APPENDIX B
HYDROLOGY AND HYDRAULIC CALCULATIONS

MWH

PROJECT TITLE:	EAST DRAINAGE REMOVAL ACTION CONSTRUCTION WORK PLAN NORTHEAST CHURCH ROCK MINE
PROJECT NO:	1012217
CALCULATION TITLE:	Hydrology and Hydraulic Calculations

	NAME	**DATE**
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Hydrologic and hydraulic calculations presented here were prepared for the design of storm water control for the East Drainage Time Critical Removal Action (RA) at the Northeast Church Rock (NECR) Mine site, as described in the Removal Action Construction Work Plan (MWH, 2012). Flow in the East Drainage channel was simulated to represent conditions that will exist once the sediment retention basin above the Red Water Pond Road south culvert is no longer present.

The Army Corps of Engineers HEC-HMS model was used to calculate peak flows which were used to design diversion channels for surface water control. A simulation was performed in HEC-HMS that represented the meteorological characteristics of the area for a 100 yr., 24 hr. storm event (2.9 inches total precipitation per NOAA Atlas 14, type II storm) using the existing topography at the Site (Table 1). Complete HEC-HMS inputs and outputs are listed in Attachment A. A figure showing the locations of the features modeled is attached.

TABLE 1
NECR Mine 100-yr 24-hr Peak Flows

Hydrologic Element	Peak Discharge (CFS)
Trailer Park	40.7
Rte 566 Culvert	40.7
Drainage Between Culverts	39.0
Sub basin Between Roads	14.6
Red Water Pond Culvert	53.7
East Drainage	51.5
South of East Drainage	13.9
Junction-1	65.2
East Home Sites Sub basin	19.6
Red Water Pond N Culvert	19.6

In the schematic shown in Attachment A, *Junction 1* represents the outfall of the East Drainage into the unnamed arroyo no. 2 to the east. Riprap for the East Drainage was sized using the 1991 U.S. Army Corps of Engineers Method (Appendix B) (COE, 1991). The simulated flow was deemed to be conservative for any final remedial scenario. The finished East Drainage channel was assumed to be trapezoidal with a five foot wide bottom, 2H:1V side slopes and a channel grade of 3.2% (matching the current grade). Minimum riprap D_{50} of six inches is required for the East Drainage channel.

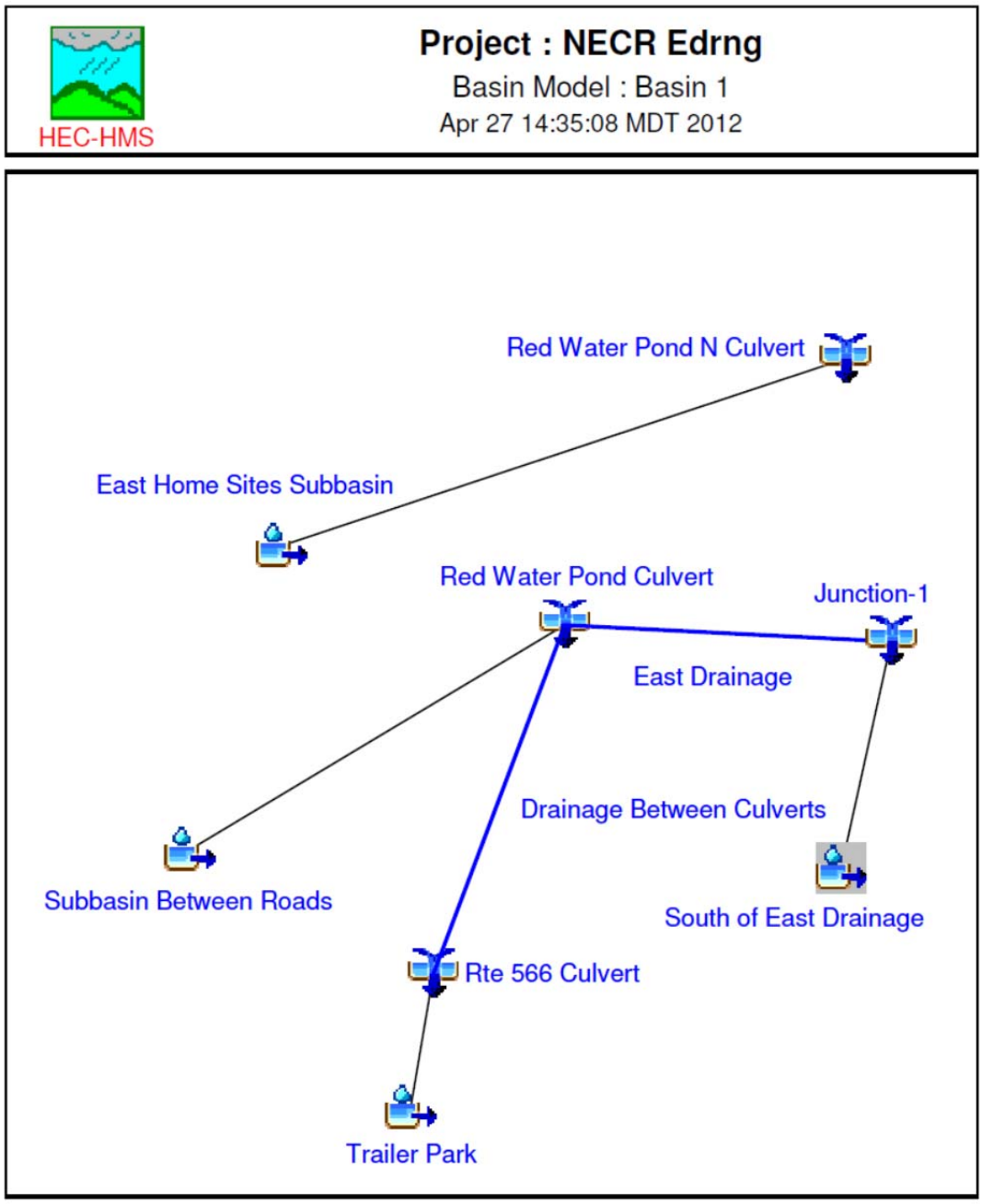
References:

FHWA Culvert Hydraulics Program HY-8, Version 7.2, January 2012.

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

ATTACHMENT A

Schematic for Run 1



Run 1: 100 yr 24-hr

Inputs:

Sub basin	Initial Abstraction (in)	Curve Number	Impervious %	Lag Time (min)
Trailer Park	0	80	0	9.7
Sub basin Between Roads	0	80	0	11.2
South of East Drainage	0	80	0	18
East Home Sites Sub basin	0	80	0	13

Reach	Length (ft)	Slope (ft/ft)	Manning's n
Drainage Between Culverts	1044	0.038	0.035
East Drainage	1501	0.032	0.035

Outputs:

Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (in)
Trailer Park	0.0585	40.7	01Jan2000, 12:10	0.86
Rte 566 Culvert	0.0585	40.7	01Jan2000, 12:10	0.86
Drainage Between Culverts	0.0585	39.0	01Jan2000, 12:10	0.86
Sub basin Between Roads	0.0223	14.6	01Jan2000, 12:10	0.86
Red Water Pond Culvert	0.0808	53.7	01Jan2000, 12:10	0.86
East Drainage	0.0808	51.3	01Jan2000, 12:15	0.86
South of East Drainage	0.0280	13.9	01Jan2000, 12:15	0.86
Junction-1	0.1088	65.2	01Jan2000, 12:15	0.86
East Home Sites Sub basin	0.0330	19.6	01Jan2000, 12:10	0.86
Red Water Pond N Culvert	0.0330	19.6	01Jan2000, 12:10	0.86