

# SPREP

South Pacific Regional  
Environment Programme



# PROE

Programme régional  
océanien de l'environnement

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## **Palau POPs Project Country Plan** **(Prepared by SPREP, January 2003)**

### **1. Introduction**

The Australian Agency for International Development (AusAID) several years ago identified the mismanagement of hazardous chemicals in the Pacific Island Countries as a serious environmental concern, and hence the Persistent Organic Pollutants in Pacific Island Countries (POPs in PICs) project was developed as an AusAID funded initiative, to be carried out by SPREP. POPs are a group of twelve particularly hazardous chemicals that have been singled out by the recent Stockholm Convention for urgent action to eliminate them from the world. They include polychlorinated biphenyls (PCBs), which are mainly found in transformers, and several pesticides that are very persistent and toxic to the environment.

Phase I of the project involved predominantly an assessment of stockpiles of waste and obsolete chemicals and identification of contaminated sites, for 13 Pacific Island Countries. Other Phase I activities included education and awareness programmes in each country and a review of relevant legislation.

Palau was a participant in Phase I of this work. A comprehensive report of this Phase I work was prepared and circulated, and significant quantities of hazardous wastes were identified in the countries visited, including estimated figures of 130 tonnes of PCB liquids and 60 tonnes of pesticides (although only about 3 tonnes of POPs pesticides). Many other hazardous wastes were also identified as well. In addition, quite a large number of contaminated sites were discovered, including six locations of buried pesticides. On the basis of this report, it was decided to proceed to the Phase II of the project, which involved the preparation of a more detailed inventory, and then collecting, transporting and disposing of the wastes, to a suitable Australian facility.

The first part (Component 1) of the Phase II work is now nearly complete, and has involved visits to each of the countries involved in the project, including Palau, for detailed inventories to be carried out, including testing of all stockpiled transformers.

Other work was also carried out during these visits, including improving the temporary storage arrangements where necessary, and obtaining written agreement from each country for the project to proceed. A copy of the Palau visit report is contained in Appendix 1 below.

The most significant conclusion found from this next stage of the work is that the estimated amount of PCB contaminated oils was far too high. Instead of the expected 130 tonnes, only 12.5 tonnes were found. This presented an opportunity to include additional wastes in the project, and it was decided to collect and dispose of all the pesticides, rather than only the POPs pesticides (as well as all the PCB transformer oils that were confirmed positive). A total of 50,265 kg of pesticides will now be dealt with, including 1825 kg of POPs pesticides and 6542 kg of unknowns, some of which may be POPs pesticides.

A full inventory of all pesticides and PCB contaminated oils was prepared in November 2002 as the basis for bid invitations to appoint an Australian Management Contractor (AMC) to carry out the rest of the Phase II work. As a result, the Australian company GHD Pty Ltd was appointed as AMC. GHD is expected to start work shortly and it is important that all countries agree to a confirmed plan for implementing the rest of the Phase II work. The wastes will all go to the BCDT / SRL Plasma plant in Narangba, north of Brisbane.

AusAID have engaged the Australian legal firm of Blake Dawson Waldron ("**BDW**") and instructed them to provide advice in relation to aspects of the POPs Project. As part of this process BDW has asked SPREP to obtain from participating countries some information as presented in Section 4 below.

## **2. Country Inventory**

(It is possible that more wastes may be found in the categories below, prior to the time of pickup. If so, these could be added to the inventory, subject to negotiation with AusAID and the AMC.)

Palau has the following **PCB Contaminated Oils** to be collected. All stockpiled transformers that had not been tested previously by an earlier US EPA exercise were tested with Dextsil Chlor-N-Oil 50 test kits and 9 initially tested positive out of 47 transformers (stockpiled at the Malakal Power Station, Koror, Ngeremlengui, Kesebelau, Babeldaob, the old Airai Power Station, and the Palau Transport Company). The Dextsil kits test for all chlorine and not just chlorine in PCBs, so they are susceptible to "false positive" results. A total of 6 of the original 9 "positive" transformers were later confirmed as positive by Hills Laboratories in New Zealand.

Palau has the following **PCB Contaminated Oils** to be collected.

<b>Location</b>	<b>Transformer</b>	<b>Wt of Oil</b>	<b>PCB Conc</b>	<b>No of</b>	<b>Total Waste Wt</b>
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	<b>ID Number</b>	<b>(kg)</b>	<b>(mg/kg)</b>	<b>Flushes</b>	<b>(incl Flushes) (kg)</b>
Kesebelau, Airai,	PK1	220	34	2	660
Babeldaob	PK2	206	117	3	824
	PK3	182	25	2	546
	PK5	202	22	2	606
	PK6	190	28	2	570
	PK11	215	75	2	645

Palau has no **Pesticides** to be collected.

### **3. Other Project Work**

Many of the transformers at the Kesebelau site had leaked and so a composite soil sample was taken of the soil, and sent for PCB analysis. The analysis of numerous PCB congeners was negative, with the sum of individual congeners being <2 mg/kg dry weight. In view of the fact, however, that six transformers on this site were tested as being positive for PCBs in the oil, it may be appropriate to do further testing and remove some of the soil at this site (skimmed off the top).

A visit was made to Ngatpang, to a site in the Mangroves where some drums of DDT had been dumped nearly 40 years ago. About 18 – 25 drums were dumped, with an average of about 30 gallons of DDT in each (i.e. possibly up to 3 tonnes of DDT). All that remained were drum fragments with some chemical still adhering to them. There was also a faint chemical odour. A composite sample of the soil was taken, together with a sample of the old drum metal with chemical adhering to it.

The results were as follows:

Parameter	Composite Soil Sample mg/kg dry weight	Metal Sample mg/kg dry weight
2,4'-DDE	0.12	<0.005
2,4'-DDD	1.5	0.013
2,4'-DDT	0.7	0.007
4,4'-DDE	1.3	0.010
4,4'-DDD	0.86	0.007
4,4'DDT	1.69	0.020
Total DDT isomers	6.18	0.06

This level of DDT contamination is quite low, indicating that most of the DDT has disappeared into the neighbouring environment in the intervening 40 years. It would be worthwhile carrying out some more testing however, to establish more accurately the

level of DDT contamination, and it may also be useful to check the levels of DDT in nearby fish, shellfish and mammals.

A visit was also made to the yard of the Palau Transport Company at Kesebelau , Babeldaob, which was being used for some chemical dumping. We found the following items:

- 18 x 200 liter drums (in deteriorating condition) of diphenyl methane diisocyanate (Iupranate M205).
- 4-5 very old rusted Japanese gas cylinders.
- About 25 badly deteriorated bags of polystyrene chips.
- 23 x 120 liter blue drums of a white waste liquid with a slight plastic smell.

These materials need to be investigated further, and disposed of properly if they are indeed wastes.

Some time was spent during the visit, on the matter of old gas cylinders. These are quite often used in Palau for decorative as well as functional purposes, in the grounds of houses etc. Usually they are partially buried in the ground. One of these old cylinders developed a leak through corrosion just before the recent visit, and released a large amount of chlorine gas, which hospitalized about twenty people and killed a large amount of vegetation. It happened during the day, but if it happened at night, it could have resulted in fatalities. Numerous other cylinders were inspected and some others were identified as representing a potential risk.

A visit was made to the Palau General Hospital where some stockpiles of chemicals were identified. The Palau High School also dropped off some chemicals to the EQPB, where some old chemicals were already being held.

An inspection was made of the two new incinerators at the Palau General Hospital, and they were found to be deficient in several respects and emitting quite hazardous fumes that were affecting operators and the general public. A letter was written to the EQPB recommending that EQPB requires the hospital to apply for a permit for the new incineration system. The permit application should be accompanied by design details, operating instructions and expected emissions information. As an immediate precaution, it was recommended that the incinerator should not be operated again until all operators are supplied with the correct respirators, access is restricted, and the area screened off (temporarily if necessary).

#### **4. Domestic Laws on Collection, Packaging, Transportation and Export of Hazardous Waste**

AusAID have engaged the Australian legal firm of Blake Dawson Waldron ("**BDW**") and instructed them to provide advice in relation to aspects of the POPs Project. As part of

this process BDW has asked SPREP to obtain from Palau (as well as all other participating countries) the following information:

- a) What are the legal responsibilities in Palau for persons involved in collection, packaging, transportation and disposal of hazardous wastes and who are those responsibilities allocated to by the laws in Palau.
- b) Who is the owner of the hazardous wastes in Palau.
- c) Does Palau have domestic legislation which allocates responsibility for POPs waste during collection, packaging and export? If so, how is this responsibility allocated? Please consider that liability and responsibility may arise from:
  - requirements to comply with clean-up notices or Government directions relating to the waste;
  - requirements to meet safety, environmental and other standards in relation to the waste; and
  - requirements to compensate others for damage to property, human health or the environment.
- d) Does Palau have a domestic policy in relation to providing or withholding consent under the prior informed consent provisions of the Waigani Convention (Article 6) for:
  - Palau
  - any other Pacific Island Countries planning to 'transit' wastes through Palau.
- e) Has Palau developed a national hazardous waste management strategy in accordance with Article 4(4)(e) of the Waigani Convention? If so, how is the strategy relevant to:
  - the collection, packaging, transportation and exportation of POP waste; and
  - responsibility for and ownership of the POP waste at each of the steps in (i).

Should you have any enquiries, please contact the following relevant Blake Dawson Waldron staff, Tony Hill on (02) 9258 6185 or Joanna Perrens on (02) 9258 6401 in Sydney, Australia.

## **5. Discussion**

There are six transformers confirmed positive for PCBs. These transformers contain 1215 kg of oil or 1430 litres. If it is decided to flush out the transformer and leave the

carcass, then a total of 3851 kg of oil plus flushing liquid will be produced, or 4530 litres. This will need a total of 23 x 200 litre drums. The alternative to solvent flushing is to take the complete transformers (contaminated oil plus carcasses), but then the oil will need to be drained out of the carcass and transported separately.

If it is decided to remove some soil from the Kesebelau transformer dumping site, probably it will be necessary to remove about 5 cubic metres, which will require about 25 drums.

Palau has no pesticides, so the total number of drums needed is therefore approximately 48 drums. One container will therefore be sufficient.

A staging location will be needed for the container, and the obvious location is at the Kesebelau transformer dumping site, as this is where all the PCB contaminated transformers and contaminated soil is located. The owner of the land will however need to be consulted.

About 15-20 transformers that were at Ngeremlengui have now apparently been transported to the island of Kayangel. Dexsil test kits were left to test these transformers but this may not have been done yet.

It is also important that consent procedures are in place to process the application from GHD to Palau to export the waste. Palau has not as yet ratified the Waigani Convention, but is planning to do so soon. Otherwise bilateral arrangements will need to be made between the Government of Palau and the Government of Australia. It is important that Palau is ready to handle the export application effectively, including any appropriate public consultation processes. SPREP plans to hold a workshop soon to assist countries with this consent process.

The impact on the public in Palau should be minimal, provided everything is organized and implemented according to a well-designed management plan. The local transport routes and movement times will be part of the plan, and the only risk of public exposure will be if some incident occurs during this local transport, which leads to a spill. The basis of the management plan should be communicated to the public effectively via radio, and printed media, but not in an alarmist fashion, as the risk to the public is very low.

## **6. Conclusions**

1. Palau has six PCB contaminated transformers containing in total 1215 kg (1430 litres) of contaminated oil.
2. Palau has no unwanted pesticides for disposal.
3. It may be necessary to remove some PCB contaminated soil from the transformer dumping area at Kesebelau.

4. A total of approximately 48 drums will be required (depending on the amount of contaminated soil to be removed) and these will fit easily into one 20 ft shipping container.
5. Palau has a contaminated site at Ngatpang in the mangroves where a DDT dumping episode 40 years ago is still causing some residual contamination. The DDT may have also contaminated the surrounding environment.
6. Palau has some stockpiles of unwanted chemicals at the Palau General Hospital and held at EQPB. There may also be other stockpiles.
7. There is a range of waste chemicals being stored at the Kesebelau site of the Palau Transport Company.
8. Many used gas cylinders are still stored and partly buried around Palau. Most are undoubtedly harmless, but a few may still be hazardous.
9. The new incinerators at the Palau General Hospital present a real health risk to operators and the public.

## **7. Actions**

1. The transformers for collection should be isolated and secured at the Kesebelau transformer dumping area. This can be achieved by separating them out from the rest of the transformers and erecting a temporary fence around them.
2. A local management plan will need to be prepared for all local operations, including the determination of the location of the container while the collection operations are going on. This plan will need to address such issues as local transportation arrangements, local contact focal point, and the best way of carrying out consultation with the Palau public on the local implementation of the project. This plan needs to be developed in conjunction with the AMC.
3. Local systems need to be put in place to ensure effective processing of the application from the AMC to export hazardous waste from Palau to Australia. This will be done under the Waigani Convention if Palau has ratified the convention in time. Otherwise bilateral arrangements will be needed. A SPREP workshop is planned for April to assist countries with these procedures, and a Palau representative should attend this workshop. (Financial assistance will be provided.)
4. Advise Palau Public Utilities Corporation of the results of the PCB analyses.
5. Note the need for further investigations into the environmental impact of the DDT dumped in Ngatpang. This should be done as soon as a suitable opportunity

arises, which will probably be during the preparation of the National Implementation Plan (NIP) for the Stockholm Convention. Substantial funding is available from the GEF for the preparation of the NIP.

6. The issue of testing the 15-20 transformers stored at Kayangel needs to be resolved.
7. Set up a programme to inspect the old gas cylinders stored on private properties throughout Palau, to ensure there is no repeat of the chlorine leak that endangered the lives of several nearby residents.
8. Continue to safely stockpile any used chemicals that are not to be picked up by the current AusAID project. It would be appropriate to find a suitable central locked storage area with proper shelving for these chemicals, and also to ensure that proper segregation of incompatibles (e.g. acids and alkalis, oxidizers and reducers, acids and cyanides) is achieved. In this respect the chemical wastes stored at the Palau Transport Company also need to be dealt with effectively
9. Ensure the incinerators at the Palau General Hospital are no longer a risk to operators or the public.
10. Provide SPREP with appropriate responses to the BDW questions regarding Domestic Laws on Collection, Packaging, Transportation and Export of Hazardous Waste



## Appendix 1

### REPORT OF THE VISIT OF JOHN O'GRADY (SPREP) TO PALAU FOR THE POPS PROJECT

#### Wednesday 12 June

Arrived in Palau at about 3pm

Met counterparts *Donald Dengokl (Assistant Executive Officer) and Emil Edesomel (Pollution Control Officer), Environmental Quality Protection Board (EQPB) Phone 680/488-1639* and discussed my visit. I also later met all the members of the EQPB, as they were having one of their regular board meetings there that afternoon.

#### Thursday 13 June

Went for tour with Emil Edesomel for most of the morning. Among other things we visited the Malakal (Koror) Power Station to have a first look at the transformers. We met *Aphon Techur, Manager, Palau Public Utilities Corporation (Phone 488-2413)*. We also visited the site of the existing landfill, which was really no more than a dumpsite. It was down at M-dock, near the inner harbour, and leachate appeared to be polluting the nearby harbour waters and mangroves.

Emil explained to me that a chlorine gas leak had occurred recently from a cylinder half buried in a front garden. It had formed a small hole and all the gas had escaped, damaging a large area of trees and vegetation. Fortunately it happened in the middle of the day and the leak was detected so people could be warned. Twenty-three people were still taken to hospital, however. The offending cylinder plus four nearby ones were dug up and disposed at sea, in deep water about 20 miles off away from land. Emil took me to inspect the location of the leak, and also showed me numerous other cylinders in people's gardens.

In one location we spotted 10 cylinders half buried in a grid pattern. They were located above several houses and we decided they should be dug up urgently in case they contained chlorine and leaked like the other one previously. We later discovered the previous owner of the house who said they were all empty oxygen cylinders and he had buried them, intending them to be used for house footings. We then decided that there was no pressing need to dig up the cylinders, although there were lingering doubts about the story of the previous owner – some of the inverted cylinders had quite different bottoms to the others.

In afternoon we continued our tour. We went to Airai, Babeldaob, and visited an old transformer dump in Kesebelau, Airai. We also visited the old Airai power station, which had a very large transformer.

When we returned to the EQPB, I met *Steve Salii, Safety Officer, Bureau of Public Works (488-2431)*. We then had a meeting with Don and Steve, to discuss plans for the remainder of my visit.

### **Friday 14 June**

Had long meeting with *Marhence Madranchar, EQPB Executive Officer*, and discussed Palau's environmental problems, especially waste management. The existing landfill (dump) should have been closed down long ago. Several possibilities for new locations have been considered, but the main problem at present is to raise the funds to do the work. The securing of a suitable location will also be a difficult problem, although there are some good prospective sites on Babeldaob. (I found out a lot more about this issue at the Conference – see Thursday 27 June below). It has also been decided to build a high quality road right around Babeldaob, and work has already commenced. The environmental impacts of this road could, however, be quite severe. Strict conditions had been laid down that need to be monitored carefully.

We commenced testing transformers at Koror power station in the morning, although many had already been tested by the US EPA. We did test five very large transformers that had already been tested as negative, and confirmed that they were indeed negative. We were rained off for the rest of the day, so I worked on a report for AusAID on the current state of the project.

### **Monday 17 June**

Took boat to Ngeremlengui (on Babeldaob) (with Donald, Emil and two assistants) and visited two sites where transformers were stored. Tested seven small units in total and all were negative. There were apparently about 20 additional units spotted there on an earlier visit, which had gone missing. Marhence subsequently found that these transformers had been taken to the remote island to the north of Babeldaob, of Kayangel. I will leave testing kits for Emil to visit Kayangel when convenient.

We also visited the site in the mangroves at Ngatpang, where some drums of DDT had been dumped nearly 40 years ago. Emil later advised that as best they could find out, there were about 18 – 25 drums, with an average of about 30 gallons of DDT in each (i.e. possibly up to 3 tonnes of DDT). All that remained were drum remnants of numerous old steel drums. They were just fragments of drums, with some chemical still adhering to them. There was also a faint chemical odour. We took a composite sample of the soil, and a sample of the old drum metal with chemical adhering to it.

## **Tuesday 18 June**

Met *Youlsau Bells, Head of the Office of Environmental Response and Coordination (Phone 488-6950)*, to discuss signing the Waigani Convention. This office has a small staff of five, including a recently appointed International Waters person. The office reports direct to the President, and is responsible for all Palau's international environmental business. It also acts as a policy agency, whereas the EQPB is primarily a regulatory agency. Youlsau thought that Palau had already ratified the Waigani Convention and promised to investigate. She said that if they hadn't ratified, then they would do so as soon as possible. I advised that SPREP had no record of Palau ratifying the Waigani Convention.

Marhence of EQPB later advised that his records showed that Palau had ratified Waigani in 1996, but that he had been unable to find confirmation of this in the files of the relevant government agency when he had done a search.

Went back to Malakal Power Station for more testing of the transformers there. There were about 180 transformers stored at Malakal Power Station, and an inspection revealed that most of them had either been tested by the US EPA previously, or were marked with a "non-PCB" label. Most of the transformers were small, old and had lost their nameplates. As a result of the previous US EPA tests, 22 transformers had been confirmed as positive (with PCB levels ranging from 278 – 851 ppm). These transformers had been removed to the USA for destruction several years ago.

We identified a group of 10 transformers, which were not marked "non-PCB" and which had not been tested by the US EPA previously, and we commenced testing these transformers. We were, however, stopped by heavy rain.

## **Wednesday 19 June**

We went early to the transformer dumping ground we had earlier identified at Kesebelau, Airai. There were a total of 45 small to medium sized transformers there and they were all very old. Most had lost their nameplates. They all appeared to be Japanese transformers. The nameplates still remaining were all in Japanese, and several also had the Mitsubishi "three diamond" brand mark on them.

We commenced testing the transformers, although they were stacked two high and crammed together, so access was difficult. After an hour or so, Donald Dengokl and Steve Salii arrived with a crane and driver as previously arranged, and the transformers were spread out so they could be tested. Many of the transformers were either empty or filled with water. We managed to get through about half of them, although we had considerable difficulty opening some of them.

We also visited the site of the old Airai Power Station and tested a very large old transformer (500 kVA) and weighing 12.9 tonnes, with the nameplate in Japanese. It tested negative.

Later in the afternoon we returned to Malakal Power Station to continue testing transformers there, and completed testing the 10 previously identified transformers, two of which tested positive.

### **Thursday 20 June**

Finished work at the Kesebelau transformer dumpsite. There are 45 transformers dumped there, and 24 could not be tested because they were empty or water-filled. Of the remaining 21 that were tested, seven tested positive. In view of the number of empty or water-filled transformers, we took a composite sample of the soil that had been contaminated by the spilled transformer oil.

Visited the Palau General Hospital with Donald Dengokl and Steve Salii in the afternoon, and met ***Francis Termeteet, the Laboratory Manager***. He showed us about 5 boxes of unwanted chemicals and other material. Most of these consisted of agar of various kinds for bacterial tissue culture, and there were 4 x one liter jars of alcohol. The rest was just inert garbage. I suggested that Donald should arrange for his staff to pick it up the following day, place it in a hole in the landfill, and cover it all up.

We also visited the Pharmacy Department, and they advised that all their surplus pharmaceuticals were being destroyed in the new hospital incinerators.

We inspected the new incinerators and discovered there were two Orion Incinerators (Model GE-730) manufactured by Green Earth Technology Ltd, and donated by Taiwan. We met ***Arsenio Saluri, the maintenance attendant***, and he could not explain how the incinerators worked. They had no stacks and were quite small single chamber units that apparently operated at 1300<sup>0</sup>F. Their capacity was 0.49 cum and their weight was 1600 kg. Mr Saluri advised they would next be operating on Monday at 1pm and invited us to inspect the operation.

### **Friday 21 June**

Revisited Kesebelau (with Emil and Ube, another EQPB employee) to inspect the boatshed and Palau Transport Company (PTC) storage area. (The boatshed is a fiberglass boat making business.) Tested the three small transformers stored in the boatshed, and they were all negative. Then had a look around the yard. We found:

- 18 x 200 liter drums (in deteriorating condition) of diphenyl methane diisocyanate (Iupranate M205).
- 4-5 very old rusted Japanese cylinders.

- About 25 badly deteriorated bags of polystyrene chips.
- 23 x 120 liter blue drums of a white waste liquid with a slight plastic smell.

Toured residential areas of Airai and Koror and found numerous examples of old cylinders stored around houses. Some were concreted into paved areas, some were buried, and some were just lying on the ground. They were being used for fences, barriers and for decorative effect. In one case the decorative effect was elaborate, with numerous cylinders brightly painted in different colours, as well as bomb casings, floats etc, treated the same way. This is a potential problem that should be resolved by the removal of all the old cylinders now stored in residential areas.

Arranged for the posting of samples back to New Zealand by DHL.

### **Monday 24 June**

Attended the first day of the 21<sup>st</sup> Pacific Environmental Conference – see conference report.

Also inspected the operation of the incinerator at the Palau National Hospital. The Taiwanese Government has just given two medical waste incinerators to the Palau Government (see Thursday 20 June above). Emil and I arrived at 1 pm, just as the operations crew had arrived to start up one of the incinerators. Before start-up I had a look at the incinerator. It was a vertical steel cylinder lined with a refractory “castable” type material, standing about 5 ft high, and about 3 ft diameter. It had a vertical steel central stand-pipe about 4 inches diameter, which was unlined and perforated with rings of small holes. This pipe was connected to a manually operated blower. There were also facilities to pump oil and water into the incinerator, to respectively heat up and cool down the combustion process. At the top of the incineration cylinder there was a large round damper the full diameter of the cylinder, which could be opened and closed electrically. There was no stack.

There was no temperature indication or any other form of indication. The control panel was small and simply consisted of manual stop/start and run indicators for the blower, water pump and oil pump, as well as damper open / close.

The operators then proceeded to start up the unit. They first charged the incinerator with quite a large amount of medical waste in sealed plastic containers. They then threw kerosene soaked rags into the incinerator from the damper at the top. These rags were then lit with a cigarette lighter through the bottom door, and the blower was started up. Fumes then began pouring out of through the top damper, which were not black, but smelled strongly of burning plastic. It was quite a disturbing smell. There were two operators there and they then started to load more medical waste (mainly old x-rays) in through the top. Neither operator was wearing a respirator and both were being badly exposed to the fumes.

## **Tuesday 25 June**

Attended the second day of the 21<sup>st</sup> Pacific Environmental Conference – see conference report.

## **Wednesday 26 June**

Attended the third day of the 21<sup>st</sup> Pacific Environmental Conference – see conference report.

We had been trying for several days to find out about any waste chemicals kept in schools. It turned out that the US EPA had removed quite a lot of these chemicals from schools several years ago. The *Palau High School* did, in the end deliver a small box of chemicals to the EQPB. These turned out to be relatively harmless salts and expired pharmaceutical chemicals which could be taken to the Palau landfill (better described as a dump). We would have done this at once, except that it was too wet. Emil agreed to dispose of these chemicals at the dump when conditions were drier, and he would place them in a part of the dump away from the harbor, and ensure they were covered. In the meantime they were placed in the locked container opposite the EQPB, which already had some small quantities of acids stored there.

## **Thursday 27 June**

Attended the fourth day of the 21<sup>st</sup> Pacific Environmental Conference – see conference report.

## **Friday 28 June**

Attended the fifth day of the 21<sup>st</sup> Pacific Environmental Conference – see conference report.

Met Youlsau Bells briefly to find out about the status of the Waigani Convention and the Stockholm NIP. Youlsau advised that she would push the Waigani Convention ratification through, using the cabinet paper I had given her. She also apologized for having made no progress on the Stockholm NIP, due to being somewhat overwhelmed with work. She promised to get something to Matthew Gubb of UNEP and Bruce Graham at SPREP in a week or so.

*Michelle Rogow, On Scene Coordinator, US EPA Region IX*, confirmed that once the “DDT in the mangroves” results were available, she would push for assistance from US EPA for a proper clean-up.

Wrote a letter on behalf of SPREP to Marhence Madranchar of EQPB (copy to Steve Salii), regarding the Palau Hospital Incineration system, and discussed the issue with Marhence and also the EQPB Attorney. (This letter is attached as *Appendix 1*.)

Had a detailed debriefing session with Marhence and Emil. *Patricia Young, EPA Program Manager for CNMI and Palau*, and also *Carl Goldstein, Program Manager, Pacific Islands Office*, joined this session for the “DDT in the mangroves” part of the discussion. Both Pat Young and Carl Goldstein were sympathetic to US EPA assistance if results indicated major DDT contamination.

## **2. REPORT ON THE 21<sup>ST</sup> PACIFIC ENVIRONMENTAL CONFERENCE, HELD IN PALAU FROM 24 – 28 JUNE**

### **Monday 24 June**

Attended the first day of the 21<sup>st</sup> Pacific Environmental Conference. The proceedings were interesting but largely political and general.

### **Tuesday 25 June**

Attended the second day of the Conference and went to the following useful sessions:

#### **Solid Waste Recycling**

*Jose Esteves, Solid Waste Program, Guam EPA*, described the Guam recycling program. They license their recyclers, and at present they have 17 licensed recyclers:

Metal – 8  
Cardboard – 3  
Tyres – 3  
Composting – 1  
Antifreeze – 1  
Waste Oil – 1 (PERI)

They are very actively promoting recycling, but there are numerous obstacles (or challenges) in a small island country such as Guam. The main challenges are:

1. Processing / shipping costs
2. End user availability
3. No cooperative marketing
4. No waste disposal restrictions in place to favour recycling
5. Enforcement limitations of the current laws and regulations
6. No local government subsidies available

7. The high cost of setting up recycling operations, especially the capital cost of the recycling equipment.

Some initiatives they have adopted are:

1. They have set up several special collections, e.g. for household hazardous waste, white goods, metallic wastes.
2. They are actively promoting waste reduction, including community awareness programs.
3. They have set up some market mechanisms that are paying off, such as the “Trash for Cash” program and the “Environmental Banking” program. (I don’t have the details of these programs, but we could ask Jose.)
4. Waste batteries are dealt with in two ways. Firstly the battery suppliers are encouraged to accept back old batteries, and some are doing this and returning them to the firms they are agents for. Secondly Jose’s Program collects the remaining batteries and sends them to Korea for reprocessing.
5. Waste tyres are being baled up in large bales and used for fences on farms. The baling process removes all the voids so they are no longer collect water and allow mosquitoes to breed.

Jose believes that a new way of thinking is necessary. His program is planning to:

1. Set realistic and achievable recycling milestones for 2010.
2. Push for the implementation of advance disposal fees, where appropriate, to be levied on goods imported into Guam, which could be recycled. These fees could be used for assisting with funding the recycling.
3. Assist with the development of recycling markets.
4. Offer direct financial incentives and subsidies to recyclers.
5. Run educational awareness and recognition programs to promote recycling.

His new recycling policy will be based around the following principles:

1. Government should take the lead role.
2. Various partnerships with private businesses need to be formed.
3. Networking with neighboring islands should be established.
4. Cooperative markets should be formed for recyclables.
5. Group purchasing of recyclable supplies and equipment should be set in place.

I later talked to Jose Esteves in the evening for quite a while at a function. He is a passionate and enthusiastic recycler, and he seems to be very practical with regard to understanding recycling markets and costs. He is keen to work with SPREP and share his experiences, and he believes that SPREP should take an active role in recycling and waste reduction in the Pacific.

***Jim Nutter, President of Island Recycling Inc, Hawaii***, then gave a presentation, which was based on a very sound practical understanding of the industry, as he founded his



company in 1983, and has, over nearly twenty years, built it up to a business that recycles nearly 3500 tons/year of a large variety of materials. He defined the business as a “volume and penny” business, where margins were very low, and high volumes were needed to make a profit.

Virtually all the recyclables he collects arise in Hawaii. I did talk to him later however, and he said that there was no impediment to bringing in recyclables into Hawaii for him to process, if the economics made sense.

His main recycling lines of business are:

1. Paper – this is divided up into three categories, namely old corrugated cardboard (OCC), newspaper, and mixed paper waste (e.g. magazines, office paper, phone books etc)
2. Non-ferrous metals – e.g. aluminum, stainless steel, copper, brass, lead, etc.
3. Ferrous metals
4. Tyres – which are ground up and shipped to the USA to be used in asphalt mix, playgrounds etc.
5. Glass – which is sorted by color, broken up and shipped as cullet.
6. Pallets – which are repaired and sold locally.

Jim outlined the main problems he saw with the recycling business, namely:

1. The high cost of transportation.
2. The need for high volumes to minimize shipping costs.
3. High recycling equipment costs – e.g. an average baler can cost \$US450,000 new.
4. Poor design of recycling centers – the designers do not normally consult with the folk at the sharp end, i.e. the people in the recycling business. (This was a sore point with Jim as Island Recycling was asked to run the Honolulu Recycling Center, which had some major deficiencies, and if Island Recycling had been consulted at the design stage, then all the problems would apparently have been avoided.)
5. The low value of the recycled commodities (this is a major disincentive to recycling.)
6. The huge fluctuations in the value of recycled commodities. This is a major problem – for example recycled paper can fetch anything from \$US3 – \$US275 per ton.

Some solutions he saw to the above problems were:

1. Impose an advance disposal fee. One simple version of this is the fee imposed on beverages in glass containers. For example a charge of 7 cents could be imposed and 5 cents refunded, with 2 cents going towards the cost of recycling.
2. Subsidised freight.
3. Subsidised equipment

4. Using the right equipment - to keep the cost down, it would be satisfactory to buy used equipment, but seek advice from someone who has practical experience. (Jim Nutter would be pleased to assist.)
5. Use combination loads where possible. The cost basis is “per container” so it always pays to maximize the load, e.g. combine scrap metal, cans etc.
6. Use backhauling if possible. To do this effectively, you need to own your own container. (At this point, Jim emphasized that shipping companies are very hard to work with, and we needed to be aware of this fact.)
7. Recyclable products should be banned from landfills.
8. One trick is to redefine the definition of “dunnage” to include pallets, cardboard, etc. It can then be shipped for free.

In a later conversation with Jim Nutter, I asked him about the huge variation in commodity prices. He said that paper was the worst, so he would use that as an example. There was not that many outlets (paper mills) for recycled paper and they tended to stockpile until they reached saturation point. As soon as the paper mills had reached saturation point, they just didn't want any more, and the price could drop quite quickly and unexpectedly, from around the \$US200 mark to \$US3, and stay low for months or even longer. Other recycled commodities usually behaved similarly, but not with as dramatic a fluctuation range as paper. It was virtually impossible to do any proper business forecasting with such fluctuations, and this made the recycling business a very frustrating one.

### **Useful Recycling Contacts**

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**Waste Oil**

In the waste oil session, ***Pearl Marumoto, Environmental Educator, EQPB Palau*** and ***Adachi Satoru, Business Manager, Palau Public Utilities Corporation*** began by explaining the Palau situation. They advised that waste oil in Palau was mainly generated by the power plants and local businesses. The only way to reuse it in Palau was to burn it in the generators at the power plant at Aimeliik, although this was very limited as the waste oil had to be blended in slowly with the diesel fuel, or the fuel quality would deteriorate to the detriment of the generators. The waste oil also had to be reasonably clean.

At present Palau generated about 70,000 US gallons per year of waste oil, although this was expected to increase considerably with the construction of the new road all around Babeldaob. Some is spilled or dumped, and some is burned or used to treat lumber. A large percentage is transported to the storage tanks at the Aimeliik power plant owned by the Palau Public Utilities Corporation. In 2001 these tanks were nearly full (740,000 gallons). PPUC then shipped about 500,000 gallons to Nauru for energy recovery, although this option is no longer available. They currently have about 300,000 gallons stored, with no real answer as to how to get rid of it. All oil delivered to the Aimeliik plant has been checked with halogen test kits.

***Renato (Ren) Mabesa, Technical Services Team Leader, Mobil Oil Guam, Inc (now Exxon/ Mobil)*** then explained Mobil's position. He said that Guam and Micronesia currently generate in total about 700,000 US gallons of waste oil per year. The cost for disposing of this waste oil varies from \$0.50 - \$3.00 per gallon, and this could go up to \$10 per gallon if the oil had any hazardous constituents.

Exxon / Mobil's global position was that it supported "the implementation of environmental, technical and economically sound waste oil management practices". The reuse techniques it preferred were energy recovery and good re-refining. It discouraged dumping, grass control, poor re-refining, and direct burning.

When I questioned him about Mobil's current policy in the Pacific (e.g. Kiribati, Cook Islands) of accepting back waste oil and delivering it to the Steel Plant in Fiji for energy recovery, Ren Mabesa said that now that Exxon had merged with Mobil, all such direct

recycling activities by the oil company were being discontinued. The countries now had to make their own arrangements, although Exxon / Mobil would assist and advise them.

**Fred Otte, Environmental Manager, Shell Guam, Inc** then explained that Shell had a “cradle-to-grave” oil philosophy, and unlike Exxon / Mobil, they were prepared to get involved in the collection of waste oil. They were concerned, however, that proper screening for PCBs and halogens was carried out. Fred Otte said that they supported PERI (see below) and were set up to market PERI’s re-refined oil.

**David (Dave) Taitano, General Manager, Pacific Environmental Resources Inc (PERI)** then described PERI. He said they started in 1993 in Guam, taking oil from military vessels. In nine years of operation, they have managed 2.3 million gallons of waste oil. They have now constructed a used oil re-refinery capable of handling 4 million gallons of waste oil per year. The capital cost of the refinery is \$US 2.5 million. The plant is still not properly commissioned after 9 months, as they are having problems with variable feedstock, but they expected to sort out these problems very soon. They have, however, produced quite a lot of re-refined oil already.

The process involves pre-treatment to remove water (about 5 % on average, of the incoming oil), followed by atmospheric distillation, which produces a naptha product and also diesel / gas oil. Then there is a vacuum distillation step, which produces fuel oil and process fuel. Blending of the diesel back in, then produces a marine diesel.

PERI supplies the local power plant, and Dave believes that PERI brings to Guam considerable environmental and economic benefits. He says they are in a position to collect waste oil from all the Pacific Islands, although John Robinson of Clean Earth Co (see Wed 26 June below) advised that this might not be possible because of Basel Convention restrictions.

Dave Taitano said that they are also developing a miniaturized waste oil processing system to bring to small Pacific Island countries.

### **Useful Waste Oil Contacts**

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**Wednesday 26 June**

Attended the third day of the Conference

Met *John Robinson of Clean Earth Co, Saipan, CNMI*. We discussed waste oil recycling, which is one of his business interests. He is a New Zealander who has lived in Saipan for the last thirty years. His speciality is shipping, and he became interested in waste oil when an Australian company exporting goods to Saipan asked him about backloading possibilities. He thought of waste oil, as there were large amounts of it in CNMI, and approached a waste oil processing company in Townsville, who was interested. For the next 18 months he then shipped quite large quantities of waste oil to Townsville for reprocessing. The shipments were stopped when the Quarantine Service in Australia became concerned about the risk of importing Giant African Snails. This concern took a year or so to sort out and then as soon as John Robinson tried to start exporting the waste oil again, he was stopped by Basel Agreement concerns. As the US was not a signatory, he could not ship hazardous wastes (which includes waste oil based on the Basel Agreement definition) to Australia.

His waste oil business was saved when Pacific Environmental Resources Inc (PERI) set in motion plans to construct a waste oil reprocessing plant in Guam. PERI commenced business in Guam by selling used oil for fuel for an asphalt batching plant. They have formed a business partnership with Shell Guam and have now constructed a Used Oil Re-Refinery Plant in Guam, which is now nearly commissioned and ready for operation. PERI have also signed an agreement with John Robinson for Clean Earth to handle collection and transportation of used oil from CMNI (Saipan, Rota and Tinian) to Guam for PERI to handle the disposal. Clean Earth is now picking up waste oil from all three islands, and delivering it to PERI in Guam for processing. Before any oil is received, they test it for both PCBs and chlorinated hydrocarbons, using the relevant Dexsil test kits.

John Robinson has been in the shipping business all his working life and knows a considerable amount about it. He has developed a cost effective system of shipping waste oil, using “flexitanks”, which are large flexible plastic bags that are manufactured in Australia and fit neatly inside a 20 ft container. He can fit these quickly inside containers so that oil can easily be pumped into them. Once emptied, the flexitanks can easily be removed, leaving an uncontaminated container, which can then be back-loaded with other goods. John R offered to supply free to SPREP, information on this technique.

I believe there is potential for using this method for picking up waste oil, at least on a trial basis, during the pickup of hazardous wastes under the POPs in PICs project. This is particularly in view of the comments (see Tuesday 25 June) above, by Mobil’s Renato Mabesa, indicating that Exxon/Mobil (and most likely all oil companies) were going to get out of directly recycling waste oil. This matter should be verified, but would mean that places like Cook Islands (Mobil), Tuvalu (BP) and Kiribati (Mobil), where the oil companies are currently accepting and returning waste oil, would then be left without such a service. Renato Mabesa, and also Fred Otte of Shell Guam, did indicate that both those companies would facilitate the collection of waste oil, so maybe that policy could be tapped into for assistance. A company in NSW, Australia (Southern Oil Refineries) have approached SPREP recently, offering to buy waste oil, so that could be one possible outlet for the waste oil collected.

The rest of the day at the conference was uneventful (at least for my purposes).

### **Thursday 27 June**

Attended the fourth day of the Conference and went to the following sessions;

#### **Landfill Planning and Design**

*Richard (Rick) Mangham, Manager, Capital Improvement Projects Office, Ministry of Resources and Development*, gave the first presentation. He spoke about all the planning and design effort to date, on the new national landfill and waste management system for Palau. The current landfill (dump) at M-Dock had been widely recognized for a long time as quite unacceptable. It was very close to the harbor and sensitive mangroves, it was unlined and on quite porous subsoil, and it was not being covered.

Several years ago, the Government of Palau appropriated \$US1.9 million for the design and construction of a new landfill. The US company Windsor and Kelly was commissioned to carry out a study, and 35 sites on Babeldaob were selected for examination. All sites were evaluated using a range of criteria. The top three ranked sites unfortunately clashed with the chosen site for a new golf course.

Ameliik State then offered a different site to any of those evaluated, but it was partly in the conservation area and partly in an agricultural demonstration area. The catchment of this site drained into Ngermedu Bay. Even though this site was clearly unacceptable, it took a year to decide not to use this site.

In the meantime, bids were invited for a “design and construct” contractor. One firm was selected out of six bidders, and this firm immediately concluded that \$1.9 million was not enough for the projected 50 year design period. The budget would stretch only to a 10 year design period, with one landfill cell constructed. The contractor started work, but everyone was still uncomfortable with the site. Eventually the President of Palau stepped in and instructed that a new site had to be chosen. Another unsatisfactory site was then selected and finally rejected, which delayed the process for several more months. This site still drained into Ngermedu Bay, and was near a river that was a potential water supply source. In the meantime about \$0.25 million of the total budget had been spent on engineering designs, environmental assessments etc, for sites that were unacceptable, and most of this work was wasted. The focus then returned to the Windsor and Kelly study, and preferred sites 4, 5, and 6 were then examined as possibilities. Site 5 was eventually chosen and the design work has commenced again.

The important new development now is that it appears that the Japanese Government is about to give the Republic of Palau \$US 14 million to build a “State of the Art” landfill probably with lined cells (although the leachate treatment does present major challenges, due to the high rainfall), for a 50 year design period, together with a recycling center and

transfer stations in each state. (At present each state has its own unsatisfactory dump, as well as Koror with the M-Dock dump.) The Japanese are also pushing for an incinerator, although Rick Mangham was somewhat vague about what the incinerator would be used for. He suggested that the waste stream might be sorted to take out incinerables like paper, to prolong the life of the landfill. They are not at present considering energy recovery. He also said that the current contractor would probably be replaced with a Japanese contractor.

It may also be possible to reconsider the Windsor and Kelly preferred sites 1, 2, and 3, as there is an alternative golf course site. The new landfill could then be constructed with a second golf course in mind as a post-closure use.

***Mike Dworsky, Supervisory Engineer for the American Samoa Power Authority (ASPA)***, then gave a presentation on the new landfill facility in American Samoa, which is being run by the ASPA. The old dump has been closed recently, and the new landfill is right next door (the Futunga Landfill). The new site is being run as a proper covered and compacted sanitary landfill, although it is not lined. The decision was made not to line the landfill, due to the very difficult problem of managing the large amounts of leachate that would be generated, due to the high rainfalls. There is a minimum of six inches of cover.

The new landfill had a capital cost of \$US2 million, including the D8 and compactor. The refuse quantity in American Samoa was about 75-80 tons per day, based on the number of trucks in (no weighing is done). The land is rented, and landfill charges are billed through the power bill. An incinerator is being considered for paper and cardboard, to prolong the life of the landfill. American Samoa's population is currently 60,000 and is expected to double in the next 15 years.

A little recycling does take place and more is planned. Scrap metal is backloaded into containers going back to New Zealand, although it is time consuming, as the metal must be cleaned (the NZ recycling company are quite fussy). It is not sold, but just given to the NZ company. ASPA are planning to promote a beverage container bill that would impose a levy on containers to aid recycling. This would then fund the sorting and recycling of plastic, glass and aluminium. They are also discussing an advance disposal fee for tyres, cars and batteries, to aid disposal and recycling. They do not take green waste and are encouraging it to be composted.

Mike said that tyres are being stockpiled in American Samoa for shredding and baling. At this point, Jim Nutter of Island Recycling commented that the US would eventually put all their old tyres on the road as crumb rubber (a stage past shredded rubber). Jim said that 10% of all old US tyres are now being used in the construction of roads now, mainly in the sunbelt. Island Recycling shred their tyres, which makes them much easier to transport, but they didn't at this stage go to the added expense of producing crumb rubber.



*(I got the impression that American Samoa would welcome a joint initiative with Independent Samoa on recycling, and that this would make economic sense too. Is this worth exploring?)*

### **International Issues**

I attended the afternoon session on “International Issues”. The first half focused on “Climate Change”, with a range of technical and administrative papers.

The second half focused on “International Agreements”, including a presentation I gave, on the “Stockholm Convention / AusAID POPs in PICs Project”.

### **Friday 28 June**

Met Youlsau Bells briefly to find out about the status of the Waigani Convention and the Stockholm NIP. Youlsau advised that she would push the Waigani Convention ratification through, using the cabinet paper I had given her. She also apologized for having made no progress on the Stockholm NIP, due to being somewhat overwhelmed with work. She promised to get something to Matthew Gubb of UNEP and Bruce Graham at SPREP in a week or so.

Attended part of the closing sessions of the fifth day of the Conference. ***Michelle Rogow, On Scene Coordinator, US EPA Region IX***, confirmed that once the “DDT in the mangroves” results were available, she would push for assistance from US EPA for a proper clean-up.

Wrote a letter on behalf of SPREP to Marhence Madranchar of EQPB (copy to Steve Salii), regarding the Palau Hospital Incineration system, and discussed the issue with Marhence and also the EQPB Attorney.

Had a detailed debriefing session with Marhence and Emil. ***Patricia Young, EPA Program Manager for CNMI and Palau***, and also ***Carl Goldstein, Program Manager, Pacific Islands Office***, joined this session for the “DDT in the mangroves” part of the discussion. Both Pat Young and Carl Goldstein were sympathetic to US EPA assistance if results indicated major DDT contamination.

## **3. LABORATORY TEST RESULTS**

### **PCBs in Transformer Oil**

The following transformer oils tested positive for PCBs.

***PK1: 34 mg/kg***

**PK2: 117 mg/kg**

**PK3: 25 mg/kg**

**PK5: 22 mg/kg**

**PK6: 28 mg/kg**

**PK11: 75 mg/kg**

All these transformers are at Kesebelau in Airai, and these transformers now need to be placed safely in covered storage until they can be picked up in the collection and disposal phase of the project.

### **DDT in Mangroves at Ngatpang**

The composite soil sample taken from around the drum fragments produced a result of **6.18 mg/kg total isomers**.

The drum fragment produced a result of **0.06 mg/kg total isomers**.

These results indicate that there still remains a residual of DDT at the site. The figures are not high but it was about 40 years ago that the drums of DDT were dumped there. The soil contamination figure of 6.18 mg/kg is still quite significant. Unfortunately most of the DDT has now probably disappeared into the neighbouring environment. There also remains a possibility that DDT was buried on the site, and therefore some exploratory digging may be appropriate.

## **4. RECOMMENDATIONS**

1. The six transformers identified as positive (PK1, PK2, PK3, PK5, PK6, PK11) should now be removed and placed in safe storage until their shipment away from Palau can be arranged. This is planned for about the middle of next year as part of the POPs project.
2. The 15 –20 transformers that, it is understood, have now been relocated to Kayangel, now need to be tested, and test kits and sample tubes have been left with Emil Edesomel to allow this work to be carried out.
3. The DDT contamination at Ngatpang still remains at significant levels. The composite sample was just to get an indication, and more sampling and investigations now need to be carried out.
4. Palau needs to ratify the Waigani Convention as a matter of priority.
5. Action needs to be taken on the hospital incinerators donated by Taiwan. At present these incinerators are a health risk to operators and anyone else exposed to the fumes they emit, including the adjacent hospital wards.

6. The chemical waste materials at the PTC Storage Yard in Airai need to be investigated. PTC need to explain why they are stored there and what they intend to do with them. They also need to explain what the waste is that is stored in the blue plastic drums.
7. In view of the emergency that occurred with the chlorine gas cylinder, the situation with the old gas cylinders needs to be monitored. An inventory needs to be taken of all cylinders used for decoration, fencing etc, and an attempt made if possible to assess what each cylinder contains (or contained). Any old cylinders that no one wants any more should be removed and dumped.
8. The chemicals from the Palau High School need to be safely placed in the landfill, if that has not happened already.
9. EQPB need to monitor the planning process for the new landfill, and work with the Capital Improvements Projects Office of the Ministry of Resources and Development to ensure that environmental impact issues are properly taken into account.

## Appendix 2

### LETTER TO PALAU EQPB ABOUT THE NEW HOSPITAL INCINERATION SYSTEM

**SPREP**

South Pacific Regional  
Environment Programme



**PROE**

Programme régional  
océanien de l'environnement

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AP 6/3/2

5 July, 2007

Environmental Quality Protection Board  
P.O. Box 100  
Koror, **Republic of Palau**

**Attention: Mr Marhence Madranchar**  
**Executive Officer**

Dear Mr Madranchar,

#### **Palau National Hospital – New Incinerator**

As part of my survey duties during my current visit to Palau, I inspected the new medical waste incineration system at the Palau National Hospital. The new hospital incinerator does have the advantage of being easy to operate, as it is unsophisticated in design, with no controls or sensitive equipment that may cause maintenance problems.

I am, however, concerned that in its present form and mode of operation, it represents a health risk to people near the incinerator when it is in operation. My concern extends especially to the incinerator operators.

The incinerator operates as follows. Medical waste is placed in the incinerator prior to start-up, together with kerosene-soaked rags, which are then lit with a cigarette lighter. A blower blows air through a vertical pipe to keep the process supplied with excess air,

which prevents black smoke forming. There is no stack, and the large damper at the top is then kept open while the operator continues to charge the incinerator with medical waste from the top. The operator can regulate the temperature by delivering either oil or water to the incinerator, but there is no temperature indicator fitted to the incinerator.

Even though the effluent gases from the incinerator have been supplied with excess air, they are untreated and are discharged at a low level, directly contacting the operators and anyone else nearby. These gases had a strong smell of plastic when I was there, and may contain a range of toxic emissions, including dioxins and furans. As a minimum precaution, I believe the operators should be wearing respirators fitted with combination organic and particulate filters, and these filters should be changed regularly. The area should be screened off, and anyone entering this area when the incinerator is in operation should also be wearing respirators.

It would also be preferable for the incinerator to be fitted with a temperature probe and indicator, and for the temperature to be maintained at greater than 1300<sup>0</sup>F whenever anything apart from completely inert waste is being burnt. This will ensure pathogenic waste is properly destroyed and will lessen the amount of toxic emissions. Such emissions will, however, still be formed.

I recommend that EQPB requires the hospital to apply for a permit for the new incineration system, and at the same time the EQPB could pass on the concerns I have raised above. The permit application should be accompanied by design details, operating instructions and expected emissions information. As an immediate precaution, the incinerator should not be operated again until all operators are supplied with the correct respirators, access is restricted, and the area screened off (temporarily if necessary).

I would be pleased to provide any further advice if necessary.

Yours truly,

John O'Grady  
**Project Coordinator**  
**Persistent Organic Pollutants (POPs) Disposal**  
For Director

cc. Mr Steve Salii, Safety Officer, Bureau of Public Works, Palau