

**EPA Superfund
Record of Decision:**

**ORDOT LANDFILL
EPA ID: GUD980637649
OU 01
AGANA, GU
09/28/1988**

U.S. NAVY, GOVERNMENT OF GUAM, AND THE DEPARTMENT OF PUBLIC WORKS. OTHER AGENCIES OR BUSINESSES THAT ARE KNOWN TO HAVE DISPOSED OF WASTE IN THE LANDFILL INCLUDE THE AGANA SEWAGE TREATMENT PLANT.

GUAM EPA REPORTED THAT PRIVATE DISPOSAL COMPANIES AND LOCAL HOSPITALS HAVE ALSO DISPOSED OF WASTE AT ORDOT. THOSE CITED WERE GUAM MEMORIAL HOSPITAL AND COMMERCIAL SANITATION SYSTEMS, INC, BUT OTHERS MAY BE ACTIVE ON THE ISLAND.

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IV. COMMUNITY RELATIONS

COMMUNITY INVOLVEMENT WAS SOLICITED AT THE CONCLUSION OF EPA'S PHASE I REMEDIAL INVESTIGATION. THE NOTICE OF AVAILABILITY OF THE PROPOSED REMEDIAL ACTION PLAN WITH SUPPORTING DOCUMENTATION, WHICH IDENTIFIED EPA'S AND GUAM EPA'S PREFERRED REMEDIAL ALTERNATIVE OF NO ACTION FOR THIS SITE, WAS PUBLISHED ON JUNE 27, 1988. THE PROPOSED REMEDIAL ACTION PLAN AND SUPPORTING DOCUMENTATION WAS RELEASED TO THE INFORMATION REPOSITORIES ON JULY 12, 1988. THE PUBLIC COMMENT PERIOD, INITIATED ON THIS DATE, SOLICITED PUBLIC COMMENT THROUGH AUGUST 12, 1988. A PUBLIC MEETING WAS HELD JULY 26, 1988.

EPA PREPARED THE ATTACHED RESPONSIVENESS SUMMARY TO ADDRESS THE SPECIFIC CONCERNS RAISED DURING THE PUBLIC COMMENT PERIOD, INCLUDING COMMENTS MADE AT THE PUBLIC MEETING. A TRANSCRIPT OF THE PUBLIC MEETING IS AVAILABLE AT THE INFORMATION REPOSITORIES AT EPA, REGION 9 OFFICES, AND GUAM EPA.

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V. REMEDIAL INVESTIGATION

A. INITIAL SITE CHARACTERIZATION (ISC)

AN INITIAL HAZARDOUS WASTE CHARACTERIZATION STUDY PERFORMED BY BLACK AND VEATCH ENGINEERS ARCHITECTS (1983) WAS INCONCLUSIVE WITH REGARD TO DOCUMENTING THE NATURE AND EXTENT OF THE THREAT ACTUALLY POSED BY CONTAMINANTS FROM ORDOT LANDFILL. EPA CONTRACTED WITH CAMP, DRESSER AND MCKEE, INC. (CDM) TO PERFORM AN INITIAL SITE CHARACTERIZATION (ISC) TO DETERMINE: 1) THE QUALITY AND QUANTITY OF CONTAMINANTS AT OR PRODUCED BY THE LANDFILL; 2) PATHWAYS BY WHICH THESE CONTAMINANTS MAY LEAVE THE SITE; AND 3) THE POTENTIAL IMPACTS OF THE CONTAMINANTS.

CDM MADE A INITIAL SITE VISIT ON OCTOBER 17-18, 1985 AND DEVELOPED A WORK PLAN FOR THE SITE CHARACTERIZATION WHICH WAS FINALIZED ON JUNE 2, 1986. SAMPLING OF GROUND WATERS, SURFACE WATERS AND LANDFILL LEACHATE WAS PERFORMED MARCH 10-16, 1987. ADDITIONALLY, RECONNAISSANCE LEVEL AIR QUALITY MONITORING, AND A GEOLOGIC RECONNAISSANCE WERE PERFORMED. THE FINAL INITIAL SITE CHARACTERIZATION REPORT WAS SUBMITTED SEPTEMBER 18, 1987.

THE SEPTEMBER 18, 1987 ISC REPORT CONCLUDED THAT:

SURFACE FLOW THROUGH THE LANDFILL WAS THE SOURCE OF LEACHATE FLOWS WITH THE UN-COMPACTED LANDFILL ALLOWING FOR RETENTION OF RAIN AND SURFACE INFLOW TO PRODUCE THE PERENNIAL LEACHATE FLOW. THERE WAS NO INDICATION OF A SPRING.

THE GEOLOGIC RECONNAISSANCE INDICATED THAT THE LANDFILL IS UNDERLAIN BY FINE GRAINED VOLCANIC DEPOSITS OF VERY LOW PERMEABILITY, WITH AN ABSENCE OF ANY CARBONATE DEPOSITS. ON THIS BASIS AND CORROBORATED BY THE GROUND WATER STUDIES, THE SITE APPEARS TO BE HYDROLOGICALLY ISOLATED FROM THE LIMESTONE AQUIFER. GROUNDWATER FLOW IS EXPECTED TO BE ALONG THE BEDDING PLANES TOWARD THE LONFIT RIVER AND AWAY FROM THE SUSPECTED FAULT. THERE WAS NO INDICATION OF PRESENCE OF A FAULT AT THE SITE. FOLLOW-UP MONITORING TO CONFIRM THE HYDROLOGIC ISOLATION OF THE SITE FROM GUAM'S SOLE SOURCE DRINKING WATER AQUIFER IS RECOMMENDED DUE TO DATA LIMITATIONS FROM THE GEOLOGIC RECONNAISSANCE.

THE WATER QUALITY SAMPLING WAS PERFORMED ONLY DURING GUAM'S DRY SEASON AND WAS LIMITED IN NUMBER OF SAMPLES. THE SAMPLES INDICATED A GENERAL ABSENCE OF ORGANIC CONTAMINANTS AT THE TIME OF SAMPLING. THE CONTACT DETECTION LIMIT FOR VINYL CHLORIDE WAS NOT SUFFICIENTLY LOW TO ASCERTAIN COMPLIANCE WITH THE MCL. TWO ORGANIC CONTAMINANTS WERE DETECTED AT LEVELS BELOW THE CONTRACT DETECTION LIMITS BUT

ABOVE THE INSTRUMENT DETECTION LIMITS INDICATING THE PRESENCE OF SOME ORGANICS AT LOW LEVELS. THE SAMPLES INDICATED AN INCREASE IN INORGANIC CONSTITUENTS DOWNGRADIENT OF THE LANDFILL WHICH, HOWEVER, DID NOT EXCEED MCLS FOR ANY INORGANIC CONSTITUENT. SECONDARY MCLS WERE EXCEEDED ONLY FOR IRON AND MANGANESE, AND NO ADVERSE HEALTH EFFECTS WOULD BE EXPECTED. SEVERAL METALS WERE PRESENT IN THE LANDFILL LEACHATE AND DOWN-GRADIENT GROUNDWATER SAMPLES IN EXCESS OF EPA AMBIENT WATER QUALITY CRITERIA (AWQC). HOWEVER, BASED UPON THE OBSERVED RELATIVE FLOW OF LEACHATE AND THE LONFIT RIVER, ADEQUATE DILUTION IS EXPECTED TO BE AVAILABLE. NO SIGNIFICANT IMPACT ON THE LONFIT RIVER WAS OBSERVED UNDER CONDITIONS AT THE TIME OF SAMPLING. GROUNDWATER IN THE SITE VICINITY IS NOT USED FOR DRINKING OR OTHER PURPOSES.

THE AIR QUALITY RECONNAISSANCE INDICATED THE PRESENCE OF MINOR AMOUNTS OF METHANE, PREDOMINANTLY IN THE OLDER LANDFILL PORTIONS. NO OTHER AIR QUALITY PROBLEMS WERE OBSERVED.

THE ISC REPORT MADE CLEAR RECOMMENDATIONS FOR A REMEDIAL PROGRAM TO IMPROVE LANDFILL OPERATION PRACTICES TO PREVENT OR MINIMIZE ANY THREATS TO HUMAN HEALTH AND THE ENVIRONMENT POSED BY DISPOSAL PRACTICES AT ORDOT. THE REMEDIAL PROGRAM INCLUDES:

IMPLEMENTATION OF PERIMETER CONTROL OF SURFACE FLOW RUN-ON TO PREVENT CURRENT FLOW THROUGH THE LANDFILL;

CAPPING UNUSED PORTIONS OF THE LANDFILL; AND

CONTINUED MONITORING TO DEMONSTRATE THE EFFECTIVENESS OF THE IMPROVED PRACTICES AND SUBSTANTIATE THE CONCLUSIONS OF THE ISC.

B. SITE GEOLOGY

B. 1. REGIONAL GEOLOGY

GUAM IS THE LARGEST AND SOUTHERNMOST ISLAND IN THE MARIANA ISLAND CHAIN.

THE ISLAND CHAIN IS LOCATED ATOP A LARGE SUBMARINE RIDGE KNOWN AS THE MARIANA ISLAND ARC SYSTEM, WHICH IS THE BOUNDARY BETWEEN SUB-DUCTING TECTONIC PLATES. THE MARIANA TRENCH IS LOCATED EAST AND SOUTH OF THE ARC. GUAM HAS TWO MAJOR PHYSIOGRAPHIC DIVISIONS (FIGURE 1-1). THE SOUTHERN HALF OF THE ISLAND IS THE OLDEST AND IS CHARACTERIZED PRIMARILY BY A DISSECTED AND RELATIVELY RUGGED VOLCANIC UPLAND, ON WHICH LIMESTONES WERE SOMETIMES DEPOSITED. ORDOT LANDFILL IS LOCATED IN THE NORTHERN PART OF THIS PHYSIOGRAPHIC AREA.

THE NORTHERN HALF OF THE ISLAND IS CHARACTERIZED BY A BROAD AND GENTLY UNDULATING LIMESTONE PLATEAU WHICH SLOPES FROM MOUNT SANTA ROSA (ELEVATION 858 FEET) ON THE NORTHEAST TOWARD THE AGANA SWAMP AREA (NEAR SEA LEVEL) ON THE SOUTHWEST (FIGURE 1-1). THE LIMESTONE PLATEAU ENDS ABRUPTLY IN NEAR VERTICAL CLIFFS ALONG MOST OF THE COAST LINE OF NORTHERN GUAM. VOLCANIC ROCKS ARE EXPOSED AT THE GROUND SURFACE NEAR THE TOPS OF MOUNT SANTA ROSA AND MATAGUAC HILL AND FORM THE SURFACE EXPRESSIONS OF THE VOLCANIC BACKBONE ON WHICH THE THICK SEQUENCES OF LIMESTONE WERE DEPOSITED. THE ROCKS OF THE NORTHERN PROVINCE PROBABLY FORMED FROM VOLCANIC EVENTS THAT ARE BOTH SEPARATE AND YOUNGER THAN THOSE IN THE SOUTH.

LIMESTONE SEQUENCES GREW ON THE SUBMERGED VOLCANIC SURFACES AS THEY WERE UPLIFTED, AND EVENTUALLY CONNECTED WITH THE SOUTHERN HALF OF THE ISLAND.

THE TWO PHYSIOGRAPHIC PROVINCES MAY BE SEPARATED BY A MAJOR NORTHWEST-SOUTHEAST TRENDING FAULT, LOCATED NORTHEAST OF ORDOT LANDFILL.

AT THIS TIME, THE ISLAND APPEARS TO BE IN A PERIOD OF RELATIVE QUIESCENCE, WITH ACTIVE FRINGING REEFS BEING FORMED AROUND THE COAST OF THE NORTHERN PLATEAU. HOWEVER, BECAUSE TECTONIC ACTIVITY IS STILL ON-GOING IN THE REGION OF THE MARIANA TRENCH, UPLIFT OF THE ISLAND ARC AND GUAM IS EXPECTED TO CONTINUE INTO THE GEOLOGIC FUTURE.

B. 2. GEOLOGIC MATERIALS BENEATH THE SITE

THE GEOLOGIC MATERIALS WHICH UNDERLIE THE SITE CONSIST OF THINLY BEDDED, TUFACEOUS SHALES AND SANDSTONES, WITH GRAIN SIZES RANGING FROM CLAY TO MEDIUM-GRAINED SAND (TRACEY, ET. AL., 1963). BEDDING RANGES FROM A FEW MILLIMETERS TO SEVERAL METERS IN THICKNESS. TYPICALLY, THESE DEPOSITS RANGE IN COLOR FROM GRAY TO LIGHT ORANGE IN FRESH EXPOSURES AND GRAY-GREEN TO DARK RED IN WEATHERED EXPOSURES. GRAY-GREEN BEDS ARE USUALLY INDICATIVE OF THE COARSER-GRAINED TUFACEOUS SANDSTONES, WITH THE DARKER COLORED BEDS ASSOCIATED WITH THE HIGHER SILICA CONTENT OF THE MATRIX MATERIAL.

MOST OF THE ROCKS OBSERVED AT THE SITE EXHIBITED VARYING DEGREES OF WEATHERING. IN MOST UN-WEATHERED EXPOSURES, THE TUFFS ARE FAIRLY HARD, BUT SHOW CHEMICAL ALTERING AROUND INDIVIDUAL ANGULAR GRAINS. WITH WEATHERING, THE FINE-GRAINED MATRIX MATERIAL BREAKS DOWN TO CLAY AND THE GRAINS CONTINUE TO WEATHER, EVENTUALLY TO CLAY WITH LITTLE EVIDENCE OF THE ORIGINAL CLASTIC TEXTURE. WEATHERING IS PROMINENT IN MOST OF THE ROCKS EXPOSED IN THE UPPER TWO TO THREE FEET OF THE SURFACE. ROCKS WITH LITTLE SIGN OF WEATHERING ARE EXPOSED IN THE AREA USED BY THE LANDFILL OPERATORS AS A SOURCE OF COVER MATERIAL AND IN ROAD CUTS IN AND NEAR THE SITE. THESE UN-WEATHERED ROCKS ORIGINALLY EXISTED OVER TEN FEET BELOW THE GROUND SURFACE. THE WEATHERED ROCKS, BECAUSE OF THEIR HIGH CLAY CONTENT, APPEAR TO HAVE EXTREMELY LOW PERMEABILITIES. UN-WEATHERED ROCKS, BECAUSE OF THEIR FINE-GRAINED MATRIX AND PARTIALLY ALTERED CLASTIC TEXTURE, ALSO APPEAR TO HAVE LOW PERMEABILITIES.

B. 3. STRUCTURAL GEOLOGY

THE ROCKS BENEATH THE SITE ARE MODERATELY FOLDED AND FRACTURED. BEDDING IS FOLDED INTO AN ANTICLINE WITH AN EAST-WEST AXIS. THE NORTH LIMB OF THE ANTICLINE DIPS 15 TO 50 DEGREES. THE SOUTH LIMB DIPS BETWEEN 40 AND 60 DEGREES. FOLDING IS COMMON WITHIN BEDS AND APPEARS TO BE DUE TO DEPOSITIONAL FEATURES. FRACTURING WAS COMMONLY OBSERVED IN THE ROCKS. HOWEVER, MOST OF THE FRACTURES ARE CLOSED AND, AS SUCH, MAY INHIBIT GROUNDWATER MOVEMENT.

MAJOR FAULTING WAS NOT OBSERVED IN THE BEDS EXPOSED IN OR ADJACENT TO THE SITE AREA. TRACEY, ET. AL. (1964) INDICATED A MAJOR NORTHWEST-SOUTHEAST TRENDING FAULT WHICH PASSES JUST NORTH OF THE ORDOT SITE. THIS FAULT IS THOUGHT TO DIVIDE THE NORTHERN LIMESTONES AND THE SOUTHERN VOLCANICS. RECONNAISSANCE OF THE AREA DID NOT SUBSTANTIATE THE EXISTENCE OR ABSENCE OF THIS FAULT. THE STEEP TERRAIN NORTH OF THE SITE COULD BE EXPLAINED AS EITHER A MAJOR BLOCK FAULT OR AS A TERRACE (EROSIONAL) FEATURE. A SPRING WAS THOUGHT TO ISSUE FROM THE FAULT ZONE AND SUBSEQUENTLY FLOW THROUGH THE SITE. HOWEVER, ON CLOSER EXAMINATION OF THE AREA, TOPOGRAPHY OF THE AREA APPEARS TO CONCENTRATE SURFACE RUNOFF AND CHANNEL IT INTO THE SITE.

B. 4. RESULTS OF GEOLOGIC RECONNAISSANCE

THE RESULTS OF THE GEOLOGIC RECONNAISSANCE INDICATE THAT THE LANDFILL IS UNDERLAIN BY FINE-GRAINED VOLCANIC DEPOSITS. THESE DEPOSITS APPEAR TO BE OF VERY LOW PERMEABILITY, BASED ON OBSERVATIONS OF THE SURFICIAL MATERIAL.

THERE DOES NOT APPEAR TO BE ANY OF THE CARBONATE DEPOSITS PRESENT IN THE IMMEDIATE SITE VICINITY, BASED ON AVAILABLE OUTCROP INFORMATION. ONE OF THE INITIAL CONCERNS ABOUT THE ORDOT LANDFILL SITE WAS THE POTENTIAL FOR LEACHATE CONTAMINATING THE LIMESTONE AQUIFER THROUGH A FAULT SUSPECTED TO BE IN THE VICINITY. HOWEVER, THE SITE APPEARS TO BE HYDROLOGICALLY ISOLATED FROM THE LIMESTONE AQUIFER BASED ON THE OBSERVATIONS ASSOCIATED WITH THE GEOLOGIC RECONNAISSANCE. FURTHERMORE, ANY GROUNDWATER ON SITE WOULD PROBABLY FLOW ALONG BEDDING PLANES OR ALONG THE CONTACT BETWEEN THE LANDFILL MATERIAL AND THE BEDROCK DEPOSITS, BOTH OF WHICH DIP TO THE SOUTH AWAY FROM THE ISLAND'S MAJOR LIMESTONE AQUIFER TOWARD THE LONFIT RIVER. THEREFORE, THERE DOES NOT APPEAR TO BE A PATHWAY FOR GROUNDWATER CONTAMINATION TO AFFECT THE LIMESTONE AQUIFER. BECAUSE THE GEOLOGIC RECONNAISSANCE WAS LIMITED IN SCOPE, CONFIRMATORY MONITORING TO FURTHER SUBSTANTIATE THE ISOLATION OF THE SITE FROM THE SOLE SOURCE AQUIFER IS APPROPRIATE. THE DESIGN OF THIS MONITORING PROGRAM WILL BE BASED UPON FURTHER HYDROGEOLOGIC STUDIES AT THE SITE AND IN THE VICINITY OF THE SITE NECESSARY TO DEFINE THE PROGRAM.

C. SITE HYDROLOGY

C.1. PRECIPITATION

THE RAINFALL RECORD INDICATES TWO DISTINCT SEASONS IN GUAM. THE DRY SEASON RUNS FROM JANUARY THROUGH JUNE, DURING WHICH TIME SHOWERS PRODUCE MOST OF THE LITTLE RAIN THAT FALLS. THE SEASONAL AVERAGE RAINFALL DURING THE DRY SEASON IS APPROXIMATELY 5 INCHES PER MONTH.

THE WET SEASON, RUNS FROM JULY THROUGH DECEMBER. THE WET SEASON RAINFALL IS PRODUCED FROM MAJOR REGIONAL STORM SYSTEMS, DURING WHICH THE SEASONAL AVERAGE RAINFALL IS ABOUT 12 INCHES PER MONTH. THE MAXIMUM MONTHLY RAINFALL FOR THE SEASON GENERALLY OCCURS IN AUGUST AND SEPTEMBER AND HAS HISTORICALLY RANGED TO OVER 30 INCHES PER MONTH, BUT AVERAGES ABOUT 14 INCHES PER MONTH. DURING TYPHOONS, RAINFALL INTENSITIES ARE EXTREME AND CAN BE AS MUCH AS EIGHT INCHES IN TWO HOURS, 18 INCHES IN 12 HOURS, AND 24 INCHES IN 24 HOURS (TRACEY, ET AL; 1964). HOWEVER, THE LONG-TERM RECORDS SHOW THAT MONTHLY AND ANNUAL RAINFALL ARE RATHER CONSISTENT ON GUAM, WITH THE EXCEPTION OF HIGH INTENSITY RAIN GENERATED DURING THE OCCASIONAL STRONG TYPHOONS.

UNLIKE SOUTHERN GUAM, NORTHERN GUAM DOES NOT HAVE A WELL ESTABLISHED, INCISED DRAINAGE SYSTEM BECAUSE THE LIMESTONES ARE SO PERMEABLE THAT RAINFALL ALMOST IMMEDIATELY INFILTRATES UPON REACHING THE GROUND. IN DEVELOPED AREAS OF THE INTERIOR, RUN-OFF OVER STREETS IS USUALLY DIVERTED TO OPEN TRENCHES, OR TO DRY WELLS. UPON REACHING STORM WATER RETENTION AREAS, THE RUN-OFF INFILTRATES. IN SOUTHERN GUAM, THE VOLCANICS WEATHER TO A RELATIVELY THICK, IMPERMEABLE SOIL ZONE. AS A RESULT, MOST OF THE RAINFALL ENDS UP AS SURFACE RUNOFF WHICH EVENTUALLY FLOWS TO THE OCEAN IN WELL ESTABLISHED DRAINAGE COURSES, SUCH AS THE LONFIT AND PAGO RIVERS.

C.2. GROUNDWATER PRODUCTION

THE WATER SUPPLY OF NORTHERN GUAM COMES ALMOST EXCLUSIVELY FROM THE LIMESTONE AQUIFERS OF THE NORTHERN PLATEAU. EXCEPT FOR A FEW PRIVATELY OWNED WELLS IN NORTHERN GUAM, THE PRODUCTION FROM THE GROUNDWATER SYSTEM IS MANAGED BY THE PUBLIC UTILITY AGENCY OF GUAM (PUAG), THE AIR FORCE, AND THE NAVY. THERE ARE PRESENTLY OVER 70 MUNICIPAL WELLS AND ONE INFILTRATION TUNNEL IN OPERATION IN NORTHERN GUAM. THESE FACILITIES HAVE A MAXIMUM CAPACITY TO YIELD ABOUT 21 MILLION GALLONS PER DAY (MGD).

ONLY A FEW LOW-YIELDING WELLS HAVE BEEN DRILLED IN SOUTHERN GUAM. WATER WELLS HAVE NOT BEEN DRILLED IN THE VOLCANICS NEAR ORDOT LANDFILL.

C.3. GROUNDWATER MOVEMENT BENEATH THE SITE

THE SITE APPEARS TO BE GEOLOGICALLY ISOLATED FROM THE LIMESTONES OF THE NORTHERN LENS AQUIFER. THE HIGH CLAY CONTENT OF THE TUFACEOUS SHALES AND SANDSTONES APPEARS TO RESTRICT INFILTRATION OF RAINFALL OR SURFACE INFLOW. AS SUCH, MOST OF THE WATER THAT ENTERS THE AREA, EITHER AS RAINFALL OR AS SURFACE INFLOW, WILL FLOW SOUTH ALONG THE ORIGINAL GROUND TOPOGRAPHIC SURFACE INTO THE LONFIT RIVER. HOWEVER, RAINFALL AT THE SITE MAY RESULT IN A SIGNIFICANT AMOUNT OF INFILTRATION INTO THE LANDFILL DEBRIS DUE TO THE INADEQUATE COVER UTILIZED AT THE SITE.

THE BACKGROUND MONITORING WELL IN THE NORTHERN PART OF THE SITE CONTAINED ONLY A SMALL AMOUNT OF WATER, INDICATING EXTREMELY LOW PERMEABILITIES FOR THE ROCKS UNDERLYING THE SITE. THE APPARENTLY SMALL AMOUNT OF GROUNDWATER WHICH FLOWS THROUGH THE SITE AREA PROBABLY FOLLOWS THE SOLID WASTE BEDROCK CONTACT, WHICH DIPS IN A SOUTHERLY DIRECTION BENEATH MOST OF THE SITE TOWARD THE LONFIT RIVER. GROUNDWATER BENEATH THE SOUTHERN PORTION OF THE SITE APPEARS TO BE RELATED TO THE ALLUVIUM ASSOCIATED WITH THE LONFIT RIVER. THE GROUNDWATER GRADIENT IN THE ALLUVIUM PROBABLY FOLLOWS THE TOPOGRAPHY AND, AS SUCH, FLOWS PARALLEL TO THE LONFIT RIVER AND EVENTUALLY ENTERS PAGO BAY ON THE EASTERN SHORE OF THE ISLAND.

D. WATER QUALITY ANALYSIS

CDM PERFORMED FIELD SAMPLING MARCH 10-16, 1987 TO DETERMINE QUALITY OF SURFACE WATER, GROUND WATER AND LEACHATE IN THE VICINITY OF THE SITE OR POTENTIALLY IMPACTED BY THE SITE. THIS SAMPLING EFFORT WAS FOR PURPOSES OF MAKING AN INITIAL SITE CHARACTERIZATION AND THEREFORE LIMITED NUMBERS OF SAMPLES WERE TAKEN. THE SAMPLES WERE COLLECTED DURING GUAM'S DRY SEASON WHERE AVERAGE MONTHLY RAINFALL IS 5 INCHES VERSUS A 12 INCH PER MONTH AVERAGE (WITH SHORT INTENSE STORMS) DURING THE RAINY SEASON. ALTHOUGH SAMPLING DURING THE DRY SEASON MAY REPRESENT WORST-CASE WITH RESPECT TO CONTAMINANT LOADING, THIS ASSUMPTION COULD BE INCORRECT IF CHANNELING OF FLOWS WITHIN THE LANDFILL OCCURS DURING LOW FLOW CONDITIONS. ADDITIONAL SAMPLING WOULD BE REQUIRED TO FULLY CHARACTERIZE THE SITE WITH RESPECT TO SEASONAL VARIATION IN FLOWS AND CONCENTRATIONS, AND TO EXPAND THE CURRENT DATA BASE.

AS DETAILED IN THE FOLLOWING ANALYSIS OF RESULTS, THE SAMPLING RESULTS INDICATED THAT ALTHOUGH THE LANDFILL LEACHATE AND DOWNGRADIENT GROUNDWATER ARE GENERALLY POOR QUALITY WITH RESPECT TO INORGANIC CONSTITUENTS, ESSENTIALLY NO VOLATILES, SEMI-VOLATILES, OR PESTICIDES/PCBS WERE DETECTED IN ANY SAMPLES. ANALYSIS OF DOWNGRADIENT GROUNDWATER SAMPLES INDICATED THE PRESENCE OF BARIUM, IRON, MANGANESE, ZINC, VANADIUM AND ALUMINUM. LEACHATE SAMPLES CONTAINED THESE METALS AND ADDITIONALLY CHROMIUM, COBALT, COPPER, CYANIDE, POTASSIUM AND LEAD. ALTHOUGH NO SAMPLES EXCEEDED THE INORGANIC PRIMARY MAXIMUM CONTAMINANT LEVELS (MCLS), SECONDARY MCLS WERE EXCEEDED FOR IRON AND MANGANESE IN LEACHATE SAMPLES AND DOWN-GRADIENT GROUNDWATER. COMPARISON OF CONCENTRATIONS OF METALS IN GROUNDWATER AND LEACHATE TO AMBIENT WATER QUALITY CRITERIA (AWQC) FOR FRESHWATER AQUATIC LIFE SHOW SOME CONCENTRATIONS ARE IN EXCESS OF THESE CRITERIA. HOWEVER, BASED UPON THE OBSERVED RELATIVE FLOW OF LEACHATE AND THE LONFIT RIVER, ADEQUATE DILUTION IS EXPECTED TO BE AVAILABLE. NO SIGNIFICANT IMPACT ON THE LONFIT RIVER WAS OBSERVED UNDER CONDITIONS AT THE TIME OF SAMPLING. THE ENDANGERMENT ASSESSMENT ADDRESSES THE POTENTIAL IMPACTS OF THESE CONTAMINANTS ON HUMAN HEALTH AND THE ENVIRONMENT.

D.1. ANALYTICAL DATA

ALL OF THE SURFACE WATER, GROUNDWATER AND LEACHATE SAMPLES COLLECTED DURING THE SAMPLING EFFORT WERE ANALYZED FOR ROUTINE ANALYTICAL SERVICES HAZARDOUS SUBSTANCES LIST (RAS HSL) VOLATILE, SEMI-VOLATILE, PESTICIDE/PCB, AND INORGANIC CONSTITUENTS. ALL DATA WERE VALIDATED BY REGION 9 USING STANDARD REVIEW PROTOCOLS AND THE DATA QUALITY WAS CONSIDERED IN ANALYSIS OF THE DATA AND IN REACHING THE DECISION.

THE FOLLOWING SAMPLES WERE TAKEN AND THE RESULTS OF THE LABORATORY ANALYSIS ARE REPORTED IN TABLE 3-2 (FROM THE ISC) FOR SURFACE WATER AND TABLE 3-3 (FROM THE ISC) FOR GROUNDWATER:

SAMPLE NUMBER	DESCRIPTION	SAMPLE NUMBER	DESCRIPTION
SW-01	LONFIT RIVER, UPSTREAM OF LANDFILL	GW-01	MUNICIPAL WELL A-11
SW-02	LONFIT RIVER, DOWNSTREAM OF LANDFILL	GW-03	MUNICIPAL WELL A-12
SW-05	LEACHATE SPRING, SOUTH SIDE OF LANDFILL	GW-04	WERI BACKGROUND MONITORING WELL
SW-07	LEACHATE POND AREA, SOUTH SIDE OF LANDFILL	GW-05	WERI DOWNGRADIENT MONITORING WELL
SW-10	LEACHATE STREAM, WEST	GW-06	WERI WELL #4 DOWNGRADIENT

DUPLICATE SAMPLE PAIRS ARE AS FOLLOWS: GW-01 AND GW-02; SW02 AND SW-13; AND GW-06 AND GW-07.

D.2 ANALYSIS OF DATA

INSPECTION OF THE DATA INDICATE THAT WATER QUALITY OF THE LEACHATE IS GENERALLY POOR, PARTICULARLY CONSIDERING THE HIGH CONCENTRATIONS OF THE INORGANIC CONSTITUENTS. HOWEVER, NONE OF THE INORGANIC CONSTITUENTS EXCEED THE USEPA MAXIMUM CONTAMINANT LIMITS (MCLS), ALTHOUGH IRON AND MANGANESE GENERALLY EXCEED THE SECONDARY MAXIMUM CONTAMINANT LIMITS (SMCLS) FOR ALL OF THE LEACHATE SAMPLES. WITH REGARD TO ORGANIC CONSTITUENTS, ONLY TRACE LEVELS OF CARBON DISULFIDE AND CHLOROBENZENE WERE DETECTED IN SAMPLE SW-7, AND PHENOL WAS DETECTED IN SW-10. EACH OF THESE CONSTITUENTS WERE DETECTED IN AMOUNTS BELOW THE CONTRACT RECOMMENDED DETECTION LIMIT (CRDL) AND ARE QUALIFIED AS SUCH. ALL OF THE OTHER ORGANIC CONSTITUENTS ANALYZED UNDER THE CLP RAS PROGRAM WERE EITHER UNDETECTED OR DETECTED IN THE METHOD BLANK, INDICATING LABORATORY CONTAMINATION. THE CRDL FOR VINYL CHLORIDE (10 UG/L) IS NOT LOW ENOUGH TO DETERMINE COMPLIANCE WITH THE MCL FOR VINYL CHLORIDE (2 UG/L).

SAMPLES WERE ALSO COLLECTED FROM THE LONFIT RIVER TO DETERMINE THE POTENTIAL IMPACT OF THE LANDFILL ON THE WATER QUALITY OF THE RIVER. SAMPLE SW-01 WAS COLLECTED FROM THE LONFIT RIVER

UP-GRADIENT OF THE LANDFILL, WHEREAS SAMPLE SW-02 WAS COLLECTED DOWNGRADIENT. SAMPLE SW-13 REPRESENTS A DUPLICATE OF SW-02.

EXAMINATION OF THE DATA FOR THE LONFIT RIVER INDICATE THAT THE WATER QUALITY IS GENERALLY BETTER THAN THE LEACHATE QUALITY. THIS IS PARTICULARLY TRUE FOR THE INORGANIC CONSTITUENTS, WHICH IN MANY CASES ARE AN ORDER OF MAGNITUDE LESS THAN THE INORGANIC CONSTITUENT CONCENTRATIONS DETECTED IN THE LEACHATE SAMPLES. IN ADDITION, NONE OF THE CONSTITUENT CONCENTRATIONS DETECTED IN THE LONFIT RIVER EXCEEDED THE MCLS OR SMCLS, AND NONE OF THE ORGANIC CONSTITUENTS WERE DETECTED IN ANY OF THE SAMPLES. FINALLY, COMPARISON OF THE DATA FOR THE DOWNGRADIENT SAMPLE (SW-02) WITH THE DATA FROM THE UP-GRADIENT SAMPLE (SW-01) INDICATES THAT THE LEACHATE DISCHARGING TO THE LONFIT RIVER HAD LITTLE IMPACT ON THE RIVER WATER QUALITY AT THE TIME OF THE SAMPLING EFFORT.

E. AIR SAMPLING

A RECONNAISSANCE AIR SAMPLING EFFORT WAS CONDUCTED AT ORDOT LANDFILL USING PORTABLE FIELD INSTRUMENTS.

THE RESULTS OF THE RECONNAISSANCE-LEVEL AIR QUALITY SURVEY INDICATE THAT AIR EMISSIONS FROM THE LANDFILL DO NOT PRESENT A MAJOR PROBLEM. FOR EXAMPLE, THE AVERAGE RESPONSE OF MOST OF THE INSTRUMENTS ALONG THE TRANSECTS WERE EITHER ZERO OR NOT ABOVE BACKGROUND LEVELS. THE EXCEPTIONS WERE THE RESPONSES OBSERVED FOR THE ORGANIC VAPOR ANALYZER (OVA). IN GENERAL, THE OVA CONSISTENTLY MAINTAINED READINGS ON THE ORDER OF 2 TO 7 PPM ABOVE BACKGROUND OVER THE ENTIRE TRANSECT. IN ADDITION, AT SEVERAL LOCATIONS ALONG THE TRANSECTS, ELEVATED READINGS ON THE OVA WERE OBSERVED, PARTICULARLY ALONG THE SOUTHERN PORTIONS OF THE LANDFILL. THE OVA READINGS OBTAINED AT THESE LOCATIONS RANGED FROM 2 TO 100 PPM, ALTHOUGH THE UPPER LEVELS GENERALLY REPRESENTED SHORT SPIKES WHICH WERE NOT SUSTAINED FOR EXTENDED PERIODS OF TIME.

THE TYPE OF INSTRUMENT RESPONSES OBSERVED AT THE LANDFILL SUGGEST THAT SMALL AMOUNTS OF METHANE ARE BEING PRODUCED AND EMITTED FROM THE LANDFILL. FOR EXAMPLE, THE HNU, WHICH DOES NOT RESPOND TO METHANE GAS, DID NOT RESPOND WHILE CONDUCTING THE TRANSECTS. HOWEVER, THE OVA, WHICH DOES DETECT METHANE GAS, GENERALLY RESPONDED ABOVE BACKGROUND ALONG THE ENTIRE COURSE OF THE TRANSECTS. THESE INSTRUMENTS WOULD NOT DETECT EMISSIONS OF CHLORINATED HYDROCARBONS AND IF FUTURE SAMPLING INDICATES PRESENCE OF CHLORINATED HYDROCARBONS AT THE LANDFILL, ADDITIONAL MONITORING TO SCREEN FOR AIR EMISSIONS IS RECOMMENDED.

THE RECONNAISSANCE-LEVEL AIR SAMPLING DATA COLLECTED INDICATES THAT METHANE IS BEING PRODUCED FROM THE SOUTHERN PORTION OF THE LANDFILL. THIS PORTION OF THE LANDFILL IS THE OLDEST AND, CONSEQUENTLY, THE WASTE HAS HAD THE MOST OPPORTUNITY TO DEGRADE. HOWEVER, OTHER PORTIONS OF THE LANDFILL ARE PRESENTLY NOT GENERATING MUCH METHANE. FURTHERMORE, THE INSTRUMENT RESPONSES AT THE SOUTHERN PORTIONS OF THE LANDFILL WERE NOT SUSTAINABLE AT THE HIGHER LEVELS, INDICATING THAT THE METHANE PRODUCTION WAS NOT SUSTAINABLE. GIVEN THESE ASPECTS, IT APPEARS THAT THE LANDFILL DOES NOT REPRESENT AN AIR QUALITY PROBLEM.

#ENA

VI. ENDANGERMENT ASSESSMENT

ICF/CLEMENTS WAS TASKED TO WRITE AN ENDANGERMENT ASSESSMENT (EA) REPORT TO EVALUATE THE MAGNITUDE AND PROBABILITY OF ACTUAL OR POTENTIAL THREAT TO PUBLIC HEALTH OR WELFARE AND THE ENVIRONMENT POSED BY THE HAZARDOUS SUBSTANCES PRESENT AT THE SITE. THE EA, BASED ON THE LIMITED DATA FROM THE INITIAL SITE CHARACTERIZATION, SUPPORTS THE CONCLUSION THAT CURRENT CONDITIONS AT THE LANDFILL DO NOT DEMONSTRATE A SIGNIFICANT AND SUBSTANTIAL ENDANGERMENT TO HUMAN HEALTH OR THE ENVIRONMENT WITH REGARD TO HAZARDOUS CONTAMINANT IMPACT APPROPRIATE FOR RESPONSE UNDER CERCLA AUTHORIZATIONS.

#SA

VII. SELECTED ALTERNATIVE

THE SUPERFUND LAW REQUIRES THAT EACH REMEDY SELECTED FOR A SITE MUST BE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT, COST EFFECTIVE, AND IN ACCORDANCE WITH STATUTORY REQUIREMENTS. PERMANENT SOLUTIONS TO TOXIC WASTE CONTAMINATION PROBLEMS ARE TO BE ACHIEVED WHEREVER POSSIBLE. ACCORDING TO THE NATIONAL CONTINGENCY PLAN UNDER WHICH THE SUPERFUND PROGRAM OPERATES, SPECIFICALLY 40 CFR PART 300.68(J), THE COST-EFFECTIVE REMEDY IS THE LOWEST COST ALTERNATIVE THAT IS TECHNICALLY FEASIBLE AND RELIABLE AND WHICH EFFECTIVELY MITIGATES AND MINIMIZES DAMAGES

TO AND PROVIDES ADEQUATE PROTECTION OF PUBLIC HEALTH, WELFARE, AND THE ENVIRONMENT.

EPA HAS DETERMINED, BASED ON THE AVAILABLE INFORMATION, THAT REMEDIAL ACTION AT THE ORDOT LANDFILL SITE UNDER THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA OR SUPERFUND) 42 U.S.C. SECTION 9605 ET SEQ. IS INAPPROPRIATE AT THIS TIME.

THIS DETERMINATION IS BASED ON SEVERAL FACTS: 1) ORDOT LANDFILL IS AN OPERATING MUNICIPAL LANDFILL; 2) ALL BUT APPROXIMATELY 4-7 ACRES OF THE 47 ACRE SITE ARE ACTIVE WASTE DISPOSAL AREAS; 3) THE 4-7 INACTIVE ACRES ARE DOWNGRAIENT OR ADJACENT TO THE ACTIVE WASTE DISPOSAL AREAS; 4) ANY REMEDY FOR THESE INACTIVE AREAS LIKELY WILL BE AFFECTED BY ACTIVITIES AT THE ACTIVE WASTE DISPOSAL AREAS OR CONTINUED SURFACE FLOW THROUGH THE LANDFILL; 5) THE BULK OF ANY ENVIRONMENTAL IMPACTS FROM THE LANDFILL WILL RESULT FROM ACTIVITIES AT THE ACTIVE WASTE DISPOSAL AREAS; 6) THE LANDFILL, BY APPLYING STANDARD OPERATION PRACTICES TO CONTROL LANDFILL LEACHATE, CAN EFFECTIVELY REDUCE OR ELIMINATE THE RELEASE OF LEACHATE TO RECEIVING WATERS; 7) EPA HAS ISSUED AN ORDER UNDER THE CLEAN WATER ACT, 33 U.S.C. SECTION 1251 ET SEQ., THAT REQUIRES THE GUAM DEPARTMENT OF PUBLIC WORKS TO CEASE DISCHARGE OF LEACHATE FROM ORDOT LANDFILL TO THE LONFIT RIVER; AND 8) EPA DATA, ALTHOUGH TOO LIMITED FOR COMPREHENSIVE CONCLUSIONS, HAS NOT DEMONSTRATED AN IMMINENT AND SUBSTANTIAL ENDANGERMENT TO HUMAN HEALTH OR WELFARE OR THE ENVIRONMENT.

EPA CONCLUDES THAT THREATS TO HUMAN HEALTH AND THE ENVIRONMENT CURRENTLY IDENTIFIED AT THE LANDFILL ARE DUE TO POOR OPERATION PRACTICES AND CAN BEST BE ACCOMPLISHED THROUGH ADDRESSING OPERATIONS AND MAINTENANCE OF THE LANDFILL ITSELF INCLUDING IMPROVED LEACHATE CONTROL MEASURES CONSISTING OF CAPPING AND SURFACE WATER CONTROL. EPA CONCLUDES THAT THE APPROPRIATE MECHANISM FOR IMPLEMENTING THESE CONTROLS IS THROUGH ENFORCEMENT OF THE CLEAN WATER ACT. THE RESPONSIBILITY FOR IMPLEMENTING THESE CONTROLS LIES WITH THE LANDFILL OPERATOR, THE TERRITORY OF GUAM. EXPENDITURES FROM THE SUPERFUND ARE NOT APPROPRIATE FOR THESE PURPOSES.

FURTHER, EPA CONCLUDES THAT ANY REMEDIAL ACTION TO ADDRESS THE INACTIVE PORTIONS OF THE LANDFILL POTENTIALLY APPROPRIATE FOR CERCLA RESPONSE WOULD BE JEOPARDIZED OR NULLIFIED UNLESS OPERATION PRACTICES AT THE ACTIVE DISPOSAL AREAS ARE IMPROVED TO REDUCE LEACHATE FORMATION AND TO PREVENT DISCHARGE OF LEACHATE. THE DESIGN FOR IMPROVED OPERATIONS AT THE ACTIVE DISPOSAL AREAS MUST CONSIDER THE INACTIVE PORTIONS DUE TO THE NATURE OF THE SITE AND THUS WOULD MAKE A SEPARATE CERCLA ACTION UNNECESSARY.

BASED ON THESE CONSIDERATIONS, EPA IS CHOOSING NO ACTION AS THE PREFERRED ALTERNATIVE. AS PART OF THE PREFERRED ALTERNATIVE, EPA WILL CONTINUE TO GATHER ADDITIONAL DATA TO IDENTIFY ANY ADVERSE IMPACTS ON HUMAN HEALTH OR THE ENVIRONMENT ATTRIBUTABLE TO THE LANDFILL NOT CURRENTLY IDENTIFIED AND REMEDIATED BY THE IMPROVED LANDFILL OPERATION PRACTICES. AS PART OF THIS CONTINUED MONITORING PROGRAM AT ORDOT LANDFILL, EPA WILL MONITOR TO DETECT AS EARLY AS POSSIBLE ANY MIGRATION OF CONTAMINANTS FROM THE LANDFILL TOWARD THE SOLE SOURCE AQUIFER. THE DESIGN OF THIS PROGRAM WILL BE BASED UPON FURTHER HYDROGEOLOGICAL INVESTIGATIONS AT THE SITE AND IN THE VICINITY OF THE SITE TO CHARACTERIZE GEOLOGIC AND HYDROLOGIC FEATURES NECESSARY TO DEFINE THE MONITORING PROGRAM.

IN CHOOSING THE NO FURTHER ACTION ALTERNATIVE EPA RESERVES ITS AUTHORITY TO PERFORM ADDITIONAL RESPONSE ACTIONS SHOULD THE NEW INFORMATION WARRANT SUCH A DECISION.

APPENDIX B

#RS

ORDOT LANDFILL
GUAM

RESPONSIVENESS SUMMARY

THIS RESPONSIVENESS SUMMARY IS REQUIRED BY SUPERFUND POLICY FOR THE PURPOSE OF PROVIDING EPA AND THE PUBLIC WITH A SUMMARY OF CITIZEN COMMENTS AND CONCERNS ABOUT THE SITE, AS RAISED DURING THE PUBLIC COMMENT PERIOD, AND EPA'S RESPONSES TO THOSE CONCERNS. ALL COMMENTS RECEIVED ARE FACTORED INTO EPA'S FINAL DECISION FOR A SITE.

FOR THE ORDOT LANDFILL SITE, COMMUNITY INVOLVEMENT WAS SOLICITED AT THE CONCLUSION OF EPA'S PHASE I REMEDIAL INVESTIGATION (THE INITIAL SITE CHARACTERIZATION). A NOTICE OF THE AVAILABILITY OF EPA'S PROPOSED REMEDIAL ACTION PLAN (PRAP) WITH SUPPORTING DOCUMENTATION WAS PUBLISHED ON JUNE 27, 1988 IN GUAM'S PACIFIC DAILY NEWS. THE NOTICE IDENTIFIED EPA'S AND GUAM EPA'S PREFERRED ALTERNATIVE OF NO ACTION FOR THIS SITE UNDER CERCLA. A PUBLIC COMMENT PERIOD WAS CONDUCTED FROM JULY 12, 1988 THROUGH AUGUST 12, 1988. EPA HELD A PUBLIC MEETING ON JULY 26, 1988 AT GUAM EPA'S OFFICES IN HARMON, GUAM. PRESS RELEASES AND NOTIFICATION TO THE COMMISSIONER OF ORDOT/CHALAN PAGO, THE NEAREST VILLAGE TO THE LANDFILL, AND TO SENATOR SAM AGUSTIN OF THE GUAM LEGISLATURE'S COMMITTEE ON HEALTH WERE PREPARED AND MADE BY GUAM EPA TO FURTHER ASSURE NOTIFICATION OF THE AFFECTED COMMUNITY AND THEIR REPRESENTATIVES.

EPA RECEIVED NO COMMENTS FROM THE COMMUNITY AT THE PUBLIC MEETING AND NO WRITTEN COMMENTS WERE RECEIVED DURING THE PUBLIC COMMENT PERIOD. ON THAT BASIS EPA IS UNAWARE OF ANY COMMUNITY CONCERNS THAT HAVE NOT BEEN ADDRESSED BY THE PREFERRED ALTERNATIVE OF NO ACTION AT THE ORDOT LANDFILL SITE UNDER CERCLA.

APPENDIX C

MR. DANIEL W. MCGOVERN
REGIONAL ADMINISTRATOR
U.S. ENVIRONMENTAL PROTECTION
AGENCY, REGION IX
215 FREMONT STREET
SAN FRANCISCO, CALIFORNIA 94105

DEAR MR. MCGOVERN:

WE HAVE REVIEWED THE FINAL RECORD OF DECISION REPRESENTING THE SELECTED ALTERNATIVE FOR ORDOT LANDFILL UNDER CERCLA.

PLEASE BE ADVISED THAT THE GUAM ENVIRONMENTAL PROTECTION AGENCY CONCURS WITH THE DECISION OF NO ACTION AS THE PREFERRED ALTERNATIVE UNDER CERCLA AT THIS TIME, UNTIL ORDOT LANDFILL OPERATION PRACTICES ARE IMPROVED AND ADDITIONAL ENVIRONMENTAL MONITORING DATA ARE GATHERED.

I LOOK FORWARD TO WORKING WITH YOU AND YOUR STAFF ON THIS PROJECT IN THE FUTURE.

SINCERELY YOURS,

CHARLES P. CRISOSTOMO, M.P.H.
ADMINISTRATOR