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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

December 10, 1996

Mr. Joseph Joyce
BRAC Environmental Coordinator
Environment and Safety Code (Code 1AU)
MCAS El Toro
P.O. Box 95001
Santa Ana, CA 92709-5001

Re: Revised Comments on the HELP Models for Sites 3&5, MCAS El Toro

Dear Mr. Joyce:

Enclosed, please find U.S. EPA's (EPA) revised comments on the HELP models for sites 3&5. Also enclosed are separate comments on the "Sensitivity Analysis of Cap Designs for Sites 3&5, which was a supplement to the original HELP models.

If you have any questions, please contact me at (415) 744-2210.

Sincerely,

Glenn R. Kistner

Glenn R. Kistner
Remedial Project Manager

cc: Andy Piskin, SWDIVNFEC
Tayseer Mahmoud, DTSC
Larry Vitale, RWQCB

COMMENTS ON THE SENSITIVITY ANALYSIS OF CAP DESIGNS FOR SITES 3 AND 5 EL TORO MARINE CORPS AIR STATION, CALIFORNIA

GENERAL COMMENTS

1. These documents present the sensitivity analysis conducted for Alternatives 5 and 6 for Sites 3 and 5. This sensitivity analysis was based on the effect of changes in the evaporative depth and curve number. While resulting infiltration rates make intuitive sense, the scientific reasoning to support changing these parameters is missing. Therefore, it appears to a reader that these input parameters were adjusted to meet a preconceived notion of what the infiltration values should be. Please provide justification to support varying these input parameters.

2. The hydraulic conductivity values used for pavement were not changed in this sensitivity analysis. No justification was provided in these documents for the chosen hydraulic conductivity values, nor was any attempt made to account for sealing of cracks under a maintenance program; a moderately aggressive maintenance program would minimize the number and size of cracks and decrease the permeability of the pavement significantly. Since the HELP model is very sensitive to permeability, it would have been appropriate to explore the effect of varying this parameter.

SPECIFIC COMMENTS (applicable to both Sites 3 and 5)

1. **Section 3.2, pp. 6 through 8.** Justify the basis for using a value of 10^{-5} cm/s for the hydraulic conductivity of concrete and asphalt paving. Describe the basis for calculating an "equivalent hydraulic conductivity" as a function of crack width and spacing. Specify the crack width and spacing values that were used in this calculation. Explain why an O&M plan was not considered to seal cracks.

   Explain why a soil evaporative zone of 24 inches is appropriate when the paving is 4 to 6 inches thick.

2. **Section 3.3.1, p. 9.** Since hydraulic conductivity of the pavement is a function of the crack width and spacing, it does not appear to be appropriate to use the SEDMX formula for paving. Please explain why this formula was used.

3. **Section 3.3.2, p. 10.** Note that SCS curve numbers are derived for soils. Is there a SCS curve number in the literature for paved surfaces? If so, please provide additional information. If not, discuss why higher curve numbers are appropriate for pavement.

Evaluation of HELP Modeling
Draft Phase II Feasibility Study Report - Site 3
Marine Corps Air Station
El Toro, California

APPENDIX C
HYDROLOGIC EVALUATION FOR PROPOSED CAP DESIGNS FOR SITE 3

The HELP model generates estimates of the infiltration and leachate quantities given site-specific descriptions of climate and cover designs. It was used in this Feasibility Study to compare various cover designs and their relatively effectiveness in minimizing infiltration and leachate generation from a landfill. The HELP model was designed to use a vegetated soil layer assumed to be a vertical percolation layer and was not designed to model a concrete surface layer barrier. Calculating evapotranspiration runoff and surface evaporation for a concrete surface layer is problem for the HELP model because this model uses the Soil Conservation Service (SCS) curve number method for estimating runoff. The SCS curve number method is an empirical method developed for small watersheds. The technique accounts for changes in runoff as a function of soil types, soil moisture and vegetative conditions. Therefore, serious errors can occur when using HELP to evaluate a paved surface.

After reviewing the input parameters and result of HELP modeling, it appears that inappropriate permeability values were used for concrete and asphaltic paving. Three pathways exist for rainfall falling on paving . The three pathways are 1) runoff, 2) surface evaporation, and 3) infiltration. Most of the rainfall falling on pavement will be lost to runoff and surface evaporation and only a small percentage will infiltrate through paving. Concrete can be very impermeable generally on the order of 10^{-8} to 10^{-12} cm/sec depending on the composition and thickness of the paving. Literature values for asphaltic concrete range from 10^{-4} to 10^{-8} cm/sec. Paving, particularly concrete paving is susceptible to cracking which is for all practical purpose is the only way for rainfall to infiltrate. An appropriate maintenance and sealing program will prevent cracking from being a significant source of infiltration. Generally as a rule of thumb a well maintained pavement is considered to have a hydraulic conductivity around 10^{-6} cm/sec and that no more than 5% of rainfall falling on pavement will infiltrate to groundwater.

The HELP model is very sensitive to the permeability value. The models for Alternatives 5a, 5b, 6a and 6b originally used a permeability value of 1.1×10^{-5} cm/sec for concrete. The permeability was increased to 1.1×10^{-4} cm/sec for the case of concrete with 10% cracks.

SPECIFIC COMMENTS

Several inconsistencies were noted in the HELP are summarized below.

1. The text states that the annual rainfall averages 10 to 12 in/yr. Appendix C lists the mean annual precipitation value as 14 in/yr.

2. The landfill acreage used was 1 acre. The Site 3 landfill covers approximately 11 acres.

3. The slope length used in the model for Site 3 was 800 ft. The slope length measured by EPA from figures provided in the report was 550 ft. Please explain this discrepancy.

4. The percent slope used for Site 3 was 2 %, which was stated as being conservative. Review of the site topography from figures included in the report show an average site slope of 3% to 4%.

RECOMMENDATIONS

1. HELP model default precipitation data for Los Angeles, California from 1974 through 1978 was used for each calculation. The average annual precipitation value based on this default data was 13.52 in/yr. EPA recommends the HELP model be run using actual precipitation data collected at the Air Station over a minimum of a 15 year period.

2. EPA recommends that actual acreage (11 acres), percent slopes (3% to 4 %), and slope lengths (550 ft.) be used to more accurately reflect site conditions.

3. EPA recommends that a loam texture be used to better match the Sorrento loam noted on-site.

Evaluation of HELP Modeling
Draft Phase II Feasibility Study Report - Site 5
Marine Corps Air Station
El Toro, California

APPENDIX C
HYDROLOGIC EVALUATION FOR PROPOSED CAP DESIGNS FOR SITE 5

The HELP model generates estimates of the infiltration and leachate quantities given site-specific descriptions of climate and cover designs. It was used in this Feasibility Study to compare various cover designs and their relatively effectiveness in minimizing infiltration and leachate generation from a landfill. The HELP model was designed to use a vegetated soil layer assumed to be a vertical percolation layer and was not designed to model a concrete surface layer barrier. Calculating evapotranspiration runoff and surface evaporation for a concrete surface layer is problem for the HELP model because this model uses the Soil Conservation Service (SCS) curve number method for estimating runoff. The SCS curve number method is an empirical method developed for small watersheds. The technique accounts for changes in runoff as a function of soil types, soil moisture and vegetative conditions. Therefore, serious errors can occur when using HELP to evaluate a paved surface.

After reviewing the input parameters and result of HELP modeling, it appears that inappropriate permeability values were used for concrete and asphaltic paving. Three pathways exist for rainfall falling on paving . The three pathways are 1) runoff, 2) surface evaporation, and 3) infiltration. Most of the rainfall falling on pavement will be lost to runoff and surface evaporation and only a small percentage will infiltrate through paving. Concrete can be very impermeable generally on the order of 10^{-8} to 10^{-12} cm/sec depending on the composition and thickness of the paving. Literature values for asphaltic concrete range from 10^{-4} to 10^{-8} cm/sec. Paving, particularly concrete paving is susceptible to cracking which is for all practical purpose is the only way for rainfall to infiltrate. An appropriate maintenance and sealing program will prevent cracking from being a significant source of infiltration. Generally as a rule of thumb a well maintained pavement is considered to have a hydraulic conductivity around 10^{-6} cm/sec and that no more than 5% of rainfall falling on pavement will infiltrate to groundwater.

The HELP model is very sensitive to the permeability value. The models for Alternatives 5a, 5b, 6a and 6b originally used a permeability value of 1.1×10^{-5} cm/sec for concrete. The permeability was increased to 1.1×10^{-4} cm/sec for the case of concrete with 10% cracks.

SPECIFIC COMMENTS

1. The text states that the annual rainfall averages 10 to 12 in/yr. Appendix C lists the mean annual precipitation value as 14 in/yr.

2. The landfill acreage used was 1 acre. The Site 5 landfill covers approximately 1.7 acres.

3. The slope length used in the model for Site 5 was 50 ft. The slope length measured by EPA from figures provided in the report was 100 ft.

RECOMMENDATIONS

1. HELP model default precipitation data for Los Angeles, California from 1974 through 1978 was used for each calculation. The average annual precipitation value based on this default data was 13.52 in/yr. EPA recommends the HELP model be run using actual precipitation data collected at the Air Station over a minimum of a 15 year period.

2. EPA recommends that model input parameters more accurately reflect site conditions. 1.7 acres should be used as the acreage and 100 ft. should be used as slope length.

3. EPA recommends that a loam texture be used to better match the Sorrento loam noted on-site.