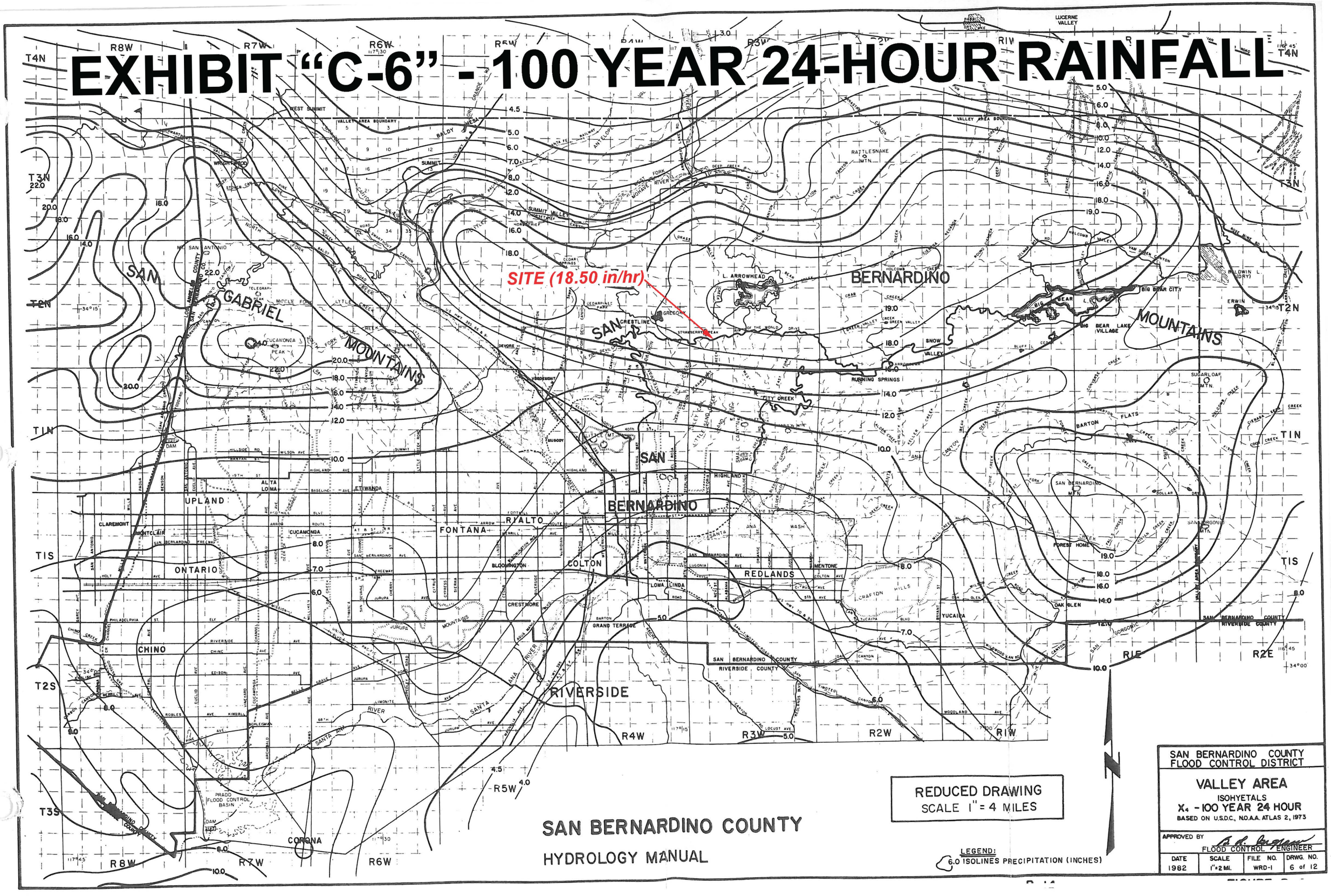


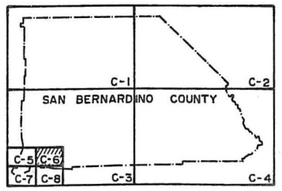
EXHIBIT “D”

Applicable Soils Groups Maps

EXHIBIT "D" - SOILS GROUP MAP

SITE (GRP. "D")

SOURCE: GEOLOGY MAP
SOURCE: 1971 SCS SURVEY



INDEX MAP

LEGEND

SOIL GROUP BOUNDARY

A SOIL GROUP DESIGNATION

BOUNDARY OF INDICATED SOURCE

SCALE 1:48,000

SCALE REDUCED BY 1/2

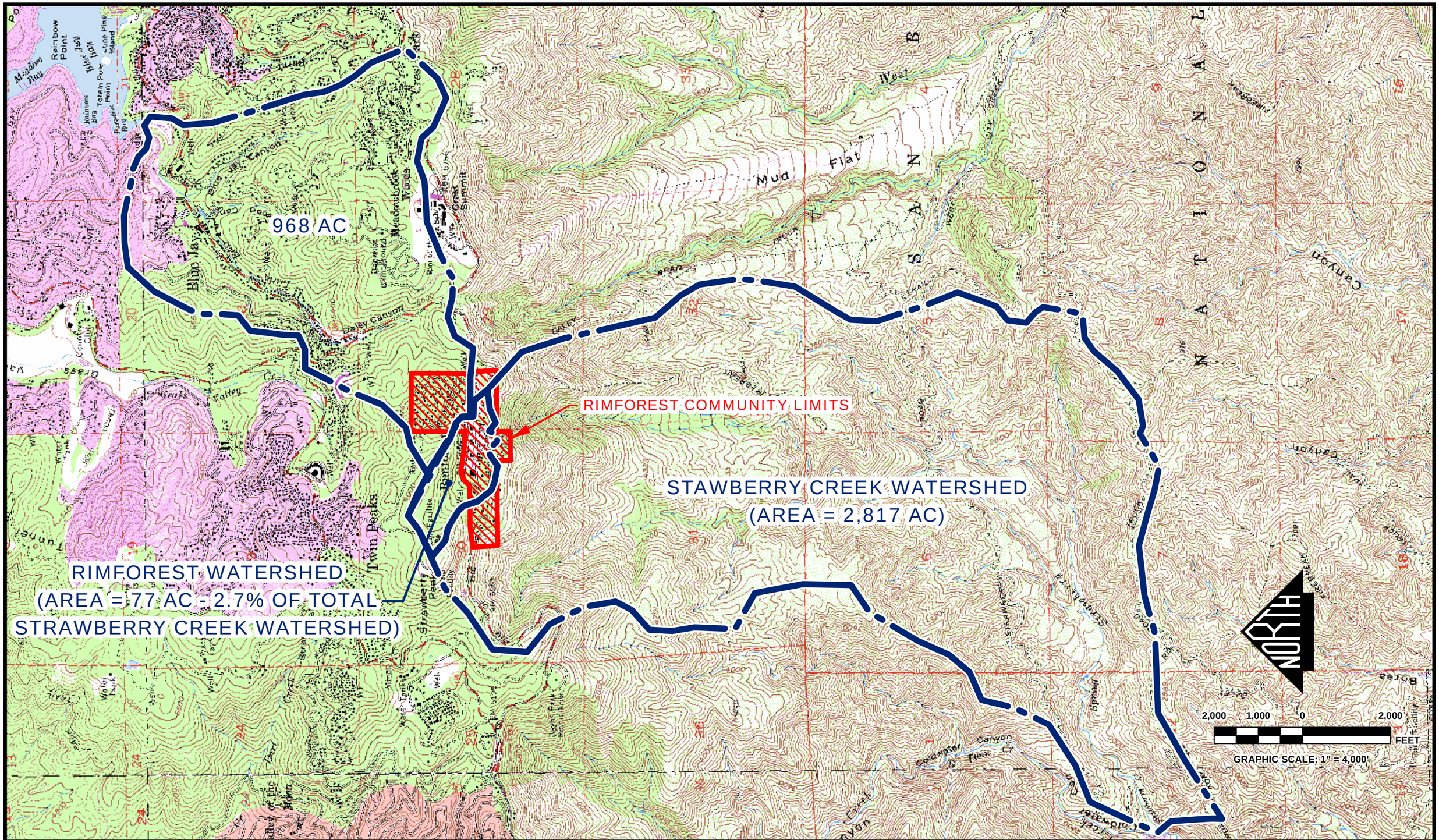
SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

HYDROLOGIC SOILS GROUP MAP
FOR
SOUTHWEST-B AREA

EXHIBIT “E”

Watershed Division Exhibit



WATERSHED DIVISION EXHIBIT

AREAS DOWNSTREAM OF RIMFOREST COMMUNITY

IN THE COUNTY OF SAN BERNARDINO, CA

JOSEPH E. BONADIMAN & ASSOCIATES, INC.
CIVIL ENGINEERING G.I.S. LAND SURVEYING
(909)793-1800 - FAX (909)793-1781

HILLTOP GEOTECHNICAL INCORPORATED

Michael Brandman Associates

BY	MARK	REVISION DESCRIPTION	DATE
JDN	1	ENTIRE EXHIBIT	07-27-09

PREPARED FOR:	SBCFCD
JOB NO:	093458
PREPARED BY:	JDN
CHECKED BY:	DWJ

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WATERSHED DIVISION EXHIBIT
AREAS DOWNSTREAM OF RIMFOREST COMMUNITY
IN THE COUNTY OF SAN BERNARDINO, CA

E

DISREGARD PRINTS BEARING EARLIER REVISION DATES → 07-27-09

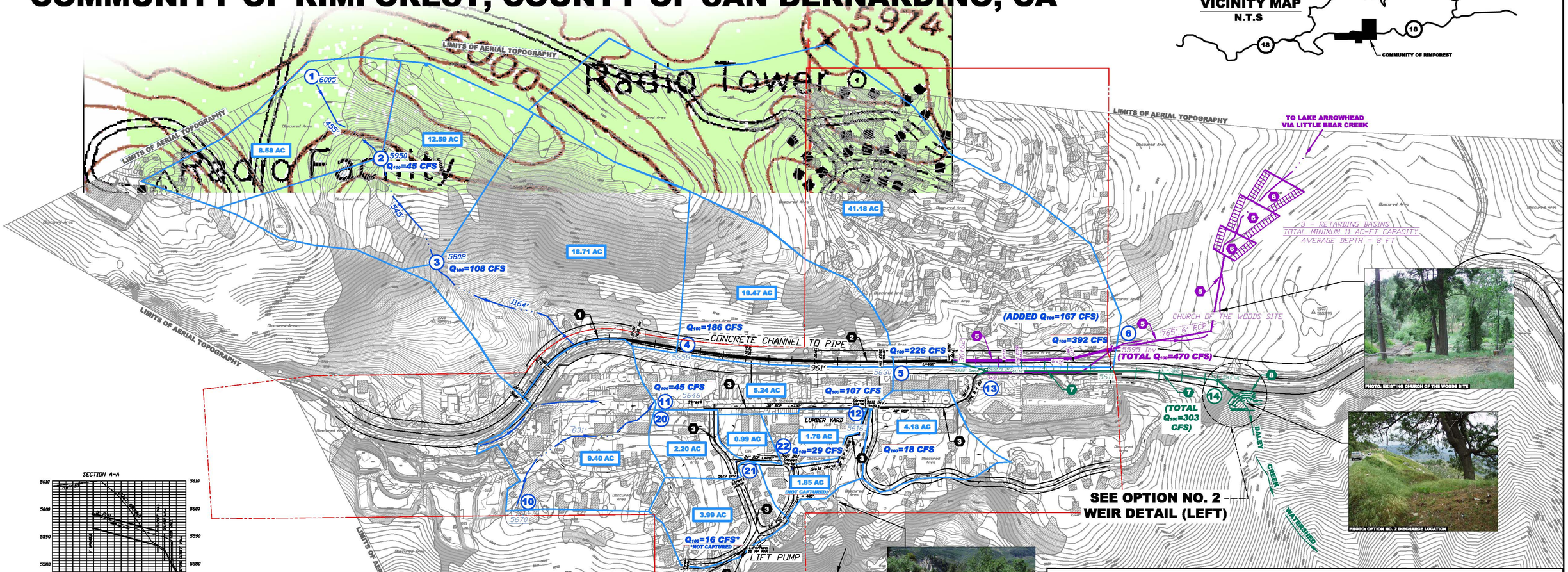
SHEET: 1 OF 1

EXHIBIT “F”

Hydrology/Hydraulics Study Map
Proposed Options No. 1 & 2

EXHIBIT "F"

PROPOSED OPTIONS NO. 1 & 2 - HYDROLOGY/HYDRAULICS STUDY MAP
COMMUNITY OF RIMFOREST, COUNTY OF SAN BERNARDINO, CA



HYDROLOGY LEGEND:

- 8.58 AC — DRAINAGE SUBAREA SIZE*
- 1 — RATIONAL METHOD NODE*
- Q_{100}=45 CFS — TOTAL PEAK FLOW RATE*

* REFER TO ATTACHMENTS NO. 1 & 2 FOR SUPPORTING RATIONAL METHOD CALCULATIONS.

EXHIBIT LEGEND:

- RIMFOREST COMMUNITY LIMITS
- DRAINAGE SUBAREA DELINEATIONS
- DRAINAGE FLOW PATHS

OPTIONS 1 & 2 STORM DRAIN IMPROVEMENTS (IN BLACK):

1. IMPROVED CHANNEL ALONG STATE HIGHWAY 18
2. 5' TO 6' RCP STORM DRAIN
3. PINE AVENUE COLLECTOR STORM DRAIN SYSTEM
4. LIFT PUMP TO CONVEY AREA FLOWS TO PINE AVENUE SYSTEM

OPTION NO. 1 IMPROVEMENTS (IN PURPLE):

5. RCP STORM DRAIN TO CONVEY FLOWS TO PROPOSED BASINS
6. (3) RETARDING BASINS

OPTION NO. 2 IMPROVEMENTS (IN GREEN):

7. 5' TO 6' RCP STORM DRAIN TO CONVEY FLOWS TO DISCHARGE SOUTH OF HIGHWAY 18
8. WEIR/WALL STRUCTURE AT DISCHARGE LOCATION

EXHIBIT NOTES:

1.) AERIAL TOPOGRAPY PREPARED BY INLAND AERIAL SURVEYS, INC.

2.) RATIONAL HYDROLOGY METHOD & UNIT HYDROGRAPH METHOD HYDROLOGY CALCULATIONS PREPARED USING SOFTWARE PROVIDED BY CIVILDESIGN(R) CORPORATION

3.) MAIN LINE & LATERAL LINE STORM DRAIN HGL ANALYSES PREPARED USING WATER SURFACE PRESSURE GRADIENT FOR WINDOWS (WSPGW).

4.) USGS QUADRANGLE OBTAINED FROM THE CALIFORNIA SPATIAL INFORMATION LIBRARY (CASIL).

5.) RIMFOREST COMMUNITY LIMITS SHAPEFILE OBTAINED FROM THE LAKE ARROWHEAD COMMUNITY SERVICES DISTRICT (LACSD).

6.) THIS EXHIBIT IS FOR CONCEPT PURPOSES ONLY AND DOES NOT IMPLY FINAL/CONSTRUCTION DESIGN SPECIFICATIONS.

7.) THE HORIZONTAL PROJECTION OF THIS EXHIBIT IS NAD 1983 CALIFORNIA STATE PLANE ZONE V.

PROPOSED OPTIONS NO. 1 & 2
HYDROLOGY/HYDRAULICS STUDY MAP
IN THE COUNTY OF SAN BERNARDINO, CA

JOSEPH E. BONADIMAN & ASSOCIATES, INC.
CIVIL ENGINEERING G.I.S. LAND SURVEYING
(909)882-3806 - Fax (909)881-1781
HILLTOP GEOTECHNICAL INCORPORATED
Michael Brandman Associates

BY	MARK	REVISION DESCRIPTION	DATE
JDN	1	ENTIRE EXHIBIT	07-27-09

PREPARED FOR:	SBCFCD
JOB NO:	093458
PREPARED BY:	JDN
CHECKED BY:	DWJ

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PROPOSED OPTIONS NO. 1 & 2
HYDROLOGY/HYDRAULICS STUDY MAP
IN THE COUNTY OF SAN BERNARDINO, CA

DISREGARD PRINTS BEARING EARLIER REVISION DATES → 07-27-09

F

SHEET: 1 OF 1

EXHIBIT “G”

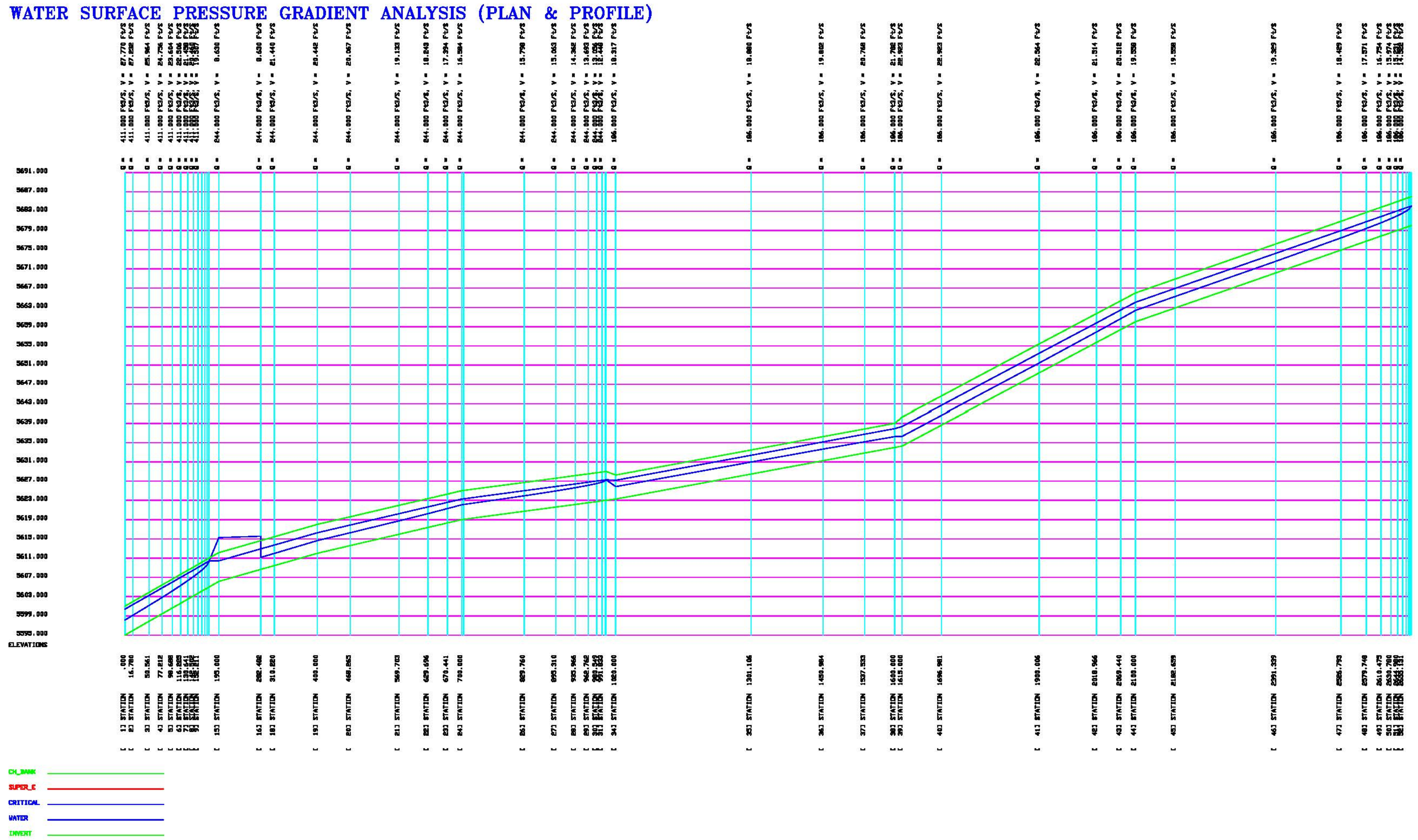
Water Surface Pressure Gradient for Windows (WSPGW) Analysis Exhibits

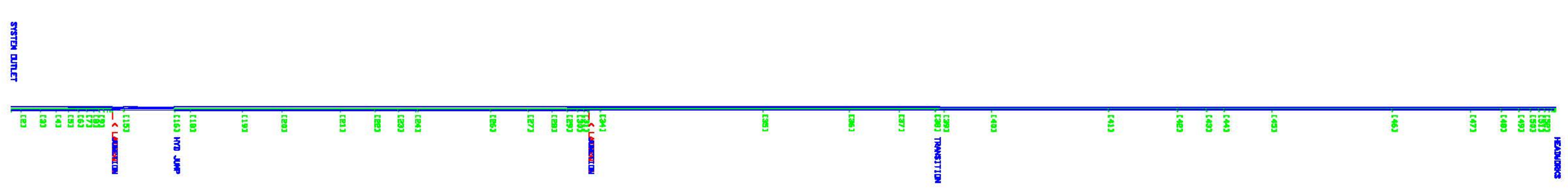
EXHIBIT "G-1"

PROPOSED OPTION NO. 1 - PRIMARY STORM DRAIN
WSPGW HGL ANALYSIS

(EXHIBIT N.T.S.)

WATER SURFACE PRESSURE GRADIENT ANALYSIS (PLAN & PROFILE)





Program Package Serial Number: 1581 Date: 7- 7-2009 Time: 2:18:16 File:optiwsw.WSW

Option 1
Main Channel N. HWY 18
Pipe To Box

[No.] TYPE OPERATION	STATION (FT)	INV ELEV (FT)	WATER LEVEL (FT)	CHAN HT (FT)	TYPE CHANNEL	"N"	#PIER/PIP	FLOW RATE (CFS)	VELOCITY (FT/S)	TOP WIDTH (FT)	CHAN WDTH (FT)	PIER WIDTH (FT)	ZL	ZR	SUPEL RT B (FT)	SUPEL LT B (FT)	CRIT DPTH (FT)	RADIUS/CPT (FT DR <)	RMKS
[1] SYSTEM OUTLET	.000	5595.000	3.110	6.000	PIPE	.013	1	411.000	27.770	5.996	6.000	.000	.000	.000	.000	.000	5.383	.000	
[2] REACH	16.780	5595.959	3.159	6.000	PIPE	.013	1	411.000	27.232	5.992	6.000	.000	.000	.000	.000	.000	5.383	.000	
[3] REACH	50.561	5597.889	3.282	6.000	PIPE	.013	1	411.000	25.964	5.973	6.000	.000	.000	.000	.000	.000	5.383	.000	
[4] REACH	77.212	5599.412	3.412	6.000	PIPE	.013	1	411.000	24.756	5.943	6.000	.000	.000	.000	.000	.000	5.383	.000	
[5] REACH	98.688	5600.639	3.549	6.000	PIPE	.013	1	411.000	23.604	5.899	6.000	.000	.000	.000	.000	.000	5.383	.000	
[6] REACH	116.225	5601.641	3.694	6.000	PIPE	.013	1	411.000	22.506	5.837	6.000	.000	.000	.000	.000	.000	5.383	.000	
[7] REACH	130.641	5602.465	3.847	6.000	PIPE	.013	1	411.000	21.458	5.756	6.000	.000	.000	.000	.000	.000	5.383	.000	
[8] REACH	142.502	5603.143	4.011	6.000	PIPE	.013	1	411.000	20.460	5.649	6.000	.000	.000	.000	.000	.000	5.383	.000	
[9] REACH	152.211	5603.697	4.187	6.000	PIPE	.013	1	411.000	19.507	5.510	6.000	.000	.000	.000	.000	.000	5.383	.000	
[10] REACH	160.054	5604.146	4.376	6.000	PIPE	.013	1	411.000	18.600	5.331	6.000	.000	.000	.000	.000	.000	5.383	.000	
[11] REACH	166.222	5604.498	4.584	6.000	PIPE	.013	1	411.000	17.734	5.096	6.000	.000	.000	.000	.000	.000	5.383	.000	
[12] REACH	170.819	5604.761	4.812	6.000	PIPE	.013	1	411.000	16.909	4.782	6.000	.000	.000	.000	.000	.000	5.383	.000	
[13] REACH	173.831	5604.933	5.072	6.000	PIPE	.013	1	411.000	16.122	4.339	6.000	.000	.000	.000	.000	.000	5.383	.000	
[14] REACH	175.000	5605.000	5.383	6.000	PIPE	.013	1	411.000	15.370	3.645	6.000	.000	.000	.000	.000	.000	5.383	.000	
[15] JUNCTION	195.000	5606.143	9.111	6.000	PIPE	.013	1	244.000	8.630	.000	6.000	.000	.000	.000	.000	.000	4.278	.000	
[16] HYD JUMP	282.482	5608.643	6.899	6.000	PIPE	.013	1	244.000	8.630	.000	6.000	.000	.000	.000	.000	.000	4.278	.000	HYD JUMP
[17] REACH	282.482	5608.643	2.521	6.000	PIPE	.013	1	244.000	21.641	5.923	6.000	.000	.000	.000	.000	.000	4.278	.000	
[18] REACH	310.220	5609.435	2.539	6.000	PIPE	.013	1	244.000	21.440	5.929	6.000	.000	.000	.000	.000	.000	4.278	.000	
[19] REACH	400.000	5612.000	2.632	6.000	PIPE	.013	1	244.000	20.442	5.955	6.000	.000	.000	.000	.000	.000	4.278	.000	
[20] REACH	468.265	5613.593	2.670	6.000	PIPE	.013	1	244.000	20.067	5.964	6.000	.000	.000	.000	.000	.000	4.278	.000	
[21] REACH	569.703	5615.959	2.770	6.000	PIPE	.013	1	244.000	19.133	5.982	6.000	.000	.000	.000	.000	.000	4.278	.000	
[22] REACH	629.696	5617.359	2.873	6.000	PIPE	.013	1	244.000	18.243	5.995	6.000	.000	.000	.000	.000	.000	4.278	.000	
[23] REACH	670.441	5618.310	2.982	6.000	PIPE	.013	1	244.000	17.394	6.000	6.000	.000	.000	.000	.000	.000	4.278	.000	
[24] REACH	700.000	5619.000	3.096	6.000	PIPE	.013	1	244.000	16.584	5.997	6.000	.000	.000	.000	.000	.000	4.278	.000	
[25] REACH	704.010	5619.053	3.098	6.000	PIPE	.013	1	244.000	16.569	5.997	6.000	.000	.000	.000	.000	.000	4.278	.000	
[26] REACH	829.760	5620.730	3.218	6.000	PIPE	.013	1	244.000	15.798	5.984	6.000	.000	.000	.000	.000	.000	4.278	.000	
[27] REACH	895.310	5621.604	3.344	6.000	PIPE	.013	1	244.000	15.063	5.960	6.000	.000	.000	.000	.000	.000	4.278	.000	
[28] REACH	935.966	5622.146	3.478	6.000	PIPE	.013	1	244.000	14.362	5.924	6.000	.000	.000	.000	.000	.000	4.278	.000	
[29] REACH	962.762	5622.503	3.619	6.000	PIPE	.013	1	244.000	13.693	5.871	6.000	.000	.000	.000	.000	.000	4.278	.000	
[30] REACH	980.549	5622.741	3.767	6.000	PIPE	.013	1	244.000	13.056	5.801	6.000	.000	.000	.000	.000	.000	4.278	.000	
[31] REACH	991.833	5622.891	3.925	6.000	PIPE	.013	1	244.000	12.448	5.707	6.000	.000	.000	.000	.000	.000	4.278	.000	
[32] REACH	998.037	5622.974	4.094	6.000	PIPE	.013	1	244.000	11.869	5.586	6.000	.000	.000	.000	.000	.000	4.278	.000	
[33] REACH	1000.000	5623.000	4.278	6.000	PIPE	.013	1	244.000	11.314	5.428	6.000	.000	.000	.000	.000	.000	4.278	.000	
[34] JUNCTION	1020.000	5623.268	2.567	5.000	PIPE	.013	1	186.000	18.317	4.998	5.000	.000	.000	.000	.000	.000	3.902	.000	
[35] REACH	1301.106	5628.469	2.507	5.000	PIPE	.013	1	186.000	18.880	5.000	5.000	.000	.000	.000	.000	.000	3.902	.000	
[36] REACH	1430.984	5631.243	2.415	5.000	PIPE	.013	1	186.000	19.802	4.997	5.000	.000	.000	.000	.000	.000	3.902	.000	
[37] REACH	1537.533	5632.844	2.328	5.000	PIPE	.013	1	186.000	20.768	4.988	5.000	.000	.000	.000	.000	.000	3.902	.000	
[38] REACH	1600.000	5634.000	2.244	5.000	PIPE	.015	1	186.000	21.782	4.974	5.000	.000	.000	.000	.000	.000	3.902	.000	
[39] TRANSITION	1615.000	5634.276	2.029	6.000	BOX	.015	0	186.000	22.923	4.000	4.000	.000	.000	.000	.000	.000	4.065	.000	
[40] REACH	1696.981	5638.625	2.028	6.000	BOX	.015	0	186.000	22.923	4.000	4.000	.000	.000	.000	.000	.000	4.065	.000	
[41] REACH	1900.006	5649.393	2.061	6.000	BOX	.015	0	186.000	22.564	4.000	4.000	.000	.000	.000	.000	.000	4.065	.000	
[42] REACH	2018.966	5655.702	2.162	6.000	BOX	.015	0	186.000	21.514	4.000	4.000	.000	.000	.000	.000	.000	4.065	.000	
[43] REACH	2069.440	5658.379	2.267	6.000	BOX	.015	0	186.000	20.512	4.000	4.000	.000	.000	.000	.000	.000	4.065	.000	
[44] REACH	2100.000	5660.000	2.278	6.000	BOX	.015	0	186.000	19.558	4.000	4.000	.000	.000	.000	.000	.000	4.065	.000	
[45] REACH	2182.659	5662.886	2.377	6.000	BOX	.015	0	186.000	19.558	4.000	4.000	.000	.000	.000	.000	.000	4.065	.000	
[46] REACH	2391.339	5670.169	2.406	6.000	BOX	.015	0	186.000	19.329	4.000	4.000	.000	.000	.000	.000	.000	4.065	.000	
[47] REACH	2526.793	5674.897	2.523	6.000	BOX	.015	0	186.000	18.429	4.000	4.000	.000	.000	.000	.000	.000	4.065	.000	
[48] REACH	2579.748	5676.746	2.646	6.000	BOX	.015	0	186.000	17.571	4.000	4.000	.000	.000	.000	.000	.000	4.065	.000	
[49] REACH	2610.475	5677.818	2.775	6.000	BOX	.015	0	186.000	16.754	4.000	4.000	.000	.000	.000	.000	.000	4.065	.000	
[50] REACH	2630.780	5678.526	2.912	6.000	BOX	.015	0	186.000	15.974	4.000	4.000	.000	.000	.000	.000	.000	4.065	.000	
[51] REACH	2644.980	5679.022	3.053	6.000	BOX	.015	0	186.000	15.231	4.000	4.000	.000	.000	.000	.000	.000	4.065	.000	
[52] REACH	2655.131	5679.376	3.203	6.000	BOX	.015	0	186.000	14.522	4.000	4.000	.000	.000	.000	.000	.000	4.065	.000	
[53] REACH	2662.369	5679.629	3.358	6.000	BOX	.015	0	186.000	13.846	4.000	4.000	.000	.000	.000	.000	.000	4.065	.000	
[54] REACH	2667.389	5679.804	3.523	6.000	BOX	.015	0	186.000	13.202	4.000	4.000	.000	.000	.000	.000	.000	4.065	.000	
[55] REACH	2670.642	5679.918	3.694	6.000	BOX	.015	0	186.000	12.587	4.000	4.000	.000	.000	.000	.000	.000	4.065	.000	
[56] REACH	2672.438	5679.980	3.875	6.000	BOX	.015	0	186.000	12.002	4.000	4.000	.000	.000	.000	.000	.000	4.065	.000	
[57] HEADWORKS	2673.000	5680.000	4.064	6.000	BOX	.015	0	186.000	11.440	4.000	4.000	.000	.000	.000	.000	.000	4.065	.000	

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PROPOSED OPTION NO. 1 - PRIMARY SD
WSPGW HGL ANALYSIS
IN THE COUNTY OF SAN BERNARDINO, CA

JOSEPH E. BONADIMAN & ASSOCIATES, INC.
CIVIL ENGINEERING G.I.S. LAND SURVEYING
(909)885-3806 ~ Fax (909)381-1721

HILLTOP GEOTECHNICAL INCORPORATED

Michael Brandman Associates

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT 1939 CALIFORNIA

BY	MARK	REVISION DESCRIPTION	DATE
JDN	1	ENTIRE EXHIBIT	07-27-09

PREPARED FOR:	SBCFCD
JOB NO:	093458
PREPARED BY:	DWJ
CHECKED BY:	DWJ

NOTE: *Joseph E. Bonadiman & Associates, Inc. does not warranty the accuracy of the G.I.S. data presented in this Exhibit. This Exhibit may contain information copyrighted to the County of San Bernardino.*

PROPOSED OPTION NO. 1 - PRIMARY SD
WSPGW HGL ANALYSIS
IN THE COUNTY OF SAN BERNARDINO, CA

DISREGARD PRINTS BEARING EARLIER REVISION DATES → 07-27-09

G-1

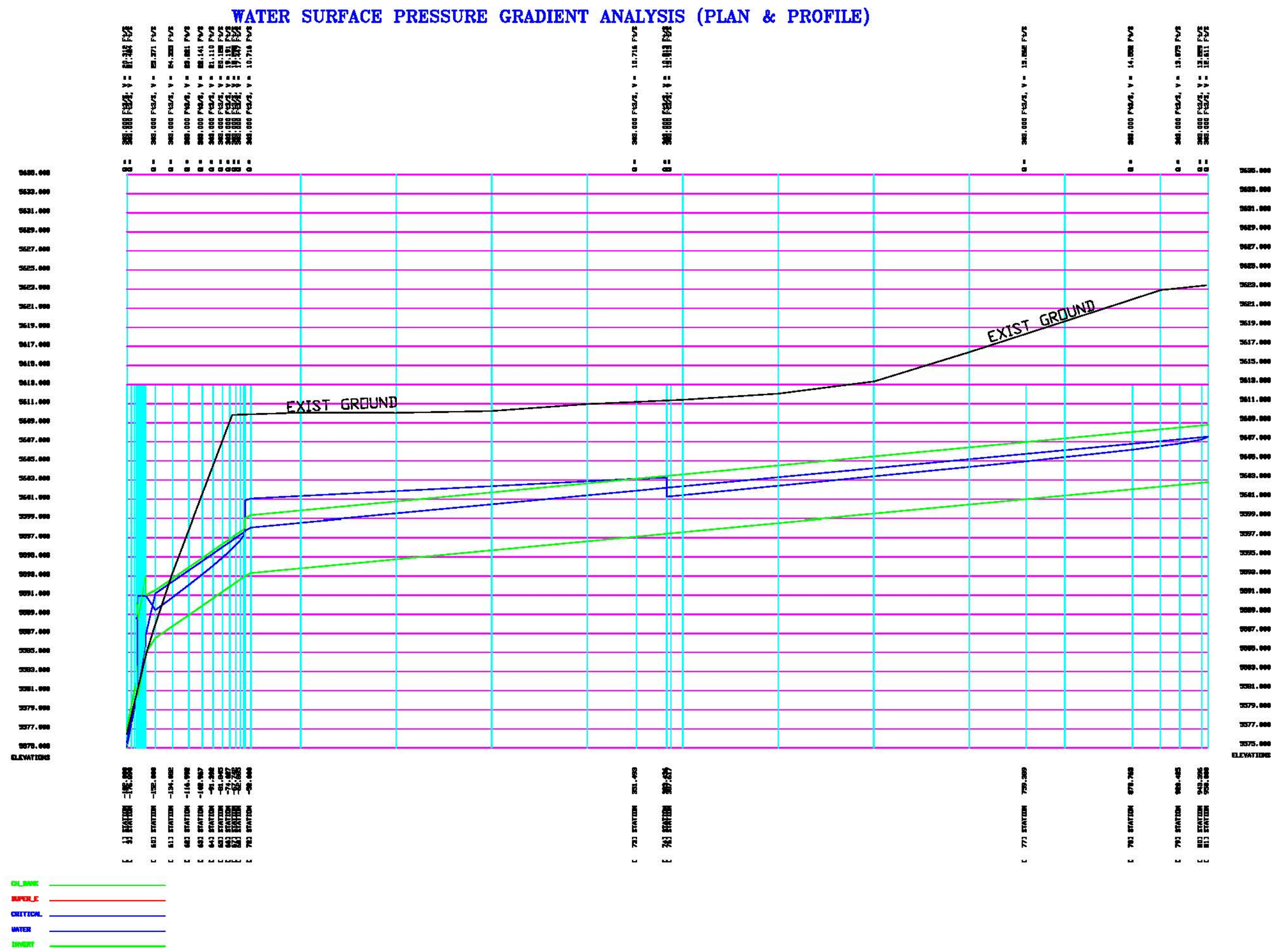
SHEET: 1 OF 1

EXHIBIT "G-2"

PROPOSED OPTION NO. 2 - PRIMARY STORM DRAIN

WSPGW HGL ANALYSIS

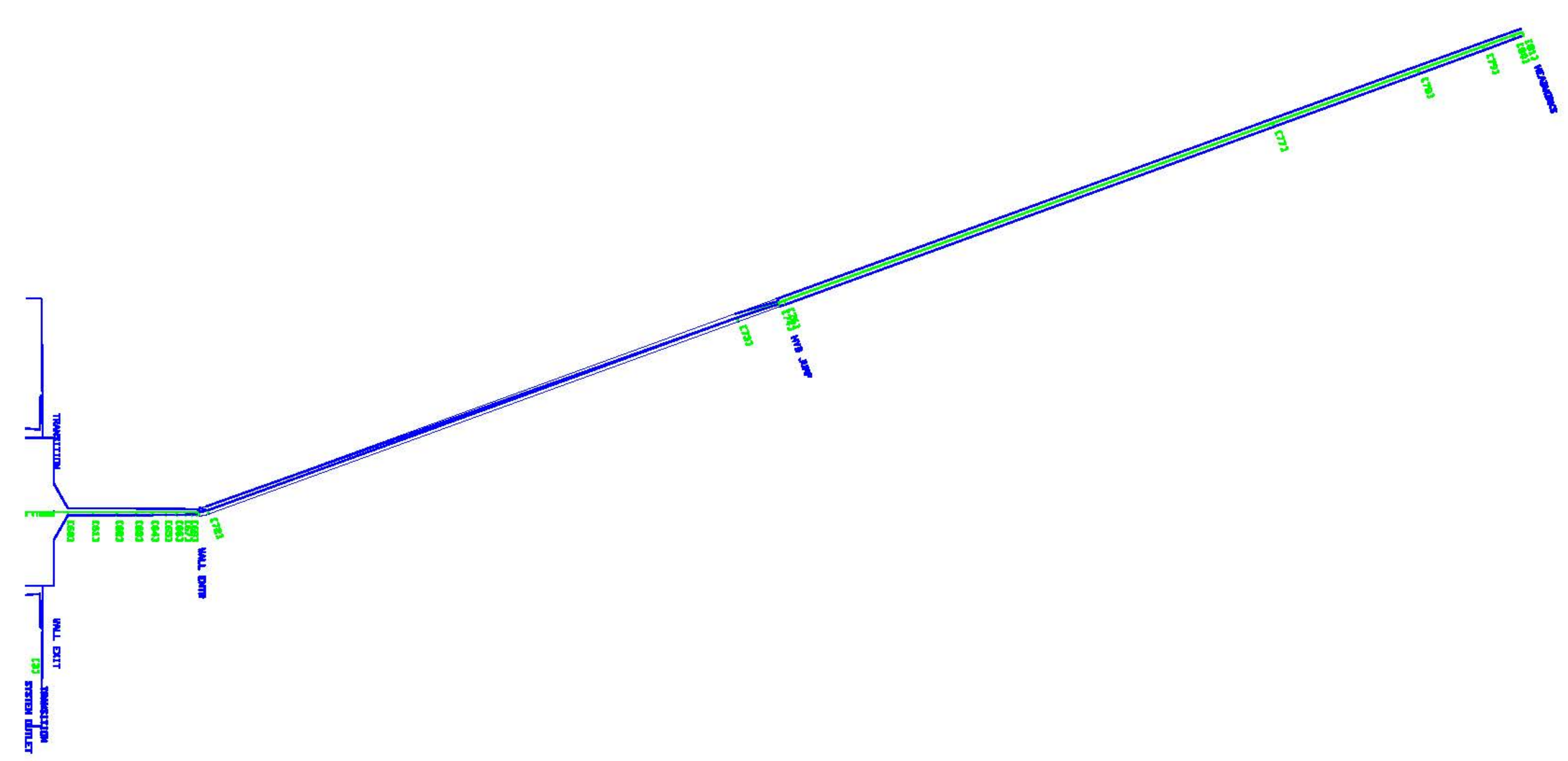
(EXHIBIT N.T.S.)



Program Package Serial Number: 1581   Date: 6-22-2009 Time:10:52:48 File:outlet.WSW

Rinforest Option 2 with Weir Wall Outlet
Weep Holes ignored in analysis

[No.]	TYPE OPERATION	STATION (FT)	INV ELEV (FT)	WATER LEVEL (FT)	CHAN HT (FT)	TYPE CHANNEL	"N"	$PIER/PIP	FLOW RATE (CFS)	VELOCITY (FT/S)	TOP WIDTH (FT)	CHAN WDTH (FT)	PIER WIDTH (FT)	ZL	ZR	SUPEL RT $ (FT)	SUPEL LT $ (FT)	CRIT DPTH (FT)	RADIUS/CPT (FT OR < >)	MSGS
[1]	SYSTEM OUTLET	-182.000	5576.000	.198	2.000	TRAPEZOIDAL	.014	0	303.000	20.812	119.846	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[2]	REACH	-181.318	5576.341	.192	2.000	TRAPEZOIDAL	.014	0	303.000	20.487	119.176	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[3]	REACH	-176.090	5577.555	.126	2.000	TRAPEZOIDAL	.014	0	303.000	21.424	118.594	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[4]	REACH	-174.070	5578.962	.121	2.000	TRAPEZOIDAL	.014	0	303.000	22.469	118.690	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[5]	REACH	-172.000	5580.001	.116	2.000	TRAPEZOIDAL	.014	0	303.000	23.556	117.506	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[6]	REACH	-171.990	5580.860	.119	2.000	TRAPEZOIDAL	.014	0	303.000	22.831	117.087	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[7]	REACH	-171.984	5581.306	.124	2.000	TRAPEZOIDAL	.014	0	303.000	21.760	118.405	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[8]	REACH	-171.978	5581.978	.130	2.000	TRAPEZOIDAL	.014	0	303.000	20.755	118.970	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[9]	REACH	-171.968	5582.582	.135	2.000	TRAPEZOIDAL	.014	0	303.000	19.790	119.575	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[10]	REACH	-171.961	5583.131	.142	2.000	TRAPEZOIDAL	.014	0	303.000	18.869	120.199	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[11]	REACH	-171.955	5583.630	.148	2.000	TRAPEZOIDAL	.014	0	303.000	17.990	120.849	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[12]	REACH	-171.949	5584.082	.155	2.000	TRAPEZOIDAL	.014	0	303.000	17.153	121.527	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[13]	REACH	-171.944	5584.492	.162	2.000	TRAPEZOIDAL	.014	0	303.000	16.355	122.235	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[14]	REACH	-171.939	5584.863	.170	2.000	TRAPEZOIDAL	.014	0	303.000	15.594	122.972	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[15]	REACH	-171.935	5585.200	.177	2.000	TRAPEZOIDAL	.014	0	303.000	14.868	123.741	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[16]	REACH	-171.931	5585.504	.186	2.000	TRAPEZOIDAL	.014	0	303.000	14.176	124.542	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[17]	REACH	-171.928	5585.780	.194	2.000	TRAPEZOIDAL	.014	0	303.000	13.517	125.377	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[18]	REACH	-171.925	5586.030	.202	2.000	TRAPEZOIDAL	.014	0	303.000	12.887	126.247	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[19]	REACH	-171.922	5586.255	.212	2.000	TRAPEZOIDAL	.014	0	303.000	12.288	127.152	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[20]	REACH	-171.919	5586.459	.222	2.000	TRAPEZOIDAL	.014	0	303.000	11.716	128.096	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[21]	REACH	-171.917	5586.644	.231	2.000	TRAPEZOIDAL	.014	0	303.000	11.171	129.077	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[22]	REACH	-171.915	5586.810	.241	2.000	TRAPEZOIDAL	.014	0	303.000	10.651	130.099	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[23]	REACH	-171.913	5586.959	.251	2.000	TRAPEZOIDAL	.014	0	303.000	10.155	131.162	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[24]	REACH	-171.911	5587.094	.262	2.000	TRAPEZOIDAL	.014	0	303.000	9.683	132.268	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[25]	REACH	-171.910	5587.215	.274	2.000	TRAPEZOIDAL	.014	0	303.000	9.232	133.417	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[26]	REACH	-171.908	5587.323	.286	2.000	TRAPEZOIDAL	.014	0	303.000	8.802	134.613	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[27]	REACH	-171.907	5587.420	.299	2.000	TRAPEZOIDAL	.014	0	303.000	8.393	135.855	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[28]	REACH	-171.906	5587.507	.311	2.000	TRAPEZOIDAL	.014	0	303.000	8.002	137.146	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[29]	REACH	-171.905	5587.584	.325	2.000	TRAPEZOIDAL	.014	0	303.000	7.630	138.487	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[30]	REACH	-171.904	5587.652	.339	2.000	TRAPEZOIDAL	.014	0	303.000	7.275	139.880	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[31]	REACH	-171.904	5587.712	.353	2.000	TRAPEZOIDAL	.014	0	303.000	6.936	141.326	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[32]	REACH	-171.903	5587.765	.368	2.000	TRAPEZOIDAL	.014	0	303.000	6.613	142.826	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[33]	REACH	-171.902	5587.812	.383	2.000	TRAPEZOIDAL	.014	0	303.000	6.306	144.383	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[34]	REACH	-171.902	5587.852	.399	2.000	TRAPEZOIDAL	.014	0	303.000	6.012	145.999	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[35]	REACH	-171.901	5587.886	.416	2.000	TRAPEZOIDAL	.014	0	303.000	5.732	147.674	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[36]	REACH	-171.901	5587.915	.434	2.000	TRAPEZOIDAL	.014	0	303.000	5.466	149.411	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[37]	REACH	-171.901	5587.938	.453	2.000	TRAPEZOIDAL	.014	0	303.000	5.211	151.211	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[38]	REACH	-171.900	5587.958	.471	2.000	TRAPEZOIDAL	.014	0	303.000	4.969	153.076	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[39]	REACH	-171.900	5587.974	.490	2.000	TRAPEZOIDAL	.014	0	303.000	4.737	155.009	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[40]	REACH	-171.900	5587.985	.511	2.000	TRAPEZOIDAL	.014	0	303.000	4.517	157.010	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[41]	REACH	-171.900	5587.994	.530	2.000	TRAPEZOIDAL	.014	0	303.000	4.307	159.081	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[42]	REACH	-171.900	5587.999	.552	2.000	TRAPEZOIDAL	.014	0	303.000	4.106	161.225	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[43]	REACH	-171.900	5588.000	.576	2.000	TRAPEZOIDAL	.014	0	303.000	3.987	163.544	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[44]	REACH	-171.242	5588.000	.604	2.000	TRAPEZOIDAL	.014	0	303.000	3.682	166.421	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[45]	REACH	-171.000	5588.000	.609	2.000	TRAPEZOIDAL	.500	0	303.000	3.647	166.888	106.000	.000	50.000	50.000	.000	.000	.575	.000	
[46]	TRANSITION	-169.900	5580.500	10.435	8.000	RECTANGULAR	.014	0	303.000	.274	106.000	106.000	.000	.000	.000	.000	.000	.633	.000	
[47]	REACH	-169.040	5580.985	9.950	8.000	RECTANGULAR	.014	0	303.000	.287	106.000	106.000	.000	.000	.000	.000	.000	.633	.000	
[48]	REACH	-168.235	5581.448	9.487	8.000	RECTANGULAR	.014	0	303.000	.301	106.000	106.000	.000	.000	.000	.000	.000	.633	.000	
[49]	REACH	-167.460	5581.890	9.048	8.000	RECTANGULAR	.014	0	303.000	.316	106.000	106.000	.000	.000	.000	.000	.000	.633	.000	
[50]	REACH	-166.701	5582.311	8.624	8.000	RECTANGULAR	.014	0	303.000	.331	106.000	106.000	.000	.000	.000	.000	.000	.633	.000	
[51]	REACH	-166.017	5582.712	8.223	8.000	RECTANGULAR	.014	0	303.000	.348	106.000	106.000	.000	.000	.000	.000	.000	.633	.000	
[52]	REACH	-165.346	5583.094	7.840	8.000	RECTANGULAR	.014	0	303.000	.365	106.000	106.000	.000	.000	.000	.000	.000	.633	.000	
[53]	REACH	-164.706	5583.459	7.475	8.000	RECTANGULAR	.014	0	303.000	.382	106.000	106.000	.000	.000	.000	.000	.000	.633	.000	
[54]	REACH	-164.096	5583.807	7.127	8.000	RECTANGULAR	.014	0	303.000	.401	106.000	106.000	.000	.000	.000	.000	.000	.633	.000	
[55]	REACH	-163.513	5584.138	6.796	8.000	RECTANGULAR	.014	0	303.000	.421	106.000	106.000	.000	.000	.000	.000	.000	.633	.000	
[56]	REACH	-162.959	5584.454	6.480	8.000	RECTANGULAR	.014	0	303.000	.441	106.000	106.000	.000	.000	.000	.000	.000	.633	.000	
[57]	REACH	-162.430	5584.755	6.178	8.000	RECTANGULAR	.014	0	303.000	.463	106.000	106.000	.000	.000	.000	.000	.000	.633	.000	
[58]	REACH	-162.000	5585.000	5.933	8.000	RECTANGULAR	.014	0	303.000	.482	106.000	106.000	.000	.000	.000	.000	.000	.633	.000	
[59]	WALL EXIT	-162.000	5585.000	5.933	6.000	RECTANGULAR	.014	1	303.000	2.553	40.000	40.000	20.000	.000	.000	.000	.000	1.984	.000	
[60]	TRANSITION	-152.000	5586.500	2.988	5.000	PIPE	.013	1	303.000	25.371	4.986	5.000	.000	.000	.000	.000	.000	4.680	.000	
[61]	REACH	-134.082	5587.739	3.029	5.000	PIPE	.013	1	303.000	24.365	4.907	5.000	.000	.000	.000	.000	.000	4.680	.000	
[62]	REACH	-116.992	5588.921	3.134	5.000	PIPE	.013	1	303.000	23.221	4.826	5.000	.000	.000	.000	.000	.000	4.680	.000	
[63]	REACH	-102.967	5589.891	3.286	5.000	PIPE	.013	1	303.000	22.141	4.746	5.000	.000	.000	.000	.000	.000	4.680	.000	
[64]	REACH	-91.392	5590.691	3.429	5.000	PIPE	.013	1	303.000	21.110	4.642	5.000	.000	.000	.000	.000	.000	4.680	.000	
[65]	REACH	-81.045	5591.351	3.582	5.000	PIPE	.013	1	303.000	20.128	4.507	5.000	.000	.000	.000	.000	.000	4.680	.000	
[66]	REACH	-74.027	5591.892	3.748	5.000	PIPE	.013	1	303.000	19.191	4.332	5.000	.000	.000	.000	.000	.000	4.680	.000	
[67]	REACH	-67.742	5592.326	3.931	5.000	PIPE	.013	1	303.000	18.298	4.100	5.000	.000	.000	.000	.000	.000	4.680	.000	
[68]	REACH	-62.885	5592.662	4.136	5.000	PIPE	.013	1	303.000	17.447	3.782	5.000	.000	.000	.000	.000	.000	4.680	.000	
[69]	REACH	-59.491	5592.897	4.374	5.000	PIPE	.013	1	303.000	16.635	3.310	5.000	.000	.000	.000	.000	.000	4.680	.000	
[70]	REACH	-58.000	5593.000	4.680	5.000	PIPE	.013	1	303.000	13.859	2.447	5.000	.000	.000	.000	.000	.000	4.680	17.189	
[71]	WALL ENTR	-58.000	5593.000	7.863	6.000	PIPE	.013	1	303.000	10.716	.000	6.000	.000	.000	.000	.000	.000	4.754	17.189	
[72]	REACH	-52.000	5593.317	7.745	6.000	PIPE	.013	1	303.000	10.716	.000	6.000	.000	.000	.000	.000	.000	4.754	.000	
[73]	REACH	351.499	5597.127	6.000	6.000	PIPE	.013	1	303.000	10.716	.000	6.000	.000	.000	.000	.000	.000	4.754	.000	
[74]	HYD JUMP	383.436	5597.429	5.817	6.000	PIPE	.013	1	303.000	10.813	2.063	6.000	.000	.000	.000	.000	.000	4.754	.000	HYD JUMP
[75]	REACH	383.436	5597.429	3.888	6.000	PIPE	.013	1	303.000	15.915	5.767	6.000	.000	.000	.000	.000	.000	4.754	.000	
[76]	REACH	387.617	5597.468	3.888	6.000	PIPE	.013	1	303.000	15.915	5.767	6.000	.000	.000	.000	.000	.000	4.754	.000	
[77]	REACH	759.389	5600.979	3.970	6.000	PIPE	.013	1	303.000	15.862	5.670	6.000	.000	.000	.000	.000	.000	4.754	.000	
[78]	REACH	879.768	5602.031	4.148	6.000	PIPE	.013	1	303.000	14.952	5.540	6.000	.000	.000	.000	.000	.000	4.754	.000	
[79]	REACH	920.485	5602.500	4.389	6.000	PIPE	.013	1	303.000	13.875	5.380	6.000	.000	.000	.000	.000	.000	4.754	.000	
[80]	REACH	943.396	5602.717	4.581	6.000	PIPE	.013	1	303.000	13.889	5.161	6.000	.000	.000	.000	.000	.000	4.754	.000	
[81]	HEADWORKS	950.000	5602.780	4.754	6.000	PIPE	.013	1	303.000	12.611	4.870	6.000	.000	.000	.000	.000	.000	4.754	.000	



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WSPGW HGL ANALYSIS
IN THE COUNTY OF SAN BERNARDINO, CA

JOSEPH E. BONADIMAN & ASSOCIATES, INC.
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(909)885-3806 ~ Fax (909)381-1721

HILLTOP GEOTECHNICAL INCORPORATED

Michael Brandman Associates

BY	MARK	REVISION DESCRIPTION	DATE
JDN	1	ENTIRE EXHIBIT	07-27-09

PREPARED FOR:	SBCFCD
JOB NO:	093458
PREPARED BY:	DWJ
CHECKED BY:	DWJ

NOTE: *Joseph E. Bonadiman & Associates, Inc. does not warranty the accuracy of the G.I.S. data presented in this Exhibit. This Exhibit may contain information copyrighted to the County of San Bernardino.*

PROPOSED OPTION NO. 2 - PRIMARY SD
WSPGW HGL ANALYSIS
IN THE COUNTY OF SAN BERNARDINO, CA

DISREGARD PRINTS BEARING EARLIER REVISION DATES → 07-27-09

G-2

SHEET: 1 OF 1

ATTACHMENT 1

Rational Method Hydrology Calculations
Proposed Option No. 1

Note: This Attachment contains the Rational Method Flow Rate Results for Proposed Drainage Option No. 1, one of two options recommended to reduce the runoff and cliff erosion of Rimforest.

Option No. 1 directs the flow into Little Bear Creek (See Exhibit “F” for Point Number Locations).

```
                San Bernardino County Rational Hydrology Program

                    (Hydrology Manual Date - August 1986)

 CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989-2005 Version 7.1
        Rational Hydrology Study        Date: 07/08/09
----------------------------------------------------------------------
Rimforest, All Area to Little Bear Creek
Option1.out


----------------------------------------------------------------------


Program License Serial Number 4500

----------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

----------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
Computed rainfall intensity:
Storm year =   100.00   1 hour rainfall =     2.050 (In.)
Slope used for rainfall intensity curve b =  0.7000
Soil antecedent moisture condition (AMC) = 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 84.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.301(In/Hr)
Initial subarea data:
Initial area flow distance =   455.000(Ft.)
Top (of initial area) elevation =  6005.000(Ft.)
Bottom (of initial area) elevation =  5950.000(Ft.)
Difference in elevation =    55.000(Ft.)
Slope =    0.12088  s(%)=      12.09
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.461 min.
Rainfall intensity =      6.160(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.856
Subarea runoff =     45.247(CFS)
Total initial stream area =        8.580(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.301(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   1.040(Ft.), Average velocity =  14.125(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00             10.00
        2             50.00              0.00
        3            100.00             10.00
Manning's 'N' friction factor =   0.035
----------------------------------------------------------------
Sub-Channel flow  =     76.445(CFS)
  '     '        flow top width =     10.404(Ft.)
  '     '    velocity=   14.125(Ft/s)
  '     '        area =      5.412(Sq.Ft)
  '     '        Froude number =     3.451

Upstream point elevation =  5950.000(Ft.)
Downstream point elevation =  5802.000(Ft.)
Flow length =   545.000(Ft.)
Travel time  =    0.64 min.
Time of concentration =   13.10 min.
Depth of flow =   1.040(Ft.)
Average velocity =  14.125(Ft/s)
Total irregular channel flow =    76.445(CFS)
Irregular channel normal depth above invert elev. =   1.040(Ft.)
Average velocity of channel(s) =  14.125(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 84.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.301(In/Hr)
Rainfall intensity =      5.947(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.855
Subarea runoff =     62.331(CFS) for   12.590(Ac.)
Total runoff =    107.578(CFS)
Effective area this stream =       21.17(Ac.)
Total Study Area (Main Stream No. 1) =       21.17(Ac.)
Area averaged Fm value =    0.301(In/Hr)
Depth of flow =   1.183(Ft.), Average velocity =  15.384(Ft/s)


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Process from Point/Station        3.000 to Point/Station        4.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   1.541(Ft.), Average velocity =  12.387(Ft/s)
        ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00             10.00
        2             50.00              0.00
        3            100.00             10.00
Manning's 'N' friction factor =   0.035
----------------------------------------------------------------
Sub-Channel flow  =    147.041(CFS)
  '     '        flow top width =     15.408(Ft.)
  '     '    velocity=   12.387(Ft/s)
  '     '        area =     11.871(Sq.Ft)
  '     '        Froude number =     2.487

Upstream point elevation =  5802.000(Ft.)
Downstream point elevation =  5658.000(Ft.)
Flow length =  1164.000(Ft.)
Travel time  =    1.57 min.
Time of concentration =   14.67 min.
Depth of flow =   1.541(Ft.)
Average velocity =  12.387(Ft/s)
Total irregular channel flow =   147.041(CFS)
Irregular channel normal depth above invert elev. =   1.541(Ft.)
Average velocity of channel(s) =  12.387(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 84.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.301(In/Hr)
Rainfall intensity =      5.495(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.851
Subarea runoff =     78.858(CFS) for   18.710(Ac.)
Total runoff =    186.435(CFS)
Effective area this stream =       39.88(Ac.)
Total Study Area (Main Stream No. 1) =       39.88(Ac.)
Area averaged Fm value =    0.301(In/Hr)
Depth of flow =   1.684(Ft.), Average velocity =  13.144(Ft/s)


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Process from Point/Station        4.000 to Point/Station        5.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =  5658.000(Ft.)
Downstream point elevation =  5630.000(Ft.)
Channel length thru subarea  =   961.000(Ft.)
Channel base width      =    5.000(Ft.)
Slope or 'Z' of left channel bank =   0.000
Slope or 'Z' of right channel bank =   0.000
Estimated mean flow rate at midpoint of channel =    206.116(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    8.000(Ft.)
Flow(q) thru subarea =    206.116(CFS)
Depth of flow =   2.196(Ft.), Average velocity =  18.768(Ft/s)
Channel flow top width =    5.000(Ft.)
Flow Velocity =   18.77(Ft/s)
Travel time  =    0.85 min.
Time of concentration =   15.52 min.
Critical depth =      3.750(Ft.)
 Adding area flow to channel
```

```
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 84.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.301(In/Hr)
Rainfall intensity =      5.282(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.849
Subarea runoff =     39.283(CFS) for   10.470(Ac.)
Total runoff =    225.718(CFS)
Effective area this stream =       50.35(Ac.)
Total Study Area (Main Stream No. 1) =       50.35(Ac.)
Area averaged Fm value =    0.301(In/Hr)
Depth of flow =   2.349(Ft.), Average velocity =  19.214(Ft/s)
Critical depth =      4.000(Ft.)


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Process from Point/Station        5.000 to Point/Station        6.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =  5630.000(Ft.)
Downstream point elevation =  5611.000(Ft.)
Channel length thru subarea  =   967.000(Ft.)
Channel base width      =    5.000(Ft.)
Slope or 'Z' of left channel bank =   0.000
Slope or 'Z' of right channel bank =   0.000
Estimated mean flow rate at midpoint of channel =    309.297(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    8.000(Ft.)
Flow(q) thru subarea =    309.297(CFS)
Depth of flow =   3.472(Ft.), Average velocity =  17.818(Ft/s)
Channel flow top width =    5.000(Ft.)
Flow Velocity =   17.82(Ft/s)
Travel time  =    0.90 min.
Time of concentration =   16.43 min.
Critical depth =      4.938(Ft.)
 Adding area flow to channel
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000     Max loss rate(Fm)=     0.317(In/Hr)
Rainfall intensity =      5.076(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.845
Subarea runoff =    167.086(CFS) for   41.180(Ac.)
Total runoff =    392.804(CFS)
Effective area this stream =       91.53(Ac.)
Total Study Area (Main Stream No. 1) =       91.53(Ac.)
Area averaged Fm value =    0.308(In/Hr)
Depth of flow =   4.194(Ft.), Average velocity =  18.730(Ft/s)
Critical depth =      5.750(Ft.)


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Process from Point/Station        5.000 to Point/Station        6.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     91.530(Ac.)
Runoff from this stream =    392.804(CFS)
Time of concentration =   16.43 min.
Rainfall intensity =     5.076(In/Hr)
Area averaged loss rate (Fm) =    0.3080(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8650
Program is now starting with Main Stream No. 2


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Process from Point/Station       10.000 to Point/Station       11.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.362(In/Hr)
Initial subarea data:
Initial area flow distance =   831.000(Ft.)
Top (of initial area) elevation =  5670.000(Ft.)
```

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Bottom (of initial area) elevation =  5646.000(Ft.)
Difference in elevation =    24.000(Ft.)
Slope =    0.02888  s(%)=       2.89
TC = k(0.469)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.025 min.
Rainfall intensity =      5.671(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.842
Subarea runoff =     44.908(CFS)
Total initial stream area =        9.400(Ac.)
Pervious area fraction = 0.800
Initial area Fm value =    0.362(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________
Top of street segment elevation =  5646.000(Ft.)
End of street segment elevation =  5616.000(Ft.)
Length of street segment  =   916.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  18.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     54.130(CFS)
Depth of flow =   0.543(Ft.), Average velocity =   6.029(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    1.71(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.798(Ft.)
Flow velocity =   6.03(Ft/s)
Travel time =    2.53 min.     TC =   16.56  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.045(In/Hr)
Rainfall intensity =      5.049(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.856
Subarea runoff =     18.334(CFS) for    5.240(Ac.)
Total runoff =     63.242(CFS)
Effective area this stream =       14.64(Ac.)
Total Study Area (Main Stream No. 2) =      106.17(Ac.)
Area averaged Fm value =    0.249(In/Hr)
Street flow at end of street =     63.242(CFS)
Half street flow at end of street =     31.621(CFS)
Depth of flow =   0.569(Ft.), Average velocity =   6.181(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    2.76(Ft.)
Flow width (from curb towards crown)=  22.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
RESIDENTIAL(3 - 4 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.6000     Max loss rate(Fm)=     0.272(In/Hr)
Time of concentration =    16.56 min.
Rainfall intensity =      5.049(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.855
Subarea runoff =     17.971(CFS) for    4.180(Ac.)
Total runoff =     81.213(CFS)
Effective area this stream =       18.82(Ac.)
Total Study Area (Main Stream No. 2) =      110.35(Ac.)
Area averaged Fm value =    0.254(In/Hr)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     18.820(Ac.)
Runoff from this stream =     81.213(CFS)
Time of concentration =   16.56 min.
Rainfall intensity =     5.049(In/Hr)
Area averaged loss rate (Fm) =    0.2540(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5607


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       21.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.226(In/Hr)
Initial subarea data:
Initial area flow distance =   448.000(Ft.)
Top (of initial area) elevation =  5643.000(Ft.)
Bottom (of initial area) elevation =  5324.000(Ft.)
Difference in elevation =   319.000(Ft.)
Slope =    0.71205  s(%)=      71.21
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    4.786 min.
Rainfall intensity =     12.036(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.883
Subarea runoff =     23.383(CFS)
Total initial stream area =        2.200(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.226(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  5624.000(Ft.)
Downstream point/station elevation =  5619.000(Ft.)
Pipe length  =   281.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    23.383(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    23.383(CFS)
Normal flow depth in pipe =   15.87(In.)
Flow top width inside pipe =   22.72(In.)
Critical Depth =   20.61(In.)
Pipe flow velocity =     10.61(Ft/s)
Travel time through pipe =    0.44 min.
Time of concentration (TC) =     5.23 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.226(In/Hr)
Time of concentration =     5.23 min.
Rainfall intensity =     11.315(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.882
Subarea runoff =      8.453(CFS) for    0.990(Ac.)
Total runoff =     31.836(CFS)
Effective area this stream =        3.19(Ac.)
Total Study Area (Main Stream No. 2) =      113.54(Ac.)
Area averaged Fm value =    0.226(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  5619.000(Ft.)
Downstream point/station elevation =  5612.000(Ft.)
Pipe length  =   526.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    31.836(CFS)
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```
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    31.836(CFS)
Normal flow depth in pipe =   19.88(In.)
Flow top width inside pipe =   23.80(In.)
Critical Depth =   23.31(In.)
Pipe flow velocity =     10.16(Ft/s)
Travel time through pipe =    0.86 min.
Time of concentration (TC) =     6.09 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       12.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.045(In/Hr)
Time of concentration =     6.09 min.
Rainfall intensity =     10.167(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.886
Subarea runoff =     12.920(CFS) for    1.780(Ac.)
Total runoff =     44.756(CFS)
Effective area this stream =        4.97(Ac.)
Total Study Area (Main Stream No. 2) =      115.32(Ac.)
Area averaged Fm value =    0.162(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       12.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      4.970(Ac.)
Runoff from this stream =     44.756(CFS)
Time of concentration =    6.09 min.
Rainfall intensity =    10.167(In/Hr)
Area averaged loss rate (Fm) =    0.1616(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3567
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     81.21    18.820     16.56    0.254      5.049
2     44.76     4.970      6.09    0.162     10.167
Qmax(1) =
           1.000 *    1.000 *    81.213) +
           0.488 *    1.000 *    44.756) + =     103.073
Qmax(2) =
           2.068 *    0.368 *    81.213) +
           1.000 *    1.000 *    44.756) + =     106.523

Total of 2 streams to confluence:
Flow rates before confluence point:
      81.213      44.756
Maximum flow rates at confluence using above data:
      103.073      106.523
Area of streams before confluence:
       18.820        4.970
Effective area values after confluence:
       23.790       11.893
Results of confluence:
Total flow rate =    106.523(CFS)
Time of concentration =     6.090 min.
Effective stream area after confluence =     11.893(Ac.)
Study area average Pervious fraction(Ap) =  0.518
Study area average soil loss rate(Fm) =    0.235(In/Hr)
Study area total (this main stream) =      23.79(Ac.)


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Process from Point/Station       12.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  5610.000(Ft.)
Downstream point/station elevation =  5595.000(Ft.)
Pipe length  =  1176.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   106.523(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =   106.523(CFS)
Normal flow depth in pipe =   32.30(In.)
Flow top width inside pipe =   35.41(In.)
```

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Critical Depth =   37.64(In.)
Pipe flow velocity =     13.43(Ft/s)
Travel time through pipe =    1.46 min.
Time of concentration (TC) =     7.55 min.


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Process from Point/Station       13.000 to Point/Station        6.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     11.893(Ac.)
Runoff from this stream =    106.523(CFS)
Time of concentration =    7.55 min.
Rainfall intensity =     8.747(In/Hr)
Area averaged loss rate (Fm) =    0.2347(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5181
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    392.80    91.530     16.43    0.308      5.076
2    106.52    11.893      7.55    0.235      8.747
Qmax(1) =
           1.000 *    1.000 *   392.804) +
           0.569 *    1.000 *   106.523) + =     453.389
Qmax(2) =
           1.770 *    0.460 *   392.804) +
           1.000 *    1.000 *   106.523) + =     426.050

Total of 2 main streams to confluence:
Flow rates before confluence point:
     393.804     107.523
Maximum flow rates at confluence using above data:
      453.389      426.050
Area of streams before confluence:
       91.530       11.893
Effective area values after confluence:
      103.423       53.961


Results of confluence:
Total flow rate =    453.389(CFS)
Time of concentration =    16.428 min.
Effective stream area after confluence  =    103.423(Ac.)
Study area average Pervious fraction(Ap) =  0.825
Study area average soil loss rate(Fm) =    0.300(In/Hr)
Study area total =     103.42(Ac.)
End of computations, Total Study Area =          115.32 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.793
Area averaged SCS curve number =  78.9
```

ATTACHMENT 2

Rational Method Hydrology Calculations
Proposed Option No. 2

Note: This Attachment contains the Rational Method Flow Rate Results for Proposed Drainage Option No. 2, one of two options recommended to reduce the runoff and cliff erosion of Rimforest.

Option No. 2 directs the flow into Daley Creek (See Exhibit “F” for Point Number Locations).

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                San Bernardino County Rational Hydrology Program

                    (Hydrology Manual Date - August 1986)

 CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989-2005 Version 7.1
        Rational Hydrology Study        Date: 07/07/09
----------------------------------------------------------------------
Rimforest, All area to Daley Creek Weir Wall
Option2.out


----------------------------------------------------------------------


Program License Serial Number 4500

----------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

----------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
Computed rainfall intensity:
Storm year =   100.00   1 hour rainfall =     2.050 (In.)
Slope used for rainfall intensity curve b =  0.7000
Soil antecedent moisture condition (AMC) = 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 84.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.301(In/Hr)
Initial subarea data:
Initial area flow distance =   455.000(Ft.)
Top (of initial area) elevation =  6005.000(Ft.)
Bottom (of initial area) elevation =  5950.000(Ft.)
Difference in elevation =    55.000(Ft.)
Slope =    0.12088  s(%)=      12.09
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.461 min.
Rainfall intensity =      6.160(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.856
Subarea runoff =     45.247(CFS)
Total initial stream area =        8.580(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.301(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =    152.890(CFS)
Depth of flow =   1.040(Ft.), Average velocity =  14.125(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00             10.00
        2             50.00              0.00
        3            100.00             10.00
Manning's 'N' friction factor =   0.035
----------------------------------------------------------------
Sub-Channel flow  =     76.445(CFS)
  '     '        flow top width =     10.404(Ft.)
  '     '    velocity=   14.125(Ft/s)
  '     '        area =      5.412(Sq.Ft)
  '     '        Froude number =     3.451

Upstream point elevation =  5950.000(Ft.)
Downstream point elevation =  5802.000(Ft.)
Flow length =   545.000(Ft.)
Travel time  =    0.64 min.
Time of concentration =   13.10 min.
Depth of flow =   1.040(Ft.)
Average velocity =  14.125(Ft/s)
Total irregular channel flow =    76.445(CFS)
Irregular channel normal depth above invert elev. =   1.040(Ft.)
Average velocity of channel(s) =  14.125(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 84.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.301(In/Hr)
Rainfall intensity =      5.947(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.855
Subarea runoff =     62.331(CFS) for   12.590(Ac.)
Total runoff =    107.578(CFS)
Effective area this stream =       21.17(Ac.)
Total Study Area (Main Stream No. 1) =       21.17(Ac.)
Area averaged Fm value =    0.301(In/Hr)
Depth of flow =   1.183(Ft.), Average velocity =  15.384(Ft/s)


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Process from Point/Station        3.000 to Point/Station        4.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =    294.082(CFS)
Depth of flow =   1.541(Ft.), Average velocity =  12.387(Ft/s)
        ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00             10.00
        2             50.00              0.00
        3            100.00             10.00
Manning's 'N' friction factor =   0.035
----------------------------------------------------------------
Sub-Channel flow  =    147.041(CFS)
  '     '        flow top width =     15.408(Ft.)
  '     '    velocity=   12.387(Ft/s)
  '     '        area =     11.871(Sq.Ft)
  '     '        Froude number =     2.487

Upstream point elevation =  5802.000(Ft.)
Downstream point elevation =  5658.000(Ft.)
Flow length =  1164.000(Ft.)
Travel time  =    1.57 min.
Time of concentration =   14.67 min.
Depth of flow =   1.541(Ft.)
Average velocity =  12.387(Ft/s)
Total irregular channel flow =   147.041(CFS)
Irregular channel normal depth above invert elev. =   1.541(Ft.)
Average velocity of channel(s) =  12.387(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 84.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.301(In/Hr)
Rainfall intensity =      5.495(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.851
Subarea runoff =     78.858(CFS) for   18.710(Ac.)
Total runoff =    186.435(CFS)
Effective area this stream =       39.88(Ac.)
Total Study Area (Main Stream No. 1) =       39.88(Ac.)
Area averaged Fm value =    0.301(In/Hr)
Depth of flow =   1.684(Ft.), Average velocity =  13.144(Ft/s)


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Process from Point/Station        4.000 to Point/Station        5.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =  5658.000(Ft.)
Downstream point elevation =  5630.000(Ft.)
Channel length thru subarea  =   961.000(Ft.)
Channel base width      =    5.000(Ft.)
Slope or 'Z' of left channel bank =   0.000
Slope or 'Z' of right channel bank =   0.000
Estimated mean flow rate at midpoint of channel =    206.116(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    8.000(Ft.)
Flow(q) thru subarea =    206.116(CFS)
Depth of flow =   2.196(Ft.), Average velocity =  18.768(Ft/s)
Channel flow top width =    5.000(Ft.)
Flow Velocity =   18.77(Ft/s)
Travel time  =    0.85 min.
Time of concentration =   15.52 min.
Critical depth =      3.750(Ft.)
 Adding area flow to channel
```

```
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 84.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.301(In/Hr)
Rainfall intensity =      5.282(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.849
Subarea runoff =     39.283(CFS) for   10.470(Ac.)
Total runoff =    225.718(CFS)
Effective area this stream =       50.35(Ac.)
Total Study Area (Main Stream No. 1) =       50.35(Ac.)
Area averaged Fm value =    0.301(In/Hr)
Depth of flow =   2.349(Ft.), Average velocity =  19.214(Ft/s)
Critical depth =      4.000(Ft.)


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Process from Point/Station        5.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  5630.000(Ft.)
Downstream point/station elevation =  5602.780(Ft.)
Pipe length  =   432.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   225.718(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =   225.718(CFS)
Normal flow depth in pipe =   30.98(In.)
Flow top width inside pipe =   36.95(In.)
Critical depth could not be calculated.
Pipe flow velocity =     29.68(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =    15.77 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station       13.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     50.350(Ac.)
Runoff from this stream =    225.718(CFS)
Time of concentration =   15.77 min.
Rainfall intensity =     5.225(In/Hr)
Area averaged loss rate (Fm) =    0.3006(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Program is now starting with Main Stream No. 2


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Process from Point/Station       10.000 to Point/Station       11.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.362(In/Hr)
Initial subarea data:
Initial area flow distance =   831.000(Ft.)
Top (of initial area) elevation =  5670.000(Ft.)
Bottom (of initial area) elevation =  5646.000(Ft.)
Difference in elevation =    24.000(Ft.)
Slope =    0.02888  s(%)=       2.89
TC = k(0.469)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.025 min.
Rainfall intensity =      5.671(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.842
Subarea runoff =     44.908(CFS)
Total initial stream area =        9.400(Ac.)
Pervious area fraction = 0.800
Initial area Fm value =    0.362(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________
Top of street segment elevation =  5646.000(Ft.)
End of street segment elevation =  5616.000(Ft.)
Length of street segment  =   916.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  22.000(Ft.)
```

```
Distance from crown to crossfall grade break  =  18.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     54.130(CFS)
Depth of flow =   0.543(Ft.), Average velocity =   6.029(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    1.71(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.798(Ft.)
Flow velocity =   6.03(Ft/s)
Travel time =    2.53 min.     TC =   16.56  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.045(In/Hr)
Rainfall intensity =      5.049(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.856
Subarea runoff =     18.334(CFS) for    5.240(Ac.)
Total runoff =     63.242(CFS)
Effective area this stream =       14.64(Ac.)
Total Study Area (Main Stream No. 2) =       64.99(Ac.)
Area averaged Fm value =    0.249(In/Hr)
Street flow at end of street =     63.242(CFS)
Half street flow at end of street =     31.621(CFS)
Depth of flow =   0.569(Ft.), Average velocity =   6.181(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    2.76(Ft.)
Flow width (from curb towards crown)=  22.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
RESIDENTIAL(3 - 4 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.6000     Max loss rate(Fm)=     0.272(In/Hr)
Time of concentration =    16.56 min.
Rainfall intensity =      5.049(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.855
Subarea runoff =     17.971(CFS) for    4.180(Ac.)
Total runoff =     81.213(CFS)
Effective area this stream =       18.82(Ac.)
Total Study Area (Main Stream No. 2) =       69.17(Ac.)
Area averaged Fm value =    0.254(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     18.820(Ac.)
Runoff from this stream =     81.213(CFS)
Time of concentration =   16.56 min.
Rainfall intensity =     5.049(In/Hr)
Area averaged loss rate (Fm) =    0.2540(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5607


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       21.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
```

```
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.226(In/Hr)
Initial subarea data:
Initial area flow distance =   448.000(Ft.)
Top (of initial area) elevation =  5643.000(Ft.)
Bottom (of initial area) elevation =  5324.000(Ft.)
Difference in elevation =   319.000(Ft.)
Slope =    0.71205  s(%)=      71.21
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    4.786 min.
Rainfall intensity =     12.036(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.883
Subarea runoff =     23.383(CFS)
Total initial stream area =        2.200(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.226(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  5624.000(Ft.)
Downstream point/station elevation =  5619.000(Ft.)
Pipe length  =   281.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    23.383(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    23.383(CFS)
Normal flow depth in pipe =   15.87(In.)
Flow top width inside pipe =   22.72(In.)
Critical Depth =   20.61(In.)
Pipe flow velocity =     10.61(Ft/s)
Travel time through pipe =    0.44 min.
Time of concentration (TC) =     5.23 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.226(In/Hr)
Time of concentration =     5.23 min.
Rainfall intensity =     11.315(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.882
Subarea runoff =      8.453(CFS) for    0.990(Ac.)
Total runoff =     31.836(CFS)
Effective area this stream =        3.19(Ac.)
Total Study Area (Main Stream No. 2) =       72.36(Ac.)
Area averaged Fm value =    0.226(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  5619.000(Ft.)
Downstream point/station elevation =  5612.000(Ft.)
Pipe length  =   526.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    31.836(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    31.836(CFS)
Normal flow depth in pipe =   19.88(In.)
Flow top width inside pipe =   23.80(In.)
Critical Depth =   23.31(In.)
Pipe flow velocity =     10.16(Ft/s)
Travel time through pipe =    0.86 min.
Time of concentration (TC) =     6.09 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       12.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.045(In/Hr)
Time of concentration =     6.09 min.
```

```
Rainfall intensity =     10.167(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.886
Subarea runoff =     12.920(CFS) for    1.780(Ac.)
Total runoff =     44.756(CFS)
Effective area this stream =        4.97(Ac.)
Total Study Area (Main Stream No. 2) =       74.14(Ac.)
Area averaged Fm value =    0.162(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       12.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      4.970(Ac.)
Runoff from this stream =     44.756(CFS)
Time of concentration =    6.09 min.
Rainfall intensity =    10.167(In/Hr)
Area averaged loss rate (Fm) =    0.1616(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3567
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     81.21    18.820     16.56    0.254      5.049
2     44.76     4.970      6.09    0.162     10.167
Qmax(1) =
           1.000 *    1.000 *    81.213) +
           0.488 *    1.000 *    44.756) + =     103.073
Qmax(2) =
           2.068 *    0.368 *    81.213) +
           1.000 *    1.000 *    44.756) + =     106.523

Total of 2 streams to confluence:
Flow rates before confluence point:
      81.213      44.756
Maximum flow rates at confluence using above data:
      103.073      106.523
Area of streams before confluence:
       18.820        4.970
Effective area values after confluence:
       23.790       11.893
Results of confluence:
Total flow rate =    106.523(CFS)
Time of concentration =     6.090 min.
Effective stream area after confluence =     11.893(Ac.)
Study area average Pervious fraction(Ap) =  0.518
Study area average soil loss rate(Fm) =    0.235(In/Hr)
Study area total (this main stream) =      23.79(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  5610.000(Ft.)
Downstream point/station elevation =  5602.780(Ft.)
Pipe length  =   562.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   106.523(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =   106.523(CFS)
Normal flow depth in pipe =   32.16(In.)
Flow top width inside pipe =   35.58(In.)
Critical Depth =   37.64(In.)
Pipe flow velocity =     13.47(Ft/s)
Travel time through pipe =    0.70 min.
Time of concentration (TC) =     6.79 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     11.893(Ac.)
Runoff from this stream =    106.523(CFS)
Time of concentration =    6.79 min.
Rainfall intensity =     9.426(In/Hr)
Area averaged loss rate (Fm) =    0.2347(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5181
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)
```

```
1    225.72    50.350     15.77    0.301      5.225
2    106.52    11.893      6.79    0.235      9.426
Qmax(1) =
           1.000 *    1.000 *   225.718) +
           0.543 *    1.000 *   106.523) + =     283.548
Qmax(2) =
           1.853 *    0.430 *   225.718) +
           1.000 *    1.000 *   106.523) + =     286.572

Total of 2 main streams to confluence:
Flow rates before confluence point:
     226.718     107.523
Maximum flow rates at confluence using above data:
      283.548      286.572
Area of streams before confluence:
       50.350       11.893
Effective area values after confluence:
       62.243       33.565


Results of confluence:
Total flow rate =    286.572(CFS)
Time of concentration =     6.786 min.
Effective stream area after confluence  =     33.565(Ac.)
Study area average Pervious fraction(Ap) =  0.908
Study area average soil loss rate(Fm) =    0.288(In/Hr)
Study area total =      62.24(Ac.)


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Process from Point/Station       13.000 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  5602.780(Ft.)
Downstream point/station elevation =  5593.000(Ft.)
Pipe length  =  1002.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   286.572(CFS)
Nearest computed pipe diameter  =     63.00(In.)
Calculated individual pipe flow  =   286.572(CFS)
Normal flow depth in pipe =   50.44(In.)
Flow top width inside pipe =   50.34(In.)
Critical Depth =   56.01(In.)
Pipe flow velocity =     15.43(Ft/s)
Travel time through pipe =    1.08 min.
Time of concentration (TC) =     7.87 min.
End of computations, Total Study Area =           74.14 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.845
Area averaged SCS curve number =  81.1
```

ATTACHMENT 3

Unit Hydrograph Method Calculations
Proposed Option No. 1

Note: This Attachment contains the Unit Hydrograph Method Flow Rate/Runoff Volume Results for Proposed Drainage Option No. 1, one of two options recommended to reduce the runoff and cliff erosion of Rimforest.

Option No. 1 directs the flow into Little Bear Creek; see *Attachment No. 5* for Detention Basin Routing Analysis.

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        U n i t   H y d r o g r a p h   A n a l y s i s

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                Study date  07/08/09

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--------------------------------------------------------------------------

San Bernardino County Synthetic Unit Hydrology Method
                Manual date - August 1986


Program License Serial Number 4500

-------------------------------------------------------------------------
Rimforest
Entire Area to Little Bear Creek


-------------------------------------------------------------------------

        Storm Event Year = 100

        Antecedent Moisture Condition = 2

 English (in-lb) Input Units Used

 English Rainfall Data (Inches) Input Values Used

 English Units used in output format



Area averaged rainfall intensity isohyetal data:
        Sub-Area        Duration        Isohyetal
        (Ac.)            (hours)         (In)
Rainfall data for year 10
           115.32            1           1.40
-------------------------------------------------------------------------
Rainfall data for year 2
           115.32            6           2.90
-------------------------------------------------------------------------
Rainfall data for year 2
           115.32           24           6.25
-------------------------------------------------------------------------
Rainfall data for year 100
           115.32            1           2.05
-------------------------------------------------------------------------
Rainfall data for year 100
           115.32            6           6.75
-------------------------------------------------------------------------
Rainfall data for year 100
           115.32           24          18.50
-------------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******** Area-averaged max loss rate, Fm ********


SCS curve  SCS curve     Area     Area     Fp(Fig C6)    Ap      Fm
No.(AMCII) NO.(AMC 2)    (Ac.)    Fraction     (In/Hr)  (dec.)   (In/Hr)
 78.8      78.8        115.32      1.000     0.390    0.765    0.298

Area-averaged adjusted loss rate Fm (In/Hr) =  0.298

********* Area-Averaged low loss rate fraction, Yb **********

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC2)           Yield Fr
    88.22   0.765         78.8      78.8       2.69     0.844
    27.10   0.235         98.0      98.0       0.20     0.987

Area-averaged catchment yield fraction, Y =  0.878
Area-averaged low loss fraction, Yb =  0.122
User entry of time of concentration  =   0.274 (hours)
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =     115.32(Ac.)
Catchment Lag time =   0.219 hours
Unit interval =   5.000 minutes
Unit interval percentage of lag time = 38.0448
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.298(In/Hr)
Average low loss rate fraction (Yb) = 0.122 (decimal)
VALLEY DEVELOPED S-Graph proportion =  0.600
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VALLEY UNDEVELOPED S-Graph proportion =  0.000
FOOTHILL S-Graph proportion =  0.000
MOUNTAIN S-Graph proportion =  0.400
DESERT S-Graph proportion =  0.000

Computed peak 5-minute rainfall =  0.973(In)
Computed peak 30-minute rainfall =  1.665(In)
Specified peak 1-hour rainfall =  2.050(In)
Computed peak 3-hour rainfall =  4.257(In)
Specified peak 6-hour rainfall =  6.750(In)
Specified peak 24-hour rainfall = 18.500(In)


Rainfall depth area reduction factors:
Using a total area of     115.32(Ac.) (Ref: fig. E-4)

5-minute factor = 0.995     Adjusted rainfall =  0.967(In)
30-minute factor = 0.995    Adjusted rainfall =  1.656(In)
1-hour factor = 0.995       Adjusted rainfall =  2.039(In)
3-hour factor = 0.999       Adjusted rainfall =  4.254(In)
6-hour factor = 1.000       Adjusted rainfall =  6.748(In)
24-hour factor = 1.000      Adjusted rainfall = 18.497(In)
----------------------------------------------------------------------

                        U n i t  H y d r o g r a p h
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Interval          'S' Graph          Unit Hydrograph
Number            Mean values             ((CFS))
----------------------------------------------------------------------
                (K =      1394.65 (CFS))

  1                3.741                  52.174
  2               21.248                 244.156
  3               46.287                 349.212
  4               67.985                 302.618
  5               79.612                 162.152
  6               85.532                  82.565
  7               88.696                  44.117
  8               90.488                  24.998
  9               91.995                  21.015
 10               93.115                  15.626
 11               93.891                  10.819
 12               94.550                   9.188
 13               95.169                   8.635
 14               95.733                   7.865
 15               96.217                   6.746
 16               96.675                   6.389
 17               97.088                   5.770
 18               97.471                   5.341
 19               97.826                   4.942
 20               98.134                   4.295
 21               98.415                   3.928
 22               98.689                   3.820
 23               98.963                   3.820
 24               99.237                   3.820
 25               99.511                   3.820
 26               99.785                   3.820
 27              100.000                   2.998
----------------------------------------------------------------------
Peak Unit   Adjusted mass rainfall  Unit rainfall
Number              (In)                (In)
  1              0.9675               0.9675
  2              1.1911               0.2236
  3              1.3452               0.1541
  4              1.4664               0.1213
  5              1.5680               0.1015
  6              1.6561               0.0882
  7              1.7345               0.0784
  8              1.8054               0.0709
  9              1.8703               0.0649
 10              1.9304               0.0601
 11              1.9864               0.0560
 12              2.0389               0.0525
 13              2.1511               0.1122
 14              2.2606               0.1094
 15              2.3674               0.1069
 16              2.4719               0.1045
 17              2.5743               0.1024
 18              2.6747               0.1004
 19              2.7733               0.0986
 20              2.8702               0.0969
 21              2.9655               0.0953
 22              3.0593               0.0938
 23              3.1517               0.0924
 24              3.2427               0.0911
 25              3.3326               0.0898
 26              3.4212               0.0887
 27              3.5088               0.0875
```

28	3.5952	0.0865
29	3.6807	0.0855
30	3.7652	0.0845
31	3.8487	0.0836
32	3.9314	0.0827
33	4.0132	0.0818
34	4.0942	0.0810
35	4.1745	0.0802
36	4.2539	0.0795
37	4.3322	0.0783
38	4.4098	0.0776
39	4.4867	0.0769
40	4.5629	0.0762
41	4.6386	0.0756
42	4.7136	0.0750
43	4.7880	0.0744
44	4.8618	0.0738
45	4.9350	0.0733
46	5.0078	0.0727
47	5.0800	0.0722
48	5.1516	0.0717
49	5.2228	0.0712
50	5.2935	0.0707
51	5.3638	0.0702
52	5.4335	0.0698
53	5.5029	0.0693
54	5.5718	0.0689
55	5.6402	0.0685
56	5.7083	0.0680
57	5.7759	0.0676
58	5.8432	0.0672
59	5.9100	0.0669
60	5.9765	0.0665
61	6.0426	0.0661
62	6.1084	0.0658
63	6.1738	0.0654
64	6.2388	0.0651
65	6.3035	0.0647
66	6.3679	0.0644
67	6.4320	0.0641
68	6.4957	0.0637
69	6.5591	0.0634
70	6.6222	0.0631
71	6.6850	0.0628
72	6.7476	0.0625
73	6.8156	0.0680
74	6.8834	0.0678
75	6.9509	0.0675
76	7.0182	0.0673
77	7.0853	0.0671
78	7.1521	0.0668
79	7.2187	0.0666
80	7.2851	0.0664
81	7.3512	0.0661
82	7.4171	0.0659
83	7.4828	0.0657
84	7.5483	0.0655
85	7.6135	0.0653
86	7.6786	0.0651
87	7.7434	0.0648
88	7.8081	0.0646
89	7.8725	0.0644
90	7.9368	0.0642
91	8.0008	0.0641
92	8.0647	0.0639
93	8.1284	0.0637
94	8.1918	0.0635
95	8.2551	0.0633
96	8.3183	0.0631
97	8.3812	0.0629
98	8.4440	0.0628
99	8.5066	0.0626
100	8.5690	0.0624
101	8.6312	0.0622
102	8.6933	0.0621
103	8.7552	0.0619
104	8.8170	0.0618
105	8.8786	0.0616
106	8.9400	0.0614
107	9.0013	0.0613
108	9.0624	0.0611
109	9.1234	0.0610
110	9.1842	0.0608
111	9.2448	0.0607
112	9.3053	0.0605
113	9.3657	0.0604
114	9.4259	0.0602
115	9.4860	0.0601

116	9.5459	0.0599
117	9.6057	0.0598
118	9.6654	0.0597
119	9.7249	0.0595
120	9.7843	0.0594
121	9.8435	0.0592
122	9.9026	0.0591
123	9.9616	0.0590
124	10.0205	0.0588
125	10.0792	0.0587
126	10.1378	0.0586
127	10.1962	0.0585
128	10.2546	0.0583
129	10.3128	0.0582
130	10.3709	0.0581
131	10.4289	0.0580
132	10.4867	0.0579
133	10.5444	0.0577
134	10.6021	0.0576
135	10.6596	0.0575
136	10.7169	0.0574
137	10.7742	0.0573
138	10.8314	0.0572
139	10.8884	0.0570
140	10.9453	0.0569
141	11.0021	0.0568
142	11.0588	0.0567
143	11.1154	0.0566
144	11.1719	0.0565
145	11.2283	0.0564
146	11.2846	0.0563
147	11.3408	0.0562
148	11.3968	0.0561
149	11.4528	0.0560
150	11.5087	0.0559
151	11.5644	0.0558
152	11.6201	0.0557
153	11.6756	0.0556
154	11.7311	0.0555
155	11.7865	0.0554
156	11.8417	0.0553
157	11.8969	0.0552
158	11.9520	0.0551
159	12.0070	0.0550
160	12.0619	0.0549
161	12.1166	0.0548
162	12.1713	0.0547
163	12.2260	0.0546
164	12.2805	0.0545
165	12.3349	0.0544
166	12.3892	0.0543
167	12.4435	0.0542
168	12.4976	0.0542
169	12.5517	0.0541
170	12.6057	0.0540
171	12.6596	0.0539
172	12.7134	0.0538
173	12.7671	0.0537
174	12.8208	0.0536
175	12.8743	0.0536
176	12.9278	0.0535
177	12.9812	0.0534
178	13.0345	0.0533
179	13.0877	0.0532
180	13.1409	0.0531
181	13.1939	0.0531
182	13.2469	0.0530
183	13.2998	0.0529
184	13.3527	0.0528
185	13.4054	0.0528
186	13.4581	0.0527
187	13.5107	0.0526
188	13.5632	0.0525
189	13.6156	0.0524
190	13.6680	0.0524
191	13.7203	0.0523
192	13.7725	0.0522
193	13.8247	0.0521
194	13.8767	0.0521
195	13.9287	0.0520
196	13.9807	0.0519
197	14.0325	0.0519
198	14.0843	0.0518
199	14.1360	0.0517
200	14.1876	0.0516
201	14.2392	0.0516
202	14.2907	0.0515
203	14.3421	0.0514

204	14.3935	0.0514
205	14.4448	0.0513
206	14.4960	0.0512
207	14.5472	0.0512
208	14.5982	0.0511
209	14.6493	0.0510
210	14.7002	0.0510
211	14.7511	0.0509
212	14.8019	0.0508
213	14.8527	0.0508
214	14.9034	0.0507
215	14.9540	0.0506
216	15.0046	0.0506
217	15.0551	0.0505
218	15.1055	0.0504
219	15.1559	0.0504
220	15.2062	0.0503
221	15.2564	0.0502
222	15.3066	0.0502
223	15.3568	0.0501
224	15.4068	0.0501
225	15.4568	0.0500
226	15.5068	0.0499
227	15.5567	0.0499
228	15.6065	0.0498
229	15.6562	0.0498
230	15.7059	0.0497
231	15.7556	0.0496
232	15.8052	0.0496
233	15.8547	0.0495
234	15.9042	0.0495
235	15.9536	0.0494
236	16.0029	0.0494
237	16.0522	0.0493
238	16.1015	0.0492
239	16.1507	0.0492
240	16.1998	0.0491
241	16.2489	0.0491
242	16.2979	0.0490
243	16.3469	0.0490
244	16.3958	0.0489
245	16.4446	0.0489
246	16.4934	0.0488
247	16.5422	0.0487
248	16.5909	0.0487
249	16.6395	0.0486
250	16.6881	0.0486
251	16.7366	0.0485
252	16.7851	0.0485
253	16.8335	0.0484
254	16.8819	0.0484
255	16.9302	0.0483
256	16.9785	0.0483
257	17.0267	0.0482
258	17.0749	0.0482
259	17.1230	0.0481
260	17.1711	0.0481
261	17.2191	0.0480
262	17.2670	0.0480
263	17.3150	0.0479
264	17.3628	0.0479
265	17.4106	0.0478
266	17.4584	0.0478
267	17.5061	0.0477
268	17.5538	0.0477
269	17.6014	0.0476
270	17.6490	0.0476
271	17.6965	0.0475
272	17.7440	0.0475
273	17.7914	0.0474
274	17.8388	0.0474
275	17.8861	0.0473
276	17.9334	0.0473
277	17.9807	0.0472
278	18.0279	0.0472
279	18.0750	0.0472
280	18.1221	0.0471
281	18.1692	0.0471
282	18.2162	0.0470
283	18.2632	0.0470
284	18.3101	0.0469
285	18.3570	0.0469
286	18.4038	0.0468
287	18.4506	0.0468
288	18.4973	0.0467

Unit Period	Unit Rainfall	Unit Soil-Loss	Effective Rainfall

(number)	(In)	(In)	(In)
1	0.0467	0.0057	0.0410
2	0.0468	0.0057	0.0411
3	0.0469	0.0057	0.0412
4	0.0469	0.0057	0.0412
5	0.0470	0.0057	0.0413
6	0.0471	0.0057	0.0413
7	0.0472	0.0058	0.0414
8	0.0472	0.0058	0.0414
9	0.0473	0.0058	0.0415
10	0.0473	0.0058	0.0416
11	0.0474	0.0058	0.0416
12	0.0475	0.0058	0.0417
13	0.0476	0.0058	0.0418
14	0.0476	0.0058	0.0418
15	0.0477	0.0058	0.0419
16	0.0478	0.0058	0.0419
17	0.0479	0.0058	0.0420
18	0.0479	0.0059	0.0421
19	0.0480	0.0059	0.0422
20	0.0481	0.0059	0.0422
21	0.0482	0.0059	0.0423
22	0.0482	0.0059	0.0423
23	0.0483	0.0059	0.0424
24	0.0484	0.0059	0.0425
25	0.0485	0.0059	0.0426
26	0.0485	0.0059	0.0426
27	0.0486	0.0059	0.0427
28	0.0487	0.0059	0.0427
29	0.0488	0.0060	0.0428
30	0.0489	0.0060	0.0429
31	0.0490	0.0060	0.0430
32	0.0490	0.0060	0.0430
33	0.0491	0.0060	0.0431
34	0.0492	0.0060	0.0432
35	0.0493	0.0060	0.0433
36	0.0494	0.0060	0.0433
37	0.0495	0.0060	0.0434
38	0.0495	0.0060	0.0435
39	0.0496	0.0061	0.0436
40	0.0497	0.0061	0.0436
41	0.0498	0.0061	0.0437
42	0.0499	0.0061	0.0438
43	0.0500	0.0061	0.0439
44	0.0501	0.0061	0.0440
45	0.0502	0.0061	0.0441
46	0.0502	0.0061	0.0441
47	0.0504	0.0062	0.0442
48	0.0504	0.0062	0.0443
49	0.0506	0.0062	0.0444
50	0.0506	0.0062	0.0444
51	0.0508	0.0062	0.0446
52	0.0508	0.0062	0.0446
53	0.0510	0.0062	0.0447
54	0.0510	0.0062	0.0448
55	0.0512	0.0062	0.0449
56	0.0512	0.0063	0.0450
57	0.0514	0.0063	0.0451
58	0.0514	0.0063	0.0451
59	0.0516	0.0063	0.0453
60	0.0516	0.0063	0.0453
61	0.0518	0.0063	0.0455
62	0.0519	0.0063	0.0455
63	0.0520	0.0063	0.0456
64	0.0521	0.0064	0.0457
65	0.0522	0.0064	0.0458
66	0.0523	0.0064	0.0459
67	0.0524	0.0064	0.0460
68	0.0525	0.0064	0.0461
69	0.0527	0.0064	0.0462
70	0.0528	0.0064	0.0463
71	0.0529	0.0065	0.0464
72	0.0530	0.0065	0.0465
73	0.0531	0.0065	0.0467
74	0.0532	0.0065	0.0467
75	0.0534	0.0065	0.0469
76	0.0535	0.0065	0.0469
77	0.0536	0.0065	0.0471
78	0.0537	0.0066	0.0472
79	0.0539	0.0066	0.0473
80	0.0540	0.0066	0.0474
81	0.0542	0.0066	0.0475
82	0.0542	0.0066	0.0476
83	0.0544	0.0066	0.0478
84	0.0545	0.0067	0.0479
85	0.0547	0.0067	0.0480
86	0.0548	0.0067	0.0481

87	0.0550	0.0067	0.0483
88	0.0551	0.0067	0.0484
89	0.0553	0.0067	0.0485
90	0.0554	0.0068	0.0486
91	0.0556	0.0068	0.0488
92	0.0557	0.0068	0.0489
93	0.0559	0.0068	0.0490
94	0.0560	0.0068	0.0491
95	0.0562	0.0069	0.0493
96	0.0563	0.0069	0.0494
97	0.0565	0.0069	0.0496
98	0.0566	0.0069	0.0497
99	0.0568	0.0069	0.0499
100	0.0569	0.0070	0.0500
101	0.0572	0.0070	0.0502
102	0.0573	0.0070	0.0503
103	0.0575	0.0070	0.0505
104	0.0576	0.0070	0.0506
105	0.0579	0.0071	0.0508
106	0.0580	0.0071	0.0509
107	0.0582	0.0071	0.0511
108	0.0583	0.0071	0.0512
109	0.0586	0.0072	0.0514
110	0.0587	0.0072	0.0516
111	0.0590	0.0072	0.0518
112	0.0591	0.0072	0.0519
113	0.0594	0.0072	0.0521
114	0.0595	0.0073	0.0522
115	0.0598	0.0073	0.0525
116	0.0599	0.0073	0.0526
117	0.0602	0.0074	0.0529
118	0.0604	0.0074	0.0530
119	0.0607	0.0074	0.0533
120	0.0608	0.0074	0.0534
121	0.0611	0.0075	0.0537
122	0.0613	0.0075	0.0538
123	0.0616	0.0075	0.0541
124	0.0618	0.0075	0.0542
125	0.0621	0.0076	0.0545
126	0.0622	0.0076	0.0546
127	0.0626	0.0076	0.0549
128	0.0628	0.0077	0.0551
129	0.0631	0.0077	0.0554
130	0.0633	0.0077	0.0556
131	0.0637	0.0078	0.0559
132	0.0639	0.0078	0.0561
133	0.0642	0.0078	0.0564
134	0.0644	0.0079	0.0566
135	0.0648	0.0079	0.0569
136	0.0651	0.0079	0.0571
137	0.0655	0.0080	0.0575
138	0.0657	0.0080	0.0577
139	0.0661	0.0081	0.0581
140	0.0664	0.0081	0.0583
141	0.0668	0.0082	0.0587
142	0.0671	0.0082	0.0589
143	0.0675	0.0082	0.0593
144	0.0678	0.0083	0.0595
145	0.0625	0.0076	0.0549
146	0.0628	0.0077	0.0551
147	0.0634	0.0077	0.0557
148	0.0637	0.0078	0.0560
149	0.0644	0.0079	0.0565
150	0.0647	0.0079	0.0568
151	0.0654	0.0080	0.0574
152	0.0658	0.0080	0.0577
153	0.0665	0.0081	0.0584
154	0.0669	0.0082	0.0587
155	0.0676	0.0083	0.0594
156	0.0680	0.0083	0.0597
157	0.0689	0.0084	0.0605
158	0.0693	0.0085	0.0609
159	0.0702	0.0086	0.0617
160	0.0707	0.0086	0.0621
161	0.0717	0.0088	0.0629
162	0.0722	0.0088	0.0634
163	0.0733	0.0089	0.0643
164	0.0738	0.0090	0.0648
165	0.0750	0.0092	0.0658
166	0.0756	0.0092	0.0664
167	0.0769	0.0094	0.0675
168	0.0776	0.0095	0.0681
169	0.0795	0.0097	0.0698
170	0.0802	0.0098	0.0704
171	0.0818	0.0100	0.0718
172	0.0827	0.0101	0.0726
173	0.0845	0.0103	0.0742
174	0.0855	0.0104	0.0750

175	0.0875	0.0107	0.0768
176	0.0887	0.0108	0.0778
177	0.0911	0.0111	0.0800
178	0.0924	0.0113	0.0811
179	0.0953	0.0116	0.0837
180	0.0969	0.0118	0.0851
181	0.1004	0.0123	0.0881
182	0.1024	0.0125	0.0899
183	0.1069	0.0130	0.0938
184	0.1094	0.0134	0.0960
185	0.0525	0.0064	0.0461
186	0.0560	0.0068	0.0492
187	0.0649	0.0079	0.0570
188	0.0709	0.0087	0.0622
189	0.0882	0.0108	0.0774
190	0.1015	0.0124	0.0891
191	0.1541	0.0188	0.1353
192	0.2236	0.0249	0.1988
193	0.9675	0.0249	0.9426
194	0.1213	0.0148	0.1064
195	0.0784	0.0096	0.0688
196	0.0601	0.0073	0.0527
197	0.1122	0.0137	0.0985
198	0.1045	0.0128	0.0918
199	0.0986	0.0120	0.0865
200	0.0938	0.0115	0.0823
201	0.0898	0.0110	0.0789
202	0.0865	0.0106	0.0759
203	0.0836	0.0102	0.0734
204	0.0810	0.0099	0.0711
205	0.0783	0.0096	0.0687
206	0.0762	0.0093	0.0669
207	0.0744	0.0091	0.0653
208	0.0727	0.0089	0.0638
209	0.0712	0.0087	0.0625
210	0.0698	0.0085	0.0613
211	0.0685	0.0084	0.0601
212	0.0672	0.0082	0.0590
213	0.0661	0.0081	0.0580
214	0.0651	0.0079	0.0571
215	0.0641	0.0078	0.0562
216	0.0631	0.0077	0.0554
217	0.0680	0.0083	0.0597
218	0.0673	0.0082	0.0591
219	0.0666	0.0081	0.0585
220	0.0659	0.0080	0.0579
221	0.0653	0.0080	0.0573
222	0.0646	0.0079	0.0568
223	0.0641	0.0078	0.0562
224	0.0635	0.0078	0.0557
225	0.0629	0.0077	0.0553
226	0.0624	0.0076	0.0548
227	0.0619	0.0076	0.0544
228	0.0614	0.0075	0.0539
229	0.0610	0.0074	0.0535
230	0.0605	0.0074	0.0531
231	0.0601	0.0073	0.0527
232	0.0597	0.0073	0.0524
233	0.0592	0.0072	0.0520
234	0.0588	0.0072	0.0517
235	0.0585	0.0071	0.0513
236	0.0581	0.0071	0.0510
237	0.0577	0.0070	0.0507
238	0.0574	0.0070	0.0504
239	0.0570	0.0070	0.0501
240	0.0567	0.0069	0.0498
241	0.0564	0.0069	0.0495
242	0.0561	0.0068	0.0492
243	0.0558	0.0068	0.0490
244	0.0555	0.0068	0.0487
245	0.0552	0.0067	0.0484
246	0.0549	0.0067	0.0482
247	0.0546	0.0067	0.0479
248	0.0543	0.0066	0.0477
249	0.0541	0.0066	0.0475
250	0.0538	0.0066	0.0472
251	0.0536	0.0065	0.0470
252	0.0533	0.0065	0.0468
253	0.0531	0.0065	0.0466
254	0.0528	0.0064	0.0464
255	0.0526	0.0064	0.0462
256	0.0524	0.0064	0.0460
257	0.0521	0.0064	0.0458
258	0.0519	0.0063	0.0456
259	0.0517	0.0063	0.0454
260	0.0515	0.0063	0.0452
261	0.0513	0.0063	0.0450
262	0.0511	0.0062	0.0449

263	0.0509	0.0062	0.0447
264	0.0507	0.0062	0.0445
265	0.0505	0.0062	0.0443
266	0.0503	0.0061	0.0442
267	0.0501	0.0061	0.0440
268	0.0499	0.0061	0.0438
269	0.0498	0.0061	0.0437
270	0.0496	0.0061	0.0435
271	0.0494	0.0060	0.0434
272	0.0492	0.0060	0.0432
273	0.0491	0.0060	0.0431
274	0.0489	0.0060	0.0429
275	0.0487	0.0060	0.0428
276	0.0486	0.0059	0.0427
277	0.0484	0.0059	0.0425
278	0.0483	0.0059	0.0424
279	0.0481	0.0059	0.0422
280	0.0480	0.0059	0.0421
281	0.0478	0.0058	0.0420
282	0.0477	0.0058	0.0419
283	0.0475	0.0058	0.0417
284	0.0474	0.0058	0.0416
285	0.0472	0.0058	0.0415
286	0.0471	0.0058	0.0414
287	0.0470	0.0057	0.0412
288	0.0468	0.0057	0.0411

Total soil rain loss = 2.16(In)
Total effective rainfall = 16.33(In)
Peak flow rate in flood hydrograph = 462.71(CFS)

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24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

```
Time(h+m) Volume Ac.Ft   Q(CFS)  0      125.0     250.0     375.0     500.0
------------------------------------------------------------------------
  0+ 5       0.0147      2.14  Q         |         |         |         |
  0+10       0.0985     12.16  Q         |         |         |         |
  0+15       0.2811     26.51  V Q       |         |         |         |
  0+20       0.5494     38.96  V  Q      |         |         |         |
  0+25       0.8639     45.67  V  Q      |         |         |         |
  0+30       1.2022     49.12  V  Q      |         |         |         |
  0+35       1.5534     51.00  V   Q     |         |         |         |
  0+40       1.9122     52.10  V   Q     |         |         |         |
  0+45       2.2775     53.04  V   Q     |         |         |         |
  0+50       2.6477     53.76  V   Q     |         |         |         |
  0+55       3.0216     54.28  V   Q     |         |         |         |
  1+ 0       3.3986     54.74  V   Q     |         |         |         |
  1+ 5       3.7785     55.17  V   Q     |         |         |         |
  1+10       4.1613     55.58  |V  Q     |         |         |         |
  1+15       4.5466     55.94  |V  Q     |         |         |         |
  1+20       4.9342     56.29  |V  Q     |         |         |         |
  1+25       5.3241     56.61  |V  Q     |         |         |         |
  1+30       5.7160     56.91  |V  Q     |         |         |         |
  1+35       6.1100     57.20  |V  Q     |         |         |         |
  1+40       6.5058     57.47  |V  Q     |         |         |         |
  1+45       6.9033     57.72  |V  Q     |         |         |         |
  1+50       7.3025     57.97  |V  Q     |         |         |         |
  1+55       7.7034     58.21  |V  Q     |         |         |         |
  2+ 0       8.1061     58.46  | V Q     |         |         |         |
  2+ 5       8.5104     58.71  | V Q     |         |         |         |
  2+10       8.9165     58.96  | V Q     |         |         |         |
  2+15       9.3241     59.18  | V Q     |         |         |         |
  2+20       9.7323     59.28  | V Q     |         |         |         |
  2+25      10.1412     59.37  | V Q     |         |         |         |
  2+30      10.5508     59.47  | V Q     |         |         |         |
  2+35      10.9610     59.57  | V Q     |         |         |         |
  2+40      11.3719     59.67  | V Q     |         |         |         |
  2+45      11.7835     59.76  |  VQ     |         |         |         |
  2+50      12.1958     59.86  |  VQ     |         |         |         |
  2+55      12.6088     59.96  |  VQ     |         |         |         |
  3+ 0      13.0224     60.07  |  VQ     |         |         |         |
  3+ 5      13.4368     60.17  |  VQ     |         |         |         |
  3+10      13.8519     60.27  |  VQ     |         |         |         |
  3+15      14.2677     60.38  |  VQ     |         |         |         |
  3+20      14.6843     60.48  |  VQ     |         |         |         |
  3+25      15.1015     60.59  |  VQ     |         |         |         |
  3+30      15.5196     60.69  |  VQ     |         |         |         |
  3+35      15.9383     60.80  |   Q     |         |         |         |
  3+40      16.3578     60.91  |   Q     |         |         |         |
  3+45      16.7780     61.02  |   Q     |         |         |         |
  3+50      17.1990     61.13  |   Q     |         |         |         |
  3+55      17.6208     61.24  |   Q     |         |         |         |
```

```
 4+ 0      18.0433     61.35  |   Q     |         |         |         |
 4+ 5      18.4666     61.47  |   Q     |         |         |         |
 4+10      18.8908     61.58  |   Q     |         |         |         |
 4+15      19.3156     61.69  |   Q     |         |         |         |
 4+20      19.7413     61.81  |   QV    |         |         |         |
 4+25      20.1678     61.93  |   QV    |         |         |         |
 4+30      20.5952     62.05  |   QV    |         |         |         |
 4+35      21.0233     62.17  |   QV    |         |         |         |
 4+40      21.4523     62.29  |   QV    |         |         |         |
 4+45      21.8821     62.41  |   QV    |         |         |         |
 4+50      22.3127     62.53  |    Q    |         |         |         |
 4+55      22.7442     62.65  |    Q    |         |         |         |
 5+ 0      23.1766     62.78  |    Q    |         |         |         |
 5+ 5      23.6098     62.90  |    QV   |         |         |         |
 5+10      24.0439     63.03  |    QV   |         |         |         |
 5+15      24.4789     63.16  |    QV   |         |         |         |
 5+20      24.9148     63.29  |    QV   |         |         |         |
 5+25      25.3516     63.42  |    QV   |         |         |         |
 5+30      25.7893     63.55  |    QV   |         |         |         |
 5+35      26.2279     63.69  |    QV   |         |         |         |
 5+40      26.6674     63.82  |    QV   |         |         |         |
 5+45      27.1079     63.96  |    QV   |         |         |         |
 5+50      27.5493     64.10  |    Q V  |         |         |         |
 5+55      27.9917     64.23  |    Q V  |         |         |         |
 6+ 0      28.4350     64.37  |    Q V  |         |         |         |
 6+ 5      28.8794     64.52  |    Q V  |         |         |         |
 6+10      29.3247     64.66  |    Q V  |         |         |         |
 6+15      29.7710     64.80  |    Q V  |         |         |         |
 6+20      30.2183     64.95  |    Q V  |         |         |         |
 6+25      30.6666     65.10  |    Q V  |         |         |         |
 6+30      31.1160     65.25  |    Q V  |         |         |         |
 6+35      31.5664     65.40  |    Q  V |         |         |         |
 6+40      32.0178     65.55  |    Q  V |         |         |         |
 6+45      32.4703     65.70  |    Q  V |         |         |         |
 6+50      32.9239     65.86  |    Q  V |         |         |         |
 6+55      33.3786     66.02  |    Q  V |         |         |         |
 7+ 0      33.8344     66.18  |    Q  V |         |         |         |
 7+ 5      34.2913     66.34  |    Q  V |         |         |         |
 7+10      34.7493     66.50  |    Q  V |         |         |         |
 7+15      35.2084     66.67  |    Q  V |         |         |         |
 7+20      35.6687     66.84  |    Q   V|         |         |         |
 7+25      36.1302     67.00  |    Q   V|         |         |         |
 7+30      36.5928     67.18  |    Q   V|         |         |         |
 7+35      37.0566     67.35  |    Q   V|         |         |         |
 7+40      37.5217     67.52  |    Q   V|         |         |         |
 7+45      37.9879     67.70  |    Q   V|         |         |         |
 7+50      38.4554     67.88  |    Q   V|         |         |         |
 7+55      38.9242     68.06  |    Q   V|         |         |         |
 8+ 0      39.3942     68.25  |    Q    V         |         |         |
 8+ 5      39.8655     68.43  |    Q    V         |         |         |
 8+10      40.3381     68.62  |    Q    V         |         |         |
 8+15      40.8120     68.81  |    Q    V         |         |         |
 8+20      41.2873     69.01  |    Q    V         |         |         |
 8+25      41.7639     69.20  |    Q    V         |         |         |
 8+30      42.2419     69.40  |    Q    V         |         |         |
 8+35      42.7212     69.60  |    Q    V         |         |         |
 8+40      43.2020     69.81  |    Q    |V        |         |         |
 8+45      43.6842     70.02  |    Q    |V        |         |         |
 8+50      44.1679     70.23  |    Q    |V        |         |         |
 8+55      44.6530     70.44  |    Q    |V        |         |         |
 9+ 0      45.1396     70.66  |    Q    |V        |         |         |
 9+ 5      45.6277     70.87  |    Q    |V        |         |         |
 9+10      46.1174     71.10  |    Q    |V        |         |         |
 9+15      46.6086     71.32  |    Q    |V        |         |         |
 9+20      47.1014     71.55  |    Q    | V       |         |         |
 9+25      47.5958     71.79  |    Q    | V       |         |         |
 9+30      48.0918     72.02  |    Q    | V       |         |         |
 9+35      48.5895     72.26  |    Q    | V       |         |         |
 9+40      49.0889     72.51  |    Q    | V       |         |         |
 9+45      49.5900     72.75  |    Q    | V       |         |         |
 9+50      50.0928     73.01  |    Q    | V       |         |         |
 9+55      50.5973     73.26  |    Q    | V       |         |         |
10+ 0      51.1037     73.53  |    Q    |  V      |         |         |
10+ 5      51.6119     73.79  |    Q    |  V      |         |         |
10+10      52.1219     74.06  |    Q    |  V      |         |         |
10+15      52.6339     74.33  |    Q    |  V      |         |         |
10+20      53.1477     74.61  |    Q    |  V      |         |         |
10+25      53.6635     74.89  |    Q    |  V      |         |         |
10+30      54.1813     75.18  |     Q   |  V      |         |         |
10+35      54.7011     75.48  |     Q   |  V      |         |         |
10+40      55.2230     75.78  |     Q   |   V     |         |         |
10+45      55.7470     76.08  |     Q   |   V     |         |         |
10+50      56.2731     76.39  |     Q   |   V     |         |         |
10+55      56.8014     76.71  |     Q   |   V     |         |         |
11+ 0      57.3319     77.03  |     Q   |   V     |         |         |
11+ 5      57.8647     77.36  |     Q   |   V     |         |         |
11+10      58.3998     77.70  |     Q   |   V     |         |         |
11+15      58.9373     78.04  |     Q   |    V    |         |         |
```

```
11+20      59.4772     78.39  |     Q   |    V    |         |         |
11+25      60.0196     78.75  |     Q   |    V    |         |         |
11+30      60.5645     79.12  |     Q   |    V    |         |         |
11+35      61.1119     79.49  |     Q   |    V    |         |         |
11+40      61.6620     79.88  |     Q   |    V    |         |         |
11+45      62.2148     80.26  |     Q   |    V    |         |         |
11+50      62.7704     80.67  |     Q   |     V   |         |         |
11+55      63.3287     81.07  |     Q   |     V   |         |         |
12+ 0      63.8900     81.50  |     Q   |     V   |         |         |
12+ 5      64.4524     81.66  |     Q   |     V   |         |         |
12+10      65.0093     80.87  |     Q   |     V   |         |         |
12+15      65.5572     79.55  |     Q   |     V   |         |         |
12+20      66.0979     78.51  |     Q   |     V   |         |         |
12+25      66.6365     78.20  |     Q   |     V   |         |         |
12+30      67.1759     78.33  |     Q   |      V  |         |         |
12+35      67.7176     78.66  |     Q   |      V  |         |         |
12+40      68.2625     79.11  |     Q   |      V  |         |         |
12+45      68.8107     79.60  |     Q   |      V  |         |         |
12+50      69.3627     80.14  |     Q   |      V  |         |         |
12+55      69.9186     80.72  |     Q   |      V  |         |         |
13+ 0      70.4788     81.34  |     Q   |      V  |         |         |
13+ 5      71.0434     81.97  |     Q   |       V |         |         |
13+10      71.6126     82.65  |     Q   |       V |         |         |
13+15      72.1865     83.34  |     Q   |       V |         |         |
13+20      72.7655     84.07  |     Q   |       V |         |         |
13+25      73.3497     84.82  |     Q   |       V |         |         |
13+30      73.9394     85.63  |     Q   |       V |         |         |
13+35      74.5348     86.45  |     Q   |        V|         |         |
13+40      75.1362     87.32  |     Q   |        V|         |         |
13+45      75.7437     88.22  |      Q  |        V|         |         |
13+50      76.3579     89.18  |      Q  |        V|         |         |
13+55      76.9788     90.16  |      Q  |        V|         |         |
14+ 0      77.6070     91.21  |      Q  |        V|         |         |
14+ 5      78.2428     92.32  |      Q  |        V|         |         |
14+10      78.8872     93.57  |      Q  |         V         |         |
14+15      79.5409     94.92  |      Q  |         V         |         |
14+20      80.2045     96.35  |      Q  |         V         |         |
14+25      80.8778     97.77  |      Q  |         V         |         |
14+30      81.5615     99.27  |      Q  |         V         |         |
14+35      82.2558    100.82  |       Q |         V         |         |
14+40      82.9617    102.49  |       Q |         |V        |         |
14+45      83.6796    104.24  |       Q |         |V        |         |
14+50      84.4108    106.16  |       Q |         |V        |         |
14+55      85.1559    108.19  |       Q |         |V        |         |
15+ 0      85.9164    110.43  |       Q |         |V        |         |
15+ 5      86.6934    112.83  |        Q|         | V       |         |
15+10      87.4889    115.50  |        Q|         | V       |         |
15+15      88.3044    118.40  |        Q|         | V       |         |
15+20      89.1425    121.70  |        Q|         | V       |         |
15+25      89.9858    122.45  |        Q|         | V       |         |
15+30      90.7655    113.21  |        Q|         |  V      |         |
15+35      91.4456     98.74  |      Q  |         |  V      |         |
15+40      92.0510     87.90  |      Q  |         |  V      |         |
15+45      92.6443     86.15  |     Q   |         |  V      |         |
15+50      93.2741     91.45  |      Q  |         |  V      |         |
15+55      93.9851    103.23  |       Q |         |  V      |         |
16+ 0      94.8607    127.14  |         Q         |   V     |         |
16+ 5      96.2629    203.59  |         |     Q   |   V     |         |
16+10      98.8852    380.77  |         |         |    V    Q         |
16+15     102.0720    462.71  |         |         |     V   |       Q |
16+20     104.8319    400.75  |         |         |     V   | Q       |
16+25     106.6324    261.43  |         |        Q     V  |         |
16+30     107.9093    185.41  |         |   Q     |     V  |         |
16+35     108.9775    155.10  |         | Q       |     V  |         |
16+40     109.9646    143.32  |         |Q        |      V |         |
16+45     110.9222    139.05  |         |Q        |      V |         |
16+50     111.8267    131.34  |         Q         |      V |         |
16+55     112.6773    123.50  |        Q|         |      V |         |
17+ 0     113.4919    118.29  |        Q|         |      V |         |
17+ 5     114.2803    114.47  |        Q|         |       V|         |
17+10     115.0423    110.64  |       Q |         |       V|         |
17+15     115.7769    106.66  |       Q |         |       V|         |
17+20     116.4900    103.54  |       Q |         |       V|         |
17+25     117.1823    100.52  |       Q |         |       V|         |
17+30     117.8562     97.86  |      Q  |         |        V        |
17+35     118.5133     95.40  |      Q  |         |        V        |
17+40     119.1543     93.08  |      Q  |         |        V        |
17+45     119.7821     91.14  |      Q  |         |        V        |
17+50     120.3987     89.54  |      Q  |         |        V        |
17+55     121.0054     88.10  |      Q  |         |        V        |
18+ 0     121.6025     86.69  |     Q   |         |        |V       |
18+ 5     122.1916     85.54  |     Q   |         |        |V       |
18+10     122.7788     85.26  |     Q   |         |        |V       |
18+15     123.3628     84.80  |     Q   |         |        |V       |
18+20     123.9320     82.65  |     Q   |         |        |V       |
18+25     124.4995     82.40  |     Q   |         |        |V       |
18+30     125.0637     81.92  |     Q   |         |        |V       |
18+35     125.6237     81.31  |     Q   |         |        | V      |
```

```
18+40     126.1782     80.51  |      Q   |          |          | V        |
18+45     126.7274     79.74  |      Q   |          |          | V        |
18+50     127.2715     79.00  |      Q   |          |          | V        |
18+55     127.8106     78.28  |      Q   |          |          | V        |
19+ 0     128.3449     77.59  |      Q   |          |          | V        |
19+ 5     128.8747     76.93  |      Q   |          |          | V        |
19+10     129.4001     76.29  |      Q   |          |          | V        |
19+15     129.9213     75.68  |      Q   |          |          |  V       |
19+20     130.4386     75.10  |      Q   |          |          |  V       |
19+25     130.9519     74.54  |     Q    |          |          |  V       |
19+30     131.4615     73.99  |     Q    |          |          |  V       |
19+35     131.9675     73.47  |     Q    |          |          |  V       |
19+40     132.4700     72.96  |     Q    |          |          |  V       |
19+45     132.9691     72.47  |     Q    |          |          |  V       |
19+50     133.4650     72.00  |     Q    |          |          |   V      |
19+55     133.9577     71.54  |     Q    |          |          |   V      |
20+ 0     134.4474     71.10  |     Q    |          |          |   V      |
20+ 5     134.9341     70.67  |     Q    |          |          |   V      |
20+10     135.4179     70.25  |     Q    |          |          |   V      |
20+15     135.8989     69.85  |     Q    |          |          |   V      |
20+20     136.3771     69.44  |     Q    |          |          |   V      |
20+25     136.8526     69.04  |     Q    |          |          |   V      |
20+30     137.3254     68.65  |     Q    |          |          |    V     |
20+35     137.7956     68.27  |     Q    |          |          |    V     |
20+40     138.2632     67.90  |     Q    |          |          |    V     |
20+45     138.7284     67.54  |     Q    |          |          |    V     |
20+50     139.1912     67.19  |     Q    |          |          |    V     |
20+55     139.6516     66.85  |     Q    |          |          |    V     |
21+ 0     140.1097     66.52  |     Q    |          |          |    V     |
21+ 5     140.5655     66.19  |     Q    |          |          |    V     |
21+10     141.0192     65.87  |     Q    |          |          |    V     |
21+15     141.4707     65.56  |     Q    |          |          |     V    |
21+20     141.9201     65.25  |     Q    |          |          |     V    |
21+25     142.3675     64.96  |     Q    |          |          |     V    |
21+30     142.8128     64.66  |     Q    |          |          |     V    |
21+35     143.2562     64.38  |     Q    |          |          |     V    |
21+40     143.6977     64.10  |     Q    |          |          |     V    |
21+45     144.1372     63.82  |     Q    |          |          |     V    |
21+50     144.5749     63.55  |     Q    |          |          |     V    |
21+55     145.0108     63.29  |     Q    |          |          |     V    |
22+ 0     145.4449     63.03  |     Q    |          |          |      V   |
22+ 5     145.8773     62.78  |     Q    |          |          |      V   |
22+10     146.3079     62.53  |     Q    |          |          |      V   |
22+15     146.7369     62.28  |    Q     |          |          |      V   |
22+20     147.1642     62.04  |    Q     |          |          |      V   |
22+25     147.5898     61.81  |    Q     |          |          |      V   |
22+30     148.0139     61.58  |    Q     |          |          |      V   |
22+35     148.4364     61.35  |    Q     |          |          |      V   |
22+40     148.8574     61.13  |    Q     |          |          |      V   |
22+45     149.2769     60.91  |    Q     |          |          |       V  |
22+50     149.6948     60.69  |    Q     |          |          |       V  |
22+55     150.1114     60.48  |    Q     |          |          |       V  |
23+ 0     150.5264     60.27  |    Q     |          |          |       V  |
23+ 5     150.9401     60.06  |    Q     |          |          |       V  |
23+10     151.3523     59.86  |    Q     |          |          |       V  |
23+15     151.7632     59.66  |    Q     |          |          |       V  |
23+20     152.1727     59.46  |    Q     |          |          |       V  |
23+25     152.5809     59.27  |    Q     |          |          |       V  |
23+30     152.9878     59.08  |    Q     |          |          |        V|
23+35     153.3933     58.89  |    Q     |          |          |        V|
23+40     153.7977     58.71  |    Q     |          |          |        V|
23+45     154.2007     58.52  |    Q     |          |          |        V|
23+50     154.6025     58.34  |    Q     |          |          |        V|
23+55     155.0031     58.17  |    Q     |          |          |        V|
24+ 0     155.4025     57.99  |    Q     |          |          |        V|
24+ 5     155.7860     55.68  |    Q     |          |          |        V|
24+10     156.0994     45.51  |   Q      |          |          |        V|
24+15     156.3133     31.06  |  Q       |          |          |        V|
24+20     156.4411     18.56  |Q         |          |          |        V|
24+25     156.5228     11.86 Q          |          |          |        V|
24+30     156.5809      8.44 Q          |          |          |        V|
24+35     156.6263      6.60 Q          |          |          |        V|
24+40     156.6646      5.56 Q          |          |          |        V|
24+45     156.6968      4.68 Q          |          |          |        V|
24+50     156.7245      4.02 Q          |          |          |        V|
24+55     156.7491      3.57 Q          |          |          |        V|
25+ 0     156.7710      3.18 Q          |          |          |        V|
25+ 5     156.7904      2.82 Q          |          |          |        V|
25+10     156.8075      2.48 Q          |          |          |        V|
25+15     156.8226      2.20 Q          |          |          |        V|
25+20     156.8360      1.93 Q          |          |          |        V|
25+25     156.8476      1.69 Q          |          |          |        V|
25+30     156.8577      1.47 Q          |          |          |        V|
25+35     156.8664      1.26 Q          |          |          |        V|
25+40     156.8738      1.08 Q          |          |          |        V|
25+45     156.8801      0.92 Q          |          |          |        V|
25+50     156.8853      0.76 Q          |          |          |        V|
25+55     156.8894      0.60 Q          |          |          |        V|
```

```
   26+ 0     156.8924      0.44  Q         |         |         |        V|
   26+ 5     156.8944      0.28  Q         |         |         |        V|
   26+10     156.8952      0.12  Q         |         |         |        V|
-----------------------------------------------------------------------
```

ATTACHMENT 4

Unit Hydrograph Method Calculations
Proposed Option No. 2

Note: This Attachment contains the Unit Hydrograph Method Flow Rate/Runoff Volume Results for Proposed Drainage Option No. 2, one of two options recommended to reduce the runoff and cliff erosion of Rimforest.

Option No. 2 directs the flow into Daley Creek; see *Attachment No. 6* for Detention Basin Routing Analysis.

U n i t H y d r o g r a p h A n a l y s i s

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Study date 07/08/09

++

San Bernardino County Synthetic Unit Hydrology Method
Manual date - August 1986

Program License Serial Number 4500

Storm Event Year = 100

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 10		
74.14	1	1.40
Rainfall data for year 2		
74.14	6	2.90
Rainfall data for year 2		
74.14	24	6.25
Rainfall data for year 100		
74.14	1	2.05
Rainfall data for year 100		
74.14	6	6.75
Rainfall data for year 100		
74.14	24	18.50

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	SCS curve NO.(AMC 2)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
81.1	81.1	74.14	1.000	0.351	0.845	0.297

Area-averaged adjusted loss rate Fm (In/Hr) = 0.297

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
62.65	0.845	81.1	81.1	2.33	0.863
11.49	0.155	98.0	98.0	0.20	0.987

Area-averaged catchment yield fraction, Y = 0.882
Area-averaged low loss fraction, Yb = 0.118
User entry of time of concentration = 0.263 (hours)
++
Watershed area = 74.14(Ac.)
Catchment Lag time = 0.210 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 39.6372
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.297(In/Hr)
Average low loss rate fraction (Yb) = 0.118 (decimal)
VALLEY DEVELOPED S-Graph proportion = 0.600
VALLEY UNDEVELOPED S-Graph proportion = 0.000
FOOTHILL S-Graph proportion = 0.000
MOUNTAIN S-Graph proportion = 0.400
DESERT S-Graph proportion = 0.000

```
Computed peak 5-minute rainfall =  0.973(In)
Computed peak 30-minute rainfall =  1.665(In)
Specified peak 1-hour rainfall =  2.050(In)
Computed peak 3-hour rainfall =  4.257(In)
Specified peak 6-hour rainfall =  6.750(In)
Specified peak 24-hour rainfall = 18.500(In)


Rainfall depth area reduction factors:
Using a total area of      74.14(Ac.) (Ref: fig. E-4)

5-minute factor = 0.997     Adjusted rainfall =  0.969(In)
30-minute factor = 0.997    Adjusted rainfall =  1.659(In)
1-hour factor = 0.997       Adjusted rainfall =  2.043(In)
3-hour factor = 1.000       Adjusted rainfall =  4.255(In)
6-hour factor = 1.000       Adjusted rainfall =  6.748(In)
24-hour factor = 1.000      Adjusted rainfall = 18.498(In)
----------------------------------------------------------------------

                        U n i t  H y d r o g r a p h
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Interval          'S' Graph          Unit Hydrograph
Number            Mean values             ((CFS))
----------------------------------------------------------------------
                (K =       896.63 (CFS))

  1                3.979                  35.679
  2               22.800                 168.755
  3               48.944                 234.411
  4               70.163                 190.256
  5               81.011                  97.267
  6               86.457                  48.832
  7               89.239                  24.945
  8               90.986                  15.663
  9               92.562                  14.129
 10               93.432                   7.807
 11               94.191                   6.806
 12               94.851                   5.917
 13               95.478                   5.620
 14               96.009                   4.762
 15               96.497                   4.374
 16               96.949                   4.053
 17               97.356                   3.650
 18               97.735                   3.402
 19               98.066                   2.966
 20               98.365                   2.680
 21               98.650                   2.559
 22               98.936                   2.559
 23               99.221                   2.559
 24               99.507                   2.559
 25               99.792                   2.559
 26              100.000                   1.865
----------------------------------------------------------------------
Peak Unit   Adjusted mass rainfall  Unit rainfall
Number              (In)                (In)
  1              0.9694               0.9694
  2              1.1934               0.2241
  3              1.3478               0.1544
  4              1.4693               0.1215
  5              1.5710               0.1017
  6              1.6593               0.0883
  7              1.7379               0.0785
  8              1.8089               0.0710
  9              1.8740               0.0651
 10              1.9341               0.0602
 11              1.9902               0.0561
 12              2.0429               0.0526
 13              2.1551               0.1122
 14              2.2644               0.1093
 15              2.3712               0.1068
 16              2.4756               0.1044
 17              2.5779               0.1023
 18              2.6782               0.1003
 19              2.7767               0.0985
 20              2.8735               0.0968
 21              2.9687               0.0952
 22              3.0623               0.0937
 23              3.1546               0.0923
 24              3.2456               0.0910
 25              3.3353               0.0897
 26              3.4238               0.0885
 27              3.5112               0.0874
 28              3.5975               0.0863
 29              3.6828               0.0853
 30              3.7672               0.0843
 31              3.8506               0.0834
 32              3.9331               0.0825
```

33	4.0148	0.0817
34	4.0956	0.0808
35	4.1757	0.0801
36	4.2550	0.0793
37	4.3333	0.0783
38	4.4108	0.0776
39	4.4877	0.0769
40	4.5640	0.0762
41	4.6396	0.0756
42	4.7146	0.0750
43	4.7890	0.0744
44	4.8628	0.0738
45	4.9361	0.0733
46	5.0088	0.0727
47	5.0810	0.0722
48	5.1527	0.0717
49	5.2238	0.0712
50	5.2945	0.0707
51	5.3648	0.0702
52	5.4345	0.0698
53	5.5039	0.0693
54	5.5727	0.0689
55	5.6412	0.0685
56	5.7092	0.0680
57	5.7769	0.0676
58	5.8441	0.0672
59	5.9110	0.0669
60	5.9774	0.0665
61	6.0436	0.0661
62	6.1093	0.0657
63	6.1747	0.0654
64	6.2397	0.0650
65	6.3044	0.0647
66	6.3688	0.0644
67	6.4329	0.0640
68	6.4966	0.0637
69	6.5600	0.0634
70	6.6231	0.0631
71	6.6859	0.0628
72	6.7484	0.0625
73	6.8165	0.0680
74	6.8843	0.0678
75	6.9518	0.0675
76	7.0191	0.0673
77	7.0862	0.0671
78	7.1530	0.0668
79	7.2196	0.0666
80	7.2860	0.0664
81	7.3521	0.0661
82	7.4180	0.0659
83	7.4837	0.0657
84	7.5492	0.0655
85	7.6144	0.0653
86	7.6795	0.0651
87	7.7443	0.0649
88	7.8090	0.0646
89	7.8734	0.0644
90	7.9377	0.0643
91	8.0017	0.0641
92	8.0656	0.0639
93	8.1293	0.0637
94	8.1928	0.0635
95	8.2561	0.0633
96	8.3192	0.0631
97	8.3821	0.0629
98	8.4449	0.0628
99	8.5075	0.0626
100	8.5699	0.0624
101	8.6322	0.0623
102	8.6943	0.0621
103	8.7562	0.0619
104	8.8179	0.0618
105	8.8795	0.0616
106	8.9410	0.0614
107	9.0022	0.0613
108	9.0634	0.0611
109	9.1243	0.0610
110	9.1851	0.0608
111	9.2458	0.0607
112	9.3063	0.0605
113	9.3667	0.0604
114	9.4269	0.0602
115	9.4870	0.0601
116	9.5469	0.0599
117	9.6067	0.0598
118	9.6664	0.0597
119	9.7259	0.0595
120	9.7853	0.0594

121	9.8445	0.0592
122	9.9036	0.0591
123	9.9626	0.0590
124	10.0214	0.0589
125	10.0802	0.0587
126	10.1388	0.0586
127	10.1972	0.0585
128	10.2556	0.0583
129	10.3138	0.0582
130	10.3719	0.0581
131	10.4299	0.0580
132	10.4877	0.0579
133	10.5454	0.0577
134	10.6031	0.0576
135	10.6606	0.0575
136	10.7179	0.0574
137	10.7752	0.0573
138	10.8324	0.0572
139	10.8894	0.0570
140	10.9463	0.0569
141	11.0031	0.0568
142	11.0598	0.0567
143	11.1164	0.0566
144	11.1729	0.0565
145	11.2293	0.0564
146	11.2856	0.0563
147	11.3418	0.0562
148	11.3978	0.0561
149	11.4538	0.0560
150	11.5097	0.0559
151	11.5654	0.0558
152	11.6211	0.0557
153	11.6767	0.0556
154	11.7321	0.0555
155	11.7875	0.0554
156	11.8428	0.0553
157	11.8979	0.0552
158	11.9530	0.0551
159	12.0080	0.0550
160	12.0629	0.0549
161	12.1177	0.0548
162	12.1724	0.0547
163	12.2270	0.0546
164	12.2815	0.0545
165	12.3359	0.0544
166	12.3902	0.0543
167	12.4445	0.0542
168	12.4987	0.0542
169	12.5527	0.0541
170	12.6067	0.0540
171	12.6606	0.0539
172	12.7144	0.0538
173	12.7681	0.0537
174	12.8218	0.0536
175	12.8753	0.0536
176	12.9288	0.0535
177	12.9822	0.0534
178	13.0355	0.0533
179	13.0887	0.0532
180	13.1419	0.0531
181	13.1950	0.0531
182	13.2479	0.0530
183	13.3009	0.0529
184	13.3537	0.0528
185	13.4064	0.0528
186	13.4591	0.0527
187	13.5117	0.0526
188	13.5642	0.0525
189	13.6167	0.0524
190	13.6690	0.0524
191	13.7213	0.0523
192	13.7735	0.0522
193	13.8257	0.0521
194	13.8778	0.0521
195	13.9298	0.0520
196	13.9817	0.0519
197	14.0335	0.0519
198	14.0853	0.0518
199	14.1370	0.0517
200	14.1887	0.0516
201	14.2402	0.0516
202	14.2917	0.0515
203	14.3432	0.0514
204	14.3945	0.0514
205	14.4458	0.0513
206	14.4970	0.0512
207	14.5482	0.0512
208	14.5993	0.0511

209	14.6503	0.0510
210	14.7012	0.0510
211	14.7521	0.0509
212	14.8030	0.0508
213	14.8537	0.0508
214	14.9044	0.0507
215	14.9550	0.0506
216	15.0056	0.0506
217	15.0561	0.0505
218	15.1065	0.0504
219	15.1569	0.0504
220	15.2072	0.0503
221	15.2575	0.0502
222	15.3076	0.0502
223	15.3578	0.0501
224	15.4078	0.0501
225	15.4578	0.0500
226	15.5078	0.0499
227	15.5577	0.0499
228	15.6075	0.0498
229	15.6572	0.0498
230	15.7069	0.0497
231	15.7566	0.0496
232	15.8062	0.0496
233	15.8557	0.0495
234	15.9052	0.0495
235	15.9546	0.0494
236	16.0039	0.0494
237	16.0532	0.0493
238	16.1025	0.0492
239	16.1517	0.0492
240	16.2008	0.0491
241	16.2499	0.0491
242	16.2989	0.0490
243	16.3478	0.0490
244	16.3968	0.0489
245	16.4456	0.0489
246	16.4944	0.0488
247	16.5432	0.0487
248	16.5918	0.0487
249	16.6405	0.0486
250	16.6891	0.0486
251	16.7376	0.0485
252	16.7861	0.0485
253	16.8345	0.0484
254	16.8829	0.0484
255	16.9312	0.0483
256	16.9795	0.0483
257	17.0277	0.0482
258	17.0759	0.0482
259	17.1240	0.0481
260	17.1720	0.0481
261	17.2200	0.0480
262	17.2680	0.0480
263	17.3159	0.0479
264	17.3638	0.0479
265	17.4116	0.0478
266	17.4594	0.0478
267	17.5071	0.0477
268	17.5548	0.0477
269	17.6024	0.0476
270	17.6500	0.0476
271	17.6975	0.0475
272	17.7450	0.0475
273	17.7924	0.0474
274	17.8398	0.0474
275	17.8871	0.0473
276	17.9344	0.0473
277	17.9816	0.0472
278	18.0288	0.0472
279	18.0760	0.0471
280	18.1231	0.0471
281	18.1702	0.0471
282	18.2172	0.0470
283	18.2641	0.0470
284	18.3110	0.0469
285	18.3579	0.0469
286	18.4048	0.0468
287	18.4515	0.0468
288	18.4983	0.0467

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0467	0.0055	0.0412
2	0.0468	0.0055	0.0413
3	0.0469	0.0055	0.0414

4	0.0469	0.0055	0.0414
5	0.0470	0.0055	0.0415
6	0.0471	0.0055	0.0415
7	0.0471	0.0055	0.0416
8	0.0472	0.0055	0.0416
9	0.0473	0.0056	0.0417
10	0.0473	0.0056	0.0418
11	0.0474	0.0056	0.0419
12	0.0475	0.0056	0.0419
13	0.0476	0.0056	0.0420
14	0.0476	0.0056	0.0420
15	0.0477	0.0056	0.0421
16	0.0478	0.0056	0.0422
17	0.0479	0.0056	0.0422
18	0.0479	0.0056	0.0423
19	0.0480	0.0056	0.0424
20	0.0481	0.0057	0.0424
21	0.0482	0.0057	0.0425
22	0.0482	0.0057	0.0425
23	0.0483	0.0057	0.0426
24	0.0484	0.0057	0.0427
25	0.0485	0.0057	0.0428
26	0.0485	0.0057	0.0428
27	0.0486	0.0057	0.0429
28	0.0487	0.0057	0.0430
29	0.0488	0.0057	0.0431
30	0.0489	0.0057	0.0431
31	0.0490	0.0058	0.0432
32	0.0490	0.0058	0.0433
33	0.0491	0.0058	0.0434
34	0.0492	0.0058	0.0434
35	0.0493	0.0058	0.0435
36	0.0494	0.0058	0.0436
37	0.0495	0.0058	0.0437
38	0.0495	0.0058	0.0437
39	0.0496	0.0058	0.0438
40	0.0497	0.0058	0.0439
41	0.0498	0.0059	0.0440
42	0.0499	0.0059	0.0440
43	0.0500	0.0059	0.0441
44	0.0501	0.0059	0.0442
45	0.0502	0.0059	0.0443
46	0.0502	0.0059	0.0443
47	0.0504	0.0059	0.0445
48	0.0504	0.0059	0.0445
49	0.0506	0.0059	0.0446
50	0.0506	0.0060	0.0447
51	0.0508	0.0060	0.0448
52	0.0508	0.0060	0.0448
53	0.0510	0.0060	0.0450
54	0.0510	0.0060	0.0450
55	0.0512	0.0060	0.0451
56	0.0512	0.0060	0.0452
57	0.0514	0.0060	0.0453
58	0.0514	0.0060	0.0454
59	0.0516	0.0061	0.0455
60	0.0516	0.0061	0.0456
61	0.0518	0.0061	0.0457
62	0.0519	0.0061	0.0458
63	0.0520	0.0061	0.0459
64	0.0521	0.0061	0.0459
65	0.0522	0.0061	0.0461
66	0.0523	0.0061	0.0461
67	0.0524	0.0062	0.0463
68	0.0525	0.0062	0.0463
69	0.0527	0.0062	0.0465
70	0.0528	0.0062	0.0465
71	0.0529	0.0062	0.0467
72	0.0530	0.0062	0.0468
73	0.0531	0.0062	0.0469
74	0.0532	0.0063	0.0470
75	0.0534	0.0063	0.0471
76	0.0535	0.0063	0.0472
77	0.0536	0.0063	0.0473
78	0.0537	0.0063	0.0474
79	0.0539	0.0063	0.0476
80	0.0540	0.0063	0.0476
81	0.0542	0.0064	0.0478
82	0.0542	0.0064	0.0479
83	0.0544	0.0064	0.0480
84	0.0545	0.0064	0.0481
85	0.0547	0.0064	0.0483
86	0.0548	0.0064	0.0484
87	0.0550	0.0065	0.0485
88	0.0551	0.0065	0.0486
89	0.0553	0.0065	0.0488
90	0.0554	0.0065	0.0489
91	0.0556	0.0065	0.0490

92	0.0557	0.0065	0.0491
93	0.0559	0.0066	0.0493
94	0.0560	0.0066	0.0494
95	0.0562	0.0066	0.0496
96	0.0563	0.0066	0.0497
97	0.0565	0.0066	0.0498
98	0.0566	0.0067	0.0499
99	0.0568	0.0067	0.0501
100	0.0569	0.0067	0.0502
101	0.0572	0.0067	0.0504
102	0.0573	0.0067	0.0505
103	0.0575	0.0068	0.0507
104	0.0576	0.0068	0.0508
105	0.0579	0.0068	0.0510
106	0.0580	0.0068	0.0512
107	0.0582	0.0068	0.0514
108	0.0583	0.0069	0.0515
109	0.0586	0.0069	0.0517
110	0.0587	0.0069	0.0518
111	0.0590	0.0069	0.0520
112	0.0591	0.0070	0.0522
113	0.0594	0.0070	0.0524
114	0.0595	0.0070	0.0525
115	0.0598	0.0070	0.0528
116	0.0599	0.0070	0.0529
117	0.0602	0.0071	0.0531
118	0.0604	0.0071	0.0533
119	0.0607	0.0071	0.0535
120	0.0608	0.0072	0.0537
121	0.0611	0.0072	0.0539
122	0.0613	0.0072	0.0541
123	0.0616	0.0072	0.0544
124	0.0618	0.0073	0.0545
125	0.0621	0.0073	0.0548
126	0.0623	0.0073	0.0549
127	0.0626	0.0074	0.0552
128	0.0628	0.0074	0.0554
129	0.0631	0.0074	0.0557
130	0.0633	0.0074	0.0559
131	0.0637	0.0075	0.0562
132	0.0639	0.0075	0.0564
133	0.0643	0.0076	0.0567
134	0.0644	0.0076	0.0569
135	0.0649	0.0076	0.0572
136	0.0651	0.0076	0.0574
137	0.0655	0.0077	0.0578
138	0.0657	0.0077	0.0580
139	0.0661	0.0078	0.0584
140	0.0664	0.0078	0.0586
141	0.0668	0.0079	0.0590
142	0.0671	0.0079	0.0592
143	0.0675	0.0079	0.0596
144	0.0678	0.0080	0.0598
145	0.0625	0.0074	0.0552
146	0.0628	0.0074	0.0554
147	0.0634	0.0075	0.0560
148	0.0637	0.0075	0.0562
149	0.0644	0.0076	0.0568
150	0.0647	0.0076	0.0571
151	0.0654	0.0077	0.0577
152	0.0657	0.0077	0.0580
153	0.0665	0.0078	0.0587
154	0.0669	0.0079	0.0590
155	0.0676	0.0080	0.0597
156	0.0680	0.0080	0.0600
157	0.0689	0.0081	0.0608
158	0.0693	0.0082	0.0612
159	0.0702	0.0083	0.0620
160	0.0707	0.0083	0.0624
161	0.0717	0.0084	0.0633
162	0.0722	0.0085	0.0637
163	0.0733	0.0086	0.0646
164	0.0738	0.0087	0.0651
165	0.0750	0.0088	0.0662
166	0.0756	0.0089	0.0667
167	0.0769	0.0090	0.0679
168	0.0776	0.0091	0.0685
169	0.0793	0.0093	0.0700
170	0.0801	0.0094	0.0706
171	0.0817	0.0096	0.0721
172	0.0825	0.0097	0.0728
173	0.0843	0.0099	0.0744
174	0.0853	0.0100	0.0753
175	0.0874	0.0103	0.0771
176	0.0885	0.0104	0.0781
177	0.0910	0.0107	0.0803
178	0.0923	0.0109	0.0814
179	0.0952	0.0112	0.0840

180	0.0968	0.0114	0.0854
181	0.1003	0.0118	0.0885
182	0.1023	0.0120	0.0903
183	0.1068	0.0126	0.0942
184	0.1093	0.0129	0.0965
185	0.0526	0.0062	0.0464
186	0.0561	0.0066	0.0495
187	0.0651	0.0077	0.0574
188	0.0710	0.0084	0.0627
189	0.0883	0.0104	0.0779
190	0.1017	0.0120	0.0898
191	0.1544	0.0182	0.1362
192	0.2241	0.0247	0.1993
193	0.9694	0.0247	0.9446
194	0.1215	0.0143	0.1072
195	0.0785	0.0092	0.0693
196	0.0602	0.0071	0.0531
197	0.1122	0.0132	0.0990
198	0.1044	0.0123	0.0922
199	0.0985	0.0116	0.0869
200	0.0937	0.0110	0.0827
201	0.0897	0.0105	0.0792
202	0.0863	0.0102	0.0762
203	0.0834	0.0098	0.0736
204	0.0808	0.0095	0.0713
205	0.0783	0.0092	0.0691
206	0.0762	0.0090	0.0673
207	0.0744	0.0087	0.0657
208	0.0727	0.0086	0.0642
209	0.0712	0.0084	0.0628
210	0.0698	0.0082	0.0616
211	0.0685	0.0080	0.0604
212	0.0672	0.0079	0.0593
213	0.0661	0.0078	0.0583
214	0.0650	0.0076	0.0574
215	0.0640	0.0075	0.0565
216	0.0631	0.0074	0.0557
217	0.0680	0.0080	0.0600
218	0.0673	0.0079	0.0594
219	0.0666	0.0078	0.0588
220	0.0659	0.0078	0.0582
221	0.0653	0.0077	0.0576
222	0.0646	0.0076	0.0570
223	0.0641	0.0075	0.0565
224	0.0635	0.0075	0.0560
225	0.0629	0.0074	0.0555
226	0.0624	0.0073	0.0551
227	0.0619	0.0073	0.0546
228	0.0614	0.0072	0.0542
229	0.0610	0.0072	0.0538
230	0.0605	0.0071	0.0534
231	0.0601	0.0071	0.0530
232	0.0597	0.0070	0.0526
233	0.0592	0.0070	0.0523
234	0.0589	0.0069	0.0519
235	0.0585	0.0069	0.0516
236	0.0581	0.0068	0.0513
237	0.0577	0.0068	0.0509
238	0.0574	0.0067	0.0506
239	0.0570	0.0067	0.0503
240	0.0567	0.0067	0.0500
241	0.0564	0.0066	0.0498
242	0.0561	0.0066	0.0495
243	0.0558	0.0066	0.0492
244	0.0555	0.0065	0.0489
245	0.0552	0.0065	0.0487
246	0.0549	0.0065	0.0484
247	0.0546	0.0064	0.0482
248	0.0543	0.0064	0.0479
249	0.0541	0.0064	0.0477
250	0.0538	0.0063	0.0475
251	0.0536	0.0063	0.0473
252	0.0533	0.0063	0.0470
253	0.0531	0.0062	0.0468
254	0.0528	0.0062	0.0466
255	0.0526	0.0062	0.0464
256	0.0524	0.0062	0.0462
257	0.0521	0.0061	0.0460
258	0.0519	0.0061	0.0458
259	0.0517	0.0061	0.0456
260	0.0515	0.0061	0.0454
261	0.0513	0.0060	0.0453
262	0.0511	0.0060	0.0451
263	0.0509	0.0060	0.0449
264	0.0507	0.0060	0.0447
265	0.0505	0.0059	0.0446
266	0.0503	0.0059	0.0444
267	0.0501	0.0059	0.0442

268	0.0499	0.0059	0.0441
269	0.0498	0.0059	0.0439
270	0.0496	0.0058	0.0438
271	0.0494	0.0058	0.0436
272	0.0492	0.0058	0.0435
273	0.0491	0.0058	0.0433
274	0.0489	0.0058	0.0432
275	0.0487	0.0057	0.0430
276	0.0486	0.0057	0.0429
277	0.0484	0.0057	0.0427
278	0.0483	0.0057	0.0426
279	0.0481	0.0057	0.0425
280	0.0480	0.0056	0.0423
281	0.0478	0.0056	0.0422
282	0.0477	0.0056	0.0421
283	0.0475	0.0056	0.0419
284	0.0474	0.0056	0.0418
285	0.0472	0.0056	0.0417
286	0.0471	0.0055	0.0416
287	0.0470	0.0055	0.0414
288	0.0468	0.0055	0.0413

Total soil rain loss = 2.08(In)
Total effective rainfall = 16.41(In)
Peak flow rate in flood hydrograph = 306.38(CFS)

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24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

```
Time(h+m) Volume Ac.Ft   Q(CFS)  0      100.0     200.0     300.0     400.0
-----------------------------------------------------------------------
  0+ 5       0.0101      1.47  Q         |         |         |         |
  0+10       0.0682      8.43  Q         |         |         |         |
  0+15       0.1930     18.11  VQ        |         |         |         |
  0+20       0.3719     25.98  V Q       |         |         |         |
  0+25       0.5787     30.03  V  Q      |         |         |         |
  0+30       0.7997     32.09  V  Q      |         |         |         |
  0+35       1.0281     33.16  V  Q      |         |         |         |
  0+40       1.2613     33.86  V  Q      |         |         |         |
  0+45       1.4988     34.49  V  Q      |         |         |         |
  0+50       1.7389     34.86  V  Q      |         |         |         |
  0+55       1.9812     35.19  V  Q      |         |         |         |
  1+ 0       2.2256     35.49  V  Q      |         |         |         |
  1+ 5       2.4720     35.77  V  Q      |         |         |         |
  1+10       2.7201     36.02  |V Q      |         |         |         |
  1+15       2.9698     36.26  |V Q      |         |         |         |
  1+20       3.2210     36.48  |V Q      |         |         |         |
  1+25       3.4737     36.69  |V Q      |         |         |         |
  1+30       3.7277     36.88  |V Q      |         |         |         |
  1+35       3.9830     37.06  |V Q      |         |         |         |
  1+40       4.2394     37.23  |V Q      |         |         |         |
  1+45       4.4969     37.39  |V Q      |         |         |         |
  1+50       4.7555     37.56  |V Q      |         |         |         |
  1+55       5.0153     37.72  |V Q      |         |         |         |
  2+ 0       5.2762     37.89  | VQ      |         |         |         |
  2+ 5       5.5383     38.05  | VQ      |         |         |         |
  2+10       5.8013     38.19  | VQ      |         |         |         |
  2+15       6.0647     38.25  | VQ      |         |         |         |
  2+20       6.3286     38.31  | VQ      |         |         |         |
  2+25       6.5929     38.37  | VQ      |         |         |         |
  2+30       6.8576     38.44  | VQ      |         |         |         |
  2+35       7.1228     38.50  | VQ      |         |         |         |
  2+40       7.3884     38.56  | VQ      |         |         |         |
  2+45       7.6544     38.63  |  Q      |         |         |         |
  2+50       7.9209     38.69  |  Q      |         |         |         |
  2+55       8.1878     38.76  |  Q      |         |         |         |
  3+ 0       8.4552     38.82  |  Q      |         |         |         |
  3+ 5       8.7230     38.89  |  Q      |         |         |         |
  3+10       8.9913     38.96  |  Q      |         |         |         |
  3+15       9.2601     39.02  |  Q      |         |         |         |
  3+20       9.5293     39.09  |  Q      |         |         |         |
  3+25       9.7990     39.16  |  Q      |         |         |         |
  3+30      10.0692     39.23  |  Q      |         |         |         |
  3+35      10.3399     39.30  |  QV     |         |         |         |
  3+40      10.6110     39.37  |  QV     |         |         |         |
  3+45      10.8827     39.44  |  QV     |         |         |         |
  3+50      11.1548     39.51  |  QV     |         |         |         |
  3+55      11.4274     39.58  |  QV     |         |         |         |
  4+ 0      11.7005     39.66  |  QV     |         |         |         |
  4+ 5      11.9741     39.73  |  QV     |         |         |         |
  4+10      12.2483     39.80  |  QV     |         |         |         |
  4+15      12.5229     39.88  |  QV     |         |         |         |
  4+20      12.7981     39.95  |  Q V    |         |         |         |
```

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 4+25      13.0737     40.03  |   QV    |         |         |         |
 4+30      13.3500     40.11  |   QV    |         |         |         |
 4+35      13.6267     40.18  |   QV    |         |         |         |
 4+40      13.9040     40.26  |   QV    |         |         |         |
 4+45      14.1818     40.34  |   QV    |         |         |         |
 4+50      14.4602     40.42  |   QV    |         |         |         |
 4+55      14.7391     40.50  |   QV    |         |         |         |
 5+ 0      15.0186     40.58  |   QV    |         |         |         |
 5+ 5      15.2986     40.66  |   Q V   |         |         |         |
 5+10      15.5792     40.74  |   Q V   |         |         |         |
 5+15      15.8604     40.83  |   Q V   |         |         |         |
 5+20      16.1421     40.91  |   Q V   |         |         |         |
 5+25      16.4244     40.99  |   Q V   |         |         |         |
 5+30      16.7074     41.08  |   Q V   |         |         |         |
 5+35      16.9909     41.17  |   Q V   |         |         |         |
 5+40      17.2750     41.25  |   Q V   |         |         |         |
 5+45      17.5597     41.34  |   Q V   |         |         |         |
 5+50      17.8451     41.43  |   Q  V  |         |         |         |
 5+55      18.1310     41.52  |   Q  V  |         |         |         |
 6+ 0      18.4176     41.61  |   Q  V  |         |         |         |
 6+ 5      18.7048     41.70  |   Q  V  |         |         |         |
 6+10      18.9927     41.80  |   Q  V  |         |         |         |
 6+15      19.2812     41.89  |   Q  V  |         |         |         |
 6+20      19.5703     41.99  |   Q  V  |         |         |         |
 6+25      19.8601     42.08  |   Q  V  |         |         |         |
 6+30      20.1506     42.18  |   Q  V  |         |         |         |
 6+35      20.4418     42.27  |   Q   V |         |         |         |
 6+40      20.7336     42.37  |   Q   V |         |         |         |
 6+45      21.0261     42.47  |   Q   V |         |         |         |
 6+50      21.3193     42.57  |   Q   V |         |         |         |
 6+55      21.6132     42.68  |   Q   V |         |         |         |
 7+ 0      21.9079     42.78  |   Q   V |         |         |         |
 7+ 5      22.2032     42.88  |   Q   V |         |         |         |
 7+10      22.4993     42.99  |   Q   V |         |         |         |
 7+15      22.7961     43.10  |   Q   V |         |         |         |
 7+20      23.0937     43.21  |   Q    V|         |         |         |
 7+25      23.3920     43.31  |   Q    V|         |         |         |
 7+30      23.6911     43.43  |   Q    V|         |         |         |
 7+35      23.9909     43.54  |   Q    V|         |         |         |
 7+40      24.2915     43.65  |   Q    V|         |         |         |
 7+45      24.5929     43.77  |   Q    V|         |         |         |
 7+50      24.8952     43.88  |   Q    V|         |         |         |
 7+55      25.1982     44.00  |   Q    V|         |         |         |
 8+ 0      25.5020     44.12  |   Q     V         |         |         |
 8+ 5      25.8067     44.24  |   Q     V         |         |         |
 8+10      26.1122     44.36  |   Q     V         |         |         |
 8+15      26.4186     44.49  |   Q     V         |         |         |
 8+20      26.7259     44.61  |   Q     V         |         |         |
 8+25      27.0340     44.74  |   Q     V         |         |         |
 8+30      27.3430     44.87  |   Q     V         |         |         |
 8+35      27.6529     45.00  |   Q     V         |         |         |
 8+40      27.9637     45.13  |   Q     |V        |         |         |
 8+45      28.2754     45.26  |   Q     |V        |         |         |
 8+50      28.5881     45.40  |   Q     |V        |         |         |
 8+55      28.9018     45.54  |   Q     |V        |         |         |
 9+ 0      29.2164     45.68  |   Q     |V        |         |         |
 9+ 5      29.5319     45.82  |   Q     |V        |         |         |
 9+10      29.8485     45.97  |   Q     |V        |         |         |
 9+15      30.1661     46.11  |   Q     |V        |         |         |
 9+20      30.4847     46.26  |   Q     | V       |         |         |
 9+25      30.8043     46.41  |   Q     | V       |         |         |
 9+30      31.1250     46.57  |   Q     | V       |         |         |
 9+35      31.4468     46.72  |   Q     | V       |         |         |
 9+40      31.7696     46.88  |   Q     | V       |         |         |
 9+45      32.0936     47.04  |   Q     | V       |         |         |
 9+50      32.4187     47.20  |   Q     | V       |         |         |
 9+55      32.7449     47.37  |   Q     | V       |         |         |
10+ 0      33.0723     47.54  |   Q     |  V      |         |         |
10+ 5      33.4009     47.71  |   Q     |  V      |         |         |
10+10      33.7306     47.88  |   Q     |  V      |         |         |
10+15      34.0616     48.06  |   Q     |  V      |         |         |
10+20      34.3939     48.24  |   Q     |  V      |         |         |
10+25      34.7274     48.42  |   Q     |  V      |         |         |
10+30      35.0622     48.61  |   Q     |  V      |         |         |
10+35      35.3983     48.80  |   Q     |  V      |         |         |
10+40      35.7357     49.00  |   Q     |   V     |         |         |
10+45      36.0745     49.19  |   Q     |   V     |         |         |
10+50      36.4147     49.40  |   Q     |   V     |         |         |
10+55      36.7563     49.60  |   Q     |   V     |         |         |
11+ 0      37.0994     49.81  |   Q     |   V     |         |         |
11+ 5      37.4439     50.02  |    Q    |   V     |         |         |
11+10      37.7899     50.24  |    Q    |   V     |         |         |
11+15      38.1375     50.46  |    Q    |    V    |         |         |
11+20      38.4866     50.69  |    Q    |    V    |         |         |
11+25      38.8373     50.92  |    Q    |    V    |         |         |
11+30      39.1897     51.16  |    Q    |    V    |         |         |
11+35      39.5437     51.40  |    Q    |    V    |         |         |
11+40      39.8994     51.65  |    Q    |    V    |         |         |
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11+45      40.2569     51.90  |    Q    |    V    |         |         |
11+50      40.6162     52.17  |    Q    |     V   |         |         |
11+55      40.9772     52.43  |    Q    |     V   |         |         |
12+ 0      41.3402     52.70  |    Q    |     V   |         |         |
12+ 5      41.7039     52.80  |    Q    |     V   |         |         |
12+10      42.0635     52.23  |    Q    |     V   |         |         |
12+15      42.4170     51.33  |    Q    |     V   |         |         |
12+20      42.7660     50.67  |    Q    |     V   |         |         |
12+25      43.1139     50.51  |    Q    |      V  |         |         |
12+30      43.4625     50.62  |    Q    |      V  |         |         |
12+35      43.8127     50.85  |    Q    |      V  |         |         |
12+40      44.1649     51.15  |    Q    |      V  |         |         |
12+45      44.5193     51.46  |    Q    |      V  |         |         |
12+50      44.8763     51.82  |    Q    |      V  |         |         |
12+55      45.2358     52.20  |    Q    |      V  |         |         |
13+ 0      45.5981     52.60  |    Q    |      V  |         |         |
13+ 5      45.9632     53.01  |    Q    |       V |         |         |
13+10      46.3313     53.45  |    Q    |       V |         |         |
13+15      46.7025     53.90  |    Q    |       V |         |         |
13+20      47.0770     54.38  |    Q    |       V |         |         |
13+25      47.4549     54.87  |    Q    |       V |         |         |
13+30      47.8363     55.39  |    Q    |       V |         |         |
13+35      48.2215     55.92  |    Q    |        V|         |         |
13+40      48.6105     56.49  |    Q    |        V|         |         |
13+45      49.0036     57.07  |    Q    |        V|         |         |
13+50      49.4010     57.70  |    Q    |        V|         |         |
13+55      49.8027     58.34  |    Q    |        V|         |         |
14+ 0      50.2092     59.02  |    Q    |        V|         |         |
14+ 5      50.6206     59.73  |    Q    |        V|         |         |
14+10      51.0375     60.53  |     Q   |         V         |         |
14+15      51.4603     61.39  |     Q   |         V         |         |
14+20      51.8892     62.29  |     Q   |         V         |         |
14+25      52.3245     63.20  |     Q   |         V         |         |
14+30      52.7664     64.17  |     Q   |         V         |         |
14+35      53.2153     65.17  |     Q   |         |V        |         |
14+40      53.6717     66.26  |     Q   |         |V        |         |
14+45      54.1359     67.41  |     Q   |         |V        |         |
14+50      54.6088     68.66  |     Q   |         |V        |         |
14+55      55.0908     69.98  |     Q   |         |V        |         |
15+ 0      55.5828     71.45  |      Q  |         |V        |         |
15+ 5      56.0857     73.02  |      Q  |         | V       |         |
15+10      56.6006     74.77  |      Q  |         | V       |         |
15+15      57.1287     76.67  |      Q  |         | V       |         |
15+20      57.6716     78.83  |      Q  |         | V       |         |
15+25      58.2173     79.24  |      Q  |         | V       |         |
15+30      58.7179     72.68  |      Q  |         |  V      |         |
15+35      59.1509     62.87  |     Q   |         |  V      |         |
15+40      59.5379     56.20  |    Q    |         |  V      |         |
15+45      59.9207     55.58  |    Q    |         |  V      |         |
15+50      60.3299     59.41  |    Q    |         |  V      |         |
15+55      60.7949     67.52  |     Q   |         |  V      |         |
16+ 0      61.3708     83.63  |       Q |         |   V     |         |
16+ 5      62.3035    135.43  |         |  Q      |   V     |         |
16+10      64.0726    256.88  |         |         |    Q    |         |
16+15      66.1827    306.38  |         |         |     V   Q         |
16+20      67.9305    253.79  |         |         |    QV   |         |
16+25      69.0430    161.53  |         |     Q   |      V  |         |
16+30      69.8384    115.49  |         |Q        |      V  |         |
16+35      70.5106     97.61  |        Q|         |      V  |         |
16+40      71.1471     92.42  |        Q|         |       V |         |
16+45      71.7676     90.10  |        Q|         |       V |         |
16+50      72.3376     82.76  |       Q |         |       V |         |
16+55      72.8836     79.29  |      Q  |         |       V |         |
17+ 0      73.4079     76.12  |      Q  |         |       V |         |
17+ 5      73.9158     73.76  |      Q  |         |        V|         |
17+10      74.4042     70.92  |      Q  |         |        V|         |
17+15      74.8769     68.64  |     Q   |         |        V|         |
17+20      75.3355     66.58  |     Q   |         |        V|         |
17+25      75.7807     64.64  |     Q   |         |        V|         |
17+30      76.2143     62.96  |     Q   |         |         V         |
17+35      76.6369     61.36  |     Q   |         |         V         |
17+40      77.0500     59.99  |    Q    |         |         V         |
17+45      77.4552     58.84  |    Q    |         |         V         |
17+50      77.8536     57.85  |    Q    |         |         V         |
17+55      78.2454     56.88  |    Q    |         |         V         |
18+ 0      78.6305     55.91  |    Q    |         |         |V        |
18+ 5      79.0096     55.05  |    Q    |         |         |V        |
18+10      79.3834     54.28  |    Q    |         |         |V        |
18+15      79.7491     53.10  |    Q    |         |         |V        |
18+20      80.1165     53.34  |    Q    |         |         |V        |
18+25      80.4831     53.23  |    Q    |         |         |V        |
18+30      80.8475     52.91  |    Q    |         |         |V        |
18+35      81.2085     52.41  |    Q    |         |         | V       |
18+40      81.5660     51.91  |    Q    |         |         | V       |
18+45      81.9202     51.43  |    Q    |         |         | V       |
18+50      82.2711     50.95  |    Q    |         |         | V       |
18+55      82.6188     50.49  |    Q    |         |         | V       |
19+ 0      82.9635     50.05  |    Q    |         |         | V       |
```

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 19+ 5      83.3054     49.63  |   Q     |         |         | V       |
 19+10      83.6444     49.23  |   Q     |         |         |  V      |
 19+15      83.9807     48.84  |   Q     |         |         |  V      |
 19+20      84.3145     48.47  |   Q     |         |         |  V      |
 19+25      84.6458     48.11  |   Q     |         |         |  V      |
 19+30      84.9748     47.76  |   Q     |         |         |  V      |
 19+35      85.3014     47.42  |   Q     |         |         |  V      |
 19+40      85.6257     47.10  |   Q     |         |         |  V      |
 19+45      85.9480     46.78  |   Q     |         |         |  V      |
 19+50      86.2681     46.48  |   Q     |         |         |   V     |
 19+55      86.5862     46.19  |   Q     |         |         |   V     |
 20+ 0      86.9023     45.90  |   Q     |         |         |   V     |
 20+ 5      87.2166     45.63  |   Q     |         |         |   V     |
 20+10      87.5290     45.36  |   Q     |         |         |   V     |
 20+15      87.8395     45.09  |   Q     |         |         |   V     |
 20+20      88.1482     44.83  |   Q     |         |         |   V     |
 20+25      88.4551     44.57  |   Q     |         |         |   V     |
 20+30      88.7604     44.32  |   Q     |         |         |    V    |
 20+35      89.0639     44.08  |   Q     |         |         |    V    |
 20+40      89.3658     43.84  |   Q     |         |         |    V    |
 20+45      89.6662     43.61  |   Q     |         |         |    V    |
 20+50      89.9649     43.38  |   Q     |         |         |    V    |
 20+55      90.2622     43.16  |   Q     |         |         |    V    |
 21+ 0      90.5580     42.95  |   Q     |         |         |    V    |
 21+ 5      90.8523     42.74  |   Q     |         |         |    V    |
 21+10      91.1452     42.53  |   Q     |         |         |    V    |
 21+15      91.4368     42.33  |   Q     |         |         |     V   |
 21+20      91.7270     42.14  |   Q     |         |         |     V   |
 21+25      92.0158     41.94  |   Q     |         |         |     V   |
 21+30      92.3034     41.76  |   Q     |         |         |     V   |
 21+35      92.5897     41.57  |   Q     |         |         |     V   |
 21+40      92.8748     41.39  |   Q     |         |         |     V   |
 21+45      93.1586     41.21  |   Q     |         |         |     V   |
 21+50      93.4412     41.04  |   Q     |         |         |     V   |
 21+55      93.7227     40.87  |   Q     |         |         |     V   |
 22+ 0      94.0031     40.70  |   Q     |         |         |      V  |
 22+ 5      94.2823     40.54  |   Q     |         |         |      V  |
 22+10      94.5604     40.38  |   Q     |         |         |      V  |
 22+15      94.8374     40.22  |   Q     |         |         |      V  |
 22+20      95.1133     40.07  |   Q     |         |         |      V  |
 22+25      95.3882     39.92  |  Q      |         |         |      V  |
 22+30      95.6621     39.77  |  Q      |         |         |      V  |
 22+35      95.9350     39.62  |  Q      |         |         |      V  |
 22+40      96.2068     39.48  |  Q      |         |         |      V  |
 22+45      96.4777     39.33  |  Q      |         |         |       V |
 22+50      96.7477     39.19  |  Q      |         |         |       V |
 22+55      97.0167     39.06  |  Q      |         |         |       V |
 23+ 0      97.2847     38.92  |  Q      |         |         |       V |
 23+ 5      97.5519     38.79  |  Q      |         |         |       V |
 23+10      97.8181     38.66  |  Q      |         |         |       V |
 23+15      98.0835     38.53  |  Q      |         |         |       V |
 23+20      98.3480     38.40  |  Q      |         |         |       V |
 23+25      98.6116     38.28  |  Q      |         |         |       V |
 23+30      98.8744     38.16  |  Q      |         |         |        V|
 23+35      99.1363     38.04  |  Q      |         |         |        V|
 23+40      99.3974     37.92  |  Q      |         |         |        V|
 23+45      99.6578     37.80  |  Q      |         |         |        V|
 23+50      99.9173     37.68  |  Q      |         |         |        V|
 23+55     100.1760     37.57  |  Q      |         |         |        V|
 24+ 0     100.4340     37.46  |  Q      |         |         |        V|
 24+ 5     100.6811     35.87  |  Q      |         |         |        V|
 24+10     100.8795     28.82  | Q       |         |         |        V|
 24+15     101.0109     19.07  |Q        |         |         |        V|
 24+20     101.0878     11.18  |Q        |         |         |        V|
 24+25     101.1370      7.13  Q         |         |         |        V|
 24+30     101.1721      5.10  Q         |         |         |        V|
 24+35     101.2000      4.06  Q         |         |         |        V|
 24+40     101.2234      3.40  Q         |         |         |        V|
 24+45     101.2428      2.81  Q         |         |         |        V|
 24+50     101.2598      2.48  Q         |         |         |        V|
 24+55     101.2749      2.19  Q         |         |         |        V|
 25+ 0     101.2883      1.94  Q         |         |         |        V|
 25+ 5     101.3000      1.70  Q         |         |         |        V|
 25+10     101.3103      1.50  Q         |         |         |        V|
 25+15     101.3194      1.32  Q         |         |         |        V|
 25+20     101.3273      1.14  Q         |         |         |        V|
 25+25     101.3341      0.99  Q         |         |         |        V|
 25+30     101.3399      0.85  Q         |         |         |        V|
 25+35     101.3449      0.72  Q         |         |         |        V|
 25+40     101.3491      0.61  Q         |         |         |        V|
 25+45     101.3526      0.50  Q         |         |         |        V|
 25+50     101.3553      0.40  Q         |         |         |        V|
 25+55     101.3573      0.29  Q         |         |         |        V|
 26+ 0     101.3585      0.18  Q         |         |         |        V|
 26+ 5     101.3591      0.08  Q         |         |         |        V|
-----------------------------------------------------------------------
```

ATTACHMENT 5

Hydrograph Routing Calculations
Proposed Option No. 1

Note: This Attachment contains the Hydrograph Routing/Detention Basin Analysis Results for Proposed Drainage Option No. 1, one of two options recommended to reduce the runoff and cliff erosion of Rimforest.

Option No. 1 directs the flow into Little Bear Creek.

```
                    FLOOD HYDROGRAPH ROUTING PROGRAM
            Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2005
                        Study date: 07/08/09

----------------------------------------------------------------------

Linear Basin
Runoff To Match Existing Flow

----------------------------------------------------------------------

Program License Serial Number 4500

----------------------------------------------------------------------
******************** HYDROGRAPH INFORMATION **********************

                From study/file name: opt1un.rte
****************************HYDROGRAPH DATA****************************
                Number of intervals =   314
                Time interval =    5.0 (Min.)
                Maximum/Peak flow rate =      462.714 (CFS)
                Total volume =     156.895 (Ac.Ft)
        Status of hydrographs being held in storage
                   Stream 1  Stream 2  Stream 3  Stream 4  Stream 5
        Peak (CFS)      0.000     0.000     0.000     0.000     0.000
        Vol (Ac.Ft)      0.000     0.000     0.000     0.000     0.000
**********************************************************************


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** RETARDING BASIN ROUTING ****
______________________________________________________________________

Program computation of outflow v. depth




CALCULATED OUTFLOW DATA AT DEPTH =    2.00(Ft.))
Pipe length  =   100.00(Ft.)   Elevation difference =  10.00(Ft.)
Manning's N = 0.013   No. of pipes = 2
Given pipe size =     24.00(In.)
 NOTE: Assuming free outlet flow.
NOTE: Normal flow is pressure flow.
The total friction loss through the pipe is     12.000(Ft.)
Pipe friction loss =      5.438(Ft.)
Minor friction loss =      6.567(Ft.)     K-factor =   1.50
Calculated flow rate through pipe(s) =    105.504(CFS)

Total outflow at this depth =    105.50(CFS)


CALCULATED OUTFLOW DATA AT DEPTH =    4.00(Ft.))
Pipe length  =   100.00(Ft.)   Elevation difference =  10.00(Ft.)
Manning's N = 0.013   No. of pipes = 2
Given pipe size =     24.00(In.)
 NOTE: Assuming free outlet flow.
NOTE: Normal flow is pressure flow.
The total friction loss through the pipe is     14.000(Ft.)
Pipe friction loss =      6.344(Ft.)
Minor friction loss =      7.662(Ft.)     K-factor =   1.50
Calculated flow rate through pipe(s) =    113.957(CFS)

Total outflow at this depth =    113.96(CFS)


CALCULATED OUTFLOW DATA AT DEPTH =    6.00(Ft.))
Pipe length  =   100.00(Ft.)   Elevation difference =  10.00(Ft.)
Manning's N = 0.013   No. of pipes = 2
Given pipe size =     24.00(In.)
 NOTE: Assuming free outlet flow.
NOTE: Normal flow is pressure flow.
The total friction loss through the pipe is     16.000(Ft.)
Pipe friction loss =      7.250(Ft.)
Minor friction loss =      8.756(Ft.)     K-factor =   1.50
Calculated flow rate through pipe(s) =    121.825(CFS)

Total outflow at this depth =    121.83(CFS)
```

```
CALCULATED OUTFLOW DATA AT DEPTH =    8.00(Ft.))
Pipe length  =   100.00(Ft.)   Elevation difference =  10.00(Ft.)
Manning's N = 0.013   No. of pipes = 2
Given pipe size =     24.00(In.)
 NOTE: Assuming free outlet flow.
NOTE: Normal flow is pressure flow.
The total friction loss through the pipe is     18.000(Ft.)
Pipe friction loss =      8.156(Ft.)
Minor friction loss =      9.851(Ft.)     K-factor =   1.50
Calculated flow rate through pipe(s) =    129.215(CFS)

Total outflow at this depth =    129.22(CFS)


CALCULATED OUTFLOW DATA AT DEPTH =   10.00(Ft.))
Pipe length  =   100.00(Ft.)   Elevation difference =  10.00(Ft.)
Manning's N = 0.013   No. of pipes = 2
Given pipe size =     24.00(In.)
 NOTE: Assuming free outlet flow.
NOTE: Normal flow is pressure flow.
The total friction loss through the pipe is     20.000(Ft.)
Pipe friction loss =      9.063(Ft.)
Minor friction loss =     10.945(Ft.)     K-factor =   1.50
Calculated flow rate through pipe(s) =    136.205(CFS)

Total outflow at this depth =    136.20(CFS)


CALCULATED OUTFLOW DATA AT DEPTH =   12.00(Ft.))
Pipe length  =   100.00(Ft.)   Elevation difference =  10.00(Ft.)
Manning's N = 0.013   No. of pipes = 2
Given pipe size =     24.00(In.)
 NOTE: Assuming free outlet flow.
NOTE: Normal flow is pressure flow.
The total friction loss through the pipe is     22.000(Ft.)
Pipe friction loss =      9.969(Ft.)
Minor friction loss =     12.040(Ft.)     K-factor =   1.50
Calculated flow rate through pipe(s) =    142.853(CFS)

Total outflow at this depth =    142.85(CFS)


CALCULATED OUTFLOW DATA AT DEPTH =   14.00(Ft.))
Pipe length  =   100.00(Ft.)   Elevation difference =  10.00(Ft.)
Manning's N = 0.013   No. of pipes = 2
Given pipe size =     24.00(In.)
 NOTE: Assuming free outlet flow.
NOTE: Normal flow is pressure flow.
The total friction loss through the pipe is     24.000(Ft.)
Pipe friction loss =     10.875(Ft.)
Minor friction loss =     13.134(Ft.)     K-factor =   1.50
Calculated flow rate through pipe(s) =    149.205(CFS)

Total outflow at this depth =    149.20(CFS)


CALCULATED OUTFLOW DATA AT DEPTH =   16.00(Ft.))
Pipe length  =   100.00(Ft.)   Elevation difference =  10.00(Ft.)
Manning's N = 0.013   No. of pipes = 2
Given pipe size =     24.00(In.)
 NOTE: Assuming free outlet flow.
NOTE: Normal flow is pressure flow.
The total friction loss through the pipe is     26.000(Ft.)
Pipe friction loss =     11.781(Ft.)
Minor friction loss =     14.229(Ft.)     K-factor =   1.50
Calculated flow rate through pipe(s) =    155.297(CFS)

Total outflow at this depth =    155.30(CFS)


CALCULATED OUTFLOW DATA AT DEPTH =   18.00(Ft.))
Pipe length  =   100.00(Ft.)   Elevation difference =  10.00(Ft.)
Manning's N = 0.013   No. of pipes = 2
Given pipe size =     24.00(In.)
 NOTE: Assuming free outlet flow.
NOTE: Normal flow is pressure flow.
The total friction loss through the pipe is     28.000(Ft.)
Pipe friction loss =     12.688(Ft.)
Minor friction loss =     15.324(Ft.)     K-factor =   1.50
Calculated flow rate through pipe(s) =    161.160(CFS)


Weir capacity using equation Q = CLH^Exp(Using Feet as units)
Weir Length =  20.00(Ft.)   C value =   2.60   Exp =   1.50
Weir flow:      Depth = H =    2.00(Ft.)   Flow =    147.08 (CFS)

Total outflow at this depth =    308.24(CFS)
```

```
-----------------------------------------------------------------------
Total number of inflow hydrograph intervals = 314
Hydrograph time unit =  5.000 (Min.)
Initial depth in storage basin =   0.00(Ft.)
-----------------------------------------------------------------------
-----------------------------------------------------------------------
Initial basin depth =   0.00 (Ft.)
Initial basin storage =      0.00 (Ac.Ft)
Initial basin outflow =   0.00 (CFS)
-----------------------------------------------------------------------
-----------------------------------------------------------------------
Depth vs. Storage and Depth vs. Discharge data:
 Basin Depth  Storage    Outflow   (S-O*dt/2)   (S+O*dt/2)
     (Ft.)    (Ac.Ft)    (CFS)     (Ac.Ft)    (Ac.Ft)
-----------------------------------------------------------------------
  0.000      0.000      0.000      0.000        0.000
  2.000      2.000    105.504      1.637        2.363
  4.000      4.000    113.957      3.608        4.392
  6.000      6.000    121.825      5.580        6.420
  8.000      8.000    129.215      7.555        8.445
 10.000     10.000    136.205      9.531       10.469
 12.000     12.000    142.853     11.508       12.492
 14.000     14.000    149.205     13.486       14.514
 16.000     16.000    155.297     15.465       16.535
 18.000     18.000    308.238     16.939       19.061
-----------------------------------------------------------------------
                Hydrograph Detention Basin Routing
-----------------------------------------------------------------------

Graph values: 'I'= unit inflow; 'O'=outflow at time shown
-----------------------------------------------------------------------
 Time   Inflow  Outflow    Storage                                   Depth
(Hours)  (CFS)   (CFS)     (Ac.Ft) .0     115.7  231.36  347.04  462.71 (Ft.)
 0.083    2.14    0.33      0.006  O       |       |       |       |     0.01
 0.167   12.16    2.43      0.046  O       |       |       |       |     0.05
 0.250   26.51    7.63      0.145  OI      |       |       |       |     0.14
 0.333   38.96   15.34      0.291  |OI     |       |       |       |     0.29
 0.417   45.67   23.64      0.448  |O I    |       |       |       |     0.45
 0.500   49.12   30.94      0.587   OI     |       |       |       |     0.59
 0.583   51.00   36.82      0.698   OI     |       |       |       |     0.70
 0.667   52.10   41.35      0.784   OI     |       |       |       |     0.78
 0.750   53.04   44.80      0.849   O      |       |       |       |     0.85
 0.833   53.76   47.44      0.899   O      |       |       |       |     0.90
 0.917   54.28   49.46      0.938   O      |       |       |       |     0.94
 1.000   54.74   51.02      0.967   O      |       |       |       |     0.97
 1.083   55.17   52.23      0.990   O      |       |       |       |     0.99
 1.167   55.58   53.19      1.008   O      |       |       |       |     1.01
 1.250   55.94   53.98      1.023   O      |       |       |       |     1.02
 1.333   56.29   54.64      1.036   O      |       |       |       |     1.04
 1.417   56.61   55.19      1.046   O      |       |       |       |     1.05
 1.500   56.91   55.68      1.055   O      |       |       |       |     1.06
 1.583   57.20   56.10      1.063   O      |       |       |       |     1.06
 1.667   57.47   56.48      1.071   O      |       |       |       |     1.07
 1.750   57.72   56.82      1.077   O      |       |       |       |     1.08
 1.833   57.97   57.14      1.083   OI     |       |       |       |     1.08
 1.917   58.21   57.43      1.089   OI     |       |       |       |     1.09
 2.000   58.46   57.71      1.094   OI     |       |       |       |     1.09
 2.083   58.71   57.98      1.099    O     |       |       |       |     1.10
 2.167   58.96   58.24      1.104    O     |       |       |       |     1.10
 2.250   59.18   58.50      1.109    O     |       |       |       |     1.11
 2.333   59.28   58.72      1.113    O     |       |       |       |     1.11
 2.417   59.37   58.91      1.117    O     |       |       |       |     1.12
 2.500   59.47   59.06      1.120    O     |       |       |       |     1.12
 2.583   59.57   59.20      1.122    O     |       |       |       |     1.12
 2.667   59.67   59.33      1.125    O     |       |       |       |     1.12
 2.750   59.76   59.45      1.127    O     |       |       |       |     1.13
 2.833   59.86   59.56      1.129    O     |       |       |       |     1.13
 2.917   59.96   59.67      1.131    O     |       |       |       |     1.13
 3.000   60.07   59.78      1.133    O     |       |       |       |     1.13
 3.083   60.17   59.88      1.135    O     |       |       |       |     1.14
 3.167   60.27   59.99      1.137    O     |       |       |       |     1.14
 3.250   60.38   60.09      1.139    O     |       |       |       |     1.14
 3.333   60.48   60.19      1.141    O     |       |       |       |     1.14
 3.417   60.59   60.30      1.143    O     |       |       |       |     1.14
 3.500   60.69   60.40      1.145    O     |       |       |       |     1.15
 3.583   60.80   60.51      1.147    O     |       |       |       |     1.15
 3.667   60.91   60.62      1.149    O     |       |       |       |     1.15
 3.750   61.02   60.72      1.151    O     |       |       |       |     1.15
 3.833   61.13   60.83      1.153    O     |       |       |       |     1.15
 3.917   61.24   60.94      1.155    O     |       |       |       |     1.16
 4.000   61.35   61.05      1.157    O     |       |       |       |     1.16
 4.083   61.47   61.16      1.159    O     |       |       |       |     1.16
 4.167   61.58   61.27      1.162    O     |       |       |       |     1.16
 4.250   61.69   61.38      1.164    O     |       |       |       |     1.16
 4.333   61.81   61.50      1.166    O     |       |       |       |     1.17
 4.417   61.93   61.61      1.168    O     |       |       |       |     1.17
 4.500   62.05   61.73      1.170    O     |       |       |       |     1.17
 4.583   62.17   61.84      1.172    O     |       |       |       |     1.17
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4.667	62.29	61.96	1.175	O				1.17
4.750	62.41	62.08	1.177	O				1.18
4.833	62.53	62.20	1.179	O				1.18
4.917	62.65	62.32	1.181	O				1.18
5.000	62.78	62.44	1.184	O				1.18
5.083	62.90	62.56	1.186	O				1.19
5.167	63.03	62.69	1.188	O				1.19
5.250	63.16	62.81	1.191	O				1.19
5.333	63.29	62.94	1.193	O				1.19
5.417	63.42	63.07	1.196	O				1.20
5.500	63.55	63.20	1.198	O				1.20
5.583	63.69	63.33	1.200	O				1.20
5.667	63.82	63.46	1.203	O				1.20
5.750	63.96	63.59	1.205	O				1.21
5.833	64.10	63.72	1.208	O				1.21
5.917	64.23	63.86	1.211	O				1.21
6.000	64.37	64.00	1.213	O				1.21
6.083	64.52	64.13	1.216	O				1.22
6.167	64.66	64.27	1.218	O				1.22
6.250	64.80	64.41	1.221	O				1.22
6.333	64.95	64.56	1.224	O				1.22
6.417	65.10	64.70	1.226	O				1.23
6.500	65.25	64.85	1.229	O				1.23
6.583	65.40	64.99	1.232	O				1.23
6.667	65.55	65.14	1.235	O				1.23
6.750	65.70	65.29	1.238	O				1.24
6.833	65.86	65.44	1.241	O				1.24
6.917	66.02	65.59	1.243	O				1.24
7.000	66.18	65.75	1.246	O				1.25
7.083	66.34	65.91	1.249	O				1.25
7.167	66.50	66.06	1.252	O				1.25
7.250	66.67	66.22	1.255	O				1.26
7.333	66.84	66.39	1.258	O				1.26
7.417	67.00	66.55	1.262	O				1.26
7.500	67.18	66.72	1.265	O				1.26
7.583	67.35	66.88	1.268	O				1.27
7.667	67.52	67.05	1.271	O				1.27
7.750	67.70	67.23	1.274	O				1.27
7.833	67.88	67.40	1.278	O				1.28
7.917	68.06	67.58	1.281	O				1.28
8.000	68.25	67.75	1.284	O				1.28
8.083	68.43	67.93	1.288	O				1.29
8.167	68.62	68.12	1.291	O				1.29
8.250	68.81	68.30	1.295	O				1.29
8.333	69.01	68.49	1.298	O				1.30
8.417	69.20	68.68	1.302	O				1.30
8.500	69.40	68.87	1.306	O				1.31
8.583	69.60	69.06	1.309	O				1.31
8.667	69.81	69.26	1.313	O				1.31
8.750	70.02	69.46	1.317	O				1.32
8.833	70.23	69.66	1.321	O				1.32
8.917	70.44	69.87	1.325	O				1.32
9.000	70.66	70.08	1.328	O				1.33
9.083	70.87	70.29	1.332	O				1.33
9.167	71.10	70.50	1.337	O				1.34
9.250	71.32	70.72	1.341	O				1.34
9.333	71.55	70.94	1.345	O				1.34
9.417	71.79	71.17	1.349	O				1.35
9.500	72.02	71.39	1.353	O				1.35
9.583	72.26	71.62	1.358	O				1.36
9.667	72.51	71.86	1.362	OI				1.36
9.750	72.75	72.10	1.367	OI				1.37
9.833	73.01	72.34	1.371	O				1.37
9.917	73.26	72.58	1.376	O				1.38
10.000	73.53	72.83	1.381	O				1.38
10.083	73.79	73.09	1.385	O				1.39
10.167	74.06	73.34	1.390	O				1.39
10.250	74.33	73.60	1.395	O				1.40
10.333	74.61	73.87	1.400	O				1.40
10.417	74.89	74.14	1.405	O				1.41
10.500	75.18	74.42	1.411	O				1.41
10.583	75.48	74.70	1.416	O				1.42
10.667	75.78	74.98	1.421	O				1.42
10.750	76.08	75.27	1.427	O				1.43
10.833	76.39	75.57	1.433	O				1.43
10.917	76.71	75.87	1.438	O				1.44
11.000	77.03	76.18	1.444	O				1.44
11.083	77.36	76.49	1.450	O				1.45
11.167	77.70	76.81	1.456	O				1.46
11.250	78.04	77.14	1.462	O				1.46
11.333	78.39	77.47	1.469	O				1.47
11.417	78.75	77.81	1.475	O				1.47
11.500	79.12	78.15	1.482	O				1.48
11.583	79.49	78.51	1.488	O				1.49
11.667	79.88	78.87	1.495	O				1.50
11.750	80.26	79.24	1.502	O				1.50
11.833	80.67	79.62	1.509	O				1.51
11.917	81.07	80.00	1.517	O				1.52

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12.000   81.50   80.40      1.524 |    O  |       |       |       |     1.52
12.083   81.66   80.76      1.531 |    O  |       |       |       |     1.53
12.167   80.87   80.91      1.534 |    O  |       |       |       |     1.53
12.250   79.55   80.70      1.530 |    O  |       |       |       |     1.53
12.333   78.51   80.19      1.520 |    O  |       |       |       |     1.52
12.417   78.20   79.62      1.509 |    O  |       |       |       |     1.51
12.500   78.33   79.20      1.501 |    O  |       |       |       |     1.50
12.583   78.66   78.99      1.497 |    O  |       |       |       |     1.50
12.667   79.11   78.96      1.497 |    O  |       |       |       |     1.50
12.750   79.60   79.08      1.499 |    O  |       |       |       |     1.50
12.833   80.14   79.32      1.504 |    O  |       |       |       |     1.50
12.917   80.72   79.66      1.510 |    O  |       |       |       |     1.51
13.000   81.34   80.08      1.518 |    O  |       |       |       |     1.52
13.083   81.97   80.57      1.527 |    O  |       |       |       |     1.53
13.167   82.65   81.10      1.537 |    O  |       |       |       |     1.54
13.250   83.34   81.68      1.548 |    O  |       |       |       |     1.55
13.333   84.07   82.31      1.560 |    O  |       |       |       |     1.56
13.417   84.82   82.96      1.573 |    O  |       |       |       |     1.57
13.500   85.63   83.66      1.586 |    O  |       |       |       |     1.59
13.583   86.45   84.39      1.600 |    O  |       |       |       |     1.60
13.667   87.32   85.16      1.614 |    OI |       |       |       |     1.61
13.750   88.22   85.96      1.630 |    OI |       |       |       |     1.63
13.833   89.18   86.80      1.645 |     O |       |       |       |     1.65
13.917   90.16   87.68      1.662 |     O |       |       |       |     1.66
14.000   91.21   88.61      1.680 |     O |       |       |       |     1.68
14.083   92.32   89.58      1.698 |     O |       |       |       |     1.70
14.167   93.57   90.61      1.718 |     O |       |       |       |     1.72
14.250   94.92   91.73      1.739 |     O |       |       |       |     1.74
14.333   96.35   92.93      1.762 |     O |       |       |       |     1.76
14.417   97.77   94.20      1.786 |     O |       |       |       |     1.79
14.500   99.27   95.53      1.811 |     O |       |       |       |     1.81
14.583  100.82   96.92      1.837 |     O |       |       |       |     1.84
14.667  102.49   98.37      1.865 |     OI|       |       |       |     1.86
14.750  104.24   99.91      1.894 |     OI|       |       |       |     1.89
14.833  106.16  101.54      1.925 |      O|       |       |       |     1.92
14.917  108.19  103.27      1.958 |      O|       |       |       |     1.96
15.000  110.43  105.13      1.993 |      O|       |       |       |     1.99
15.083  112.83  105.66      2.036 |      O|       |       |       |     2.04
15.167  115.50  105.90      2.094 |      O|       |       |       |     2.09
15.250  118.40  106.22      2.169 |      OI       |       |       |     2.17
15.333  121.70  106.61      2.263 |      OI       |       |       |     2.26
15.417  122.45  107.06      2.367 |      OI       |       |       |     2.37
15.500  113.21  107.37      2.441 |      O|       |       |       |     2.44
15.583   98.74  107.33      2.431 |     IO|       |       |       |     2.43
15.667   87.90  106.92      2.336 |     IO|       |       |       |     2.34
15.750   86.15  106.35      2.201 |    I O|       |       |       |     2.20
15.833   91.45  105.85      2.082 |     IO|       |       |       |     2.08
15.917  103.23  105.61      2.024 |      O|       |       |       |     2.02
16.000  127.14  105.88      2.089 |      OI       |       |       |     2.09
16.083  203.59  107.59      2.493 |      O|     I |       |       |     2.49
16.167  380.77  112.88      3.746 |      O|       |       I       |     3.75
16.250  462.71  121.21      5.844 |       O       |       |     I |     5.84
16.333  400.75  129.05      7.956 |       O       |       I       |     7.96
16.417  261.43  133.87      9.331 |       |O      I       |       |     9.33
16.500  185.41  136.00      9.940 |       |O  I   |       |       |     9.94
16.583  155.10  136.78     10.174 |       |OI     |       |       |    10.17
16.667  143.32  137.06     10.258 |       |O      |       |       |    10.26
16.750  139.05  137.16     10.286 |       |O      |       |       |    10.29
16.833  131.34  137.11     10.273 |       |O      |       |       |    10.27
16.917  123.50  136.89     10.207 |       IO      |       |       |    10.21
17.000  118.29  136.53     10.098 |       IO      |       |       |    10.10
17.083  114.47  136.07      9.961 |      I|O      |       |       |     9.96
17.167  110.64  135.51      9.801 |      I|O      |       |       |     9.80
17.250  106.66  134.87      9.618 |      I|O      |       |       |     9.62
17.333  103.54  134.16      9.415 |      I|O      |       |       |     9.42
17.417  100.52  133.40      9.197 |     I |O      |       |       |     9.20
17.500   97.86  132.58      8.964 |     I |O      |       |       |     8.96
17.583   95.40  131.73      8.719 |     I |O      |       |       |     8.72
17.667   93.08  130.84      8.464 |     I |O      |       |       |     8.46
17.750   91.14  129.92      8.201 |     I O       |       |       |     8.20
17.833   89.54  128.96      7.931 |     I O       |       |       |     7.93
17.917   88.10  127.95      7.658 |     I O       |       |       |     7.66
18.000   86.69  126.93      7.383 |    I  O       |       |       |     7.38
18.083   85.54  125.91      7.105 |    I  O       |       |       |     7.10
18.167   85.26  124.89      6.829 |    I  O       |       |       |     6.83
18.250   84.80  123.89      6.558 |    I  O       |       |       |     6.56
18.333   82.65  122.88      6.285 |    I  O       |       |       |     6.29
18.417   82.40  121.87      6.011 |    I  O       |       |       |     6.01
18.500   81.92  120.81      5.741 |    I  O       |       |       |     5.74
18.583   81.31  119.76      5.475 |    I  O       |       |       |     5.47
18.667   80.51  118.72      5.211 |    I  O       |       |       |     5.21
18.750   79.74  117.69      4.949 |    I  O       |       |       |     4.95
18.833   79.00  116.66      4.688 |    I  O       |       |       |     4.69
18.917   78.28  115.65      4.430 |    I O|       |       |       |     4.43
19.000   77.59  114.64      4.174 |    I O|       |       |       |     4.17
19.083   76.93  113.62      3.920 |    I O|       |       |       |     3.92
19.167   76.29  112.56      3.668 |    I O|       |       |       |     3.67
19.250   75.68  111.51      3.420 |    I O|       |       |       |     3.42
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19.333   75.10  110.47      3.175  |    I O|       |       |       |     3.17
19.417   74.54  109.45      2.933  |    I O|       |       |       |     2.93
19.500   73.99  108.44      2.694  |    I O|       |       |       |     2.69
19.583   73.47  107.44      2.459  |    I O|       |       |       |     2.46
19.667   72.96  106.46      2.226  |    I O|       |       |       |     2.23
19.750   72.47  105.37      1.998  |    I O|       |       |       |     2.00
19.833   72.00   95.19      1.804  |   I O |       |       |       |     1.80
19.917   71.54   87.99      1.668  |   I O |       |       |       |     1.67
20.000   71.10   82.86      1.571  |   IO  |       |       |       |     1.57
20.083   70.67   79.18      1.501  |   IO  |       |       |       |     1.50
20.167   70.25   76.50      1.450  |   IO  |       |       |       |     1.45
20.250   69.85   74.52      1.413  |   IO  |       |       |       |     1.41
20.333   69.44   73.02      1.384  |   IO  |       |       |       |     1.38
20.417   69.04   71.86      1.362  |   O   |       |       |       |     1.36
20.500   68.65   70.93      1.345  |   O   |       |       |       |     1.34
20.583   68.27   70.17      1.330  |   O   |       |       |       |     1.33
20.667   67.90   69.53      1.318  |   O   |       |       |       |     1.32
20.750   67.54   68.97      1.308  |   O   |       |       |       |     1.31
20.833   67.19   68.48      1.298  |   O   |       |       |       |     1.30
20.917   66.85   68.03      1.290  |   O   |       |       |       |     1.29
21.000   66.52   67.62      1.282  |   O   |       |       |       |     1.28
21.083   66.19   67.23      1.274  |   O   |       |       |       |     1.27
21.167   65.87   66.86      1.267  |   O   |       |       |       |     1.27
21.250   65.56   66.51      1.261  |   O   |       |       |       |     1.26
21.333   65.25   66.17      1.254  |   O   |       |       |       |     1.25
21.417   64.96   65.84      1.248  |   O   |       |       |       |     1.25
21.500   64.66   65.53      1.242  |   O   |       |       |       |     1.24
21.583   64.38   65.22      1.236  |   O   |       |       |       |     1.24
21.667   64.10   64.92      1.231  |   O   |       |       |       |     1.23
21.750   63.82   64.62      1.225  |   O   |       |       |       |     1.23
21.833   63.55   64.34      1.220  |   O   |       |       |       |     1.22
21.917   63.29   64.05      1.214  |   O   |       |       |       |     1.21
22.000   63.03   63.78      1.209  |   O   |       |       |       |     1.21
22.083   62.78   63.51      1.204  |   O   |       |       |       |     1.20
22.167   62.53   63.25      1.199  |   O   |       |       |       |     1.20
22.250   62.28   62.99      1.194  |   O   |       |       |       |     1.19
22.333   62.04   62.74      1.189  |   O   |       |       |       |     1.19
22.417   61.81   62.49      1.185  |   O   |       |       |       |     1.18
22.500   61.58   62.24      1.180  |   O   |       |       |       |     1.18
22.583   61.35   62.00      1.175  |   O   |       |       |       |     1.18
22.667   61.13   61.77      1.171  |   O   |       |       |       |     1.17
22.750   60.91   61.54      1.167  |   O   |       |       |       |     1.17
22.833   60.69   61.31      1.162  |   O   |       |       |       |     1.16
22.917   60.48   61.09      1.158  |   O   |       |       |       |     1.16
23.000   60.27   60.87      1.154  |   O   |       |       |       |     1.15
23.083   60.06   60.65      1.150  |   O   |       |       |       |     1.15
23.167   59.86   60.44      1.146  |   O   |       |       |       |     1.15
23.250   59.66   60.23      1.142  |   O   |       |       |       |     1.14
23.333   59.46   60.02      1.138  |   O   |       |       |       |     1.14
23.417   59.27   59.82      1.134  |   O   |       |       |       |     1.13
23.500   59.08   59.62      1.130  |   O   |       |       |       |     1.13
23.583   58.89   59.43      1.127  |   O   |       |       |       |     1.13
23.667   58.71   59.23      1.123  |   O   |       |       |       |     1.12
23.750   58.52   59.04      1.119  |   O   |       |       |       |     1.12
23.833   58.34   58.86      1.116  |   O   |       |       |       |     1.12
23.917   58.17   58.67      1.112  |   O   |       |       |       |     1.11
24.000   57.99   58.49      1.109  |   O   |       |       |       |     1.11
24.083   55.68   57.98      1.099  |  IO   |       |       |       |     1.10
24.167   45.51   55.71      1.056  |  O    |       |       |       |     1.06
24.250   31.06   50.35      0.954  | IO    |       |       |       |     0.95
24.333   18.56   42.50      0.806  |IO     |       |       |       |     0.81
24.417   11.86   34.11      0.647  I O     |       |       |       |     0.65
24.500    8.44   26.74      0.507  IO      |       |       |       |     0.51
24.583    6.60   20.83      0.395  IO      |       |       |       |     0.39
24.667    5.56   16.30      0.309  IO      |       |       |       |     0.31
24.750    4.68   12.86      0.244  O       |       |       |       |     0.24
24.833    4.02   10.24      0.194  O       |       |       |       |     0.19
24.917    3.57    8.26      0.157  O       |       |       |       |     0.16
25.000    3.18    6.76      0.128  O       |       |       |       |     0.13
25.083    2.82    5.60      0.106  O       |       |       |       |     0.11
25.167    2.48    4.69      0.089  O       |       |       |       |     0.09
25.250    2.20    3.97      0.075  O       |       |       |       |     0.08
25.333    1.93    3.39      0.064  O       |       |       |       |     0.06
25.417    1.69    2.90      0.055  O       |       |       |       |     0.06
25.500    1.47    2.49      0.047  O       |       |       |       |     0.05
25.583    1.26    2.15      0.041  O       |       |       |       |     0.04
25.667    1.08    1.85      0.035  O       |       |       |       |     0.03
25.750    0.92    1.59      0.030  O       |       |       |       |     0.03
25.833    0.76    1.35      0.026  O       |       |       |       |     0.03
25.917    0.60    1.15      0.022  O       |       |       |       |     0.02
26.000    0.44    0.95      0.018  O       |       |       |       |     0.02
26.083    0.28    0.77      0.015  O       |       |       |       |     0.01
26.167    0.12    0.60      0.011  O       |       |       |       |     0.01
26.250    0.00    0.43      0.008  O       |       |       |       |     0.01
26.333    0.00    0.30      0.006  O       |       |       |       |     0.01
26.417    0.00    0.21      0.004  O       |       |       |       |     0.00
26.500    0.00    0.14      0.003  O       |       |       |       |     0.00
26.583    0.00    0.10      0.002  O       |       |       |       |     0.00
```

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26.667    0.00    0.07      0.001  O       |       |       |       |     0.00
26.750    0.00    0.05      0.001  O       |       |       |       |     0.00

        ****************************HYDROGRAPH DATA****************************
                        Number of intervals =   321
                        Time interval =    5.0 (Min.)
                        Maximum/Peak flow rate =      137.156 (CFS)
                        Total volume =     156.894 (Ac.Ft)
                Status of hydrographs being held in storage
                           Stream 1  Stream 2  Stream 3  Stream 4  Stream 5
                Peak (CFS)      0.000     0.000     0.000     0.000     0.000
                Vol (Ac.Ft)      0.000     0.000     0.000     0.000     0.000
        ***********************************************************************

        ----------------------------------------------------------------------
```

ATTACHMENT 6

Hydrograph Routing Calculations
Proposed Option No. 2

Note: This Attachment contains the Hydrograph Routing/Detention Basin Analysis Results for Proposed Drainage Option No. 2, one of two options recommended to reduce the runoff and cliff erosion of Rimforest.

Option No. 2 directs the flow into Daley Creek.

```
                    FLOOD HYDROGRAPH ROUTING PROGRAM
            Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2005
                        Study date: 07/08/09

---------------------------------------------------------------------

Weir Discharge To Daley Creek
100-Year Storm

---------------------------------------------------------------------

Program License Serial Number 4500

---------------------------------------------------------------------
******************** HYDROGRAPH INFORMATION **********************

                From study/file name: opt2un.rte
****************************HYDROGRAPH DATA****************************
                Number of intervals =   313
                Time interval =    5.0 (Min.)
                Maximum/Peak flow rate =      306.377 (CFS)
                Total volume =     101.359 (Ac.Ft)
        Status of hydrographs being held in storage
                   Stream 1  Stream 2  Stream 3  Stream 4  Stream 5
        Peak (CFS)      0.000     0.000     0.000     0.000     0.000
        Vol (Ac.Ft)      0.000     0.000     0.000     0.000     0.000
**********************************************************************



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       13.000
**** RETARDING BASIN ROUTING ****
______________________________________________________________________

Program computation of outflow v. depth




CALCULATED OUTFLOW DATA AT DEPTH =    4.50(Ft.))
Pipe length  =     1.00(Ft.)   Elevation difference =   0.10(Ft.)
Manning's N = 0.013   No. of pipes = 18
Given pipe size =      6.00(In.)
 NOTE: Assuming free outlet flow.
NOTE: Normal flow is pressure flow.
The total friction loss through the pipe is      4.600(Ft.)
Pipe friction loss =      0.230(Ft.)
Minor friction loss =      4.368(Ft.)     K-factor =   1.50
Calculated flow rate through pipe(s) =     48.402(CFS)

Pipe length  =     1.00(Ft.)   Elevation difference =   0.10(Ft.)
Manning's N = 0.013   No. of pipes = 18
Given pipe size =      6.00(In.)
 NOTE: Assuming free outlet flow.
NOTE: Normal flow is pressure flow.
The total friction loss through the pipe is      0.600(Ft.)
Pipe friction loss =      0.030(Ft.)
Minor friction loss =      0.570(Ft.)     K-factor =   1.50
Calculated flow rate through pipe(s) =     17.481(CFS)

Total outflow at this depth =     65.88(CFS)


CALCULATED OUTFLOW DATA AT DEPTH =    6.50(Ft.))
Pipe length  =     1.00(Ft.)   Elevation difference =   0.10(Ft.)
Manning's N = 0.013   No. of pipes = 18
Given pipe size =      6.00(In.)
 NOTE: Assuming free outlet flow.
NOTE: Normal flow is pressure flow.
The total friction loss through the pipe is      6.600(Ft.)
Pipe friction loss =      0.330(Ft.)
Minor friction loss =      6.268(Ft.)     K-factor =   1.50
Calculated flow rate through pipe(s) =     57.977(CFS)

Pipe length  =     1.00(Ft.)   Elevation difference =   0.10(Ft.)
Manning's N = 0.013   No. of pipes = 18
Given pipe size =      6.00(In.)
 NOTE: Assuming free outlet flow.
NOTE: Normal flow is pressure flow.
The total friction loss through the pipe is      2.600(Ft.)
Pipe friction loss =      0.130(Ft.)
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Minor friction loss =      2.469(Ft.)     K-factor =   1.50
Calculated flow rate through pipe(s) =     36.389(CFS)

Total outflow at this depth =     94.37(CFS)


CALCULATED OUTFLOW DATA AT DEPTH =    8.00(Ft.))
Pipe length  =     1.00(Ft.)   Elevation difference =   0.10(Ft.)
Manning's N = 0.013   No. of pipes = 18
Given pipe size =      6.00(In.)
 NOTE: Assuming free outlet flow.
NOTE: Normal flow is pressure flow.
The total friction loss through the pipe is      8.100(Ft.)
Pipe friction loss =      0.404(Ft.)
Minor friction loss =      7.692(Ft.)     K-factor =   1.50
Calculated flow rate through pipe(s) =     64.228(CFS)

Pipe length  =     1.00(Ft.)   Elevation difference =   0.10(Ft.)
Manning's N = 0.013   No. of pipes = 18
Given pipe size =      6.00(In.)
 NOTE: Assuming free outlet flow.
NOTE: Normal flow is pressure flow.
The total friction loss through the pipe is      4.100(Ft.)
Pipe friction loss =      0.205(Ft.)
Minor friction loss =      3.894(Ft.)     K-factor =   1.50
Calculated flow rate through pipe(s) =     45.696(CFS)

Total outflow at this depth =    109.92(CFS)


CALCULATED OUTFLOW DATA AT DEPTH =    8.50(Ft.))
Pipe length  =     1.00(Ft.)   Elevation difference =   0.10(Ft.)
Manning's N = 0.013   No. of pipes = 18
Given pipe size =      6.00(In.)
 NOTE: Assuming free outlet flow.
NOTE: Normal flow is pressure flow.
The total friction loss through the pipe is      8.600(Ft.)
Pipe friction loss =      0.429(Ft.)
Minor friction loss =      8.167(Ft.)     K-factor =   1.50
Calculated flow rate through pipe(s) =     66.181(CFS)

Pipe length  =     1.00(Ft.)   Elevation difference =   0.10(Ft.)
Manning's N = 0.013   No. of pipes = 18
Given pipe size =      6.00(In.)
 NOTE: Assuming free outlet flow.
NOTE: Normal flow is pressure flow.
The total friction loss through the pipe is      4.600(Ft.)
Pipe friction loss =      0.230(Ft.)
Minor friction loss =      4.368(Ft.)     K-factor =   1.50
Calculated flow rate through pipe(s) =     48.402(CFS)


Weir capacity using equation Q = CLH^Exp(Using Feet as units)
Weir Length = 106.00(Ft.)   C value =   2.63   Exp =   1.50
Weir flow:      Depth = H =    0.50(Ft.)   Flow =     98.56 (CFS)

Total outflow at this depth =    213.15(CFS)

-------------------------------------------------------------------
Total number of inflow hydrograph intervals = 313
Hydrograph time unit =  5.000 (Min.)
Initial depth in storage basin =   0.00(Ft.)
-------------------------------------------------------------------
-------------------------------------------------------------------
Initial basin depth =   0.00 (Ft.)
Initial basin storage =      0.00 (Ac.Ft)
Initial basin outflow =   0.00 (CFS)
-------------------------------------------------------------------
-------------------------------------------------------------------
Depth vs. Storage and Depth vs. Discharge data:
 Basin Depth  Storage    Outflow   (S-O*dt/2)   (S+O*dt/2)
     (Ft.)    (Ac.Ft)    (CFS)     (Ac.Ft)    (Ac.Ft)
-------------------------------------------------------------------
  0.000      0.000      0.000      0.000        0.000
  4.500      0.055     65.883     -0.172        0.282
  6.500      0.128     94.366     -0.197        0.453
  8.000      0.210    109.924     -0.169        0.589
  8.500      0.234    213.147     -0.500        0.968
-------------------------------------------------------------------
                Hydrograph Detention Basin Routing
-------------------------------------------------------------------

Graph values: 'I'= unit inflow; 'O'=outflow at time shown
-------------------------------------------------------------------
 Time   Inflow  Outflow    Storage                                  Depth
(Hours)  (CFS)   (CFS)     (Ac.Ft) .0      76.6  153.19  229.78  306.38 (Ft.)
 0.083    1.47    1.18      0.001  O       |       |       |       |     0.08
 0.167    8.43    7.25      0.006  O       |       |       |       |     0.50
```

0.250	18.11	16.94	0.014	O				1.16
0.333	25.98	25.16	0.021	O				1.72
0.417	30.03	29.74	0.025	O				2.03
0.500	32.09	31.86	0.027	O				2.18
0.583	33.16	33.09	0.028	O				2.26
0.667	33.86	33.76	0.028	O				2.31
0.750	34.49	34.42	0.029	O				2.35
0.833	34.86	34.83	0.029	O				2.38
0.917	35.19	35.15	0.029	O				2.40
1.000	35.49	35.46	0.030	O				2.42
1.083	35.77	35.74	0.030	O				2.44
1.167	36.02	36.00	0.030	O				2.46
1.250	36.26	36.23	0.030	O				2.47
1.333	36.48	36.45	0.030	O				2.49
1.417	36.69	36.66	0.031	O				2.50
1.500	36.88	36.86	0.031	O				2.52
1.583	37.06	37.04	0.031	O				2.53
1.667	37.23	37.21	0.031	O				2.54
1.750	37.39	37.37	0.031	O				2.55
1.833	37.56	37.54	0.031	O				2.56
1.917	37.72	37.70	0.031	O				2.58
2.000	37.89	37.87	0.032	O				2.59
2.083	38.05	38.03	0.032	O				2.60
2.167	38.19	38.17	0.032	O				2.61
2.250	38.25	38.25	0.032	O				2.61
2.333	38.31	38.30	0.032	O				2.62
2.417	38.37	38.37	0.032	O				2.62
2.500	38.44	38.43	0.032	O				2.62
2.583	38.50	38.49	0.032	O				2.63
2.667	38.56	38.56	0.032	O				2.63
2.750	38.63	38.62	0.032	O				2.64
2.833	38.69	38.69	0.032	O				2.64
2.917	38.76	38.75	0.032	O				2.65
3.000	38.82	38.82	0.032	O				2.65
3.083	38.89	38.88	0.032	O				2.66
3.167	38.96	38.95	0.033	O				2.66
3.250	39.02	39.02	0.033	O				2.66
3.333	39.09	39.08	0.033	O				2.67
3.417	39.16	39.15	0.033	O				2.67
3.500	39.23	39.22	0.033	O				2.68
3.583	39.30	39.29	0.033	O				2.68
3.667	39.37	39.36	0.033	O				2.69
3.750	39.44	39.43	0.033	O				2.69
3.833	39.51	39.50	0.033	O				2.70
3.917	39.58	39.58	0.033	O				2.70
4.000	39.66	39.65	0.033	O				2.71
4.083	39.73	39.72	0.033	O				2.71
4.167	39.80	39.79	0.033	O				2.72
4.250	39.88	39.87	0.033	O				2.72
4.333	39.95	39.94	0.033	O				2.73
4.417	40.03	40.02	0.033	O				2.73
4.500	40.11	40.10	0.033	O				2.74
4.583	40.18	40.17	0.034	O				2.74
4.667	40.26	40.25	0.034	O				2.75
4.750	40.34	40.33	0.034	O				2.75
4.833	40.42	40.41	0.034	O				2.76
4.917	40.50	40.49	0.034	O				2.77
5.000	40.58	40.57	0.034	O				2.77
5.083	40.66	40.65	0.034	O				2.78
5.167	40.74	40.73	0.034	O				2.78
5.250	40.83	40.82	0.034	O				2.79
5.333	40.91	40.90	0.034	O				2.79
5.417	40.99	40.98	0.034	O				2.80
5.500	41.08	41.07	0.034	O				2.81
5.583	41.17	41.16	0.034	O				2.81
5.667	41.25	41.24	0.034	O				2.82
5.750	41.34	41.33	0.035	O				2.82
5.833	41.43	41.42	0.035	O				2.83
5.917	41.52	41.51	0.035	O				2.84
6.000	41.61	41.60	0.035	O				2.84
6.083	41.70	41.69	0.035	O				2.85
6.167	41.80	41.79	0.035	O				2.85
6.250	41.89	41.88	0.035	O				2.86
6.333	41.99	41.97	0.035	O				2.87
6.417	42.08	42.07	0.035	O				2.87
6.500	42.18	42.17	0.035	O				2.88
6.583	42.27	42.26	0.035	O				2.89
6.667	42.37	42.36	0.035	O				2.89
6.750	42.47	42.46	0.035	O				2.90
6.833	42.57	42.56	0.036	O				2.91
6.917	42.68	42.66	0.036	O				2.91
7.000	42.78	42.77	0.036	O				2.92
7.083	42.88	42.87	0.036	O				2.93
7.167	42.99	42.98	0.036	O				2.94
7.250	43.10	43.08	0.036	O				2.94
7.333	43.21	43.19	0.036	O				2.95
7.417	43.31	43.30	0.036	O				2.96
7.500	43.43	43.41	0.036	O				2.97

7.583	43.54	43.52	0.036	O				2.97
7.667	43.65	43.64	0.036	O				2.98
7.750	43.77	43.75	0.037	O				2.99
7.833	43.88	43.87	0.037	O				3.00
7.917	44.00	43.99	0.037	O				3.00
8.000	44.12	44.10	0.037	O				3.01
8.083	44.24	44.22	0.037	O				3.02
8.167	44.36	44.35	0.037	O				3.03
8.250	44.49	44.47	0.037	O				3.04
8.333	44.61	44.60	0.037	O				3.05
8.417	44.74	44.72	0.037	O				3.05
8.500	44.87	44.85	0.037	O				3.06
8.583	45.00	44.98	0.038	O				3.07
8.667	45.13	45.11	0.038	O				3.08
8.750	45.26	45.25	0.038	O				3.09
8.833	45.40	45.38	0.038	O				3.10
8.917	45.54	45.52	0.038	O				3.11
9.000	45.68	45.66	0.038	O				3.12
9.083	45.82	45.80	0.038	O				3.13
9.167	45.97	45.95	0.038	O				3.14
9.250	46.11	46.09	0.038	O				3.15
9.333	46.26	46.24	0.039	O				3.16
9.417	46.41	46.39	0.039	O				3.17
9.500	46.57	46.55	0.039	O				3.18
9.583	46.72	46.70	0.039	O				3.19
9.667	46.88	46.86	0.039	O				3.20
9.750	47.04	47.02	0.039	O				3.21
9.833	47.20	47.18	0.039	O				3.22
9.917	47.37	47.35	0.040	O				3.23
10.000	47.54	47.52	0.040	O				3.25
10.083	47.71	47.69	0.040	O				3.26
10.167	47.88	47.86	0.040	OI				3.27
10.250	48.06	48.04	0.040	O				3.28
10.333	48.24	48.22	0.040	O				3.29
10.417	48.42	48.40	0.040	O				3.31
10.500	48.61	48.59	0.041	O				3.32
10.583	48.80	48.78	0.041	O				3.33
10.667	49.00	48.97	0.041	O				3.34
10.750	49.19	49.17	0.041	O				3.36
10.833	49.40	49.37	0.041	O				3.37
10.917	49.60	49.58	0.041	O				3.39
11.000	49.81	49.79	0.042	O				3.40
11.083	50.02	50.00	0.042	O				3.42
11.167	50.24	50.22	0.042	O				3.43
11.250	50.46	50.44	0.042	O				3.45
11.333	50.69	50.66	0.042	O				3.46
11.417	50.92	50.90	0.042	O				3.48
11.500	51.16	51.13	0.043	O				3.49
11.583	51.40	51.37	0.043	O				3.51
11.667	51.65	51.62	0.043	O				3.53
11.750	51.90	51.87	0.043	O				3.54
11.833	52.17	52.13	0.044	O				3.56
11.917	52.43	52.40	0.044	O				3.58
12.000	52.70	52.67	0.044	O				3.60
12.083	52.80	52.80	0.044	O				3.61
12.167	52.23	52.34	0.044	O				3.57
12.250	51.33	51.43	0.043	O				3.51
12.333	50.67	50.74	0.042	O				3.47
12.417	50.51	50.51	0.042	O				3.45
12.500	50.62	50.60	0.042	O				3.46
12.583	50.85	50.81	0.042	O				3.47
12.667	51.15	51.11	0.043	O				3.49
12.750	51.46	51.42	0.043	O				3.51
12.833	51.82	51.78	0.043	O				3.54
12.917	52.20	52.16	0.044	O				3.56
13.000	52.60	52.55	0.044	O				3.59
13.083	53.01	52.96	0.044	O				3.62
13.167	53.45	53.40	0.045	O				3.65
13.250	53.90	53.85	0.045	O				3.68
13.333	54.38	54.32	0.045	O				3.71
13.417	54.87	54.81	0.046	O				3.74
13.500	55.39	55.32	0.046	O				3.78
13.583	55.92	55.86	0.047	O				3.82
13.667	56.49	56.42	0.047	O				3.85
13.750	57.07	57.00	0.048	O				3.89
13.833	57.70	57.62	0.048	O				3.94
13.917	58.34	58.26	0.049	O				3.98
14.000	59.02	58.93	0.049	O				4.03
14.083	59.73	59.65	0.050	O				4.07
14.167	60.53	60.43	0.050	O				4.13
14.250	61.39	61.28	0.051	O				4.19
14.333	62.29	62.18	0.052	O				4.25
14.417	63.20	63.09	0.053	O				4.31
14.500	64.17	64.05	0.053	O				4.37
14.583	65.17	65.05	0.054	O				4.44
14.667	66.26	66.06	0.055	O				4.51
14.750	67.41	66.95	0.058	OI				4.57
14.833	68.66	68.19	0.061	O				4.66

```
14.917   69.98   69.49      0.064  |      O|       |       |       |     4.75
15.000   71.45   70.90      0.068  |      O|       |       |       |     4.85
15.083   73.02   72.43      0.072  |      O|       |       |       |     4.96
15.167   74.77   74.11      0.076  |      O|       |       |       |     5.08
15.250   76.67   75.95      0.081  |      OI       |       |       |     5.21
15.333   78.83   78.01      0.086  |       O       |       |       |     5.35
15.417   79.24   79.19      0.089  |       O       |       |       |     5.43
15.500   72.68   75.49      0.080  |      O|       |       |       |     5.17
15.583   62.87   66.65      0.057  |     O |       |       |       |     4.55
15.667   56.20   55.51      0.046  |    O  |       |       |       |     3.79
15.750   55.58   56.12      0.047  |    O  |       |       |       |     3.83
15.833   59.41   58.33      0.049  |     O |       |       |       |     3.98
15.917   67.52   66.39      0.056  |     OI|       |       |       |     4.54
16.000   83.63   76.92      0.083  |       O       |       |       |     5.28
16.083  135.43  108.11      0.200  |       |  O  I |       |       |     7.83
       Warning: Basin depth limit exceeded, the data here is an estimation
16.167  256.88  177.69      0.567  |       |       | O     | I     |    14.53
       Warning: Basin depth limit exceeded, the data here is an estimation
16.250  306.38  259.83      1.000  |       |       |       |  O    I    22.45
       Warning: Basin depth limit exceeded, the data here is an estimation
16.333  253.79  275.84      1.084  |       |       |       | I O   |    24.00
       Warning: Basin depth limit exceeded, the data here is an estimation
16.417  161.53  221.96      0.800  |       |       I      O|       |    18.80
       Warning: Basin depth limit exceeded, the data here is an estimation
16.500  115.49  156.00      0.453  |       |   I   O       |       |    12.44
16.583   97.61  126.50      0.214  |       | I  O  |       |       |     8.08
16.667   92.42   90.98      0.119  |       |O      |       |       |     6.26
16.750   90.10   91.30      0.120  |       |O      |       |       |     6.28
16.833   82.76   85.71      0.106  |       O       |       |       |     5.89
16.917   79.29   80.33      0.092  |       O       |       |       |     5.51
17.000   76.12   77.32      0.084  |      IO       |       |       |     5.30
17.083   73.76   74.59      0.077  |      O|       |       |       |     5.11
17.167   70.92   72.01      0.071  |      O|       |       |       |     4.93
17.250   68.64   69.45      0.064  |      O|       |       |       |     4.75
17.333   66.58   67.34      0.059  |     IO|       |       |       |     4.60
17.417   64.64   65.15      0.054  |     O |       |       |       |     4.45
17.500   62.96   62.98      0.053  |     O |       |       |       |     4.30
17.583   61.36   61.66      0.051  |     O |       |       |       |     4.21
17.667   59.99   60.07      0.050  |     O |       |       |       |     4.10
17.750   58.84   59.01      0.049  |     O |       |       |       |     4.03
17.833   57.85   57.94      0.048  |     O |       |       |       |     3.96
17.917   56.88   57.02      0.048  |    O  |       |       |       |     3.89
18.000   55.91   56.02      0.047  |    O  |       |       |       |     3.83
18.083   55.05   55.15      0.046  |    O  |       |       |       |     3.77
18.167   54.28   54.37      0.045  |    O  |       |       |       |     3.71
18.250   53.10   53.28      0.044  |    O  |       |       |       |     3.64
18.333   53.34   53.19      0.044  |    O  |       |       |       |     3.63
18.417   53.23   53.35      0.045  |    O  |       |       |       |     3.64
18.500   52.91   52.90      0.044  |    O  |       |       |       |     3.61
18.583   52.41   52.51      0.044  |    O  |       |       |       |     3.59
18.667   51.91   51.94      0.043  |    O  |       |       |       |     3.55
18.750   51.43   51.50      0.043  |    O  |       |       |       |     3.52
18.833   50.95   51.00      0.043  |    O  |       |       |       |     3.48
18.917   50.49   50.55      0.042  |    O  |       |       |       |     3.45
19.000   50.05   50.10      0.042  |    O  |       |       |       |     3.42
19.083   49.63   49.68      0.041  |    O  |       |       |       |     3.39
19.167   49.23   49.27      0.041  |    O  |       |       |       |     3.37
19.250   48.84   48.89      0.041  |    O  |       |       |       |     3.34
19.333   48.47   48.51      0.040  |    O  |       |       |       |     3.31
19.417   48.11   48.15      0.040  |    O  |       |       |       |     3.29
19.500   47.76   47.80      0.040  |   O   |       |       |       |     3.26
19.583   47.42   47.46      0.040  |   O   |       |       |       |     3.24
19.667   47.10   47.14      0.039  |   O   |       |       |       |     3.22
19.750   46.78   46.82      0.039  |   O   |       |       |       |     3.20
19.833   46.48   46.52      0.039  |   O   |       |       |       |     3.18
19.917   46.19   46.22      0.039  |   O   |       |       |       |     3.16
20.000   45.90   45.94      0.038  |   O   |       |       |       |     3.14
20.083   45.63   45.66      0.038  |   O   |       |       |       |     3.12
20.167   45.36   45.39      0.038  |   O   |       |       |       |     3.10
20.250   45.09   45.12      0.038  |   O   |       |       |       |     3.08
20.333   44.83   44.86      0.037  |   O   |       |       |       |     3.06
20.417   44.57   44.60      0.037  |   O   |       |       |       |     3.05
20.500   44.32   44.35      0.037  |   O   |       |       |       |     3.03
20.583   44.08   44.11      0.037  |   O   |       |       |       |     3.01
20.667   43.84   43.87      0.037  |   O   |       |       |       |     3.00
20.750   43.61   43.64      0.036  |   O   |       |       |       |     2.98
20.833   43.38   43.41      0.036  |   O   |       |       |       |     2.96
20.917   43.16   43.19      0.036  |   O   |       |       |       |     2.95
21.000   42.95   42.97      0.036  |   O   |       |       |       |     2.94
21.083   42.74   42.76      0.036  |   O   |       |       |       |     2.92
21.167   42.53   42.56      0.036  |   O   |       |       |       |     2.91
21.250   42.33   42.36      0.035  |   O   |       |       |       |     2.89
21.333   42.14   42.16      0.035  |   O   |       |       |       |     2.88
21.417   41.94   41.97      0.035  |   O   |       |       |       |     2.87
21.500   41.76   41.78      0.035  |   O   |       |       |       |     2.85
21.583   41.57   41.59      0.035  |   O   |       |       |       |     2.84
21.667   41.39   41.41      0.035  |   O   |       |       |       |     2.83
21.750   41.21   41.24      0.034  |   O   |       |       |       |     2.82
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21.833   41.04   41.06      0.034  |   O   |       |       |       |     2.80
21.917   40.87   40.89      0.034  |   O   |       |       |       |     2.79
22.000   40.70   40.72      0.034  |   O   |       |       |       |     2.78
22.083   40.54   40.56      0.034  |   O   |       |       |       |     2.77
22.167   40.38   40.40      0.034  |   O   |       |       |       |     2.76
22.250   40.22   40.24      0.034  |   O   |       |       |       |     2.75
22.333   40.07   40.09      0.033  |   O   |       |       |       |     2.74
22.417   39.92   39.93      0.033  |   O   |       |       |       |     2.73
22.500   39.77   39.78      0.033  |   O   |       |       |       |     2.72
22.583   39.62   39.64      0.033  |   O   |       |       |       |     2.71
22.667   39.48   39.49      0.033  |   O   |       |       |       |     2.70
22.750   39.33   39.35      0.033  |   O   |       |       |       |     2.69
22.833   39.19   39.21      0.033  |   O   |       |       |       |     2.68
22.917   39.06   39.07      0.033  |   O   |       |       |       |     2.67
23.000   38.92   38.94      0.033  |   O   |       |       |       |     2.66
23.083   38.79   38.81      0.032  |   O   |       |       |       |     2.65
23.167   38.66   38.67      0.032  |   O   |       |       |       |     2.64
23.250   38.53   38.55      0.032  |   O   |       |       |       |     2.63
23.333   38.40   38.42      0.032  |   O   |       |       |       |     2.62
23.417   38.28   38.29      0.032  |  O    |       |       |       |     2.62
23.500   38.16   38.17      0.032  |  O    |       |       |       |     2.61
23.583   38.04   38.05      0.032  |  O    |       |       |       |     2.60
23.667   37.92   37.93      0.032  |  O    |       |       |       |     2.59
23.750   37.80   37.81      0.032  |  O    |       |       |       |     2.58
23.833   37.68   37.70      0.031  |  O    |       |       |       |     2.57
23.917   37.57   37.58      0.031  |  O    |       |       |       |     2.57
24.000   37.46   37.47      0.031  |  O    |       |       |       |     2.56
24.083   35.87   36.17      0.030  |  O    |       |       |       |     2.47
24.167   28.82   30.01      0.025  |  O    |       |       |       |     2.05
24.250   19.07   20.24      0.017  |IO     |       |       |       |     1.38
24.333   11.18   12.00      0.010  |O      |       |       |       |     0.82
24.417    7.13    7.42      0.006  O       |       |       |       |     0.51
24.500    5.10    5.32      0.004  O       |       |       |       |     0.36
24.583    4.06    4.13      0.003  O       |       |       |       |     0.28
24.667    3.40    3.49      0.003  O       |       |       |       |     0.24
24.750    2.81    2.87      0.002  O       |       |       |       |     0.20
24.833    2.48    2.50      0.002  O       |       |       |       |     0.17
24.917    2.19    2.23      0.002  O       |       |       |       |     0.15
25.000    1.94    1.96      0.002  O       |       |       |       |     0.13
25.083    1.70    1.73      0.001  O       |       |       |       |     0.12
25.167    1.50    1.52      0.001  O       |       |       |       |     0.10
25.250    1.32    1.34      0.001  O       |       |       |       |     0.09
25.333    1.14    1.16      0.001  O       |       |       |       |     0.08
25.417    0.99    1.01      0.001  O       |       |       |       |     0.07
25.500    0.85    0.86      0.001  O       |       |       |       |     0.06
25.583    0.72    0.74      0.001  O       |       |       |       |     0.05
25.667    0.61    0.62      0.001  O       |       |       |       |     0.04
25.750    0.50    0.52      0.000  O       |       |       |       |     0.04
25.833    0.40    0.41      0.000  O       |       |       |       |     0.03
25.917    0.29    0.30      0.000  O       |       |       |       |     0.02
26.000    0.18    0.20      0.000  O       |       |       |       |     0.01
26.083    0.08    0.09      0.000  O       |       |       |       |     0.01
26.167    0.00    0.01      0.000  O       |       |       |       |     0.00

        ****************************HYDROGRAPH DATA****************************
                        Number of intervals =   314
                        Time interval =    5.0 (Min.)
                        Maximum/Peak flow rate =      275.838 (CFS)
                        Total volume =     101.359 (Ac.Ft)
                Status of hydrographs being held in storage
                            Stream 1  Stream 2  Stream 3  Stream 4  Stream 5
                Peak (CFS)      0.000     0.000     0.000     0.000     0.000
                Vol (Ac.Ft)      0.000     0.000     0.000     0.000     0.000
        ***********************************************************************

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ATTACHMENT 7

Water Surface Pressure Gradient for Windows (WSPGW) Analysis Proposed Option No. 1

Note: This Attachment contains the WSPGW water surface profile results for Proposed Option No. 1, one of two options recommended to reduce the runoff and cliff erosion of Rimforest.

This Attachment shows the results for flow into Little Bear Creek (see Exhibit “F” for stationing).

Program Package Serial Number: 1521
WATER SURFACE PROFILE LISTING Date: 5- 6-2009 Time:10:58:59

Rimforest
Option 1
Drain to Little Bear Creek

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1899.000	5580.000	3.363	5583.363	303.00	21.57	7.23	5590.59	.00	4.68	4.69	5.000	.000	.00	1 .0
293.739	.0215					.0215	6.31	3.36	2.20	3.36	.013	.00	.00	PIPE
2192.739	5586.314	3.363	5589.677	303.00	21.57	7.23	5596.90	.00	4.68	4.69	5.000	.000	.00	1 .0
435.305	.0215					.0209	9.12	3.36	2.20	3.36	.013	.00	.00	PIPE
2628.044	5595.672	3.429	5599.101	303.00	21.11	6.92	5606.02	.00	4.68	4.64	5.000	.000	.00	1 .0
215.760	.0215					.0193	4.16	3.43	2.12	3.36	.013	.00	.00	PIPE
2843.804	5600.310	3.582	5603.892	303.00	20.13	6.29	5610.18	.00	4.68	4.51	5.000	.000	.00	1 .0
95.437	.0215					.0172	1.65	3.58	1.94	3.36	.013	.00	.00	PIPE
2939.241	5602.362	3.748	5606.110	303.00	19.19	5.72	5611.83	.00	4.68	4.33	5.000	.000	.00	1 .0
56.111	.0215					.0155	.87	3.75	1.77	3.36	.013	.00	.00	PIPE
2995.352	5603.568	3.931	5607.499	303.00	18.30	5.20	5612.70	.00	4.68	4.10	5.000	.000	.00	1 .0
35.716	.0215					.0140	.50	3.93	1.60	3.36	.013	.00	.00	PIPE
3031.068	5604.335	4.136	5608.471	303.00	17.45	4.73	5613.20	.00	4.68	3.78	5.000	.000	.00	1 .0
21.974	.0215					.0128	.28	4.14	1.43	3.36	.013	.00	.00	PIPE
3053.042	5604.808	4.374	5609.182	303.00	16.63	4.30	5613.48	.00	4.68	3.31	5.000	.000	.00	1 .0
8.958	.0215					.0120	.11	4.37	1.25	3.36	.013	.00	.00	PIPE
3062.000	5605.000	4.680	5609.680	303.00	15.86	3.91	5613.59	.00	4.68	2.45	5.000	.000	.00	1 .0

ATTACHMENT 8

Water Surface Pressure Gradient for Windows (WSPGW) Analysis Proposed Option No. 1 (Lateral)

Note: This Attachment contains the WSPGW water surface profile results for the Proposed Option No. 1 lateral pipe, from Pine Avenue to outlet at Little Bear Creek.

```
FILE: lat1.WSW                          W S P G W  - EDIT LISTING - Version 14.06              Date: 7- 7-2009  Time: 2: 7:24
                                   WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING                                PAGE    1
 CARD  SECT  CHN   NO OF  AVE PIER  HEIGHT 1  BASE    ZL    ZR   INV   Y(1)  Y(2)  Y(3)  Y(4)  Y(5)  Y(6)  Y(7)  Y(8)  Y(9)  Y(10)
 CODE   NO   TYPE PIER/PIP WIDTH    DIAMETER  WIDTH              DROP

 CD      1    4      1             4.000
                                                W S P G W                                                          PAGE NO   1
                            WATER SURFACE PROFILE - TITLE CARD LISTING
HEADING LINE NO 1 IS -
                              Lateral To Pine St,
HEADING LINE NO 2 IS -
                              Rimforest
HEADING LINE NO 3 IS -

                                                W S P G W                                                          PAGE NO   2
                            WATER SURFACE PROFILE - ELEMENT CARD LISTING
 ELEMENT NO   1 IS A SYSTEM OUTLET     *         *     *
                     U/S DATA   STATION    INVERT  SECT                                    W S ELEV
                                    .000 5595.000    1                                      5598.110
 ELEMENT NO   2 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                                1176.570 5610.000    1             .013                          .000     .000      .000     3
 ELEMENT NO   3 IS A SYSTEM HEADWORKS                  *                         *
                     U/S DATA   STATION    INVERT  SECT                                    W S ELEV
                                1176.570 5610.000    1                                     5610.000
 FILE: lat1.WSW                          W S P G W - CIVILDESIGN Version 14.06                                      PAGE    1
                              Program Package Serial Number: 1521
                                          WATER SURFACE PROFILE LISTING                  Date: 7- 7-2009  Time: 2: 7:27
                         Lateral To Pine St,
                           Rimforest

************************************************************************************************************************ ********
         | Invert  |  Depth |  Water  |    Q    |  Vel     Vel  |  Energy | Super |Critical|Flow Top|Height/|Base Wt|      |No Wth
 Station |  Elev   |  (FT)  |  Elev   |  (CFS)  | (FPS)    Head |  Grd.El.| Elev  | Depth  | Width  |Dia.-FT|or I.D.|  ZL  |Prs/Pip
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-    -|
 L/Elem  |Ch Slope |        |         |         |         SF Ave|    HF   |SE Dpth|Froude N|Norm Dp |  "N"  | X-Fall|  ZR  |Type Ch
*********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|*****|*******
         |         |        |         |         |       |       |         |       |        |        |       |       |     |
     .000  5595.001    2.372  5597.373    107.00   13.79    2.95  5600.32     .00    3.13     3.93    4.000     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-    -|
  721.144    .0127                                     .0127     9.19    2.37    1.73     2.37    .013     .00   .00  PIPE
         |         |        |         |         |       |       |         |       |        |        |       |       |     |
  721.144  5604.195    2.372  5606.566    107.00   13.79    2.95  5609.52     .00    3.13     3.93    4.000     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-    -|
  237.668    .0127                                     .0124     2.95    2.37    1.73     2.37    .013     .00   .00  PIPE
         |         |        |         |         |       |       |         |       |        |        |       |       |     |
  958.812  5607.225    2.413  5609.638    107.00   13.50    2.83  5612.47     .00    3.13     3.91    4.000     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-    -|
  117.253    .0127                                     .0114     1.34    2.41    1.67     2.37    .013     .00   .00  PIPE
         |         |        |         |         |       |       |         |       |        |        |       |       |     |
 1076.064  5608.719    2.512  5611.231    107.00   12.88    2.57  5613.81     .00    3.13     3.87    4.000     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-    -|
   48.616    .0127                                     .0101      .49    2.51    1.55     2.37    .013     .00   .00  PIPE
         |         |        |         |         |       |       |         |       |        |        |       |       |     |
 1124.680  5609.339    2.618  5611.957    107.00   12.28    2.34  5614.30     .00    3.13     3.80    4.000     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-    -|
   26.479    .0127                                     .0090      .24    2.62    1.43     2.37    .013     .00   .00  PIPE
         |         |        |         |         |       |       |         |       |        |        |       |       |     |
 1151.160  5609.676    2.731  5612.407    107.00   11.70    2.13  5614.53     .00    3.13     3.72    4.000     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-    -|
   15.143    .0127                                     .0080      .12    2.73    1.32     2.37    .013     .00   .00  PIPE
         |         |        |         |         |       |       |         |       |        |        |       |       |     |
 1166.302  5609.869    2.853  5612.722    107.00   11.16    1.93  5614.66     .00    3.13     3.62    4.000     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-    -|
    7.861    .0127                                     .0071      .06    2.85    1.21     2.37    .013     .00   .00  PIPE
```

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         |         |         |         |         |         |         |         |         |         |         |
1174.164  5609.969    2.984  5612.954    107.00   10.64    1.76  5614.71     .00    3.13     3.48    4.000     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
   2.406    .0127                                   .0064      .02     2.98    1.10    2.37    .013       .00   .00  PIPE
         |         |         |         |         |         |         |         |         |         |         |
1176.570  5610.000    3.130  5613.130    107.00   10.14    1.60  5614.73     .00    3.13     3.30    4.000     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
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ATTACHMENT 9

Water Surface Pressure Gradient for Windows (WSPGW) Analysis Proposed Option No. 2

Note: This Attachment contains the WSPGW water surface profile results for Proposed Option No. 2, one of two options recommended to reduce the runoff and cliff erosion of Rimforest.

This Attachment shows the results for flow into Daley Creek (see Exhibit “G” for stationing).

Rim Forest
Option 2 - Drain to New Canyon
Tributary to Strawberry Creek

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
.000	4790.000	1.436	4791.437	303.70	74.85	87.00	4878.43	.00	3.97	3.84	4.000	.000	.00	1 .0
252.754	.5877					.5877	148.54	1.44	12.83	1.44	.013	.00	.00	PIPE
252.754	4938.541	1.436	4939.977	303.70	74.85	87.00	5026.97	.00	3.97	3.84	4.000	.000	.00	1 .0
209.123	.5877					.6282	131.37	1.44	12.83	1.44	.013	.00	.00	PIPE
461.878	5061.439	1.388	5062.827	303.70	78.43	95.52	5158.34	.00	3.97	3.81	4.000	.000	.00	1 .0
74.122	.5877					.7159	53.06	1.39	13.71	1.44	.013	.00	.00	PIPE
536.000	5105.000	1.340	5106.339	303.70	82.26	105.07	5211.41	.00	3.97	3.78	4.000	.000	.00	1 .0
119.204	.7886					.7261	86.55	1.34	14.66	1.33	.013	.00	.00	PIPE
655.204	5199.003	1.377	5200.379	303.70	79.28	97.61	5297.99	.00	3.97	3.80	4.000	.000	.00	1 .0
62.103	.7886					.6465	40.15	1.38	13.92	1.33	.013	.00	.00	PIPE
717.307	5247.977	1.426	5249.402	303.70	75.59	88.73	5338.14	.00	3.97	3.83	4.000	.000	.00	1 .0
36.132	.7886					.5667	20.48	1.43	13.01	1.33	.013	.00	.00	PIPE
753.439	5276.470	1.477	5277.947	303.70	72.08	80.67	5358.61	.00	3.97	3.86	4.000	.000	.00	1 .0
24.967	.7886					.4970	12.41	1.48	12.16	1.33	.013	.00	.00	PIPE
778.405	5296.159	1.530	5297.688	303.70	68.72	73.33	5371.02	.00	3.97	3.89	4.000	.000	.00	1 .0
18.750	.7886					.4360	8.17	1.53	11.36	1.33	.013	.00	.00	PIPE
797.155	5310.944	1.585	5312.529	303.70	65.52	66.67	5379.20	.00	3.97	3.91	4.000	.000	.00	1 .0
14.786	.7886					.3826	5.66	1.58	10.61	1.33	.013	.00	.00	PIPE

Rim Forest
Option 2 - Drain to New Canyon
Tributary to Strawberry Creek

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
811.941	5322.604	1.643	5324.247	303.70	62.47	60.61	5384.85	.00	3.97	3.94	4.000	.000	.00	1 .0
12.038	.7886					.3359	4.04	1.64	9.91	1.33	.013	.00	.00	PIPE

823.979	5332.097	1.703	5333.800	303.70	59.57	55.10	5388.90	.00	3.97	3.96	4.000	.000	.00	1	.0
10.021	.7886					.2950	2.96	1.70	9.25	1.33	.013	.00	.00	PIPE	
834.000	5340.000	1.765	5341.765	303.70	56.80	50.09	5391.85	.00	3.97	3.97	4.000	.000	.00	1	.0
33.330	.2597					.2783	9.28	1.77	8.63	1.80	.013	.00	.00	PIPE	
867.330	5348.657	1.757	5350.414	303.70	57.16	50.73	5401.14	.00	3.97	3.97	4.000	.000	.00	1	.0
123.997	.2597					.3001	37.22	1.76	8.71	1.80	.013	.00	.00	PIPE	
991.327	5380.864	1.695	5382.558	303.70	59.95	55.80	5438.36	.00	3.97	3.95	4.000	.000	.00	1	.0
67.316	.2597					.3417	23.00	1.69	9.33	1.80	.013	.00	.00	PIPE	
1058.643	5398.349	1.635	5399.983	303.70	62.87	61.38	5461.36	.00	3.97	3.93	4.000	.000	.00	1	.0
46.939	.2597					.3893	18.27	1.63	10.00	1.80	.013	.00	.00	PIPE	
1105.582	5410.541	1.577	5412.118	303.70	65.94	67.52	5479.64	.00	3.97	3.91	4.000	.000	.00	1	.0
36.418	.2597					.4436	16.16	1.58	10.71	1.80	.013	.00	.00	PIPE	
1142.000	5420.000	1.522	5421.522	303.70	69.16	74.27	5495.79	.00	3.97	3.88	4.000	.000	.00	1	.0
15.693	.5619					.4663	7.32	1.52	11.46	1.45	.013	.00	.00	PIPE	
1157.693	5428.817	1.534	5430.351	303.70	68.48	72.81	5503.16	.00	3.97	3.89	4.000	.000	.00	1	.0
50.420	.5619					.4317	21.77	1.53	11.30	1.45	.013	.00	.00	PIPE	

Rim Forest
Option 2 - Drain to New Canyon
Tributary to Strawberry Creek

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1208.113	5457.149	1.589	5458.738	303.70	65.29	66.19	5524.93	.00	3.97	3.91	4.000	.000	.00	1 .0
32.560	.5619					.3789	12.34	1.59	10.56	1.45	.013	.00	.00	PIPE
1240.673	5475.444	1.647	5477.091	303.70	62.25	60.18	5537.27	.00	3.97	3.94	4.000	.000	.00	1 .0
23.597	.5619					.3326	7.85	1.65	9.86	1.45	.013	.00	.00	PIPE
1264.270	5488.704	1.707	5490.411	303.70	59.36	54.71	5545.12	.00	3.97	3.96	4.000	.000	.00	1 .0
18.204	.5619					.2922	5.32	1.71	9.20	1.45	.013	.00	.00	PIPE
1282.474	5498.933	1.770	5500.703	303.70	56.59	49.73	5550.44	.00	3.97	3.97	4.000	.000	.00	1 .0
14.600	.5619					.2568	3.75	1.77	8.58	1.45	.013	.00	.00	PIPE
1297.074	5507.137	1.836	5508.973	303.70	53.96	45.21	5554.18	.00	3.97	3.99	4.000	.000	.00	1 .0
12.023	.5619					.2258	2.71	1.84	8.00	1.45	.013	.00	.00	PIPE
1309.097	5513.893	1.905	5515.797	303.70	51.45	41.10	5556.90	.00	3.97	4.00	4.000	.000	.00	1 .0

10.088	.5619					.1986	2.00	1.90	7.46	1.45	.013	.00	.00	PIPE	
1319.185	5519.561	1.977	5521.538	303.70	49.05	37.36	5558.90	.00	3.97	4.00	4.000	.000	.00	1	.0
8.582	.5619					.1749	1.50	1.98	6.95	1.45	.013	.00	.00	PIPE	
1327.767	5524.383	2.053	5526.436	303.70	46.77	33.97	5560.40	.00	3.97	4.00	4.000	.000	.00	1	.0
7.378	.5619					.1541	1.14	2.05	6.47	1.45	.013	.00	.00	PIPE	
1335.145	5528.529	2.132	5530.661	303.70	44.59	30.88	5561.54	.00	3.97	3.99	4.000	.000	.00	1	.0
6.394	.5619					.1359	.87	2.13	6.02	1.45	.013	.00	.00	PIPE	

Rim Forest
Option 2 - Drain to New Canyon
Tributary to Strawberry Creek

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1341.539	5532.122	2.215	5534.337	303.70	42.52	28.07	5562.41	.00	3.97	3.98	4.000	.000	.00	1 .0
5.576	.5619					.1200	.67	2.22	5.59	1.45	.013	.00	.00	PIPE
1347.115	5535.255	2.303	5537.558	303.70	40.54	25.52	5563.08	.00	3.97	3.95	4.000	.000	.00	1 .0
4.885	.5619					.1060	.52	2.30	5.19	1.45	.013	.00	.00	PIPE
1352.000	5538.000	2.396	5540.396	303.70	38.65	23.20	5563.60	.00	3.97	3.92	4.000	.000	.00	1 .0
10.194	.1131					.0991	1.01	2.40	4.81	2.30	.013	.00	.00	PIPE
1362.194	5539.152	2.402	5541.555	303.70	38.53	23.05	5564.61	.00	3.97	3.92	4.000	.000	.00	1 .0
99.917	.1131					.0931	9.30	2.40	4.79	2.30	.013	.00	.00	PIPE
1462.111	5550.450	2.501	5552.951	303.70	36.74	20.96	5573.91	.00	3.97	3.87	4.000	.000	.00	1 .0
58.927	.1131					.0825	4.86	2.50	4.43	2.30	.013	.00	.00	PIPE
1521.037	5557.113	2.606	5559.719	303.70	35.03	19.05	5578.77	.00	3.97	3.81	4.000	.000	.00	1 .0
40.730	.1131					.0733	2.99	2.61	4.09	2.30	.013	.00	.00	PIPE
1561.768	5561.719	2.718	5564.437	303.70	33.40	17.32	5581.76	.00	3.97	3.73	4.000	.000	.00	1 .0
30.420	.1131					.0653	1.99	2.72	3.77	2.30	.013	.00	.00	PIPE
1592.188	5565.159	2.839	5567.998	303.70	31.84	15.75	5583.74	.00	3.97	3.63	4.000	.000	.00	1 .0
23.753	.1131					.0583	1.38	2.84	3.46	2.30	.013	.00	.00	PIPE
1615.941	5567.845	2.969	5570.814	303.70	30.36	14.31	5585.13	.00	3.97	3.50	4.000	.000	.00	1 .0
19.059	.1131					.0523	1.00	2.97	3.16	2.30	.013	.00	.00	PIPE

Rim Forest
Option 2 - Drain to New Canyon
Tributary to Strawberry Creek

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1635.000	5570.000	3.112	5573.112	303.70	28.95	13.01	5586.12	.00	3.97	3.32	4.000	.000	.00	1 .0
101.337	.0556					.0477	4.83	3.11	2.87	2.96	.013	.00	.00	PIPE
1736.336	5575.629	3.232	5578.862	303.70	27.91	12.10	5590.96	.00	3.97	3.15	4.000	.000	.00	1 .0
79.251	.0556					.0439	3.48	3.23	2.65	2.96	.013	.00	.00	PIPE
1815.588	5580.032	3.409	5583.441	303.70	26.62	11.00	5594.44	.00	3.97	2.84	4.000	.000	.00	1 .0
52.352	.0556					.0405	2.12	3.41	2.34	2.96	.013	.00	.00	PIPE
1867.940	5582.941	3.623	5586.564	303.70	25.38	10.00	5596.56	.00	3.97	2.34	4.000	.000	.00	1 .0
37.060	.0556					.0404	1.50	3.62	1.98	2.96	.013	.00	.00	PIPE
1905.000	5585.000	3.970	5588.970	303.70	24.19	9.09	5598.06	.00	3.97	.69	4.000	.000	.00	1 .0
WALL ENTRANCE														
1905.000	5585.000	14.917	5599.917	303.70	10.74	1.79	5601.71	.00	4.76	.00	6.000	.000	.00	1 .0
297.000	.0168					.0051	1.53	14.92	.00	3.18	.013	.00	.00	PIPE
2202.000	5590.000	11.444	5601.444	303.70	10.74	1.79	5603.24	.00	4.76	.00	6.000	.000	.00	1 .0
385.360	.0174					.0051	1.98	11.44	.00	3.15	.013	.00	.00	PIPE
2587.360	5596.721	6.703	5603.424	303.70	10.74	1.79	5605.22	.00	4.76	.00	6.000	.000	.00	1 .0
HYDRAULIC JUMP														
2587.360	5596.721	3.229	5599.951	303.70	19.58	5.95	5605.90	.00	4.76	5.98	6.000	.000	.00	1 .0
100.310	.0174					.0159	1.59	3.23	2.14	3.15	.013	.00	.00	PIPE

FILE: opt2.WSW W S P G W - CIVILDESIGN Version 14.06 PAGE 6
Program Package Serial Number: 1521
WATER SURFACE PROFILE LISTING Date: 5- 6-2009 Time: 1:14:16

Rim Forest
Option 2 - Drain to New Canyon
Tributary to Strawberry Creek

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
2687.670	5598.470	3.254	5601.724	303.70	19.39	5.84	5607.56	.00	4.76	5.98	6.000	.000	.00	1 .0
150.740	.0174					.0148	2.23	3.25	2.11	3.15	.013	.00	.00	PIPE
2838.409	5601.100	3.382	5604.482	303.70	18.49	5.31	5609.79	.00	4.76	5.95	6.000	.000	.00	1 .0
79.028	.0174					.0130	1.03	3.38	1.96	3.15	.013	.00	.00	PIPE

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 2917.437  5602.478    3.517  5605.995    303.70   17.63    4.83  5610.82     .00    4.76    5.91    6.000     .000   .00   1   .0
   50.103    .0174                                          .0115     .58    3.52    1.82    3.15     .013      .00   .00  PIPE
 2967.540  5603.352    3.660  5607.012    303.70   16.81    4.39  5611.40     .00    4.76    5.85    6.000     .000   .00   1   .0
   34.228    .0174                                          .0102     .35    3.66    1.69    3.15     .013      .00   .00  PIPE
 3001.768  5603.949    3.812  5607.761    303.70   16.03    3.99  5611.75     .00    4.76    5.78    6.000     .000   .00   1   .0
   24.008    .0174                                          .0091     .22    3.81    1.56    3.15     .013      .00   .00  PIPE
 3025.776  5604.368    3.973  5608.341    303.70   15.28    3.63  5611.97     .00    4.76    5.68    6.000     .000   .00   1   .0
   16.718    .0174                                          .0081     .13    3.97    1.44    3.15     .013      .00   .00  PIPE
 3042.494  5604.660    4.146  5608.806    303.70   14.57    3.30  5612.10     .00    4.76    5.54    6.000     .000   .00   1   .0
   11.064    .0174                                          .0072     .08    4.15    1.32    3.15     .013      .00   .00  PIPE
 3053.559  5604.853    4.332  5609.185    303.70   13.89    3.00  5612.18     .00    4.76    5.38    6.000     .000   .00   1   .0
    6.351    .0174                                          .0064     .04    4.33    1.21    3.15     .013      .00   .00  PIPE
 3059.909  5604.963    4.535  5609.498    303.70   13.25    2.72  5612.22     .00    4.76    5.16    6.000     .000   .00   1   .0
    2.091    .0174                                          .0058     .01    4.53    1.11    3.15     .013      .00   .00  PIPE
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Rim Forest
Option 2 - Drain to New Canyon
Tributary to Strawberry Creek

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**********************************************************************************************************************************
         | Invert  |  Depth  |  Water  |    Q    |  Vel     Vel  |  Energy | Super |Critical|Flow Top|Height/|Base Wt|      |No Wth
 Station |  Elev   |  (FT)   |  Elev   |  (CFS)  | (FPS)    Head |  Grd.El.|  Elev | Depth  | Width  |Dia.-FT|or I.D.|  ZL  |Prs/Pip
         |         |         |         |         |         SF Ave|    HF   |SE Dpth|Froude N|Norm Dp |  "N"  | X-Fall|  ZR  |Type Ch
*********|*********|*********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|*****|*******
 3062.000  5605.000    4.759  5609.759    303.70   12.63    2.48  5612.23     .00    4.76    4.86    6.000     .000   .00   1   .0
JUNCT STR   .0625                                          .0059     .05    4.76    1.00            .013      .00   .00  PIPE
 3070.000  5605.500    6.611  5612.111    208.50   10.62    1.75  5613.86     .00    4.11     .00    5.000     .000   .00   1   .0
   52.668    .0214                                          .0064     .34    6.61     .00    2.64     .013      .00   .00  PIPE
 3122.668  5606.626    5.822  5612.448    208.50   10.62    1.75  5614.20     .00    4.11     .00    5.000     .000   .00   1   .0
HYDRAULIC JUMP
 3122.668  5606.626    2.772  5609.398    208.50   18.66    5.41  5614.80     .00    4.11    4.97    5.000     .000   .00   1   .0
   16.639    .0214                                          .0181     .30    2.77    2.19    2.64     .013      .00   .00  PIPE
 3139.307  5606.982    2.787  5609.769    208.50   18.53    5.33  5615.10     .00    4.11    4.97    5.000     .000   .00   1   .0
   82.563    .0214                                          .0169    1.39    2.79    2.17    2.64     .013      .00   .00  PIPE
 3221.869  5608.747    2.898  5611.645    208.50   17.67    4.85  5616.49     .00    4.11    4.94    5.000     .000   .00   1   .0
   49.922    .0214                                          .0149     .74    2.90    2.01    2.64     .013      .00   .00  PIPE
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3271.792  5609.814    3.015  5612.830    208.50   16.85    4.41  5617.24     .00    4.11     4.89    5.000     .000   .00   1   .0
       -|-       -|-       -|-       -|-       -|-      -|-     -|-       -|-     -|-      -|-      -|-      -|-      -|-     |-
  33.750    .0214                                        .0132      .45     3.01    1.87    2.64    .013       .00   .00  PIPE
       |         |         |         |         |         |       |         |       |       |       |       |       |       |
3305.542  5610.536    3.139  5613.675    208.50   16.07    4.01  5617.68     .00    4.11     4.83    5.000     .000   .00   1   .0
       -|-       -|-       -|-       -|-       -|-      -|-     -|-       -|-     -|-      -|-      -|-      -|-      -|-     |-
  23.970    .0214                                        .0117      .28     3.14    1.73    2.64    .013       .00   .00  PIPE
       |         |         |         |         |         |       |         |       |       |       |       |       |       |
3329.511  5611.049    3.271  5614.320    208.50   15.32    3.64  5617.96     .00    4.11     4.76    5.000     .000   .00   1   .0
       -|-       -|-       -|-       -|-       -|-      -|-     -|-       -|-     -|-      -|-      -|-      -|-      -|-     |-
  17.295    .0214                                        .0104      .18     3.27    1.60    2.64    .013       .00   .00  PIPE
```


Program Package Serial Number: 1521

WATER SURFACE PROFILE LISTING Date: 5- 6-2009 Time: 1:14:16

Rim Forest
Option 2 - Drain to New Canyon
Tributary to Strawberry Creek

```
************************************************************************************************************************************************ ********
         | Invert  |  Depth |  Water  |    Q    |  Vel     Vel  |  Energy | Super |Critical|Flow Top|Height/|Base Wt|      |No Wth
 Station |  Elev   |  (FT)  |  Elev   |  (CFS)  | (FPS)    Head |  Grd.El.|  Elev | Depth  | Width  |Dia.-FT|or I.D.|  ZL  |Prs/Pip
       -|-       -|-       -|-       -|-       -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-      -|-    -|
 L/Elem  |Ch Slope |        |         |         |       |  SF Ave |    HF   |SE Dpth|Froude N|Norm Dp |  "N"  | X-Fall|  ZR  |Type Ch
*********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|***** |*******
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
3346.806  5611.418    3.412  5614.831    208.50   14.61    3.31  5618.14     .00    4.11     4.66    5.000     .000   .00   1   .0
       -|-       -|-       -|-       -|-       -|-      -|-     -|-       -|-     -|-      -|-      -|-      -|-      -|-     |-
  12.311    .0214                                        .0093      .11     3.41    1.47    2.64    .013       .00   .00  PIPE
       |         |         |         |         |         |       |         |       |       |       |       |       |       |
3359.117  5611.682    3.564  5615.246    208.50   13.93    3.01  5618.26     .00    4.11     4.52    5.000     .000   .00   1   .0
       -|-       -|-       -|-       -|-       -|-      -|-     -|-       -|-     -|-      -|-      -|-      -|-      -|-     |-
   8.330    .0214                                        .0083      .07     3.56    1.35    2.64    .013       .00   .00  PIPE
       |         |         |         |         |         |       |         |       |       |       |       |       |       |
3367.447  5611.860    3.729  5615.588    208.50   13.28    2.74  5618.33     .00    4.11     4.35    5.000     .000   .00   1   .0
       -|-       -|-       -|-       -|-       -|-      -|-     -|-       -|-     -|-      -|-      -|-      -|-      -|-     |-
   4.896    .0214                                        .0074      .04     3.73    1.23    2.64    .013       .00   .00  PIPE
       |         |         |         |         |         |       |         |       |       |       |       |       |       |
3372.343  5611.964    3.909  5615.874    208.50   12.66    2.49  5618.36     .00    4.11     4.13    5.000     .000   .00   1   .0
       -|-       -|-       -|-       -|-       -|-      -|-     -|-       -|-     -|-      -|-      -|-      -|-      -|-     |-
   1.657    .0214                                        .0067      .01     3.91    1.12    2.64    .013       .00   .00  PIPE
       |         |         |         |         |         |       |         |       |       |       |       |       |       |
3374.000  5612.000    4.112  5616.112    208.50   12.07    2.26  5618.37     .00    4.11     3.82    5.000     .000   .00   1   .0
       -|-       -|-       -|-       -|-       -|-      -|-     -|-       -|-     -|-      -|-      -|-      -|-      -|-     |-
```

ATTACHMENT 10

Water Surface Pressure Gradient for Windows (WSPGW) Analysis Proposed Option No. 2 (Lateral)

Note: This Attachment contains the WSPGW water surface profile results for the Proposed Option No. 2 lateral pipe, from Pine Avenue to junction point with the primary Option No. 2 pipe.

```
FILE: lat2.WSW                          W S P G W  - EDIT LISTING - Version 14.06              Date: 7- 8-2009  Time:10:55:54
                                   WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING                                PAGE    1
 CARD  SECT  CHN   NO OF  AVE PIER  HEIGHT 1  BASE    ZL    ZR   INV   Y(1)  Y(2)  Y(3)  Y(4)  Y(5)  Y(6)  Y(7)  Y(8)  Y(9)  Y(10)
 CODE   NO   TYPE PIER/PIP WIDTH    DIAMETER  WIDTH              DROP

 CD      1    4      1             4.000
 CD      2    4      1             4.000
                                                W S P G W                                                          PAGE NO   1
                             WATER SURFACE PROFILE - TITLE CARD LISTING
HEADING LINE NO 1 IS -
                               Option 2 Lateral From Pine St
HEADING LINE NO 2 IS -
                               Connects to Main Pipe at Intersection With Hwy 18
HEADING LINE NO 3 IS -

                                                W S P G W                                                          PAGE NO   2
                             WATER SURFACE PROFILE - ELEMENT CARD LISTING
 ELEMENT NO   1 IS A SYSTEM OUTLET     *         *     *
                     U/S DATA   STATION    INVERT  SECT                                    W S ELEV
                                -950.000 5602.780    2                                      5605.900
 ELEMENT NO   2 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                                -384.600 5610.000    2              .013                          .000     .000      .000     0
 ELEMENT NO   3 IS A SYSTEM HEADWORKS                  *                    *
                     U/S DATA   STATION    INVERT  SECT                                    W S ELEV
                                -384.600 5610.000    2                                     5610.000
 FILE: lat2.WSW                          W S P G W - CIVILDESIGN Version 14.06                                      PAGE    1
                               Program Package Serial Number: 1521
                                          WATER SURFACE PROFILE LISTING                   Date: 7- 8-2009  Time:10:55:57
                           Option 2 Lateral From Pine St
                             Connects to Main Pipe at Intersection With Hwy 18

*************************************************************************************************************************** ********
         | Invert  |  Depth  |  Water  |    Q    |  Vel     Vel  |  Energy | Super |Critical|Flow Top|Height/|Base Wt|      |No Wth
 Station |  Elev   |  (FT)   |  Elev   |  (CFS)  | (FPS)    Head |  Grd.El.|  Elev | Depth  | Width  |Dia.-FT|or I.D.|  ZL  |Prs/Pip
         -|       -|       -|       -|       -|       -|     -|       -|     -|       -|       -|       -|       -|     -|
 L/Elem  |Ch Slope |        |        |        |        SF Ave|    HF   |SE Dpth|Froude N|Norm Dp |  "N"  | X-Fall|  ZR  |Type Ch
*********|*********|********|********|********|*******|*******|*********|*******|********|********|*******|*******|***** |*******
         |         |        |        |        |       |       |         |       |        |        |       |       |      |
 -950.000  5602.780    2.370  5605.150    107.00   13.79    2.95  5608.10     .00    3.13     3.93    4.000     .000   .00   1   .0
         -|       -|       -|       -|       -|       -|     -|       -|     -|       -|       -|       -|       -|     -|
  112.405    .0128                                        .0128     1.44     2.37    1.73     2.37    .013       .00   .00  PIPE
         |         |        |        |        |       |       |         |       |        |        |       |       |      |
 -837.595  5604.215    2.370  5606.586    107.00   13.79    2.95  5609.54     .00    3.13     3.93    4.000     .000   .00   1   .0
         -|       -|       -|       -|       -|       -|     -|       -|     -|       -|       -|       -|       -|     -|
  237.690    .0128                                        .0124     2.95     2.37    1.73     2.37    .013       .00   .00  PIPE
         |         |        |        |        |       |       |         |       |        |        |       |       |      |
 -599.904  5607.250    2.413  5609.664    107.00   13.50    2.83  5612.50     .00    3.13     3.91    4.000     .000   .00   1   .0
         -|       -|       -|       -|       -|       -|     -|       -|     -|       -|       -|       -|       -|     -|
  115.439    .0128                                        .0114     1.32     2.41    1.67     2.37    .013       .00   .00  PIPE
         |         |        |        |        |       |       |         |       |        |        |       |       |      |
 -484.466  5608.725    2.512  5611.237    107.00   12.88    2.57  5613.81     .00    3.13     3.87    4.000     .000   .00   1   .0
         -|       -|       -|       -|       -|       -|     -|       -|     -|       -|       -|       -|       -|     -|
   48.229    .0128                                        .0101      .49     2.51    1.55     2.37    .013       .00   .00  PIPE
         |         |        |        |        |       |       |         |       |        |        |       |       |      |
 -436.237  5609.340    2.618  5611.958    107.00   12.28    2.34  5614.30     .00    3.13     3.80    4.000     .000   .00   1   .0
         -|       -|       -|       -|       -|       -|     -|       -|     -|       -|       -|       -|       -|     -|
   26.331    .0128                                        .0090      .24     2.62    1.43     2.37    .013       .00   .00  PIPE
         |         |        |        |        |       |       |         |       |        |        |       |       |      |
 -409.905  5609.677    2.731  5612.408    107.00   11.70    2.13  5614.54     .00    3.13     3.72    4.000     .000   .00   1   .0
         -|       -|       -|       -|       -|       -|     -|       -|     -|       -|       -|       -|       -|     -|
   15.076    .0128                                        .0080      .12     2.73    1.32     2.37    .013       .00   .00  PIPE
         |         |        |        |        |       |       |         |       |        |        |       |       |      |
 -394.830  5609.869    2.853  5612.722    107.00   11.16    1.93  5614.66     .00    3.13     3.62    4.000     .000   .00   1   .0
         -|       -|       -|       -|       -|       -|     -|       -|     -|       -|       -|       -|       -|     -|
```

```
   7.832    .0128                                          .0071      .06     2.85    1.21    2.37    .013       .00   .00  PIPE
        |         |        |         |         |              |        |       |       |       |       |       |      |    |
-386.998  5609.969    2.984  5612.954    107.00   10.64    1.76  5614.71     .00    3.13    3.48    4.000     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-     -|-     -|-     -|-     -|-     |-
   2.398    .0128                                          .0064      .02     2.98    1.10    2.37    .013       .00   .00  PIPE
        |         |        |         |         |              |        |       |       |       |       |       |      |    |
-384.600  5610.000    3.130  5613.130    107.00   10.14    1.60  5614.73     .00    3.13    3.30    4.000     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-     -|-     -|-     -|-     -|-     |-
```

ATTACHMENT 11

Pump Analysis

Note: This Attachment contains an analysis to determine the pump size for Phase 3 of either Option No. 1 or No. 2. The pump would be located at the intersection of Apache Trail and Blackfoot Trail West. This analysis shows the power and capacity required to pump the maximum 100-Year flow rate of 17.40 CFS from the 3.99-acre drainage area to the proposed 30-inch drain pipe through the existing lumber yard to Pine Avenue.

```
  CIVILCADD/CIVILDESIGN  Engineering Software, (c) 2004   Version 7.0
---------------------------------------------------------------------
Lift Pump - Rimforest



---------------------------------------------------------------------


Program License Serial Number 4500

---------------------------------------------------------------------
                *** Pump or Turbine Analysis ***

        Upstream (headworks) Elevation =   5610.000(Ft.)
        Downstream (outlet) Elevation =   5616.000(Ft.)
        Runoff/Flow Distance =    405.000(Ft.)
        Maximum flow rate in channel(s) =     12.800(CFS)
---------------------------------------------------------------------



Pressure or depth at pipe inlet =      0.000(Ft.)
Pressure or depth at pipe outlet =      0.000(Ft.)
Difference in static head (inlet - outlet) =     -6.000(Ft.)
Pipe size =     18.00(In.)
Number of pipes = 1, Mannings 'N' =    0.013

PRESSURE FLOW CONDITION:

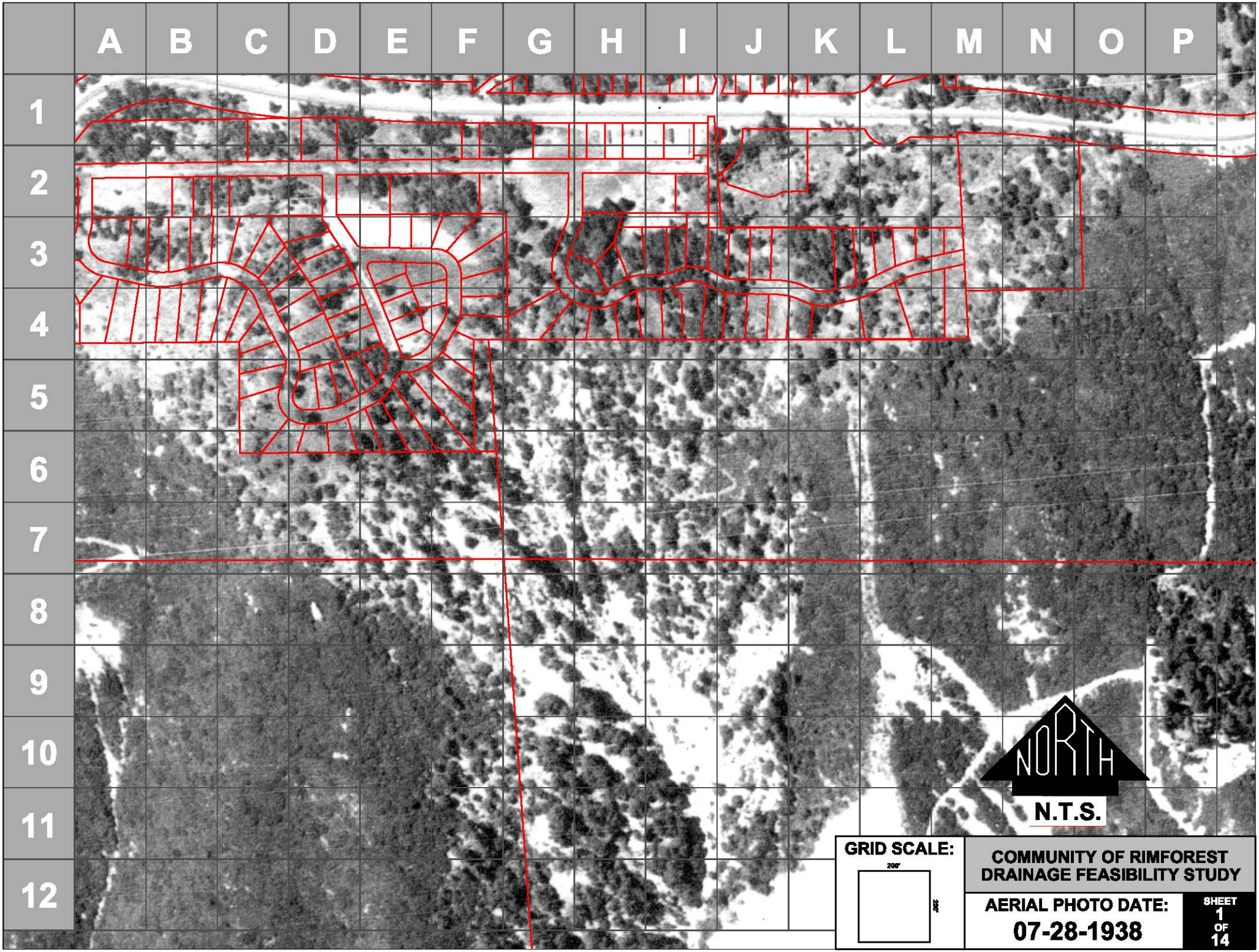
Following is data if FULL FLOW rate of     12.800(CFS) is
forced through pipe(s):
Velocity =      7.243(Ft/s)
Pressure required at inlet =     13.234(Ft.)
Pipe friction loss =      6.012(Ft.)
Minor Friction loss =      1.222(Ft.)  K-factor =   1.50


------------  Power Analysis -------------
Pump Analysis
Flow for pump/turbine =          5744.68  Gallons/Min.
Efficiency = 0.7000
Power  =     27.464  Horsepower
Electrical power =     20.480 kilowatts
---------------------------------------------------------------------


---------------------------------------------------------------------
```

ATTACHMENT 12

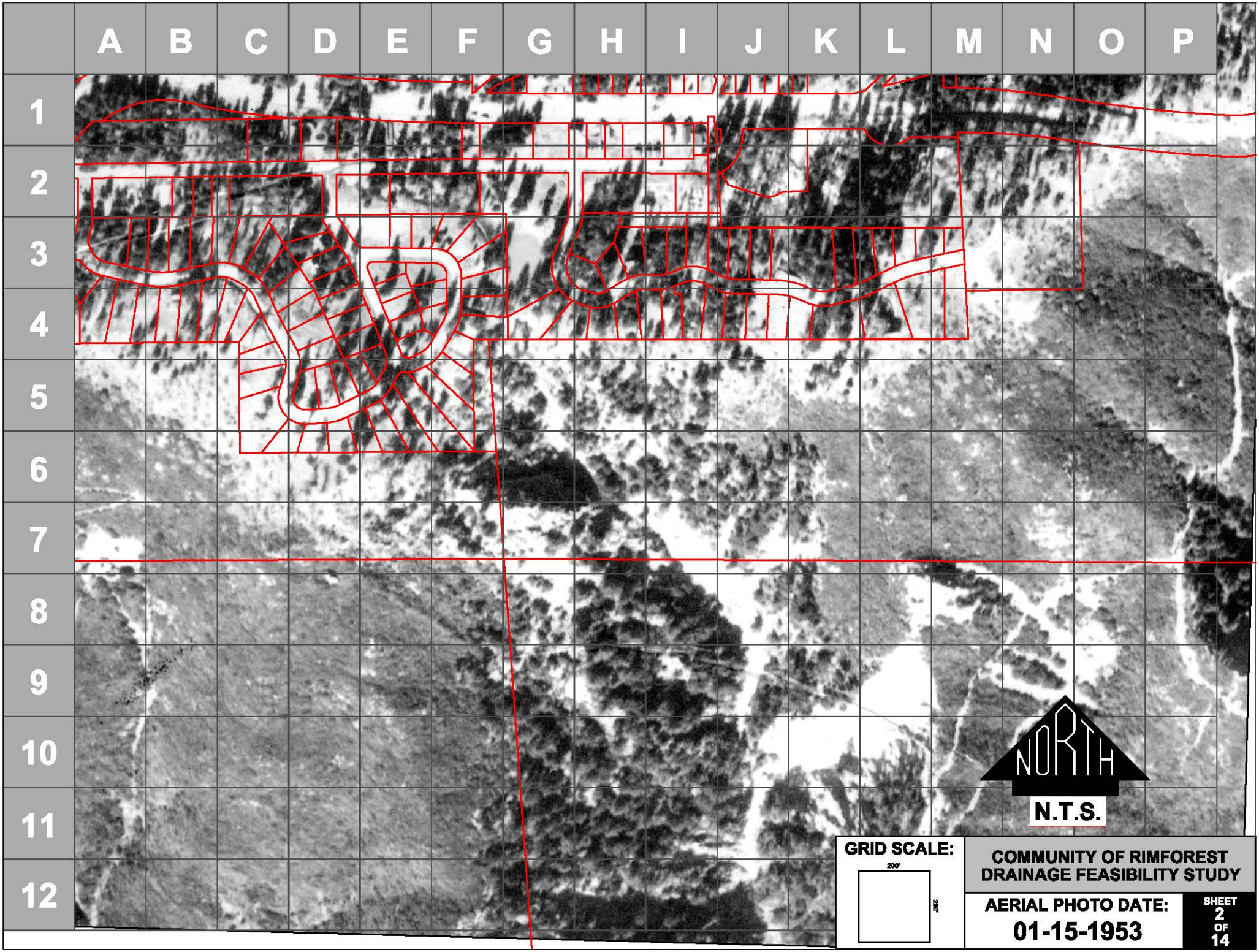
Aerial Photos Timeline (1938-2009)



COMMUNITY OF RIMFOREST
DRAINAGE FEASIBILITY STUDY

AERIAL PHOTO DATE:
07-28-1938

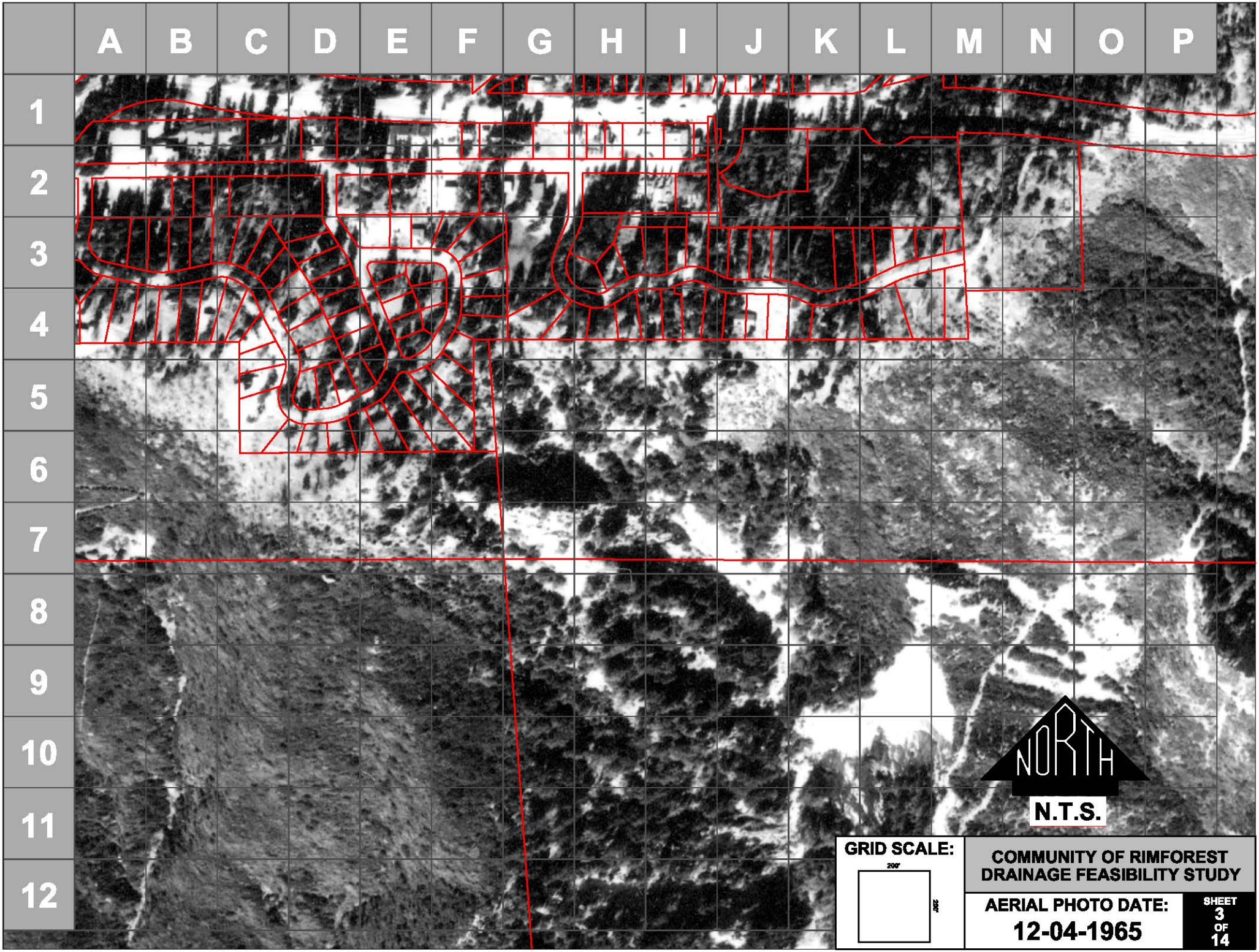
SHEET 1 OF 14



COMMUNITY OF RIMFOREST
DRAINAGE FEASIBILITY STUDY

AERIAL PHOTO DATE:
01-15-1953

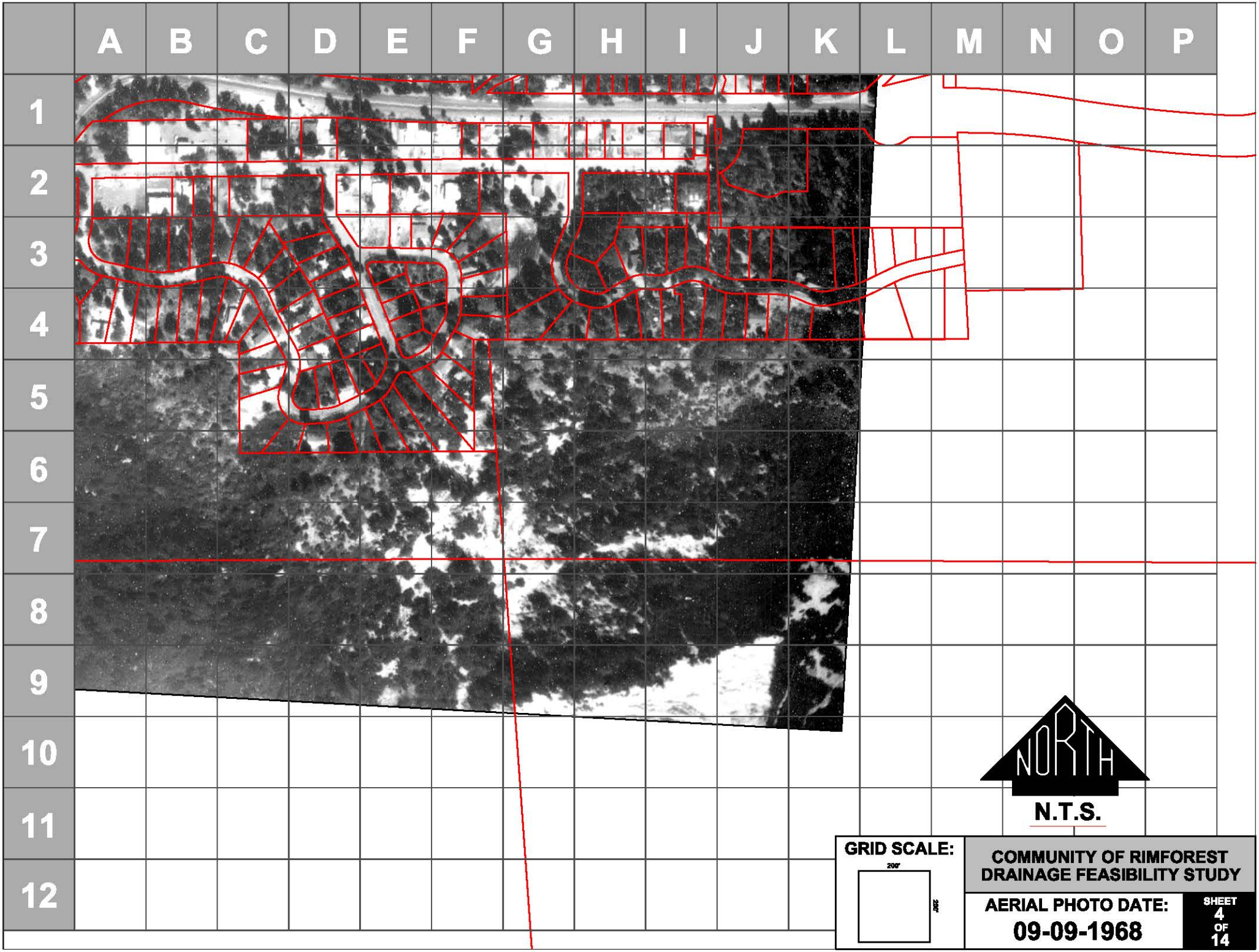
SHEET 2 OF 14



COMMUNITY OF RIMFOREST
DRAINAGE FEASIBILITY STUDY

AERIAL PHOTO DATE:
12-04-1965

SHEET 3 OF 14



COMMUNITY OF RIMFOREST
DRAINAGE FEASIBILITY STUDY

AERIAL PHOTO DATE:
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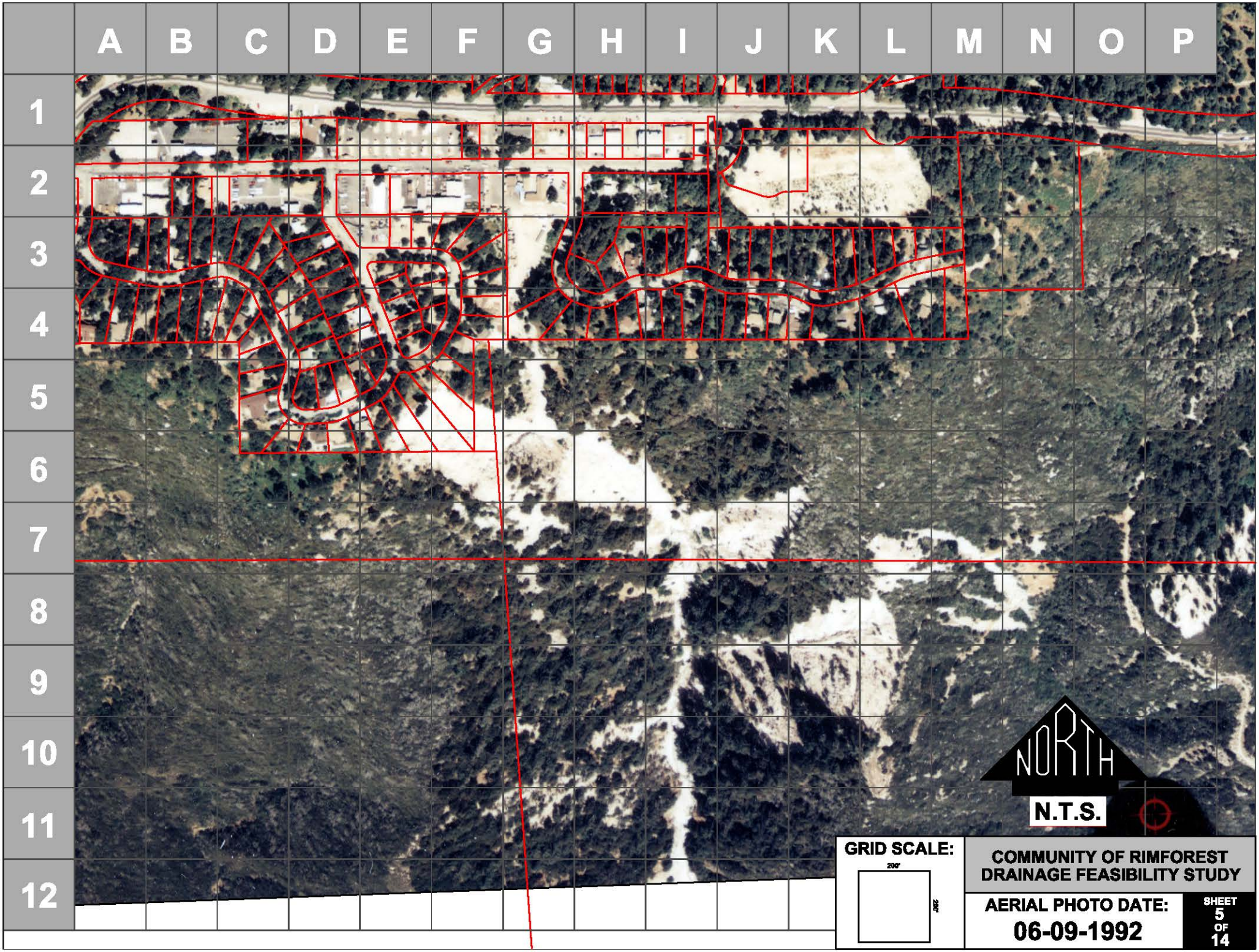
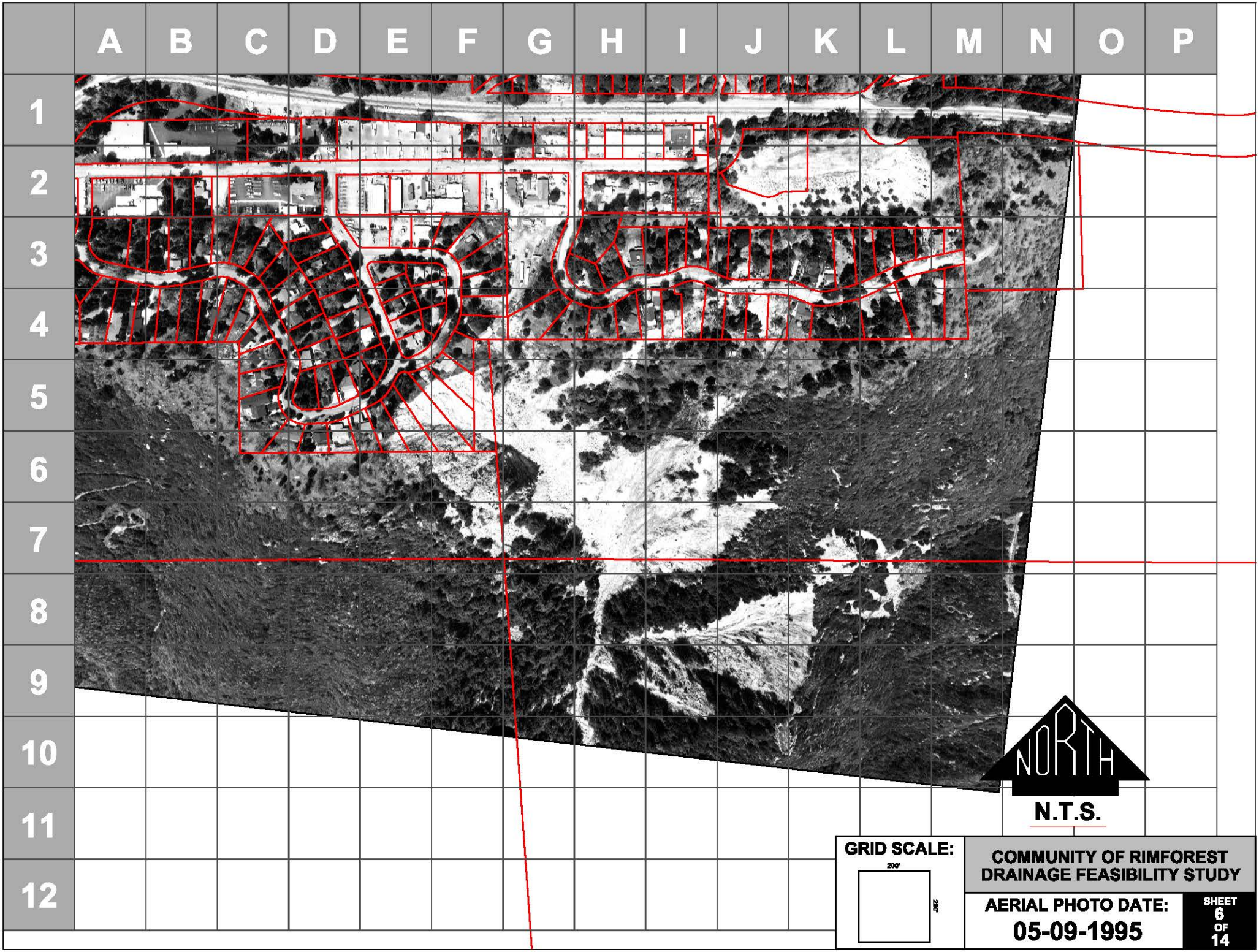
SHEET 4 OF 14



COMMUNITY OF RIMFOREST
DRAINAGE FEASIBILITY STUDY

AERIAL PHOTO DATE:
06-09-1992

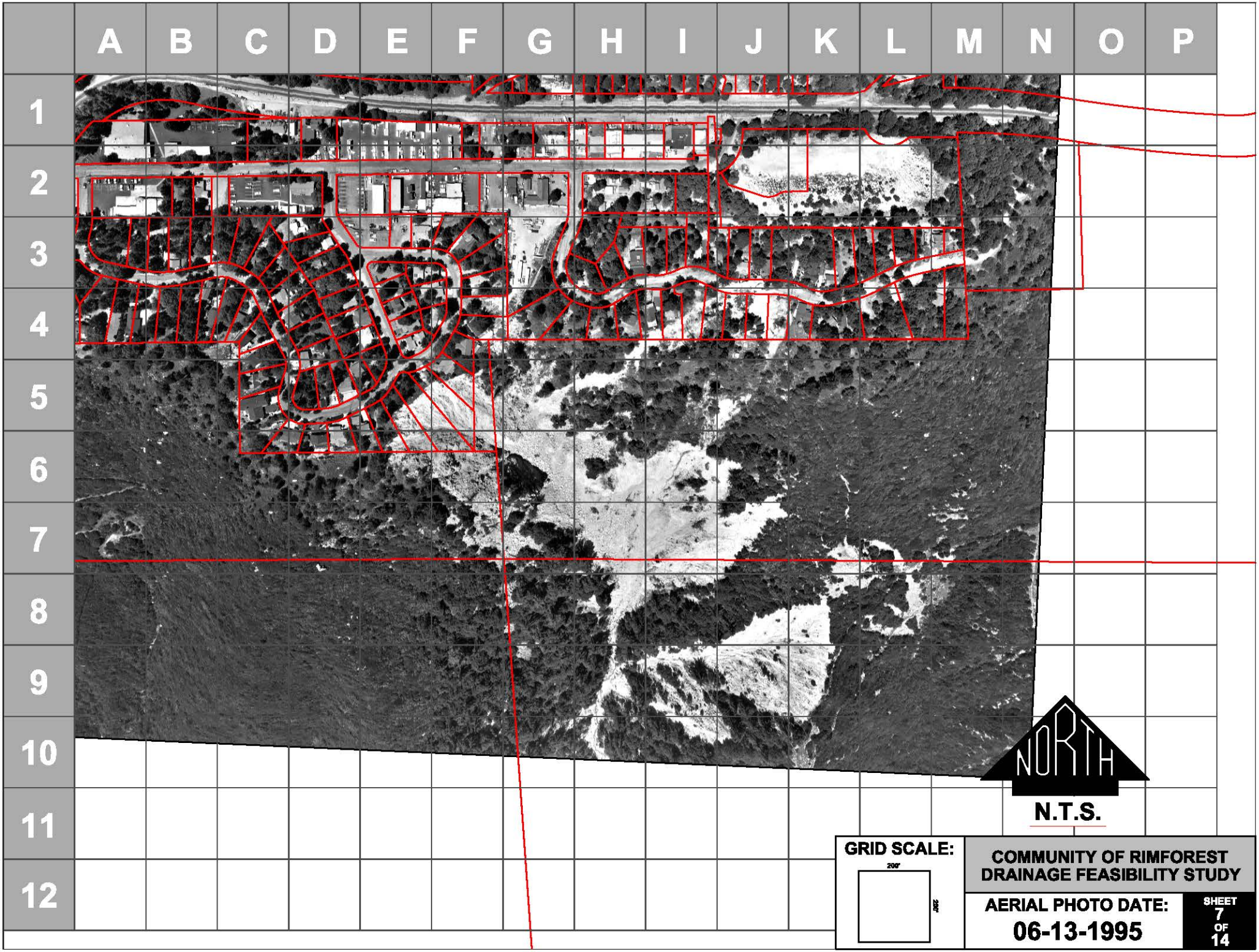
SHEET 5 OF 14



COMMUNITY OF RIMFOREST
DRAINAGE FEASIBILITY STUDY

AERIAL PHOTO DATE:
05-09-1995

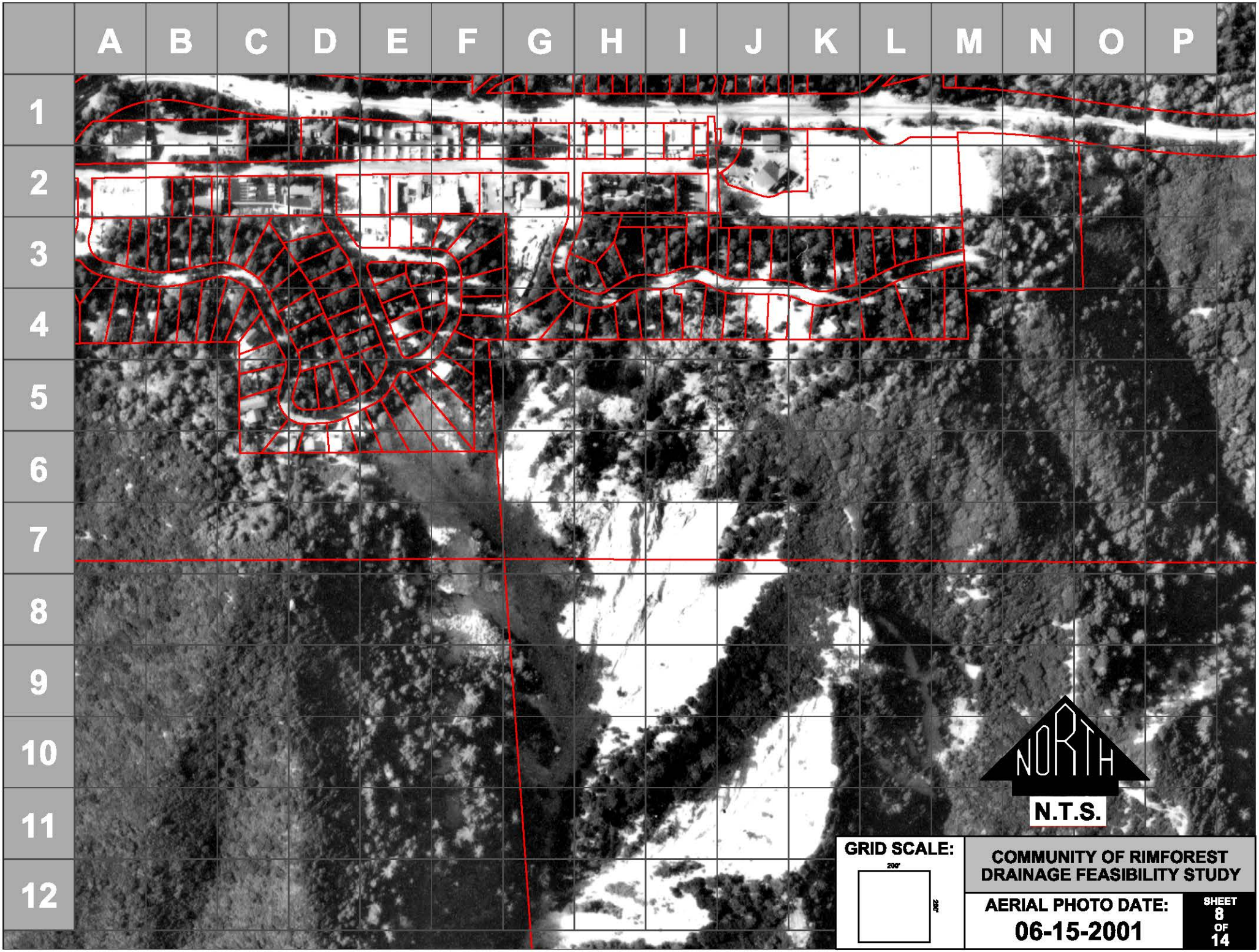
SHEET 6 OF 14



COMMUNITY OF RIMFOREST
DRAINAGE FEASIBILITY STUDY

AERIAL PHOTO DATE:
06-13-1995

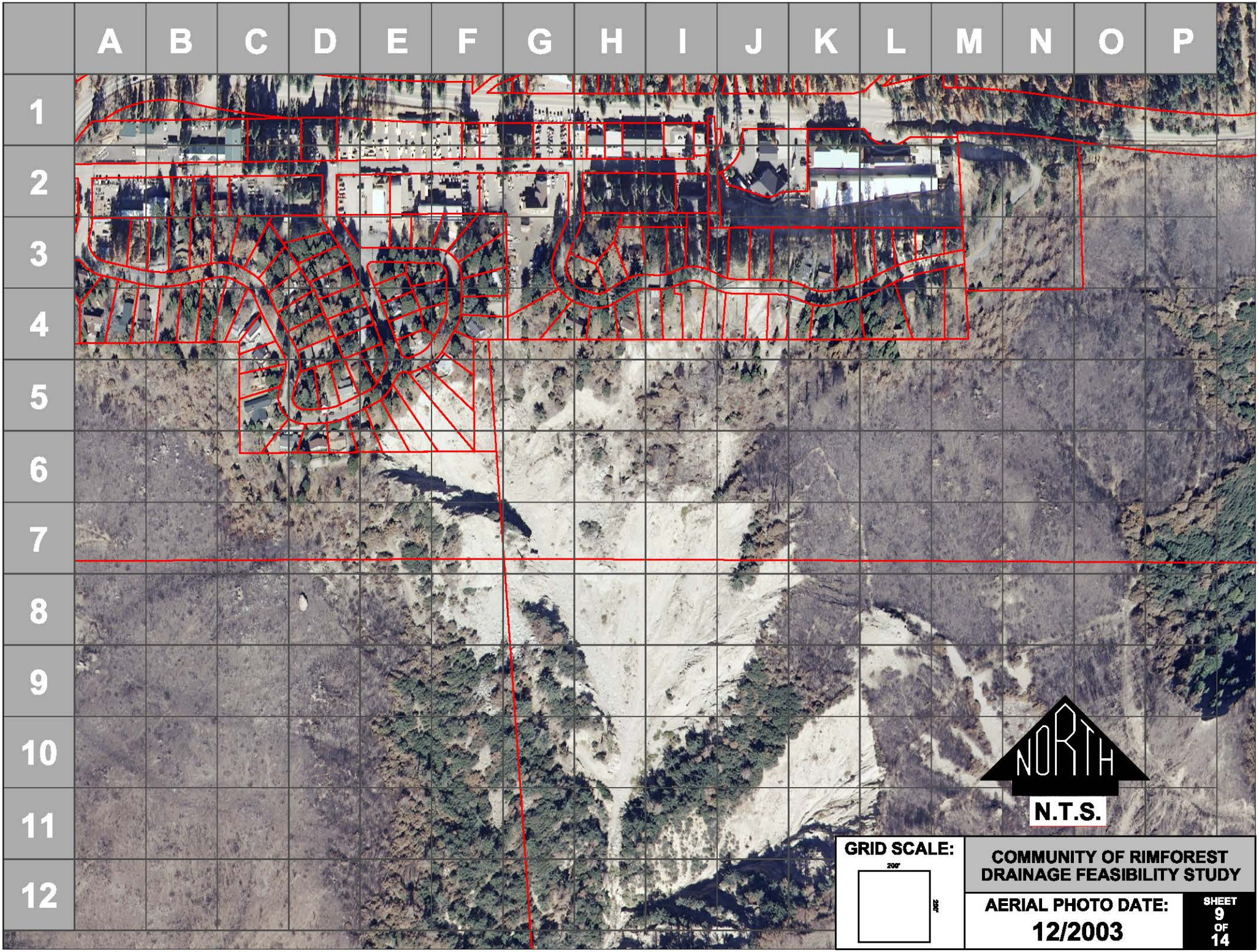
SHEET 7 OF 14



COMMUNITY OF RIMFOREST
DRAINAGE FEASIBILITY STUDY

AERIAL PHOTO DATE:
06-15-2001

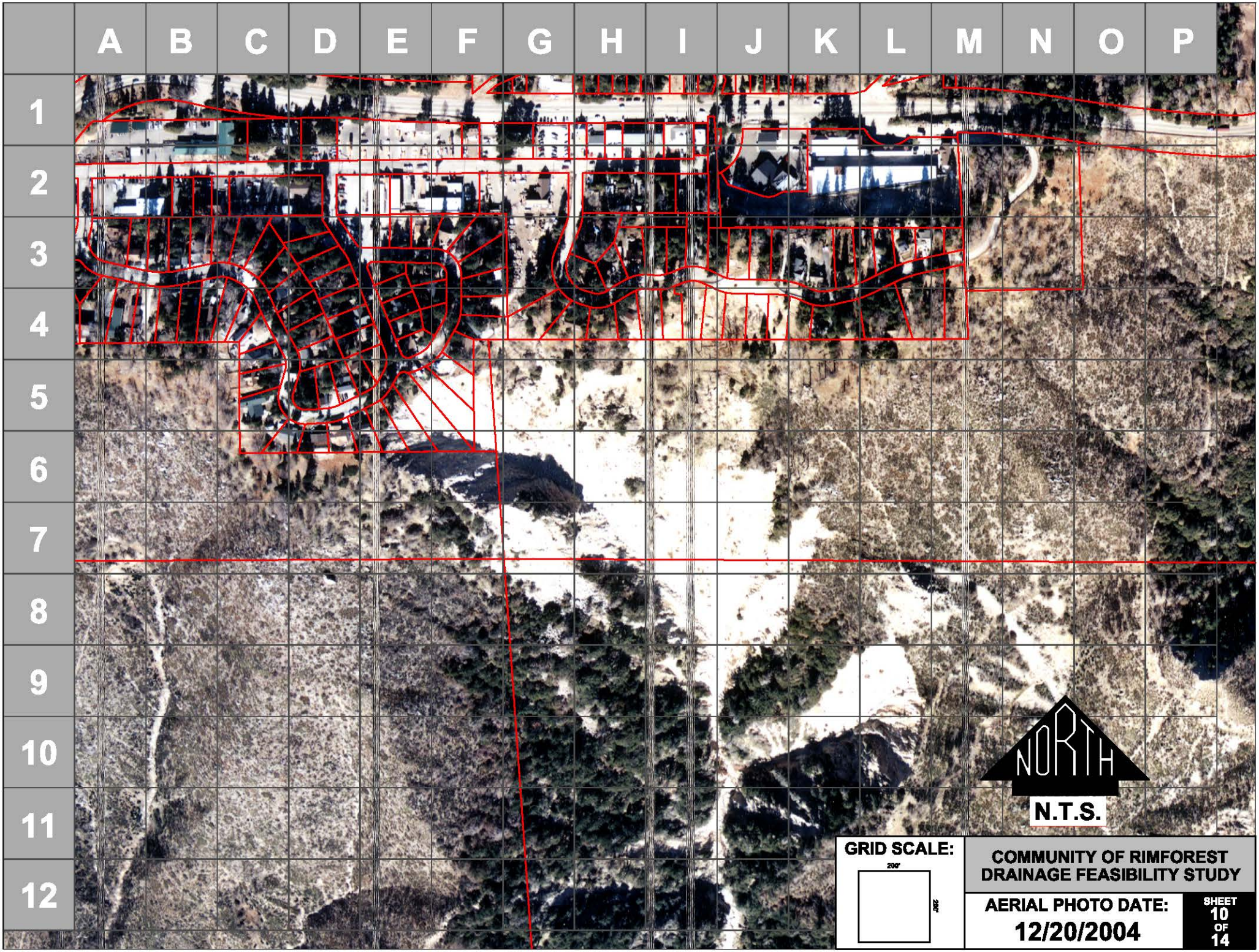
SHEET 8 OF 14



COMMUNITY OF RIMFOREST
DRAINAGE FEASIBILITY STUDY

AERIAL PHOTO DATE:
12/2003

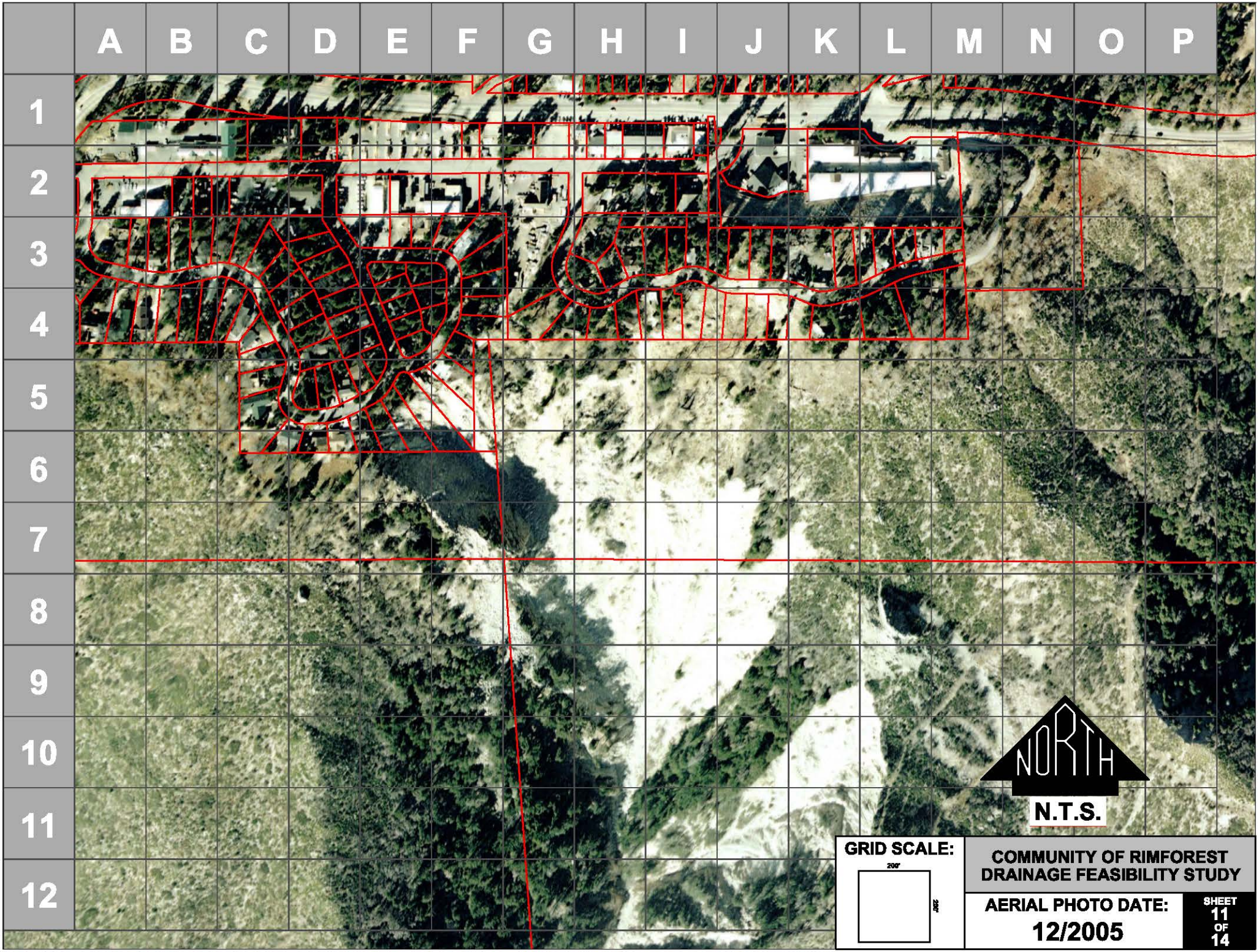
SHEET 9 OF 14



COMMUNITY OF RIMFOREST
DRAINAGE FEASIBILITY STUDY

AERIAL PHOTO DATE:
12/20/2004

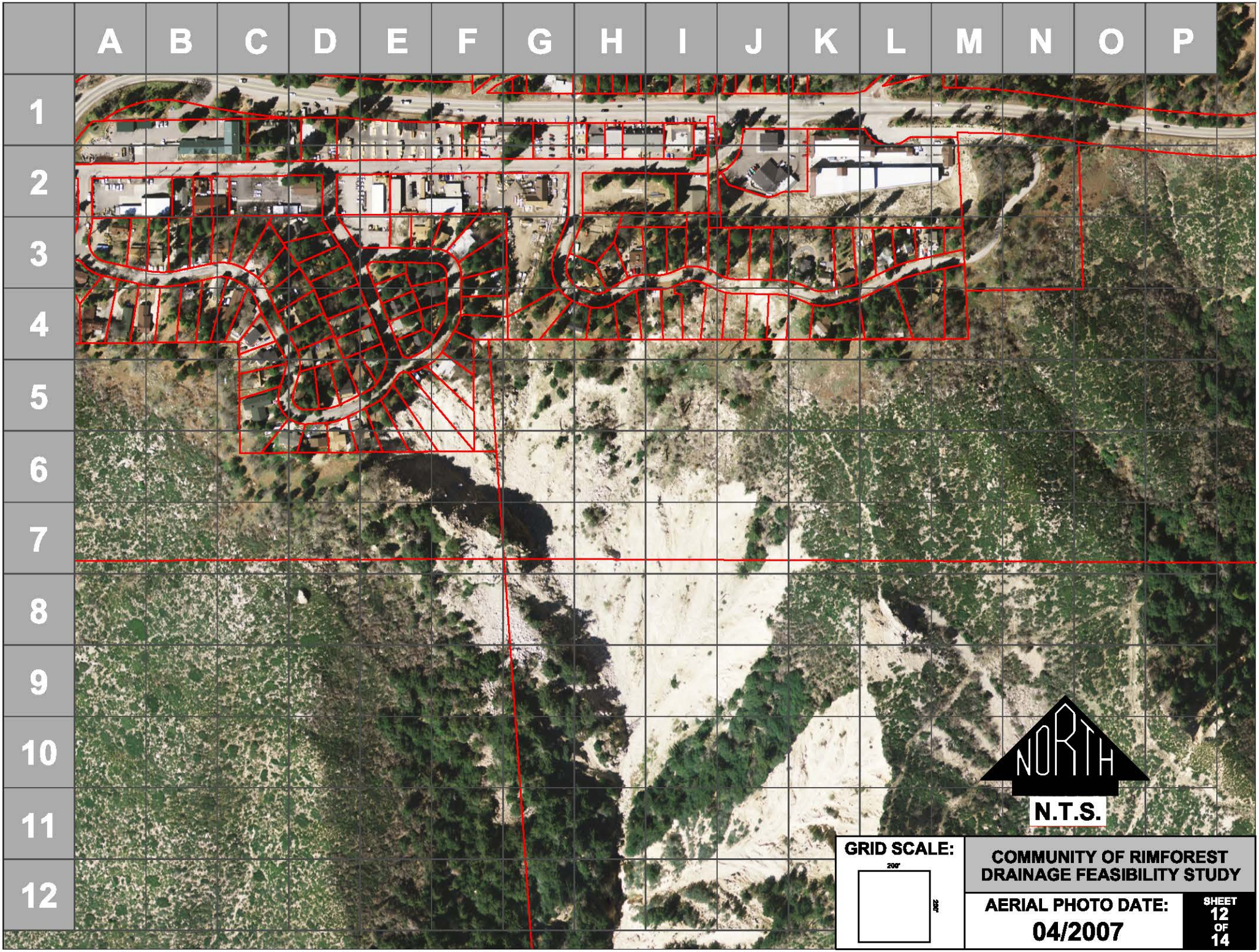
SHEET 10 OF 14



COMMUNITY OF RIMFOREST
DRAINAGE FEASIBILITY STUDY

AERIAL PHOTO DATE:
12/2005

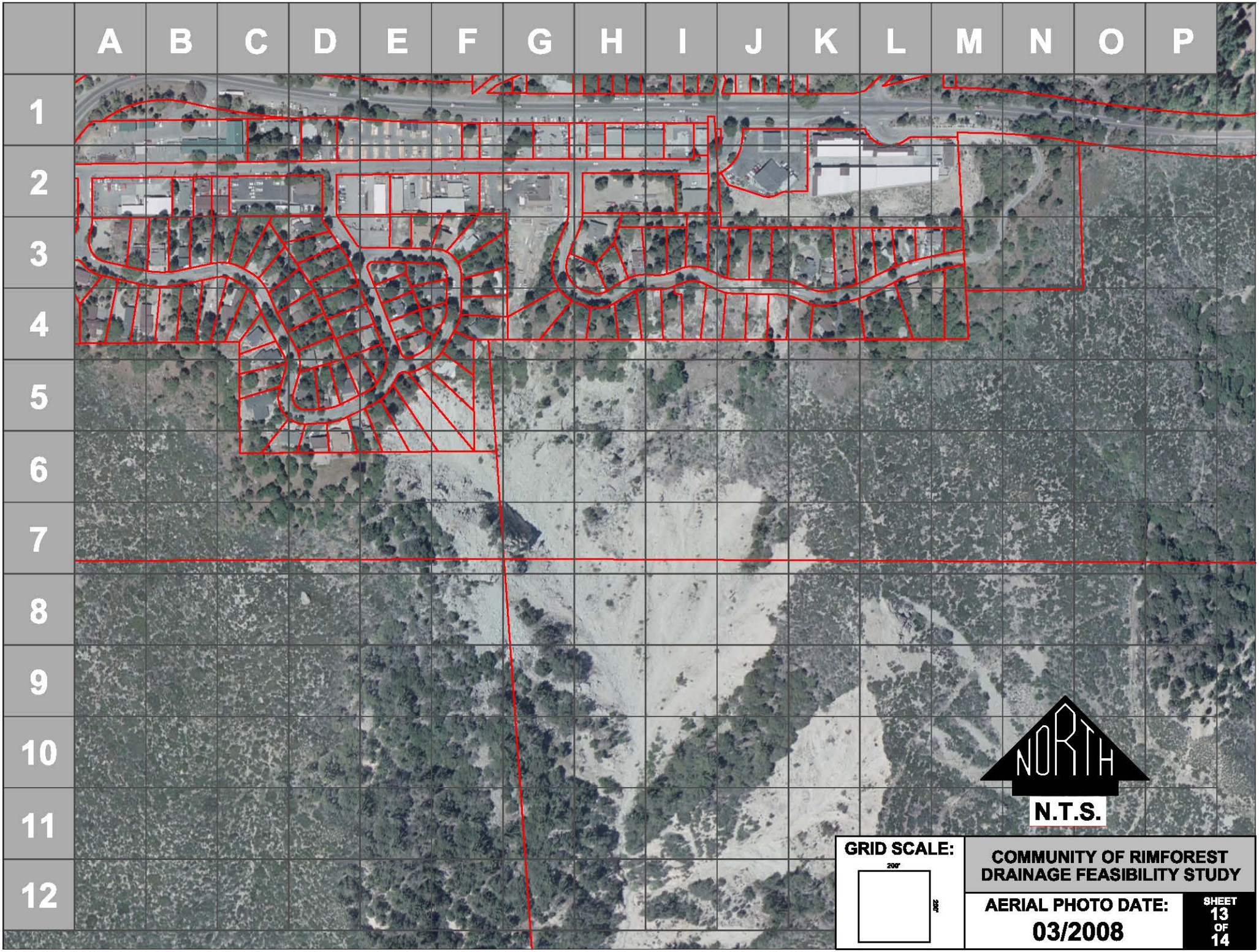
SHEET 11 OF 14



COMMUNITY OF RIMFOREST
DRAINAGE FEASIBILITY STUDY

AERIAL PHOTO DATE:
04/2007

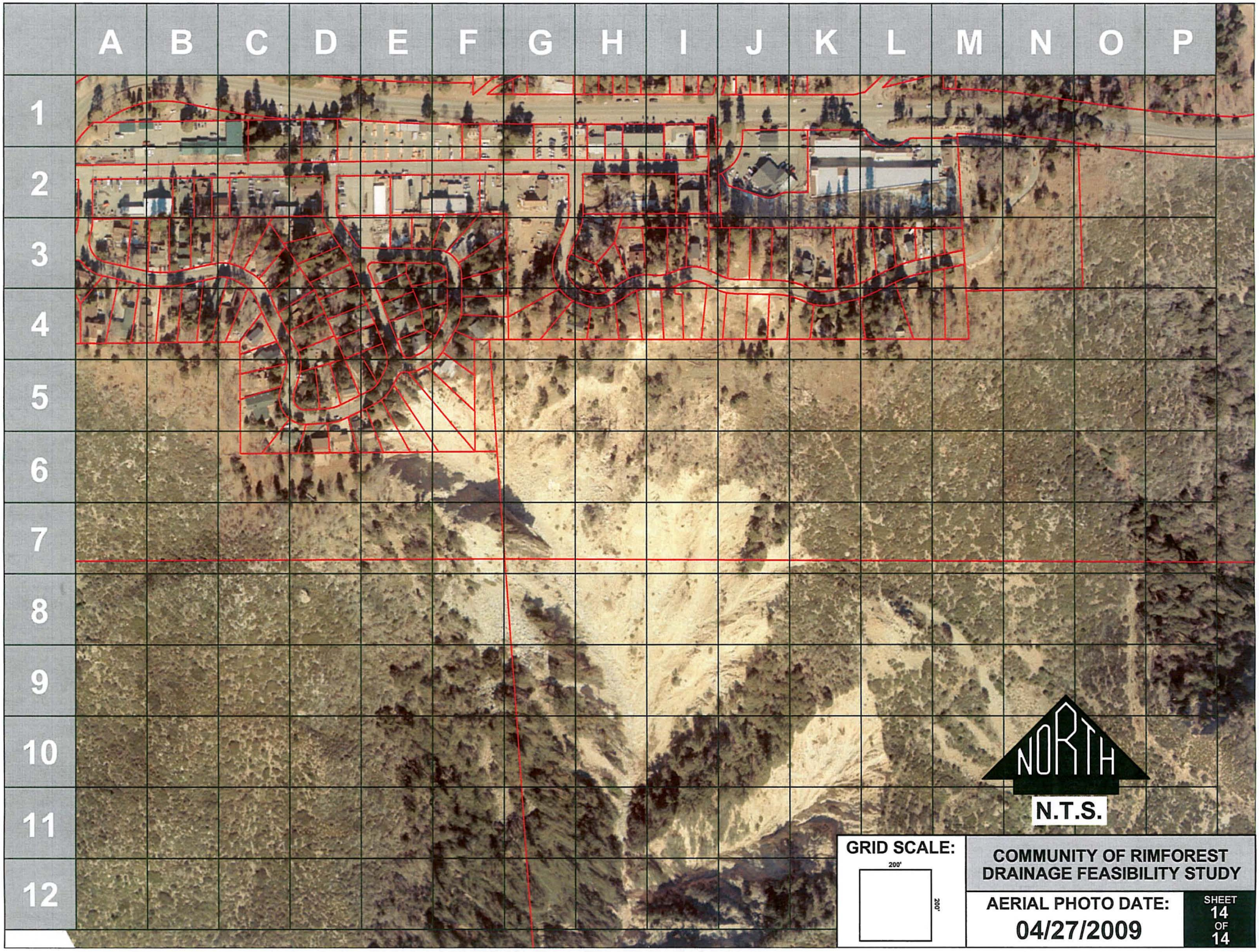
SHEET 12 OF 14



COMMUNITY OF RIMFOREST
DRAINAGE FEASIBILITY STUDY

AERIAL PHOTO DATE:
03/2008

SHEET 13 OF 14



COMMUNITY OF RIMFOREST
DRAINAGE FEASIBILITY STUDY

AERIAL PHOTO DATE:
04/27/2009

SHEET 14 OF 14

ATTACHMENT 13

Topographic Maps Timeline (1905-1996) & Discussion

Rimforest Topographic Map History

This attachment contains four topographic maps for historical comparison purposes.

1) The first map, the 1996 USGS current version compares very well with the new map prepared in this report, however, the contour interval is at 40' intervals. Using this map as a guide, a green poly-line was traced over Highway 18. This line was used as on overlay on top of the remaining historical maps for reference purposes.

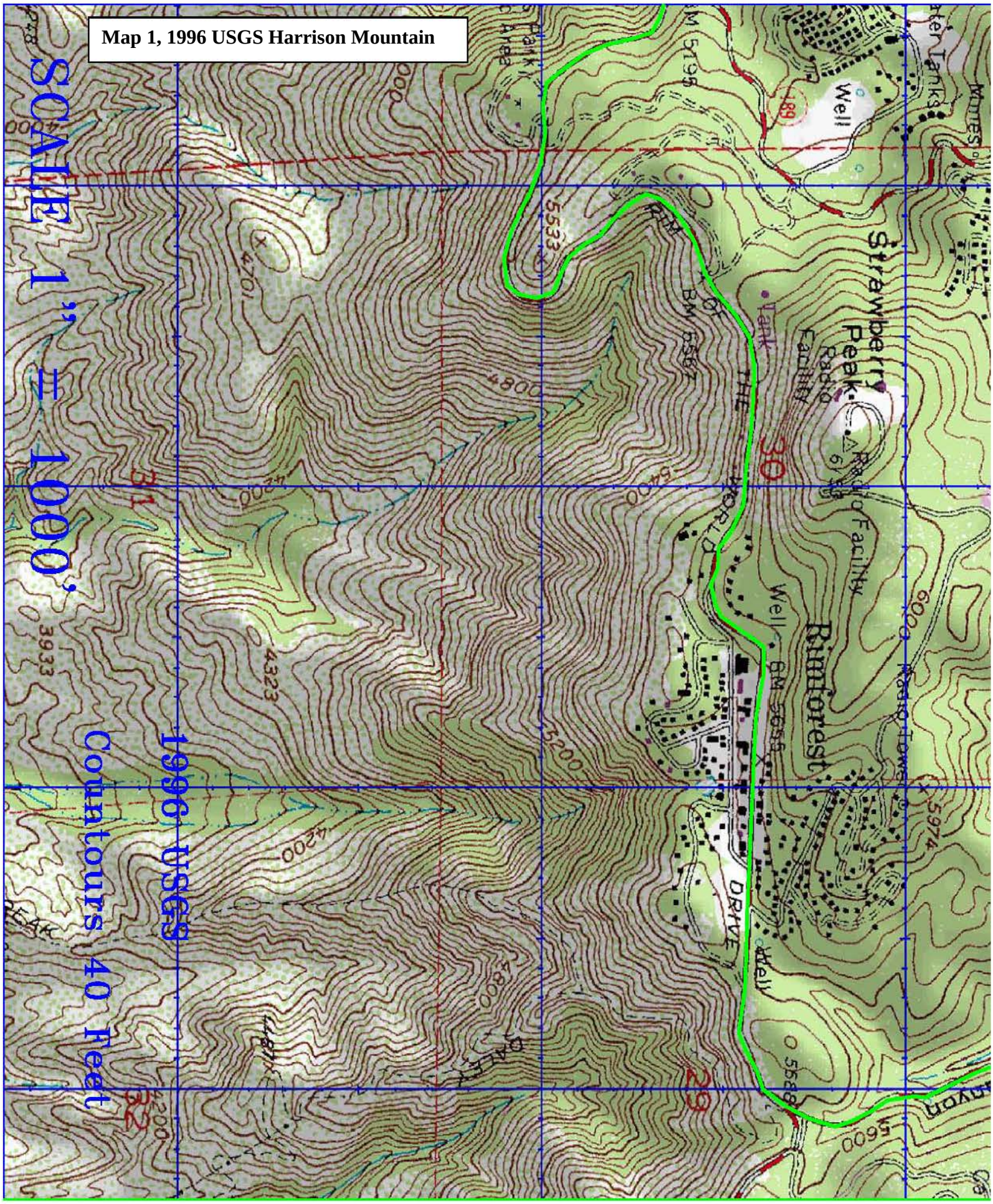
2) The second map, a 1953 USGS version has similar contours, except very little slope erosion appears on the south side of Rimforest. Note that the Blackfoot Trail road was interconnected before the later years erosion occurred. This map calculated topography from 1952 aerial photographs by multiplex methods.

3) The third map, a 1939 U. S. Department of the Interior Redlands Quadrangle is a reprint of the August 1901 edition. This map shows the Rimforest area before construction of Highway 18. Note that there are large differences in the contour data presented. The Strawberry Peak elevation is the same, and, some of the trails shown on the map are in the same location as present day roads. However there are large differences in data related to the western side of Highway 18, and higher elevations inside Rimforest, and ridgelines extending from Strawberry Peak. The map has 50-foot contour intervals.

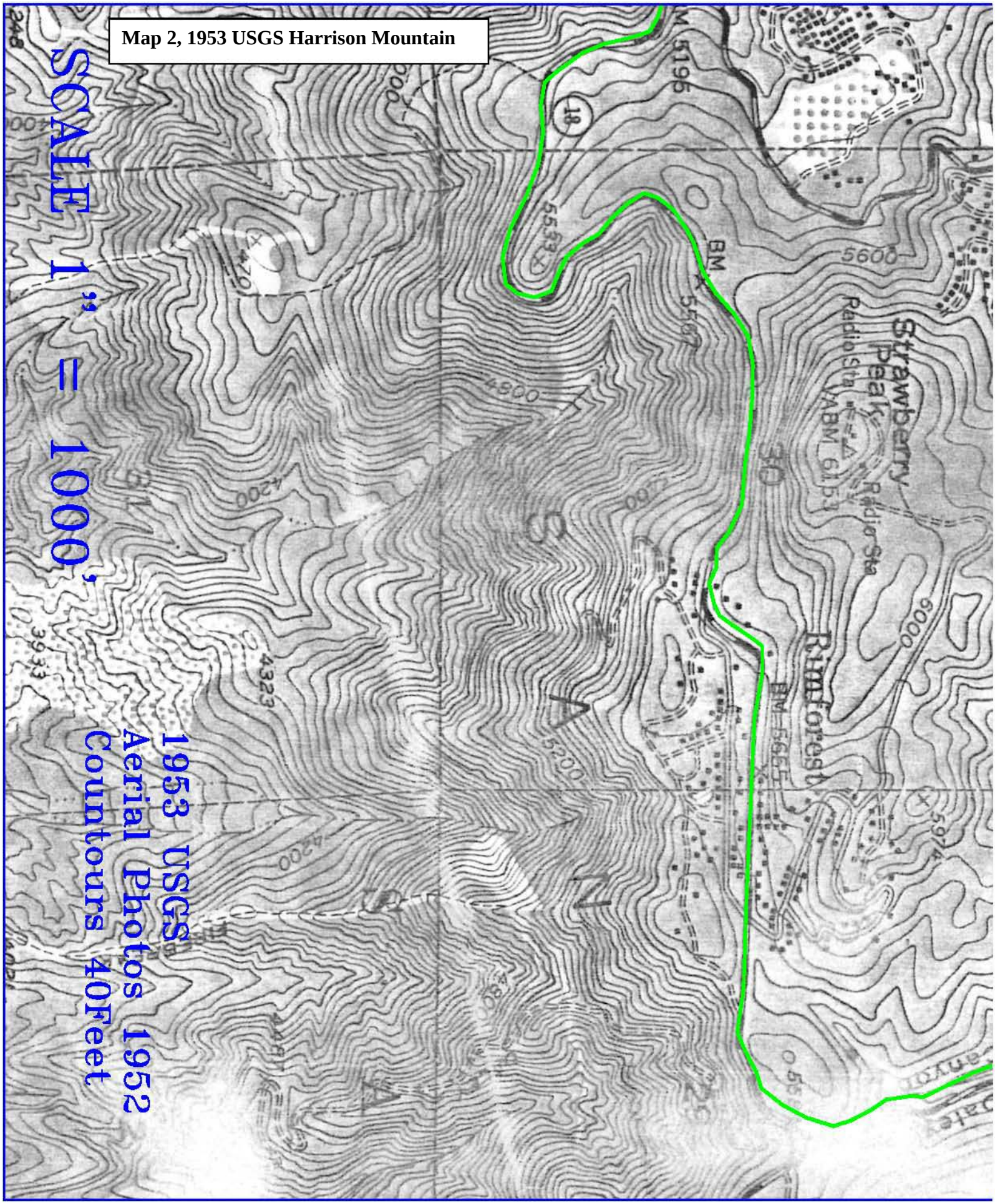
4) The fourth map, a 1905 Hydrologic Map of San Bernardino, Redlands and Vicinity. This map appears to have identical topographic data as the 1939 third map above.

It is of our opinion that the contour data shown in maps 3 and 4, are lacking in accuracy because of the surveying methods used. However, the maps are presented as part of this report as part of the investigation of the Rimforest erosion problems.

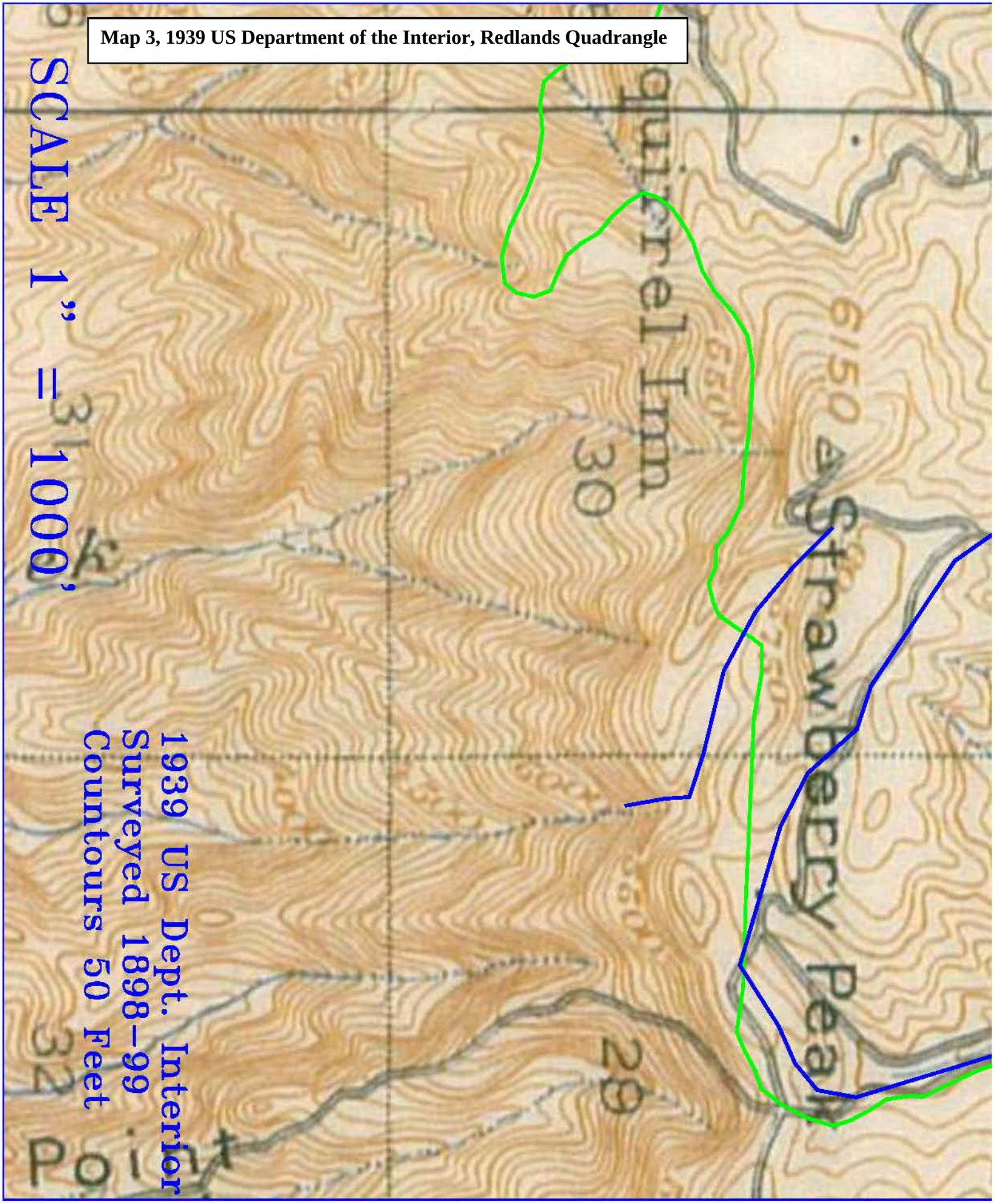
Map 1, 1996 USGS Harrison Mountain



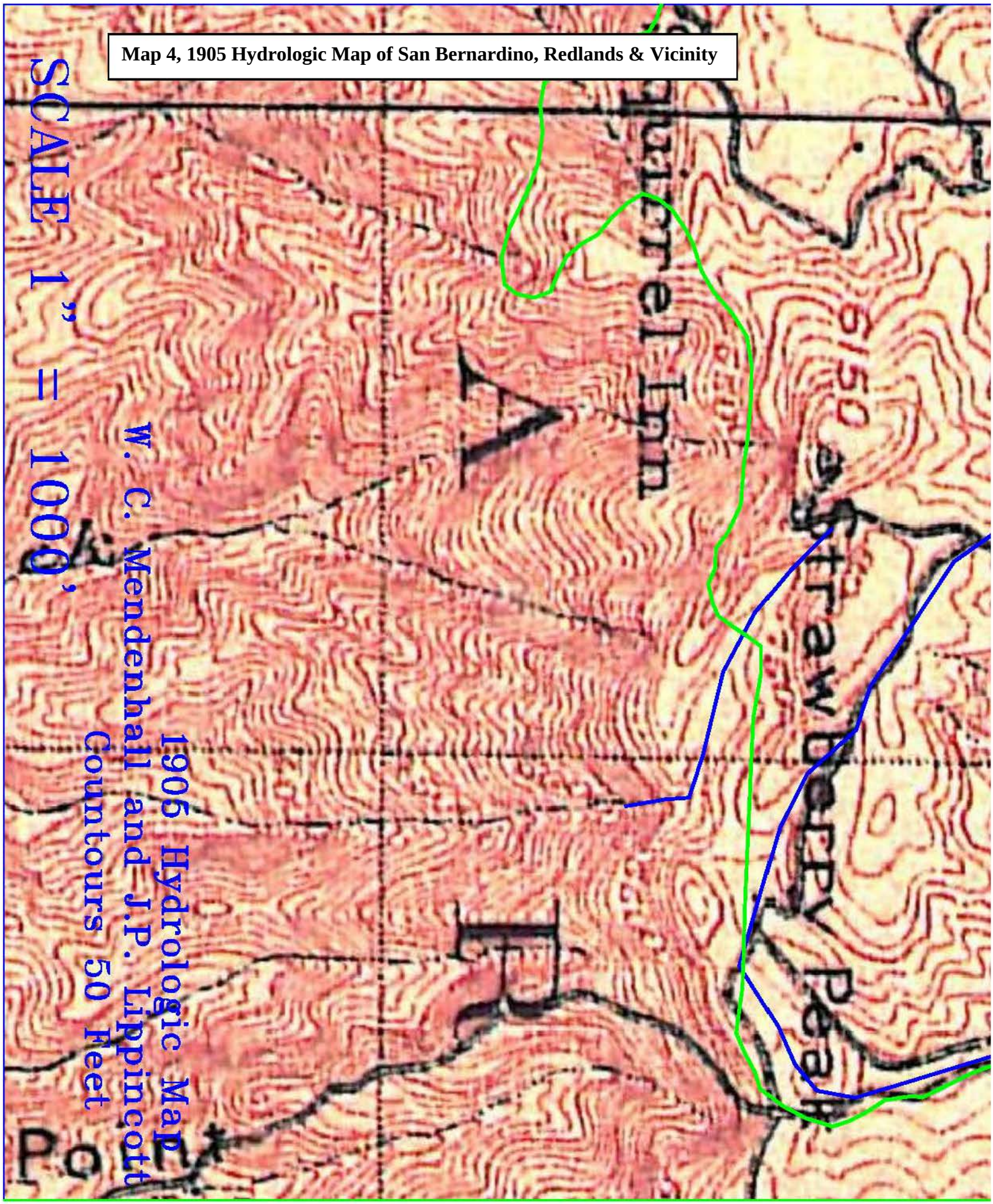
Map 2, 1953 USGS Harrison Mountain

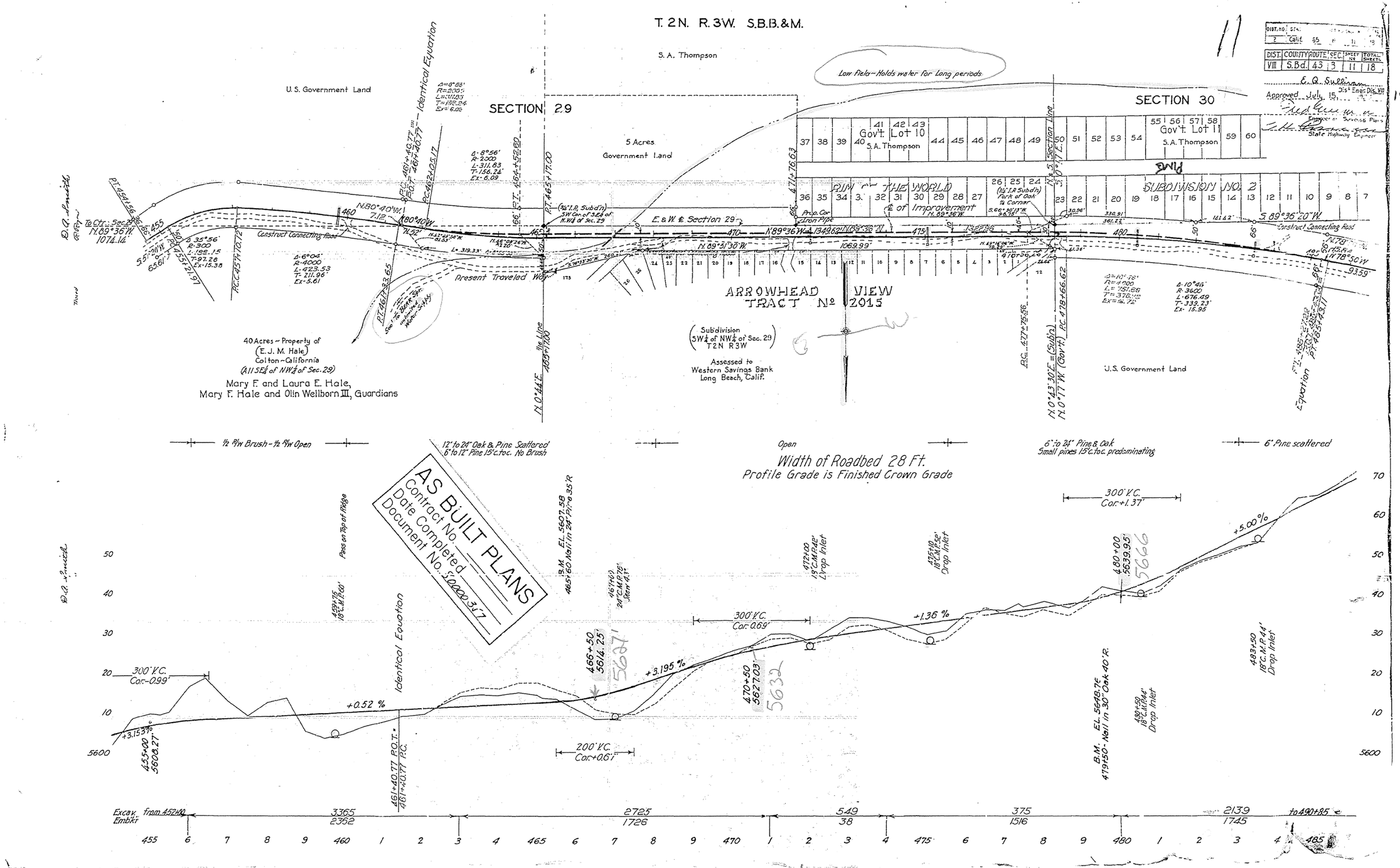


Map 3, 1939 US Department of the Interior, Redlands Quadrangle



Map 4, 1905 Hydrologic Map of San Bernardino, Redlands & Vicinity





DIST. NO. 2 Calif. 55

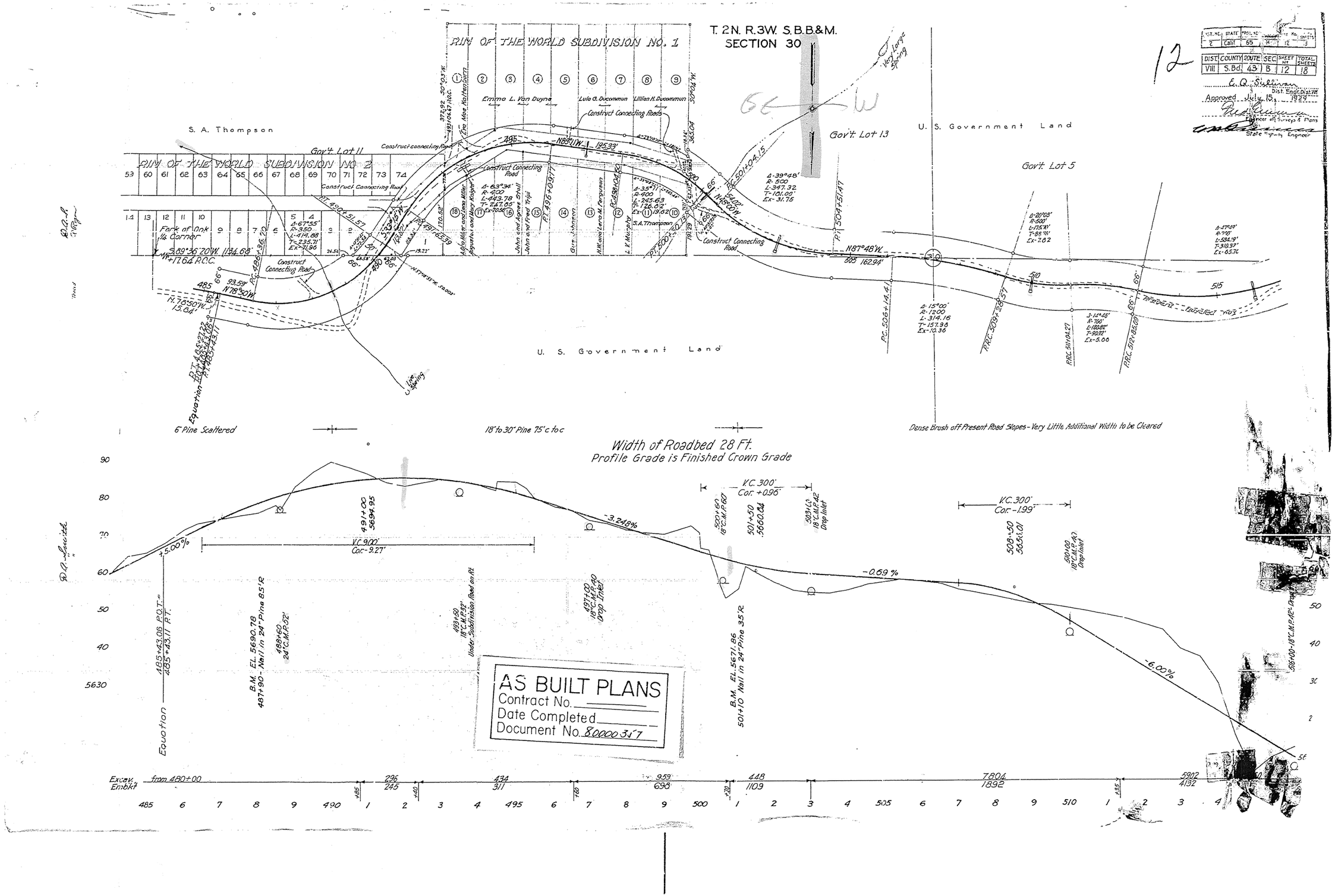
DIST.	COUNTY	ROUTE	SEC.	SHEET NO.	TOTAL SHEETS
VIII	S.Bd.	43	3	11	18

E. A. Sullivan
Dist. Engr. Dis. VIII

Approved July 15, 1929

Engineer of Bridge Plans

State Highway Engineer


T. 2N. R.3W. S.B.B.&M.
SECTION 30
RIM OF THE WORLD SUBDIVISION NO. 1
RIM OF THE WORLD SUBDIVISION NO. 2
S. A. Thompson
Gov't Lot 11
Gov't Lot 13
Gov't Lot 5
U. S. Government Land
Construct Connecting Roads
Construct Connecting Road
Fork of Oak
1/4 Corner
Equation
Dense Brush off Present Road Slopes - Very Little Additional Width to be Cleared
Width of Roadbed 28 Ft.
Profile Grade is Finished Crown Grade
V.C. 900'
Cor.-9.27'
V.C. 300'
Cor.-1.99'
-3.24%
-0.69%
-6.00%
B.M. EL. 5690.78
487+90 - Nail in 24" Pine 85'R
B.M. EL. 5671.86
501+10 Nail in 24" Pine 35'R
AS BUILT PLANS
Contract No.
Date Completed
Document No. 8000035-7
Excav.
Embkt
from 480+00
District VIII
County S.Bd.
Route 43
Approved July 15, 1929
State Highway Engineer

ATTACHMENT 14

Annual Runoff from Rimforest - Discussion

Annual Runoff Water From Rimforest

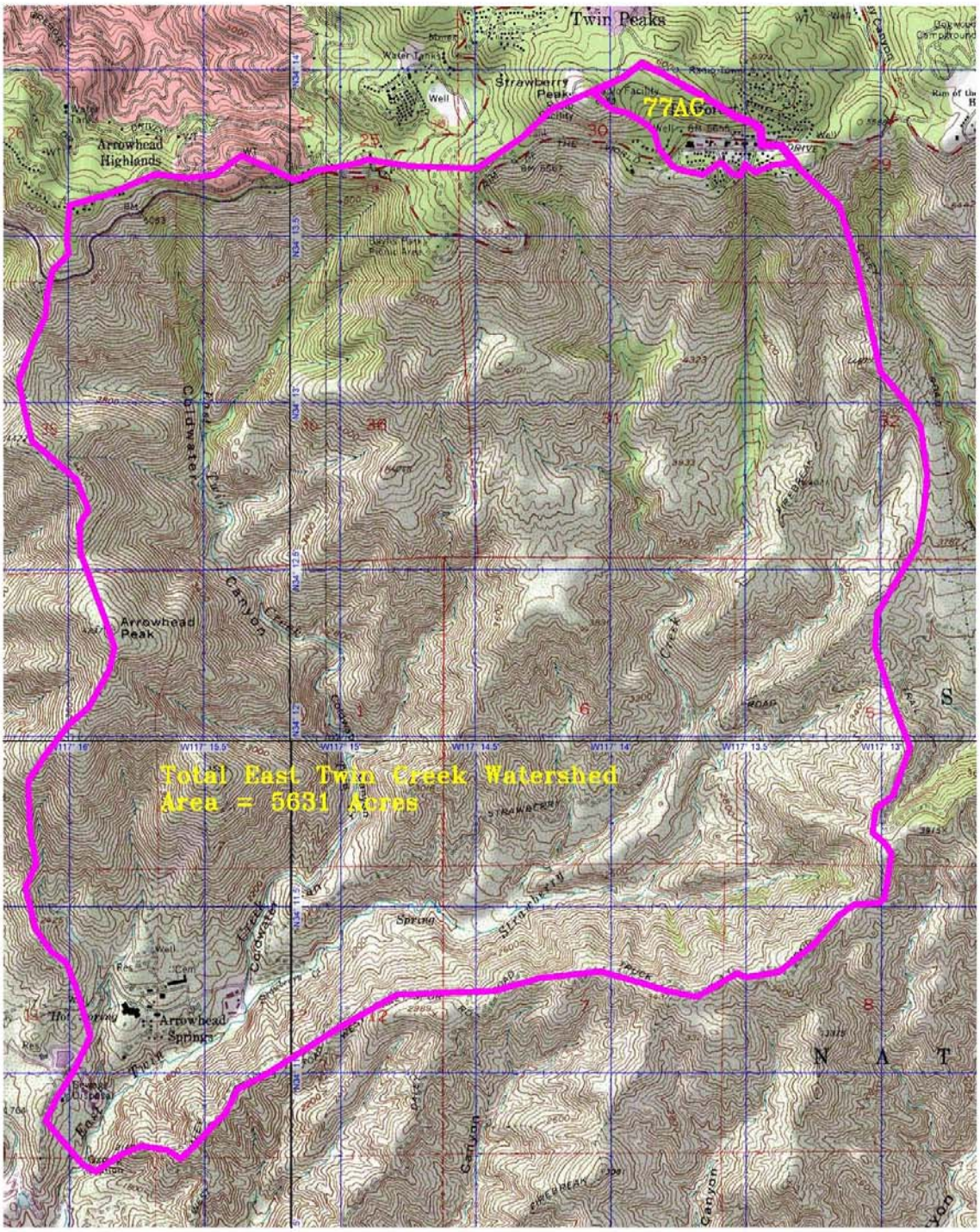
This attachment contains an analysis calculating the amount of runoff from the area of 77 acres to be diverted from the Santa Ana River watershed to the Mojave Watershed if Option 1 of the report is applied.

Two items governing the calculations are historical rainfall data and stream gage data. A computer model was prepared by CivilDesign® software program WRCC, to read the rainfall data, calculate the runoff from each storm event, and, compare the volume of runoff with that recorded on the stream gage receiving runoff that is tributary to the watershed.

San Bernardino County Water Resources furnished 30 years of rainfall data on an hourly basis from Rain Gage number 2962. USGS stream gage 11058500 at East Twin Creek Narrows was used to verify some storm runoff volumes.

The first WRCC computer model included the entire 5631-Acre runoff from East Twin Creek, which includes Strawberry Creek runoff. The results of this model were compared to the stream gage data to verify model accuracy regarding volume of runoff, which averaged 1921 Acre Feet per Year. The second WRCC computer subtracted the 77 Acre area of Rimforest which will be diverted to Lake Arrowhead if Option 1 is selected, which shows a reduced annual volume of runoff to be 1874 Acre Feet. The difference in the 2 models shows that the runoff will be reduced by 47 Acre-Feet on an average annual basis.

The following pages show the area map tributary to the stream gage, and the two output files from the WRCC runoff calculations. The program also prepares detailed runoff calculations on an hourly basis during each storm, and a summary file showing the results of each storm. The summary file for the first model is included, but the hourly file is not due to its length. All files are available upon request.


Twin Peaks
Strawberry Peak
77AC
Arrowhead Highlands
Arrowhead Peak
Total East Twin Creek Watershed
Area = 5631 Acres
Arrowhead Springs
Spring
Cascade Canyon
Strawberry Canyon
Strawberry Creek
Twin Creek
Cascade Creek
Canyon Creek
Canyon
Water Tanks
Well
Rim of the World Campground
Devils Punch Bowl Picnic Area
W117° 16'
W117° 15.5'
W117° 15'
W117° 14.5'
W117° 14'
W117° 13.5'
W117° 13'

W a t e r R u n o f f C a p t u r e F o r C o n s e r v a t i o n A n a l y s i s
Copyright (c) CIVILCADD/CIVILDESIGN, 2000-2009 Version 6.4

Study date 09/30/09 File: twcr.out Rainfall File: t2962.txt

++

Twin Creek

Joseph E. Bonadiman & Associates, Inc., San Bernardino, CA

English (in-lb) Input Units Used
English Units used in output format

Antecedent Moisture Condition = 2
User Defined Inter-Event Time Period (Between Storms = 24.0 hours
User Defined Annual Storm Capture Percentage For Basin Sizes = 80.00%
Actual storm lengths used in calculations
Total Study Area = 5631.00(Ac.)

********** Area-Averaged SCS Curve Number **********

Area (Ac.)	Area fract	SCS CN (AMC2)	SCS CN (AMC2)	Adj.SCS CN	IA (In)
5500.00	0.977	69.0	69.0	69.0	0.899
131.00	0.023	98.0	98.0	98.0	0.041

Area Averaged Initial Abstraction = 0.879(In)
Rainfall Data File: San Bernardino Co.
Beginning Year = 1979, Month = 10, Day = 1, Hour = 1

Number of years in rainfall record = 30
Total Number of Storms (Rainfall Events) = 713
Total Number of Storms Resulting in Runoff = 564
Total Rainfall = 589.9(In) Total Runoff = 122.8(In)
Average Annual Rainfall = 19.662(In)
Average Annual Runoff = 4.094(In)
Average Annual Runoff = 1921.023 Ac Ft
Average Annual Runoff Per Storm = 0.218(In)
Average Annual Runoff Volume Per Storm = 102.182(Ac.Ft)

Maximum Storm Rainfall Occurance Ending Date:
1980 MO 2 DAY 19 HR 7 Rain = 11.7000(In)

Maximum Storm Runoff Occurance Ending Date:
1980 MO 2 DAY 19 HR 7 Runoff = 7.7176(In)

Minimum Storm Runoff Occurance Ending Date:
1980 MO 4 DAY 21 HR 4 Runoff = 0.0000(In)

Minimum Storm Rainfall Occurance Ending Date:
1994 MO 5 DAY 31 HR 4 Rain = 0.0100(In)

CUMULATIVE OCCURANCE PROBABILITY DISTRIBUTION OF STORM RAINFALL AMOUNTS

No. Storms	Cumulative Probability %	Rainfall Amount(In)
323	45.30	0.234
420	58.91	0.468
484	67.88	0.702
523	73.35	0.936
563	78.96	1.170
585	82.05	1.404
599	84.01	1.638
620	86.96	1.872
634	88.92	2.106
647	90.74	2.340
653	91.58	2.574
666	93.41	2.808
674	94.53	3.042
679	95.23	3.276
687	96.35	3.510
688	96.49	3.744
688	96.49	3.978
689	96.63	4.212
691	96.91	4.446
694	97.34	4.680
696	97.62	4.914
698	97.90	5.148
698	97.90	5.382
701	98.32	5.616
703	98.60	5.850
703	98.60	6.084
703	98.60	6.318
704	98.74	6.552
704	98.74	6.786
705	98.88	7.020
707	99.16	7.254
707	99.16	7.488
709	99.44	7.722
709	99.44	7.956

709	99.44	8.190
709	99.44	8.424
709	99.44	8.658
709	99.44	8.892
710	99.58	9.126
710	99.58	9.360
711	99.72	9.594
711	99.72	9.828
711	99.72	10.062
711	99.72	10.296
711	99.72	10.530
711	99.72	10.764
712	99.86	10.998
712	99.86	11.232
712	99.86	11.466
713	100.00	11.700

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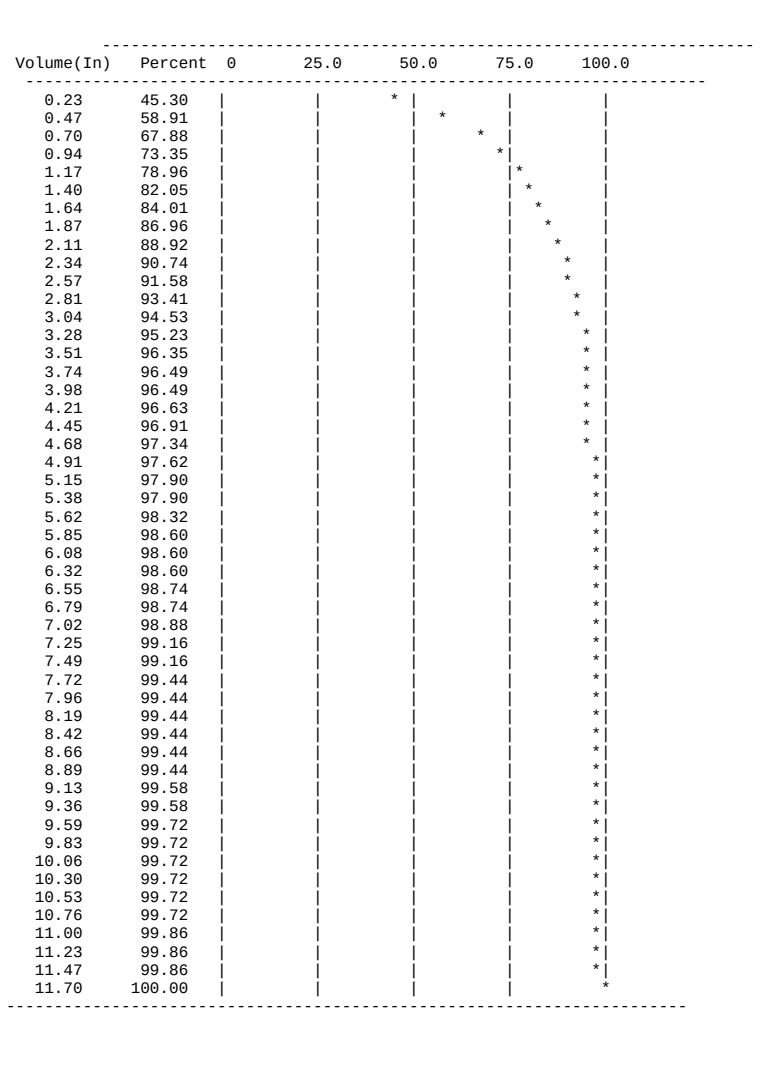
CUMULATIVE PROBABILITY DISTRIBUTION OF RAINALL AMOUNTS



ANNUAL RUNOFF CAPTURE RATE VS. STORAGE VOLUME
Basin begins draining after becoming brim full
Rainfall File = t2962.txt RUNOFF Events = 564 RAINFALL EVENTS = 713
RECORD YEARS = 30, User Defined Basin Detention Time = 100 hours
Average Number of Rainfall Events Per Year = 23.77
Average Number of Runoff Events Per Year = 18.80

Unit Storage Volume(In)	Storage (Ac.Ft)	%Runoff Volume Captured	%Overflow Volume	Average Basin Outflow(CFS)	Average No. Overflows per Year
0.010	4.69	3.06	96.94	0.57	8.47
0.020	9.38	4.89	95.11	1.14	5.83
0.030	14.08	6.41	93.59	1.70	5.27
0.040	18.77	7.82	92.18	2.27	4.93
0.050	23.46	9.17	90.83	2.84	4.73
0.060	28.16	10.45	89.55	3.41	4.47
0.070	32.85	11.67	88.33	3.97	4.33
0.080	37.54	12.85	87.15	4.54	4.23
0.090	42.23	14.01	85.99	5.11	4.13
0.100	46.92	15.15	84.85	5.68	4.07
0.110	51.62	16.26	83.74	6.25	4.00

0.120	56.31	17.35	82.65	6.81	3.90
0.130	61.00	18.42	81.58	7.38	3.83
0.140	65.69	19.45	80.55	7.95	3.70
0.150	70.39	20.44	79.56	8.52	3.63

BMP Capture Volume Basin Size Passed, Curve Slope = 1.00

0.160	75.08	21.41	78.59	9.08	3.53
0.170	79.77	22.38	77.62	9.65	3.40
0.180	84.47	23.31	76.69	10.22	3.30
0.190	89.16	24.18	75.82	10.79	3.17
0.200	93.85	25.03	74.97	11.36	3.10
0.210	98.54	25.88	74.12	11.92	3.10
0.220	103.24	26.72	73.28	12.49	3.07
0.230	107.93	27.56	72.44	13.06	3.00
0.240	112.62	28.37	71.63	13.63	3.00
0.250	117.31	29.17	70.83	14.19	2.93
0.260	122.01	29.97	70.03	14.76	2.93
0.270	126.70	30.73	69.27	15.33	2.73
0.280	131.39	31.47	68.53	15.90	2.73
0.290	136.08	32.20	67.80	16.47	2.63
0.300	140.78	32.90	67.10	17.03	2.63
0.310	145.47	33.63	66.37	17.60	2.57
0.320	150.16	34.30	65.70	18.17	2.57
0.330	154.85	34.98	65.02	18.74	2.43
0.340	159.55	35.63	64.37	19.30	2.43
0.350	164.24	36.29	63.71	19.87	2.37
0.360	168.93	36.93	63.07	20.44	2.33
0.370	173.62	37.53	62.47	21.01	2.30
0.380	178.32	38.14	61.86	21.58	2.20
0.390	183.01	38.75	61.25	22.14	2.20
0.400	187.70	39.34	60.66	22.71	2.20
0.410	192.39	39.93	60.07	23.28	2.20
0.420	197.09	40.52	59.48	23.85	2.17
0.430	201.78	41.12	58.88	24.42	2.17
0.440	206.47	41.69	58.31	24.98	2.13
0.450	211.16	42.25	57.75	25.55	2.13
0.460	215.86	42.82	57.18	26.12	2.07
0.470	220.55	43.38	56.62	26.69	2.00
0.480	225.24	43.90	56.10	27.25	2.00
0.490	229.93	44.45	55.55	27.82	2.00
0.500	234.63	44.95	55.05	28.39	1.90
0.510	239.32	45.46	54.54	28.96	1.87
0.520	244.01	45.94	54.06	29.53	1.80
0.530	248.70	46.41	53.59	30.09	1.77
0.540	253.40	46.88	53.12	30.66	1.73
0.550	258.09	47.36	52.64	31.23	1.73
0.560	262.78	47.81	52.19	31.80	1.73
0.570	267.47	48.27	51.73	32.36	1.73
0.580	272.17	48.74	51.26	32.93	1.67
0.590	276.86	49.18	50.82	33.50	1.67
0.600	281.55	49.63	50.37	34.07	1.67
0.610	286.24	50.06	49.94	34.64	1.57
0.620	290.94	50.47	49.53	35.20	1.57
0.630	295.63	50.88	49.12	35.77	1.53
0.640	300.32	51.27	48.73	36.34	1.50
0.650	305.01	51.66	48.34	36.91	1.47
0.660	309.71	52.02	47.98	37.47	1.47
0.670	314.40	52.42	47.58	38.04	1.40
0.680	319.09	52.80	47.20	38.61	1.37
0.690	323.78	53.20	46.80	39.18	1.33
0.700	328.48	53.53	46.47	39.75	1.33
0.710	333.17	53.89	46.11	40.31	1.33
0.720	337.86	54.25	45.75	40.88	1.30
0.730	342.55	54.60	45.40	41.45	1.30
0.740	347.25	54.96	45.04	42.02	1.30
0.750	351.94	55.32	44.68	42.58	1.27
0.760	356.63	55.67	44.33	43.15	1.23
0.770	361.32	55.99	44.01	43.72	1.20
0.780	366.02	56.30	43.70	44.29	1.20
0.790	370.71	56.65	43.35	44.86	1.20
0.800	375.40	56.97	43.03	45.42	1.17
0.810	380.09	57.25	42.75	45.99	1.17
0.820	384.79	57.55	42.45	46.56	1.17
0.830	389.48	57.86	42.14	47.13	1.17
0.840	394.17	58.16	41.84	47.69	1.13
0.850	398.86	58.47	41.53	48.26	1.13
0.860	403.56	58.79	41.21	48.83	1.13
0.870	408.25	59.12	40.88	49.40	1.13
0.880	412.94	59.46	40.54	49.97	1.13
0.890	417.63	59.76	40.24	50.53	1.13
0.900	422.33	60.09	39.91	51.10	1.10
0.910	427.02	60.39	39.61	51.67	1.10
0.920	431.71	60.67	39.33	52.24	1.10
0.930	436.40	60.99	39.01	52.80	1.10
0.940	441.10	61.31	38.69	53.37	1.03
0.950	445.79	61.54	38.46	53.94	0.97
0.960	450.48	61.79	38.21	54.51	0.93
0.970	455.17	62.06	37.94	55.08	0.90
0.980	459.87	62.30	37.70	55.64	0.90
0.990	464.56	62.56	37.44	56.21	0.90
1.000	469.25	62.81	37.19	56.78	0.87
1.010	473.94	63.07	36.93	57.35	0.87
1.020	478.64	63.32	36.68	57.91	0.83
1.030	483.33	63.56	36.44	58.48	0.83
1.040	488.02	63.78	36.22	59.05	0.83
1.050	492.71	64.03	35.97	59.62	0.83
1.060	497.41	64.26	35.74	60.19	0.83
1.070	502.10	64.49	35.51	60.75	0.83
1.080	506.79	64.74	35.26	61.32	0.83
1.090	511.48	64.97	35.03	61.89	0.83
1.100	516.18	65.22	34.78	62.46	0.83

1.110	520.87	65.45	34.55	63.02	0.83
1.120	525.56	65.67	34.33	63.59	0.83
1.130	530.25	65.91	34.09	64.16	0.83
1.140	534.95	66.13	33.87	64.73	0.83
1.150	539.64	66.35	33.65	65.30	0.83
1.160	544.33	66.58	33.42	65.86	0.83
1.170	549.02	66.81	33.19	66.43	0.83
1.180	553.72	67.06	32.94	67.00	0.83
1.190	558.41	67.27	32.73	67.57	0.83
1.200	563.10	67.52	32.48	68.14	0.83
1.210	567.79	67.73	32.27	68.70	0.83
1.220	572.49	67.93	32.07	69.27	0.83
1.230	577.18	68.16	31.84	69.84	0.83
1.240	581.87	68.40	31.60	70.41	0.83
1.250	586.56	68.62	31.38	70.97	0.83
1.260	591.26	68.84	31.16	71.54	0.83
1.270	595.95	69.07	30.93	72.11	0.83
1.280	600.64	69.25	30.75	72.68	0.83
1.290	605.33	69.48	30.52	73.25	0.83
1.300	610.03	69.69	30.31	73.81	0.83
1.310	614.72	69.93	30.07	74.38	0.83
1.320	619.41	70.12	29.88	74.95	0.83
1.330	624.10	70.34	29.66	75.52	0.83
1.340	628.80	70.55	29.45	76.08	0.80
1.350	633.49	70.75	29.25	76.65	0.83
1.360	638.18	70.88	29.12	77.22	0.80
1.370	642.87	71.11	28.89	77.79	0.80
1.380	647.57	71.28	28.72	78.36	0.80
1.390	652.26	71.49	28.51	78.92	0.77
1.400	656.95	71.68	28.32	79.49	0.77
1.410	661.64	71.89	28.11	80.06	0.77
1.420	666.34	72.04	27.96	80.63	0.80
1.430	671.03	72.23	27.77	81.19	0.80
1.440	675.72	72.38	27.62	81.76	0.80
1.450	680.41	72.61	27.39	82.33	0.77
1.460	685.11	72.74	27.26	82.90	0.77
1.470	689.80	72.94	27.06	83.47	0.77
1.480	694.49	73.15	26.85	84.03	0.73
1.490	699.18	73.36	26.64	84.60	0.73
1.500	703.88	73.49	26.51	85.17	0.73
1.510	708.57	73.70	26.30	85.74	0.73
1.520	713.26	73.89	26.11	86.30	0.73
1.530	717.95	74.08	25.92	86.87	0.73
1.540	722.65	74.28	25.72	87.44	0.73
1.550	727.34	74.46	25.54	88.01	0.70
1.560	732.03	74.63	25.37	88.58	0.70
1.570	736.72	74.81	25.19	89.14	0.70
1.580	741.42	75.01	24.99	89.71	0.70
1.590	746.11	75.21	24.79	90.28	0.70
1.600	750.80	75.37	24.63	90.85	0.70
1.610	755.49	75.55	24.45	91.41	0.67
1.620	760.19	75.71	24.29	91.98	0.63
1.630	764.88	75.85	24.15	92.55	0.63
1.640	769.57	76.03	23.97	93.12	0.63
1.650	774.26	76.19	23.81	93.69	0.63
1.660	778.96	76.33	23.67	94.25	0.63
1.670	783.65	76.50	23.50	94.82	0.60
1.680	788.34	76.63	23.37	95.39	0.63
1.690	793.03	76.81	23.19	95.96	0.60
1.700	797.73	76.94	23.06	96.52	0.60
1.710	802.42	77.11	22.89	97.09	0.60
1.720	807.11	77.26	22.74	97.66	0.60
1.730	811.80	77.41	22.59	98.23	0.60
1.740	816.50	77.58	22.42	98.80	0.60
1.750	821.19	77.70	22.30	99.36	0.60
1.760	825.88	77.87	22.13	99.93	0.60
1.770	830.57	78.02	21.98	100.50	0.60
1.780	835.27	78.17	21.83	101.07	0.60
1.790	839.96	78.34	21.66	101.63	0.60
1.800	844.65	78.49	21.51	102.20	0.60
1.810	849.34	78.61	21.39	102.77	0.60
1.820	854.04	78.70	21.30	103.34	0.60
1.830	858.73	78.85	21.15	103.91	0.60
1.840	863.42	78.99	21.01	104.47	0.60
1.850	868.11	79.07	20.93	105.04	0.57
1.860	872.81	79.22	20.78	105.61	0.53
1.870	877.50	79.38	20.62	106.18	0.50
1.880	882.19	79.47	20.53	106.74	0.53
1.890	886.88	79.59	20.41	107.31	0.50
1.900	891.58	79.71	20.29	107.88	0.50
1.910	896.27	79.82	20.18	108.45	0.50
1.920	900.96	79.94	20.06	109.02	0.50
1.930	905.65	80.09	19.91	109.58	0.50

User Defined Average Annual Capture Percentage = 80.00%

1.940	910.35	80.23	19.77	110.15	0.50
1.950	915.04	80.35	19.65	110.72	0.50
1.960	919.73	80.48	19.52	111.29	0.50
1.970	924.42	80.60	19.40	111.86	0.50
1.980	929.12	80.70	19.30	112.42	0.50
1.990	933.81	80.82	19.18	112.99	0.50
2.000	938.50	80.91	19.09	113.56	0.50
2.010	943.19	81.03	18.97	114.13	0.50
2.020	947.89	81.14	18.86	114.69	0.50
2.030	952.58	81.26	18.74	115.26	0.50
2.040	957.27	81.41	18.59	115.83	0.50
2.050	961.96	81.56	18.44	116.40	0.50
2.060	966.66	81.68	18.32	116.97	0.50
2.070	971.35	81.78	18.22	117.53	0.50
2.080	976.04	81.91	18.09	118.10	0.50

2.090	980.73	81.99	18.01	118.67	0.50
2.100	985.42	82.14	17.86	119.24	0.50
2.110	990.12	82.29	17.71	119.80	0.50
2.120	994.81	82.40	17.60	120.37	0.50
2.130	999.50	82.53	17.47	120.94	0.50
2.140	1004.19	82.68	17.32	121.51	0.50
2.150	1008.89	82.74	17.26	122.08	0.50
2.160	1013.58	82.87	17.13	122.64	0.50
2.170	1018.27	83.01	16.99	123.21	0.50
2.180	1022.96	83.12	16.88	123.78	0.50
2.190	1027.66	83.27	16.73	124.35	0.50
2.200	1032.35	83.41	16.59	124.91	0.47
2.210	1037.04	83.47	16.53	125.48	0.50
2.220	1041.73	83.57	16.43	126.05	0.50
2.230	1046.43	83.68	16.32	126.62	0.50
2.240	1051.12	83.77	16.23	127.19	0.47
2.250	1055.81	83.89	16.11	127.75	0.47
2.260	1060.50	84.01	15.99	128.32	0.47
2.270	1065.20	84.13	15.87	128.89	0.47
2.280	1069.89	84.23	15.77	129.46	0.50
2.290	1074.58	84.34	15.66	130.02	0.47
2.300	1079.27	84.46	15.54	130.59	0.47
2.310	1083.97	84.59	15.41	131.16	0.43
2.320	1088.66	84.70	15.30	131.73	0.43
2.330	1093.35	84.83	15.17	132.30	0.43
2.340	1098.04	84.94	15.06	132.86	0.43
2.350	1102.74	85.06	14.94	133.43	0.40
2.360	1107.43	85.15	14.85	134.00	0.37
2.370	1112.12	85.26	14.74	134.57	0.37
2.380	1116.81	85.37	14.63	135.13	0.37
2.390	1121.51	85.42	14.58	135.70	0.37
2.400	1126.20	85.54	14.46	136.27	0.37
2.410	1130.89	85.65	14.35	136.84	0.37
2.420	1135.58	85.74	14.26	137.41	0.37
2.430	1140.28	85.85	14.15	137.97	0.37
2.440	1144.97	85.92	14.08	138.54	0.37
2.450	1149.66	85.97	14.03	139.11	0.37
2.460	1154.35	86.09	13.91	139.68	0.37
2.470	1159.05	86.18	13.82	140.24	0.37
2.480	1163.74	86.27	13.73	140.81	0.37
2.490	1168.43	86.36	13.64	141.38	0.37
2.500	1173.12	86.47	13.53	141.95	0.37
2.510	1177.82	86.58	13.42	142.52	0.37
2.520	1182.51	86.67	13.33	143.08	0.37
2.530	1187.20	86.76	13.24	143.65	0.37
2.540	1191.89	86.85	13.15	144.22	0.37
2.550	1196.59	86.94	13.06	144.79	0.37
2.560	1201.28	87.05	12.95	145.35	0.37
2.570	1205.97	87.10	12.90	145.92	0.37
2.580	1210.66	87.21	12.79	146.49	0.37
2.590	1215.36	87.30	12.70	147.06	0.37
2.600	1220.05	87.39	12.61	147.63	0.37
2.610	1224.74	87.47	12.53	148.19	0.40
2.620	1229.43	87.54	12.46	148.76	0.37
2.630	1234.13	87.65	12.35	149.33	0.37
2.640	1238.82	87.74	12.26	149.90	0.33
2.650	1243.51	87.84	12.16	150.47	0.33
2.660	1248.20	87.92	12.08	151.03	0.33
2.670	1252.90	87.97	12.03	151.60	0.33
2.680	1257.59	88.08	11.92	152.17	0.33
2.690	1262.28	88.16	11.84	152.74	0.33
2.700	1266.97	88.24	11.76	153.30	0.33
2.710	1271.67	88.29	11.71	153.87	0.33
2.720	1276.36	88.37	11.63	154.44	0.33
2.730	1281.05	88.47	11.53	155.01	0.33
2.740	1285.74	88.55	11.45	155.58	0.33
2.750	1290.44	88.63	11.37	156.14	0.33
2.760	1295.13	88.66	11.34	156.71	0.33
2.770	1299.82	88.76	11.24	157.28	0.33
2.780	1304.51	88.82	11.18	157.85	0.33
2.790	1309.21	88.87	11.13	158.41	0.33
2.800	1313.90	88.97	11.03	158.98	0.33
2.810	1318.59	89.07	10.93	159.55	0.33
2.820	1323.28	89.13	10.87	160.12	0.33
2.830	1327.98	89.23	10.77	160.69	0.33
2.840	1332.67	89.31	10.69	161.25	0.33
2.850	1337.36	89.31	10.69	161.82	0.33
2.860	1342.05	89.39	10.61	162.39	0.33
2.870	1346.75	89.44	10.56	162.96	0.33
2.880	1351.44	89.49	10.51	163.52	0.33
2.890	1356.13	89.59	10.41	164.09	0.33
2.900	1360.82	89.65	10.35	164.66	0.33
2.910	1365.52	89.67	10.33	165.23	0.33
2.920	1370.21	89.70	10.30	165.80	0.33
2.930	1374.90	89.80	10.20	166.36	0.33
2.940	1379.59	89.87	10.13	166.93	0.33
2.950	1384.29	89.92	10.08	167.50	0.33
2.960	1388.98	90.02	9.98	168.07	0.33
2.970	1393.67	90.10	9.90	168.63	0.33
2.980	1398.36	90.20	9.80	169.20	0.33
2.990	1403.06	90.24	9.76	169.77	0.33
3.000	1407.75	90.34	9.66	170.34	0.33
3.010	1412.44	90.44	9.56	170.91	0.33
3.020	1417.13	90.51	9.49	171.47	0.30
3.030	1421.83	90.58	9.42	172.04	0.30
3.040	1426.52	90.67	9.33	172.61	0.30
3.050	1431.21	90.73	9.27	173.18	0.30
3.060	1435.90	90.82	9.18	173.74	0.30
3.070	1440.60	90.83	9.17	174.31	0.30
3.080	1445.29	90.85	9.15	174.88	0.30

3.090	1449.98	90.89	9.11	175.45	0.30
3.100	1454.67	90.98	9.02	176.02	0.30
3.110	1459.37	91.04	8.96	176.58	0.30
3.120	1464.06	91.10	8.90	177.15	0.30
3.130	1468.75	91.14	8.86	177.72	0.30
3.140	1473.44	91.20	8.80	178.29	0.30
3.150	1478.14	91.29	8.71	178.85	0.30
3.160	1482.83	91.35	8.65	179.42	0.27
3.170	1487.52	91.41	8.59	179.99	0.27
3.180	1492.21	91.46	8.54	180.56	0.30
3.190	1496.91	91.54	8.46	181.13	0.27
3.200	1501.60	91.62	8.38	181.69	0.27
3.210	1506.29	91.70	8.30	182.26	0.27
3.220	1510.98	91.78	8.22	182.83	0.27
3.230	1515.68	91.85	8.15	183.40	0.27
3.240	1520.37	91.91	8.09	183.96	0.27
3.250	1525.06	91.96	8.04	184.53	0.27
3.260	1529.75	91.96	8.04	185.10	0.27
3.270	1534.45	92.04	7.96	185.67	0.27
3.280	1539.14	92.12	7.88	186.24	0.27
3.290	1543.83	92.19	7.81	186.80	0.27
3.300	1548.52	92.25	7.75	187.37	0.27
3.310	1553.22	92.30	7.70	187.94	0.27
3.320	1557.91	92.32	7.68	188.51	0.27
3.330	1562.60	92.40	7.60	189.07	0.27
3.340	1567.29	92.48	7.52	189.64	0.27
3.350	1571.99	92.50	7.50	190.21	0.27
3.360	1576.68	92.58	7.42	190.78	0.27
3.370	1581.37	92.58	7.42	191.35	0.27
3.380	1586.06	92.66	7.34	191.91	0.27
3.390	1590.76	92.73	7.27	192.48	0.27
3.400	1595.45	92.78	7.22	193.05	0.27
3.410	1600.14	92.83	7.17	193.62	0.27
3.420	1604.83	92.88	7.12	194.19	0.27
3.430	1609.53	92.91	7.09	194.75	0.27
3.440	1614.22	92.98	7.02	195.32	0.27
3.450	1618.91	93.06	6.94	195.89	0.27
3.460	1623.60	93.11	6.89	196.46	0.27
3.470	1628.30	93.16	6.84	197.02	0.27
3.480	1632.99	93.21	6.79	197.59	0.27
3.490	1637.68	93.28	6.72	198.16	0.27
3.500	1642.37	93.36	6.64	198.73	0.27
3.510	1647.07	93.41	6.59	199.30	0.27
3.520	1651.76	93.49	6.51	199.86	0.27
3.530	1656.45	93.53	6.47	200.43	0.23
3.540	1661.14	93.57	6.43	201.00	0.23
3.550	1665.84	93.52	6.48	201.57	0.27
3.560	1670.53	93.56	6.44	202.13	0.23
3.570	1675.22	93.63	6.37	202.70	0.23
3.580	1679.91	93.67	6.33	203.27	0.23
3.590	1684.61	93.68	6.32	203.84	0.23
3.600	1689.30	93.72	6.28	204.41	0.23
3.610	1693.99	93.79	6.21	204.97	0.23
3.620	1698.68	93.83	6.17	205.54	0.23
3.630	1703.38	93.84	6.16	206.11	0.23
3.640	1708.07	93.87	6.13	206.68	0.23
3.650	1712.76	93.88	6.12	207.24	0.23
3.660	1717.45	93.89	6.11	207.81	0.23
3.670	1722.15	93.96	6.04	208.38	0.23
3.680	1726.84	94.02	5.98	208.95	0.23
3.690	1731.53	94.00	6.00	209.52	0.23
3.700	1736.22	94.04	5.96	210.08	0.23
3.710	1740.92	94.10	5.90	210.65	0.23
3.720	1745.61	94.11	5.89	211.22	0.23
3.730	1750.30	94.18	5.82	211.79	0.23
3.740	1754.99	94.21	5.79	212.35	0.20
3.750	1759.69	94.21	5.79	212.92	0.20
3.760	1764.38	94.23	5.77	213.49	0.20
3.770	1769.07	94.29	5.71	214.06	0.20
3.780	1773.76	94.32	5.68	214.63	0.20
3.790	1778.46	94.35	5.65	215.19	0.20
3.800	1783.15	94.41	5.59	215.76	0.20
3.810	1787.84	94.46	5.54	216.33	0.20
3.820	1792.53	94.49	5.51	216.90	0.20
3.830	1797.23	94.49	5.51	217.46	0.20
3.840	1801.92	94.54	5.46	218.03	0.20
3.850	1806.61	94.60	5.40	218.60	0.20
3.860	1811.30	94.63	5.37	219.17	0.20
3.870	1816.00	94.69	5.31	219.74	0.20
3.880	1820.69	94.74	5.26	220.30	0.20
3.890	1825.38	94.80	5.20	220.87	0.20
3.900	1830.07	94.79	5.21	221.44	0.17
3.910	1834.77	94.84	5.16	222.01	0.17
3.920	1839.46	94.88	5.12	222.57	0.20
3.930	1844.15	94.90	5.10	223.14	0.20
3.940	1848.84	94.96	5.04	223.71	0.17
3.950	1853.54	95.01	4.99	224.28	0.17
3.960	1858.23	95.06	4.94	224.85	0.17
3.970	1862.92	95.11	4.89	225.41	0.17
3.980	1867.61	95.15	4.85	225.98	0.17
3.990	1872.31	95.17	4.83	226.55	0.17
4.000	1877.00	95.19	4.81	227.12	0.17
4.010	1881.69	95.24	4.76	227.68	0.17
4.020	1886.38	95.29	4.71	228.25	0.17
4.030	1891.08	95.33	4.67	228.82	0.17
4.040	1895.77	95.38	4.62	229.39	0.17
4.050	1900.46	95.43	4.57	229.96	0.17
4.060	1905.15	95.48	4.52	230.52	0.17
4.070	1909.85	95.53	4.47	231.09	0.17

4.080	1914.54	95.58	4.42	231.66	0.17
4.090	1919.23	95.63	4.37	232.23	0.17
4.100	1923.92	95.68	4.32	232.79	0.17
4.110	1928.62	95.73	4.27	233.36	0.17
4.120	1933.31	95.74	4.26	233.93	0.17
4.130	1938.00	95.79	4.21	234.50	0.17
4.140	1942.69	95.83	4.17	235.07	0.13
4.150	1947.39	95.87	4.13	235.63	0.13
4.160	1952.08	95.91	4.09	236.20	0.13
4.170	1956.77	95.95	4.05	236.77	0.13
4.180	1961.46	96.00	4.00	237.34	0.13
4.190	1966.16	96.04	3.96	237.91	0.13
4.200	1970.85	96.08	3.92	238.47	0.13
4.210	1975.54	96.12	3.88	239.04	0.13
4.220	1980.23	96.16	3.84	239.61	0.13
4.230	1984.93	96.13	3.87	240.18	0.13
4.240	1989.62	96.17	3.83	240.74	0.13
4.250	1994.31	96.21	3.79	241.31	0.13
4.260	1999.00	96.25	3.75	241.88	0.13
4.270	2003.70	96.29	3.71	242.45	0.13
4.280	2008.39	96.33	3.67	243.02	0.13
4.290	2013.08	96.37	3.63	243.58	0.13
4.300	2017.77	96.41	3.59	244.15	0.13
4.310	2022.47	96.42	3.58	244.72	0.13
4.320	2027.16	96.46	3.54	245.29	0.13
4.330	2031.85	96.50	3.50	245.85	0.13
4.340	2036.54	96.54	3.46	246.42	0.13
4.350	2041.24	96.58	3.42	246.99	0.13
4.360	2045.93	96.58	3.42	247.56	0.13
4.370	2050.62	96.55	3.45	248.13	0.13
4.380	2055.31	96.59	3.41	248.69	0.13
4.390	2060.01	96.63	3.37	249.26	0.13
4.400	2064.70	96.67	3.33	249.83	0.13
4.410	2069.39	96.71	3.29	250.40	0.13
4.420	2074.08	96.75	3.25	250.96	0.13
4.430	2078.78	96.79	3.21	251.53	0.13
4.440	2083.47	96.83	3.17	252.10	0.13
4.450	2088.16	96.87	3.13	252.67	0.13
4.460	2092.85	96.92	3.08	253.24	0.13
4.470	2097.55	96.96	3.04	253.80	0.13
4.480	2102.24	97.00	3.00	254.37	0.13
4.490	2106.93	96.96	3.04	254.94	0.13
4.500	2111.62	96.97	3.03	255.51	0.13
4.510	2116.32	97.01	2.99	256.07	0.13
4.520	2121.01	97.05	2.95	256.64	0.13
4.530	2125.70	97.09	2.91	257.21	0.13
4.540	2130.39	97.13	2.87	257.78	0.13
4.550	2135.09	97.17	2.83	258.35	0.13
4.560	2139.78	97.21	2.79	258.91	0.13
4.570	2144.47	97.24	2.76	259.48	0.10
4.580	2149.16	97.27	2.73	260.05	0.10
4.590	2153.86	97.30	2.70	260.62	0.10
4.600	2158.55	97.33	2.67	261.18	0.10
4.610	2163.24	97.36	2.64	261.75	0.10
4.620	2167.93	97.39	2.61	262.32	0.10
4.630	2172.63	97.42	2.58	262.89	0.10
4.640	2177.32	97.45	2.55	263.46	0.10
4.650	2182.01	97.44	2.56	264.02	0.10
4.660	2186.70	97.47	2.53	264.59	0.10
4.670	2191.40	97.42	2.58	265.16	0.10
4.680	2196.09	97.45	2.55	265.73	0.10
4.690	2200.78	97.48	2.52	266.29	0.10
4.700	2205.47	97.51	2.49	266.86	0.10
4.710	2210.17	97.55	2.45	267.43	0.10
4.720	2214.86	97.54	2.46	268.00	0.10
4.730	2219.55	97.57	2.43	268.57	0.10
4.740	2224.24	97.60	2.40	269.13	0.10
4.750	2228.94	97.63	2.37	269.70	0.10
4.760	2233.63	97.66	2.34	270.27	0.10
4.770	2238.32	97.69	2.31	270.84	0.10
4.780	2243.01	97.72	2.28	271.40	0.10
4.790	2247.71	97.75	2.25	271.97	0.10
4.800	2252.40	97.78	2.22	272.54	0.10
4.810	2257.09	97.81	2.19	273.11	0.10
4.820	2261.78	97.84	2.16	273.68	0.10
4.830	2266.48	97.83	2.17	274.24	0.10
4.840	2271.17	97.86	2.14	274.81	0.10
4.850	2275.86	97.89	2.11	275.38	0.10
4.860	2280.55	97.92	2.08	275.95	0.10
4.870	2285.25	97.95	2.05	276.51	0.10
4.880	2289.94	97.94	2.06	277.08	0.10
4.890	2294.63	97.97	2.03	277.65	0.10
4.900	2299.32	98.00	2.00	278.22	0.10
4.910	2304.02	98.02	1.98	278.79	0.07
4.920	2308.71	98.04	1.96	279.35	0.07
4.930	2313.40	98.07	1.93	279.92	0.07
4.940	2318.09	98.09	1.91	280.49	0.07
4.950	2322.79	98.11	1.89	281.06	0.07
4.960	2327.48	98.13	1.87	281.63	0.07
4.970	2332.17	98.15	1.85	282.19	0.07
4.980	2336.86	98.17	1.83	282.76	0.07
4.990	2341.56	98.18	1.82	283.33	0.10
5.000	2346.25	98.21	1.79	283.90	0.07
5.010	2350.94	98.23	1.77	284.46	0.07
5.020	2355.63	98.23	1.77	285.03	0.10
5.030	2360.33	98.26	1.74	285.60	0.10
5.040	2365.02	98.29	1.71	286.17	0.07
5.050	2369.71	98.31	1.69	286.74	0.07
5.060	2374.40	98.33	1.67	287.30	0.07
5.070	2379.10	98.35	1.65	287.87	0.07

5.080	2383.79	98.37	1.63	288.44	0.07
5.090	2388.48	98.39	1.61	289.01	0.07
5.100	2393.17	98.41	1.59	289.57	0.07
5.110	2397.87	98.43	1.57	290.14	0.07
5.120	2402.56	98.41	1.59	290.71	0.07
5.130	2407.25	98.43	1.57	291.28	0.07
5.140	2411.94	98.45	1.55	291.85	0.07
5.150	2416.64	98.47	1.53	292.41	0.07
5.160	2421.33	98.49	1.51	292.98	0.07
5.170	2426.02	98.51	1.49	293.55	0.07
5.180	2430.71	98.53	1.47	294.12	0.07
5.190	2435.41	98.55	1.45	294.68	0.07
5.200	2440.10	98.57	1.43	295.25	0.07
5.210	2444.79	98.59	1.41	295.82	0.07
5.220	2449.48	98.61	1.39	296.39	0.07
5.230	2454.18	98.63	1.37	296.96	0.07
5.240	2458.87	98.61	1.39	297.52	0.07
5.250	2463.56	98.63	1.37	298.09	0.07
5.260	2468.25	98.59	1.41	298.66	0.10
5.270	2472.95	98.62	1.38	299.23	0.10
5.280	2477.64	98.65	1.35	299.79	0.10
5.290	2482.33	98.68	1.32	300.36	0.10
5.300	2487.02	98.66	1.34	300.93	0.10
5.310	2491.72	98.69	1.31	301.50	0.10
5.320	2496.41	98.72	1.28	302.07	0.10
5.330	2501.10	98.70	1.30	302.63	0.07
5.340	2505.79	98.72	1.28	303.20	0.07
5.350	2510.49	98.74	1.26	303.77	0.07
5.360	2515.18	98.76	1.24	304.34	0.07
5.370	2519.87	98.78	1.22	304.90	0.07
5.380	2524.56	98.80	1.20	305.47	0.07
5.390	2529.26	98.82	1.18	306.04	0.07
5.400	2533.95	98.84	1.16	306.61	0.07
5.410	2538.64	98.86	1.14	307.18	0.07
5.420	2543.33	98.88	1.12	307.74	0.07
5.430	2548.03	98.90	1.10	308.31	0.07
5.440	2552.72	98.92	1.08	308.88	0.07
5.450	2557.41	98.94	1.06	309.45	0.07
5.460	2562.10	98.96	1.04	310.01	0.07
5.470	2566.80	98.98	1.02	310.58	0.07
5.480	2571.49	99.00	1.00	311.15	0.07
5.490	2576.18	99.02	0.98	311.72	0.07
5.500	2580.87	99.04	0.96	312.29	0.07
5.510	2585.57	99.06	0.94	312.85	0.07
5.520	2590.26	99.08	0.92	313.42	0.07
5.530	2594.95	99.10	0.90	313.99	0.07
5.540	2599.64	99.08	0.92	314.56	0.07
5.550	2604.34	99.10	0.90	315.12	0.07
5.560	2609.03	99.12	0.88	315.69	0.07
5.570	2613.72	99.14	0.86	316.26	0.07
5.580	2618.41	99.16	0.84	316.83	0.07
5.590	2623.11	99.18	0.82	317.40	0.07
5.600	2627.80	99.20	0.80	317.96	0.07
5.610	2632.49	99.17	0.83	318.53	0.07
5.620	2637.18	99.19	0.81	319.10	0.07
5.630	2641.88	99.21	0.79	319.67	0.07
5.640	2646.57	99.23	0.77	320.23	0.07
5.650	2651.26	99.20	0.80	320.80	0.07
5.660	2655.95	99.22	0.78	321.37	0.07
5.670	2660.65	99.24	0.76	321.94	0.07
5.680	2665.34	99.26	0.74	322.51	0.07
5.690	2670.03	99.28	0.72	323.07	0.07
5.700	2674.72	99.30	0.70	323.64	0.07
5.710	2679.42	99.32	0.68	324.21	0.07
5.720	2684.11	99.29	0.71	324.78	0.07
5.730	2688.80	99.31	0.69	325.35	0.07
5.740	2693.49	99.29	0.71	325.91	0.07
5.750	2698.19	99.31	0.69	326.48	0.07
5.760	2702.88	99.33	0.67	327.05	0.07
5.770	2707.57	99.35	0.65	327.62	0.07
5.780	2712.26	99.32	0.68	328.18	0.07
5.790	2716.96	99.34	0.66	328.75	0.07
5.800	2721.65	99.31	0.69	329.32	0.07
5.810	2726.34	99.28	0.72	329.89	0.07
5.820	2731.03	99.30	0.70	330.46	0.07
5.830	2735.73	99.27	0.73	331.02	0.07
5.840	2740.42	99.24	0.76	331.59	0.07
5.850	2745.11	99.26	0.74	332.16	0.07
5.860	2749.80	99.28	0.72	332.73	0.07
5.870	2754.50	99.30	0.70	333.29	0.07
5.880	2759.19	99.27	0.73	333.86	0.07
5.890	2763.88	99.29	0.71	334.43	0.07
5.900	2768.57	99.26	0.74	335.00	0.07
5.910	2773.27	99.28	0.72	335.57	0.07
5.920	2777.96	99.30	0.70	336.13	0.07
5.930	2782.65	99.27	0.73	336.70	0.07
5.940	2787.34	99.29	0.71	337.27	0.07
5.950	2792.04	99.31	0.69	337.84	0.07
5.960	2796.73	99.28	0.72	338.40	0.07
5.970	2801.42	99.30	0.70	338.97	0.07
5.980	2806.11	99.32	0.68	339.54	0.07
5.990	2810.81	99.34	0.66	340.11	0.07
6.000	2815.50	99.36	0.64	340.68	0.07
6.010	2820.19	99.37	0.63	341.24	0.07
6.020	2824.88	99.39	0.61	341.81	0.07
6.030	2829.58	99.41	0.59	342.38	0.07
6.040	2834.27	99.43	0.57	342.95	0.07
6.050	2838.96	99.45	0.55	343.51	0.07
6.060	2843.65	99.47	0.53	344.08	0.07
6.070	2848.35	99.49	0.51	344.65	0.07

6.080	2853.04	99.51	0.49	345.22	0.07
6.090	2857.73	99.47	0.53	345.79	0.07
6.100	2862.42	99.49	0.51	346.35	0.07
6.110	2867.12	99.51	0.49	346.92	0.07
6.120	2871.81	99.53	0.47	347.49	0.07
6.130	2876.50	99.55	0.45	348.06	0.07
6.140	2881.19	99.57	0.43	348.62	0.07
6.150	2885.89	99.54	0.46	349.19	0.07
6.160	2890.58	99.56	0.44	349.76	0.07
6.170	2895.27	99.52	0.48	350.33	0.07
6.180	2899.96	99.54	0.46	350.90	0.07
6.190	2904.66	99.56	0.44	351.46	0.07
6.200	2909.35	99.53	0.47	352.03	0.07
6.210	2914.04	99.55	0.45	352.60	0.07
6.220	2918.73	99.57	0.43	353.17	0.07
6.230	2923.43	99.58	0.42	353.73	0.07
6.240	2928.12	99.60	0.40	354.30	0.07
6.250	2932.81	99.62	0.38	354.87	0.07
6.260	2937.50	99.59	0.41	355.44	0.07
6.270	2942.20	99.61	0.39	356.01	0.07
6.280	2946.89	99.63	0.37	356.57	0.07
6.290	2951.58	99.64	0.36	357.14	0.07
6.300	2956.27	99.66	0.34	357.71	0.07
6.310	2960.97	99.68	0.32	358.28	0.07
6.320	2965.66	99.70	0.30	358.84	0.07
6.330	2970.35	99.72	0.28	359.41	0.07
6.340	2975.04	99.74	0.26	359.98	0.07
6.350	2979.74	99.70	0.30	360.55	0.07
6.360	2984.43	99.72	0.28	361.12	0.07
6.370	2989.12	99.74	0.26	361.68	0.07
6.380	2993.81	99.76	0.24	362.25	0.07
6.390	2998.51	99.78	0.22	362.82	0.07
6.400	3003.20	99.79	0.21	363.39	0.07
6.410	3007.89	99.81	0.19	363.95	0.07
6.420	3012.58	99.83	0.17	364.52	0.07
6.430	3017.28	99.85	0.15	365.09	0.07
6.440	3021.97	99.87	0.13	365.66	0.07
6.450	3026.66	99.89	0.11	366.23	0.07
6.460	3031.35	99.90	0.10	366.79	0.07
6.470	3036.05	99.92	0.08	367.36	0.07
6.480	3040.74	99.89	0.11	367.93	0.07
6.490	3045.43	99.91	0.09	368.50	0.07
6.500	3050.12	99.93	0.07	369.07	0.07
6.510	3054.82	99.94	0.06	369.63	0.07
6.520	3059.51	99.96	0.04	370.20	0.07
6.530	3064.20	99.98	0.02	370.77	0.07
6.540	3068.89	99.94	0.06	371.34	0.07
6.550	3073.59	99.95	0.05	371.90	0.03
6.560	3078.28	99.96	0.04	372.47	0.03
6.570	3082.97	99.97	0.03	373.04	0.03
6.580	3087.66	99.98	0.02	373.61	0.03
6.590	3092.36	99.99	0.01	374.18	0.03
6.600	3097.05	100.00	0.00	374.74	0.03

++

UNIT STORAGE VOLUME VS. %RUNOFFS CAPTURED

Volume(In)	Percent	0	25.0	50.0	75.0	100.0
0.01	3.06	*				
0.02	4.89	*				
0.03	6.41	*				
0.04	7.82	*				
0.05	9.17	*				
0.06	10.45	*				
0.07	11.67	*				
0.08	12.85	*				
0.09	14.01	*				
0.10	15.15	*				
0.11	16.26	*				
0.12	17.35	*				
0.13	18.42	*				
0.14	19.45	*				
0.15	20.44	*				
0.16	21.41	*				
0.17	22.38	*				
0.18	23.31	*				
0.19	24.18	*				
0.20	25.03	*				
0.21	25.88	*				
0.22	26.72	*				
0.23	27.56	*				
0.24	28.37	*				
0.25	29.17	*				
0.26	29.97	*				
0.27	30.73	*				
0.28	31.47	*				
0.29	32.20	*				
0.30	32.90	*				
0.31	33.63	*				
0.32	34.30	*				
0.33	34.98	*				
0.34	35.63	*				
0.35	36.29	*				
0.36	36.93	*				
0.37	37.53	*				
0.38	38.14	*				
0.39	38.75	*				
0.40	39.34	*				
0.41	39.93	*				
0.42	40.52	*				
0.43	41.12	*				
0.44	41.69	*				
0.45	42.25	*				
0.46	42.82	*				
0.47	43.38	*				
0.48	43.90	*				
0.49	44.45	*				
0.50	44.95	*				
0.51	45.46	*				
0.52	45.94	*				
0.53	46.41	*				
0.54	46.88	*				
0.55	47.36	*				
0.56	47.81	*				
0.57	48.27	*				
0.58	48.74	*				
0.59	49.18	*				
0.60	49.63	*				
0.61	50.06	*				
0.62	50.47	*				
0.63	50.88	*				
0.64	51.27	*				
0.65	51.66	*				
0.66	52.02	*				
0.67	52.42	*				
0.68	52.80	*				
0.69	53.20	*				
0.70	53.53	*				
0.71	53.89	*				
0.72	54.25	*				
0.73	54.60	*				
0.74	54.96	*				
0.75	55.32	*				
0.76	55.67	*				
0.77	55.99	*				
0.78	56.30	*				
0.79	56.65	*				
0.80	56.97	*				
0.81	57.25	*				
0.82	57.55	*				
0.83	57.86	*				
0.84	58.16	*				
0.85	58.47	*				
0.86	58.79	*				
0.87	59.12	*				
0.88	59.46	*				
0.89	59.76	*				
0.90	60.09	*				
0.91	60.39	*				
0.92	60.67	*				
0.93	60.99	*				

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0.94      61.31   |         |         |   *     |         |
0.95      61.54   |         |         |   *     |         |
0.96      61.79   |         |         |   *     |         |
0.97      62.06   |         |         |   *     |         |
0.98      62.30   |         |         |   *     |         |
0.99      62.56   |         |         |    *    |         |
1.00      62.81   |         |         |    *    |         |
1.01      63.07   |         |         |    *    |         |
1.02      63.32   |         |         |    *    |         |
1.03      63.56   |         |         |    *    |         |
1.04      63.78   |         |         |    *    |         |
1.05      64.03   |         |         |    *    |         |
1.06      64.26   |         |         |    *    |         |
1.07      64.49   |         |         |    *    |         |
1.08      64.74   |         |         |    *    |         |
1.09      64.97   |         |         |    *    |         |
1.10      65.22   |         |         |     *   |         |
1.11      65.45   |         |         |     *   |         |
1.12      65.67   |         |         |     *   |         |
1.13      65.91   |         |         |     *   |         |
1.14      66.13   |         |         |     *   |         |
1.15      66.35   |         |         |     *   |         |
1.16      66.58   |         |         |     *   |         |
1.17      66.81   |         |         |     *   |         |
1.18      67.06   |         |         |     *   |         |
1.19      67.27   |         |         |     *   |         |
1.20      67.52   |         |         |      *  |         |
1.21      67.73   |         |         |      *  |         |
1.22      67.93   |         |         |      *  |         |
1.23      68.16   |         |         |      *  |         |
1.24      68.40   |         |         |      *  |         |
1.25      68.62   |         |         |      *  |         |
1.26      68.84   |         |         |      *  |         |
1.27      69.07   |         |         |      *  |         |
1.28      69.25   |         |         |      *  |         |
1.29      69.48   |         |         |      *  |         |
1.30      69.69   |         |         |      *  |         |
1.31      69.93   |         |         |      *  |         |
1.32      70.12   |         |         |       * |         |
1.33      70.34   |         |         |       * |         |
1.34      70.55   |         |         |       * |         |
1.35      70.75   |         |         |       * |         |
1.36      70.88   |         |         |       * |         |
1.37      71.11   |         |         |       * |         |
1.38      71.28   |         |         |       * |         |
1.39      71.49   |         |         |       * |         |
1.40      71.68   |         |         |       * |         |
1.41      71.89   |         |         |       * |         |
1.42      72.04   |         |         |       * |         |
1.43      72.23   |         |         |       * |         |
1.44      72.38   |         |         |       * |         |
1.45      72.61   |         |         |        *|         |
1.46      72.74   |         |         |        *|         |
1.47      72.94   |         |         |        *|         |
1.48      73.15   |         |         |        *|         |
1.49      73.36   |         |         |        *|         |
1.50      73.49   |         |         |        *|         |
1.51      73.70   |         |         |        *|         |
1.52      73.89   |         |         |        *|         |
1.53      74.08   |         |         |        *|         |
1.54      74.28   |         |         |        *|         |
1.55      74.46   |         |         |        *|         |
1.56      74.63   |         |         |        *|         |
1.57      74.81   |         |         |        *|         |
1.58      75.01   |         |         |         *         |
1.59      75.21   |         |         |         *         |
1.60      75.37   |         |         |         *         |
1.61      75.55   |         |         |         *         |
1.62      75.71   |         |         |         *         |
1.63      75.85   |         |         |         *         |
1.64      76.03   |         |         |         *         |
1.65      76.19   |         |         |         *         |
1.66      76.33   |         |         |         *         |
1.67      76.50   |         |         |         *         |
1.68      76.63   |         |         |         *         |
1.69      76.81   |         |         |         *         |
1.70      76.94   |         |         |         *         |
1.71      77.11   |         |         |         *         |
1.72      77.26   |         |         |         *         |
1.73      77.41   |         |         |         *         |
1.74      77.58   |         |         |         |*        |
1.75      77.70   |         |         |         |*        |
1.76      77.87   |         |         |         |*        |
1.77      78.02   |         |         |         |*        |
1.78      78.17   |         |         |         |*        |
1.79      78.34   |         |         |         |*        |
1.80      78.49   |         |         |         |*        |
1.81      78.61   |         |         |         |*        |
1.82      78.70   |         |         |         |*        |
1.83      78.85   |         |         |         |*        |
1.84      78.99   |         |         |         |*        |
1.85      79.07   |         |         |         |*        |
1.86      79.22   |         |         |         |*        |
1.87      79.38   |         |         |         |*        |
1.88      79.47   |         |         |         |*        |
1.89      79.59   |         |         |         |*        |
1.90      79.71   |         |         |         |*        |
1.91      79.82   |         |         |         |*        |
1.92      79.94   |         |         |         |*        |
1.93      80.09   |         |         |         | *       |
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1.94	80.23				*
1.95	80.35				*
1.96	80.48				*
1.97	80.60				*
1.98	80.70				*
1.99	80.82				*
2.00	80.91				*
2.01	81.03				*
2.02	81.14				*
2.03	81.26				*
2.04	81.41				*
2.05	81.56				*
2.06	81.68				*
2.07	81.78				*
2.08	81.91				*
2.09	81.99				*
2.10	82.14				*
2.11	82.29				*
2.12	82.40				*
2.13	82.53				*
2.14	82.68				*
2.15	82.74				*
2.16	82.87				*
2.17	83.01				*
2.18	83.12				*
2.19	83.27				*
2.20	83.41				*
2.21	83.47				*
2.22	83.57				*
2.23	83.68				*
2.24	83.77				*
2.25	83.89				*
2.26	84.01				*
2.27	84.13				*
2.28	84.23				*
2.29	84.34				*
2.30	84.46				*
2.31	84.59				*
2.32	84.70				*
2.33	84.83				*
2.34	84.94				*
2.35	85.06				*
2.36	85.15				*
2.37	85.26				*
2.38	85.37				*
2.39	85.42				*
2.40	85.54				*
2.41	85.65				*
2.42	85.74				*
2.43	85.85				*
2.44	85.92				*
2.45	85.97				*
2.46	86.09				*
2.47	86.18				*
2.48	86.27				*
2.49	86.36				*
2.50	86.47				*
2.51	86.58				*
2.52	86.67				*
2.53	86.76				*
2.54	86.85				*
2.55	86.94				*
2.56	87.05				*
2.57	87.10				*
2.58	87.21				*
2.59	87.30				*
2.60	87.39				*
2.61	87.47				*
2.62	87.54				*
2.63	87.65				*
2.64	87.74				*
2.65	87.84				*
2.66	87.92				*
2.67	87.97				*
2.68	88.08				*
2.69	88.16				*
2.70	88.24				*
2.71	88.29				*
2.72	88.37				*
2.73	88.47				*
2.74	88.55				*
2.75	88.63				*
2.76	88.66				*
2.77	88.76				*
2.78	88.82				*
2.79	88.87				*
2.80	88.97				*
2.81	89.07				*
2.82	89.13				*
2.83	89.23				*
2.84	89.31				*
2.85	89.31				*
2.86	89.39				*
2.87	89.44				*
2.88	89.49				*
2.89	89.59				*
2.90	89.65				*
2.91	89.67				*
2.92	89.70				*
2.93	89.80				*

2.94	89.87				*	
2.95	89.92				*	
2.96	90.02				*	
2.97	90.10				*	
2.98	90.20				*	
2.99	90.24				*	
3.00	90.34				*	
3.01	90.44				*	
3.02	90.51				*	
3.03	90.58				*	
3.04	90.67				*	
3.05	90.73				*	
3.06	90.82				*	
3.07	90.83				*	
3.08	90.85				*	
3.09	90.89				*	
3.10	90.98				*	
3.11	91.04				*	
3.12	91.10				*	
3.13	91.14				*	
3.14	91.20				*	
3.15	91.29				*	
3.16	91.35				*	
3.17	91.41				*	
3.18	91.46				*	
3.19	91.54				*	
3.20	91.62				*	
3.21	91.70				*	
3.22	91.78				*	
3.23	91.85				*	
3.24	91.91				*	
3.25	91.96				*	
3.26	91.96				*	
3.27	92.04				*	
3.28	92.12				*	
3.29	92.19				*	
3.30	92.25				*	
3.31	92.30				*	
3.32	92.32				*	
3.33	92.40				*	
3.34	92.48				*	
3.35	92.50				*	
3.36	92.58				*	
3.37	92.58				*	
3.38	92.66				*	
3.39	92.73				*	
3.40	92.78				*	
3.41	92.83				*	
3.42	92.88				*	
3.43	92.91				*	
3.44	92.98				*	
3.45	93.06				*	
3.46	93.11				*	
3.47	93.16				*	
3.48	93.21				*	
3.49	93.28				*	
3.50	93.36				*	
3.51	93.41				*	
3.52	93.49				*	
3.53	93.53				*	
3.54	93.57				*	
3.55	93.52				*	
3.56	93.56				*	
3.57	93.63				*	
3.58	93.67				*	
3.59	93.68				*	
3.60	93.72				*	
3.61	93.79				*	
3.62	93.83				*	
3.63	93.84				*	
3.64	93.87				*	
3.65	93.88				*	
3.66	93.89				*	
3.67	93.96				*	
3.68	94.02				*	
3.69	94.00				*	
3.70	94.04				*	
3.71	94.10				*	
3.72	94.11				*	
3.73	94.18				*	
3.74	94.21				*	
3.75	94.21				*	
3.76	94.23				*	
3.77	94.29				*	
3.78	94.32				*	
3.79	94.35				*	
3.80	94.41				*	
3.81	94.46				*	
3.82	94.49				*	
3.83	94.49				*	
3.84	94.54				*	
3.85	94.60				*	
3.86	94.63				*	
3.87	94.69				*	
3.88	94.74				*	
3.89	94.80				*	
3.90	94.79				*	
3.91	94.84				*	
3.92	94.88				*	
3.93	94.90				*	

3.94	94.96	|	|	|	|	* |
3.95	95.01	|	|	|	|	* |
3.96	95.06	|	|	|	|	* |
3.97	95.11	|	|	|	|	* |
3.98	95.15	|	|	|	|	* |
3.99	95.17	|	|	|	|	* |
4.00	95.19	|	|	|	|	* |
4.01	95.24	|	|	|	|	* |
4.02	95.29	|	|	|	|	* |
4.03	95.33	|	|	|	|	* |
4.04	95.38	|	|	|	|	* |
4.05	95.43	|	|	|	|	* |
4.06	95.48	|	|	|	|	* |
4.07	95.53	|	|	|	|	* |
4.08	95.58	|	|	|	|	* |
4.09	95.63	|	|	|	|	* |
4.10	95.68	|	|	|	|	* |
4.11	95.73	|	|	|	|	* |
4.12	95.74	|	|	|	|	* |
4.13	95.79	|	|	|	|	* |
4.14	95.83	|	|	|	|	* |
4.15	95.87	|	|	|	|	* |
4.16	95.91	|	|	|	|	* |
4.17	95.95	|	|	|	|	* |
4.18	96.00	|	|	|	|	* |
4.19	96.04	|	|	|	|	* |
4.20	96.08	|	|	|	|	* |
4.21	96.12	|	|	|	|	* |
4.22	96.16	|	|	|	|	* |
4.23	96.13	|	|	|	|	* |
4.24	96.17	|	|	|	|	* |
4.25	96.21	|	|	|	|	* |
4.26	96.25	|	|	|	|	* |
4.27	96.29	|	|	|	|	* |
4.28	96.33	|	|	|	|	* |
4.29	96.37	|	|	|	|	* |
4.30	96.41	|	|	|	|	* |
4.31	96.42	|	|	|	|	* |
4.32	96.46	|	|	|	|	* |
4.33	96.50	|	|	|	|	* |
4.34	96.54	|	|	|	|	* |
4.35	96.58	|	|	|	|	* |
4.36	96.58	|	|	|	|	* |
4.37	96.55	|	|	|	|	* |
4.38	96.59	|	|	|	|	* |
4.39	96.63	|	|	|	|	* |
4.40	96.67	|	|	|	|	* |
4.41	96.71	|	|	|	|	* |
4.42	96.75	|	|	|	|	* |
4.43	96.79	|	|	|	|	* |
4.44	96.83	|	|	|	|	* |
4.45	96.87	|	|	|	|	* |
4.46	96.92	|	|	|	|	* |
4.47	96.96	|	|	|	|	* |
4.48	97.00	|	|	|	|	* |
4.49	96.96	|	|	|	|	* |
4.50	96.97	|	|	|	|	* |
4.51	97.01	|	|	|	|	* |
4.52	97.05	|	|	|	|	* |
4.53	97.09	|	|	|	|	* |
4.54	97.13	|	|	|	|	* |
4.55	97.17	|	|	|	|	* |
4.56	97.21	|	|	|	|	* |
4.57	97.24	|	|	|	|	* |
4.58	97.27	|	|	|	|	* |
4.59	97.30	|	|	|	|	* |
4.60	97.33	|	|	|	|	* |
4.61	97.36	|	|	|	|	* |
4.62	97.39	|	|	|	|	* |
4.63	97.42	|	|	|	|	* |
4.64	97.45	|	|	|	|	* |
4.65	97.44	|	|	|	|	* |
4.66	97.47	|	|	|	|	* |
4.67	97.42	|	|	|	|	* |
4.68	97.45	|	|	|	|	* |
4.69	97.48	|	|	|	|	* |
4.70	97.51	|	|	|	|	* |
4.71	97.55	|	|	|	|	* |
4.72	97.54	|	|	|	|	* |
4.73	97.57	|	|	|	|	* |
4.74	97.60	|	|	|	|	* |
4.75	97.63	|	|	|	|	* |
4.76	97.66	|	|	|	|	* |
4.77	97.69	|	|	|	|	* |
4.78	97.72	|	|	|	|	* |
4.79	97.75	|	|	|	|	* |
4.80	97.78	|	|	|	|	* |
4.81	97.81	|	|	|	|	* |
4.82	97.84	|	|	|	|	* |
4.83	97.83	|	|	|	|	* |
4.84	97.86	|	|	|	|	* |
4.85	97.89	|	|	|	|	* |
4.86	97.92	|	|	|	|	* |
4.87	97.95	|	|	|	|	* |
4.88	97.94	|	|	|	|	* |
4.89	97.97	|	|	|	|	* |
4.90	98.00	|	|	|	|	* |
4.91	98.02	|	|	|	|	* |
4.92	98.04	|	|	|	|	* |
4.93	98.07	|	|	|	|	* |

4.94	98.09	|	|	|	|	*|
4.95	98.11	|	|	|	|	*|
4.96	98.13	|	|	|	|	*|
4.97	98.15	|	|	|	|	*|
4.98	98.17	|	|	|	|	*|
4.99	98.18	|	|	|	|	*|
5.00	98.21	|	|	|	|	*|
5.01	98.23	|	|	|	|	*|
5.02	98.23	|	|	|	|	*|
5.03	98.26	|	|	|	|	*|
5.04	98.29	|	|	|	|	*|
5.05	98.31	|	|	|	|	*|
5.06	98.33	|	|	|	|	*|
5.07	98.35	|	|	|	|	*|
5.08	98.37	|	|	|	|	*|
5.09	98.39	|	|	|	|	*|
5.10	98.41	|	|	|	|	*|
5.11	98.43	|	|	|	|	*|
5.12	98.41	|	|	|	|	*|
5.13	98.43	|	|	|	|	*|
5.14	98.45	|	|	|	|	*|
5.15	98.47	|	|	|	|	*|
5.16	98.49	|	|	|	|	*|
5.17	98.51	|	|	|	|	*|
5.18	98.53	|	|	|	|	*|
5.19	98.55	|	|	|	|	*|
5.20	98.57	|	|	|	|	*|
5.21	98.59	|	|	|	|	*|
5.22	98.61	|	|	|	|	*|
5.23	98.63	|	|	|	|	*|
5.24	98.61	|	|	|	|	*|
5.25	98.63	|	|	|	|	*|
5.26	98.59	|	|	|	|	*|
5.27	98.62	|	|	|	|	*|
5.28	98.65	|	|	|	|	*|
5.29	98.68	|	|	|	|	*|
5.30	98.66	|	|	|	|	*|
5.31	98.69	|	|	|	|	*|
5.32	98.72	|	|	|	|	*|
5.33	98.70	|	|	|	|	*|
5.34	98.72	|	|	|	|	*|
5.35	98.74	|	|	|	|	*|
5.36	98.76	|	|	|	|	*|
5.37	98.78	|	|	|	|	*|
5.38	98.80	|	|	|	|	*|
5.39	98.82	|	|	|	|	*|
5.40	98.84	|	|	|	|	*|
5.41	98.86	|	|	|	|	*|
5.42	98.88	|	|	|	|	*|
5.43	98.90	|	|	|	|	*|
5.44	98.92	|	|	|	|	*|
5.45	98.94	|	|	|	|	*|
5.46	98.96	|	|	|	|	*|
5.47	98.98	|	|	|	|	*|
5.48	99.00	|	|	|	|	*|
5.49	99.02	|	|	|	|	*|
5.50	99.04	|	|	|	|	*|
5.51	99.06	|	|	|	|	*|
5.52	99.08	|	|	|	|	*|
5.53	99.10	|	|	|	|	*|
5.54	99.08	|	|	|	|	*|
5.55	99.10	|	|	|	|	*|
5.56	99.12	|	|	|	|	*|
5.57	99.14	|	|	|	|	*|
5.58	99.16	|	|	|	|	*|
5.59	99.18	|	|	|	|	*|
5.60	99.20	|	|	|	|	*|
5.61	99.17	|	|	|	|	*|
5.62	99.19	|	|	|	|	*|
5.63	99.21	|	|	|	|	*|
5.64	99.23	|	|	|	|	*|
5.65	99.20	|	|	|	|	*|
5.66	99.22	|	|	|	|	*|
5.67	99.24	|	|	|	|	*|
5.68	99.26	|	|	|	|	*|
5.69	99.28	|	|	|	|	*|
5.70	99.30	|	|	|	|	*|
5.71	99.32	|	|	|	|	*|
5.72	99.29	|	|	|	|	*|
5.73	99.31	|	|	|	|	*|
5.74	99.29	|	|	|	|	*|
5.75	99.31	|	|	|	|	*|
5.76	99.33	|	|	|	|	*|
5.77	99.35	|	|	|	|	*|
5.78	99.32	|	|	|	|	*|
5.79	99.34	|	|	|	|	*|
5.80	99.31	|	|	|	|	*|
5.81	99.28	|	|	|	|	*|
5.82	99.30	|	|	|	|	*|
5.83	99.27	|	|	|	|	*|
5.84	99.24	|	|	|	|	*|
5.85	99.26	|	|	|	|	*|
5.86	99.28	|	|	|	|	*|
5.87	99.30	|	|	|	|	*|
5.88	99.27	|	|	|	|	*|
5.89	99.29	|	|	|	|	*|
5.90	99.26	|	|	|	|	*|
5.91	99.28	|	|	|	|	*|
5.92	99.30	|	|	|	|	*|
5.93	99.27	|	|	|	|	*|

5.94	99.29	|	|	|	|	*|
5.95	99.31	|	|	|	|	*|
5.96	99.28	|	|	|	|	*|
5.97	99.30	|	|	|	|	*|
5.98	99.32	|	|	|	|	*|
5.99	99.34	|	|	|	|	*|
6.00	99.36	|	|	|	|	*|
6.01	99.37	|	|	|	|	*|
6.02	99.39	|	|	|	|	*|
6.03	99.41	|	|	|	|	*|
6.04	99.43	|	|	|	|	*|
6.05	99.45	|	|	|	|	*|
6.06	99.47	|	|	|	|	*|
6.07	99.49	|	|	|	|	*|
6.08	99.51	|	|	|	|	*|
6.09	99.47	|	|	|	|	*|
6.10	99.49	|	|	|	|	*|
6.11	99.51	|	|	|	|	*|
6.12	99.53	|	|	|	|	*|
6.13	99.55	|	|	|	|	*|
6.14	99.57	|	|	|	|	*|
6.15	99.54	|	|	|	|	*|
6.16	99.56	|	|	|	|	*|
6.17	99.52	|	|	|	|	*|
6.18	99.54	|	|	|	|	*|
6.19	99.56	|	|	|	|	*|
6.20	99.53	|	|	|	|	*|
6.21	99.55	|	|	|	|	*|
6.22	99.57	|	|	|	|	*|
6.23	99.58	|	|	|	|	*|
6.24	99.60	|	|	|	|	*|
6.25	99.62	|	|	|	|	*|
6.26	99.59	|	|	|	|	*|
6.27	99.61	|	|	|	|	*|
6.28	99.63	|	|	|	|	*|
6.29	99.64	|	|	|	|	*|
6.30	99.66	|	|	|	|	*|
6.31	99.68	|	|	|	|	*|
6.32	99.70	|	|	|	|	*|
6.33	99.72	|	|	|	|	*|
6.34	99.74	|	|	|	|	*|
6.35	99.70	|	|	|	|	*|
6.36	99.72	|	|	|	|	*|
6.37	99.74	|	|	|	|	*|
6.38	99.76	|	|	|	|	*|
6.39	99.78	|	|	|	|	*|
6.40	99.79	|	|	|	|	*|
6.41	99.81	|	|	|	|	*|
6.42	99.83	|	|	|	|	*|
6.43	99.85	|	|	|	|	*|
6.44	99.87	|	|	|	|	*|
6.45	99.89	|	|	|	|	*|
6.46	99.90	|	|	|	|	*|
6.47	99.92	|	|	|	|	*|
6.48	99.89	|	|	|	|	*|
6.49	99.91	|	|	|	|	*|
6.50	99.93	|	|	|	|	*|
6.51	99.94	|	|	|	|	*|
6.52	99.96	|	|	|	|	*|
6.53	99.98	|	|	|	|	*|
6.54	99.94	|	|	|	|	*|
6.55	99.95	|	|	|	|	*|
6.56	99.96	|	|	|	|	*|
6.57	99.97	|	|	|	|	*|
6.58	99.98	|	|	|	|	*|
6.59	99.99	|	|	|	|	*|
6.60	100.00	|	|	|	|	*|

W a t e r R u n o f f C a p t u r e F o r C o n s e r v a t i o n A n a l y s i s
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Study date 09/30/09 File: twcr.out Rainfall File: t2962.txt

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********** Area-Averaged SCS Curve Number **********

Area (Ac.)	Area fract	SCS CN (AMC2)	SCS CN (AMC2)	Adj.SCS CN	IA (In)
5500.00	0.977	69.0	69.0	69.0	0.899
131.00	0.023	98.0	98.0	98.0	0.041

++

For each time interval of the rainfall file, the total rainfall up to that storm time is calculated. Then the Soil Conservation Service SCS (report 1972, 1975) Curve Number (CN) is used to determine the amount of direct runoff in using the following equations:

$$Q = \frac{(P - Ia)^2}{P - Ia + S}$$

Where:
Q = direct runoff, P = depth of precipitation, Ia = Initial Abstraction and S is the watershed storage in inches. S and Ia are given by the following equations:

$$S = \frac{1000}{CN} - 10 \quad \text{and} \quad Ia = 0.2\,S$$

Note: If Metric (SI) Units are used, rainfall data is converted by the program internally into inches for these calculations.

```
1980 MO  2 DAY 19 HR    7 Rain =    11.700(In) Runoff =     7.718(In) =  3621.47 AcFt Duration 166.00 HRS AVG Q =  264.0 CFS
1980 MO  3 DAY  3 HR   22 Rain =     4.100(In) Runoff =     1.391(In) =   652.73 AcFt Duration 58.00 HRS AVG Q =  136.2 CFS
1980 MO  3 DAY  6 HR   20 Rain =     1.630(In) Runoff =     0.133(In) =    62.31 AcFt Duration 51.00 HRS AVG Q =   14.8 CFS
1980 MO  3 DAY 11 HR    8 Rain =     1.200(In) Runoff =     0.041(In) =    19.45 AcFt Duration 44.00 HRS AVG Q =    5.3 CFS
1980 MO  3 DAY 18 HR   23 Rain =     0.350(In) Runoff =     0.004(In) =     2.03 AcFt Duration 36.00 HRS AVG Q =    0.7 CFS
1980 MO  3 DAY 21 HR   19 Rain =     0.400(In) Runoff =     0.005(In) =     2.50 AcFt Duration 27.00 HRS AVG Q =    1.1 CFS
1980 MO  3 DAY 26 HR    2 Rain =     0.530(In) Runoff =     0.008(In) =     3.77 AcFt Duration 36.00 HRS AVG Q =    1.3 CFS
1980 MO  4 DAY  2 HR    9 Rain =     0.600(In) Runoff =     0.010(In) =     4.47 AcFt Duration 53.00 HRS AVG Q =    1.0 CFS
1980 MO  4 DAY 21 HR    4 Rain =     0.050(In) Runoff =     0.000(In) =     0.00 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
1980 MO  4 DAY 23 HR   11 Rain =     0.140(In) Runoff =     0.001(In) =     0.35 AcFt Duration 48.00 HRS AVG Q =    0.1 CFS
1980 MO  4 DAY 30 HR   18 Rain =     0.560(In) Runoff =     0.009(In) =     4.07 AcFt Duration 88.00 HRS AVG Q =    0.6 CFS
1980 MO  5 DAY 11 HR 2400 Rain =     1.020(In) Runoff =     0.022(In) =    10.31 AcFt Duration 72.00 HRS AVG Q =    1.7 CFS
1980 MO  5 DAY 22 HR    6 Rain =     0.190(In) Runoff =     0.001(In) =     0.69 AcFt Duration 56.00 HRS AVG Q =    0.1 CFS
1980 MO 10 DAY 16 HR    3 Rain =     1.040(In) Runoff =     0.024(In) =    11.04 AcFt Duration 56.00 HRS AVG Q =    2.4 CFS
1980 MO 12 DAY  4 HR   18 Rain =     0.690(In) Runoff =     0.011(In) =     5.39 AcFt Duration 32.00 HRS AVG Q =    2.0 CFS
1981 MO  1 DAY 29 HR   20 Rain =     2.520(In) Runoff =     0.473(In) =   222.09 AcFt Duration 67.00 HRS AVG Q =   40.1 CFS
1981 MO  2 DAY 11 HR    6 Rain =     0.750(In) Runoff =     0.013(In) =     6.01 AcFt Duration 40.00 HRS AVG Q =    1.8 CFS
1981 MO  2 DAY 26 HR    2 Rain =     0.750(In) Runoff =     0.013(In) =     6.01 AcFt Duration 31.00 HRS AVG Q =    2.3 CFS
1981 MO  3 DAY  3 HR   12 Rain =     1.460(In) Runoff =     0.090(In) =    42.13 AcFt Duration 69.00 HRS AVG Q =    7.4 CFS
1981 MO  3 DAY  6 HR    4 Rain =     0.720(In) Runoff =     0.012(In) =     5.70 AcFt Duration 52.00 HRS AVG Q =    1.3 CFS
1981 MO  3 DAY 16 HR   10 Rain =     0.240(In) Runoff =     0.002(In) =     1.07 AcFt Duration 25.00 HRS AVG Q =    0.5 CFS
1981 MO  3 DAY 20 HR    4 Rain =     0.640(In) Runoff =     0.010(In) =     4.88 AcFt Duration 35.00 HRS AVG Q =    1.7 CFS
1981 MO  3 DAY 26 HR   14 Rain =     0.130(In) Runoff =     0.001(In) =     0.30 AcFt Duration 25.00 HRS AVG Q =    0.1 CFS
1981 MO  4 DAY  2 HR    9 Rain =     0.170(In) Runoff =     0.001(In) =     0.55 AcFt Duration 26.00 HRS AVG Q =    0.3 CFS
1981 MO  4 DAY 20 HR   19 Rain =     1.200(In) Runoff =     0.041(In) =    19.45 AcFt Duration 58.00 HRS AVG Q =    4.1 CFS
1981 MO  5 DAY 15 HR    7 Rain =     0.260(In) Runoff =     0.003(In) =     1.24 AcFt Duration 34.00 HRS AVG Q =    0.4 CFS
1981 MO  5 DAY 27 HR    3 Rain =     0.130(In) Runoff =     0.001(In) =     0.30 AcFt Duration 27.00 HRS AVG Q =    0.1 CFS
1981 MO  9 DAY 30 HR    1 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1981 MO 10 DAY  2 HR   20 Rain =     0.250(In) Runoff =     0.002(In) =     1.16 AcFt Duration 43.00 HRS AVG Q =    0.3 CFS
1981 MO 10 DAY 11 HR    8 Rain =     0.570(In) Runoff =     0.009(In) =     4.17 AcFt Duration 29.00 HRS AVG Q =    1.7 CFS
1982 MO  2 DAY 11 HR    4 Rain =     2.040(In) Runoff =     0.268(In) =   125.79 AcFt Duration 43.00 HRS AVG Q =   35.4 CFS
1982 MO  3 DAY  2 HR   20 Rain =     0.370(In) Runoff =     0.005(In) =     2.22 AcFt Duration 51.00 HRS AVG Q =    0.5 CFS
1982 MO  3 DAY 12 HR   13 Rain =     0.560(In) Runoff =     0.009(In) =     4.07 AcFt Duration 46.00 HRS AVG Q =    1.1 CFS
1982 MO  3 DAY 18 HR   19 Rain =     4.550(In) Runoff =     1.699(In) =   797.44 AcFt Duration 144.00 HRS AVG Q =   67.0 CFS
1982 MO  3 DAY 26 HR    4 Rain =     0.410(In) Runoff =     0.006(In) =     2.60 AcFt Duration 35.00 HRS AVG Q =    0.9 CFS
1982 MO  3 DAY 30 HR 2400 Rain =     1.080(In) Runoff =     0.027(In) =    12.71 AcFt Duration 54.00 HRS AVG Q =    2.8 CFS
1982 MO  4 DAY  1 HR   18 Rain =     1.760(In) Runoff =     0.171(In) =    80.30 AcFt Duration 39.00 HRS AVG Q =   24.9 CFS
1982 MO  4 DAY 11 HR   16 Rain =     0.490(In) Runoff =     0.007(In) =     3.37 AcFt Duration 28.00 HRS AVG Q =    1.5 CFS
1982 MO  5 DAY  4 HR   14 Rain =     0.120(In) Runoff =     0.001(In) =     0.24 AcFt Duration 31.00 HRS AVG Q =    0.1 CFS
1982 MO  5 DAY  9 HR   10 Rain =     0.250(In) Runoff =     0.002(In) =     1.16 AcFt Duration 45.00 HRS AVG Q =    0.3 CFS
1982 MO  6 DAY 18 HR   10 Rain =     0.260(In) Runoff =     0.003(In) =     1.24 AcFt Duration 48.00 HRS AVG Q =    0.3 CFS
1982 MO  9 DAY 15 HR   18 Rain =     0.070(In) Runoff =     0.000(In) =     0.04 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
1982 MO  9 DAY 26 HR   23 Rain =     2.400(In) Runoff =     0.418(In) =   196.08 AcFt Duration 49.00 HRS AVG Q =   48.4 CFS
1982 MO 11 DAY 10 HR   21 Rain =     1.980(In) Runoff =     0.246(In) =   115.32 AcFt Duration 58.00 HRS AVG Q =   24.1 CFS
1982 MO 11 DAY 19 HR    7 Rain =     1.280(In) Runoff =     0.054(In) =    25.30 AcFt Duration 35.00 HRS AVG Q =    8.7 CFS
1982 MO 12 DAY  2 HR    8 Rain =     2.310(In) Runoff =     0.378(In) =   177.38 AcFt Duration 53.00 HRS AVG Q =   40.5 CFS
1982 MO 12 DAY 22 HR   22 Rain =     2.740(In) Runoff =     0.581(In) =   272.76 AcFt Duration 39.00 HRS AVG Q =   84.6 CFS
1983 MO  1 DAY 19 HR    8 Rain =     0.860(In) Runoff =     0.015(In) =     7.16 AcFt Duration 30.00 HRS AVG Q =    2.9 CFS
1983 MO  1 DAY 23 HR    3 Rain =     1.590(In) Runoff =     0.122(In) =    57.21 AcFt Duration 44.00 HRS AVG Q =   15.7 CFS
1983 MO  1 DAY 24 HR   18 Rain =     0.710(In) Runoff =     0.012(In) =     5.60 AcFt Duration 32.00 HRS AVG Q =    2.1 CFS
1983 MO  1 DAY 27 HR   18 Rain =     2.580(In) Runoff =     0.502(In) =   235.54 AcFt Duration 36.00 HRS AVG Q =   79.2 CFS
1983 MO  1 DAY 29 HR    3 Rain =     0.740(In) Runoff =     0.013(In) =     5.91 AcFt Duration 29.00 HRS AVG Q =    2.5 CFS
1983 MO  2 DAY  3 HR    1 Rain =     0.800(In) Runoff =     0.014(In) =     6.53 AcFt Duration 40.00 HRS AVG Q =    2.0 CFS
1983 MO  2 DAY  8 HR    8 Rain =     2.140(In) Runoff =     0.307(In) =   144.07 AcFt Duration 89.00 HRS AVG Q =   19.6 CFS
1983 MO  2 DAY 25 HR    3 Rain =     0.340(In) Runoff =     0.004(In) =     1.94 AcFt Duration 37.00 HRS AVG Q =    0.6 CFS
1983 MO  3 DAY  4 HR   18 Rain =     9.100(In) Runoff =     5.382(In) =  2525.32 AcFt Duration 181.00 HRS AVG Q =  168.8 CFS
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1983 MO  3 DAY  6 HR    2 Rain =     0.140(In) Runoff =     0.001(In) =     0.35 AcFt Duration 28.00 HRS AVG Q =    0.2 CFS
1983 MO  3 DAY 18 HR   23 Rain =     2.850(In) Runoff =     0.638(In) =   299.44 AcFt Duration 102.00 HRS AVG Q =   35.5 CFS
1983 MO  3 DAY 21 HR   12 Rain =     0.680(In) Runoff =     0.011(In) =     5.29 AcFt Duration 42.00 HRS AVG Q =    1.5 CFS
1983 MO  3 DAY 24 HR   18 Rain =     0.990(In) Runoff =     0.020(In) =     9.36 AcFt Duration 75.00 HRS AVG Q =    1.5 CFS
1983 MO  4 DAY 12 HR   20 Rain =     0.490(In) Runoff =     0.007(In) =     3.37 AcFt Duration 46.00 HRS AVG Q =    0.9 CFS
1983 MO  4 DAY 18 HR   20 Rain =     0.860(In) Runoff =     0.015(In) =     7.16 AcFt Duration 47.00 HRS AVG Q =    1.8 CFS
1983 MO  4 DAY 21 HR    5 Rain =     2.040(In) Runoff =     0.268(In) =   125.79 AcFt Duration 51.00 HRS AVG Q =   29.8 CFS
1983 MO  4 DAY 30 HR    5 Rain =     1.180(In) Runoff =     0.039(In) =    18.15 AcFt Duration 54.00 HRS AVG Q =    4.1 CFS
1983 MO  8 DAY  7 HR    9 Rain =     0.100(In) Runoff =     0.000(In) =     0.15 AcFt Duration 26.00 HRS AVG Q =    0.1 CFS
1983 MO  8 DAY 19 HR   19 Rain =     5.850(In) Runoff =     2.666(In) =  1251.08 AcFt Duration 130.00 HRS AVG Q =  116.4 CFS
1983 MO 10 DAY  1 HR   13 Rain =     2.240(In) Runoff =     0.348(In) =   163.34 AcFt Duration 37.00 HRS AVG Q =   53.4 CFS
1983 MO 10 DAY  5 HR 2400 Rain =     0.120(In) Runoff =     0.001(In) =     0.24 AcFt Duration 29.00 HRS AVG Q =    0.1 CFS
1983 MO 11 DAY  1 HR   20 Rain =     0.260(In) Runoff =     0.003(In) =     1.24 AcFt Duration 26.00 HRS AVG Q =    0.6 CFS
1983 MO 11 DAY 13 HR    2 Rain =     1.760(In) Runoff =     0.171(In) =    80.30 AcFt Duration 60.00 HRS AVG Q =   16.2 CFS
1983 MO 11 DAY 18 HR    3 Rain =     0.720(In) Runoff =     0.012(In) =     5.70 AcFt Duration 34.00 HRS AVG Q =    2.0 CFS
1983 MO 11 DAY 21 HR   17 Rain =     0.190(In) Runoff =     0.001(In) =     0.69 AcFt Duration 57.00 HRS AVG Q =    0.1 CFS
1983 MO 11 DAY 25 HR    1 Rain =     1.650(In) Runoff =     0.138(In) =    64.94 AcFt Duration 32.00 HRS AVG Q =   24.6 CFS
1983 MO 12 DAY  2 HR   16 Rain =     0.530(In) Runoff =     0.008(In) =     3.77 AcFt Duration 28.00 HRS AVG Q =    1.6 CFS
1983 MO 12 DAY  9 HR   19 Rain =     0.110(In) Runoff =     0.000(In) =     0.19 AcFt Duration 29.00 HRS AVG Q =    0.1 CFS
1983 MO 12 DAY 27 HR   21 Rain =     5.410(In) Runoff =     2.328(In) =  1092.49 AcFt Duration 101.00 HRS AVG Q =  130.9 CFS
1984 MO  1 DAY 14 HR    7 Rain =     0.130(In) Runoff =     0.001(In) =     0.30 AcFt Duration 34.00 HRS AVG Q =    0.1 CFS
1984 MO  2 DAY 16 HR   18 Rain =     0.200(In) Runoff =     0.002(In) =     0.76 AcFt Duration 26.00 HRS AVG Q =    0.4 CFS
1984 MO  3 DAY 14 HR    7 Rain =     0.160(In) Runoff =     0.001(In) =     0.48 AcFt Duration 27.00 HRS AVG Q =    0.2 CFS
1984 MO  3 DAY 26 HR   20 Rain =     0.170(In) Runoff =     0.001(In) =     0.55 AcFt Duration 29.00 HRS AVG Q =    0.2 CFS
1984 MO  3 DAY 31 HR   22 Rain =     0.170(In) Runoff =     0.001(In) =     0.55 AcFt Duration 28.00 HRS AVG Q =    0.2 CFS
1984 MO  4 DAY  7 HR    4 Rain =     0.050(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1984 MO  4 DAY 20 HR    6 Rain =     0.310(In) Runoff =     0.004(In) =     1.67 AcFt Duration 30.00 HRS AVG Q =    0.7 CFS
1984 MO  7 DAY 15 HR   20 Rain =     0.070(In) Runoff =     0.000(In) =     0.04 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
1984 MO  8 DAY 15 HR    3 Rain =     0.100(In) Runoff =     0.000(In) =     0.15 AcFt Duration 25.00 HRS AVG Q =    0.1 CFS
1984 MO  9 DAY 11 HR   18 Rain =     0.120(In) Runoff =     0.001(In) =     0.24 AcFt Duration 28.00 HRS AVG Q =    0.1 CFS
1984 MO  9 DAY 18 HR   17 Rain =     0.190(In) Runoff =     0.001(In) =     0.69 AcFt Duration 26.00 HRS AVG Q =    0.3 CFS
1984 MO 10 DAY 17 HR    5 Rain =     0.390(In) Runoff =     0.005(In) =     2.41 AcFt Duration 28.00 HRS AVG Q =    1.0 CFS
1984 MO 11 DAY  8 HR    7 Rain =     0.290(In) Runoff =     0.003(In) =     1.50 AcFt Duration 28.00 HRS AVG Q =    0.6 CFS
1984 MO 11 DAY 13 HR    8 Rain =     0.600(In) Runoff =     0.010(In) =     4.47 AcFt Duration 30.00 HRS AVG Q =    1.8 CFS
1984 MO 11 DAY 21 HR   14 Rain =     0.350(In) Runoff =     0.004(In) =     2.03 AcFt Duration 29.00 HRS AVG Q =    0.8 CFS
1984 MO 11 DAY 25 HR   21 Rain =     0.850(In) Runoff =     0.015(In) =     7.05 AcFt Duration 32.00 HRS AVG Q =    2.7 CFS
1984 MO 12 DAY  3 HR    9 Rain =     0.140(In) Runoff =     0.001(In) =     0.35 AcFt Duration 30.00 HRS AVG Q =    0.1 CFS
1984 MO 12 DAY  9 HR    3 Rain =     0.450(In) Runoff =     0.006(In) =     2.98 AcFt Duration 28.00 HRS AVG Q =    1.3 CFS
1984 MO 12 DAY 11 HR    2 Rain =     0.140(In) Runoff =     0.001(In) =     0.35 AcFt Duration 31.00 HRS AVG Q =    0.1 CFS
1984 MO 12 DAY 15 HR    3 Rain =     0.550(In) Runoff =     0.008(In) =     3.97 AcFt Duration 26.00 HRS AVG Q =    1.8 CFS
1984 MO 12 DAY 20 HR    3 Rain =     3.400(In) Runoff =     0.947(In) =   444.61 AcFt Duration 65.00 HRS AVG Q =   82.8 CFS
1984 MO 12 DAY 27 HR   22 Rain =     2.180(In) Runoff =     0.323(In) =   151.66 AcFt Duration 58.00 HRS AVG Q =   31.6 CFS
1985 MO  1 DAY  8 HR    6 Rain =     0.960(In) Runoff =     0.018(In) =     8.59 AcFt Duration 42.00 HRS AVG Q =    2.5 CFS
1985 MO  1 DAY 29 HR 2400 Rain =     1.000(In) Runoff =     0.021(In) =     9.66 AcFt Duration 56.00 HRS AVG Q =    2.1 CFS
1985 MO  2 DAY  3 HR   12 Rain =     0.450(In) Runoff =     0.006(In) =     2.98 AcFt Duration 33.00 HRS AVG Q =    1.1 CFS
1985 MO  2 DAY  7 HR   14 Rain =     1.310(In) Runoff =     0.059(In) =    27.76 AcFt Duration 40.00 HRS AVG Q =    8.4 CFS
1985 MO  2 DAY 20 HR   14 Rain =     0.270(In) Runoff =     0.003(In) =     1.32 AcFt Duration 33.00 HRS AVG Q =    0.5 CFS
1985 MO  2 DAY 28 HR   17 Rain =     2.100(In) Runoff =     0.291(In) =   136.64 AcFt Duration 63.00 HRS AVG Q =   26.2 CFS
1985 MO  3 DAY 18 HR   17 Rain =     0.180(In) Runoff =     0.001(In) =     0.62 AcFt Duration 31.00 HRS AVG Q =    0.2 CFS
1985 MO  3 DAY 28 HR   12 Rain =     2.030(In) Runoff =     0.264(In) =   124.02 AcFt Duration 57.00 HRS AVG Q =   26.3 CFS
1985 MO  4 DAY 18 HR   10 Rain =     0.380(In) Runoff =     0.005(In) =     2.31 AcFt Duration 33.00 HRS AVG Q =    0.8 CFS
1985 MO  4 DAY 22 HR    6 Rain =     0.270(In) Runoff =     0.003(In) =     1.32 AcFt Duration 62.00 HRS AVG Q =    0.3 CFS
1985 MO  6 DAY  3 HR    7 Rain =     0.160(In) Runoff =     0.001(In) =     0.48 AcFt Duration 28.00 HRS AVG Q =    0.2 CFS
1985 MO  9 DAY  5 HR    5 Rain =     0.060(In) Runoff =     0.000(In) =     0.02 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
1985 MO  9 DAY 11 HR    2 Rain =     0.250(In) Runoff =     0.002(In) =     1.16 AcFt Duration 27.00 HRS AVG Q =    0.5 CFS
1985 MO  9 DAY 18 HR    1 Rain =     0.260(In) Runoff =     0.003(In) =     1.24 AcFt Duration 25.00 HRS AVG Q =    0.6 CFS
1985 MO 10 DAY  7 HR    3 Rain =     0.050(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1985 MO 10 DAY  9 HR   21 Rain =     0.380(In) Runoff =     0.005(In) =     2.31 AcFt Duration 26.00 HRS AVG Q =    1.1 CFS
1985 MO 10 DAY 21 HR   23 Rain =     0.740(In) Runoff =     0.013(In) =     5.91 AcFt Duration 32.00 HRS AVG Q =    2.2 CFS
1985 MO 11 DAY 12 HR    5 Rain =     1.700(In) Runoff =     0.153(In) =    71.74 AcFt Duration 51.00 HRS AVG Q =   17.0 CFS
1985 MO 11 DAY 25 HR    7 Rain =     1.280(In) Runoff =     0.054(In) =    25.30 AcFt Duration 41.00 HRS AVG Q =    7.5 CFS
1985 MO 11 DAY 30 HR    4 Rain =     2.080(In) Runoff =     0.283(In) =   132.98 AcFt Duration 70.00 HRS AVG Q =   23.0 CFS
1985 MO 12 DAY  3 HR    8 Rain =     0.680(In) Runoff =     0.011(In) =     5.29 AcFt Duration 46.00 HRS AVG Q =    1.4 CFS
1985 MO 12 DAY 26 HR    1 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1986 MO  1 DAY  2 HR    7 Rain =     2.200(In) Runoff =     0.331(In) =   155.52 AcFt Duration 79.00 HRS AVG Q =   23.8 CFS
1986 MO  1 DAY  3 HR   22 Rain =     0.300(In) Runoff =     0.003(In) =     1.58 AcFt Duration 29.00 HRS AVG Q =    0.7 CFS
1986 MO  2 DAY  3 HR   20 Rain =     0.280(In) Runoff =     0.003(In) =     1.41 AcFt Duration 27.00 HRS AVG Q =    0.6 CFS
1986 MO  2 DAY  6 HR    1 Rain =     0.180(In) Runoff =     0.001(In) =     0.62 AcFt Duration 25.00 HRS AVG Q =    0.3 CFS
1986 MO  2 DAY 17 HR   14 Rain =     4.930(In) Runoff =     1.971(In) =   925.11 AcFt Duration 133.00 HRS AVG Q =   84.2 CFS
1986 MO  2 DAY 19 HR   13 Rain =     0.750(In) Runoff =     0.013(In) =     6.01 AcFt Duration 31.00 HRS AVG Q =    2.3 CFS
1986 MO  3 DAY  8 HR   20 Rain =     1.430(In) Runoff =     0.083(In) =    38.99 AcFt Duration 43.00 HRS AVG Q =   11.0 CFS
1986 MO  3 DAY 11 HR    7 Rain =     1.410(In) Runoff =     0.079(In) =    36.97 AcFt Duration 57.00 HRS AVG Q =    7.8 CFS
1986 MO  3 DAY 13 HR   21 Rain =     0.820(In) Runoff =     0.014(In) =     6.74 AcFt Duration 61.00 HRS AVG Q =    1.3 CFS
1986 MO  3 DAY 16 HR   18 Rain =     2.030(In) Runoff =     0.264(In) =   124.02 AcFt Duration 49.00 HRS AVG Q =   30.6 CFS
1986 MO  4 DAY  7 HR    1 Rain =     1.140(In) Runoff =     0.034(In) =    15.76 AcFt Duration 47.00 HRS AVG Q =    4.1 CFS
1986 MO  9 DAY 25 HR    4 Rain =     1.780(In) Runoff =     0.177(In) =    83.25 AcFt Duration 49.00 HRS AVG Q =   20.6 CFS
1986 MO 10 DAY 12 HR    7 Rain =     0.550(In) Runoff =     0.008(In) =     3.97 AcFt Duration 57.00 HRS AVG Q =    0.8 CFS
1986 MO 11 DAY 18 HR    5 Rain =     0.970(In) Runoff =     0.019(In) =     8.83 AcFt Duration 31.00 HRS AVG Q =    3.4 CFS
1986 MO 12 DAY  8 HR    2 Rain =     1.080(In) Runoff =     0.027(In) =    12.71 AcFt Duration 54.00 HRS AVG Q =    2.8 CFS
1987 MO  1 DAY  5 HR    4 Rain =     2.050(In) Runoff =     0.272(In) =   127.57 AcFt Duration 43.00 HRS AVG Q =   35.9 CFS
1987 MO  1 DAY  7 HR    7 Rain =     0.480(In) Runoff =     0.007(In) =     3.27 AcFt Duration 40.00 HRS AVG Q =    1.0 CFS
1987 MO  1 DAY 28 HR    1 Rain =     0.140(In) Runoff =     0.001(In) =     0.35 AcFt Duration 27.00 HRS AVG Q =    0.2 CFS
1987 MO  2 DAY 13 HR   19 Rain =     0.240(In) Runoff =     0.002(In) =     1.07 AcFt Duration 29.00 HRS AVG Q =    0.4 CFS
1987 MO  2 DAY 25 HR   22 Rain =     1.240(In) Runoff =     0.047(In) =    22.24 AcFt Duration 81.00 HRS AVG Q =    3.3 CFS
1987 MO  3 DAY  7 HR    6 Rain =     1.310(In) Runoff =     0.059(In) =    27.76 AcFt Duration 66.00 HRS AVG Q =    5.1 CFS
1987 MO  3 DAY  9 HR    4 Rain =     0.190(In) Runoff =     0.001(In) =     0.69 AcFt Duration 31.00 HRS AVG Q =    0.3 CFS
1987 MO  3 DAY 15 HR    2 Rain =     0.370(In) Runoff =     0.005(In) =     2.22 AcFt Duration 28.00 HRS AVG Q =    1.0 CFS
1987 MO  3 DAY 19 HR   18 Rain =     0.530(In) Runoff =     0.008(In) =     3.77 AcFt Duration 36.00 HRS AVG Q =    1.3 CFS
1987 MO  3 DAY 21 HR   18 Rain =     0.400(In) Runoff =     0.005(In) =     2.50 AcFt Duration 29.00 HRS AVG Q =    1.0 CFS
1987 MO  4 DAY  3 HR   22 Rain =     0.990(In) Runoff =     0.020(In) =     9.36 AcFt Duration 46.00 HRS AVG Q =    2.5 CFS
1987 MO  4 DAY 30 HR    6 Rain =     0.200(In) Runoff =     0.002(In) =     0.76 AcFt Duration 34.00 HRS AVG Q =    0.3 CFS
1987 MO  7 DAY 17 HR    9 Rain =     0.320(In) Runoff =     0.004(In) =     1.76 AcFt Duration 31.00 HRS AVG Q =    0.7 CFS
1987 MO  8 DAY 14 HR   16 Rain =     0.400(In) Runoff =     0.005(In) =     2.50 AcFt Duration 36.00 HRS AVG Q =    0.8 CFS
1987 MO  9 DAY 23 HR   20 Rain =     0.070(In) Runoff =     0.000(In) =     0.04 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
1987 MO 10 DAY 12 HR   19 Rain =     0.510(In) Runoff =     0.008(In) =     3.57 AcFt Duration 51.00 HRS AVG Q =    0.8 CFS
1987 MO 10 DAY 23 HR   10 Rain =     2.590(In) Runoff =     0.507(In) =   237.80 AcFt Duration 46.00 HRS AVG Q =   62.6 CFS
1987 MO 10 DAY 29 HR   17 Rain =     0.470(In) Runoff =     0.007(In) =     3.18 AcFt Duration 31.00 HRS AVG Q =    1.2 CFS
1987 MO 11 DAY  2 HR   12 Rain =     2.650(In) Runoff =     0.536(In) =   251.58 AcFt Duration 81.00 HRS AVG Q =   37.6 CFS
1987 MO 11 DAY  5 HR   20 Rain =     1.800(In) Runoff =     0.184(In) =    86.25 AcFt Duration 50.00 HRS AVG Q =   20.9 CFS
1987 MO 11 DAY 17 HR   22 Rain =     0.060(In) Runoff =     0.000(In) =     0.02 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
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1987 MO 12 DAY  5 HR    1 Rain =     0.870(In) Runoff =     0.015(In) =     7.26 AcFt Duration 34.00 HRS AVG Q =    2.6 CFS
1987 MO 12 DAY  7 HR    5 Rain =     0.100(In) Runoff =     0.000(In) =     0.15 AcFt Duration 27.00 HRS AVG Q =    0.1 CFS
1987 MO 12 DAY 17 HR    5 Rain =     1.310(In) Runoff =     0.059(In) =    27.76 AcFt Duration 40.00 HRS AVG Q =    8.4 CFS
1987 MO 12 DAY 23 HR    2 Rain =     0.430(In) Runoff =     0.006(In) =     2.79 AcFt Duration 30.00 HRS AVG Q =    1.1 CFS
1987 MO 12 DAY 29 HR   22 Rain =     0.430(In) Runoff =     0.006(In) =     2.79 AcFt Duration 33.00 HRS AVG Q =    1.0 CFS
1988 MO  1 DAY  5 HR   19 Rain =     0.340(In) Runoff =     0.004(In) =     1.94 AcFt Duration 31.00 HRS AVG Q =    0.8 CFS
1988 MO  1 DAY 17 HR   20 Rain =     2.200(In) Runoff =     0.331(In) =   155.52 AcFt Duration 43.00 HRS AVG Q =   43.8 CFS
1988 MO  2 DAY  2 HR   16 Rain =     0.640(In) Runoff =     0.010(In) =     4.88 AcFt Duration 41.00 HRS AVG Q =    1.4 CFS
1988 MO  2 DAY 28 HR    2 Rain =     0.110(In) Runoff =     0.000(In) =     0.19 AcFt Duration 32.00 HRS AVG Q =    0.1 CFS
1988 MO  3 DAY  1 HR   23 Rain =     1.940(In) Runoff =     0.231(In) =   108.55 AcFt Duration 58.00 HRS AVG Q =   22.6 CFS
1988 MO  4 DAY 15 HR    2 Rain =     1.740(In) Runoff =     0.165(In) =    77.40 AcFt Duration 46.00 HRS AVG Q =   20.4 CFS
1988 MO  4 DAY 17 HR   21 Rain =     0.570(In) Runoff =     0.009(In) =     4.17 AcFt Duration 46.00 HRS AVG Q =    1.1 CFS
1988 MO  4 DAY 21 HR   10 Rain =     1.980(In) Runoff =     0.246(In) =   115.32 AcFt Duration 60.00 HRS AVG Q =   23.3 CFS
1988 MO  4 DAY 23 HR   16 Rain =     0.270(In) Runoff =     0.003(In) =     1.32 AcFt Duration 28.00 HRS AVG Q =    0.6 CFS
1988 MO  5 DAY 29 HR    6 Rain =     0.320(In) Runoff =     0.004(In) =     1.76 AcFt Duration 28.00 HRS AVG Q =    0.8 CFS
1988 MO  9 DAY 20 HR    9 Rain =     0.220(In) Runoff =     0.002(In) =     0.91 AcFt Duration 32.00 HRS AVG Q =    0.3 CFS
1988 MO 11 DAY 14 HR    4 Rain =     0.780(In) Runoff =     0.013(In) =     6.32 AcFt Duration 30.00 HRS AVG Q =    2.6 CFS
1988 MO 11 DAY 25 HR   21 Rain =     0.940(In) Runoff =     0.017(In) =     8.17 AcFt Duration 78.00 HRS AVG Q =    1.3 CFS
1988 MO 12 DAY 17 HR    1 Rain =     1.800(In) Runoff =     0.184(In) =    86.25 AcFt Duration 65.00 HRS AVG Q =   16.1 CFS
1988 MO 12 DAY 18 HR   17 Rain =     0.390(In) Runoff =     0.005(In) =     2.41 AcFt Duration 32.00 HRS AVG Q =    0.9 CFS
1988 MO 12 DAY 21 HR    7 Rain =     1.790(In) Runoff =     0.181(In) =    84.75 AcFt Duration 35.00 HRS AVG Q =   29.3 CFS
1988 MO 12 DAY 23 HR    2 Rain =     0.160(In) Runoff =     0.001(In) =     0.48 AcFt Duration 30.00 HRS AVG Q =    0.2 CFS
1988 MO 12 DAY 26 HR   14 Rain =     1.680(In) Runoff =     0.147(In) =    68.98 AcFt Duration 73.00 HRS AVG Q =   11.4 CFS
1988 MO 12 DAY 31 HR   22 Rain =     0.300(In) Runoff =     0.003(In) =     1.58 AcFt Duration 31.00 HRS AVG Q =    0.6 CFS
1989 MO  1 DAY  6 HR 2400 Rain =     1.330(In) Runoff =     0.063(In) =    29.48 AcFt Duration 63.00 HRS AVG Q =    5.7 CFS
1989 MO  2 DAY  4 HR   17 Rain =     3.500(In) Runoff =     1.008(In) =   472.89 AcFt Duration 52.00 HRS AVG Q =  110.0 CFS
1989 MO  2 DAY 10 HR    2 Rain =     1.150(In) Runoff =     0.035(In) =    16.34 AcFt Duration 68.00 HRS AVG Q =    2.9 CFS
1989 MO  3 DAY  2 HR   23 Rain =     0.800(In) Runoff =     0.014(In) =     6.53 AcFt Duration 37.00 HRS AVG Q =    2.1 CFS
1989 MO  3 DAY 26 HR 2400 Rain =     1.500(In) Runoff =     0.099(In) =    46.52 AcFt Duration 49.00 HRS AVG Q =   11.5 CFS
1989 MO  4 DAY 26 HR    4 Rain =     0.080(In) Runoff =     0.000(In) =     0.07 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
1989 MO  5 DAY 15 HR   20 Rain =     0.540(In) Runoff =     0.008(In) =     3.87 AcFt Duration 60.00 HRS AVG Q =    0.8 CFS
1989 MO  5 DAY 21 HR   21 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 49.00 HRS AVG Q =    0.0 CFS
1989 MO  9 DAY 17 HR    5 Rain =     0.270(In) Runoff =     0.003(In) =     1.32 AcFt Duration 27.00 HRS AVG Q =    0.6 CFS
1989 MO  9 DAY 19 HR   11 Rain =     0.980(In) Runoff =     0.019(In) =     9.09 AcFt Duration 27.00 HRS AVG Q =    4.1 CFS
1989 MO 10 DAY 22 HR   19 Rain =     0.400(In) Runoff =     0.005(In) =     2.50 AcFt Duration 65.00 HRS AVG Q =    0.5 CFS
1989 MO 10 DAY 25 HR    7 Rain =     0.340(In) Runoff =     0.004(In) =     1.94 AcFt Duration 30.00 HRS AVG Q =    0.8 CFS
1989 MO 11 DAY 26 HR   10 Rain =     0.700(In) Runoff =     0.012(In) =     5.49 AcFt Duration 37.00 HRS AVG Q =    1.8 CFS
1990 MO  1 DAY  2 HR    6 Rain =     0.510(In) Runoff =     0.008(In) =     3.57 AcFt Duration 32.00 HRS AVG Q =    1.3 CFS
1990 MO  1 DAY 14 HR   17 Rain =     1.690(In) Runoff =     0.150(In) =    70.35 AcFt Duration 67.00 HRS AVG Q =   12.7 CFS
1990 MO  1 DAY 17 HR   13 Rain =     1.350(In) Runoff =     0.067(In) =    31.26 AcFt Duration 61.00 HRS AVG Q =    6.2 CFS
1990 MO  1 DAY 31 HR    1 Rain =     0.680(In) Runoff =     0.011(In) =     5.29 AcFt Duration 31.00 HRS AVG Q =    2.1 CFS
1990 MO  2 DAY  1 HR    8 Rain =     0.170(In) Runoff =     0.001(In) =     0.55 AcFt Duration 25.00 HRS AVG Q =    0.3 CFS
1990 MO  2 DAY  4 HR   19 Rain =     0.290(In) Runoff =     0.003(In) =     1.50 AcFt Duration 34.00 HRS AVG Q =    0.5 CFS
1990 MO  2 DAY 18 HR   17 Rain =     4.240(In) Runoff =     1.485(In) =   696.93 AcFt Duration 65.00 HRS AVG Q =  129.7 CFS
1990 MO  3 DAY  5 HR    4 Rain =     0.250(In) Runoff =     0.002(In) =     1.16 AcFt Duration 28.00 HRS AVG Q =    0.5 CFS
1990 MO  3 DAY 13 HR   10 Rain =     0.770(In) Runoff =     0.013(In) =     6.22 AcFt Duration 85.00 HRS AVG Q =    0.9 CFS
1990 MO  3 DAY 28 HR   22 Rain =     0.740(In) Runoff =     0.013(In) =     5.91 AcFt Duration 34.00 HRS AVG Q =    2.1 CFS
1990 MO  4 DAY  4 HR   15 Rain =     0.140(In) Runoff =     0.001(In) =     0.35 AcFt Duration 27.00 HRS AVG Q =    0.2 CFS
1990 MO  4 DAY 17 HR   19 Rain =     2.240(In) Runoff =     0.348(In) =   163.34 AcFt Duration 56.00 HRS AVG Q =   35.3 CFS
1990 MO  4 DAY 24 HR    2 Rain =     0.760(In) Runoff =     0.013(In) =     6.12 AcFt Duration 38.00 HRS AVG Q =    1.9 CFS
1990 MO  4 DAY 30 HR   17 Rain =     0.310(In) Runoff =     0.004(In) =     1.67 AcFt Duration 62.00 HRS AVG Q =    0.3 CFS
1990 MO  5 DAY 28 HR   16 Rain =     0.950(In) Runoff =     0.018(In) =     8.37 AcFt Duration 39.00 HRS AVG Q =    2.6 CFS
1990 MO  8 DAY  6 HR   21 Rain =     0.070(In) Runoff =     0.000(In) =     0.04 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1990 MO  8 DAY 12 HR   20 Rain =     0.210(In) Runoff =     0.002(In) =     0.84 AcFt Duration 25.00 HRS AVG Q =    0.4 CFS
1990 MO 10 DAY 19 HR   11 Rain =     0.190(In) Runoff =     0.001(In) =     0.69 AcFt Duration 41.00 HRS AVG Q =    0.2 CFS
1990 MO 11 DAY 20 HR    5 Rain =     0.680(In) Runoff =     0.011(In) =     5.29 AcFt Duration 32.00 HRS AVG Q =    2.0 CFS
1990 MO 11 DAY 26 HR    5 Rain =     0.120(In) Runoff =     0.001(In) =     0.24 AcFt Duration 28.00 HRS AVG Q =    0.1 CFS
1991 MO  1 DAY  5 HR    3 Rain =     2.510(In) Runoff =     0.469(In) =   219.88 AcFt Duration 68.00 HRS AVG Q =   39.1 CFS
1991 MO  1 DAY  9 HR   14 Rain =     0.160(In) Runoff =     0.001(In) =     0.48 AcFt Duration 28.00 HRS AVG Q =    0.2 CFS
1991 MO  2 DAY  5 HR   20 Rain =     0.050(In) Runoff =     0.000(In) =     0.00 AcFt Duration 27.00 HRS AVG Q =    0.0 CFS
1991 MO  3 DAY  1 HR    4 Rain =     7.220(In) Runoff =     3.772(In) =  1769.84 AcFt Duration 63.00 HRS AVG Q =  339.9 CFS
1991 MO  3 DAY  5 HR    4 Rain =     0.490(In) Runoff =     0.007(In) =     3.37 AcFt Duration 33.00 HRS AVG Q =    1.2 CFS
1991 MO  3 DAY 15 HR    7 Rain =     1.280(In) Runoff =     0.054(In) =    25.30 AcFt Duration 66.00 HRS AVG Q =    4.6 CFS
1991 MO  3 DAY 21 HR    8 Rain =     3.100(In) Runoff =     0.774(In) =   363.13 AcFt Duration 81.00 HRS AVG Q =   54.2 CFS
1991 MO  3 DAY 27 HR   11 Rain =     3.350(In) Runoff =     0.918(In) =   430.67 AcFt Duration 80.00 HRS AVG Q =   65.1 CFS
1991 MO  4 DAY 21 HR    6 Rain =     0.110(In) Runoff =     0.000(In) =     0.19 AcFt Duration 30.00 HRS AVG Q =    0.1 CFS
1991 MO  4 DAY 25 HR    3 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
1991 MO  5 DAY  9 HR    5 Rain =     0.100(In) Runoff =     0.000(In) =     0.15 AcFt Duration 26.00 HRS AVG Q =    0.1 CFS
1991 MO  5 DAY 30 HR   16 Rain =     0.150(In) Runoff =     0.001(In) =     0.42 AcFt Duration 28.00 HRS AVG Q =    0.2 CFS
1991 MO  6 DAY 27 HR    9 Rain =     0.140(In) Runoff =     0.001(In) =     0.35 AcFt Duration 27.00 HRS AVG Q =    0.2 CFS
1991 MO  7 DAY  7 HR   19 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1991 MO  7 DAY 31 HR   11 Rain =     0.090(In) Runoff =     0.000(In) =     0.10 AcFt Duration 27.00 HRS AVG Q =    0.0 CFS
1991 MO  9 DAY  4 HR   22 Rain =     0.090(In) Runoff =     0.000(In) =     0.10 AcFt Duration 25.00 HRS AVG Q =    0.1 CFS
1991 MO 10 DAY 22 HR   11 Rain =     0.070(In) Runoff =     0.000(In) =     0.04 AcFt Duration 28.00 HRS AVG Q =    0.0 CFS
1991 MO 10 DAY 27 HR 2400 Rain =     1.030(In) Runoff =     0.023(In) =    10.66 AcFt Duration 34.00 HRS AVG Q =    3.8 CFS
1991 MO 11 DAY 17 HR   20 Rain =     0.190(In) Runoff =     0.001(In) =     0.69 AcFt Duration 32.00 HRS AVG Q =    0.3 CFS
1991 MO 12 DAY 10 HR   14 Rain =     0.090(In) Runoff =     0.000(In) =     0.10 AcFt Duration 27.00 HRS AVG Q =    0.0 CFS
1991 MO 12 DAY 19 HR    5 Rain =     1.370(In) Runoff =     0.071(In) =    33.10 AcFt Duration 27.00 HRS AVG Q =   14.8 CFS
1991 MO 12 DAY 28 HR    3 Rain =     0.450(In) Runoff =     0.006(In) =     2.98 AcFt Duration 28.00 HRS AVG Q =    1.3 CFS
1991 MO 12 DAY 30 HR    8 Rain =     1.160(In) Runoff =     0.036(In) =    16.92 AcFt Duration 44.00 HRS AVG Q =    4.7 CFS
1992 MO  1 DAY  3 HR   19 Rain =     0.550(In) Runoff =     0.008(In) =     3.97 AcFt Duration 39.00 HRS AVG Q =    1.2 CFS
1992 MO  1 DAY  6 HR    3 Rain =     1.920(In) Runoff =     0.224(In) =   105.23 AcFt Duration 45.00 HRS AVG Q =   28.3 CFS
1992 MO  1 DAY  7 HR   20 Rain =     0.490(In) Runoff =     0.007(In) =     3.37 AcFt Duration 35.00 HRS AVG Q =    1.2 CFS
1992 MO  2 DAY  7 HR   14 Rain =     1.010(In) Runoff =     0.021(In) =     9.98 AcFt Duration 52.00 HRS AVG Q =    2.3 CFS
1992 MO  2 DAY 13 HR   17 Rain =     5.490(In) Runoff =     2.389(In) =  1120.98 AcFt Duration 115.00 HRS AVG Q =  117.9 CFS
1992 MO  2 DAY 15 HR   20 Rain =     1.650(In) Runoff =     0.138(In) =    64.94 AcFt Duration 39.00 HRS AVG Q =   20.1 CFS
1992 MO  3 DAY  3 HR 2400 Rain =     1.050(In) Runoff =     0.024(In) =    11.43 AcFt Duration 41.00 HRS AVG Q =    3.4 CFS
1992 MO  3 DAY  4 HR    4 Rain =     0.070(In) Runoff =     0.000(In) =     0.04 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
1992 MO  3 DAY  7 HR   17 Rain =     0.370(In) Runoff =     0.005(In) =     2.22 AcFt Duration 59.00 HRS AVG Q =    0.5 CFS
1992 MO  3 DAY  8 HR   22 Rain =     0.080(In) Runoff =     0.000(In) =     0.07 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1992 MO  3 DAY 23 HR   10 Rain =     6.330(In) Runoff =     3.045(In) =  1428.94 AcFt Duration 97.00 HRS AVG Q =  178.2 CFS
1992 MO  3 DAY 28 HR    7 Rain =     2.080(In) Runoff =     0.283(In) =   132.98 AcFt Duration 61.00 HRS AVG Q =   26.4 CFS
1992 MO  4 DAY  1 HR   15 Rain =     0.500(In) Runoff =     0.007(In) =     3.47 AcFt Duration 67.00 HRS AVG Q =    0.6 CFS
1992 MO  5 DAY  6 HR   19 Rain =     0.200(In) Runoff =     0.002(In) =     0.76 AcFt Duration 57.00 HRS AVG Q =    0.2 CFS
1992 MO  5 DAY  9 HR   14 Rain =     0.120(In) Runoff =     0.001(In) =     0.24 AcFt Duration 27.00 HRS AVG Q =    0.1 CFS
1992 MO  7 DAY  7 HR   19 Rain =     0.120(In) Runoff =     0.001(In) =     0.24 AcFt Duration 27.00 HRS AVG Q =    0.1 CFS
1992 MO  7 DAY 13 HR    2 Rain =     0.660(In) Runoff =     0.011(In) =     5.08 AcFt Duration 49.00 HRS AVG Q =    1.3 CFS
1992 MO 10 DAY 31 HR 2400 Rain =     2.620(In) Runoff =     0.521(In) =   244.66 AcFt Duration 71.00 HRS AVG Q =   41.7 CFS
1992 MO 12 DAY  4 HR   12 Rain =     0.420(In) Runoff =     0.006(In) =     2.69 AcFt Duration 30.00 HRS AVG Q =    1.1 CFS
1992 MO 12 DAY  7 HR   23 Rain =     3.420(In) Runoff =     0.959(In) =   450.22 AcFt Duration 53.00 HRS AVG Q =  102.8 CFS
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1992 MO 12 DAY 11 HR   22 Rain =     0.120(In) Runoff =     0.001(In) =     0.24 AcFt Duration 26.00 HRS AVG Q =    0.1 CFS
1992 MO 12 DAY 18 HR    1 Rain =     0.960(In) Runoff =     0.018(In) =     8.59 AcFt Duration 30.00 HRS AVG Q =    3.5 CFS
1992 MO 12 DAY 28 HR    4 Rain =     1.240(In) Runoff =     0.047(In) =    22.24 AcFt Duration 35.00 HRS AVG Q =    7.7 CFS
1992 MO 12 DAY 30 HR    2 Rain =     2.130(In) Runoff =     0.303(In) =   142.20 AcFt Duration 43.00 HRS AVG Q =   40.0 CFS
1993 MO  1 DAY  2 HR   10 Rain =     0.640(In) Runoff =     0.010(In) =     4.88 AcFt Duration 31.00 HRS AVG Q =    1.9 CFS
1993 MO  1 DAY 10 HR   20 Rain =     7.700(In) Runoff =     4.174(In) =  1958.72 AcFt Duration 139.00 HRS AVG Q =  170.5 CFS
1993 MO  1 DAY 18 HR   22 Rain =     9.510(In) Runoff =     5.743(In) =  2694.91 AcFt Duration 177.00 HRS AVG Q =  184.2 CFS
1993 MO  1 DAY 31 HR    3 Rain =     0.120(In) Runoff =     0.001(In) =     0.24 AcFt Duration 27.00 HRS AVG Q =    0.1 CFS
1993 MO  2 DAY 10 HR 2400 Rain =     4.600(In) Runoff =     1.735(In) =   813.97 AcFt Duration 85.00 HRS AVG Q =  115.9 CFS
1993 MO  2 DAY 20 HR   13 Rain =     5.420(In) Runoff =     2.336(In) =  1096.04 AcFt Duration 76.00 HRS AVG Q =  174.5 CFS
1993 MO  2 DAY 24 HR    4 Rain =     1.230(In) Runoff =     0.046(In) =    21.52 AcFt Duration 49.00 HRS AVG Q =    5.3 CFS
1993 MO  2 DAY 28 HR   10 Rain =     1.010(In) Runoff =     0.021(In) =     9.98 AcFt Duration 72.00 HRS AVG Q =    1.7 CFS
1993 MO  3 DAY 28 HR    6 Rain =     2.500(In) Runoff =     0.464(In) =   217.67 AcFt Duration 80.00 HRS AVG Q =   32.9 CFS
1993 MO  5 DAY  4 HR 2400 Rain =     0.090(In) Runoff =     0.000(In) =     0.10 AcFt Duration 28.00 HRS AVG Q =    0.0 CFS
1993 MO  6 DAY  6 HR    7 Rain =     1.810(In) Runoff =     0.187(In) =    87.77 AcFt Duration 49.00 HRS AVG Q =   21.7 CFS
1993 MO  9 DAY  2 HR   16 Rain =     0.030(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1993 MO  9 DAY 13 HR    5 Rain =     0.120(In) Runoff =     0.001(In) =     0.24 AcFt Duration 30.00 HRS AVG Q =    0.1 CFS
1993 MO 10 DAY 11 HR    3 Rain =     0.090(In) Runoff =     0.000(In) =     0.10 AcFt Duration 27.00 HRS AVG Q =    0.0 CFS
1993 MO 10 DAY 16 HR   22 Rain =     0.230(In) Runoff =     0.002(In) =     0.99 AcFt Duration 30.00 HRS AVG Q =    0.4 CFS
1993 MO 11 DAY 12 HR   14 Rain =     0.830(In) Runoff =     0.015(In) =     6.85 AcFt Duration 64.00 HRS AVG Q =    1.3 CFS
1993 MO 11 DAY 14 HR    6 Rain =     0.090(In) Runoff =     0.000(In) =     0.10 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
1993 MO 11 DAY 30 HR    6 Rain =     0.180(In) Runoff =     0.001(In) =     0.62 AcFt Duration 28.00 HRS AVG Q =    0.3 CFS
1993 MO 12 DAY 12 HR    2 Rain =     0.390(In) Runoff =     0.005(In) =     2.41 AcFt Duration 36.00 HRS AVG Q =    0.8 CFS
1993 MO 12 DAY 14 HR   19 Rain =     0.580(In) Runoff =     0.009(In) =     4.27 AcFt Duration 28.00 HRS AVG Q =    1.8 CFS
1993 MO 12 DAY 19 HR    5 Rain =     0.070(In) Runoff =     0.000(In) =     0.04 AcFt Duration 28.00 HRS AVG Q =    0.0 CFS
1994 MO  1 DAY 25 HR   21 Rain =     0.790(In) Runoff =     0.014(In) =     6.43 AcFt Duration 48.00 HRS AVG Q =    1.6 CFS
1994 MO  1 DAY 27 HR   10 Rain =     0.060(In) Runoff =     0.000(In) =     0.02 AcFt Duration 27.00 HRS AVG Q =    0.0 CFS
1994 MO  2 DAY  5 HR    7 Rain =     1.130(In) Runoff =     0.032(In) =    15.21 AcFt Duration 60.00 HRS AVG Q =    3.1 CFS
1994 MO  2 DAY  8 HR   12 Rain =     2.740(In) Runoff =     0.581(In) =   272.76 AcFt Duration 59.00 HRS AVG Q =   55.9 CFS
1994 MO  2 DAY 19 HR 2400 Rain =     0.910(In) Runoff =     0.016(In) =     7.70 AcFt Duration 66.00 HRS AVG Q =    1.4 CFS
1994 MO  2 DAY 20 HR   19 Rain =     0.980(In) Runoff =     0.019(In) =     9.09 AcFt Duration 39.00 HRS AVG Q =    2.8 CFS
1994 MO  3 DAY  7 HR   16 Rain =     0.520(In) Runoff =     0.008(In) =     3.67 AcFt Duration 63.00 HRS AVG Q =    0.7 CFS
1994 MO  3 DAY 11 HR    6 Rain =     0.100(In) Runoff =     0.000(In) =     0.15 AcFt Duration 30.00 HRS AVG Q =    0.1 CFS
1994 MO  3 DAY 20 HR    2 Rain =     1.910(In) Runoff =     0.221(In) =   103.58 AcFt Duration 48.00 HRS AVG Q =   26.1 CFS
1994 MO  3 DAY 25 HR   17 Rain =     0.940(In) Runoff =     0.017(In) =     8.17 AcFt Duration 48.00 HRS AVG Q =    2.1 CFS
1994 MO  4 DAY 10 HR    6 Rain =     0.540(In) Runoff =     0.008(In) =     3.87 AcFt Duration 76.00 HRS AVG Q =    0.6 CFS
1994 MO  4 DAY 29 HR    4 Rain =     1.580(In) Runoff =     0.119(In) =    55.97 AcFt Duration 167.00 HRS AVG Q =    4.1 CFS
1994 MO  5 DAY  7 HR 2400 Rain =     0.440(In) Runoff =     0.006(In) =     2.88 AcFt Duration 67.00 HRS AVG Q =    0.5 CFS
1994 MO  5 DAY  8 HR   17 Rain =     0.100(In) Runoff =     0.000(In) =     0.15 AcFt Duration 39.00 HRS AVG Q =    0.0 CFS
1994 MO  5 DAY 13 HR    8 Rain =     0.050(In) Runoff =     0.000(In) =     0.00 AcFt Duration 60.00 HRS AVG Q =    0.0 CFS
1994 MO  5 DAY 18 HR   15 Rain =     0.460(In) Runoff =     0.007(In) =     3.08 AcFt Duration 49.00 HRS AVG Q =    0.8 CFS
1994 MO  5 DAY 26 HR    5 Rain =     0.160(In) Runoff =     0.001(In) =     0.48 AcFt Duration 50.00 HRS AVG Q =    0.1 CFS
1994 MO  5 DAY 31 HR    4 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1994 MO  6 DAY 15 HR   11 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1994 MO  7 DAY  1 HR    5 Rain =     0.030(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1994 MO 10 DAY  5 HR   11 Rain =     1.760(In) Runoff =     0.171(In) =    80.30 AcFt Duration 58.00 HRS AVG Q =   16.8 CFS
1994 MO 10 DAY 15 HR    3 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 29.00 HRS AVG Q =    0.0 CFS
1994 MO 11 DAY  3 HR    1 Rain =     0.070(In) Runoff =     0.000(In) =     0.04 AcFt Duration 38.00 HRS AVG Q =    0.0 CFS
1994 MO 11 DAY  8 HR    1 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1994 MO 11 DAY 10 HR   14 Rain =     0.660(In) Runoff =     0.011(In) =     5.08 AcFt Duration 31.00 HRS AVG Q =    2.0 CFS
1994 MO 11 DAY 16 HR    9 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1994 MO 11 DAY 18 HR    8 Rain =     0.160(In) Runoff =     0.001(In) =     0.48 AcFt Duration 36.00 HRS AVG Q =    0.2 CFS
1994 MO 11 DAY 26 HR   14 Rain =     0.850(In) Runoff =     0.015(In) =     7.05 AcFt Duration 37.00 HRS AVG Q =    2.3 CFS
1994 MO 12 DAY 13 HR    4 Rain =     0.190(In) Runoff =     0.001(In) =     0.69 AcFt Duration 28.00 HRS AVG Q =    0.3 CFS
1994 MO 12 DAY 25 HR   20 Rain =     2.510(In) Runoff =     0.469(In) =   219.88 AcFt Duration 97.00 HRS AVG Q =   27.4 CFS
1994 MO 12 DAY 28 HR   22 Rain =     0.360(In) Runoff =     0.005(In) =     2.13 AcFt Duration 27.00 HRS AVG Q =    1.0 CFS
1995 MO  1 DAY  5 HR   21 Rain =     4.840(In) Runoff =     1.906(In) =   894.46 AcFt Duration 88.00 HRS AVG Q =  123.0 CFS
1995 MO  1 DAY  9 HR    3 Rain =     3.060(In) Runoff =     0.752(In) =   352.66 AcFt Duration 66.00 HRS AVG Q =   64.7 CFS
1995 MO  1 DAY 13 HR   12 Rain =     4.400(In) Runoff =     1.595(In) =   748.37 AcFt Duration 101.00 HRS AVG Q =   89.7 CFS
1995 MO  1 DAY 16 HR   18 Rain =     0.590(In) Runoff =     0.009(In) =     4.37 AcFt Duration 72.00 HRS AVG Q =    0.7 CFS
1995 MO  1 DAY 21 HR    4 Rain =     0.180(In) Runoff =     0.001(In) =     0.62 AcFt Duration 29.00 HRS AVG Q =    0.3 CFS
1995 MO  1 DAY 26 HR   11 Rain =     4.490(In) Runoff =     1.657(In) =   777.72 AcFt Duration 112.00 HRS AVG Q =   84.0 CFS
1995 MO  2 DAY  8 HR    8 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 28.00 HRS AVG Q =    0.0 CFS
1995 MO  2 DAY 12 HR    5 Rain =     0.070(In) Runoff =     0.000(In) =     0.04 AcFt Duration 43.00 HRS AVG Q =    0.0 CFS
1995 MO  2 DAY 15 HR    6 Rain =     2.940(In) Runoff =     0.686(In) =   321.89 AcFt Duration 71.00 HRS AVG Q =   54.9 CFS
1995 MO  2 DAY 25 HR    2 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1995 MO  3 DAY  6 HR    2 Rain =     7.050(In) Runoff =     3.631(In) =  1703.74 AcFt Duration 142.00 HRS AVG Q =  145.2 CFS
1995 MO  3 DAY 12 HR    8 Rain =     3.450(In) Runoff =     0.977(In) =   458.68 AcFt Duration 71.00 HRS AVG Q =   78.2 CFS
1995 MO  3 DAY 23 HR   17 Rain =     1.520(In) Runoff =     0.104(In) =    48.80 AcFt Duration 82.00 HRS AVG Q =    7.2 CFS
1995 MO  4 DAY  8 HR    3 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 28.00 HRS AVG Q =    0.0 CFS
1995 MO  4 DAY 13 HR   20 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1995 MO  4 DAY 18 HR   18 Rain =     1.010(In) Runoff =     0.021(In) =     9.98 AcFt Duration 85.00 HRS AVG Q =    1.4 CFS
1995 MO  4 DAY 20 HR   19 Rain =     0.060(In) Runoff =     0.000(In) =     0.02 AcFt Duration 28.00 HRS AVG Q =    0.0 CFS
1995 MO  5 DAY  8 HR   19 Rain =     0.460(In) Runoff =     0.007(In) =     3.08 AcFt Duration 136.00 HRS AVG Q =    0.3 CFS
1995 MO  5 DAY 10 HR   10 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1995 MO  5 DAY 15 HR    8 Rain =     0.180(In) Runoff =     0.001(In) =     0.62 AcFt Duration 101.00 HRS AVG Q =    0.1 CFS
1995 MO  5 DAY 16 HR   21 Rain =     0.050(In) Runoff =     0.000(In) =     0.00 AcFt Duration 28.00 HRS AVG Q =    0.0 CFS
1995 MO  5 DAY 24 HR   21 Rain =     0.240(In) Runoff =     0.002(In) =     1.07 AcFt Duration 90.00 HRS AVG Q =    0.1 CFS
1995 MO  6 DAY  2 HR   11 Rain =     0.060(In) Runoff =     0.000(In) =     0.02 AcFt Duration 49.00 HRS AVG Q =    0.0 CFS
1995 MO  6 DAY 19 HR   14 Rain =     0.410(In) Runoff =     0.006(In) =     2.60 AcFt Duration 129.00 HRS AVG Q =    0.2 CFS
1995 MO  6 DAY 22 HR    4 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1995 MO  7 DAY 16 HR    1 Rain =     0.050(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1995 MO  9 DAY  2 HR   17 Rain =     0.170(In) Runoff =     0.001(In) =     0.55 AcFt Duration 50.00 HRS AVG Q =    0.1 CFS
1995 MO 12 DAY 14 HR    1 Rain =     1.160(In) Runoff =     0.036(In) =    16.92 AcFt Duration 52.00 HRS AVG Q =    3.9 CFS
1995 MO 12 DAY 23 HR   15 Rain =     0.320(In) Runoff =     0.004(In) =     1.76 AcFt Duration 35.00 HRS AVG Q =    0.6 CFS
1996 MO  1 DAY 17 HR    3 Rain =     0.640(In) Runoff =     0.010(In) =     4.88 AcFt Duration 35.00 HRS AVG Q =    1.7 CFS
1996 MO  1 DAY 19 HR    6 Rain =     0.030(In) Runoff =     0.000(In) =     0.00 AcFt Duration 27.00 HRS AVG Q =    0.0 CFS
1996 MO  1 DAY 22 HR   14 Rain =     0.790(In) Runoff =     0.014(In) =     6.43 AcFt Duration 48.00 HRS AVG Q =    1.6 CFS
1996 MO  1 DAY 28 HR    8 Rain =     0.170(In) Runoff =     0.001(In) =     0.55 AcFt Duration 35.00 HRS AVG Q =    0.2 CFS
1996 MO  2 DAY  2 HR    3 Rain =     3.260(In) Runoff =     0.865(In) =   405.94 AcFt Duration 73.00 HRS AVG Q =   67.3 CFS
1996 MO  2 DAY  3 HR   13 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
1996 MO  2 DAY 22 HR    9 Rain =     7.010(In) Runoff =     3.598(In) =  1688.24 AcFt Duration 103.00 HRS AVG Q =  198.3 CFS
1996 MO  2 DAY 28 HR    6 Rain =     1.050(In) Runoff =     0.024(In) =    11.43 AcFt Duration 98.00 HRS AVG Q =    1.4 CFS
1996 MO  3 DAY  6 HR 2400 Rain =     2.470(In) Runoff =     0.450(In) =   211.10 AcFt Duration 60.00 HRS AVG Q =   42.6 CFS
1996 MO  3 DAY 14 HR   16 Rain =     1.720(In) Runoff =     0.159(In) =    74.54 AcFt Duration 75.00 HRS AVG Q =   12.0 CFS
1996 MO  3 DAY 23 HR    4 Rain =     0.150(In) Runoff =     0.001(In) =     0.42 AcFt Duration 46.00 HRS AVG Q =    0.1 CFS
1996 MO  3 DAY 26 HR    2 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1996 MO  3 DAY 28 HR   18 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1996 MO  7 DAY 27 HR    7 Rain =     0.120(In) Runoff =     0.001(In) =     0.24 AcFt Duration 26.00 HRS AVG Q =    0.1 CFS
1996 MO  8 DAY 23 HR   16 Rain =     0.050(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
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1996 MO  9 DAY 16 HR    7 Rain =     0.050(In) Runoff =     0.000(In) =     0.00 AcFt Duration 30.00 HRS AVG Q =    0.0 CFS
1996 MO  9 DAY 26 HR    8 Rain =     0.030(In) Runoff =     0.000(In) =     0.00 AcFt Duration 28.00 HRS AVG Q =    0.0 CFS
1996 MO 10 DAY 31 HR    2 Rain =     1.520(In) Runoff =     0.104(In) =    48.80 AcFt Duration 44.00 HRS AVG Q =   13.4 CFS
1996 MO 11 DAY 15 HR    8 Rain =     0.050(In) Runoff =     0.000(In) =     0.00 AcFt Duration 35.00 HRS AVG Q =    0.0 CFS
1996 MO 11 DAY 23 HR    9 Rain =     4.990(In) Runoff =     2.015(In) =   945.68 AcFt Duration 79.00 HRS AVG Q =  144.8 CFS
1996 MO 12 DAY  6 HR    9 Rain =     0.170(In) Runoff =     0.001(In) =     0.55 AcFt Duration 33.00 HRS AVG Q =    0.2 CFS
1996 MO 12 DAY 10 HR   16 Rain =     1.370(In) Runoff =     0.071(In) =    33.10 AcFt Duration 51.00 HRS AVG Q =    7.9 CFS
1996 MO 12 DAY 13 HR   21 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1996 MO 12 DAY 22 HR   16 Rain =     1.780(In) Runoff =     0.177(In) =    83.25 AcFt Duration 35.00 HRS AVG Q =   28.8 CFS
1996 MO 12 DAY 28 HR    5 Rain =     1.020(In) Runoff =     0.022(In) =    10.31 AcFt Duration 45.00 HRS AVG Q =    2.8 CFS
1997 MO  1 DAY  3 HR   15 Rain =     3.570(In) Runoff =     1.051(In) =   492.99 AcFt Duration 62.00 HRS AVG Q =   96.2 CFS
1997 MO  1 DAY  6 HR 2400 Rain =     0.290(In) Runoff =     0.003(In) =     1.50 AcFt Duration 45.00 HRS AVG Q =    0.4 CFS
1997 MO  1 DAY 15 HR   17 Rain =     3.440(In) Runoff =     0.971(In) =   455.86 AcFt Duration 106.00 HRS AVG Q =   52.0 CFS
1997 MO  1 DAY 24 HR    1 Rain =     1.080(In) Runoff =     0.027(In) =    12.71 AcFt Duration 108.00 HRS AVG Q =    1.4 CFS
1997 MO  1 DAY 27 HR    3 Rain =     3.500(In) Runoff =     1.008(In) =   472.89 AcFt Duration 68.00 HRS AVG Q =   84.1 CFS
1997 MO  2 DAY 28 HR    3 Rain =     1.650(In) Runoff =     0.138(In) =    64.94 AcFt Duration 46.00 HRS AVG Q =   17.1 CFS
1997 MO  3 DAY 23 HR    9 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1997 MO  3 DAY 28 HR    6 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1997 MO  3 DAY 31 HR   14 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 42.00 HRS AVG Q =    0.0 CFS
1997 MO  4 DAY  3 HR   13 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1997 MO  4 DAY  9 HR    3 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1997 MO  6 DAY  6 HR    5 Rain =     0.190(In) Runoff =     0.001(In) =     0.69 AcFt Duration 29.00 HRS AVG Q =    0.3 CFS
1997 MO  6 DAY 11 HR    8 Rain =     0.430(In) Runoff =     0.006(In) =     2.79 AcFt Duration 72.00 HRS AVG Q =    0.5 CFS
1997 MO  9 DAY  3 HR    2 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 33.00 HRS AVG Q =    0.0 CFS
1997 MO  9 DAY 15 HR    7 Rain =     0.380(In) Runoff =     0.005(In) =     2.31 AcFt Duration 41.00 HRS AVG Q =    0.7 CFS
1997 MO  9 DAY 26 HR   11 Rain =     1.130(In) Runoff =     0.032(In) =    15.21 AcFt Duration 59.00 HRS AVG Q =    3.1 CFS
1997 MO 10 DAY  7 HR   10 Rain =     1.250(In) Runoff =     0.049(In) =    22.98 AcFt Duration 50.00 HRS AVG Q =    5.6 CFS
1997 MO 10 DAY 11 HR    2 Rain =     0.060(In) Runoff =     0.000(In) =     0.02 AcFt Duration 28.00 HRS AVG Q =    0.0 CFS
1997 MO 10 DAY 24 HR    5 Rain =     0.070(In) Runoff =     0.000(In) =     0.04 AcFt Duration 49.00 HRS AVG Q =    0.0 CFS
1997 MO 11 DAY 11 HR    3 Rain =     0.690(In) Runoff =     0.011(In) =     5.39 AcFt Duration 39.00 HRS AVG Q =    1.7 CFS
1997 MO 11 DAY 14 HR   10 Rain =     0.980(In) Runoff =     0.019(In) =     9.09 AcFt Duration 68.00 HRS AVG Q =    1.6 CFS
1997 MO 11 DAY 27 HR    4 Rain =     0.870(In) Runoff =     0.015(In) =     7.26 AcFt Duration 41.00 HRS AVG Q =    2.1 CFS
1997 MO 12 DAY  1 HR   15 Rain =     0.290(In) Runoff =     0.003(In) =     1.50 AcFt Duration 51.00 HRS AVG Q =    0.4 CFS
1997 MO 12 DAY  8 HR   16 Rain =     3.040(In) Runoff =     0.740(In) =   347.47 AcFt Duration 86.00 HRS AVG Q =   48.9 CFS
1997 MO 12 DAY 21 HR    9 Rain =     0.320(In) Runoff =     0.004(In) =     1.76 AcFt Duration 27.00 HRS AVG Q =    0.8 CFS
1998 MO  1 DAY  4 HR   18 Rain =     0.300(In) Runoff =     0.003(In) =     1.58 AcFt Duration 61.00 HRS AVG Q =    0.3 CFS
1998 MO  1 DAY 11 HR    1 Rain =     2.590(In) Runoff =     0.507(In) =   237.80 AcFt Duration 64.00 HRS AVG Q =   45.0 CFS
1998 MO  1 DAY 13 HR    5 Rain =     0.140(In) Runoff =     0.001(In) =     0.35 AcFt Duration 29.00 HRS AVG Q =    0.1 CFS
1998 MO  1 DAY 19 HR   21 Rain =     0.660(In) Runoff =     0.011(In) =     5.08 AcFt Duration 44.00 HRS AVG Q =    1.4 CFS
1998 MO  1 DAY 29 HR   20 Rain =     0.640(In) Runoff =     0.010(In) =     4.88 AcFt Duration 37.00 HRS AVG Q =    1.6 CFS
1998 MO  2 DAY  4 HR    6 Rain =     1.700(In) Runoff =     0.153(In) =    71.74 AcFt Duration 45.00 HRS AVG Q =   19.3 CFS
1998 MO  2 DAY  8 HR 2400 Rain =     0.330(In) Runoff =     0.004(In) =     1.85 AcFt Duration 60.00 HRS AVG Q =    0.4 CFS
1998 MO  3 DAY  6 HR   20 Rain =     0.110(In) Runoff =     0.000(In) =     0.19 AcFt Duration 47.00 HRS AVG Q =    0.0 CFS
1998 MO  3 DAY 14 HR   15 Rain =     0.650(In) Runoff =     0.011(In) =     4.98 AcFt Duration 50.00 HRS AVG Q =    1.2 CFS
1998 MO  3 DAY 16 HR    5 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 27.00 HRS AVG Q =    0.0 CFS
1998 MO  3 DAY 21 HR    2 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1998 MO  3 DAY 25 HR   14 Rain =     0.970(In) Runoff =     0.019(In) =     8.83 AcFt Duration 33.00 HRS AVG Q =    3.2 CFS
1998 MO  3 DAY 29 HR   15 Rain =     2.640(In) Runoff =     0.531(In) =   249.27 AcFt Duration 88.00 HRS AVG Q =   34.3 CFS
1998 MO  4 DAY  2 HR    6 Rain =     0.800(In) Runoff =     0.014(In) =     6.53 AcFt Duration 61.00 HRS AVG Q =    1.3 CFS
1998 MO  4 DAY  3 HR   23 Rain =     0.120(In) Runoff =     0.001(In) =     0.24 AcFt Duration 28.00 HRS AVG Q =    0.1 CFS
1998 MO  4 DAY  7 HR    9 Rain =     0.930(In) Runoff =     0.017(In) =     8.00 AcFt Duration 63.00 HRS AVG Q =    1.5 CFS
1998 MO  4 DAY 12 HR    7 Rain =     0.730(In) Runoff =     0.012(In) =     5.80 AcFt Duration 42.00 HRS AVG Q =    1.7 CFS
1998 MO  4 DAY 15 HR   13 Rain =     0.640(In) Runoff =     0.010(In) =     4.88 AcFt Duration 69.00 HRS AVG Q =    0.9 CFS

1998 MO  4 DAY 25 HR    6 Rain =     0.050(In) Runoff =     0.000(In) =     0.00 AcFt Duration 29.00 HRS AVG Q =    0.0 CFS
1998 MO  5 DAY  6 HR    9 Rain =     3.120(In) Runoff =     0.785(In) =   368.39 AcFt Duration 78.00 HRS AVG Q =   57.1 CFS
1998 MO  5 DAY  8 HR    1 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 33.00 HRS AVG Q =    0.0 CFS
1998 MO  5 DAY 10 HR    8 Rain =     0.100(In) Runoff =     0.000(In) =     0.15 AcFt Duration 54.00 HRS AVG Q =    0.0 CFS
1998 MO  5 DAY 12 HR   20 Rain =     0.130(In) Runoff =     0.001(In) =     0.30 AcFt Duration 30.00 HRS AVG Q =    0.1 CFS
1998 MO  5 DAY 26 HR    8 Rain =     0.050(In) Runoff =     0.000(In) =     0.00 AcFt Duration 71.00 HRS AVG Q =    0.0 CFS
1998 MO  6 DAY  4 HR    6 Rain =     0.160(In) Runoff =     0.001(In) =     0.48 AcFt Duration 31.00 HRS AVG Q =    0.2 CFS
1998 MO  6 DAY  8 HR    3 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1998 MO  6 DAY  9 HR    7 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1998 MO  6 DAY 12 HR   13 Rain =     0.320(In) Runoff =     0.004(In) =     1.76 AcFt Duration 60.00 HRS AVG Q =    0.4 CFS
1998 MO  6 DAY 16 HR    8 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1998 MO  8 DAY 13 HR   15 Rain =     0.340(In) Runoff =     0.004(In) =     1.94 AcFt Duration 27.00 HRS AVG Q =    0.9 CFS
1998 MO  8 DAY 31 HR   20 Rain =     0.200(In) Runoff =     0.002(In) =     0.76 AcFt Duration 27.00 HRS AVG Q =    0.3 CFS
1998 MO  9 DAY 21 HR    3 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1998 MO 10 DAY 25 HR    3 Rain =     0.080(In) Runoff =     0.000(In) =     0.07 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
1998 MO 11 DAY  9 HR    2 Rain =     0.380(In) Runoff =     0.005(In) =     2.31 AcFt Duration 48.00 HRS AVG Q =    0.6 CFS
1998 MO 11 DAY 12 HR    4 Rain =     0.170(In) Runoff =     0.001(In) =     0.55 AcFt Duration 44.00 HRS AVG Q =    0.2 CFS
1998 MO 11 DAY 28 HR   18 Rain =     0.780(In) Runoff =     0.013(In) =     6.32 AcFt Duration 35.00 HRS AVG Q =    2.2 CFS
1998 MO 12 DAY  4 HR    1 Rain =     0.080(In) Runoff =     0.000(In) =     0.07 AcFt Duration 27.00 HRS AVG Q =    0.0 CFS
1998 MO 12 DAY  6 HR   11 Rain =     0.230(In) Runoff =     0.002(In) =     0.99 AcFt Duration 56.00 HRS AVG Q =    0.2 CFS
1998 MO 12 DAY 21 HR    2 Rain =     0.230(In) Runoff =     0.002(In) =     0.99 AcFt Duration 58.00 HRS AVG Q =    0.2 CFS
1999 MO  1 DAY 21 HR    6 Rain =     0.400(In) Runoff =     0.005(In) =     2.50 AcFt Duration 54.00 HRS AVG Q =    0.6 CFS
1999 MO  1 DAY 27 HR   12 Rain =     1.270(In) Runoff =     0.052(In) =    24.51 AcFt Duration 80.00 HRS AVG Q =    3.7 CFS
1999 MO  2 DAY  1 HR   10 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 49.00 HRS AVG Q =    0.0 CFS
1999 MO  2 DAY  5 HR    1 Rain =     0.170(In) Runoff =     0.001(In) =     0.55 AcFt Duration 35.00 HRS AVG Q =    0.2 CFS
1999 MO  2 DAY 10 HR    2 Rain =     0.090(In) Runoff =     0.000(In) =     0.10 AcFt Duration 36.00 HRS AVG Q =    0.0 CFS
1999 MO  2 DAY 19 HR    2 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
1999 MO  3 DAY  4 HR    6 Rain =     0.030(In) Runoff =     0.000(In) =     0.00 AcFt Duration 28.00 HRS AVG Q =    0.0 CFS
1999 MO  3 DAY 15 HR   14 Rain =     0.080(In) Runoff =     0.000(In) =     0.07 AcFt Duration 28.00 HRS AVG Q =    0.0 CFS
1999 MO  3 DAY 20 HR   12 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
1999 MO  3 DAY 23 HR    2 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1999 MO  3 DAY 24 HR   11 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1999 MO  3 DAY 25 HR   22 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1999 MO  4 DAY  1 HR   14 Rain =     0.080(In) Runoff =     0.000(In) =     0.07 AcFt Duration 51.00 HRS AVG Q =    0.0 CFS
1999 MO  4 DAY  4 HR    8 Rain =     0.060(In) Runoff =     0.000(In) =     0.02 AcFt Duration 42.00 HRS AVG Q =    0.0 CFS
1999 MO  4 DAY  8 HR   22 Rain =     1.150(In) Runoff =     0.035(In) =    16.34 AcFt Duration 87.00 HRS AVG Q =    2.3 CFS
1999 MO  4 DAY 12 HR   19 Rain =     1.280(In) Runoff =     0.054(In) =    25.30 AcFt Duration 54.00 HRS AVG Q =    5.7 CFS
1999 MO  4 DAY 22 HR    4 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1999 MO  4 DAY 25 HR 2400 Rain =     0.330(In) Runoff =     0.004(In) =     1.85 AcFt Duration 52.00 HRS AVG Q =    0.4 CFS
1999 MO  4 DAY 28 HR   19 Rain =     0.210(In) Runoff =     0.002(In) =     0.84 AcFt Duration 38.00 HRS AVG Q =    0.3 CFS
1999 MO  4 DAY 30 HR   15 Rain =     0.450(In) Runoff =     0.006(In) =     2.98 AcFt Duration 36.00 HRS AVG Q =    1.0 CFS
1999 MO  5 DAY  3 HR   21 Rain =     0.230(In) Runoff =     0.002(In) =     0.99 AcFt Duration 46.00 HRS AVG Q =    0.3 CFS
1999 MO  5 DAY  9 HR    3 Rain =     0.080(In) Runoff =     0.000(In) =     0.07 AcFt Duration 28.00 HRS AVG Q =    0.0 CFS
1999 MO  5 DAY 22 HR    8 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
1999 MO  6 DAY  3 HR    1 Rain =     0.720(In) Runoff =     0.012(In) =     5.70 AcFt Duration 49.00 HRS AVG Q =    1.4 CFS
1999 MO  6 DAY  4 HR    8 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
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1999 MO  9 DAY 21 HR   16 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
1999 MO 11 DAY  9 HR    6 Rain =     0.300(In) Runoff =     0.003(In) =     1.58 AcFt Duration 49.00 HRS AVG Q =    0.4 CFS
1999 MO 11 DAY 17 HR    8 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 29.00 HRS AVG Q =    0.0 CFS
1999 MO 12 DAY 31 HR    1 Rain =     0.030(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2000 MO  1 DAY  2 HR    1 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2000 MO  1 DAY  6 HR    1 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2000 MO  1 DAY 26 HR    7 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 54.00 HRS AVG Q =    0.0 CFS
2000 MO  1 DAY 29 HR   15 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2000 MO  1 DAY 30 HR   22 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2000 MO  2 DAY  1 HR    4 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2000 MO  2 DAY 10 HR   17 Rain =     0.030(In) Runoff =     0.000(In) =     0.00 AcFt Duration 40.00 HRS AVG Q =    0.0 CFS
2000 MO  2 DAY 16 HR   18 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2000 MO  2 DAY 20 HR    7 Rain =     0.030(In) Runoff =     0.000(In) =     0.00 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
2000 MO  2 DAY 27 HR   21 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2000 MO  3 DAY  3 HR   22 Rain =     0.170(In) Runoff =     0.001(In) =     0.55 AcFt Duration 25.00 HRS AVG Q =    0.3 CFS
2000 MO  3 DAY  5 HR   15 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2000 MO  3 DAY 27 HR   10 Rain =     0.060(In) Runoff =     0.000(In) =     0.02 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
2000 MO  4 DAY  5 HR    9 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2000 MO  4 DAY 14 HR   16 Rain =     0.030(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2000 MO  4 DAY 18 HR    3 Rain =     1.380(In) Runoff =     0.073(In) =    34.04 AcFt Duration 38.00 HRS AVG Q =   10.8 CFS
2000 MO  4 DAY 21 HR   23 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2000 MO  5 DAY  8 HR   10 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
2000 MO  5 DAY 16 HR    2 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
2000 MO  5 DAY 24 HR   10 Rain =     0.030(In) Runoff =     0.000(In) =     0.00 AcFt Duration 27.00 HRS AVG Q =    0.0 CFS
2000 MO  9 DAY 21 HR   23 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2000 MO 10 DAY  4 HR    8 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2000 MO 10 DAY 10 HR 2400 Rain =     0.030(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2000 MO 10 DAY 22 HR    1 Rain =     0.030(In) Runoff =     0.000(In) =     0.00 AcFt Duration 44.00 HRS AVG Q =    0.0 CFS
2000 MO 10 DAY 27 HR    8 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 35.00 HRS AVG Q =    0.0 CFS
2000 MO 11 DAY  7 HR    8 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2000 MO 11 DAY 10 HR    5 Rain =     0.170(In) Runoff =     0.001(In) =     0.55 AcFt Duration 26.00 HRS AVG Q =    0.3 CFS
2000 MO 11 DAY 11 HR   23 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2000 MO 12 DAY  9 HR    4 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2000 MO 12 DAY 13 HR   16 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2001 MO  1 DAY  5 HR   21 Rain =     0.050(In) Runoff =     0.000(In) =     0.00 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
2001 MO  1 DAY  8 HR   19 Rain =     0.220(In) Runoff =     0.002(In) =     0.91 AcFt Duration 29.00 HRS AVG Q =    0.4 CFS
2001 MO  1 DAY 16 HR 2400 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 29.00 HRS AVG Q =    0.0 CFS
2001 MO  3 DAY 25 HR    9 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2001 MO  4 DAY  2 HR   23 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
2001 MO  4 DAY 20 HR    2 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
2001 MO  5 DAY 12 HR   14 Rain =     0.090(In) Runoff =     0.000(In) =     0.10 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
2001 MO  5 DAY 27 HR   10 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 28.00 HRS AVG Q =    0.0 CFS
2001 MO  6 DAY  3 HR    2 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 28.00 HRS AVG Q =    0.0 CFS
2001 MO  6 DAY 12 HR    9 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2001 MO  7 DAY  5 HR   22 Rain =     0.150(In) Runoff =     0.001(In) =     0.42 AcFt Duration 26.00 HRS AVG Q =    0.2 CFS
2001 MO 10 DAY 30 HR   20 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 28.00 HRS AVG Q =    0.0 CFS
2001 MO 11 DAY  4 HR   11 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2001 MO 11 DAY 11 HR   12 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
2001 MO 11 DAY 24 HR   19 Rain =     0.650(In) Runoff =     0.011(In) =     4.98 AcFt Duration 28.00 HRS AVG Q =    2.2 CFS
2001 MO 11 DAY 26 HR   20 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2001 MO 12 DAY  2 HR   17 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2001 MO 12 DAY 14 HR   15 Rain =     0.130(In) Runoff =     0.001(In) =     0.30 AcFt Duration 27.00 HRS AVG Q =    0.1 CFS
2001 MO 12 DAY 21 HR    2 Rain =     0.100(In) Runoff =     0.000(In) =     0.15 AcFt Duration 36.00 HRS AVG Q =    0.0 CFS
2001 MO 12 DAY 29 HR   13 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 32.00 HRS AVG Q =    0.0 CFS
2002 MO  1 DAY  3 HR    2 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2002 MO  1 DAY  4 HR    6 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2002 MO  1 DAY 28 HR    2 Rain =     0.260(In) Runoff =     0.003(In) =     1.24 AcFt Duration 31.00 HRS AVG Q =    0.5 CFS
2002 MO  1 DAY 29 HR   22 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2002 MO  2 DAY 17 HR   13 Rain =     0.110(In) Runoff =     0.000(In) =     0.19 AcFt Duration 31.00 HRS AVG Q =    0.1 CFS
2002 MO  2 DAY 28 HR   23 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2002 MO  3 DAY  7 HR    2 Rain =     0.100(In) Runoff =     0.000(In) =     0.15 AcFt Duration 32.00 HRS AVG Q =    0.1 CFS
2002 MO  3 DAY 13 HR   23 Rain =     0.030(In) Runoff =     0.000(In) =     0.00 AcFt Duration 39.00 HRS AVG Q =    0.0 CFS
2002 MO  3 DAY 18 HR    9 Rain =     0.410(In) Runoff =     0.006(In) =     2.60 AcFt Duration 39.00 HRS AVG Q =    0.8 CFS
2002 MO  3 DAY 23 HR    6 Rain =     0.050(In) Runoff =     0.000(In) =     0.00 AcFt Duration 28.00 HRS AVG Q =    0.0 CFS
2002 MO  3 DAY 28 HR   10 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2002 MO  4 DAY  6 HR    8 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2002 MO  4 DAY 15 HR   10 Rain =     0.110(In) Runoff =     0.000(In) =     0.19 AcFt Duration 29.00 HRS AVG Q =    0.1 CFS
2002 MO  4 DAY 24 HR   14 Rain =     0.120(In) Runoff =     0.001(In) =     0.24 AcFt Duration 26.00 HRS AVG Q =    0.1 CFS
2002 MO  5 DAY 19 HR    6 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2002 MO  5 DAY 20 HR   12 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2002 MO 10 DAY 17 HR   17 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2002 MO 10 DAY 31 HR   12 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2002 MO 11 DAY 10 HR    1 Rain =     3.440(In) Runoff =     0.971(In) =   455.86 AcFt Duration 71.00 HRS AVG Q =   77.7 CFS
2002 MO 11 DAY 30 HR   16 Rain =     0.200(In) Runoff =     0.002(In) =     0.76 AcFt Duration 44.00 HRS AVG Q =    0.2 CFS
2002 MO 12 DAY 17 HR   16 Rain =     1.030(In) Runoff =     0.023(In) =    10.66 AcFt Duration 51.00 HRS AVG Q =    2.5 CFS
2002 MO 12 DAY 21 HR   12 Rain =     0.680(In) Runoff =     0.011(In) =     5.29 AcFt Duration 59.00 HRS AVG Q =    1.1 CFS
2002 MO 12 DAY 29 HR    3 Rain =     0.210(In) Runoff =     0.002(In) =     0.84 AcFt Duration 27.00 HRS AVG Q =    0.4 CFS
2003 MO  2 DAY 14 HR    1 Rain =     2.940(In) Runoff =     0.686(In) =   321.89 AcFt Duration 95.00 HRS AVG Q =   41.0 CFS
2003 MO  2 DAY 20 HR    8 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
2003 MO  2 DAY 28 HR    3 Rain =     1.800(In) Runoff =     0.184(In) =    86.25 AcFt Duration 98.00 HRS AVG Q =   10.6 CFS
2003 MO  3 DAY  4 HR   22 Rain =     0.090(In) Runoff =     0.000(In) =     0.10 AcFt Duration 42.00 HRS AVG Q =    0.0 CFS
2003 MO  3 DAY 17 HR   16 Rain =     2.270(In) Runoff =     0.361(In) =   169.30 AcFt Duration 81.00 HRS AVG Q =   25.3 CFS
2003 MO  4 DAY  3 HR   13 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 55.00 HRS AVG Q =    0.0 CFS
2003 MO  4 DAY  5 HR    7 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 29.00 HRS AVG Q =    0.0 CFS
2003 MO  4 DAY 15 HR    5 Rain =     2.930(In) Runoff =     0.681(In) =   319.37 AcFt Duration 75.00 HRS AVG Q =   51.5 CFS
2003 MO  4 DAY 18 HR    9 Rain =     0.420(In) Runoff =     0.006(In) =     2.69 AcFt Duration 40.00 HRS AVG Q =    0.8 CFS
2003 MO  5 DAY  4 HR   22 Rain =     0.920(In) Runoff =     0.017(In) =     7.84 AcFt Duration 64.00 HRS AVG Q =    1.5 CFS
2003 MO  5 DAY  9 HR   22 Rain =     0.320(In) Runoff =     0.004(In) =     1.76 AcFt Duration 68.00 HRS AVG Q =    0.3 CFS
2003 MO  5 DAY 11 HR    5 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2003 MO  5 DAY 17 HR   18 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2003 MO  6 DAY 18 HR   13 Rain =     0.080(In) Runoff =     0.000(In) =     0.07 AcFt Duration 38.00 HRS AVG Q =    0.0 CFS
2003 MO  6 DAY 30 HR   16 Rain =     0.170(In) Runoff =     0.001(In) =     0.55 AcFt Duration 40.00 HRS AVG Q =    0.2 CFS
2003 MO  7 DAY  4 HR    8 Rain =     0.110(In) Runoff =     0.000(In) =     0.19 AcFt Duration 72.00 HRS AVG Q =    0.0 CFS
2003 MO 10 DAY  3 HR   12 Rain =     0.030(In) Runoff =     0.000(In) =     0.00 AcFt Duration 28.00 HRS AVG Q =    0.0 CFS
2003 MO 11 DAY  1 HR    8 Rain =     0.320(In) Runoff =     0.004(In) =     1.76 AcFt Duration 32.00 HRS AVG Q =    0.7 CFS
2003 MO 11 DAY  3 HR   19 Rain =     0.150(In) Runoff =     0.001(In) =     0.42 AcFt Duration 37.00 HRS AVG Q =    0.1 CFS
2003 MO 11 DAY  5 HR   14 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 27.00 HRS AVG Q =    0.0 CFS
2003 MO 11 DAY 13 HR   14 Rain =     0.880(In) Runoff =     0.016(In) =     7.37 AcFt Duration 61.00 HRS AVG Q =    1.5 CFS
2003 MO 11 DAY 16 HR    5 Rain =     0.350(In) Runoff =     0.004(In) =     2.03 AcFt Duration 33.00 HRS AVG Q =    0.7 CFS
2003 MO 12 DAY  7 HR   22 Rain =     0.240(In) Runoff =     0.002(In) =     1.07 AcFt Duration 47.00 HRS AVG Q =    0.3 CFS
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2003 MO 12 DAY 11 HR   16 Rain =     0.030(In) Runoff =     0.000(In) =     0.00 AcFt Duration 32.00 HRS AVG Q =    0.0 CFS
2003 MO 12 DAY 14 HR   17 Rain =     0.170(In) Runoff =     0.001(In) =     0.55 AcFt Duration 28.00 HRS AVG Q =    0.2 CFS
2003 MO 12 DAY 23 HR   18 Rain =     0.060(In) Runoff =     0.000(In) =     0.02 AcFt Duration 27.00 HRS AVG Q =    0.0 CFS
2003 MO 12 DAY 25 HR   23 Rain =     2.310(In) Runoff =     0.378(In) =   177.38 AcFt Duration 52.00 HRS AVG Q =   41.3 CFS
2004 MO  1 DAY  3 HR    7 Rain =     0.580(In) Runoff =     0.009(In) =     4.27 AcFt Duration 43.00 HRS AVG Q =    1.2 CFS
2004 MO  1 DAY 21 HR    1 Rain =     0.060(In) Runoff =     0.000(In) =     0.02 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2004 MO  1 DAY 25 HR   15 Rain =     0.060(In) Runoff =     0.000(In) =     0.02 AcFt Duration 40.00 HRS AVG Q =    0.0 CFS
2004 MO  1 DAY 27 HR   17 Rain =     0.020(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2004 MO  1 DAY 29 HR   21 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2004 MO  2 DAY  3 HR    1 Rain =     0.760(In) Runoff =     0.013(In) =     6.12 AcFt Duration 29.00 HRS AVG Q =    2.6 CFS
2004 MO  2 DAY 18 HR   20 Rain =     0.550(In) Runoff =     0.008(In) =     3.97 AcFt Duration 32.00 HRS AVG Q =    1.5 CFS
2004 MO  2 DAY 23 HR   11 Rain =     2.670(In) Runoff =     0.546(In) =   256.24 AcFt Duration 100.00 HRS AVG Q =   31.0 CFS
2004 MO  2 DAY 27 HR   13 Rain =     2.190(In) Runoff =     0.327(In) =   153.58 AcFt Duration 66.00 HRS AVG Q =   28.2 CFS
2004 MO  3 DAY  3 HR    2 Rain =     1.000(In) Runoff =     0.021(In) =     9.66 AcFt Duration 58.00 HRS AVG Q =    2.0 CFS
2004 MO  3 DAY 26 HR    3 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2004 MO  4 DAY  4 HR    2 Rain =     0.460(In) Runoff =     0.007(In) =     3.08 AcFt Duration 91.00 HRS AVG Q =    0.4 CFS
2004 MO  4 DAY 10 HR   15 Rain =     0.010(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2004 MO  4 DAY 18 HR    2 Rain =     0.660(In) Runoff =     0.011(In) =     5.08 AcFt Duration 39.00 HRS AVG Q =    1.6 CFS
2004 MO  5 DAY 17 HR   10 Rain =     0.240(In) Runoff =     0.002(In) =     1.07 AcFt Duration 29.00 HRS AVG Q =    0.4 CFS
2004 MO  5 DAY 21 HR    8 Rain =     0.160(In) Runoff =     0.001(In) =     0.48 AcFt Duration 29.00 HRS AVG Q =    0.2 CFS
2004 MO  5 DAY 24 HR    7 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2004 MO  5 DAY 29 HR    5 Rain =     0.120(In) Runoff =     0.001(In) =     0.24 AcFt Duration 27.00 HRS AVG Q =    0.1 CFS
2004 MO 10 DAY 21 HR   16 Rain =     5.840(In) Runoff =     2.658(In) =  1247.43 AcFt Duration 134.00 HRS AVG Q =  112.6 CFS
2004 MO 10 DAY 28 HR    9 Rain =     2.880(In) Runoff =     0.654(In) =   306.86 AcFt Duration 59.00 HRS AVG Q =   62.9 CFS
2004 MO 11 DAY  1 HR    8 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2004 MO 11 DAY  9 HR    3 Rain =     0.360(In) Runoff =     0.005(In) =     2.13 AcFt Duration 37.00 HRS AVG Q =    0.7 CFS
2004 MO 11 DAY 21 HR   23 Rain =     0.640(In) Runoff =     0.010(In) =     4.88 AcFt Duration 51.00 HRS AVG Q =    1.2 CFS
2004 MO 11 DAY 27 HR   22 Rain =     0.680(In) Runoff =     0.011(In) =     5.29 AcFt Duration 32.00 HRS AVG Q =    2.0 CFS
2004 MO 12 DAY  5 HR   18 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2004 MO 12 DAY 29 HR   16 Rain =     2.300(In) Runoff =     0.374(In) =   175.34 AcFt Duration 60.00 HRS AVG Q =   35.4 CFS
2004 MO 12 DAY 31 HR   14 Rain =     0.680(In) Runoff =     0.011(In) =     5.29 AcFt Duration 31.00 HRS AVG Q =    2.1 CFS
2005 MO  1 DAY  4 HR   16 Rain =     1.580(In) Runoff =     0.119(In) =    55.97 AcFt Duration 58.00 HRS AVG Q =   11.7 CFS
2005 MO  1 DAY 11 HR   23 Rain =    10.840(In) Runoff =     6.934(In) =  3253.96 AcFt Duration 137.00 HRS AVG Q =  287.4 CFS
2005 MO  1 DAY 27 HR 2400 Rain =     0.560(In) Runoff =     0.009(In) =     4.07 AcFt Duration 45.00 HRS AVG Q =    1.1 CFS
2005 MO  1 DAY 29 HR    3 Rain =     1.830(In) Runoff =     0.194(In) =    90.84 AcFt Duration 41.00 HRS AVG Q =   26.8 CFS
2005 MO  2 DAY  6 HR   21 Rain =     0.560(In) Runoff =     0.009(In) =     4.07 AcFt Duration 35.00 HRS AVG Q =    1.4 CFS
2005 MO  2 DAY 12 HR   23 Rain =     2.800(In) Runoff =     0.612(In) =   287.20 AcFt Duration 75.00 HRS AVG Q =   46.3 CFS
2005 MO  2 DAY 23 HR    7 Rain =     7.510(In) Runoff =     4.014(In) =  1883.58 AcFt Duration 160.00 HRS AVG Q =  142.4 CFS
2005 MO  2 DAY 25 HR   16 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2005 MO  3 DAY  3 HR    2 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2005 MO  3 DAY  4 HR   19 Rain =     0.160(In) Runoff =     0.001(In) =     0.48 AcFt Duration 39.00 HRS AVG Q =    0.1 CFS
2005 MO  3 DAY 14 HR    2 Rain =     0.320(In) Runoff =     0.004(In) =     1.76 AcFt Duration 47.00 HRS AVG Q =    0.5 CFS
2005 MO  3 DAY 19 HR   18 Rain =     0.560(In) Runoff =     0.009(In) =     4.07 AcFt Duration 50.00 HRS AVG Q =    1.0 CFS
2005 MO  3 DAY 21 HR    5 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2005 MO  3 DAY 23 HR    2 Rain =     0.800(In) Runoff =     0.014(In) =     6.53 AcFt Duration 34.00 HRS AVG Q =    2.3 CFS
2005 MO  3 DAY 24 HR   15 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2005 MO  4 DAY  4 HR   11 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2005 MO  4 DAY  9 HR    2 Rain =     0.320(In) Runoff =     0.004(In) =     1.76 AcFt Duration 28.00 HRS AVG Q =    0.8 CFS
2005 MO  4 DAY 19 HR    8 Rain =     0.030(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2005 MO  4 DAY 22 HR   18 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2005 MO  4 DAY 24 HR   12 Rain =     0.320(In) Runoff =     0.004(In) =     1.76 AcFt Duration 33.00 HRS AVG Q =    0.6 CFS
2005 MO  4 DAY 25 HR   16 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2005 MO  4 DAY 29 HR    6 Rain =     0.760(In) Runoff =     0.013(In) =     6.12 AcFt Duration 50.00 HRS AVG Q =    1.5 CFS
2005 MO  5 DAY  6 HR    8 Rain =     1.110(In) Runoff =     0.030(In) =    14.16 AcFt Duration 48.00 HRS AVG Q =    3.6 CFS
2005 MO  5 DAY  9 HR   15 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2005 MO  9 DAY 20 HR   13 Rain =     0.200(In) Runoff =     0.002(In) =     0.76 AcFt Duration 33.00 HRS AVG Q =    0.3 CFS
2005 MO 10 DAY 18 HR    7 Rain =     1.560(In) Runoff =     0.114(In) =    53.53 AcFt Duration 79.00 HRS AVG Q =    8.2 CFS
2005 MO 10 DAY 25 HR    5 Rain =     0.160(In) Runoff =     0.001(In) =     0.48 AcFt Duration 29.00 HRS AVG Q =    0.2 CFS
2005 MO 10 DAY 27 HR   11 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2005 MO 11 DAY 10 HR   21 Rain =     0.120(In) Runoff =     0.001(In) =     0.24 AcFt Duration 25.00 HRS AVG Q =    0.1 CFS
2005 MO 12 DAY  3 HR    3 Rain =     0.190(In) Runoff =     0.001(In) =     0.69 AcFt Duration 29.00 HRS AVG Q =    0.3 CFS
2005 MO 12 DAY  9 HR    4 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2006 MO  1 DAY  3 HR   14 Rain =     2.960(In) Runoff =     0.697(In) =   326.96 AcFt Duration 95.00 HRS AVG Q =   41.6 CFS
2006 MO  1 DAY 19 HR    6 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2006 MO  2 DAY 18 HR 2400 Rain =     0.200(In) Runoff =     0.002(In) =     0.76 AcFt Duration 28.00 HRS AVG Q =    0.3 CFS
2006 MO  2 DAY 19 HR   11 Rain =     0.230(In) Runoff =     0.002(In) =     0.99 AcFt Duration 33.00 HRS AVG Q =    0.4 CFS
2006 MO  2 DAY 28 HR    9 Rain =     2.800(In) Runoff =     0.612(In) =   287.20 AcFt Duration 41.00 HRS AVG Q =   84.8 CFS
2006 MO  3 DAY  3 HR   15 Rain =     0.310(In) Runoff =     0.004(In) =     1.67 AcFt Duration 29.00 HRS AVG Q =    0.7 CFS
2006 MO  3 DAY  7 HR   23 Rain =     0.830(In) Runoff =     0.015(In) =     6.85 AcFt Duration 54.00 HRS AVG Q =    1.5 CFS
2006 MO  3 DAY 12 HR   19 Rain =     0.980(In) Runoff =     0.019(In) =     9.09 AcFt Duration 81.00 HRS AVG Q =    1.4 CFS
2006 MO  3 DAY 21 HR    2 Rain =     1.110(In) Runoff =     0.030(In) =    14.16 AcFt Duration 107.00 HRS AVG Q =    1.6 CFS
2006 MO  3 DAY 29 HR    7 Rain =     1.450(In) Runoff =     0.088(In) =    41.07 AcFt Duration 52.00 HRS AVG Q =    9.6 CFS
2006 MO  4 DAY  1 HR   12 Rain =     0.400(In) Runoff =     0.005(In) =     2.50 AcFt Duration 32.00 HRS AVG Q =    0.9 CFS
2006 MO  4 DAY  5 HR   22 Rain =     2.600(In) Runoff =     0.512(In) =   240.08 AcFt Duration 57.00 HRS AVG Q =   51.0 CFS
2006 MO  4 DAY 15 HR    3 Rain =     0.820(In) Runoff =     0.014(In) =     6.74 AcFt Duration 39.00 HRS AVG Q =    2.1 CFS
2006 MO  4 DAY 23 HR    3 Rain =     0.120(In) Runoff =     0.001(In) =     0.24 AcFt Duration 25.00 HRS AVG Q =    0.1 CFS
2006 MO  4 DAY 26 HR 2400 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2006 MO  4 DAY 28 HR    6 Rain =     0.160(In) Runoff =     0.001(In) =     0.48 AcFt Duration 35.00 HRS AVG Q =    0.2 CFS
2006 MO  5 DAY 22 HR   12 Rain =     0.350(In) Runoff =     0.004(In) =     2.03 AcFt Duration 32.00 HRS AVG Q =    0.8 CFS
2006 MO  5 DAY 27 HR    6 Rain =     0.240(In) Runoff =     0.002(In) =     1.07 AcFt Duration 29.00 HRS AVG Q =    0.4 CFS
2006 MO  7 DAY 17 HR   15 Rain =     0.080(In) Runoff =     0.000(In) =     0.07 AcFt Duration 38.00 HRS AVG Q =    0.0 CFS
2006 MO  7 DAY 31 HR   10 Rain =     0.470(In) Runoff =     0.007(In) =     3.18 AcFt Duration 54.00 HRS AVG Q =    0.7 CFS
2006 MO 10 DAY 15 HR    4 Rain =     1.500(In) Runoff =     0.099(In) =    46.52 AcFt Duration 55.00 HRS AVG Q =   10.2 CFS
2006 MO 10 DAY 17 HR    2 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2006 MO 11 DAY 28 HR    6 Rain =     0.230(In) Runoff =     0.002(In) =     0.99 AcFt Duration 47.00 HRS AVG Q =    0.3 CFS
2006 MO 12 DAY 10 HR    3 Rain =     0.320(In) Runoff =     0.004(In) =     1.76 AcFt Duration 28.00 HRS AVG Q =    0.8 CFS
2006 MO 12 DAY 16 HR   23 Rain =     0.350(In) Runoff =     0.004(In) =     2.03 AcFt Duration 35.00 HRS AVG Q =    0.7 CFS
2006 MO 12 DAY 28 HR 2400 Rain =     0.200(In) Runoff =     0.002(In) =     0.76 AcFt Duration 43.00 HRS AVG Q =    0.2 CFS
2007 MO  1 DAY  5 HR 2400 Rain =     0.390(In) Runoff =     0.005(In) =     2.41 AcFt Duration 29.00 HRS AVG Q =    1.0 CFS
2007 MO  1 DAY 12 HR    3 Rain =     0.080(In) Runoff =     0.000(In) =     0.07 AcFt Duration 27.00 HRS AVG Q =    0.0 CFS
2007 MO  1 DAY 31 HR   23 Rain =     0.470(In) Runoff =     0.007(In) =     3.18 AcFt Duration 50.00 HRS AVG Q =    0.8 CFS
2007 MO  2 DAY 11 HR   12 Rain =     0.240(In) Runoff =     0.002(In) =     1.07 AcFt Duration 30.00 HRS AVG Q =    0.4 CFS
2007 MO  2 DAY 13 HR   18 Rain =     0.350(In) Runoff =     0.004(In) =     2.03 AcFt Duration 44.00 HRS AVG Q =    0.6 CFS
2007 MO  2 DAY 19 HR    6 Rain =     0.590(In) Runoff =     0.009(In) =     4.37 AcFt Duration 27.00 HRS AVG Q =    2.0 CFS
2007 MO  2 DAY 20 HR   13 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2007 MO  2 DAY 23 HR   21 Rain =     0.520(In) Runoff =     0.008(In) =     3.67 AcFt Duration 52.00 HRS AVG Q =    0.9 CFS
2007 MO  2 DAY 27 HR   22 Rain =     0.600(In) Runoff =     0.010(In) =     4.47 AcFt Duration 43.00 HRS AVG Q =    1.3 CFS
2007 MO  3 DAY 21 HR    9 Rain =     0.560(In) Runoff =     0.009(In) =     4.07 AcFt Duration 37.00 HRS AVG Q =    1.3 CFS
2007 MO  3 DAY 27 HR   14 Rain =     0.120(In) Runoff =     0.001(In) =     0.24 AcFt Duration 34.00 HRS AVG Q =    0.1 CFS
2007 MO  4 DAY  8 HR    5 Rain =     0.120(In) Runoff =     0.001(In) =     0.24 AcFt Duration 43.00 HRS AVG Q =    0.1 CFS
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2007 MO  4 DAY  9 HR   12 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2007 MO  4 DAY 15 HR   22 Rain =     0.320(In) Runoff =     0.004(In) =     1.76 AcFt Duration 35.00 HRS AVG Q =    0.6 CFS
2007 MO  4 DAY 18 HR    6 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2007 MO  4 DAY 20 HR   16 Rain =     0.680(In) Runoff =     0.011(In) =     5.29 AcFt Duration 31.00 HRS AVG Q =    2.1 CFS
2007 MO  4 DAY 23 HR    6 Rain =     0.080(In) Runoff =     0.000(In) =     0.07 AcFt Duration 29.00 HRS AVG Q =    0.0 CFS
2007 MO  5 DAY 22 HR    1 Rain =     0.080(In) Runoff =     0.000(In) =     0.07 AcFt Duration 39.00 HRS AVG Q =    0.0 CFS
2007 MO  6 DAY  6 HR    4 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2007 MO  9 DAY 19 HR    9 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2007 MO  9 DAY 20 HR   11 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2007 MO  9 DAY 22 HR   16 Rain =     0.320(In) Runoff =     0.004(In) =     1.76 AcFt Duration 36.00 HRS AVG Q =    0.6 CFS
2007 MO 10 DAY 13 HR    5 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2007 MO 10 DAY 16 HR    5 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2007 MO 12 DAY  1 HR   11 Rain =     2.320(In) Runoff =     0.382(In) =   179.42 AcFt Duration 53.00 HRS AVG Q =   41.0 CFS
2007 MO 12 DAY  9 HR    2 Rain =     2.800(In) Runoff =     0.612(In) =   287.20 AcFt Duration 77.00 HRS AVG Q =   45.1 CFS
2007 MO 12 DAY 19 HR    8 Rain =     0.740(In) Runoff =     0.013(In) =     5.91 AcFt Duration 39.00 HRS AVG Q =    1.8 CFS
2007 MO 12 DAY 20 HR   22 Rain =     0.360(In) Runoff =     0.005(In) =     2.13 AcFt Duration 31.00 HRS AVG Q =    0.8 CFS
2008 MO  1 DAY  7 HR    3 Rain =     4.840(In) Runoff =     1.906(In) =   894.46 AcFt Duration 84.00 HRS AVG Q =  128.8 CFS
2008 MO  1 DAY  9 HR    8 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2008 MO  1 DAY 21 HR    7 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2008 MO  1 DAY 25 HR    4 Rain =     0.710(In) Runoff =     0.012(In) =     5.60 AcFt Duration 59.00 HRS AVG Q =    1.1 CFS
2008 MO  1 DAY 28 HR   21 Rain =     2.830(In) Runoff =     0.628(In) =   294.52 AcFt Duration 73.00 HRS AVG Q =   48.8 CFS
2008 MO  2 DAY  2 HR    1 Rain =     0.080(In) Runoff =     0.000(In) =     0.07 AcFt Duration 27.00 HRS AVG Q =    0.0 CFS
2008 MO  2 DAY  4 HR 2400 Rain =     1.180(In) Runoff =     0.039(In) =    18.15 AcFt Duration 46.00 HRS AVG Q =    4.8 CFS
2008 MO  2 DAY 20 HR   16 Rain =     0.510(In) Runoff =     0.008(In) =     3.57 AcFt Duration 39.00 HRS AVG Q =    1.1 CFS
2008 MO  2 DAY 24 HR   13 Rain =     1.620(In) Runoff =     0.130(In) =    61.02 AcFt Duration 90.00 HRS AVG Q =    8.2 CFS
2008 MO  3 DAY  2 HR    3 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2008 MO  3 DAY 15 HR   21 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2008 MO  5 DAY  7 HR    5 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2008 MO  5 DAY 12 HR    8 Rain =     0.080(In) Runoff =     0.000(In) =     0.07 AcFt Duration 30.00 HRS AVG Q =    0.0 CFS
2008 MO  5 DAY 24 HR 2400 Rain =     0.980(In) Runoff =     0.019(In) =     9.09 AcFt Duration 64.00 HRS AVG Q =    1.7 CFS
2008 MO  6 DAY  4 HR   19 Rain =     0.080(In) Runoff =     0.000(In) =     0.07 AcFt Duration 35.00 HRS AVG Q =    0.0 CFS
2008 MO 10 DAY  5 HR    1 Rain =     0.080(In) Runoff =     0.000(In) =     0.07 AcFt Duration 26.00 HRS AVG Q =    0.0 CFS
2008 MO 11 DAY  1 HR   22 Rain =     0.390(In) Runoff =     0.005(In) =     2.41 AcFt Duration 27.00 HRS AVG Q =    1.1 CFS
2008 MO 11 DAY  4 HR    7 Rain =     0.120(In) Runoff =     0.001(In) =     0.24 AcFt Duration 27.00 HRS AVG Q =    0.1 CFS
2008 MO 11 DAY  9 HR    7 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2008 MO 11 DAY 10 HR   10 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2008 MO 11 DAY 27 HR   12 Rain =     1.380(In) Runoff =     0.073(In) =    34.04 AcFt Duration 61.00 HRS AVG Q =    6.8 CFS
2008 MO 12 DAY 13 HR   21 Rain =     0.190(In) Runoff =     0.001(In) =     0.69 AcFt Duration 26.00 HRS AVG Q =    0.3 CFS
2008 MO 12 DAY 15 HR   23 Rain =     2.050(In) Runoff =     0.272(In) =   127.57 AcFt Duration 45.00 HRS AVG Q =   34.3 CFS
2008 MO 12 DAY 18 HR   11 Rain =     0.630(In) Runoff =     0.010(In) =     4.78 AcFt Duration 54.00 HRS AVG Q =    1.1 CFS
2008 MO 12 DAY 22 HR   22 Rain =     0.430(In) Runoff =     0.006(In) =     2.79 AcFt Duration 36.00 HRS AVG Q =    0.9 CFS
2008 MO 12 DAY 25 HR   21 Rain =     1.150(In) Runoff =     0.035(In) =    16.34 AcFt Duration 46.00 HRS AVG Q =    4.3 CFS
2009 MO  1 DAY 24 HR    2 Rain =     0.390(In) Runoff =     0.005(In) =     2.41 AcFt Duration 88.00 HRS AVG Q =    0.3 CFS
2009 MO  1 DAY 26 HR    9 Rain =     0.390(In) Runoff =     0.005(In) =     2.41 AcFt Duration 32.00 HRS AVG Q =    0.9 CFS
2009 MO  2 DAY  9 HR   17 Rain =     3.150(In) Runoff =     0.802(In) =   376.34 AcFt Duration 120.00 HRS AVG Q =   37.9 CFS
2009 MO  2 DAY 11 HR   21 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2009 MO  2 DAY 13 HR   20 Rain =     0.510(In) Runoff =     0.008(In) =     3.57 AcFt Duration 36.00 HRS AVG Q =    1.2 CFS
2009 MO  2 DAY 17 HR   13 Rain =     1.850(In) Runoff =     0.200(In) =    93.96 AcFt Duration 56.00 HRS AVG Q =   20.3 CFS
2009 MO  3 DAY  4 HR   23 Rain =     0.160(In) Runoff =     0.001(In) =     0.48 AcFt Duration 26.00 HRS AVG Q =    0.2 CFS
2009 MO  3 DAY  9 HR 2400 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2009 MO  3 DAY 22 HR   22 Rain =     0.160(In) Runoff =     0.001(In) =     0.48 AcFt Duration 38.00 HRS AVG Q =    0.2 CFS
2009 MO  3 DAY 30 HR 2400 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2009 MO  4 DAY  3 HR    9 Rain =     0.120(In) Runoff =     0.001(In) =     0.24 AcFt Duration 34.00 HRS AVG Q =    0.1 CFS
2009 MO  4 DAY 11 HR   10 Rain =     0.940(In) Runoff =     0.017(In) =     8.17 AcFt Duration 52.00 HRS AVG Q =    1.9 CFS
2009 MO  6 DAY  7 HR    7 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2009 MO  6 DAY  9 HR   10 Rain =     0.040(In) Runoff =     0.000(In) =     0.00 AcFt Duration 25.00 HRS AVG Q =    0.0 CFS
2009 MO  6 DAY 13 HR   11 Rain =     0.120(In) Runoff =     0.001(In) =     0.24 AcFt Duration 30.00 HRS AVG Q =    0.1 CFS
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W a t e r R u n o f f C a p t u r e F o r C o n s e r v a t i o n A n a l y s i s
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Study date 09/30/09 File: twcrw.out Rainfall File: t2962.txt

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Twin Creek

Without 77 Acre Rim Forest Area Runoff

Joseph E. Bonadiman & Associates, Inc., San Bernardino, CA

English (in-lb) Input Units Used
English Units used in output format

Antecedent Moisture Condition = 2
User Defined Inter-Event Time Period (Between Storms = 24.0 hours
User Defined Annual Storm Capture Percentage For Basin Sizes = 80.00%
Actual storm lengths used in calculations
Total Study Area = 5554.00(Ac.)

********** Area-Averaged SCS Curve Number **********

Area (Ac.)	Area fract	SCS CN (AMC2)	SCS CN (AMC2)	Adj.SCS CN	IA (In)
5444.00	0.980	69.0	69.0	69.0	0.899
110.00	0.020	98.0	98.0	98.0	0.041

Area Averaged Initial Abstraction = 0.882(In)
Rainfall Data File: San Bernardino Co.
Beginning Year = 1979, Month = 10, Day = 1, Hour = 1

Number of years in rainfall record = 30
Total Number of Storms (Rainfall Events) = 713
Total Number of Storms Resulting in Runoff = 564
Total Rainfall = 589.9(In) Total Runoff = 121.5(In)
Average Annual Rainfall = 19.662(In)
Average Annual Runoff = 4.050(In)
Average Annual Runoff = 1874.613 Ac Ft
Average Annual Runoff Per Storm = 0.215(In)
Average Annual Runoff Volume Per Storm = 99.713(Ac.Ft)

Maximum Storm Rainfall Occurance Ending Date:
1980 MO 2 DAY 19 HR 7 Rain = 11.7000(In)

Maximum Storm Runoff Occurance Ending Date:
1980 MO 2 DAY 19 HR 7 Runoff = 7.7043(In)

Minimum Storm Runoff Occurance Ending Date:
1980 MO 4 DAY 21 HR 4 Runoff = 0.0000(In)

Minimum Storm Rainfall Occurance Ending Date:
1994 MO 5 DAY 31 HR 4 Rain = 0.0100(In)

CUMULATIVE OCCURANCE PROBABILITY DISTRIBUTION OF STORM RAINFALL AMOUNTS

No. Storms	Cumulative Probability %	Rainfall Amount(In)
323	45.30	0.234
420	58.91	0.468
484	67.88	0.702
523	73.35	0.936
563	78.96	1.170
585	82.05	1.404
599	84.01	1.638
620	86.96	1.872
634	88.92	2.106
647	90.74	2.340
653	91.58	2.574
666	93.41	2.808
674	94.53	3.042
679	95.23	3.276
687	96.35	3.510
688	96.49	3.744
688	96.49	3.978
689	96.63	4.212
691	96.91	4.446
694	97.34	4.680
696	97.62	4.914
698	97.90	5.148
698	97.90	5.382
701	98.32	5.616
703	98.60	5.850
703	98.60	6.084
703	98.60	6.318
704	98.74	6.552
704	98.74	6.786
705	98.88	7.020
707	99.16	7.254
707	99.16	7.488
709	99.44	7.722
709	99.44	7.956

709	99.44	8.190
709	99.44	8.424
709	99.44	8.658
709	99.44	8.892
710	99.58	9.126
710	99.58	9.360
711	99.72	9.594
711	99.72	9.828
711	99.72	10.062
711	99.72	10.296
711	99.72	10.530
711	99.72	10.764
712	99.86	10.998
712	99.86	11.232
712	99.86	11.466
713	100.00	11.700

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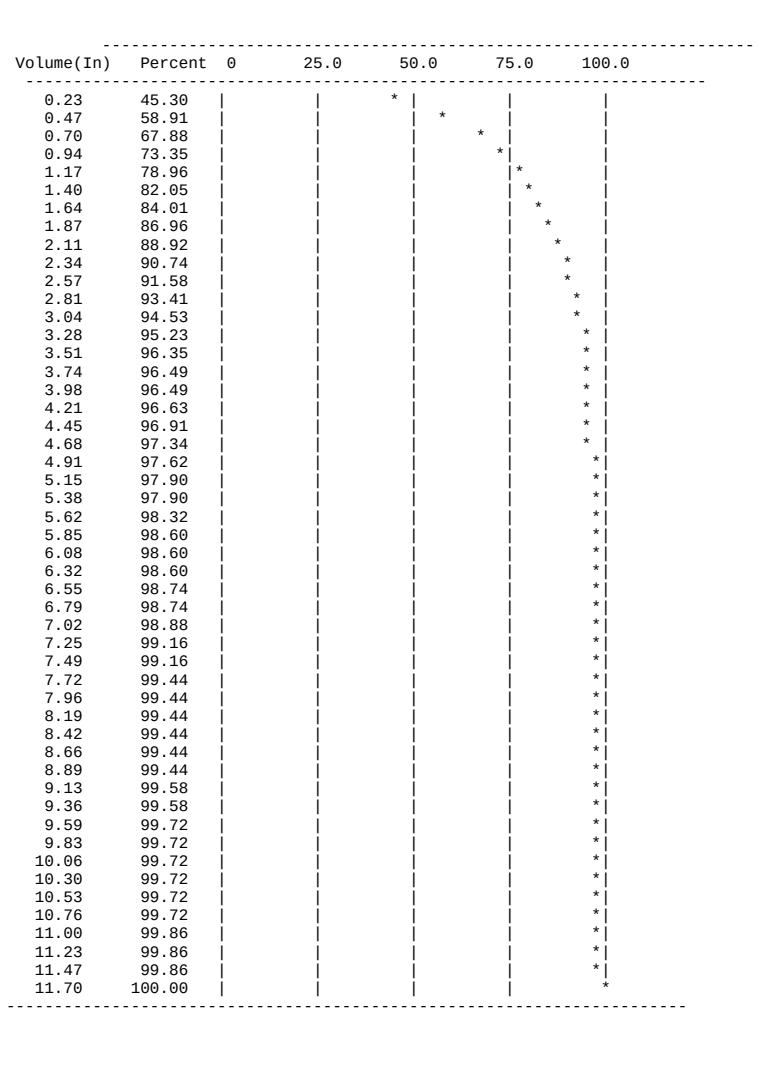
CUMULATIVE PROBABILITY DISTRIBUTION OF RAINALL AMOUNTS



ANNUAL RUNOFF CAPTURE RATE VS. STORAGE VOLUME
Basin begins draining after becoming brim full
Rainfall File = t2962.txt RUNOFF Events = 564 RAINFALL EVENTS = 713
RECORD YEARS = 30, User Defined Basin Detention Time = 100 hours
Average Number of Rainfall Events Per Year = 23.77
Average Number of Runoff Events Per Year = 18.80

Unit Storage Volume(In)	Storage (Ac.Ft)	%Runoff Volume Captured	%Overflow Volume	Average Basin Outflow(CFS)	Average No. Overflows per Year
0.010	4.63	2.96	97.04	0.56	7.63
0.020	9.26	4.69	95.31	1.12	5.53
0.030	13.89	6.19	93.81	1.68	5.20
0.040	18.51	7.59	92.41	2.24	4.87
0.050	23.14	8.93	91.07	2.80	4.57
0.060	27.77	10.20	89.80	3.36	4.43
0.070	32.40	11.42	88.58	3.92	4.27
0.080	37.03	12.61	87.39	4.48	4.20
0.090	41.65	13.78	86.22	5.04	4.13
0.100	46.28	14.91	85.09	5.60	4.00
0.110	50.91	16.02	83.98	6.16	3.97

0.120	55.54	17.12	82.88	6.72	3.87
0.130	60.17	18.18	81.82	7.28	3.80
0.140	64.80	19.21	80.79	7.84	3.70
0.150	69.42	20.22	79.78	8.40	3.57
0.160	74.05	21.19	78.81	8.96	3.50

BMP Capture Volume Basin Size Passed, Curve Slope = 0.97

0.170	78.68	22.14	77.86	9.52	3.40
0.180	83.31	23.05	76.95	10.08	3.20
0.190	87.94	23.92	76.08	10.64	3.13
0.200	92.57	24.78	75.22	11.20	3.10
0.210	97.20	25.63	74.37	11.76	3.10
0.220	101.82	26.49	73.51	12.32	3.03
0.230	106.45	27.33	72.67	12.88	3.00
0.240	111.08	28.15	71.85	13.44	2.93
0.250	115.71	28.94	71.06	14.00	2.93
0.260	120.34	29.73	70.27	14.56	2.80
0.270	124.97	30.51	69.49	15.12	2.73
0.280	129.59	31.23	68.77	15.68	2.67
0.290	134.22	31.96	68.04	16.24	2.63
0.300	138.85	32.68	67.32	16.80	2.57
0.310	143.48	33.38	66.62	17.36	2.57
0.320	148.11	34.07	65.93	17.92	2.47
0.330	152.74	34.73	65.27	18.48	2.43
0.340	157.36	35.42	64.58	19.04	2.37
0.350	161.99	36.06	63.94	19.60	2.33
0.360	166.62	36.67	63.33	20.16	2.33
0.370	171.25	37.30	62.70	20.72	2.23
0.380	175.88	37.91	62.09	21.28	2.20
0.390	180.51	38.52	61.48	21.84	2.20
0.400	185.13	39.12	60.88	22.40	2.20
0.410	189.76	39.72	60.28	22.96	2.17
0.420	194.39	40.32	59.68	23.52	2.17
0.430	199.02	40.89	59.11	24.08	2.17
0.440	203.65	41.46	58.54	24.64	2.13
0.450	208.28	42.04	57.96	25.20	2.10
0.460	212.90	42.62	57.38	25.76	2.00
0.470	217.53	43.15	56.85	26.32	2.00
0.480	222.16	43.70	56.30	26.88	2.00
0.490	226.79	44.23	55.77	27.44	1.97
0.500	231.42	44.75	55.25	28.00	1.90
0.510	236.05	45.21	54.79	28.56	1.80
0.520	240.67	45.70	54.30	29.12	1.77
0.530	245.30	46.18	53.82	29.68	1.73
0.540	249.93	46.66	53.34	30.24	1.73
0.550	254.56	47.11	52.89	30.80	1.73
0.560	259.19	47.59	52.41	31.36	1.73
0.570	263.82	48.06	51.94	31.92	1.67
0.580	268.44	48.51	51.49	32.48	1.67
0.590	273.07	48.97	51.03	33.04	1.67
0.600	277.70	49.41	50.59	33.60	1.57
0.610	282.33	49.84	50.16	34.16	1.57
0.620	286.96	50.28	49.72	34.72	1.50
0.630	291.59	50.66	49.34	35.28	1.47
0.640	296.21	51.06	48.94	35.84	1.50
0.650	300.84	51.43	48.57	36.40	1.47
0.660	305.47	51.84	48.16	36.96	1.43
0.670	310.10	52.20	47.80	37.52	1.37
0.680	314.73	52.60	47.40	38.08	1.37
0.690	319.36	52.94	47.06	38.64	1.33
0.700	323.98	53.33	46.67	39.20	1.33
0.710	328.61	53.69	46.31	39.76	1.33
0.720	333.24	54.04	45.96	40.32	1.30
0.730	337.87	54.39	45.61	40.88	1.30
0.740	342.50	54.76	45.24	41.44	1.27
0.750	347.13	55.12	44.88	42.00	1.27
0.760	351.75	55.46	44.54	42.56	1.20
0.770	356.38	55.78	44.22	43.12	1.20
0.780	361.01	56.10	43.90	43.68	1.20
0.790	365.64	56.44	43.56	44.24	1.17
0.800	370.27	56.75	43.25	44.80	1.17
0.810	374.90	57.05	42.95	45.36	1.17
0.820	379.52	57.34	42.66	45.92	1.17
0.830	384.15	57.64	42.36	46.48	1.13
0.840	388.78	57.97	42.03	47.04	1.13
0.850	393.41	58.29	41.71	47.60	1.13
0.860	398.04	58.62	41.38	48.16	1.13
0.870	402.67	58.95	41.05	48.72	1.13
0.880	407.29	59.30	40.70	49.28	1.13
0.890	411.92	59.59	40.41	49.84	1.13
0.900	416.55	59.90	40.10	50.40	1.13
0.910	421.18	60.21	39.79	50.96	1.10
0.920	425.81	60.51	39.49	51.52	1.10
0.930	430.44	60.83	39.17	52.08	1.10
0.940	435.06	61.07	38.93	52.64	1.00
0.950	439.69	61.36	38.64	53.20	0.93
0.960	444.32	61.60	38.40	53.76	0.90
0.970	448.95	61.84	38.16	54.32	0.90
0.980	453.58	62.11	37.89	54.88	0.90
0.990	458.21	62.37	37.63	55.44	0.87
1.000	462.83	62.62	37.38	56.00	0.87
1.010	467.46	62.89	37.11	56.56	0.87
1.020	472.09	63.12	36.88	57.12	0.83
1.030	476.72	63.36	36.64	57.68	0.83
1.040	481.35	63.59	36.41	58.24	0.83
1.050	485.98	63.83	36.17	58.80	0.83
1.060	490.60	64.08	35.92	59.36	0.83
1.070	495.23	64.31	35.69	59.92	0.83
1.080	499.86	64.55	35.45	60.48	0.83
1.090	504.49	64.80	35.20	61.04	0.83
1.100	509.12	65.04	34.96	61.60	0.83

1.110	513.75	65.29	34.71	62.16	0.83
1.120	518.37	65.50	34.50	62.72	0.83
1.130	523.00	65.72	34.28	63.28	0.83
1.140	527.63	65.94	34.06	63.84	0.83
1.150	532.26	66.18	33.82	64.40	0.83
1.160	536.89	66.42	33.58	64.96	0.83
1.170	541.52	66.66	33.34	65.52	0.83
1.180	546.14	66.90	33.10	66.08	0.83
1.190	550.77	67.13	32.87	66.64	0.83
1.200	555.40	67.34	32.66	67.20	0.83
1.210	560.03	67.54	32.46	67.76	0.83
1.220	564.66	67.78	32.22	68.32	0.83
1.230	569.29	68.02	31.98	68.88	0.83
1.240	573.91	68.24	31.76	69.44	0.83
1.250	578.54	68.47	31.53	70.00	0.83
1.260	583.17	68.70	31.30	70.56	0.83
1.270	587.80	68.91	31.09	71.12	0.83
1.280	592.43	69.11	30.89	71.68	0.83
1.290	597.06	69.32	30.68	72.24	0.83
1.300	601.68	69.57	30.43	72.80	0.83
1.310	606.31	69.76	30.24	73.36	0.83
1.320	610.94	69.98	30.02	73.92	0.83
1.330	615.57	70.19	29.81	74.48	0.80
1.340	620.20	70.40	29.60	75.04	0.83
1.350	624.83	70.53	29.47	75.60	0.80
1.360	629.45	70.77	29.23	76.16	0.80
1.370	634.08	70.93	29.07	76.72	0.80
1.380	638.71	71.15	28.85	77.28	0.77
1.390	643.34	71.34	28.66	77.84	0.80
1.400	647.97	71.56	28.44	78.40	0.77
1.410	652.60	71.70	28.30	78.96	0.80
1.420	657.22	71.90	28.10	79.52	0.80
1.430	661.85	72.05	27.95	80.08	0.80
1.440	666.48	72.28	27.72	80.64	0.80
1.450	671.11	72.42	27.58	81.20	0.77
1.460	675.74	72.62	27.38	81.76	0.77
1.470	680.37	72.83	27.17	82.32	0.73
1.480	684.99	73.04	26.96	82.88	0.73
1.490	689.62	73.18	26.82	83.44	0.73
1.500	694.25	73.39	26.61	84.00	0.73
1.510	698.88	73.60	26.40	84.56	0.73
1.520	703.51	73.78	26.22	85.12	0.73
1.530	708.14	73.99	26.01	85.68	0.73
1.540	712.76	74.16	25.84	86.24	0.70
1.550	717.39	74.33	25.67	86.80	0.70
1.560	722.02	74.52	25.48	87.36	0.70
1.570	726.65	74.72	25.28	87.92	0.70
1.580	731.28	74.92	25.08	88.48	0.70
1.590	735.91	75.08	24.92	89.04	0.70
1.600	740.53	75.26	24.74	89.60	0.70
1.610	745.16	75.43	24.57	90.16	0.63
1.620	749.79	75.59	24.41	90.72	0.63
1.630	754.42	75.75	24.25	91.28	0.63
1.640	759.05	75.91	24.09	91.84	0.63
1.650	763.68	76.05	23.95	92.40	0.63
1.660	768.30	76.23	23.77	92.96	0.60
1.670	772.93	76.36	23.64	93.52	0.63
1.680	777.56	76.54	23.46	94.08	0.60
1.690	782.19	76.71	23.29	94.64	0.60
1.700	786.82	76.84	23.16	95.20	0.60
1.710	791.45	77.00	23.00	95.76	0.60
1.720	796.07	77.15	22.85	96.32	0.60
1.730	800.70	77.32	22.68	96.88	0.60
1.740	805.33	77.45	22.55	97.44	0.60
1.750	809.96	77.61	22.39	98.00	0.60
1.760	814.59	77.77	22.23	98.56	0.60
1.770	819.22	77.92	22.08	99.13	0.60
1.780	823.84	78.09	21.91	99.69	0.60
1.790	828.47	78.24	21.76	100.25	0.60
1.800	833.10	78.36	21.64	100.81	0.60
1.810	837.73	78.52	21.48	101.37	0.60
1.820	842.36	78.61	21.39	101.93	0.60
1.830	846.99	78.74	21.26	102.49	0.60
1.840	851.61	78.83	21.17	103.05	0.60
1.850	856.24	78.98	21.02	103.61	0.53
1.860	860.87	79.14	20.86	104.17	0.50
1.870	865.50	79.23	20.77	104.73	0.53
1.880	870.13	79.36	20.64	105.29	0.50
1.890	874.76	79.48	20.52	105.85	0.50
1.900	879.38	79.59	20.41	106.41	0.50
1.910	884.01	79.71	20.29	106.97	0.50
1.920	888.64	79.86	20.14	107.53	0.50
1.930	893.27	80.00	20.00	108.09	0.50

User Defined Average Annual Capture Percentage = 80.00%

1.940	897.90	80.15	19.85	108.65	0.50
1.950	902.53	80.26	19.74	109.21	0.50
1.960	907.15	80.38	19.62	109.77	0.50
1.970	911.78	80.48	19.52	110.33	0.50
1.980	916.41	80.60	19.40	110.89	0.50
1.990	921.04	80.69	19.31	111.45	0.50
2.000	925.67	80.81	19.19	112.01	0.50
2.010	930.30	80.93	19.07	112.57	0.50
2.020	934.92	81.05	18.95	113.13	0.50
2.030	939.55	81.20	18.80	113.69	0.50
2.040	944.18	81.35	18.65	114.25	0.50
2.050	948.81	81.47	18.53	114.81	0.50
2.060	953.44	81.57	18.43	115.37	0.50
2.070	958.06	81.70	18.30	115.93	0.50
2.080	962.69	81.79	18.21	116.49	0.50
2.090	967.32	81.94	18.06	117.05	0.50

2.100	971.95	82.09	17.91	117.61	0.50
2.110	976.58	82.20	17.80	118.17	0.50
2.120	981.21	82.34	17.66	118.73	0.50
2.130	985.83	82.49	17.51	119.29	0.50
2.140	990.46	82.55	17.45	119.85	0.50
2.150	995.09	82.68	17.32	120.41	0.50
2.160	999.72	82.81	17.19	120.97	0.50
2.170	1004.35	82.93	17.07	121.53	0.50
2.180	1008.98	83.08	16.92	122.09	0.50
2.190	1013.60	83.22	16.78	122.65	0.47
2.200	1018.23	83.29	16.71	123.21	0.50
2.210	1022.86	83.38	16.62	123.77	0.50
2.220	1027.49	83.49	16.51	124.33	0.50
2.230	1032.12	83.59	16.41	124.89	0.47
2.240	1036.75	83.71	16.29	125.45	0.47
2.250	1041.37	83.83	16.17	126.01	0.47
2.260	1046.00	83.95	16.05	126.57	0.47
2.270	1050.63	84.05	15.95	127.13	0.50
2.280	1055.26	84.16	15.84	127.69	0.50
2.290	1059.89	84.28	15.72	128.25	0.47
2.300	1064.52	84.42	15.58	128.81	0.43
2.310	1069.14	84.53	15.47	129.37	0.43
2.320	1073.77	84.66	15.34	129.93	0.43
2.330	1078.40	84.77	15.23	130.49	0.43
2.340	1083.03	84.90	15.10	131.05	0.40
2.350	1087.66	84.98	15.02	131.61	0.40
2.360	1092.29	85.09	14.91	132.17	0.37
2.370	1096.91	85.21	14.79	132.73	0.37
2.380	1101.54	85.26	14.74	133.29	0.37
2.390	1106.17	85.37	14.63	133.85	0.37
2.400	1110.80	85.49	14.51	134.41	0.37
2.410	1115.43	85.58	14.42	134.97	0.37
2.420	1120.06	85.69	14.31	135.53	0.37
2.430	1124.68	85.77	14.23	136.09	0.37
2.440	1129.31	85.82	14.18	136.65	0.37
2.450	1133.94	85.93	14.07	137.21	0.37
2.460	1138.57	86.02	13.98	137.77	0.37
2.470	1143.20	86.11	13.89	138.33	0.37
2.480	1147.83	86.21	13.79	138.89	0.37
2.490	1152.45	86.32	13.68	139.45	0.37
2.500	1157.08	86.43	13.57	140.01	0.37
2.510	1161.71	86.52	13.48	140.57	0.37
2.520	1166.34	86.61	13.39	141.13	0.37
2.530	1170.97	86.70	13.30	141.69	0.37
2.540	1175.60	86.79	13.21	142.25	0.37
2.550	1180.22	86.91	13.09	142.81	0.37
2.560	1184.85	86.95	13.05	143.37	0.37
2.570	1189.48	87.07	12.93	143.93	0.37
2.580	1194.11	87.16	12.84	144.49	0.37
2.590	1198.74	87.25	12.75	145.05	0.37
2.600	1203.37	87.33	12.67	145.61	0.40
2.610	1207.99	87.40	12.60	146.17	0.37
2.620	1212.62	87.52	12.48	146.73	0.37
2.630	1217.25	87.60	12.40	147.29	0.33
2.640	1221.88	87.70	12.30	147.85	0.33
2.650	1226.51	87.78	12.22	148.41	0.33
2.660	1231.14	87.84	12.16	148.97	0.33
2.670	1235.76	87.94	12.06	149.53	0.33
2.680	1240.39	88.02	11.98	150.09	0.33
2.690	1245.02	88.10	11.90	150.65	0.33
2.700	1249.65	88.16	11.84	151.21	0.33
2.710	1254.28	88.24	11.76	151.77	0.33
2.720	1258.91	88.34	11.66	152.33	0.33
2.730	1263.53	88.42	11.58	152.89	0.33
2.740	1268.16	88.50	11.50	153.45	0.33
2.750	1272.79	88.54	11.46	154.01	0.33
2.760	1277.42	88.64	11.36	154.57	0.33
2.770	1282.05	88.69	11.31	155.13	0.33
2.780	1286.68	88.75	11.25	155.69	0.33
2.790	1291.30	88.85	11.15	156.25	0.33
2.800	1295.93	88.95	11.05	156.81	0.33
2.810	1300.56	89.01	10.99	157.37	0.33
2.820	1305.19	89.11	10.89	157.93	0.33
2.830	1309.82	89.19	10.81	158.49	0.33
2.840	1314.45	89.19	10.81	159.05	0.33
2.850	1319.07	89.27	10.73	159.61	0.33
2.860	1323.70	89.30	10.70	160.17	0.33
2.870	1328.33	89.38	10.62	160.73	0.33
2.880	1332.96	89.48	10.52	161.29	0.33
2.890	1337.59	89.53	10.47	161.85	0.33
2.900	1342.22	89.56	10.44	162.41	0.33
2.910	1346.84	89.59	10.41	162.97	0.33
2.920	1351.47	89.69	10.31	163.53	0.33
2.930	1356.10	89.76	10.24	164.09	0.33
2.940	1360.73	89.81	10.19	164.65	0.33
2.950	1365.36	89.91	10.09	165.21	0.33
2.960	1369.99	89.99	10.01	165.77	0.33
2.970	1374.61	90.09	9.91	166.33	0.33
2.980	1379.24	90.14	9.86	166.89	0.33
2.990	1383.87	90.24	9.76	167.45	0.33
3.000	1388.50	90.34	9.66	168.01	0.33
3.010	1393.13	90.41	9.59	168.57	0.30
3.020	1397.76	90.47	9.53	169.13	0.30
3.030	1402.38	90.56	9.44	169.69	0.30
3.040	1407.01	90.63	9.37	170.25	0.30
3.050	1411.64	90.72	9.28	170.81	0.30
3.060	1416.27	90.73	9.27	171.37	0.30
3.070	1420.90	90.75	9.25	171.93	0.30
3.080	1425.53	90.79	9.21	172.49	0.30

3.090	1430.15	90.88	9.12	173.05	0.30
3.100	1434.78	90.94	9.06	173.61	0.30
3.110	1439.41	91.01	8.99	174.17	0.30
3.120	1444.04	91.05	8.95	174.73	0.30
3.130	1448.67	91.11	8.89	175.29	0.30
3.140	1453.30	91.20	8.80	175.85	0.30
3.150	1457.92	91.26	8.74	176.41	0.27
3.160	1462.55	91.31	8.69	176.97	0.27
3.170	1467.18	91.36	8.64	177.53	0.30
3.180	1471.81	91.45	8.55	178.09	0.27
3.190	1476.44	91.53	8.47	178.65	0.27
3.200	1481.07	91.61	8.39	179.21	0.27
3.210	1485.69	91.69	8.31	179.77	0.27
3.220	1490.32	91.74	8.26	180.33	0.27
3.230	1494.95	91.82	8.18	180.89	0.27
3.240	1499.58	91.87	8.13	181.45	0.27
3.250	1504.21	91.87	8.13	182.01	0.27
3.260	1508.84	91.95	8.05	182.57	0.27
3.270	1513.46	92.03	7.97	183.13	0.27
3.280	1518.09	92.11	7.89	183.69	0.27
3.290	1522.72	92.16	7.84	184.25	0.27
3.300	1527.35	92.22	7.78	184.81	0.27
3.310	1531.98	92.24	7.76	185.37	0.27
3.320	1536.61	92.32	7.68	185.93	0.27
3.330	1541.23	92.40	7.60	186.49	0.27
3.340	1545.86	92.42	7.58	187.05	0.27
3.350	1550.49	92.45	7.55	187.61	0.27
3.360	1555.12	92.50	7.50	188.17	0.27
3.370	1559.75	92.58	7.42	188.73	0.27
3.380	1564.38	92.66	7.34	189.29	0.27
3.390	1569.00	92.68	7.32	189.85	0.27
3.400	1573.63	92.76	7.24	190.41	0.27
3.410	1578.26	92.81	7.19	190.97	0.27
3.420	1582.89	92.83	7.17	191.53	0.27
3.430	1587.52	92.91	7.09	192.09	0.27
3.440	1592.15	92.99	7.01	192.65	0.27
3.450	1596.77	93.04	6.96	193.21	0.27
3.460	1601.40	93.09	6.91	193.77	0.27
3.470	1606.03	93.14	6.86	194.33	0.27
3.480	1610.66	93.21	6.79	194.89	0.27
3.490	1615.29	93.29	6.71	195.45	0.27
3.500	1619.92	93.34	6.66	196.01	0.27
3.510	1624.54	93.42	6.58	196.57	0.27
3.520	1629.17	93.46	6.54	197.13	0.23
3.530	1633.80	93.48	6.52	197.69	0.23
3.540	1638.43	93.45	6.55	198.25	0.27
3.550	1643.06	93.50	6.50	198.81	0.23
3.560	1647.69	93.57	6.43	199.37	0.23
3.570	1652.31	93.61	6.39	199.93	0.23
3.580	1656.94	93.62	6.38	200.49	0.23
3.590	1661.57	93.65	6.35	201.05	0.23
3.600	1666.20	93.72	6.28	201.61	0.23
3.610	1670.83	93.76	6.24	202.17	0.23
3.620	1675.46	93.74	6.26	202.73	0.23
3.630	1680.08	93.81	6.19	203.29	0.23
3.640	1684.71	93.82	6.18	203.85	0.23
3.650	1689.34	93.83	6.17	204.41	0.23
3.660	1693.97	93.89	6.11	204.97	0.23
3.670	1698.60	93.90	6.10	205.53	0.23
3.680	1703.23	93.94	6.06	206.09	0.23
3.690	1707.85	93.98	6.02	206.65	0.23
3.700	1712.48	94.04	5.96	207.21	0.23
3.710	1717.11	94.05	5.95	207.77	0.23
3.720	1721.74	94.12	5.88	208.33	0.23
3.730	1726.37	94.15	5.85	208.89	0.20
3.740	1731.00	94.15	5.85	209.45	0.20
3.750	1735.62	94.17	5.83	210.01	0.20
3.760	1740.25	94.23	5.77	210.57	0.20
3.770	1744.88	94.26	5.74	211.13	0.20
3.780	1749.51	94.29	5.71	211.69	0.20
3.790	1754.14	94.35	5.65	212.25	0.20
3.800	1758.77	94.41	5.59	212.81	0.20
3.810	1763.39	94.43	5.57	213.37	0.20
3.820	1768.02	94.43	5.57	213.93	0.20
3.830	1772.65	94.49	5.51	214.49	0.20
3.840	1777.28	94.55	5.45	215.05	0.20
3.850	1781.91	94.57	5.43	215.61	0.20
3.860	1786.54	94.63	5.37	216.17	0.20
3.870	1791.16	94.69	5.31	216.73	0.20
3.880	1795.79	94.75	5.25	217.29	0.20
3.890	1800.42	94.74	5.26	217.85	0.17
3.900	1805.05	94.79	5.21	218.41	0.17
3.910	1809.68	94.83	5.17	218.97	0.20
3.920	1814.31	94.85	5.15	219.53	0.20
3.930	1818.93	94.91	5.09	220.09	0.17
3.940	1823.56	94.96	5.04	220.65	0.17
3.950	1828.19	95.00	5.00	221.21	0.17
3.960	1832.82	95.05	4.95	221.77	0.17
3.970	1837.45	95.10	4.90	222.33	0.17
3.980	1842.08	95.12	4.88	222.89	0.17
3.990	1846.70	95.14	4.86	223.45	0.17
4.000	1851.33	95.19	4.81	224.01	0.17
4.010	1855.96	95.24	4.76	224.57	0.17
4.020	1860.59	95.29	4.71	225.13	0.17
4.030	1865.22	95.34	4.66	225.69	0.17
4.040	1869.85	95.38	4.62	226.25	0.17
4.050	1874.47	95.43	4.57	226.81	0.17
4.060	1879.10	95.48	4.52	227.37	0.17
4.070	1883.73	95.53	4.47	227.93	0.17
4.080	1888.36	95.58	4.42	228.49	0.17

4.090	1892.99	95.63	4.37	229.05	0.17
4.100	1897.62	95.68	4.32	229.61	0.17
4.110	1902.24	95.70	4.30	230.17	0.17
4.120	1906.87	95.75	4.25	230.73	0.17
4.130	1911.50	95.79	4.21	231.29	0.13
4.140	1916.13	95.83	4.17	231.85	0.13
4.150	1920.76	95.87	4.13	232.41	0.13
4.160	1925.39	95.91	4.09	232.97	0.13
4.170	1930.01	95.95	4.05	233.53	0.13
4.180	1934.64	95.99	4.01	234.09	0.13
4.190	1939.27	96.04	3.96	234.65	0.13
4.200	1943.90	96.08	3.92	235.21	0.13
4.210	1948.53	96.12	3.88	235.77	0.13
4.220	1953.16	96.09	3.91	236.33	0.13
4.230	1957.78	96.13	3.87	236.89	0.13
4.240	1962.41	96.17	3.83	237.45	0.13
4.250	1967.04	96.21	3.79	238.01	0.13
4.260	1971.67	96.25	3.75	238.57	0.13
4.270	1976.30	96.29	3.71	239.13	0.13
4.280	1980.93	96.33	3.67	239.69	0.13
4.290	1985.55	96.38	3.62	240.25	0.13
4.300	1990.18	96.38	3.62	240.81	0.13
4.310	1994.81	96.42	3.58	241.37	0.13
4.320	1999.44	96.46	3.54	241.93	0.13
4.330	2004.07	96.50	3.50	242.49	0.13
4.340	2008.70	96.54	3.46	243.05	0.13
4.350	2013.32	96.51	3.49	243.61	0.13
4.360	2017.95	96.52	3.48	244.17	0.13
4.370	2022.58	96.56	3.44	244.73	0.13
4.380	2027.21	96.60	3.40	245.29	0.13
4.390	2031.84	96.64	3.36	245.85	0.13
4.400	2036.47	96.68	3.32	246.41	0.13
4.410	2041.09	96.72	3.28	246.97	0.13
4.420	2045.72	96.76	3.24	247.53	0.13
4.430	2050.35	96.80	3.20	248.09	0.13
4.440	2054.98	96.84	3.16	248.65	0.13
4.450	2059.61	96.88	3.12	249.21	0.13
4.460	2064.24	96.92	3.08	249.77	0.13
4.470	2068.86	96.93	3.07	250.33	0.13
4.480	2073.49	96.93	3.07	250.89	0.13
4.490	2078.12	96.93	3.07	251.45	0.13
4.500	2082.75	96.98	3.02	252.01	0.13
4.510	2087.38	97.02	2.98	252.57	0.13
4.520	2092.01	97.06	2.94	253.13	0.13
4.530	2096.63	97.10	2.90	253.69	0.13
4.540	2101.26	97.14	2.86	254.25	0.13
4.550	2105.89	97.18	2.82	254.81	0.13
4.560	2110.52	97.21	2.79	255.37	0.10
4.570	2115.15	97.24	2.76	255.93	0.10
4.580	2119.78	97.27	2.73	256.49	0.10
4.590	2124.40	97.30	2.70	257.05	0.10
4.600	2129.03	97.33	2.67	257.61	0.10
4.610	2133.66	97.36	2.64	258.17	0.10
4.620	2138.29	97.39	2.61	258.73	0.10
4.630	2142.92	97.42	2.58	259.29	0.10
4.640	2147.55	97.41	2.59	259.85	0.10
4.650	2152.17	97.44	2.56	260.41	0.10
4.660	2156.80	97.40	2.60	260.97	0.10
4.670	2161.43	97.43	2.57	261.53	0.10
4.680	2166.06	97.46	2.54	262.09	0.10
4.690	2170.69	97.49	2.51	262.65	0.10
4.700	2175.32	97.48	2.52	263.21	0.10
4.710	2179.94	97.51	2.49	263.77	0.10
4.720	2184.57	97.54	2.46	264.33	0.10
4.730	2189.20	97.57	2.43	264.89	0.10
4.740	2193.83	97.60	2.40	265.45	0.10
4.750	2198.46	97.63	2.37	266.01	0.10
4.760	2203.09	97.66	2.34	266.57	0.10
4.770	2207.71	97.69	2.31	267.13	0.10
4.780	2212.34	97.72	2.28	267.69	0.10
4.790	2216.97	97.75	2.25	268.25	0.10
4.800	2221.60	97.78	2.22	268.81	0.10
4.810	2226.23	97.81	2.19	269.37	0.10
4.820	2230.86	97.81	2.19	269.93	0.10
4.830	2235.48	97.84	2.16	270.49	0.10
4.840	2240.11	97.87	2.13	271.05	0.10
4.850	2244.74	97.90	2.10	271.61	0.10
4.860	2249.37	97.93	2.07	272.17	0.10
4.870	2254.00	97.92	2.08	272.73	0.10
4.880	2258.63	97.95	2.05	273.29	0.10
4.890	2263.25	97.98	2.02	273.85	0.10
4.900	2267.88	98.00	2.00	274.41	0.07
4.910	2272.51	98.02	1.98	274.97	0.07
4.920	2277.14	98.05	1.95	275.53	0.07
4.930	2281.77	98.07	1.93	276.09	0.07
4.940	2286.40	98.09	1.91	276.65	0.07
4.950	2291.02	98.11	1.89	277.21	0.07
4.960	2295.65	98.13	1.87	277.77	0.07
4.970	2300.28	98.15	1.85	278.33	0.07
4.980	2304.91	98.17	1.83	278.89	0.10
4.990	2309.54	98.19	1.81	279.45	0.07
5.000	2314.17	98.21	1.79	280.01	0.07
5.010	2318.79	98.21	1.79	280.57	0.10
5.020	2323.42	98.24	1.76	281.13	0.10
5.030	2328.05	98.27	1.73	281.69	0.07
5.040	2332.68	98.29	1.71	282.25	0.07
5.050	2337.31	98.31	1.69	282.81	0.07
5.060	2341.94	98.33	1.67	283.37	0.07
5.070	2346.56	98.35	1.65	283.93	0.07

5.080	2351.19	98.37	1.63	284.49	0.07
5.090	2355.82	98.39	1.61	285.05	0.07
5.100	2360.45	98.41	1.59	285.61	0.07
5.110	2365.08	98.39	1.61	286.17	0.07
5.120	2369.71	98.41	1.59	286.73	0.07
5.130	2374.33	98.43	1.57	287.29	0.07
5.140	2378.96	98.45	1.55	287.85	0.07
5.150	2383.59	98.47	1.53	288.41	0.07
5.160	2388.22	98.49	1.51	288.97	0.07
5.170	2392.85	98.52	1.48	289.53	0.07
5.180	2397.48	98.54	1.46	290.09	0.07
5.190	2402.10	98.56	1.44	290.65	0.07
5.200	2406.73	98.58	1.42	291.21	0.07
5.210	2411.36	98.60	1.40	291.77	0.07
5.220	2415.99	98.62	1.38	292.33	0.07
5.230	2420.62	98.59	1.41	292.89	0.07
5.240	2425.25	98.59	1.41	293.45	0.10
5.250	2429.87	98.58	1.42	294.01	0.10
5.260	2434.50	98.61	1.39	294.57	0.10
5.270	2439.13	98.64	1.36	295.13	0.10
5.280	2443.76	98.67	1.33	295.69	0.10
5.290	2448.39	98.65	1.35	296.25	0.10
5.300	2453.02	98.68	1.32	296.82	0.10
5.310	2457.64	98.71	1.29	297.38	0.10
5.320	2462.27	98.69	1.31	297.94	0.07
5.330	2466.90	98.71	1.29	298.50	0.07
5.340	2471.53	98.73	1.27	299.06	0.07
5.350	2476.16	98.75	1.25	299.62	0.07
5.360	2480.79	98.77	1.23	300.18	0.07
5.370	2485.41	98.79	1.21	300.74	0.07
5.380	2490.04	98.81	1.19	301.30	0.07
5.390	2494.67	98.83	1.17	301.86	0.07
5.400	2499.30	98.85	1.15	302.42	0.07
5.410	2503.93	98.87	1.13	302.98	0.07
5.420	2508.56	98.89	1.11	303.54	0.07
5.430	2513.18	98.91	1.09	304.10	0.07
5.440	2517.81	98.93	1.07	304.66	0.07
5.450	2522.44	98.95	1.05	305.22	0.07
5.460	2527.07	98.97	1.03	305.78	0.07
5.470	2531.70	98.99	1.01	306.34	0.07
5.480	2536.33	99.01	0.99	306.90	0.07
5.490	2540.95	99.03	0.97	307.46	0.07
5.500	2545.58	99.05	0.95	308.02	0.07
5.510	2550.21	99.07	0.93	308.58	0.07
5.520	2554.84	99.09	0.91	309.14	0.07
5.530	2559.47	99.07	0.93	309.70	0.07
5.540	2564.10	99.09	0.91	310.26	0.07
5.550	2568.72	99.11	0.89	310.82	0.07
5.560	2573.35	99.13	0.87	311.38	0.07
5.570	2577.98	99.15	0.85	311.94	0.07
5.580	2582.61	99.17	0.83	312.50	0.07
5.590	2587.24	99.14	0.86	313.06	0.07
5.600	2591.87	99.16	0.84	313.62	0.07
5.610	2596.49	99.18	0.82	314.18	0.07
5.620	2601.12	99.20	0.80	314.74	0.07
5.630	2605.75	99.22	0.78	315.30	0.07
5.640	2610.38	99.20	0.80	315.86	0.07
5.650	2615.01	99.22	0.78	316.42	0.07
5.660	2619.64	99.24	0.76	316.98	0.07
5.670	2624.26	99.26	0.74	317.54	0.07
5.680	2628.89	99.28	0.72	318.10	0.07
5.690	2633.52	99.30	0.70	318.66	0.07
5.700	2638.15	99.32	0.68	319.22	0.07
5.710	2642.78	99.29	0.71	319.78	0.07
5.720	2647.41	99.31	0.69	320.34	0.07
5.730	2652.03	99.28	0.72	320.90	0.07
5.740	2656.66	99.30	0.70	321.46	0.07
5.750	2661.29	99.32	0.68	322.02	0.07
5.760	2665.92	99.34	0.66	322.58	0.07
5.770	2670.55	99.31	0.69	323.14	0.07
5.780	2675.18	99.33	0.67	323.70	0.07
5.790	2679.80	99.30	0.70	324.26	0.07
5.800	2684.43	99.28	0.72	324.82	0.07
5.810	2689.06	99.30	0.70	325.38	0.07
5.820	2693.69	99.22	0.78	325.94	0.07
5.830	2698.32	99.24	0.76	326.50	0.07
5.840	2702.95	99.26	0.74	327.06	0.07
5.850	2707.57	99.28	0.72	327.62	0.07
5.860	2712.20	99.30	0.70	328.18	0.07
5.870	2716.83	99.27	0.73	328.74	0.07
5.880	2721.46	99.29	0.71	329.30	0.07
5.890	2726.09	99.26	0.74	329.86	0.07
5.900	2730.72	99.28	0.72	330.42	0.07
5.910	2735.34	99.30	0.70	330.98	0.07
5.920	2739.97	99.27	0.73	331.54	0.07
5.930	2744.60	99.29	0.71	332.10	0.07
5.940	2749.23	99.30	0.70	332.66	0.07
5.950	2753.86	99.27	0.73	333.22	0.07
5.960	2758.49	99.29	0.71	333.78	0.07
5.970	2763.11	99.31	0.69	334.34	0.07
5.980	2767.74	99.33	0.67	334.90	0.07
5.990	2772.37	99.35	0.65	335.46	0.07
6.000	2777.00	99.37	0.63	336.02	0.07
6.010	2781.63	99.39	0.61	336.58	0.07
6.020	2786.26	99.41	0.59	337.14	0.07
6.030	2790.88	99.43	0.57	337.70	0.07
6.040	2795.51	99.45	0.55	338.26	0.07
6.050	2800.14	99.46	0.54	338.82	0.07
6.060	2804.77	99.48	0.52	339.38	0.07
6.070	2809.40	99.50	0.50	339.94	0.07

6.080	2814.03	99.47	0.53	340.50	0.07
6.090	2818.65	99.49	0.51	341.06	0.07
6.100	2823.28	99.51	0.49	341.62	0.07
6.110	2827.91	99.53	0.47	342.18	0.07
6.120	2832.54	99.55	0.45	342.74	0.07
6.130	2837.17	99.57	0.43	343.30	0.07
6.140	2841.80	99.53	0.47	343.86	0.07
6.150	2846.42	99.50	0.50	344.42	0.07
6.160	2851.05	99.52	0.48	344.98	0.07
6.170	2855.68	99.54	0.46	345.54	0.07
6.180	2860.31	99.56	0.44	346.10	0.07
6.190	2864.94	99.53	0.47	346.66	0.07
6.200	2869.57	99.55	0.45	347.22	0.07
6.210	2874.19	99.56	0.44	347.78	0.07
6.220	2878.82	99.58	0.42	348.34	0.07
6.230	2883.45	99.60	0.40	348.90	0.07
6.240	2888.08	99.62	0.38	349.46	0.07
6.250	2892.71	99.59	0.41	350.02	0.07
6.260	2897.34	99.61	0.39	350.58	0.07
6.270	2901.96	99.63	0.37	351.14	0.07
6.280	2906.59	99.64	0.36	351.70	0.07
6.290	2911.22	99.66	0.34	352.26	0.07
6.300	2915.85	99.68	0.32	352.82	0.07
6.310	2920.48	99.70	0.30	353.38	0.07
6.320	2925.11	99.72	0.28	353.94	0.07
6.330	2929.73	99.74	0.26	354.50	0.07
6.340	2934.36	99.70	0.30	355.06	0.07
6.350	2938.99	99.72	0.28	355.62	0.07
6.360	2943.62	99.74	0.26	356.18	0.07
6.370	2948.25	99.76	0.24	356.74	0.07
6.380	2952.88	99.78	0.22	357.30	0.07
6.390	2957.50	99.80	0.20	357.86	0.07
6.400	2962.13	99.81	0.19	358.42	0.07
6.410	2966.76	99.83	0.17	358.98	0.07
6.420	2971.39	99.85	0.15	359.54	0.07
6.430	2976.02	99.87	0.13	360.10	0.07
6.440	2980.65	99.89	0.11	360.66	0.07
6.450	2985.27	99.91	0.09	361.22	0.07
6.460	2989.90	99.93	0.07	361.78	0.07
6.470	2994.53	99.89	0.11	362.34	0.07
6.480	2999.16	99.91	0.09	362.90	0.07
6.490	3003.79	99.93	0.07	363.46	0.07
6.500	3008.42	99.95	0.05	364.02	0.07
6.510	3013.04	99.96	0.04	364.58	0.07
6.520	3017.67	99.98	0.02	365.14	0.07
6.530	3022.30	99.95	0.05	365.70	0.03
6.540	3026.93	99.96	0.04	366.26	0.03
6.550	3031.56	99.96	0.04	366.82	0.03
6.560	3036.19	99.97	0.03	367.38	0.03
6.570	3040.81	99.98	0.02	367.94	0.03
6.580	3045.44	99.99	0.01	368.50	0.03
6.590	3050.07	100.00	0.00	369.06	0.03

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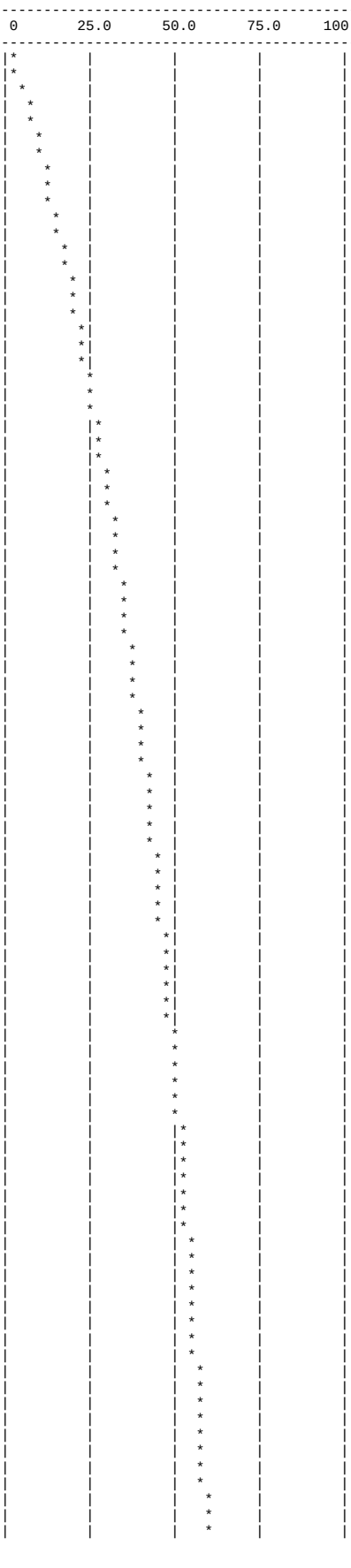
UNIT STORAGE VOLUME VS. %RUNOFFS CAPTURED

Volume(In)	Percent
0.01	2.96
0.02	4.69
0.03	6.19
0.04	7.59
0.05	8.93
0.06	10.20
0.07	11.42
0.08	12.61
0.09	13.78
0.10	14.91
0.11	16.02
0.12	17.12
0.13	18.18
0.14	19.21
0.15	20.22
0.16	21.19
0.17	22.14
0.18	23.05
0.19	23.92
0.20	24.78
0.21	25.63
0.22	26.49
0.23	27.33
0.24	28.15
0.25	28.94
0.26	29.73
0.27	30.51
0.28	31.23
0.29	31.96
0.30	32.68
0.31	33.38
0.32	34.07
0.33	34.73
0.34	35.42
0.35	36.06
0.36	36.67
0.37	37.30
0.38	37.91
0.39	38.52
0.40	39.12
0.41	39.72
0.42	40.32
0.43	40.89
0.44	41.46
0.45	42.04
0.46	42.62
0.47	43.15
0.48	43.70
0.49	44.23
0.50	44.75
0.51	45.21
0.52	45.70
0.53	46.18
0.54	46.66
0.55	47.11
0.56	47.59
0.57	48.06
0.58	48.51
0.59	48.97
0.60	49.41
0.61	49.84
0.62	50.28
0.63	50.66
0.64	51.06
0.65	51.43
0.66	51.84
0.67	52.20
0.68	52.60
0.69	52.94
0.70	53.33
0.71	53.69
0.72	54.04
0.73	54.39
0.74	54.76
0.75	55.12
0.76	55.46
0.77	55.78
0.78	56.10
0.79	56.44
0.80	56.75
0.81	57.05
0.82	57.34
0.83	57.64
0.84	57.97
0.85	58.29
0.86	58.62
0.87	58.95
0.88	59.30
0.89	59.59
0.90	59.90
0.91	60.21
0.92	60.51
0.93	60.83



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0.94      61.07   |         |         |   *     |         |
0.95      61.36   |         |         |   *     |         |
0.96      61.60   |         |         |   *     |         |
0.97      61.84   |         |         |   *     |         |
0.98      62.11   |         |         |   *     |         |
0.99      62.37   |         |         |   *     |         |
1.00      62.62   |         |         |    *    |         |
1.01      62.89   |         |         |    *    |         |
1.02      63.12   |         |         |    *    |         |
1.03      63.36   |         |         |    *    |         |
1.04      63.59   |         |         |    *    |         |
1.05      63.83   |         |         |    *    |         |
1.06      64.08   |         |         |    *    |         |
1.07      64.31   |         |         |    *    |         |
1.08      64.55   |         |         |    *    |         |
1.09      64.80   |         |         |    *    |         |
1.10      65.04   |         |         |     *   |         |
1.11      65.29   |         |         |     *   |         |
1.12      65.50   |         |         |     *   |         |
1.13      65.72   |         |         |     *   |         |
1.14      65.94   |         |         |     *   |         |
1.15      66.18   |         |         |     *   |         |
1.16      66.42   |         |         |     *   |         |
1.17      66.66   |         |         |     *   |         |
1.18      66.90   |         |         |     *   |         |
1.19      67.13   |         |         |     *   |         |
1.20      67.34   |         |         |     *   |         |
1.21      67.54   |         |         |      *  |         |
1.22      67.78   |         |         |      *  |         |
1.23      68.02   |         |         |      *  |         |
1.24      68.24   |         |         |      *  |         |
1.25      68.47   |         |         |      *  |         |
1.26      68.70   |         |         |      *  |         |
1.27      68.91   |         |         |      *  |         |
1.28      69.11   |         |         |      *  |         |
1.29      69.32   |         |         |      *  |         |
1.30      69.57   |         |         |      *  |         |
1.31      69.76   |         |         |      *  |         |
1.32      69.98   |         |         |      *  |         |
1.33      70.19   |         |         |       * |         |
1.34      70.40   |         |         |       * |         |
1.35      70.53   |         |         |       * |         |
1.36      70.77   |         |         |       * |         |
1.37      70.93   |         |         |       * |         |
1.38      71.15   |         |         |       * |         |
1.39      71.34   |         |         |       * |         |
1.40      71.56   |         |         |       * |         |
1.41      71.70   |         |         |       * |         |
1.42      71.90   |         |         |       * |         |
1.43      72.05   |         |         |       * |         |
1.44      72.28   |         |         |       * |         |
1.45      72.42   |         |         |       * |         |
1.46      72.62   |         |         |        *|         |
1.47      72.83   |         |         |        *|         |
1.48      73.04   |         |         |        *|         |
1.49      73.18   |         |         |        *|         |
1.50      73.39   |         |         |        *|         |
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1.52      73.78   |         |         |        *|         |
1.53      73.99   |         |         |        *|         |
1.54      74.16   |         |         |        *|         |
1.55      74.33   |         |         |        *|         |
1.56      74.52   |         |         |        *|         |
1.57      74.72   |         |         |        *|         |
1.58      74.92   |         |         |        *|         |
1.59      75.08   |         |         |         *         |
1.60      75.26   |         |         |         *         |
1.61      75.43   |         |         |         *         |
1.62      75.59   |         |         |         *         |
1.63      75.75   |         |         |         *         |
1.64      75.91   |         |         |         *         |
1.65      76.05   |         |         |         *         |
1.66      76.23   |         |         |         *         |
1.67      76.36   |         |         |         *         |
1.68      76.54   |         |         |         *         |
1.69      76.71   |         |         |         *         |
1.70      76.84   |         |         |         *         |
1.71      77.00   |         |         |         *         |
1.72      77.15   |         |         |         *         |
1.73      77.32   |         |         |         *         |
1.74      77.45   |         |         |         *         |
1.75      77.61   |         |         |         |*        |
1.76      77.77   |         |         |         |*        |
1.77      77.92   |         |         |         |*        |
1.78      78.09   |         |         |         |*        |
1.79      78.24   |         |         |         |*        |
1.80      78.36   |         |         |         |*        |
1.81      78.52   |         |         |         |*        |
1.82      78.61   |         |         |         |*        |
1.83      78.74   |         |         |         |*        |
1.84      78.83   |         |         |         |*        |
1.85      78.98   |         |         |         |*        |
1.86      79.14   |         |         |         |*        |
1.87      79.23   |         |         |         |*        |
1.88      79.36   |         |         |         |*        |
1.89      79.48   |         |         |         |*        |
1.90      79.59   |         |         |         |*        |
1.91      79.71   |         |         |         |*        |
1.92      79.86   |         |         |         |*        |
1.93      80.00   |         |         |         | *       |
```

1.94	80.15				*
1.95	80.26				*
1.96	80.38				*
1.97	80.48				*
1.98	80.60				*
1.99	80.69				*
2.00	80.81				*
2.01	80.93				*
2.02	81.05				*
2.03	81.20				*
2.04	81.35				*
2.05	81.47				*
2.06	81.57				*
2.07	81.70				*
2.08	81.79				*
2.09	81.94				*
2.10	82.09				*
2.11	82.20				*
2.12	82.34				*
2.13	82.49				*
2.14	82.55				*
2.15	82.68				*
2.16	82.81				*
2.17	82.93				*
2.18	83.08				*
2.19	83.22				*
2.20	83.29				*
2.21	83.38				*
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2.23	83.59				*
2.24	83.71				*
2.25	83.83				*
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2.31	84.53				*
2.32	84.66				*
2.33	84.77				*
2.34	84.90				*
2.35	84.98				*
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2.41	85.58				*
2.42	85.69				*
2.43	85.77				*
2.44	85.82				*
2.45	85.93				*
2.46	86.02				*
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2.50	86.43				*
2.51	86.52				*
2.52	86.61				*
2.53	86.70				*
2.54	86.79				*
2.55	86.91				*
2.56	86.95				*
2.57	87.07				*
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2.59	87.25				*
2.60	87.33				*
2.61	87.40				*
2.62	87.52				*
2.63	87.60				*
2.64	87.70				*
2.65	87.78				*
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2.67	87.94				*
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2.69	88.10				*
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2.73	88.42				*
2.74	88.50				*
2.75	88.54				*
2.76	88.64				*
2.77	88.69				*
2.78	88.75				*
2.79	88.85				*
2.80	88.95				*
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2.88	89.48				*
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2.93	89.76				*

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2.96	89.99				*	
2.97	90.09				*	
2.98	90.14				*	
2.99	90.24				*	
3.00	90.34				*	
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3.02	90.47				*	
3.03	90.56				*	
3.04	90.63				*	
3.05	90.72				*	
3.06	90.73				*	
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3.10	90.94				*	
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3.19	91.53				*	
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3.36	92.50				*	
3.37	92.58				*	
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3.39	92.68				*	
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3.41	92.81				*	
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3.43	92.91				*	
3.44	92.99				*	
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3.46	93.09				*	
3.47	93.14				*	
3.48	93.21				*	
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3.62	93.74				*	
3.63	93.81				*	
3.64	93.82				*	
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3.83	94.49				*	
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3.89	94.74				*	
3.90	94.79				*	
3.91	94.83				*	
3.92	94.85				*	
3.93	94.91				*	

3.94	94.96	|	|	|	|	* |
3.95	95.00	|	|	|	|	* |
3.96	95.05	|	|	|	|	* |
3.97	95.10	|	|	|	|	* |
3.98	95.12	|	|	|	|	* |
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4.00	95.19	|	|	|	|	* |
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4.02	95.29	|	|	|	|	* |
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4.08	95.58	|	|	|	|	* |
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4.10	95.68	|	|	|	|	* |
4.11	95.70	|	|	|	|	* |
4.12	95.75	|	|	|	|	* |
4.13	95.79	|	|	|	|	* |
4.14	95.83	|	|	|	|	* |
4.15	95.87	|	|	|	|	* |
4.16	95.91	|	|	|	|	* |
4.17	95.95	|	|	|	|	* |
4.18	95.99	|	|	|	|	* |
4.19	96.04	|	|	|	|	* |
4.20	96.08	|	|	|	|	* |
4.21	96.12	|	|	|	|	* |
4.22	96.09	|	|	|	|	* |
4.23	96.13	|	|	|	|	* |
4.24	96.17	|	|	|	|	* |
4.25	96.21	|	|	|	|	* |
4.26	96.25	|	|	|	|	* |
4.27	96.29	|	|	|	|	* |
4.28	96.33	|	|	|	|	* |
4.29	96.38	|	|	|	|	* |
4.30	96.38	|	|	|	|	* |
4.31	96.42	|	|	|	|	* |
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4.33	96.50	|	|	|	|	* |
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4.35	96.51	|	|	|	|	* |
4.36	96.52	|	|	|	|	* |
4.37	96.56	|	|	|	|	* |
4.38	96.60	|	|	|	|	* |
4.39	96.64	|	|	|	|	* |
4.40	96.68	|	|	|	|	* |
4.41	96.72	|	|	|	|	* |
4.42	96.76	|	|	|	|	* |
4.43	96.80	|	|	|	|	* |
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4.48	96.93	|	|	|	|	* |
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4.76	97.66	|	|	|	|	*|
4.77	97.69	|	|	|	|	*|
4.78	97.72	|	|	|	|	*|
4.79	97.75	|	|	|	|	*|
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4.81	97.81	|	|	|	|	*|
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4.92	98.05	|	|	|	|	*|
4.93	98.07	|	|	|	|	*|

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4.97	98.15	|	|	|	|	*|
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4.99	98.19	|	|	|	|	*|
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5.02	98.24	|	|	|	|	*|
5.03	98.27	|	|	|	|	*|
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5.06	98.33	|	|	|	|	*|
5.07	98.35	|	|	|	|	*|
5.08	98.37	|	|	|	|	*|
5.09	98.39	|	|	|	|	*|
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5.12	98.41	|	|	|	|	*|
5.13	98.43	|	|	|	|	*|
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5.19	98.56	|	|	|	|	*|
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5.30	98.68	|	|	|	|	*|
5.31	98.71	|	|	|	|	*|
5.32	98.69	|	|	|	|	*|
5.33	98.71	|	|	|	|	*|
5.34	98.73	|	|	|	|	*|
5.35	98.75	|	|	|	|	*|
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5.45	98.95	|	|	|	|	*|
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5.50	99.05	|	|	|	|	*|
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5.55	99.11	|	|	|	|	*|
5.56	99.13	|	|	|	|	*|
5.57	99.15	|	|	|	|	*|
5.58	99.17	|	|	|	|	*|
5.59	99.14	|	|	|	|	*|
5.60	99.16	|	|	|	|	*|
5.61	99.18	|	|	|	|	*|
5.62	99.20	|	|	|	|	*|
5.63	99.22	|	|	|	|	*|
5.64	99.20	|	|	|	|	*|
5.65	99.22	|	|	|	|	*|
5.66	99.24	|	|	|	|	*|
5.67	99.26	|	|	|	|	*|
5.68	99.28	|	|	|	|	*|
5.69	99.30	|	|	|	|	*|
5.70	99.32	|	|	|	|	*|
5.71	99.29	|	|	|	|	*|
5.72	99.31	|	|	|	|	*|
5.73	99.28	|	|	|	|	*|
5.74	99.30	|	|	|	|	*|
5.75	99.32	|	|	|	|	*|
5.76	99.34	|	|	|	|	*|
5.77	99.31	|	|	|	|	*|
5.78	99.33	|	|	|	|	*|
5.79	99.30	|	|	|	|	*|
5.80	99.28	|	|	|	|	*|
5.81	99.30	|	|	|	|	*|
5.82	99.22	|	|	|	|	*|
5.83	99.24	|	|	|	|	*|
5.84	99.26	|	|	|	|	*|
5.85	99.28	|	|	|	|	*|
5.86	99.30	|	|	|	|	*|
5.87	99.27	|	|	|	|	*|
5.88	99.29	|	|	|	|	*|
5.89	99.26	|	|	|	|	*|
5.90	99.28	|	|	|	|	*|
5.91	99.30	|	|	|	|	*|
5.92	99.27	|	|	|	|	*|
5.93	99.29	|	|	|	|	*|

```
    5.94      99.30   |         |         |         |        *|
    5.95      99.27   |         |         |         |        *|
    5.96      99.29   |         |         |         |        *|
    5.97      99.31   |         |         |         |        *|
    5.98      99.33   |         |         |         |        *|
    5.99      99.35   |         |         |         |        *|
    6.00      99.37   |         |         |         |        *|
    6.01      99.39   |         |         |         |        *|
    6.02      99.41   |         |         |         |        *|
    6.03      99.43   |         |         |         |        *|
    6.04      99.45   |         |         |         |        *|
    6.05      99.46   |         |         |         |        *|
    6.06      99.48   |         |         |         |        *|
    6.07      99.50   |         |         |         |        *|
    6.08      99.47   |         |         |         |        *|
    6.09      99.49   |         |         |         |        *|
    6.10      99.51   |         |         |         |        *|
    6.11      99.53   |         |         |         |        *|
    6.12      99.55   |         |         |         |        *|
    6.13      99.57   |         |         |         |        *|
    6.14      99.53   |         |         |         |        *|
    6.15      99.50   |         |         |         |        *|
    6.16      99.52   |         |         |         |        *|
    6.17      99.54   |         |         |         |        *|
    6.18      99.56   |         |         |         |        *|
    6.19      99.53   |         |         |         |        *|
    6.20      99.55   |         |         |         |        *|
    6.21      99.56   |         |         |         |        *|
    6.22      99.58   |         |         |         |        *|
    6.23      99.60   |         |         |         |        *|
    6.24      99.62   |         |         |         |        *|
    6.25      99.59   |         |         |         |        *|
    6.26      99.61   |         |         |         |        *|
    6.27      99.63   |         |         |         |        *|
    6.28      99.64   |         |         |         |        *|
    6.29      99.66   |         |         |         |        *|
    6.30      99.68   |         |         |         |        *|
    6.31      99.70   |         |         |         |        *|
    6.32      99.72   |         |         |         |        *|
    6.33      99.74   |         |         |         |        *|
    6.34      99.70   |         |         |         |        *|
    6.35      99.72   |         |         |         |        *|
    6.36      99.74   |         |         |         |        *|
    6.37      99.76   |         |         |         |        *|
    6.38      99.78   |         |         |         |        *|
    6.39      99.80   |         |         |         |        *|
    6.40      99.81   |         |         |         |        *|
    6.41      99.83   |         |         |         |        *|
    6.42      99.85   |         |         |         |        *|
    6.43      99.87   |         |         |         |        *|
    6.44      99.89   |         |         |         |        *|
    6.45      99.91   |         |         |         |        *|
    6.46      99.93   |         |         |         |        *|
    6.47      99.89   |         |         |         |        *|
    6.48      99.91   |         |         |         |        *|
    6.49      99.93   |         |         |         |        *|
    6.50      99.95   |         |         |         |        *|
    6.51      99.96   |         |         |         |        *|
    6.52      99.98   |         |         |         |        *|
    6.53      99.95   |         |         |         |        *|
    6.54      99.96   |         |         |         |        *|
    6.55      99.96   |         |         |         |        *|
    6.56      99.97   |         |         |         |        *|
    6.57      99.98   |         |         |         |        *|
    6.58      99.99   |         |         |         |        *|
    6.59     100.00   |         |         |         |        *|
-----------------------------------------------------------------------
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Note: The WRCC summary file for the reduced watershed of this area is not included but available upon request.

ATTACHMENT 15

HydroLynx Systems, Inc.
Documentation/Specifications

MODEL 5073NS-5
NovaStar5 Software

General Description

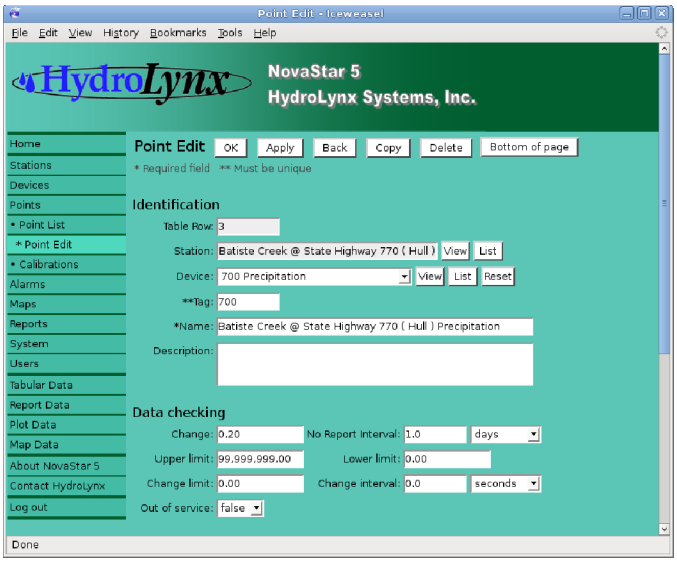
NovaStar5 Software from HydroLynx is a real-time data collection, alarm monitoring and control system. NovaStar5 runs under the Linux operating system. The Linux operating system is stable, non-proprietary, well known, and trusted by IT managers.

The NovaStar5 database uses Postgresql. This is a powerful, open source, non-proprietary, SQL database. This ODBC SQL database allows remote access to the data from third party software. The database tables can be viewed and modified with a graphical user interface administrative tool.

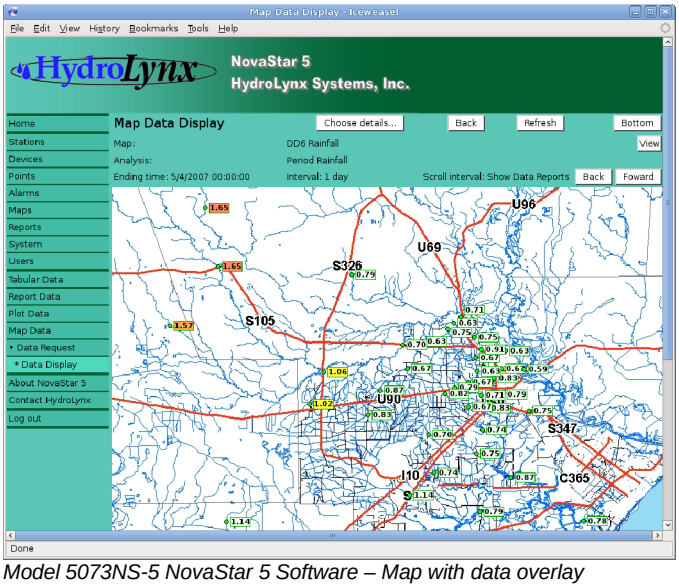
The NovaStar5 database can be mirrored over a local area network, LAN, on a hot backup server. A LAN failover system maintains redundant databases on two NovaStar5 servers and does automatic failover if the primary system fails.

The NovaStar5 user interface uses web pages to simplify user access to the database and system operations. The web page user interface is client based and runs on any internet browser. Local access on the NovaStar5 server, office intranet access, and remote internet access is supported.

Security is essential on systems that must stay operational 24 hours a day, provide information for public protection, and hold years of invaluable data in its database. NovaStar5 provides 3 levels of encrypted password protected security. The lowest level allows data viewing only; no changes to the database or system are allowed. The middle level allows database change, setup, and maintenance. The highest level allows database and system setup and administration. The web page user interface only shows activities allowed for the user's security level.



Model 5073NS-5 NovaStar5 Database setup screen



Model 5073NS-5 NovaStar 5 Software – Map with data overlay

NovaStar5 supports real-time data collection of self reporting data, remote station interrogation, data import and export. Self reporting data can use the ALERT1 and ALERT2 protocols. Remote station interrogation pulls data from stations over telephone lines, two-way radio, satellite, and the internet. Station interrogations schedules can be manual and automated. Data imports read data values from data logger download files and files pushed or pulled from the network. Data exports push data in files over the network.

Data collected is validated by programmable data checking limits: change between reports, change over an interval, upper and lower limits; before it is stored in the SQL database. The data validation flag is stored with the data for user viewing.

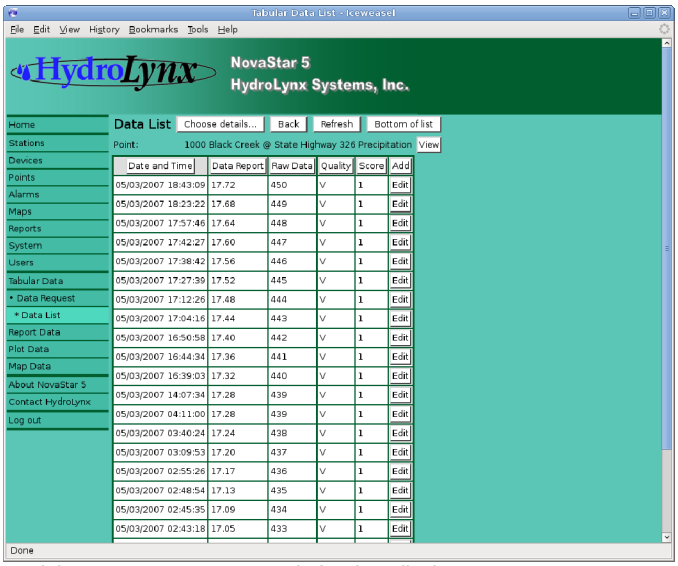
Validated data can trigger alarm actions when alarm trigger limits are met. Alarm triggers are: change over an interval; upper, lower, and at limit; or no data reported. Alarms actions include audible and visual alarm, telephone or email paging, voice dial-out, map display interface, and set a hydrologic threat score.

Rating tables compute discharge or other data units from collected data. Unlimited time based, multiple rating table assignment, and multiple shift assignment are supported. Rating table data computation is triggered by the real-time data collection. A user request can also compute the rating table data over a time period.

Real-time equations create new data point values from one or more data collection points and statistical analysis. Predefined equations include basin rainfall average; dewpoint and wet bulb temperature; vapor pressure; and evapotranspiration demand. Equation data computation is triggered by the real-time data collection. A user request can also compute the equation data over a time period.

Collected data, rating table data, and equation data can be displayed in tables, group reports, time series plots, and overlaid on map backgrounds. The data displayed can be the data report or a statistical analysis of the data over an interval.

Data values displayed are highlighted with background colors based on the hydrologic threat score. The user can select a time interval for the automatic refresh of a data display. Data displays can be scheduled for unattended printing or distribution.

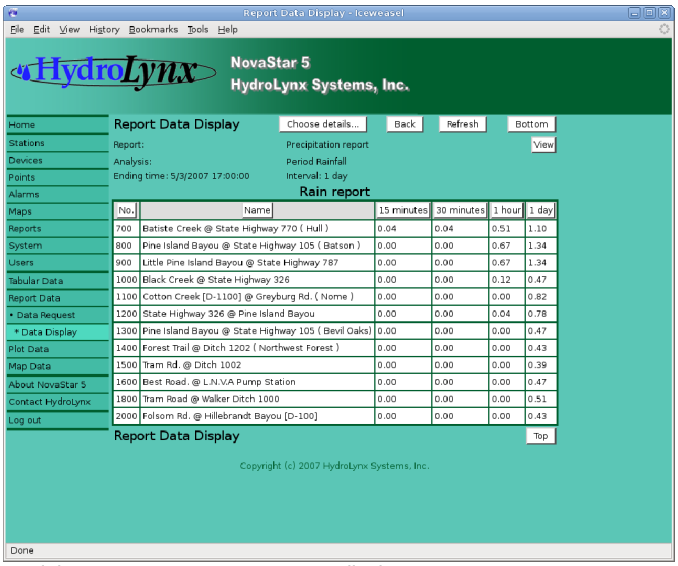


Model 5073NS-5 NovaStar5 Tabular data display

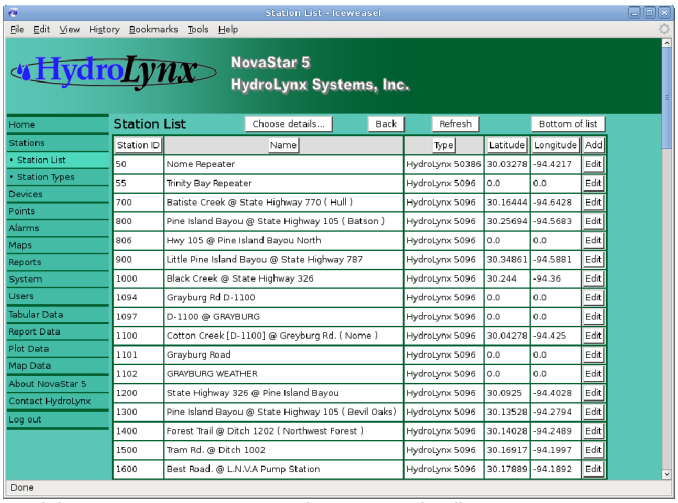
The statistical analyses include last report in period, maximum, minimum, mean, variance, standard deviation, skew, coefficient of skew, difference, sum, period rainfall, storm rainfall, rainfall intensity, rate of change, runtime, volume computation, and count of reports in period.

Custom report creation allows the user to select data collection points, data analysis, and display intervals. Report data can be organized with data collection points or display intervals in rows. Both even and uneven display intervals are supported.

Time series plots display data values over time of single or overlaid data collection points. Plots can shows curves, filled areas, histograms. Left and right scales are used to show different types of data. Scales are programmable and adjustable.



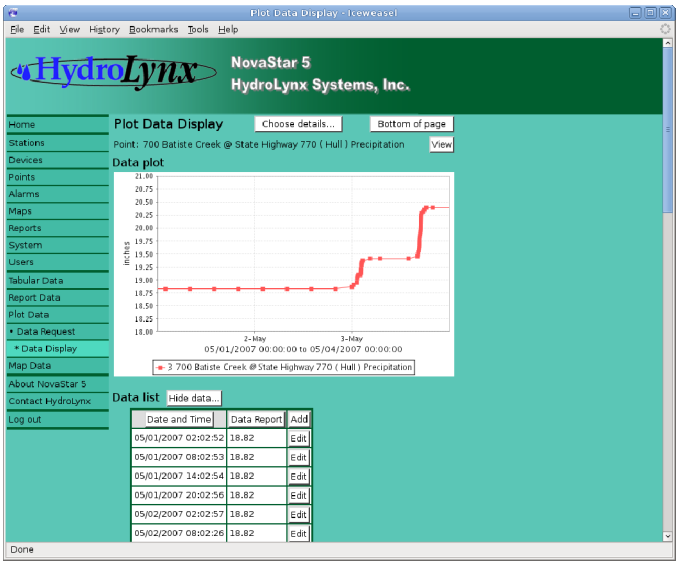
Model 5073NS-5 NovaStar5 Report display



Model 5073NS-5 NovaStar 5 Software – Station list

Graphical map or schematic backgrounds are imported by the user. The user can select the type of data, analysis, and display intervals to overlay on the background as data readouts. The data readout position is auto-located by station location or manually located by the user. Click on a data readout to display an action menu. The data readout actions include: data report display and editing, database setup and editing, remote station polling, and control actions.

Control commands are sent to remote station through the telemetry system. Control commands are executed by the user through the user interface or automatically using the NovaStar5 expert system software. The expert system is rule based decision making software that examines data from one or more data collection points.



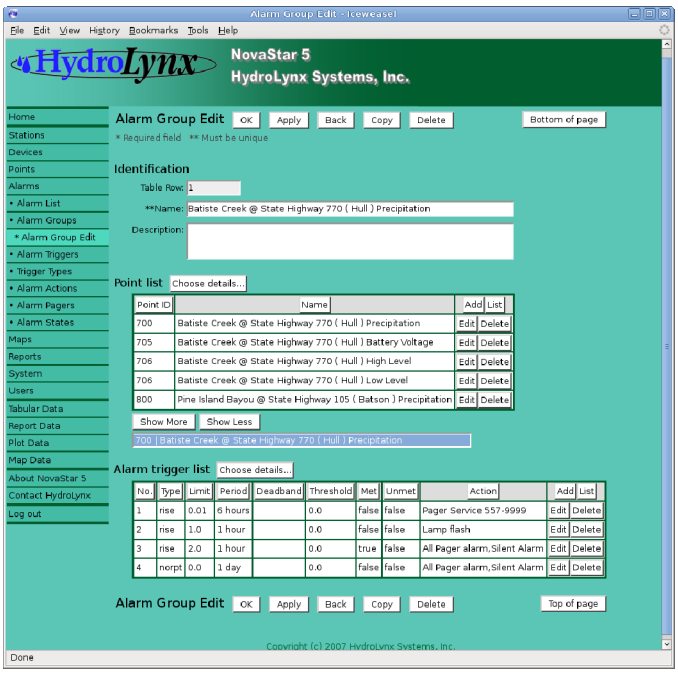
Model 5073NS-5 NovaStar 5 Software - Time Series Plot

Features

- Linux operating system
- Postgresql ODBC SQL database
- Mirrored database on hot backup server
- Web page user interface
- Three levels of encrypted password protected security
- Manual and scheduled data collection
  - o Real-time data collection of ALERT1/2 self reporting data
  - o Remote station polling over telephone, radio, satellite
  - o Data imports from data logger and network files
- Manual and scheduled data export to network files
- Automatic validation of collected data
  - o Change between reports
  - o Change over interval
  - o High and low limits
- Alarm checking of validated data
  - o High, low and at limit
  - o Change over interval with threshold limit
  - o No report
- Alarm actions
  - o Audible and visual alarm
  - o Telephone and email paging
  - o Voice dial-out
  - o Map display interface
  - o Set a hydrologic threat score
- Rating tables compute discharge or other data
  - o Unlimited time based table and shift assignment
- Real-time equations
  - o Programmed statistical analysis
  - o Predefined equations
    - § Basin rainfall average
    - § Dewpoint and wet bulb temperature
    - § Vapor pressure
    - § Evapotranspiration demand
- Data display
  - o Tabular data
    - § Column select and sort
    - § Data report edit
  - o Report groups
    - § Select data collection points
    - § Select data analysis and interval
    - § Rows of points
    - § Rows of display intervals
    - § Even and uneven display intervals
    - § Column sort
  - o Time series plots display data values over time
    - § Plot single or overlaid data collection points
    - § Draw lines, filled areas, histograms
    - § Left and right scales for different data types
    - § Programmable and adjustable scales
  - o Map backgrounds with overlaid readout data
    - § Import graphical map or schematic backgrounds
    - § Select data collection points
    - § Select data analysis and interval
    - § Data readout position auto-located or user located
    - § Data readout hyperlink displays an action menu
      - Data report display and editing
      - Station setup display and editing
      - Remote station polling
      - Control action
  - o Data report or statistical analysis over an interval
  - o Highlight background for hydrologic threat score
  - o Automatic refresh of a data display
  - o Automated display schedule
- Statistical analyses include
  - o Last and closest report
  - o Maximum, minimum, mean
  - o Variance, standard deviation, skew, coefficient of skew,
  - o Difference, sum, count
  - o Period rainfall, storm rainfall, rainfall intensity
  - o Rate of change, runtime, volume
- Send control commands
  - o Local control
  - o Remote control through the telemetry system
  - o Rule based decision making expert system software

Ordering Information

5073NS-5 ..... NovaStar 5 Software, with Manual
5073NS-5UP ..... NovaStar 4 to NovaStar 5 Version Upgrade



Model 5073NS-5 NovaStar 5 Software – Alarm setup screen

MODEL 5096ES
Emergency Status Sensor

General Description

The Model 5096ES Emergency Status Sensor is designed to be used in conjunction with the Model 5096 Transmitter status input to transmit water level alarms. The Model 5096 Transmitter status input may be configured to transmit alarm data, once the alarm level is reached, for intervals as short as 20 seconds for as long as the alarm level is maintained. The Model 5096 Transmitter status input will accommodate up to eight emergency status sensors.

The switch is a magnetically actuated, normally closed, dry reed switch inside a stainless steel stem. The normally closed operation is standard for alarm applications.

The protective housing is made of perforated steel with a 1 in. pipe fitting.

Electrical connection is made via 24 in. 22 awg leads. The use of 22 awg buried cable for cable runs to the 5096 Transmitter is recommended.

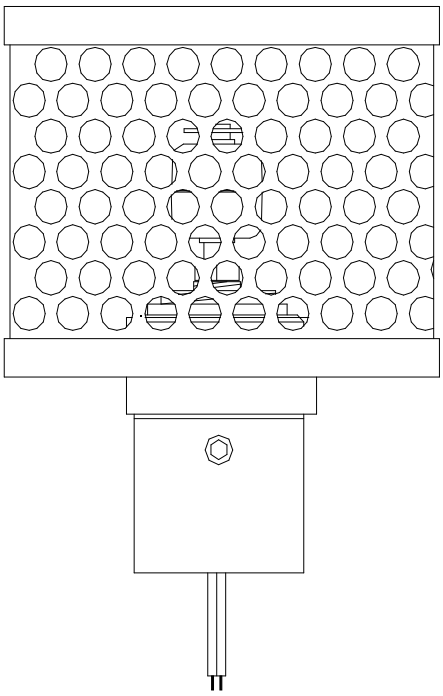
Model 5096ES Emergency Status Sensor

Specifications

Height: ..... 6 in.
Diameter: ..... 5 in.
Switch: ..... Dry reed, magnetically actuated. Normally closed is standard.
Float: ..... Stainless-steel
Cable: ..... 24 in. 22 awg leads
Conduit: ..... 1 in.

Ordering Information

5096ES..... Emergency Status Sensor
5096ES10..... 10 Pin Cable Connector for Interface to 5096 Transmitter (Round Canister Models)
5096ES-DBC..... Direct Burial Cable (22 awg), per foot



Model 5096ES Emergency Status Sensor

MODEL DCU-11
Self-Contained Ultrasonic Level Sensor

General Description

The Model DCU-11 Ultrasonic Level Sensor is a highly accurate distance sensor used to measure water level. Units with maximum measurement ranges of 35 ft. and 50 ft. are available. The self-contained feature eliminates the necessity for an external controller. The 4-20 mA and trip point outputs of the Model DCU-11 are programmable to anywhere within the sensing range.

The unit is contained in rugged PVC housing which is environmentally sealed and enables the sensor to provide reliable performance in harsh environments for extended periods of time.

A keypad is mounted on the back of the sensor and is opened for initial setup. The keypad is then sealed with an O-ring fitted cap to preserve the NEMA-4 rating while the sensor is in operation.

The Model DCU-11 is microprocessor controlled to enable total programmability and signal filtering capabilities. The AutoSense software provides automatic filtering of unwanted echoes received back from the perimeters of the ultrasonic beam pattern. This software also provides automatic adjustment of the sensitivity of the sensor. Temperature compensation is achieved by use of an internal thermistor which preserves the sensor accuracy over a wide range of temperatures.

Features

- Simple to use
- Low cost installation
- High accuracy
- Microprocessor controlled
- Self-contained rugged housing
- Low power
- 2 Adjustable solid state relay outputs
- 4-20 mA output
- Seven trip point configurations plus 27 programmable modes

Model DCU-11 Ultrasonic Level Sensor

Specifications

Supply voltage: ..... 12 to 30 Vdc
Operating temperature:..... -30 to 60 °C
Outputs:..... 4 to 20
2 solid state form A relays
200 mA max.
Resolution:..... 0.1 in. (2.54 mm)
Accuracy:..... 0.25% of range with no temperature gradient
Total current drain: ..... 180 mA max. at 24 Vdc
Sample rate: ..... 1 to 8 Hz
Beam pattern: ..... 9 degrees off axis
Diameter: ..... 3.5 in. (89 mm)
Length:..... 13 in. (330 mm)
Cable: ..... 6 ft. (1.8 m), 10 conductor 22 AWG with shield PVC jacketed with MS Connector
Weight: ..... 8 lbs.
Shipping weight: ..... 10 lbs.

Ordering Information

DCU-11 ..... Ultrasonic Sensor
Specify range: 1.5 to 35 ft. or 2 to 50 ft. range.
DCU-11-C ..... Additional Cable, per foot

MODEL 5096
Real-Time Data Transmitter

General Description

The Model 5096 Real-Time Data Transmitter collects, processes, and transmits analog and digital sensor data on events and timed intervals. The collection, processing, and transmission of sensor data is controlled by parameters that are easily programmed using a terminal or computer with standard communications software. Communications with the transmitter is through an RS-232 port.

The Model 5096 Data Transmitter features on-board data logging capabilities. Data is stored automatically in memory as backup to radio transmission or as a stand-alone data logger. The 24K memory capacity can store up to 4,000 event data points or more than 12,000 data points at uniform time intervals. Data can be downloaded using a portable computer during onsite visits.

The Model 5096 Data Transmitter is field-programmable, including a full set of commands for sensor setup and data logging. You can set and read sensors, access on-line help, and perform diagnostics at the remote site. Sensor parameters can be individually set, including transmission intervals, sample intervals, and starting values. Sensor data can be calibrated to report in engineering units. For firmware Versions 3.1 and later, no programming is required with default program setup for standard sensors.

The Model 5096 Data Transmitter logic board has up to 4 digital inputs, 7 analog inputs, and 8 digital status lines for a wide variety of sensor configurations. The battery voltage can be set to transmit at selected time intervals. Each sensor's default identification number is based on the setting of the 4 digit ID switch. Each sensor ID number can be programmed to any other unused number between 0 and 8191. The programmable ID feature helps avoid ID overlap when adding additional transmitters to an existing ALERT system.

The Model 5096 Data Transmitter includes a TEST button, LED indicators, and test points for diagnostic testing. The TEST function checks memory, both RAM and ROM, clock functions, and sensor values. Active sensors are read and their values are transmitted.

The Model 5096N is housed in a NEMA-4X fiberglass enclosure and is designed for outdoor mounting onto a panel or a mast as well as indoor wall-mounting. The 5096N can be equipped with a radio and used as part of a telemetry system, or it can be used as a stand alone data logger.

Model 5096 Real-Time Data Transmitter

Model 5096 Firmware Upgrades

The newest 5096 Data Transmitter 9601-01 firmware release on January 30, 2006 is **Version 4.4.1**. This release contains all the features introduced in previous releases.

Some added firmware features include "Plug and Play" parameter sets for the Package Data Transmitters: 5096-54, 88, 90, 81 & 5096N. The SHOWALL command displays all active sensor parameter sets, current raw and calibrated readings, and station setup parameters. The rain gauge counters can be reset to zero on a programmed day of the year. A "Listen before Talk" radio feature waits for no radio carrier before transmitting data reports. Multiple level tests transmit all sensor data, transmit tone or no tone. The Enhanced IFLOWS protocol data format is supported. A dial-in modem connection allows telephone polling and data transmitter setup.

Contact HydroLynx to request a complete list of enhancements.

Specifications

Environment

Operating temperature: ..... -40 to 65 °C
Storage temperature: ..... -60 to 75 °C
Operating humidity: ..... 0 to 100 %RH, non-condensing

Main Logic Board

Memory size: ..... 96 Kbytes, CMOS EPROM - 64 Kb CMOS RAM - 32 Kb, battery backed
Manual controls: ..... Reset switch, Test switch, Station ID
Diagnostic LEDS: ..... Test error, power error, sensor power, TX-on, test, run
Standby current ..... <300 µA (120 µA)
Supply voltage: ..... 10.5 to 18.5 Vdc (12.2 to 14.5 Vdc battery operated with radio)
Serial port baud rate: ..... 300 (default), 1200, 2400, 4600, 9600
Transmitter baud rate: 300
CPU type: 80C196 (5MHz)
Clock: ..... Real-time software clock
Digital inputs: ..... 4 digital channels, up to 100 event triggers/second, 2 channels up/down accumulator, 2 channels up only with pre-divide counter.
Status inputs: ..... 1 channel with 8 digital status lines.
Analog inputs: ..... 8 analog ch. (10-bit resolution with ± 0.24% non-linearity error), 7 ch. (0-5 Vdc), 1 ch. for battery voltage.
Analog supply voltages: ..... Vbatt (12 Vdc nominal) non-switched, +5 Vdc non-switched, Vsw (12 Vdc nominal) switched , Vref (+5 Vdc) switched

Models 5096-54, 88, 90, 81

Enclosure: ..... Aluminum canister
Size: ..... 8 in. diameter x 23 in. high
Weight: ..... 19 lbs with battery
Shipping weight: ..... 12 lbs (battery shipped separately)
Sensor inputs: ..... Keyed MS male connectors
5096-54 ..... 1 precipitation digital
5096-88 ..... 1 precipitation digital, 1 water level digital
5096-90 ..... 1 precipitation digital, 1 water level digital, 1 analog
5096-81 ..... 1 precipitation digital, 1 water level digital, 1 wind speed digital, 1 counter digital, 7 analog
5096STATUS ..... 8 digital status
Battery: ..... 12 Vdc, 12 Amp-hour rechargeable gel cell
External 12 Vdc connector: ..... 3 pin MS male connector for solar panel or optional AC charger
Antenna: ..... BNC female bulkhead
Serial console: ..... 9 pin D-type RS-232C female connector mounted on circuit board

Model 5096N

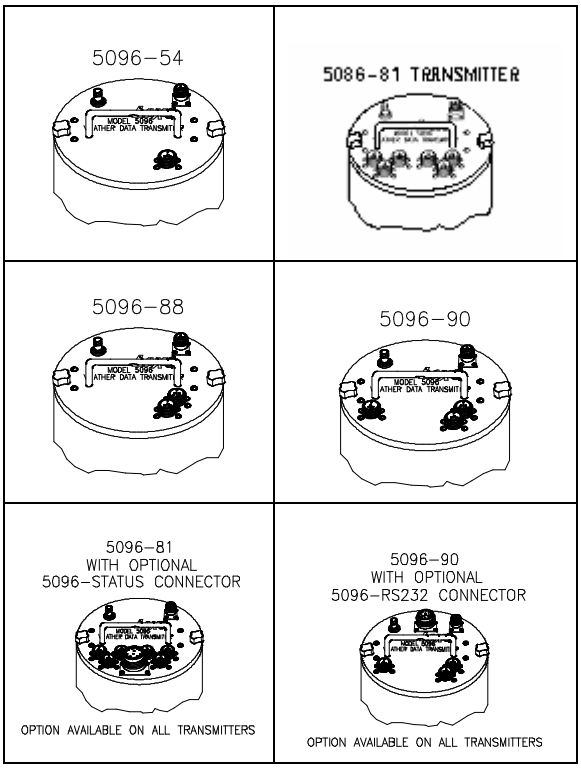
Enclosure: ..... NEMA-4X fiberglass
Size: ..... 13.6 in. x 11.5 in. 5.3 in.
Mounting holes: ..... 12.75 in. x 8 in.
Weight: ..... 16 lbs (with battery)
Shipping weight: ..... 12 lbs (battery shipped separately)
Sensor inputs: ..... Enclosure with 7 cable strain reliefs
Connections: ..... Screw terminal interconnect PCB for 4 digital, 7 analog, and 8 digital status or MS connector package
Battery: ..... 12 Vdc, 7 Amp-hour rechargeable gel cell
Antenna: ..... N-type female lightning arrestor
External 12 Vdc connector: ..... 3 pin MS male connector for 12 Vdc input
Serial console: ..... 9 pin D-type RS232C Female connector mounted on circuit board

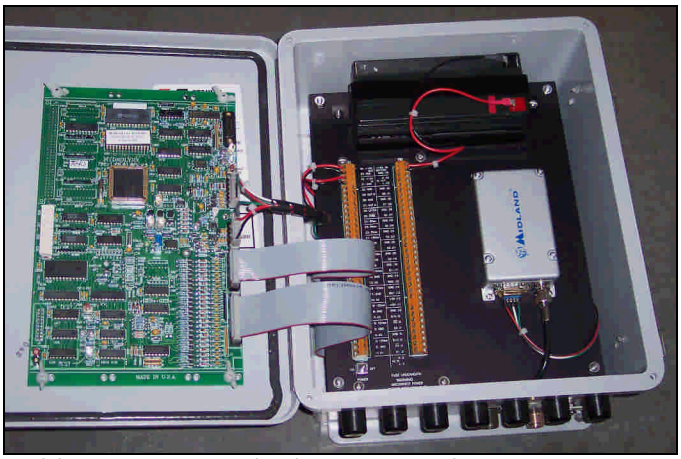
Options

RTR ..... Radio Link (Specify frequency)
5096STATUS ..... 10 pin MS Female Bulkhead Connector
5096RS232 ..... 7 pin MS Male Bulkhead Connector
9601-xx-Vyy ..... Firmware Upgrade (Specify model and version)

Ordering Information

5096-54 ..... Transmitter in Round Canister, 1 Precipitation Input
5096-88 ..... Same as 5096-54 with 2 Digital Inputs
5096-90 ..... Same as 5096-54 with 2 Digital, 1 Analog Input
5096-81 ..... Same as 5096-54 with 7 Analog Inputs and 3 Digital Inputs
5096N ..... Transmitter in NEMA 4X Enclosure





Model 5096N Data Transmitter in NEMA-4X Enclosure

ATTACHMENT 16

CD of Complete Report
(PDF Format)

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