NOTICE OF APPLICATION AND PROPOSED ACTION
by the
U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
REGION IX
75 HAWTHORNE STREET
SAN FRANCISCO, CALIFORNIA 94105
(415) 972-3476

Application for a Research Permit
to Transport and Dump Liquid Carbon Dioxide (CO_2)
into Ocean Waters

Public Notice Number OD 02-01

Pursuant to Section 102 of the Marine Protection, Research and Sanctuaries Act of 1972 (MPRSA), as amended (U.S.C. §1401 et seq.), and EPA's Ocean Dumping Regulations and Criteria (40 CFR Parts 220-228, notice is hereby given of receipt by this office of complete application for a research permit to transport and dump 20 metric tons of liquid CO_2 into ocean waters at the Nawiliwili ocean dredged material disposal site, approximately 4 nautical miles off the coast of Kauai, from:

Pacific International Center for High Technology Research
(PICHTR)
1020 Auahi Street, Building 5, Bay 14
Honolulu, Hawaii 96814

on behalf of the following organizations

Power & Environmental Systems Division
National Energy Technology Laboratory
Department of Energy
MS 922-262, P.O. Box 10940
Pittsburgh, PA 15236-0940

ABB Corporate Research Ltd.
Segelhof
CH-5405 Baden
Switzerland

Division of Marine Research
CSIRO Marine Research
GPO Box 1538
Hobart, TAS 7001
Australia

CRIEPI
Abiko Research Laboratory
1646 Abiko, Abiko-shi
Chiba 270-1194, Japan

Global Environmental Technology Dept.
NEDO
Sunshine 60-30F
1-1, 3-Chome Higashi-Ikebukuro
Tokyo, 170-6028
Japan

The Research Council of Norway
P.O. Box 2700
St. Hansbaugen, 0131
Oslo
Norway

Office of Energy Research & Development
Natural Resources Canada
580 Booth Street
Ottawa, Ontario K1A 0E4
Canada

The following information is provided in accordance with 40 CFR § 222.3 Notice of applications.

1. SUMMARY OF INFORMATION INCLUDED IN THE PERMIT APPLICATION

A consortium of international organizations (U.S., Japan, Norway, Switzerland, Canada, and Australia) is proposing to participate in a small-scale field experiment to evaluate the dispersion and diffusion of liquid carbon dioxide droplets in ocean waters relative to results predicted by computer modeling. The proposed research project is described in the Environmental Assessment (EA) "Ocean Sequestration of CO_2 *Field Experiment*", December 2001, hereafter referred to as the "field experiment"). If approved, it would be conducted in a series of test releases over an approximate two-week period during ideal oceanographic conditions, not to exceed an overall discharge volume limit imposed by the permit. The 18-month period of this permit should provide sufficient time to procure research vessel time in advance of conducting the field experiment.

The Pacific International Center for High Technology Research (PICHTR), a non-profit R&D organization based in Honolulu, Hawaii, was selected by consensus and funded by the research organizations to serve as the general contractor for the field experiment. PICHTR is responsible for organizing experimental infrastructure, securing permits and authorizations, and providing technical and support services over the duration of the project.

The proposed field experiment would provide information on (1) physical and chemical changes induced in seawater following discharge of liquid CO_2 and (2) relationships between release parameters (e.g., flow rate, injection velocity) and the physical

dynamics of CO_2 droplets. In addition, sampling of biota and naturally occurring bacteria populations in the vicinity of the discharge nozzle would be conducted to provide insight into potential biological responses resulting from the short-term exposure to CO_2.

The proposed field experiment involves the intermittent release of liquid carbon dioxide at a depth of approximately 2,950 feet (900 meters), which is within the depth range used in the computer models. The proposed site is the EPA Region IX-designated Nawiliwili ocean dredged material disposal site located off Nawiliwili Harbor, Kauai. (Figure 1-1) The total amount of CO_2 released under this permit would not exceed 20 metric tons (approximately 5,000 gallons). At least two research vessels would be involved in this field experiment - one for handling the CO_2 discharge equipment and another for conducting the field monitoring tasks during each test release. (Figure 3-1) The carbon dioxide would be supplied at flow rates of between 1.6 and 9.5 gallons per minute (0.1 to 0.6 kg/sec) through flexible tubing from a surface vessel to a nozzle attached to a retrievable platform resting on the ocean floor within the Nawiliwili ocean disposal site.

The released carbon dioxide droplets and changes in seawater chemistry would be monitored using a combination of remotely operated vehicles controlled from surface vessels, a submersible, and bottom arrays of measurement equipment. (Figure 3-4) Dispersion of the CO_2 into liquid droplets would be achieved using a specially designed discharge nozzle attached to the platform. The experiment would provide information to validate computer modeling predictions of the fate of liquid CO_2 plumes after discharge. The Nawiliwili ocean dredged material disposal site is an ideal site for this proposed field experiment because it possesses the appropriate weather, wave, and general oceanographic conditions to conduct the research continuously more than 4 nautical miles offshore over an approximate 14-day period.

The limited discharge of liquid CO_2 is expected to result in transient plumes with temporary localized impacts in the vicinity of the discharge. (Figure 4-6) Under typical current speeds for this area at the proposed depths, these plumes are expected to be very limited in extent (approximately 2%) relative to the overall area of the Nawiliwili ocean disposal site. Because the plumes are expected to be very limited in extent within the disposal site, there would be no significant adverse impacts to the local marine environment outside of the boundaries of the Nawiliwili ocean disposal site.

High concentrations of CO_2, contained in the plume in the immediate vicinity of the discharge nozzle are expected to increase the acidity of seawater initially. There may be

significant adverse impacts to organisms which cannot escape the plume in the immediate area of the discharge nozzle.(Figure 4-10) The acidity of the seawater is expected to return to normal (ambient) conditions rapidly with increasing distance from the discharge nozzle. According to computer modeling results, the plumes in the vicinity of the discharge nozzle are expected to completely dissipate within 3 hours or less after test release is stopped, depending on the speed of the current.

2. TENTATIVE DETERMINATIONS MADE PURSUANT TO 40 CFR § 222.2(b)

EPA Region IX has made the tentative determination to issue a Research Ocean Dumping Permit to PICHTR to transport and dispose of no more than 20 metric tons (approximately 5,000 gallons) of food grade carbon dioxide. The primary objective of this research experiment is to collect data to determine the accuracy of computer modeling results generated in laboratory studies regarding the dynamics of liquid CO_2 following release in seawater. Release would be expected to occur in a series of test releases over a period of no longer than two weeks. The proposed dump site for the field experiment trials would be upcurrent portion of the Nawiliwili ocean dredged material disposal site, located approximately 4 nautical miles off the coast of Kauai.

Proposed Time Limitations

The transportation and disposal of liquid CO_2 will take place over a period not to exceed 14 continuous days. If additional time is required to complete the field experiment as a result of adverse weather and sea state conditions, the applicant shall contact EPA Region IX no later than 48 hours in advance of the request. The proposed permit would expire 18 months after issuance. This 18 month period would allow for time to make arrangements for research vessels and other logistics in advance of the preferred oceanographic season during which the proposed field experiment would be conducted.

Proposed Rate of Discharge from the Vessel Transporting the Carbon Dioxide

The field experiment will be comprised of a series of 2-hour test releases (or discharge) of liquid CO_2. Two different flow rates will be used - 1.6 and 9.5 gallons per minute - during the series of test releases. No more than 20 metric tons (approximately 5,000 gallons) shall be released under this research permit.

Proposed Dumping Site

The center coordinates of the Nawiliwili ocean dredged material disposal site are 21° 55' North Latitude, 159° 17' West Longitude.

Brief Description of any Other Proposed Conditions

The permittees will be required to conduct an EPA Region IX-approved monitoring program to document that potential environmental impacts in the ocean will not be unreasonable and will be localized within the project site. The permittees will be required to perform a pre-disposal survey to assess baseline conditions, including but not limited to video and appropriate benthic community sampling. During the field experiment, sampling of biota and a study of naturally occurring bacteria populations in the immediate vicinity of the discharge nozzle would be conducted to assess the potential impacts of exposure to this discharged material. If adverse impacts are determined to be occurring close to or outside of the boundaries of the disposal site, management options shall be implemented, including but not limited to: adjustment of maximum rate or volume of discharge for the test release, or termination of the field experiment. Finally, the permittee will be required to perform a post-disposal survey to assess any changes relative to baseline conditions.

3. BRIEF DESCRIPTION OF THE PROCEDURES FOR REQUESTING A PUBLIC HEARING ON THE APPLICATION

Within 30 days of the date of this notice, any person may request a public hearing to consider the issuance or denial of, or the conditions to be imposed upon this permit. Any such request for a public hearing must 1) be in writing; 2) identify the person requesting the hearing; and 3) state any objections to the issuance or denial of, or to the conditions to be imposed upon, the proposed permit, and the issues which are proposed to be considered at the hearing. Such requests should be sent to:

U.S. Environmental Protection Agency
Region IX
Attn: Allan Ota (WTR-8)
75 Hawthorne Street
San Francisco, California 94105
Telephone (415) 972-3476

In accordance with 40 CFR 222.4, the Regional Administrator's determination on whether or not to hold a public hearing shall be based on whether the request presents genuine issues of policy or facts amenable to resolution by public hearing.

4. BRIEF STATEMENT OF THE FACTORS CONSIDERED IN REACHING THE TENTATIVE DETERMINATION TO ISSUE THE PERMIT AND REASONS FOR THE CHOICE OF THE PARTICULAR PERMIT CONDITIONS SELECTED

The scale of this proposed research experiment is expected to have minimal adverse impact on human health and/or the environment. The primary objective of this proposed activity is

to collect field data to validate the results of computer modeling. The transient plumes that would be generated during the series of test releases are expected to be very limited in extent (approximately 2%) relative to the overall area of the Nawiliwili ocean dredged material disposal site. Existing information from published scientific papers regarding exposure and mortality of the most sensitive indicators (fish larvae, clam larvae, and oyster larvae) to seawater acidity and computer modeling of the liquid CO_2 plumes expected during this experiment suggests that the impacts would be minimal. (Figure 4-12) The primary environmental impact of the proposed discharge would be short-term increases in the acidity (decreases in pH) of the seawater in the vicinity of the discharge nozzle. Computer modeling indicates that the ambient conditions would be restored as the plumes dissipate after the test release is complete. Furthermore, the 20 metric tons of liquid CO_2 proposed to be released during this research experiment is 15 to 200 times smaller than the documented volume released over a 2-week period in 1997 out of the Lo'ihi Vents located off Hawaii (Big Island). EPA-approved monitoring will be implemented to assess environmental conditions before, during, and after the field experiment. If significant adverse impacts are detected during the field experiment, management options shall be implemented as appropriate, including the termination of the experiment. Hence, EPA Region IX believes that the benefit of assessing any impacts of the discharge of food-grade liquid CO_2 outweighs any temporary transient localized adverse impacts during this research experiment. Furthermore, EPA Region IX shall not issue the research permit until the proposed activities associated with this research project has been determined to comply with the Coastal Zone Management Act, Endangered Species Act, and Essential Fish Habitat (Magnuson Act) requirements.

5. PUBLIC COMMENTS AND LOCATION AT WHICH INTERESTED PERSONS MAY OBTAIN FURTHER INFORMATION

The Administrative Record, which includes the application and other relevant documents, is available for public review Monday through Friday from 9:00 am to 4:00 pm at the EPA address shown above at the EPA Pacific Islands Contact Office (300 Ala Moana Boulevard, Room 5-152, Honolulu, Hawaii 96850; telephone: 808-541-2710) and the Lihue Public Library (4344 Hardy Street, Lihue, Hawaii 96766; telephone: 808-241-3222). Persons wishing to comment upon or object to the tentative determination may do so by submitting such written comments within 30 days of the date of this Notice to:

U.S. Environmental Protection Agency
Region IX
Attn: Allan Ota (WTR-8)
75 Hawthorne Street
San Francisco, California 94105

Telephone (415) 972-3476

All comments or objections received within 30 days of the date of this Notice will be considered in the formulation of final determinations regarding the application. Further information may be obtained by writing or calling the EPA Regional Office or PICO.

Date: March 14, 2002