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NIGER DIELDRIN DISPOSAL PROGRAM

FINAL REPORT

INCLUDING

DESCRIPTIVE PESTICIDE DISPOSAL PLAN OUTLINE

AND

DESCRIPTIVE ENVIRONMENTAL ASSESSMENT OUTLINE

- *US Agency for International Development, Niger*
- *Directorate of Crop Protection, Government of Niger*
- *Royal Dutch Shell Companies*
- *Pesticide Service Project, German Technical Assistance Agency*

USAID/Niger
Niamey, Niger
June 10, 1992

Remerciement

The accomplishments described in this report, and the advances in chemical hazard risk reduction in developing countries which the Niger Dieldrin Disposal Program may serve to catalyze, are due to the efforts, hard work and sacrifice of the following individuals.

"If it had been easy, we would not have had to do it."

US AID

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The NDDP Final Report was prepared by Tilda Leahy.

List of Acronyms and Abbreviations

(note: some AID office acronyms changed on October 1, 1992)

AELGA	Africa Emergency Locust/Grasshopper Assistance project, AID/W Africa Bureau
AFR/TR	U.S. Agency for International Development, Africa Region, Technical Resources Office
AID	U.S. Agency for International Development
AID/W	AID Washington Office
AVR	Afvalverwerking Rijnmond, The Netherlands (incineration firm)
AIDAR	U.S. Agency for International Development Acquisition Regulations
BF	Burkina Faso
BL	Bill of Lading
CNAA	*Centre National Anti-Acridien* (National Anti-locust Center, Niger)
DCP	Directorate of Crop Protection, Niger
DDA	*Direction Departementale de l'Agriculture* (Department of Agriculture, Niger)
DPV	*Direction de la Protection des Vegetaux* (Directorate of Crop Protection, Niger)
DTP	*Direction des Travaux Publics* (Directorate of Public Works, Niger)
DRRP	Dieldrin Risk Reduction Plan, developed by the GON and USAID/Niger
DRU	Disaster Relief Unit, U.S. Agency for International Development, Niger
EA	Environmental Assessment
EPA	U.S. Environmental Protection Agency
FAO	United Nations Food and Agriculture Organization
FAR	U.S. Federal Acquisition Regulations
GIFAP	International Group of National Associations of Agrochemical Manufacturers, Brussels
GOH	Government of Holland
GON	Government of Niger
GRM	Government of the Republic of Mali
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (German Technical Assistance Agency)
HF	High Frequency
KPEG	Potassium Polyethylene Glycolate (chemical detoxification process)
L,l.	litre
m	meter
mt	metric ton

MOU	Memorandum of Understanding
MS/PPE	U.S. Agency for International Development, Bureau of Management Services, Procurement Policy Planning and Evaluation
NDDP	Niger Dieldrin Disposal Plan/Program
OCALAV	*Organisation Commune de Lutte Anti-acridienne et de Lutte Anti-aviaire* (Joint Organization for Locust and Predator Bird Control, Dakar)
OFDA	U.S. Agency for International Development, Office of Foreign Disaster Assistance, Washington
OFEDES	*Office des Eaux du Sous-Sol* (Office of Ground Water Development, Niger)
OSHA	U.S. Occupational Safety and Health Administration
OTA	U.S. Congressional Office of Technology Assessment
PDP	Pesticide Disposal Plan
PEA	Programmatic Environmental Assessment for Locust and Grasshopper Control in Africa/Asia (USAID 1989)
PIC	Product of Incomplete Combustion
PIO/T	Project Implementation Order/Technical Assistance
PIO/C	Project Implementation Order/Commodities
POL	Petroleum, oil and lubricants
PPE	Personal Protective Equipment
PRIFAS	French agency addressing grasshopper/locust research, development and management in the Sahel and elsewhere.
RCRA	U.S. Resource Conservation and Recovery Act
REDSO/WCA	U.S. AID Regional Economic Development Support Office, Western and Central Africa, Abidjan
RFP	Request For Proposal
SEA	Supplemental Environmental Assessment
SICC	Shell International Chemical Company Ltd, London
SICM	Shell Internationale Chemie Maatschappij B.V., The Hague
SNC	Shell Nederland Chemie, B.V., Rotterdam
SNTN	*Societe Nationale des Transports Nigeriens* (Niger National Transportation Company)
SOW	Scope of Work
TRC	Technical Review Committee, representation from AID/W and U.S. EPA
TSCA	U.S. Toxic Substances Control Act
USAID/N	U.S. Agency for International Development, Niger
USD	U.S. Dollar
USG	U.S. Government
VROM	Dutch Ministry of Environment
WWF/N	World Wildlife Fund/Niger
XA	U.S. Agency for International Development, External Affairs Office, Washington

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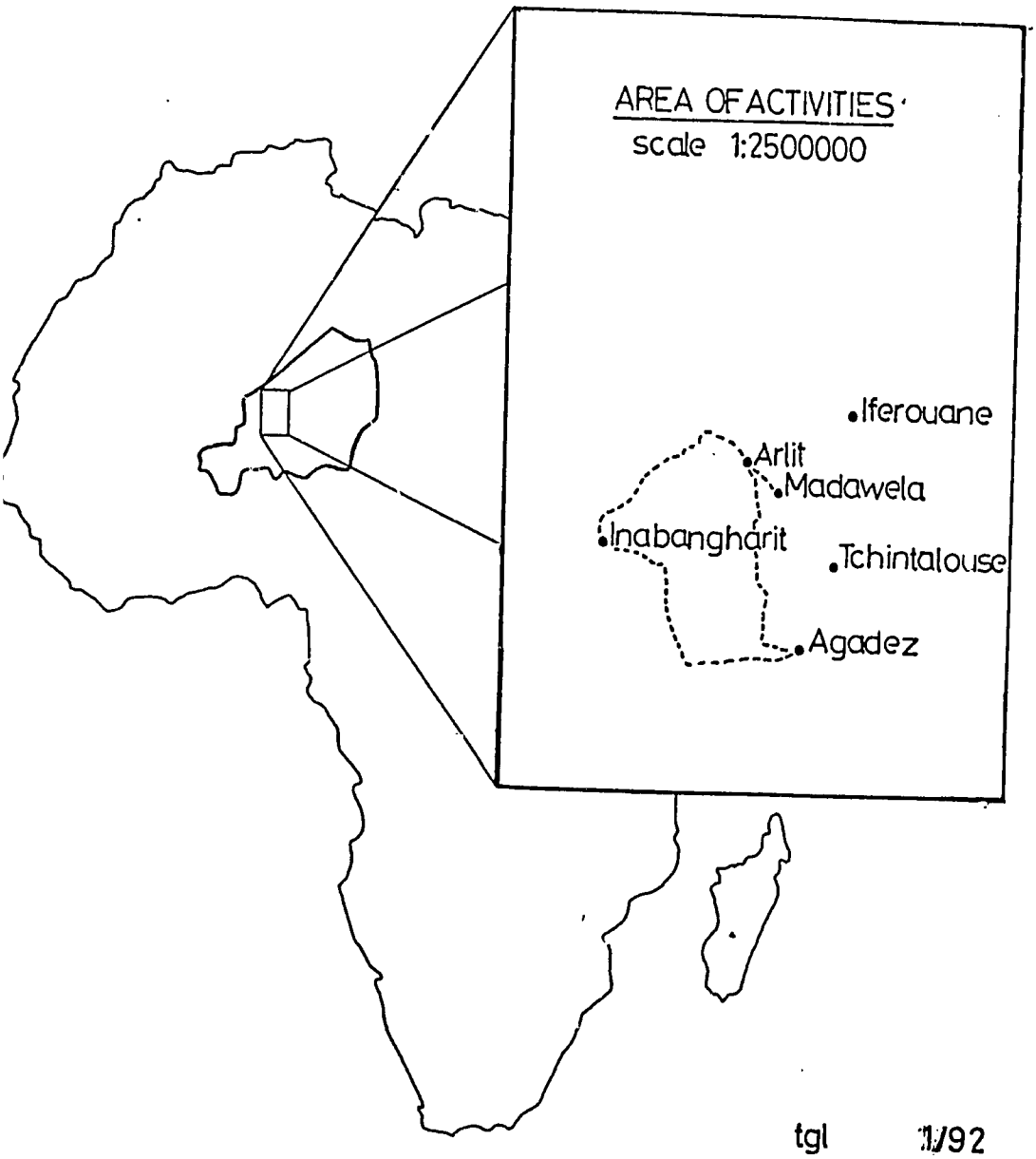
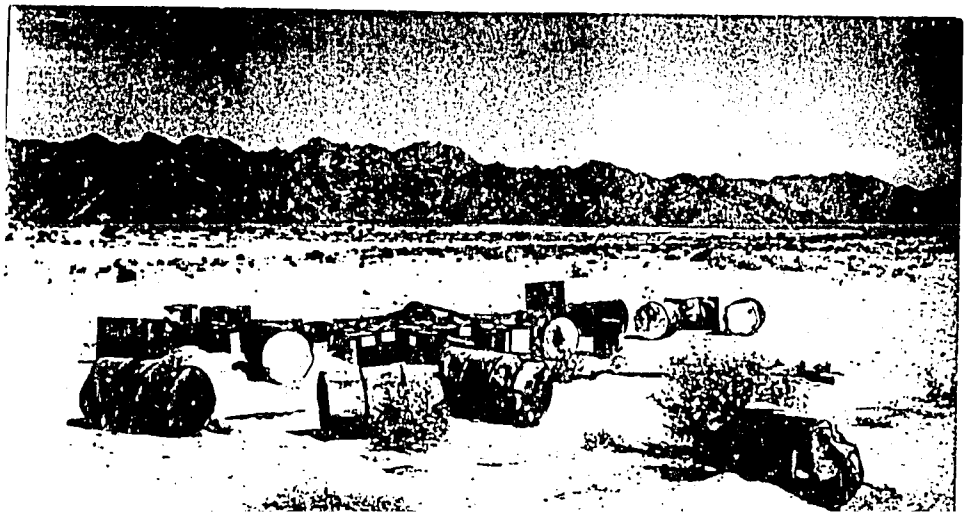
NIGER DIELDRIN DISPOSAL OPERATION

Area of Activities





1. Dieldrin and other pesticides at Tchintalouse

2. Leaking dieldrin barrel at Tchintalouse

I. Executive Summary

This document is a record of the 1990-91 Niger Dieldrin Disposal Program (NDDP), which was carried out through a unique collaboration of the U. S. Agency for International Development (USAID), the German Technical Assistance Agency (GTZ), the Government of Niger (GON), and companies of the Royal Dutch Shell Group (Shell). The program collected, evacuated and safely destroyed 56,000 liters of dieldrin held in Niger. The dieldrin was provided over a 30 year period and was considered unusable under current pest management policies. The program was successful in eliminating an out-of-date pesticide stock which posed a health and environmental hazard.

Dieldrin, an organochloride pesticide produced by Shell, was the pesticide of choice for Desert Locust control during the 1950's and 1960's. During the 1970's use of dieldrin in the US was severely restricted because of it's long term toxicity and a biomagnification impact in the food chain. By the 1980's AID had initiated a policy to discourage the use of all organochloride pesticides, including dieldrin, in keeping with a broader USG policy to minimize the negative impacts of pesticide use.

In 1986, USAID/Niger and the GON began discussions about USG concerns as to the use of the dieldrin. By 1988, the dialogue resulted in GON agreement not to use dieldrin if alternative pesticides were available.

In late 1988, USAID/Niger was approached by the Worldwide Fund for Nature with a report of leaking dieldrin barrels at a site near the Tamgak nature reserve. Collaborative USAID-GON efforts to minimize the risk posed by the leaking and damaged barrels resulted in implementation of the Dieldrin Risk Reduction Plan in 1989-90.

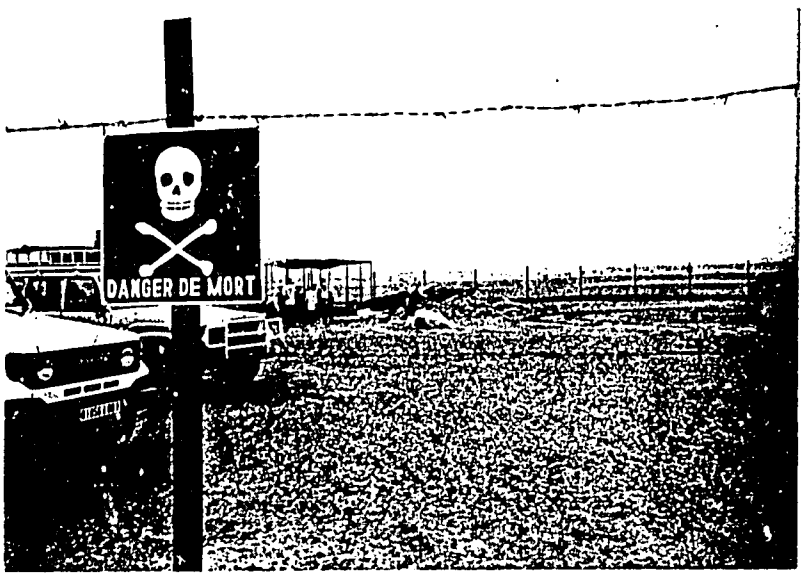
Several long-term options for managing the unusable dieldrin, including its destruction, were investigated during 1989-90. Only long-term storage appeared to be appropriate. However, following discussions at the USG-GON sponsored West Africa Regional Conference on the Disposal of Obsolete Pesticides and Pesticide Containers held in Niamey during January, 1990, Shell approached USAID/Niger with the suggestion that the dieldrin be removed from Niger and destroyed at a commercial chemical incineration plant.

Technical and policy discussions leading to the implementation of this suggestion, involving USAID, the GON, Shell and the GTZ Pesticide Service Project, took place from late-1990 until May, 1991. Operations in Niger began in May and the dieldrin was incinerated in Holland in August, 1991.

The Niger program cost $640,275. We estimate that approximately 30 % of this figure was for first time program development expenses. The cost of similar programs would probably be lower, given the lower plan development costs resulting from the documentation and guidelines provided in this report.

This document also provides Descriptive Pesticide Disposal Plan and Environmental Assessment outlines as guides for developing country specific pesticide disposal programs.

3. Storage warehouse in Agadez



4. Fenced collection and storage sites

II. Program Description

The Niger Dieldrin Disposal Program (NDDP) was a pilot exercise which took place in 1990-1991 involving a unique collaboration of the United States Agency for International Development (USAID), the German Technical Assistance Agency (GTZ), the Government of Niger (GON), and companies of the Royal Dutch Shell Group (Shell). The NDDP operation collected, evacuated and safely destroyed 56,000 liters of dieldrin held in desert locations in Niger, thus eliminating an out-of-date pesticide stock which posed an immediate human health and environmental hazard.

The purpose of this document is twofold:

1) to provide a historical record of the Niger disposal operation and;
2) to provide descriptive outlines of a pesticide disposal plan and accompanying Environmental Assessment (EA) to serve as a guide for developing a country specific operation plan.

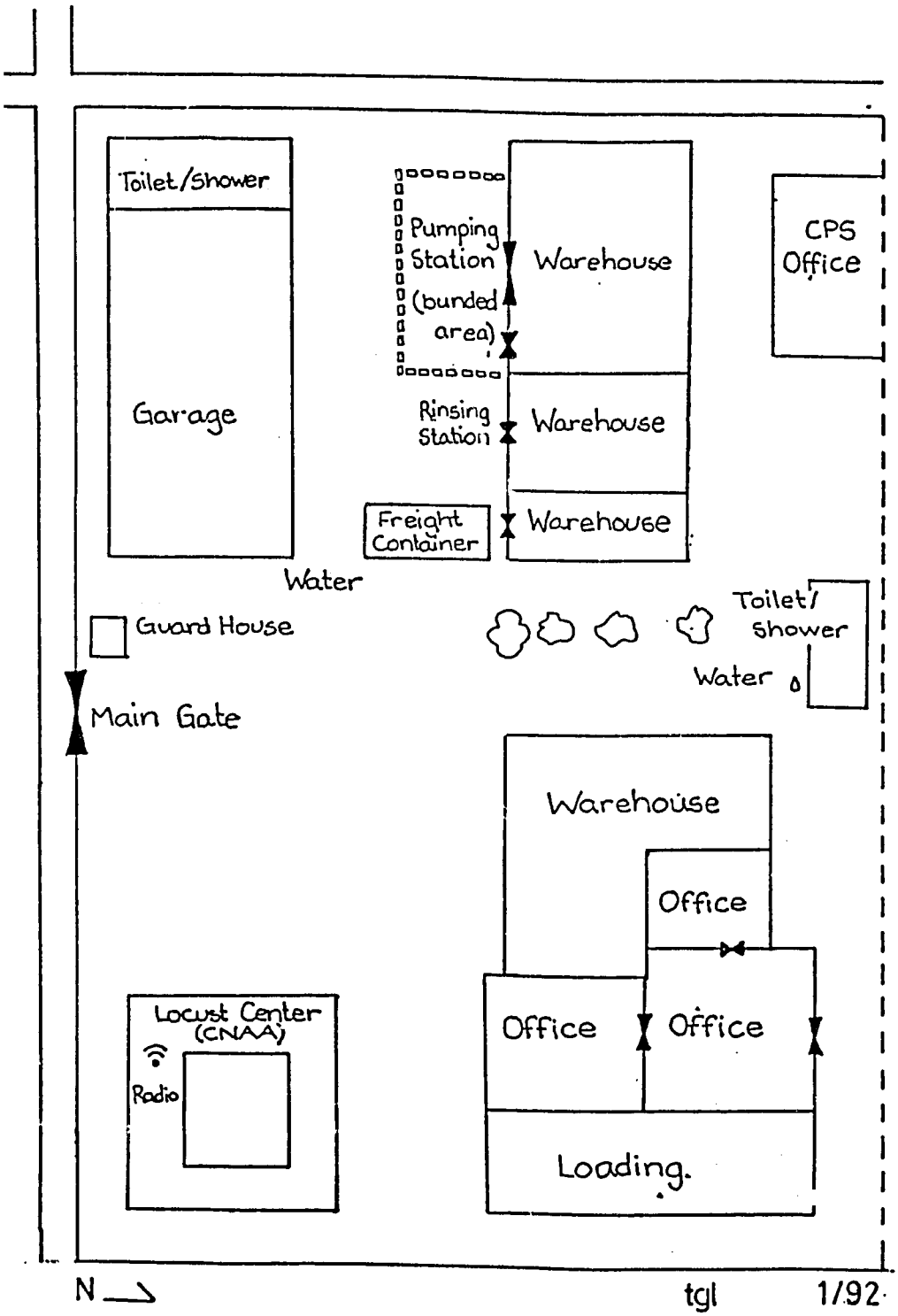
The need will remain for field assessments, technical inputs from qualified parties and modification of procedures as circumstances warrant, but the basis and structure for a environmentally sound, cost effective operation can be found in this report.

Historically, dieldrin, an organochloride produced by Shell, was the pesticide of choice for control of Desert Locust in Africa and Asia. During the 1950's and early 1960's, donors supplied regional locust control organizations and Africa countries with large quantities of the pesticide.

In 1974, after extensive studies, the US Environmental Protection Agency (EPA) severely restricted dieldrin use because of it's long term toxicity and the biomagnification of the pesticide in the food. Since 1987, AID has had a policy of discouraging the use of dieldrin and other organochlorine pesticides. This policy is consistent with a broader USG policy to minimize the negative impacts of pesticide use and management.

In 1986, the USAID Mission to Niger (USAID/Niger) approached the Government of Niger (GON) with concerns about the use of the pesticide dieldrin for locust control in northern Niger. By 1988, as a result of the dialogue with the GON regarding the USG restrictions on the use of dieldrin, the Government of Niger agreed not to use dieldrin if alternative pesticides for locust control operations were available. This condition was met through donations of approved pesticides from the USG and other donors. Thus the dieldrin stocks held by the GON (approximately 34,000 liters) and by the *Organization Commune de la Lutte Anti-Acridienne et de la Lutte Anti-Aviaire* (OCLALAV) (approximately 46,000 liters) were not used for locust control in 1988 and 1989. This stock, held in at least 6 locations throughout Niger, was 3 to 30 years old, with some barrels in very poor condition. None of the dieldrin held in Niger had been acquired with USG funds.

NIGER DIELDRIN DISPCSAL OPERATION
Site Sketch: Agadez Operations Site



In late 1988, USAID/Niger was approached by the Worldwide Fund for Nature, Fund Niger (WWF/N) with a report of leaking dieldrin barrels at Tchintalouse in northern Niger. The leakage was of particular concern to the WWF/N as the barrels were located on the edge of the Tamgak nature reserve. USAID/Niger passed this information on to the Government of Niger's Directorate of Crop Protection (DCP). Following consultations, a collaborative effort to minimize the human and environmental risk posed by the leaking and damaged dieldrin barrels was initiated by the GON and USAID/Niger. The resulting Dieldrin Risk Reduction Plan (DRRP) was approved by the GON by letter in May, 1989.

As the plan was being developed the GON also became the de facto owner of the approximately 34,000 liters of dieldrin in Niger which had been in the possession of OCLALAV. This ownership was formalized with the official restructuring of OCLALAV in late 1989. This increased the amount of dieldrin in possession of the GON to 56,000 liters.

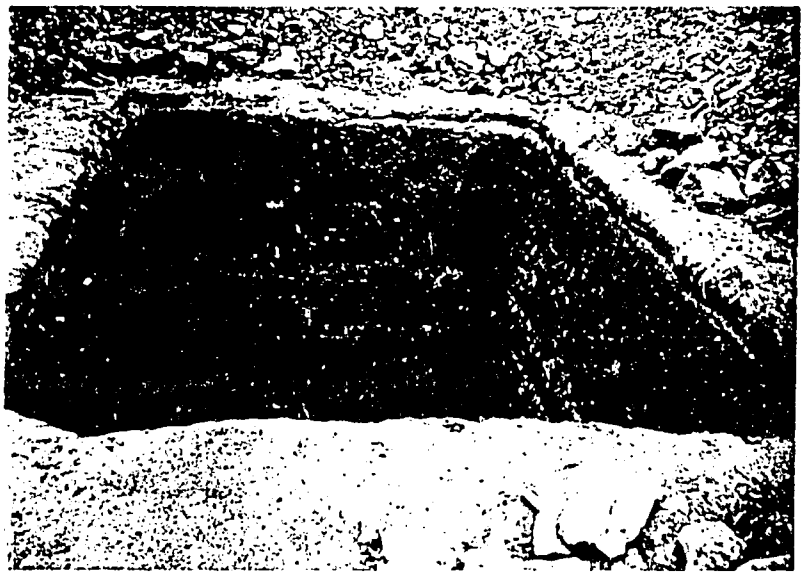
The GON-USAID/Niger collaborative effort to minimize the immediate dieldrin risk were implemented in Phase I of the DRRP: to safely move all the dieldrin stocks in Niger to two locations (Agadez and Inabangharit), and isolate the spill site at Tchintalouse, as no other feasible means of long-term clean-up and disposal could be identified. These operations were completed in mid-1990.

Concurrently with the Phase I operations, plans were developed for the reduction of the long-term risk posed by the dieldrin. Of immediate concern was the deteriorating condition of some dieldrin barrels. There was also an expectation that while the dieldrin would not be used for pest control operations, it would remain chemically potent longer than the barrels could provide secure storage. Finally, the dieldrin was occupying scarce warehouse space, resulting in the storage of other pesticides in less-than-optimal conditions.

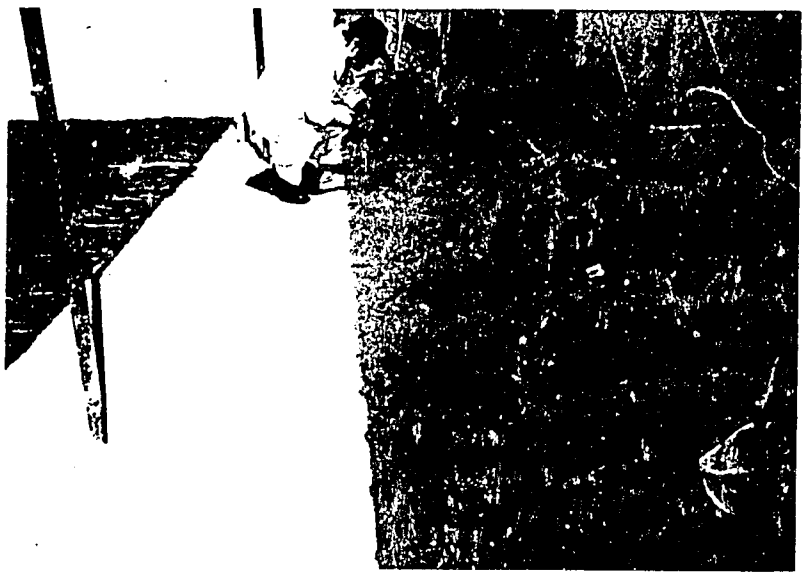
Several long-term management options, including destruction, were investigated by USAID/Niger and the GON. No option other than long-term storage appeared to be appropriate under the circumstances in Niger. A Phase II plan for long-term storage of the dieldrin was developed. The plan was reviewed at a USG-GON sponsored West Africa Regional Conference on the Disposal of Obsolete Pesticides and Pesticide Containers held in Niamey during January, 1990.

Several months after the conference, Shell International Chemical Company Ltd. (SICC) approached USAID/Niger with a preliminary proposal for the removal of the dieldrin from Niger and the ultimate destruction of the pesticide at a commercial chemical incineration plant in Holland. In October 1990, after several months of technical discussions, Shell Nederland Chemie B.V. (SNC) presented USAID/Niger with a formal proposal for a cooperative venture with USAID to remove the dieldrin from Niger and incinerate it in Holland where it was originally produced.

The Niger Dieldrin Disposal Plan was developed over a one year period through cooperation between AID, the German Technical Assistance Agency (GTZ), the Government of Niger (GON) and Shell International Chemical Company and her sister companies, primarily Shell Nederland Chemie (SNC). AID was to provide administrative and technical support for the field operations and provide



5. Landfill pit for contaminated solid



6. Collecting soil samples outside the Agadez warehouse

financing and procurement of personnel, materials, technical assistance, rental of equipment and storage facilities, transportation and incineration of the dieldrin; GTZ was to provide the balance of funding and technical support; GON was to apply for the necessary transit, importation and incineration permits as well as providing personnel, facilities, equipment, and vehicles needed for the removal and clean-up operation; SNC was to provide two technical experts, arrange for equipment and supplies, provide international logistical support and assist in arranging the incineration. The estimated cost of this pilot exercise was $200,000, excluding indirect costs on the part of AID, Shell, GTZ and the GON. These costs were to be financed through the USAID/Niger Africa Emergency Locust/Grasshopper Assistance (AELGA) Grant with the GON and with financial assistance from GTZ projects.

To allow pesticide-related financial assistance to be provided by AID, a Supplemental Environmental Assessment (SEA) specific to Niger had to be developed to ensure that environmental consequences of AID-financed activities were identified, especially those impacts which were not adequately addressed in the AELGA Project Programmatic Environmental Assessment (PEA). An amendment to the SEA specifically covering the activities planned under the NDDP was drafted in late 1990 with assistance from the US Environmental Protection Agency. The SEA Amendment was accepted by AID/W on January 26, 1991 and recommended changes in the NDDP were made. Final approval for the NDDP was received on January 30, 1991.

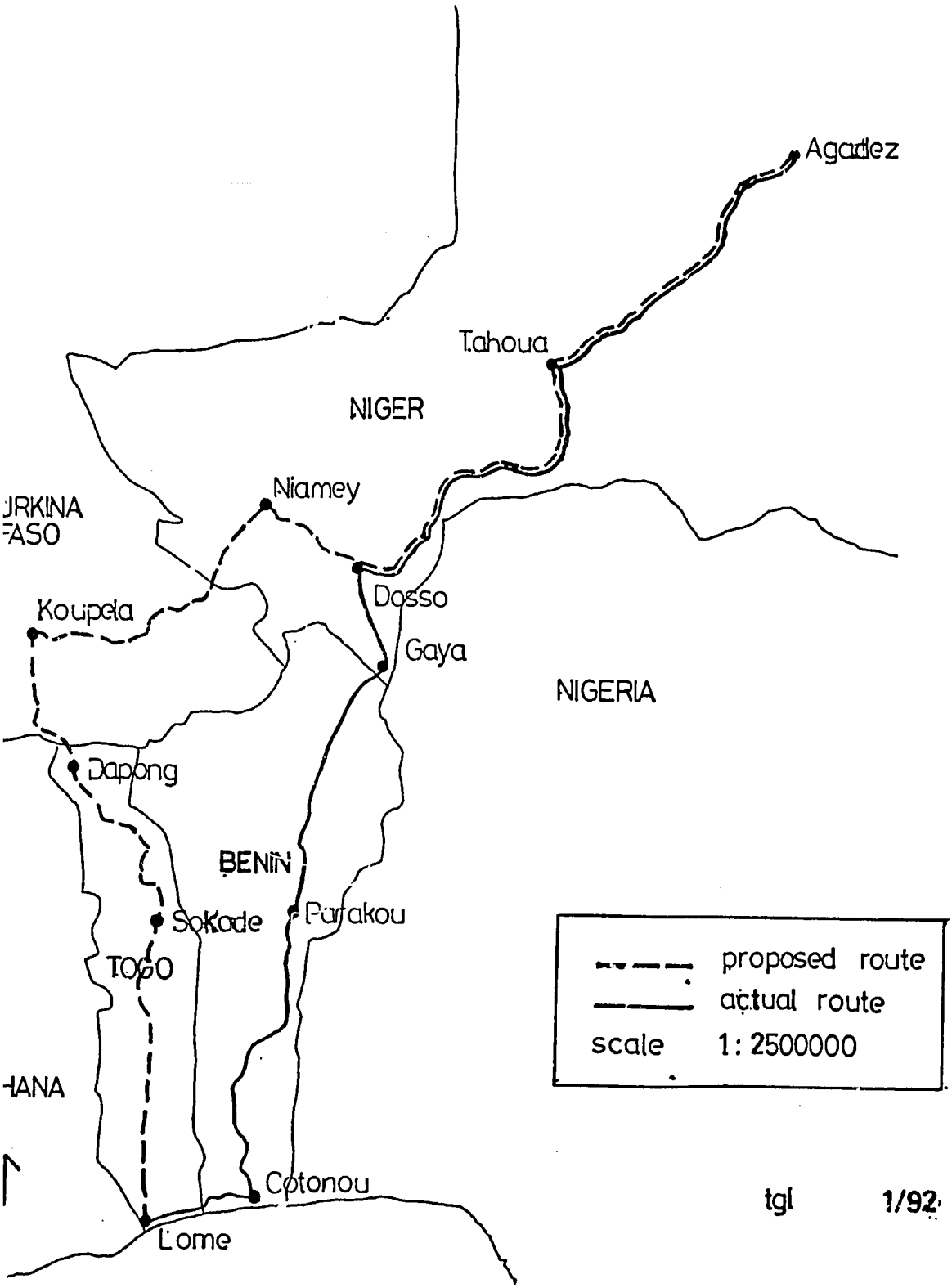
Operations began in Agadez on May 13, 1991. During a three week period 56,000 liters of dieldrin were pumped from 660 storage drums into four isotanks. The drums were rinsed, cut or crushed, packaged and loaded into a freight container. The convoy, carrying 70 tons of dieldrin and rinsate, proceeded 1,860 kilometers overland via Benin to the port of Lome, Togo where it was loaded onto a ship ultimately destined for Holland.

Once in Holland the dieldrin was transferred to a commercial waste disposal plant for high temperature incineration. For this operation a special license had been granted by the Dutch Ministry for the Environment. In a modern and fully equipped laboratory, the product was analyzed to determine its basic composition. Based on the results, it was mixed in a precise ratio with chemical wastes ready for incineration. Emissions were constantly monitored during incineration and no deviation from normal operating conditions were observed. Thus concluded the safe removal and destruction of an obsolete pesticide which had posed a long term risk to human health and the environment.

Final cost of the operation was $640,275, including indirect costs. Though considerably higher than the original estimate this figure includes:

- one time costs to AID, GTZ, SICC and the GON for developing a pilot plan (over 30% of cost),
- removal of twice the originally estimated amount of pesticide,
- delays in the arrival of specialized equipment at the operation site, and
- last minute rerouting of the convoy due to unexpected political upheaval in Togo.

NIGER DIELDRIN DISPOSAL OPERATION
Overland Transportation Route



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III. LESSONS LEARNED, GUIDELINES AND RECOMMENDATIONS

This list is a consolidation of the views of GON, AID, GTZ and Shell companies derived from the post operations review meeting at The Hague, late September, 1991.

A. General

a) Clean-up should cover all products. The Niger project was set up specifically to remove the unwanted stocks of dieldrin. Left behind were unwanted stocks of Lindane and other products. By far the best approach for the future would be to implement a clean-up operation which is not product specific, but to remove and dispose of all unwanted pesticides present in a given country.

b) Video film of operation. A 25 min. video of the Niger operation (produced by Shell) is already proving invaluable in briefings and will help training in the future. Production of a video record should be an indispensable condition for future operations.

B. Organization/Planning/Procudures

a) Framework plan only. Considerable time had to be spent on the highly detailed NDDP document. When the project was implemented the reality was different from the plan and the people on the ground had to make their best judgements. Although detailed plans may be required, initiatives taken in the field and based on the information provided in the plan will be a key component to the successful completion of any operation.

b) Simpler purchasing system. A single contract for all supplies and services, with adequate lead time for tendering and procurement decisions, should be provided for in future project designs.

c) Include Contract Officer in planning phase. Involvement of a procurement representative in the project technical review phase is a normal AID procedure. However, due to the novelty of this type of collaboration it is recommended that AID contract and legal personnel be included from the initial planning phase of future AID funded pesticide disposal operations.

d) More lead time. The need for specialized inputs was far greater than expected. More lead time is recommended in the planning and review process so appropriate specialists can be located and respond to questions raised.

e) Pre-visit essential. Prior to Shell experts visiting the Niger stocks, AID reported the quantity of dieldrin as 27,000 liters. Shell found the actual quantity to be 54,000 liters. Furthermore, for any clean-up operation, an expert judgement is required on matters such as container integrity, health and environmental risk, and equipment needs.

Only one expert should be required for the pre-visit, but he should make a video recording in order to brief other participants as to the situation in the expected area of operations.

f) Qualified field based coordinator is essential. " Without the presence and efforts of the local USAID coordinator (C. Kelly) the Niger project could not have been successfully implemented. A local coordinator is needed and must have access to any appropriate authority or institution and carry sufficient weight to cut through 'red tape'" (SNC, 1991).

g) Document translation. Most of the Niger project documents were drafted in English or Dutch and needed to be translated for the GON and for customs. Considering the urgency of the operation and the volume of the documents, it was sometimes difficult to have the paperwork ready in a timely manner.

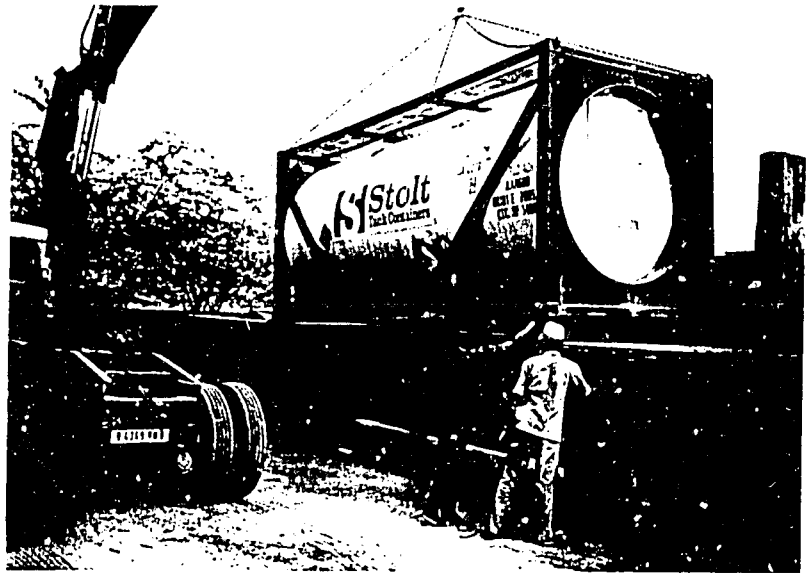
It should be made clear at the beginning of a project which languages are required for which documents, and an efficient translation procedure arranged.

h) Technical assistance teams should arrive after containers and equipment are in place at the operation site. Several weeks were lost in Niger because technical assistance personnel had to await the containers and equipment, which were unexpectedly delayed.

i) Timing of operation. The timing of the operational phase of future operations must be fixed at an early stage and must avoid periods of climatic extremes, in particular rain and/or high temperatures.

j) All obsolete stocks moved to one site. Where safety permits, it would be preferred if the local coordinator arrange for all product to be collected at one site in time for the arrival of the clean-up experts. A briefing can be provided during the pre-operation assessment visit on how to do this safely. Some leakers may have to await the arrival of equipment (overdrums etc).

k) Standard contact list needed. All focal points should receive a common contact list, giving key contacts, fall-back contacts and all telecom numbers and addresses.



7. Loading isotanks onto trucks

8. Pumping operation

l) Terms of reference for all operational participants. These should be documented so there is no misunderstanding of roles and responsibilities; particularly in light of the parties' financial involvement. Legal position of all managerial level personnel should also be made clear.

m) Standard Agreement document Memorandum of Understanding (MOU). The NDDP agreement document, or MOU, between the participating agencies: Shell, AID, GTZ, and the Government of Niger, was negotiated by the AID regional legal advisor, the lawyers of Shell and GTZ, and their counterparts in the cooperating government. Standardizing such an agreement, which would address liability and legal and customs responsibilities, would be useful.

n) Standard contract documents. Legal time and costs would be minimized if a standard contractual document could be agreed upon between the coordinating aid agency and the party providing the operational expertise/resources (eg. waste management firm). Discussions should be on a lawyer-to-lawyer basis.

o) Standard agreement with the Dutch Ministry of the Environment and AVR. If future stocks of pesticides were to be returned to the Netherlands for incineration a standard agreement should be arranged with VROM and AVR.

p) Operational petty cash. Many small cash payments are required during the operational phase. Cash outlays in Niger exceeded $18,000 over a 2 month period. A significant petty cash reserve should be held at the field level.

q) Security. Security arrangements should be arranged with authorities at a sufficiently high level and guaranteed in writing. If the local authority cannot provide adequate security then private security may need to be arranged.

r) Bill of Lading for equipment. A notional value should be put on future BLs. Because the SNC BL for the equipment contained no value, the container was held up by customs in Lome.

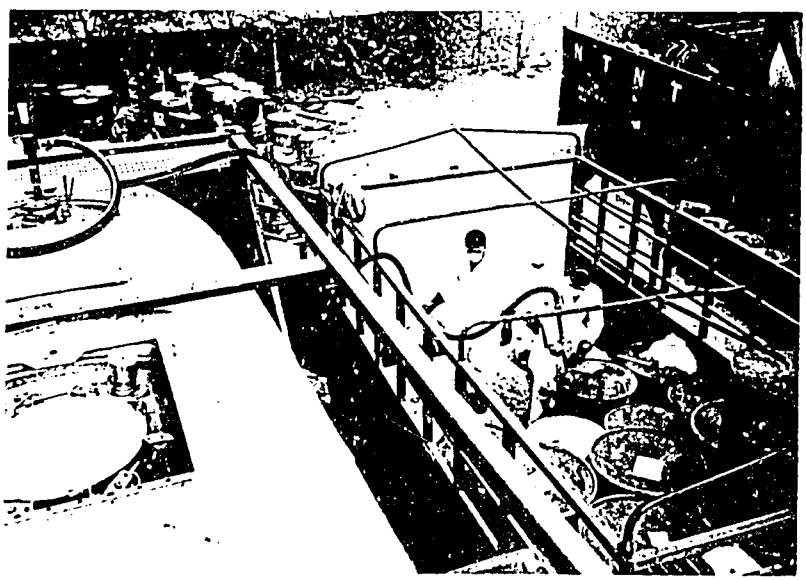
C. Transportation/Travel

a) Truck isotank and container fittings. Only trucks with the correct locking devices for container/isotanks (Tyss-Locks) should be used.

b) Crane. If deemed cost effective, a crane capable of lifting a full isotank (25 tons) may prove useful at the operation site.

c) Supervision of transport. A senior project supervisor should accompany the convoy of filled tanks until all product has boarded the ship for departure.

9. Decanting 60 l. dieldrin drum into surge vessel



10. Pumping barrels retrieved from Inabangharit

d) One party to arrange all logistics. Time was lost during the handover of isotanks/container from the Shell-arranged ship to the AID-arranged trucks. It would be more efficient for one party to do it all. However, consideration should be given to having transportation handled through a local transportation firm.

e) Local transport availability. There must be ready availability of vehicles and fuel for moving people/equipment in the vicinity of the operation site.

f) Customs clearance for full convoy. When moving a full convoy through several countries it can help if someone travels ahead of the convoy to facilitate customs clearance.

g) Deviations from plan. Contingencies should be considered for possible deviations from the plan. For example, the dieldrin from Niger was unloaded at Antwerp instead of Rotterdam, so the papers were inappropriate.

D. Communications

a) Radio communication for the returning convoy. The use of DCP HF base and mobile radios for communication during the movement of the convoy (which was anticipated in the plan) was canceled because rebels took two of the DCP radios during the Inabangharit base attack. A secure means should be arranged for the convoy to keep in contact with base while on the road.

b) Languages/Communication during operations. Sometimes communication was difficult and time consuming because translation became necessary due to the broad range of languages spoken, including English, Dutch, German, French, Haoussa, Djerma, and Tamacheck. The supervising clean-up expert should be able to communicate in the main local international language (either English, French or Portuguese for Africa).

E. Technical points

a) Contingency planning. Estimating the exact quantity of the dieldrin to be removed was difficult due to the poor storage condition of the dieldrin barrels, and mixture of dieldrin barrels with other pesticide containers. Also, unanticipated stocks of twelve 200 liter barrels of dieldrin were discovered at a military base 240 km north of Agadez, which fortunately could still be accommodated in the pumping and transfer operation.

Contingency isotank space should be allowed for in case unanticipated product is discovered, while the assessment visit should include the investigation of possible sites of unaccounted pesticide storage, including military bases, cooperatives, non-agricultural government warehouses and "abandoned" government or project buildings.

11. Cutting top and bottom of barrel

12. Cutting body of barrel

b) Isotanks. Top-loading isotanks should be used to avoid any risk of bottom valve leakage. During the movement of the filled isotanks to Lome a problem of slopping was encountered. Isotanks should either be baffled (if such tanks exist), should be filled (topped-up) up with diesel oil or smaller isotanks should be used. Smaller isotanks may also be easier to handle at the work site. Transportation requirements and capacities need to be taken into account during the assessment phase when developing recommendations on tank sizes and numbers.

c) Pumps. The manual pumps were robust but arduous and time-consuming to operate. In future, electrical peristaltic (explosion-proof), pumps would be preferred. An electrical generator may also be needed. Large gauge accessible filters should be used to prevent pumps blocking with loose drum lacquer and other residues. Two pumping stations would speed transfer operations.

d) Drum trolley. Drum trolleys for large (200 l.) and small (20 - 60 l.) drums are recommended. Trolleys may need to be modified for sandy soils, e.g. larger tires for better traction.

e) Protective equipment. The quantity of protective equipment was not sufficient to allow 2 sets per person. Thus, it was necessary to wash the clothing every day after the operation. In future, 2 sets per person should be provided.

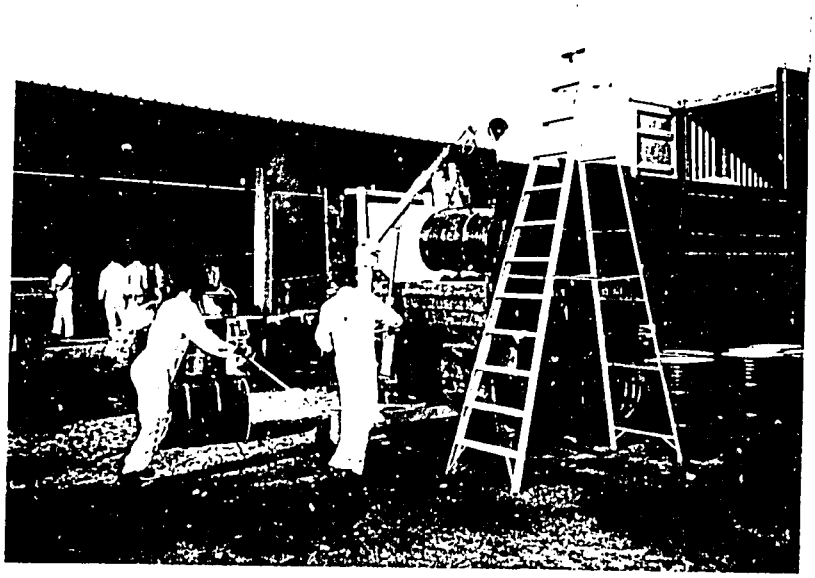
f) Face masks/visors. The Shell Occupational Hygienist suggests that the simple "3M"-type of dust/mist respirator may be more appropriate and comfortable in hot climates than the full face masks worn in Niger. A face visor would give adequate eye protection.

g) Clean-up chemicals. Limestone and/or caustic-lye should be available for the clean-up procedures of the soil and the floor of the warehouses contaminated with hydrolyzable pesticides such as organophosphates.

h) Warehouse floor sealing. The proposal to use an epoxy sealant proved impractical in Niger because the warehouse floors were badly pitted. In such cases a new concrete floor may need to be laid and later covered with epoxy. Information from the EPA indicates that a clean floor (dirt or concrete) covered with thick plastic, 10 cm of lightly reinforced concrete and epoxy would provide an adequate seal against pesticide movement into the warehouse area.

i) Dedicated set of equipment. If clean-up operations would become routine it is recommended that a dedicated set of equipment be set aside. It would probably require 2 freight containers, one being essentially a mobile workshop with bench and tools.

13. Packaging drums and scrap metal for transport



14. Loading Freight Container

j) Additional equipment. In addition to the equipment in the NDDP plan the following is recommended for a similar future exercise:

- large steel funnels (sheet metal)
- 2" bung valves
- more drum top/bottom cutters
- drum trolleys with large wheels (to cope with sand)
- fixed assembly of decant surge vessel with pump suction drum for decanting smaller barrels (< 60 l.)

k) Incinerator emissions. The average emission values for the period of the incineration must be provided by the incineration company. Prior certification of the plan emissions standards and performance is also required to verify compliance with the applicable regulatory criteria.

F. Health/Safety/Environment

a) Blood and soil analysis. The NDDP blood analysis demonstrated that occupational hygiene during the operation was good. The soil analysis demonstrated that some contamination had occurred as a result of dripping during the operation. Both monitoring techniques are therefore recommended, where practical and appropriate, for future operations.

b) Extension of bunded area. The soil analysis demonstrated that the bunded (spill containment) area should be extended to cover the rinsing area and the space between the transfer equipment and the isotank being filled.

c) Blood sampling. Many post operational blood samples were missing and some arrived broken. Further samples then had to be sought. Better management of this aspect is required in future. Baseline levels should be known before the operation starts.

d) Notification of local hospital. The local hospital should be given a thorough briefing of the planned operation, product properties and treatment of poisoning.

e) Fire brigade. When flammable products are being handled the local fire brigade should be briefed in the same way as the hospital.

G. Public Affairs (PA)

a) Public affairs need. The need for well planned publicity was substantiated by the good and reasonably well-informed media coverage.

b) Questions/answer document. A more comprehensive document will be needed for any similar future undertaking, containing the Niger experience.

15. DDA Warehouse after Dieldrin removal

c) Public interest groups. PA focal points should discuss and agree whether to discuss project outlines with appropriate public interest groups.

d) Release of information to the media to be handled simultaneously among different providers of information and different locations.

The Dutch Press received the Greenpeace release before the SNC release because SNC did not issue its release on the agreed date. It would be preferable in future if all participating parties would issue their releases at the same time.

e) Local media release. A release should be prepared for local use and released to the local press/TV at the most appropriate time (to be agreed by all parties).

IV. Pesticide Disposal Plan Outline

The following provides guidelines and a checklist for a generic pesticide retrieval and disposal operation. Modifications should be made as circumstances warrant.

A. Pre-operation Assessment Visit: About six months before the anticipated operation a technical expert familiar with the pesticides to be handled visits the proposed operation site to: 1) confirm quantity and composition of the pesticide stock; 2) assess the integrity of the storage barrels; 3) review the operation plan procedures; and 4) determine if facilities and experienced personnel are adequate. A video record of the visit should be made.

B. Operations Plan: A country specific operations plan is developed using inputs from the local mission, the host country government and the technical team performing the pre-operation assessment visit. Special attention should be given to the EA outline when developing the PDP. Addressing EA issues during the planning phase can avoid time consuming and costly plan revisions. An outline of the EA can be found in Section IX.

a. Objectives: A clear statement of goals and objectives, which not only drive the planning and implementation document, but also establish standards by which the success of the operation can be measured.

b. Definition of Responsibilities: Definition and delegation of responsibilities among the participating parties are formalized in the Memorandum of Understanding. Items covered in the MOU include but are not limited to:

1. Ownership of, and liability for, the pesticide(s) to be removed and destroyed.

2. Financial contribution(s) of each party, e.g.:
   - salaries;
   - per diem;
   - equipment procurement;
   - diluent rinsate, POL;
   - freight;
   - incineration, smelting, land disposal;
   - laboratory and field tests.

3. Technical assistance provided by each party:
   - health and safety monitoring;
   - advice on equipment and operational procedures;
   - technical training;
   - supervision of the operation.

4. Logistical arrangements executed or coordinated by each party:
   - preparation and management of operation site: personnel, facilities, equipment rental, vehicles and other assistance as appropriate;
   - permit application for transport, importation and incineration;
   - transportation of pesticide(s) to a central location, rental of isotanks and container, overland transportation, customs and third country transit arrangements, storage facilities while awaiting sea transport, ocean transport, and transport to the incineration and smelting facilities;
   - incineration of pesticide(s) and smelting of containers; disposal of solids

5. Designation of a coordinator for each of the participating parties.

See Annex E: Niger MOU for an example.

c. Personnel and Participants: Minimal staffing requirements are as follows:

No	Title	Tasks/Responsibilities
1	Project Coordinator	Coordinate activities of all participating parties; supervise retrieval operation; accompany convoy to exit port. Must have access to appropriate institutions and carry sufficient authority to cut through "red tape".
1	Host Country Coordinator	Supervise the technical and administrative inputs of the host government throughout the planning and implementation phase of the operation.
1	Technical Advisor	Perform pre-operation assessment visit; advise staff on technical and safety procedures; train local crew; act as health and site safety officer.
1	Site Manager	Develop and implement logistics plan for the movement of personnel and commodities to and from the operation site; prepare and manage operation site; manage accounting system for local procurement and salaries; and coordinate daily site operations with all participating parties.

1 (ea)	Physician & Assistant	Provide daily (if site is isolated from health services) and emergency health care at the operation site; draw pre- and post-blood samples; treat accidental pesticide exposure and administer therapeutic drugs, if necessary.
15	Laborers	Collect, pump, rinse, cut or crush barrels of pesticide according to operational standards set forth in the PDP. Previous pesticide handling experience preferred. Actual number of laborers can vary depending on quantity and timing of operation, but 15 workers is probably the maximum which can be effectively monitored at one site.
5	Drivers	Light vehicle and truck operation (not including transportation contractor).
4	Support Personnel (funding party)	Procurement management; technical assistance; and assistance in overall coordination of the project.

Annex B of this report contains a complete listing of all personnel and participants of the Niger Dieldrin Disposal Operation.

d. Equipment Required: The following lists the equipment required for a removal operation. Equipment and material specifications are listed in Annex F, additional details may also be obtained from the Niger PIO/T & Cs found in the Annex G.

Item	Quantity
Health	
1. Blood Sampling Kit	1 set
2. Drugs (emergency)	1 set
3. Eye Rinse	2 bottles
4. First Aid Kit	1 per operations site
5. Personnel Prot. Equip.	2 sets per laborer
6. Personnel Prot. Equip. (special activity)	2 sets
Safety	
7. Fire Extinguisher, Lg	2
8. Fire Extinguisher, Sm	2
9. Fire Alarm	1
10. Earth Lines (ground wire)	1 per rinse station
11. Red Flags	Adequate for convoy vehicles (1m x1m)
12. Inflammable International Code Stickers	1 set (4) per isotank and container to be transported (front, back, sides)
Operations	
13. Isotanks (20 Mt)	Adequate for pesticide, rinsate, and 15% contingency space
14. Freight Container (20')	1
15. Pump/Hose (sets)	4 : 3 electric, 1 manual
16. Drum Cutter	1
17. Drum Head Cutters	4
18. Drum Draining Rack	1
19. Barrel Hoisting Rig	1
20. Fixed Decant Surge Vessel	1
21. Bung Valves, 2 "	4 per rinse station
22. Steel Funnels	4 per rinse station
23. Drum dolly	3: 2 for 200 l barrels, 1 for 60 l barrels
24. Overdrums (overpack barrels)	No. of leaking barrels + 10% contingency overdrums
25. Barrel Crusher [1]	1

[1] If manual cutting of drums is not planned. Manual cutters may be required if only one crusher is used as a contingency against equipment failure.

26. Plastic Sheeting	25 m^2 per rinse station
27. Jute/PVC Bags (50 kg)	75 per rinse station
28. Hydraulic Oil	4 liters
29. Grease	1 liter
30. Tool Kit	1
31. Diluent (diesel)	10 l diluent per 100 l barrel x 3 rinses, 7 l diluent per 60 l barrel x 3 rinses, 3 l diluent per 20 l barrel x 3 rinses.
32. POL	As needed for vehicles and generators, based on specific operation.
33. Incineration[2]	Number of Liters of pesticide + rinsate
<u>Cleaning</u>	
34. Open Top Drums	10% of total number of barrels retrieved
35. Plastic Bags	1,000: .75m x 1.5m
36. Blocking Tape	2 rolls
37. Buckets, Shovels, Brooms, Bushes,	15 each
38. Floor Sealant	Adequate for cement warehouse floors
39. Plastic Sheeting	Adequate for earthen warehouse floors (temporary)
40. Absorbent	500 kg
41. Limestone and/or Caustic Lye	Adequate to neutralize spill area (for organophosphate pesticides only)
42. Excavation Equipment	Adequate for landfill pit construction (if necessary)
43. Lubricating Oil	50 l
44. Personal Hygiene (soap, towels, hand creme)	2 sets per participant

<u>Camping</u> (As needed for technical team and convoy personnel)

45. Camping chairs and tables
46. Camping beds
47. Linens
48. Blankets
49. Mosquito nets
50. Cooking pans
51. Cooking utensils
52. Eating utensils
53. Camp stove and gas

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[2] Though not a material, the facility providing incineration services must meet EPA specifications if the operation is supported by the USG.

54. Lanterns and fuel	
55. Flashlights and batteries	
56. Water jugs	
57. Water filter	
58. Coolers	
59. Buckets	
60. Sponges, rags, and soap	
61. Cord	
62. Tents	Adequate for personnel + 2 for office use
63. Generator set	Incl. fuel, lights and ancillary equipment

e. Procedures

1. Training

The 15 member labor crew, the warehouseman, guards, drivers and supervisory staff will participate in a one day "on site" pesticide handling and safety training to ensure safe and environmentally sound procedures are followed. Technical advisor(s) from the consulting chemical manufacturing firm will facilitate or participate in the training. The trainer will be able to communicate in the official language of the country (French, English or Portuguese in Africa). The crews will be trained in:

- understanding the properties, risks and safe handling of pesticides;
- proper use of Personal Protective Equipment (PPE);
- how to (un)load and operate mechanical equipment (drum cutter, hoisting equipment, manual pumps, etc.);
- how to handle full drums properly;
- emptying full drums into isotanks;
- rinsing the drums with diesel fuel;
- avoiding unnecessary spills;
- procedures to deal with accidental spills;
- fire prevention measures, use of earth lines to reduce risk of electrostatic explosion, no smoking at the operation site;
- chemical fire fighting procedures, use of dry chemical fire extinguisher, value and use of common soil to smother chemical fires; and,
- cleaning of sites.

All subjects will be explained to, demonstrated to, and practiced by the crew. Training material will include the use of the actual PPE and equipment which is to be used during the operation. Handling, emptying and rinsing of drums will be demonstrated and practiced with empty drums first.

2. Health monitoring

Blood tests: A local doctor (host country to designate) takes blood samples of prospective crew members; only those applicants whose blood samples indicate they have had no exposure to the pesticide(s) to be evacuated are selected. The pre-operation blood samples provide the base level of pesticide(s) in the blood of each crew member to which the post-operation levels will be compared. Samples are properly labeled and stored while awaiting transport by the fastest possible means to an appropriate blood analysis laboratory. Note: Due to the complex nature of the analysis, the blood samples are analyzed at a specialized laboratory. Results should be available in less than 10 days.

If one of the crew members leaves the crew before the job is finished, his final blood sample is taken. As soon as a new member is added in the operation, his blood is sampled for a determination of his pesticide base level.

If one of the crew members should show signs of illness the assigned doctor is to be consulted. If contamination is suspected, a blood sample is taken for immediate analysis. The crew member is withdrawn from the work until further notice.

The health specialist who will provide backstopping for the operation provides blood sampling and storage instructions for the doctor involved in the operation. Appropriate blood sampling equipment and blood storage/mailing boxes should also be provided.

Fatigue prevention: The daily work schedule must be adapted to local circumstances (temperatures, humidity, dust). Sufficient periods of rest and refreshment will be scheduled based on weather conditions and types of work being performed. Provisions should be made to ensure that adequate water is available for the crew to wash-up at the conclusion of each work period. Soap, shampoo and towels are to be provided.

Use of Personal Protective Equipment (PPE): Pesticide exposure is limited through the use of proper PPE. All PPE complies with EPA criteria, and is used in a manner consistent with OSHA operational plant standards. Standard PPE is worn during normal activities e.g. drum handling, emptying and rinsing. For complex operations, e.g. handling severely leaking drums, specialized PPE is required.

A dust/mist cartridge mask covering the mouth and nose together with a face shield, may be preferable to a full face mask in hot/humid conditions. For a listing of standard and specialized PPE see equipment specifications in Annex F.

After completion of the operation all used PPE are put into open top drums and sent with the returning freight containers for proper disposal, or in the case of the specialized PPE for proper cleaning and re-use.

Daily visual observation: Because the motivation to remain a crew member is high, it is likely that crew members would not readily report physical symptoms of pesticide poisoning (central nervous system effects such hyperexcitability, tremors, convulsions). Thus, the person monitoring health will visually monitor and record individual crew members' condition on a daily basis.

Emergency procedures: The operation health/safety officer will also hold a briefing and deliver documents to the local health facility and the doctor assigned to the operation which describe measures to be taken if, despite the use of PPE, accidental exposure to the pesticide(s) occurs. Emergency therapeutic drugs to be administered by the designated doctor will also be provided. Eye rinsing liquid and first aid kits will be part of this package.

3. Site security and safety

Site security: Minimal risks from unauthorized entry and accidental contamination of non-operational personnel should be assured. Physical security may be established by surrounding the operation site with a wall which has a single entry and appointing a 24 hour guard charged with keeping the site free of unsolicited visitors. Warning signs will be posted in official and local languages.

The isotanks and the equipment freight container will be located on the operation site. This site should have radio and phone facilities, electrical power and water.

Site safety: The assurance of safe operations will be based on:

- sufficient rest breaks for the crew members;
- warnings and eventually dismissal of crew member(s) who do not work according to the strict guidelines and instructions;
- proper use and storage of equipment and materials (isotanks, diesel fuel);
- no admission of untrained crew members; and,
- proper cleaning of the site.

Standard safety equipment and precautions will consist of:

- two sizes of powder fire extinguisher;
- earth lines to prevent accumulation of static electricity during pumping of the dieldrin into the isotank;
- dedicated hoisting equipment to unload drums properly;

- over pack drums for handling leaking or poor-quality barrels;
- simple, easy-to-use manually operated pumps or explosion-proof electric pumps if pre-operations assessment recommends this option; and,
- absorbent, shovels and plastic sheeting to minimize and absorb unintended spills.

Safety signs and placarding of isotanks and the operations sites will also be used to maximize site and transportation safety. Fire extinguishers, hoisting equipment and all other safety items are to accompany the convoy and should be in easy access in the event of an emergency. Empty open top drums should also be carried by the convoy so that in the event of an accidental spill contaminated soil may be transported with the convoy for proper disposal.

Fire safety: The following safety procedures are designed to minimize the chance of fires:

- areas in the vicinity of the pesticide(s) will be well-ventilated, so that vapor pressure, and thus combustibility, will remain low;
- small quantities (nte 200 l.) will be pumped at a given time during drum rinsing, emptying, and transfer operations, and site specific safety procedures will be followed;
- earth lines will be used during all pumping operations to minimize the chance of electrostatic discharge; and,
- drum cutters rather than drum crushers will be used.

The operation safety officer will instruct the crew and contract manager in appropriate measures to take should a fire develop despite precautions. Crews will be trained in the use of the fire extinguisher, and will also be instructed as to the value and appropriate use of common sand and soil in the event of a fire. The safety officer will also brief the local fire brigade on the fire risks associated with the operation and develop a contingency fire fighting plan.

4. Centralization of stock

All stock should be collected at one central location. Procedures for the collection and transport of outlying stock are as follows:

- a trained and blood-tested crew, wearing standard PPE, loads barrels onto the transport truck;
- wearing specialized PPE (if necessary), the crew loads leaking or suspect drums into overdrums using barrel hoisting equipment; overdrums are then loaded onto the truck;
- drums are securely tied down and precautions taken to minimize accidents, e.g. slow speeds, routing over best possible roads versus shortest route;and,

- several empty barrels will be transported with the shipment, if accidental leakage occurs in transit, the crew will place the leakers and any contaminated soil into the empty barrels.

5. Pumping and rinsing operation

Drums from outlying areas will be pumped first. To reduce amount of handling, drums in poor condition are pumped directly into the isotank from the delivery truck, not unloaded and then pumped. This may require a bunded spill containment area around the delivery truck and special pump station. All safety regulations will be enforced and crews will wear standard PPE.

Drum emptying and safety procedures involve the following steps:

- Bags of sand are stacked side ways two high to create a bund wall around the pumping, rinsing, and transfer area. The bunded area is then covered with several layers of thick plastic to contain any spills and prevent spilled material from soaking into the sand. Roofing the work areas is also strongly recommended to provide shade and minimize rainfall into the operations areas. Absorbent will be kept close at hand for handling spills.
- The pesticide drums are placed to one side, the isotank at the other, with pumping equipment in between;
- The isotank earth cable is connected to the ground;
- The manhole on top of isotank opened;
- The pump is placed in an empty overpack drum;
- The valve between pump and isotank closed;
- The hose from the pump is put into the isotank manhole and secured in place with a flange.

The actual drum emptying and cleaning operation involve the following steps:

- The drum is opened carefully;
- if the drum is 200 l or larger, the pump is inserted carefully into the drum, if smaller than 200 l, the drum is decanted into a transfer vessel.
- valve on hose is opened and pumping is started;
- drum is emptied;
- valve on hose is closed;
- pump is put back in an empty open-top drum;
- emptied drum is filled with a pre-determined amount of diesel fuel[3];
- drum is closed and rolled on rack (rinsing);

[3] The amount of diesel fuel per rinsing will depend on the drum size, as follows: 200 liter drum - 10 liters of diesel per rinse; 60 liter drum - 7 liters of diesel per rinse; 20 liter drum - 3 liters of diesel per rinse.

- drum is opened, pump is inserted and rinsing liquid is pumped into isotank;
- repeat of rinse steps two additional times;
- empty drum is placed on a draining rack. The draining rack is designed to provide for the safe collection of all rinsate.

Special handling procedures may be needed for cleaning small (less than 60 liter) drums, including the use of a holding and transfer tank and a surge vessel. The Niger experience indicates it is easier to empty smaller drums into a holding tank (modified 240 l. overpack drum) and then, using a fixed surge vessel and pump station, transfer the pesticide into the isotank. Special handling procedures can be developed during the site assessment visit.
Drums with obvious or suspected external pesticide contamination will be washed with solvent in an overpack drum three times or until clean. Brushes used for cleaning drums will be shipped with the other used equipment for disposal. For damaged drums which pose a potential leakage problem, all internal rinsing will be done with the drum in a overpack container.

6. Drum conversion

Once the drum has been thoroughly drained it will be converted into scrap metal by being cut into sections. This process will involve the following steps:

- The drum is placed in an overpack drum;
- the drum top is removed with a large drum opener; - inside of drum is checked and cleaned with diesel and/or absorbent, as required;
- the drum is reversed;
- the bottom of the drum is removed;
- the drum is removed from the overpack drum;
- the drum is manually cut into two halves with the drum cutter; and,
- cut drum halves will be put into decontaminated drums or open head drums, absorbent is added, the drum is closed and prepared for transport.

In cutting the drums, care will be taken to ensure that no product or rinsate is released into the environment. Emptying and cutting 660 drums using this procedure in Niger took approximately 15 days, using three teams of 5 persons each working on a 2 hr. rotation for 6 hrs/day.

7. Storage site clean-up

The extent of contamination and subsequent clean-up is determined through analysis of substrate samples taken from within and around the storage sites. Samples are to be collected using approved random sampling techniques and tested by a qualified pesticide residue analysis laboratory. Cleaning will be carried out by the

operations crew wearing standard PPE and dust masks.

Concrete floors should be brushed to collect dust and removable contamination. Spills are to be treated with absorbent. Dust and absorbent are collected in open top drums for subsequent disposal. After cleaning, the floors are to be treated with a commercial industrial sealant to prevent any possible pesticide migration from the concrete or sub-soil into the warehouse. If the floor in question is too pitted to receive the sealant the floor is to be resurfaced with concrete per EPA or other appropriate criteria.

Earthen floors are to be swept to the extent practical. The dust is to be segregated into contaminated and non-contaminated groups. The non-contaminated group, soil determined not to have a level of pesticide contamination above the background level in the surrounding environment, will be disposed of by land spreading over fallow soil. Demonstrably contaminated material is to be removed and disposed of through pit burial or a similarly approved method for the pesticide in question. The floor is to be surfaced with concrete per EPA or other appropriate criteria.

8. Disposition of solids

Several options should be developed for the disposal of contaminated solids collected at the storage sites. These options should be covered in detail in the PDP, EA and presented for approval by the Technical Review Committee (TRC). The transportation and disposition of solids must meet EPA standards (see Annex K). Note: EPA Office of Solid Wastes allows variances to modify land-fill criteria on a case-by-case basis.

If burial is to take place appropriate excavation equipment must be brought to the storage site to make the burial pit and cover the area once the burial is complete. Materials to be buried are to be carried from the warehouse in closed open-top 200 l drums, which will be rinsed with diesel before re-use in the disposal operation.

9. Transportation and logistics

The discussion below applies to the movement of liquid pesticides. Once the appropriate type and number of isotanks and containers are rented, arrangements for their delivery to the operations site begin. Empty isotanks may be loaded two or three to a flatbed (20,000 l empty tank weight does not exceed 4 mt) and transported overland by the most direct route.

After the pesticide is loaded, full isotanks are loaded one to a flatbed due to weight (25 Mt) and safety factors. Routing should be over the best possible roads available during that season. The route is previewed and kilometer by kilometer road conditions are made available to the convoy. The average speed of the convoy should

not exceed 60 km/h and daily drive time not exceed 8 hours.

Rest breaks are scheduled at three hour intervals to avoid fatigue. All travel takes place during daylight hours; parking and camping arrangements are to be made accordingly. Vehicles are radio-equipped to provide assistance in case of a break down or accident and to coordinate vehicle movements.

A customs officer should accompany the convoy through local checkpoints. The project coordinator should travel ahead of the convoy to facilitate border crossings and make necessary arrangements. A contingency route should be programmed in case of natural or political problems.

10. Incineration

The incineration facilities must meet or exceed EPA incineration guidelines (see Annex L). A mechanism must be in place to properly track the material until it is completely incinerated, as emission data are required throughout the burn. Emission data are the responsibility of the incinerating facility and all results must be submitted to AID. As indicated in the MOU, one party will be responsible for obtaining the necessary importation and incineration permits and ensuring that all conditions stated by the country of importation are met.

11. Post operation review

A review of the transfer and disposal operation will be conducted. This review will be in the form of a meeting between the major parties involved in the execution of the plan. The primary purposes of the review will be to:

- to review experiences and lessons learned;
- document new procedures used in the operation;
- recommend improvements for similar operations in the future;
- determine cost effectiveness of the operation; and,
- review the process to establish a generic private sector recovery and disposal capacity.

f. Schedule of actions: The following is a schedule of actions which can be anticipated in undertaking a pesticide disposal operation. This schedule should serve as a checklist for developing, drafting and implementing a pesticide disposal plan. Actual time required to complete a disposal/remediation operation will vary depending on the options chosen, the quantity and nature of the product involved, logistics requirements, the need for site clean-up in addition to product transfer, and weather conditions. A minimum of 6 months can be expected from a request for assistance until the completion of an After Action Report.

-- Initiation of Pesticide Disposal Program based on request for assistance and informal agreement between parties to conduct assessment and planning process.

-- Inputs solicited from all potential participating parties on technical, legal, procedural issues and timing. Initial decisions made on which disposal or remediation option (land disposal, reuse/reformulation, incineration, ...) and contracting/procurement methods to be pursued.

-- Pre-operation assessment visit by the party providing technical assistance completed.

-- Decision, based on assessment report, to proceed with PDP.

-- Establishment of Technical Review Committee (TRC), allocation of responsibilities and designation of liaison persons for each party involved.

-- General implementation schedule and budget circulated.

-- Technical, procurement and legal advisors collaborate on the development of the budget, procurement plan and definition of responsibilities.

-- Complete draft PDP. Hard and electronic copies for technical review, distributed and translated, if needed.

-- EA drafted and submitted for approval/review. (Translate, if needed).

-- PDP and EA sent to host government.

-- TRC meeting for PDP and EA review.

-- Soil samples sent for residue analysis.

-- Participating party approval of the PDP via MOU.

-- Copies of Final PDP and approved EA sent to all participating parties and to countries of transit.

-- Procurement process begins.

-- Completion of procurement documents for isotanks, off-shore equipment and freight.

-- Shipment of materials to country of operation.

-- Identification of local physician responsible for health monitoring; shipment of blood sampling equipment to physician with briefing materials.

-- Concurrences of officials from countries of transit and the country of import and incineration.

-- Contract started for operations manager. Preparation of the operation site begins.

-- Arrival of containers at nearest seaport.

-- Recruitment of labor crews; blood sampling of crews, samples sent by express mail to analysis lab.

-- Arrival of containers in country of operation, confirmation of start date.

-- Local procurement complete. Departure of local materials for operation site. POL delivered to operation site.

-- Centralization of pesticide completed.

-- Arrival of containers at operations site.

-- Arrival of technical teams in country.

-- Training of crews.

-- Preparation of pumping and rinsing stations.

-- Operations begin.

-- Transfer of pesticide into isotanks, drum cleaning, drum conversion begins.

-- Site operations complete.

-- Shipment begins.

-- Shipment completed.

-- Incineration completed.

-- Post-operations review meeting.

-- After Action Report.

g. Summary Budget: Line items and calculation formulas for the summary budget are as follows (Additional details can be found in

Section IV, Budget and Annex G, Niger's PIO/T and Cs):

1. Labor
   1 training day x 15 laborers
   15 operation days x 15 laborers
   7 clean-up days x 8 laborers
   20 convoy days x 7 laborers

2. Per Diem
   same as above x appropriate local rates

3. Fuel and Solvent
   Fuel : As needed for support vehicles
   Solvent : 10 l solvent/ 100 l barrel x 3 rinses
   7 l solvent/ 60 l barrels x 3 rinses
   3 l solvent/ 20 l barrel x 3 rinses

4. Rentals (Isotanks, Container)
   isotanks = $ 6,000/month for 4 months
   container = $ 1,000/month for 4 months

5. Transport (Isotanks, Container)

6. Incineration and Smelting
   Incineration = $ 300/Mt
   Smelting = bid price

7. Equipment
   Calculated according to local rental or purchase prices. Niger equipment expenditures equaled $ 22,500.

8. Local/Misc. Costs
   Averaged $ 20,000 in Niger.

h. Public Affairs: Government officials of the country of operation and the countries of transit are briefed well in advance of the operation. All parties should be appraised of relevant changes in the operation as they occur.

News releases are developed jointly by participating parties. A fact sheet on the pesticide(s) is provided to the press; see Annex I for Niger Public Affairs Documents. Suggested time of releases: at the beginning of the pumping operation and upon completion of incineration. Exact timing of all US and European press releases to be coordinated amongst all parties.

Local press releases should be prepared for distribution by the host government throughout the operation. Addressing local health and environmental safety concerns will minimize negative reaction to the operation and general public awareness will facilitate on-site and transportation safety procedures.

C. Technical Review Committee: During the development of the PDP a Technical Review Committee (TRC) periodically examines the document. In addition to technical specialists the TRC should include environmental specialists, a procurement officer, a legal advisor and a public relations specialist from participating parties. Approval is dependent upon technical soundness, adherence to EPA standards for health and environmental safety, cost effectiveness, and compatibility with current participating parties' policy, program priorities and environmental procedures.

V. ENVIRONMENTAL ASSESSMENT

The following provides a descriptive outline of a Pesticide Disposal Plan Environmental Assessment. The actual assessment document may be part of an existing programmatic Environmental Assessment covering pesticide disposal or other related pesticide uses such as grasshopper control or integrated rural development.

If a programmatic Environmental Assessment (EA) has not evaluated the economic, social and environmental risks and benefits of the "use" (removal and destruction is considered a use) of the pesticide, AID regulations require that a Supplemental Environmental Assessment (SEA) be performed. If no EA has been done as part of a broader development program then PDP specific EA is required.

A. Introduction: A discussion of the purpose of the assessment; who requires it; the events or project proposal which led to an amendment being required; who will review the document and for what purpose.

Reference should be made to any documents being amended and the AID procedures which require the development of such a document. NOTE: Section 22 CFR Part 216 of the Environmental Procedures for AID Foreign Assistance (Reg. 16) states that it is AID's policy to ensure that environmental consequences of AID financed activities are considered and appropriate safeguards and mitigative actions are adopted. Section 216.3(b), Pesticide Procedures, states that when a project includes assistance for the use of pesticides registered by the U.S. EPA, the initial environmental examination must evaluate the economic, social and environmental risks and benefits. If the pesticide disposal is to be considered a "use", Section 216.3(b)(1)(iv) regarding pesticides for which EPA has taken regulatory action applies. The regulation requires that the nature of the EPA action be discussed with the host government and considered in an environmental assessment.

B. Pesticide toxicity and envrionmental fate

a. Toxicity: How the pesticide[4] is absorbed and stored within the body. How it is metabolized. Target organs. Teratogenic effects and fetal toxicity. EPA carcinogenic classification. Number and circumstances of fatal poisonings worldwide. Fatal concentration of the pesticide as well as concentrations found in the general population which have no complaint of ill health.

b. Environmental Fate: Resistance to biodegradation. Possible by-products of the degradation process.

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[4] If more than one pesticide is involved, the assessment should be completed for each pesticide, although part of the discussion can refer to the general type of pesticides involved if this is appropriate.

1. In Soil. Type of soil the pesticide is most likely to adhere to; propensity for leaching (indicator = concentrations found in ground water); depth of soil profile to which the pesticide is found; potential for surface run-off (indicator = concentrations found in the surface water); rate of volatilization from the soil, especially under environmental conditions existing in the country of operation; and potential for microbial degradation.

2. In Water. Occurrence in ground and surface water; potential for degradation in water.

3. In Air. Average lifetime in the atmosphere; data on atmospheric degradation of the pesticide(s) if available; propensity for photovolatilization from plants; properties of the photovolatilized pesticide(s), if different from the parent compound.

4. In Biosphere. Bioaccumulation at each level of the food chain (to the extent described in the scientific literature); animals most susceptible to poisoning and the lethal concentration; evidence of indefinite accumulation in the environment, if any.

C. Disposal options: Listing of the options for consideration and discussion of investigations performed to date. The following options were investigated, and conclusions made, in the Niger SEA:

a. Long term storage. This option required transferring the pesticide to new barrels for long term storage. These barrels were expected to deteriorate more rapidly than the toxicity of the product, thus requiring additional intervention at some later date. There could have been a temptation to use the product at some future date, especially in the event of major locust infestations or plagues. Security of the area would have required continual resource expenditure, and the space needed for storage of less persistent, usable pesticides would have remained occupied by an unusable product.

b. Landfill burial. Would have required perpetual security and the barrels, and possibly the pit liner, were expected to deteriorate before the pesticide.

c. Chemical detoxification. Chemical degradation techniques such as the KPEG technique developed by EPA's Dr. Charles Rogers, were still being studied. At that time, the products of the process were of unknown toxicity and the process produced an end product in greater quantity than the original pesticide.

d. Incineration. Incineration's main advantage is that it permanently destroys the unwanted chemical (EPA, 1988)[5]. The Congressional Office of Technology Assessment (OTA) had concluded that incineration was safer than land disposal and long-term containment (OTA, 1985)[5]. The generic concern about incineration was that very small quantities of "products of incomplete combustion" (PICs) may be formed, and that some of them may be toxic. In a high temperature incinerator, PIC formation is minimized by keeping the initial products of combustion at high temperature for the appropriate length of time, and by removing them with air pollution control devices.

Based on then-current data, EPA believed that incineration was the best technology available for the treatment of many organic wastes because it reduced both waste toxicity and volume (EPA, 1988)[5]. EPA has developed incinerator performance standards to ensure that no threat is posed to the surrounding population and environment (see Annex L).

Three main options existed for incineration:

1. Mobile dedicated high temperature incinerator. Issues against this option were: high cost, use of unproven technology, transportation constraints in Africa, and unsatisfactory results from recently performed mobile incinerator burns.

2. Cement kiln. This option was deemed inappropriate in Niger due to the deteriorated condition of the only kiln in country and the political difficulty encountered sending the pesticide to a neighboring country for incineration.

3. Incineration in a third country. The unprecedented option pursued by Niger, made possible by the unique collaboration of a pesticide manufacturer using technology and contacts, AID funding and field personnel, GTZ co-funding and technical assistance and host country ground support. The pesticide (dieldrin) was collected in specialized isotanks, then transported to Holland for destruction in a state-of-the-art incinerator. Note: The Niger dieldrin was transported to Holland as pesticide, not as toxic/chemical waste.

e. Barrel disposal. The option of smelting the barrels locally should be explored. If appropriate facilities are unavailable the option exists of sending the barrels to a third country for disposal. The volume of barrels to be transported may be reduced by cutting or crushing the rinsed and dried barrels. Methods for reducing the volume of barrels to be transported are: Electric barrel crushers, Flattening the barrels with heavy machinery (such as a bulldozer), Cutting barrels into sections with a manual drum cutter.

[5] Additional citations are contained in original document.

D. Pesticide Disposal Plan (PDP) activities: Each PDP activity is summarized and comments made regarding their technical soundness and compliance with EPA regulations. The PDP operations outline (Table of Contents) should be followed as a guide for this review.

Recommendations are made which would improve health and/or environmental safety of the operation. Areas requiring additional monitoring are highlighted. The activities to be reviewed include:

a. Training. Location, duration, participants, facilitator, content, method of delivery, and language(s) of execution.

b. Health monitoring. Blood sampling method, appropriate local health provider, briefing health provider and local health facilities, first aid kits and therapeutic drugs available at the site, essential health facilities at the site, health monitoring procedures and frequency, and appointment of appropriate health and safety monitor.

c. Site security and safety. Enclosures, access, guards, admittance procedures, identification of high risk activities, safety procedures (applicable to staff, crew and observers), safety equipment, and appointment of an appropriate safety officer.

d. Personnel. Minimum staffing requirements, experience preferred, and designation of an appropriate personnel recruiter.

e. Equipment. Review equipment specifications to ensure they meet or exceed EPA standards.

f. Centralization of stock and transfer of pesticide(s) to Isotanks. Collection and centralization activities, special treatment of leaking barrels, safety procedures during transport from outlying storage sites, contingency procedures in the event of an accidental spill, detailed sequence of activities for the transfer to isotanks and the rinsing and conversion of contaminated barrels, health and environmental safety procedures practiced throughout the operation and the designation of an appropriate site safety officer.

g. Clean-up operation. Pre- and post-operation soil sampling procedures which test pesticide residue levels of the soil at the storage warehouse and surrounding yard, analysis performed on samples, designation of heavily versus minimally contaminated soil and the appropriate method of disposal for each, procedures for cleaning and sealing the warehouse floors, follow-up sampling of the disposition area for the contaminated solids.

h. Disposition of solids. Estimation of the volume of contaminated solids to be treated, pro's and con's of soil disposal options. NOTE: A decision matrix could be developed by the TRC regarding which level of residue found in the soil samples would invoke which disposal option.

1. Land spreading. Location description; risk to human, animal and plan life; distance to nearest inhabited areas, migration routes, and water sources; rate and effects of volatilization using this method, including substantiating studies; degradation rate and likely by-products given the properties of the pesticide(s) in question in relation to the local environment, e.g. soil type, climate, etc.; method and rate at which the contaminated soil would be spread; using soil as the diluent; possible public opinion regarding use of this method. In general, it is recommended that lightly contaminated soils be spread on the surface of a posted use site in such a way as to simulate the formerly acceptable use rate.

2. Burial at a mine site. Location of the mine; security at the site; method of burial; logistics, transportation and equipment necessary; possible public opinion regarding this method of disposal, especially the opinion of the mine workers union.

3. Pit disposal. Site hydraulic characteristics, based on data from reliable hydraulic maps; waste characteristics in relation to the local environment; engineering design compliance with EPA Office of Solid Waste (OSW) recommendations for landfilling the pesticide(s) in question; equipment and materials necessary; possible public opinion regarding this action. NOTE: Variances may be applied which modify landfill criteria on a case-by-case basis.

i. Transportation and Logistics. Detailed itinerary with descriptions of road conditions, distances, communication plans, security during rest stops, contingency plans for accidents and maps; road conditions and water courses traversed at the time (season) of transit; safety procedures while in transit and at the storage facility site awaiting sea transport; compliance with relevant international and national laws and regulations regarding transport of pesticides by land and sea; appointment of appropriate staff personnel to monitor the decontamination of the isotanks and the documentation assuring compliance with maritime law.

j. Incineration. Review of the specifications of the incineration facility to ensure they meet or exceed EPA standards required under the Resource Conservation and Recovery Act (RCRA) for organic compounds, dioxins and dibenzofurans, or the more stringent standards required under the Toxic Substances Control Act (TSCA) for polychlorinated biphenyls (PCBs); quantity and mixture in which the pesticide(s) to be burned; trained staff and monitoring equipment available at the facility; documented emissions tests and mechanism to track when the pesticide(s) are completely incinerated.

E. Additional Environmental Assessment Issues

a. Public Awareness Considerations. Existence of a plan for informing government officials, involving the press and facilitating general public relations; Participating parties representatives in the countries of transit are briefed and provided a copy of the operation plan; government officials in the countries of transit are briefed in a timely fashion and by the appropriate channels; press release content and timing are coordinated among the participating parties; fact sheet on the pesticide(s) and the removal operation are developed and forwarded as appropriate for onward distribution in the country of operation.

b. Populations at Risk

1. Human populations. Census of the local population at the operations site(s) and the population of the villages, towns, and cities the convoy will pass through; subpopulations most at risk e.g. nursing infants, pregnant women, etc.; risk reduction factors encompassed by the plan; comparison of risk due to no action versus the action proposed by the PDP.

2. Wildlife populations. Proximity to migratory routes, bird nesting areas, protected areas and bodies of water; concentration of the pesticide(s) in the existing populations along the transport route; comparison of the risks due to no action versus the action proposed by the PDP.

c. Emergency Contingency Plans. Review of contingency plans for technical soundness, adherence to EPA standards and a demonstrated willingness on the part of all parties involved to adopt the aforementioned plans. Contingency plans should be outlined to handle accident site assessment, first-aid, site security, pesticide containment and clean-up, and changes in travel conditions, personnel or timing.

d. Accidental Release: Mitigating Factors. Designation of the primary potential causes of accidental release of the pesticide into the environment during this type of operation and a review of the safeguards and procedures identified to address these possibilities; identification of the risk should an accidental release occur despite the safeguards and safety procedures.

e. Environmental Monitoring. AID Regulation 16 states monitoring should be done to measure any changes in environmental quality, positive or negative. Review of all monitoring systems identified in the PDP to ensure an adequate monitoring plan is in place before the start-up, and throughout the operation. Follow-up sampling may also be indicated.

f. Implications of No Action. Possible short and long term effects of no action are analyzed. Beyond the risk to local populations and the environment, does no action substantiate any commitment made by parties involved in the PDP to the host country to reduce pesticide risks; would

no action promote responsible stewardship of pesticides on the part of private industry.

F. Conclusions. Closing statement and recommendation for approval or denial of the operation plan by the Technical Review Committee.

G. References. Policies, procedures, congressional acts, case studies, articles and telecommunications cited as substantiating references in the EA.

Annex A: DESCRIPTIVE CHRONOLOGY: Niger Dieldrin Disposal Program.

1974	AID speaks out against the use of chlorinated hydrocarbon pesticides because of the bioaccumulativity and persistence in the food chain, particularly under developing country conditions.
1986	US press incorrectly accuses AID of supporting the use of dieldrin in Niger. USAID/N initiates discussions with the GON on problems associated with dieldrin use.
1986	In response to grasshopper/locust outbreak FAO proposes funding the transportation of a gift of dieldrin from the Government of Tunisia to the Government of Mali. USAID intervenes diplomatically to "prevent" that shipment but is unable to stop similar deliveries.
1988	Dieldrin delivered by aircraft to Agadez. Libya and Tunisia are reported sources.
5/88	USAID/N opposes, in writing, the use of dieldrin in 1988 locust/grasshopper campaign.
7/88	USAID/N requests GON not use dieldrin stocks; cites possible stoppage in USG anti-locust aid if dieldrin used.
7/88	GON indicates willingness to not use dieldrin stocks if other pesticide supplies are adequate for needs.
5/9/88	USAID/N delivers 20,000 l. malathion to Niamey (and additional 40,000 l. between June and September, 1988) as an alternative to the use of dieldrin in locust control.
10/88	FAO meeting in Rome to discuss the use and hazards of dieldrin in desert locust control. FAO declares dieldrin is no longer an FAO approved pesticide and commits to undertaking an inventory of dieldrin stocks in N. Africa as a prerequisite to dealing with the problem of dieldrin disposal or containment.
late 1988	WWF/N and USAID/N fence pesticide storage site at Iferouane with DCP personnel. Funding from USAID/N.
early 1989	WWF/N alerts USAID/N that barrels of dieldrin are leaking at Tchintalouse in the Air mountains.
3/2/89	OFDA provides USAID/N technical advice on containment and sampling of dieldrin leakage in Niger.
	EPA specifies protective clothing required for persons involved in sampling, transport, or storage of dieldrin.

16/3/89	USAID/N receives formal letters from GON requesting assistance in developing a response to the problem of leaking dieldrin barrels in northern Niger.
2-18/3/89	D. Sutherland, senior EPA entomologist, visits Niamey to develop implementation plan for removal or safe storage of surplus and unusable insecticides in Niger.
14/4/89	USAID/N submits draft Dieldrin Risk Reduction Plan to GON. Copies forwarded to other donors. USAID/N allocates 30,000 USD of AELGA funds for the dieldrin management plan. Other donors to be solicited for remaining 55,000 USD of the estimated cost. Mission requests GON select two regional storage sites to be fenced with AELGA funds.
19/5/89	AID/W approves Sutherland's Implementation Plan for GON to Reduce Hazard of Surplus and Unusable Insecticides Acquired for Use in the Locust/Grasshopper Control Program.
5/89	GON approves dieldrin risk reduction plan and designates site in Agadez for isolated pesticide storage.
22/6/89	USAID/N completes Phase I of Dieldrin Risk Reduction Plan. Actions included: (1) retrieval of dieldrin drums from Arlit, Iferouane, Tchintalouse; (2) collection of soil samples from Tchintalouse; (3) burial of small volume of contaminated solids in Arlit; and (4) assessment of future containment requirements.
8/7/89	GTZ Pesticide residue analysis laboratory analyzes 47 soil samples taken from Tchintalouse. Pesticides analyzed include; dieldrin, karate, fenitrothion, malathion.
7/8/89	USAID/N requests quotations for specialized over-pack drums from manufacturers.
7/8/89	AID/W holds peer review of Dr. Charles Roger's "KPEG"[6] procedures for the on-site disposal of chlorinated hydrocarbon pesticides by chemical degradation. Consensus: decomposition of lindane and dieldrin is possible using this method but additional research needed before it can be recommended.
14/8/89	GTZ provides USAID/N results of soil samples taken in Tchintalouse. Results indicate relatively high concentrations of dieldrin.
8/89	USAID/N fences pesticide storage sites in Agadez and Arlit.

[6] Potassium Polyethylene Glycolate

4-8/9/89	FAO sponsors pesticide management workshop in Ghana. Topics: international code of conduct on distribution and use of pesticides, field research, legislation and legal procedures, pesticide storage, role of private industry in implementation of code.
14/9/89	Shell provides USAID/N with specifications on barrels appropriate for long term storage of dieldrin.
9/89	USAID/N fences two pesticide storage sites at Tchintalouse.
1/11/89	AID/W informs mission that cement kiln burn demonstration in Pakistan is scheduled mid-November.
6/11/89	Shell forwards information on dieldrin formulation to USAID/N.
9/11/89	Morocco locust control project supplies USAID/N with lessons learned regarding use of drum crushers.
11/11/89	USAID/N unable to attend Pakistan test burn, requests results when available.
10-11/89	FAO evaluation missions visit Chad, Mali, and Tunisia to survey pesticide stocks, including dieldrin.
11/89	USAID/N designates $54,000 for the Niger Dieldrin Risk Reduction Plan under AELGA.
21-26/1/90	AID/W Africa Bureau sponsors West African Regional Pesticide Disposal Conference in Niamey to discuss disposal options of obsolete pesticides. International donor agencies, government ministries and private industry representatives participated.
17/4/90	Shell International contacts USAID/N to explore possibility of collaboratively removing dieldrin from Niger for incineration in Holland. Anticipated quantity to be shipped: 27,000 L; anticipated cost to be covered by USAID not to exceed 74,000 USD. PRIFAS publishes article criticizing USG policy regarding the use of pesticide dieldrin.
29/4/90	Dutch authorities begin review of the draft Shell disposal plan.
25/4/90	USAID/N notifies GON/Directorate of Crop Protection that: (1) appropriate disposal technology is not available in Niger (e.g. cement kiln disposal) (2) appropriate technology cannot be expected to be operational for 3 to 5 years. As a result, the draft plan for the second phase of the risk reduction focuses on assuring safe long term storage until appropriate disposal facilities are operational.
6/90	Greenpeace correspondent releases article opposing incineration of obsolete pesticides due to the possible generation of large quantities of PICs (Product of Incomplete Combustion).

2/8/90	Shell requests the following from USAID/N before continuing their draft proposal; (1) formal request for assistance; (2) clarification of ownership of dieldrin stock and responsibility for public health; (3) GON to secure necessary security and political clearance for movement through Burkina Faso and Togo.
9/8/90	USAID/N receives initial proposal from Shell regarding their willingness to collaborate in the removal of obsolete dieldrin stocks from Niger for high temperature incineration in Holland.
13/8/90	Shell completes the French translation of the initial proposed disposal plan.
18/8/90	USAID/N forwards Shell proposal to AID/W and OFDA.
23/8/90	Shell requests that USAID confirm or deny statement from Greenpeace article that "Ironically, USAID, which organized the disposal conference in Niamey, concluded last year that there was no evidence that dieldrin and lindane had been effective in preventing locust and grasshopper plagues. USAID subsequently terminated programs that encourage the use of these pesticides."
	Shell proposes a technical assessment team visit the dieldrin storage sites in Niger 10-16/9/90.
31/8/90	USAID/N asks to postpone the assessment team visit until week of 24/9/90.
4/9/90	Shell assessment team unavailable for week of 24/9/90. Counterproposal is week of 17/9/90. Shell is opposed to postponing visit until Oct. 1990 due to added time constraints to the operation start-up date.
9/9/90	GON expresses concern about all obsolete pesticides. Shell's proposal is to deal only with the pesticide which they manufactured, dieldrin.
10/9/90	USAID/OFDA environmental officer, Gudrun Huden, investigates source of Greenpeace quote and refutes it's accuracy.
12/9/90	USAID/N requests ASAP guidance from AID/W regarding the mission's ability to process the Shell proposal if all FAR requirements, including advertising requirements and sole source justification, are met.
	Shell confirms assessment team's arrival in Niamey 16/9/90 for approximately one week.
16/9/90	Shell assessment team, D. Zwartbol and G. Kroezemann, arrive in Niamey.
17/9/90	Shell assessment team meets with USAID and DCP.

18/9/90	AID/W sends approval which allows for deviations to the US AIDAR i.e. the USAID/N may now receive and process the Shell proposal directly.
18-20/9/90	Shell assessment team visits dieldrin storage sites in Agadez and Inabangharit.
21/9/90	Shell assessment team briefs USAID/N and AFR/TR Director Cobb on their findings. Major findings include: the volume of dieldrin and flushing liquid to be removed is 70 m^3, 80% more than had been anticipated; technical aspects of the retrieval should not pose significant problems; facilities and experienced personnel are adequate; most viable option for transfer of dieldrin in Inabangharit would be to truck drums and over-pack barrels to Agadez before pumping into isotanks; Shell and USAID are to investigate the possibility of air freighting the isotanks from Agadez to Europe due to the possible difficulty of securing overland transit agreements from neighboring countries. USAID/N passes briefing materials to GON. AID/W advises mission that in order to support the program, USAID/N must either: (1) amend and expand the draft Niger SEA to address [Shell's] proposed dieldrin disposal plan in detail; or (2) prepare a separate initial environmental examination and an environmental assessment that discusses the proposed plan and addresses potential adverse environmental impacts. Option 1 is chosen by the mission.
24/9/90	AID/W Representative Knausenberger passes copy of the proposal to FAO for information and possible cooperation in implementation.
25/9/90	USAID/N begins formal contracts with GON on selection of disposal site in Niger, transit authority through neighboring countries and liability.
9/10/90	Shell confirms Oct. 15 meeting in London.
12/10/90	USAID/N requests that AID/W establish a Technical Review Committee (TRC) to study and comment on the Shell proposal.
15/10/90	Shell-USAID/N meeting in London to discuss the proposal to collaboratively remove dieldrin from Niger for incineration in Holland. Agenda: (1) Review findings from recent SNC/SICM assessment visit in Niger; (2) Review AID/W fax points of 20/9/90; (3) Agree on revised plan of action and outline costing; (4) Agree on next steps.
19/10/90	USAID/N requests AID/W circulate and distribute all NDDP related communications to the mission.
22/10/90	USAID/N Representative Kelly briefs AID/W on results of the 15/10/90 meeting with Shell in London.

23/10/90	AID/W convenes a TRC meeting to assess the status of the deliberations with Shell, identify remaining technical issues, outline an implementation plan, allocate responsibilities and establish a timetable for follow-up.
30/10/90	AID/W sends SICC draft outline of the TRC reviewed implementation plan.
2/11/90	USAID/N requests whether the steel facility in Lome is interested in the cleaned dieldrin storage barrels as scrap metal.
12/11/90	USAID/N requests USAID/Burkina Faso and USAID/Togo assistance in ascertaining whether there are any restrictions on the transit, via freight forwarders, of pesticides through Burkina Faso and Togo.
15/11/90	Director of Lome steel mill responds negatively to the disposal of the dieldrin storage barrels at their facility.
	EPA circulates proposal to landfill contaminated solids, for comments.
19/11/90	TRC meeting to merge USAID/N and SICC inputs into the NDDP draft.
22/11/90	Technical planning meeting between AID and Shell held in the Hague to discuss the NDDP. Topics covered: division of responsibilities, legal issues, timing and task time line, plan development responsibilities, landfill/disposition of solids, incineration criteria, transportation, insurance, budget, and technical review. USAID to investigate the option of air transport from Niger to Lome with sea transportation onwards to the Netherlands.
23/11/90	USAID/N Representative Kelly meets with GTZ in Eschborn to brief GTZ/Pesticide Service Project personnel on the NDDP and solicit their support in the effort.
26/11/90	Translation of draft SEA sent to the GON ministries.
27/11/90	Review meeting of all AELGA funded projects.
28/11/90	Shell notes they are unable to support the 15/11/90 EPA landfill proposal, requests EPA's urgent counterproposal.
13/12/90	USAID/N sends SICC a revised operations schedule, operations to begin in Agadez March 8, 1991.
16/12/90	USAID/N sends final NDDP draft to SICC and AID/W.
23/12/90	EPA chemist Jude Andreasen arrives in Niamey to complete the SEA amendment for the NDDP.

31/12/91	USAID/N requests GTZ technical and financial assistance in the laboratory testing of soil samples taken from the dieldrin storage sites.
4/1/91	USAID/N provides draft SEA amendment to AID/W for review.
7/1/91	USAID/N sends AID/W technical review committee, SICC, and GTZ revision 4 of the NDDP draft.
10/1/91	C. Kelly collects soil samples: 8 from DDA warehouse Agadez, 28 from NAAC warehouse in Inabangharit, 5 at 1 km intervals along road from Inabangharit well towards Agadez.
15/1/91	USAID/N requests AID/W provide concurrence to the NDDP by 30/1/91 or the Mission would be obliged to cancel the dieldrin retrieval operations.
28/1/91	TRC completes final review of the NDDP and SEA amendment, approves draft contingent on suggested changes.
30/I/91	AID/W approves NDDP.
4/2/91	USAID/N prepares Dutch import application for GON signatures.
16/2/91	USAID/N submits draft SOW for Operations Manager to AID/W for comment.
19/2/91	GTZ project team leader, Dr. Vaagt arrives in Niger to finalize GTZ commitments and obligations.
22/2/91	AID/W responds with comments on the proposed SOW for an operations manager.
1/3/91	USAID/N receives freight contract RFP from REDSO for vetting.
2/3/91	USAID/N decides a one month delay in NDDP will not result in a significant increase of road transportation risk. Shortening the loading time in Agadez and shipping the dieldrin to Lome before the completion of clean-up operations would regain two of the three weeks lost by delays.
4/3/91	SNC signs amended memorandum of understanding for the NDDP.
I2/3/91	Freight carriers receive RFP on the NDDP freight contract.
14/3/91	REDSO receives PIO/T for round trip freight contract of isotanks Holland-Lome-Holland with 57,384 USD remaining in AELGA funds. Remainder to be funded once "Brooke-Alexander" restrictions are lifted.

18/3/91	USAID/N submits translations of NDDP and SEA documents to GON, USAID/BF, REDSO/Abidjan.
20/3/91	USAID/N obtains verbal agreement from the GON Secretary of State for Agriculture for the dieldrin retrieval operations.
21/3/91	GTZ signs MOU for NDDP allocation of responsibilities. GTZ provides USAID/N with soil residue analyses.
26/3/91	SNC ships freight container from Holland to Togo.
	USAID/N Director Eaton meets GON Secretary of State Agriculture. Instructions given to GON/DCP to complete appropriate paperwork and sign the MOU.
28/3/91	"Brooke-Alexander" restrictions lifted. USAID awards freight contract to SNTN.
29/3/91	USAID/N sends translation of the NDDP and SEA documents to USAID/Togo, AID/W, SICC, GTZ.
4/4/91	Isotanks and equipment leave Holland for Lome, Togo.
5/4/91	USAID/Mali requests copy of NDDP. GRM has obsolete pesticide stock on hand and is interested in finding a way to dispose of it.
18/4/91	Isotanks arrive in Lome, Togo.
19/4/91	GON signs Memorandum of Understanding for NDDP.
21/4/91	SNC technical team arrives in Niamey.
22/4/91	USAID/N submits translations of the NDDP to GON ministries: Ministry of Public Health, Ministry of Agriculture and Livestock, Ministry of Water and Environment.
24/4/91	EPA observer Jensen arrives in Niamey to monitor field operations.
	AID/W distributes draft press release regarding the commencement of the dieldrin removal activities in Agadez.
26/4/91	GTZ representative Schimpf arrives in Niamey.
29/4/91	USAID/N signs the Memorandum of Understanding with GON, GTZ and SNC for the NDDP.
30/4/91	Isotanks loaded in Lome for transport to Niamey. Departure delayed by holidays and problems with essential paperwork.
	GON signs Dutch import application.

1-4/6/91	Technical team labels isotanks with international codes for flammable and toxic compounds and briefs convoy personnel on safety and emergency procedures. Vehicles receive thorough equipment check. Transit and customs documents are reviewed for accuracy. Post operation blood samples are drawn.
4/6/91	Prefect of Agadez makes televised visit to the Agadez operations.
5/6/91	Dieldrin convoy departs Agadez for Lome, Togo. The first stop is to be B. Konni, Niger. Later the same day USAID/Togo advises the convoy not to travel through Togo due to expected political problems. Convoy is rerouted to Cotonou, Benin.
	AID/W submits XA approved draft press release to USAID/N for comments. Final content and release date to be coordinated with Shell and GTZ.
6/6/91	Convoy travels from B. Konni to Dosso.
7-11/6/91	Convoy parks at Dosso awaiting resolution of Togo/Benin transit problems.
7/6/91	DRU coordinator, C. Kelly precedes convoy to report on road conditions and make appropriate travel arrangements. GOH signs formal agreement on the importation of the Dieldrin for incineration at the AVR plant in Rotterdam.
	SNC technical advisors leave Niger.
	SICC expresses concern over the wording of the press release drafted by AFR/XA.
12/6/91	Convoy travels from Dosso to Gaya. Ministry of Foreign Affairs (GON) advised of change in itinerary for the dieldrin convoy.
13/6/91	Convoy travels from Gaya to Parakou, Benin; ship on which dieldrin to be loaded passes Cotonou 7 days early. Efforts made to reroute shipment to Lome for the following reasons: the long expected delay of a ship passing through Cotonou willing to handle the dieldrin, the high cost of storage space in Cotonou, the availability of no-cost storage at the Shell/Togo facilities and a greater degree of political stability apparent in Togo.
14-15/6/91	Convoy parks at Parakou.
16/6/91	Convoy travels from Parakou to Cotonou.
17/6/91	Convoy parks at Cotonou.
18/6/91	Convoy arrives in Lome, Togo. Travel days = 6, Stop days = 8.

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20/6/91	Dieldrin unloaded from contractor's trucks and placed in hazardous materials storage.
21/6/91	Due to holidays in Togo the ship on which the dieldrin is scheduled passes Lome without taking on cargo.
22/6/91	Workers and convoy personnel return to Niamey.
26/6/91	M/V Woerman Ulanga loads four isotanks of dieldrin and one dry box. USAID/N Representative Kelly and Shell/Togo monitor the loading process.
27/6/91	Dieldrin leaves Lome for Rotterdam. USAID/N notifies SNC, SICC and AID/W of shipping changes.
2/7/91	SNC reports receiving 26 blood samples drawn from workers at the beginning of the operation and 7 samples (2 of which arrived broken) for workers at the end of the operation.
30/6/91-5/7/91	DDA warehouse floor is prepared for resurfacing. DCP crews bury 20 m^3 of contaminated sand, soil, absorbent and solids in landfill pit constructed to NDDP standards 10 km from Agadez. Blood samples scheduled to be collected from second worker crew, warehousemen, and any untested personnel.
9/7/91	USAID/N sends AID/W their preliminary comments and Lessons Learned from the dieldrin disposal operation.
10/7/91	Site-inspection of the clean up activities in Agadez.
20/7/91	Dieldrin unloaded at Antwerp due to dock strikes in Rotterdam. The isotanks are sent to Pernis by railroad, the couplings are changed and the tanks are sent on to AVR to be emptied. The tanks are later returned to Pernis for final cleaning.
	Final NDDP field operation report due from NDDP operations manager.
7/91	USAID/N submits translation of news release to GON.
7/91	SNC circulates press releases and news articles in Europe.
27/7/91	USAID/N sends SNC/Pernis Purchase Order for the incineration of the dieldrin.
1/8/91	AID/W circulates the XA approved press release in the U.S.
8/7/91	Shell proposes post operation review meeting at the Hague 26-27 Sept. 1991.

8/8/91	USAID/N submits proposal to GTZ for the financing of the rehabilitation and upgrading of the DDA warehouse in Agadez from remaining GTZ funds.
24/8/91	USAID/N solicits participants comments on the NDDP operation from the technical review committee in Washington, SNC, GTZ, GON. Responses requested by 5/9/91 for compilation before the meeting in the Hague.
26/8/91	GTZ returns to USAID/N the analytical results of the soil samples taken before and after the NDDP operation. Analysis indicates the wall of the DDA warehouse in Agadez is highly contaminated with Fenitrothion. GTZ agrees to USAID proposal to rehabilitate and upgrade the DDA warehouse.
8/9/91	AID/W confirms meeting with GIFAP to review Niger dieldrin program scheduled for 30 Sept. 1991.
19/9/91	USAID/N receives Shell's comments and recommendations for future disposal operations.
22/9/91	USAID/N draws post operation blood samples to replace those missing or broken in the original shipment to SNC.
26-27/9/91	Post operation review meeting at Shell Nederland Chemie, The Hague, among the major parties involved in the execution of the plan. The primary purposes of the meeting are: - to review the experiences and lessons learned; - document the actual procedures used in the operation; - recommend improvements for similar operations in the future; - determine whether this type of operation is cost effective; and, - review the planning process to establish a generic recovery and disposal plan.
30/9/91	Reporting cable (Hague 7371) summarizing the NDDP review meeting sent to AID/W and USAID Missions in Africa.
1/3/92	Agadez warehouse rehabilitation complete.

Annex B: PERSONNEL AND PARTICIPANTS. The following is a list of personnel and participants in the NDDP with a summary description of the contribution made by each participant.

United States Agency for International Development (AID)

Central Headquarters/Washington

L. Saiers, AFR, Deputy Assistant Administrator:
Cleared all US press releases and coordinated media releases with all major parties participating in the disposal operation.

R. Cobb, AFR/Technical Resources Office Director:
Reviewed and approved the NDDP AELGA SEA Amendment. Upon approval by the Technical Review Committee gave final authorization for the NDDP operation.

W. Knausenberger, AFR/TR/Natural Resources Consultant:
Chief technical advisor in Washington. Coordinated AID/W and EPA activities. Primary contact person for Shell, GTZ, and USAID/N coordinators. TRC participant.

W. Thomas, AFR/TR/Natural Resources Consultant:
TRC participant.

J. Gaudet, AFR/TR/ANR Environmental Officer:
Monitored the planning, implementation and review for possible replication in other USAID assisted countries. Ensured agency environmental policies were followed.

G. Huden, Office of Foreign Disaster Assistance:
Supplied technical references to similar activity in Pakistan. Investigated validity of Greenpeace media comments. TRC participant.

Technical Review Committee:
A multidisciplinary team of AID and EPA technicians reviewed the NDDP for sound environmental and health procedures which would meet or exceed EPA standards. When necessary, proposed options appropriate to the Sahel.

AID Regional Economic Development Support Office/West and Central Africa (REDSO/WCA), Abidjan

S. Cromer, Regional Contracts Officer:
Advised Mission on all procurement; executed all contracts over 100,000 USD.

M. Alexander, Regional Legal Advisor:
Clarified legal position of USAID regarding contracting, purchasing, insurance requirements and liabilities; negotiated with GTZ and Shell regarding memorandum of understanding (MOU).

R. Hanchett, Regional Environmental Officer:
Reviewed the project design, provided advice and options regarding environmentally sound procedures appropriate to the Sahel.

Country Mission/Niger

J. Slattery, AELGA Project Officer:
Chief, General Development Office:
Provided final authorization for the deployment of personnel, resources and finances of the Disaster Relief Unit handling the dieldrin disposal operation. Met with GON ministry officials to finalize MOU's and speed execution of necessary paperwork.

C. Kelly, Disaster Relief Coordinator:
Drafted NDDP. Coordinated activities of all participating parties, supervised retrieval operations in Agadez, accompanied convoy to the exit port, tracked dieldrin until completely incinerated.

S. Kondo, AELGA Project Assistant:
Assisted in the drafting and translation of the NDDP, made all pre-operation arrangements in Agadez (labor, lodging, health), managed accounting for procurement of local materials and payment of salaries and per diems, served as facilitator, translator and liaison officer whenever necessary.

G. Ouedraogo, Operations Manager, Agadez:
Hired to develop logistics plan for the movement of personnel and commodities to and from Agadez. Coordinated daily NDDP operations at Agadez with GON, AID and Shell. Managed accounting system for local procurement and salaries. Tracked status of the dieldrin, solvent, barrels, scrap metal, tools, and contaminated solids to the point of shipment from Niger or in-country disposal.

5 Drivers

Government of Niger (GON)

Ministry of Agriculture

M. Boulama, Secretary of State:
Signed official documents and provided authorization for GON participation in all NDDP related activities.

Dept of Agriculture:
Direction of Crop Protection (DCP)

O. Kabo, Director Crop Protection Service:
Reviewed NDDP draft. Facilitated contact with appropriate ministry personnel to sign the MOU. Assigned the GON project coordinator. Authorized DCP and CNAA collaboration.

I. Denga, GON Project Coordinator:
Supervised the technical and administrative component of all GON inputs during the operation phase.

H. Belko, Assistant GON Project Coordinator:
Assisted in the technical supervision of the labor team.

I. Mouddour, Agriculture Engineer (former DCP Director):
Provided country specific technical and institutional advice during the development of the NDDP operations plan. Facilitated implementation of the plan.

2 Drivers

National Antilocust Center (CNAA)

M.S. Mouddy, Director CNAA, Agadez:
Maintained communication with appropriate local authorities (Prefect, Mayor, Dept. Director of Agriculture). Advised team on the technical assistance and commodities available in Agadez, facilitated contact with appropriate personnel when necessary. Arranged the hiring of experienced local laborers

M. Alhasanne, Deputy Director CNAA, Agadez:
Coordinated motor pool and secretarial assistance. Acted as guide for the Inabangharit retrieval operation.

15 Laborers:
Collected, pumped, rinsed, cut, crushed, and packaged 660 drums of dieldrin according to the operational standards set forth in the NDDP. Constructed, filled, and covered the landfill pit for $20m^3$ of contaminated solids.

4 Drivers
1 Secretary
1 Laundryman
1 Warehouseman
1 Watchman

Departmental Direction of Agriculture (DDA)

M. Boubacar, Director DDA Agadez:
Advised on the disposal operation in Agadez.

Ministry of Health:

1 Medical Doctor:
Provided health care for team members whenever necessary.

1 Medical Technician:
Drew pre- and post operation blood samples from laborers using equipment and procedures designated by Shell.

Army/National Guard:

70 Officers and Guardsmen:
Provided security for Inabangharit operation.

Customs

1 Customs Officer:
Accompanied the convoy and facilitated clearances at custom checkpoints in Niger.

Ministry of Public Works

A. Gado, Departmental Director of Public Works:
Facilitated the rental of necessary equipment for the barrel crushing operation.

1 Bulldozer Driver:
Crushed empty barrels in preparation for transport to smelting plant in Holland.

Ministry of Mines

1 OFEDES Officer:
Facilitated the rental of a compressor and the hiring of experienced local labor for the excavation of the landfill pit for contaminated solids.

German Technical Assistance (GTZ)

G. Vaagt, Project Chief:
Negotiated GTZ contributions and signed final MOU.

W. Schimpf, Chemist:
Field operation representative. Ensured proper soil and blood sampling procedures were executed, inspected spill areas and recommended clean-up procedures, monitored GTZ funding contributions.

Shell International Chemical Company (SICC)

Shell International Chemical Company, London

L.S. Dollimore, CHSEL/23, Chemical, Health, Safety & Environment:
Presented Shell retrieval and incineration option. Chaired planning, action and review meetings. Coordinated all Shell contributions to ensure timely delivery of materials, personnel, and technical assistance.

E.W. Nickson, Chemical Division, Public Affairs:
Coordinated European press releases with AID/Washington. Supervised production of a training video covering the NDDP operation.

Shell International Chemical Maastrich, The Hague

D. Zwartbol, Fine & Agro Chemical Manufacturing:
Performed pre-operation assessment visit. Advised and trained workers in proper dieldrin handling and safety measures, monitored the pumping and transfer operations,and briefed convoy personnel on safety and emergency procedures during transit. Ensured isotanks were properly labeled with international codes for flammable and toxic compounds.

Shell Nederland Chemie/Pernis

G. Kroezemann, Chemical Division, Agricultural Services:
Performed pre-operation assessment visit. Advised and trained workers in proper dieldrin handling and safety measures, monitored the pumping and transfer operations, and briefed convoy personnel on safety and emergency procedures during transit. Ensured isotanks were properly labeled with international codes for flammable and toxic compounds.

J. Backer, Legal Advisor:
Liaised with AID legal advisor regarding all legal arrangements and the MOU.

Shell Nederland/Rotterdam

H. Williamsen, Fine & Agro Chemical Manufacturing, Assistant Plant Manager:
Arranged sea transportation of the isotanks and Shell sponsored equipment from Holland to Lome, Togo. Coordinated the return sea shipment of the full tanks and their overland delivery to the incineration site.

Environmental Protection Agency (EPA), USA

J. Andreasen, Chemist:
Drafted the SEA for the Niger Dieldrin Disposal Plan. TRC participant.

J. Jensen, Chemist:
Scheduled to monitor the environmental safety procedures utilized during the pumping and transfer operations in Agadez. Due to the late arrival of the isotanks was unable to observe the operations. TRC participant.

Niger National Transportation Company (SNTN)

J. Afanibo, Commercial Director:
Contracted for the shipment of four empty isotanks and one freight container from Pernis, Holland to Agadez via Lome, Togo and the return of the full tanks and container to the same port. Provided the requested number and type of vehicles and drivers on the dates specified.

Annex C: BUDGET.

NIGER DIELDRIN DISPOSAL PROGRAM
PROGRAM COSTS AND CONTRIBUTIONS - ALL AMOUNTS IN US$

ITEM	SUBTOTAL	AID		GTZ		SHELL	GON
		NIGER	AID/W	NIGER	HQ		
LABOR	301,165						
- WORKERS				2,700			
- GON							2,808
- PROFESSIONAL		53,295	22,515		16,240	203,607	
PER DIEM	86,451						
- WORKERS				2,718			
- GON				2,082			
- PROFESSIONAL		15,535	14,000		6,900	45,216	
FUEL	4,600	1,000		3,600			
SOLVENT	8,180			8,180			
RENTALS	16,430						
- ISOTANKS		15,900					
- CONTAINER		530					
TRANSPORT	172,000						
- PERSONNEL					2,000		
- CONTAINERS		170,000					
INCINERATION	10,600	10,600					
EQUIPMENT	22,500	15,900		1,000		5,600	
LOCAL/MISC. COSTS	18,349	7,000		1,760	7,700	1,889	
TOTAL	640,275	289,760	36,515	22,040	32,840	256,312	2,808

Annex D: Test Results

Pages 54-69

w/Copletti-H

TELEFAX

Pflanzenschutzmittel Service Projekt
Pesticide Service Project
Postfach 5180 D-6236 Eschborn Germany
Telefon 06196-79- Telefax 06196-797180

FAX No. 00227- 723918

Date: 21.3.91

To Mr. Charles Kelly
US-AID, c/o US-Embassy
B.P. 11201
Niamey/ N I G E R

No. of pages: 2

Va/sch

- Niger Dieldrin Disposal Plan (NDDP)
- Your fax dated 19.3th an 11th of march 1991
- Analytical results of soil samples

Dear Mr. Kelly

- No objections against the change of wording in the memorandum of understanding. A copy of the signed memo is sent to you by mail.

- Please keep us informed about NPDP schedule, the travel of Mr. Schimpf is tentatively scheduled between April 22nd and 12th of May.

- Pouring concrete on the floor in Inabargehrtit should not become part of the NPPD - timeschedule. We habe given Mr. Krall/Dr. Nasseh a copy of your fax and we propose to contact him directly, his direct fax no is 06196-797413.

- Does the modification of the NPPD in Inabangarlit result in different (higher) contributions by the GTZ-Projects, if yes please let us know the rough figures as soon as possible.

- A minimmum of 15 syringes (Baker Bond columns + syringes) will be sent to US-aid, Niger by Skypack/TNT including accessoires and instructions.

- Residue results:
  Attached please find all the results of our soil residue analysis. As we do not know the location, the depth and other details of your samples, our comments will be brief. The bad smell of the soil is caused by the very high content of Fenitrothion. We also found in five samples Endrin residues (sample No. 2a, 3a, 4a, 6a and 7a) Both additional pesticide residues do not influence in our opinion the proposed disposal procedure - spreading the soil in the desert- as Fenitrothion will easily be destroyed and degraded by sunlight and the high temperatures and Endrin has similar toxicological and environmental properties as Dieldrin. The Dieldrin residues range from 1050 mg /kg (ppm) to < o,ol mg/kg (ppm) and are therefore in general lower than formerly acceptable use rates.

With best regards

Pflanzenschutzmittel Postfach 5180 GTZ

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Pesticide Service Project
Schimpf/Vaagt

Eschborn, 21.3.91

Analytical Results of the Soil Samples from Niger

No.	Sample	Dieldrin (ppm*)	Fenitrohion (ppm*)	Other (ppm*)
1	a	280	360	
2	a	1050	594	350 Endrin
3	a	560	1555	350 Endrin
4	a	330	6,55 %	50 Endrin
5	a	420	2370	
6	a	350	3,7 %	5 Endrin
7	a	770	791	20 Endrin
8	a	20	43	
4		0.04	< 10	
8		0.7	108	
9		26	202	
10		22	107	
11		4	< 10	
12		130	65	
13		8	< 10	
14		120	28	
15		40	67	
16		10	33	
17		160	360	
18		90	1.07 %	
19		30	1100	
20		50	2200	
21		14	220	
22		64	625	
23		29	119	
24		220	172	
25		9.7	59	
26		80	2.4 %	
27		> 4	191	
28		24	674	
29		16	203	
30		168	910	
31		20	40	
32		44	16	
33		1.4	1.9	
34		0.5	0.7	
35		< 0.01	0.7	
36		< 0.01	1.4	
37		0.5	0.7	
39		< 0.01	0.5	
41		< 0.01	0.2	
42		0.3	0.2	
43		< 0.01	0.2	
44		< 0.01	< 0.1	

III/24

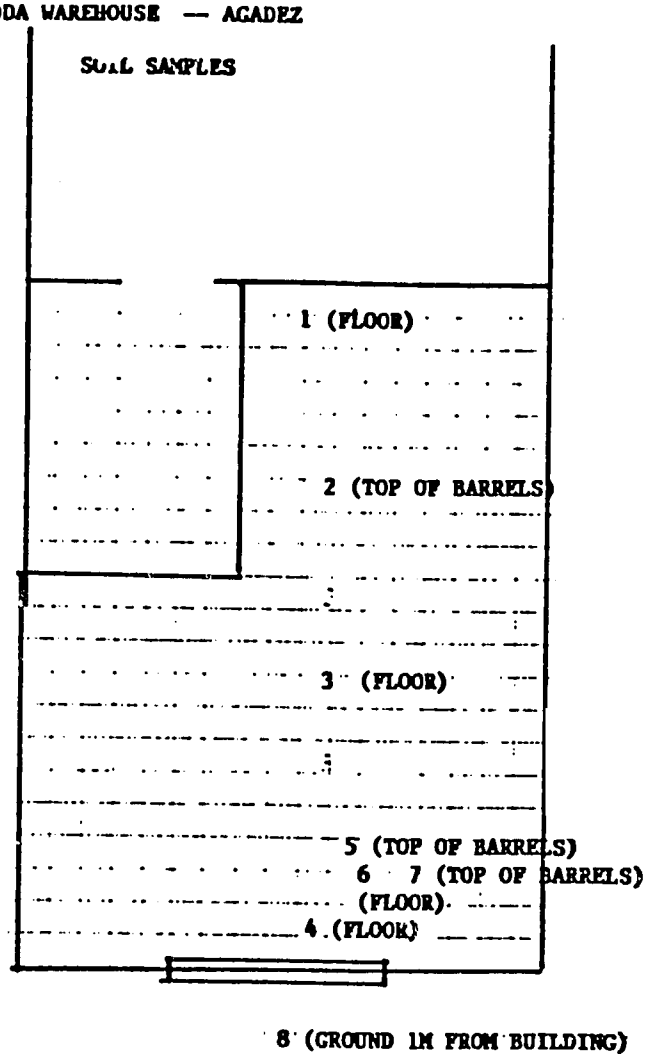
Information Note

Attached is a report from the GTZ Pesticide Service Project on the analysis of soil samples from locations in Niger. These samples were collected at the Agadez Departmental Direction of Agriculture Warehouse (DDA Warehouse - #s 1 - 8), the National Antiacridian Center base at Inabangarhit (#s 9 - 37) and along the road from Inabangarhit well at 1 km intervals towards Agadez (#s 39, 41, 42, 43, 44).

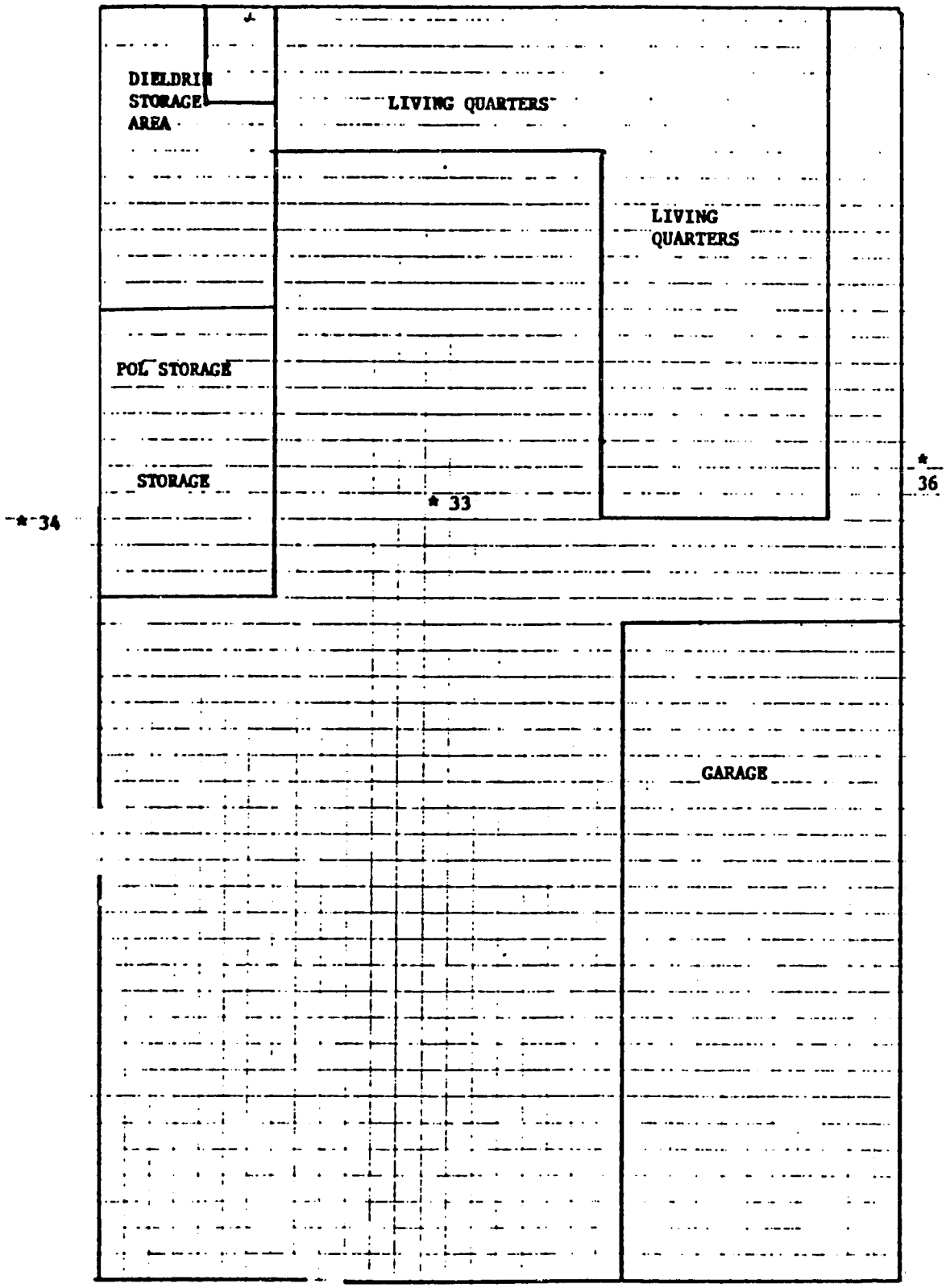
The samples were collected on January 24, 1991 and processed by the Pesticide Service Project in Germany. The test results have been shared with Shell, the Government of Niger and AID-EPA.

C. Kelly
Niamey
April 25, 1991

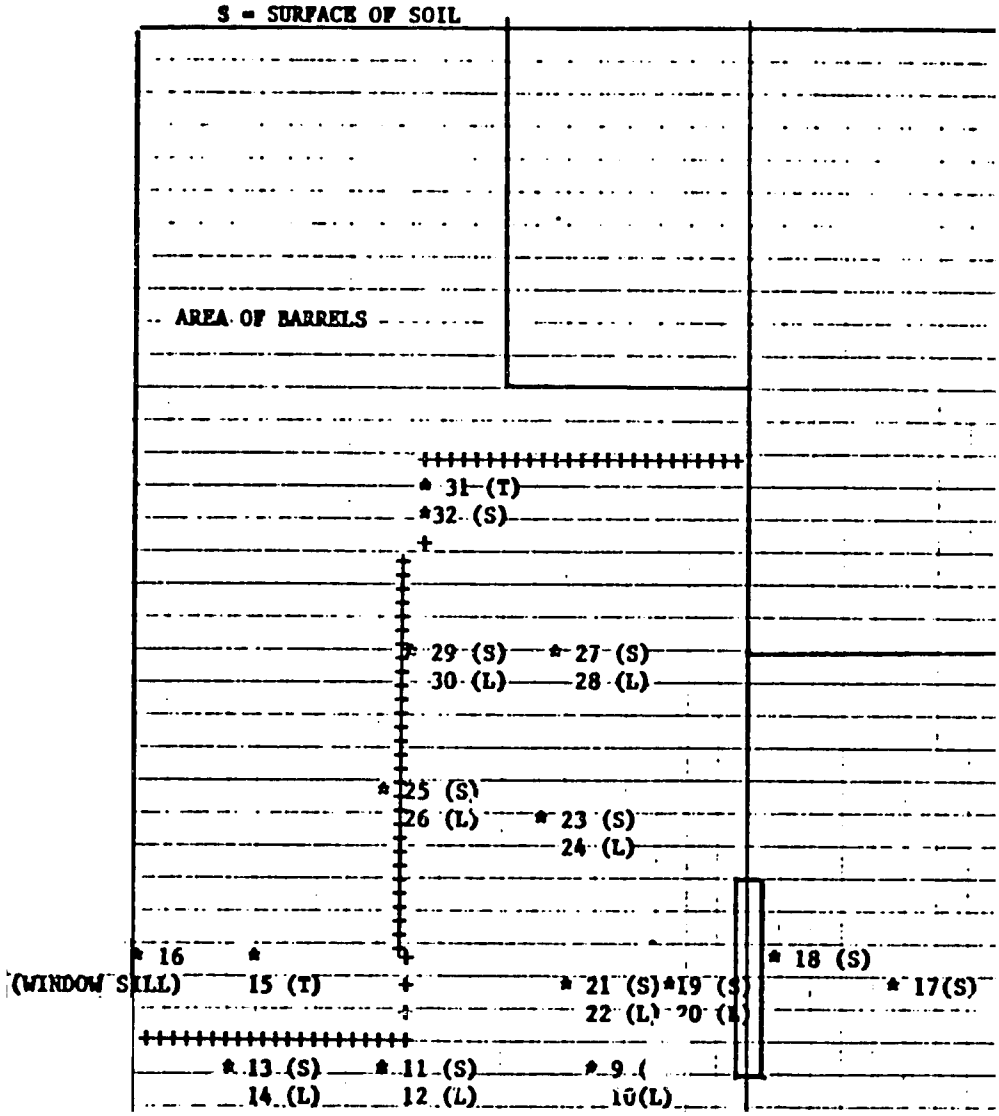
DDA WAREHOUSE — AGADEZ



INABANGARHIT WAREHOUSE SITE PLAN
SOIL MPLES - SURFACE COLLECTION POI. .3



INABANK IIT WAREHOUSE - SOIL SAMPLES
L = SUBSOIL T = TOP OF BARREL * = LOCATION
S = SURFACE OF SOIL



Pesticide Disposal Project
Wolfgang A. Schimpf

NDDP Final Report: Analytical Results

On the CNAA compound in Agadez where the NDDP operation took place, soil samples were collected before and after the operation and analysed for Dieldrin.
Using this method it was possible to monitor the contamination of the NDDP working area.

Results:

Table: Analytical results of the soil sample (mg Dieldrin/kg soil)

Sample-Number	Location	Soil sample taken before operation	after operation
1	Pumping area	7.8	8.2
2	Pumping area	17.4	14.8
3	Pumping area	88.0	226.0
4	Pumping area	1.2	2.0
5	Pumping area	24.0	17.0
6	Pumping area	52.0	404.0
7	Pumping area	18.2	140.0
8	Rinsing area	0.21	144.0
9	Back site of the Isotank		3.0
10	Cutting Area	0.4	0.08

The working area was selected and 10 sampling spots were marked before the pumping area was protected with plastic foil.
A surface soil sample was taken from each spot by means of the cross sampling technique prior to operation.

After the operation, soil samples were taken from the same sampling spots.
The analyses were carried out in the Analytical Laboratory of the GTZ Pesticides Service Project in Darmstadt/Germany.

Conclusion:

The analysis of the soil samples taken before the start of the operation indicates that the sand was contaminated with Dieldrin before the NDDP operation took place.

The analytical results obtained with sample spots 3, 6 and 7 showed higher concentrations of Dieldrin in the soil after the operation, because these sample spots were on the border between the covered and uncovered working area.
In this area the Dieldrin barrels were moved, opened and pumped into the Isotanks. Dieldrin was probably spilt in this area and consequently contaminate the soil.

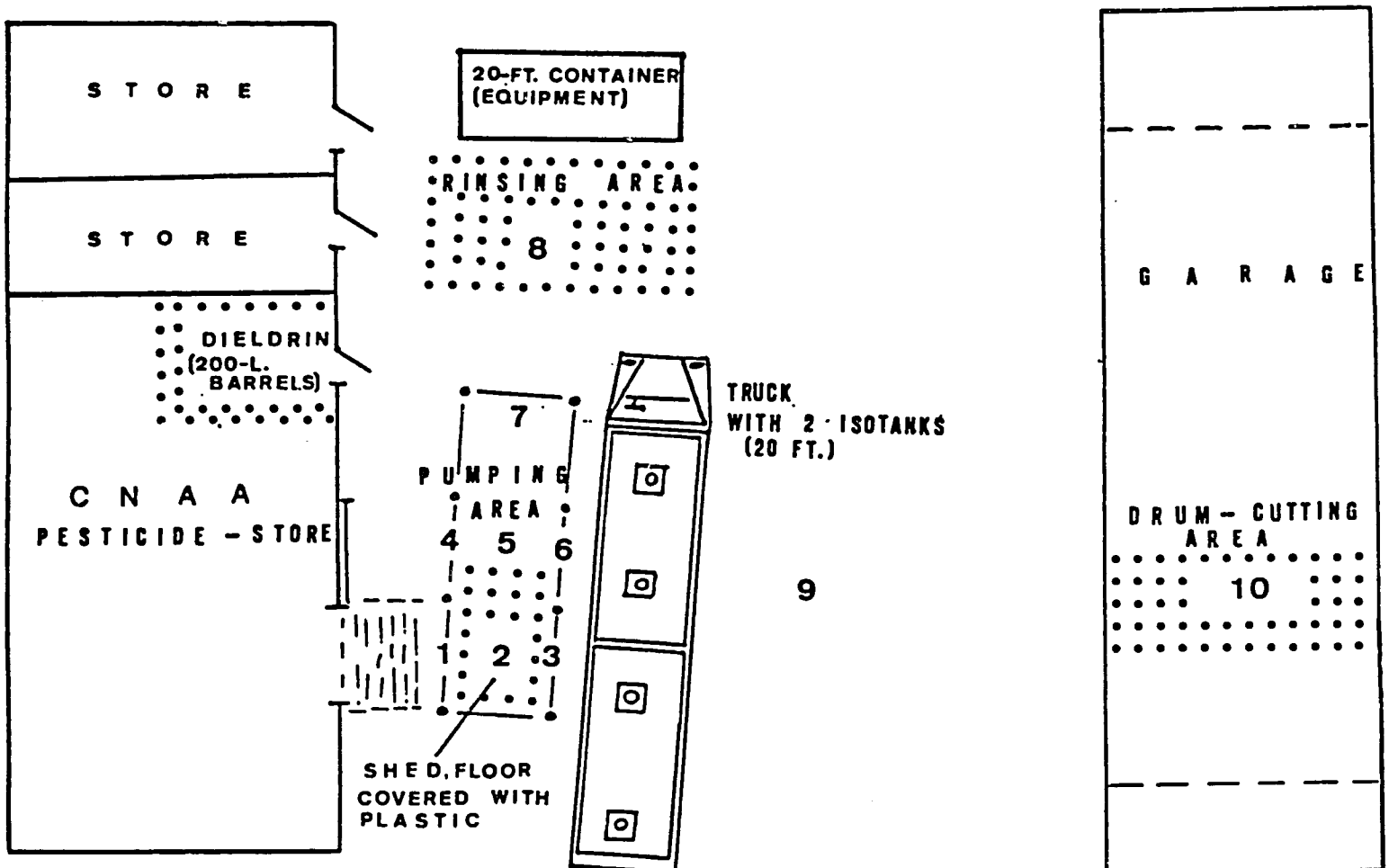
The floor of the rinsing area was not covered with plastic, and, consequently, the soil sample at spot 8 showed Dieldrin residues after the operation. A few thousand litres of kerosin were used to rinse hundreds of empty Dieldrin barrels 2-3 times. Kerosin and the dissolved Dieldrin were spilt during the rinsing process and/or escaped from leaking barrels.

Due to the intensive cleaning of the drums with kerosin the cutting area (sample spot 10) was not contaminated.

Suggestions:

The area between the pumping station and the Isotank should be covered with plastic too. A wooden lining should be placed on top of the plastic to protect it from the heavy barrels.

To minimize contamination during the rinsing operation, this working area should also be covered with plastic.



SAMPLING SPOTS AT THE CNAA COMPOUND

Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH

DATE	START	TIME	PARTY'S NAME	MODE	PAGE	RESULT
30	10:08	5'14	703 235 3805	G3	05	OK

DATE	START	TIME	PARTY'S NAME	MODE	PAGE	RESULT
Aug. 30	10:03	3'42	703 235 3805	G3	02	OK

DATE: August 28, 1991

☒ Official

☐ Personal

TO: W. Knausenberger/B. Thomas

ORGANIZATION: AELGA Proj. - AFR/TR/ANR/NR

FAX: 00-1-703 - 235-3805

FROM: C. Kelly

NUMBER OF PAGES (INCLUDING COVER SHEET) —7--

REMARKS:

1. Pages following provide copy of GTZ report on NDDP Agadez Opertations. We have taken note of the Feni concentration in the "DDA Warehouse" and will remove/replace the contaminated area in the warehouse rehabilitation plan. Also note GTZ contribution toward this effort.

2. Can you contact Shell to officially invite GTZ to the Hague meeting?

3. Also suggest that the GTZ be requested to provide a 30 min - 45 min report on testing at Agadez and earlier (Tchintoulouse, Inabangarhit) with recommendations for further testing, at the Hague meeting.

DATE	START	TIME	PARTY'S NAME	MODE	PAGE	RESULT
Aug. 30	9:57	0'38	703 235 3805	G3	00	ER 61

CLEARANCES: DRU:CKelly
GDO:HSoos

344

64

TELEFAX

Pflanzenschutzmittel Service Projekt
Pesticide Service Project
Postfach 5180 · D-6236 Eschborn · Germany
Telefon 06196-79-1082 Telefax 06196-797180

FAX No. 00227-723918

AGR LL

Date: 26. 8.91

To Mr. Charles Kelly
US-AID
c/o US-Embassy
B.P. 11201
Niamey/NIGER

No. of pages: 6

ACTION: DRU
INFO: DIR:DD
GDO/DC
CERON

Ref.: Niger-Dieldrin-Disposal-Plan

DUE DATE: 09-03-91

Dear Mr. Kelly,

Thank you very much for all your information about the transport of the Dieldrin and its incineration.

1. Round-Up meeting in The Haque

According to your information, the incineration has been completed in Holland. Finally we have a round-up meeting in The Haque on 26/27th September to review the Niger exercise. I am coming to Holland for the meeting and I hope Dr. Vaagt would be able to come too. Please sent us an official invitation with a time schedule.

2. Analytical results

I have enclosed the analytical results of the soil samples, taken before and after the NDDP-operation. This data could be important for further disposal-operations.
The analysis from the wall in the office directly behind the DDA-Warehouse indicated that the concrete is highly contaminated with Fenitrothion (1.9 %) !!!

3. Funds

Thank you for the summary report about the calculation of the expenditure of funds, advanced under the Pesticide-Disposal and Pesticide-Service-Projects of the GTZ. I am informed, that you presented all the receipts for a total of 6,140,539 F CFA to Mr. Burmeister of the GTZ-Administration Office in Niamey/Niger. Your calculation indicates that 1,416,061 F CFA of the advanced remains outstanding.

4. DDA Warehouse rehabilitation proposal

In your fax from the 8 of August you presented our project the plan to rehabilitate and upgrade the DDA-Warehouse in Agadez/Niger: According to your estimation, this operation will cost approx. 7000 US$.

GTZ agrees to your proposal: Our project will support your plan

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and finance the rehabilitation of the DDA-Warehouse in Agadez/Niger with the remaining 1,416,061 F CFA (equivalent about 4700 US$) which should cover a part of the costs. For the above mentioned money we need all the receipts and a final report with a complete documentation about this project (a plan, photos, quotation etc.).

5. Solvent

According to your fax from July 27, some solvent (kerosin) has been left over.
Please transfer the vouchers to Mr. Burmeister. We would like to use the kerosin for further activities in Niger.

6. Budget/costs for the NDDP

We would appreciate it if you could inform us about the total cost of the whole NDDP-operation (the costs for transport, rental of the Isotanks, incineration, labour etc.)
For further activities, we are keen to know this figures.

7. I will Inform Mr. Burmeister about topic 4 and 5.

8. Enclosed you will find a summery of my report of the NDDP-Operation for the GTZ.

I am looking forward to see you in The Haque
With best regards

W.A. Schimpf
Pesticide-Disposal-Project

Encl. 1

PSM-Disposal-Project
Wolfgang A. Schimpf

Eschborn, 20.8.91

Analytical results of the soil samples,

collected during the Niger-Dieldrin-Disposal-Operation (NDDP) on the premisses of the CNNA and DDA in Agadez/Niger.

a= Sample taken before the operation
b= Sample taken after the operation

Number Sample	Location	Dieldrin (ppm)	Fenitrothion (%)
1	Concrete from the DDA-Office	< 0.01	1.9
2 a	Pumping station	7.8	
2 b	" "	8.2	
3 a	" "	17.4	
3 b	" "	14.8	
4 a	" "	88.0	
4 b	" "	226.0	
5 a	" "	1.2	
5 b	" "	2.0	
6 a	" "	24.0	
6 b	" "	17.0	
7 a	" "	52.0	
7 b	" "	404.0	
8 a	" "	18.2	
8 b	" "	140.0	
9	Area behind the CNNA-storehouse	2.4	
10	" "	<0.01	5.2
11	Next to the Isotank 1	3.0	
12 a	Drum-cutting area	0.4	
12 b	" "	0.08	
14 a	Rinsing area	0.21	
14 b	" "	144.0	
Blank		0.002	

Conclusion:

i. -Sample 1:

The concrete of the wall in the DDA-Office is saturated with Fenitrothion (1.9.%)

ii. -Samples 4,7,8: Pumping area

-The analysis from the soil-sample taken from this area indicates, that the sand was highly contaminated with Dieldrin before the NDDP-operation started !!!
-After the operation the results of the analysis of the soil from the same spots shows higher Dieldrin concentrations.

	Before:	After:
Sample 4:	38 ppm	226 ppm
Sample 7:	52 ppm,	404 ppm
Sample 8:	18 ppm	140 ppm

-The sample-spots 4 and 7 were on the border between the covered and the uncovered working area. In this area the full and empty barrels were moved, opened and filled into the pumping-drums. This is the area, were the Dieldrin could be spilt and consequently contaminated the soil.

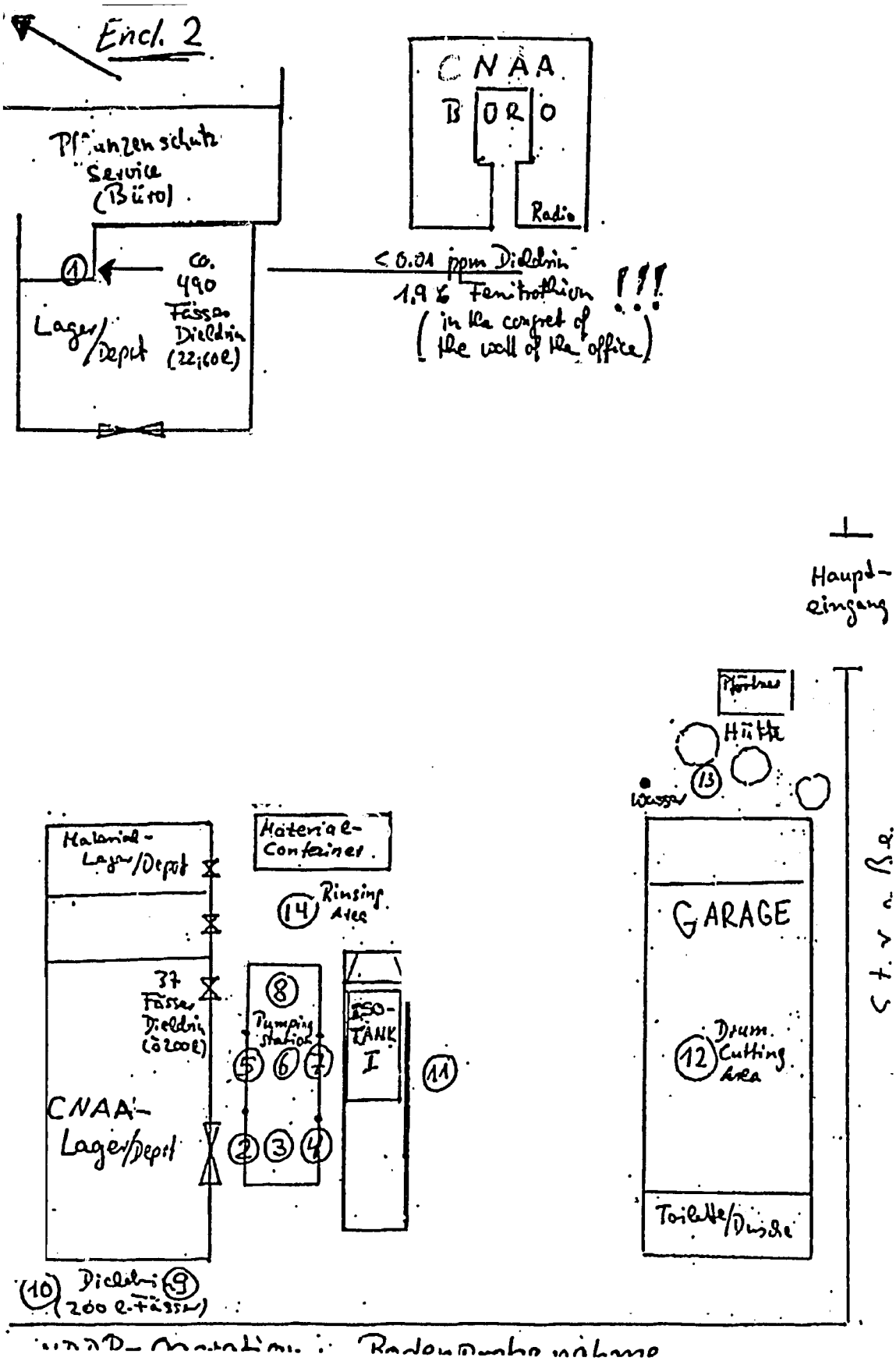
-Suggestion for improvement:
To avoid this negative effect, the area between the pumping station and the Isotank should be covered with plastic too.

iii.-Sample 14: Rinsing station

-This area was not covered with plastic.
-A few thousand litre kerosin has been used to rinse the emptied Dieldrin barrels 2-3 times all. Kerosin and the dissolved Dieldrin were spilt during the rinsing process and/or through leaking barrels.

-Suggestion for improvement:
To minimize contamination during the rinsing process, this area should be covered with plastic too.

Encl. 2


Pflanzenschutz Service (Büro)
CNAA
BORO
Radio
1
ca. 490 Fässer Dieldrin (22,600 l)
Lager/Depot
< 0.01 ppm Dieldrin
1,9 % Fenitrothion !!!
(in the carpet of the wall of the office)
Haupteingang
Pförtner
Hütte
13
Wasser
Material-Lager/Depot
Material-Container
14 Rinsing Area
37 Fässer Dieldrin (à 200 l)
8 Pumping station
5 6 7
2 3 4
ISO-TANK I
11
CNAA-Lager/Depot
GARAGE
12 Drum Cutting Area
Toilette/Dusche
Straße
10 Dieldrin 9 (200 l-Fässer)

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SUMMERY

Disposal of dieldrin in the Niger

In May 1991, donors, recipients and a large insecticide manufacturer joined forces to safely transport 60,000 litres of dieldrin back to its country of origin, the Netherlands, in the first operation of its kind.

The insecticide dieldrin had been supplied to countries of Africa in the fifties and sixties by international development aid organisations, for locust control. Later investigations revealed dieldrin to be highly toxic. As a result of its high stability, it accumulates in the biosphere, in soils and in the entire food chain. Since 1974, dieldrin application has been permitted only subject to certain restrictions; in 1987, production was halted completely.

Spread across several sites in the north of the Niger, and stored in heavily corroded metal containers, were some 60,000 litres (about 66 tonnes) of dieldrin. In view of the hazards this involved both to the population and the environment, the Niger Government and US-AID, with the assistance of the GTZ and the dieldrin manufacturer, drew up a "Niger Dieldrin Disposal Plan". The two supra-regional GTZ projects "Pesticide Service Project" and "Pilot Pesticide Disposal Project" were involved in both the planning and implementation of the dieldrin disposal.

After 1 year's (!) preparation, the dieldrin was disposed of in May 1991. Taking strict safety precautions, the dieldrin was pumped from the corroded containers into safety tanks. The containers were cleaned, shredded and packed to withstand rigorous transit. The dieldrin and shredded metal containers were then transported from northern Niger more than 2,000 km overland via Benin to Lomé in Togo, and from there they were shipped to the Netherlands. The dieldrin was disposed of in a hazardous waste incineration plant. The containers were melted down.

The contaminated soils surrounding the sites at which the dieldrin had been stored were removed and deposited in a specially set up landfill.

This so far unique measure to return pesticides no longer suitable for use to their country of origin required a high level of administrative, organisational and financial input. There are still some 1,000 tonnes of dieldrin stored in various countries of Africa, for which ways and means of disposal will still have to be found.

Annex E: Niger Memorandum of Understanding

MEMORANDUM OF UNDERSTANDING

February 25, 1991

This memorandum of understanding records the intentions of the participants in the Niger Dieldrin Disposal Plan (NDDP) concerning the objectives and essential allocations of responsibility as further defined in the Plan. The contributions and tasks of the parties are stated in detail in the NDDP. It is understood that all participants accept the NDDP as set forth in the attached documents with the proviso that the exigencies of implementation may require alteration of logistical details within the bounds of legal constraints.

The objectives of the Plan are summarized as follows:

1. Safely removing 70,000 liters of dieldrin and barrel-rinsing solvent from Niger to an appropriate disposal unit in Holland.

2. Disposal of the dieldrin by incineration at a plant which operates at, or at least compatible with, U.S. Government standards.

3. Providing for the safe disposal of the dieldrin-contaminated solids (soil, sand) from the Agadez and Inabangharit storage sites in Niger.

4. Decontaminating and cutting triple-rinsed dieldrin containers and disposing of the containers by smelting (in Holland).

5. Conducting the removal, disposal and destruction activities with minimal risk to human health and the environment.

The essential allocation of responsibilities is summarized as follows:

1. The Government of the Republic of Niger (GON) is the owner of certain stocks of the pesticide, dieldrin, which it intends to dispose of by transport to, and incineration in, the Netherlands. GON is responsible for the overall dieldrin removal operation and clean-up of the storage sites; it will provide personnel, facilities, equipment, vehicles and other assistance including, but not limited to

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application for necessary importation, transit and incineration permits, and issuance, where required, of appropriate formal documentation.

2. The Africa Emergency Locust and Grasshopper Assistance project (AELGA) of GON and the United States Agency for International Development (A.I.D.) is available to provide assistance to NDDP operations. The AELGA Project is expected to supply financing and procurement of personnel, materials, technical assistance, disposal facilities, transportation from Niger to Lome and from Lome to the Netherlands, and rental of equipment and storage facilities.

3. The GTZ Pesticides Services Project and the GTZ Pilot Project for Pesticides of Deutsche Gesellsheft für Technische Zusammenarbeit are available to provide assistance to NDDP activities at the storage sites in Agadez and Inabangharit. These Projects are expected to supply financing and procurement of personnel, materials and technical assistance in Niger.

4. Shell Nederland Chemie (SNC) will act as facilitator, providing advice, guidance and facilities to NDDP; will* arrange for incineration capacity, temporary storage of the dieldrin in Lome, and storage and transport in the Netherlands. SNC is expected to provide expert advice to Niger local operations and to absorb its own costs.

It is understood that where Shell International Chemie Maatschappij B.V. (SICM) is involved, as outlined in the Plan, its experts should, for purposes of this operation, be considered as acting in assistance to, and under the supervision of SNC. SNC states that neither SNC nor SICM (nor its employees, officers or agents) are deemed to have accepted explicitly or implicitly the jurisdiction of United States federal or state courts in any dispute that may arise in connection with the NDDP.

* assist in arranging

Agreed

Signed:

Title:

Date: 19 AVR. 1991

For the Government of Niger

Signed: [illegible]

Title: USAID/Niger

Date: [illegible]

For the Agency for International Development as party to Africa Emergency Locust and Grasshopper Assistance Project Grant Agreement

Signed: Gero Vaagt

Title: Project Leader

Date: 21 March, 1991

For the GTZ Pesticides Service Project and the GTZ Pilot Project for Pesticides

Signed: A.L. Moriwaki

Title: Inspecteur-directeur Afrique Zone Chimicals

Date: 4.3.91

For Shell Nederland Chemie

Cms 6/3/91

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ANNEX F

Equipment and Materials Specifications

1. Blood Sampling Kit 1 set

Syringes, Baker Bond columns, vials, rubber tubing, and packing tubes in sufficient quantities to sample each crew member and participant twice (pre and post operation samples) plus 5% contingency for sampling crew members displaying any ill effects from handling the pesticide stock.

2. Drugs (emergency) 1 set

Enough doses of the therapeutic drug to treat every participant of the operation, 100 count box syringes.

3. Eye Rinse 2 bottles

4. First Aid Kit 1 set

1 box gauze pads, 1 bag cotton wool, 2 pressure band-aids, assorted sized band-aids, disinfectant, aspirin, antibiotic ointment, smelling salts, rehydration solution, e.g. minor trauma kit.

5. Personal Protection Equipment, Standard 2 sets per laborer

White cotton underwear (large); white socks (large); white cotton overalls (large); PVC gloves (large); full face shields (1 per laborer, large); safety shoes with metal caps (1 per laborer, large); and dust masks (100 units per worker).

6. Personal Protection Equipment, Specialized 2 sets

Nortilon overalls (large); rubber boots (large); gas masks with cartridges.

7. Fire extinguisher, Large 2

Dry powder, 20 lbs (8 kg) portable extinguisher good for class A, B, and C fires; with hose, size: 27" x 9" 1/2; steel casing.

8. Fire extinguisher, Small 2

Dry powder, 10 lbs (5 kg) portable extinguisher good for class A, B, and C fires; with hose, size: 22" 1/2 x 8" 1/2; steel casing.

9. Fire Alarm 1

10. Earth lines

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(ground wire and clamps)	1 per rinse station
11. Red Flags	Adequate for each convoy vehicle;1m x1m "Slow moving vehicle" warning flags.
12. Inflammable International Code Stickers	1 set (4) per isotank and container

Inflammable adhesive stickers with the appropriate US DOT, USCG, or UN international code for the hazardous and flammable materials carried in the isotanks and freight container.

13. Isotanks (20 Mt)	Adequate for pesticide, rinseate, and 5% contingency space

A. The tank will be "Short Container" size (approx. 20' long, 8' wide, 8' tall), for the handling of up to 20,000 liters of liquid, empty weight approx: 3 Mt.; full weight net. 25 Mt. The tank will be mountable on a standard flat bed tractor trailer.

B. The tank will be top loading to avoid risk of bottom valve leakage and will contain at least one closeable and lockable "no leak" hatch on the top of the tank. If available, the tank should be baffled to reduce slopping. Tank liner valve and hatch fittings will be resistant to the pesticide(s) being transported. The construction of the tank, fittings and support structure will meet relevant US DOT and USCG requirements for structural integrity, crash and puncture resistance for a substance of the nature of pesticide(s). Standard DOT, USCG or UN hazardous placards will be provided with the tanks.

C. Before delivery, the tank will be tested and certified by an independent surveyor (licensed in the country of procurement) to meet the structural and over-pressure requirements set out in the relevant requirements. Copies of the testing and certification documents will be forwarded to the party coordinating the evacuation operation as a condition to the acceptance of the rental.

D. The tanks will be delivered, inspected and modified as necessary, by the party providing technical advise and assistance or the contract waste management disposal company. The isotanks will be purged with nitrogen to reduce the risk of explosion when filling begins. Once purged it is essential that no-one try to inspect the tanks by placing their head inside the tank.

14. Freight Container 1

A. One standard "short container" (20' x 8' x 8') of metal construction with double closable sealed doors at one end. The container will meet or exceed relevant US DOT and USCG requirements for land and sea transportation.

B. Before delivery, the container will be tested and certified by an independent surveyor (licensed in the country of procurement) to meet the structural requirements set out in the relevant requirements. Copies of the certification documents will be forwarded to the party coordinating the evacuation operation as a condition to the acceptance of the rental.

C. The container will be delivered, inspected and modified as necessary, by the party providing technical advise and assistance or the contract waste disposal company. Packing of the container will be the responsibility of a third party.

15. Pump/hose sets 4 : 3 electric
1 manual (reserve)

Pumps: electrical, explosion proof, pumps (with a back-up electrical generator) and a manual lever action pump; both pump models with rigid (metal or hose) suction pipe (2 m min. length, 5 cm min. diameter) and out-put hose (4 m min. length, 6 cm min. diameter), enclosed pumping chamber which is non-reactive to the pesticide(s), draw of 2 m (min.) and lift of 4 m (min.). Hose: rubber wire reinforced, inner surface composition of nitrile 50 shorl, electrical resistance at 10 ohms; complies with British Standards (BS) 5173, Part 4, or better, matched to pump in and out-lets with secure non-leak fittings in pump and hose. Filters should be used to prevent blockage caused by loose drum lacquer and other residues.

16. Drum Cutter 1

Tripod mounted, hand operated, single blade hinged descending pressure cutter for cutting steel drums (.5 cm thickness). Reach of the cutting blade should be 300 mm and the pressure arm should be 2 m long. Cutting surface should be 300 mm long and be grooved to receive the cutting blade to ensure complete cut. Cutter will be build to withstand heavy and frequent use. Device should be painted with flat black metal paint.

17. Drum Head Cutters 4

Single lever standard drum deheader, with one extra blade per tool.

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18. Drum Drying Rack 1

Locally fabricated metal draining rack with tray to collect rinsate.

19. Barrel hoisting rig 4

Crane assembly for the lifting up to 700 kg to a height of 2 meters; wheel base for the movement of the crane assembly, hydraulic lift or chain lift system for rigging with drum lifting assembly; base structure to allow for movement of crane lifting head over barrels from a distance of 2 meters.

20. Fixed Decant Surge Vessel 1

For decanting and pumping drums smaller than 60 Liters.

21. Bung Valves 4 per rinse station

2" steel bung valves.

22. Steel Funnels 4 per rinse station

Large sheet metal funnels for the decanting operation. To be rinsed, crushed and packaged for transport to smelting facility.

23. Drum dolly 4 : 2 for 200 l barrels
2 for 60 l barrels (if needed)

Solid deck stainless 14 gauge steel drum dollies with 2 wheels and turned up retaining lip; inside diameter for 200 l drums (24 1/4") : inside diameter for 60 l drums (? ") (MMC #2686T12, p. 361)
Oversized wheels may be appropriate in sandy site conditions.

24. Overdrums No. of leaking barrels
+ 10% contingency barrels

Open head drums, 96 gal. capacity (inside diameter 26", height 42") conforming to DOT CFR 49; 16 ga. sides, 12 ga. top; screw closing ring and gasket, epoxyphenolic inner lining and black enamel finish with white enamel top.

25. Barrel Crusher 1

Explosion proof construction, electro-hydraulic drive compression model barrel crusher with collection basin for residual liquid. 200 L barrel size capacity, capable of crushing light sheet metal barrels. NOTE: This item is an option to a manual barrel cutter. It would also require a reliable electric power source.

26. Plastic sheeting 25 m^2 per rinse station

For bunded area, 1 mm thickness, clear color, sheet size dependent on supplier.

27. Jute Bags 75 per rinse station

1 m x 0.5 m; filled with soil and stacked two high to create a bund wall around the pumping, rinsing and transfer area.

28. Hydraulic oil 4 l
As specified by hydraulic barrel hoisting rig manufacturer.

29. Grease 1 l

Commercial grade, for greasing drum and drum head cutters.

30. Tool Kit 1

31. Diluent (diesel) 10 l diluent/ 100 l barrel x 3 rinses
7 l diluent/ 60 l barrel x 3 rinses 3
1 diluent/ 20 l barrel x 3 rinses

Commercial grade diesel fuel.

32. POL As needed for support vehicles

Commercial grade fuel.

33. Incineration Number of l pesticide and rinseate

Operating criteria of incinerator: Temperature = 1200 deg. C (continuous monitoring); Residence time in gas phase = 2 sec.; Oxygen in off-gas = 3%; Removal efficiency = 99.999%. In addition, there will be continuous monitoring and registrations of emissions of SO^2, HCl, HF, and total hydrocarbons. During every week there will be a one hour measurement of heavy metals in the dust monitored, including Sn, Ni, Cu, Cd, Zn, Cr, Co, Ag, and Au. The incinerator will operate at or above the levels required by the government of the country of operation permit for the incineration of toxic waste materials.

34. Open top drums 10% of total number of barrels retrieved

Open head drums, 55 gal. capacity (inside diameter 22"1/2; height 35") conforming to DOT 17E; 16 ga. sides, 12 ga. top; clasp or screw closing ring and gasket, rust resistant inner lining and red enamel finish and red enamel top.

35. Plastic Bags 1,000: .75m x 1.5m

1,000: .75m x 1.5 m, heavy gauge, white plastic.

36. Blocking Tape 2 rolls

2" x 1,000' adhesive blocking tape.

37. Buckets, Shovels, Brooms 15 each

Buckets: 20 l galvanized. Shovels: spade shaped blade, D handle. Brooms: industrial plastic, long bristle, wooden handle and base.

38. Floor Sealant Adequate for cement warehouse floors

Epoxy resin, 100% solids, 2 components, 16 hr cure time, 120 degree C operating temp.; adequate for coverage of 150 M/2 of floor.

39. Plastic Sheeting Adequate for earthen warehouse floors

1 mm thickness, white or clear, sheet size dependent on supplier.

40. Absorbent 500 kg

Particle size 1-3 mm., non-reactive to the pesticide and not toxic to humans; able to absorb 50% of particle weight.

41. Limestone and/or Caustic Lye Adequate to neutralize the spill area

42. Excavation Equipment Adequate for landfill pit construction (if necessary)

43. Lubricating Oil 50 l

SEA 20/30 weight oil for lubricating drum head cutter and other equipment.

44. Personal Hygiene (Soap, towels) 2 per participant

Hand soap: 500 g. blocks. Towels: cotton, 1.5 m x .75 m, colorfast.

Annex G

Niger NDDP Project Implementation Orders (PIOs)

1.	PIO/T 698-0517.83-3-40908	Pesticide Disposal Consultant
2.	PIO/C 683-0517-4-91067	Overpack Drums
3.	PIO/T 625-0517-3-91121	Isotank Rental
4.	PIO/T 698-0517-3-00071	Transportation of Materials: Freight
5.	PIO/T 625-1517-3-91124	Container Rental
6.	PIO/C 625-0517-4-91125	Personal Protection Equipment, Floor Sealent, Absorbent, Pump Hose, Open Top Drums, Overdrums, Drum Cutters
7.	PIO/T 683-0517-3-10011	Operations Manager
8.	PIO/T 698-0517-3-10037	Incineration
9.	PIO/T 698-0517-3-10066	Editor/Translator NDDP
10.	PIO/T 698-0517-3-10091	Rehabilitation of the Pesticide Warehouse

ANNEX H

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Annex I: Niger Public Affairs Documents

Inter C-H-E-M

Issue No. 14 October 1991

Chemical honour ■ Profile of CTMS ■ EO and EO ■ Grindstone ■ Lógo Style Plant

Clean-up in Niger

The story of dieldrin has come full circle. This pioneer among insecticides used to be made by Shell Nederland Chemie, at Pernis, and was supplied to many countries in Africa and Asia to control the desert locust. But, in 1987, with almost no warning, the influential US Agency for International Development (USAID) refused to provide further aid funding to any country that continued to use dieldrin for locust control.

This action presented many of those countries with a major problem. Over the years, considerable amounts of strategic stocks had been built up in many developing countries, and those stocks now have to be disposed of safely. This summer, Shell took part in a clean-up operation to collect the old stocks of dieldrin in Niger, and ship them to The Netherlands, where they have been incinerated by a Dutch incineration company.

This was an unusual exercise on all accounts. It started with a meeting in the Niger capital, Niamey, in January 1990. Representatives of 15 African countries had gathered to discuss what to do with their unwanted stocks of insecticides. USAID was there, and so was Greenpeace. Lawrie Dollimore, CHSEL/23, led a small group representing the crop protection industry.

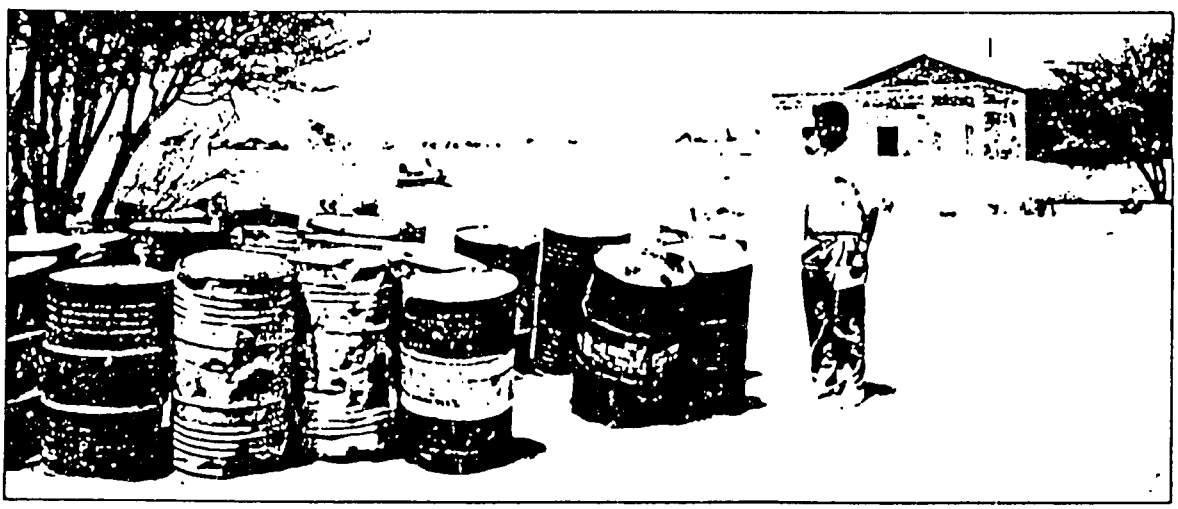
Dieldrin was one of the pesticides that was particularly identified as a problem. The Government of Niger asked USAID for assistance in disposing of its old stocks, and Lawrie offered Shell's technical assistance. A direct consequence was Dick Zwartbol, CMFA/132, getting over a month's 'holiday' in the Sahara desert.

Recalls Dick, "First, I and a colleague from Pernis spent three weeks in Niamey, waiting for our equipment to arrive – it had gone walkabout – and then we set up camp in the desert city of Agadez. We were there for four weeks, with a local work-force of 20. We knew where the old stocks were, so it was a matter of collecting them all together."

Agadez is in the Sahara desert: "and it was hell. June is the hottest month of the year there. Wearing the protective equipment of gloves and masks made us even hotter. We could only work from 6 a.m. to noon. At 6 a.m., the temperature was 35°C; at 10 a.m., it was 55°C in the sun; at noon, we just had to stop. All I could do in the afternoons was lie on my bed. There were several plagues in the shape of sandstorms. It was also the beginning of the rainy season: it rains so hard, you nearly drown. It was like taking the dieldrin away from the gates of Hell."

Once the stocks had been collected – about 75,000 litres of them – they were pumped into four large isotanks. It had been arranged that the dieldrin should be shipped from Togo, so the convoy of isotanks (with

(continued overleaf)



The start of the collection.

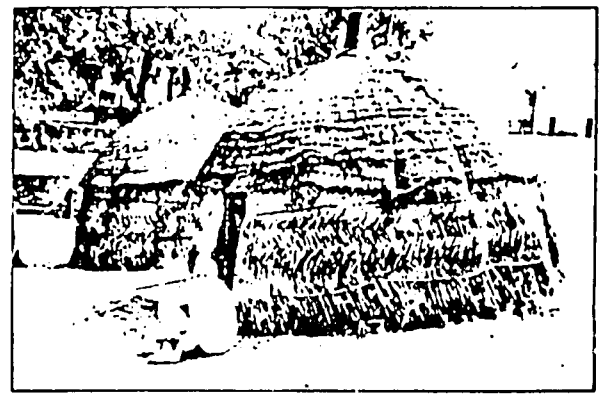
continued from front page

a car in front and behind, in case of road accidents) accordingly set off for Togo. But Lawrie, who was coordinating the exercise, had reckoned without the uprising that happened in Togo at the beginning of July. ("Lack of foresight on my part," he admits.)

During the course of that month, Lawrie spent vast chunks of time on the phone to the USAID chap who was travelling with the convoy. It was eventually arranged for the cargo to be shipped from Benin instead of Togo, so the convoy changed direction. It reached the port in Benin only to find that the ship on which the cargo was booked had arrived early and left early. More phone calls to and from Lawrie. By this time, things had settled down in Togo, and so the convoy returned there. Finally, with huge sighs of relief all round, the isotanks were put on a ship and taken back to The Netherlands. By early August, all the dieldrin had been incinerated.

Part of the problem. Not what drums ought to look like. ◄

Outside the Hilton Hotel, desert-style. Air-conditioning was provided by the absence of a door. ▼



The exercise in Agadez also involved CPA (chemicals public affairs) in quite a lot of activity behind the scenes. Eric Nickson, CPA/2, was busy preparing a joint press release, which meant contact with USAID in Washington, Shell Nederland in Rotterdam and Shell Oil in Houston. All the parties involved in the project had to be made fully aware of what was happening, so Eric drew up a comprehensive list of questions and answers, designed to respond to any questions from the press.

Eric was particularly concerned with the position that environmental pressure groups such as Greenpeace would take and why they would choose adverse articles in the newspapers. "All the hard work was justified," says Eric. "The project received positive press coverage in chemical journals and in Holland. Even Greenpeace was reasonably positive."

Dick practises with a PET trumpet, while resting in the 55°C heat of the day.

At the end of September, Lawrie chaired a meeting in The Hague of all the key contributors, to review the clean-up operation. Representatives of the Niger Government, USAID and the German aid agency GTZ were there, as well as all the other Shell participants. The idea was to review the Niger exercise, and to produce a model that can be used to deal with the remaining 1000 tonnes or so of unwanted stocks of dieldrin around the world. Enthusiasm for the Shell cooperation was such that, even before the meeting, GTZ had visited Shell Centre to propose a cooperative venture to dispose of dieldrin stocks in Madagascar.

"We have set a responsible industry precedent for good product stewardship in doing what we have done," says Lawrie. "We are prepared to cooperate in similar exercises in other countries, as long as the aid agencies provide financial and personnel support. This seems to be forthcoming."

Doubtless Dick will now find himself involved in other clean-up projects in Africa. "One of the more difficult things in working in these countries," he adds, "is the frustration. You have to keep laughing, and you must have the patience of an ox. But then you have the satisfaction of knowing that you are doing a very worthwhile job." ■■■

– INTERCHEM FOCAL POINTS –

CFN:	Barbara Fouley, CFN, X 2267 Geoff Mihell, CFNG, X 4845
CFNI:	Julian Cann, CFNI/1, X 4854
CRG:	Barry Wagg, CRME/1, X 5466
CSP:	Mel Jones, CSP/32, X 6998
CMFA:	Fedde Breimer, CMFA/14, X 1886 (Hague)
CMFE:	Peter Franssen, CMFE/148 X 2383 (Hague)
CMFP:	Henk Aase, CMFP/511, X 1599 (Hague)
CHSE:	Nick Wells, CHSEL/241, X 5337 Reginald Asbroek, CHSE/13, X 2849 (Hague)
CMF/O:	Jan Klein, CMFE/02, X 4081 (Hague)
CREN:	Martijn Werker, CRNS/1, X 1802 (Hague)
CBD:	Chris Smith, CBDS/3, X 3384
CTMC:	Simon Lockett, CTMCB/2, X 5777
CTMB:	David Harries, CTMB/41, X 5737
CTMDF:	Jim Dalton, CTMDF/52, X 3238
CTMO:	Brian Hopper, CTMOP/14, X 3382
CTMS:	Keith Moller, CTMSO, X 3500
CTMP:	Peter Taylor, CTMP/24, X 6517

Shell Chemicals

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FRONTLINES

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

USAID Helps Niger Dispose of Toxics

A unique consortium involving the United States, Germany and companies of the Royal Dutch/Shell Group is helping he West African nation of Niger dispose f all its known stocks of dieldrin, a per-istent and highly toxic pesticide.

Nearly 20,000 gallons of dieldrin vere carefully collected in Niger and rucked to the Togolese port of Lome. 'rom there it was shipped to the Nether-ands for destruction in a state-of-the-art igh-temperature incinerator.

Niger was interested in having the ieldrin removed because, while the pesti-ide itself is stable, the containers are ubject to corrosion, and some have begun to leak. Cooperating in this venture are USAID, the U.S. Environmental Protection Agency, the German development assistance agency (GTZ), Shell Nederland Chemie, several Dutch government agencies and the government of Niger.

Once the pesticide of choice in combating locust infestations in Africa and Asia, dieldrin is no longer supported by international assistance organizations.

"This innovative disposal operation is consistent with the overall USAID policy of helping developing countries achieve sustained economic and social progress through environmentally sound resource conservation and management," said Scott Spangler, assistant administrator for Africa.

Spangler said the operation was made possible because of the "unique cooperation" of the participating parties.

Dieldrin, formerly manufactured by Shell Nederland Chemie, was supplied for locust control in Africa by various international agencies over the last 30 years. Shell stopped its manufacture in 1987, and the plant is being dismantled. The cost of the removal, estimated at $350,000, was funded jointly by USAID and GTZ.

The stocks of dieldrin are being shipped to the Netherlands because there are no suitable alternative chemical disposal facilities in Africa.

According to the U.N. Food and Agriculture Organization, there are old or unwanted stocks of dieldrin in some 21 countries, largely in the locust belt in Africa north of the equator, but also as far east as Pakistan and India.

—John Metelsky,
Office of External Affairs

Awards

(from page 5)

Nepal; and Mintara Silawatshananai, USAID/Thailand.

Superior Unit Citations were presented to the Office of Health, S&T; the Development Information Division, Bureau for Program and Policy Coordination (PPC); and the Regional Food for Peace Division, REDSO/ESA.

Meritorious Unit Citations went to the Employee Point of Light pins for their volunteer work in the community. Receiving pins for their service to others from Gregg Petersmeyer, White House director of national service, were Frank Method and Tom Bebout, PPC; Joanne Gros-

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Shell helps incinerate insecticide from Niger.

Rotterdam, 6 August. Last month Shell Nederland helped destroy old stock of insecticide from the African state of Niger which the company had supplied to that country thirty years ago.

Shell arranged for AVR Chemie (Rijnmond Waste Processors) to incinerate 54 tonnes of Dieldrin, an insecticide used in the 1950s and 1960s to combat locusts in the African deserts and in Asia. Minister Alders (environmental adminstration) gave permission for the toxins to be imported into the Netherlands and incinerated here.

The direct costs of transport and destruction, namely 950,000 dollars, was paid by the American and German development agencies USAID and GTZ. The Niger government had asked these organisations to assist in clearing up the old Dieldrin stocks. Shell provided technical support, training and assistance free of charge.

Shell Chemie stopped production of Dieldrin in 1988 (illegible) and a few years later the production of similar insecticides - Aldrin and Endrin - was also stopped because it appeared that, if, used incorrectly, they posed a serious health risk. The new products Fastac and Nomolt have since been developed which are less dangerous if incorrectly handled, but which are just as effective as Dieldrin in the control of locust and termites.

Although a Shell spokesman described Dieldrin as an "excellent product" if used properly and safely, the company has decided to also have AVR incinerate a supply of 125 (illegible) tonnes of Dieldrin still present on the Shell Chemie site at Pernis. Shell does not know how many countries may still be holding more old stocks of Dieldrin and ----- insecticides. The spokesman said that, after prolonged storage, the products no longer retain their original characteristics and it is better to destroy them.

According to Prof. Lucas Reijnders of the Stichting Natuur en Milieu (Nature and Environment Foundation) it is clear from the 'long history of much damage' associated with the use of Dieldrin that this hydrocarbon which is toxic to all animal life including humans is dangerous even when used properly. There have been many accidents with the product in the third world because, in practice, the proper precautions are not adequately implemented.

Dieldrin is based on a very persistant substance which gradually evaporates in the soil but remains in the atmosphere and is sometimes found in seawater hundreds or thousands of kilometers away from the field originally sprayed. Traces of Dieldrin have even been found at the North and South poles.

Doc. 3991x

In the early 1960s, a problem at Shell Chemie's Pernis plant led to Telodrin being discharged, causing plants and wildlife in the area to be poisoned and older ducks and seagulls on the western Weddensee to be killed in large numbers. Shell is still embroiled in a court case with the State over the cost of cleaning up the Zellingwijk residential area in Gouderak which was constructed on a former dumping ground for 'drins' (including Dieldrin).

Prof. Reijnders describes the new locust control pesticides developed by Shell as 'acceptable', although you can't say that they won't cause any problems at all. Fastac in particular kills cold-blooded creatures such as fish and crustaceans, as well as locusts, but it's all a matter of balance. The locusts have to be controlled, and as effectively as possible'.

Poisons from Niger incinerated

Shell gets back old stocks of pesticides

AVR (Afvalverwerking Rijnmond - Rijnmond Refuse Processors) last week incinerated old stocks of the pesticide dieldrin. The consignment had been received from the African state of Niger.

Shell, the producer of dieldrin, provided technical assistance for this clean-up operation, trained the people there and organised transport outside Niger. The project was undertaken at the request of the Niger government by the American international development agency USAID and the German development body GTZ.

There were 54 tonnes of old dieldrin stocks in Niger. The substance was used in the past to combat plagues of locusts. Dieldrin is one of the so-called 'drins' which were banned years ago in western countries because they are highly toxic, difficult to break down and highly dangerous when used incorrectly.

Shell Chemie of Pernis was the last company anywhere in the world to produce 'drins' principally for export to the third world. A Shell spokesman stated that USAID asked the company to help get the dieldrin stocks out of Niger. The safest method was for AVR to use high temperature incineration (above 1400 degrees). The environmental organisation Greenpeace stated yesterday that the old dieldrin stocks had been sent back on the basis of "return to sender" and that there were more African countries where toxic pesticides were stockpiled that would be following Niger's example.

Shell stated that AVR had been chosen because it was the best place for the dieldrin to be processed. The possibility of incinerating the insecticides in a mobile installation in situ was also considered, but the environmental risk was too great. The ministry for environmental management granted a permit for incineration to take place. The whole operation cost 700,000 guilders, 85% being paid for by USAID and 15% by GTZ. Shell did not charge for its ---------- FAO is currently establishing where in Africa more old pesticides might be held. Shelll Nederland has declared its willingness to co-operate in safe processing of old pesticides produced by the company.

Greenpeace states that there are pesticides stockpiled in virtually every country in Africa, constituting a risk to both men and the environment. The organisation is of the opinion that the industrialised countries must bear responsibility for the substances they sold to Africa: they should take them back and, at the same time stop producing them.

Shell has now stopped producing 'drins'. Endrin production was stopped in the early 1980s, and dieldrin was taken out of production in 1987. Over and above the volumes contracted to be sold, Shell Chemie has 125 tonnes of dieldrin stocks: these were dealt with by AVR earlier this year. Less toxic alternatives have now been developed for control of the desert locust. Shell ceased production of aldrin in the early part of 1990. The company still has sales obligations but these will have expired by the end of the year, finally marking the end of the era of 'drins' production and sale. Production in the past caused serious pollution of the Eorate Petroleumbaven*. The ground has since been decontaminated.

* Literally: First Oil Port - a reference to Rotterdam, I assume CP.

Nigeria (SIC) returns 50 tonnes of prohibited pesticide to the Netherlands.

Washington, 4 AUG (IPS) - Niger returned approximately 50 tonnes of pesticides to the Netherlands lask week. The product concerned was the prohibited, highly toxic pesticide dieldrin, given* to the African country during the last 30 years and produced by Shell Nederland. This was the report given by the American office of the international environmental organisation, Greenpeace.

Dieldrin has been given to Niger by American and European aid organisations since the sixties for the control of locust infestations. It was shipped back to the Netherlands by the American aid organisation USAID, the German agency for development cooperation, GTZ, and Shell, at the request of the Niger authorities.

According to Greenpeace, however, the donationd of pesticides to the Third World are still continuing. Between 1986 and 1989, the development organisations donated 275 million dollars to insecticide programme for locust control in 23 countries in Africa and the Middle East.

The American agency for technological development (OTA - Office of Technology Assessment), expressed doubts of the effectiveness of pesticides in locust control in a report last year. , "Those who really benefit from the pesticide donationations are the chemical companies, while the African population is saddled with poisoned food and a polluted environment", says Bill Barclay, spokesman for Greenpeace. USA's pesticide campaign.

However, Greenpeace has warned that development organisations and chemical companies are planning to destroy pesticides in Africa, Incinerators would be constructed in Africa with the aim of destroying the stocks of pesticides. The organisations involved include USAID, the United Nations Food and Agricultural Organisation (FAO) and the Swiss chemical company, Ciba-Geigy.

The environemntal organisation argues in favour of sending the pesticides back to their country of origin instead of incinerating them in Africa. "If they are returned to whoever sent them, the African environment will be protected, dangerous processing facilities will be prevented from being built in the Third World and the ------- industrialised countries will be forced to take the responsibility for pesticides which they send to Africa", says Barclay.

Translator's note: the verb "schenken" generally means "to give", but according to the dictionary, also has the meaning "to sell". However, the noun "schenking" also used in this text only has the meaning of a "gift" or "donation".

Par ailleurs, on se souvient encore de la controverse qui s'éleva très [illegible] entre bailleurs de fonds sur l'utilisation de la dieldrine. Les USA sont à l'origine du débat. Ils imposèrent de fait son interdiction sur la base de leur malheureuse expérience nationale avec l'usage à grande échelle de tous les produits de la famille des "drines". La contribution américaine aux efforts de lutte fut en effet conditionnée au non-usage de la dieldrine dans les pays envahis par le Criquet pèlerin. Seuls les pays autonomes financièrement et économiquement, comme l'Arabie Saoudite, restèrent libres de l'utiliser, ce qu'ils firent avec de bons résultats.

Pendant que les hommes s'interpellaient dans les instances internationales, sur le terrain, il n'était déjà plus question de lutte préventive ou curative en région désertique là où l'usage de la dieldrine aurait été admissible, on entrait dans la phase de lutte palliative contre une invasion qui avait atteint les régions habitées. D'énormes quantités de divers pesticides organophosporés moins persistants et réputés non bio-accumulables furent déversées. Ainsi, durant la campagne 1988/89 le Maroc traita presque deux millions d'hectares et, en deux ans, plus de vingt millions d'hectares furent aspergés d'insecticides concentrés en Afrique.

L'affaire en resta là jusqu'en 1989. On fit semblant de croire que la dieldrine n'existait plus mais les rumeurs les plus diverses circulèrent sur les réserves de ce produit dont les stocks disparaissaient brusquement des statistiques officielles. On parla même de trafic, de ventes mystérieuses et de dons de dieldrine de certains pays africains à d'autres plus pauvres qu'eux et politiquement plus complaisants.

En 1989, l'USAID, Agence des Etats Unis pour le Développement international, voulut assumer sa politique jusqu'au bout. Elle décida de réagir à une information provenant du Niger. Des fûts de dieldrine qui fuyaient étaient signalés dans les dépôts du nord du pays [illegible] Après recensement de l'ensemble des stocks et de l'état des fûts, on regroupa le tout sur un site sur[illegible] La dernière phase de ce programme de gestion des pesticides indésirables entamé au Niger prévoit la construction d'un hangar spécial qui sera constamment surveillé. Même les outils qui auront servi aux manipulations y seront abandonnés. Des suremballages spéciaux garantiront la pérennité des fûts abîmés. Reste à régler le sort des portions de sol et des entrepôts fortement pollués par les fuites. L'intérieur des entrepôts serait complètement remis à neuf y compris le revêtement des murs. Le coût de cette phase de l'opération dépasserait les 800.000 FF (40 millions de F CFA) et il ne s'agit que de 26.000 litres ! Aucune solution d'élimination directe n'est envisagée si ce n'est d'attendre que le temps fasse son œuvre en dégradant peu à peu le produit. À noter que des stocks vieux de plus de trente ans gardent une bonne efficacité antiacridienne. Tout ceci fait étrangement penser, à une échelle heureusement plus modeste, aux déchets radioactifs dont on a tant de mal à se débarrasser.

À suivre

INÉDIT : LES DIRECTIONS DOMINANTES DE DÉPLACEMENT DES AILÉS SGR DU CENTRE SUD DU SAHARA EN FIN 1988

En coopération avec MÉTÉO FRANCE, (ex. Météorologie nationale française), le PRIFAS a établi les grands axes de déplacement possibles pour les essaims de Criquet pèlerin, *Schistocerca gregaria* (Forskål, 1775) en fin 1988, juste après la fameuse échappée vers les Caraïbes qui laissa le monde acridologique perplexe, voire incrédule.

Pour la clarté de l'exposé, on ne retiendra que le devenir des populations ailées disponibles à ce moment-là dans le Centre Sud du Sahara, c'est-à-dire dans l'Adrar des Iforas, le Tamesna, l'Aïr, au nord-est du Mali et au nord-ouest du Niger.

Cinq grandes périodes sont à considérer :

1. du 29 octobre au 10 novembre 1988 : les ailés peuvent aller selon les jours soit vers le nord et le nord-ouest, en direction de l'Algérie et du Maroc (2 jours sur 3), soit vers l'ouest, en direction de la Mauritanie et du Sénégal (1 jour sur 3) ;
2. du 12 au 23 novembre 1988 : le circuit ouest est privilégié. Les ailés disponibles traversent le Mali et vont au Sénégal et en Mauritanie ;
3. du 23 novembre au 3 décembre 1988 : les vents sont très variables, des mouvements se produisent partout mais ils se compensent. Globalement, le brassage des ailés n'aboutit pas à une émigration massive ;
4. du 4 au 22 décembre 1988 : un fort encouragement à aller vers le sud se dessine avec de rares possibilités d'échappées vers l'est. À ce moment, de nouveaux pays se trouvent envahis passagèrement : le Burkina Faso, la Guinée, la Guinée Bissau, la Gambie ;
5. du 23 au 26 décembre 1983 : les voies de déplacement vers l'ouest, et plus rarement vers le nord-ouest, sont ouvertes, mais peu d'ailés sont encore disponibles pour en profiter.

Ces premiers éléments font partie du biomodèle SGR en cours de création par le PRIFAS. Ce projet est financé dans sa phase I par le Ministère français de la Coopération et la Commission des Communautés Européennes.

SAS PAR LUI-MÊME

Au 20 mars 1990, 276 réponses au questionnaire SAS 18/89 sont parvenues au PRIFAS.

Question 6

Le nombre annuel idéal de lettres est de 18 selon 84 % des correspondants ; au moins 12 % se satisferaient de 12 lettres, 1 % de 16 et 3 % de 14. En 1990, SAS s'efforcera de satisfaire la majorité, donc de publier 18 lettres si ses moyens le lui permettent

Questions 7 et 8

Environ 37 % des correspondants ont utilisé des fiches de signalisation pour faire état des situations acridiennes qu'ils ont rencontrées. Si l'on écarte le cas des personnes qui n'ont plus l'occasion d'utiliser les fiches, à cause d'un changement de fonction par exemple, mais qui sont toujours intéressées à rester dans la mouvance SAS, 45 % des correspondants ayant répondu évoquent un manque de temps pour faire plus, 40 % un manque de moyens et 15 % demandent une participation aux frais d'envoi.

Questions 9 et 10

La grande majorité des correspondants (92 %) diffusent les lettres SAS autour d'eux. Chaque lettre a en moyenne 5 à 6 lecteurs. On compte deux types de diffusion, l'une par proximité autour des correspondants (de 2 à 4), l'autre autour des institutions par photocopie (de 5 à 20 et plus). À noter que 35 % des correspondants font des photocopies des lettres.

Question 11

Plus de 93 % des correspondants pensent qu'il faut poursuivre l'opération SAS sous sa forme actuelle.

In other cts, we can still recall the early controversy between th. nancial backers on the use of dieldrin. USA is at the heart of the debate. .neir interdiction was imposed, based on their own unfortunate national experience with the large-scale use of all of the products in the "drines" family. The American contribution to locust control efforts were based on the conditional non-use of dieldrin in countries overwhelmed by Desert Locusts. Only financially and economically autonomous countries, like Saudi Arabia, were free t. use it, which they did with good results.

While people challenged one another internationally in the field, there was no longer any question of using preventive or curative controls in desert regions, where the use of dieldrin could have been acceptable, palliative control was necessary since outbreaks had reached the inhabited regions. Enormous quantities of various organophosphorous pesticides, known to be less persistent and non bio-accumulative, were spread. Hence, during the 1988/89 season, Morocco treated almost 2 million hectares, and in 2 years more than 20 million hectares were soaked with concentrated insecticides in Africa.

The affair continued in this way until 1989. Dieldrin seemed to no longer exist, but there were many different rumours circulating on the reserves of this product whose stocks had suddenly disappeared from the official statistical lists. There were even stories of trafficking, mysterious sales and donations of dieldrin from certain African countries to other, poorer and more politically complaisant countries.

In 1989, USAID, the U.S. Agency for International Development, hoped to take their policy to its limit. They decided to act on a piece of information from Niger. Leaking drums of dieldrin were reported in depots in the north of the country near inhabited zones. After surveying the entire stock and the condition of the drums, everything was collected onto one guarded site. The second phase of this program begun in Niger to manage undesirable pesticides, involved construction of a special shed which would always be guarded. Even the equipment used in treatment was to be left there. Special wrapping was meant to guarantee the perpetuity of damaged drums. Interiors of storage depots were to be completely renovated, including wall coverings. The cost of this phase of the operation would be more than 800 000 FF (40 million F CFA) and would only involve 20,000 litres of insecticide ! There have been no plans to directly eliminate these products, except by leaving them to degrade slowly with time. It should be noted that stocks of older than 30 years still are effective for locust control. Strangely enough, this brings back the memory of the radioactive waste problem, which luckily is on a smaller scale, which is so difficult to get rid of.

To be continued...

UPDATE : THE MAIN MIGRATORY DIRECTIONS OF SGR ADULTS IN CENTRAL SOUTH SAHARA AT THE END OF 1988

PRIFAS, in cooperation with MÉTÉO FRANCE, (formerly Météorologie nationale française), have established the main possible migration routes for Desert Locust, *Schistocerca gregaria* (Forskål, 1775) swarms at the end of 1988, just after the famous escape towards the Caribbean, which perplexed and amazed the acridological world.

For clarity, only the fate of available adult populations at that moment in central-southern Sahara are considered, which means in Adrar des Iforas, Tamesna, Aïr, northeastern Mali and northwestern Niger.

There were 5 important periods :

1. from October 29 to November 10, 1988 : depending on the days, adults could go towards the north and the northwest in the direction of Mauritania and Senegal (1 day in 3) ;
2. from November 12 to 23, 1988 : the western route was favourable. The available adults crossed Mali and on to Senegal and Mauritania ;
3. from November 23 to December 3, 1988 : the winds were very variable, locust movements occurred everywhere, but they were counterbalanced. Generally, the mixing of adults did not result in a massive emigration ;
4. from December 4 to 22, 1988 : there was a strong encouragement to go southwards, with a few possibilities to escape towards the east. At this moment, new countries were momentarily invaded : Burkina Faso, Guinea, Guinea Bissau and Gambia ;
5. from December 23 to 26, 1988 : the migration routes towards the west, and less often towards the northwest, were open, but few adults were available to take advantage of this situation.

The first elements are part of the SGR biomodel, currently being created by PRIFAS. Phase I of this project is being financed by the French Ministry of Cooperation and the Commission of European Communities.

SAS ITSELF

By March 20, 1990, 276 replies to the SAS 18/89 questionnaire had been sent to PRIFAS.

Question 6

The ideal annual number of Newsletters is 18, according to 84 % of correspondents ; at least 12 % would be satisfied with 12 letters, 1 % with 16 and 3 % with 14. In 1990, SAS will strive to satisfy the majority, thus publish 18 Newsletters if this is financially possible.

Questions 7 and 8

About 37 % of correspondents had used the report sheets to describe locust situations they had experienced. If the correspondents who are no longer able to use the report sheets because of job changes etc., but who still wish to remain with SAS, are not taken into consideration, then 45 % of those who replied said they do not have enough time to fill in more, 40 % lack the means and 15 % request help for mailing costs.

Questions 9 and 10

Most correspondents (92 %) distribute SAS Newsletters to others around them. Each Newsletter having an average of 5 - 6 readers. There are two types of distribution, one is by hand to people around correspondents (from 2 to 4), the other around institutions by photocopy (from 5 to 20 and more). It should be noted that 35 % of correspondents photocopy the Newsletters.

Question 11

More than 93 % of correspondents believe that the SAS operation should continue in its present form.

UNIQUE CONSORTIUM HELP REMOVE DIELDRIN PESTICIDE FROM NIGER

III|24

A unique consortium involving the U.S., Germany and companies of the Royal Dutch/Shell group is helping the West African nation of Niger dispose of all its known stocks of dieldrin, a persistent and highly toxic pesticide.

Nearly 20,000 gallons of dieldrin were carefully collected in Niger and trucked to the Togolese port of Lome. From there it was shipped to The Netherlands for destruction in a state-of-the-art high-temperature incinerator.

Niger was interested in having the dieldrin removed because, while the pesticide itself is stable, the containers are subject to corrosion, and some have begun to leak.

Cooperating in this venture are the U.S. Agency for International Development (USAID), the U.S. Environmental Protection Agency, the German Development Assistance Agency (GTZ), Shell Nederland Chemie, several Dutch Government agencies, and the Government of Niger.

Once the pesticide of choice in combating locust infestations in Africa and Asia, dieldrin is no longer supported by international assistance organizations.

"This innovative disposal operation is consistent with the overall USAID policy of helping developing countries achieve sustained economic and social progress through environmentally sound resource conservation and management," said Scott Spangler, Assistant USAID Administrator for Africa.

Spangler said the operation was made possible because of the "unique cooperation" of the participating parties.

Dieldrin, formerly manufactured by Shell Nederland Chemie, was supplied for locust control in Africa by various international agencies over the last thirty years. Shell stopped its manufacture in 1987, and the plant is being dismantled.

The cost of the removal, estimated at $350,000, was funded jointly by USAID and GTZ. The incineration of the dieldrin was completed on August 2, 1991 in The Netherlands by Afvlverwerking Rijnmond (AVR), a waste processing company.

There are no suitable alternative chemical disposal facilities in Africa.

According to the United Nations Food and Agricultural Organization, there are old or unwanted stocks of dieldrin in 16 countries, largely in the locust belt in Africa north of the equator, but also as far east as Pakistan and India.

USAID administers U.S. economic and humanitarian assistance in more than 70 countries worldwide.

Agadez

Le préfet visite le Centre national anti-acridien

Le préfet du département d'Agadez, le commandant Moussa Moumouni Djermakoye a visité hier matin le Centre national anti-acridien.

Créé depuis 1988, ce centre a remplacé pour le Niger l'ancienne OCLALAV (l'organisation commune de lutte anti-aviaire et anti-acridienne). Il s'occupe de la lutte anti-acridienne dans notre pays. Mais cette lutte bien qu'efficace n'a toujours pas été saine pour l'homme et pour l'environnement. C'est pour s'informer de cette situation que le préfet du département s'est rendu sur les lieux pour s'enquérir des dispositions prises et à prendre pour éviter les mauvaises conséquences d'un certain nombre de produits chimiques utilisés dans les traitements des zones infectées et prendre connaissance du plan d'enlèvement et d'élimination de la «Diédrine rougère». La Diédrine est un pesticide orga-chloré jadis utilisé dans la lutte anti-acridienne et dont l'utilisation s'est avérée dangereuse pour l'homme et l'environnement.

Intakarbayet Alnouden

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III/24

AGENCY FOR INTERNATIONAL DEVELOPMENT
BUREAU FOR AFRICA
Office of Technical Resources
AFR/TR/ANR
Washington, DC 20523-1515

PRESS RELEASE

Not for Release until 29 april 1991

UNWANTED PESTICIDE STOCKS BEING REMOVED FROM NIGER, WEST AFRICA

An unusual three-way collaborative venture between a major pesticide producer, a host government recipient of donor-financed assistance, and two major development assistance agencies has been initiated in Niger, West Africa. The Government of Niger has asked the United States Agency for International Development (USAID) to assist in the disposal of unwanted stocks of the insecticide dieldrin, and companies of the Royal Dutch/Shell Group have taken a very constructive role to assist in this process. This disposal operation is part of the overall USAID assistance policy of helping developing countries achieve sustained economic and social progress through environmental and conservation and management. The operation in Niger is also being supported by the German development assistance agency GTZ.

Dieldrin had been previously manufactured by Shell Nederland Chemie (Shell Chemical of the Netherlands), and supplied for locust control in Africa by various international agencies over the last thirty years. Historically, dieldrin was the pesticide of choice against the Desert Locust in Africa and Asia, particularly because of dieldrin's long residual action. This pesticide was used almost exclusively for locust control campaigns during the 1950's and early 60's, and the dieldrin now in Niger was supplied for this purpose. The use of the product for this purpose in no longer supported by international aid organizations. The U.S. Environmental Protection Agency (EPA) canceled all uses of dieldrin in the United States in 1987 (the EPA had severely restricted dieldrin use in 1974). The present

Q2. What is the objective of the Niger dieldrin disposal plan?

A2. The objective of the NDDP is to minimize or eliminate the potential human and environmental health risks posed by surplus, deteriorating stocks of dieldrin in Niger by:

- Safely removing 70,000 liters of dieldrin and barrel rinsing solvent from Niger to Holland, in special tanks, via the port of Lome, Togo.
- Disposing of the dieldrin by incineration at a plant which operates at or above U.S. Government standards.
- Recovering, and providing safe disposal or long-term-storage for, dieldrin contaminated solids (soil, barrels) in Niger.
- Decontaminating and crushing dieldrin containers and disposing of the containers by smelting.
- Conducting the recovery, disposal, long term disposition and destruction activities with minimal risk to human health and the environment.

Q3. What will be the responsibilities of USAID, Shell Chemical, GTZ, and the government of Niger?

A3. The USAID field office in Niger will provide assistance to the Government of Niger (GON) for the transfer and destruction of the dieldrin now stored in Niger. The assistance to be provided by USAID/Niger includes, but will not be limited to, the financing and procurement of personnel, materials, technical assistance, disposal facilities, transportation and the rental of equipment and storage facilities.

The Government of Niger (GON) will be responsible for the overall dieldrin removal operation in Niger. To this end, the GON will provide personnel, facilities, equipment, vehicles and other assistance, as may be appropriate. The GON will also make all non-commercial arrangements for the transportation of the dieldrin in Niger and from Niger to the point of embarkation for Holland, including agreements with neighboring countries as may be needed. In addition, the GON will appoint a Coordinator for this activity and

ensure appropriate and timely cooperation of GON personnel which may be required for the operation.

The Shell Chemical Company will provide, under agreement with USAID/Niger and on a reimbursement basis, Isotanks and other equipment required for removal of the dieldrin, transportation of the tanks and equipment to and from Lome, Togo (as may be appropriate), storage of the Isotanks in Holland and the disposal of the dieldrin at a licensed incinerator in Holland. Shell has secured Approval from the Government of Holland for the incineration of the dieldrin in Holland. Shell will also provide two technical experts to give on-the-spot training and to supervise local operations.

The German Techncial Assistance Agency (GTZ, Eschborn, Germany) has a long history of involvement in Niger through its plant protection support to the Directorate of Crop Protection. Also, two regional GTZ projects active in Niger -- the Pesticide Service Project and the Acridology Project -- have expressed an interest in the NDDP. GTZ will participate in the execution of this Plan by providing scientific review of the plan, and by rendering technical and financial assistance, such as for the analysis of sand and soil samples from the warehouse sites for dieldrin residue levels. This analysis will be provided through the GTZ Pesticide Service Project.

The GTZ will also provide financial assistance for implementation of the NDDP (for example, fuel, oil and per diem for the local work crew). The GTZ Acridology Project's biological control program will finance the addition of a cement floor to the Inabangharit warehouse.

Q4. Is there any soil contaminated with dieldrin at the storage sites in Niger, and if so, what will happen to it?

A4. An estimated 35 cubic meters (about three dump truck loads) of soil is considered to be sufficiently contaminated, based on pesticide residue analyses, so to require special disposal procedures. All contaminated sand and soil will be buried in specially prepared pits lined with charcoal and provided with an

impervious cover. The pits will be located in isolated areas where the water table is very deep.

Q5. What will be the fate of the emptied dieldrin barrels?

A5. There are over 250 barrels involved, which, after being rinsed, will be cut into pieces in Niger and shipped to Holland to a steel smelter to be melted down.

Q6. Will all of the dieldrin in Niger be removed and destroyed?

A6. Yes

Q7. To which customers/countries does Shell still supply dieldrin?

A7. Shipments of dieldrin from the SNC plant in Holland ceased at the end of 1990. No further orders will be accepted. Stocks held by Shell operating companies are small and are expected to be sold and used during 1991. In each of the countries where sales continue, government approvals have been obtained for the use of the products. The prime remaining use of this product is for the control of subterranean termites around buildings and for the control of insect pests in timber and industrial situations. A strict product stewardship program is in place in all countries where dieldrin is sold to ensure the product is stored, handled, and used in a safe and responsible manner.

Q8. With dieldrin stocks in so many African countries, why is USAID (and consequently Shell) concentrating first on Niger?

A8. USAID, an agency of the American government, identified the problem in Niger and has a field mission there capable of providing the necessary organizational support. In addition, the German overseas technical assistance agency, GTZ, has joined USAID in supporting the dieldrin removal operation in Niger.

Q9. Why was it decided not to incinerate locally?

A9. There are no suitable incinerators in Niger, nor in elsewhere in sub-Saharan Africa.

Q10. What do you mean by unwanted products?

A10. They are stocks which are many years old and therefore may no longer be suitable for use. A further complication is that drums have sometimes been abused during handling and storage and over long periods; this can lead to a risk of leakage. In addition, USAID it is policy to not support the use of this type of pesticide.

Q11. In how many countries are there still old or unwanted dieldrin stocks?

A11. In 16 countries, principally those in the African locust belt north of the equator, and including countries as far east as Pakistan and India. This is based on a survey by the FAO.

Q12. What about the costs needed to retrieve the old dieldrin stocks? Who will pay for it?

A12. It will be expensive and will involve governments and aid organizations. Shell has made available its expertise and manpower free of charge.

Q13. How long will the Niger dieldrin disposal project last?

A13. Incineration of the stock from Niger will take place as from June 1991. Shell is prepared to co-operate in the collection for destruction of similar stocks of dieldrin from other countries provided there is a competent local organization able to assist.

Q14. Do you know anything about products from other companies? Shell is surely not the only company that has supplied insecticides to the countries in question.

A14. According to FAO and USAID, there are large quantities of unwanted stocks of insecticides in the African continent and elsewhere. Bodies such as FAO and USAID are developing strategies for dealing with the problem. The International Association of Pesticide Manufacturers is about to publish a booklet on how to dispose of such stocks and how to avoid a recurrence of the situation.

Q15. What will be the impact on the environment if dieldrin is incinerated in the Netherlands?

A15. It will be done at AVR in a very modern installation under controlled conditions, with the agreement of the ministry for Housing, Regional Development and the Environment. The incineration will be fully monitored and carried out in full compliance with the stringent Netherlands standards, which are among the highest in Europe.

Q16. What are the alternative products which you are now offering instead of dieldrin?

A16. They are products such a acyl ureas (anti-moulting agents) and the synthetic pyrethroid Fastac (alpha cypermethrin).

Q17. How long have you made dieldrin in the Netherlands, and was this the only Shell location to make this and similar products?

A17. Dieldrin and similar pesticides have been produced in at the Shell Netherlands facility since 1954. Production of endrin was terminated in 1982, dieldrin in 1987 and aldrin in February 1990. Shell Oil USA produced these pesticides from 1952 to 1979.

Q18. What are the health effects on workers involved in manufacturing dieldrin?

A18. A Ph.D dissertation written by a Shell scientist indicated that there is no evidence of adverse health effects in any of the factory workers. On the contrary, they were found to have a lower mortality than the general population.

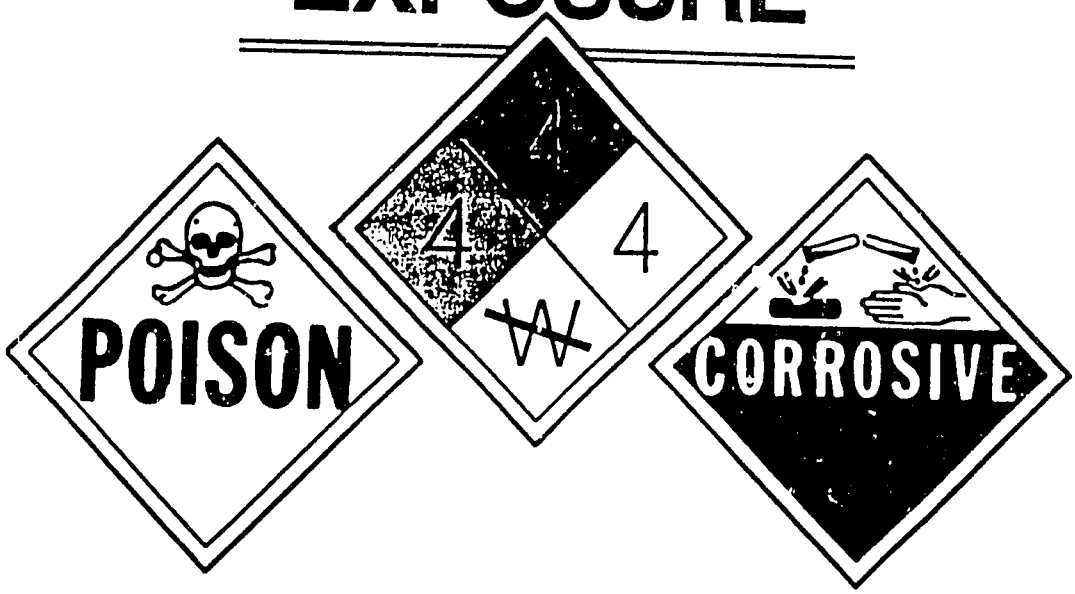
In this regard, Shell companies impose stringent safety requirements on those working in their plants, so exposure to the product is prevented to the extent possible, but inevitably exposure of these workers was higher than the general population. Furthermore, the health of these people has been carefully monitored on a routine basis by Shell. The above discussed Ph.D research supports Shell's view that these products may be used without hazard provided that they are handled correctly.

Q19. What is the current status of these pesticide manufacturing plants?

A19. These production plants have been dismantled.

Annex J: Emergency Care for Hazardous Materials Exposure

EMERGENCY CARE FOR HAZARDOUS MATERIALS EXPOSURE



Alvin C. Bronstein
Phillip L. Currance

EMERGENCY CARE FOR HAZARDOUS MATERIALS EXPOSURE

Alvin C. Bronstein, M.D., FACEP
Phillip L. Currance EMT-P

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uthorizes anyone to perform
perating protocols, standing
Emergency Medical Service

losages and precautions are
ult the package information

lecontamination procedures
cope of this text to advise the
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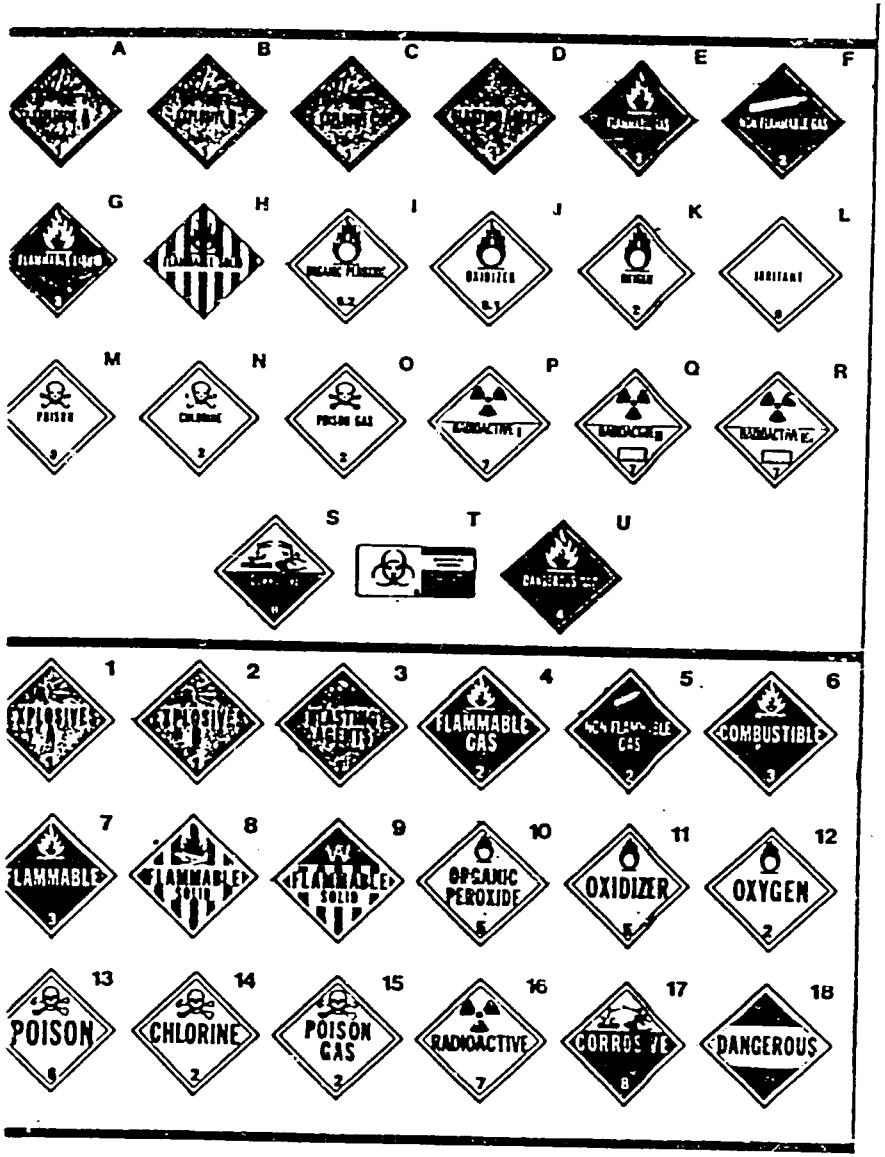

Hazard Class—Labels

A See Guideline 1 (Explosives)
B See Guideline 1 (Explosives)
C See Guideline 1 (Explosives)
D See Guideline 1 (Explosives)
E See Guideline 2 (Flammable Gases)
F See Guideline 3 (Non-Flammable Gases)
G See Guideline 5 (Flammable Liquids)
H See Guideline 6 (Flammable Solids)
I See Guideline 7 (Organic Peroxide)
J See Guideline 8 (Oxidizer)
K See Guideline 8 (Oxidizer)
L See Guideline 9 (Irritating Material)
M See Guideline 10 (Poisons)
N See Guideline 10 (Poisons)
O See Guideline 10 (Poisons)
P See Guideline 12 (Radioactives)
Q See Guideline 12 (Radioactives)
R See Guideline 12 (Radioactives)
S See Guideline 13 (Corrosives)
T See Guideline 11 (Etiological Agents).
U See Guideline 6

Hazard Class—Placards

1 See Guideline 1 (Explosives)
2 See Guideline 1 (Explosives)
3 See Guideline 1 (Explosives)
4 See Guideline 2 (Flammable Gases)
5 See Guideline 3 (Non-Flammable Gases)
6 See Guideline 4 (Combustible Liquids)
7 See Guideline 5 (Flammable Liquids)
8 See Guideline 6 (Flammable Solids)
9 See Guideline 6 (Flammable Solids)
10 See Guideline 7 (Organic Peroxide)
11 See Guideline 8 (Oxidizer)
12 See Guideline 8 (Oxidizer)
13 See Guideline 10 (Poisons)
14 See Guideline 10 (Poisons)
15 See Guideline 10 (Poisons)
16 See Guideline 12 (Radioactives)
17 See Guideline 13 (Corrosives)
18 Insufficient information to determine proper guideline.

CHEMICAL NAME	UN #	CHRIS	GUIDELINE #
Demeciphum			19
Demeriton	1957		79
DDT			35
Di (1-Hydroxycyclohexyl) Peroxide	2148		16
Di (2-Ethylhexyl) Phosphoric Acid	1902	DEP	14
Di-butylamine	2361		16
Di-butylene	2050		16
Di-Isopropyl Ether	1159		71
Diacetone Alcohol	1148	DOA	5
Diallate			27
Diallylether	2360		71
Diamitafos			58
Diazinon	2783	DZN	58
1,2-Dibromoethane	1605		30
1,2-Dibromo-3-chloropropane			36
Dibromodifluoromethane	1941		72
Dibromane	1941		73
Dichlofenthion			58
Dichloran			34 & 38
Dichloracetic Acid	1764		14
Dichlorobenzene	1591	DBM	30
	1592		
o-Dichlorobenzene	1591	DBO	30
p-Dichlorobenzene	1592	DBP	30
Dichlorodifluoromethane	1028	DCF	3
1,3-Dichloro-5,5-Dimethyl hydantoin			44
1,1-Dichloroethane	2362	DCH	30
1,2-Dichloroethane			30
1,1-Dichloro-2,2-bis (p-chlorophenyl) ethane			35
Dichloroethylene	1150	DEL	30
1,2-Dichloroethylene	1150		30
1,1-Dichloroethylene			30
Dichloroethyl Ether	1916		30
Dichloroisocyanuric Acid Dry	2465		14
Dichloromethane	1593	DCM	30

CHEMICAL NAME	UN #	CHRIS	GUIDELINE #
Dichloromonofluoromethane	1029		72
1,1-Dichloro-1-Nitroethane	2650		55
Dichloropentane	1152		72
Dichlorophen(e)			59
2,4-Dichlorophenol	2021	DCP	59
2,5-Dichlorophenol	2021		59
Dichlorophenoxyacetic Acid	2765	DCA	34
4-(2,4-Dichlorophenoxy) butyric acid			34
2-(2,4-Dichlorophenoxy) Ethyl Sulfate Sodium Salts	1594		34
2-(2,4-Dichlorophenoxy) Propionic Acid			34
1,2-Dichloropropane	1279	DPP	36
1,3-Dichloro-2-Propanol	2750		30 & 36
Dichloropropene	2047		36
1,3-Dichloropropene	2047	IPU	36
2,2-Dichloropropionic Acid	1760		14
Dichlorotetrafluoromethane	1958		3
Dichlorvos	2783	DCV	58
Dichromate Salts			14 & 32
Dicrotophos	2783		58
Dicyclohexylamine	2565		38
Dicyclohexylamine 4,6-Dinitro -o-cyclohexylphenate			38
Dicyclohexylamine Nitrite	2687		34
Dicyclopentadiene	2048	DPT	5
Dieldrin	2761	DLD	37
Dienochlor			31
Diesel Oil		OHS	46
Diethylamine	1154	DEN	5
Diethylaminoethanol	2686		5
Diethyl Aniline	2432		19
Diethylhexyne	2049	DEH	19
Diethyl 2-Chloroethyl Phosphate			58
Diethylene Glycol		DEG	30
Diethylene Glycol Abietate			39

EMERGENCY SCENE MANAGEMENT

— Isolate the hazard area and deny entry.

— Establish a safe zone that is upwind and uphill (if possible), avoid low-lying areas. Keep unnecessary people away (including non-essential emergency response personnel).

— Evacuation distances vary depending on chemical, weather, and situation. The distances listed below are only suggested guidelines. Consult other reference material as soon as possible for exact distances.

- Evacuate area for a minimum of 1 mile in all directions if Class A explosives are involved, ½ mile if Class B or C.
- Evacuate area for a minimum of 1 mile if a tank or tank car of gaseous material is involved in a fire.
- Evacuate area for a minimum of ½ mile if a tank or tank car of flammable liquid is involved in a fire.

— Do not assume that the scene is safe because the substance does not have any odor or apparent color.

— Call for help from local authorities (PD, FD, HAZMAT Team, Health Dept., etc.)

— Wear self contained breathing apparatus and proper protective clothing (protective equipment must be appropriate and compatible with the chemicals involved. Selection must be made by a qualified individual using appropriate reference material). Do not enter hazardous environments, even to effect rescue or carry out decontamination procedures without proper protective equipment.

— Attempt to identify the products involved by placard, UN number, or on scene personnel. Do not attempt to recover manifest or bill of lading unless properly protected.

— For emergency assistance call CHEMTREC, 1-(800)-424-9300 and your local poison control center.

— Consult the U.S. Department of Transportation, Emergency Response Guide for more complete information.

GUIDELINE 37

SUBSTANCE IDENTIFICATION: Found in solid form as a colorless to light tan waxy substance with a musty odor. In liquid form it can be found as a colorless to thick amber liquid with a mild to chlorine-like odor. Used as pesticides and insecticides.

ROUTES OF EXPOSURE:

Skin and eye contact
Inhalation
Ingestion
Skin absorption

LIFE THREAT: Seizures and respiratory failure.

SIGNS & SYMPTOMS BY SYSTEM:

Cardiovascular—Increased heart rate and blood pressure. Arrhythmias may be present.
Respiratory— Respiratory failure and irritation to the mucous membranes.
CNS—Seizures, usually without warning, muscle tremors, headache, dizziness, and confusion.
Gastrointestinal—Nausea, vomiting, diarrhea, and abdominal pain.
Eye—Chemical conjunctivitis and blurred vision.
Skin—Irritation.
Other—Symptoms may be delayed 30 minutes to 10 hours post-exposure. Some toxicity may be due to the solvent (usually kerosene or xylene); see Guidelines #46 and #69. Prolonged exposure to hydrocarbon solvents can cause organic brain dysfunction known as the Psycho-Organic Syndrome of Solvents. In severe cases of exposure this may progress to toxic neuroencephalopathy (dementia). This can produce permanent brain damage. Even breathing relatively small amounts of solvent fumes can produce this syndrome.

DECONTAMINATION:

- Wear positive pressure self-contained breathing apparatus and special protective equipment.
- Delay entry until equipment is available.
- Remove patient from contaminated area.
- Gently brush away any dry particles and blot, with absorbent material, any excess liquids that are present.
- Rinse patient with water and remove all clothing, jewelry, and shoes.
- Wash patient with Tincture of Green Soap and large quantities of water.
- Refer to decontamination protocol in Section III.

BASIC TREATMENT:

- Assist ventilations as needed.
- Administer oxygen by nonrebreather mask at 6 to 12 L/min.
- Anticipate seizures, reduce all external stimuli and treat as necessary (refer to seizure protocol in Section III).
- Flush eye immediately with available water for eye contamination. In adults, if lid and globe are intact and without edema, eye irrigation lens may be used. Do not force lens; if unable to insert easily, do not use. For children, and if unable to use irrigation lens

in adults, flush eyes using large bore IV tubing. Irrigate each eye with a minimum of 1000 ccs of normal saline (refer to eye irrigation protocol in Section III).

- Administer 4 to 8 oz of water for dilution if product was ingested and the patient can swallow, has a good gag reflex, and no drooling.
- Do not use emetics.

ADVANCED TREATMENT:

- Consider orotracheal or nasotracheal intubation for airway control in the unconscious or severe respiratory distress patient.
- Monitor cardiac rhythm and treat arrhythmias as necessary (refer to cardiac protocol in Section III).
- Start an IV with LR TKO.
- Treat seizures with diazepam (Valium®). DOSAGE: 2 to 10 mg in 2 mg increments slow IV push (refer to diazepam protocol in Section IV).
- Use proparacaine hydrochloride to assist eye irrigation (refer to proparacaine hydrochloride protocol in Section IV).

SPECIAL CONSIDERATIONS: Use epinephrine and vasopressors cautiously unless in cardiac arrest. These drugs may cause overstimulation of the myocardium. See Guidelines #46 and #69 for care of toxicity due to vehicle involved.

DECONTAMINATION PROTOCOL

INDICATIONS:

- Stop absorption and prevent systemic exposure.
- Confine contaminants in a specified area.
- Prevent contamination of EMS and hospital personnel.

PROCEDURE:

- Identify the product, life threat, and route of exposure.
- Establish a controlled access system with an entry and exit point.
- Establish a minimum two stage decontamination process that is upwind and uphill from contaminated area. Take into consideration distance from contaminated area; if distance is great, transportation may be required (i.e., a pickup truck). The first stage is a water rinse and the second stage consists of a soap and water scrub and rinse (a more extensive decontamination process may be necessary, refer to resource data and on scene authorities).
- Wear positive pressure self-contained breathing apparatus and special protective clothing applicable to the specific chemicals involved.
- Delay entry until protective equipment is available. Do not enter hazardous environments or carry out decontamination procedures unless properly protected.
- Remove the patient from the contaminated area.
- Solid or particle contaminants should be brushed off as completely as possible prior to washing, in order to reduce the chance of reaction to water. Heavy liquid contaminants should also be blotted from the body prior to washing.
- Rinse patient with water than remove all clothing, jewelry, and shoes from the patient.
- Wash patient with Tincture of Green soap or other mild soap. Liquid soaps dispensed from small squeeze bottles work very well. Pay special attention to hair, nail beds, and skin folds. Soft brushes and sponges may be used. Be careful not to abrade the skin and use extra caution over bruised or broken skin areas. Abraded skin can enhance the skin absorption of toxic products. The patient should be rinsed with large quantities of water (a water massage shower head may be beneficial). In some cases, a special rinse may be beneficial (refer to on-scene expertise).
- For removal of contact lens and emergent eye care, refer to eye irrigation protocol in Section III.
- Contain all runoff. Small children's wading pools or draft tanks may be useful. If no containers are available, channel runoff to a containment area.
- Use low water pressure on hose lines to control the spray and avoid aggravating any soft tissue injuries. Avoid over-spray and splashing.
- If possible, use warm water. More extensive washing can be accomplished. If cold water must be used, there is a high risk of hypothermia.
- The patient should be transported in a plastic zip front body bag that is closed to chest or chin level. This will limit the amount of contamination to the transport crew and ambulance. Because of the zip front, instant access to the patient can be maintained. If no body bags are available, wrap the patient in sheets or blankets before turning over to transport personnel. All nonessential equipment should be removed from the ambulance. If time permits, cover floor and walls of ambulance with plastic to reduce

contamination. Equipment such as monitors and radios can be placed in plastic bags to reduce possible contamination. All transport vehicles, equipment, and crews must be decontaminated prior to returning to service.

- All clothing must be saved in a separate plastic bag, marked with the patient's name. The level of exposure can sometimes be estimated from the amount of contaminant on the patient's clothes. Place patient's personal effects in a separate plastic bag also labeled with the patient's name.

SPECIAL CONSIDERATIONS:

- If weather conditions are extreme, consider transporting patients to a local facility (school, firehouse, indoor car washes) after initial rinse for thorough decontamination. Remember that transport personnel, vehicles, and facility used will be contaminated. Another problem associated with indoor facility use is containment of runoff. Consult with local water authorities for assistance.
- Hospitals are poor choices for decontamination unless they have a special decontamination unit. Remember that transport vehicles and personnel will be contaminated.
- Because of the high possibility of hypothermia, have sheets and blankets available to cover stretcher patients. If possible, supply disposable clothes or scrubs and footwear for ambulatory patients post decontamination.

SEIZURES

MECHANISM OF INJURY: Many metabolic disturbances may result from toxic exposures such as hypocapnia, cerebral anoxia, water intoxication, and hypoglycemia. Seizures may result from any of these abnormalities. Certain compounds such as strychnine, picrotoxin, pentylenetetrazol, camphor, DDT, chlorinated insecticides, parathion, and other organo fluroacetates regularly cause seizures.

SIGNS & SYMPTOMS:

CNS—Focal or grand mal seizures and possibly status epilepticus. Deviation of the eyes may occur.

Other—Increased temperature, fractures, dislocations. Trauma to the tongue and incontinence may occur.

BASIC TREATMENT:

- Assure an open airway and support ventilations as necessary if patient is in status epilepticus.
- Administer oxygen by nonrebreather mask at 6 to 12 L/min.
- Do not force anything between the teeth.
- Protect patient from injury, do not restrain.
- Reassess patient postseizure.

ADVANCED TREATMENT:

- Consider orotracheal or nasotracheal intubation for airway control in the unconscious or status epilepticus patient.
- Monitor cardiac rhythm and treat arrhythmias as necessary.
- Start an IV of LR of NS TKO and draw blood sample.
- Administer 50% glucose. DOSAGE: 25 gm IV push in the adult patient.
- If patient is actively convulsing, administer diazepam (Valium®). DOSAGE: 2 to 10 mg in 2mg increments slow IV push.

SPECIAL CONSIDERATIONS:

- Diazepam may depress respiratory drive, be prepared to assist respirations.
- Reduce stimuli as much as possible.

DIAZEPAM (VALIUM)

MAJOR ACTIONS:

- Acts as an antianxiety agent.
- Acts as an anticonvulsant.
- Produces sedation.
- Acts as a skeletal muscle relaxant.

INDICATIONS:

- Patients with active seizure activity.
- Status epilepticus. Any seizure lasting more than five minutes, or two seizures wit regaining consciousness.
- Valium should only be administered to a patient who is actively seizing.

DOSAGE:

- *Adult:* 2 to 10 mg in 2 mg increments by slow IV push.
- *Pediatric:* 0.3 mg/kg by slow IV push. Total of 2-5 mg.

PRECAUTIONS:

- Can cause respiratory depression and arrest.
- Effect is intensified in patients with other depressants or alcohol on board.

HOW SUPPLIED:

- In prefilled syringes of: 10 mg/2 ml.

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Smith W: An Investigation of Suspected Dinoseb Poisoning After the Agricultural Use of a Herbicide. The Practitioner 1981;225:923-6.

Aldrin
Dieldrin

Common name	Shell trade mark	WHO Hazard Class*	Formulation types
aldrin	Aldrin	1b	EC, WP, UL
dieldrin	Dieldrin	1b	EC, UL

*The classification refers to the active ingredient.

NOTE The manufacture of both aldrin and dieldrin has ceased. This advice sheet will assist in safe handling and disposal of any remaining stocks.

Hazard summary Aldrin and dieldrin are organochlorine insecticides. They are highly hazardous by the oral and dermal routes. It is therefore essential that in handling and use the correct precautions are observed.

Aldrin is converted to dieldrin in biological systems. Dieldrin is persistent in the environment and is not readily biodegradable. Care must be taken in handling and use and particularly with waste disposal to avoid environmental contamination.

Storage Technical materials and formulations should be stored in locked buildings preferably dedicated to insecticides and in a bunded area.

Keep all products out of reach of children and unauthorised personnel. Do not store near foodstuffs.

Transport Comply with any local requirements regarding movement of hazardous goods. Do not transport with foodstuffs. Check that containers are correctly labelled before despatch.

Transport accident procedures Before dealing with any accidents ensure that the advice given under Personal Protection (below) will be followed.

Contact the emergency services (fire, police) and call an ambulance if there are injuries.

Consult the 'Tremcard' (see Section 1.4) carried by drivers of road vehicles, if available.

Contact the local Shell company and inform them of the actions taken.

Liquid products Keep spectators away from leaking product and do not allow smoking or use of naked flames at the scene of the accident.

Prevent liquid from spreading or contaminating other cargo, vegetation or waterways, with a barrier of the most suitable, readily available material eg, earth or sand.

Absorb spilled liquid with spill control material, sawdust, sand or earth, and place it in a closeable container for subsequent safe disposal (see 'Waste disposal').

Solid products

Keep spectators well away from spillage. Avoid raising a dust cloud.

Use an industrial vacuum cleaner or add damp sawdust, sand or earth to the spilled product, then sweep up the residue into a suitable container (eg, closed-top drum) for subsequent safe disposal (see Waste disposal).

Decontamination

As soon as possible after the accident, cover all contaminated areas with spill control material, damp sawdust, sand or earth.

Sweep up the residue and place it in a closeable container for subsequent safe disposal (see 'Waste disposal' below).

Scrub contaminated areas with detergent solution and rinse with water. As far as possible, retain rinsings as contaminated waste. Avoid run-off into drains and water courses.

Check that other goods or cargo are not contaminated.

Personal protection

When unloading or handling containers, wear protective nitrile rubber or neoprene gloves and impervious apron. Avoid breathing the dust from powder products.

Avoid contact with the skin and eyes. Wash off any skin contamination with soap and water. If eyes are contaminated flush well with clean water. If irritation persists, obtain medical attention.

If clothes or overalls become contaminated, remove them without delay and well wash the skin beneath. Thoroughly wash the clothes, etc. before re-use.

When handling leaking containers or when cleaning up leakage or spillage, wear overalls, nitrile rubber or neoprene gloves, rubber boots, impervious apron, goggles or face-shield. Instead of a face-shield, wear a dust mask if powder formulations are involved.

Wash hands and exposed skin before smoking, eating, drinking and after work.

Environmental protection

Do not allow to contaminate soil or water. Do not apply to any crops. Keep away from animals and all forms of wild life.

Safety in use

Follow the advice under Personal Protection. Items in the GARDMAN protective clothing pack (see Section 1.5) will give protection during handling formulations and application.

Handling liquid formulations

Wear protective nitrile rubber or neoprene gloves and apron, cotton or synthetic overalls, rubber boots and face shield.

Handling powder formulations

Avoid raising a dust cloud. Wear protective gloves and dust mask.

Application in the field

Read the label. Uses of aldrin and dieldrin are severely restricted.

Do not apply to the aerial parts of food crops.

Wear hat or cap, cotton or synthetic overalls or long sleeve shirt and long trousers, boots or shoes. Items in the GARDMAN protective clothing pack will give adequate protection.

At all times avoid exposure to the spray. Do not spray into the wind.

Triple rinse empty liquid containers with water and add the rinsings to the spray tank.

After work

Ensure that equipment is thoroughly cleaned and stored away ready for use the next time. Carry out any essential maintenance.

Partly used containers should be reclosed and returned to store. Empty containers should be disposed of as advised below.

Change out of working clothes and take a bath or shower.

Waste disposal

Aldrin and dieldrin are not readily decomposed chemically or biologically and are persistent in the environment. Waste material, or surplus or redundant stock must be burned in a proper incinerator (see Section 1.9) designed for organochlorine pesticide waste disposal. Comply with any local legislation regarding disposal of toxic wastes. Seek further advice from your local Shell Chemical Company or distributor.

Emergency situations

Ensure that the advice given under Personal Protection will be followed.

Leaks and spills

Stop leaks, if this can be done without risk.

Absorb spillage with spill control material, sawdust, sand or earth and place in a clean, labelled container for later safe disposal.

Empty any product remaining in damaged or leaking containers into a clean, empty drum which should be closed and labelled.

Empty containers should be rinsed three times with water at the rate of 1 litre per 20 litres drum capacity. Swirl round to rinse the container walls, empty and add the rinsings to the absorbents.

Scrub contaminated areas with detergent solution and rinse with water. As far as possible, retain all rinsings as contaminated waste. Avoid run-off into drains and water courses.

Inform the local Shell company of the incident and request further assistance from them.

Fire Powder products will not burn.
Liquid products will burn and emulsifiable concentrates are miscible with water.

Extinguish fires with alcohol-resistant foam, CO_2 or powder.

Note: With sufficient burning or external heat, aldrin and dieldrin will decompose emitting toxic fumes. The fire service should be advised that the smoke and fumes could be hazardous through inhalation, or absorption through the skin, therefore protective clothing and self-contained breathing apparatus will be required. Confine the use of water spray to cooling of unaffected stock, thus avoiding the accumulation of polluted run-off from the site.

In case of poisoning Aldrin and dieldrin are highly toxic by mouth, by skin contact (especially liquid formulations) and by inhalation of dust from powder concentrates.

Symptoms of poisoning Headache, dizziness, nausea. Severe poisoning progresses to vomiting, muscular weakness and convulsions. Death may result form cardiac arrest. Chronic intoxication may produce convulsions alone, without earlier symptoms.

First Aid If poisoning symptoms occur, particularly if there has been known contamination or gross exposure, OBTAIN MEDICAL ATTENTION IMMEDIATELY.

Skin contact: Remove contaminated clothing. Wash exposed skin with soap and water.

Eye contact: Flush eyes well with water. If irritation persists, obtain medical attention.

Ingestion: Do not induce vomiting. If the patient is conscious, give a large amount of activated charcoal powder with water. Do not give oils or milk as these will assist absorption.

Antidote: There is no specific antidote for aldrin and dieldrin.

Medical advice The following is a short text suitable for product labels, information sheets, etc. For full details of medical treatment of intoxication by OCs, refer to Section 2.3.

Aldrin and dieldrin are central nervous system stimulants. Convulsions are a sign of serious intoxication, but may be delayed for 48 hours following exposure.

Treatment is symptomatic, aimed at eliminating the material from the body, controlling convulsions and restoring respiration.

If ingested, gastric lavage is indicated, followed by activated charcoal powder.

To control convulsions, use benzodiazepines (*clonazepam* or *diazepam*). If not available, use phenobarbital sodium. *Diazepam* is recommended, injected intravenously. Large quantities may be required. When convulsions are under control, continue with phenobarbitone (oral) for up to 2-4 weeks.

Morphine or its derivatives, epinephrine and nor-adrenalin are contraindicated.

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2.3 Organochlorine (OC) poisoning

Organochlorine compounds are central nervous system stimulants. Prolonged or repeated exposure may cause convulsions without earlier symptoms. After ingestion or skin contact, OCs can be absorbed into the bloodstream and cause toxic effects such as headache, dizziness, nausea, vomiting and muscular weakness. Convulsions may be delayed for 48 hours following exposure. Death may result from cardiac arrest.

In case of accidental or deliberate ingestion or skin absorption, the subject should be kept under observation and treated symptomatically as indicated by his/her condition. Because of OCs' acute toxicity, gastric lavage within 4 hours should be considered.

Following ingestion, specific treatment consists of gastric lavage, avoiding aspiration into the lungs. This should be followed by intragastric administration of 3-4 tablespoons of activated charcoal and 30 g of magnesium or sodium sulphate in a 30% aqueous solution. No fats, oils or milk should be given by mouth since these promote absorption of OCs by the intestinal tract. In the case of ingestion of a solution, or of an emulsifiable concentrate, the possible occurrence of a chemical pneumonitis following aspiration of the solvent in the respiratory tract must be borne in mind.

Morphine or its derivatives, epinephrine and nor-adrenaline should never be given because of their depressive effects on the respiratory centre and because they may sensitise the myocardium and thus provoke serious cardiac arrhythmias.

Drug therapy of convulsive state

Fast acting tranquillisers or hypnotic drugs are required for controlling convulsions.

Drugs of choice are the anticonvulsant benzodiazepines *clonazepam* or *diazepam*. There is no major pharmacological difference between the two, but *clonazepam* has a more selective anticonvulsant action in comparison with *diazepam*. Central effects of both drugs wane rapidly as a result of redistribution to other tissues. Repeated intravenous application may therefore be required to maintain a blood level sufficiently high to control convulsions.

Benzodiazepines are relatively safe and carry a much smaller risk of sedation and respiratory depression than other sedatives, eg barbiturates. Very high daily dosages are known to be tolerated without unwanted side effects.

Recommended doses

Drug	Adults	Children		
		>12 years	2-12 years	<2 years
Diazepam IV	10 mg	10 mg	5 mg	2 mg
Diazepam per rectum	10 mg	10 mg	5 mg	2 mg
Clonazepam IV	1 mg	1 mg	0.5 mg	0.2 mg

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Annex K: EPA Burial Guide and Standards

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

November 23, 1990

MEMORANDUM

SUBJECT: **Landfilling Dieldrin Wastes in Niger, West Africa**

TO: Ken Shuster, Special Assistant
Permits and State Programs Division (OS-340)
Office of Solid Waste

FROM: Janice King Jensen, Chemist
Pesticide Management and Disposal Staff
Environmental Fate and Effects Division (H-7507)
Office of Pesticide Programs

The purpose of this memorandum is to confirm in writing the key points of the telephone discussion we had on November 15th on the safe landfilling of soil and other associated wastes contaminated with dieldrin in Niger, West Africa.

BACKGROUND

In the 1960s, large stocks of the pesticide dieldrin were prepositioned to remote desert areas in Niger to fight locust outbreaks. These stocks were not used and now represent a major disposal problem.

The US Agency for International Development (USAID), in collaboration with Shell Chemical Company, is developing an operational plan to assist the Government of Niger with the safe removal and disposal of 70,000 liters of dieldrin and solvents from Niger to Holland. The dieldrin will be disposed in a hazardous waste incinerator which meets all government standards.

It is expected that a total of 60 cubic meters of material (soil, sand, and dust) contaminated with dieldrin will be recovered from two warehouse facilities and require landfilling. The intent of USAID is to have these materials buried safely in accordance with the USEPA technical standards.

I have been requested by USAID to find out from your Office about these technical standards, especially the engineering requirements for the landfill. I will provide USAID with a copy of the US regulations for landfilling hazardous material (40 CFR Part 264.300-317, Subpart N).

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CRITERIA FOR SAFE LANDFILLING IN NIGER

You said that there are three key factors to consider to ensure safe landfilling: 1) site hydrogeologic characteristics; 2) waste characteristics; and 3) engineering design of the landfill. The first two characteristics, as they relate to the landfill site selected in Niger, are summarized as follows:

1) Site Hydrogeologic Characteristics:

- Sahara desert area in West Africa;
- Annual rainfall less than 10 inches;
- Ambient temperature about 100 F for six months, about 100-115 F for six months;
- Groundwater more than 20 meters deep; and
- Site away from vulnerable water sources, or potential water passages.

2) Waste Characteristics:

- Contaminated solids from dieldrin removal (soil, sand, dust, possibly empty drums);
- Dieldrin, RCRA P037, chem abstracts 60-57-1, is a chlorinated thanonaphthalene, and is stable to alkali, mild acids, and to light; and
- Dieldrin adsorbs to clays.

Based on the two characteristics outlined above, USAID would meet the criteria set out in 40 CFR Part 264.301 (b) for a double liner variance for the safe disposal by USEPA technical standards by meeting the engineering design described below:

3) Engineering Design of the Landfill:

- Line disposal pit with locally available clay;
- Then add an organic layer of peat or charcoal;
- Top of wastes should be capped with a plastic liner (high density polyethylene) designed for that purpose; and
- On top of the cap should be 2-4 feet of soil.

As we discussed, this variance assumes the amount rainfall is minimal so that there will be no recharge of water into the landfill. Also, the addition of an organic layer is specific to this variance, and is required because of the tendency of dieldrin to adhere to the organic layer, thereby reducing migration.

Thank you for your assistance with this matter. If you have any questions, please call me at (703) 557-7706, FAX (703) 557-9309.

cc: Dr. Paul F. Schuda, OPP/EFED
Robert Denny, OPP/EFED/PMDS
Cathleen M. Barnes, OPP
Jude Andreasen, OPP/SRRD
Walter Knausenberger, USAID (enclosures as stated)

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Subpart N - Landfills

(4) The effectiveness of additional treatment, design, or monitoring techniques.

(b) The Regional Administrator may determine that additional design, operating, and monitoring requirements are necessary for land treatment facilities managing hazardous wastes FO20, FO21, FO22, FO23, FO26, and FO27 in order to reduce the possibility of migration of these wastes to ground water, surface water, or air so as to protect human health and the environment.

[50 FR 2004, Jan. 14, 1985]

* * **Subpart N—Landfills** * *

SOURCE: 47 FR 32365, July 26, 1982, unless otherwise noted.

§ 264.300 Applicability.

The regulations in this subpart apply to owners and operators of facilities that dispose of hazardous waste in landfills, except as § 264.1 provides otherwise.

§ 264.301 Design and operating requirements.

(a) Any landfill that is not covered by paragraph (c) of this section or § 265.301(a) of this chapter must have a liner system for all portions of the landfill (except for existing portions of such landfill). The liner system must have:

(1) A liner that is designed, constructed, and installed to prevent any migration of wastes out of the landfill to the adjacent subsurface soil or ground water or surface water at anytime during the active life (including the closure period) of the landfill. The liner must be constructed of materials that prevent wastes from passing into the liner during the active life of the facility. The liner must be:

(i) Constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrogeologic forces), physical contact with the waste or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation;

(ii) Placed upon a foundation or base capable of providing support to the liner and resistance to pressure gradients above and below the liner to prevent failure of the liner due to settlement, compression, or uplift; and

(iii) Installed to cover all surrounding earth likely to be in contact with the waste or leachate; and

(2) A leachate collection and removal system immediately above the liner that is designed, constructed, maintained, and operated to collect and remove leachate from the landfill. The Regional Administrator will specify design and operating conditions in the permit to ensure that the leachate depth over the liner does not exceed 30 cm (one foot). The leachate collection and removal system must be:

(i) Constructed of materials that are:

(A) Chemically resistant to the waste managed in the landfill and the leachate expected to be generated; and

(B) Of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying wastes, waste cover materials, and by any equipment used at the landfill; and

(ii) Designed and operated to function without clogging through the scheduled closure of the landfill.

(b) The owner or operator will be exempted from the requirements of paragraph (a) of this section if the Regional Administrator finds, based on a demonstration by the owner or operator, that alternative design and operating practices, together with location characteristics, will prevent the migration of any hazardous constituents (see § 264.93) into the ground water or surface water at any future time. In deciding whether to grant an exemption, the Regional Administrator will consider:

(1) The nature and quantity of the wastes;

(2) The proposed alternate design and operation;

(3) The hydrogeologic setting of the facility, including the attenuative capacity and thickness of the liners and soils present between the landfill and ground water or surface water; and

(4) All other factors which would influence the quality and mobility of the leachate produced and the potential

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for it to migrate to ground water or surface water.

(c) The owner or operator of each new landfill, each new landfill unit at an existing facility, each replacement of an existing landfill unit, and each lateral expansion of an existing landfill unit, must install two or more liners and a leachate collection system above and between the liners. The liners and leachate collection systems must protect human health and the environment. The requirement for the installation of two or more liners in this paragraph may be satisfied by the installation of a top liner designed, operated and constructed of materials to prevent the migration of any constituent into such liner during the period such facility remains in operation (including any post-closure monitoring period), and a lower liner designed, operated, and constructed to prevent the migration of any constituent through such liner during such period. For the purpose of the preceding sentence, a lower liner shall be deemed to satisfy such requirement if it is constructed of at least a 3-foot thick layer of recompacted clay or other natural material with a permeability of no more than 1×10^{-7} centimeter per second.

(d) Paragraph (c) of this section will not apply if the owner or operator demonstrates to the Regional Administrator, and the Regional Administrator finds for such landfill, that alternative design and operating practices, together with location characteristics, will prevent the migration of any hazardous constituent into the ground water or surface water at least as effectively as such liners and leachate collection systems.

(e) The double liner requirement set forth in paragraph (c) of this section may be waived by the Regional Administrator for any monofill, if:

(1) The monofill contains only hazardous wastes from foundry furnace emission controls or metal casting molding sand and such wastes do not contain constituents which would render the wastes hazardous for reasons other than the EP toxicity characteristics in § 261.24 of this chapter; and

(2)(i)(A) The monofill has at least one liner for which there is no evidence that such liner is leaking;

(B) The monofill is located more than one-quarter mile from an underground source of drinking water (as that term is defined in § 144.3 of this chapter); and

(C) The monofill is in compliance with generally applicable groundwater monitoring requirements for facilities with permits under RCRA 3005(c); or

(ii) The owner or operator demonstrates that the monofill is located, designed and operated so as to assure that there will be no migration of any hazardous constituent into ground water or surface water at any future time.

(f) The owner or operator must design, construct, operate, and maintain a run-on control system capable of preventing flow onto the active portion of the landfill during peak discharge from at least a 25-year storm.

(g) The owner or operator must design, construct, operate, and maintain a run-off management system to collect and control at least the water volume resulting from a 24-hour, 25-year storm.

(h) Collection and holding facilities (e.g., tanks or basins) associated with run-on and run-off control systems must be emptied or otherwise managed expeditiously after storms to maintain design capacity of the system.

(i) If the landfill contains any particulate matter which may be subject to wind dispersal, the owner or operator must cover or otherwise manage the landfill to control wind dispersal.

(j) The Regional Administrator will specify in the permit all design and operating practices that are necessary to ensure that the requirements of this section are satisfied.

(k) Any permit under RCRA 3005(c) which is issued for a landfill located within the State of Alabama shall require the installation of two or more liners and a leachate collection system above and between such liners, notwithstanding any other provision of RCRA.

(Approved by the Office of Management and Budget under control number 2050-0007)

[47 FR 32365, July 26, 1982, as amended at 50 FR 4514, Jan. 31, 1985; 50 FR 28748, July 15, 1985]

§ 264.302 [Reserved]

§ 264.303 Monitoring and inspection.

(a) During construction or installation, liners (except in the case of existing portions of landfills exempt from § 264.301(a)) and cover systems (e.g., membranes, sheets, or coatings) must be inspected for uniformity, damage, and imperfections (*e.g.*, holes, cracks, thin spots, or foreign materials). Immediately after construction or installation:

(1) Synthetic liners and covers must be inspected to ensure tight seams and joints and the absence of tears, punctures, or blisters; and

(2) Soil-based and admixed liners and covers must be inspected for imperfections including lenses, cracks, channels, root holes, or other structural non-uniformities that may cause an increase in the permeability of the liner or cover.

(b) While a landfill is in operation, it must be inspected weekly and after storms to detect evidence of any of the following:

(1) Deterioration, malfunctions, or improper operation of run-on and run-off control systems;

(2) Proper functioning of wind dispersal control systems, where present; and

(3) The presence of leachate in and proper functioning of leachate collection and removal systems, where present.

[47 FR 32365, July 26, 1982, as amended at 50 FR 28748, July 15, 1985]

§§ 264.304—264.308 [Reserved]

§ 264.309 Surveying and recordkeeping.

The owner or operator of a landfill must maintain the following items in the operating record required under § 264.73:

(a) On a map, the exact location and dimensions, including depth, of each cell with respect to permanently surveyed benchmarks; and

(b) The contents of each cell and the approximate location of each hazardous waste type within each cell.

(Approved by the Office of Management and Budget under control number 2050-0007)

[47 FR 32365, July 26, 1982, as amended at 50 FR 4514, Jan. 31, 1985]

§ 264.310 Closure and post-closure care.

(a) At final closure of the landfill or upon closure of any cell, the owner or operator must cover the landfill or cell with a final cover designed and constructed to:

(1) Provide long-term minimization of migration of liquids through the closed landfill;

(2) Function with minimum maintenance;

(3) Promote drainage and minimize erosion or abrasion of the cover;

(4) Accommodate settling and subsidence so that the cover's integrity is maintained; and

(5) Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.

(b) After final closure, the owner or operator must comply with all post-closure requirements contained in §§ 264.117 through 264.120, including maintenance and monitoring throughout the post-closure care period (specified in the permit under § 264.117). The owner or operator must:

(1) Maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events;

(2) Continue to operate the leachate collection and removal system until leachate is no longer detected;

(3) Maintain and monitor the ground-water monitoring system and comply with all other applicable requirements of Subpart F of this part;

(4) Prevent run-on and run-off from eroding or otherwise damaging the final cover; and

(5) Protect and maintain surveyed benchmarks used in complying with § 264.309.

[47 FR 32365, July 26, 1982, as amended at [illegible]

§ 264.311 [Reserved]

§ 264.312 Special requirements for ignitable or reactive waste.

(a) Except as provided in paragraph (b) of this section, and in § 264.316, ignitable or reactive waste must not be placed in a landfill, unless the waste in treated, rendered, or mixed before or immediately after placement in a landfill so that:

(1) The resulting waste, mixture, or dissolution of material no longer meets the definition of ignitable or reactive waste under § 261.21 or § 261.23 of this chapter; and

(2) Section 264.17(b) is complied with.

(b) Ignitable wastes in containers may be landfilled without meeting the requirements of paragraph (a) of this section, provided that the wastes are disposed of in such a way that they are protected from any material or conditions which may cause them to ignite. At a minimum, ignitable wastes must be disposed of in non-leaking containers which are carefully handled and placed so as to avoid heat, sparks, rupture, or any other condition that might cause ignition of the wastes; must be covered daily with soil or other non-combustible material to minimize the potential for ignition of the wastes; and must not be disposed of in cells that contain or will contain other wastes which may generate heat sufficient to cause ignition of the waste.

§ 264.313 Special requirements for incompatible wastes.

Incompatible wastes, or incompatible wastes and materials, (see Appendix V of this part for examples) must not be placed in the same landfill cell, unless § 264.17(b) is complied with.

§ 264.314 Special requirements for bulk and containerized liquids.

(a) Bulk or non-containerized liquid waste or waste containing free liquids may be placed in a landfill prior to May 8, 1985 only if:

(1) The landfill has a liner and leachate collection and removal

(2) Before disposal, the liquid waste or waste containing free liquids is treated or stabilized, chemically or physically (e.g., by mixing with an absorbent solid), so that free liquids are no longer present.

(b) Effective May 8, 1985, the placement of bulk or non-containerized liquid hazardous waste or hazardous waste containing free liquids (whether or not absorbents have been added) in any landfill is prohibited.

(c) To demonstrate the absence or presence of free liquids in either a containerized or a bulk waste, the following test must be used: Method 9095 (Paint Filter Liquids Test) as described in "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods." [EPA Publication No. SW-846].

(d) Containers holding free liquids must not be placed in a landfill unless:

(1) All free-standing liquid: (i) has been removed by decanting, or other methods; (ii) has been mixed with absorbent or solidified so that free-standing liquid is no longer observed; or (iii) has been otherwise eliminated; or

(2) The container is very small, such as an ampule; or

(3) The container is designed to hold free liquids for use other than storage, such as a battery or capacitor; or

(4) The container is a lab pack as defined in § 264.316 and is disposed of in accordance with § 264.316.

(e) Effective November 8, 1985, the placement of any liquid which is not a hazardous waste in a landfill is prohibited unless the owner or operator of such landfill demonstrates to the Regional Administrator, or the Regional Administrator determines, that:

(1) The only reasonably available alternative to the placement in such landfill is placement in a landfill or unlined surface impoundment, whether or not permitted or operating under interim status, which contains, or may reasonably be anticipated to contain, hazardous waste; and

(2) Placement in such owner or operator's landfill will not present a risk of contamination of any underground

(Approved by the Office of Management and Budget under control number 2050-0037)

[47 FR 32365, July 26, 1982, as amended at 50 FR 18374, Apr. 30, 1985; 50 FR 28748, July 15, 1985]

§ 264.315 Special requirements for containers.

Unless they are very small, such as an ampule, containers must be either:

(a) At least 90 percent full when placed in the landfill; or

(b) Crushed, shredded, or similarly reduced in volume to the maximum practical extent before burial in the landfill.

§ 264.316 Disposal of small containers of hazardous waste in overpacked drums (lab packs).

Small containers of hazardous waste in overpacked drums (lab packs) may be placed in a landfill if the following requirements are met:

(a) Hazardous waste must be packaged in non-leaking inside containers. The inside containers must be of a design and constructed of a material that will not react dangerously with, be decomposed by, or be ignited by the contained waste. Inside containers must be tightly and securely sealed. The inside containers must be of the size and type specified in the Department of Transportation (DOT) hazardous materials regulations (49 CFR Parts 173, 178, and 179), if those regulations specify a particular inside container for the waste.

(b) The inside containers must be overpacked in an open head DOT-specification metal shipping container (49 CFR Parts 178 and 179) of no more than 416-liter (110 gallon) capacity and surrounded by, at a minimum, a sufficient quantity of absorbent material to completely absorb all of the liquid contents of the inside containers. The metal outer container must be full after packing with inside containers and absorbent material.

(c) The absorbent material used must not be capable of reacting dangerously with, being decomposed by, or being ignited by the contents of the inside containers in accordance with § 264.17(b).

(d) Incompatible wastes, as defined in § 260.10 of this chapter, must not be placed in the same outside container.

(e) Reactive wastes, other than cyanide- or sulfide-bearing waste as defined in § 261.23(a)(5) of this chapter, must be treated or rendered non-reactive prior to packaging in accordance with paragraphs (a) through (d) of this section. Cyanide- and sulfide-bearing reactive waste may be packed in accordance with paragraphs (a) through (d) of this section without first being treated or rendered non-reactive.

§ 264.317 Special requirements for hazardous wastes FO20, FO21, FO22, FO23, FO26, and FO27.

(a) Hazardous Wastes FO20, FO21, FO22, FO23, FO26, and FO27 must not be placed in a landfills unless the owner or operator operates the landfill in accord with a management plan for these wastes that is approved by the Regional Administrator pursuant to the standards set out in this paragraph, and in accord with all other applicable requirements of this part. The factors to be considered are:

(1) The volume, physical, and chemical characteristics of the wastes, including their potential to migrate through the soil or to volatilize or escape into the atmosphere;

(2) The attenuative properties of underlying and surrounding soils or other materials;

(3) The mobilizing properties of other materials co-disposed with these wastes; and

(4) The effectiveness of additional treatment, design, or monitoring requirements.

(b) The Regional Administrator may determine that additional design, operating, and monitoring requirements are necessary for landfills managing hazardous wastes FO20, FO21, FO22, FO23, FO26, and FO27 in order to reduce the possibility of migration of these wastes to ground water, surface water, or air so as to protect human health and the environment.

[50 FR 2004, Jan. 14, 1985]

Annex L: EPA Incineration Guidelines
AVR Incineration Specifications

Pages 135-216

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

November 23, 1990

Walter Knausenberger
Entomology Advisor
Pest and Pesticide Management
Africa Bureau, AFR/TR/ANR/NR
USAID SA-8A, Rm 602
Washington, DC 20523-1515

Dear Walter,

DIELDRIN STOCKS IN NIGER

As a member of the Technical Review Committee for the Niger Dieldrin Disposal Operation Plan, you asked me to provide answers to the following questions:

1) How do incinerator emission standards differ between Holland and the US?

EPA measures incinerator performance by destruction and removal efficiencies (DREs), not by emission standards. I do not have the either the emission standards for Holland or the DRE for the incinerator facility, so am unable to compare them for you. Sorry.

The DRE concepts are described in the two EPA Office of Solid Waste (OSW) documents which I provided to you several weeks ago: Hazardous Waste Incineration, Questions and Answers; and Permitting Hazardous Waste Incinerators.

2) How does the difficulty of incinerating dieldrin compare with incinerating PCBs?

I have enclosed an article by Dr. Barry Dollinger at the University of Dayton Research Institute on the thermal stability ranking of hazardous organic compounds. According to this article, dieldrin has a relatively high ranking of 162-164, which means that the chemical structure of dieldrin is relatively simple to incinerate.

This information came from Greg Carroll, Chemical Engineer, Risk Reduction Engineering Laboratory, EPA Office of Research and Development. I have enclosed a copy of the memo confirming our discussions. Greg called Dr. Dollinger about the incineration index of PCBs, which were not included in the article. Dr. Dollinger has recently tested PCBs, which he said have a ranking

of 30-35. This means the chemical structures of PCBs are significantly harder to incinerate than the structure of dieldrin.

I have also enclosed the EPA regulations on incinerating hazardous wastes: 40 CFR Part 264, Subpart O.

3) What are the combustion products of dieldrin?

Dr. Dollinger said that bi-products of dieldrin combustion may be of greater concern than of the dieldrin itself. He said there was the theoretical potential to get hexachlorobenzene and furans as products of incomplete combustion (PICs). However, he said that only well designed incinerators can completely destroy PCBs, and that such an incinerator would also completely destroy dieldrin to carbon dioxide, water and chlorine gas. In other words, since the facility in Holland is designed to incinerate PCBs, the complete combustion of dieldrin would not likely be a problem at that facility.

Dr. Dollinger recommended that a laboratory test be conducted in advance to identify common PICs, if the size of the dieldrin project warranted it. Such as test would identify a target list of compounds, which would simplify incinerator monitoring.

4) How can USAID safely landfill soil contaminated with dieldrin using EPA standards?

Based on the site hydrogeologic characteristics found in Niger and the waste characteristics of dieldrin, the engineering design of the landfill would meet EPA technical standards by meeting the criteria described below:

- Line disposal pit with locally available clay;
- Then add an organic layer of peat or charcoal;
- Top of wastes should be capped with a plastic liner (high density polyethylene) designed for that purpose; and
- On top of the cap should be 2-4 feet of soil.

This is based on information from Ken Shuster, Special Assistant, Permits and State Programs Division, EPA Office of Solid Waste. I have enclosed a memo confirming our discussions.

I have also enclosed the US regulations for landfilling hazardous waste: 40 CFR Part 264, Subpart N.

I hope this information will be of use to you and the dieldrin disposal program in Niger. If you have any questions or need additional information, please feel free to call me at (703) 557-7706, FAX (703) 557-9309.

Sincerely yours,

Janice King Jensen
Chemist
Pesticide Management and Disposal Staff
Environmental Fate & Effects Division (H-7507C)
Office of Pesticide Programs

Enclosures:

Hazardous Waste Incineration, Q and A (provided 10/90)
Permitting Hazardous Waste Incinerators (provided 10/90)
Article by Dr. Barry Dollinger
Jensen memo to Greg Carroll, EPA/RREL
Incinerating hazardous wastes: 40 CFR Part 264, Subpart O
Jensen memo to Ken Shuster, EPA/OSW
Landfilling hazardous waste: 40 CFR Part 264, Subpart N.

cc: Dr. Paul F. Schuda, OPP/EFED
Robert Denny, OPP/EFED/PMDS
Cathleen M. Barnes, OPP
Jude Andreasen, OPP/SRRD

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

November 23, 1990

MEMORANDUM

SUBJECT: **Incineration of Dieldrin Wastes**

TO: Greg Carroll, Chemical Engineer
Risk Reduction Engineering Laboratory (MLK-481)
Office of Research and Development

FROM: Janice King Jensen, Chemist
Pesticide Management and Disposal Staff
Environmental Fate and Effects Division (H-7507)
Office of Pesticide Programs

The purpose of this memorandum is to confirm in writing the key points of the telephone discussion we had on November 22nd on the incineration of the pesticide dieldrin.

I was requested by the US Agency for International Development (USAID) to find out as much information as possible from your Office and the Office of Solid Waste (OSW) about the incineration of dieldrin, including combustion products, and then to compare the difficulty of incinerating dieldrin with PCBs.

I contacted OSW and obtained copies of the following documents: Hazardous Waste Incineration, Questions and Answers; and Permitting Hazardous Waste Incinerators. I will provide these to USAID, along with the US regulations for incinerating hazardous material (40 CFR Part 264.340-351, Subpart O).

BACKGROUND

In the 1960s, large stocks of the pesticide dieldrin were prepositioned to remote desert areas in Niger to fight locust outbreaks. These stocks were not used and now represent a major disposal problem.

The USAID, in collaboration with Shell Chemical Company, is developing an operational plan to assist the Government of Niger with the safe removal and disposal of 70,000 liters of dieldrin and solvents from Niger to Holland. The dieldrin will be disposed in a hazardous waste incineration facility in Holland which meets all government standards. This facility has never incinerated dieldrin, but has extensive experience incinerating PCBs and organochlorines.

INCINERATION OF DIELDRIN

Dieldrin is an OSW "P" listed waste (P037), which means it was listed because of acute toxicity. The oral toxicity (rat) is LD 50 is 37-87 mg/kg, the dermal is 60-80, mg/kg, according to Farm Chemicals Handbook. Dieldrin is a chlorinated thanonaphthalene, and is stable to alkali, mild acids, and light.

Thank you for FAXing me the article by Dr. Barry Dollinger at the University of Dayton Research Institute on the thermal stability ranking of hazardous organic compounds. According to this article, dieldrin has a relatively high ranking of 162-164, which means that the chemical structure of dieldrin is relatively simple to incinerate. You indicated that this stability ranking was theoretically calculated, and that the author had no data on the incineration of dieldrin.

I would also like to thank you for contacting Dr. Dollinger directly about the incineration index of PCBs, which are not included in the article. You said Dr. Dollinger has recently tested PCBs, which he said have a ranking of 30-35. This means the chemical structures of PCBs are significantly harder to incinerate than the structure of dieldrin.

Dr. Dollinger said that bi-products of dieldrin combustion may be of greater concern than of the dieldrin itself. He said there was the <u>theoretical</u> potential to get hexachlorobenzene and furans as products of incomplete combustion (PICs). However, he said that only well designed incinerators can completely destroy PCBs, and that such an incinerator would also completely destroy dieldrin to carbon dioxide, water and chlorine gas. In other words, since the facility in Holland is designed to incinerate PCBs, the complete combustion of dieldrin would not likely be a problem at that facility.

Dr. Dollinger recommended that a laboratory test be conducted in advance to identify common PICs, if the size of the dieldrin project warranted it. Such as test would identify a target list of compounds, which would to simplify incinerator monitoring.

Thank you very much for your prompt, thorough help. Also, thank you for discussing this with Don Oberacker and others at RREL, as well as Dr. Dollinger. If you have any questions or would like to suggest changes in the above information, please call me at (703) 557-7706, FAX (703) 557-9309.

cc: Paul Schuda, Rob Denny, Jude Andreasen, Cathleen Barnes, OPP
Walter Knausenberger, USAID (enclosures as stated)

Subpart O - Incinerators

Subpart O—Incinerators

§ 264.340 Applicability.

(a) The regulations in this subpart apply to owners or operators of facilities that incinerate hazardous waste, except as § 264.1 provides otherwise. The following facility owners or operators are considered to incinerate hazardous waste:

(1) Owners or operators of hazardous waste incinerators (as defined in § 260.10 of this chapter); and

(2) Owners or operators who burn hazardous waste in boilers or in industrial furnaces in order to destroy them, or who burn hazardous waste in boilers or in industrial furnaces for any recycling purpose and elect to be regulated under this subpart.

(b) After consideration of the waste analysis included with Part B of the permit application, the Regional Administrator, in establishing the permit conditions, must exempt the applicant from all requirements of this subpart except § 264.341 (Waste analysis) and § 264.351 (Closure),

(1) If the Regional Administrator finds that the waste to be burned is:

(i) Listed as a hazardous waste in Part 261, Subpart D, of this chapter solely because it is ignitable (Hazard Code I), corrosive (Hazard Code C), or both; or

(ii) Listed as a hazardous waste in Part 261, Subpart D, of this chapter solely because it is reactive (Hazard Code R) for characteristics other than those listed in § 261.23(a) (4) and (5), and will not be burned when other hazardous wastes are present in the combustion zone; or

(iii) A hazardous waste solely because it possesses the characteristic of ignitability, corrosivity, or both, as determined by the test for characteristics of hazardous wastes under Part 261, Subpart C, of this chapter; or

(iv) A hazardous waste solely because it possesses any of the reactivity characteristics described by § 261.23(a) (1), (2), (3), (6), (7), and (8) of this chapter, and will not be burned when other hazardous wastes are present in the combustion zone; and

(2) If the waste analysis shows that the waste contains none of the hazardous constituents listed in Part 261, Appendix VIII, of this chapter, which would reasonably be expected to be in the waste.

(c) If the waste to be burned is one which is described by paragraphs (b)(1)(i), (ii), (iii), or (iv) of this section and contains insignificant concentrations of the hazardous constituents listed in Part 261, Appendix VIII, of this chapter, then the Regional Administrator may, in establishing permit conditions, exempt the applicant from all requirements of this subpart, except § 264.341 (Waste analysis) and § 264.351 (Closure), after consideration of the waste analysis included with Part B of the permit application, unless the Regional Administrator finds that the waste will pose a threat to human health and the environment when burned in an incinerator.

(d) The owner or operator of an incinerator may conduct trial burns subject only to the requirements of § 270.62 of this chapter (Short term and incinerator permits).

[46 FR 7678, Jan. 23, 1981, as amended at 47 FR 27532, June 24, 1982; 48 FR 14295, Apr. 1, 1983; 50 FR 665, Jan. 4, 1985; 50 FR 49203, Nov. 29, 1985]

§ 264.341 Waste analysis.

(a) As a portion of the trial burn plan required by § 270.62 of this chapter, or with Part B of the permit application, the owner or operator must have included an analysis of the waste feed sufficient to provide all information required by § 270.62(b) or § 270.19 of this chapter. Owners or operators of new hazardous waste incinerators must provide the information required by § 270.62(c) or § 270.19 of this chapter to the greatest extent possible.

(b) Throughout normal operation the owner or operator must conduct sufficient waste analysis to verify that waste feed to the incinerator is within the physical and chemical composition limits specified in his permit (under § 264.345(b)).

(Approved by the Office of Management and Budget under control number 2050-0002)

[46 FR 7678, Jan. 23, 1981, as amended at 47 FR 27532, June 24, 1982; 48 FR 14295, Apr. 1, 1983; 48 FR 30115, June 30, 1983; 50 FR 4514, Jan. 31, 1985]

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§ 264.342 Principal organic hazardous constituents (POHCs).

(a) Principal Organic Hazardous Constituents (POHCs) in the waste feed must be treated to the extent required by the performance standard of § 264.343.

(b)(1) One or more POHCs will be specified in the facility's permit, from among those constituents listed in Part 261, Appendix VIII of this chapter, for each waste feed to be burned. This specification will be based on the degree of difficulty of incineration of the organic constituents in the waste and on their concentration or mass in the waste feed, considering the results of waste analyses and trial burns or alternative data submitted with Part B of the facility's permit application. Organic constituents which represent the greatest degree of difficulty of incineration will be those most likely to be designated as POHCs. Constituents are more likely to be designated as POHCs if they are present in large quantities or concentrations in the waste.

(2) Trial POHCs will be designated for performance of trial burns in accordance with the procedure specified in § 270.62 of this chapter for obtaining trial burn permits.

[46 FR 7678, Jan. 23, 1981, as amended at 48 FR 14295, Apr. 1, 1983]

§ 264.343 Performance standards.

An incinerator burning hazardous waste must be designed, constructed, and maintained so that, when operated in accordance with operating requirements specified under § 264.345, it will meet the following performance standards:

(a)(1) Except as provided in paragraph (a)(2) of this section, an incinerator burning hazardous waste must achieve a destruction and removal efficiency (DRE) of 99.99% for each principal organic hazardous constituent (POHC) designated (under § 264.342) in its permit for each waste feed. DRE is determined for each POHC from the following equation:

$$DRE = \frac{(W_{in} - W_{out})}{W_{in}} \times 100\%$$

where:

W_{in} = mass feed rate of one principal organic hazardous constituent (POHC) in the waste stream feeding the incinerator

and

W_{out} = mass emission rate of the same POHC present in exhaust emissions prior to release to the atmosphere.

(2) An incinerator burning hazardous wastes FO20, FO21, FO22, FO23, FO26, or FO27 must achieve a destruction and removal efficiency (DRE) of 99.9999% for each principal organic hazardous constituent (POHC) designated (under § 264.342) in its permit. This performance must be demonstrated on POHCs that are more difficult to incinerate than tetra-, penta-, and hexachlorodibenzo-*p*-dioxins and dibenzofurans. DRE is determined for each POHC from the equation in § 264.343(a)(1). In addition, the owner or operator of the incinerator must notify the Regional Administrator of his intent to incinerate hazardous wastes FO20, FO21, FO22, FO23, FO26, or FO27.

(b) An incinerator burning hazardous waste and producing stack emissions of more than 1.8 kilograms per hour (4 pounds per hour) of hydrogen chloride (HCl) must control HCl emissions such that the rate of emission is no greater than the larger of either 1.8 kilograms per hour or 1% of the HCl in the stack gas prior to entering any pollution control equipment.

(c) An incinerator burning hazardous waste must not emit particulate matter in excess of 180 milligrams per dry standard cubic meter (0.08 grains per dry standard cubic foot) when corrected for the amount of oxygen in the stack gas according to the formula:

$$P_c = P_m \times \frac{14}{21 - Y}$$

Where P_c is the corrected concentration of particulate matter, P_m is the

measured concentration of particulate matter, and Y is the measured concentration of oxygen in the stack gas, using the Orsat method for oxygen analysis of dry flue gas, presented in Part 60, Appendix A (Method 3), of this chapter. This correction procedure is to be used by all hazardous waste incinerators except those operating under conditions of oxygen enrichment. For these facilities, the Regional Administrator will select an appropriate correction procedure, to be specified in the facility permit.

(d) For purposes of permit enforcement, compliance with the operating requirements specified in the permit (under § 264.345) will be regarded as compliance with this section. However, evidence that compliance with those permit conditions is insufficient to ensure compliance with the performance requirements of this section may be "information" justifying modification, revocation, or reissuance of a permit under § 270.41 of this chapter.

[46 FR 7678, Jan. 23, 1981, as amended at 47 FR 27532, June 24, 1982; 48 FR 14295, Apr. 1, 1983; 50 FR 2005, Jan. 14, 1985]

§ 264.344 Hazardous waste incinerator permits.

(a) The owner or operator of a hazardous waste incinerator may burn only wastes specified in his permit and only under operating conditions specified for those wastes under § 264.345, except:

(1) In approved trial burns under § 270.62 of this chapter; or

(2) Under exemptions created by § 264.340.

(b) Other hazardous wastes may be burned only after operating conditions have been specified in a new permit or a permit modification as applicable. Operating requirements for new wastes may be be based on either trial burn results or alternative data included with Part B of a permit application under § 270.19 of this chapter.

(c) The permit for a new hazardous waste incinerator must establish appropriate conditions for each of the applicable requirements of this subpart, including but not limited to allowable waste feeds and operating conditions necessary to meet the requirements of § 264.345, sufficient comply with the following standard

(1) For the period beginning v initial introduction of hazardous w to the incinerator and ending with tiation of the trial burn, and only the minimum time required to est lish operating conditions required paragraph (c)(2) of this section, no exceed a duration of 720 hours ope ing time for treatment of hazard waste, the operating requireme must be those most likely to ens compliance with the performa standards of § 264.343, based on Regional Administrator's engineer judgment. The Regional Administ tor may extend the duration of t period once for up to 720 additio hours when good cause for the ext sion is demonstrated by the applic

(2) For the duration of the t burn, the operating requireme must be sufficient to demonstr compliance with the performa standards of § 264.343 and must be accordance with the approved t burn plan;

(3) For the period immediately lowing completion of the trial bu and only for the minimum period s ficient to allow sample analysis, d computation, and submission of trial burn results by the applicant, a review of the trial burn results a modification of the facility permit the Regional Administrator, the op ating requirements must be th most likely to ensure compliance w the performance standards § 264.343, based on the Regional ministrator's engineering judgement

(4) For the remaining duration the permit, the operating requi ments must be those demonstrated, a trial burn or by alternative d specified in § 270.19(c) of this chapt as sufficient to ensure compliar with the performance standards § 264.343.

(Approved by the Office of Managem and Budget under control number 20 0002)

[46 FR 7678, Jan. 23, 1981, as amended a FR 27532, June 24, 1982; 48 FR 14295, A 1, 1983; 50 FR 4514, Jan. 31, 1985]

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§ 264.345 Operating requirements.

(a) An incinerator must be operated in accordance with operating requirements specified in the permit. These will be specified on a case-by-case basis as those demonstrated (in a trial burn or in alternative data as specified in § 264.344(b) and included with Part B of a facility's permit application) to be sufficient to comply with the performance standards of § 264.343.

(b) Each set of operating requirements will specify the composition of the waste feed (including acceptable variations in the physical or chemical properties of the waste feed which will not affect compliance with the performance requirement of § 264.343) to which the operating requirements apply. For each such waste feed, the permit will specify acceptable operating limits including the following conditions:

(1) Carbon monoxide (CO) level in the stack exhaust gas;

(2) Waste feed rate;

(3) Combustion temperature;

(4) An appropriate indicator of combustion gas velocity;

(5) Allowable variations in incinerator system design or operating procedures; and

(6) Such other operating requirements as are necessary to ensure that the performance standards of § 264.343 are met.

(c) During start-up and shut-down of an incinerator, hazardous waste (except wastes exempted in accordance with § 264.340) must not be fed into the incinerator unless the incinerator is operating within the conditions of operation (temperature, air feed rate, etc.) specified in the permit.

(d) Fugitive emissions from the combustion zone must be controlled by:

(1) Keeping the combustion zone totally sealed against fugitive emissions; or

(2) Maintaining a combustion zone pressure lower than atmospheric pressure; or

(3) An alternate means of control demonstrated (with Part B of the permit application) to provide fugitive emissions control equivalent to maintenance of combustion zone pressure lower than atmospheric pressure.

(e) An incinerator must be operated with a functioning system to automatically cut off waste feed to the incinerator when operating conditions deviate from limits established under paragraph (a) of this section.

(f) An incinerator must cease operation when changes in waste feed, incinerator design, or operating conditions exceed limits designated in its permit.

(Approved by the Office of Management and Budget under control number 2050-0002)

[46 FR 7678, Jan. 23, 1981, as amended at 47 FR 27532, June 24, 1982; 50 FR 4514, Jan. 31, 1985]

§ 264.346 [Reserved]

§ 264.347 Monitoring and inspections.

(a) The owner or operator must conduct, as a minimum, the following monitoring while incinerating hazardous waste:

(1) Combustion temperature, waste feed rate, and the indicator of combustion gas velocity specified in the facility permit must be monitored on a continuous basis.

(2) CO must be monitored on a continuous basis at a point in the incinerator downstream of the combustion zone and prior to release to the atmosphere.

(3) Upon request by the Regional Administrator, sampling and analysis of the waste and exhaust emissions must be conducted to verify that the operating requirements established in the permit achieve the performance standards of § 264.343.

(b) The incinerator and associated equipment (pumps, valves, conveyors, pipes, etc.) must be subjected to thorough visual inspection, at least daily, for leaks, spills, fugitive emissions, and signs of tampering.

(c) The emergency waste feed cutoff system and associated alarms must be tested at least weekly to verify operability, unless the applicant demonstrates to the Regional Administrator that weekly inspections will unduly restrict or upset operations and that less frequent inspection will be adequate. At a minimum, operational testing must be conducted at least monthly.

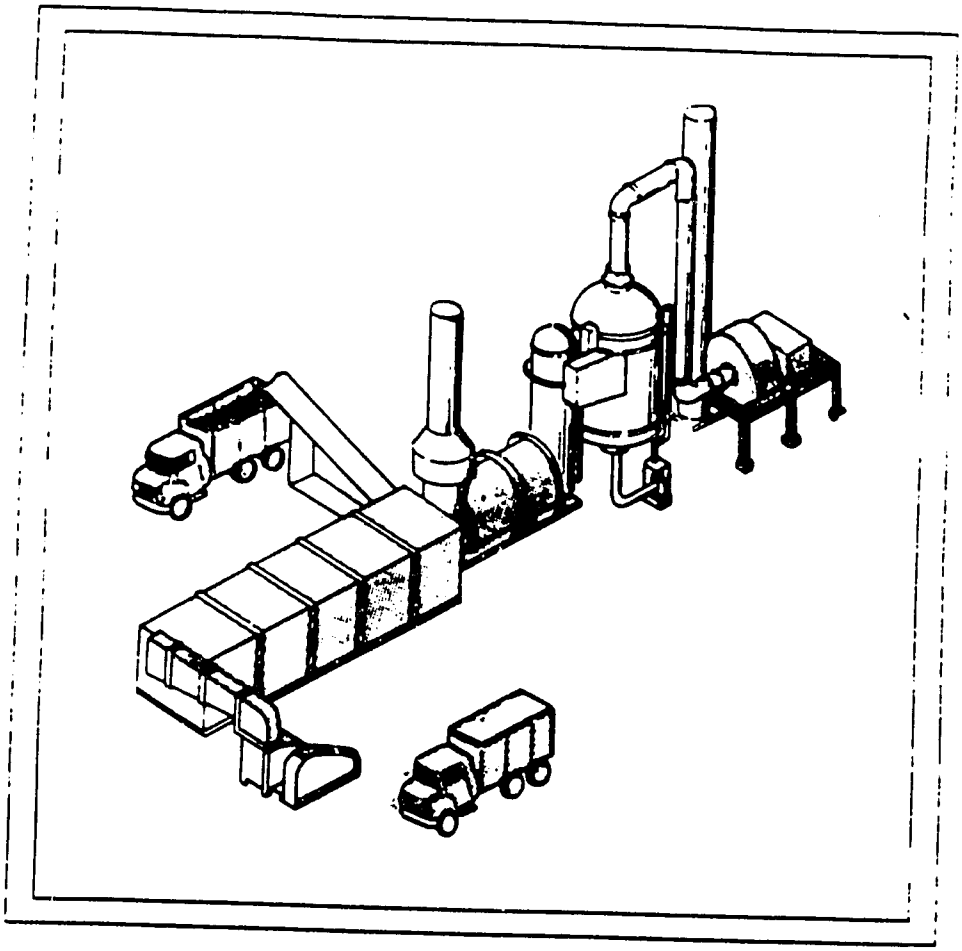
United States
Environmental Protection
Agency

Solid Waste

Office of Solid Waste
Washington, DC 20460
EPA/530-SW-88-013
April 1988

EPA

Hazardous Waste Incineration: Questions and Answers



(d) This monitoring and inspection data must be recorded and the records must be placed in the operating log required by § 264.73.

(Approved by the Office of Management and Budget under control number 2050-0002)

[46 FR 7678, Jan. 23, 1981, as amended at 47 FR 27533, June 24, 1982; 50 FR 4514, Jan. 31, 1985]

§§ 264.348—264.350 [Reserved]

§ 264.351 Closure.

At closure the owner or operator must remove all hazardous waste and hazardous waste residues (including, but not limited to, ash, scrubber waters, and scrubber sludges) from the incinerator site.

[*Comment:* At closure, as throughout the operating period, unless the owner or operator can demonstrate, in accordance with § 261.3(d) of this chapter, that the residue removed from the incinerator is not a hazardous waste, the owner or operator becomes a generator of hazardous waste and must manage it in accordance with applicable requirements of Parts 262 through 266 of this chapter.]

[46 FR 7678, Jan. 23, 1981]

Subparts P–W [Reserved]

Subpart X—Miscellaneous Units

SOURCE: 52 FR 46964, Dec. 10, 1987, unless otherwise noted.

§ 264.600 Applicability.

The requirements in this subpart apply to owners and operators of facilities that treat, store, or dispose of hazardous waste in miscellanenous units, except as § 264.1 provide otherwise.

§ 264.601 Environmental performance standards.

A miscellaneous unit must be located, designed, constructed, operated, maintained, and closed in a manner that will ensure protection of human health and the environment. Permits for miscellaneous units are to contain such terms and provisions as necessary to protect human health and the environment, including, but not limited to, as appropriate, design and operating requirements, detection and mon ing requirements, and requirem for responses to releases of hazar waste or hazardous constituents f the unit. Permit terms and provis shall include those requirement Subparts I through 0 of this part, 270, and Part 146 that are appropr for the miscellaneous unit being mitted. Protection of human he and the environment includes, bu not limited to:

(a) Prevention of any releases may have adverse effects on hu heath or the environment due to gration of waste constituents in ground water or subsurface envi ment, considering:

(1) The volume and physical chemical characteristics of the w in the unit, including its potential migration through soil, liners, or o containing structures;

(2) The hydrologic and geol characteristics of the unit and the rounding area;

(3) The existing quality of gro water, including other sources of tamination and their cumula impact on the ground water;

(4) The quantity and direction ground-water flow;

(5) The proximity to and withdra rates of current and potential grou water users;

(6) The patterns of land use in region;

(7) The potential for deposition migration of waste constituents i subsurface physical structures, into the root zone of food-chain cr and other vegetation;

(8) The potential for health ri caused by human exposure to wa constituents; and

(9) The potential for damage to mestic animals, wildlife, crops, vege tion, and physical structures caused exposure to waste constituents;

(b) Prevention of any releases t may have adverse effects on hum health or the environment due to gration of waste constituents in s face water, or wetlands or on the surface considering:

(1) The volume and physical chemical characteristics of the wa in the unit;

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4 ENFORCEMENT OF PERMIT OPERATING CONDITIONS ..... [illegible]

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ACKNOWLEDGEMENTS

This booklet was developed by Lori DeRose and Vanessa Musgrave of the Office of Solid Waste, U.S. Environmental Protection Agency, and Leslie Kostrich, Nancy Knappenberger, David Helzner, Andy Szatkowski, Richard Lipinski, and David Jensen of ICF Incorporated, Fairfax, Va. We particularly would like to acknowledge the special contributions of the following: Matt Hale, Frank McAlister, Sonya Stelmack, Robin Anderson, Robert Holloway, and Mary Cunningham of EPA and Lewis Michaelson, Edwin Berk, Elizabeth Marcotte, Carl St. Cin, Nora Zirps, Gary Dietrich, and Pamela Bridgen of ICF. We also wish to thank the following EPA staff who provided information for the booklet and served as reviewers: Edward Anna, Carol Bass, Pete Bentley, Olga Carey, Linda Galer, Nancy Grundahl, Lyndell Harrington, Judy Kertcher, Debra Martin, Bruce Means, Henry Onsgard, David Redford, Moira Schoen, Adam Sutkus, Marcia Williams and Larry Zaragoza.

INTRODUCTION

This booklet provides answers to questions that citizens may have about hazardous waste incineration. Many cities and towns operate incinerators that burn non-hazardous wastes, such as household garbage. Incinerators are also used to burn **hazardous wastes**.* Most hazardous wastes are byproducts of a broad spectrum of industrial and manufacturing processes; other hazardous wastes result from other activities, for example, the removal of contaminated soil from a **Superfund** site or a chemical spill. When managed improperly, hazardous wastes can pollute the environment, causing harm to people, animals, and plants. Incineration detoxifies hazardous wastes by destroying many of the harmful components of the wastes. Based on the results of research on incineration, EPA has concluded that incineration is the best method currently available for treating certain types of hazardous wastes.

Why is hazardous waste incineration important?

EPA expects that increased use of hazardous waste incineration will help avoid the environmental problems caused by mismanagement of hazardous waste. EPA studies and independently prepared reports have concluded that hazardous waste incineration is safe and is preferable in many cases to the primary competing technology, disposal of wastes on land. In the Hazardous and Solid Waste Amendments (**HSWA**) of 1984, Congress mandated a ban on the land disposal of untreated hazardous wastes. EPA believes that incineration will play a major role in providing a treatment alternative to land disposal.

Incineration's main advantage is that it permanently destroys some of the toxic qualities of the waste. A report by the Congressional Office of Technology Assessment (OTA) concluded that hazardous waste incineration is safer than land disposal. The report stated that "it is preferable to permanently reduce risks to human health and the environment by waste treatments that destroy or permanently reduce the hazardous character of material, than to rely on long-term containment in land-based disposal structures."

Incineration has been used in the U.S. and Europe to treat hazardous wastes for many years. As of 1987, there were over 200 hazardous waste incinerators operating in the U.S. Most of these incinerators are used by companies for their own wastes; the remainder incinerate wastes for payment. Today, incineration is also playing an important role in the cleanup of many Superfund sites, where it is used for treating contaminated soils and other wastes removed from the site. In recent regulations that set treatment standards for hazardous wastes that are to be disposed on land, EPA has

* Words defined in the glossary at the end of the booklet are marked in bold at their first appearance.

identified incineration as the **Best Demonstrated Available Technology** (that is, the commercially developed technology that provides the most effective treatment) for certain types of wastes.

EPA believes that greater quantities of hazardous wastes will be treated using incinerators in the coming years. As demand for incineration increases, EPA expects to receive applications for permits from businesses wishing to build and operate new incinerators. In addition, Congress, in the Hazardous and Solid Waste Amendments of 1984 (HSWA), gave EPA a deadline of November 8, 1989 for final decisions on permit applications for hazardous waste incinerators that were submitted to EPA by November 8, 1984. Incineration will therefore be more in the public eye, and will be the object of more interest and questions from citizens.

What information can be found in this booklet?

The focus of this booklet is hazardous waste incineration and its regulation under the Resource Conservation and Recovery Act (**RCRA**). Because hazardous waste is a legal term, wastes must meet specific criteria to be regulated as hazardous under RCRA. Certain wastes that have dangerous properties, for example, radioactive wastes and polychlorinated biphenyls (**PCBs**), are not included in the legal definition of hazardous waste. Management of radioactive wastes is regulated by the Nuclear Regulatory Commission and the Department of Energy; management of PCBs is regulated by EPA under the Toxic Substances Control Act (**TSCA**).

EPA's regulatory program for PCB incineration is based on a similar framework of standards, permits, and enforcement, although there are some differences in specific procedures and requirements. This booklet does not provide information on this program. For more information on incineration of PCBs, contact your EPA regional office (see page 44).

This booklet is organized into six chapters. The first chapter answers questions about the technical aspects of hazardous waste incineration. Chapter 2 provides a general description of EPA's program for regulating hazardous waste incinerators and describes the federal performance standards for hazardous waste incinerators. Chapter 3 explains the process of developing and issuing permits, while Chapter 4 describes how permit conditions are enforced. Chapter 5 describes general standards that apply to owners and operators of all hazardous waste treatment, storage, or disposal facilities. The last chapter, Chapter 6, explains the potential risks involved in hazardous waste incineration.

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CHAPTER 1

HAZARDOUS WASTE INCINERATION: A TECHNICAL OVERVIEW

This chapter describes technical aspects of hazardous waste incineration, including the following:

- Overview of the incineration process;
- Types of wastes suitable for incineration;
- Descriptions of several of the more common types of hazardous waste incinerators;
- Descriptions of common types of air pollution control devices used on hazardous waste incinerators;
- Maintenance requirements for incineration units; and
- Alternatives to incineration;

The chemical reactions that occur during incineration are extremely complex. The intent of this chapter is to describe this complex process in general terms to provide a basic understanding. The variety of incinerator designs and air pollution control equipment, however, precludes a complete and detailed discussion of incineration technology. Only the most commonly used designs and equipment are discussed.

BASIC PRINCIPLES OF INCINERATION

What is incineration?

Incineration is the burning of substances by controlled flame in an enclosed area (compartment). This process (1) detoxifies hazardous wastes by destroying organic compounds contained in the wastes, (2) reduces the volume of the wastes, and (3) converts wastes to solids by vaporizing water and other liquids the wastes may contain. Organic compounds (compounds composed of carbon, hydrogen, and sometimes other elements) burn over a broad range of temperatures. Wood, oil, and coal, for example, are all composed of organic compounds that burn at relatively low temperatures. Some organic compounds, including some found in certain hazardous wastes, burn less readily and must be subjected to higher temperatures before they burn. A hotter fire also burns more completely than a cooler one. As a consequence, hazardous waste incinerators must maintain extremely high temperatures (typically ranging from 1800°F to 2500°F) to ensure that virtually all organic compounds in the wastes are destroyed. Although

incineration does not destroy **inorganic compounds** (carbonless compounds such as salts or metals, and carbon compounds lacking hydrogen, such as carbon monoxide and carbon dioxide), it can be used for wastes that contain them in order to prepare the inorganic materials for easier management and handling. Incineration is more effective, however, in reducing the hazardous properties of wastes that are mainly composed of organic compounds.

How does an incinerator work?

Incineration involves four basic steps:

- Wastes are fed into the incinerator;
- Wastes are burned, destroying organic compounds and yielding residual products in the form of ash and gases;
- Ash is collected, cooled, and removed from the incinerator; and
- Gases are cooled, cleaned, and released to the atmosphere through the incinerator stack (or chimney).

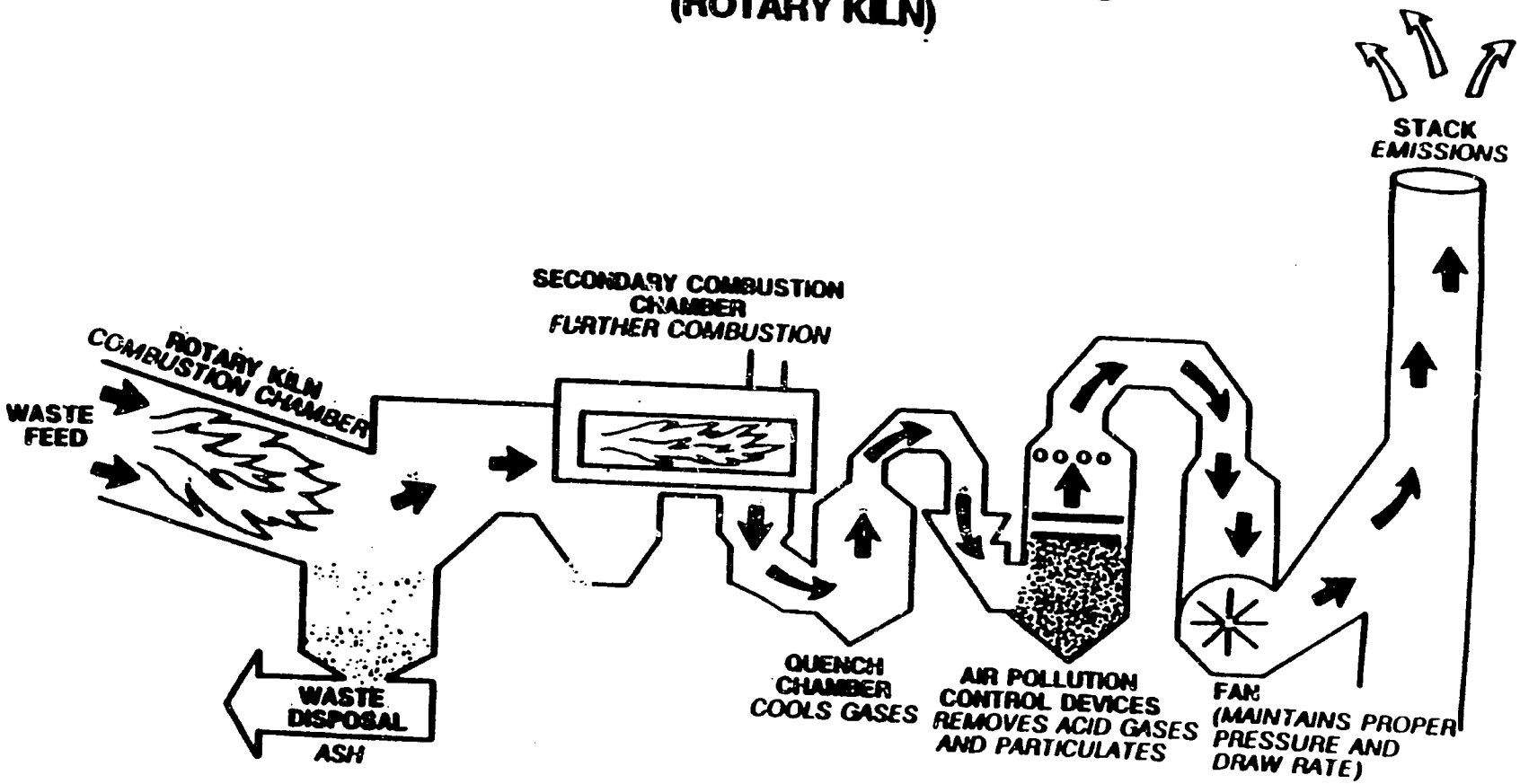
The specific equipment used for each step depends on the incinerator type and the physical and chemical characteristics of the wastes the incinerator is designed to burn. In addition, steps may be added at various points to improve efficiency. For example, in some systems, wastes are preheated or ignited before they enter the parts of the incinerator where the highest temperatures are maintained. The picture (see next page) shows a typical rotary kiln system, one that could be used for incineration of a wide variety of wastes.

How are wastes burned in the incinerator?

During a burn (a period during which the incinerator is in operation), wastes are fed into the incinerator in batches or in a continuous stream. Whether continuous or batch, this flow of wastes is generally referred to as the **waste feed**. Feed mechanisms are diverse: liquid wastes are often pumped into incinerators through a nozzle, a device that breaks up the liquid into fine droplets that burn more easily. Solid wastes may be fed into the incinerator in bulk or in containers using a conveyer or a gravity system.

Wastes are burned in the **combustion chamber**, a furnace-like area that contains a burner and which is designed to withstand and maintain extremely high temperatures. As the wastes are heated, they are converted from solids or liquids into gases. The gases are mixed with air and passed through the extremely hot flame. As the temperature of the gases rises, the organic compounds in the gases begin to break down into atoms. These atoms recombine with the oxygen from the air to form stable inorganic compounds,

TYPICAL INCINERATOR PROCESSES (ROTARY KILN)



such as carbon dioxide and water. Depending on waste composition, other inorganic compounds (for example, acid gases such as hydrogen chloride) may form. This entire process is called **combustion**.

Temperatures in combustion chambers vary, but are generally in the range of 1,800°F to 2,500°F, temperatures well above those required to break down the more difficult-to-burn organic compounds. Wastes are generally maintained at these elevated temperatures from less than one second to several seconds. In many incinerators, combustion occurs in two combustion chambers. Combustion of more easily burned organics is completed in the first chamber. For compounds that are difficult to burn, combustion is completed in the **secondary combustion chamber** after the compounds have been converted to gases and partially combusted in the first chamber.

What is the composition of residuals from the combustion process?

Combustion yields two residual products: solids, in the form of ash, and gases. Combustion gases are composed primarily of carbon dioxide and water, plus small quantities of carbon monoxide, nitrogen oxides, and other gases that depend on the composition of the waste burned. Ash is an **inert** inorganic material made up of carbon, salts, and metals. The exact composition, like that of the gases, depends on the waste burned. During combustion, most ash collects at the bottom of the combustion chamber; some ash, however, is carried along with the gases as small particles, or **particulate matter**. Different types of wastes yield different quantities of ash. Incineration of liquids generally produces very small quantities of ash relative to the quantity of waste burned. Incineration of solid wastes yields greater quantities of ash: typically, from 10 to 30 percent of the original waste quantity. Ash is removed from the bottom of the combustion chamber and, by regulation, is considered a hazardous waste (as are all residuals from hazardous waste treatment processes, whether or not the residuals exhibit the characteristics of hazardous wastes). If the owner or operator can prove that the ash is not hazardous, however, EPA issues an exemption called a "**delisting**."

How are combustion gases cooled and cleaned before release?

Following combustion, the combustion gases move through various devices that cool and cleanse the gases before the gases are released to the atmosphere through the incinerator stack. A fan is typically used to maintain the flow of gases through the system. One common cooling system is a **quench chamber**, where gases are cooled by direct mixing with water. **Air pollution control devices** are used to remove both particulate matter and acid gases from the combustion gases. The exact number and types of devices used will depend on the incinerator and the types of waste it burns. For example, hydrogen chloride is created by combustion of wastes containing chlorinated organic compounds. RCRA standards limit the amount of hydrogen chloride that can be released through the emission of combustion gases. If an incinerator is not used for burning chlorinated organic wastes, it will not require a special device for hydrogen chloride removal.

Does incineration destroy all organics in the waste?

A well-designed hazardous waste incinerator that is properly operated will destroy all but a tiny fraction of the organic compounds contained in the waste. Such incinerators perform at levels extremely close to complete combustion (that is, the total destruction of all organic compounds) and new technology is being developed that will improve upon current levels of performance. Complete combustion is only a theoretical concept, however, since the development of a 100 percent efficient incinerator is not possible.

The three critical factors that determine the completeness of combustion in an incinerator are (1) the temperature in the combustion chamber; (2) the length of time wastes are maintained at high temperatures; and (3) the turbulence, or degree of mixing, of the wastes and the air (an important determinant of the availability of oxygen during burning). To ensure that these factors are working together to promote virtually complete combustion, a RCRA permit for a hazardous waste incinerator specifies allowable ranges for and requires continuous monitoring of certain critical parameters. Among these parameters, or **operating conditions**, are maximum allowable carbon monoxide levels in emissions, allowable ranges for temperature, and maximum waste feed rates.

What is contained in the gases emitted from the incinerator?

Incinerator emission gases are composed primarily of two harmless inorganic compounds, carbon dioxide and water. The type and quantity of other compounds depends on the composition of the wastes, the completeness of the combustion process, and the air pollution control equipment with which the incinerator is equipped. These compounds include organic and inorganic compounds contained in the original waste and organic and inorganic compounds created during combustion:

> Organic compounds from the original waste. A well designed incinerator, when operated properly, is highly efficient, and will burn all but a very small quantity of the organics in the waste. The organics that do not combust are carried along in the gases leaving the combustion chamber. As the gaseous, uncombusted organics move through the remainder of the incinerator, some are removed by air pollution control equipment. RCRA standards set a limit on emissions of designated organic compounds. ⇐

> Inorganic compounds from the original waste. Inorganic compounds, such as salts and metals, do not combust. These compounds end up either in the bottom of the combustion chamber in the ash or carried along with the combustion gases,

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depending primarily upon their weight. These inorganic compounds generally are contained in or adhere to particulate matter. RCRA standards limit the quantity of particulate matter that may be emitted from the incinerator. Air pollution control devices are therefore used to remove most particulate matter and adhering materials from the combustion gases.

Organic compounds not present in the original waste. Because combustion in an incinerator is not 100 percent efficient, very small quantities of "new" organic compounds may form from the breakdown and recombination of the original compounds. These compounds are called "products of incomplete combustion" (or PICs) and are formed during the combustion of any organic material. For example, PICs are formed when wood is burned in wood stoves, or when gasoline is burned in an automobile engine. The combustion process may create small quantities of many different types of PICs and some fraction of these compounds may be hazardous. Among the types of compounds found in various analyses of PICs are some that are considered toxic, including dioxins and dibenzofurans. In a state-of-the-art incinerator, PIC formation is minimized by keeping the initial products of combustion at high temperatures for an appropriate length of time. PICs are destroyed by the high temperatures maintained in the combustion zone or a secondary combustion chamber. Air pollution control devices also remove PICs.

Inorganic compounds not present in the original waste. In addition to carbon dioxide and water, combustion always produces small quantities of carbon monoxide and nitrogen oxides (from the combination of oxygen and nitrogen in the air). Combustion of complex organic compounds (including many hazardous wastes) may create other inorganic compounds, depending on what is being burned. Many hazardous wastes contain chlorinated organic compounds, sulfur, or organically-bound nitrogen. Combustion of these compounds yields hydrogen chloride, oxides of sulphur, and oxides of nitrogen, respectively. Carbon monoxide, as well as nitrogen and sulfur oxides, are typically found in auto emissions and emissions from other combustion facilities, such as coal-burning power plants. Because it

is more uniquely associated with the burning of hazardous wastes. RCRA standards place limitations on emissions of hydrogen chloride.

What types of wastes are incinerated?

Incinerators can be designed to accept wastes of any physical form, including gases, liquids, solids, **sludges** (thick, heavy mixtures of liquids and solids), and **slurries** (thin mixtures of liquids and solids). Although any waste can be incinerated, incineration is primarily for the treatment of wastes that contain organic compounds. Wastes with a wide range of chemical and physical characteristics are suitable for incineration. Most of these wastes are byproducts of industrial manufacturing and chemical production processes or result from the clean-up of contaminated sites.

INCINERATION TECHNOLOGY

Are there different types of hazardous waste incinerators?

The two most common types of hazardous waste incinerators are rotary kiln and liquid injection. Other types exist, some of which are becoming more widely used; others are still in the developmental stage. Choice of a particular type of incinerator design is determined primarily by the types of wastes to be treated.

Rotary kiln incinerators are versatile units that can accept gases, liquids, sludges, slurries, and solids either separately or simultaneously, either in bulk or in containers. Because of this versatility, rotary kilns are commonly used to treat a variety of wastes. The kiln is a cylindrical shell mounted on its side at a slight angle to the horizontal. As the kiln rotates and the wastes travel down the slope, the organic chemicals in the waste convert into gases and partially combust. The gases then pass into another combustion chamber (called an **afterburner** or the secondary combustion chamber) where more complete combustion is achieved. Ash residue is removed from the lower end of the kiln.

Liquid injection incinerators are capable of accepting gases, liquids, and slurries. The heart of the liquid injection incinerator is a nozzle or some other device that "atomizes" the liquid stream. Pumped at high pressure through the atomizer, the liquids emerge as tiny droplets that mix well with air and auxiliary fuel and easily convert into gases. Liquid injection systems are often designed for specific wastes. Consequently, the design of the atomizing device limits the types of wastes that a particular incinerator can treat. In spite of this disadvantage, liquid injection systems are widely used where versatility is not a primary requirement, or as an adjunct to a more flexible unit, such as the rotary kiln.

Mobile incineration systems have been constructed using various designs. These systems are hauled to a site on flat-bed trucks, then assembled and tested. Mobile incinerators are usually smaller than stationary facilities, but they operate on identical principles. Incinerators may also be mounted on ships.

Among the many types of hazardous waste incinerators, one of the more common types is the fluidized bed. **Fluidized bed incinerators** burn finely divided solids, sludges, slurries, and liquids. The bed consists of an inert granular material, usually sand, that is suspended by pressurized air in a highly turbulent, or fluidized state above the combustion chamber floor. Waste is conveyed into the fluidized bed where direct contact with the bed material improves the transfer of heat. Combustion gases move out of the combustion chamber for cooling and further treatment. Ash caught in the bed material is eventually removed when the bed material is replaced.

What types of pollution control devices are used on hazardous waste incinerators?

Combustion gases are typically treated to remove inorganic acid gases and particulate matter. Particulate matter (and adhering metals) can be removed with several devices. One of the oldest methods is **baghouse filtration** which involves passing the gas through a material (usually fabric) that collects the particulate matter. Another method involves **electrostatic precipitators**; the particulate matter is electrically charged and collects on plates that are oppositely charged. The particulate matter is then periodically cleaned from the plates. Still another approach is the venturi scrubber. **Venturi scrubbers** use high-pressure water to remove the particulate matter.

Hydrogen chloride gas is typically removed using other types of scrubber devices. Some examples are **packed bed**, **spray tower**, and **plate tower scrubbers**. These scrubbers bring alkaline water and the combustion gases together, providing the greatest possible contact between the water and the gases. The water is broken up into fine droplets and sprayed into the gas or the gas is broken up into small bubbles and flows up through the water. This allows hydrogen chloride, an acid gas, to dissolve in and be neutralized by the alkaline water. Also available are dry scrubbers which use either dry scrubbing material or an alkaline slurry which is dried when it is injected in to the hot combustion gases. Venturi scrubbers are not generally used for hydrogen chloride removal; however, the use of alkaline water in a venturi scrubber will remove some hydrogen chloride, in addition to removing particulate matter.

Many air pollution control devices use water, thus creating wastewaters containing the pollutants that have been removed from the gases. The Clean Water Act sets requirements for wastewater discharges, placing limits on temperature, pH (a measure of acidity or alkalinity), quantity of suspended solids, and pollutant levels. Any wastewaters from the incinerator not meeting these requirements must be treated before being disposed or released to a river, stream, or sewer system. Possible treatments include settling, metals precipitation, and neutralization.

What maintenance does an incinerator require?

Equipment maintenance varies greatly depending upon the type of equipment, its materials of construction, and the chemical and physical stresses to which the equipment is subjected. For example, the heat-resistant lining in the combustion chamber normally lasts two to three years, but incineration of wastes

containing alkali metals may require the lining to be replaced every four months. To ensure that the incinerator functions properly throughout its lifetime, RCRA permits require that the owner or operator of the facility perform regular inspections and maintenance according to schedules included the permit (Chapter 5 provides more information on these requirements). In addition, the regulations require that an incinerator maintain the same operating conditions (such as temperature) that it did when it was tested. Incinerator must be maintained properly in order to achieve the operating conditions. EPA (or the responsible state agency) also conducts periodic inspections and may review maintenance records and other data to ensure that incinerator continues to operate well. Furthermore, the permit is effective no more than ten years, less than the potential life of the incinerator. Thu the performance and operating condition of older incinerators are scrutinized when permits come up for renewal.

ALTERNATIVES TO INCINERATION

How does incineration compare to land disposal?

Incineration, since it is a method of treatment rather than disposal, has several advantages over land disposal methods. Incineration breaks down organic compounds, permanently eliminating environmental hazards posed by them. Land disposal only controls the hazard as long as the wastes remain contained in the disposal unit. The very small amounts of hazardous compounds released during incineration are released in a slow, controlled manner so that they do not pose any threat to nearby residents or the surrounding environment. Although incinerator ash requires disposal in a landfill, the process of incineration greatly reduces the volume of the material to be disposed. This is extremely valuable, given that space in landfills is becoming increasingly scarce. In addition, ash consists mostly of inert material, whereas organic compounds may react with other compounds in the landfill to form acids that hasten deterioration of liners that contain the wastes in the landfill.

Today, the principal disadvantage of incineration compared to land disposal is that of cost. However, as the land disposal restrictions instituted by HSWA begin to go into effect, the land disposal alternative will become more costly since producers of hazardous wastes will have to treat wastes before they can be disposed on land. Land disposal costs will also increase over the coming years because of changes in RCRA requirements. Thus, the cost difference between incineration and land disposal will disappear for some wastes and become less important for others. For many types of hazardous wastes, incineration will become the least expensive treatment alternative.

Rather than building incinerators to treat their hazardous waste, why don't companies change their production processes so that these wastes are not produced?

Waste minimization, that is, steps that eliminate or reduce the production of hazardous wastes, is becoming increasingly important as society deals with the problem of hazardous waste. EPA encourages waste minimization, and is assisting companies in determining how waste minimization techniques can be

applied to their processes. The move towards waste minimization is a gradual process, however, and it is likely to take many years before hazardous waste volumes are significantly reduced. In addition, waste minimization techniques will not totally eliminate the need for treatment and disposal technologies. Incineration should therefore remain an important technology for treating hazardous wastes, even as less waste is produced.

Are there any other alternatives to incineration?

Many new types of **thermal treatment** technologies are currently being studied. Incineration is one type of thermal treatment that uses combustion (burning) in the presence of oxygen to destroy hazardous compounds. Other thermal treatments use hot fluids or other materials with elevated temperature to treat wastes. At this time, most of these technologies are probably too new to be considered commercially available alternatives to incineration, but they may play an increasingly significant role in the future. These new technologies include **pyrolysis**, **molten salt reactors**, reaction in **supercritical water**, and **plasma-arc reactors**. Of these technologies, only pyrolysis is commercially available now. The others are in the developmental stages.

For some types of liquid organic wastes, biological or chemical treatment are an economical and effective alternative to incineration. **Biological treatment** breaks down organic wastes using microorganisms that consume the organics. Although these systems cannot presently tolerate very toxic wastes or wastes containing more than small amounts of inorganics, future biotreatment systems may be developed which can treat a greater variety of wastes. Several forms of **chemical treatment** can be used to recover valuable materials in the wastes, such as solvents. Some processes that allow solvent recovery are distillation, steam stripping, and solvent extraction. These processes may be preferable to incineration if the chemicals contained in the waste are expensive to produce or if the waste is only slightly contaminated. Other forms of chemical treatment (for example, lime precipitation) are more effective than incineration for wastes containing large quantities of metals or wastes composed mostly of inorganic chemicals.

Based on current data, EPA believes that incineration is the best technology available for the treatment of many organic wastes. Although there are still some areas of technical and scientific uncertainty concerning incinerator emissions, incineration is preferable to alternative technologies such as land disposal because it reduces both waste toxicity and volume.

CHAPTER 2

THE REGULATORY PROGRAM FOR HAZARDOUS WASTE INCINERATORS

The treatment, storage, and disposal of hazardous wastes, including land-based incineration of hazardous wastes, is regulated under Subtitle C of the Resource Conservation and Recovery Act (RCRA). RCRA was passed by Congress in 1976 and amended by the Hazardous and Solid Waste Amendments (HSWA) in 1984. Under RCRA, EPA is required to set standards for the management of hazardous waste from "cradle to grave," from the time the waste is first produced until it is treated or disposed. RCRA provides EPA with the authority to develop standards for producers and transporters of hazardous wastes and facilities that treat, store, or dispose of hazardous waste. RCRA requires that these standards be sufficiently stringent to protect human health and the environment.

Who regulates hazardous waste incinerators?

RCRA gives states the option of developing and administering their own hazardous waste programs in place of the federal program that EPA administers. EPA must approve a state's program before it can take the place of EPA's program. To gain approval, a state program must be consistent with and equivalent to the federal RCRA program, and at least as stringent. State programs may be more stringent or extensive than the federal program. For example, a state may adopt a broader definition of hazardous waste in its regulations, designating certain wastes hazardous that are not hazardous under the federal regulations. This booklet describes the federal RCRA program, the minimum requirements applicable throughout the country. These regulations are contained in Parts 260-271 of Volume 40 of the Code of Federal Regulations. Volume 40, Part 264 of the Code of Federal Regulations contains standards for permitted hazardous waste facilities; Subpart O of Part 264 gives the specific standards for incinerators. Regulations that are new or have not been finalized can be found in the **Federal Register**, a document that is published daily and contains notification of government agency actions.

How do regulations ensure safe operation of hazardous waste incinerators?

EPA has developed **performance standards** for the incineration of hazardous wastes based on research on incinerator air emissions, and health and environmental risk studies. These standards have been developed under RCRA to ensure that incineration is carried out in a safe manner and poses no threat to the health of people living or working nearby or to the surrounding environment. All incinerators emit gases through a stack, or chimney, as the final step in the incineration process. These gases are composed primarily of carbon dioxide and water vapor, two harmless gases, but may contain trace quantities of pollutants, as do emissions from other fuel-burning facilities, such as power plants. The quantity of pollutants in the emissions is the major determinant of the risk of incineration. The performance standards cover emissions of designated organic compounds, hydrogen chloride, and particulate matter.

In addition to performance standards, owners or operators of incinerators are subject to general standards that apply to all facilities that treat, store or dispose of hazardous waste. General standards cover such aspects of facility operations as personnel training, inspection of equipment, and contingency planning. These standards are discussed in more detail in Chapter 5

How can EPA or the state ensure that incineration facilities will operate according to regulations?

Facilities that incinerate hazardous wastes, like other facilities that treat, store, or dispose of hazardous wastes, must apply for and receive a RCRA permit. This permit, based on a detailed analysis of the data provided by the permit applicant (either the owner or operator of the incinerator), specifies conditions for operations that ensure that the incinerator will meet all applicable RCRA standards. Permits can be issued by EPA or by states with approved RCRA programs. The procedures followed for issuing or denying a permit, including provisions for public comment and participation, are similar whether EPA or a state agency is responsible. (Chapter 3 discusses the permitting process.)

Once a permit is issued, the owner or operator of the incinerator is legally bound to operate according to the conditions specified within it. The permitting agency enforces the permit by periodically inspecting the facility to ensure that it is meeting the conditions specified in its permit. When owners or operators fail to meet the requirements of their permits, they are subject to a broad range of civil and criminal actions, including suspension or revocation of their permit, fines, or imprisonment. (A more detailed discussion of enforcement is found in Chapter 4.)

How does EPA measure incinerator performance?

To qualify for permitting, an incinerator must be able to burn wastes and cleanse combustion gases so that only very small quantities of pollutants are emitted through its stack. EPA's principal measure of incinerator performance is **destruction and removal efficiency (DRE)**. Destruction refers to the combustion of the waste, while removal refers to the cleansing of pollutants from the combustion gases before they are released from the stack. For example, a 99.99 percent DRE (commonly called "four nines DRE") means that one molecule of an organic compound is released to the air for every 10,000 molecules entering the incinerator; a DRE of 99.9999 percent ("six nines") reduces this to one molecule released out of every 1,000,000 molecules. = 1ppm ?

Do performance standards apply to all pollutants present in the original waste?

It is technically infeasible to monitor DRE results for all organic compounds contained in the waste feed. Therefore, selected hazardous compounds, called the **principal organic hazardous constituents (POHCs)**, are designated in the permit. POHCs are selected based on their high concentration in the waste feed and their difficulty to burn compared to other organic compounds in the

POHCs
for dieldrin ?

waste feed. If the incinerator achieves the required DRE for POHCs, then the incinerator should achieve the same or better DRE for organic compounds that are easier to incinerate.

What levels of incinerator performance do RCRA standards require?

RCRA performance standards require: (1) a minimum destruction and removal efficiency of 99.99 percent for organic compounds designated in the permit as the principal organic hazardous constituents, or POHCs; (2) a minimum destruction and removal efficiency of 99.9999 percent for **dioxins** and **dibenzofurans**; (3) removal of 99 percent of hydrogen chloride gas from the incinerator emissions, unless the quantity of hydrogen chloride emitted is less than 4 pounds per hour; and (4) a limit of 180 milligrams of particulate matter per dry standard cubic meter of gas emitted through the stack. These standards were set based on analyses of potential risks to health or the environment and the levels of performance that have been measured for properly-operated, well-designed incinerators. Although the 99.99 DRE is protective of human health and the environment, a more stringent standard of 99.9999 DRE was set for wastes containing dioxins or dibenzofurans because of EPA's and the public's concern about these particularly toxic chemicals.

Do performance standards differ for incinerators which accept PCBs?

TSCA standards are somewhat different in form from RCRA standards. For incineration of liquid PCBs, TSCA standards set a minimum "dwell" time (time in the combustion chamber), temperature, and oxygen levels. For non-liquid PCBs, the TSCA standards require 99.9999 DRE. Although the general TSCA standard for liquid PCBs should result in 99.9999 DRE, EPA requires permit applicants wishing to burn liquid PCBs to make a demonstration to prove that they will achieve 99.9999 DRE during incineration.

CHAPTER 3

PERMITS AND THE PERMITTING PROCESS

Permits are developed by determining the conditions under which a facility may operate while meeting all applicable standards. These operating conditions are specified in the permit as the only conditions under which the facility may legally operate. The permit also specifies the maximum rate at which different types of wastes may be incinerated, maintenance and inspection procedures, training requirements, and other conditions that affect the operation of the incinerator. The permit similarly sets conditions for all other hazardous waste storage, treatment, or disposal units to be operated at the facility.

This chapter provides an overview of EPA's permitting process. The topics covered include

- The purpose of the permit,
- How the permitting process works;
- How the public can participate in the permitting process;
- How location-related factors are considered in the permitting process; and
- Information on trial burn procedures.

PERMITS AND THE PERMITTING PROCESS

How does the permit ensure that privately owned or operated hazardous waste incinerators operate according to standards?

To ensure that the performance standards are met, the permit for an incinerator specifies operating conditions that have been proven to result or are expected to result in the incinerator meeting the performance standards. The permit may specify different operating conditions for different types of waste feeds. These operating conditions specify ranges or minimum or maximum levels for different parameters, such as temperature. The permitting agency has discretion to set operating conditions for any parameter the permitting agency considers necessary to ensure that the incinerator meets performance standards.

Can a hazardous waste incinerator operate without a permit?

Recognizing that it would take EPA and authorized states many years to process all permit applications, Congress allowed hazardous waste facilities that were under construction or in operation by November 19, 1980 to operate without a permit, providing that the facilities qualified for **interim status**. To obtain interim status, owners or operators of hazardous waste facilities were required to submit the first part, Part A, of a two-part permit application.

Part A of the permit application is a standard form, while Part B is a more extensive description of the facility, including detailed and highly technical information. It may take several years to prepare Part B of a permit application and several more for the permitting agency to complete its review and provide for opportunity for public comment. Although interim status facilities are subject to general and specific standards, these standards are less strict than those that apply to permitted facilities.

In the Hazardous and Solid Waste Amendments of 1984 (HSWA), Congress established a deadline of November 8, 1986 for submission of Part B of the permit application for interim status incinerators. Owners and operators of interim status incinerators that failed to meet this deadline will lose interim status on November 8, 1989, requiring that they close their incinerator. In HSWA, Congress also established deadlines for EPA for processing permit approvals or denials. Permit applications for incinerators received by EPA before November 8, 1984 must be approved or denied by November 8, 1989. There are currently no time limits for applications received after that date.

How are interim status incinerators permitted?

Because Congress allows interim status incinerators to operate without a permit, EPA has developed different approaches to permitting interim status and "new" incinerators (those for which construction began after November 19, 1980). Owners and operators of interim status incinerators must demonstrate that their incinerator meets all applicable performance standards by submitting performance data developed during actual burns., Performance data are used to determine whether the incinerator meets RCRA performance standards when burning a specific waste under a specific set of operating conditions. Many applicants develop such data for a number of different wastes and for a variety of operating conditions to support their applications. These data are developed during a trial burn, a test during which sufficient data are gathered to assess the incinerator's ability to meet performance standards. Although the owner or operator of an interim status incinerator does not require prior approval to conduct a trial burn, it is within the permitting agency's discretion to reject the trial burn data, if insufficient to evaluate incinerator performance. Therefore, many owners or operators of interim status incinerators seek prior approval of a trial burn plan, a detailed description of how the trial burn is to be carried out.

How are new incinerators permitted?

Anyone wishing to operate a new hazardous waste incinerator is required to obtain a RCRA permit before construction of the unit begins. The RCRA permit for a new incinerator covers four phases of operation: (1) a "shake-down" period, during which the newly-constructed incinerator is brought to the level of normal operating conditions in preparation for the trial burn; (2) the trial burn period, during which burns are conducted so that performance can be tested over a range of conditions; (3) the period following the trial burn (this period may last several months), during which time the data from the trial burn is

[illegible]uated and the facility may operate under conditions specified by the permitting agency, and (4) the final operating period, which continues throughout the life of the permit (10 years or less).

The permitting agency specifies operating conditions for all four phases based on a technical evaluation of the incinerator design, the information contained in the permit application and trial burn plan, and results of trial burns for other incinerators. These operating conditions are set so that the incinerator theoretically will meet all performance standards at all times. Results from the trial burn are used to verify the adequacy of these conditions. If the trial burn results fail to verify that performance standards can be met under some operating conditions, the permit will be modified for the final operating phase so that the incinerator cannot operate under these conditions.

What information does the permitting agency require to determine whether an applicant should be given a permit to operate a hazardous waste incinerator?

All RCRA permit applicants must submit a complete permit application. Permit applicants for hazardous waste incinerators must also submit performance data that demonstrate the conditions under which the incinerator can meet the minimum performance standards, or, in the case of a new incinerator, a trial burn plan detailing how these data will be developed during the incinerator's trial burn.

RCRA standards specify the information that must be provided in the permit application and give the permitting agency broad authority to request any additional information it requires to identify the necessary operating conditions for the facility permit. The RCRA permit application consists of two parts, Part A and Part B. Part A provides general information including the name and location of the facility; its owner; its physical layout; and the types and quantities of wastes that will be managed at the facility. Part B, which has no standard format, contains detailed technical information on the facility's equipment, operating procedures, training and inspection programs, emergency prevention and response procedures, environmental monitoring systems, and geological and other physical characteristics. It is not unusual for a Part B application to be several volumes in length.

How is a permit application reviewed?

The process by which a permit application is reviewed may vary somewhat depending on the permitting agency. The basic process, however, consists of five steps:

(1) EPA or the authorized state reviews the application for completeness. If information is missing, the reviewer issues a Notice of Deficiency to request additional information from the applicant.

(2) The permitting agency evaluates the application and any other information submitted by the applicant (for example, performance data from an interim status incinerator or a trial burn plan for a new incinerator).

(3) The permitting agency prepares either a **draft permit** if it judges that the facility meets the regulatory standards, or it issues a **notice of intent to deny** the application. In either case, a notice is sent to the applicant and is published in a local newspaper. Issuance of a draft permit does not constitute final approval of the permit application. The draft permit, however, consists of all the same elements as a final permit, including technical requirements, general operating conditions, and special conditions developed specifically for the individual facility, including the duration of the permit.

(4) The permitting agency solicits and receives comments from the public during a formal **public comment period**. If requested to do so, the permitting agency will give notice of and hold a **public hearing** during the public comment period.

(5) After considering the technical merits of the comments, the permitting agency makes a final decision on the application. The permit is either issued or denied. If a permit is issued, the permit conditions are based on a careful examination of the complete **administrative record**, including all information and data submitted by the applicant and any information received from the public. The permit, as issued, may differ from the draft permit. It may correct mistakes (for example, typographical errors) or it may contain substantive changes based on technical or other pertinent information received during the public comment period. If the permitting agency intends to make substantive changes in the permit as a result of comments received during the public comment period, an additional public comment period may be held before the permit is issued.

Who decides whether or not the permit should be issued or denied?

The person with primary responsibility for evaluating the application and for writing or denying the permit is called the **permit writer**. Although he or she may be assisted by other staff in reviewing parts of the application, the permit writer will be involved in every aspect of reviewing the application, developing a proposal for responding to the application, receiving and responding to comments from the public on the proposal, and modifying the proposal, as necessary. The permit writer, by virtue of his or her technical expertise, familiarity with the facility, and involvement in every stage of the permitting process, is the key staff member responsible for determining the

operating conditions under which the facility will be able to meet applicable RCRA standards, and for making sure the permit only allows operations consistent with those conditions. The permit writer, although playing a major role in the decision process, does not make the final decision on whether to grant or deny permit. The responsibility for that decision rests with the head of the permitting agency or with another senior agency official to whom the responsibility has been delegated.

Does EPA complete an Environmental Impact Statement before issuing a RCRA permit?

In 1979, EPA determined that preparation of an **Environmental Impact Statement (EIS)** is not required in connection with the issuance of RCRA permits. Environmental Impact Statements are required by the **National Environmental Policy Act** when actions of federal agencies may adversely affect the environment. Since the procedures for issuing RCRA permits result in a rigorous review of environmental and health considerations, the health and safety of the community and the environment can be ensured without an EIS.

What is to prevent a facility, once it has a permit, from expanding its operations?

The permit specifies limits on all aspects of operations. For example, the permit limits the maximum amount, as well as the type of wastes that can be incinerated; and specifies whether the facility can incinerate only its own wastes or can accept wastes from other generators. If the facility wishes to deviate from any conditions specified in the permit, it must apply for a permit modification. Any request to expand operations would require a major modification of the permit. For major modifications, the permitting agency must follow public notice, comment, and hearing procedures similar to those required for the original permit.

What happens if an incinerator deviates from the operating conditions specified in the permit?

During operations, the permit requires continuous monitoring of certain parameters (for example, combustion temperature) to ensure that they are within the ranges specified by the permit. If parameters deviate from these ranges, a sensor will trigger the **automatic waste feed shut-off system** which is required in all **permitted** incinerators. This system promptly cuts off the feeding of wastes to the incinerator. The waste feed will not resume until the required operating conditions have been restored.

How does an automatic waste feed shut-off system work?

The mechanisms that stop the waste feed differ, depending on the design of the incinerator. In one common type of system, sensors, which operate continuously, are connected to the feed valve through electrical relays. When certain operating parameters deviate from ranges set by the permit, sensors automatically trigger the closing of the feed valve. The automatic shut-off

system must be tested weekly unless the owner or operator can demonstrate that the weekly inspections unduly disrupt operations and that less frequent inspections will not affect safety. In some systems, these sensors are also connected, on separate circuits, to a back-up alarm system. Back-up alarms might consist of audio-visual displays that can alert plant operators to potential problems (if the system approaches permit or other operating limits but is still within limits) as well as any change in parameters that would trigger the automatic shut-off system. Then, if the automatic shut-off fails the plant operator can cut off the waste feed using manual controls.

PUBLIC INVOLVEMENT IN THE PERMITTING PROCESS

How can local residents make sure that the permitting agency considers their concerns before granting the facility a permit?

Before a permit is issued, members of the public have opportunities to express their views during the public comment period. Prior to this comment period, EPA or the state agency makes a tentative decision concerning whether to issue or deny the permit. The agency issues a **public notice** of its decision, allowing a minimum of 45 days for written comments. In the special case of permits for the incineration of wastes containing dioxins or dibenzofurans, the comment period is extended to a minimum of 60 days. Along with the public notice, the agency must prepare a **fact sheet** to inform citizens about the permitting process and the basis of the agency's tentative decision. Both the fact sheet and the draft permit are made available for public review.

Members of the public may submit written comments (including questions) to the agency during the public comment period. All comments become a part of the administrative record, [illegible] forms the basis for any subsequent action on the draft permit. Issues raised during the public comment period often cause the permitting agency to rethink certain aspects of the draft permit. The draft permit may be changed or revised because of new technical information or to address concerns about the technical operations of the facility.

Are written comments the only way citizens can participate in the permitting process?

Aside from submitting written comments, there are other means by which citizens can participate in the permitting process. EPA or the state must hold a formal public hearing on the draft permit, if someone requests one in writing during the public comment period. The hearing provides an additional opportunity for members of the public to express their views and concerns. The proceedings and any written statements received at the hearing become part of the administrative record. If a hearing is held, the public comment period is automatically extended to the close of the hearing, and may be extended beyond the close of the hearing by the hearing officer. If interest warrants, the agency may also hold informal meetings with people from within the community to hear their views and respond to questions.

After the close of the public comment period the permitting agency carefully considers the entire administrative record for the permit application including all written comments and any comments made during the public hearing. Comments made at informal meetings are not part of the administrative record and therefore cannot be formally considered by the permitting agency as it makes its final evaluation of the permit application. After this evaluation the permit is written and the decision on the permit is issued, along with the **Response to Comments** a document that summarizes and responds to all significant comments received during the comment period. This document specifies which provisions if any, of the draft permit have been changed in the permit and the reasons for the change. Under certain circumstances, the conditions included in the permit may be appealed.

Before making any decisions, will EPA or the state consider the likely impact of the incinerator on the surrounding community?

RCRA requires that facilities operate in a manner that protects human health and the environment. To that end, federal standards for hazardous waste facilities are designed to ensure that the health of individuals in the community is protected and that the facility will not cause environmental damage. When evaluating a permit application, the permitting agency considers only those factors affecting compliance with these standards. It is not within the scope of the standards to consider the potential effects of the facility on other aspects of community life.

What if residents are opposed to the location and operation of an incinerator in their community?

During the public comment period, all members of the community are afforded an opportunity to express their concerns about the operating conditions proposed by the permitting agency in the draft permit or about any aspect of the data submitted by the permit applicant as part or in support of the application. The permitting agency will take into account any technical information relating to the ability of the incinerator to meet performance standards under the proposed permit conditions. Permitting agencies, however, do not have authority to reject permit applications on non-technical grounds. If the permit applicant demonstrates that the facility meets all RCRA standards and does not pose a threat to human health or the environment, the permitting agency must issue the applicant a permit.

Will the operation of the incinerator produce unpleasant smoke, odors, or noise that disturbs people living and working nearby?

A well-operated incinerator is smokeless and odorless. A white cloud, similar to what can be seen from a power plant, may be visible at times. These emissions are primarily water vapor. Other activities at the site, for example, storage or waste transfer, may occasionally produce odors. RCRA requires that all containers containing hazardous waste be sealed minimizing odors from wastes stored in containers. Although operation of the incinerator should not contribute to area noise levels, there may be noise from additional truck

traffic to and from the facility. EPA does not have authority under RCRA to directly regulate noise or odors from an incinerator. In some cases, local regulations may empower local authorities to address these problems

LOCATION AND PERMITTING

Are there any prohibitions or restrictions on the location of hazardous waste incinerators?

RCRA currently includes special requirements for incinerators and other facilities located in **100-year floodplains** (areas with a 1 percent or greater chance of flooding in any given year) and bans the location of new facilities in certain areas of seismic activity. Location of hazardous waste management facilities on certain types of lands may be prohibited by the requirements of federal regulations issued under statutes other than RCRA. Lands protected by these federal statutes include archaeological and historical sites, critical habitats for endangered or threatened species, wetlands, wilderness areas, parks, wildlife refuges, coastal areas, and scenic rivers, among others. The location of an incinerator facility in such areas must be consistent with the requirements of the relevant statutes and standards or the permit application will be denied.

In addition, HSWA authorizes EPA to develop location standards for hazardous waste treatment, storage, and disposal facilities, including incinerators. EPA is currently in the process of doing so, and expects these standards to be made final in 1989.

Why is a particular location chosen for an incinerator when there may be more suitable sites?

Criteria for site selection depends on the needs the incinerator is intended to meet. Generally, a commercial waste management company is likely to consider proximity to potential customers, the cost of the land, the cost of labor, and local zoning or land use ordinances when selecting a location.

Zoning and land use are local issues. EPA develops RCRA standards so that health and the environment will be protected no matter where the incinerator is located. EPA and authorized state agencies give careful consideration to the physical suitability of the site before granting a permit. They cannot, however, deny a permit because there may be a better site elsewhere. As part of the permit application, the owner or operator must submit information on the site's location and data pertaining to its physical characteristics, including a topographical map, aspects of the site's hydrogeology, and prevailing wind patterns. The permitting agency considers this information in developing permit conditions to ensure that operations will meet all applicable RCRA standards.

TRIAL BURN PROCEDURES

What is a trial burn?

A trial burn is a test of an incinerator's ability to meet all applicable performance standards when burning a waste under a specific set of operating conditions. Before final permits for hazardous waste incinerators can be issued owners or operators must demonstrate that their incinerator meets performance standards. Data to be used in evaluating an incinerator's performance are generally gathered by conducting a trial burn.

What happens during the trial burn?

Because data from the trial burn are the main basis for proving that the operating conditions included in the RCRA permit will result in the incinerator meeting performance standards, the trial burn is designed to provide data that demonstrates the incinerator's capabilities. Many companies hire outside contractors to conduct trial burns. During the trial burn, the owner or operator measures the waste feed rate, levels of carbon monoxide in the stack emissions, combustion temperature, combustion gas velocity, and other parameters. In order to make judgments concerning the incinerator's destruction and removal efficiency (DRE), the owner or operator must also measure the quantities of designated constituents, the principal organic hazardous constituents (POHCs), emitted from the incinerator. The permitting agency selects one or more POHCs for each waste feed tested. Emissions of particulate matter and hydrogen chloride are also measured during the trial burn, as is the efficiency of hydrogen chloride removal systems if hydrogen chloride emissions exceed 4 pounds per hour.

The waste feed burned in the trial burn may take one of three forms:

- Actual wastes or mixtures of wastes normally expected to be burned at the incinerator;
- Actual wastes with increased levels of hazardous chemicals or additional hazardous chemicals added; or
- Artificial wastes selected by the applicant that provide suitable proxies for the actual wastes.

In order to establish the most flexible permit conditions, the trial burn may involve incineration of different waste feeds using a wide range of operating conditions. This allows the development of different permit requirements for each tested waste feed, which can be advantageous if the facility anticipates that some of its wastes will be easier to burn than others. If the trial burn results demonstrate that the incinerator meets performance requirements for some waste feeds under less severe operating conditions (for example, using lower combustion temperatures), then the permit can specify more flexible operating conditions (a wider range of permissible combustion temperatures) for these waste feeds. This flexibility may help reduce operating costs of the incinerator.

What happens if the incinerator does not meet the performance standards during the trial burn?

The trial burn involves the measurement of incinerator performance under different sets of operating conditions. If the incinerator fails to meet these performance standards, the incinerator design or operation must be modified, and the trial burn must be repeated before the permitting process can proceed to the next step. Thus, in the case of an interim status incinerator, the permitting agency will not prepare a draft permit until the incinerator has been demonstrated to meet performance standards under at least one set of operating conditions.

For a new incinerator, the owner or operator will be required to apply for a permit modification before a second trial burn can be conducted. In such cases the procedures used to evaluate the application for permit modification are very similar to procedures for the issuance of the original permit, including submission of a trial burn plan, development of a proposed modification by the permitting agency, and allowance for public participation and comment before issuance or denial of the modification. The permit will not be modified to allow an additional trial burn unless the permitting agency is satisfied that the incinerator will meet performance standards during the trial burn. Thus, the application and new trial burn plan must address in some way (either through changes in operating conditions or by modifications in equipment design) any problems identified during the initial trial burn. For example, if the incinerator failed to meet the standards for hydrogen chloride emissions, the facility operator may modify the incinerator's air pollution control equipment to improve its performance.

If the trial burn data indicate compliance with performance standards under some, but not all, tested operating conditions, the permit applicant (in the case of an interim status incinerator) or permit holder (in the case of a new incinerator) may choose not to repeat the trial burn. In the case of an interim status incinerator, the permit, if issued, will require that the incinerator operate under the conditions demonstrated during the trial burn that resulted in compliance with performance standards. For a new incinerator, the existing permit will be modified to include only the conditions demonstrated during the trial burn that resulted in compliance with performance standards. If, at any time thereafter, the permit holder wishes to expand the range of allowable operating conditions or waste feed types to allow greater flexibility, he or she must seek a permit modification.

Do all incinerators perform trial burns?

RCRA standards allow permit applicants the option of submitting performance data that can serve as a substitute for trial burn results. However, few RCRA permits have been issued to date without the performance of a trial burn. All permit applicants must demonstrate the ability of their incinerator to meet performance standards or agree to perform a trial burn, either before the permit is issued (for an interim status incinerator) or after (for a new incinerator). If an applicant chooses to submit data in lieu of a trial burn, these data must demonstrate the conditions under which the incinerator will achieve the minimum

performance standards for specific wastes covered by the application. If the data are not considered adequate, the permit writer requests the applicant to submit other data or agree to perform a trial burn. Acceptable data are therefore limited to performance data from similar or identical incinerators that were burning similar or identical wastes to those covered in the application. Applicants operating an interim status incinerator could develop these data during normal operations. Applicants for a new incinerator might submit trial burn data from an incinerator with identical design to the one covered by the application.

Given that new incinerators are untested, could the conduct of the trial burn pose a serious risk to human health and the environment?

A trial burn is conducted to show that the incinerator can operate in a manner that protects nearby residents and the surrounding environment. Therefore, during the trial burn, the incinerator will be operating only under conditions that the permitting agency judges will result in the incinerator meeting the performance standards. Occasionally, an incinerator may fail to meet the performance standards during a trial burn. The risk to the environment and the public in such cases is minimal due to the short duration of these tests.

To ensure that trial burns will be properly planned and executed, RCRA standards require that the owner or operator of a new incinerator develop a detailed trial burn plan. The plan proposes operating conditions for the trial burn, provides a description of all emission control equipment to be used, and explains the procedures for stopping the waste feed, shutting down the incinerator, and controlling emissions in the event of any problems. The trial burn plan is submitted with the permit application, reviewed by the permitting agency, and is not approved unless the permitting agency judges that the incinerator will meet all standards throughout the trial burn, and that any departure from this expected level of performance will not pose an imminent hazard to health or the environment.

How are the results of the trial burn evaluated?

Within 90 days following the trial burn, the applicant must provide data from the trial burn and analysis of these data for each waste feed incinerated during the trial burn. All data collected by the applicant must be submitted to the permitting agency for evaluation. The 90-day period following the trial burn allows time for analyzing both the samples collected and other pertinent data.

After the data have been submitted, the permit writer reviews the data to determine whether the performance standards were met and under what range of operating conditions. For each set of operating conditions used during the trial burn, the permit writer either calculates or reviews the applicant's calculations for destruction and removal efficiency for each POHC, the efficiency of the hydrogen chloride removal system if hydrogen chloride emissions exceeded 4 pounds per hour, and the concentration of particulate matter in stack emissions.

How are the results of the trial burn reflected in the permit?

For each type of waste feed to be burned by the incinerator, the permit specifies a set of operating conditions consistent with those conditions demonstrated during the trial burn to result in compliance with the performance standards. At a minimum, the permit specifies operating conditions for combustion gas carbon monoxide levels, waste feed rate, combustion temperature combustion gas flow rate, and acceptable variations in the waste feed composition. The operating conditions may allow for normal fluctuations in these parameters that do not affect performance, as demonstrated during the trial burn. For example, the combustion temperature specified in the permit can be expressed as a range of values over which compliance with the performance standards has been demonstrated. In addition, the permit writer may specify other operating conditions deemed necessary to ensure compliance with the performance standards.

After review of trial burn data from an interim status facility, the permitting agency prepares a draft permit based on the trial burn results. For a new facility, if the data from the trial burn show that the operating conditions included in the permit for the final operating period are sufficient, the facility may enter into this phase of operations. Otherwise, the permit will require modification before this phase of operations may begin.

CHAPTER 4

ENFORCEMENT OF PERMIT OPERATING CONDITIONS

After a permit is granted, the permitting agency must make sure that the facility complies with all permit conditions. Facility inspections are the main tool by which federal or state officials monitor for compliance. An inspection is a formal visit to a facility to review records, take samples, and observe facility operations. EPA conducts inspections in all states, including those states with their own RCRA programs. Authorized states will also have their own inspection programs. Local authorities and local residents can also play a role in making sure that facilities comply with RCRA regulations.

How will EPA or the state ensure that incinerator operations meet the requirements of the permit?

The principal goal of the RCRA compliance monitoring and enforcement program is to ensure that the regulatory and statutory provisions of RCRA are met. If a facility fails to comply with all provisions of its permit, the permitting agency has at its disposal various **enforcement** measures, including administrative actions, civil actions, and criminal actions.

Administrative actions provide enforcement outside of the court system. These actions may be informal, such as a phone call or letter notifying the facility of a problem. Continued violation may necessitate a warning letter that specifies the action required and that describes enforcement measures that will be taken if the action is not taken by a specific date.

Besides these informal actions, the permitting agency can issue **administrative orders**. These orders are legal documents that compel the permit holder to take action in accordance with the terms of the permit, as indicated in the administrative order. Administrative orders can assess penalties for non-compliance and can suspend or revoke the permit (or interim status, if applicable).

Civil actions are law suits that are either settled by negotiation or tried in court. The permitting agency may pursue a civil suit when administrative orders are ignored or where dangers to human health and the environment are significant (for example, if non-compliance results in a release of hazardous waste). Civil suits can seek penalties and suspension or revocation of the permit or interim status. Criminal actions are pursued for the most serious violations. Section 3008 of RCRA identifies seven violations that carry criminal penalties. Penalties for six of the seven violations can include a fine of up to $50,000 per day or a prison sentence of up to 5 years. The seventh and most serious offense could include a penalty of up to $250,000 or 15 years imprisonment. An example of a criminal violation is knowingly transporting waste to a facility not covered by a permit or by interim status.

What occurs during an inspection?

The main purpose of any inspection is to determine whether the facility is operating in accordance with the terms of its permit. An inspection typically consists of the following steps:

- Before visiting the facility, the inspector reviews the facility's permit and other agency records on the facility to identify any problems that may be encountered.

- The inspector enters the facility, identifies himself or herself, and describes the nature of the inspection. An opening conference is held with the owner or operator to describe the information and samples to be gathered.

- The facility is inspected. The inspection includes examination of facility records, possible collection of samples, and observation of the facility including the incinerator and any other hazardous waste management operations. The inspector will also observe all associated activities, such as unloading of wastes, lab work, and safety procedures. The inspector may use field notebooks, checklists, and photographs to document the visit.

- The inspector holds a closing conference with the owner or operator to respond to questions about the inspection and provide additional information.

- The inspector prepares a report summarizing the results of the inspection, including the results of sampling. Violations of the permit are documented in the report. Inspections usually last between one day and a week.

If the facility is in violation of the permit, enforcement actions may be taken. Enforcement actions can range from informal actions to criminal judicial cases, depending on the severity of the violation. The severity is determined by the likelihood that the violation will pose a threat to human health or the environment. For example, some recordkeeping violations would be judged less severe than operating violations that affect incinerator performance. The EPA regional offices have broad discretion in these matters.

Why aren't there government inspectors at the facility at all times, or at least whenever the incinerator is operating?

To date, EPA has not exercised its authority under RCRA to require that facilities accept a full-time inspector, or to require a facility to pay expenses related to full-time inspectors. Other methods are used to ensure a satisfactory inspection program. First, EPA's current inspection program uses a variety of techniques to provide adequate monitoring of facility activities without maintaining a full-time inspector at each facility. These techniques

include periodic inspections (both announced and unannounced), interviews with facility personnel, and frequent contacts and cooperation with state inspectors. Second, the regulatory requirement that operating parameters be linked to automatic waste feed shut-off is meant to ensure that the operating conditions in the permit are maintained at all times. (See page 20 for an explanation of automatic waste feed shut-off.) The incinerator control system must be designed so that if operating conditions vary from the allowable ranges, all waste feed to the unit is immediately cut off and the incinerator shuts down its destruction activities. Third, in authorized states, incinerators are subject to state enforcement authority and inspections. Some states, as part of their enforcement program, require that inspectors be present at hazardous waste management facilities at all times. The use of full-time inspectors is a matter of state law in authorized states, and is not part of the RCRA federal program.

How often will the facility be inspected by the permitting agency?

RCRA requires that all federal- or state-operated facilities be inspected at least annually and that all other hazardous waste generators and management facilities be inspected at least once every 2 years. EPA has successfully encouraged more frequent inspections. Inspections are scheduled by states and EPA regional offices according to criteria that ensure greater attention to facilities of greater concern. Inspections may also be conducted at any time based on suspicion that a violation is occurring. Finally, facilities may be chosen for an inspection when specific information is needed to support the development of additional RCRA standards.

Is the facility given notice before an inspection is made?

Normally, facilities are given notice of an upcoming inspection. Advanced warning does not diminish the effectiveness of the inspection because the primary purpose of a routine inspection is to examine ongoing facility records. These records are generally more revealing of ongoing practices than observations of facility operations on a single day. In cases where a facility has or is believed to be violating the requirements of its permit, unannounced and more frequent inspections are more common. The decision concerning notice of an inspection is generally left to the discretion of the inspecting agency.

In terms of enforcement, will local authorities have any responsibility for ensuring that the facility operates safely and in accordance with regulations?

The permitting agency cannot delegate its enforcement responsibilities to local authorities. Agencies at the local level, however, can play a significant role in monitoring facilities within their jurisdiction. To the extent that local agencies actively enforce local regulations (for example, fire and safety rules), are knowledgeable about RCRA requirements and about the activities being carried out at the facility, these agencies can help ensure that an individual facility operates safely and consistently within the conditions of its permit. By sharing information with EPA or the appropriate state agency concerning possible violations of requirements or possible hazards, local authorities and citizens help in the enforcement effort.

What should local residents do if they have complaints about a facility or wish to inform someone of something they have observed?

Citizens should contact the regional EPA office or the state environmental agency to describe any problems they perceive (see page 44). EPA's or the state's response to the complaint will depend on the potential severity of the incident or condition involved. This response could range from an on-site investigation of the problem to a telephone inquiry to the facility. EPA welcomes the active participation of citizens on issues involving hazardous waste, including formal and informal involvement in all aspects of permitting and the enforcement of permits. The public is entitled to review reports, data and records maintained by EPA concerning a specific facility including, for example, inspection reports. Some limited types of information received from some facilities may be designated "Confidential Business Information" and will not be available for review in order to protect trade secrets.

CHAPTER 5

GENERAL STANDARDS FOR FACILITIES OPERATING HAZARDOUS WASTE INCINERATORS

This section discusses the general standards that apply to all facilities that treat, store, and dispose of hazardous wastes, including facilities operating hazardous waste incinerators. The standards appear in Volume 40 Parts 264 of the Code of Federal Regulations and were developed to ensure that these facilities are properly designed, operated, and maintained. They include provisions covering accident prevention, planning and equipment for emergencies, waste transportation, waste testing and storage, recordkeeping, personnel training, and insurance and closure requirements, among other topics.

This chapter also describes specific standards for tanks and containers. Tank and container standards are included because these types of units are more commonly used in association with incinerators than other types (for example, surface impoundments and waste piles). Facilities operating other types of hazardous waste management units are subject to specific standards for these units. For information on these standards, contact the EPA regional office for your area (see page 44).

The chapter provides information on the following topics:

- The safe transportation of hazardous waste to the facility;
- Prevention of spills and leaks during storage;
- Requirements for handling incompatible, reactive, and ignitable wastes;
- Management of treatment residues;
- Routine inspections of the facility and training of employees;
- Procedures and requirements that protect the public and facility personnel in the event of a spill or an emergency at the facility;
- Liability insurance;
- Protection from floods;
- Measures required for the maintenance of security; and
- Procedures required when the facility ceases operations.

TRANSPORTATION AND STORAGE OF WASTES

What regulations ensure that hazardous wastes will be transported safely to the incinerator facility?

Transporters of hazardous waste are regulated jointly by EPA under RCRA and by the Department of Transportation (DOT) under the Hazardous Materials Transportation Act (HMTA). Under HMTA, DOT has set standards for the transportation and labeling of shipments of hazardous materials, including hazardous waste. These standards cover shipping containers and labeling; placarding of vehicles; design, construction, and maintenance of containers (for example, tanks); and the use of shipping papers. Under the Motor Carrier Act, DOT has developed additional standards for driver qualifications and training as well as the design, construction, and maintenance of vehicles.

RCRA standards require that each hazardous waste transporter obtain an identification number before it can legally accept wastes for shipment (except in certain emergency situations). Transporters are required to take immediate action to notify the proper authorities if an accident causing a release of hazardous waste occurs, and are liable for the cost of cleaning up any spills that may occur. RCRA standards also require use of a special manifest form (acceptable under HMTA standards for shipping papers).

The RCRA manifest system allows tracking of individual waste shipments. The generator fills out a manifest form that designates a final destination point for the waste (for example, a specific incinerator facility). Each time the shipment changes custody (generator to transporter, transporter to incinerator facility), the manifest is signed to acknowledge the transfer of custody and a copy is retained by each party. When the shipment reaches the designated facility, the owner or operator of the facility must send a copy of the completed manifest to the generator. If the generator does not receive a copy of the manifest, the generator must contact the transporter and the designated facility. If, after 45 days, the generator still does not receive the completed manifest, the generator must contact EPA. The manifest system allows EPA to keep track of wastes that are accidentally spilled and helps to prevent illegal disposal practices, such as "midnight-dumping."

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At any facility where hazardous waste is stored, there is a possibility of leaks and spills. When wastes are stored or transferred from one storage vessel to another, for example, small amounts of vaporized pollutants may be released. These releases are referred to as **fugitive emissions**. These emissions will occur at all sites at which hazardous wastes are managed, including incinerator sites. To ensure that problems do not occur during storage of wastes, RCRA regulations require that the facility be designed, constructed, operated, and maintained to minimize the possibility of releases and to prevent accidental releases from causing adverse health or environmental effects. Hazardous wastes destined for incineration are typically stored in containers or tanks. Containers are generally portable and can be sealed to prevent the release of vapors, dusts, or liquids. Common containers for storing hazardous waste

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include hoppers and metal drums. Standards for hazardous waste containers require that containers be inspected weekly and that the contents be transferre from any container found in poor condition. Containers must be closed during storage and can only be opened when wastes are being sampled or transferred to or from the containers. Containers must be stored in areas with "secondary containment" (that is, areas in which any leaks or spills will be safely held until they can be cleaned up).

Tanks are stationary structures that are designed, constructed, and maintained as part of the facility. They may be installed above or below ground. For each tank, the facility must obtain certification from a registere professional engineer that the tank will withstand expected physical and chemical stresses. A corrosion expert must also certify that tanks with external portions in contact with soil or water will withstand this contact throughout the period during which the tanks will be used. All tanks must be equipped with a secondary containment system (a structure that holds potential leaks or spills until they can be cleaned up). These systems must be designed so that leaks or failure of the tank or the secondary containment system itself are detected within 24 hours. RCRA standards require daily inspections of tanks.

HANDLING OF WASTES AT THE FACILITY

What happens to a shipment of waste from the time it arrives at the facility until the time it is incinerated?

Before a facility may treat or accept a waste for management, it must perform a detailed chemical and physical analysis to ensure that the waste may be managed under the conditions of its permit and to determine the proper method of managing the waste. These procedures are fully described in the facility's Waste Analysis Plan, which is a part of its permit application and which is incorporated by reference in the facility permit. Subsequent shipments of the same waste must be sampled and examined, and detailed analyses performed if there is any reason to believe that the waste's characteristics have changed. In any case, the facility can accept wastes only if the wastes are allowed under its permit conditions. Otherwise, it must refuse to accept the waste and the shipment must be returned to the generator. In the event that a waste shipment deviates either from the specifications of the accompanying manifest or from characteristics expected from earlier analyses, the facility must follow procedures specified in the Waste Analysis Plan for resolving the discrepancy.

Once a shipment of waste has been accepted, it may be stored at the facility before being incinerated. The period of time a waste is stored before incineration varies. Facilities handling various waste types which must be incinerated separately may store a particular waste until enough has accumulated to justify a continuous burn. In some cases, wastes may be blended together or treated (for example, metals removed) prior to incineration. Any storage, treatment, or blending of wastes will be fully addressed in the facility's permit.

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How does a facility keep track of all the different types of wastes it receives so that incompatible, reactive, or ignitable wastes are handled properly?

The facility's Waste Analysis Plan must ensure that the facility will perform any necessary analyses to determine which wastes are incompatible, reactive, or ignitable. The plan also specifies the measures to be taken if such wastes are identified. Mixing or other contact between incompatible wastes may produce heat or pressure; fire or explosion; violent reaction; toxic dusts, mists, fumes, or gases; or flammable fumes or gases. RCRA standards prohibit storage or treatment of incompatible wastes in the same container or tank unless the wastes are mixed according to a proven, safe procedure. If a waste is to be placed into an empty tank which previously held an incompatible waste, the tank must first be cleaned. Incompatible wastes stored or treated near each other must be placed in container areas or tanks having separate secondary containment systems.

RCRA standards include explicit criteria for identifying ignitable and reactive wastes. Ignitable wastes include liquid wastes with flash points less than 140°F; non-liquid wastes that under standard pressure and temperature could cause fires through friction, absorption of moisture, or spontaneous chemical changes; certain compressed gases; and oxidizers. Reactive wastes generally are those that react violently; form potentially explosive mixtures; produce toxic vapors, gases, or fumes in the presence of water; or undergo detonation or explosive reaction when exposed to a strong initiating source.

Ignitable and reactive wastes must be separated and kept away from sources of ignition or reaction during storage. Wastes that are unstable at normal temperatures may be cooled during storage. Tanks and auxiliary piping systems for the storage of water-reactive wastes are designed to eliminate the possibility of water being introduced accidentally to the tanks. Ignitable and reactive wastes may be handled only in areas where smoking and open flames are prohibited. Containers with ignitable or reactive waste must be located a minimum of 50 feet inside the facility's property line. For tanks storing these wastes, the facility must follow the National Fire Protection Agency's "Flammable and Combustible Liquids Code" to determine the minimum safe distance from public ways, streets, alleys, or adjoining property.

How are treatment residues, such as ash from the incinerator, managed?

All residues from hazardous waste treatment are considered, by regulation, to be hazardous. Incineration byproducts, including ash and any wastewaters from cooling or air pollution control devices, are therefore subject to the requirements governing transportation, treatment, storage, and disposal of hazardous wastes. Incinerator ash is generally disposed in a hazardous waste landfill. Wastewaters are often disposed through the sewer system or discharged to a river or stream. In these cases, the wastewaters must be managed according to Clean Water Act standards, as well as RCRA standards, before discharge. Disposing of wastewaters in streams and rivers requires a National Pollution Discharge Elimination System (NPDES) permit. These permits place restrictions on the quantity of wastewaters released, the level of pollutants in the water,

and other characteristics (such as temperature). To meet these requirements, the facility may treat its wastewaters before disposal. Disposal through the sewer system may also require that the wastewaters be treated to meet Clean Water Act standards.

RCRA standards allow for exemptions to the requirements that treatment residues be managed as hazardous wastes. If the owner or operator of the facility can prove to EPA that the byproducts are not hazardous, the owner or operator can obtain an exemption from these requirements. This exemption, called a delisting, is issued by EPA on a case-by-case basis. Regardless of whether the wastewaters are considered hazardous or not, if they are to be disposed by release to a stream or river or through the sewer, the owner or operator must comply with the Clean Water Act.

INSPECTIONS AND TRAINING

How will equipment malfunctions or other problems be detected?

RCRA standards require that all monitoring equipment, safety and emergency equipment, and operating and structural equipment which prevents, detects, or responds to spills or releases be inspected by the owner or operator according to a written schedule. The inspection frequency for each item depends upon its expected rate of deterioration and the probability of adverse effects to nearby residents or the environment should the item fail. The inspection schedule is submitted with Part B of the permit application and is incorporated by reference into the permit.

Loading and unloading areas, and other areas where spills may occur, must be inspected daily when in use. Tank systems must be inspected daily, while container storage areas must be inspected at least weekly for leaking containers and deterioration of containers and containment systems. The data from monitoring and leak detection equipment must be reviewed on a daily basis. Deterioration or malfunctions must be remedied immediately if a hazard is imminent or already exists. If there is no imminent hazard, the situation must be remedied on a schedule that ensures that there is no harm to nearby residents or to the environment.

Will employees be able to recognize and respond quickly to problems?

RCRA standards require that facility personnel be trained to perform their jobs safely and to respond properly to both emergencies and more routine problems. Employees must know the procedures for emergency shutdown of operations and understand the operation of the incinerator's automatic waste feed shut-off system. They must be trained in the use of alarm and communications systems and trained to respond to fires, explosions, spills, and leaks. Personnel must also be trained to inspect, repair, and replace emergency and monitoring equipment.

Employees must complete their training within six months of employment at the facility or assignment to a new position. Employees may not work unsupervised until training is complete. All personnel must take annual review courses. An outline of the training program and a description of how the program will correspond to actual job tasks must be included with Part B of the permit application and is included as a part of the facility permit.

SPILLS AND EMERGENCIES

What if leaks or spills occur that nobody notices?

Areas where spills or leaks are likely to occur are frequently inspected according to a set schedule. Thus, a spill, if undetected at the time it occurs, will be detected soon after. Areas where wastes are transferred or stored must have spill containment systems. These systems facilitate clean up and help prevent adverse consequences from spills. Detection of leaks can be aided by automatic leak detection systems, and backed up by manual inspections. Automatic leak detection equipment and spill containment systems are frequently inspected to ensure their integrity.

What if spills occur during the transfer of wastes from truck to tanks or other storage containers?

If spills occur, they must be cleaned up as soon as possible. To contain any spills that occur, loading and unloading areas must be designed to collect liquids and must have a base impervious to liquids. Large spills collect in a slump and may be cleaned up by pumping the waste into containers. Small spills can be picked up with an absorbent material designed specifically for use with hazardous waste. The chances of a spill are probably greatest when wastes are transferred from one container to another. Spills can be prevented, however, with a combination of strict procedures, training of personnel, and good process design, all of which are covered in the permit. Spill prevention procedures include draining liquids and bleeding pressure from connection lines before wastes are transferred.

How do facilities plan ahead in case of an emergency, such as a fire or explosion?

Every hazardous waste incineration facility must regularly inspect and maintain emergency equipment, such as fire extinguishers and sprinklers, and have adequate alarm systems for notifying facility personnel of emergency situations. All facilities are required to have an evacuation plan. This plan is part of the facility's Contingency Plan for responding to emergency situations. The Contingency Plan is a required part of Part B of the permit application and is incorporated by reference into the permit.

A copy of the contingency plan must be maintained at the facility and copies must be distributed to all local officials who may be involved in emergency response. The plan must inform police, fire departments, and emergency response teams of the facility layout; identify the characteristics of the hazardous

wastes present; describe the hazards associated with the wastes and the processes in use; indicate the probable location of employees during normal operations; and designate personnel evacuation routes from the facility. The plan must designate one fire department as the primary authority in an emergency for which such assistance is required. The plan also describes the actions facility personnel will take in the event of an emergency.

The plan must contain the names, addresses, and phone numbers of facility personnel qualified to act as "emergency coordinators." The emergency coordinator has the authority to take any action necessary to carry out the Contingency Plan and must be knowledgeable of the plan, all operations and activities at the facility, the location and characteristics of all wastes, and the location of all records within the facility. A designated emergency coordinator must be at the facility or on call at all times.

What will happen if an emergency occurs?

If a release, fire, or explosion occurs, the emergency coordinator must:

- Alert facility personnel;
- Notify local agencies if their help is needed;
- Identify the character, amount, source, and extent of any releases; and
- Assess possible hazards to human health and the environment.

If the coordinator determines that a threat exists, the appropriate officials must be advised on whether surrounding areas should be evacuated. Measures must be taken to ensure that fire or explosion does not recur, or spread to other wastes. After the emergency, released wastes and materials contaminated with released wastes must be recovered and stored for proper treatment or disposal.

How will individuals or the community be compensated for any negative effects of accidents at the facility?

RCRA regulations require that owners or operators be financially responsible for both sudden and non-sudden accidental occurrences due to operations at a facility. All owners or operators must carry liability coverage to compensate individuals for bodily injury or property damage caused by sudden accidental occurrences. Owners or operators of facilities with one or more landfills, surface impoundments, or land treatment units must also have liability coverage for non-sudden accidental occurrences.

How will the facility be secured from vandals or unauthorized visitors?

The active areas of the facility must be completely enclosed by a fence or some combination of artificial and natural barriers that restricts entry. Entrance to the active, enclosed areas must be controlled and monitored at all times.

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CLOSING THE FACILITY

What will happen to the site when the facility ceases operations?

When the facility or any single waste management unit at the facility cease operations, the facility or unit will be "closed" in accordance with a plan tha has been approved by EPA. For a permitted facility, the closure plan is submitted with Part B of the permit application and becomes a part of the permit. For an interim status facility, the owner or operator submits a plan t EPA before closure begins. EPA makes this plan available to the public for comment. Following the comment period, EPA may decide to approve, modify, or disapprove the plan. For both interim status and permitted facilities, the pla details a set of actions and sets a timetable for closure. Following the completion of all plan activities, the owner or operator and an independent registered professional engineer must certify that the facility has been properly closed.

Closure involves all aspects of the facility's waste management operations For a facility operating only storage and incineration services, closure would involve the removal and proper disposal elsewhere of any wastes or waste residues. It also would require decontamination or proper disposal elsewhere o all struccures in which wastes were handled and any equipment that came into contact with wastes, such as blending and storage tanks and the incinerator itself. Because incineration is a treatment rather than a disposal process, closure of an incinerator would result in the removal of all hazardous wastes from the site, and continued care measures would not be required. If there wer spills or other types of contamination at the incinerator site that could not b adequately removed at the time of release, long term clean up measures (corrective action) would be required.

How does RCRA ensure that the owner/operator has funds available for closure?

RCRA regulations establish financial requirements to ensure that funds are available to pay for closing a facility. For closure, owners or operators must prepare a written cost estimate for closing the facility. These estimates must reflect the actual cost of conducting all the activities outlined in the facility's closure plan, and are adjusted annually for inflation. The cost estimate for closure is based on the point in the facility's operating life whe closure would be the most expensive. Following preparation of the closure cost estimate, the owner or operator must demonstrate to EPA the ability to pay the estimated amounts. This is called financial assurance for closure. RCRA regulations describes several mechanisms for guaranteeing financial assurance for closure activities, including use of a trust fund, or a letter of credit, among others. All mechanisms require annual adjustments for inflation or changes in cost estimates. If, for any reason, the owner/operator should declare bankruptcy and does not provide funds for closure, EPA would become one of the facility's creditors to obtain these funds.

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CHAPTER 6

POTENTIAL RISKS OF HAZARDOUS WASTE INCINERATION

Hazardous waste incineration, like other industrial operations, is not without risk. Some risks are associated with incineration itself; others are associated with related operations, such as the transportation and storage of the hazardous waste. RCRA requires EPA to examine risks that could be associated with activities involving hazardous wastes and to develop standards that protect human health and the environment. This chapter outlines the risks associated with hazardous waste incineration and briefly describes the standards developed by EPA and other agencies. Chapters 2 through 5 provide more detailed information on the specific requirements of RCRA standards.

Do emissions from hazardous waste incinerators cause health and environmental problems?

EPA believes that a well-designed and properly-operated incinerator will not cause health or environmental problems. Based on the best available information concerning the risks of incineration, EPA has developed standards that place strict limits on the quantities of pollutants in emissions from hazardous waste incinerators.

Hazardous waste incinerator emissions contain small quantities of metals and uncombusted organic compounds. The organic compounds consist of trace levels of the organic compounds in the hazardous waste feed as well as products of incomplete combustion (PICs), formed during the combustion process. EPA standards limit emissions of designated organic compounds in the waste (called principle organic hazardous constituents, or POHCs) and particulate matter. To ensure that emissions of total residual organic compounds and metals are minimized to acceptable levels, EPA is developing regulations that would strengthen the existing controls to directly regulate these emissions. In the interim until those regulations are promulgated, permit writers can implement the controls on a case-by-case basis as necessary to protect human health and the environment.

How are risks from hazardous waste incineration estimated?

Potential human health risks can be measured using risk assessment techniques. Risk assessment uses established methods to evaluate the relationship between exposure to toxic substances and the subsequent occurrence of disease. A thorough risk assessment considers not only possible risks from day-to-day operation, but also risks caused by abnormal operation ("upset" conditions), and accidents. Some risk assessments involve fairly simple calculations using conservative screening values to determine worst-case risks, while others involve complex computer models. EPA has developed air dispersion models and health effects data for use in risk assessment. EPA is continuing to update this information and to develop further guidance in the area of risk assessment.

Risk assessment of hazardous waste incineration examines two factors--the

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toxicity of the pollutants emitted from the incinerator, and the magnitude of exposure of humans to these pollutants. Toxicity is a measure of the type of adverse effects a pollutant may cause in humans or other species. Exposure is the estimated amount of human contact with the pollutant that occurs. A risk assessment estimates the probability of adverse health effects occurring as a result of human exposure to a pollutant with a specified toxicity.

To measure the health risk from hazardous waste incinerator emissions, several steps must be taken. The first step is to measure emissions or to estimate them based on the incinerator's technical specifications (destruction and removal efficiency or DRE) and the types and quantities of waste to be burned in the incinerator. To predict the concentration of pollutants in the air, models can be used that account for dilution and dispersion of the pollutants as they move away from the incinerator. Based on estimates of pollutant concentrations at various locations, it is possible to determine the maximum pollutant concentration. Using conservative assumptions (for example, lifetime exposure to the maximum pollutant concentration) and toxicological data, health risks can then be identified and quantified.

Do risk assessments ever underestimate or overestimate risks?

Risk assessments always involve assumptions and thus include some degree of uncertainty. These assumptions influence the outcome of the risk assessment; i the assumptions are conservative, the risk assessment will tend to overestimate risks. Both conservative and nonconservative assumptions are commonly used. A example of a nonconservative assumption is that synergism between compounds doe not occur (that is, compounds do not interact to cause risks greater than the sum of the risks from exposure to each individual compound). Conservative approaches often used in risk assessment include basing risk estimates on lifetime exposures at the point of maximum ground level concentrations of pollutants (essentially assuming that individuals are exposed to the maximum concentrations for 70 years) and using safety factors so that risk estimates reflect risks to the most sensitive people (that is, the people most likely to experience effects from exposure). On balance, EPA risk assessments are conservative by design, and will tend to overestimate risks.

What are the risks from hazardous waste incineration?

Reasonable, worst-case estimates of health risks posed by metals and organ compounds in emissions for a permitted hazardous waste incinerator range from one chance in 100,000 to one chance in 100,000,000 of contracting cancer over a lifetime. These conservative estimates assume 70 years of continuous exposure at the point where pollutant concentrations would be the highest.

To put the above figures into context, the death rate from motor vehicle accidents in 1986 was 19.6 per 100,000 population, or approximately one chance in 100 lifetime risk.[1] For various regulatory purposes, EPA has considered acceptable risk levels for hazardous waste regulatory programs to range from a lifetime risk of one chance in 10,000 to one chance in 10,000,000. Levels of

[1] The World Almanac and Book of Facts, 1988; Editor, Mark S. Hoffman.

acceptability vary depending on the nature of the risks involved and the types of activities associated with the risk.

How do EPA performance standards protect human health?

EPA sets performance standards to control the amount of pollutants which are emitted from hazardous waste incinerators. EPA's principal measure of performance is destruction and removal efficiency (see chapter 2 for a more detailed discussion). A 99.99 percent DRE means that one molecule of a chemical is released to the air for every 10,000 molecules entering the incinerator. These performance standards set limits on the amount of pollutants allowed in emissions, given the amount of waste which is burned. Only a very small percentage of toxic substances originally contained in the waste can be released into the air. EPA has done numerous studies which indicate that incinerators meeting EPA's performance standards pose no significant health hazards.

EPA's current incinerator regulations also include performance standards limiting the amount of particulate matter and hydrogen chloride emitted. As discussed above, EPA is in the process of strengthening the current standards to directly control emissions of total residual organic compounds and toxic metals.

Although EPA regulations do not require owners or operators to perform risk assessments, many companies develop risk assessments in support of their permit applications. Permit writers have the authority to require more stringent risk-based operating conditions in the permit when necessary to provide adequate protection of human health and the environment, in addition to operating conditions required to meet regulatory performance standards. Although EPA believes that hazardous waste incinerators meeting performance standards will not cause health or environmental problems, a permit writer may occasionally require additional safeguards to provide extra assurance that problems will not occur.

What are the risks involved during the transportation of hazardous waste to the site?

Activities involving the handling of hazardous wastes always involve some risk that wastes will be released to the environment. These are the same types of risks that are involved in the transportation of chemicals to industrial plants. Hazards can be reduced through proper planning, use, and maintenance of equipment, and development of safety-oriented procedures. Among the potential hazards are releases caused by accidents while transporting the hazardous waste to and within the facility, and leaks and spills during the transfer of wastes to and from the vehicle.

EPA requirements for transporters cover emergency procedures and the use of a special form, called a manifest, that allows the tracking of individual waste shipments. RCRA standards require transporters to take immediate action to notify the proper authorities if an accident causing a release of hazardous waste occurs. Transporters are liable for the cost of cleaning up any spill that may occur. Transporters that fail to handle waste properly are subject to financial penalties. In addition, RCRA standards require procedures that minimize the chance of leaks or spills occuring during transfer of wastes, and

which ensure that leaks and spills that do occur are quickly and safely cleaned up. Transporters of hazardous waste are also required to follow Department of Transportation (DOT) standards. (For more information on DOT standards see Chapter 5.)

What are the chances of a fire or explosion occurring?

Fires and explosions are always possible at any industrial facility, such as a petroleum refinery, where ignitable, pressurized, or reactive substances are present. All incinerators require the use of fuel; in addition, some of the wastes being treated may be ignitable or reactive. RCRA standards ensure proper handling, storage, and incineration of such wastes so that there is very little chance of fire or explosion. For example, standards require isolating ignition sources from ignitable hazardous waste during storage and prohibit mixing incompatible substances. Incompatible wastes must be stored and treated separately so that there is no possibility of accidental mixing.

Department of Transportation regulations outline procedures for safe packaging, handling, and storage of ignitable and reactive wastes that are transported. Applicants for a RCRA permit are also required to provide a complete chemical analysis of wastes they propose to incinerate, to use engineering controls to monitor operation, and to develop contingency plans and institute emergency response procedures that ensure quick and appropriate measures in response to incidents at the facility. Facilities must provide the local police and fire departments with information on the types of waste that are handled. RCRA contingency planning and emergency response procedures are discussed in greater detail in Chapter 5.

Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 established a regulatory program entitled the "Emergency Planning and Community Right-to-Know Act." The Act requires facilities to disclose information about hazardous chemicals handled at the facility. This law also mandates the formation of State Emergency Response Commissions and Local Emergency Planning Committees. These groups are responsible for formulating emergency response plans for chemical mishaps.

What if there is a bad storm or flood at the facility?

Storms, floods, or other natural disasters have the potential to damage any structure or facility. In the case of hazardous waste incinerator facilities, RCRA regulations define standards ensuring containment of hazardous wastes in the event of certain natural disasters. A facility located in a 100-year floodplain (an area that has a 1 percent or greater chance of being flooded in any given year) is required to be designed, constructed, operated, and maintained to prevent release of hazardous wastes should a flood occur. In addition, the facility permit will require stormwater management techniques to ensure that any stormwater that enters areas where wastes are handled is collected, tested, and treated as necessary before being disposed.

CONTACTS FOR FURTHER INFORMATION

RCRA/Superfund Hotline

Toll Free: (800) 424-9346
In the Washington D.C. area: 382-3000

EPA Regional Offices

Region I	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont	EPA John F. Kennedy Federal Bldg. Boston, MA 02203 (617) 573-9644
Region II	New Jersey, New York, Puerto Rico, Virgin Islands	EPA 26 Federal Plaza New York, NY 10278 (212) 264-8682
Region III	Delaware, D.C., Maryland, Pennsylvania, Virginia, West Virginia	EPA 841 Chestnut Street Philadelphia, PA 19107 (215) 597-7940
Region IV	Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee	EPA 345 Courtland Street, NE Atlanta, GA 30365 (404) 347-3433
Region V	Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin	EPA 230 South Dearborn St. 13th Floor - (HR-11) Chicago, IL 60604 (312) 353-0398
Region VI	Arkansas, Louisiana, New Mexico, Oklahoma, Texas	EPA First International Building 1201 Elm St. Dallas, TX 75270 (214) 655-6785
Region VII	Iowa, Kansas, Nebraska, Missouri	EPA 726 Minnesota Ave. Kansas City, KS 66101 (913) 236-2888
Region VIII	Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming	EPA One Denver Place - Suite 1300 999 18th Street Denver, CO 80202-2413 (303) 293-1676

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Region IX	Arizona, California, Hawaii, Nevada, American Samoa, Guam	EPA 215 Fremont St. San Francisco, CA 94105 (415) 974-8026
Region X	Alaska, Idaho, Oregon, Washington	EPA 1200 Sixth Ave. Seattle, WA 98101 (206) 442-1099

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GLOSSARY

Administrative order: An official, legally enforceable order issued by EPA to force a facility's owner or operator to address potential threats to human health and the environment resulting from activities at the facility. Administrative orders can be used to force a facility to comply with specific regulations, to take corrective action, and to perform monitoring, testing, and analysis.

Administrative record: All information gathered regarding an EPA action, including public comments. EPA makes decisions based on the information contained in the administrative record.

afterburner: The secondary combustion chamber of a rotary kiln incinerator.

air pollution control devices: Mechanisms or equipment which "clean" emissions generated by an incinerator. These devices remove pollutants (particulate matter, acid gases) that would otherwise be released to the atmosphere.

automatic waste feed shut-off system: A device that automatically stops the feeding of waste to an incinerator when it is not operating according to conditions specified in the facility's permit. These operating conditions (for example, temperature, carbon monoxide levels, waste-feed levels) are constantly monitored for deviations from the allowable ranges specified in the permit.

baghouse filtration: An air pollution control method in which emissions containing tiny particles (particulate matter) are passed through a filter. The filter is specifically designed to capture and prevent release of particulate matter to the atmosphere.

Best Demonstrated Available Technology (BDAT): As identified by EPA, the most effective commercially available means of treating specific types of hazardous wastes. The BDAT for a particular waste may change in the future as new advances in treatment technologies are made.

biological treatment: The use of microorganisms (for example, bacteria) to consume and break down organic wastes. Liquids containing organic wastes are often mixed with oxygen, promoting both the growth of the microorganisms and their consumption of organic materials.

chemical treatment: A broad category of hazardous waste treatment processes that use chemicals to remove dissolved inorganics or transform waste components to less toxic forms.

Code of Federal Regulations (CFR): A series of documents that contain all regulations developed and finalized by government agencies. RCRA regulations are contained in Volume 40 of the Code of Federal Regulations.

combustion: The controlled burning of wastes. During combustion, heat is used to chemically alter the organic compounds in the waste. Combusti converts most of the organic compounds into stable inorganic compounds such as carbon dioxide and water.

combustion chamber: The actual compartment (chamber) where wastes are burn (combusted) in an incinerator.

delisting: A process whereby a type of waste that is listed as hazardous by EPA can be excluded from hazardous waste regulation. If the genera can demonstrate that a particular waste does not pose risks to human h and the environment, the waste can be delisted.

destruction and removal efficiency (DRE): A percentage that represents the number of molecules of a compound removed or destroyed in an incinerat relative to the number of molecules of the compound which entered the incinerator system. A DRE of 99.99 percent means that 9,999 molecules compound are destroyed for every 10,000 molecules that enter the incinerator. A DRE of 99.99 is referred to as "four nines."

dibenzofurans: A group of highly toxic organic compounds for which RCRA regulations set more stringent destruction and removal efficiencies (99.9999, or "six nines") than the DRE required for most other organic compounds (99.99, or "four nines").

dioxins: A group of highly toxic organic compounds that are often found in herbicides. RCRA regulations require a higher destruction and removal efficiency (99.9999) for dioxins than the DRE required for most other organic compounds (99.99).

draft permit: A preliminary permit drafted and published by EPA. The draft permit is subject to public review and comment before EPA takes final action on a permit application.

electrostatic precipitators: Air pollution control devices that use electrical charges to remove particulate matter from emission gases. Th process is similar to picking up metal filings or needles with a magne

enforcement: Action that may be taken by EPA to ensure that an owner or operator of a hazardous waste management facility is complying with operating conditions specified in the facility's RCRA permit. EPA's compliance monitoring and enforcement program includes inspections of facilities and penalties against violators.

Environmental Impact Statement (EIS): A detailed report on the possible effe that a pending structure or development will have on the environment. EIS must be prepared by a government agency when a "major" federal acti that will have "significant" environmental impacts is planned.

fact sheet: A document prepared by EPA to inform the public about the permitting process and EPA's tentative decision with regard to a permit application.

Federal Register: A document published daily by the federal government containing notification of government agency actions. The Federal Register contains notification of EPA actions, including notification of EPA decisions concerning permit applications.

financial assurance for closure: Documentation or proof that an owner or operator of a facility is capable of paying the projected costs of closing his or her facility. RCRA regulations require a hazardous waste management facility owner or operator to provide financial assurance in the form of a trust fund, letter of credit, or similar financial mechanism.

flash point: The lowest temperature at which the vapors above a volatile substance ignite in air when exposed to flame.

fluidized bed incinerators: A type of incinerator which uses a bed of hot sand or other granular material to transfer heat directly to waste, resulting in waste destruction. Currently, these incinerators are used mainly for municipal sludge.

fugitive emissions: Releases of vaporized pollutants to the atmosphere that occur at all sites at which hazardous waste is managed. Fugitive emissions can occur when vapors are vented from containers or tanks where hazardous wastes are stored. Fugitive emissions can also be caused by spills occurring during the unloading of hazardous wastes from vehicles that transport the waste, leaks through pipes and valves, and through operation of faulty equipment.

hazardous wastes: Wastes exhibiting any of the following characteristics: ignitability, corrosivity, reactivity, or EP-toxicity (yielding toxic constituents in a leaching test). In addition, EPA has listed as hazardous other wastes which do not necessarily exhibit these characteristics. Although the legal definition of hazardous waste is complex, the term more generally refers to any waste that EPA believes could pose a threat to human health and the environment if managed improperly. RCRA regulations set strict controls on the management of hazardous waste.

HSWA: Hazardous and Solid Waste Amendments of 1984. These amendments to RCRA greatly expanded the scope of hazardous waste regulation. In HSWA, Congress directed EPA to take measures to further reduce the risks to human health and the environment caused by hazardous wastes.

inert: Lacking the ability to chemically react with other substances.

inorganic compounds: Compounds that either do not contain carbon or do not contain hydrogen along with carbon. Inorganic compounds include metals, salts, and various carbon oxides (carbon monoxide, carbon dioxide). These compounds do not combust in incinerators, although incinerators may generate inorganic compounds.

interim status: A legal classification which applies to hazardous waste incinerators or other hazardous waste management facilities that were under construction or in operation by November 19, 1980, and can meet other interim status requirements. Interim status facilities may operate without a permit until EPA has made a final decision on the permit application. EPA is required to approve or deny incinerator permit applications for

interim status facilities by November 1989

liquid injection incinerator: A commonly used incinerator that relies on high pressure to prepare liquid wastes for incineration. A pressure forces liquid waste through a nozzle, "breaking" the liquid into droplets and thus allowing easier combustion of the waste. This is is parallel to splitting logs into smaller pieces so that they burn quickly and easily.

mobile incinerator systems: Hazardous waste incinerators that can be transported from one site to another to treat hazardous wastes. These systems allow generators of hazardous waste the flexibility of treating hazardous waste on-site rather than transporting wastes to commercial incinerator facilities.

molten salt reactor: A type of thermal treatment unit that rapidly heats waste in a heat-conducting, fluid bath of carbonate salt.

National Environmental Policy Act (NEPA): A federal statute that imposed the first requirements on federal agencies to consider the environmental effects that may result from agency actions. One provision of NEPA requires the preparation of an Environmental Impact Statement by federal agencies when "major" actions are taken.

Notice of Deficiency: A reply from EPA to a facility owner or operator applying for a RCRA permit. The Notice of Deficiency requests the applicant to supply further information before a preliminary decision on the permit application can be made.

Notice of Intent to Deny: Notification by EPA of its preliminary decision to deny a permit application.

operating conditions: Conditions specified in a RCRA permit that dictate how an incinerator must operate as it burns different waste types. These conditions are set by EPA on the expectation that if the operating conditions are met, the performance standards will also be met. The trial burn is used to identify operating conditions for which performance standards are met.

organic compounds: Compounds that contain carbon, hydrogen, and often oxygen. Organic compounds are combustible and can therefore be destroyed in an incinerator.

packed bed scrubber: An air pollution control device in which emissions pass through alkaline water to neutralize hydrogen chloride gas. The acidic emissions are introduced to the alkaline water in a cylinder containing packing materials. The packing material provides additional surface area where the neutralization of the acid gas can occur.

particulate matter: Material composed of tiny particles. For example, smoke is composed of gases and airborne particulate matter (soot)

PCBs: Polychlorinated biphenyls (PCBs) are highly toxic compounds. Incineration of PCBs is regulated under TSCA, rather than RCRA. Incinerators that burn PCBs must achieve DREs of 99.9999.

performance data: Information collected during a trial burn on concentrations of designated organic compounds and pollutants (particulate matter, hydrogen chloride) found in an incinerator's emissions. Analysis of the performance data must show that the incinerator meets RCRA performance standards under the operating conditions that are specified in the RCRA permit.

performance standards: Specific regulatory requirements established by EPA limiting the concentrations of designated organic compounds, particulate matter, and hydrogen chloride in emissions from incinerators. Permit applicants must show that the incinerator can meet the performance standards under specific operating conditions specified in the RCRA permit.

permit writer: The EPA (or state) staff member responsible for evaluating a permit application and for writing the permit for a facility. Although the permit writer does not make the final decision regarding approval or denial of a permit application, the permit writer performs evaluations of the data provided in the application and makes recommendations about the permit application to the decisionmaker.

PICs: Products of incomplete combustion (PICs) are organic compounds formed when combustion occurs. These compounds are generated in very small amounts and are sometimes toxic. PICs are heat-altered versions of the original material fed into the incinerator. For example, charcoal is a PIC from burning wood.

plasma-arc reactors: A type of incinerator which operates at extremely high temperatures. This type of incinerator is effective for treating highly toxic wastes that do not combust easily.

plate tower scrubber: A type of air pollution control device that uses alkaline water to neutralize hydrogen chloride gas. The alkaline water flows in a thin layer down a series of metal plates. The gas is bubbled through holes in the plates, thus allowing neutralization of the acid gas to occur.

principle organic hazardous constituents (POHCs): Specific hazardous compounds monitored during an incinerator's trial burn. POHCs are selected based on their high concentration in the waste feed and their difficulty to burn relative to other organic compounds contained in the waste. For each waste feed, one or more POHCs may be designated.

public comment period: A specified amount of time allowed for members of the public to express their views and concerns regarding an action by EPA. The public comment period begins after EPA publishes a draft permit or a Notice of Intent to Deny.

public hearing: A formal gathering of EPA officials and the public where the views and concerns of members of the public are verbally expressed regarding an EPA action. EPA is required to consider the comments in its evaluation of the action being taken. A public hearing must be held if a member of the public requests a hearing during the public comment period.

public notice: Notification by EPA informing the public of Agency actions, for example, the issuance of a draft permit. For draft permits, EPA must follow procedures to ensure proper public notice, including publication of the notice in newspapers and broadcast of the notice over radio stations.

pyrolysis: A method of thermal treatment that first uses high temperature in oxygen-free chamber to transform inorganics into more easily handled forms and then uses a high temperature oxygen-containing chamber for combustion of organics.

quench chamber: A common type of gas-cooling device in which heated gases are mixed directly with water.

RCRA: Resource Conservation and Recovery Act of 1976, an amendment to the first federal solid waste legislation, the Solid Waste Disposal Act of 1965. In RCRA, Congress established initial directives and guidelines for EPA to regulate hazardous wastes.

response to comments: A document that addresses all significant public comments received by EPA during the public comment period. The document includes a summary of each comment as well as EPA's response to each comment.

risk assessment: The use of established methods to measure the risks posed by an activity such as hazardous waste incineration. Risk assessments evaluate the relationship between exposure to toxic substances and the subsequent occurrence of health effects.

rotary kiln incinerator: A type of incinerator that includes a rotating combustion chamber. The constant rotation of the combustion chamber keeps waste moving, allowing the wastes to vaporize (convert to gas) for easier burning.

secondary combustion chamber: The compartment or chamber immediately following the primary combustion chamber. Organic compounds partially combusted in the primary chamber are further combusted in the secondary combustion chamber.

sludge: A thick, heavy, mud-like mixture of solids and liquids often resulting from the settling of solids from a liquid.

slurry: A thin, watery mixture of solids and liquids. Slurries contain more water than sludges and, as a result, slurries flow more easily.

spray tower scrubber: A device that uses alkaline water to neutralize hydrogen chloride gas. The alkaline water is injected in a spray of tiny droplets into a chamber where the acid gas is also introduced. The small size of the droplets aids in the neutralization of the gas.

supercritical water: A type of thermal treatment that uses moderate temperatures (>374°C) and high pressures to enhance the ability of water to break down large organic molecules into smaller, less toxic ones. Oxygen injected during this process combines with the simple organic compounds to form carbon dioxide and water.

United States
Environmental
Protection Agency

Office of Solid Waste

Washington, DC 20460
EPA/530-SW-88-024

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EPA

Permitting Hazardous Waste Incinerators

INTRODUCTION

Incineration reduces the volume of hazardous waste and breaks down the chemical constituents of the waste into their less toxic residues. A well-operated incinerator can destroy hazardous waste safely.

The use of incinerators to manage hazardous waste is likely to increase in the near future. This development reflects a growing understanding on the part of industry, regulatory agencies, and the public that incineration is safer than its chief alternative —disposal in landfills—for many types of hazardous wastes. It also reflects recent regulatory changes. In the 1984 Amendments to the Resource Conservation and Recovery Act (RCRA), for example, Congress placed stringent restrictions on the land disposal of untreated hazardous waste. These limitations are to be phased in by 1990.

To ensure that hazardous waste incinerators are safe and effective, the Environmental Protection Agency (EPA) and the states regulate them by requiring that they obtain a permit to operate. The permitting process that an incinerator owner or operator must follow is strict.

Public involvement is a required and important part of the permitting process. EPA has prepared this publication to inform the public about the process for permitting incinerators, and to encourage public participation.

USING INCINERATORS TO TREAT HAZARDOUS WASTE

Incineration can effectively treat many types of hazardous wastes, such as dioxin and organic solvents. In addition, contaminated soil from the cleanup of abandoned hazardous waste sites can be incinerated. So can gases, liquids, solids, sludge, and slurries containing hazardous waste. Some types of incinerators even allow for the recovery of energy and recycling of chemical by-products. Incineration reduces the volume of waste that would require expensive hazardous waste land disposal. Therefore, a growing number of companies favor building new incinerators or converting existing furnaces to burn hazardous wastes.

For decades, industrial incinerators have burned waste products. More recently, hazardous waste incineration techniques have been refined so that wastes are burned more effectively. Important conditions for proper incineration include high temperatures (usually 1500-2500 degrees Fahrenheit), enough time within the incinerator, sufficient oxygen, and proper mixing of the waste with oxygen.

Several kinds of incinerators are suitable for treating hazardous wastes. The rotary kiln incinerator—used primarily for burning solids—and the liquid injection incinerator account for roughly 90 percent of all incineration of hazardous wastes in the United States. Other designs include the fluidized-bed incinerator, the multiple hearth incinerator, and co-incineration methods.

PERFORMANCE STANDARDS FOR HAZARDOUS WASTE INCINERATORS

An incinerator's performance is measured by how completely it destroys hazardous waste. Incinerators must demonstrate they can meet several performance standards to be approved to operate. No incinerator can burn 100 percent of the waste fed to it. However, the EPA performance standards require an incinerator to destroy or remove 99.99 percent of the organic hazardous constituents. This percentage is called the destruction and removal efficiency (DRE). For dioxins and PCBs, the required DRE is 99.9999 percent. A DRE of 99.99 percent means that one molecule of the hazardous constituents out of every ten thousand molecules is not burned or removed and is vented from the facility through its

The Congress, in an effort to address the nation's growing concern about its hazardous and solid waste problem, enacted the Resource Conservation and Recovery Act (RCRA). The Hazardous and Solid Waste Amendments of 1984 greatly expanded RCRA and the Environmental Protection Agency's (EPA) authority to manage these wastes.

As a result, EPA is promoting regulations and programs to reduce, recycle, and treat wastes; restrict land disposal; and require corrective action for releases of hazardous waste into the environment. EPA's Office of Solid Waste, through its publications, aims to foster public understanding and encourage citizen involvement in helping to manage the national waste crisis.

smoke stack. A DRE of 99.9999 percent means that one molecule ut of every million is not destroyed. Other performance standards require that gaseous [illegible] gen chloride be reduced by 99 percent, or to 4 pounds per [illegible]. Furthermore, and that [illegible] date matter—very small [illegible] public meters.

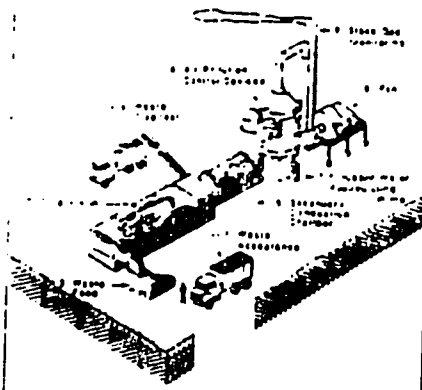
Current performance standards do not explicitly address missions of metals or products f incomplete combustion PICs). The burning of some wastes may release small quantities of metals through the moke stacks. These metals sually adhere to particulate atter. Therefore, restrictions n particulate matter emissions elp prevent emissions of etals in quantities that may ose a threat to public health the environment.

Products of incomplete combustion (PICs) are products at are not totally destroyed incineration. PICs occur in y combustion process—such as automobile engines, boilers, rbeques, woodstoves—when me organics are only partial- destroyed or when new compounds are formed. PICs are esent in very small quantities and are predominantly n-toxic emissions. According current EPA data, PICS do t present an unacceptable k.

An incinerator must demonstrate compliance with performance standards during a permance test called a trial m. The conditions under ich the incinerator operates ring the trial [illegible] then cluded in the [illegible] to sure continued [illegible]liance.

HE TRIAL BURN

Before conducting a trial n, the incinerator operator ally develops a trial burn n. The trial burn plan scribes (1) the content of waste to be fed into the inerator (waste feed); (2) rating conditions to be ted under the most adverse ations; (3) monitoring and pling tests to be conducted; (4) how trial burn data will be analyzed; and (5) how sampling results are to be verified and reported.



A TYPICAL
ROTARY KILN INCINERATOR

From the list of chemicals making up the waste feed, the applicant proposes several of the most difficult compounds to burn. The selected compounds are referred to as the Principal Organic Hazardous Constituents, or POHCs. POHCs are selected because if they are destroyed to the required DRE of 99.99 percent, the destruction of more easily burned compounds will be even more complete. Sometimes a more easily burned but highly toxic compound is also selected as one of the POHC compounds. This is to make sure that such a toxic component is destroyed during incineration.

During the trial burn, the owner and operator, with EPA or state oversight, must measure emissions from the incinerator for POHC compounds, particulate matter, and hydrogen chloride. Using those measurements, EPA can then determine whether the incinerator meets the performance standards.

The information that is gathered during the trial burn, confirming that the facility can meet the DRE under specified conditions, is used to set the final permit conditions. The facility must then maintain these specified operating conditions at all times when burning hazardous waste. When operating conditions deviate from those in the permit, the waste feed must be automatically stopped.

THE PERMITTING PROCES

Under RCRA, the Federal government and many state governments are authorized to oversee hazardous waste facilities. Regulations issued under RCRA in 1980 enable Federal and state governments to better control the treatment, storage, and disposal of hazardous wastes. In addition, the regulations set up a process for issuing strict operating permits to facilities that properly manage such wastes and for closing those that fail to do so.

A permit specifies the conditions under which the facility can operate. These conditions include, for example, the allowable range for incinerator temperatures, the types of waste which may be burned in the incinerator, and provisions for automatic shutdown if permit conditions are violated. Adequate security procedures, facility inspections, personnel training, contingency planning for emergencies, use of the RCRA manifest waste-tracking system, and accurate record-keeping must also be ensured. Moreover, owners and operators must describe plans for securely closing the facility at the end of its useful life.

Existing Facilities

Facilities that already existed when the regulations took effect operate under "interim status." Interim status allows a facility to continue operating under a set of specific standards until a final permit decision is made. Existing incinerators with interim status must follow the stringent permitting process outlined on these pages.

The EPA and state agencies oversee operations at facilities that have interim status. By 1989, EPA must issue or den final permits to incinerator facilities having interim status. About 150 of these are awaiting permit decisions. The majority of these facilities are located near the chemical plants or manufacturing sites where waste is generated.

PERMIT PROCESS STEPS

For Existing Incinerators with Interim Status

1. **Submit Part A.** Applicant provides general information, such as the name and location of the facility, its owner, [illegible] This step is required for [illegible] existing incinerators submitted Part A in 1980.

2. **Submit Part B.** Applicant provides detailed information specific to the individual facility. This information enables EPA to evaluate the proposed design and operation of an incinerator. Completion of a Part B application is long and complex. It also includes a trial burn plan and/or trial burn data or data from a similar incinerator. (The following steps reflect when a trial burn plan is submitted with the application.)

3. **Review of application.** EPA reviews application and trial burn plan. Trial burn plan is evaluated to see if it would adequately test the performance of the unit. During this period EPA may ask for more information. EPA or the state approves the trial burn plan.

4. **Trial burn.** Applicant conducts the trial burn with EPA or state staff in attendance.

5. **Trial burn analysis and review.** Applicant submits data and information on incinerator's performance during trial burn. EPA reviews information and may request additional data from applicant.

6. **Preparation of draft permit.** If the trial burn demonstrates that the incinerator meets performance standards, EPA prepares a draft permit. Permit includes operating conditions based on the data gathered during the trial burn. If it appears that a facility is unable to meet statutory or regulatory standards, a "Notice of Intent to Deny" is prepared. Either way, acceptance or denial of the permit, a 45-day public comment period must be held.

7. **Public comment on draft permit.** EPA solicits, reviews, and responds to public comments. Public comment period is at least 45 days. A public hearing will also be held if requested.

8. **Permit determination.** Final permit is issued or denied depending on public comment and the facility's ability to meet RCRA regulations. Final permit describes operating conditions for the facility, and is effective for up to ten years. If denied a permit, a facility must comply with closure/post closure requirements.

New Facilities

For new facilities, a RCRA permit application and trial burn plan must be approved and proposed for public comment. If a complete EPA and state review shows that the proposed incinerator design and trial burn plan are acceptable, and public comments are addressed, a four-phase permit will be issued. This permit establishes the conditions to be met by the facility following its construction. Each phase of the permit specifies operating conditions for that portion of the incinerator's operation.

PERMIT PROCESS STEPS

For New Facilities

1. **Submit Parts A and B.** Applicant includes a trial burn plan with the permit application.

2. **Review of application.** EPA performs technical review of the incinerator's design to determine if the incinerator is likely to meet the performance standards.

3. **Preparation of draft permit.** EPA prepares a draft permit that includes a trial burn plan and facility design specifications. It also includes operating conditions under which the facility is expected to meet the performance standards.

4. **Public comment on draft permit.** EPA publishes for public comment the draft permit and trial burn plan. The public comment period is at least 45 days. If requested, a public hearing is held.

5. **Four-phase permit.** After EPA review and public comment, a four-phase permit is issued or the application is denied. A permit would establish the conditions to be met by the facility following its construction.

6. **Start-up/Shake-down period (Phase One).** This phase allows limited burning of wastes to help stabilize the new facility's operations.

7. **Trial burn (Phase Two).** Emissions and operating conditions are monitored to determine if performance standards are met. This period usually lasts two weeks or less.

8. **Post-trial burn (Phase Three).** In this phase, the incinerator may operate under specified limits for several months, while trial burn results are reviewed.

9. **Final operating conditions (Phase Four).** If the incinerator meets the performance standards during the trial burn, the incinerator is allowed to operate under the final operating conditions in the permit. Some modifications to these conditions may be necessary based on the trial burn results. If the incinerator does not pass the trial burn, the permit may be modified to allow an additional trial burn. A major modification of the permit, such as a second trial burn, would require a new public comment period.

PUBLIC INVOLVEMENT IN THE PERMIT PROCESS

Community involvement in the permit process is strongly encouraged. Procedures to ensure public involvement vary from state to state and often overlap with EPA efforts. Whether or not EPA or a state

decides to issue or deny a permit, a public notice will appear in two local news papers and at least a 45-day comment period will be held. Information about the permit, usually in a newsletter or fact sheet, will be provided to interested community members. Additional information and a copy of the draft permit will be available from EPA or the state.

If anyone submits a written request for one during the comment period, EPA will hold a public hearing. Any testimony provided at the hearing would become part of a formal record. In addition, EPA may hold informal meetings with community members to hear their views and respond to questions.

During the comment period, written comments and questions may also be submitted to EPA. All concerns must be considered before a final decision on a permit is made. Moreover, EPA must prepare "Response to Comments" within 60 days after the close of the comment period. This document responds to major comments and explains what, if any, provisions of the draft permit have been changed.

The public comment period ensures that EPA fully considers the public's concerns regarding the effects of a facility on human health, safety, and the environment. And technical or factual comments from the public can influence the provisions and safeguards of the final permit or cause a permit to be denied. Citizens often offer useful information to EPA about the applicant or the facility site. Practical information contributed by the public about the impact of the permit on community services can be invaluable, as well. For example, is the applicant's contingency plan feasible given the capabilities of the local fire department?

For new facilities, the public comment period occurs prior to construction. Public comments may be directed toward important decisions--for instance, the design specifications, selection of the POHCs, waste feed components, contingency planning, site security, trucking routes, and the need for noise controls. For existing facilities, already operational, community members may wish to comment on trial burn results, monitoring and operating procedures, site security, noise control, and trucking routes.

For both existing and new facilities, EPA conducts public involvement efforts to keep community members informed and to respond to public inquiries during the lengthy permit review process. Again, public involvement is encouraged. Solving the nation's hazardous waste problem is up to everyone.

For more information on the permitting of hazardous waste incinerators contact:

Toll free RCRA/Superfund Hotline: 800-424-9346 or, in the Washington, D.C. area, call 382-3000.

Or contact EPA Regional Offices:

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JFK Federal Building
Boston, MA 02203
(617) 573-9644

Region II
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Development of a Thermal Stability Based Ranking of Hazardous Organic Compound Incinerability

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■ It is believed that emissions from full-scale incinerators can often be related to poor microscale mixing of waste and oxygen. To develop a scientifically defensible ranking of hazardous organic waste incinerability, the temperatures for 99% decomposition for a series of organic compounds were evaluated under constant conditions of elemental waste mixture composition (C:H:Cl molar ratios of 3:3:1), fuel/oxygen equivalence ratio (Φ = 3.0), and gas-phase residence time (t_r = 2.0 s). Theoretically consistent data were obtained for 66 compounds. A thermochemical reaction kinetic analysis indicated that the ranking can be applied to waste/oxygen equivalence ratios greater than 1.0 and H/Cl ratios greater than 1.0. This result suggests that deviations from the ranking may occur under thermal quenching and/or high waste chlorine failure modes. Pilot- and full-scale evaluations of the laboratory-based ranking are currently being conducted.

Introduction

Controlled, high-temperature incineration, in spite of the associated high costs, is a viable organic waste reduction technology (*1*). The current performance requirement states that principal organic hazardous constituents (POHCs) designated in each waste must be destroyed and/or removed to an efficiency of 99.99%. The complexity of hazardous organic waste streams often makes correct POHC selection and demonstration of 99.99% destruction and removal efficiency (DRE) a nontrivial task.

To aid the process of POHC selection, the U.S. EPA has limited the number of hazardous organic compounds to those listed in Appendix VIII of 40 CFR Part 261.3 and ranked these substances by their heat of combustion per unit mass (ΔH_c/g) (*2*). This scale is based on the premise that the lower the heat of combustion, the more difficult the compound is to incinerate. The heat of combustion approach has undergone considerable policy debate and received criticism on theoretical grounds from the scientific community (*3–5*). Results of laboratory- and full-scale studies have indicated that this ranking is not consistent with the relative gas-phase thermal stability of numerous POHCs (*6–9*).

Calculations and experimental observations have shown that the emissions of undestroyed, residual POHCs are kinetically, not thermodynamically controlled, (i.e., thermodynamic equilibrium calculations predict emission rates 3–10 orders of magnitude less than observed) (*3, 10–13*). Thus, under the assumption that heterogeneous reactions are insignificant and mass transport is not rate-limiting, POHC destruction in incinerators is controlled by gas-phase chemical kinetic factors including temperature, reaction atmosphere, and residence time. A numerical model encompassing the exact time, temperature, and reaction atmosphere history of all molecules in an incinerator is necessary to determine absolute POHC destruction efficiency (DE). Detailed chemical kinetic models of the thermal degradation of a few simple chlorinated hydrocarbons (e.g., chloromethane, dichloromethane, trichloroethylene) are under development by several researchers (*14–17*). Computer codes modeling incinerator conditions are also under development (*18*). Nonetheless, a sufficiently detailed understanding of this complex chemical and physical process is not currently possible. However, less information is required to estimate the relative DE (viz., incinerability ranking) of potential POHCs.

Simple conceptual models and more complex computer models indicate that all hazardous compounds entering the flame zone of an incinerator are destroyed and only the small fraction that does not pass through this zone may be emitted from the facility (*19, 20*). Various transient "failure modes" may cause a small fraction of POHCs to circumvent the flame zone (*5, 20*). Once in the postflame zone, thermal decomposition kinetics control the rate of POHC destruction. Even with the simplified hypothesis that postflame thermal decomposition controls the relative emission rates of POHCs, there remain several complex, interdependent kinetic variables. The objective of this study was to develop a self-consistent set of precisely controllable experimental conditions where POHC relative incinerability could be expediently evaluated by using a laboratory-scale thermal instrumentation system.

Our initial necessary assumption was that all POHCs in a given waste stream experienced the same postflame residence time, temperature, and reaction atmosphere. This required that mixtures of POHCs were volatilized at nearly the same rate. Our own calculations (*21*) as well as models and experiments from other laboratories (*22, 23*) have shown that vaporization times for even very large droplets (>500 μm) are still very short compared to the total gas-phase residence time in an incinerator. Thus, the individual components of multicomponent droplets experience essentially identical gas-phase residence times, as initially assumed. Clearly one cannot make this assumption for POHCs injected at different points in an incinerator (e.g., rotary kiln and an afterburner).

The problem was thus reduced to one of developing a set of independent temperatures, residence times, and reaction atmospheres that could be used to effectively predict relative POHC incinerability for a range of operating conditions. It has been previously proposed that the temperature for 99% destruction at 2.0-s residence time is a viable method of determining the relative stability of POHCs (*4, 19*). Other residence times or temperatures may be used to develop such a ranking. However, laboratory-scale flow reactor data have indicated that although absolute POHC DEs are dependent upon time and temperature, relative DEs are insensitive to these parameters (*19*).

The concept of reaction atmosphere may be specifically characterized by four parameters: total reactant concentration, molecular waste composition, elemental waste composition, and waste/oxygen equivalence ratio. Under the partial equilibrium hypothesis, it is assumed that the concentrations of highly reactive species, e.g., OH radicals

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and H, O, and Cl atoms, achieve equilibrium with each other via fast bimolecular reactions even though the overall system is not at chemical equilibrium (*24*). Since bimolecular pathways involving these reactive species along with unimolecular reactions govern the rate of POHC decomposition, only the elemental composition of the waste feed and waste/oxygen stoichiometry will *critically* affect POHC DE. Laboratory studies have confirmed that oxygen concentration and elemental composition are major variables in determining relative incinerability (*7, 9*).

In principle, other reactive species including polyatomic radicals (e.g., CH_3) can also react to destroy the feed material. These reactions have been proposed at moderately high temperatures in models of the degradation of simple hydrocarbons (*25*) and chlorohydrocarbons (*15, 16*). However, at higher temperatures, the concentrations of these "alternate" radicals are generally 1–2 orders of magnitude smaller than OH, H, O, and Cl such that highly improbable radical chain reactions in the long-chain limit are required for appreciable contribution to waste destruction.

Calculations using available kinetic data indicate that the emissions from full-scale incinerators are several orders of magnitude higher than those calculated by using oxidation kinetics and residence times and temperatures near the mean values in the postflame zones of typical incinerators (*5, 8, 12*). This result suggests that oxygen-depleted pathways are responsible for most POHC emissions (*8, 26, 27*). Even though typical incineration facilities may be operating under a nominally oxygen-rich stoichiometry, poor mixing on the molecular level may result in the creation of oxygen-deficient pockets. Consequently, it is believed that gas-phase thermal stability under oxygen-starved reaction conditions may be an effective predictor of relative POHC DE.

Experimental Approach

Quantitative decomposition of synthetic waste mixtures was measured with the Thermal Decomposition Unit-Gas Chromatographic System. The thermal decomposition unit consisted of a fused-silica tubular reactor in which a gas stream exhibiting a laminar flow pattern was exposed to temperatures as high as 1100 °C for mean residence times of 2.0 s. Reactor design ensured that each molecule experienced a square-wave thermal pulse with a very narrow ($\Delta t/t_r$ = 0.00692), near-Gaussian residence time distribution (*28, 29*). Heated fused silica transfer lines (250 °C) connected the insertion chamber to the reactor and the reactor to the gas chromatographic analytical system. The analytical function was performed by a Varian Vista 4600 programmed temperature gas chromatograph in conjunction with a CDS 401 computer data station.

For each multicomponent mixture, a constant elemental waste feed composition of C_3H_3Cl was a priori selected on the basis of estimated upper limit C:H:Cl molar ratios of hazardous waste streams subjected to full-scale incineration (~50 wt % Cl). For a large majority of mixtures tested, atom populations were balanced within ±10% of these constraints. For each mixture, a constant experimental condition of waste/oxygen equivalence ratio (Φ = 3.0) and mean residence time (t_r = 2.0 s) was also a priori selected on the basis of a statistically significant correlation between laboratory-scale flow reactor and full-scale emissions data under oxygen-deficient reaction conditions (*8*)! (Fuel/oxygen equivalence ratio (Φ) was defined as (moles of fuel/moles of O_2)$_{actual}$/(moles of fuel/moles of O_2)$_{stoich}$. CO_2, H_2O, HCl, HF, HBr, and NO were assumed to be combustion end products as appropriate for a given waste mixture composition (*30, 31*).) Calibration tests indicated that a *total* organic mixture reactor concentration of ~1000 ppm would ensure highly reproducible data acquisition within the constraints of the previously defined reaction atmosphere. This was also felt to be a reasonable approximation of the waste concentration in a full-scale incinerator. Concentrations of the individual components varied from ~100 to ~900 ppm. Exposure temperature was thus chosen as the critical independent variable with data gathered over a range of 300–1100 °C.

For the large majority of experiments, condensed-phase samples were prepared by injecting specific amounts of high purity (≥99%) stock liquids and solids into a small borosilicate vial. Liquid samples were then injected into the insertion chamber with a small submicroliter syringe at a nominal rate of ~0.01 μL/s. Flowing dry nitrogen doped with 1000 ± 10 ppm oxygen was used as the carrier gas for these experiments. For experiments involving highly volatile POHCs, gas-phase hazardous organic mixtures were prepared by injecting specific amounts of high-purity (≥99%) stock liquids and gases into a 1-L Pyrex bulb purged with room air. Gaseous samples were then injected into the insertion chamber of the thermal decomposition unit with special gas-tight syringes at a nominal rate of ~1.5 μL/s. Flowing dry nitrogen (≤1 ppm oxygen) was used as the carrier gas for these experiments.

Chromatographic analyses of the reactor effluent were obtained by use of several different fused silica capillary columns, depending on the nature of the samples being evaluated. Typically, the gas chromatography (GC) oven was programmed from −60 to 250 °C at 20 °C/min. Helium was used as the GC carrier gas and a hydrogen flame ionization detector was used for solute detection. Relative retention time indexes were used to monitor the destruction of a given POHC. For each mixture, an internal standard, normally benzene, toluene, or dichloromethane, was used to ensure the accuracy of this approach, especially for experiments where low POHC integrated responses were measured.

Regarding data precision, day-to-day uncertainty in the raw data (integrated response) was generally within ±5% for quantitation runs and for low levels of thermal decomposition (<10%). For high levels of decomposition (>90%), uncertainties ranged from ±10 to ±20%. Thermocouple and flow meter calibrations indicated exposure temperature and residence time uncertainties of less than 1%.

Results

Figure 1 represents an example of the type of thermal stability ranking data obtained with this approach. The relative stability of the individual components of a given mixture was determined by the position of the thermal decomposition profile plotted as fraction remaining (on a logarithmic scale) versus reactor temperature. To quantitate the data, the individual components were ranked by the temperature required for 99% percent destruction for a mean residence time of 2.0 s (T_{99}). Ranking by this method allowed intercomparison of thermal stability results from different mixtures.

During the course of this investigation, 69 multicomponent mixtures were examined. Table I presents a list of 66 compounds for which experimentally and theoretically consistent data were obtained. For comparison, $\Delta H_c/g$ values for each compound evaluated are also presented in Table I. The lack of a relationship between a compound's gas-phase thermal stability and heat of combustion is clearly apparent. Several compounds were reexamined in different mixtures to determine the effect of concentration on [illegible]

Table I. Thermal Stability and Heat of Combustion Indexes for Experimentally Evaluated POHCs

POHC	T_{IN}	$\Delta H_c/g$
hydrogen cyanide	>1150	N/A[a]
benzene	~1150	10.03
naphthalene	1070	9.63
acetonitrile	1000	7.37
chlorobenzene	930	6.60
acrylonitrile	985	5.57
2-chloronaphthalene	975	7.37
1,2-dichlorobenzene	970	4.57
1,3-dichlorobenzene	960	4.57
1,2,3-trichlorobenzene	955	3.40
1,2,4-trichlorobenzene	955	3.40
1,2,3,5-tetrachlorobenzene	955	2.61
chloroform	950	3.25
1,2,4,5-tetrachlorobenzene	950	2.61
bromoform	935	1.70
pentachlorobenzene	935	2.06
hexachlorobenzene	935	1.79
toluene	890	10.14
tetrachloroethene	890	1.19
trichloroethene	865	1.74
1,1-dichloroethene	850	2.70
1,2-dichloroethene	825	3.00
dichloromethane	815	1.70
methacrylonitrile	815	5.55
pyridine	785	7.53
1,3-dichloropropene	780	3.44
1,2,2-trichloro-1,1,2-trifluoroethane	780	N/A[a]
difluorodichloromethane	775	0.22
acetophenone	775	8.28
trichlorofluoromethane	775	0.11
ethyl cyanide	770	4.57
hexachlorobutadiene	765	2.12
dimethyl phthalate	755	5.74
acetyl chloride	755	2.77
p-cresol	745	8.18
benzenethiol	725	8.43
isobutyl alcohol	715	7.62
crotonaldehyde	710	7.73
3-chloropropene	690	N/A[a]
1,1,2,2-tetrachloroethane	690	1.39
benzyl chloride	685	6.18
dibromomethane	685	0.50
1,2-dichloroethane	680	3.00
1,4-dioxane	680	6.41
nitrobenzene	655	5.50
3-chloropropionitrile	655	4.50
methyl ethyl ketone	650	6.07
tetrachloromethane	645	0.24
chlorodifluoromethane	645	N/A[a]
hexachlorocyclohexane	645	1.12
dichlorofluoromethane	640	N/A[a]
pentachloroethane	640	0.53
1,1,2-trichloroethane	635	1.99
trichloromethane	625	0.75
1,2,3-trichloropropane	625	2.81
benzal chloride	625	N/A[a]
bis(2-chloroethyl) ether	615	3.35
1,1-dichloroethane	610	3.00
tribromomethane	585	0.13
hexachloroethane	580	0.46
2-chloroethyl vinyl ether	565	5.19
1,1,1,2-tetrachloroethane	560	1.39
1,1,1-trichloroethane	545	1.99
hexachloropropene	505	0.70
n-butyl benzyl phthalate	415	N/A[a]
di-n-octyl phthalate	380	N/A[a]

[a] N/A, heat of combustion data unavailable for this compound.

tively insensitive to large variations in individual ponent concentration.

priori, it is reasonable to expect that the kinetic be- or of many of the compounds tested is not first order

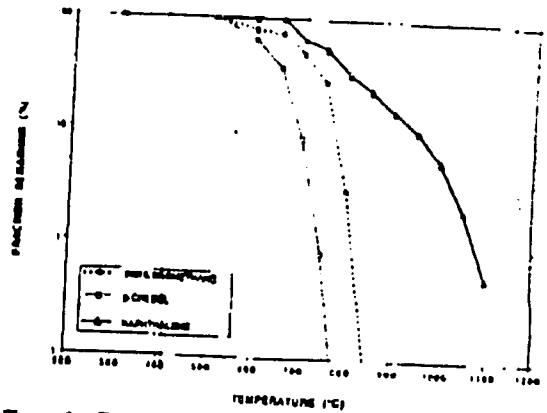

Figure 1. Thermal decomposition curves for a three-component hazardous organic compound mixture. Elemental composition, $C_{7.7}H_{3.4}Cl_{1.1}O_{0.01}$; Φ = 2.9; t_r = 2.0 s.

Table II. Effect of POHC Concentration on T_{IN}

POHC	concn, ppm	T_{IN}
acetonitrile	95	980
	155	1000
	210	950
	615	935
benzene	455	~1150
	360	~1150
benzyl chloride	665	690
	310	685
	435	690
chlorobenzene	760	980
	260	950
chloromethane	160	950
	815	950
1,3-dichlorobenzene	355	1000
	590	960
1,1-dichloroethene	175	890
	655	860
1,2-dichloroethane	265	835
	665	840
dichloromethane	780	815
	580	810
	540	810
	275	815
	95	800
methyl ethyl ketone	165	650
	200	650
	95	650
tetrachloroethene	570	905
	335	880
tetrachloromethane	60	670
	100	645
	335	645
toluene	590	895
	240	920
	410	900
	595	890
	665	900
trichloroethene	165	860
	410	865
trichloromethane	200	635
	450	625

in parent concentration. This may at first seem to contradict our experimental results. However, we must remember that each compound was studied in a multicomponent mixture of constant total concentration and elemental composition. Our results indicate that the invariant composition of the high-temperature radical pool derived from these mixtures controls the decomposition of each compound. The complexity of pure compound

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decomposition kinetics is thus dampened. This is the same result as one might expect in a full-scale incinerator where concentrations of POHCs in the waste feed vary from <100 to ~10 000 ppm.

The results of this experimental study and prior studies reported in the literature in conjunction with thermochemical reaction kinetic theory (32) have been used to develop an incinerability ranking (33) of 320 POHCs. The incinerability ranking is presented in Appendix I. The subsequent paragraphs present a generalized evaluation of the ranking.

The incinerability ranking may be divided into three stability families defined by the type of mechanism that generally dominates compound decomposition. The first family, which includes the most stable 77 compounds on the list, may be characterized by bimolecular decomposition processes, which are believed to dominate decomposition. Compounds in this class include hydrogen cyanide, benzene, naphthalene, 2-chloronaphthalene, short-chain aliphatic nitriles, chlorinated benzenes, monosubstituted halomethanes, chlorinated ethylenes, and toluenes. Of the three stability families, this group of compounds is the most difficult to assess theoretically due to the lack of high-temperature bimolecular reaction rate data and the multiplicity of reaction pathways. Emphasis was thus placed on accurate experimental measurements with 24 of the compounds in this class experimentally evaluated.

For a large majority of these compounds, degradation is likely dominated by H atom methathesis and Cl atom displacement reactions. The relative stability of the hydrogen-containing chlorinated ethylenes is consistent with H atom metathesis. Tetrachloroethylene, however, cannot decompose by this pathway. Besides C–Cl bond fission, Cl atom displacement by H atoms is the only available route. Preliminary studies of the rates of displacement versus metathesis for other organic compounds at 1000 °C indicate the former to be somewhat slower (27). This is consistent with the greater stability of C_2Cl_4 as compared to the other chlorinated ethylenes (see Table I). The displacement mechanism has been further verified by the identification of trichloroethylene as a major product in the thermal decomposition of a multicomponent mixture containing C_2Cl_4 (34). The chlorinated benzenes represent another class of stable POHCs that are believed to decompose largely by Cl displacement reactions under oxygen-starved reaction conditions (27).

Hydrogen cyanide is of particular interest due to its extreme stability. Abstraction of H by Cl would appear to be the dominant destruction mechanism, although still very slow due to the strength of the H–CN bond (125 kcal/mol) (35). Re-formation of HCN is also highly probable due to the extreme stability of the CN radical, which can recombine with available H atoms. This reformation behavior was observed in laboratory experiments above temperatures of 1050 °C.

The second family division, which includes compound 78 through compound 125, may be characterized by decomposition dominated by mixed unimolecular and bimolecular processes. Compounds within this class include halogen-saturated chlorofluorocarbons (CFCs), oxygenated compounds, chlorinated propylenes, cresol, pyridine, hexachlorobutadiene, ethyl cyanide, etc. The decomposition of CFCs, hexachlorobutadiene, and the oxygenated compounds is consistent with dominant unimolecular mechanisms involving bond fission or concerted molecular elimination. In addition to these unimolecular processes, atom metathesis and Cl displacement contribute to the decomposition of pyridine, cresol, chlorinated propylenes, dimethyl phthalate, and acetyl chloride. Seventeen of the compounds in this class have been experimentally evaluated.

The third family division, which includes all compounds below compound 125, may be characterized by decomposition dominated by unimolecular processes. Compounds within this class include CFCs, halogenated alkanes, nitrobenzenes, chlorinated toluene derivatives, ketones, esters, ethers, phthalates, etc. The decomposition of α-chlorinated toluene derivatives, nitrobenzene, and tetrachloromethane are believed to be dominated by bond fission (36). Documented concerted molecular elimination processes include four-center HCl and HBr elimination for halogenated alkanes and hydrogen-containing CFCs, H_2O elimination for certain ethers, and six-center elimination for long-chain alkylated phthalates (32). Twenty-five of the compounds in this class have been experimentally evaluated.

Discussion

The complexity of incineration and chemical reaction kinetics makes it essentially impossible for a single incinerability ranking to apply to every operating scenario. In this section, a reaction kinetic analysis is conducted to determine the effect of changes in reaction atmosphere on the ranking, i.e., to determine the range of conditions for which the ranking may be considered appropriate. For approximately 65% of the 320 compounds ranked, thermal decomposition is postulated to occur by unimolecular processes that are largely independent of reaction atmosphere. (Our data were generated at atmospheric pressure as is typical of full-scale incinerators. Thus, possible pressure-related "falloff" effects would not appear to be the cause for any special concern.) The remaining 35%, which undergo bimolecular thermal decomposition processes, were targeted in this analysis.

Comparison to Theory. To develop a theoretical thermal decomposition curve, a kinetic expression similar to that used by other researchers (3) incorporating all known reaction pathways for chemical transformation of the POHC was derived:

$$-\ln f_r = \sum_i tA_i \exp(-E_i/RT) + \sum_j tR_j\lambda_j A_j \exp(-E_j/RT) \quad (1)$$

where f_r is the fraction remaining, A_i the preexponential factor for unimolecular reaction (1/s), A_j the preexponential factor for bimolecular reaction (cm³/molecule·s), E_i the activation energy for unimolecular reaction (cal/mol), E_j the activation energy for bimolecular reaction (cal/mol), $R_j(T)$ the temperature-dependent radical concentration (molecule/cm³), λ_j the chain length for radical j, defined as number of POHC molecules destroyed divided by the steady-state population of radical j, T the reaction temperature (K), R the ideal gas constant (cal/mol·K), and t the gas-phase residence time (s).

In the evaluation of eq 1, a major consideration is the estimation of the radical concentration at elevated temperatures. We are currently invoking the partial equilibrium hypothesis (24, 30) to estimate these radical concentrations. We justify this approach on the basis of general agreement (factor of 2) between reactive species concentrations from experimental flame measurements and equilibrium calculations under fuel-rich conditions (37–40). A similar result is expected in our reactor (and incinerators) due to the atmospheric pressure conditions, which promote fast termolecular reaction, and fuel-rich

Table III. Kinetic Analysis Arrhenius Rate Parameters

model compd	k, s^{-1} (bond homolysis)	k, s^{-1} (HCl elimination)	k, cm^3/molecule-s (H, Cl atom abstrctn)	k, cm^3/molecule-s (CH_3 displace.)
$CHCl_3$	1.6×10^{16} exp[−77000/RT]^a	2.0×10^{14} exp[−64500/RT]^d	1.0×10^{-11} exp[−3300/RT]^{e,h}	
CH_2Cl_2	2.6×10^{16} exp[−79400/RT]^a	7.1×10^{13} exp[−70000/RT]^e	4.2×10^{-11} exp[−3000/RT]^{e,h}	
CH_3Cl	2.6×10^{16} exp[−82900/RT]^a		6.3×10^{-11} exp[−3300/RT]^{e,h}	
$C_6H_5CH_3$	8.0×10^{16} exp[−90800/RT]^b		$7.6 \times 10^{-18}T^2$ exp[22/RT]^{f,i}	2.0×10^{-10} exp[−5122/RT]^g
C_6H_6	2.0×10^{17} exp[−118000/RT]^c		2.0×10^{-10} exp[−8222/RT]^{f,j}	
			$3.3 \times 10^{-18}T^2$ exp[−654/RT]^{f,j}	
			8.1×10^{-11} exp[−7948/RT]^{f,j}	

^{a} High pressure limit Arrhenius parameters derived from transition-state theory (32). ^{b} High pressure limit Arrhenius parameters ($C_6H_5CH_3 \rightarrow C_6H_5CH_2 + H$) obtained from ref 45. ^{c} High pressure limit Arrhenius parameters obtained from ref 46. ^{d} High pressure limit Arrhenius parameters obtained from ref 42. ^{e} Arrhenius parameters obtained from ref 43. ^{f} Arrhenius parameters obtained from ref 44. ^{g} Arrhenius parameters obtained from ref 27. ^{h} Arrhenius coefficients reflect Cl abstraction by H and H abstraction by H and Cl; equal rate coefficients for all three metathesis reactions have been employed. ^{i} Arrhenius coefficients reflect H abstraction by Cl. ^{j} Arrhenius coefficients reflect H abstraction by H.

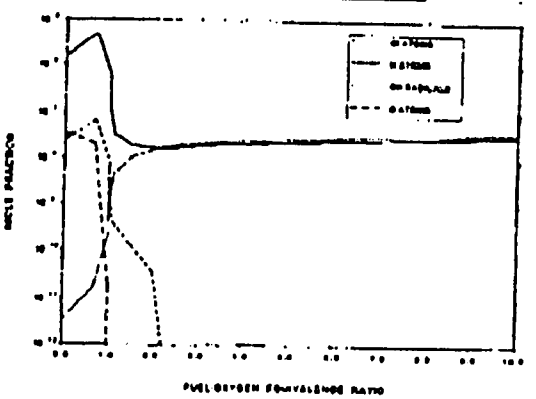

Figure 2. Equilibrium reactive species concentrations at 1273 K as a function of waste/oxygen equivalence ratio. Organic mixture elemental composition, C_2H_3Cl.

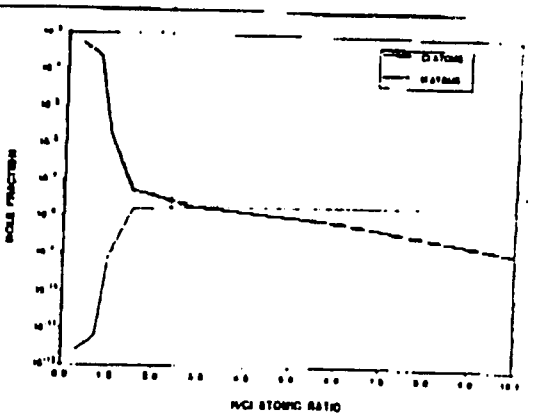

Figure 3. Equilibrium reactive species concentrations at 1273 K as a function of H/Cl atomic ratio. $\Phi = 3.0$.

Subsequent paragraphs demonstrate that this approach does appear to adequately predict reactive species concentrations, resulting in agreement between experimental and theoretical thermal decomposition curves for compounds suspected of undergoing bimolecular thermal decomposition.

Figure 2 presents equilibrium radical concentrations (at 1000 °C) as a function of waste/oxygen equivalence ratio for an elemental waste composition of C_2H_3Cl. Figure 3 depicts equilibrium radical concentrations (at 1000 °C) as a function of H/Cl atomic ratio for a waste/oxygen equivalence ratio of 3.0. The data in Figure 2 indicate that OH radicals and O and Cl atoms are in highest concentration under oxygen-rich ($\Phi \leq 1.0$) conditions while H and Cl atoms are in highest concentration under fuel-rich ($\Phi > 1.0$) conditions. For a fuel-rich stoichiometry ($\Phi = 3.0$), the data in Figure 3 indicated that the Cl atom concentration became equal to or greater than the H atom concentration for H/Cl atomic ratios of <3.0. For larger H/Cl atomic ratios (up to H/Cl of 10.0), the H atom concentration gradually increased while the Cl atom concentration steadily decreased. On the basis of these equilibrium calculations, under the conditions of this study, Cl atoms and H atoms were the reactive species in greatest concentration (typical concentrations ranged from 2×10^9 cm^{-3} at 800 °C to 5×10^{11} cm^{-3} at 1100 °C).

Equation 1 was used to generate theoretical curves for comparison to experimental decomposition curves for five POHCs for which generally reliable kinetic data were available. The thermal stabilities of these compounds ranged from moderately fragile to very stable with kinetic pathways ranging from unimolecular to mixed unimolecular and bimolecular processes. These model compounds included trichloromethane, dichloromethane, chloromethane, toluene, and benzene. Table III presents a summary of the Arrhenius parameters used for the model compounds in this analysis. Transition-state theory (32) and unimolecular QRRK calculations (41) were employed to provide reasonable estimates of rate parameters where experimental data were unavailable.

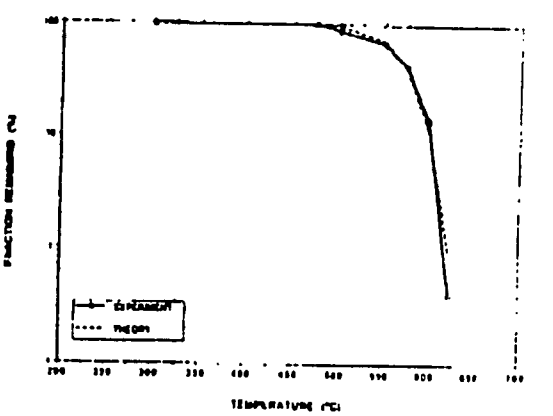

Figure 4. Experimental and theoretical thermal decomposition curves for trichloromethane. Mixture elemental composition, $C_{2.3}H_{3.3}Cl$; $\Phi = 3.0$; $t_r = 2.0$ s.

The decomposition of trichloromethane (see Figure 4) is largely unimolecular in nature. The dominant reaction is concerted three-center HCl elimination with Arrhenius rate parameters recently measured (42). C–Cl bond fission

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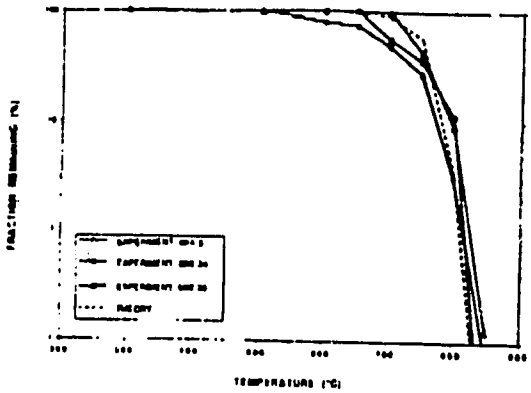

Figure 5. Experimental and theoretical thermal decomposition curves for dichloromethane. Mix 2: elemental composition, $C_2H_4Cl_2$; $\Phi = 3.0$. Mix 34: elemental composition, $C_2H_{3.8}Cl$; $\Phi = 3.2$. Mix 36: elemental composition, $C_3H_4Cl_{0.4}$; $\Phi = 2.8$; $t_r = 2.0$ s.

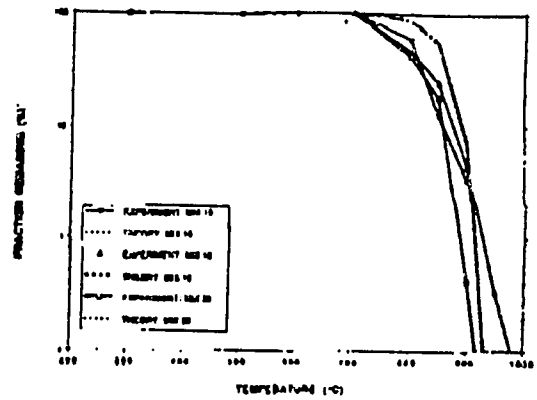

Figure 7. Experimental and theoretical thermal decomposition curves for toluene. Mix 16: elemental composition, $C_2H_{3.2}Cl_{1.1}$; $\Phi = 3.4$. Mix 18: elemental composition, $C_{3.3}H_3Cl_{0.4}$; $\Phi = 3.0$. Mix 20: elemental composition, $C_{3.1}H_4Cl$; $\Phi = 2.7$; $t_r = 2.0$ s.

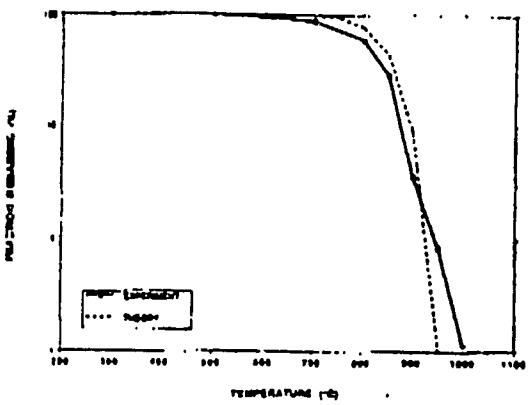

Figure 6. Experimental and theoretical thermal decomposition curves for chloromethane. Mixture elemental composition, $C_{3.1}H_4Cl_{1.8}$; $\Phi = 3.0$; $t_r = 2.0$ s.

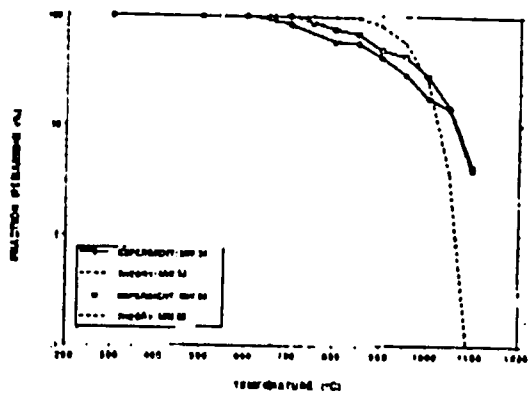

Figure 8. Experimental and theoretical thermal decomposition curves for benzene. Mix 34: elemental composition, $C_2H_{3.8}Cl$; $\Phi = 3.0$. Mix 63: elemental composition, C_2H_4Cl; $\Phi = 3.0$; $t_r = 2.0$ s.

is insignificant at these temperatures and H and Cl atom methathesis is negligible due to the low H and Cl atom concentrations. The excellent agreement between theory and experiment at the 1% remaining level (within 5 °C) indicated that a single unimolecular pathway adequately accounted for the thermal decomposition behavior of this compound. The decomposition of dichloromethane (see Figure 5) is also largely unimolecular in nature. The dominant reactions are three-center HCl elimination and C–Cl bond fission. H and Cl atom metathesis reactions represented minor contributions at higher temperatures (>800 °C). The good agreement between theory and experiment at the 1% remaining level (within 10 °C) indicated that inclusion of these two unimolecular reaction channels adequately accounted for the thermal decomposition behavior of this compound.

The remaining compounds, chloromethane, toluene, and benzene, decompose largely through bimolecular reaction pathways. For chloromethane and benzene (see Figures 6 and 8), H abstraction by Cl atoms makes the largest contribution, with H abstraction by H (and Cl abstraction by H for CH_3Cl) also significant. For toluene (see Figure 7), H atom metathesis by Cl atoms and CH_3 displacement by H atoms dominate. For all three compounds, the experimental curves indicated reaction commencing at ~100

code. However, for high levels of PCHC decomposition (1–10% remaining), the experimental and theoretical curves tend to converge with agreement at the 1% remaining level within 10 and 30 °C for chloromethane and toluene, respectively. For benzene, at the ~10% remaining level, the theoretical and experimental curves intersected, with the experimental data demonstrating greater stability at higher temperatures. The extrapolated discrepancy between theory and experiment is estimated to be ~50 °C at the 1% remaining level. POHC re-formation reactions excluded in the kinetic relation may be responsible for the larger discrepancy observed for this compound. The agreement between theory and experiment was fairly good for chloromethane ($\Delta T \leq 50$ °C for levels of destruction greater than 10%). This suggests that H atom metathesis by CH_3 radicals does not significantly effect the T_{99} of this compound under the conditions of this study.

We believe the stability of the atoms and diatomic radicals at elevated temperatures is the key to the success of our simple model. Potentially reactive organic (e.g., CH_3, C_2H_3, CCl_3) and inorganic (e.g., ClO) radicals are not stable enough above 750–800 °C to significantly contribute to the destruction of the waste. Indeed, a kinetic sensitivity analysis of a chemical kinetic model for fuel-rich

Table IV. ΔT_{99} as a Function of Waste Feed Concentration (Radical Concentration) for Five Model Compounds*

A/A_0	R/R_0	$CHCl_3$	CH_2Cl_2	$C_6H_5CH_3$	CH_3Cl	C_6H_6
1.1	1.02	<-1	<-1	<-1	< 1	-6
1.3	1.06	<-1	< 1	<-1	-2	-14
1.5	1.10	< 1	<-1	-1	3	-23
2.0	1.20	<-1	<-1	-1	-6	-46
3.0	1.40	<-1	<-1	-8	-12	-88

* In this analysis, we have assumed that the additional radical concentration (R/R_0) abstracts a H atom from the model compound at the same rate as a Cl atom. The relationship between waste feed concentration (A/A_0) and radical concentration was determined from a series of equilibrium calculations for nominal incinerability mixtures at 1000 °C.

sumption above 750 °C while H metathesis by OCl and C_2Cl_3 are significant destruction pathways at lower temperatures (*15*).

Effect of Varying Waste Feed Rate and Radical Chains. On the basis of the known complexity of hydrocarbon and chlorinated hydrocarbon reaction systems (*47, 14–17*) it may seem fortuitous that such a simple kinetic model can predict the thermal decomposition behavior of such a wide range of species. We acknowledge the need for detailed chemical kinetic mechanisms to predict the thermal decomposition behavior of a given species over wide ranges of experimental conditions. However, the goal of this kinetic analysis was simply the prediction of T_{99}s for one experimental condition.

Using eq 1, we have iteratively calculated the effect of increases in the waste feed concentration on T_{99} for the five model compounds. As shown in Table IV, results indicate that acceptably small decreases in T_{99} (<20 °C) were observed for all compounds for a factor of 2 increase in waste feed rate and acceptably small decreases were observed for all compounds except benzene for a factor of 3 increase in waste feed concentration (~40% increase in radical concentration). For chloroform and dichloromethane, the insensitivity of T_{99} on waste feed concentration is consistent with mechanisms dominated by molecular elimination reactions. The variance in T_{99} for the other compounds is due to the relative contributions of bimolecular radical attack versus unimolecular reaction.

In principle, radical chain reactions can increase the effect of varying radical concentration. Significant chain lengths ($\lambda > 2$) are not expected under incineration conditions due to termination by the formation of stable H_2 and HCl molecules. Polymerization reactions may have longer chain lengths but these reactions are not likely to contribute to POHC destruction in the H- and Cl-rich environment of an incinerator. Both pseudoequilibrium and kinetic calculations indicate that other readily formed polyatomic radicals (e.g., CH_2, CCl_2) that can participate in short chains are in concentrations lower by a factor of 10-100 than H and Cl. Thus, chain lengths for these species would have to be on the order of 10–100 before they would contribute to POHC destruction, which is highly unlikely. Our calculations indicate that chains of $\lambda \leq 2$ produce shifts in T_{99} of equal or lesser magnitude than the effect of changing the radical concentration of up to a factor of 2.

The above analysis indicates that exceptional compounds that are resistant to unimolecular reaction and exhibit large shifts in T_{99} with small increases in radical concentration do exist (e.g., C_6H_6). However, since the stability of all compounds undergoing bimolecular decomposition will shift in the same direction as the radical concentration is varied, changes in their *relative* T_{99} values

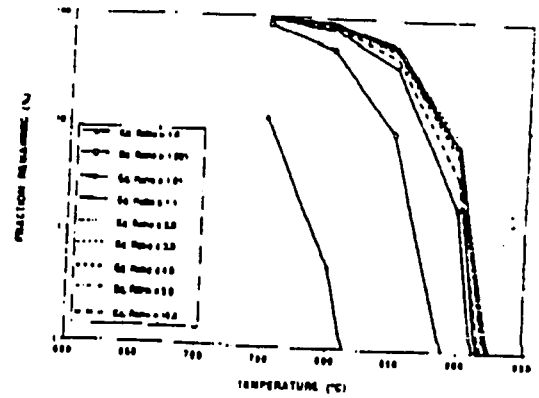

Figure 9. Sensitivity of toluene thermal decomposition behavior as a function of waste/oxygen equivalence ratio. Mixture elemental composition, C_6H_5Cl; t_r = 2.0 s.

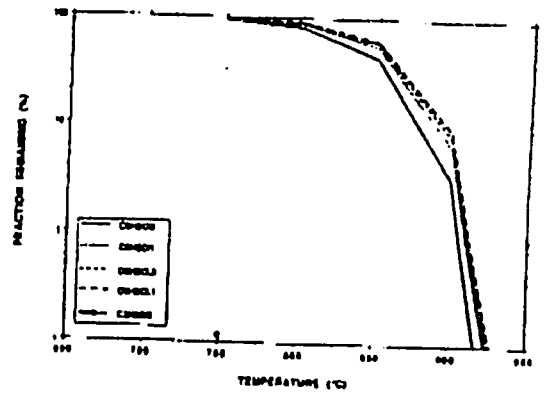

Figure 10. Sensitivity of toluene thermal decomposition behavior as a function of organic mixture Cl atom population. Φ = 3.0; t_r = 2.0 s.

will be suppressed. Since compounds at the top of the ranking decompose predominantly via bimolecular reactions, changes in their relative incinerability are expected to be minimal. Only as we descend through the ranking to where different compounds decompose by bimolecular versus unimolecular pathways will the ranking be expected to exhibit some variance. However, in this regime unimolecular decomposition reactions are available for compounds dominated by bimolecular pathways at nominal conditions. Thus, changes in T_{99} are again expected to be minimal.

Effect of Varying Equivalence Ratio and Waste Feed Composition. Toluene was selected as the model compound for further analysis, as this compound decomposes by numerous bimolecular reactions that are sensitive to changes in reaction atmosphere. We have analyzed the effect of reaction atmosphere by varying the fuel/oxygen stoichiometry ($0.05 < \Phi < 10.0$) for nominal values of mixture elemental composition and by varying mixture elemental composition ($0.33 < H/Cl < 30.0$) for nominal values of fuel/oxygen stoichiometry. Figure 9 presents the results of the sensitivity analysis for variation of waste/oxygen equivalence ratio while Figure 10 presents the results in relation to a variation of Cl and H atom populations, respectively.

Inspection of Figure 9 indicates that for waste/oxygen equivalence ratios ranging from 2.0 to 5.0, there is no significant difference (±10 °C) in T_{99}. As one decreases this parameter to 10.0, a small decrease in T_{99} was ob-

served. A shift in this parameter to 1.0 produced a ~130 °C decrease in T_{99}. Simulations were also conducted for fuel-lean equivalence ratios of 0.67 and 0.05, respectively. The large Cl, O, and OH concentrations (see Figure 2) for these stoichiometries resulted in greater than 99% DE at a temperature of 750 °C. Experimentally evaluated indexes were obtained by fuel/oxygen stoichiometries ranging ±20% of the nominal value (Φ = 3.0). This analysis indicates that the T_{99}s generated in laboratory experiments are clearly intercomparable with relative uncertainties of less than ±10 °C.

In Figure 10, inspection of the toluene decomposition curve indicated that a factor of 10 increase in H/Cl ratio (for a constant C/H ratio) produced only a ~5 °C change T_{99}. However, a factor of 2 decrease in H/Cl ratio decreased T_{99} by ~10 °C, with a factor of 3 decrease in H/Cl ratio dramatically shifting the stability ranking to much lower temperatures. As shown in Figure 3, the dramatic decrease in toluene thermal stability is due to the Cl atom concentration reaching a threshold value where its rate of attack becomes greater than the rate of H atom attack. Flow reactor mixture experiments for benzene, toluene, and naphthalene with very high Cl atom populations have demonstrated this effect. Experimentally evaluated indexes have been obtained for H and Cl atom populations within a factor of 2 of nominal values. This analysis indicates the T_{99}s are clearly intercomparable with relative uncertainties of less than ±10 °C.

The effects of reaction atmosphere on toluene stability may be interpreted on the basis of the concentration and reactivity of OH radicals and Cl, O, and H atoms as a function of these widely varying reaction atmospheres. For nominal elemental compositions under oxidative reactive atmospheres, the concentration of highly reactive OH radicals and Cl atoms becomes kinetically significant at relatively low temperatures, thus promoting rapid thermal destruction. For nominal oxygen-starved fuel/oxygen stoichiometries, the effects of H/Cl ratio may be interpreted on the basis of the relative reactivities of these elemental species when involved in H atom metathesis reactions. Although the kinetic data base for Cl atom attack is very limited, results indicate that Cl atoms rival and in some instances surpass the reactivity of OH radicals, with H atoms much less reactive at temperatures of 800–1100 °C (25). These differences in reactivity are such that toluene exhibits a nearly identical thermal behavior for organic mixture elemental compositions of $C_3H_{10}Cl$ and C_3H_3Cl. The somewhat surprising result as one increases the fuel/oxygen stoichiometry from oxygen-starved to completely pyrolytic conditions is due to a subtle increase in the Cl and H atom concentration, countering the effects of a rapidly decreasing OH concentration.

Summary

A thermochemical reaction kinetic based "sensitivity" analysis of the ranking has produced several significant findings. In relation to the laboratory-scale flow reactor experiments, results indicated that 66 thermal stability rankings obtained over the slight variations in reaction atmosphere are intercomparable. This is especially important for the ~110 Appendix VIII compounds whose decomposition is likely dominated by bimolecular reaction. The results of this analysis also indicated that experimental variations in fuel/oxygen stoichiometry and H/Cl atomic ratio were not sufficiently large to produce significant changes in decomposition mechanisms for a given class of hazardous organic compounds.

In relation to full-scale incineration conditions, an pyrolytic based ranking applies to fuel-rich stoichiometries (Φ > 1.0) and an oxidative based ranking applies to stoichiometric and fuel-lean stoichiometries ($\Phi \leq 1.0$). A similar analysis of the effect of H/Cl atomic ratio of the waste feed indicated that a high-Cl ranking applies to H/Cl ratios equal to or less than 1.0 and a low-Cl ranking applies to H/Cl ratios greater than 1.0. Thus, the incinerability ranking developed may be further classified as a pyrolytic, low-Cl based ranking.

This ranking would appear to be appropriate for most full-scale incineration conditions, although exceptions must certainly exist. Full-scale incinerators nominally operate at postflame temperatures of ≥1000 °C and residence times of ≥2.0 s. For these conditions, our simple kinetic model and other kinetic calculations indicate that, for gaseous pockets of $\Phi \leq 1.0$, very little material escapes undestroyed and there is little contribution to the emissions. However, short residence time or low-temperature oxidative pathways where POHC destruction is incomplete cannot be ruled out, and an oxidative ranking would dominate under temporal or thermal incinerator failure mode conditions. The kinetic analysis also indicated that very low H/Cl ratios (≤1.0) were required for a significant change in the incinerability ranking. It would seem that H/Cl ratios of ≤1.0 are very unlikely in an incinerator and the validity of the ranking developed here would be maintained. One could argue that high-chlorine pockets of gas may escape from the flame zone due to their difficulty in burning.

The rates of bimolecular reactions are extremely sensitive to changes in reactive species concentration and composition. Thus, a change in the relative ranking of incinerability is likely when the *local* radical concentrations in full-scale systems are outside of the waste/oxygen equivalence ratio and H/Cl ranges discussed above. On the basis of our analysis, one would expect a general contraction of the ranking with increases in oxygen and Cl concentration as nearly all compounds suspected of undergoing bimolecular decomposition would exhibit substantially lower thermal stability.

In conclusion, to cover all possible conditions, it would be desirable to develop both oxidative and pyrolytic rankings. However, pilot- and full-scale comparisons are currently being conducted to determine if the pyrolytic, low-Cl ranking approach presented here is sufficient to accurately predict the relative incinerability of hazardous organic compounds.

Acknowledgments

We acknowledge S. Stelmac of the U.S. EPA's Office of Solid Waste for her support and input concerning the practical application of the ranking. We also thank W. Tsang and S. Heneghan for their helpful discussions regarding pyrolytic thermal decomposition mechanisms for aromatic and chlorinated aromatic hydrocarbons and W. Rubey, J. Graham, and R. Striebich for their review of the experimental design. Last, but not least, we owe special thanks to J. Kasner for assisting in the STANJAN equilibrium and unimolecular QRRK calculations.

Appendix I. Thermal Stability Ranking of Hazardous Organic Compounds

Principal Organic Hazardous Constituent[a]	Rank
cyanogen (ethanedinitrile)	1
hydrogen cyanide (hydrocyanic acid)	2
benzene	3
sulfur hexafluoride[b]	4

fluoranthene [benzo[*jk*]fluorene] 6
benzo[*j*]fluoranthene [7,8-benzofluoranthene] 7
benzo[*b*]fluoranthene [2,3-benzofluoranthene] 8
benzanthracene (1,2-) [benz[*a*]anthracene] 9
chrysene [1,2-benzophenanthrene] 10
benzo[*a*]pyrene [1,2-benzopyrene] 11
dibenz[*a,h*]anthracene [1,2,5,6-dibenzanthracene] 12
indeno(1,2,3-*cd*)pyrene [1,10-(1,2-phenylene)pyrene] 13
dibenzo[*a,h*]pyrene [1,2,5,6-dibenzopyrene] 14
dibenzo[*a,i*]pyrene [1,2,7,8-dibenzopyrene] 15
dibenzo[*a,e*]pyrene [1,2,4,5-dibenzopyrene] 16
cyanogen chloride [chlorine cyanide] 17–18
acetonitrile [ethanenitrile] 17–18
chlorobenzene 19
acrylonitrile [2-propenenitrile] 20
dichlorobenzene [1,4-dichlorobenzene] 21–22
chloronaphthalene (1-) 21–22
cyanogen bromide [bromine cyanide] 23–24
dichlorobenzene [1,2-dichlorobenzene] 23–24
dichlorobenzene [1,3-dichlorobenzene] 25
trichlorobenzene [1,3,5-trichlorobenzene]' 26–27
trichlorobenzene [1,2,4-trichlorobenzene] 26–27
tetrachlorobenzene [1,2,3,5-tetrachlorobenzene]' 28
chloromethane [methyl chloride] 29–30
tetrachlorobenzene [1,2,4,5-tetrachlorobenzene] 29–30
pentachlorobenzene 31–33
hexachlorobenzene 31–33
bromomethane [methyl bromide] 31–33
tetrachlorodibenzo-*p*-dioxin (2,3,7,8-) [TCDD] 34
toluene [methylbenzene] 35
tetrachloroethene 36
chloroaniline [chlorobenzenamine] 37
DDE [1,1-dichloro-2,2-bis(4-chlorophenyl-ethylene)] 38
formic acid [methanoic acid] 39–40
phosgene [carbonyl chloride] 39–40
trichloroethene 41
diphenylamine [*N*-phenylbenzenamine] 42–44
dichloroethene (1,1-) 42–44
fluoroacetic acid 42–44
dimethylbenz[*a*]anthracene (7,12-) 45
aniline [benzenamine] 46–50
formaldehyde [methylene oxide] 46–50
malononitrile [propanedinitrile] 46–50
methyl chlorocarbonate [carbonochloridic acid, methyl ester] 46–50
methyl isocyanate [methylcarbylamine] 46–50
aminobiphenyl (4-) [(1,1'-biphenyl)-4-amine] 51
naphthylamine (1-) 52–53
naphthylamine (2-) 52–53
dichloroethene (*trans*-1,2-) 54
fluoroacetamide (2-) 55–56
propyn-1-ol (2-) [propargyl alcohol] 55–56
phenylenediamine (1,4) [benzenediamine] 57–59
phenylenediamine (1,2-) [benzenediamine] 57–59
phenylenediamine (1,3-) [benzenediamine] 57–59
benzidine [(1,1'-biphenyl)-4,4'-diamine] 60–64
acrylamide [2-propenamide] 60–64
dimethylphenethylamine (*α,α*-) 60–64
methyl methacrylate [2-propenoic acid, 2-methyl-, methyl ester] 60–64
vinyl chloride [chloroethene] 60–64
dichloromethane [methylene chloride] 65–66
methacrylonitrile [2-methyl-2-propenenitrile] 65–66
dichlorobenzidine (3,3'-) 67
methylcholanthrene (3-) 68
toluenediamine (2,6-) [diaminotoluene] 69–77
toluenediamine (1,4-) [diaminotoluene] 69–77
toluenediamine (2,4-) [diaminotoluene] 69–77
toluenediamine (1,3-) [diaminotoluene] 69–77
toluenediamine (3,5-) [diaminotoluene] 69–77
toluenediamine (3,4-) [diaminotoluene] 69–77
chloro-1,3-butadiene (2-) [chloroprene] 69–77
pronamide [3,5-dichloro-*N*-(1,1-dimethyl-2-propynyl)benzamide] 69–77
(acetylamino)fluorene (2-) [acetamide, *N*-(9*H*-fluoren-2-yl)-] 69–77
dimethylbenzidine (3,3'-) 78
n-propylamine [1-propanamine] 79
pyridine 80
picoline (2-) [pyridine, 2-methyl-] 81–84
dichloropropene (1,1-) 81–84
thioacetamide [ethanethioamide] 81–84
trichloro(1,2,2-)trifluoroethane(1,1,2-) [Freon 113]' 81–84
benz[*c*]acridine [3,4-benzacridine] 85–88
dichlorodifluoromethane [Freon 12] 85–88
acetophenone [ethanone, 1-phenyl-] 85–88
trichlorofluoromethane [Freon 11] 85–88
dichloropropene (*trans*-1,2-) 89–91
ethyl cyanide [propionitrile] 89–91
benzoquinone [1,4-cyclohexadienedione] 89–91
dibenz[*a,h*]acridine [1,2,5,6-dibenzacridine] 92–97
dibenz[*a,j*]acridine [1,2,7,8-dibenzacridine] 92–97
hexachlorobutadiene (*trans*-1,3) 92–97
naphthoquinone (1,4-) [1,4-naphthalenedione] 92–97
dimethyl phthalate 92–97
acetyl chloride [ethanoyl chloride] 92–97
acetonylbenzyl-4-hydroxycoumarin (3-*α*-) [warfarin] 98–99
maleic anhydride [2,5-furandione] 98–99
phenol [hydroxybenzene] 100–101
dibenzo[*c,g*]carbazole (7*H*-) [3,4,5,6-dibenzocarbazole] 100–101
chlorophenol (2-) 102
cresol (1,3-) [methylphenol] 103
cresol (1,4-) [methylphenol] 104–105
cresol (1,2-) [methylphenol] 104–105
acrolein [2-propenal] 106–107
dihydroxy-*α*-[(methylamino)methyl]benzyl alcohol (3,4-) [adrenaline] 106–107
methyl ethyl ketone [2-butanone] 108–109
diethylstilbesterol 108–109
benzenethiol [thiophenol] 110
resorcinol [1,3-benzenediol] 111
isobutyl alcohol [2-methyl-1-propanol] 112
crotonaldehyde [2-butenal] 113–115
dichlorophenol (2,4-) 113–115
dichlorophenol (2,6-) 113–115
methylacrylonitrile (2-) [propanenitrile, 2-hydroxy-2-methyl-] 116–118
allyl alcohol [2-propen-1-ol] 116–118

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chlorocresol [4-chloro-3-methylphenol] 116–118
dimethylphenol (2,4-) 119
chloropropene (3-) [allyl chloride] 120
dichloropropene (*cis*-1,3-) 121–125
dichloropropene (*trans*-1,3-) 121–125
tetrachloroethane (1,1,2,2-) 121–125
trichlorophenol (2,4,5-) 121–125
trichlorophenol (2,4,6-) 121–125
chloroethane [ethyl chloride][r] 126
dichloropropene (2,3-) 127–130
hydrazine [diamine] 127–130
benzyl chloride [chloromethylbenzene] 127–130
dibromomethane [methylene bromide] 127–130
dichloroethane (1,2-) 131
mustard gas [bis(2-chloroethyl) sulfide] 132–134
nitrogen mustard 132–134
N,N-bis(2-chloroethyl)-2-naphthylamine [chlornaphazine] 132–134
dichloropropene (3,3-) 135
dichloro-2-butene (1,4-) 136–138
tetrachlorophenol (2,3,4,6-) 136–139
bromoacetone [1-bromo-2-propanone] 136–139
hexachlorophene [2,2′-methylenebis(3,4,6-trichlorophenol)] 136–139
dioxane (1,4-) [1,4-diethylene oxide] 140
chlorambucil 141
nitrobenzene 142–143
chloropropionitrile (3-) [3-chloropropanenitrile] 142–143
dichloro-2-propanol (1,1-) 144–145
DDD [dichlorodiphenyldichloroethane] 144–145
dichloro-2-propanol (1,3-) 146
phthalic anhydride [1,2-benzenedicarboxylic acid anhydride] 147–149
methyl parathion 147–149
nitrophenol (4-) 147–149
tetrachloromethane [carbon tetrachloride] 148–153
chlorodifluoromethane [Freon 22][r] 148–153
pentachlorophenol 148–153
hexachlorocyclohexane [lindane] 148–153
dichlorofluoromethane [Freon 21][r] 154–157
dinitrobenzene (1,3-) 154–157
nitroaniline [4-nitrobenzenamine] 154–157
pentachloroethane 154–157
dinitrobenzene (1,4-) 158–161
dinitrobenzene (1,2-) 158–161
trichloroethane (1,1,2-) 158–161
trichloromethane [chloroform] 158–161
isodrin 162–164
dieldrin 162–164
aldrin 162–164
dichloropropane (1,3-) 165
nitrotoluidine (5-) [benzenamine, 2-methyl-5-nitro-] 166–167
chloroacetaldehyde 166–167
trichloropropane (1,2,3-) 168–173
dinitrotoluene (2,4-) 168–173
dinitrotoluene (2,6-) 168–173
hexachlorocyclopentadiene 168–173
benzal chloride [α,α-dichlorotoluene] 168–173
dichloro-1-propanol (2,3-) 168–173
ethylene oxide [oxirane] 174
dichloroethane (1,1-) [ethylidene dichloride] 175–178
dimethylcarbamoyl chloride 175–178
[illegible] 175–178
DDT [dichlorodiphenyltrichloroethane] 175–178
dichloropropane (1,2-) [propylene dichloride] 179
auramine 180–181
heptachlor 180–181
dichloropropane (1,1-) 182
chloro-2,3-epoxypropane (1-) [oxirane, 2-chloromethyl-] 183–186
dinitrophenol (2,4-) 183–186
bis(2-chloroethyl) ether 183–186
trinitrobenzene [1,3,5-trinitrobenzene] 183–186
butyl-4,6-dinitrophenol (2-*sec*-) [DNBP] 187–188
cyclohexyl-4,6-dinitrophenol (2-) 187–188
bis(2-chloroethoxy)methane 189–192
chloral [trichloroacetaldehyde] 189–192
trichloromethanethiol 189–192
dinitrocresol (4,6-) [phenol, 2,4-dinitro-6-methyl-] 189–192
heptachlor epoxide 193
diepoxybutane (1,2,3,4-) [2,2′-bioxirane] 194
benzotrichloride [trichloromethylbenzene] 195–196
methapyrilene 195–196
phenacetin [*N*-(4-ethoxyphenyl)acetamide] 197–198
methylhydrazine 197–198
dibromoethane (1,2-) [ethylene dibromide] 199
aflatoxins 200
trichloroethane (1,1,1-) [methylchloroform] 201
hexachloroethane 202–203
bromoform [tribromomethane] 202–203
chlorobenzilate 204–207
ethyl carbamate [urethan] [carbamic acid, ethyl ester] 204–207
ethyl methacrylate [2-propenoic acid, 2-methyl-, ethyl ester] 204–207
lasiocarpine 204–207
amitrole [1*H*-1,2,4-triazol-3-amine] 208–209
muscimol [5-aminomethyl-3-isoazotol] 208–209
iodomethane [methyl iodide] 210
dichlorophenoxyacetic acid (2,4-) [2,4-D] 211–213
chloroethyl vinyl ether (2-) [ethene, (2-chloroethoxy)-] 211–213
methylenebis(2-chloroaniline) (4,4-) 211–213
dibromo-3-chloropropane (1,2-) 214
tetrachloroethane (1,1,1,2-) 215
dimethylhydrazine (1,1-) 216–217
N,N-diethylhydrazine [1,2-diethylhydrazine] 216–217
chloromethyl methyl ether [chloromethoxymethane] 218–220
dimethyl-1-(methylthio)-2-butanone, *O*-[(methylamino)carbonyl] 218–220
oxime (3,3-) [thiofanox]
dimethylhydrazine (1,2-) 218–220
chlordane (α and γ isomers) 221
bis(chloromethyl) ether [methane, oxybis(2-chloro-)] 222–223
parathion 222–223
dichloropropane (2,2-) 224
maleic hydrazide [1,2-dihydro-3,6-pyridazinedione] 225
bromophenyl phenyl ether (4-) [benzene, 1-bromo-4-phenoxy-] 226
bis(2-chloroisopropyl) ether 227–228
dihydrosafrole [1,2-(methylenedioxy)-4-propylbenzene] 227–228
methyl methanesulfonate (methanesulfonic acid, methyl ester) 229

propane sulfone (1,3-) [1,2-oxathiolane, 2,2-dioxide] 230
saccharin [1,2-benzoisothiazolin-3-one, 1,1-dioxide] 231
methyl-2-(methylthio)propionaldehyde *O*-(methylcarbamyl)oxime (2-) 232–233
methyomyl 232–233
hexachloropropene 234
pentachloronitrobenzene [PCNB] 235–239
diallate [*S*-(2,3-dichloroallyl)diisopropyl thiocarbamate] 235–239
ethylenimine [aziridine] 235–239
aramite 235–239
dimethoate 235–239
trichlorophenoxyacetic acid (2,4,5-) [2,4,5-T] 240–241
trichlorophenoxypropionic acid (2,4,5-) [2,4,5-TP] [silvex] 240–241
tris(2,3-dibromopropyl)phosphate 242
methylaziridine (2-) [1,2-propylenimine] 243–244
methoxychlor 243–244
brucine [strychnidin-10-one, 2,3-dimethoxy-] 245–246
kepone 245–246
isosafrole [1,2-(methylenedioxy)-4-allylbenzene] 247–249
safrole [1,2-methylene-4-allylbenzene] 247–249
tris(1-aziridinyl)phosphine sulfide 247–249
dimethoxybenzidine (3,3'-) 250
diphenylhydrazine (1,2-) 251
O,O-diethylphosphoric acid, *O*-*p*-nitrophenyl ester 252
n-butylbenzyl phthalate 253
O,O-diethyl-*O*-2-pyrazinylphosphorothioate 254
dimethylaminoazobenzene 255
diethyl phthalate 256–257
O,O-diethyl-*S*-methyl ester of phosphoric acid 256–257
O,O-diethyl *S*-[(ethylthio)methyl] ester of phosphorodithioic acid 258–259
citrus red no. 2 [2-naphthol, 1-[(2,5-dimethoxyphenyl)azo-]] 258–259
trypan blue 260
ethyl methanesulfonate [methanesulfonic acid, ethyl ester] 261–265
disulfoton 261–265
diisopropylfluorophosphate [DFP] 261–265
O,O,O-triethylphosphorothioate 261–265
di-*n*-butyl phthalate 261–265
paraldehyde [2,4,6-trimethyl-1,3,5-trioxane] 266
di-*n*-octyl phthalate 267
octamethylpyrophosphoramide [octamethyldiphosphoramide] 268
bis(2-ethylhexyl) phthalate 269–270
methylthiouracil 269–270
propylthiouracil 271
strychnine [strychnidin-10-one] 272
cyclophosphamide 273–276
nicotine [(*S*)-3-(1-methyl-2-pyrrolidinyl)pyridine] 273–276
reserpine 273–276
toluidine hydrochloride [2-methylbenzenamine hydrochloride] 273–276
tolylene diisocyanate [1,3-diisocyanatomethylbenzene] 277
endrin 278
butanone peroxide (2-) [methyl ethyl ketone, peroxide] 279
tetraethylpyrophosphate 280
nitroglycerine [trinitrate-1,2,3-propanetriol] 281
tetraethyldithiopyrophosphate 282
ethylenebis(dithiocarbamic acid) 283
tetranitromethane 284
uracil mustard [5-[bis(2-chloroethyl)amino]uracil] 285
acetyl-2-thiourea (1-) [acetamide, *N* (aminothioxomethyl)-] 286–290
(chlorophenyl)thiourea (1-) [thiourea, (2-chlorophenyl)-] 286–290
N-phenylthiourea 286–290
naphthyl-2-thiourea (1-) [thiourea, 1-naphthalenyl-] 286–290
thiourea [thiocarbamide] 286–290
daunomycin 291–292
ethylenethiourea [2-imidazolidinethione] 291–292
thiosemicarbazide [hydrazinecarbothioamide] 293–294
melphalan [alanine, 3-[*p*-bis(2-chloroethyl)amino]phenyl-, L-] 293–294
dithiobiuret (2,4-) [thioimidodicarbonic diamide] 295–296
thiuram [bis(dimethylthiocarbamoyl) disulfide] 295–296
azaserine [L-serine, diazoacetate (ester)] 297
hexaethyl tetraphosphate 298
nitrogen mustard *N*-oxide 299–300
nitroquinoline 1-oxide (4-) 299–300
cycasin [*β*-D-glucopyranoside, (methyl-ONN-azoxy)methyl-] 301
streptozotocin 302
N-methyl-*N'*-nitro-*N*-nitrosoguanidine 303–318
N-nitroso-diethanolamine [(2,2'-nitrosoimino)bisethanol] 303–318
N-nitroso-di-*N*-butylamine [*N*-butyl-*N*-nitroso-1-butanamine] 303–318
N-nitroso-*N*-ethylurea [*N*-ethyl-*N*-nitrosocarbamide] 303–318
N-nitroso-*N*-methylurea [*N*-methyl-*N*-nitrosocarbamide] 303–318
N-nitroso-*N*-methylurethane 303–318
N-nitrosodiethylamine [*N*-ethyl-*N*-nitrosoethanamine] 303–318
N-nitrosodimethylamine [dimethylnitrosamine] 303–318
N-nitrosomethylethylamine [*N*-methyl-*N*-nitrosoethanamine] 303–318
N-nitrosomethylvinylamine [*N*-methyl-*N*-nitrosoethenamine] 303–318
N-nitrosomorpholine 303–318
N-nitrosonornicotine 303–318
N-nitrosopiperidine [hexahydro-*N*-nitrosopyridine] 303–318
N-nitrososarcosine 303–318
nitrosopyrrolidine [*N*-nitrosotetrahydropyrrole] 303–318
di-*n*-propylnitrosamine [*N*-nitrosodi-*n*-propylamine] 303–318
oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid (7-) [endothal] 319
endosulfan 320

Footnotes: [a]Boldface print indicates compound thermal stability is experimentally evaluated; ranking based on UDRI experimental data coupled with reaction kinetic theory. Italicized print indicates compound thermal stability is ranked on the basis of literature experimental data coupled with reaction kinetic theory. [b]This compound is not currently on the U.S. EPA Appendix VIII list. [c]N.O.S. listing; ranking is based on either UDRI or literature ex-

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Annex E 2

AVR Incineration Specifications

AVR, Cherie B.V. operates according to Dutch incineration standards for chlorinated hydrocarbons (summary):

Process and permit conditions:

- temperature:	1200 C (continueous monitoring)
- residence time in gasphase:	2 sec
- oxygen % in offgases:	3 %
- removal efficiency:	99.999% (permit condition) (*)
- flow of offgases:	15 m/s

(*) AVR states that recent mesurements have proven that the incineration of PCB's results in a conversion of at least 99.9999%. SNC has requested and will probably receive a report on the mesurements supporting this statement.

Offgas monitoring:

- contineous: mesurement and registration of the emission of: SO2, HCl, HF and total hydrocarbons.
- every week: 1-hour and 24-hour mesurements of SO2, HCl and HF emissions.
- every week: 1-hour mesurement of dust emission.
- every week: quantitative determination of heavy metals in the above mentioned dust sample: Sn, Ni, Cu, Cd, Pb, Zn, Cr, Co, Ag and Au.
- every month: quantitative determination of Hg in the above mentioned dust sample.
- every year: before the 1st of February AVR has to report the following results on emission measurements of the year before:

  # for each emission mesurement and for each component: concentration (mg/m3) and emission (kg/hr).
  # offgasflow, -temperature and -moisture content
  # date and time of the mesurements
  # overview of actions after incidents
  # mesurement methods

Emission levels

* Heavy metals (based on dry offgases and 11% oxygen) median of cumulative distribution of hour-average samples of 1 year should not exceed:

- Pb: 1.5 mg/m3
- Zn: 50 "
- Cu: 2 "
- Cd: 0.05 "
- Cr: 5 "
- Ni: 1 "
- Sn: 20 "
- Co: 1 "
- Ag: 0.1 "
- As: 0.5 "
- Hg: 0.05 "

* Components (wet offgases, yearly average, 11 % oxygen):

- dust:	50	mg/m3 resp.	4.5	kg/hr as 24 hour average
:	75	mg/m3 resp.	6.75	kg/hr as 1 hour average
- HCl:	100	mg/m3 resp.	9.0	kg/hr as 24 hour average
:	100	mg/m3 resp.	9.0	kg/hr as 1 hour average
- HF:	2	mg/m3 resp.	0.18	kg/hr as 24 hour average
:	5	mg/m3 resp.	0.45	kg/hr as 1 hour average
- SO2:	400	mg/m3 resp.	36.0	kg/hr as 24 hour average
:	500	mg/m3 resp.	45.0	kg/hr as 1 hour average

During 1989 the Dutch Government decided to tighten the emission standards ("Richtlijn verbranden 1989"). The new standards issued by the Ministry of Environmental Affairs are immediately applicable for new waste incineration installations. Existing waste incinerators will have to try to comply to them by December 31, 1992. From December 1, 1993 onwards the new standards will be fully applicable for existing waste incinerators (e.g. AVR).

The emission to air of an incinerator is not allowed to exceed the following maximum emission levels:

Component	Maximum emission (mg/m3)	Mesurement frequency: (per annum)
Total dust	5	contineous
Hydrochloric acid	10	contineous
Fluorines	1	4 *
CO	50	contineous
Organic components (as C)	10	contineous
SOx	40	SO2: contineous SO3: 4 * (existing: ult. 31.12.1997)
NOx	70	
PCDD's and PCDF's (dioxines and dibenzofuranes)	0.1 nanogram TEQ/m3	2 *

Heavy metals:

Sb+Pb+Cr+Cu+Mn+V+Sn+ As+Co+Ni+Se+Te	1.0	4 *
Cd	0.05	4 *
Hg	0.05	4 *

The maximum emission levels mentioned are related to dry offgases under normal conditions (273 K, 101.3 kPa), calculated to 11% oxygen and measured as hourly-averaged values.

The maximum emission levels have to be measured according to prescribed standard methods and with a frequency as given in the table above.

AVR will provide post burn documents to SNC and USAID, presenting the process conditions and offgas monitoring results during the incineration of the contents of the 4 isotanks. It is possible to visit AVR during the incineration of Dieldrin.

Annex M: Niger Communication Traffic

III/25

AGR 4L

VZCZCNMI *
PP RUEHC RUEHAB RUTABM RUFHPC RUFHLD RUFHOC
DE RUEHNM #8033/01 249 **
ZNR UUUUU ZZH
P 061322Z SEP 90
FM AMEMBASSY NIAMEY
TO RUEHC / SECSTATE WASHDC PRIORITY
RUEHAB / AMEMBASSY ABIDJAN 6763
RUTABM / AMEMBASSY BAMAKO 8450
RUFHPC / AMEMBASSY LOME 8843
RUFHLD / AMEMBASSY LONDON 1025
RUFHOC / AMEMBASSY OUAGADOUGOU 2365
BT
UNCLAS NIAMEY 08033

RECEIVED
6 SEP 90 16 29
USAID/NIGER

CLASS: UNCLASSIFIED
CHRGE: AID 09/05/90
APPRV: DIR:GTEATON
DRFTD: DRU:[illegible]
CLEAR: 1. GDO:JSLAT
2. ADO:GTAYL
3. EXO:AVODR

DISTR: AMB DCM AID

AIDAC/LOCUST

E.O. 12356: N/A
TAGS:
SUBJECT: DIELDRIN/NIGER: SHELL PROPOSAL

1. SUMMARY: THE MISSION HAS RECEIVED AN UNSOLICITED PROPOSAL FROM SHELL INTERNATIONAL FOR THE RETRIEVAL AND DISPOSAL OF DIELDRIN STOCKS IN NIGER. WE REQUEST AID/W COMMENTS ON THE PROPOSAL AND ADDITIONAL INFORMATION AS INDICATED BELOW. END SUMMARY.

2. FOLLOWING THEIR PARTICIPATION IN THE JANUARY, 1990, USAID SPONSORED PESTICIDE DISPOSAL CONFERENCE IN NIAMEY, SHELL INTERNATIONAL HAS BEEN IN CONTACT WITH USAID/NIGER ON A PERMANENT SOLUTION TO THE PROBLEM POSED BY DIELDRIN STOCKS IN NIGER. AS A RESULT OF THIS INTEREST SHELL HAS SUBMITTED A PROPOSAL TO USAID/NIGER FOR MOVING THE DIELDRIN TO HOLLAND AND FOR ITS DISPOSAL IN A COMMERCIAL INCINERATOR. COPIES OF THE PRELIMINARY PLAN HAVE BEEN SENT BY MAIL TO AFR/TR/ANR/NR AND OFDA. THE PROPOSAL CALLS FOR:

— THE COLLECTION OF DIELDRIN STOCKS IN NIGER AT AGADEZ

— THE TRANSFER OF THE DIELDRIN INTO ISOTANKS;

— THE CLEANING AND CRUSHING OF THE EMPTIED BARRELS

— COLLECTION OF DIELDRIN CONTAMINATED SOIL AND PLACEMENT IN EMPTIED DIELDRIN DRUMS:

— SEALING OF DIELDRIN CONTAMINATED WAREHOUSE FLOOR AND;

— THE TRANSPORTATION OF THE ISOTANKS FROM AGADEZ OVERLAND TO LOME AND THEN, VIA BOAT, TO HOLLAND FOR DISPOSAL IN A LICENSED INCINERATOR.

3. SHELL HAS DEVELOPED THE PRELIMINARY PLAN AND SUBMITTED IT TO USAID/NIGER FOR REVIEW. A COPY OF THE SHELL PLAN HAS ALSO BEEN PASSED TO THE GON FOR REVIEW.

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4. SHELL PROPOSES TO MAKE THE ARRANGEMENTS FOR THE DISPOSAL IN HOLLAND, DEVELOP THE DETAILED PLAN AND PROVIDE TECHNICAL ASSISTANCE FOR THE TRANSFER OPERATION. THEY HAVE REQUESTED USAID/NIGER TO ARRANGE AND DIRECT ALL LOCAL OPERATIONS AND TO FINANCE THE PROCUREMENT OF THE EQUIPMENT NEEDED FOR THE OPERATION, THE COST OF TRANSPORTATION OF THE EQUIPMENT TO NIGER AND THE DIELDRIN TO HOLLAND, LOCAL COSTS AND A DISPOSAL CHARGE IN HOLLAND. THE TOTAL AID REQUIRED FUNDING WOULD BE ABOUT 100,000 DOLLARS. USAID/NIGER HAS ALREADY SET ASIDE APPROXIMATELY 70,000 DOLLARS, THEREFORE AID/W WOULD BE ASKED TO PROVIDE APPROXIMATELY 30,000 DOLLARS.

- USAID/NIGER IS ALSO BEING REQUESTED TO ACT AS THE LIAISON BETWEEN SHELL AND THE GON. USAID/NIGER ALREADY HAS A FORMAL RELATIONSHIP WITH THE GON ON REDUCING THE RISK POSED BY DIELDRIN.

- SHELL HAS PROPOSED A SHORT TIME FRAME FOR THE COMPLETION OF THE COLLECTION AND TRANSPORTATION SEGMENT OF THE PLAN. THEY HAVE REQUESTED THAT A TECHNICAL ASSESSMENT TEAM VISIT NIGER FOR ONE WEEK O/A SEPTEMBER 10 AND A TECHNICAL PLANNING AND REVIEW MEETING BE HELD IN EUROPE AT THE END OF SEPTEMBER...WE HAVE ALREADY INFORMED SHELL THAT WE WOULD NOT BE ABLE TO MAINTAIN THIS TIME TABLE.

- USAID AND GON REVIEW AND APPROVAL OR DISAPPROVAL OF THE OPERATION HAS BEEN SCHEDULED BY SHELL TO TAKE PLACE BY THE END OF SEPTEMBER. THE ACTUAL COLLECTION AND SHIPMENT OPERATION WOULD TAKE PLACE BETWEEN NOVEMBER AND DECEMBER WITH THE TRANSPORTATION AND DISPOSAL SCHEDULED FOR JANUARY - MARCH, 1991. GIVEN USAID WORKLOAD, THIS SCHEDULE IS ALSO NOT PRACTICAL.

5. FOR AID/W: WE WOULD LIKE TO REQUEST AID/W COMMENTS ON THE SHELL PROPOSAL AS SOON AS CONVENIENT. WE ARE

SPECIFICALLY INTERESTED IN WHETHER WE WOULD HAVE TO DO AN AMENDMENT TO OUR SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT (SEA) TO COVER THIS OPERATION. WHAT OTHER FACTORS SHOULD WE CONSIDER? FYI: THE DISPOSAL OF THE DIELDRIN IS ALREADY AN OBJECTIVE STATED IN THE SEA. END FYI.

- IN ADDITION, WHAT TECHNICAL ASSISTANCE OR ADVICE WOULD AID/W AND OTHER RELEVANT USG AGENCIES RECOMMEND IN CONSIDERING THIS PROPOSED OPERATION.

6. - FOR OTHER ADDRESSEES, ESPECIALLY TRANSIT COUNTRIES WE WOULD APPRECIATE ANY COMMENTS YOU MIGHT HAVE ON FEASIBILITY OF TRANSITING DIELDRIN ON THE WAY TO SUCH DISPOSAL IN HOLLAND.

7. PLEASE ADVISE SOONEST. CUNDIFF

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USAID/NIGER

CLASS: UNCLASSIFIED
CHRGE: AID 09/12/90
APPRV: DIR:GTEATON
DRFTD: RCO GRENDER
CLEAR: 1. EXO:AVODRAS
2. CDO:DRU:CKE
DISTR: ~~AMS DCM AID~~

ADM AID

FOR MS/PPE FROM RCO RENDER

E.O. 12356: N/A
TAGS:
SUBJECT: UNSOLICITED PROPOSAL

1. USAID/NIGER HAS RECEIVED AN UNSOLICITED PROPOSAL FOR A UNIQUE AND INNOVATIVE METHOD OF DISPOSING OF OBSOLETE DIELDRIN PESTICIDE NOW BEING STORED IN NORTHERN NIGER.

2. IN READING AIDAR SUBPART 715.5 UNSOLICITED PROPOSALS, THERE IS NO DISTINCTION MADE BETWEEN UNSOLICITED PROPOSALS SUBMITTED TO AID/W AND THOSE SUBMITTED TO CONTRACTING ACTIVITIES OVERSEAS. AS A COMPARISON OF MISSION VERSUS AID/W AUTHORITY, HB 13 GRANTS, CHAPTER 2, AUTHORIZES OVERSEAS CONTRACTING ACTIVITIES TO AWARD MISSION FUNDED GRANTS OR COOPERATIVE AGREEMENTS BASED ON UNSOLICITED PROPOSALS WHEN CERTAIN CRITERIA ARE MET. THEREFORE, IT WOULD SEEM TO FOLLOW THAT OVERSEAS CONTRACTING ACTIVITIES, WHEN FOLLOWING THE GUIDELINES OF FAR SUBPART 15.5, SHOULD ALSO HAVE THE AUTHORITY TO AWARD CONTRACTS BASED ON UNSOLICITED PROPOSALS. FURTHER TO THIS, THE FAR MAKES NO MENTION OF A SINGLE AGENCY CONTACT POINT AND IN FACT AID/W HAS TWO CONTACT POINTS. ONCE A MISSION ESTABLISHES PROCEDURES TO HANDLE RECEIPT AND EVALUATION OF UNSOLICITED PROPOSALS THIS WOULD MEET THE REQUIREMENTS OF THE FAR. IF THIS IS NOT IN ACCORDANCE WITH AGENCY POLICY, WILL AID/W DELEGATE AUTHORITY TO THE MISSION TO PROCESS THE UNSOLICITED PROPOSAL? IF SO, IT SHOULD BE NOTED THAT USAID/NIGER HAS REVIEWED THE PROPOSAL AND IS PREPARED TO COMPLY WITH REQUIREMENTS FOUND IN FAR SUBPART 15.5 UNSOLICITED PROPOSALS, INCLUDING ADVERTISING REQUIREMENTS AND SOLE SOURCE JUSTIFICATION PURSUANT TO FAR 6.302-1 AS REQUIRED BY AIDAR 715.506-1 TO EFFECT AWARD OF A COST TYPE CONTRACT.

3. PLEASE ADVISE SOONEST AS THE PROPOSAL IS CONTINGENT UPON GOVERNMENT OF THE NETHERLANDS AND GOVERNMENT OF NIGER TIME CONSTRAINTS. CUNDIFF
BT
#8244

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INFO RUEHC / SECSTATE WASHDC PRIORITY 8355
RUEHAB / AMEMBASSY ABIDJAN 6930
RUTABM / AMEMBASSY BAMAKO 8545
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RUEHRO / AMEMBASSY ROME 2445
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USAID/NIGER

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CLASS: UNCLASSIFIED
CHRGE: AID 10/09/90
APPRV: GDO:JSLATTERY
DRFTD: DRU:CKELLY:PAO
CLEAR: RDO:GTAYLOR(IN
DISTR: AMB DCM AID
CHRON

AIDAC

LONDON AND THE HAGUE FOR SCIENCE/ENVIRONMENTAL COUNSELOR;
AID/W FOR AFR/TR/ANR/NR ABLGA PROJECT,
AFR/SWA - N. MCKAY, OFDA;
ABIDJAN FOR REDSO/WCA, REO AND PASS TO APHIS;
ROME FOR FODAG AND PASS TO FAO

E.O. 12356: N/A
TAGS:
SUBJECT: DIELDRIN/NIGER: LONDON MEETING WITH SHELL

REF: STATE 320183

1. PER REFTEL AND SEPTEL, SHELL HAS CONFIRMED THE SCHEDULING OF A TECHNICAL REVIEW MEETING ON THE NIGER DIELDRIN DISPOSAL PLAN FOR OCTOBER 15 AT 1000 AT SHELL CENTER, LONDON. THE MEETING WILL COVER:

A. REVISIONS TO THE SHELL PROPOSAL FOLLOWING THE TECHNICAL ASSESSMENT VISIT TO NIGER BY SHELL PERSONNEL

B. A POINT BY POINT RESPONSE TO THE ISSUES AND QUESTIONS RAISED IN REFTEL ABOUT THE PROPOSAL,

C. PRESENTATION OF A PROPOSED AGREEMENT BETWEEN SHELL AND AID ON THE IMPLEMENTATION OF THE PROPOSAL, AND

D. DISCUSSION OF FURTHER STEPS FOR IMPLEMENTATION OF THE DISPOSAL PLAN.

FYI: PER POINT 1. B: SHELL WILL BE ADVISED THAT USAID/NIGER CANNOT ACCEPT THE PROPOSED SHELL AGREEMENT PER SE, BUT THE DOCUMENT WILL BE USED TO DEFINE SHELL'S CONCERNS FOR USE IN WRITING ANY EVENTUAL AGREEMENT WHICH MAY BE PROPOSED BY USAID TO SHELL. END FYI.

2. AS INDICATED SEPTEL, CHARLES KELLY, THE MISSION'S DISASTER RELIEF COORDINATOR WILL BE ATTENDING THIS MEETING AS AN OBSERVER AND TECHNICAL CONSULTANT FOR USAID/NIGER. KELLY WILL BE TRAVELLING TO WASHINGTON

FOLLOWING THE MEETING AND WILL UNDERTAKE FURTHER TECHNICAL DISCUSSIONS WITH APPROPRIATE AID/W PERSONNEL ON THE FURTHER DEVELOPMENT OF THE DISPOSAL PLAN.

3. FOR LONDON:

- THE SHELL PROPOSAL FOR DISPOSAL OF DIELDRIN IN NIGER IS INNOVATIVE AND IS SEEN BY SHELL AND USAID AS A POSSIBLE PROTOTYPE FOR FUTURE INDUSTRY-GOVERNMENT COOPERATION IN DEALING WITH UNUSABLE PESTICIDES AND HAZARDOUS MATERIALS IN DEVELOPING COUNTRIES. WE ARE SURE SHELL WOULD HAVE NO OBJECTION TO HAVING EMBASSY PARTICIPATION IN THE OCTOBER 15 MEETING. ALTERNATIVELY, KELLY COULD BRIEF APPROPRIATE EMBASSY PERSONNEL ON THE SHELL PROPOSAL AND FOLLOW-UP ACTIONS ON THE MORNING OF OCTOBER 16. THE SHELL CONTACT FOR THE DISPOSAL PLAN IS MR. LORRIE DOLLIMORE, SHELL SICC LONDON, CHSEL/23: PHONE:72-934-5339; FAX 71-934-6938. KELLY WILL CONTACT EMBASSY UPON ARRIVAL.

4. FOR THE HAGUE AND LONDON:

- SHELL'S DIELDRIN DISPOSAL PLAN EFFORT IS BEING RUN OUT OF LONDON, WITH TECHNICAL BACKSTOP COMING FROM SHELL/HOLLAND. ELEMENTS OF THE PROPOSED DISPOSAL PLAN INVOLVE THE GOVERMENT OF HOLLAND AND THE ACTUAL DISPOSAL OF THE DIELDRIN HAS BEEN PROPOSED TO TAKE PLACE IN HOLLAND. WE FEEL IT MAY BE USEFUL FOR KELLY TO DISCUSS BY TELEPHONE WITH APPROPRIATE EMBASSY PERSONNEL THE SHELL PROPOSAL, THE REQUIREMENTS FOR COORDINATION WITH THE GOVERNMENT OF HOLLAND AND POSSIBLE EXPECTED BACKSTOPPING NEEDS FROM EMBASSY/THE HAGUE. A CALL COULD BE ARRANGED FOR OCTOBER 16.

- ASSISTANCE FROM AMEMBASSY LONDON IN MAKING APPROPRIATE CONTACTS IN THE HAGUE WOULD VERY MUCH BE APPRECIATED.
CUNDIFF
BT
#9179

NNNN

Subject: Dieldrin - Niger

Place/Date: Shell Centre, London 15th October 1990

Present:

C. Kelly,	USAID, Niger	
J.A.M. Willemson,	SNC, Pernis,	CAS/2
J.P. Backer,	SNC, Pernis,	JVR
D.P. Zwartbol,	SICM, The Hague	CMFA/132
D. Box	SICC, London	CIMCI/3
E. Nickson,	SICC, London	CPA/2
L.S. Dollimore,	SICC, London	CHSEL/23

Distribution: Participants

SICC, London CIMC CIMCI CRME/1 CHSEL/2 CIMDF/21/23
SIPC, London, ME/3
SICM, The Hague, CMFA/1 CHSE/12
SIPM, The Hague HSE/38
Shell Chemie, Abidjan, IPC

The following are the salient points of the meeting.

1. General

Objectives

1. review findings from recent SNC/SICM visit to Niger to view dieldrin stocks.
2. review and discuss points in USAID table of 20/9/90
3. agree revised plan of action and outline costing
4. agree next steps

As introduction, the SNC/SICC/SICM company relationship and USAID organisational/governmental relationships were explained.

In essence, USAID situation re Niger, as follows:

- bilateral agreement with Govt of Niger (GON) to cover all US activities
- USAID provides technical resources and means
- Grasshopper/locust campaign is major current activity
- "Dieldrin risk reduction implementation plan" is related activitity
- re dieldrin activities:
  - USAID Niger has administrative control
  - USAID Washington has technical control
- USAID has a 'hold harmless' agreement with GON

CK explained USAID policy against use of dieldrin and background to current situation of unwanted dieldrin stocks.

Shell proposal termed "unsolicited proposal" - USAID contractual term with specific review procedure. Projects involving USAID financing obliged to comply US standards.

61D72

- 54.6m3 stock and not 27m3
- most containers in reasonably good condition; a few leakers
- local aspects of proposal seem relatively straightforward (subject to Washington approval)
- USAID having contents of some unlabelled drums checked (probably by GTZ).
- three drums DDVP found in Inabanghrit store-one leaking
- necessary utilities available at Agadez (location of main operation)
- drums will be transferred from Inabanghrit to Agadez.

Main outcome of visit:

- need for additional equipment and funding (due to higher volume of product)
- refinement of proposal details

3. USAID Cable 20/9/90 review/discussion

Cable reviewed in detail (informal CHSEL/23 commentary dated 10/10/90 passed to CK). Key points/actions arising:

- additional product found means additional cost (revised rough cost estimate given as Attachment 2)

- some non-Shell product found (DDVP). USAID will deal separately with disposal. Shell volunteered advice on handling.

  Action: Shell to provide CK with copy Shell Agricuture Safety Guide which covers this matter).

- propose burying contaminated sand/soil locally
- after clean-up, GTZ will lay concrete floor in Inabanghrit warehouse (currently sand).
- warehouse 2 (Agadez) will be decommissioned as pesticide warehouse.
  Action: CAS/2 to send CK details of floor sealant.
- USAID require details of Dutch incinerator emission standards and AVR performance
  ACTION: CHSEL/23 to fax info to Washington for 22 October.
- CK prefers rinsed/crushed drums to be smelted rather than buried.
  ACTION: CK to investigate possible use of smelter in Lome'
- CK prefers to fly product to Holland in view perceived difficulties/risks associated with trucking to Lome. May be able to use [illegible] considerable cost plus PA concern at Dutch end.

  Alternative proposal by CK is to fly product to Lome.
  ACTION: CK to check cost Agadez/Lome
  ACTION: CHSEL/23 to discuss trucking/flight options with Shell (ME/31)

6LD72

that stated in the original Shell proposal (letter to USAID of 9/8/90), namely:

Shell to act as a facilitator:

- to seek suitable incineration capacity (done)
- to seek necessary permits from the Dutch Authorities (done)
- to produce a detailed proposed plan of action
- to arrange and coordinate logistics outside of Africa
- to provide technical assistance to local operations
- to bear own costs

Shell will not accept additional costs, such as the cost of incinerating the product (as proposed in USAID cable)

the seeking by USAID of co-funding partners, such as FAO, will be time consuming and could force the project to miss the 1990/91 window.

there is no objection to USAID calling in additional experts or observers provided it is deemed essential for the project or will definitely benefit future projects. The preference is to have as few 'extras' as possible.

Shell (SNC) requires a written agreement before undertaking the project. There was discussion about under which country law the contract would operate - a USAID contract would apparently be under US law.
ACTION: CK to send Shell the model USAID agreement for scutiny.

ACTION: CK to consider possibility of SNC/GON agreement "Host country contract".

Contract and liability aspects clearly need further detailed discussion.

USAID Niger has notified GON of Shell's proposal (letter of 4/10/90 to Director of Min of Ag and Livestock).

4. <u>Plan of Action, costing and timing</u>

- revised outline proposal at 10/10/90 (including 54.6m3 product) is given in Attachment 1
- Operational aspects at Inabanghrit and Agadez are now reasonably well defined and, subject to Washington comment /input, can be finalised.

- Operations at the Dutch end are also well defined.

- Major current unknown is the movement to/from Niger, namely: truck/ship or plane/ship.

- USAID Washington require an environmental Assessment for the proposal.. Shell believes this would best be prepared by USAID

22 OCT '90 14:06 FROM CCL/DSA

themselv (in their appropriate format) the basis of data provided by Shell. Additional informatic can be provided by Shell if required.

ACTION: CK to discuss in Washington

Current estimated project costs (excluding Shell's costs) are given in Attachment 2.

timing is now a major concern (in view delays foreseen by USAID Washington's technical and procedural requirements). The latest date at which the local clean-up can be undertaken (before the weather gets too hot) is mid February. This means USAID/Shell 'go-ahead' is needed around end November latest in order make necessary arrangements. If this deadline is missed the earliest next window opens in November 1991.

a Nigerean would be officially in charge of the project

5. Next steps

23rd October - CK reviews proposal with USAID Washington

24th October - CK will fax feedback to Shell (CHSEL/23)

by 12th November - Shell to reply to USAID Washington on any points raised.

19th November - possible meeting between CK/Shell to review situation and if possible to finalise any agreement/plan. (Probable venue Holland)

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Ken III/25

AGENCY FOR INTERNATIONAL DEVELOPMENT
BUREAU FOR AFRICA
Office of Technical Resources
AFR/TR/ANR
Washington, DC 20523-1515

November 15, 1990

MEMORANDUM

TO: Ben Stoner, AFR/TR/ANR/NR

FROM: Walter I. Knausenberger, AFR/TR/ANR/NR

THROUGH: John Gaudet, AFR/TR/ANR/NR

SUBJ: Update No. 1 on Niger Dieldrin Disposal Implementation Plan

WE SENT A CABLE TO NIGER ON NOVEMBER 1, REGARDING PROGRESS TOWARDS DEVELOPING AN IMPLEMENTATION PLAN. THE ESSENCE OF THIS CABLE IS GIVEN BELOW, FOLLOWED BY A SUMMARY OF WHAT HAS TRANSPIRED SINCE THE LAST TECHNICAL REVIEW COMMITTEE MEETING (OCT. 23, 1990):

1. AFR/TR WILL KEEP USAID/NIGER FULLY INVOLVED IN THE PROCESS OF ELABORATING A DRAFT IMPLEMENTATION PLAN FOR THE REMOVAL AND DISPOSAL OF DIELDRIN IN NIGER. INDEED, WE SEE THE PROCESS AS DRIVEN BY THE MISSION, AND SUPPORTED BY AID/W TO THE EXTENT APPROPRIATE.

2. ON OCTOBER 23, 1990, AFR/TR CONVENED A TECHNICAL REVIEW COMMITTEE {TRC} MEETING {INVOLVING AFR/TR, ENE/TR, OFDA, ST/AGR, EPA/OPP, EPA/OIA AND USAID/NIGER/DRU}, TO ASSESS THE STATUS OF DELIBERATIONS FOLLOWING THE LONDON MEETING {REF B}, IDENTIFY TECHNICAL ISSUES REQUIRING AID/W INPUT AND TO DETERMINE THE NEXT STEPS TOWARDS DEVELOPING AN IMPLEMENTATION PLAN.

3. NO MAJOR NEW TECHNICAL ISSUES WERE IDENTIFIED AT THE TRC MEETING. THE FOLLOWING ARE THE MAIN FOLLOW-UP ITEMS FROM THIS MEETING:

- AFR/TR TO CONSIDER PARTICIPATION IN CO-FUNDING THIS ACTIVITY WITH USAID/NIGER;

- DEVELOP A DETAILED OUTLINE OF THE IMPLEMENTATION PLAN, WITH ASSIGNMENT OF RESPONSIBILITY FOR WRITING SECTIONS {DRAFTED 24 OCTOBER, REVIEWED AND REVISED BY 30 OCTOBER 1990};

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- AID/W TO FAX A COPY OF THE DRAFT OUTLINE, ONCE REVIEWED, TO SHELL FOR THEIR RESPONSE AND AGREEMENT ON WRITING TASKS {FAX SENT 30 OCTOBER};

- AFR/TR TO ASSEMBLE INFORMATION ON A.I.D. CONTRACTS PROCESS {STANDARD PROVISIONS, ETC.} TO SEND TO SHELL LONDON;

- EPA TO PROVIDE USG GUIDELINES AND STANDARDS ON HAZARDOUS WASTE INCINERATION AND TRANSPORTATION;

- OBTAIN MORE INFORMATION ON CROSS-BORDER TRANSIT OF PESTICIDES {SEPTEL SENT TO OUAGA AND LOME};

- DETERMINE FEASIBILITY OF MELTING DOWN THE EMPTY BARRELS AT THE SMELTING PLANT IN LOME {SEPTEL SENT};

- CONTACT GTZ PESTICIDE SERVICE PROJECT REGARDING POSSIBLE INVOLVEMENT IN THE DIELDRIN REMOVAL PROCESS {LETTER SENT OCTOBER 30, 1990}.

- INITIATE DISCUSSION WITH AID/GC REGARDING LEGAL AND REGULATORY ISSUES.

4. A COPY OF THE DRAFT OUTLINE OF THE DIELDRIN REMOVAL IMPLEMENTATION PLAN HAS BEEN POUCHED TO USAID/NIGER WITH MATERIALS RESULTING FROM THE LONDON MEETING. ALL DOCUMENTATION, CABLES, ETC. DEVELOPED IN CONNECTION WITH THIS EFFORT WILL BE PROVIDED TO USAID/NIGER.

5. TO ALLOW THE DRAFT IMPLEMENTATION PLAN TO BE DEVELOPED TO THE FULLEST EXTENT POSSIBLE WHILE KELLY IS STILL IN THE U.S., AFR/TR PROPOSED THAT KELLY EXTEND HIS STAY BY THREE DAYS, UNTIL NOVEMBER 25. THIS SHOULD ALLOW HIS INPUTS TO BE MERGED WITH THOSE PROVIDED BY SHELL AND AID/W, AND ANOTHER TRC MEETING TO BE CONVENED ON NOVEMBER 19, 1990. ON THE WAY BACK TO NIGER, KELLY PROPOSES TO TRAVEL THROUGH THE HAGUE TO VISIT SHELL {NOVEMBER 22}, AND ON TO FRANKFURT TO VISIT GTZ {NOVEMBER 23} TO DISCUSS THIS PLAN. KELLY'S INPUT INTO THE DEVELOPMENT, ASSEMBLY, AND BACKSTOPPING OF THE IMPLEMENTATION PLAN IS ESSENTIAL. HIS WILLINGNESS TO PARTICIPATE SO FULLY, INCLUDING DRAFTING MAJOR PARTS OF THE PLAN--DESPITE HIS BEING ON VACATION--IS COMMENDABLE.

6. IF MATTERS DEVELOP AS PLANNED, IT SHOULD BE POSSIBLE TO HAVE THE MAJOR ELEMENTS OF AN IMPLEMENTATION PLAN READY FOR ADMINISTRATIVE REVIEW BY AID/W AND USAID/NIGER IN DECEMBER 1990. ISSUES SUCH AS COST DETAILS, A.I.D.-SHELL AGREEMENTS, GON APPROVAL, WILL HAVE TO BE WORKED OUT BY THE MISSION. IN ANY CASE, NO COMMITMENTS WILL BE MADE IN AID/W WITHOUT FULL MISSION PARTICIPATION.

SUBSEQUENT ACTIVITIES, IN REFERENCE TO THE ABOVE LIST, PARA. 4:

1. THE DRAFT OUTLINE OF THE IMPLEMENTATION/OPERATIONS PLAN WAS SENT TO SHELL INTERNATIONAL, AND THEY READILY AGREED TO WRITE OR

CONTRIBUTE TO 11 OF THE 18 SECTIONS OF THE PLAN. THIS INPUT IS EXPECTED BY 15 NOVEMBER.

2. A FIRST DRAFT OF THE SECTIONS TO BE WRITTEN BY A.I.D. HAS BEEN PREPARED (ATTACHED).

3. DISCUSSIONS HAVE BEEN CONDUCTED WITH CONTRACTS AND GC OFFICIALS TO ADDRESS CONTRACTUAL AND LEGAL ISSUES. THUS FAR, NO INSUPERABLE ISSUES HAVE ARISEN.

4. A MEETING OF THE TECHNICAL REVIEW COMMITTEE HAS BEEN CALLED FOR 19 NOVEMBER AT 10 A.M., TR CONFERENCE ROOM, 1ST FLOOR. CHARLES KELLY WILL BE PRESENT.

5. A SECOND MEETING WILL BE ORGANIZED FOR AFR/TR AND AFR/ SWA MANANGEMENT AND GC/AFR.

6. KELLY WILL ASSEMBLE AS COMPLETE A DRAFT OF THE OPERATIONS PLAN AS POSSIBLE BEFORE RETURNING TO NIGER. ON HIS WAY BACK, HE WILL STOP IN HOLLAND TO MEET WITH SHELL OFFICIALS TO DISCUSS FURTHER DETAILS OF A POSSIBLE JOINT IMPLEMENTATION OF THIS ACTIVITY.

7. GTZ HAS BEEN KEPT INFORMED, AND HAS EXPRESSED STRONG INTEREST IN POSSIBLE INVOLVEMENT IN NIGER THROUGH THEIR PESTICIDE SUPPORT PROJECT.

8. FUNDING -- KEY ISSUE REMAINING: IF THIS PROJECT CONTINUES TO APPEAR FEASIBLE TO IMPLEMENT, AND THE SHORT TIME FRAME CAN BE MAINTAINED, A DECISION SOON WILL BE NEEDED ON THE ISSUE OF THE LEVEL OF FUNDING BY AID/W (I.E., AFR/TR, AELGA) WHICH WE WILL BE ABLE TO SUPPORT, IN ADDITION TO WHAT USAID/NIGER MAY BE WILLING TO CONTRIBUTE. USAID HAS STATED THAT THEY WILL NOT BE ABLE TO SUPPORT THE FULL COST. AT THIS TIME, THE TOTAL BUDGET EXCEEDS $200,000; AID/W SHOULD NOT FUND MORE THAN HALF OF THE COSTS.

CC: W. THOMAS

AFR/TR/ANR:WKNAUSENBERGER:\DIEL\UPDAT1

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RUTAEM / AMEMBASSY BAMAKO 8718
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28 JAN 91 11 50
U.S. ... NIGER

CLASS: UNCLASSIFIED
CHRGE: AID 21/15/91
APPRV: DIRECTOR
DRFTD: REN:CKELLY:P
CLEAR: 1. SUO:MEENS
2. ADO:STAYL
3. GTO:JSLAT
4. DDIR:VDHO
DISTR: AMB DCM AID

AIDAC

AID/W FOR AA/AFR E.L. SAIERS;
GC/AFR, K.F. O'DONNELL;
AFR/TR, R. COBB AND AELGA PROJECT;
AFR/SWA, N MCKAY;
OFDA;
ABIDJAN FOR REDSO/WCA, REO HANCHETT;
BAMAKO FOR EHAUSENSBERGER

E.O. 12356: N/A
TAGS:
SUBJECT: DIELDRIN/NIGER: REQUEST FOR ACTION

REF: (A) NIAMEY 0697, (B) 90 STATE 383089,
(C) NIAMEY 0684

1. SUMMARY:

- THIS IS AN ACTION CABLE TO CALL TO THE ATTENTION OF THE ADDRESSEES THAT THE MISSION REQUIRES AID/W CONCURRENCE TO THE NIGER DIELDRIN DISPOSAL PLAN (REF A) BY JANUARY 30, 1991. IF CONCURRENCE IS NOT RECEIVED BY THIS DATE, THE MISSION WILL BE OBLIGED TO CANCEL THIS ACTIVITY. THE CHANCES OF THIS EFFORT BEING RESTARTED ARE NEGLIGIBLE. END SUMMARY.

2. BACKGROUND:

- IN 1988 THE MISSION, FOLLOWING USG POLICY AGAINST THE USE OF CHLORINATED HYDROCARBON PESTICIDES, SUCCEEDED IN PREVENTING THE GON FROM USING DIELDRIN FOR LOCUST CONTROL. IN EARLY 1989, THE MISSION WAS APPROACHED BY AN ENVIRONMENTAL GROUP IN NIGER WITH A REPORT THAT THE UNUSED DIELDRIN WAS LEAKING INTO THE GROUND AT A SITE ON THE EDGE OF THE TAMGAK NATURAL RESERVE. FOLLOW-UP WITH THE GON INDICATED THEY WERE CONCERNED ABOUT THIS PROBLEM, AND THE DETERIORATING CONDITION OF OTHER STOCKS OF DIELDRIN IN NIGER, BUT WERE UNABLE TO RESOLVE THE PROBLEM WITHOUT ASSISTANCE.

- IN RESPONSE TO A REQUEST FROM THE GON, USAID/NIGER INITIATED AN EFFORT TO MINIMIZE THE HUMAN AND ENVIRONMENTAL RISKS POSED BY THE DIELDRIN AND TO IDENTIFY A LONG TERM SOLUTION TO NIGER'S DIELDRIN PROBLEM. A LONG TERM APPROACH WAS REQUIRED AS LENGTH OF

DIELDRIN'S CHEMICAL EFFECTIVENESS EXCEEDS THE STORAGE LIFE OF SHELL BARRELS. PURSUING A SHORT TERM APPROACH WOULD HAVE RESULTED IN A RECURRENT PROBLEM OF LEAKING DIELDRIN AND THE CONTINUAL THREAT THAT THE PESTICIDE WOULD BE USED IN FUTURE LOCUST CONTROL EFFORTS.

- THE MISSION'S EFFORTS WERE UNDERTAKEN IN COORDINATION WITH OFDA AND AFR/TI/ANR/AE AND UNDER THE POLICY GUIDANCE ON DISPOSAL OF OBSOLETE PESTICIDES PROVIDED IN THE AELGA PROJECT PROGRAMMATIC ENVIRONMENTAL ASSESSMENT. USAID'S EFFORTS AT IMPROVING ENVIRONMENTAL QUALITY WERE NOT ALWAYS APPRECIATED BY OTHER DONORS AND THE MISSION AND THE AGENCY HAVE BEEN PUBLICLY CRITICIZED FOR OUR EFFORTS TO PREVENT THE USE OF THE DIELDRIN AND DEVELOP A LONG TERM DISPOSAL OPTION.

- MISSION COOPERATION WITH THE GON RESULTED IN AN INITIAL RISK REDUCTION OPERATION AND THE IDENTIFICATION OF THREE OPTIONS FOR DEALING WITH THE DIELDRIN OVER THE LONG TERM. THESE OPTIONS, CEMENT KILN DISPOSAL (A USAID EVALUATED METHOD), COMMERCIAL INCINERATION AND LONG TERM STORAGE, WERE REVIEWED AT AN INTERNATIONAL CONFERENCE ON OBSOLETE PESTICIDES HELD IN NIAMEY IN JANUARY, 1990. THIS REVIEW AND FOLLOW-UP FIELD ASSESSMENT INDICATED THE ONLY NIGERIEN CEMENT FACTORY IS TOO OLD FOR ADEQUATE MONITORING OF PESTICIDE INCINERATION AND ON-SITE COMMERCIAL INCINERATION WAS SEEN AS TOO EXPENSIVE, LEAVING ONLY LONG TERM STORAGE AS A VIABLE OPTION.

- SEVERAL MONTHS FOLLOWING THE NIAMEY CONFERENCE THE MISSION WAS APPROACHED BY SHELL INTERNATIONAL CHEMICAL COMPANY WITH A SUGGESTION TO SHIP THE DIELDRIN TO HOLLAND FOR COMMERCIAL INCINERATION. SHELL, THE MANUFACTURER OF THE DIELDRIN, HAD PARTICIPATED AT THE

NIAMEY CONFERENCE AND FELT THAT TOTAL DESTRUCTION WAS A BETTER WAY TO DEAL WITH THE DIELDRIN THAN LONG TERM STORAGE. THEIR PROPOSAL WAS THE FIRST TIME A PESTICIDE MANUFACTURER VOLUNTEERED ITS ASSISTANCE IN RECOVERING AND SAFELY DISPOSING OF AN OUT-MODED PESTICIDE IN AFRICA.

- SUBSEQUENT DISCUSSIONS BETWEEN SHELL AND USAID HAVE RESULTED IN THE NIGER DIELDRIN DISPOSAL PLAN. THIS DOCUMENT IS BASED ON A SHELL FIELD VISIT TO NIGER, TWO TECHNICAL MEETINGS WITH SHELL IN EUROPE AND EXTENSIVE PARTICIPATION BY THE AID/W PROJECT TECHNICAL REVIEW COMMITTEE. THE PLAN, FINANCED BY USAID/NIGER AND IMPLEMENTED WITH SHELL TECHNICAL ASSISTANCE (AT NO COST TO USAID OR THE GON), PROVIDES FOR THE SAFE RECOVERY OF DIELDRIN IN NIGER, SHIPMENT OF THE DIELDRIN TO HOLLAND AND ITS INCINERATION IN A COMMERCIAL FACILITY AT LESS THAN COMMERCIAL COST.

- THE CURRENT VERSION OF THE PLAN HAS RECEIVED GENERAL CONCURRENCE FROM SHELL AND IS UNDERGOING A FINAL REVIEW BY THE AID/W TECHNICAL REVIEW COMMITTEE. THE MISSION HAS ALSO SUBMITTED AN ENVIRONMENTAL ASSESSMENT OF THE DISPOSAL PLAN TO AID/W AND THIS DOCUMENT IS ALSO IN REVIEW BY THE TECHNICAL REVIEW COMMITTEE.

- THE PLAN HAS ALSO BEEN FAVORABLY REVIEWED BY THE GERMAN DEVELOPMENT AGENCY PESTICIDE SERVICE PROJECT, WHICH HAS EXPRESSED A DESIRE TO PARTICIPATE IN THE OPERATION. WE UNDERSTAND THAT THE FAO AND PESTICIDE MANUFACTURERS ARE INTERESTED IN, AND WILL BE MONITORING, THE DEVELOPMENT AND IMPLEMENTATION OF THE NIGER OPERATION AS A MODEL FOR SIMILAR PESTICIDE CLEAN-UP EFFORTS IN OTHER DEVELOPING COUNTRIES.

3. TIMING

- FOLLOWING MEETINGS BETWEEN USAID/NIGER AND AFR/TR/ARR/NR STAFF IN NOVEMBER, 1990 (REF B) IT WAS AGREED THAT AN UPDATED DISPOSAL PLAN (THE CURRENT VERSION) WOULD BE SUBMITTED BY THE MISSION TO THE TECHNICAL REVIEW COMMITTEE FOR FINAL REVIEW BEFORE THE END OF 1990. IN ADDITION, IT WAS AGREED THAT A SPECIAL AMENDMENT TO THE NIGER/AELGA SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT (SEA) WOULD BE SUBMITTED TO AID/W BY THE BEGINNING OF 1991. THE DRAFT SEA AMENDMENT WAS SUBMITTED IN REF (C) ON JANUARY 4, 1991.

- IT HAS BECOME APPARENT THAT THE ANTICIPATED MARCH 1 START DATE FOR OPERATIONS IN NIGER CANNOT BE MET. THIS DATE WAS CHOSEN TO TAKE ADVANTAGE OF GOOD WEATHER CONDITIONS, BUT REQUIRES PROCUREMENT ACTIONS TO BEGIN BY MID-JANUARY. AS WE HAVE NOT YET RECEIVED CONCURRENCE TO THE DISPOSAL PLAN, WE WILL NOT BE ABLE TO PROCEED WITH THE PROCUREMENT ACTIONS BY THE END OF THE MONTH AND THE START DATE FOR FIELD OPERATIONS WILL NEED TO BE POSTPONED.

- AFTER A FURTHER REVIEW OF THE SAFETY AND OPERATIONAL ASPECTS OF IMPLEMENTING THE DIELDRIN RECOVERY AND DISPOSAL OPERATION, INCLUDING WEATHER, MISSION AND GON WORKLOAD AND SPELL PARTICIPATION, WE HAVE CONCLUDED THAT APRIL 1 IS THE LATEST DATE THAT FIELD OPERATIONS CAN BEGIN. TO MEET THIS DATE WE WILL NEED TO START PROCUREMENT ACTIONS BY FEBRUARY 4 AND REQUIRE AFRICA BUREAU CONCURRENCE TO THE PLAN NO LATER THAN JANUARY 30, 1991. PLEASE NOTE THAT THE REGIONAL CONTRACTING

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OFFICER, REGO/WCA WILL BE ARRIVING NIAMEY FEBRUARY 4 AND WILL BE ABLE TO PROVIDE NEEDED CONTRACTING ASSISTANCE FOR IMPLEMENTATION OF THE DIELDRIN DISPOSAL PLAN.

4. ACTION REQUESTED

- THE MISSION REQUESTS AID/W CONCURRENCE TO THE NIGER DIELDRIN DISPOSAL PLAN BY JANUARY 30, 1991. IF THIS CONCURRENCE IS NOT RECEIVED, THE MISSION WILL ADVISE THE GON AND SHELL THAT WE ARE UNABLE TO SUPPORT THE NIGER DIELDRIN DISPOSAL PLAN AT THIS TIME.

- WE DO NOT BELIEVE THE RECOVERY AND DISPOSAL PROGRAM CAN BE RESTARTED LATER IN 1991. SHELL HAS INDICATED A STRONG LIKELIHOOD THAT THEY WILL NOT BE ABLE TO ENSURE ITS PARTICIPATION OR WAIT 6 TO 9 MONTHS FOR FAVORABLE WEATHER CONDITIONS TO IMPLEMENT THE DISPOSAL EFFORT. STAFFING AND FUNDING UNDER THE AELGA PROJECT WILL NO LONGER BE AVAILABLE TO SUPPORT THE OPERATION. WITH ALL CRITICAL ELEMENTS OF THE PROGRAM BEING THROWN INTO AN UNDEFINED TIMEFRAME WE CAN NOT ASSUME THAT THIS WINDOW OF OPPORTUNITY WILL PRESENT ITSELF AGAIN.

- WE REGRET THE NECESSITY OF SETTING A DEADLINE FOR CONCURRENCE TO THE DIELDRIN DISPOSAL PLAN. WE ARE CONSTRAINED BY WEATHER FACTORS, PERSONNEL REQUIREMENTS AND THE WILLINGNESS OF SHELL TO PROVIDE KEY TECHNICAL ASSISTANCE AND SUPPORT FOR THE OPERATION.

- THE MISSION HAS BEEN WORKING FOR OVER 3 YEARS TO IMPLEMENT THE AGENCY'S POLICY ON PREVENTING THE USE OF CHLORINATED HYDROCARBON PESTICIDES AND IMPROVING THE QUALITY OF LIFE AND THE ENVIRONMENT IN NIGER. UNLESS WE CAN BRING THIS EFFORT TO A DECISIVE CONCLUSION WITHIN THE TIME FRAME, WE WILL BE FORCED TO WITHDRAW FROM THIS EFFORT. CUNDIFF
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C&I

ACTION: AID INFO: AMB DCM /3

AGR 41 III/24

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RR RUEENM
DE RUEHC #1340 0310944
ZNR UUUUU ZZH
R 310945Z JAN 91
FM SECSTATE WASHDC
TO RUEENM/AMEMBASSY NIAMEY 6[illegible]
INFO RUEHAF/AMEMBASSY ABIDJAN 3288
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RECEIVED
31 JAN 91 15 11
USAID/NIGER

LOC: 216 384
31 JAN 91 0948
CN: 04558
CHRG: AID
DIST: AID

ACTION: DRU
INFO: DIR:DO
GDO/DC
ADO
CHRON

DUE DATE: 02-07-91

UNCLAS STATE 031340

AIDAC ABIDJAN FOR REDSO WCA/REO

E.O. 12356: N/A
TAGS:
SUBJECT: AID/W APPROVAL OF NIGER DIELDRIN DISPOSAL PLAN

1. SUMMARY. AID/W HAS COMPLETED THE REVIEW OF THE 15 DECEMBER DRAFT OF THE NIGER DIELDRIN DISPOSAL PLAN (NDDP). PROVISIONAL UPON THE INCLUSION OF THE CHANGES AND ADDITIONS CONTAINED IN THIS CABLE, AID/W APPROVES THE NDDP. END SUMMARY.

2. THE AID/W NDDP TECHNICAL REVIEW COMMITTEE (TRC) HAS COMPLETED THE FINAL REVIEW OF THE NDDP DATED 15 DECEMBER WITH ADDITIONAL PAGES OF 23 DECEMBER. PROVISIONAL UPON THE INCLUSION OF THE CHANGES AND ADDITIONS CONTAINED IN PARAGRAPH 3 OF THIS CABLE, THE TRC APPROVES THE NDDP. IN DISCUSSING NEEDED CHANGES, THIS CABLE WILL REFER TO NDDP SECTION NUMBERS AND PARAGRAPH NUMBERS. NOTE THAT THIS CABLE COVERS ONLY SUBSTANTIVE CHANGES WITH THE NDDP, AND DOES NOT INCLUDE EDITORIAL OR GRAMMATICAL COMMENTS THAT HAVE NO IMPACT ON THE TECHNICAL NATURE OF THE DOCUMENT. EDITORIAL AND GRAMMATICAL CHANGES, ALONG WITH THE SUBSTANTIVE COMMENTS DISCUSSED HEREIN, WILL BE POUCHED TO MISSION IN A MARKED-UP COPY OF THE NDDP.

3. TECHNICAL COMMENTS/CONCERNS:

SECTION I: PARA THREE, WORLD WILDLIFE FUND/NIGER. PARA TEN, MAJOR DONOR SHOULD BE CHANGED TO REMOVE ANY POSSIBLE ASSOCIATION WITH USAID AND THE ORIGINAL DONATION OF THE DIELDRIN. EMPHASIZE THAT THE DIELDRIN WAS NOT PURCHASED BY THE USG.

SECTION II: NUMBER 4, INSERT THE LOCATION OF THE SMELTING OPERATION. NUMBER 5, EXPAND ON WHAT IS MEANT BY THE WORD RECOVERY; THE WORD RECOVERY IS MISLEADING STANDING ALONE.

SECTION III: PARA THREE, DISCUSS COMMITMENTS MADE BY THE GON, INCLUDING NAMES OF INDIVIDUALS INVOLVED, LETTERS OF AGREEMENT, ETC. PARA SEVEN, DISCUSS THE FORM OF GOH APPROVAL (I.E. PERMIT), REFER TO SECTION XIII.

SECTION V: PARA ONE, EXPAND ON THE ISSUE OF BLOOD ANALYSIS TO INCLUDE THE TIME FRAME NEEDED TO OBTAIN RESULTS ON BASE

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Date 91/1/28
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LINE DIELDRIN BLOOD LEVELS. WILL RESULTS BE AVAILABLE DURING THE OPERATION, OR ONLY AS HISTORICAL REFERENCE. PARA ELEVEN, DROP NP, AND DEFINE INABANGHRIT WATER PROVISIONS.

SECTION VI: PARA FIVE, SAFETY SIGNS MUST BE IN FRENCH AND APPROPRIATE LOCAL LANGUAGES.

SECTION VII: INCLUDE THE DOCTOR IN THE PERSONNEL LIST.

SECTION VIII: IN THE COLUMN HEADINGS, CHANGE NUMBER TO QUANTITY. INCREASE THE NUMBER OF EYE RINSE/FIRST AID KITS TO 20.

SECTION IX: B,6, DEFINE LOCATION OF MANHOLE. C, LAST WORD ABOVE SHOULD BE CHANGED TO IN SECTION VIII AND ANNEX A.

SECTION X: 2,P, DISCUSS SOIL RESIDUE TESTING AT AGADEZ.

SECTION XIII: PARA FOUR, NOTE THAT THE PERMITS WITH THE DUTCH GOVERNMENT WILL BE OBTAINED PRIOR TO STARTING THE FIELD OPERATIONS. PARA EIGHT, DEFINE WHAT WILL BE MONITORED IN THE CONTINUOUS MONITORING LISTED UNDER TEMPERATURE - TEMPERATURE IS ASSUMED TO BE THE OBJECT HERE, BUT WILL ANYTHING ELSE BE MONITORED?

SECTION XVI: PUBLIC RELATIONS COMPONENT MUST INCLUDE USAID/NIGER.

ANNEX D, SECTION IV: 4,B, INCLUDE INSPECTION OF TRUCK BRAKES AND LIGHTS.

AID/W APPRECIATES USAID/NIGER EFFORTS IN THE PREPARATION OF THIS PLAN, AND BELIEVES THAT THE GUIDANCE OF THIS DOCUMENT WILL ALLOW AN ENVIRONMENTALLY SOUND DIELDRIN REMOVAL OPERATION. BAKER
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#1340

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ACTION: AID INFO: AMB DCM /3

AGR 12 X AGR 4L

RECEIVED
11 JUN 91 09 59
USAID/NIGER

LOC: 342 .677
11 JUN 91 0530
CN: 23957
CHRG: AID
DIST: AID

ACTION: LRU
INFO: DIR:BD
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DUE DATE: 06-18-91

NVZCZCNMC327
CO RUEBNM
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ZNR UUUUU ZZH
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FM AMEMBASSY COTONOU
TO RUEHOS/AMEMBASSY LAGOS IMMEDIATE 4424
RUEENM/AMEMBASSY NIAMEY PRIORITY 3372
INFO RUEEC/SECSTATE WASHDC 9783
RUEEAB/AMEMBASSY ABIDJAN 9319
RUEHPC/AMEMBASSY LOME 5789
BT
UNCLAS COTONOU 01620

AIDAC

LAGOS FOR AID REP AND PASS TO RCO CROMER;
NIAMEY FOR DRU/WHEELER
AID/W FOR AFR/SWA - MC KAY, AFR/TR/ANR/NR, AFR/DP,
OFDA, MS/OP/TRANS FOR R. GOLDMAN, FVA/FFP/AFR - LANGLOIS
ABIDJAN FOR REDSO/PAE, R. FRAENKEL OR I. MESERVE

E.O. 12356: N/A
TAGS: N/A
SUBJECT: DISASTER ASSISTANCE/NIGER: NDDP AND FOOD AID
OMNIBUS

REF: (A) NIAMEY 4784, (B) STATE 187395 (NOTAL)

1. THIS CABLE PROVIDES INFORMATION FOR NIAMEY AND LAGOS ON NIGER DIELDRIN DISPOSAL PLAN OPERATIONS (REF A) AND FOOD AID OPERATIONS FOR NIGER. SEE BELOW FOR RCO AND USAID/NIGER ACTIONS.

2. NIGER DIELDRIN DISPOSAL PLAN UPDATE

A. ROAD INSPECTION INDICATES THAT ONLY SEGMENTS OF SIGNIFICANT CONCERN ARE IN BENIN 40 KM NORTH OF SAVE (DIRT ROAD) AND FROM BOBICON TO COTONOU. A DETAILED REPORT ON ROAD CONDITIONS AND NECESSARY SAFETY PRECAUTIONS IS BEING SENT SEPTEL TO USAID/NIGER.

B. DUE TO CONTINUING PROBLEMS IN LOME IT IS EXPECTED THAT THE M/V CONCORDIA, THE SHIP ON WHICH THE DIELDRIN IS TO BE TRANSPORTED TO HOLLAND, WILL ARRIVE BEFORE JUNE 17. CONFIRMATION OF THE ACTUAL ARRIVAL DATE WILL NOT BE POSSIBLE UNTIL JUNE 12.

C. THE TENTATIVE DIELDRIN CONVOY TRAVEL SCHEDULE IS FOR THE CONVOY TO LEAVE DOSSO, NIGER ON JUNE 12 AND OVERNIGHT AT GAYA, NIGER. THERE IS ADEQUATE SPACE FOR SAFE PARKING OF THE CONVOY AT THE NIGER CUSTOMS. ON JUNE 13, THE CONVOY WILL TRAVEL FROM GAYA TO PARAKOU, BENIN AND SPEND THE NIGHT IN THE SNTN YARD. FROM PARAKOU THE CONVOY WILL LEAVE JUNE 14 FOR COTONOU. THE CONVOY WILL STOP AT ABOMEY-CALAVI UNTIL LATE AT NIGHT, WHEN TRAVEL THROUGH

ACTION RECORD
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Date 6/11
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1/2 355 UNCLASSIFIED COTONOU 001620/01

THE CONGESTED ROADS OF COTONOU WILL BE LESS HAZARDOUS.

I. THE CONVOY SHOULD PLAN TO DEPART FOR GAYA ON THE AFTERNOON OF JUNE 12. A DECISION TO PROCEED FROM GAYA WILL BE MADE ON THE AFTERNOON OF JUNE 12 BY AID AND SNTN, DEPENDING ON THE EXPECTED ARRIVAL DATE FOR THE M/V CONCORDIA.

3. FOOD AID OPERATIONS/COTONOU

A. LEMCINE, THE COTONOU FOOD AID FREIGHT CONTRACTOR, HAS DISPATCHED JUST OVER 5,000 MT OF SECTION 416 SORGHUM FOR NIAMEY AS OF JUNE 9, 1991. DISPATCHING FOR ZINDER FROM PARAKOU IS EXPECTED TO BEGIN C/A JUNE 12. THE ZINDER BOUND TONNAGE CAN BE SWITCHED TO NIAMEY IF ACTION IS TAKEN QUICKLY.

B. LEMCINE CLAIMS TO HAVE RECEIVED ONLY 300 EMPTY BAGS FROM THE M/V MARINE PRINCESS. THEY DO NOT HAVE ENOUGH EMPTY BAGS FOR RECONDITIONING DAMAGED BAGS IN COTONOU AND NIGER. LEMOINE IS PREPARING A LETTER TO RCO CROMER ASKING FOR AUTHORITY TO PURCHASE ADDITIONAL BAGS, PER THE TERMS OF THE CONTRACT.

C. LEMCINE IS ALSO ENCOUNTERING MINOR PROCEDURAL PROBLEMS WITH THEIR BANK, WHICH IS PROVIDING A LOAN TO TO PAY FOR TRANSPORT BILLS IN BENIN. THE BANK WANTS AID TO SIGN A CERTIFICATION THAT AID WILL MAKE ALL PAYMENTS FOR THE CONTRACT TO A SPECIFIC ACCOUNT. PER SECTION H 2. OF THE CONTRACT, IT APPEARS THAT SUCH AN ASSIGNMENT OF PAYMENTS CANNOT BE MADE WITHOUT RCO APPROVAL.LEMOINE IS SENDING A SECOND LETTER TO CRO CROMER ON THE ASSIGNMENT OF PAYMENTS. BOTH LETTERS WILL BE HAND CARRIED TO RCO CROMER IN LAGOS FOR ACTION.

4. FOOD AID/LAGOS

A. PER REF (B) AND USAID/NIGER - MS/OP/TRANS TELECOM OF JUNE 7. 1991, THE 15,000 MT OF SECTION 416 TONNAGE DESTINED FOR LOME IS BEING OFF-LOADED IN LAGOS. IT IS OUR UNDERSTANDING THAT RCO CROMER HAS PROPOSED MODIFICATION OF THE LEMOINE CONTRACT TO PROVIDE FOR THE DELIVERY OF ALL THE 10,000 MT EX COTONOU TO NIAMEY. THE LAGOS CONTRACT WITH PANAFINA MAY ALSO BE MODIFIED TO PROVIDE FOR DELIVERY OF THE ADDITIONAL 15,000 MT OFF-LOADED IN

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LAGOS TO LOCATIONS IN WESTERN AND EASTERN NIGER. THE SECOND OPTION FOR LAGOS DISPATCHING IS TO EXECUTE A NEW CONTACT FOR DELIVERY OF PART OR ALL OF THE ADDITIONAL 15,000 MT.

E. THERE IS A NEED TO TAKE QUICK ACTION ON FREIGHT DISPATCHING FROM COTONOU AND LAGOS TO MINIMIZE COSTS AND MAXIMIZE FOOD SHIPMENTS TO NIGER. C. KELLY, USAID/NIGER DISASTER RELIEF COORDINATOR CURRENTLY IN COTONOU, PLANS TO TRAVEL OVERLAND FROM COTONOU TO LAGOS ON JUNE 11 TO ASSIST RCO CROMER IN REORGANIZING THE PORT TO NIGER FOOD LOGISTICS PLANS AND FREIGHT CONTRACTING. KELLY WILL RETURN TO COTONOU O/A JUNE 12 TO COMPLETE ANY NEW ARRANGEMENTS WITH LEMOINE.

5. FOR LAGOS AND RCO CROMER: DUE TO SHORT TIME AVAILABLE TO REARRANGE FOOD AID CONTRACTS WE HOPE THAT THE PLANS OUTLINED ABOVE MEET YOUR APPROVAL. KELLY WILL CONTACT CROMER AT THE US EMBASSY. ATTEMPTS TO CALL LAGOS ON JUNE 10 WERE UNSUCCESSFUL, BUT KELLY HAS MADE RESERVATIONS AT THE SHERATON AND WILL STOP THERE FIRST. PLEASE LEAVE MESSAGE IF POSSIBLE.

6. FOR NIAMEY/IRU: KELLY WILL ADVISE DAILY BY TELCOM OR CABLE ON DEVELOPMENTS WITH THE M/V CONCORDIA AND FOOD AID PLANS.

- IT IS RECOMMENDED YOU ADVISE THE SURVEY AGENT (CEM) THAT DELIVERIES TO ZINDER AND POINTS EAST MAY BEGIN AS EARLY AS JUNE 21. PASS SIMILAR INFORMATION ON TO OPERATIONS MANAGER KOENIGER IN ZINDER.

- IT IS ALSO RECOMMENDED THAT YOU ADVISE OPVN THAT THERE MAY BE AS MUCH AS 7,000 MT OF SORGHUM ARRIVING AT NIAMEY IN THE NEXT THREE WEEKS AND THAT CONCURRENT DELIVERIES MAY BEGIN AT ZINDER, DIFFA AND MAINE SOROA BY JUNE 25.

- PLEASE ALSO ADVISE RCO CROMER (COPY CABLE TO ABIDJAN AND LAGOS) WHEN FOOD AID PIL 2 IS SIGNED BY THE GON AND WHEN PIO/TS FOR INTERNAL TRANSPORTATION AND CARE COOPERATIVE AGREEMENT HAVE BEEN SIGNED BY THE MISSION. ISOM

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Memo

November 28, 1990

To: DRU File III/25, Chron
J. Slattery, GDO, USAID/Niger
W. Knausenberger, AFR/TR/ANR/NR, AID/W

From: C. Kell CK Disaster Relief Coord., DRU, USAID/Niger

Subject: Dieldrin Disposal Plan; Shell and GTZ Meetings

This Memo provides an summary of the meetings with Shell (The Hague, Nov. 22, 1990) and GTZ Pesticide Service Project (Eschborn, Nov. 23, 1990) on dieldrin disposal in Niger. The first meeting was held to discuss the technical and legal aspects of the Niger Dieldrin Disposal Plan. The second meeting briefed the GTZ Pesticide Service Project on the disposal plan and solicited support for this effort.

Shell Meeting

The Shell meeting was held in their corporate headquarters at The Hague, the Netherlands. The meeting was chaired by Mr. L. Dollimore of Shell/London and included representatives of Shell/London, Shell Netherlands Chemical Company (SNC) and the higher level Shell/Netherlands corporate structure.

The meeting began with my briefing the Shell personnel on progress to date on the part of the USG in completing technical and political/policy approval of the disposal plan. Issues related to technical approval for the plan through the Technical Review Committee (TRC), funding and final policy approval for the disposal effort were reviewed in detail. The draft plan, Task Time Line and listing of responsibilities were also distributed and reviewed during the briefing and the rest of the meeting. Specific topics covered during the meeting are summarized below.

Division of Responsibilities:

Shell will advise AFR/TR and USAID/Niger as to the appropriate Shell designators to use in the plan. This will permit Shell tasks which are assigned to different parts of the overall entity to be properly identified.

Contact for completion of the technical aspects of the plan and determination of the nature of any procurement agreements will be with USAID/Niger, who will be responsible for sharing this information with other parts of AID, the GON and other donors.

AFR/TR/ANR/NR will work directly with Shell on the incineration issues, public relations and dealing with environmental groups.

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Legal Issues:

Shell is maintaining their opposition to a direct contract with the USG. It appears that a host country contract will be the only option other than dropping Shell's procurement role and having this be completed by AID directly. In either case, there would be an exchanged of letters between AID and Shell noting approval of the disposal plan and setting out Shell's participation. USAID/Niger is to follow-up on this issue.

Shell is in the process of securing the actual permit for the importation of the dieldrin into the Netherlands. This follows the formal Gov. of the Netherlands approval for the operation. For this permit, SNC will also need a formal agreement from the GON for the incineration of the dieldrin. USAID/Niger will work on securing this formal agreement within the context of GON approval of the overall operations plan.

Timing and Task Time Line:

Shell was in general agreement with the new Task Time Line drafted after the TRC meeting in November. A formal Shell approval of the plan was added to the time line for late December.

Plan Development Responsibilities:

Shell was in general agreement with the Plan Development Responsibilities outline developed by myself and AFR/TR/ANR/NR. Securing Shell approval of the plan was added to the SNC/Shell section.

Shell indicated they may not be able to provide any information on large scale dieldrin incineration, as this is not something which Shell has done recently. Shell will be contacting AFR/TR/ANR/NR on this point as well as public relations and dealing with environmental groups.

Landfill/Disposition of Solids:

The draft EPA recommendations on landfill disposal of solids was review during the meeting. Among the Shell representatives there was discussion as to whether Shell wanted to leave highly contaminated solids in Niger, even in a secure land fill. This would present a continued "liability" for Shell and the problem of the persistance of dieldrin: Shell could be asked in the future to clean up the land fill.

Shell is going to review this issue and advise AID of their position. Shell may suggest that solids which are known to be contaminated should incinerated, as the volume is relatively small (+/- 20 M3). Implicitly, Shell would make arrangements for this incineration and propose the means to determine contamination levels.

Shell has also reviewed the possibilities for drum handling. They appreciate our efforts to smelt the drums in Lome. They believe this is the best manner for drum disposal and would prefer not to bury the barrels due to the long term "liability" problem noted above.

The meeting reached the tentative conclusion that a electro-mechanical drum compactor will not be used. Shell has investigated the possibility of using hand operated drum head cutters and a mechanical sheet metal cutter to cut the drums in two or more parts. Similar devices are used in Niger for sheet metal cutting. Shell will conduct a final review of this alternate proposal and advise AID. The operations plan will be modified accordingly.

If the mechanical cutter is used it would be shipped in from the Netherlands and remain in Niger. The cost the drum head and sheet metal cutters should not exceed $1,500. The electro-mechanical crusher would cost $10,000.

Incineration Criteria:

The EPA documents on toxic waste incineration were shared with SNC, who will pass them to AVR, the incineration company. It appears that the manner in which the Netherlands and the US establish criteria for safe incineration differ, but are not incompatible. SNC will provide AFR/TR/ANR/NR with all the relevant data from AVR and their response to the EPA guidance. It was agreed that AFR/TR would then share this data with EPA/Solid Waste for a determination as to whether the AVR operation would meet EPA requirements.

Transportation:

Shell is opposed to air transportation of the dieldrin. To facilitate overland movement through Togo and Benin, Shell will be informally contacting each country and will advise AID.

Shell will also look into executing a round-trip freight contract for the shipment of isotanks and containerized equipment from the Netherlands to Agadez and then back to the Netherlands. Functionally, this will be easier for AID and speed-up implementation of the operation. USAID/Niger will provide SNC with contacts in France for known freight forwarders who can handle this type of operation.

Insurance:

AFR/TR will secure GC guidance on insurance requirements for all aspects of the operation, including shipping. This information will be passed to Shell.

Budget:

Shell identified a number of cost savings in the draft budget. These include:

- a reduction of $8,500 if the drum crusher is replaced by a mechanical drum cutter;

- a reduction of $8,000 in the cost of protective equipment (all to be purchased in the Netherlands);

- a possible 50% reduction in the cost of incineration;

- a reduction, to 25, of the number of over pack drum, with a possible 50% savings in this line item.

Based on the budget and technical discussions at the meeting, USAID/Niger will revise the budget and up-date local cost estimates. USAID/Niger will also complete a procurement plan for the operation.

Technical Review:

There was not sufficient time for a full technical review of the operations plan. Shell will provide comments on the plan to USAID/Niger within 10 days and provide additional technical information (barrel disposal, ...) as soon as possible.

Other points:

References in the plan to "Holland" should be changed to "The Netherlands" according to SNC. The former refers to a province rather than the whole country.

Shell is also interested in participation by other donors and having observers attend the Niger operation. The importance of not having "too many cooks" and thus complicating the operation was discussed and agreed to as a guiding principal.

AID's intent to have a technical observer (from EPA) and a on site contract manager was discussed. Shell agreed that this approach would have advantages.

GTZ Pesticide Service Project (Eschborn, Nov. 23, 1990)

The meeting with the GTZ Pesticide Service Project was held at the GTZ head offices at Eschborn, FRG on Nov. 23, 1990. The GTZ was represented by G. Vaagt, Team Leader, and W. Schimpf, Analytical Chemist. The meeting covered the history of USAID/Niger's involvement with the dieldrin problem in Niger, the Shell incineration proposal and the status of the technical and

policy discussions to date. The GTZ was given copies of the latest draft of the operations plan, time line and plan responsibilities, the draft EPA recommendations on land fill disposal and the EPA's Hazardous Waste Incineration: Questions and Answers.

The GTZ Pesticide Service Project will be embarking on a new component of their project in the next 2-3 months which will deal with pesticide disposal. For this reason they are very interested in the disposal plan for Niger as well as the results of the results of the "Pakistan burn". The project may conduct a cement kiln pesticide burn to evaluate flue gas changes and the production of hazardous compounds as the gases from the incineration process cool in the stack.

Based on our discussions, the project personnel indicated they might be able to provide the following contributions to the Niger operation:

- Technical Assistance:	Mr. Schimpf as an observer/advisor; research and technical advice from their facilities in Eschborn or laboratory in Germany.
- Commodities:	POL for vehicles and/or solvent; salaries/per diem for local personnel; local equipment procurement.
- Analysis:	Use of their laboratory in Germany for sample analysis and testing.

As the pesticide disposal component of the project has not received funding, the project team could not make any formal commitments to support the Niger operation. It was agreed that USAID/Niger would keep the project up-to-date on the development of the plan and timing of the operation.

If the GTZ project receives funding in time and agrees to the disposal plan, they will advise USAID/Niger. Steps will then be taken to define the actual contribution from the project and secure a formal GON request this assistance to the GTZ.

Informally, Mr. Schimpf will review the draft disposal operations plan and forward his comments to USAID/Niger. This has the advantages of adding an outsider to our review process and facilitating any future GTZ involvement in the operation.

ACTION: AID INFO: AMB DCM /3

RECEIVED
30 JAN 91 09 33
USAID/NIGER

LOC: 212 653
28 JAN 91 0737
CN: 03970
CHRG: AID
DIST: AID

V7C7CNM0010
PP RUEHNM
DE RUEHC #6939/01 0261641
ZNR UUUUU ZZH
P 261642Z JAN 91
FM SECSTATE WASHDC
TO RUEHNM/AMEMBASSY NIAMEY 6452
INFO RUEHAB/AMEMBASSY ABIDJAN 3171
BT

UNCLAS STATE 026939

AIDAC ABIDJAN FOR REDSO/REO (PANCHETT)

E.O. 12356: N/A
TAGS:
SUBJECT: AID/W REVIEW OF THE NIGER SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT AMENDMENT ON THE NIGER DIELDR DISPOSAL PLAN

REF: NIAMEY 0084

1. SUMMARY. AID/W HAS COMPLETED THE REVIEW OF THE AMENDMENT TO THE NIGER SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT (SEA) CONCERNING THE NIGER DIELDRIN DISPOSAL PLAN (NDDP), AS PRESENTED IN REFTEL. PROVISIONAL UPON THE INCLUSION OF THE CHANGES AND ADDITIONS CONTAINED IN THIS CABLE, AID/W APPROVES AMENDMENT TEXT. END SUMMARY.

2. THE AID/W NDDP TECHNICAL REVIEW COMMITTEE (TRC) HAS COMPLETED FINAL REVIEW OF THE NIGER SEA NDDP AMENDMENT (REFTEL). PROVISIONAL UPON THE INCLUSION OF THE CHANGES AND ADDITIONS CONTAINED IN PARAGRAPHS 3 AND 4 OF THIS CABLE, THE TRC APPROVES THE SEA NDDP AMENDMENT. IN DISCUSSING NEEDED CHANGES, THIS CABLE WILL REFER TO REFTEL PARAGRAPHS BY NUMBER.

3. THE TRC HAS REJECTED THE CONTAMINATED SOIL DISPOSAL OPTION OF QUOTE LAND-FARMING END QUOTE, PARAS 64 TO 69.

AID/W REQUESTS USAID/NIGER PURSUE THE OPTIONS OF EITHER BURYING THE MATERIAL IN AN ISOLATED LOCATION, OR IN THE AGADEZ MINE TIPS.

4. SPECIFIC CHANGES:

PARA (4): CHANGE QUOTE THE SHELL COMPANY END QUOTE TO: QUOTE SHELL INTERNATIONAL CHEMICAL COMPANY LIMITED END QUOTE.

PARA (6): INSERT THE FOLLOWING AFTER THE FIRST SENTENCE, QUOTE IT IS RECOGNIZED THAT THE DIELDRIN AND THE DIELDRIN-CONTAMINATED SOIL ARE AND WILL REMAIN THE PROPERTY OF THE GON UNTIL INCINERATION OR FINAL DISPOSAL END QUOTE.

PARA (25): SENTENCE FOUR, CHANGE QUOTE HAD VOLATILIZED END QUOTE TO QUOTE HAD LIKELY VOLATILIZED END QUOTE.

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PARA (26) AFTER SENTENCE TWO, QUOTE ...BY AT LEAST A FACTOR OF 10 END QUOTE, ADD: QUOTE THIS IS PROBABLY DUE TO THE HIGHER FAT SOLUBILITY AND USAGE OF DDT RELATIVE TO DIELDRIN. END QUOTE.

PARA (32) AFTER SENTENCE TWO, QUOTE ..... OTHER DISPOSAL ACTIVITIES END QUOTE , INSERT QUOTE THE PAKISTAN BURN DEMONSTRATED THE ADVANTAGES OF LOCAL INCINERATION, AND IF A FACILITY EXISTED IN NIGER THAT COULD PROVIDE A CLEAN BURN, THIS WOULD BE A DESIRABLE OPTION. END QUOTE.

PARA (33) DELETE EVERYTHING AFTER SENTENCE ONE AND REPLACE WITH: QUOTE THE REPORT ON THE PILOT BURN IN PAKISTAN GIVES EXAMPLES OF THE TYPES OF COMPLICATING FACTORS THAT COULD ARISE. WHILE THESE COULD BE ADDRESSED BY LONG-TERM PLANNING, NEGOTIATIONS WOULD BE SOMEWHAT HINDERED BY THE DIFFERING ADMINISTRATIVE LANGUAGES OF THE TWO COUNTRIES. END QUOTE

PARA (35) ADD TO END OF PARAGRAPH: QUOTE SATISFACTORY RESULTS WERE NOT OBTAINED IN THE RECENT BURNS IN SUDAN AND MOROCCO. END QUOTE.

PARA (36) IN SENTENCE FIVE, INSERT QUOTE IN HOLLAND END QUOTE AFTER QUOTE DESTROY IT BY INCINERATION END QUOTE.

PARA (44) INSERT THE NAME OF THE LOCAL DOCTOR.

PARA (60) INSERT GTZ INSTEAD OF QUOTE ANOTHER DONOR END QUOTE.

PARA (62) SENTENCE ONE: PUT A PERIOD AFTER AGADEZ, AND REMOVE PARENTHESES TO HAVE SENTENCE TWO READ: QUOTE A CUBIC METER IS EQUIVALENT TO FOUR TO FIVE 55-GALLON DRUMS, WHICH MEANS THE AMOUNT OF CONTAMINATED SOIL IS EXPECTED TO EQUAL A MAXIMUM OF 175 55-GALLON DRUMS. END QUOTE

PARA (64) REPLACE QUOTE HEAVY EQUIPMENT END QUOTE WITH QUOTE BULLDOZERS END QUOTE.

PARA (67) IN FIRST SENTENCE, INSERT QUOTE TO A LABELLED USE SITE END QUOTE AFTER QUOTE LAND SPREADING OF PESTICIDES END QUOTE.

PARA (69) DELETE EVERYTHING FOLLOWING THE FIRST SENTENCE AND REPLACE WITH THE FOLLOWING: QUOTE IN ADDITION, NEGATIVE ASPECTS OF THIS DISPOSAL OPTION INCLUDE THE FOLLOWING: (A) SINCE DIELDRIN HAS A LOW VAPOR PRESSURE, IT

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WILL VOLATILIZE FROM THE SPREAD SOIL VERY SLOWLY, THUS REMAINING POTENTIALLY HAZARDOUS TO PASSING NOMADS AND ANIMALS. (B) THE QUANTITY OF HYDROXYL IONS (NECESSARY FOR ATMOSPHERIC DEGRADATION OF DIELDRIN) IN THE TROPOSPHERE VARIES GREATLY IN THE ATMOSPHERE, DEPENDING ON GEOGRAPHIC LOCATION, AND MAY BE ESPECIALLY LOW IN DESERT AREAS. (C) NO LITERATURE EXISTS ON WHAT THE PRODUCTS OF THE REACTION BETWEEN DIELDRIN AND THE HYDROXYL RADICAL MAY BE, BUT SHOULD SOME DEGRADATION ACTUALLY OCCUR, THE REACTION WOULD LIKELY PRODUCE CHLORINE RADICALS, WHICH WILL DESTROY OZONE. (D) SPREADING THE CONTAMINATED SOIL OUT OVER THE DESERT WILL RESULT IN THE DESTRUCTION OF INSECT FAUNA IN THE DISPOSAL AREAS, AND WILL LIKELY ENTER THE FOOD CHAIN. (E) SPREADING THE SOIL ONTO THE DESERT IS STRIKINGLY SIMILAR TO SPRAYING DIELDRIN, A PRACTICE USAID DOES NOT SUPPORT, AND WHICH MAY ENGENDER NEGATIVE PUBLIC OPINION. END QUOTE.

PARA (72) DELETE THE WORD QUOTE EFFECTIVELY END QUOTE FROM THE LAST SENTENCE.

PARA (73) ADD THE FOLLOWING AFTER THE LAST SENTENCE, QUOTE THE PIT WILL CONTAIN SOLIDS OF LOW MIGRATION POTENTIAL RATHER THAN CONCENTRATED LIQUIDS. THE DIELDRIN IS NOT EXPECTED TO MIGRATE MORE THAN TWENTY CM IN ANY DIRECTION, EVEN IN THE ABSENCE OF A PIT LINER, AND AN AREA CAN BE CHOSEN IN WHICH THE WATER TABLE IS SEVERAL HUNDRED METERS DEEP. THE AGADEZ AREA HAS BEEN SPRAYED WITH DIELDRIN DURING LOCUST INVASIONS IN THE RECENT PAST, AND THERE IS A BACKGROUND CONCENTRATION OF DIELDRIN IN SURROUNDING SOIL. END QUOTE.

PARA (74) DELETE PARAGRAPH AND REPLACE WITH THE FOLLOWING, QUOTE CONS: SOIL DEGRADATION IS VERY SLOW, AND SOME CONCENTRATION OF DIELDRIN WOULD REMAIN IN THE SOIL FOR YEARS. BULLDOZERS WILL BE NEEDED TO DIG THE PIT, AND A PLASTIC CAP WOULD HAVE TO BE IMPORTED. ALTHOUGH IT MAY BE POSSIBLE TO CHOOSE A SITE RELATIVELY PROTECTED FROM WIND, OR AT LEAST PREDICTABLE IN TERMS OF WIND DIRECTION, THERE WOULD BE NOT GUARANTEE THAT A PLASTIC CAP WOULD NOT BE EXPOSED BY STRONG DESERT WINDS, AND/OR REMOVED FOR OTHER PURPOSES. PERMANENT GUARDING OF THE SITE IS OUT OF THE QUESTION, AND THE INTEGRITY OF A PIT LINING WOULD BE QUESTIONABLE. END QUOTE.

PARA (89) CHANGE THE SECOND SENTENCE TO READ QUOTE THERE SHOULD BE A PLAN TO INVOLVE THE PRESS AND TO FACILITATE PUBLIC RELATIONS IN GENERAL END QUOTE.

PARA (98) CHANGE THE NEXT TO LAST SENTENCE INTO TWO SENTENCES AS FOLLOWS: QUOTE ANOTHER CONSEQUENCE OF NO ACTION WOULD BE THE USAID/NIGER MISSION'S LOSS OF CREDIBILITY WITH THE GON. BOTH THE PEA AND SEA INDICATE A COMMITMENT TO ASSISTING NIGER IN DIELDRIN RISK REDUCTION, DESPITE THE FACT THAT USAID PLAYED NO ROLE IN THE NIGER DIELDRIN ACQUISITION END QUOTE.

PARA (99) DELETE QUOTE ENVIRONMENTALLY SOUND END QUOTE

FROM THE FIRST SENTENCE. IN SENTENCE THREE, ADD QUOTE IN HOLLAND END QUOTE AFTER QUOTE SMELTING END QUOTE.

5. AID/W APPRECIATES USAID/NIGER EFFORTS IN THIS OPERATION, AND BELIEVES THAT THIS DOCUMENT WILL BE AN IMPORTANT PART OF AN ENVIRONMENTALLY SOUND DIELDRIN REMOVAL OPERATION. BAKER

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III (2B)

UNITED STATES GOVERNMENT

memorandum

DATE: February 19, 1991

REPLY TO ATTN OF: Margaret Alexander, RLA

SUBJECT: Application of OSHA Regulations in NDDP

TO: Charles Kelly, DRU

Summary: The question has been raised whether U.S. Occupational Safety and Health Administration (OSHA) regulations should apply to the clean-up and transport efforts of the Niger Dieldrin Disposal Plan (NDDP) under the Africa Emergency Grasshopper and Locust Assistance Project, No. 698-051.83. Briefly, the conclusion is that OSHA regulations apply only to U.S. personnel involved in the operation.

For immediate procurement purposes, that conclusion means that either the purchase orders for personal protective equipment should require that the gear provided meet OSHA standards or that U.S. personnel must provide their own OSHA standard equipment. You may choose between these two options according to logistical convenience.

It is possible that there are also OSHA regulations governing the other working conditions on site (e.g., rest periods, air quality, safety measures). In all likelihood, such regulations will be less stringent than those that SNC imposes for desert conditions. Moreover, the Technical Review Committee's approval of the NDDP and Supplemental Environmental Assessment included the calculation that the air quality and health regimen at working sites will be acceptable. (See, NDDP, Annex G and SEA, pp.12-15). To make sure, I will get copies of the relevant regulations and send them on from Abidjan.

Discussion: The determination that OSHA regulations apply only to U.S. personnel on the NDDP is based on the essentially non-American character of the operation: The Dieldrin belongs to Niger and was acquired from sources other than the U.S; its handling, transportation and burning will be entirely outside of the United States; the financing is provided from funds granted by the U.S. to the GON; and the purchase orders and contracts will all be made outside the U.S. with (for reasons stated in the procurement waivers) non-American entities. These facts add up to a situation in which it would be difficult to make a case that U.S. regulatory authority is greater than that of Niger or, for that matter, the Netherlands. In telephone conversations, John Guedet, AFR's Environmental Officer and Kevin O'Donnell from GC advised that they believe there is no need to argue for application of OSHA regulations because of the circumstances cited above and because of SNC's own experience and regulation with pesticide handling in West Africa.

Conclusion: In short, OSHA regulations are not applicable to NDDP except to the extent that U.S. personnel will have to have protection equipment up to OSHA standards and may have to observe OSHA imposed work-site requirements. I will advise shortly about the latter.

ADR LL

ACTION: AID INFO: AMB DCM /3

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RR RUEHNM
DE RUEEC #2446 0580200
ZNR UUUUU ZZE
R 270201Z FEB 91
FM SECSTATE WASHDC
TO RUEHAB/AMEMBASSY ABIDJAN 3990
RUEENM/AMEMBASSY NIAMEY 6727
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RECEIVED
27 FEB 91 09 43
USAID/NIGER

LOC: 241 463
27 FEB 91 0634
CN: 08590
CHRG: AID
DIST: AID

ACTION: DRU
INFO: ~~DIR:DD~~
GDO/DC
CHRON

DUE DATE: 03-06-91

AIDAC ABIDJAN: REDSO RCO (CROMER), NIAMEY: DRU (KELLY)

E.O. 12356: N/A
TAGS:
SUBJECT: NIGER DIELDRIN DISPOSAL PLAN

REF: (A) ABIDJAN 2482, (B) THOMAS/CROMER TELECOM 2/20/91

1. PER REF (A), PARA 2, AND REF (B) CONCERNING REGULATIONS GOVERNING TRANSPORT OF PESTICIDES IN REGARD TO THE NIGER DIELDRIN DISPOSAL PLAN (NDDP). THE NDDP INVOLVES TRANSPORT OF PESTICIDES FROM NIGER TO HOLLAND. THE FOLLOWING INFORMATION WAS OBTAINED FROM THE EPA, DOT, GSA, AID/AFR/MS/OP/TRANS, AND AID/AFR/MS/OP/O. NOTE THAT THE REGULATIONS DISCUSSED BELOW HAVE BEEN ANNOTATED AND SUMMARIZED SPECIFICALLY FOR THE SUBJECT PROJECT. EACH REGULATION MUST BE REFERRED TO FOR SPECIFIC LANGUAGE AND CONTENTS.

2. FEDERAL STANDARD 313B, AS DISCUSSED IN FEDERAL ACQUISITION REGULATION 52.223-3, DOES NOT APPLY TO PESTICIDES OR PESTICIDE TRANSPORT. THIS STANDARD APPLIES TO HAZARDOUS MATERIAL PROCUREMENT, AND STATES THAT A MATERIAL SAFETY DATA SHEET IS NEEDED WHEN A HAZARDOUS MATERIAL IS OBTAINED. FEDERAL STANDARD 313B EXCLUDES TRANSPORT OF HAZARDOUS MATERIALS AND SPECIFICALLY EXCLUDES PESTICIDES.

3. THE FOLLOWING REGULATIONS GOVERN TRANSPORT OF PESTICIDES:

(A) CODE OF FEDERAL REGULATIONS 49, SECTION 171.8 DEFINES A HAZARDOUS MATERIAL AS ONE WHICH MAY PRESENT A RISK TO HEALTH, SAFETY, AND PROPERTY WHEN TRANSPORTED. SECTION 172.101 LISTS DIELDRIN AS A ORM-A HAZARDOUS MATERIAL, MEANING THAT IT HAS ANESTHETIC, IRRITATING, NOXIOUS, OR TOXIC PROPERTIES WHICH CAN CAUSE EXTREME ANNOYANCE IN THE EVENT OF LEAKAGE DURING TRANSPORT.
(B) CODE OF FEDERAL REGULATIONS 40.156.10(A)(4)(II)(A)(B) STATES THAT WHEN TRANSPORTING A PESTICIDE, A MATERIAL SAFETY DATA SHEET (MSDS) AND PESTICIDE LABEL MUST ACCOMPANY THE SHIPMENT AND THAT PROCEDURES STATED IN THE MSDS AND LABEL BE FOLLOWED.
(C) FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT (AS AMENDED IN 1988) SECTION 19(136Q)(A)(1)(B) AND

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(2)(A)(F) REQUIRES THAT LABEL PROCEDURES ARE FOLLOWED IN REGARD TO PESTICIDE TRANSPORT.

4. NOTE THAT SHELL CHEMICAL (THE MANUFACTURE OF DIELDRIN), WILL PROVIDE POTE A DIELDRIN LABEL AND DIELDRIN MATERIAL SAFETY DATA SHEET. THESE DOCUMENTS WILL ACCOMPANY THE PESTICIDE AT ALL PHASES OF TRANSPORT. THIS WILL FULFILL THE ABOVE-DISCUSSED FEDERAL REGULATIONS. BAKER
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#2446

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DE RUEHNM #4784/21 158 **
ZNR UUUUU ZZE
C 071632Z JUN 91
FM AMEMBASSY NIAMEY
TO RUEHAB / AMEMBASSY ABIDJAN IMMEDIATE 8855
RUEBCC / AMEMBASSY COTONOU IMMEDIATE 6216
RUFRFC / AMEMBASSY LOME PRIORITY 9432
INFO RUEBC / SECSTATE WASHDC PRIORITY 1531
BT
UNCLAS NIAMEY 04784

AIDAC

ABIDJAN FOR RCO CROMER AND REO;
COTONOU FOR AID REP.;
AID/W FOR AFR/TR/ANR/NR - ABLGA;
AFR/SWA FOR MCKAY;
CEDA

E.O. 12356: N/A
TAGS:
SUBJECT: DIELDRIN/NIGER: TRANSIT COUNTRY AND PORT CHANGES

REF: (A) PANTHER - KELLY TELECOM, JUNE 5, 1991, (B) KELLY - CROMER TELECOM, JUNE 5, 1991; (C) LOME 2872 (NOTAL), (D) KELLY - USAID/BENIN TELCOM, JUNE 6, 1991, (E) COTONOU 1590

1. RELEC/WCA: SEE PARA 5 FOR ACTION REQUESTED.

2. STATUS TO DATE:

A. OVER THE PAST MONTH USAID/NIGER HAS BEEN WORKING WITH THE GON, SHELL AND THE GTZ ON THE COLLECTION AND CLEAN-UP OF DIELDRIN STOCKS IN NORTHERN NIGER (SEE BELOW FOR ADDITIONAL BACKGROUND). ON THE MORNING OF JUNE 5, A CONVOY INCLUDING FOUR TRUCKS CARRYING A TOTAL OF 72,000 LITRES OF DIELDRIN IN ISOTANKS LEFT AGADEZ FOR LOME, TOGO AND ONWARD SHIPMENT TO ROTTERDAM AND INCINERATION.

B. ON THE AFTERNOON OF JUNE 5, THE MISSION RECEIVED WORD FROM USAID/TOGO THAT THE DIELDRIN CONVOY SHOULD NOT GO THROUGH TOGO DUE TO EXPECTED POLITICAL PROBLEMS (REF A). BASED ON DISCUSSIONS WITHIN THE MISSION, WITH THE GON CROP PROTECTION SERVICE AND RCO CROMER (REF B), THE MISSION IS WORKING WITH THE FREIGHT CONTRACTOR SNTN ON ROUTING THE DIELDRIN CONVOY THROUGH BENIN TO COTONOU. FROM COTONOU THE DIELDRIN TANKS AND EQUIPMENT CONTAINER WILL BE SHIPPED TO SHELL IN ROTTERDAM/PERNIS, AS HAD BEEN PLANNED FROM LOME.

C. WE CURRENTLY EXPECT THAT THE REROUTING PAPERWORK WILL BE COMPLETED BY COB JUNE 10. SEE BELOW FOR OTHER LOGISTICS DETAILS. THE GON IS CONTACTING THE GOVERNMENT OF BENIN AND ADVISING THEM THAT THE DIELDRIN CONVOY WILL TRANSIT FROM DOSSO, NIGER TO COTONOU.

AGR 11
CLASS: UNCLASSIFIED
CHRGE: AID 26/06/91
APPRV: A/DIR:VP-GORTON
DRFTD: TRU:CKELLY:PAC
CLEAR: 1.A/GDO:CARAHMAA
2.EXO:AVODRASKA
DISTR: AMB DCM AID

2. BACKGROUND TO OPERATION:

A. THE DIELDRIN, A CHLORINATED HYDROCARBON PESTICIDE, WAS ORIGINALLY DONATED TO NIGER FOR LOCUST CONTROL, SOME AS LONG AGO AS THE '70S. THE USG DID NOT REP NOT PROVIDE THE DIELDRIN TO NIGER.

B. USAID, UNDER A POLICY TO REDUCE THE USE OF THIS CLASS OF PESTICIDE, HAS WORKED WITH THE GON OVER THE PAST THREE YEARS TO DEVELOP AND IMPLEMENT A PLAN TO SAFELY DISPOSE OF THE DIELDRIN. THE GON'S WILLINGNESS TO DISPOSE OF THE DIELDRIN WAS BASED ON A REALIZATION THAT THIS PESTICIDE COULD NOT BE USED FOR PRACTICAL REASONS (IT IS EXTREMELY PERSISTANT) AND THAT CONTINUED STORAGE OF THE PRODUCT IN NIGER WOULD ONLY LEAD TO ADDITIONAL ENVIRONMENTAL DAMAGE AS THE BARRELS BEGAN LEAKING WITH AGE.

C. A NIGER DIELDRIN DISPOSAL PLAN (NDDP) WAS DEVELOPED BY USAID/NIGER, SHELL, THE GON AND THE GTZ BETWEEN SEPTEMBER, 1990, AND FEBRUARY, 1991. THE NDDP RECEIVED AID/W APPROVAL, INCLUDING AN EIA REVIEW, EARLY 1991.

D. UNDER THE PLAN, THE DIELDRIN IN NIGER HAS BEEN COLLECTED AND TRANSFERED INTO ISOTANKS FOR SAFE TRANSPORTATION. THE DIELDRIN BARRELS HAVE BEEN RINSED AND CUT-UP FOR TRANSPORTATION TO A SMELTER IN EUROPE. IN ADDITION, SOIL AND OTHER SOLIDS FROM CONTAMINATED WAREHOUSES HAVE BEEN COLLECTED AND WILL BE BURIED IN A SAFE DISPOSAL SITE IN NIGER.

E. THE DIELDRIN CONVOY, IS TRANSPORTING 72,000 LITERS OF DIELDRIN PESTICIDE AND SOLVENT IN FOUR TANKS, ONE EACH ON 4 TRACTOR-TRAILER TRUCKS. A CONTAINER OF RECOVERED

BARRELS AND EQUIPMENT IS ON A FIFTH TRUCK. THERE ARE FOUR ESCORT VEHICLES IN THE CONVOY AND A SEVEN PERSON RESPONSE CREW FOR EMERGENCIES. THE TANKS ARE DESIGNED FOR THE TRANSPORT OF HAZARDOUS MATERIALS AND MEET OR EXCEED USG REQUIREMENTS FOR SAFE TRANSPORTATION OF THE DIELDRIN.

4. SAFETY AND SECURITY

- THE ROAD SAFETY OF THE DIELDRIN CONVOY IS BASED ON THE FOLLOWING ACTIONS:

-- ALL CONVOY VEHICLES ARE INSPECTED DAILY TO ENSURE THEY ARE IN SAFE OPERATING CONDITION. ADDITIONAL SPOT CHECKS OF THE VEHICLES ARE PERFORMED DURING EACH REST STOP.

-- THE CONVOY SPEED IS SET AT 65 KM PER HOUR, MAXIMUM. THE SPEED OF THE CONVOY IS DEPENDENT ON LOCAL WEATHER AND ROAD CONDITIONS.

-- DRIVERS ARE REQUIRED TO STOP EVERY 3 HRS FOR A REST BREAK AND THE DAILY TRAVEL BY THE CONVOY IS PLANNED TO NOT OVERTIRE THE DRIVERS. THE DRIVERS AND OTHER CONVOY CREW RECEIVED A SAFETY BRIEFING BEFORE DEPARTURE FROM AGADEZ.

-- THE FOUR ISOTANK TRUCKS ARE PART OF A CONVOY WHICH HAS INITIAL AND FINAL ESCORT VEHICLES. IN ADDITION, THE FIRST AND LAST TRUCKS ARE FLAGGED FOR BETTER VISIBILITY.

-- THE CONVOY HAS ADEQUATE EQUIPMENT FOR THE CLEAN-UP OF A MINOR SPILL OF DIELDRIN OR THE CONTAINMENT OF AN ACCIDENT. A SEVEN PERSON RESPONSE TEAM IS ACCOMPANYING THE CONVOY.

-- SPECIAL PROVISIONS, INCLUDING THE STOPPING OF ON-COMING TRAFFIC, WILL BE MADE FOR THE CONVOY TO CROSS LARGE RIVERS OR NARROW BRIDGES. TRAVEL DURING POOR VISIBILITY AND HEAVY RAIN WILL BE PROHIBITED.

-- THE CONVOY WILL BE PARKED IN SECURE LOCATIONS AND GUARDED AT NIGHT DURING THE TRIP TO COTONOU.

- THESE SAFETY ACTIONS ARE THE SAME AS WERE TO BE APPLIED FOR THE NIGER-LOME TRIP.

5. LOGISTICS INFORMATION

A. THE CONVOY SHOULD LEAVE NIGER C/A JUNE 14 AND PASS THE NIGHT AT PARAKOU, BENIN. THE VEHICLES WILL BE PARKED AT THE SNTN YARD IN PARAKOU. ON JUNE 15 THE VEHICLES WILL TRAVEL FROM PARAKOU TO COTONOU. SNTN IS ARRANGING FOR PARKING OF THE VEHICLES IN COTONOU ALONG WITH TRANSIT ARRANGEMENTS FOR ONWARD SHIPMENT TO ROTTERDAM. THE FINAL DECISION ON THE NIGER - COTONOU SCHEDULE WILL BE MADE ON JUNE 10, BASED ON THE ARRIVAL DATE FOR THE SHIP TO TRANSPORT THE DIELDRIN TO

OTTERIAM.

. VEHICLE REGISTRATION INFORMATION:

- TOYOTA LANDCRUISER, 50 CD 24 RN (USAID/NIGER)

- TOYOTA LANDCRUISER, 50 CD 30 RN (USAID/NIGER)

- TOYOTA LANDCRUISER, 6638 ITNY (GON)

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-- TRACTOR-TRAILER - DIELDRIN TANK, 0702 NY 2 (SOCIETE NATIONALE DES TRANSPORTS NIGERIENS - SNTN)

-- TRACTOR-TRAILER - DIELDRIN TANK, B4275 RN 8 (SNTN)

-- TRACTOR-TRAILER - FREIGHT CONTAINER, B6135 RN 8 (SNTN)

-- TRACTOR-TRAILER - DIELDRIN TANK, B7829 RN 8 (SNTN)

-- TRACTOR-TRAILER - DIELDRIN TANK, B6912 RN 8 (SNTN).

6. ACTION REQUESTED:

FOR ABIDJAN: PER REFS (A), (B) AND (C), MISSION IS PROCEEDING WITH PLANS TO REROUTE THE DIELDRIN SHIPMENT FROM ICME TO COTONOU. THE OTHER OPTION OF OFF-LOADING TEN CONTAINERS IN NIAMEY PENDING CLARIFICATION OF THE SITUATION IN TOGO IS NOT CONSIDERED FEASIBLE DUE TO LOGISTICAL, FINANCIAL AND POLITICAL CONSIDERATIONS.

PLEASE CONFIRM RCO AGREEMENT TO A CHANGE ORDER FOR THE SNTN CONTRACT TO PERMIT SHIPMENT OF THE DIELDRIN VIA BENIN AND THE PORT OF COTONOU.

B. FOR COTONOU: AS NOTED ABOVE, THE GON IS INFORMING THE GOVERNMENT OF BENIN ABOUT THE CONVOY AND SNTN IS HANDLING THE FREIGHT ARRANGEMENTS. WE DO NOT ANTICIPATE ANY NEED FOR INTERVENTION ON THE PART OF USAID/BENIN REF D AND E). PLEASE USE THE INFORMATION CONTAINED IN THIS CABLE TO FIELD ANY REQUESTS FOR INFORMATION WHICH MAY COME FROM THE AUTHORITIES IN COTONOU.

- WE WILL PROVIDE ADDITIONAL DETAILS ON THE MOVEMENT OF THE CONVOY AS AVAILABLE. PLEASE ALSO NOTE THAT THE OPERATION OF THIS CONVOY MEETS OR EXCEEDS REQUIREMENTS FOR SHIPMENT OF SIMILAR MATERIALS IN THE CONUS. SECURITY AND SAFETY FOR THIS CONVOY ARE SIGNIFICANTLY GREATER THAN CURRENT FREIGET SHIPMENT PROCEDURES IN EFFECT IN THE COTONOU - NIGER CORRIDOR.

7. C. KELLY, THE MISSION'S DISASTER RELIEF COORDINATOR AND PROJECT BACKSTOP FOR NDEP, WILL ARRIVE IN COTONOU ON JUNE 9 TO FACILITATE LOCAL ARRANGEMENTS FOR THE DIELDRIN CONVOY AND ALSO WORK ON FOOD AID ISSUES. KELLY WILL CONTACT USAID/BENIN ON ARRIVAL. CUNDIFF
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ACTION: AID INFO: AMB DCM /2

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FM AMEMBASSY COTONOU
TO RUEENM/AMEMBASSY NIAMEY IMMEDIATE 3385
RUEHFC/AMEMBASSY LOME 5805
INFO RUEHC/SECSTATE WASHDC 9807
RUEHAB/AMEMBASSY ABIDJAN 9333
RUEHCC/AMEMBASSY OUAGADOUGOU 3297
BT
UNCLAS COTONOU 01659

LOC: 346 496
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CN: 24568
CHRG: AID
DIST: AID

14 JUN 91 16 16

USAID/NIGER

ACTION: DRU
INFO: DIR:DD
GDO/DC
CHRON

AIDAC

DUE DATE: 06-21-91

NIAMEY FOR DRU/WHEELER
AID/W FOR AFR/TR/ANR/NR - AELGA PROJECT, AFR/SWA - MC KAY, OFDA; ABIDJAN FOR REDSC - RCO;
OUAGADOUGOU HOLD FOR RCO CROMER

E.O. 12356: N/A
TAGS: N/A
SUBJECT: DIELDRIN/NIGER: REVISED SHIPMENT PLANS

REF (A) KELLY - PANTHER TELCOM, JUNE 13, 1991, (B) KELLY - WHEELER TELCOM, JUNE 14, 1991

1. CURRENT STATUS OF DIELDRIN SHIPMENT:

- THE DIELDRIN CONVOY IS PRESENTLY AT PARAKOU, BENIN. THE SHIP ON WHICH THE DIELDRIN WAS TO HAVE BEEN EMBARKED, THE M/V CONCORDIA, PASSED AT COTONOU JUNE 13, 5 DAYS AHEAD OF SCHEDULE. IN VIEW OF THE LACK OF NO-COST STORAGE SPACE AT COTONOU, DIFFICULTIES IN SCHEDULING SPACE ON OTHER SHIPS FOR THE DIELDRIN IN THE NEXT 3 DAYS, THE HIGH COST OF STORAGE OF THE DIELDRIN AT COTONOU (EST. COST OF 1,000 DOLLARS/DAY FOR 4 TANKS), AND THE AVAILABILITY OF THE SHELL FACILITIES AT LOME, A DECISION HAS BEEN REACHED TO REROUTE THE CONVOY TO LOME (REFS A AND B). FYI: IT IS NOW REPORTED THAT THE M/V CONCORDIA WILL PASS AT LOME ON JUNE 18. END FYI.

2. CURRENT PLAN

- THE NIAMEY FREIGHT CONTRACTOR AND HIS AGENT IN BENIN ARE WORKING ON THE PAPERWORK TO REROUTE THE CONVOY FROM A COTONOU EMBARKATION TO A LOME EMBARKATION. BECAUSE THE CONVOY WAS ROUTED TO COTONOU AT THE POINT OF ENTRY INTO BENIN, THE CONVOY WILL HAVE TO PASS VIA COTONOU BEFORE PROCEEDING TO LOME. PAPERWORK FOR THIS REROUTING WILL BE COMPLETED O/A THE MORNING OF JUNE 17.

- ASSUMING A SMOOTH FLOW OF PAPERWORK, THE CONVOY WILL LEAVE PARAKOU FOR COTONOU ON JUNE 16 AND OVERNIGHT ON ROUTE. ON JUNE 17, THE CONVOY WILL PROCEED FROM THE

ACTION RECORD
INFO
NIAMEY 6/14
Date
Initials

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OVERNIGHT STOP TO COTONOU AND ON TO LOME IN ONE DAY.

- EVEN IF THE CONVOY IS DELAYED ONE DAY AND DOES NOT MAKE THE M/V CONCORDIA AT LOME, IT WILL BE POSSIBLE TO STORE THE DIELDRIN SAFELY AND AT NO COST UNTIL ALTERNATE SHIPPING ARRANGEMENTS CAN BE MADE.

3. TRAVEL PLANS

- PER REF (B), C. KELLY PLANS TO TRAVEL TO LOME FROM COTONOU ON JUNE 14 TO VERIFY ROAD CONDITIONS AND FOLLOW-UP ON CONTACTS WITH SHELL AND USAID/TOGO. KELLY WILL THEN PROCEED TO PARAKOU VIA COTONOU TO MEET WITH THE CONVOY AND COMPLETE PLANS FOR THE TRIP TO COTONOU AND ON TO LOME. KELLY WILL ADVISE NIAMEY, COTONOU AND LOME AS APPROPRIATE ON THE PROGRESS OF THE CONVOY.

4. SHELL/LONDON (DOLLIMORE) HAS BEEN ADVISED OF THE CHANGE IN THE ROUTING OF THE DIELDRIN AND WILL PASS THIS INFORMATION ON PARTIES WITHIN THE SHELL ORGANIZATION.ISCM

BT
#1659

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ACTION: AID INFO: AMB DCM /3

AGR 4L III/24

VZCZCNMO202
RR RUEHNM
DE RUEHPC #3130 1751422
ZNR UUUUU ZZH
R 241422Z JUN 91
FM AMEMBASSY LOME
TO RUEHNM/AMEMBASSY NIAMEY 9316
INFO RUEHC/SECSTATE WASHDC 8066
RUEHAB/AMEMBASSY ABIDJAN 5361
BT
UNCLAS LOME 03130

RECEIVED
25 JUN 91 1320
USAID/NIGER

LOC: 354 372
25 JUN 91 0656
CN: 25764
CHRG: AID
DIST: AID

ACTION: DRU
INFO: DIR:SD
GDO/DC
CHRON

AIDAC

DUE DATE: 07-02-91

E.O. 12356 N/A
SUBJECT: NIGER DIELDRIN DISPOSAL: OCEAN SHIPMENT UPDATE

REF: COTONOU 1674

1. THE M/V CONCORDIA PASSED LOME ON JUNE 20 WITHOUT DOCKING. THE CONCORDIA'S OWNERS DID NOT WANT THE SHIP TO SPEND TWO UNPRODUCTIVE DAYS IN LOME WHILE THE PORT WAS CLOSED DUE TO NATIONAL HOLIDAYS.

2. DIELDRIN AND FREIGHT CONTAINERS ARE NOW SCHEDULED TO LEAVE LOME ON THE M/V WOERMAN ULANGA (ETA LOME JUNE 25-26). IT IS REPORTED THAT THIS SHIP WILL SAIL DIRECTLY FROM LOME TO EUROPE.

3. THE DIELDRIN ISOTANKS ARE CURRENTLY IN THE HAZARDOUS MATERIALS STORAGE AREA AT THE LOME PORT. NO PROBLEMS OCCURED DURING THE UNLOADING OF THE TANKS FROM THE CONTRACTOR'S TRUCKS ON JUNE 20.

3. WILL ADVISE WHEN ACTUAL ETA FOR WOERMAN ULANGA IS KNOWN. SHIPPING INFORMATION IS BEING SHARED WITH SHELL/TOGO AND SHELL/PERNIS. KIRBY

BT
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ACTION RECORD
INFO
NIAMEY
Date 6/25
Initials

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UNCLASSIFIED

SECSTA WASHDC 003182
AGR 4L

ACTION: AID INFO: AMB DCM /3

VZCZCNMO618
PP RUEBAM
DE RUEHBC #3182 1781502
ZNR UUUUU
R 271502Z JUN 91
FM SECSTATE WASHDC
TO RUEHNM/AMEMBASSY NIAMEY
INFO RUEHAB/AMEMBASSY ABIDJAN
RUTAEM/AMEMBASSY BAMAKO
RUEHCO/AMEMBASSY COTONOU
RUFHOC/AMEMBASSY OUAGADOUGOU
RUFHLI/AMEMBASSY LONDON
RUEHNK/AMEMBASSY NOUAKCHOTT
RUEHRC/AMEMBASSY ROME
RUFHTH/AMEMBASSY THE HAGUE
BT
UNCLAS WASHDC 03182

RECEIVED
28 Jun 91 10 13
USAID/NIGER

LOC: 356 838
27 JUN 91 1507
CN: 26164
CHRG: AID
DIST: AID

ACTION: DRU
INFO: DIRDD
GDO/DC
CHRON
DUE DATE: 07-05-91

AIDAC

NIAMEY FOR DRU

AIDW FOR AFRTRANRNR - AELGA PROJECT; AFRSWA FOR MC KAY; CFDA FOR BUDEN

ABIDJAN FOR REDSOWCA - RCO AND REO, AND PASS TO APHIS

ICNION FOR AID AFFAIRS

OUAGADOUGOU FOR RCO CROMER

ROME FOR FODAG AND PASS TO FAO

THE HAGUE FOR AID AFFAIRS

E.O. 12356
SUBJECT: NIGER DIELDRIN DISPOSAL PROGRAM: SHIP DEPARTURE NOTICE

REF: LOME 3130 (NOTAL)

1. THE MV WOERMAN UIANGA LOADED 4 ISOTANKS OF DIELDRIN AND ONE DRY BOX OF CUT-UP BARRELS AND USED EQUIPMENT AT 2100 JUNE 26. LOADING WENT WITHOUT INCIDENT. SHIP DEPARTED LOME 0730 JUNE 27, SCHEDULED FOR ROTTERDAM AFTER STOPS AT COTONOU, LAGOS, DOUALA, ABIDJAN, DAKAR, LAS PALMAS AND LE HARVE.

2. SHELLTOGO AND SHELLPERNIS ADVISED OF LOADING. BILLS OF LADING WILL BE SENT TO SHELLTOGO, SHELLPERNIS AND SAGATRANSROTTERDAM, FREIGHT FORWARDING AGENT.

3. KELLY WILL LEAVE LOME JUNE 27 FOR NIAMEY VIA BURKINA.

4. FOR AFR/TR/ANR/NR - AELGA PROJECT: SEPTEL FROM NIAMEY WILL PROVIDE A STATUS REPORT ON THE NIGER DIELDRIN

ACTION RECORD
CB/INFO
NIAMEY
Date 2/9/
Initials

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026692

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DISPOSAL OPERATION. NIAMEY WILL ALSO CONTACT GTZ
PESTICIDE SERVICE PROJECT WITH A STATUS REPORT ON THE
OPERATION. KIRBY

FT
#3182

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