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NuTECH Enterprises, Inc.

STATUS REPORT
OPTIONS FOR OFF-SITE TREAT
CALORIA OIL CONTAMINATED SOILS

PREPARED FOR:
CUNNINGHAM DAVIS COMPANY

November 10, 1993

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I. EXECUTIVE SUMMARY

This Confidential Report represents the current status for Caloria Oil contaminated soils stockpiled at the Edison Solar One facility in Dagget, California. As a result of a pre-selected vendor's inability to thermally treat the material to acceptable limits, we have been requested by the prime Contractor - Cunningham Davis to prepare a Confidential Paper on backup options with a review of schedule and economic impacts to the original Bid and Proposal (August, 1993).

The technologies we reviewed include:

- Thermal Desorbtion/Oxidation
- Biotreat
- Asphalt Reuse (Hot and Cold)
- Non Hazardous Landfill Cover

For purposes of expedited review we have divided the Report into three sections --- 1) a discussion of the applicability of the technologies; 2) a discussion of the schedule impacts top selection of vendor and technology; and 3) a discussion of the economic impact to the original Bid and Proposal.

This Confidential Report is submitted to Cunningham Davis this November 10, 1993.

Rita M. Lavelle

R.M. Lavelle,
NuTECH Enterprises Inc.

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II. TECHNOLOGY REVIEW

In order to pre-qualify treatment alternatives for permitted off-site handling and re-use of the Caloria Oil contaminated soils, we utilized the data obtained during the demolition phase of the contract. This data indicated the Caloria Oil solids/soils were 3/4 inch minus to fines in concentrations of 2-4% by weight oil:solids.

As shown on Table One below the materials did not have characteristic problems as defined in CAC Title 22 for pH, Flash (>230 degrees Fahrenheit), Heavy Metals, Halogenated components, Sulfides or other Reactives, nor any residual biphenyls from incomplete oxidation or aging. In addition both the oil and the oil contaminated solids passed the CAC defined Aquatic Toxicity test for toxic characteristics.

TABLE ONE

TOXICITY DATA
CALORIA OIL AND ROCK
9/93

LAB TEST	METHOD	DATA RESULTS
Halogenated Volatiles	US EPA 8010	Non-Detect full series to 3 ug/kg (ppb) detection limits.
Aromatic Volatile Organics	US EPA 8020	Oil had 0.75 ppm Benzene; 6.5 ppm Toluene; 4.5 ppm Ethylbenzene; and 33.0 ppm Total Xylenes. Rocks/Oil had ND for Benzene, Toluene, Ethylbenzene and 0.23 ppm Total Xylenes.
Chlorinated Pesticides	US EPA 8080	Non-Detect Full Series to 1-4 ug/kg (ppb) detection limits.
Polychlorinated Biphenyls	US EPA 8080	Non-Detect Full Series to 20 ug/kg (ppb) detection limits.
Metals Full Series	US EPA 6010-TTLC	Non-Detect Full Series 5 and less mg/kg (ppm) detection limits.
pH	US EPA 9045	7-9 average
Cyanide (Total)	US EPA 335.2	Non-Detect to 0.5 mg/kg (ppm) detection limit
Sulfides (Total)	US EPA 9030	Non-Detect to 1.0 mg/kg (ppm) detection limit
Flash	ASTM 10/0	>230 degrees Fahrenheit
Volatile Organics	US EPA 8240	Non-Detect Full Series 3-20 mg/kg (ppm) detection limits.
Aquatic Toxicity	DOHS Bioassay	LC Fathead Minnow >750 mg/L.

Because of the hydrocarbon fingerprint as well as the physical characteristics of the Caloria Oil (viscosity, flash point, vapor and volatilization) we had recommended that the material could only be thermally desorbed in a rotary kiln with fluidized bed or in a single chamber unit with engineered modifications for temperature, % O_2, residence time and turbidity or surface exposures. In addition because of the heavy ended hydrocarbon chain components, we recommended that a US EPA 418.1 test for presence was more indicative than the traditional test for C_4 through C_{14} chain components.

Two separate test burns were completed October 30 and November 2 at the selected vendor --- TPS in Adelanto. TPS has notified Cunningham Davis that it is currently unable to process the materials even with engineered modifications to their equipment.

Thus we have sought treatability demonstrations from two other vendors. One is pre-qualified by Edison, Clean Soils of Bakersfield, California; the second REMAT of Buckeye, Arizona has specially modified thermal equipment that may be able to handle the Caloria Oil contaminated materials. Both vendors have been requested by Cunningham Davis (See Attached Letters) to participate in a treatability demonstration.

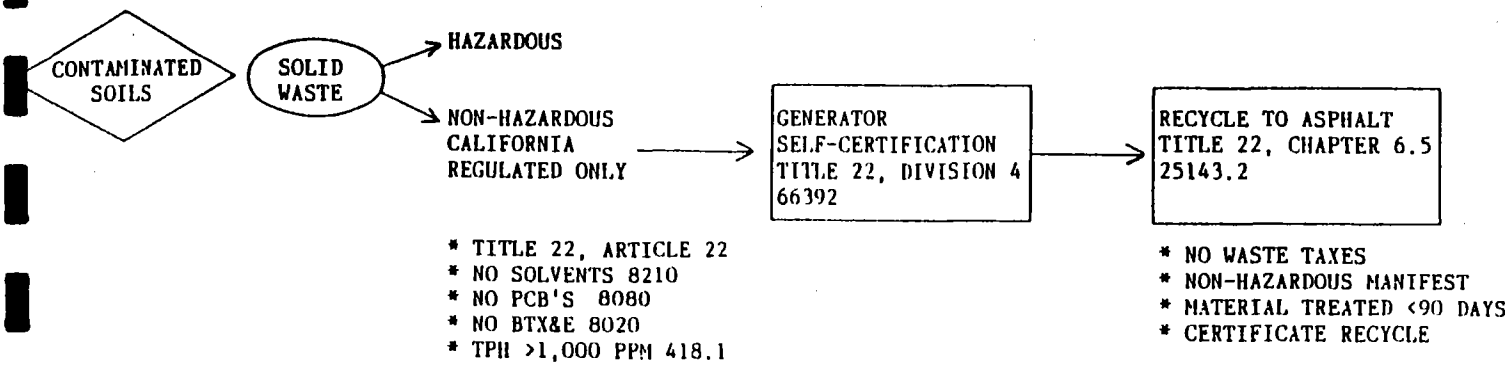
The in depth examination of the properties of the Caloria Oil matrix also lead us to believe that biotreat reduction of the hydrocarbon components to inerts would be possible. Because of the requirement for off-site treatment ONLY, we examined the availability of proximal EPA permitted biotreat recycle-reclaim facilities and located Candelaria Environmental in Anza California (southeast Riverside County - See Attachment B). The facility is fully permitted, and has successfully undergone several site and operations audits by companies as Mobil, Chevron, San Diego Gas and Electric, Texaco and the MTD of San Diego. We approached the facility for acceptance of the material. While they have stated they can accept the material as profiled, they would like to complete a treatability study to document the amount of treatment time and the specific treatment protocols for recycle within their facility cells.

Asphalt recycle reclaim was examined also as an option. Research showed that a test burn in a hot mix plant of identical materials had resulted in "excessive smoking and incomplete blends" for use as a make-up in a hot batch process. In addition , our research showed that chamber temperatures reach 600-700 degrees Fahrenheit as was the case with TPS. We then examined cold emulsion mix treatments.

Cunningham Davis identified two or three possible end users of the asphalt/concrete matrix. In late September we presented findings that use of at least three proprietary cold emulsion cross linkers would result in a Cal TRANS/ DOT designated "commodity."

The technical approach is consistent with California Title 22 provisions (See Table Two) and with Assembly Bill 1306 requirements for solid waste:paving materials. Under this option Edison would be positioned as an approved materials recycler vs. a waste generator. When the resultant materials demonstrate non-leachable hydrocarbons; and compliance with a published Cal TRANS specification, the material is legally titled an "approved commodity" consistent with the definitions in RCRA 40 CFR and Title 22. It is no longer a waste. Edison is an approved "recycler." There is no associated liability according to current regulations.

TABLE TWO
CAC TITLE 22 IMPACTS
ASPHALT/RECYCLE OPTIONS



In order to demonstrate treatment feasibility using this alternative we used separate formulations and cure protocols for three samples and then ran a TCLP extraction on each for extractable hydrocarbons. The samples which are available for Edison examination, were all formulated from approximately 2-2.5% Caloria Oil concentration of oil and solids.

> Sample #1: a light colored material was complexed with a formula that permits a rapid set up time of 24 hours at ambient Solar One temperatures.

Sample #2: a black colored material was complexed with a material that will result in a Greenbook acceptable setup within two weeks at Solar One ambient temperatures. It could thus be stored for 10+ days PRIOR to being rolled and laid.

Sample #3: a green/brown colored material would have to be rolled and load almost immediately as it peaks within 24 hours at temperatures <150 degrees ambient.

The TCLP leach tests for all of these samples within 24 hours was Non-Detect for oil components as measured by US EPA 418.1. Compaction and Greenbook ASTM tests will still be required to be run if requested for the "commodity" verification demonstration necessary to eliminate liability and afford status as an approved "recycler."

To complete our review of possible alternative treatments we approached a rail served Non Hazardous RCRA D Facility in Utah. The facility East Carbon Development Company (See Attachment C) is the proposed end user for several California municipal garbage waste streams and is seeking good cover material which is RCRA Non-Hazardous. Identifying a close spur to the Dagget operation, we approached the company for handling of the Caloria Oil contaminated materials. They profiled the materials in and have offered a letter of acceptance as well as a commitment on rail transport and use at the Utah facility.

III. REGULATORY REVIEW

Our objective in this review process has been to position the generator as "liability free" waste producers. To ensure this objective was reached early on in the project we tested the waste streams for classification as either Hazardous or Non-Hazardous consistent with both California Title 22 definitions and the federal US EPA definitions contained in 40 CFR.

Armed with a certified data supported designation as California Regulated ONLY, RCRA and California NON-Hazardous we reviewed the options for permit compliance and for liability indemnification. Our review is complete and the confidential results are displayed below on Table Three.

TABLE THREE
REGULATORY COMPLIANCE OVERVIEW

Technology	Vendor	Profile or Other Requirement	Permits/ Indemnification
Thermal Oxidation	TPS, CA	<20,000 ppm TPH & Profile NH	Financials Very Good Permitted
	Clean Soils, CA	<20,000 ppm TPH & Profile NH	Financials Weak Permitted
	REMAT, AZ	Profile NH	Financials Weak Permitted
Biotreat (Off-Site)	Candelaria, CA	Profile NH & Biotreat Treatability	Permitted and Certificate of
			Recycle Financials Good
Asphalt	Cunningham-Davis, C	Profile NH & ASTM Tests	Recycle Title 22 Section 25143.2
Non-Hazardous Landfill Cover	ECDC, Utah	Profile NH	Permitted; Financials Excellent

We have concluded that use of Thermal Oxidation with certified "ND" data for 418.1 components to 10 mg/kg would afford the highest protection. The other technologies all afford similar indemnifications if data are filed verifying treatment with the Final Site Closure Report.

IV. ECONOMIC and SCHEDULE IMPACTS

While it is impossible at this time to offer fixed price costs to complete the identified treatment options, several observations and budget prices can be suggested.

First there have been significant impacts to our original Project Budget and Schedule because of the inability of TPS to process the solids. To identify and verify alternative options numerous lab fees have been incurred as well as several hours of company principals and project senior management. These facts will significantly impact the project budget. Cost impact to follow.

An immediate identifiable impact to our schedule at this time (November 10, 1993) is the requirement to stockpile 6,800 cubic yards of the solids rather than stockpile to a surge pile for loading to scheduled trucks. It appears we will now be forced to stockpile the materials on-site on a spill containment pad with weather proofing tarping for regulatory compliance. Schedule Impact ~ 1-2 weeks. Economic impact $15,000 (estimate).

Another significant impact to the original Project Schedule and Budget is the requirement to demobilize the project and remobilize when a decision is reached on the final disposition and handling of the Caloria Oil contaminated materials. Fortunately the estimated impact to a load and transport mobilization is less than that

required for an entire project. Thus we estimate these impacts at three days each for mobilization, and demobilization and $6,000 for costs.

Other impacts to schedule are displayed on the next page as Table Four. Basically, all but the ECDC use as fill cover require 1-2 weeks for treatability studies and economic refinements.

For planning and review purposes we have developed some estimated budgets to complete the alternatives (inclusive of the delineated tasks on Table Four). These cost estimates would include:

* Thermal Desorbtion $15 - $40/ton over original budget
* Biotreat $40 - $65/ton over original budget
* Asphalt: An estimated savings of $50,000 under original budget
* Utah Fill Cover ~$10 - $20/ton over original budget

We appreciate the opportunity to review these impacts with Edison and welcome your questions and suggestions.

TABLE FOUR

MILESTONE SCHEDULE

Solar One

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○ Begin

● Finish