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To: "von Till, Bill (E-mail)" <rwv@nrc.gov>
Date: 5/24/05 10:13AM
Subject: NECR documentation request 3 - UNC - Doc. 40-8907

Finally, the original Closeout Plan
<<NECR Closeout Plan.pdf>>

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MWH

January 30, 2004

Ms. Karen Garcia, Director
State of New Mexico
Mining and Minerals Division
Pinion Building
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

RE: Northeast Church Rock Mine Closeout Plan

Dear Ms. Garcia:

On behalf of United Nuclear Corporation (UNC) enclosed are 6 copies of the Northeast Church Rock Mine Closeout Plan.

If you have any questions please feel free to contact me at the number below or Larry Bush at UNC.

Sincerely,

MWH

Mike Ross, P.E.
Project Engineer

Enclosures

cc: Roy Blickwedel, GECE
Larry Bush, UNC
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NORTHEAST CHURCH ROCK MINE CLOSEOUT PLAN

January 2004

Prepared by:

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1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION AND BACKGROUND

This Closeout Plan (Plan) for United Nuclear Corporation's (UNCs) former Northeast Church Rock (NECR) Mine has been prepared in compliance with the requirements of Section 5 of the New Mexico Mining Act. The Plan is based on available site data and topographic mapping and was prepared using the Mining Act Reclamation Program Closeout Plan Guidelines compiled by the State of New Mexico Energy, Minerals and Natural Resources Department. Components of the Plan are intended to reclaim the NECR Mine to a post-mining land use of livestock grazing. Plan components include regrading and revegetating non-economic storage areas, removal and disposal of the remaining foundations on site, and abandoning shafts and vent holes. Closeout plan components are discussed in the following sections.

The NECR Mine Site is located approximately 16 miles northeast of Gallup, New Mexico, as shown on Figure 1, *Cover Sheet and General Location Map* and is accessed via State Highway 566. The mine was located in Sections 34 and 35, Township 17 North, Range 16 West and Section 3, Township 16 North, Range 16 West in McKinley County, New Mexico.

The majority of the mine property was operated by UNC under the terms of a mineral lease with the predecessors of what is now Newmont Gold Corporation (NGC), current owner of the mineral estate. Closure of the NECR Mine was performed between 1986 and 1994 pursuant to the terms of UNC's mineral lease, and included backfilling and sealing of the NECR-1 and NECR-2 Mine Shafts with non-economic mine materials; sealing of the two mine shafts and associated vent holes with reinforced concrete caps; and regrading, covering and revegetating the storage area for non-economic materials and overburden. Closure activity at the site was approved by the NRC, and the site was released for unrestricted use as detailed in an NRC memorandum dated October 31, 1989. The mineral lease was terminated in 1992.

Site features are shown on Figure 2, *NECR Mine Existing Conditions* and include the NECR-1 and NECR-2 areas, buildings and foundations from former mine support facilities, mine roads, the area for deposition of non-economic materials and overburden, and the NRC-regulated sandfill locations. Licensing and regulatory authority for the sandfill areas were returned to the NRC by the State of New Mexico. The NRC found that UNC adequately removed the NRC-regulated material from the mine site and concluded that no further action in these areas was necessary. Reclamation of the other remaining facilities and features is discussed in the following sections.

1.2 SITE SOILS

The native soils within the site boundary consist of well-drained silty sands and inorganic silts and clays, characteristic of a semi-arid pinyon-juniper region. The NECR-1 pad was constructed of non-economic mine materials consisting of sandstone and clay shale fragments, while the NECR-2 pad was constructed primarily of native soils. The NECR-2 pad and non-economic storage area were seeded in 1994. The non-economic storage area was covered with native soil prior to reseeding. Currently all areas support a variety of native vegetation.

1.3 SITE GEOLOGY

The NECR Mine is located in a canyon at an elevation ranging from 7,100 to 7,200 feet. The surrounding cliffs are comprised of white, medium- to coarse-grained sandstone from the Dalton Sandstone Member of the Crevasse Canyon Formation.

The mine shafts and facilities are located in the center of the canyon on pads constructed out of the alluvial soils and non-economic mine materials.

The NERC-1 and NECR-2 mine shafts at the site extend to a depth of approximately 1,800 feet where they intersect the uranium ore body in the Westwater Canyon Member of the Morrison Formation. The Westwater Member consists of fine- to coarse-grained sandstone.

1.4 SURFACE AND GROUNDWATER

During active operations, mine water was pumped to the surface, treated using an ion exchange process and discharged into the unnamed arroyo adjacent to the NECR-1 area. The unnamed arroyo flowed into the Pipeline Arroyo and eventually into the North Fork of the Rio Puerco, a large, ephemeral drainage. The treated water provided a watering source for both domestic animals and wildlife during operations. Treated surface water discharge was discontinued at the site in 1983, and currently all flows originating from the site are ephemeral and occur only as storm runoff after major precipitation events.

According to the log for NECR Mine shaft sunk in 1968 and 1969, ground water was first encountered approximately 400 feet below the surface of the mine in the lower portion of the First Gallup Sandstone Member of the Gallup Formation. Inflow of water from this formation was small, amounting to only 30 gpm. Water was also encountered at a low inflow rate of 50 gpm in the Second Gallup Sandstone Member. Water was not encountered again until the Dakota Formation was reached at the base of the Mancos Shale. Ground water inflows from the Dakota Formation were at 800 gpm prior to grouting. Water inflows from the underlying Westwater Canyon Member were even larger, averaging from 1,500 to 2,100 gpm during shaft construction.

Water pumped from the mine was treated prior to discharge to reduce suspended solids and radionuclide levels as required by the NPDES permits. The water was pumped to Pond 1 where flocculents were added to reduce suspended solids. Water then flowed from Pond 1 into Ponds 2 and 3 where further treatment was performed to remove radium through precipitation. The water from Pond 3 was pumped to the IX plant to remove uranium and was then discharged into the adjacent arroyo. The IX plant was constructed in 1976 and started operations in 1977. Water quality analyses of the NECR Mine water discharge from the IX plant were performed as required by the NPDES permit until the end of operations in 1983.

The site is located in the San Juan Hydrologic Basin where the sandstones such as the Dakota and the Morrison Formations are important regional aquifers. The thick shale units, particularly the Mancos Formation, behave as aquitards. Formations that consist of sandstone and shale, such as the Dilco Member of the Crevasse Canyon Formation, transmit water in the predominantly sandy zones but are not considered important aquifers in the region. The Dakota and Morrison formations are approximately 1,400 to 1,800 feet below the surface at the NECR Mine, and due to this depth and the presence of several natural aquatards between these aquifers and the ground surface, mining-related surface water impacts to these formations was negligible.

Water quality samples have been collected from the well at the Church Rock Mill, shown on Figure 2. The well was completed into the Westwater Canyon Member and was originally used as a domestic supply for the mill during operations. The well is currently used as a non-potable supply for the mine offices and to supplement the water in the tailings impoundment evaporation ponds to prevent the pond liners from drying out. It is operated continuously from approximately March through November and produces water at the rate of approximately 24 gpm, and offers the best indication of potential mine-related water quality that is available. After the well was completed, stopes and other mine workings were completed in the Westwater Canyon Member within approximately 1,000 feet of the well.

Data for water samples from the well are presented in Table 1.1, *Church Rock Mill Well Water Quality.*

TABLE 1.1
CHURCH ROCK MILL WELL WATER QUALITY

Constituent	Units	Sample Dates					
		8/12/76	10/9/84	4/23/92	7/28/93	6/18/02	NMED Std.
Calcium	(mg/L)	5.5	4.7	3.2	15.0	16.0	
Magnesium	(mg/L)	0.8	3.24	0.4	4.9	4.2	
Sodium	(mg/L)	60	103.2	123	708	644	
Potassium	(mg/L)	6.6	1.6	1.0	3.0	3.5	
Bicarbonate	(mg/L)	121.7	239.7	245	229	225	
Sulfate	(mg/L)	32	17.7	33.3	1260	1100	600
Chloride	(mg/L)	17	4.1	6.3	182	160	250
Ammonium as N	(mg/L)	--	<0.05	<0.1	<0.05	0.50	
Nitrate + Nitrate as N	(mg/L)	5.3	--	<0.10	<0.10	<0.10	10.0
TDS	(mg/L)	335	228	292	2258	2090	
pH	(std. units)	7.98	8.49	8.83	8.49	8.34	6 to 9
Aluminum	(mg/L)	--	<0.05	<0.10	0.16	<0.10	5.0
Arsenic	(mg/L)	<0.001	<0.001	0.004	<0.001	<0.001	0.1
Beryllium	(mg/L)	--	--	<0.10	<0.005	<0.01	
Cadmium	(mg/L)	<0.01	<0.01	<0.01	0.01	<0.005	0.01
Cobalt	(mg/L)	--	<0.05	<0.01	<0.01	<0.01	0.05
Lead	(mg/L)	--	<0.05	<0.05	<0.05	<0.05	0.05
Manganese	(mg/L)	0.08	<0.01	<0.01	0.24	0.05	0.2
Molybdenum	(mg/L)	--	<0.01	<0.10	<0.10	<0.10	1.0
Nickel	(mg/L)	--	<0.05	<0.05	<0.05	<0.05	0.2
Selenium	(mg/L)	<0.01	<0.001	0.218	0.003	<0.001	0.05
Vanadium	(mg/L)	--	<0.01	<0.10	<0.10	<0.10	
Uranium, dissolved	(mg/L)	--	0.065	0.576	0.002	0.0700	5.0
Radium 226	(pCi/L)	--	1.8 ± 2.1	0.4 ± 0.2	1.6	0.7	
Radium 228	(pCi/L)	--	--	2.1 ± 0.8	1.4	2.7	
Thorium 230	(pCi/L)	--	61.3 ± 5.9	<0.2	<0.2	<0.02	
Lead 210	(pCi/L)	--	9.3 ± 2.2	<1.0	--	<1.0	
Gross Alpha	(pCi/L)	--	43 ± 7	2.3 ± 0.2	1.8	<1.0	

As seen in Table 1.1 concentrations of sulfate and sodium increased significantly (causing a commensurate increase in TDS) in the period of approximately one year from 1992 to 1993. This increase cannot presently be explained, however probable causes will continue to be explored. It does not appear to be related to mining which ceased nine years earlier, and the concentrations of regulated metals and radionuclides did not adversely change.

Other than the well at the Church Rock Mill, there are no wells in the vicinity of the NECR Mine that have been completed in the Westwater Canyon Member. Two wells have been completed in the First or Second Gallup Sandstone members downgradient of the site. One well is located approximately one mile east-northeast of the site and is referred to as the Pipeline Canyon Well. The other well is located approximately one-half mile directly north of the site and is called the Friendship Well.

A groundwater sample was collected from the Friendship Well on August 5, 2003 and was analyzed for water quality parameters. Data from the analysis are presented in Table 1.2, *Gallup Member Water Quality*.

TABLE 1.2
GALLUP MEMBER WATER QUALITY

Constituent	Units	Concentration	NMED Standard
Calcium	(mg/L)	310	
Magnesium	(mg/L)	125.1	
Sodium	(mg/L)	143.1	
Potassium	(mg/L)	7.1	
Bicarbonate	(mg/L)	475.07	
Sulfate	(mg/L)	1097.22	600
Chloride	(mg/L)	19.05	250
Ammonium as N	(mg/L)	--	
Nitrate + Nitrate as N	(mg/L)	<0.1	10.0
TDS	(mg/L)	2136	
pH	(std. Units)	8.07	6 to 9
Aluminum	(mg/L)	<0.01	5.0
Arsenic	(mg/L)	0.008	0.1
Beryllium	(mg/L)	<0.05	
Cadmium	(mg/L)	<0.001	0.01
Cobalt	(mg/L)	<0.05	0.05
Lead	(mg/L)	<0.001	0.05
Manganese	(mg/L)	1.1	0.2
Molybdenum	(mg/L)	<0.1	1.0
Nickel	(mg/L)	<0.1	0.2
Selenium	(mg/L)	<0.005	0.05
Vanadium	(mg/L)	<0.1	
Uranium, dissolved	(mg/L)	0.003	5.0
Radium 226	(pCi/L)	2.60	
Radium 228	(pCi/L)	--	
Thorium 230	(pCi/L)	--	
Lead 210	(pCi/L)	--	
Gross Alpha	(pCi/L)	7.5	

During mine dewatering, water originating from the Gallup Members accounted for only about three percent of the total inflow to the mine, demonstrating that they had a substantially lower yield than the Dakota and Westwater Canyon Formations. Water quality standards for sulfate and manganese are exceeded in this well, which is a fairly typical occurrence for wells open to the Gallup Formation and is not in any way related to mining activities at NECR.

1.5 POST-MINING LAND USE

Reclamation at the NECR Mine is intended to achieve a post-mining land use of livestock grazing comparable to surrounding areas. Prior to reseeding, vegetation surveys will be conducted in nearby areas to determine the native species and corresponding plant densities for undisturbed areas. Soils will be sampled prior to revegetation to determine agronomic requirements to ensure vegetation success. Should the water in Pond 3 meet water quality standards, it will be left in place to provide a water source for livestock and wildlife. Water in the pond will be sampled prior to reclamation.

2.0 CLOSEOUT PLAN COMPONENTS

2.1 SURFACE WATER AND EROSION CONTROL

Surface water will be controlled to limit flow velocities and route runoff away from regraded and revegetated slopes. Silt fence and straw bales will be installed prior to construction and will be maintained for the duration of construction. All runoff from the site will be conveyed into Pond 3, which will function as a sediment control basin and will reduce or prevent the flow of sediment-laden water leaving the site. Runoff from the NECR-1 and Pond 3 embankments will not be captured in Pond 3, and therefore sediment controls will be placed at the toes of the slopes. Straw bales will be placed in the NECR-2 and Non-economic Material Pile channels to control flow velocities and reduce erosion prior to placement of riprap.

A hydrologic analysis was performed using the 100-year, 24-hour design storm. The storm precipitation depth of 2.9 inches used in the analysis was obtained from NOAA Atlas 14. The Army Corps of Engineers HEC-1 model was used to calculate peak flows which were used to design diversion channels for surface water control. Basins used in the analysis are shown on Figure A-1 in Appendix A. Output from the HEC-1 model is presented in Appendix A and is summarized in Table 2.1, *NECR Mine 100-year, 24-hour Peak Flows.*

TABLE 2.1
NECR MINE 100-YEAR, 24-HOUR PEAK FLOWS

Basin	Design Discharge (cubic feet per second)
Basin 1 below the Reclaimed Non-economic Storage Area	116
Basin 3 Below NECR-2	23
Basin 9 at NECR-1	21
Combined Flow into Pond 3	223
Pond 3 Outlet Channel Routed Discharge	136

The hydrologic analysis was performed assuming that Pond 3 would remain in place and would be full at the start of the design storm event. Thus, the calculated peak discharge from the site through the outlet channel is conservative.

Diversion channels will be constructed to be trapezoidal in shape and will be located approximately as shown on Figure 3, *NECR Mine Reclamation Topography* to direct runoff away from regraded and revegetated areas. The final alignment and extent of each channel may be modified based on site-specific conditions encountered during construction.

Riprap for the channels was designed using the 1991 U.S. Army Corps of Engineers method. Manning's equation was used to size the diversion channels to convey the design flow with a minimum freeboard of one foot. Riprap sizing and channel design spreadsheets are provided in Appendix A, and preliminary channel design parameters are presented in Table 2.2, *Preliminary Channel Design Parameters.*

TABLE 2.2 PRELIMINARY CHANNEL DESIGN PARAMETERS			
Channel	Bottom Width (ft)	Design Depth (ft)	Minimum Required Riprap D_{50} (in)
NECR-1	3.0	2.0	1.5
NECR-2	4.0	1.5	8.0
Pond 3 Outlet	15.0	2.0	6.0
Non-economic Storage Area	4.0	2.5	9.0

Riprap will be placed uniformly to prevent segregation and will be underlain with a non-woven geotextile with a minimum weight of 12 ounces per square yard. For reasons of economy, the 9-inch riprap may also be used in the NECR-2 and Pond 3 Outlet Channels. It is anticipated that durable limestone riprap will be used and will be obtained from a limestone quarry approximately 10 miles from the site. Riprap used in the channels will be sized to meet the gradation specifications shown in Table 2.3, *Riprap Gradation Specifications.*

TABLE 2.3 RIPRAP GRADATION SPECIFICATIONS	
Rock Size	Percent Finer
$1.5 * D_{50}$	75 - 100
D_{50}	30 - 70
$0.5 * D_{50}$	0 - 25

2.2 REGRADING

Regrading at the NECR-1 and NECR-2 areas will consist of recontouring the surfaces to promote non-erosive runoff into the diversion channels and constructing drainage channels to route the runoff away from the regraded areas. Runoff adjacent to the non-economic storage area is currently confined to a natural channel on the east side of the pile. The natural channel will be reconstructed as necessary to convey the peak design flow and will be lined with riprap to provide erosional stability.

2.2.1 NECR-1

The NECR-1 Mine Area is shown on Figure 2 and consists of a level pad of approximately 13.6 acres constructed by cut and fill methods. The southeast portion of the pad is built on top of native soils and the northwest portion is built of non-economic mine materials. The portion of the pile constructed of non-economic materials is a maximum of 20 to 30 feet thick along the northwest perimeter of the pad.

As shown on Figure 3, the surface of the NECR-1 pad will be regraded to slopes ranging from 0.5 percent to 3 percent to direct runoff away from the embankment into the channel on the southern edge of the pile. The embankment of the pad will be regraded to flatten the slope to approximately 2.5H:1V and remove existing headcuts and rills. Both the pad surface and the embankment will be revegetated to establish vegetation consistent with the post-mining uses of livestock grazing and wildlife habitat.

The regraded configuration of the pile was analyzed for geotechnical slope stability using the Slope/W model. Circular failures were analyzed by the model at one cross section location using Bishop's method. Input parameters for the model were estimated using typical properties for waste rock, and included a unit weight of 110 pounds per cubic foot, an internal friction angle of 33 degrees and a cohesion of zero. Typically acceptable factors of safety for long-term stability range from 1.3 to 1.5, and flattening of the embankment through regrading will result in a factor of safety of approximately

2.0. The location of the analyzed cross section and output from the Slope/W model are contained in Appendix B.

2.2.2 NECR-2

The NECR-2 Mine Area contains the NECR-2 Shaft and is located further up the canyon and to the southwest of the NECR-1 Mine as shown on Figure 2. The pad encompasses approximately 3.9 acres and, unlike the NECR-1 pad, is constructed primarily of native soils. Regrading at the NECR-2 area will consist of repairing existing rills and headcuts on the embankment and performing minor recontouring of the surface on the northern end of the pad to direct runoff into the adjacent diversion channel. As vegetation has become established on the pad surface, areas disturbed during construction will be re-seeded.

2.2.3 Non-Economic Material Storage Area and Former Boneyard

The non-economic material storage area and former boneyard were reclaimed in 1994 by regrading the areas, placing riprap on the regraded storage area embankment, covering the areas with clean soil and seeding. No regrading is anticipated for the areas, however the existing reclamation will be supplemented by constructing a riprap-lined channel within the existing drainage to the east of the reclaimed storage area as shown on Figure 3. The channel will convey runoff from the upper canyon into the valley below and will prevent degradation of the reclaimed pile. Areas disturbed during channel construction will be revegetated.

2.2.4 Ponds 1 and 2

Pond 1 will be used as a disposal area for buildings and foundations removed during reclamation. Debris will be placed in the pond and the existing embankment will be regraded and used as cover over the buried debris with a minimum cover thickness of 3 feet. Pond 2 will be reclaimed by regrading the embankment into the pond to balance the cut and fill quantities. The surfaces of both ponds will be regraded to promote non-erosive runoff, and both areas will be revegetated using a native seed mix to be determined prior to construction. The regraded ponds are shown on Figure 3.

2.2.5 Pond 3

Pond 3 currently stores water after significant storm events. Prior to reclamation, water stored in the pond will be sampled and analyzed for constituents applicable to surface waters impounded for wildlife and livestock use. If water quality standards are not met the pond will be left in place until the end of construction to act as a sediment detention basin. When construction is complete the pond will be removed by regrading the embankment into the pond and recontouring the regraded area, balancing cut and fill quantities.

Should water quality standards for Pond 3 be met, it will be left in place. Currently the pond embankment is greater than 10 feet in height and the storage capacity of the pond is greater than 10 acre-feet, making it a jurisdictional dam subject to New Mexico State Engineer dam safety criteria. The embankment height and spillway channel invert elevation will be lowered to remove the jurisdictional classification. The existing outlet riser pipe will be removed and the outlet pipe will be filled with grout to form a watertight seal. The outlet channel located on the northeastern edge of the pond currently serves as an emergency spillway during larger storm events. The channel will be lined with riprap to prevent erosion and headcutting. The regraded embankment and outlet channel are shown on Figure 3.

2.3 FOUNDATION DEMOLITION AND REMOVAL

Closure of the mine was completed in 1994, leaving the structures and foundations shown on Figure 2 in place. It is anticipated that all existing foundations and buildings at the NECR Mine will be removed and placed in the designated disposal area in Pond 2. Power poles and power lines currently on site will be removed and salvaged if possible.

2.4 ROAD RECLAMATION

Existing access roads and culverts on the site are shown on Figure 2. Reclamation of roads will involve ripping and regrading the surfaces and removing the existing culverts at the completion of reclamation activities. Road reclamation will likely be completed as a final task after regrading at NECR-1, NECR-2 and Pond 3 has been completed. Revegetation of the regraded roads will be performed concurrently with other areas. It is not anticipated that any roads will be left on site as part of the final reclamation.

2.5 REVEGETATION

Areas impacted by regrading, channel construction and building and foundation demolition will be revegetated. Revegetation is intended to reduce impacts to surface water by establishing a self-sustaining plant community which provides erosional stability. For the NECR-1 area, establishment of vegetation will also reduce infiltration of precipitation into the pile through evapotranspiration. Soils in the revegetated areas will be sampled for agronomic analysis prior to seeding to determine amendment requirements. Required quantities of soil amendments will be determined on a site-specific basis. Inorganic fertilizer will be added to increase the nitrogen, phosphate, and potassium available to the plants as required by analytical analysis. Mulch will be applied after seeding is complete to conserve soil moisture and protect the soil from wind and water erosion. Revegetation will likely take place between June and September. Approximately 18 acres will be revegetated as part of this Plan.

Amended areas will be seeded with a mixture that contains native grasses and forbs that will not depend on external inputs of water or fertilizer. Based on the vegetation transects surveyed at the site in 1974, it is anticipated that the species listed in Table 2.4, *Plant Species and Percent Composition at the NECR Mine Site,* will be used in the seed mix. Specific species, composition percentages and seeding rates will be determined during a vegetation survey that will be conducted prior to the start of reclamation. A wildlife survey will be performed concurrently with the vegetation survey.

TABLE 2.4
PLANT SPECIES AND PERCENT COMPOSITION AT THE NECR MINE SITE

Species	Percent of Composition (approx.)
Blue Grama (*Bouteloua gracilis*)	21
Galleta (*Pleuraphis jamesii*)	10
Indian Ricegrass (*Achnatherum hymenoides*)	6
Sand Dropseed (*Sporobolus Cryptandrus*)	2
Aster, Babywhite (*Chaetopappa ericoides*)	10
Deer's Tongue (*Trilisa odoratissima*)	3
Gilia (*Ipomopsis rubra*)	5
Pingue (*Hymenoxys richardsonii*)	11
Wild Buckwheat, James (*Eriogonum jamesii*)	3
Big Sagebrush (*Artemisia tridentata*)	5
Broom Snakeweed (*Gutierrezia sarothrae*)	13
Fringed Sagewort (*Artemisia frigida*)	6

Quantities of amendments and seeding rates will be applied based on a revegetation plan developed based on a vegetation survey and agronomic analyses. Revegetation success will entirely depend on landowner activities and livestock use at the site. Therefore, revegetation will be considered to be complete based on documentation that the quantities of fertilizer and seed applied to revegetated areas met or exceeded the requirements in the Revegetation Plan developed for the NECR Mine.

2.6 REGULATORY COMPLIANCE

A stormwater discharge permit (NPDES) for construction activities will be obtained as required prior to implementation of the Closeout Plan. Temporary erosion control measures such as straw bales, silt fences and sediment basins will be placed as needed prior to the start of construction and will be removed once construction has been completed. Erosion control measures will be maintained for the duration of construction. Dust will be controlled by periodically watering haul roads and other dust-generating areas as necessary.

Water quality sampling performed for Pond 3 prior to reclamation will be sufficient to demonstrate long-term compliance with water quality standards. Additional sampling after the completion of reclamation is not anticipated, and therefore implementation of a site-specific water monitoring plan will not be required.

2.7 SITE ACCESS CONTROL

The NECR Mine is located on Navajo Trust and privately-owned land, and access agreements are currently being negotiated. A locked gate will be placed at the entrance to the site to prevent public access. Fences that are currently on site will remain in place and will be repaired and photographically documented. UNC will assume no responsibility for the maintenance of site access controls or for security of the site once the improvements have been made because UNC does not own or control the site.

3.0 CLOSEOUT PLAN SCHEDULE

Implementation of the NECR Closeout Plan will begin after it has been approved by the Mining and Minerals Division (MMD) and access agreements have been negotiated and are in place. Once agreements are in place, vegetation and wildlife surveys will be performed during the peak of the growing season prior to the start of construction. Water in Pond 3 will be sampled and analyzed for wildlife and livestock water quality standards prior to the start of reclamation. Sampling will likely take place during the monsoon season from late July through September when water is likely to be present in the pond. An NPDES stormwater permit will be in place prior to the start of construction.

A specific reclamation schedule will be developed by the contractor during the construction bidding process. The general schedule for construction is as follows:

Weeks 1-3:
- Mobilization
- Installation of sediment controls

Weeks 2-5:
- Preparation of disposal area for foundations
- Demolition and disposal of foundations, buildings and miscellaneous structures

Weeks 3-7:
- Regrading at NECR-1 and NECR-2
- Regrading of the Pond 3 embankment and abandonment of the existing outlet pipe
- Construction of the Pond 3 outlet channel (if pond is to remain in place)
- Construction of diversion channels at the NECR-1, NECR-2 and Non-economic Storage Areas
- Final contouring of the Pond 1 and Pond 2 embankments and disposal areas
- Diversion channel riprap placement

Weeks 6-8:
- Final contouring
- Fence repair and placement, site access gate placement
- Reclamation of roads, removal of culverts

Week 9:
- Revegetation

4.0 REFERENCES

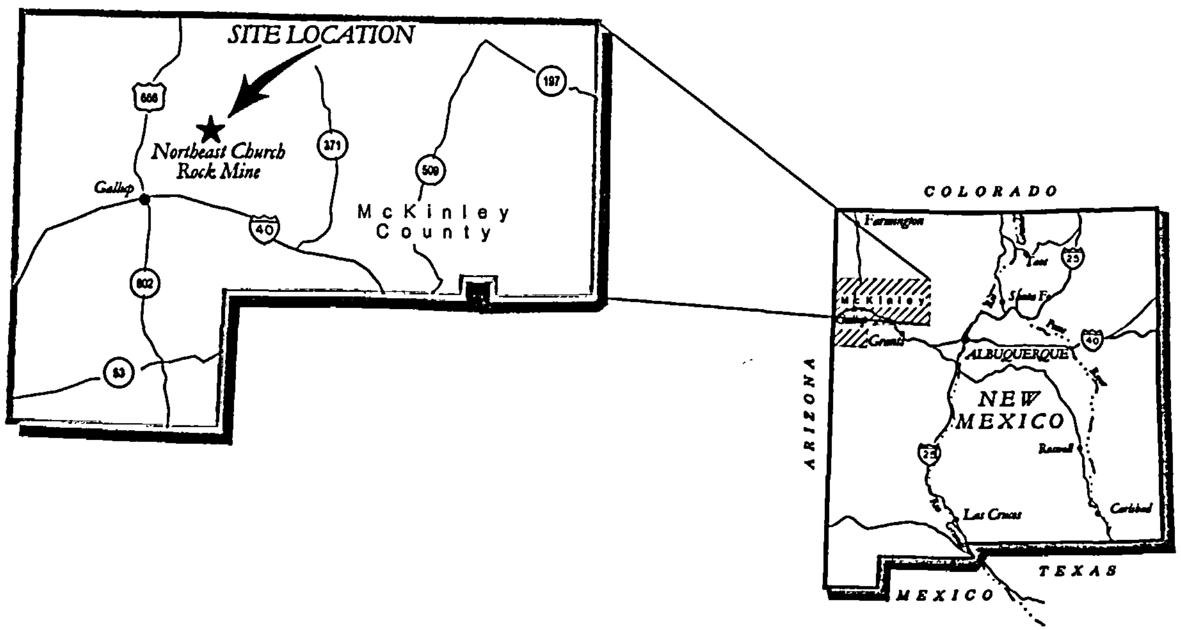
MWH, 2003, Northeast Church Rock Mine Site Assessment, Steamboat Springs, Colorado.

United Nuclear Corporation, 1975, Environmental Report on the Church Rock, New Mexico Uranium Mill and Mine, UNC-ER-1.

FIGURES

UNITED NUCLEAR CORPORATION
NORTHEAST CHURCH ROCK
CLOSEOUT PLAN

JANUARY 2004



LIST OF FIGURES

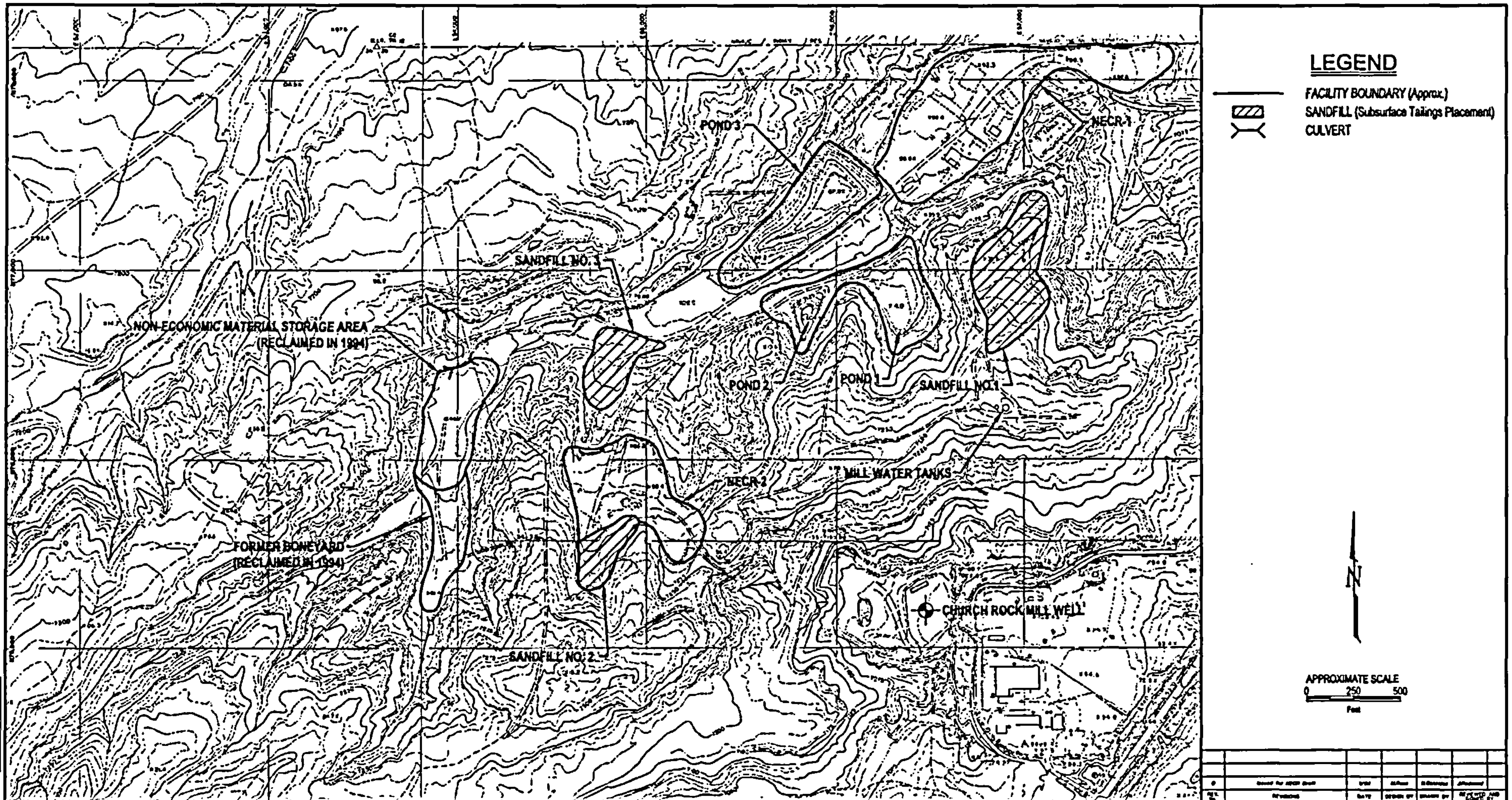
PREPARED FOR:

UNC
P.O. BOX 3077
Gallup, New Mexico 87305-3077

PREPARED BY:

MWH

FIGURE No.	REV.
1	0



UNC P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT: NECR CLOSEOUT PLAN

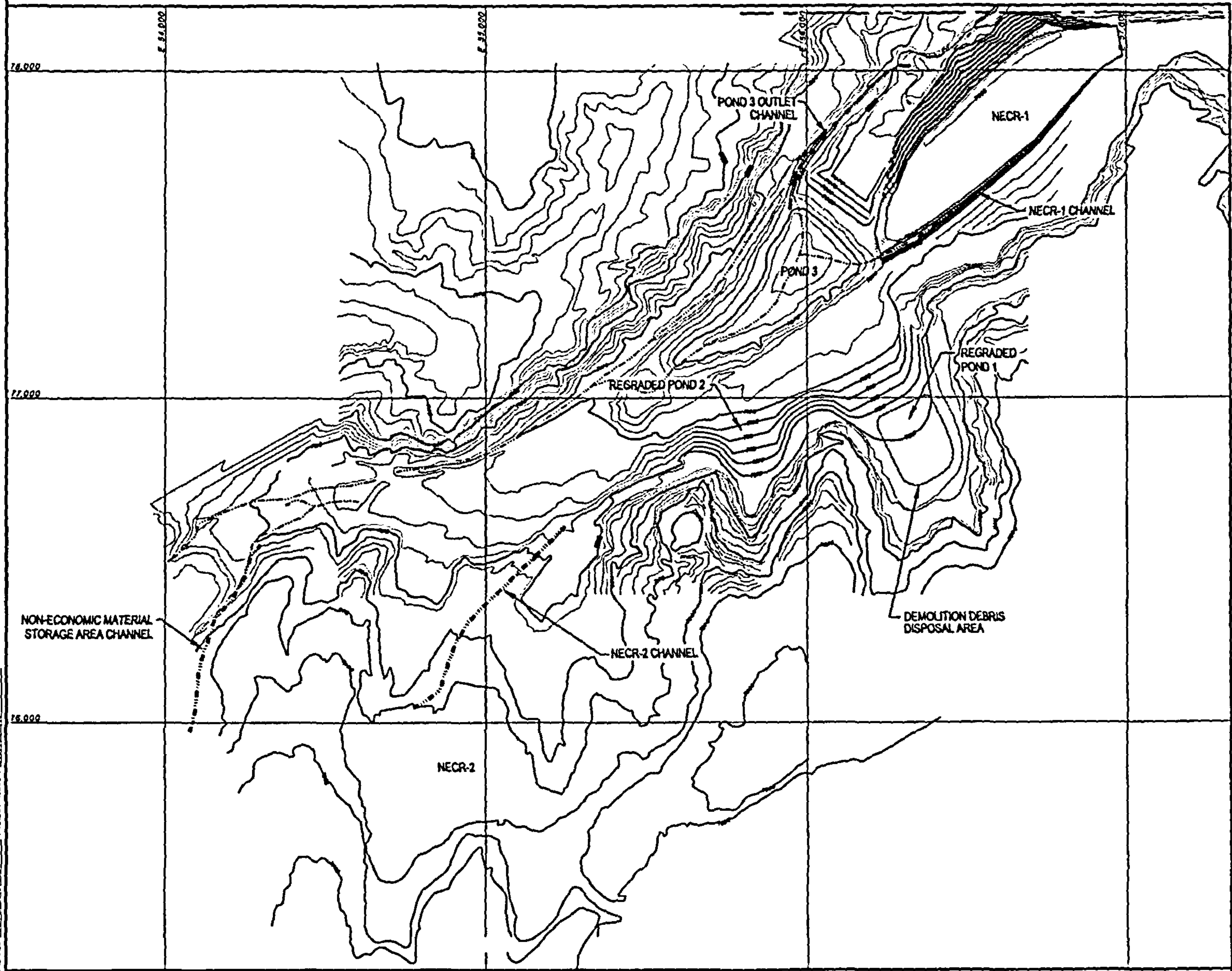
DRAWING TITLE: NECR MINE SITE
EXISTING FACILITIES

MWH

Sheet 1 Of 1 Sheets

SCALE: As Shown

FIGURE No. 2



LEGEND

- NAVAJO INDIAN RESERVATION BOUNDARY
- REGRADE CONTOURS
- EXISTING CONTOURS
- CHANNEL (Centerline Approximate - See Note Below)

NOTES:

1. SILT FENCE AND/OR STRAW BALES WILL BE PLACED AT THE TOES OF THE POND 3 AND NECR-1 EMBANKMENTS PRIOR TO REGRADING. STRAW BALES WILL BE PLACED AS NECESSARY IN THE NECR-2 AND NON-ECONOMIC STORAGE AREA CHANNELS DURING CONSTRUCTION.
2. CHANNEL ALIGNMENTS SHOWN ON THIS FIGURE ARE APPROXIMATE. ACTUAL CHANNEL ALIGNMENTS MAY CHANGE BASED ON CONDITIONS ENCOUNTERED DURING CONSTRUCTION.
3. CHANNEL DIMENSIONS ARE PRESENTED IN TABLE 2.3 OF THE NORTHEAST CHURCH ROCK MINE CLOSEOUT PLAN.

N

SCALE

CONTOUR INTERVAL 5 FT

UNC
P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT:
NECR CLOSEOUT PLAN

DRAWING TITLE:
NECR RECLAMATION TOPOGRAPHY

MWH

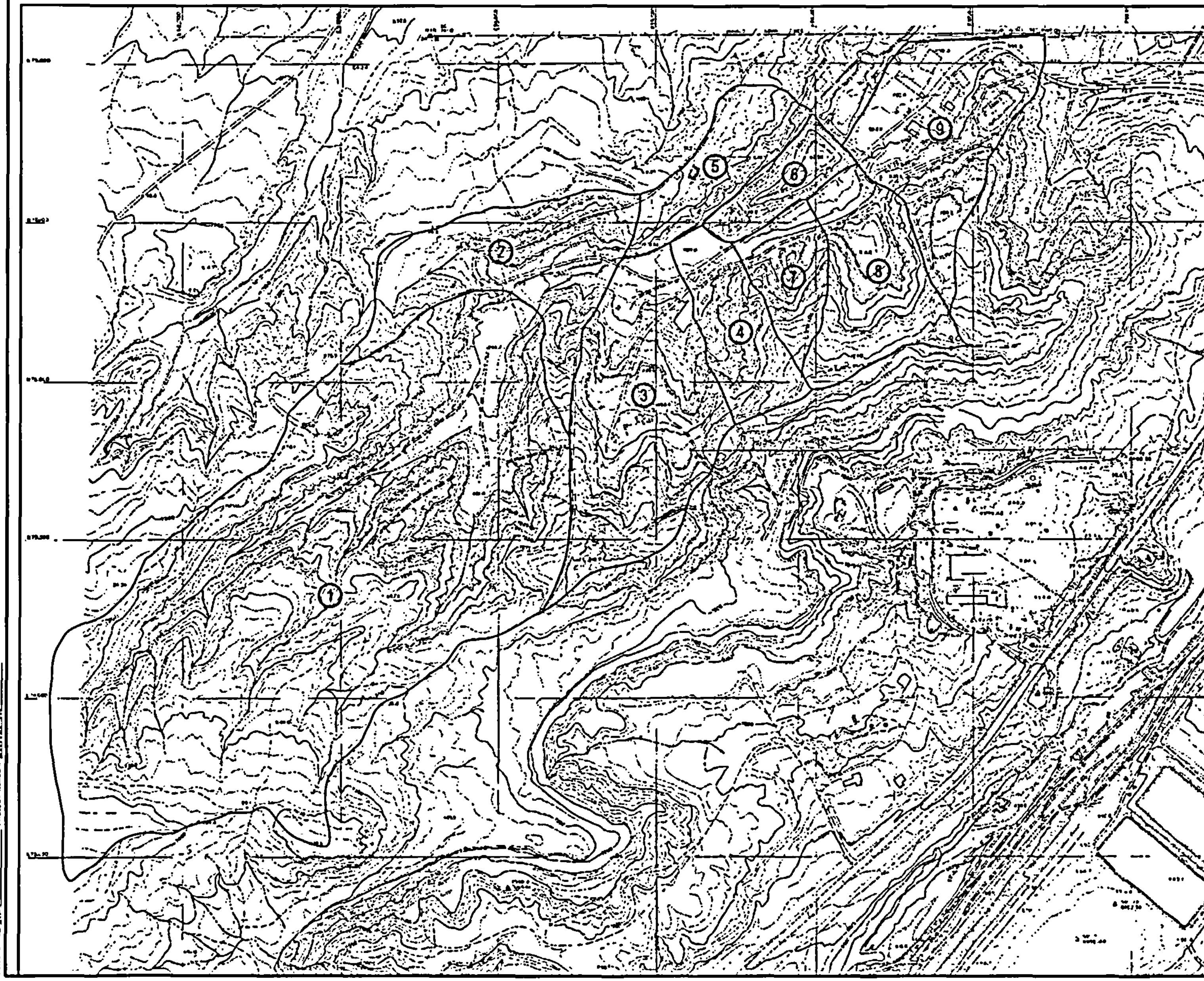
Sheet 1 Of 1 Sheets

SCALE: As Shown

FIGURE No. 3

APPENDIX A

HYDROLOGIC MODEL OUTPUT AND HYDRAULIC DESIGN SPREADSHEETS



LEGEND

———	DRAINAGE BASIN BOUNDARY
①	DRAINAGE BASIN I.D.

N

APPROXIMATE SCALE
0 300 600
Feet

P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT:
NECR CLOSEOUT PLAN

DRAWING TITLE:
BASINS

MWH

Sheet 1 Of 1 Sheets

SCALE: As Shown

FIGURE No. A-1

NECR Mine Closeout Plan

Basin Parameters for HEC-1 Modeling

Basin ID	Drainage Area (ft^2)	Drainage Area (mi^2)	Vertical Drop (ft)	Horizontal Length (ft)	Average Basin Slope (%)	Flow Length (ft)	Curve Number	SCS Lag Time (hrs)	Notes
1	6,825,024	0.2448	310	4846	6.40	4856	80	0.4448	
2	1,539,792	0.0552	110	1836	5.99	1839	80	0.2114	
3	832,320	0.0299	200	2040	9.80	2050	80	0.1802	
4	1,092,420	0.0392	160	1938	8.26	1945	80	0.1883	
5	417,600	0.0150	55	520	10.58	523	80	0.0582	
6	556,800	0.0200	15	1090	1.38	1090	90	0.2037	CN adj for pond surface
7	465,600	0.0167	135	780	17.31	792	80	0.0634	
8	532,800	0.0191	140	1150	12.17	1158	80	0.1024	
9	1,011,200	0.0363	155	1280	12.11	1289	80	0.1119	Basin Segment
			6	600	1.00	600	80	0.2112	Channelized Segment
								0.3231	Total Lag for Basin 9

```
1*****************************************                    *****************************************
*                                       *                    *                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *   U.S. ARMY CORPS OF ENGINEERS        *
*              JUN   1998               *                    *   HYDROLOGIC ENGINEERING CENTER       *
*           VERSION 4.1                 *                    *        609 SECOND STREET              *
*                                       *                    *      DAVIS, CALIFORNIA 95616          *
* RUN DATE   27JAN04  TIME  09:21:06    *                    *        (916) 756-1104                 *
*                                       *                    *                                       *
*****************************************                    *****************************************
```

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X       XXXXX    X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


```
 LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1           ID   NECR CLOSEOUT PLAN
   2           ID   100-YEAR, 24-HOUR STORM
   3           ID   SCS TYPE II DISTRIBUTION
   4           ID   ANALYSIS OF NECR SITE
   5           ID   POND 3 SPILLWAY DISCHARGE CALCULATED ASSUMING THAT POND IS FULL
   6           ID   DISCHARGE RATING CURVE CALCULATED ASSUMING FLAT SPILLWAY SLOPE (0.001 ft/ft)
               *DIAGRAM
   7           IT       5       0       0     300       0       0
   8           IN      15       0       0
   9           IO       3       0

  10           KK   BAS 1
  11           KO       0       0       0       0      21
  12           PB     2.9
  13           PC   .0000   .0030   .0050   .0080   .0110   .0130   .0160   .0190   .0220   .0250
  14           PC   .0280   .0310   .0340   .0370   .0410   .0440   .0480   .0510   .0550   .0580
  15           PC   .0620   .0660   .0700   .0740   .0790   .0830   .0880   .0920   .0970   .1020
  16           PC   .1080   .1130   .1190   .1250   .1310   .1380   .1450   .1530   .1610   .1700
  17           PC   .1800   .1900   .2020   .2160   .2350   .2570   .2900   .4000   .6600   .7100
  18           PC   .7350   .7560   .7720   .7880   .8000   .8100   .8200   .8300   .8390   .8470
  19           PC   .8550   .8620   .8690   .8750   .8810   .8870   .8920   .8980   .9030   .9080
```

```
  20      PC   .9120   .9170   .9210   .9260   .9300   .9340   .9380   .9420   .9450   .9490
  21      PC   .9520   .9560   .9590   .9630   .9660   .9690   .9720   .9750   .9780   .9810
  22      PC   .9840   .9870   .9890   .9920   .9950   .9970  1.0000
  23      BA   .2448
  24      LS       0      80
  25      UD   .4448
          *

  26      KK   ROUTE BAS 1
  27      RD    1090   .0490   0.035           TRAP      20       5
          *

  28      KK   BAS 2
  29      BA   .0552
  30      LS       0      80
  31      UD   .2114
          *

  32      KK   BAS 3
  33      BA   .0299
  34      LS       0      80
  35      UD   .1802
          *

  36      KK   BAS 4
  37      BA   .0392
  38      LS       0      80
  39      UD   .1883
          *
1                                      HEC-1 INPUT                                         PAGE  2

LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  40      KK   COMB BAS 1-4
  41      HC       4
          *

  42      KK   ROUTE
  43      RD     600   .0250   0.035           TRAP      10       5
          *

  44      KK   BAS 5
  45      BA   .0150
  46      LS       0      80
  47      UD   .0582
          *

  48      KK   BAS 6
  49      BA   .0200
  50      LS       0      90
  51      UD   .2037
          *

  52      KK   BAS 7
  53      BA   .0167
  54      LS       0      80
  55      UD   .0634
          *
```

```
            56          KK   BAS 8
            57          BA   .0191
            58          LS       0      80
            59          UD   .1024
                        *

            60          KK   BAS 9
            61          BA   .0363
            62          LS       0      80
            63          UD   .3231
                        *

            64          KK   COMB ALL
            65          HC       6
                        *

            66          KK   ROUTE THROUGH POND 3 SPILLWAY
            67          RS       1    ELEV    7079
            68          SA    0.45    1.34    2.11    2.71    2.86    3.54
            69          SE    7065    7070    7075    7079    7080    7083
            70          SQ       0       0       0       0      21     246
                        *
            71          ZZ
1
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.       (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

   10       BAS 1
                V
                V
   26       ROUTE
                .
                .
   28           .     BAS 2
                .         .
                .         .
   32           .         .     BAS 3
                .         .         .
                .         .         .
   36           .         .         .     BAS 4
                .         .         .         .
                .         .         .         .
   40       COMB.......................................
                V
                V
   42       ROUTE
                .
                .
   44           .     BAS 5
                .         .
                .         .
   48           .         .     BAS 6
                .         .         .
                .         .         .
   52           .         .         .     BAS 7
```

```
56          .         .         .         .        BAS 8
            .         .         .         .          .
60          .         .         .         .          .        BAS 9
            .         .         .         .          .          .
64    COMB  .....................................................
            V
            V
66    ROUTE

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

```
1*****************************************                ****************************************
*                                        *                *                                      *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)     *                *   U.S. ARMY CORPS OF ENGINEERS       *
*            JUN   1998                  *                *   HYDROLOGIC ENGINEERING CENTER      *
*           VERSION 4.1                  *                *        609 SECOND STREET             *
*                                        *                *     DAVIS, CALIFORNIA 95616          *
*  RUN DATE   27JAN04  TIME  09:21:06    *                *        (916) 756-1104                *
*                                        *                *                                      *
******************************************                ****************************************
```

```
                    NECR CLOSEOUT PLAN
                    100-YEAR, 24-HOUR STORM
                    SCS TYPE II DISTRIBUTION
                    ANALYSIS OF NECR SITE
                    POND 3 SPILLWAY DISCHARGE CALCULATED ASSUMING THAT POND IS FULL
                    DISCHARGE RATING CURVE CALCULATED ASSUMING FLAT SPILLWAY SLOPE (0.001 ft/ft)

   9 IO         OUTPUT CONTROL VARIABLES
                      IPRNT          3  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT         HYDROGRAPH TIME DATA
                       NMIN          5  MINUTES IN COMPUTATION INTERVAL
                      IDATE     1    0  STARTING DATE
                      ITIME       0000  STARTING TIME
                         NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE     2    0  ENDING DATE
                     NDTIME       0055  ENDING TIME
                      ICENT         19  CENTURY MARK

                  COMPUTATION INTERVAL     .08 HOURS
                       TOTAL TIME BASE   24.92 HOURS

         ENGLISH UNITS
              DRAINAGE AREA          SQUARE MILES
              PRECIPITATION DEPTH    INCHES
              LENGTH, ELEVATION      FEET
              FLOW                   CUBIC FEET PER SECOND
              STORAGE VOLUME         ACRE-FEET
              SURFACE AREA           ACRES
```

```
              TEMPERATURE          DEGREES FAHRENHEIT

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          ***************
          *             *
 10 KK    *    BAS 1    *
          *             *
          ***************

 11 KO         OUTPUT CONTROL VARIABLES
                     IPRNT          3  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE
                     IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                      IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2        300  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT       .083  TIME INTERVAL IN HOURS

  8 IN         TIME DATA FOR INPUT TIME SERIES
                     JXMIN         15  TIME INTERVAL IN MINUTES
                    JXDATE      1   0  STARTING DATE
                    JXTIME          0  STARTING TIME

              SUBBASIN RUNOFF DATA

 23 BA         SUBBASIN CHARACTERISTICS
                     TAREA        .24  SUBBASIN AREA

               PRECIPITATION DATA

 12 PB               STORM       2.90  BASIN TOTAL PRECIPITATION

 13 PI           INCREMENTAL PRECIPITATION PATTERN
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .01
                   .01      .01      .01      .01      .01      .01      .01      .01      .04      .04
                   .04      .09      .09      .09      .02      .02      .02      .01      .01      .01
                   .01      .01      .01      .01      .01      .01      .01      .01      .01      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
```

```
           .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
           .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
           .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
           .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
           .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
           .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
           .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
           .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
           .00      .00      .00      .00      .00      .00      .00      .00

 24 LS         SCS LOSS RATE
                  STRTL        .50  INITIAL ABSTRACTION
                 CRVNBR      80.00  CURVE NUMBER
                  RTIMP        .00  PERCENT IMPERVIOUS AREA

 25 UD         SCS DIMENSIONLESS UNITGRAPH
                   TLAG        .44  LAG

                                                        ***

                                                     UNIT HYDROGRAPH
                                                29 END-OF-PERIOD ORDINATES
        19.      59.     121.     194.     235.     243.     226.     196.     153.     110.
        83.      63.      48.      36.      28.      21.      16.      12.       9.       7.
         5.       4.       3.       2.       2.       1.       1.       0.       0.

     ***           ***           ***           ***           ***

                  HYDROGRAPH AT STATION    BAS 1

   TOTAL RAINFALL =    2.90, TOTAL LOSS =    1.72, TOTAL EXCESS =    1.18

  PEAK FLOW     TIME                      MAXIMUM AVERAGE FLOW
                                  6-HR       24-HR       72-HR      24.92-HR
+   (CFS)       (HR)
                           (CFS)
+    116.      12.33                25.          8.          7.          7.
                        (INCHES)  .956       1.175       1.175       1.175
                         (AC-FT)   12.         15.         15.         15.

                       CUMULATIVE AREA =     .24 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            ***************
            *             *
 26 KK      *    ROUTE    *     BAS 1
            *             *
            ***************

             HYDROGRAPH ROUTING DATA

 27 RD         MUSKINGUM-CUNGE CHANNEL ROUTING
                     L       1090.  CHANNEL LENGTH
                     S       .0490  SLOPE
```

N	.035	CHANNEL ROUGHNESS COEFFICIENT
CA	.00	CONTRIBUTING AREA
SHAPE	TRAP	CHANNEL SHAPE
WD	20.00	BOTTOM WIDTH OR DIAMETER
Z	5.00	SIDE SLOPE

***

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
		COMPUTATION TIME STEP						
MAIN	1.92	1.44	2.34	545.00	115.13	742.73	1.17	7.75
		INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL						
MAIN	1.92	1.44	5.00		114.86	745.00	1.17	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1534E+02 EXCESS= .0000E+00 OUTFLOW= .1533E+02 BASIN STORAGE= .1162E-01 PERCENT ERROR= .0

*** *** *** *** ***

HYDROGRAPH AT STATION ROUTE

	PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
				6-HR	24-HR	72-HR	24.92-HR
+	(CFS)	(HR)					
			(CFS)				
+	115.	12.42		25.	8.	7.	7.
			(INCHES)	.956	1.174	1.174	1.174
			(AC-FT)	12.	15.	15.	15.

CUMULATIVE AREA = .24 SQ MI

*** ***

```
                 **************
                 *            *
   28 KK         *    BAS 2   *
                 *            *
                 **************
```

SUBBASIN RUNOFF DATA

29 BA SUBBASIN CHARACTERISTICS

TAREA .06 SUBBASIN AREA

PRECIPITATION DATA

12 PB STORM 2.90 BASIN TOTAL PRECIPITATION

13 PI INCREMENTAL PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
.01	.01	.01	.01	.01	.01	.01	.01	.04	.04
.04	.09	.09	.09	.02	.02	.02	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

30 LS SCS LOSS RATE

STRTL	.50	INITIAL ABSTRACTION
CRVNBR	80.00	CURVE NUMBER
RTIMP	.00	PERCENT IMPERVIOUS AREA

31 UD SCS DIMENSIONLESS UNITGRAPH

TLAG .21 LAG

***

UNIT HYDROGRAPH

15 END-OF-PERIOD ORDINATES

24.	80.	106.	89.	54.	31.	19.	11.	6.	4.
2.	1.	1.	0.	0.					

*** *** *** *** ***

HYDROGRAPH AT STATION BAS 2

TOTAL RAINFALL = 2.90, TOTAL LOSS = 1.72, TOTAL EXCESS = 1.18

	PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
				6-HR	24-HR	72-HR	24.92-HR
+	(CFS)	(HR)					
			(CFS)				
+	38.	12.08		6.	2.	2.	2.

(INCHES)	.959	1.175	1.175	1.175
(AC-FT)	3.	3.	3.	3.

CUMULATIVE AREA = .06 SQ MI

*** ***

```
           ***************
           *             *
32 KK      *    BAS 3    *
           *             *
           ***************
```

SUBBASIN RUNOFF DATA

33 BA SUBBASIN CHARACTERISTICS
TAREA .03 SUBBASIN AREA

PRECIPITATION DATA

12 PB STORM 2.90 BASIN TOTAL PRECIPITATION

13 PI INCREMENTAL PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
.01	.01	.01	.01	.01	.01	.01	.01	.04	.04
.04	.09	.09	.09	.02	.02	.02	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

34 LS SCS LOSS RATE
STRTL .50 INITIAL ABSTRACTION

```
                      CRVNBR        80.00  CURVE NUMBER
                       RTIMP          .00  PERCENT IMPERVIOUS AREA

  35 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG          .18  LAG

                                                             ***

                                                       UNIT HYDROGRAPH
                                                   13 END-OF-PERIOD ORDINATES
                 18.        57.        63.        44.        22.        12.         7.         4.         2.         1.
                  1.         0.         0.

      ***            ***            ***             ***            ***

                        HYDROGRAPH AT STATION    BAS 3

    TOTAL RAINFALL =     2.90, TOTAL LOSS =     1.72, TOTAL EXCESS =     1.18

   PEAK FLOW      TIME                             MAXIMUM AVERAGE FLOW
                                        6-HR        24-HR        72-HR       24.92-HR
+    (CFS)        (HR)
                             (CFS)
+       23.       12.08                   3.          1.           1.           1.
                           (INCHES)     .959       1.176        1.176        1.176
                            (AC-FT)       2.          2.           2.           2.

                         CUMULATIVE AREA =      .03 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

               ***************
               *             *
  36 KK        *    BAS 4    *
               *             *
               ***************

                SUBBASIN RUNOFF DATA

  37 BA          SUBBASIN CHARACTERISTICS
                       TAREA          .04  SUBBASIN AREA

                 PRECIPITATION DATA

  12 PB                STORM         2.90  BASIN TOTAL PRECIPITATION

  13 PI           INCREMENTAL PRECIPITATION PATTERN
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
.01	.01	.01	.01	.01	.01	.01	.01	.04	.04
.04	.09	.09	.09	.02	.02	.02	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

38 LS SCS LOSS RATE

STRTL	.50	INITIAL ABSTRACTION
CRVNBR	80.00	CURVE NUMBER
RTIMP	.00	PERCENT IMPERVIOUS AREA

39 UD SCS DIMENSIONLESS UNITGRAPH

TLAG	.19	LAG

***

UNIT HYDROGRAPH
13 END-OF-PERIOD ORDINATES

22.	70.	81.	60.	31.	18.	10.	5.	3.	2.
1.	1.	0.							

*** *** *** *** ***

HYDROGRAPH AT STATION BAS 4

TOTAL RAINFALL = 2.90, TOTAL LOSS = 1.72, TOTAL EXCESS = 1.18

	PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+	(CFS)	(HR)					
			(CFS)				
+	29.	12.08		4.	1.	1.	1.
			(INCHES)	.959	1.176	1.176	1.176
			(AC-FT)	2.	2.	2.	2.

CUMULATIVE AREA = .04 SQ MI

*** ***

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              **************
              *            *
   40 KK      *    COMB    *     BAS 1-4
              *            *
              **************

   41 HC          HYDROGRAPH COMBINATION
                       ICOMP            4  NUMBER OF HYDROGRAPHS TO COMBINE
                                                                     ***

      ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION     COMB

  PEAK FLOW      TIME                              MAXIMUM AVERAGE FLOW
                                           6-HR         24-HR         72-HR        24.92-HR
+   (CFS)        (HR)
                           (CFS)
+      168.      12.25                      38.           12.           11.            11.
                        (INCHES)          .956         1.175         1.175          1.175
                         (AC-FT)           19.           23.           23.            23.

                        CUMULATIVE AREA =      .37 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
   42 KK      *   ROUTE    *
              *            *
              **************

              HYDROGRAPH ROUTING DATA

   43 RD        MUSKINGUM-CUNGE CHANNEL ROUTING
                            L        600.  CHANNEL LENGTH
                            S       .0250  SLOPE
                            N        .035  CHANNEL ROUGHNESS COEFFICIENT
                           CA         .00  CONTRIBUTING AREA
                        SHAPE        TRAP  CHANNEL SHAPE
                           WD       10.00  BOTTOM WIDTH OR DIAMETER
                            Z        5.00  SIDE SLOPE
                                                                     ***
                                  COMPUTED MUSKINGUM-CUNGE PARAMETERS
                                      COMPUTATION TIME STEP
             ELEMENT     ALPHA       M         DT         DX       PEAK     TIME TO      VOLUME    MAXIMUM
                                                                             PEAK                   CELERITY
                                             (MIN)       (FT)      (CFS)     (MIN)        (IN)      (FPS)

              MAIN        1.84      1.39      1.35      300.00    167.79    735.23        1.17       7.41

                                      INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL
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```
                                MAIN      1.84      1.39      5.00              167.69    735.00      1.17

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2312E+02 EXCESS= .0000E+00 OUTFLOW= .2312E+02 BASIN STORAGE= .7655E-02 PERCENT ERROR=    .0


      ***            ***            ***            ***            ***

                                 HYDROGRAPH AT STATION    ROUTE

  PEAK FLOW     TIME                               MAXIMUM AVERAGE FLOW
                                        6-HR         24-HR        72-HR        24.92-HR
+   (CFS)       (HR)
                           (CFS)
+    168.       12.25                    38.          12.          11.           11.
                          (INCHES)      .956         1.175        1.175         1.175
                           (AC-FT)       19.          23.          23.           23.

                           CUMULATIVE AREA =     .37 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

                  **************
                  *            *
   44 KK          *    BAS 5   *
                  *            *
                  **************

                     SUBBASIN RUNOFF DATA

   45 BA               SUBBASIN CHARACTERISTICS
                             TAREA          .01  SUBBASIN AREA

                       PRECIPITATION DATA

   12 PB                     STORM        2.90  BASIN TOTAL PRECIPITATION

   13 PI                 INCREMENTAL PRECIPITATION PATTERN
                             .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                             .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                             .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                             .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                             .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                             .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                             .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                             .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                             .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                             .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                             .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                             .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                             .00       .00       .00       .00       .00       .00       .00       .00       .00       .01
                             .01       .01       .01       .01       .01       .01       .01       .01       .04       .04
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.04	.09	.09	.09	.02	.02	.02	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

46 LS SCS LOSS RATE

STRTL	.50	INITIAL ABSTRACTION
CRVNBR	80.00	CURVE NUMBER
RTIMP	.00	PERCENT IMPERVIOUS AREA

47 UD SCS DIMENSIONLESS UNITGRAPH

TLAG	.06	LAG

***

UNIT HYDROGRAPH
5 END-OF-PERIOD ORDINATES

69.	35.	9.	2.	1.

*** *** *** *** ***

HYDROGRAPH AT STATION BAS 5

TOTAL RAINFALL = 2.90, TOTAL LOSS = 1.72, TOTAL EXCESS = 1.18

	PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
				6-HR	24-HR	72-HR	24.92-HR
+	(CFS)	(HR)					
			(CFS)				
+	15.	12.00		2.	0.	0.	0.
			(INCHES)	.960	1.176	1.176	1.176
			(AC-FT)	1.	1.	1.	1.

CUMULATIVE AREA = .01 SQ MI

*** ***

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            **************
            *            *
48 KK       *    BAS 6   *
            *            *
            **************
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SUBBASIN RUNOFF DATA

49 BA SUBBASIN CHARACTERISTICS

TAREA	.02	SUBBASIN AREA

PRECIPITATION DATA

12 PB

STORM	2.90	BASIN TOTAL PRECIPITATION

13 PI INCREMENTAL PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
.01	.01	.01	.01	.01	.01	.01	.01	.04	.04
.04	.09	.09	.09	.02	.02	.02	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00		

50 LS SCS LOSS RATE

STRTL	.22	INITIAL ABSTRACTION
CRVNBR	90.00	CURVE NUMBER
RTIMP	.00	PERCENT IMPERVIOUS AREA

51 UD SCS DIMENSIONLESS UNITGRAPH

TLAG	.20	LAG

***

UNIT HYDROGRAPH
14 END-OF-PERIOD ORDINATES

9.	31.	39.	32.	18.	11.	6.	4.	2.	1.
1.	0.	0.	0.						

*** *** *** *** ***

HYDROGRAPH AT STATION BAS 6

TOTAL RAINFALL = 2.90, TOTAL LOSS = 1.01, TOTAL EXCESS = 1.89

	PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
				6-HR	24-HR	72-HR	24.92-HR
+	(CFS)	(HR)					
			(CFS)				
+	23.	12.08		3.	1.	1.	1.
			(INCHES)	1.519	1.892	1.892	1.892
			(AC-FT)	2.	2.	2.	2.

CUMULATIVE AREA = .02 SQ MI

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            ***************
            *             *
52 KK       *    BAS 7    *
            *             *
            ***************
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SUBBASIN RUNOFF DATA

53 BA SUBBASIN CHARACTERISTICS
TAREA .02 SUBBASIN AREA

PRECIPITATION DATA

12 PB STORM 2.90 BASIN TOTAL PRECIPITATION

13 PI INCREMENTAL PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
.01	.01	.01	.01	.01	.01	.01	.01	.04	.04
.04	.09	.09	.09	.02	.02	.02	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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  54 LS         SCS LOSS RATE
                      STRTL          .50  INITIAL ABSTRACTION
                      CRVNBR       80.00  CURVE NUMBER
                      RTIMP          .00  PERCENT IMPERVIOUS AREA

  55 UD         SCS DIMENSIONLESS UNITGRAPH
                      TLAG           .06  LAG

                                                           ***

                                                     UNIT HYDROGRAPH
                                                 6 END-OF-PERIOD ORDINATES
              70.       44.       12.        3.        1.        0.

     ***             ***              ***              ***              ***

                         HYDROGRAPH AT STATION    BAS 7

   TOTAL RAINFALL =    2.90, TOTAL LOSS =    1.72, TOTAL EXCESS =    1.18

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR        24-HR        72-HR      24.92-HR
+  (CFS)        (HR)
                            (CFS)
+     17.      12.00                   2.           1.           1.           1.
                           (INCHES)  .960        1.176        1.176        1.176
                           (AC-FT)     1.           1.           1.           1.

                         CUMULATIVE AREA =     .02 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

             **************
             *            *
  56 KK      *    BAS 8   *
             *            *
             **************

              SUBBASIN RUNOFF DATA

  57 BA         SUBBASIN CHARACTERISTICS
                      TAREA          .02  SUBBASIN AREA

                PRECIPITATION DATA

  12 PB               STORM         2.90  BASIN TOTAL PRECIPITATION

  13 PI           INCREMENTAL PRECIPITATION PATTERN
                 .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                 .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                 .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
.01	.01	.01	.01	.01	.01	.01	.01	.04	.04
.04	.09	.09	.09	.02	.02	.02	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

58 LS SCS LOSS RATE

STRTL	.50	INITIAL ABSTRACTION
CRVNBR	80.00	CURVE NUMBER
RTIMP	.00	PERCENT IMPERVIOUS AREA

59 UD SCS DIMENSIONLESS UNITGRAPH

TLAG	.10	LAG

***

UNIT HYDROGRAPH
8 END-OF-PERIOD ORDINATES

40.	62.	28.	11.	4.	2.	1.	0.

*** *** *** *** ***

HYDROGRAPH AT STATION BAS 8

TOTAL RAINFALL = 2.90, TOTAL LOSS = 1.72, TOTAL EXCESS = 1.18

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 17.	12.00		2.	1.	1.	1.
		(INCHES)	.960	1.176	1.176	1.176
		(AC-FT)	1.	1.	1.	1.

CUMULATIVE AREA = .02 SQ MI

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
 60 KK      *    BAS 9   *
            *            *
            **************

              SUBBASIN RUNOFF DATA

 61 BA          SUBBASIN CHARACTERISTICS
                      TAREA          .04  SUBBASIN AREA

                PRECIPITATION DATA

 12 PB                STORM         2.90  BASIN TOTAL PRECIPITATION

 13 PI            INCREMENTAL PRECIPITATION PATTERN
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .01
                      .01       .01       .01       .01       .01       .01       .01       .01       .04       .04
                      .04       .09       .09       .09       .02       .02       .02       .01       .01       .01
                      .01       .01       .01       .01       .01       .01       .01       .01       .01       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00

 62 LS          SCS LOSS RATE
                      STRTL          .50  INITIAL ABSTRACTION
                     CRVNBR        80.00  CURVE NUMBER
                      RTIMP          .00  PERCENT IMPERVIOUS AREA

 63 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG          .32  LAG

                                               ***
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                                        UNIT HYDROGRAPH
                                  21 END-OF-PERIOD ORDINATES
        6.        19.        38.        48.        46.        39.        27.        18.        12.         9.
        6.         4.         3.         2.         1.         1.         1.         0.         0.         0.
        0.

   ***             ***             ***             ***             ***

                   HYDROGRAPH AT STATION     BAS 9

 TOTAL RAINFALL =    2.90, TOTAL LOSS =    1.72, TOTAL EXCESS =    1.18

 PEAK FLOW      TIME                          MAXIMUM AVERAGE FLOW
                                  6-HR        24-HR        72-HR      24.92-HR
+  (CFS)        (HR)
                         (CFS)
+      21.      12.25                4.           1.           1.            1.
                       (INCHES)    .958        1.175        1.175         1.175
                        (AC-FT)      2.           2.           2.            2.

                    CUMULATIVE AREA =      .04 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
  64 KK     *    COMB    *     ALL
            *            *
            **************

  65 HC          HYDROGRAPH COMBINATION
                       ICOMP           6  NUMBER OF HYDROGRAPHS TO COMBINE
                                                                ***

   ***             ***             ***             ***             ***

                   HYDROGRAPH AT STATION     COMB

 PEAK FLOW      TIME                          MAXIMUM AVERAGE FLOW
                                  6-HR        24-HR        72-HR      24.92-HR
+  (CFS)        (HR)
                         (CFS)
+     223.      12.17               50.          15.          15.           15.
                       (INCHES)    .978        1.205        1.205         1.205
                        (AC-FT)     25.          31.          31.           31.

                    CUMULATIVE AREA =      .48 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
               **************
               *            *
66 KK          *   ROUTE    *      THROUGH POND 3 SPILLWAY
               *            *
               **************

                 HYDROGRAPH ROUTING DATA

67 RS              STORAGE ROUTING
                       NSTPS              1  NUMBER OF SUBREACHES
                        ITYP           ELEV  TYPE OF INITIAL CONDITION
                      RSVRIC        7079.00  INITIAL CONDITION
                           X            .00  WORKING R AND D COEFFICIENT

68 SA                     AREA          .4        1.3        2.1        2.7        2.9        3.5

69 SE                ELEVATION     7065.00    7070.00    7075.00    7079.00    7080.00    7083.00

70 SQ                DISCHARGE          0.         0.         0.         0.        21.       246.

                                                                       ***

                                                 COMPUTED STORAGE-ELEVATION DATA

             STORAGE         .00       4.28      12.83      22.45      25.23      34.81
           ELEVATION     7065.00    7070.00    7075.00    7079.00    7080.00    7083.00

        ***          ***          ***          ***          ***

                       HYDROGRAPH AT STATION     ROUTE

  PEAK FLOW      TIME                              MAXIMUM AVERAGE FLOW
                                           6-HR        24-HR        72-HR      24.92-HR
+    (CFS)       (HR)
                              (CFS)
+     136.      12.58                       47.          15.          14.          14.
                            (INCHES)       .920        1.174        1.174        1.174
                             (AC-FT)        23.          30.          30.          30.

 PEAK STORAGE    TIME                              MAXIMUM AVERAGE STORAGE
                                           6-HR        24-HR        72-HR      24.92-HR
+  (AC-FT)       (HR)
       30.      12.58                       26.          24.          24.          24.

  PEAK STAGE     TIME                              MAXIMUM AVERAGE STAGE
                                           6-HR        24-HR        72-HR      24.92-HR
+   (FEET)       (HR)
   7081.54      12.58                   7080.31      7079.48      7079.46      7079.46

                          CUMULATIVE AREA =      .48 SQ MI

1

                                                         RUNOFF SUMMARY
                                                 FLOW IN CUBIC FEET PER SECOND
                                               TIME IN HOURS,   AREA IN SQUARE MILES

                                         PEAK   TIME OF      AVERAGE FLOW FOR MAXIMUM PERIOD       BASIN    MAXIMUM    TIME OF
          OPERATION       STATION        FLOW     PEAK                                              AREA     STAGE    MAX STAGE
```

+					6-HOUR	24-HOUR	72-HOUR			
+	HYDROGRAPH AT	BAS 1	116.	12.33	25.	8.	7.	.24		
+	ROUTED TO	ROUTE	115.	12.42	25.	8.	7.	.24		
+	HYDROGRAPH AT	BAS 2	38.	12.08	6.	2.	2.	.06		
+	HYDROGRAPH AT	BAS 3	23.	12.08	3.	1.	1.	.03		
+	HYDROGRAPH AT	BAS 4	29.	12.08	4.	1.	1.	.04		
+	4 COMBINED AT	COMB	168.	12.25	38.	12.	11.	.37		
+	ROUTED TO	ROUTE	168.	12.25	38.	12.	11.	.37		
+	HYDROGRAPH AT	BAS 5	15.	12.00	2.	0.	0.	.01		
+	HYDROGRAPH AT	BAS 6	23.	12.08	3.	1.	1.	.02		
+	HYDROGRAPH AT	BAS 7	17.	12.00	2.	1.	1.	.02		
+	HYDROGRAPH AT	BAS 8	17.	12.00	2.	1.	1.	.02		
+	HYDROGRAPH AT	BAS 9	21.	12.25	4.	1.	1.	.04		
+	6 COMBINED AT	COMB	223.	12.17	50.	15.	15.	.48		
+	ROUTED TO	ROUTE	136.	12.58	47.	15.	14.	.48		
+									7081.54	12.58
1										

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

						INTERPOLATED TO COMPUTATION INTERVAL			
ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
ROUTE	MANE	2.34	115.13	742.73	1.17	5.00	114.86	745.00	1.17

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1534E+02 EXCESS= .0000E+00 OUTFLOW= .1533E+02 BASIN STORAGE= .1162E-01 PERCENT ERROR= .0

ROUTE	MANE	1.35	167.79	735.23	1.17	5.00	167.69	735.00	1.17

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2312E+02 EXCESS= .0000E+00 OUTFLOW= .2312E+02 BASIN STORAGE= .7655E-02 PERCENT ERROR= .0

*** NORMAL END OF HEC-1 ***

NORMAL DEPTH CALCULATION AND RIPRAP SIZING USING 1991 COE METHOD

PROJECT: NECR Closeout Plan
LOCATION: Channel at NECR-1

Channel hydraulic properties (input):

Flow (cfs):	21	
Assumed D-50 (in.):	2.0	(must be greater than or equal to calculated D50)
Manning's n:	0.0293	
Bottom Width (ft):	3	
Right Side Slope, z:	2	
Left Side Slope, z:	2	
Channel Slope (ft/ft):	0.0083	
Rock Specific Gravity:	2.6	
Angle of Repose (degrees):	41	

Solve

Channel Hydraulic Results:

Depth (ft) =	1.091
Hydraulic Radius (ft) =	0.718
Cross-Sectional Area (sq ft) =	5.66
Average Velocity (fps) =	3.71
Topwidth (ft) =	7.36
Froude Number =	0.75
Flow Condition:	subcritical

Depth	Formula
1.0912	0.00

INPUT COEFFICIENTS: (see manual for description)

Safety Factor, S_f:	1.1	(PMP=1.0, otherwise 1.1)
Stability Coefficient, C_s:	0.3	(angular rock=0.30, round rock=0.375)
Vertical Velocity Distribution Coefficient, C_v:	1.0	(1.0 for straight channels; 1.283-0.2*log(R/W) for outside of bends) (R=center-line radius of bend, W=water surface width)
Thickness Coefficient, C_T:	1.0	
Taken steepest Side Slope (H:1V):	2	
side slope angle (deg):	26.6	
Side Slope Correction Factor, K1:	0.732	

Calculated values:

Velocity (fps):	3.713	
Depth (ft):	1.091	
D-30 rock size (ft):	0.09	
D-30 rock size (in):	1.1	
D-50 rock size (ft):	0.131	(assuming D30 = 0.7 * D50)
D-50 rock size (in):	1.6	(must be less than or equal to assumed D50)

Ref: COE, 1991. Hydraulic Design of Flood Control Channels, EM 1110-2-1601, pp. 3-1 - 3-7.

NORMAL DEPTH CALCULATION AND RIPRAP SIZING USING 1991 COE STEEP METHOD

PROJECT: NECR Closeout Plan
LOCATION: Pond 3 Outlet Channel

Channel hydraulic properties (input):

Flow (cfs):	136	
Assumed D-50 (in.):	6.0	(must be greater than or equal to calculated D_{50})
Manning's n:	0.0347	
Bottom Width (ft):	15	
Right Side Slope, z:	2	
Left Side Slope, z:	2	
Channel Slope (ft/ft):	0.03	
Rock Specific Gravity:	2.6	
Angle of Repose (degrees):	40	

Solve

Channel Hydraulic Results:

Depth (ft) =	1.100
Hydraulic Radius (ft) =	0.950
Cross-Sectional Area (sq ft) =	18.93
Average Velocity (fps) =	7.18
Topwidth (ft) =	19.40
Froude Number =	1.28
Flow Condition:	supercritical

variable:	formula:
1.1005	0.00

INPUT COEFFICIENTS: (see manual for description)

Safety Factor, S_f:	1.1	(PMP=1.0; othewise 1.1)
Stability Coefficient, C_s:	0.3	(angular rock= 0.30; rounded rock=0.375)
Vertical Velocity Distribution Coefficient, C_v:	1	(1.0 for straight channels; 1.283-0.2*log(R/W) for outside of bends) (R=center-line radius of bend, W=water surface width)
Thickness Coefficient, C_T:	1.0	
Taken steepest Side Slope (H:1V):	2	
side slope angle (deg):	26.6	
Channel Bed Angle (deg):	1.72	
Side Slope Correction Factor, K_1:	0.941	

Calculated values:

Velocity (fps):	7.185	
Depth (ft):	1.100	
D-30 rock size (ft):	0.41	
D-30 rock size (in):	4.9	
D-50 rock size (ft):	0.490	(assuming D_{50} = 1.2 * D_{30}, per Maynord paper)
D-50 rock size (in):	5.9	(must be less than or equal to assumed D_{50})

Ref: COE, 1991. Hydraulic Design of Flood Control Channels, EM 1110-2-1601
Ref: Stephen T. Maynord, Steep Stream Riprap Design

NORMAL DEPTH CALCULATION AND RIPRAP SIZING USING 1991 COE STEEP METHOD

PROJECT: NECR Closeout Plan
LOCATION: Channel Below the NECR-2 Area

Channel hydraulic properties (input):

Flow (cfs):	23	
Assumed D-50 (in.):	8.0	(must be greater than or equal to calculated D50)
Manning's n:	0.0440	
Bottom Width (ft):	4	
Right Side Slope, z:	2	
Left Side Slope, z:	2	
Channel Slope (ft/ft):	0.1	
Rock Specific Gravity:	2.6	
Angle of Repose (degrees):	41	

Channel Hydraulic Results:

Solve

Depth (ft) =	0.647
Hydraulic Radius (ft) =	0.497
Cross-Sectional Area (sq ft) =	3.42
Average Velocity (fps) =	6.72
Topwidth (ft) =	6.59
Froude Number =	1.64
Flow Condition:	supercritical

variable:	formula:
0.6469	0.00

INPUT COEFFICIENTS: (see manual for description)

Safety Factor, S_f:	1.1	(PMP=1.0; othewise 1.1)
Stability Coefficient, C_s:	0.3	(angular rock= 0.30; rounded rock=0.375)
Vertical Velocity Distribution Coefficient, C_v:	1	(1.0 for straight channels; 1.283-0.2*log(R/W) for outside of bends) (R=center-line radius of bend, W=water surface width)
Thickness Coefficient, C_T:	1.0	
Taken steepest Side Slope (H:1V):	2	
side slope angle (deg):	26.6	
Channel Bed Angle (deg):	5.71	
Side Slope Correction Factor, K_1:	0.809	

Calculated values:

Velocity (fps):	6.716	
Depth (ft):	0.647	
D-30 rock size (ft):	0.54	
D-30 rock size (in):	6.4	
D-50 rock size (ft):	0.643	(assuming D50 = 1.2 * D30, per Maynord paper)
D-50 rock size (in):	7.7	(must be less than or equal to assumed D50)

Ref: COE, 1991. Hydraulic Design of Flood Control Channels, EM 1110-2-1601
Ref: Stephen T. Maynord, Steep Stream Riprap Design

NORMAL DEPTH CALCULATION AND RIPRAP SIZING USING 1991 COE STEEP METHOD

NECR Closeout Plan
LOCATION: Channel at the Non-economic Storage Pile

Channel hydraulic properties (input):

Flow (cfs):	116	
Assumed D-50 (in.):	9.0	(must be greater than or equal to calculated D50)
Manning's n:	0.0370	
Bottom Width (ft):	4	
Right Side Slope, z:	2	
Left Side Slope, z:	2	
Channel Slope (ft/ft):	0.03	
Rock Specific Gravity:	2.6	
Angle of Repose (degrees):	41	

Solve

Channel Hydraulic Results:

Depth (ft) =	1.902
Hydraulic Radius (ft) =	1.187
Cross-Sectional Area (sq ft) =	14.85
Average Velocity (fps) =	7.81
Topwidth (ft) =	11.61
Froude Number =	1.22
Flow Condition:	supercritical

variable:	formula:
1.9023	0.00

INPUT COEFFICIENTS: (see manual for description)

Safety Factor, S_f:	1.1	(PMP=1.0; othewise 1.1)
Stability Coefficient, C_s:	0.3	(angular rock= 0.30; rounded rock=0.375)
Vertical Velocity Distribution Coefficient, C_v:	1	(1.0 for straight channels; 1.283-0.2*log(R/W) for outside of bends) (R=center-line radius of bend, W=water surface width)
Thickness Coefficient, C_T:	1.0	
Taken steepest Side Slope (H:1V):	2	
side slope angle (deg):	26.6	
Channel Bed Angle (deg):	1.72	
Side Slope Correction Factor, K_1:	0.943	

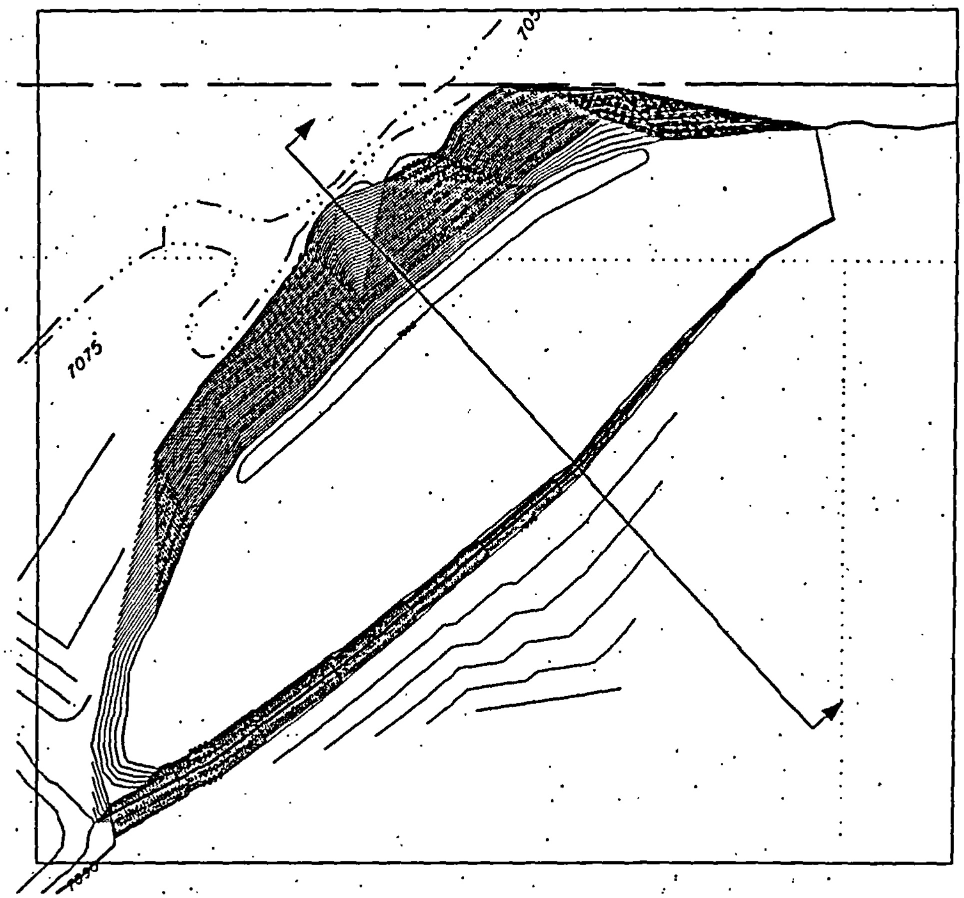
Calculated values:

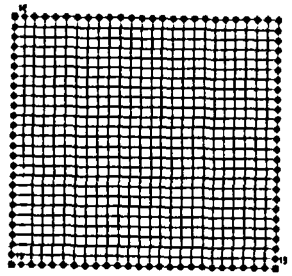
Velocity (fps):	7.813	
Depth (ft):	1.902	
D-30 rock size (ft):	0.62	
D-30 rock size (in):	7.4	
D-50 rock size (ft):	0.744	(assuming D50 = 1.2 * D30, per Maynord paper)
D-50 rock size (in):	8.9	(must be less than or equal to assumed D50)

Ref: COE, 1991. Hydraulic Design of Flood Control Channels, EM 1110-2-1601
Ref: Stephen T. Maynord, Steep Stream Riprap Design

APPENDIX B

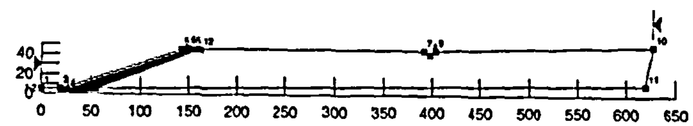
GEOTECHNICAL STABILITY MODEL OUTPUT

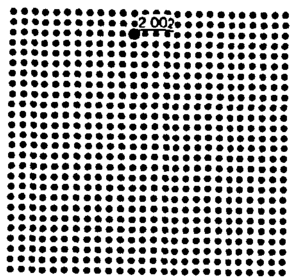

1075



Description: Northeast Churchrock Area 1
Analysis Method: Morgenstern-Price
Slip Surface Option: Grid and Radius

Description: Waste Rock
Soil Model: Mohr-Coulomb
Unit Weight: 110
Cohesion: 0
Phi: 33





Description: Northeast Churchrock Area 1
Analysis Method: Morgenstern-Price
Slip Surface Option: Grid and Radius

Description: Waste Rock
Soil Model: Mohr-Coulomb
Unit Weight: 110
Cohesion: 0
Phi: 33