For information
on 7 January 2000

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Legislative Council Panel on Health Services
and Legislative Council Panel on Environmental Affairs

Clinical Waste Control Scheme
Dioxin Emissions

Introduction

At the Joint Health Services/Environmental Affairs Panel meeting on 14 December 1999 Members requested additional information on a number of issue related to dioxin emissions. This paper sets out the Administration's response to those requests.

Assessment of Dioxin Emissions in Hong Kong

2. The study covers the following main tasks –

- To review the ambient dioxin monitoring data and advise the likely significant sources of dioxin in Hong Kong.

- To review the existing emission data, health assessment studies of Hong Kong's waste facilities and to assess whether the local community is being exposed to a dangerous level of dioxin generated from the existing waste management facilities.

- To advise on the dioxin monitoring requirements.

- To review and advise on both the short-term and long-term health impacts of dioxin emission from the existing and planned incineration facilities for municipal solid waste, sewage sludge, animal carcasses, clinical waste and chemical waste.

- To advise on the control mechanism on dioxin emission to be set for the planned incineration facilities.

- To audit the dioxin emission control mechanism of the CWTC, taking into consideration that clinical waste will be co-incinerated with chemical waste at the CWTC in the future.

- To advise on the limit of exposure of the public to emissions of dioxins from all the significant sources identified. Also to advise on the risk as well as the appropriate contingency and emergency response measure in the event of any mal-operation leading to release of significantly quantities of dioxin.

3. We have engaged Dr. Gev Eduljee to conduct the study. Dr Eduljee is an acknowledged authority on dioxins and has conducted several studies for the UK regulatory authorities and the European Commission. His extensive experience in waste management studies relating to incineration facilities for municipal waste, hazardous waste and clinical waste is particularly relevant to Hong Kong. Dr. Eduljee's CV s at Annex A. The study brief covering terms and scope of the dioxin assessment study is at Annex B.

Review of Assessment of Dioxin Emissions Study

4. Another renowned international expert, Professor Christoffer Rappe, has been invited to review the study conducted by Dr. Eduljee. Professor Rappe has provided expert advice to a number of governments and international organisations. Professor Rappe's CV is at Annex C. The study brief covering the terms and scope of the dioxin review is at Annex D.

Cost of Study and Review

5. The appointment of Dr Eduljee for the Dioxin Assessment study is at a lump sum fee of HK$471,500. The honorarium for Professor Rappe to review Dr Gev Eduljee's work will be made on a time charge basis subject to a ceiling of HK$230,000.

Schedule of Meetings to be held

6. We expect the dioxin study and its review to be completed in February 2000. We intend to publish the reports of both Dr. Eduljee and Professor Rappe. We will invite Dr. Eduljee and Professor Rappe to attend a series of meetings to discuss their findings. We intend to consult Legislative Council Members, the Advisory Council on the Environment (ACE), and District Councils. We also plan to hold a public forum where green groups and other interested members of the public can exchange views on the dioxin issues.

7. It is our intention that this exercise take place in about a week's time in March 2000. We have started to examine the logistical arrangements, but need to wait until District Council meetings dates are arranged before we can finalise our programme. If necessary, we will suggest special meetings of the bodies concerned.

Quantity of PVC in Clinical Waste in Hong Kong

8. According to the surveys conducted by the Hospital Authority in October 1999 and January 2000, the estimated quantity of PVC in Clinical Waste in HA Hospitals and Institutions is around 3% by weight of the total clinical waste generated per day. No survey has been conducted for private hospitals which we understand the situation should be similar. Department of Health has advised that it has little, if any, equipment that contains PVC Member will wish to compare these facts with the Greenpeace's claim that most of our medical waste contains PVC.

Report on two incidents where dioxin emissions at the Chemical Waste Treatment Centre exceeded the contract limit

9. The report is at Annex E.

Meeting with Greenpeace

10. A meeting had been arranged with Greenpeace on 28 December 1999 to discuss issues relating to clinical waste. Unfortunately, illness prevented Greenpeace's representative from attending the meeting as arranged. Greenpeace

postponed the meeting to 4 January 2000 and the meeting noted the following points:

- The incineration technology adopted by the CWTC could comply with the world-wide acceptable stringent emission standards. However, Greenpeace maintained their mission of “zero dioxin emission”.

- Greenpeace considered that if existing hospitals were to install their clinical waste treatment facilities, the cost could be less than that for a regional treatment facility.

- Alternative technologies were not risk free and/or toxic emission free.

- Greenpeace appreciated the volume reduction of clinical waste as a result of the segregation practice adopted by Hospital Authority.

Environment and Food Bureau
January 2000

Annex A

DR GEV EDULJEE
Director

Nationality Indian

Year of Birth 1950

Education BSc Chemistry, Bombay University, 1971
MSc Chemistry, Bombay University, 1973
PhD Chemical Engineering, Birmingham University, 1976

Professional Affiliations Member of the Royal Society of Chemistry
Chartered Chemist
Member of the Society of Chemical Industry

Languages Gujerati (mother tongue), English

Synopsis Dr Gev Eduljee is Director of ERM's Environmental and Technical Services Division. He is a specialist in waste treatment and disposal, particularly by high-temperature incineration, on which he has written extensively. Additionally, Dr Eduljee is a leading expert in environmental and risk assessment, particularly of contaminated land, waste treatment and disposal facilities. His involvement with environmental assessments and audits of waste facilities throughout Europe has given him an international perspective of the environmental impacts, problems and practices in waste management.

Prior to joining ERM, Dr Eduljee worked for Rechem International Ltd, a leading hazardous waste treatment and incineration operator, as manager of their environmental monitoring unit and as a development chemist in toxic and hazardous waste management. He has acted as the UK expert on PCBs for the International Electrochemical Commission.

Relevant Experience

RISK ASSESSMENT AND DIOXIN STUDIES

Assessment of the Risks Posed by PCP through the Exposure to Man and the Environment to Dioxins, DG III of the European Commission, 1997. ERM was commissioned to undertake a comparative risk assessment study of the contribution of dioxin burdens in the environment from the use of PCP as a

consumer product, relative to inputs from other sources. A human health and ecological risk assessment was prepared using data of PCP and dioxin levels in the environment. It was estimated that PCP contributed approximately 5-10% of the dioxin burden in the environment in terms of toxic equivalents.

Examination of Dioxin Congener Profiles, SmithKline Beecham, 1996. Dr Eduljee assisted SmithKline Beecham in the interpretation of dioxin measurements conducted on three chemical waste incinerator stacks on their Cork site in the Republic of Ireland. Each set of congeners at different levels of chlorination were examined for the possibility of identifying a pattern representative of plant operation on the site.

Examination of Dioxin Emissions from Coke Ovens, British Steel, 1996. Dr Eduljee undertook an assessment of dioxin releases from coke ovens for British Steel as part of an ongoing programme of environmental improvement. Detailed congener profiles were available as part of this project.

Risk Assessment of Releases from Household Waste Landfill Sites, for DoE, 1996-1997. Project Director for a study to develop a risk assessment methodology of use to decision makers, seeking to characterise the public health risks associated with releases of chemicals to air, water and land from household waste landfill sites. The study considers both operator and offsite impacts, and includes the emissions from landfill gas utilisation schemes.

The Use of Immunoassay Techniques for the Analysis of Dioxins in Stack Gases and Effluents, Department of the Environment, 1996. ERM was commissioned to examine the feasibility of applying immunoassay as a screening technique to provide lower cost and speedy analysis of stack gases and effluents, in order to increase the frequency of sampling undertaken by Industry in a cost-effective manner. The study identified sample preparation as a critical aspect of the overall analytical procedure, and which drives the total cost of the analysis.

The Effect of Changes in Waste Management Practices on Dioxin Releases to the Environment, for Department of Trade and Industry, 1995-1996. ERM examined the effect of changes in the management of household wastes on dioxin releases to air, land and water. This was undertaken by considering scenarios ranging from 100% landfilling and 100% incineration to integrated solutions incorporating glass and metals recovery and composting. Dioxin releases were estimated for a unit weight of waste, and for national waste arisings. The effect of changing legislation and adherence to recycling targets was also investigated.

Emissions of Dioxins from Combustion Processes, for Department of Trade and Industry, 1995-1996. In this study, the latest insights into the formation mechanisms of dioxins in combustion plant were reviewed, and this knowledge applied to a typical operating incinerator in an attempt to model the formation and emission of dioxins in the field. Based on this work, appropriate control techniques were discussed, which will individually or

collectively reduce the likelihood of formation of dioxins in combustion systems.

Risk Assessment of Dioxin Emissions from Municipal Waste Incinerators, for HMIP, 1995-1996. Project Director for a study involving the development of a methodology to characterise the potential public health risk arising from exposure to emissions of dioxins from MWIs. Both direct and indirect pathways were examined. The study concluded that MWIs operating to new plant standards do not pose a significant health risk under conservative exposure conditions.

Review of Exposure Assessment in USEPA Draft Document Estimating Exposure to Dioxin-Like Compounds, for Department of the Environment, 1994. ERM conducted a review of Chapter 3 of the USEPA's re-evaluation of the sources and health risks of dioxin emissions. The review covered the estimation of dioxin releases and modelling emissions and formed part of the UK's formal response to the USEPA.

Inventory of Dioxin Releases to Atmosphere in the UK, for HMIP, 1994-1995. Project Director for a study to develop an inventory of Part A Processes that have the potential to emit dioxins to atmosphere. Following screening of industrial processes, ERM developed emission factors for each shortlisted industrial process. The final report also included a selection of non-industrial processes which were considered by DoE as part of the UK Government's response to the US EPA reassessment of the toxicity of dioxins. The study has been published by HMIP in 1996.

Risk Assessment of Lead Emissions from a Secondary Lead Facility, for HMIP, 1994-1996. Project Director for a study examining lead releases and environmental monitoring data collected in the vicinity of the plant over a 10 year period, and assessment of the health risks the emissions could pose relative to contributions from other sources.

Assistance in the Bonnybridge Court Action, Shanks & McEwan, 1993-1994. ERM was involved in providing advice on emissions and environmental effects of PCDDs and PCDFs, to Shanks and McEwan in relation to the on-going court action between Andrew Graham and Rechem International Limited. The brief involved examination of the mechanisms for formation in combustors, dispersion and deposition onto soil and grass, and uptake into cattle. The presence of dioxins in ash residues was also addressed. ERM gave expert evidence in court.

The Fate and Uptake of Dioxins in Sewage Sludge, for a Water Company, 1994. Project Director for a study examining the behaviour of dioxins in sludge amended soil and resulting uptake and concentrations in food products.

A risk assessment of Two Proposed Groundwater Remediation Plants at AEA Technology, Harwell, for Oxfordshire County Council, 1992-1993. Project Director for a quantitative health risk assessment to assess the health risks associated with the inhalation of a range of volatile organic chemicals

emitted from the proposed plants. The assessment was used to recommend emission limits.

Development of Risk-Based Clean-up Levels for Contaminated Land, Texaco, 1992. Project Director for a risk assessment to assess the risks associated with the redevelopment of a contaminated site. The site had previously been used as a tank farm and transfer depot for petroleum products. Groundwater contamination and the risks associated with the migration of groundwater off-site was assessed through the application of models. Risk-based clean-up levels were determined for a variety of site end-uses and used as the basis for the development of a remedial strategy.

Health Risk Assessment of a Proposed Gas Processing Plant at Point Ayr, Hamilton Brothers Oil and Gas, 1991. Project Director for an environmental assessment for the proposed gas processing plant, and a human health risk assessment. the assessment considered the health effects of short term, long term and fugitive emissions to atmosphere. Particular attention was paid to critical groups such as asthmatics.

Health Risk Assessment for Two Proposed Sewage Sludge Incinerators in East London for a private client, 1991. Project Director and technical expert for the health risk assessment of the emissions from two proposed sewage sludge incinerators. The assessment included establishing the primary exposure pathways for members of public and calculation and quantification of the risk to health to the exposed population.

Framework for the Risk Assessment of Contaminated Land for the Department of Environment, 1991. Project Manager for a study of the application of risk assessment techniques to contaminated land. The study provided the Department of Environment with site specific risk assessment protocols, and guidance on strategic and policy issues and standards appropriate for clean up of contaminated land.

Hazard/Risk Assessment for the Disposal of Sewage Sludge for Thames Water, 1990. Project Manager for a health hazard/risk assessment of the disposal of sewage sludge and the development of a matrix of risk associated with specific contaminants in the sludge disposed through each route. The risks were placed in perspective with other common activities and related to existing standards of acceptable risk exposure.

Health Effects from Hazardous Waste Landfill Sites for the Department of the Environment, 1989-92. Project Manager for a study seeking to establish methodologies for assessing the potential health effects of emissions and discharges from landfill sites accepting hazardous wastes. Exposure pathways through air, soil and groundwater were modelled, sensitive receptors identified and techniques for assessing direct and indirect carcinogenic and non-carcinogenic risk developed.

Risk Assessment of the Impact of Sludge Application to Agricultural Land for a confidential client, 1993. Project Director for a study examining the implications of applying waste material from paper manufacture, to

agricultural land. The study involved sampling and analysis of the material and applied soils for trace metals, dioxins and furans, and assessment of the application by comparison with relevant standards and background soil quality.

Assessment of Dioxin Emissions from a Chemical Waste Incinerator for a confidential client, 1993. Project Director for a study that assessed the environmental impact of dioxin and furan emissions from an on-site chemical waste incinerator. The study involved modelling of stack emissions, collation and assessment of data on air and soils relating to the background environment, and identification of source-specific impacts through examination of isomer profiles and wind direction in relation to off-site sampling programmes.

Dioxin emissions inventory, for the European Commission, 1993. ERM was commissioned by the EC to prepare their 5th Environmental Action Plan (5AEP). A key contribution to the project was to estimate total PCDD and PCDF emissions from the major sources within the EC and to predict the change in these emissions over a 20-year period under a number of possible scenarios designed to reduce pollution.

MUNICIPAL WASTE INCINERATION/ENERGY FROM WASTE

Baseline monitoring, Air Quality and Public Health Risk Assessment for Four Proposed Waste Incinerator Sites, Hampshire Waste Services, 1996-ongoing. Project Director for specialist environmental assessments relating to air quality and public health in relation to four incinerators proposed in Hampshire. The project commenced with a year-long baseline monitoring programme involving collection and analysis of samples of air, soil and vegetation in the vicinity of the four sites. In the current phase of the project, a detailed air quality assessment and public health risk assessment is being conducted as input to Environmental Statements for each of the proposed sites.

Review of Proposals for an Incineration Facility for the Isle of Man for Braddan Parish Commissioners, 1996-98. Project Director for the provision of technical support to the local authority with respect to proposals by the Isle of Man government to develop an incineration facility for municipal waste, animal wastes and clinical waste. ERM provided technical expertise to assess the siting of the facility and review the development and EA process.

Review of Environmental Performance and Pollution Control Regime for a Wood Gasifier for B9 Energy, 1996-97. Project Director for a review of the pollution aspects of a novel wood gasifier designed to utilise wood chips, forestry "brush" and coppice wood and generate 200 kWe plus 200 kWth to meet the energy needs of a local amenity facility (a museum). The study included a review of the environmental regulations applicable to the process, classification of the fuel with respect to the definition of waste and an assessment of the polluting potential of the process.

Site Selection Study, Braddan Parish Commissioners, Isle of Man, 1996. Project Director for a study examining the environmental attributes of alternative sites for the location of a proposed municipal waste incinerator.

Environmental Review of 6 Potential Sites for a 200-400,000 tonnes per year Energy from Waste Plant for a Private Client, 1996. Project Director for the assessment of potential sites and appraisal of their environmental advantages and sensitivities to support a bid for the waste disposal contract. The study considered six sites and, on the basis of environmental criteria and consultations with the planning authorities, was designed to recommend the preferred site for development.

Identification and Environmental Review of 9 Potential Sites for a 80-180,000 tonnes per year Energy from Waste Plant in the Northeast of England for a Private Client, 1996. Project Director for the identification of potential sites and appraisal of their environmental advantages and sensitivities to support a bid for the waste disposal contract. The study identified nine sites for consideration and, on the basis of environmental criteria, recommended the preferred site for development.

Siting Study, Scoping Study and Environmental Assessment for a 400,000 tonnes per year Energy from Waste Plant and Materials Recycling Facility (MRF) in North Kent for PowerGen CHP, 1996. Project Director for linked studies to support the planning application for an integrated energy from waste plant and MRF. The Siting Study assessed the relative merits of four alternative sites. The EA included a detailed assessment of stack emissions and health risks, in the context of regional emissions from major power stations located on the north Kent coastline. Key issues included traffic and prevention of disturbance to nearby Sites of Special Scientific Interest.

Environmental Review of the Feasibility of 4 Sites for an Energy from Waste Plant to Support Bids under the Non-Fossil Fual Obligation (NFFO) for a private client, 1996. Project Director for a environmental review of four sites to assess their viability for an energy from waste plant on planning and environmental grounds. The review considered the site settings, presence of sensitive receptors and planning designation and policy at the site and surrounding area.

Environmental Assessment of a Proposed One Million Tonnes per Year Energy from Waste Plant in East London for PowerGen CHP Ltd, 1994-96. Project Director for an assessment of a proposed refuse-fired Combined Heat and Power plant, including the preparation of the Environmental Statement under the Town and Country Planning (Assessment of Environmental Effects) Regulations 1988. The plant is designed to receive waste by road and river, and the assessment included a detailed examination of the impacts on air quality from incinerator emissions and on estuary waters from the development of a reception jetty, water extraction, and effluent discharges.

Site Selection for an Energy from Waste Plant for a private client, 1996. Project Director for a site selection study to identify the preferred site for a

300-400,000 tonnes per year energy from waste plant. The study comprised an environmental review of a short-list of six potential sites and the application of multi-attribute decision analysis to combine and evaluate the environmental aspects of each site and the importance of each environmental issue. The study provided a transparent and robust site selection methodology to support the development of the facility.

Environmental Assessment and Preparation of an ARCI (IPC) Application for an Energy from Waste Plant at Belfast West Power Station, Belfast, for NIGEN, 1993-97. Project Director for a comprehensive EA for a major energy from waste plant, including options to co-incinerate with sewage sludge and increase the plant capacity, located in Belfast Harbour. The EA followed on from a preliminary scoping study conducted by ERM. Important features of the assessment included a detailed dispersion modelling and assessment of stack emissions, traffic counts and evaluations, and a wide variety of consultations with statutory bodies. A second phase of work involved the preparation of the application for authorisation from ARCI, equivalent to an IPC application in the rest of the UK. The work included supporting NIGEN at a Public Inquiry into the proposals.

Monitoring and Assessment of Air, Soil and Vegetation Quality in Belfast for NIGEN, 1993. Project Director for a monitoring programme designed to obtain baseline data on the concentrations of key trace metals, organics and acid gases in air, soil and grass in the vicinity of a proposed energy from waste plant at Belfast West Power Station.

Site Selection and Environmental Review of Sites for a Waste-to-Energy Plant for a private client, 1993-94. Project Director for an environmental review of potential sites for a waste-to-energy co-incineration plant in the North of England, which would handle municipal waste and sewage sludge. The review included a site search to identify potentially available sites, an investigation of the practical and economic merits of alternative sites and an environmental review of a number of short-listed sites. The review included consideration of air quality, the likely dispersion of stack emissions, the planning context, visual impact, water resources, traffic, ecology and noise.

Preliminary Environmental Assessment of an Energy from Waste Plant in Belfast for NIGEN, 1993. Project Director for a preliminary environmental assessment which evaluated a proposed site for an energy from waste plant at Belfast West Power Station. The assessment included preliminary consultations with key consultees to scope the environmental issues. Thereafter, a preliminary assessment was carried out of the potential impacts on air quality (including stack dispersion modelling), traffic, water resources and contaminated land, visual impact, noise and the planning framework.

Preliminary Environmental Assessment of Wolverhampton Municipal Waste Incineration Plant for Mass Energy, 1993. Project Director for a preliminary environmental assessment of the potential for upgrading the municipal waste incineration plant at Wolverhampton to a modern waste-to-energy facility. The preliminary assessment considered the potential impacts on air quality

(including stack dispersion modelling), traffic, water resources and contaminated land, visual impact, ecology, noise and the planning context.

Environmental Assessment and IPC Application for a Municipal Waste Incinerator at Portrack for Cleveland County Council, 1992. Project Director responsible for the assessment of the emissions to land, water and air from the existing incinerator at Portrack and preparation of the supporting document for the application for authorisation under IPC. A second part of the project involved the joint management of an Environmental Assessment under the Town and Country Planning (Assessment of Environmental Effects) Regulations 1988 for the development of a new waste-to-energy plant as a replacement for the existing plant.

Preliminary Environmental Assessment of Five Sites for the Development of a Waste-to-Energy Plant for a confidential client, 1992. Project Director for a preliminary environmental assessment which evaluated five potential sites for a waste-to-energy plant, considering key features and potential impacts of each site, including the planning framework, air quality, traffic, contaminated land and hydrogeology, visual impact and noise.

Environmental Assessment of a Proposed Municipal Waste-to-Energy Plant for Yorkshire Renewable Energy, 1992. Project Director for an assessment of a proposed municipal waste-to-energy incineration plant, including the preparation of the Environmental Statement under the Town and Country Planning (Assessment of Environmental Effects) Regulations 1988. The assessment included a detailed examination of health risks from emissions.

Environmental Assessment of a RDF Incinerator, for the City of Brescia, Italy, 1989. Project Manager for an environmental assessment for a proposed incinerator, focusing on health risks posed from emissions to atmosphere through inhalation and via ingestion of local foods, and on the impact of traffic.

Review of a Combined Heat and Power Station for a Residents Steering Group, London, 1989-90. Dr Eduljee provided a technical appraisal of an environmental assessment for a Combined Heat and Power Station, with specific attention to establishing the consistency of the assessment, accuracy of interpretations and conclusions, and to identifying additional areas which needed clarification.

OTHER INCINERATION AND LIQUID WASTE TREATMENT STUDIES

Environmental Assessment of a Hazardous Waste Incineration Plant and Physico-chemical Treatment Facility in the Southeast for a private client, 1993-94. Project Director for a comprehensive EA for a hazardous waste incineration plant and physico-chemical treatment facility. Important features of the EA included the assessment of health risks of stack emissions, potential spillages of waste and fires in waste storage areas, and the assessment of

traffic, noise and effluent discharges. An environmental monitoring programme covering air, soil and vegetation was also carried out.

Review of a Planning Application for an Animal Carcass Incinerator in Birmingham for the Black Country Development Corporation, 1992-93. Project Director for a review of a proposal for an animal carcass incineration plant. The review focused on the environmental setting and sensitivities of the proposed site, the incineration plant design and pollution control measures and the potentially significant environmental issues if the plant were to be granted planning permission.

Environmental Assessment of a Proposed Munitions Waste Incinerator for the Ministry of Defence, 1992-93. Project Director for an assessment of a unique proposed incineration plant for treatment of spent munitions, including the preparation of the Environmental Statement under the Town and Country Planning (Assessment of Environmental Effects) Regulations 1988. The assessment included a detailed examination of health risks from air emissions and services related to the design of the plant, particularly the pollution abatement equipment.

Ongoing Environmental Monitoring for the Calder Valley Sewage Sludge Incinerator for Yorkshire Water, 1993. Project Director for a sampling and analysis programme of soil, grass and air in the vicinity of the Calder Valley sewage sludge incinerator, as part of the second phase of ongoing environmental monitoring associated with the plant. The study included comparison and analysis of the results of the analysis with previous measurements and typical background values found in the UK.

Environmental Assessment of a Proposed Hazardous Waste Incinerator for a major waste management contractor, 1991-92. Project Director for an assessment of a proposed hazardous waste incinerator. The initial assessment included examinations of the proposed site, neighbouring landuses, transport infrastructure and planning context. The results of the initial assessment led to the recommendation that the site was unsuitable and the development has, as a result, been discontinued.

Environmental Assessment of a Proposed Liquid Wastes Treatment Plant for Thames Waste Management Ltd, 1991-92. Project Manager for an assessment of a proposed liquid wastes treatment plant, which includes treatment of waste in bulk and in drums/small packages. The assessment led to the preparation of the Environmental Statement under the Town and Country Planning (Assessment of Environmental Effects) Regulations 1988 and included detailed evaluation of traffic, plant safety and landscaping. The plant has been granted planning permission.

Environmental Assessment of a Proposed Chemical Waste Treatment Facility at Newport for Browning-Ferris Environmental Services, 1990. Project Manager for an assessment of the environmental impacts of a proposed facility for the treatment of aqueous chemical wastes, including the preparation of the Environmental Statement under the Town and Country

Planning (Assessment of Environmental Effects) Regulations 1988. The plant has been granted planning permission.

Development of Central Chemical Waste Treatment Facility for the Hong Kong Government, 1991. Dr Eduljee provided technical input to a project for the development of a central chemical waste treatment plant in Hong Kong. ERM acted as managing contractor for the development of the treatment facility which includes wastewater/inorganic treatment, solvent recovery and incineration. ERM was responsible for a full environmental assessment, specification, scoping and sizing of plant, tender preparation, and also supervised construction and commissioning.

Environmental Assessment of a Proposed Sewage Sludge Incinerator for Yorkshire Water, 1990-91. Project Manager for an assessment of a proposed incinerator designed for disposing of sewage sludge, including the preparation of the Environmental Statement under the Town and Country Planning (Assessment of Environmental Effects) Regulations 1988. The assessment included a detailed examination of the health risks from air emissions.

Appraisal of a Hazardous Waste Incinerator and Solvent Recovery Plant for Doncaster Borough Council, 1990. Dr Eduljee provided technical assistance to Doncaster Borough Council to appraise a planning application relating to a hazardous waste incinerator and solvent recovery facility. Dr Eduljee appeared as an expert witness on behalf of the Council at the Public Inquiry concerning the application. The application was rejected.

Feasibility Study for the Waste Disposal Requirements and Incinerator Design Services for Glaxo Group Research, 1990. Project Manager and technical expert for a study of the disposal requirements of a major pharmaceutical research facility, including the collection, handling, transportation and disposal options for waste on-site and off-site, following a cradle-to-grave philosophy. The study recommended an on-site incinerator, and the second phase of the work prepared a detailed specification, assessed tenders against the specification, and selected an incinerator manufacturer. Ongoing work included overseeing the development of the incinerator, including the Environmental Assessment and planning application.

Environmental Assessment of a Proposed Sewage Sludge Incinerator for Yorkshire Water, 1989. Project Manager for an environmental assessment of a proposed incinerator designed for disposing of sewage sludge, including the preparation of the Environmental Statement under the Town and Country Planning (Assessment of Environmental Effects) Regulations 1988. the assessment included a detailed examination of the health risks associated with air emissions. The planning application was granted.

Environmental Assessment of a Hazardous Waste Incinerator for Ocean Environmental Management Limited (now Cory), 1988. Project Manager for an assessment of a proposed hazardous waste incineration plant, including the preparation of the Environmental Statement under the Town and Country Planning (Assessment of Environmental Effects) Regulations 1988. The

assessment includes a detailed examination of health risks from air emissions. Dr Eduljee appeared as an expert witness on behalf of Cory at the Public Inquiry concerning the application.

Appraisal of a Hazardous Waste Incinerator for Nottingham County Council, 1987. Dr Eduljee provided technical assistance to Nottingham County Council in appraising a planning and licence application relating to a hazardous waste incineration facility. The study consisted of a site audit, a technical appraisal of the incinerator and an overall assessment of the environmental impact of incinerator emissions.

Dr Eduljee appeared as expert witness on behalf of the Council at a Public Inquiry concerning the planning and licence application for the incinerator.

LANDFILLING

Environmental Impact Assessment of a Industrial Waste Landfill, for a Confidential Client, Nigeria, 1997. Project Director for an EIA on a industrial waste landfill to be developed in Nigeria, the first licensed and professionally designed landfill within the country. The key issues examined were potential impacts upon air quality, hydrogeology, ecology, health and socio-economics. Outputs from the project included a stand-alone Environmental Management Plan.

Environmental Audit of Seven Landfill Sites for a private client, 1994-95. Project Manager and technical specialist for the inspection and review of the operations of seven landfill sites, including infilling of quarry workings, cut and fill, valley infill and land-raising designs. The review focussed on the site activities, engineering and environmental issues, providing recommendations for improving operations.

Preparation of Waste Management Paper 26C on Landfilling for the Department of the Environment, 1994. Project Director for the preparation of the UK Government's guidance on landfilling operational practices. The project included a technical review of existing landfill practices, available guidance and legislation and the results of recent research on landfill processes. On this basis, proposals for guidance on the future operational management of landfilling were developed, with particular reference to the bioreactor concept for stabilising landfill sites and achieving completion.

Appraisal of Landfill Disposal of Industrial Waste for a private client, 1991. Technical assessment of an industrial waste landfill site servicing a manufacturing plant in Northern France. The study included identifying potential operational and pollution concerns, and compliance with current and proposed EC legislation.

ENERGY AND POWER STATIONS

Review of Legislation on Power Generation and the Environment in Malaysia for a private client, 1998. Project Director for a comprehensive review of legislation which may affect the consenting of new thermoelectric and hydroelectric power stations in Malaysia.

Review of Legislation on Power Generation and the Environment in Brazil for a private client, 1998. Project Director for a comprehensive review of legislation which may affect the consenting of new thermoelectric and hydroelectric power stations in Brazil. The review covered national legislation and local legislation in 3 regions.

IPC Application for a Cogeneration Plant at Esso Oil Refinery, Fawley for National Power, 1998. Project Director for the IPC application for an on-site cogeneration plant designed to use off gases from the refinery and natural gas generate electricity. The assessment included ADMS modelling of emissions from the plant and assessments of BPEO/BATNEEC for the special circumstances of fuel use within the plant.

Environmental Assessment, IPC Authorisation and Associated Consents for an Underground Gas Storage Facility for InterGen, 1997-98. Project Director for the EA and applications for IPC and other authorisations for a natural gas storage facility in caverns excavated by solution mining techniques. The study included a full EA plus risk assessment study to support the CIMAH/COMAH application to the HSE.

Environmental Assessment and IPC Application for a 75 MWe Gas-fired CHP Plant and Overhead Electricity Line at a Fertiliser Plant for PowerGen CHP, 1997-98. Project Director for the EA and IPC application for an on-site gas-fired CHP plant designed to service the electricity needs of a major fertiliser plant and export surplus electricity to local industry. The assessment included ADMS modelling of emissions from the CHP plant alone and in conjunction with other emission sources in the area, as well as extensive assessments of ecological and landscape and visual impacts.

Siting Study, Environmental Assessment and IPC Authorisation for a 1,200 MWe CCGT Power Station for a private client, 1996-98. Project Director for the site selection, EA and application for IPC authorisation for a major gas-fired power station. The study includes the following:

- development of siting criteria and review of alternative sites;
- Environmental Assessment to support the Section 36 Consent;
- support of the application for IPC authorisation.

Strategic advice related to the EA of the support infrastructure, including overhead powerlines, underground gas pipeline and water supply was also provided.

Scoping Study for a Coal-fired Power Station in Croatia for National Power, 1997. Project Director for the preparation of an environmental review of proposals for a coal-fired power station in Croatia, to support the tender for

the contract to build and operate the power station. The consenting system and procedures for development in Croatia was also investigated.

Environmental Assessment for a 60 MWe plus 100 MWth Gas-fired CHP Plant at a Paper Mill for PowerGen CHP, 1997. Project Director for the EA for an on-site gas-fired CHP plant designed to service the steam and electricity needs of a major paper mill. The assessment included ADMS modelling of emissions from the CHP plant compared to an existing coal-fired boiler on the site, to demonstrate the potential improvements to air quality.

Site Selection, Environmental Assessment and IPC Authorisation for a 750 MWe CCGT Power Station for InterGen, 1996-97. Project Director for the EA and application for IPC authorisation for a major gas-fired power station. The study included the review of 3 alternative sites for the proposed power station; Environmental Assessment to support the application for Section 36 Consent; application for IPC authorisation; strategic advice related to the EA of the support infrastructure, including overhead powerlines, underground gas pipeline and water supply, together with the assessment of the cumulative impacts of all the developments; and presentations to local Councils and the general public.

HOSPITAL WASTE MANAGEMENT

Assessment of Hospital Waste Arisings, Rentokil, 1997. Project Director for an assessment of clinical waste arisings from the Camden & Islington National Health Trust. The assessment compared waste arising estimates based on data on collection trips and ad hoc surveys against waste generation factors calculated for other Trusts.

Preparation of a Waste Management Plan and Support for the Waste Disposal Tender for Taunton & Somerset Hospital Trust, 1996. Project Director for the preparation of a waste management plan for a major (735 bed) hospital, employing over 2,000 staff and 10 outlying Community hospitals. The work included preparation of a Code of Practice for segregating and handling clinical waste, review of options for improving waste containment (including wheelie-bin systems) and preparation of a specification for waste disposal.

Support at a Public Inquiry on a Clinical Waste Incinerator, Blue Circle Incineration, 1996. Project Director for an assignment involving the provision of expert evidence on air quality to a Public Inquiry held in respect of a clinical waste incinerator located at Hillingdon Hospital. ERM modelled the emissions from the stack and also co-ordinated evidence on public health. A decision on the Inquiry is awaited.

Water Management Strategy for West Suffolk Hospital, Bury St Edmunds, for the West Suffolk Hospitals NHS Trust, 1997. Project Director for the development of a water management strategy for a major acute hospital, covering water supply and distribution and the disposal of sewage, site

drainage and other effluents. The objective of the study was to develop a comprehensive water management plan in order to reduce water consumption and wastewater generation, and minimise costs to the Trust. The study included the development of technical solutions to minimising water consumption and effluent generation, preparation of a water management strategy and training for key staff.

Development of a Clinical Waste Control Scheme for Hong Kong for the Hong Kong Government, 1994-98. Technical specialist for the preparation of a Clinical Waste Control Scheme for Hong Kong, covering the on-site management of wastes at health care premises through collection and transport to delivery to a final disposal facility. The study considered both the practical arrangements, management requirements, institutional needs and regulatory framework for clinical waste management in Hong Kong, covering 60 hospitals and 1,500 GPs, clinics and other practices.

Preparation of a Waste Management Plan for West Suffolk Hospital, Bury St Edmunds, for West Suffolk Hospital NHS Trust, 1995-96. Project Director for the preparation and implementation studies for a comprehensive Waste Management Plan for a major hospital, employing over 2,000 staff and including acute, community and psychiatric care. The work included:

- preparation of a waste management policy statement, Code of Practice for segregating and handling clinical waste and an implementation plan for a container system for collection of clinical waste;
- preparation of a specification for the disposal of clinical waste;
- design and specification of a waste transfer facility on-site and supervision of the construction of the facility;
- training of staff;
- auditing of the waste management plan following implementation.

A full, integrated waste management system was designed and implemented, incorporating safe segregation of clinical waste, separation of recyclables and separate management of hazardous wastes, as well as the training of staff and auditing the waste management system after implementation.

Environmental Analysis of a Clinical Waste Incinerator at Bolton for White Rose Environmental, 1994-95. Project Director and technical specialist for an assessment of the environmental impacts of a clinical waste incinerator with a capacity of 750 kg per hour, covering the following:

- emissions to air, health risks, traffic and noise;
- evaluation of the alternatives to incineration;
- potential impact of dioxin emissions;
- potential impacts of disposal of radioactive materials.

The assessment considered the effects of the combined emissions of the incinerator and coal-fired boilers in comparison with an old incinerator and boilers which previously operated on the site. ERM provided expert witnesses and support at the Public Hearing into the application for authorisation for the plant.

Assessment of Emissions from the Clinical Waste Incineration Plant at Alexandra Hospital, Redditch, 1993-95. Project Director and technical specialist for an assessment of the stack emissions from a 1.5 tonnes per hour clinical waste incineration plant. The assessment included dispersion modelling of emissions from the main stack for routine emissions and the dump stack for emergency plant upsets. All the chemicals of concern indicated by HMIP plus radioactive materials were considered in the assessment. The impact of radioactivity in the incinerator ash was also evaluated. The assessment was used to support the applications for authorisation under IPC and the Radioactive Substances Act 1990.

Review of an Environmental Assessment for a Clinical Waste Incinerator and Nickel Reclamation Plant at Crowle, Humberside for Humberside County Council, 1994. Project Director and technical input into a review of a proposal for a clinical waste incinerator and nickel reclamation plant, carried out in conjunction with planning consultants Antony Walker and Partners. Due to the nature of the proposed site, the review focused on the issues of air quality, nickel contamination in the area, ecology and the technical designs of the proposed incineration facilities.

Review of an Environmental Assessment for a Clinical Waste Incinerator in the Wirral for the Metropolitan Borough of Wirral, 1993. Project Director and technical input into a review of a proposal for a clinical waste incinerator, carried out in conjunction with planning consultants DTZ Debenham Thorpe. The review focused on the adequacy of the Environmental Statement and assessment carried out, the accuracy of the results and the accuracy of the conclusions.

Environmental Assessment of a Clinical Waste Incinerator at Knostrop for Yorkshire Water Enterprises, 1992-93. Project Director for a full EA for a 1 tonne per hour clinical waste incinerator in Leeds. The EA included detailed assessment of the impacts of stack emissions, including of radioactive substances, as well as traffic and the risks involved in storing and handling clinical waste on-site. The plant received planning permission.

Review of a Planning Application for an Animal Carcass Incinerator in Birmingham for the Black Country Development Corporation, 1992-93. Project Director and technical input into the review of a proposal for an animal carcass incineration plant. The review focused on the environmental setting and sensitivities of the proposed site, the incineration plant design and pollution control measures, environmental regulation and enforcement and the potentially significant environmental issues if the plant were to be granted planning permission.

Clinical Waste Management Feasibility Study for Norwich Health Authority, 1992. Project Director for a study of the siting and costs of a clinical waste incinerator in the Norwich area. The study included an economic evaluation of the implications of several alternative schemes, including the costs of transportation and incinerator plant. In addition, three prospective sites for an incinerator were reviewed with regard to environmental aspects of the development of an incineration plant.

Environmental Assessment of a Proposed Clinical Waste Incinerator for Yorkshire Water Enterprises, 1991. Project Manager for an assessment of a proposed clinical waste incinerator, including the preparation of the Environmental Statement under the Town and Country Planning (Assessment of Environmental Effects) Regulations 1988. The assessment included a detailed examination of health risks from air emissions, including emissions due to the incineration of radioactive material.

Environmental Assessment of a Clinical Waste Incinerator for the Greater Manchester Waste Disposal Authority, 1989-90. Project Manager for the environmental assessment of a clinical waste incinerator, specifically focusing on the potential impact of stack emissions on the surrounding environment and public health. Planning permission for the incinerator has since been granted.

Environmental Assessment of a Clinical Waste Incinerator for the City of Turin, Italy, 1989. Project Manager for an environmental assessment which included a study of site selection in relation to considerations of human health and traffic.

IPC, BPEO AND BATNEEC STUDIES

Judicial Review of IPC Authorisation, Lubrizol Limited, 1998. Dr Eduljee prepared expert evidence in support of the client's case in a judicial review of the granting of an authorisation by the Environment Agency to operate a thermal oxidiser for VOC emissions from a chemical process. The evidence commented on the applicability of EU Directives on hazardous waste to gaseous emissions, and whether thermal oxidation constituted an operation separate to that of chemicals manufacture.

Judicial Review of IPC Authorisation, Redland Aggregates Limited, 1998. Dr Eduljee prepared expert evidence in support of the client's case in a judicial review of the granting of an authorisation by the Environment Agency to permit the use of secondary fuels as a supplement to fossil fuels in a lime kiln. The evidence examined the application by the Plaintiff of the Environment Agency's BPEO assessment methodology, in particular the test for significance and the development of options for control.

BPEO Assessment of sulphur dioxide abatement techniques for British Steel, 1997-1998. Project Director for a BPEO study examining the options for control of sulphur dioxide emissions resulting from the combustion of coke

oven gas produced in British Steel coke oven batteries at Scunthorpe Works. Three options were compared, based on emission data, atmospheric dispersion modelling and cost information were provided by British Steel.

BPEO Assessment for Weardale Works, Blue Circle Industries, 1996
Project Director for the preparation of a BPEO assessment for the use of recycled liquid fuel (RLF) at the client's cement works at Weardale. The assessment uses the current HMIP assessment methodology which ERM was instrumental in developing.

Completion of BPEO assessment, Redlands Aggregates, 1995 - 1996
Project Director for a BPEO assessment to compare the environmental impact associated with solvent derived fuel (SDF) burning in a lime kiln. The impact of 100% petroleum coke firing was compared to 25% SDF burning using HMIP's proposed methodology for the assessment of BPEO which includes the assessment of long term impacts of releases to air, water and land, short term releases to air, waste arisings and the global warming potential and ground level ozone formation potential of air emissions. A risk assessment of dioxin releases was also completed using human uptake models. The company was granted authorisation to burn supplementary liquid fuels.

Preparation of BPEO assessment, Redland Aggregates Ltd, 1995
Project Director for the preparation of a BPEO assessment according to HMIP's draft methodology to compare the environmental impacts of burning 100% petroleum coke and 40% substitution with solvent derived fuels (SDF) in the lime kiln at the site. The study was completed under a separate contract in 1996.

Assistance with BPEO assessment, Rugby Cement PLC, 1995
Project Director for a study to conduct dispersion modelling of emissions from a proposed cement kiln, and to assess the significance of these releases according to HMIP's BPEO assessment methodology. The study was submitted as part of Rugby Cement's application for authorisation under IPC regulations.

BPEO study on Barrington Cement Works, Rugby Cement, 1994 - 1995
ERM was asked to model emissions from a cement kiln when burning coal as a fuel and when burning solvents substituting 25% of the fuel input. A BPEO assessment as required by HMIP was also undertaken. The company was granted authorisation to burn supplementary liquid fuels.

Development of BPEO Assessment Methodology, Her Majesty's Inspectorate of Pollution (UK), 1994-1996. Project Director for nine case-studies to assess and further develop HMIP's methodology for the determination of Best Practicable Environmental Option (BPEO). The case studies included operations within the ferrous and non-ferrous metals industry, power generation, chemicals, manufacturing and waste disposal industries. For each case-study the emissions to air, water and land and waste arisings, were quantified and their environmental impacts assessed. Options for pollution control and abatement for each case-study were then investigated and their associated environmental benefits and costs compared to determine which technique best represented BPEO.

The project culminated in the publication by the Environment Agency of the draft guidance on BPEO assessment methodologies.

Case Studies Using HMIP's BPEO Assessment Methodology, Confidential Client, 1994. Project Director for three case studies using HMIP's BPEO Methodology on behalf of cement and lime industry clients. The purpose of the studies was to determine whether the supplementary burning of waste solvents in cement and lime links represented BPEO compared to burning of conventional fuels. Emissions to air, water and land, and waste arisings were quantified and their potential environmental impacts were assessed. Conclusions were then made regarding the likely Best Environmental Option.

BPEO Economics Refinery Sector Study, Her Majesty's Inspectorate of Pollution (UK), 1994. Project Director for a study to determine the economic, financial and industry-wide market factors which affect refinery profitability, and how these factors affect the selection of Best Available Techniques Not Entailing Excessive Costs (BATNEEC). This was carried out following the proposed HMIP methodology. The emissions to air and water, and wastes arising, for a "typical" refinery are being quantified, and potential pollution control techniques are being investigated to determine BATNEEC. ERM also investigated how feasible the proposed methodology was to apply to sectors within the Environmental Protection Act 1990 as well as the refinery sector.

WASTE TRANSFER AND RECYCLING

Environmental Assessment for Kingsway Waste Transfer Station and Materials Recycling Facility, Luton for Luton Borough Council, 1996-97. Project Manager for the EA to support the planning application for the upgrading and redesign of a waste transfer/MRF in Luton. The facility is designed to handle up to 70,000 tonnes of municipal and mixed recyclable waste (collected in a dual-use vehicle) together with 12,000 tonnes of CA site waste and up to 70,000 tonnes of commercial waste. The facility includes bulk waste transfer, green waste separation and recovery of recyclable materials using magnetic separation, eddy-current separation and hand-picking.

Technical and Environmental Appraisal of Gerpins Lane Civic Amenity Site for the London Borough of Havering, 1993-94. Project Manager and technical specialist for a review of the operations of a major civic amenity site, including waste receipt, storage and handling, transfer operations and environmental management. The review was used to support the Borough in an appeal against licensing conditions being imposed on the site. ERM provided expert witnesses at the Hearing into the licence application.

Preliminary Environmental Assessment of Dudley Transfer Station for Mass Energy, 1993. Project Manager for a preliminary environmental assessment of the development of a municipal waste transfer station at the old Dudley incineration plant. The preliminary assessment considered the potential impacts on air quality, traffic, water resources and contaminated land, visual impact, ecology, noise and the planning framework.

COMPLIANCE AUDITING

Compliance Audit of Waste Incineration Facility, for SELCHP, 1997. Dr Eduljee audited the SELCHP facility in Southeast London to assess compliance with planning and authorisation requirements, and with commitments made by the company to the planning authority and local resident groups.

Compliance Audit and Development of Waste Management Plan for Bristol-Myres Squibb Pharmaceuticals, 1997. Project Director for a study examining the waste management chain for materials in the possession of field representatives, and recommending appropriate measures to ensure compliance with legislative requirements and with the Duty of Care.

Auditing of Waste Disposal Facilities, for Waste Facilities Audit Association, 1994-ongoing. Project Director and auditor for an ongoing project conducting environmental audits of a variety of chemical waste treatment, recycling and disposal facilities in the UK.

Duty of Care Audits for the Waste Facilities Audit Association, 1993. Project Director for ongoing Duty of Care audits of waste treatment and disposal facilities in the UK, for a consortium of industrial generators. The first tranche of audits in the 1993 programmes involved the audit of three waste disposal sites.

Industrial Waste Treatment and Disposal Plant Auditing and Screening Services for a major multi-national company, 1992-93. Project Director and technical input for a range of auditing and screening services relating to waste treatment and disposal plants in the European Community. The services included identifying potential plants, technical and financial screening to indicate those operating to acceptable standards and detailed auditing of site operations.

Waste Treatment Facility Screening in the UK, West Germany and Japan for the Waste Site Inspection Group (WSIG), 1989-90. Project Director for a study examining the commercial waste management industry in the UK, West Germany and Japan including the assessment of industrial waste arisings, legislative frameworks, and availability of treatment/ disposal facilities. Incineration, landfill, physico-chemical treatment, and oil and solvent recovery facilities were assessed and ranked according to their technical capabilities, management capabilities and financial strength.

Compliance auditing and environmental assessment of a Zinc Mine and Smelter Project, for the Overseas Development Administration, 1989, 1991, 1994, 1998. Lead auditor for a series of compliance audits which examined the pollution control provisions at a zinc mine and smelter complex in Rajasthan, North India. Four visits were made to the smelter site over an eight year period.

Audits of Hazardous Waste Contractors for Waste Site Inspection Group (WSIG) 1987-ongoing. Dr Eduljee audited 20 facilities in the UK and Europe. The audits included detailed site inspections, the assessment of regulatory compliance and the identification of potential pollution pathways and the risk to air, surface water and groundwater quality. Solvent recovery, oil recovery, physico-chemical treatment, incineration plants, and landfill sites were included in the audits.

Environmental Audits of Hazardous Waste Contractors for IBM (UK) Limited 1987. Dr Eduljee conducted detailed site inspections of all hazardous waste facilities used by IBM (UK). A total of fifteen facilities were audited throughout the UK and close liaison with local regulatory authorities was an integral part of the audits.

WASTE MANAGEMENT PLANNING, STUDIES AND ENVIRONMENTAL ANALYSIS

Review of Draft Waste management Strategy, Kent County Council, 1998. Dr Eduljee reviewed and commented on Kent County Council's draft waste management strategy and presented his findings at three public meetings organised by the Council. The aim of the strategy was to formalise considerations relating to environmental performance and recycling and recovery targets when assessing options for waste management in Kent. A key aspect of the strategy was a coordinated approach to waste management in which Waste Collection Authorities and public organisations were fully integrated.

Review of Waste Incineration in the UK, JETRO London, 1996-1998. Project Director for an annual review of municipal waste incineration in the UK, examining the legislative, technical and commercial aspects of incineration.

Application of Life Cycle Assessment to Waste Management, Environment Agency, 1998. Project Director for a study reviewing techniques for environmental impact assessment in LCA and their application to waste management. A range of LCA and non-LCA impact assessment techniques were reviewed against a framework developed for the project. The assessment techniques were tested on hypothetical case studies to determine the relative strengths and weaknesses of the different methods.

Expert Evidence in Support of a Claim against Damage to Cattle and Crops, Rhone Poulenc/Staveley Chemicals, 1997 - ongoing. Dr Eduljee prepared expert evidence assessing the environmental significance of levels of heavy metals, sulphur and fluorine in soils and plants on a farm. Damage to cattle and crops was alleged against the site, principally from two processes. Dr Eduljee will be giving evidence in the High Court in 1998.

Environmental Analysis of Options for an Integrated Waste Management Strategy for Greater Manchester for the GMWDA, 1997. Project Director for a comprehensive analysis of the potential emissions from alternative "scenarios"

for the future waste management strategy for the disposal of 1.2 million tonnes of municipal waste arising in Greater Manchester. The analysis covered 11 scenarios, and included the assessment and quantification of emissions and energy consumption/ recovery from transport, transfer stations, composting, anaerobic digestion, incineration (fluidised bed and mass burn) and landfilling (with and without landfill gas utilisation). The study was supported by the presentation of the findings to the GMWDA and local authorities, together with inputs into the public consultation process.

Environmental Impact Analysis of the Potential Strategies for the East London Waste Authority, 1996. Project Director for the assessment of nine alternative strategies for the disposal of 400,000 tonnes of municipal waste arising in ELWA, encompassing recycling, transfer operations, composting, anaerobic digestion, incineration and landfilling. The analysis considered the environmental issues associated with each process, environmental constraints on siting waste management facilities, availability of potential sites and the relative implications and emissions resulting from waste transport by road, river and rail.

Scoping Study for the Use of Electronic Nose Technology, Environment Agency, 1997 - 1998. Project Director for a study examining the use of electronic nose technology as a tool in the regulation and monitoring of IPC processes. The current state of development and commercialisation were examined. Potential applications and the limitations of the technique as a regulatory tool were assessed.

Research into Municipal Waste Incineration/Power Generation in Europe for JETRO, 1996. Project Manager for a study of the status of municipal waste incineration/power generation in the UK, Belgium, France, Germany and the Netherlands. The study identified the number and location of municipal waste incineration plants with and without power generation and technical information on the plant designs in each of the countries, together with research and evaluation of the development of waste incineration in the UK, covering the quantity and composition of waste, regulation of plants, power generation, alternative disposal outlets and barriers/constraints on development.

Waste Management Plan for Barrow in Furness, Cumbria, for Cumbria County Council/Barrow Waste Consortium/Furness Enterprise, 1996. Technical specialist on the environmental, planning and siting issues for waste management infrastructure in the Barrow in Furness area. The study involves the development of a waste management strategy covering municipal, commercial and industrial waste.

Review of Energy from Waste for Rochester City Council, 1995-96. Project Director for a review of the environmental and siting issues of energy from waste plants in comparison with other waste disposal methods. The study provided the Council members with a comprehensive review of the key environmental issues and evidence for health impacts associated with energy from waste and provide siting criteria for consideration in the development of future energy from waste facilities.

Environmental Review of an Energy from Waste Plant and Landfill of Residues vs Direct Landfill for a private client, 1995. Project Director for an environmental review of proposals for an energy from waste plant with landfill disposal of the ash residues in comparison to direct landfilling. The environmental review considered the place of energy from waste in the waste management hierarchy, environmental impacts of energy from waste versus direct landfill (covering energy production, atmospheric emissions, waste reduction, compatibility with recycling and reduction in transport) and site-specific environmental issues of proposed locations for an energy from waste plant and landfill. The review was used to support a bid for a waste disposal contract serving a major UK city.

Evaluation of the Environmental Impacts of Energy Recovery and Final Disposal of Paper for London Environmental Economics Research Centre, 1994. Project Director for an extensive literature review and appraisal of the options for energy recovery and final disposal of paper. The project considered the status, energy recovery potential and environmental impacts of incineration, paper-derived fuel manufacture, composting, anaerobic digestion and landfilling of paper.

Evaluation of the Implications of the 5th Environmental Action Plan for the Commission of the European Communities, 1993-94. Technical specialist as part of a multi-disciplinary team evaluating the potential impacts of the 5th EAP on the environment. Involvement in the study focused on the potential impacts on waste arisings, including domestic waste, hazardous and non-hazardous waste from manufacturing industry, used tyres and end-of-life vehicles. Spreadsheet analyses were developed to allow the rapid assessment of the 5th EAP policies.

Market Survey for a Proposed Aqueous Waste Treatment Plant for a confidential client, 1993. Project Director for a market survey designed to identify types and quantities of aqueous wastes arising in a region of the UK, to support the construction and operation of a consented waste treatment plant.

Evaluation of the Investment Costs and Technical and Economic Feasibility Threshold for Waste Treatment Plants for the CEC, 1991. Technical input on the industrial and municipal waste treatment technologies, including incineration, physico-chemical treatment, composting, materials separation and landfilling, to enable capital and operational costs to be realistically compared. The project covered 8 EC Member States and included interview visits to waste treatment facilities in the UK and Denmark.

Techno-economic Assessments of Refuse Combustion Technology for the Energy Technology Support Unit (ETSU), 1989-91. Project Manager and technical input into a major study identifying refuse combustion systems and assessing their technical status, economic attractiveness and future potential for application in the UK. The study was carried out to help form the basis of the ETSU strategy for encouraging development of refuse-derived fuel (rdf) ns in the UK. The role included leading the liaison with

manufacturers of incinerator plant and managing the assessment of the technologies and context of their development.

Waste Management Strategy for a major chemical manufacturer, 1989-90. Project Manager for the preparation of a waste management strategy for a manufacturer of pigments, following the discontinuation of the disposal of its chemical wastes to sea.

Charges and Charging Policy for the CEC, 1989. Project Manager for a study examining the charging policies for the treatment and disposal of hazardous wastes in selected EC Member States. The effect of subsidies, compulsory use of facilities, market forces, etc were examined in relation to cross-EC charges, competition, and the potential for transfrontier movement of wastes.

EYE Awards Scheme for the European Commission, 1988. ERM acted as the technical secretariat for judging of entries for The Better Environment Awards to industry as part of the European Year of the Environment. Categories of award were green product design, clean technology, export of appropriate environmental technology and good environmental management. Dr Eduljee provided expert assessment of the entries against their technical and economic feasibility, innovative character and applicability to other countries.

Improving Information on Hazardous Wastes for the CEC 1987. Project Manager for a study which examined waste arisings for selected Member States for a number of wastes currently included as an Annex to Directive 78/319/EEC on toxic and dangerous waste. The study involved high-level interviews with senior people within Governments and trade associations as well as relevant industries.

Planning and Assessment Manual for the Safe Disposal of Hazardous Wastes for the World Bank and UNEP, 1986-87. Dr Eduljee contributed the technical chapters on incineration, solidification, sea disposal and central treatment facilities to this important manual, which was a co-operative effort between the World Bank, the United Nations Environment Programme and the World Health Organisation. The manual specifically emphasised the problems and needs of developing countries.

Monitoring of Clean Technologies Demonstration Schemes for the CEC, 1987-90. Clean technologies are processes involving modifications aimed at "waste minimisation". The European Commission funded 12 such demonstration schemes for which Dr Eduljee co-ordinated a two year monitoring programme. The study involved both the technical and financial assessment of each demonstration scheme.

Hazardous Waste Facility Inventory in the European Community for the CEC, 1989. Database Manager for the compilation of an inventory of all hazardous waste treatment and disposal facilities in all EC Member States. The inventory covered incineration, physico-chemical, oil and solvent recovery and landfill facilities, and has been continually updated since the project to provide a major resource of waste management facility information.

Prior to joining ERM: Manager of Environmental Monitoring, Rechem International Limited 1985-87.

Development of stack monitoring techniques for the measurement of PCB, dioxin and dibenzofuran emissions from hazardous waste incinerators.

Modelling of the dispersion characteristics of stack emissions, and investigating the mechanisms describing their fate in the environment.

Health risk assessment of hazardous waste incinerator emissions.

External environmental monitoring to assess the impact of PCB incineration and other stack emissions on surrounding land.

In addition to the above, Dr Eduljee retained the responsibilities of his previous post.

Development Chemist, Rechem International Limited 1979-85.

Development, operation and supervision of pilot plants for a variety of reclamation and detoxification projects, including solidification, recycling of spent etchants and treatment of high COD aqueous wastes.

Appraisal and evaluation of new processes for detoxification and recycling of industrial waste.

Research into the chemistry involved in waste management and reclamation techniques.

Monitoring and dispersion modelling of pollutants emitted from incinerator stacks, especially dioxins and dibenzofurans.

Senior Application Engineer, Tolltreck Linkrose Limited 1976-1979.

Research and development in the field of physico-chemical wastewater treatment.

Design of dissolved air flotation plants for the treatment of sewage sludge, industrial effluents and oily wastes; mineral benefaction gas-liquid contractors for the neutralisation of wastewater with carbon dioxide; and high pressure air and oxygen systems for the aeration of sewage.

Tender Ref. SW 99-069

Annex B

SPECIAL CONDITIONS OF CONTRACT

Tender for the Provision of Services for An Assessment of Dioxin Emissions in Hong Kong

1. Background

1.1 The waste management system in Hong Kong has long been relying on landfill as the ultimate disposal means. With the current waste intake rate at the landfills of about 16,000 tonnes per day and the rising trend of waste growth, the existing landfills will likely be exhausted by 2015 and Hong Kong will be running out of land for waste disposal. If we do nothing to reverse this trend, we will need to find about 860 hectares of land for new landfills within the next 20 years. Finding suitable sites for the new landfills is very difficult given the many competing demands for the very limited land resources in Hong Kong. To overcome this problem, the Government of the Hong Kong Special Administration (HKSAR) issued a Waste Reduction Framework Plan (WRFP) in 1998. Among other recommendations on waste avoidance, minimization and recycling initiatives, the WRFP recommended the use of incineration as a bulk waste reduction means for municipal solid waste.

1.2 Apart from municipal solid waste, incineration is also recommended by the Sludge Treatment and Disposal Strategy Study as the most appropriate means of disposing the vast quantity of sewage sludge generated in Hong Kong. The infectious nature of animal carcasses has rendered the existing landfill disposal arrangement undesirable and there is plan to develop an animal cremator to cremate all the carcasses.

1.3 Recently, public concern was aroused by the dioxin incidences originated from the contamination of dairy products in Belgium, followed by the disclosure of two occasions where the Chemical Waste Treatment Centre (CWTC) failed to meet its dioxin emission standard of 0.1 ng/m3 during its monthly flue gas monitoring programme. Whilst the exceedence of dioxin emission was only for a short period of time and the level of exceedence was very low (less than 0.5 ng/m3), these incidences have attracted much public criticism on the potential health impacts caused by incineration.

1.4 In view of the above, it is considered necessary for the Government of HKSAR to provide some positive assurance to the public that the CWTC and any other dioxin sources, including the planned incinerators, will not pose any threat to the public health. As the formation and health impacts of dioxins are still under extensive investigation, it is advisable to invite the world's most renowned experts to assess Hong Kong dioxin baseline conditions and provide an unbiased view on the health impacts caused by dioxin emission from our waste management system. It is proposed to engage a consultant (hereafter called "Consultant") with in-depth knowledge on the dioxin issues, the Hong Kong environment and the waste management system adopted in Hong Kong to undertake the assessment work. To ensure the Consultant's findings are not biased, it is proposed to submit the Consultant's findings and recommendations (in the form of a comprehensive report) to an international dioxin Expert, for an independent review. The recommendations of the Expert, together with the Consultant's Report, will then be considered by the HKSAR Government and made known to the public.

2. Objectives of Study

2.1 The Consultant will be appointed to offer the Services with the following key objectives:

(i) Advise on the formation, source and health impacts of dioxins;

(ii) Evaluate and assess the health impact of any known dioxin sources in Hong Kong;

(iii) Evaluate and assess the potential health impact of the planned incineration facilities resulting from their dioxin emissions; and

(iv) Advise on dioxin control measures and their impacts on the adoption of incineration as an integral part of Hong Kong's waste management strategy.

3. The Services

3.1 Without prejudice to the generality of the above, the Services shall consist of the following tasks:

(i) To review the ambient dioxin monitoring data and advise the likely significant sources of dioxin in Hong Kong.

(ii) To review the existing emission data, health assessment studies of Hong Kong's waste facilities and to assess whether the local community is being exposed to a dangerous level of dioxin generated from the existing waste management facilities.

(iii) To advise on the dioxin monitoring requirements including ambient monitoring and the monitoring of other dioxin sources considered by the consultant to be significant.

(iv) To review and advise on both the short term and long term health impacts of dioxin emission taking into account the population density of Hong Kong, the possible cumulative effect from the existing and planned incineration facilities for municipal solid waste, sewage sludge, animal carcasses, clinical waste and chemical waste.

(v) To advise on the control mechanism on dioxin emission to be set for the planned incineration facilities taking into account international practices and the findings of task (iv) above. The dioxin control mechanism shall cover, but not limited to, the emission limit, dioxin suppression system, ash management, monitoring and testing regime.

(vi) To audit the dioxin emission control mechanism of the CWTC, taking into consideration that clinical waste will be co-incinerated with chemical waste at the CWTC in the future.

(vii) To advise on the limit of exposure of the public to emissions of dioxins from all the significant sources identified in task (i) above. Also to advise on the risk as well as the appropriate contingency and emergency response measure in the event of any mal-operation leading to release of significantly quantities of dioxin.

4. Programme and Deliverables

4.1 The tasks identified in Section 3.1 above are to be completed within 6 weeks of commencement of the agreement.

4.2 The Consultant is required to submit 10 copies of the draft Report and an electronic copy within 6 weeks of commencement of the agreement. The Report shall be reviewed and commented on by an independent dioxin expert. The Report shall consist of at least, but not limited to, the following main headings for the tasks mentioned in Section 3.1 above:

(i) Executive Summary,

(ii) Objectives of Study,

(iii) Scope of Study,

(iv) Methodology,

(v) Assessment Results and Discussion, and

(vi) Recommendations.

If required by the Director's Representative, the Consultant shall conduct briefing sessions to present the Report. For the purpose of payment, the Consultant shall assume that he will be required to give at least 4 detailed presentations, including 1 day travelling time and 4 working days.

4.3 The Consultant shall answer questions raised by the Director's Representative, the independent dioxin expert or other consultation committees regarding details of the draft Report and any other issues related to the tasks specified in Section 3.1.

4.4 The Consultant is required to submit 30 copies of the Final Report and an electronic copy to the Director's Representative on completion of the above assignments.

5. Method of Payment

5.1 The remuneration of the Consultant for the performance of the Services shall be the lump sum amount in Item No. 1 of the Schedule. Payment of fee shall be made in accordance with the below:

Payment 1	30% of the Lump Sum Fee on signing of agreement
Payment 2	40% of the Lump Sum Fee on submission of draft Report
Payment 3	30% of the Lump Sum Fee on approval of Final Report

5.2 Upon instruction from the Director's Representative for additional work, the Consultant shall be reimbursed by the Employer for:

(i) a sum of HK$1,600 per day for hotel expense and subsistence allowance for each extra day of stay;

(ii) time charge for the additional work..

5.3 In the event that a return visit is required after the presentations stipulated in section 4.2, the Consultant shall be reimbursed by the Employer for:

(i) time charge for one day for travelling time;

(ii) time charge for additional work;

(iii) hotel expense and subsistence allowance of HK$1,600 per day;

(iv) approved airfare for standard direct round trip Business Class between the country of residence and Hong Kong.

Annex C

CURRICULUM VITAE

Name: Carl Magnus Christoffer Rappe

Date and place of birth: May 26, 1933 in Malmö, Sweden

Pre-university schools: Gymnasium, graduated 1951

University education: Fil.kand. (B.Sc.) at Uppsala University 1956 (chemistry, geology).
Fil.lic. at Uppsala University 1962 (organic chemistry, chemistry, biochemistry)
Fil.dr. (Ph.D.) at Uppsala University 1965 in organic chemistry
Thesis: Studies on α-haloketones with special regard to structure, preparation and rearrangements of aliphatic α-bromoketones.

Military service: 1954-1955 (15 months)

Employments: Teaching assistant, Agricultural University, Uppsala 1955-59 and University of Uppsala 1959-62.
Biträdande lärare (lecturer) in organic chemistry University of Uppsala 1965-70.
Docent (associate professor) in organic chemistry University of Uppsala 1965-70.
Professor and Chairman of Organic Chemistry University of Umeå 1970-1988.
Professor and Chairman of Environmental Chemistry University of Umeå 1988-1998
Professor emeritus 1998-

Scientific publications: Totally around 550 papers in synthetic organic chemistry (100 papers) and environmental chemistry, 450 papers as listed separately.

Professional assignments: Member of the International Agency for Research on Cancer (IARC) working group on the evaluation of the carcinogenic risk of chemicals to man: Polychlorinated Biphenyls (Lyon 1977), N-Nitrosamines (Lyon 1977), Wood Leather and some Associated industries (Lyon 1980), Carbon Blacks, Mineral Oils and some Nitroarenes (Lyon 1983), Some Organohalogen Compounds (Lyon, 1986).

Rapporteur in the NIEHS/IARC Working Group for Long term hazards of polychlorinated dibenzodioxins and polychlorinated dibenzofurans, Lyon 1978.

Rapporteur in the WHO Task Group on Environmental

Professional assignments: (ctd)

Expert to the Italian authorities after Seveso, 1976.

Member of the Organizing Committee of the Royal Swedish Academy of Sciences Dioxin Meeting, Stockholm 1977.

Member of the Organizing Committee for American Chemical Society Dioxin Meetings 1979, 1982, 1983 and 1985. Member of the Organizing Committee for DIOXIN '80, '82, '84, '85, '86, '87, '88, '89, '90 '91, '92, '93, '94, '95, '96 '97, '98, and '99.

Member of Peer Review Board of US EPA documents for polychlorinated dibenzofurans (Cincinnati, 1980 and 1986) and polychlorinated dioxins (Cincinnati, 1983).

Invited lecturer to NIEHS symposium on PCB fires in Helsinki, 1983.

Invited expert by the Italian authorities to review scientific reports from Seveso in Milan in 1984.

Invited author to WHO IPCS Environmental Health Criteria Document on PCDDs and PCDFs 1985.

Invited expert to guide the French government about the PCB fire in Reims, 1985.

Temporary adviser at WHO consultation on PCDDs/PCDFs in human milk, Bilthoven, Holland, 1985.

Temporary adviser at WHO consultation on risk evaluation of PCB fires, Helsinki, 1985 and 1986.

Invited keynote speaker at DIOXIN '86 in Fukuoka, Japan, 1986.

Temporary adviser at WHO consultation on PCDDs/PCDFs in breast milk, Copenhagen 1986, 1987 and 1988.

Organizer for the WHO interlaboratory calibration study on PCDDs, PCDFs and PCBs in human milk (1986, 1987).

Temporary adviser at WHO during consultation on PCDDs/PCDFs in municipal incinerators in Naples, Italy, 1986.

Invited expert by WHO for planning epidemiological studies on health effects of Dioxin exposure, Geneva 1986 and Bayreuth 1990.

Invited expert by the government of New Zeeland, 1987.

Professional assignments: (ctd)

Author and member on the working group for the WHO/IPCS environmental health criteria documents on PCDDs and PCDFs, London 1987.

Temporary adviser for WHO for the assessment of health risks in infant associated with exposure to PCB, PCDDs and PCDFs in breast milk, Abano Terme, Italy, 1987.

Member of the panel for the evaluation of dioxins collected by the Nordic Council, Vattholma, Sweden, 1987, and Almaretäket, Stockholm, Sweden, 1995.

Chairman of DIOXIN '88 in Umeå 1988.

Invited expert by Canadian authorities to guide about the PCB fire outside Montreal, 1988.

Member of the Expert Panel evaluating environmental research in Denmark, Copenhagen, 1989.

Invited expert to an EC meeting on the analyses of cow's milk, Brussels 1990.

Invited keynote speaker at DIOXIN '90 in Bayreuth, Germany 1990.

Member of the Swedish delegation of chemists to study environmental problems in Estonia, 1990.

Invited keynote speaker at the dioxin formation during the combustion seminar in Kyoto, Japan, 1991.

Organizer of Source session and invited speaker at DIOXIN '91 in Research Triangle Park, NC, USA.

Invited lecturer at DIOXIN '92 in Tampere, Finland.

Invited speaker at the Third Global Chlor-Alkali Symposium in Monte Carlo, Monaco, 1992.

Invited expert by the Federal German Authorities at the Dioxin hearing in Berlin in 1992.

Invited expert for the formation of dioxin during comb by the Minister of Health in Luxembourg, 1992-93.

Invited organizer and speaker of the EU dioxin workshop in Como, Italy, 1993

Professional assignments: (ctd)

Expert for the Commission of European Community (CEC), 1994, 1995.

Invited expert to the Chemical Inspectorate's workshop on Chlorine, Stockholm, 1994.

Invited expert to the SETAC workshop on Chlorine, Alliston, Ontarito, Canada, 1994.

Invited keynote lecturer at DIOXIN '94 in Kyoto, Japan.

Invited expert by the EPA Ireland in 1994.

- Invited panel member of IEHR review panel on US EPA Dioxin Draft Document, Washington D.C., 1994-1995.

Invited panel member of AET review panel on dioxin formation during pulp bleaching with "chlorine dioxide only" in Montreal, Canada, 1995.

Invited expert to the dioxin formation by the Government of Taiwan, 1995.

Invited expert of dioxin formation during incineration of wastes by the US Conference of Mayers, Washington, 1995.

- Invited expert to US EPA workshop on Dioxins in Washington, D.C. and in Chevy Chase, MD, 1996.

Invited expert to ICPS Meeting on brominated dioxins and dibenzofurans in Hannover, Germany. 1996

Invited author and expert and vice chairman at the IARC Monograph meeting on PCDDs and PCDFs in Lyon, 1997.

- Received the Royal Skytteanska price 1997.

- Invited author to WHO meeting on PCDDs and PCDFs in Geneva 1998.

The 1999 annual price of the Environmental Chemistry Division of the Italian Chemical Society.

Doctoral theses supervisor: 12 in Organic Chemistry, 16 in Environmental Chemistry.

Member of the Editorial Board in the following scientific journals:
Chemosphere
American Journal of Industrial Medicine
Toxicological and Environmental Chemistry
Fresenius Journal of Environmental Chemistry

Annex D

SPECIAL CONDITION OF CONTRACT

Provision of Services for
Review of Dioxin Emissions in Hong Kong

Background

The waste management system in Hong Kong has long been relying on landfill as the ultimate disposal means. With the current waste intake rate at the landfills of about 16,000 tonnes per day and the rising trend of waste growth, the existing landfills will likely be exhausted by 2015 and Hong Kong will be running out of land for waste disposal. If we do nothing to reverse this trend, we will need to find about 860 hectares of land for new landfills within the next 20 years. Finding suitable sites for the new landfills is very difficult given the many competing demands for the very limited land resources in Hong Kong. To overcome this problem, the Government of the Hong Kong Special Administration (HKSAR) issued a Waste Reduction Framework Plan (WRFP) in 1998. Among other recommendations on waste avoidance, minimization and recycling initiatives, the WRFP recommended the use of incineration as a bulk waste reduction means for municipal solid waste.

2. Apart from municipal solid waste, incineration is also recommended by the Sludge Treatment and Disposal Strategy Study as the most appropriate means of disposing the vast quantity of sewage sludge generated in Hong Kong. The infectious nature of animal carcasses has rendered the existing landfill disposal arrangement undesirable and there is plan to develop an animal cremator to cremate all the carcasses.

3. Recently, public concern was aroused by the dioxin incidences originated from the contamination of dairy products in Belgium, followed by the disclosure of two occasions where the Chemical Waste Treatment Centre (CWTC) failed to meet its dioxin emission standard of 0.1 ng/m^3 during its monthly flue gas monitoring programme. Whilst the exceedence of dioxin emission was only for a short period of time and the level of exceedence was very low (less than 0.5 ng/m^3), these incidences have attracted much public criticism on the potential health impacts caused by incineration.

4. In view of the above, it is considered necessary for the Government of HKSAR to provide some positive assurance to the public that the CWTC and any other dioxin sources, including the planned incinerators, will not pose any threat to the public health. As the formation and health impacts of dioxins are still under extensive investigation, it is advisable to invite the world's most renowned experts to assess Hong Kong dioxin baseline conditions and provide an unbiased view on the health impacts caused by dioxin emission from our waste management system. It is proposed to engage a consultant (hereafter called "Consultant") with in-depth knowledge on the dioxin issues, the Hong Kong environment and the waste management system adopted in Hong Kong to undertake the assessment work. To ensure the Consultant's findings are not biased, it is also proposed to submit the Consultant's findings and recommendations (in the form of a comprehensive report) to an international dioxin expert (hereafter called "Expert"), for an independent review. The recommendations of the Expert, together with the Consultant's Report, will then be considered by the HKSAR Government and made known to the public.

Objectives

5. The Expert will be appointed to offer the Services with the following key objectives:

i. Advise on the formation, source and health impacts of dioxins;

ii. Evaluate and assess the health impact of any known dioxin sources in Hong Kong;

iii. Evaluate and assess the potential health impact of the planned incineration facilities resulting from their dioxin emissions; and

iv. Advise on dioxin control measures and their impacts on the adoption of incineration as an integral part of Hong Kong's waste management system.

6. **Definition**

"Director"	The Director of Environmental Protection
"Director's Representative"	The Assistant Director of Environmental Protection (Waste Facilities)
"Commencement Date"	The date appointed by the Director's Representative upon receipt of the Expert's confirmation of acceptance of the Agreement.
"Term"	From the Commencement Date for a period of 3 months and for subsequent periods as may be mutually agreed.

The Services

7. During the Term, the Expert shall devote his/her time, attention and abilities to the Director's Representative as may be necessary for the proper exercise of his/her duties as specialist advisor to the Government of the HKSAR. The Expert will be given a copy of the Consultant's report and any other relevant information for review. Upon completion of the independent review, the Expert will be required to present his/her review findings in Hong Kong. The duration of visit to Hong Kong will normally be no more than 4 working days.

8. Without prejudice to the generality of the above, the Services shall consist of an independent review of the Consultant's Report and in particular, provide comments on the following areas:

i. Significant sources of dioxin in Hong Kong.

ii. Short term and long term health impacts of dioxin emission to the local community, taking into account the population density of Hong Kong, the cumulative effect of dioxin emissions from the existing and planned incineration facilities and other sources identified in item (i) above.

iii. Dioxin monitoring requirements, for ambient monitoring and at point source.

iv. Proposed control mechanism on dioxin emission for the planned incineration facilities.

v. The audit result of the CWTC.

vi. Exposure limit of the public to emissions of dioxins from individual dioxin sources.

vii. The risk of mal-operation of any of the significant dioxin sources identified that would potentially release significant quantities of dioxin.

viii. The proposed contingency and emergency response measure in the event of significant quantities of dioxin being released from the identified dioxin sources as a result of its mal-operation.

9. If required by the Director's Representative, the Expert shall conduct briefing sessions to present his/her views/comments on the Consultant's Report or matters essential for meeting the objectives stated in Section 5. The Expert may be required to attend briefings to the Advisory Council on the Environment (ACE), Legislative Council (LegCo) meetings, and public/press conferences to present his/her views on the Consultant's Report with particular reference to the health impacts of dioxin emission from the identified dioxin sources.

10. The tasks identified in Section 8 above are to be completed within 3 weeks after receipt of the Consultant's draft Report. The Expert shall submit a report consisting of his/her comments or recommendations on the Consultant's draft Report.

11. On appointment and during the currency of this Agreement, the Expert must declare any interest if it is considered to be in real or apparent conflict with the duties to be performed. The Expert should not undertake any services, which could give rise to conflict of interest, except with the prior approval of the Director's Representative.

Honorarium and Other Payments

12. In consideration of the Services to be rendered under this Agreement, the Expert will be remunerated directly by the Government of the HKSAR in accordance with the Schedule of Fees

Termination

13. This Agreement may be terminated by either party giving one week's notice in writing.

Responsibility

14. The Expert shall agree to perform the Services with that standard of care, skill and diligence normally provided by a professional person in the performance of similar services. The Expert shall understand that the Government of the HKSAR will be relying upon the accuracy, competence and completeness of the Services provided.

15. In performing the Services under this Agreement, the Expert shall operate as and have the status of an independent consultant and shall not act as or be an agent or employee of the Government of the HKSAR.

Confidentiality

16. The Expert shall be obliged, except authorized by his/her duties, at any time during or after the Term, not to divulge or allow to be divulged to any person any confidential information relating to the business or affairs of the Government of the HKSAR or relating to the business or affairs of the Director's Representative, obtained from or through the Government of the HKSAR or developed or obtained by himself/herself in connection with the Services unless -

i. The information was known to him/her prior to his/her obtaining it from the Government of the HKSAR;

ii. The information was at the time of disclosure by him/her, already in the public domain; or

iii. The information was obtained by him/her from a third party who did not receive it directly or indirectly from the Government of the HKSAR.

17. This Agreement shall be governed by the Laws of the HKSAR.

Annex E

Report on dioxin exceedence at the CWTC

Background

The CWTC contractor is required under the contract to monitor the dioxin level in stack gas on a monthly basis and the emission standard for dioxin is set at 0.1ng/m3, which is at present the most stringent standard in the world. There is an enormous factor of safety between this emission standard and the related safety limit recommended by the World Health Organization. The dioxin monitoring work is being done by an independent consultant, Hong Kong Productivity Council. The preparation and sampling of dioxin usually takes about 24 hours to complete and the laboratory analysis of dioxin samples will take about 1 week to complete. Formal laboratory report will usually be available in 2 to 3 weeks' time.

The November 98 Incident

Routine dioxin sampling was taken on 11 November 98 and the laboratory report revealed that the dioxin level was 0.2142 ng/m3 which exceeded the control limit of 0.1 ng/m3. This triggered an investigation by EPD and the contractor to examine the possible causes for the high reading. However, the investigation showed that the waste intake content and all burning parameters for that day were within the operational requirements and no obvious cause for the exceedence could be identified. To confirm the performance of the incinerator, three additional stack samples were taken on 9, 16, 22 December 1998 and the dioxin results were found to be 0.0355, 0.0063 and 0.0057 ng/m3 respectively, i.e. all were lower than the control limit. The results showed that the incinerator's performance was back to normal.

The result of dioxin monitoring on 20 January 99 was 0.0188 ng/m3 indicating that the performance of the incinerator was normal.

The February 99 Incident

The incinerator was shut down for general maintenance from 30 January 99 to 8 February 99. Soon after the incinerator had resumed working, a stack gas sample was taken on 12 February 99. Preliminary laboratory results showed that the dioxin emission was 0.4495 ng/m3 which exceeded the control limit of 0.1 ng/m3. Investigation was carried out on 25 February 99 and it was found that the power supply to the activated carbon injection system was improperly connected after the

overhaul. This fault was immediately corrected and further dioxin samples were taken on 26 February, 5 and 10 March 99. Laboratory results showed that the dioxin levels were 0.0991 ng/m3, 0.0476 ng/m3 and 0.0252 ng/m3 respectively and the operation of the incinerator was back to normal.

Actions Taken

Subsequent to these two incidents, the following actions have been implemented on top of the contractual monitoring arrangement:

1. An additional activated carbon injection system has been installed. Both the primary and secondary systems are running continuously whenever waste is incinerated.

2. The key equipment in controlling dioxin emission is inspected on a shift basis by the Contractor and on a daily basis by EPD site staff.

3. Starting from October 1999, the ambient air monitoring frequency has been increased from once every half year to once every month. This is to monitor closely the air quality in Kwai Tsing district.

4. In the past, the environmental monitoring report for the Kwai Tsing Provisional District Board (DB) was submitted every six months. The half-yearly report covering the November 98 incident was submitted in March 99 and the report covering the Feb 99 incident was submitted in September 99 in accordance with the previously agreed submission schedule. In view of Kwai Tsing Provisional DB's concern on the dioxin issue, EPD will increase the reporting frequency to once every three months starting from the quarter of July to September 1999.

5. EPD has initiated an assessment study on dioxin emissions in Hong Kong, with the view to identifying any potential health impact of known sources or from other planned facilities.