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MCAS EL TORO
SSIC # 5090.3

**Bechtel**

401 West A Street
Suite 1000
San Diego, CA 92101-7905

CLEAN II Program
Bechtel Job No. 22214
Contract N68711-92-D-4670
File Code: 0217.3

**IN REPLY/REFERENCE: CTO-0080/** 0077

September 20, 1995

Joseph Joyce BRAC Environmental Coordinator
Department of the Navy - Southwest Division
Naval Facilities Engineering Command
Environmental Division
1220 Pacific Highway, RM 18
San Diego, CA 92132-5181

Subject: Submittal of of Technical Notes Related to Detector Selection for Field Gas Chromatography Work at MCAS El Toro, CTO-0080.

Dear Mr. Joyce:

I am providing this submittal of Technical Notes Related to Detector Selection for Field Gas Chromatography Work at MCAS El Toro. The notes are brief and were developed to clarify the value of the headspace analyses to be conducted at MCAS El Toro using a field gas chromatograph with an electron capture detector.

If I can be of any further assistance please call me in Bechtel's San Diego office at (619) 687-8780.

Sincerely,

Dante J. Tedaldi, Ph.D., P.E.
Technical Quality Assurance MCAS El Toro

Attachment: Technical Notes on Field Gas Chromatography Work at MCAS El Toro.

cc: Larry Vitale, Remedial Project Manager
Juan Jimenez, RPM Base Closure Branch
Bonnie Arthur, RPM

# TECHNICAL NOTES RELATED TO DETECTOR SELECTION FOR FIELD GAS CHROMATOGRAPHY WORK AT MCAS EL TORO

## Background

This brief technical note was prepared to provide additional information related to field screening using headspace analysis and gas chromatography employing an electron capture detector (ECD).

At MCAS El Toro the CLEAN II team is using a Hewlett-Packard 5890 Gas Chromatograph with a Hewlett-Packard Networking Integrator and a single capillary column. The instrument is calibrated using standard solution samples. U.S. EPA Method 3810 is used for the indirect determination of halogenated volatile organic compounds (HVOCs) within soil. Briefly, the method consists of creating a slurry of organic-free water (about 20 mL) and a soil sample about (5 grams) in a 40-mL volatile organic analyte (VOA) vial. The contents of the vials are allowed to equilibrate for at least 30 minutes in a constant temperature bath after which a sample of the vapor from the headspace is analyzed directly by the GC.

The gas phase results can be used directly as an approximate indicator of HVOC content in soil or the results may be normalized based on the weight of the soil sample and Henry's Law would then be used to estimate the original soil concentration in units of µg/kg (wet weight basis). The soil concentration calculation is based on an assumption of 100 percent reversible desorption from soil. Because complete desorption under the extraction conditions used is unlikely, the estimated soil HVOC concentration would probably be *less* than the true soil concentration. This effect is of little significance because the test results are intended for screening and do not represent true quantitative values. Moreover, offsite fixed-based laboratory analytical extraction and recovery techniques are often no more effective than those which can be achieved in the field with Method 3810. For example, the acceptable range for accuracy (percent recovery for VOCs by GC/MS U.S. EPA Method 8240B is between 60 and 140 percent.

## Discussion

While there are a variety of detectors that are available for use in environmental analysis the three types most commonly associated with work at MCAS El Toro are the flame ionization detector (FID), the photoionization detector (PID) and the electron capture detector (ECD). At MCAS El Toro the Phase II Work Plan calls for the use of FID and PID instruments for handheld direct vapor phase screening. The ECD will be used in the onsite stationary laboratory. The ECD is a very specialized detector. Some classes of compounds, notably halogenated compounds, it detects well, but most other compounds it does not detect at all. The sensitivity for hydrocarbons and oxygen-containing compounds is never good. It is this selectivity which is the reason for its use at MCAS El Toro and it is employed to simplify analyses. It is extremely sensitive to halogenated compounds, such as tricholoethylene, however, its response is not very linear and it is not easy to use since a great deal of attention must be given to laboratory and equipment cleanliness and the purity of the gases and solvents. Its poor linearity means that a very careful calibration must be carried out for each analysis and the results must be read from a calibration curve which is indeed a curve. The computerized data integrator automates this process; however, the results are only as good as the initial calibration curve and a five point curve is recommended. Water and oxygen impurities in the carrier gas can cause the ECD to respond and thus cause a noisy baseline.

## Conclusions

For the determination of chlorinated solvents commonly reported at MCAS El Toro the ECD represents a significant advantage over less selective detectors. Although the ECD ease of use is debatable, the selectivity of the detector more than compensates. When combined with Method 3810, the ECD provide the MCAS El Toro project with a powerful tool for screening soil and water samples for the presence of and determination of semi-quantitative concentrations of halogenated organics.

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September 20, 1995

Juan Jimenez, RPM Base Closure Branch
State of California Environmental Protection Agency
Department of Toxic Substances Control
245 West Broadway, Suite 350
Long Beach, CA 90802-4444

Subject: Submittal of of Technical Notes Related to Detector Selection for Field Gas Chromatography Work at MCAS El Toro. CTO-0080.

Dear Mr. Jimenez:

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Larry Vitale, Remedial Project Manager
California Regional Water Quality Control Board - Santa Ana Region
2010 Iowa Avenue, Suite 100
Riverside, CA 92507-2409

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Bonnie Arthur, RPM
U. S. Environmental Protection Agency Region IX
Hazardous Waste Management Division, H-9-2
75 Hawthorne Street
San Francisco, CA 94105-3901

Subject: Submittal of of Technical Notes Related to Detector Selection for Field Gas Chromatography Work at MCAS El Toro, CTO-0080.

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