TIER II DIRECT-EXPOSURE RISK ASSESSMENT MODEL

DETIER2 Version: October 1996
State of Hawai'i
Department of Health
Environmental Management Division

Assumes residential exposure by ingestion, inhalation, & dermal contact.
Assumes impacted soil is or could potentially be exposed at the surface.
Does not address potential groundwater impact or indoor air concerns.

STEPS. 1. Check with DOH to ensure that this is an up-to-date version of the spreadsheet.
2. Check with DOH to ensure that the default toxicity data provided is up-to-date.
3. *Input site data. Use default values where site-specific data are not available.
4. Input default physio-chemical data. (Copy & paste from end of spreadsheet.)
5. Spreadsheet generates direct-exposure SALs for site (see accompanying document).
6. Complete information at bottom of this page. Submit printout of spreadsheet with appropriate documents.

[*Site-specific input data must be supported in text of site investigation report(s). For soil with mixtures of contaminants, assume that no more than 10% of the total soil organic carbon (foc) is available for adsorption of any one contaminant. Note that input foc does not affect SAL results when mass-balance model or particulate-emission models are used and input soil thickness does not affect SAL results when the PRG or particulate-emission models are used. See text.]

CONTAMINANT:	1,2-DCP
Carcinogen Soil Action Level (mg/kg):	1.06
Non-carcinogen Soil Action Level (mg/kg):	16.79

VOLATILE CONTAMINANT
MASS-BALANCE
MODEL USED
(refer to note #7)

Site Data	DEFAULT	INPUT
Area impacted soil (m^2)	N/A	2025
Thickness impacted soil (m)	N/A	5.50
Soil density (g/cm^3)	1.50	1.50
Particle density (g/cm^3)	2.65	2.65
Soil moisture content (ml/g)	0.10	0.10
Fraction organic carbon in soil	0.002	0.002
Fraction surface covered/vegetated	0.50	0.50
Windspeed (m/s)	2.5	2.5

Chemical Data (see below)		1,2-DCP
MW		113
Sol	mg/l	2800
Kh	atm m^3/mole	0.0028
Kh	dimensionless	0.1145
Di-air	cm^2/sec	0.078
Koc	ml/g	44
CSFo	1/(mg/kg-d)	6.80E-02
CSFi	1/(mg/kg-d)	6.80E-02
RfDo	mg/kg-d	1.10E-03
RfDi	mg/kg-d	1.10E-03

SITE NAME: Former Emulsion Plant
SITE ADDRESS: 750 Fraser Avenue, Lanai City, Hawaii

DOH ID NO. 9-402424

SPREADSHEET PREPARED BY: D. Hamura
SIGNATURE:

DATE: 12/4/2007

SUPPORTING SITE INVESTIGATION REPORT(S) (Note report title, date, and preparer's name and address):
July 13, 1993, Further Phase II Site Characterization Report, prepared by Brewer Environmental Services
April 16, 2003, Soil Sampling Report, Former Emulsion Plant, prepared by EnviroServices & Training Center, LLC
December 5, 2007, Subsurface Soil Sampling Report, Former Emulsion Plant, prepared by EnviroServices & Training Center, LLC

Human Receptor Data (fixed)			INPUT
25% surface area - adults	SAa	cm^2	5000
25% surface area - children	SAc	cm^2	2000
Adherence factor	AF	mg/cm^2	0.2
Skin absorption factor	ABS	unitless	0.10
Inhalation Rate - adults	IRAa	m^3/d	20
Inhalation Rate - children	IRAc	m^3/d	10
Soil ingestion rate - adults	IRSA	mg/d	100
Soil ingestion rate - children	IRSc	mg/d	200
Exposure time - residents	ETr	h/d	24
Exposure frequency - residents	EFr	d/y	350
Exposure duration - residents total	EDr	yrs	30
Exposure duration - children	EDc	yrs	6
Body weight - adult	BWa	kg	70
Body weight - child	BWc	kg	15
Averaging time (years)	AT	yrs	70
Days/year conversion		d/yr	365
Target Risk (x 10^{-6})	R		1
Target Hazard Quotient	HQ		1

Other variables (fixed)			
Surface diffusion height	DH	m	2
[4]Calculations			
Various:			
Side perpendicular to wind (assumed = area$^{0.5}$)	LS	m	45
Soil porosity	Pt		0.43
Soil air-filled porosity	Pa		0.28
Soil-water partition coeff.	Kd	cm^3/g	8.74E-02
[3]Air dispersion factor - outdoor	ER	m^3/sec	2.25E+02
Ingestion exposure factor	IFS	mg-yr/kg-d	114
Skin contact exposure factor	SFS	mg-yr/kg-d	503
Inhalation exposure factor	InhF	mg^3-yr/kg-d	11
Impacted-Soil Emissions:			
Effective diffusivity - soil to air	Dei_{as}	cm^2/sec	6.28E-03
[6]Volatilization factor - modified PRG	VF_{pep}	m^3/kg	3.80E+03
[7]Volatilization factor - mass balanced	VF_{mbr}	m^3/kg	1.27E+04
[8]Volatilization factor site scenario	VF_{ss}	m^3/kg	1.27E+04
[9]Particulate emission factor	PEF	m^3/kg	1.61E+06
[10]Soil action level (carcinogen) - residential	SAL_{ca}	mg/kg	1.06E+00
[11]Soil action level (non-carcinogen) - residential	SAL_{nca}	mg/kg	1.68E+01
Other:			
Mass impacted soil		g	1.67E+07

NOTES:

1. Use default physio-chemical and toxicity data provided in EPA Region IX PRGs (from IRIS data base), First Half, 1995, or as otherwise directed or approved by DOH.
2. Total areal extent of soil contaminated above Tier 1 soil action levels.
3. For soils contaminated with a mixture of contaminants (e.g., petroleum), assume a default foc of 0.002 or a maximum of 10% of the measured total soil foc. For soils contaminated with a pure product, assume a default foc of 0.02 or the measured total soil foc.
4. Calculations based on modified equations presented in EPA Region IX PRGs (USEPA, 1995,see text).
5. ER (or "dispersion factor") for outdoor air calculated using ER = LS x V x DH. (Refer to California Preliminary Endangerment Assessment Guidance Manual, pg. B-3. ER term incorporated into August 1, 1994, EPA Region IX PRGs "Volatilization Factor" equation 3-9. Also incorporated into ASTM RBCA guidance, Table X2.1. Air exchange rate/area term in 1994 PRGs replaced with default "Q/C" value in 1995 PRG model. See also Note 6.)
6. Volatilization factor calculated using modification of equation 4-9 in EPA Region IX PRGs, First Half, 1995. PRG equation is equivalent to "air dispersion term/(emission rate/soil concentration)" as can be generated using equations presented in Fig. 2-7 (emission rate) and on pg B-3 (includes air exchange rate) in California Preliminary Endangerment Assessment Guidance Manual. (See also notes 4 & 5.)
7. Mass-balanced volatilization factor. Takes into account the thickness of soil impacted with volatile contaminants. (Not applicable for semi-volatile and non-volatile contaminants.) Calculated by dividing the total contaminant mass by the total exposure duration. Reflects the maximum, average emission rate required for the source to be completely exhausted at the end of in the input exposure duration. (i.e., Worst-case scenario. All of the contaminant is emitted from the soil during the exposure period.)
8. Volatilization factor used for site model (see text).
9. Particulate emission factor calculated using equation 4-11 from EPA Region IX PRGs, First Half, 1995, but substituting air exchange rate/area (ER/A) for the term Q/C. (Refer to notes 5 & 6.) ASTM default particulate emission rate is 6.9E-13kg/m^2-s.
10. Calculated using equation 4-1 from EPA Region IX PRGs, First Half, 1995.
11. Calculated using equation 4-2 from EPA Region IX PRGs, First Half, 1995.

REFERENCES:

ASTM. 1994. *Emergency Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites*. Designation ES 38-94. Philadelphia, Pennsylvania.

California EPA. 1994. *Preliminary Endangerment Assessment Guidance Manual*. Department of Toxic Substances Control, Sacramento, California.

HIDOH. 1995. *Risk-Based Corrective Action And Decision Making At Sites With Contaminated Soil And Groundwater*: Hawai'i Department of Health, Environmental Management Division.

U.S. EPA. 1994. *Region IX Preliminary Remediation Goals (PRGs) Second Half, 1994*. Technical Support Section, San Francisco, California.

U.S. EPA. 1995. *Region IX Preliminary Remediation Goals (PRGs) First Half, 1995*. Technical Support Section, San Francisco, California.

TIER II SIMPLIFIED MODEL FOR GROUNDWATER-PROTECTION SOIL ACTION LEVELS

QUIKSOIL Version: October 1996
State of Hawai'i
Department of Health
Environmental Management Division

Calculates Tier 2 soil action level (SAL) for protection against adverse leachate impact on groundwater.

Does not incorporate vadose-zone fate and transport of leachate. (SESOIL computer application should be used for highly volatile or biodegradable contaminants or for sites where the base of the impacted soils is more than 10 meters from groundwater. See text.)

Does not address dilution of leachate on mixing with groundwater. SALs generated using this spreadsheet should be multiplied by the site dilution attenuation factor to calculate the final Tier 2 groundwater-protection SAL for the site (refer to DAF spreadsheet).

STEPS. 1. Check with DOH to ensure that this is an up-to-date version of the spreadsheet.
2. *Input site data. Use default values where site-specific data are not available.
3. Input default physio-chemical data. (Copy & paste from end of spreadsheet.)
4. Spreadsheet generates leachate-impact SAL for site (see accompanying document).
5. Complete information at bottom of this page. Submit printout of spreadsheet with appropriate documents.

*Site-specific input data must be supported in text of site investigation report(s).

CONTAMINANT:	1,2-DCP
[1]Groundwater Protection SAL: (mg/kg):	0.020

Site Data	DEFAULT	INPUT
[2]Target Leachate Conc. mg/l	N/A	0.12
Soil density (g/cm3)	1.50	1.50
Particle dns. (g/cm3)	2.65	2.65
Fraction air-filled porosity	0.65	0.65
[3]Fraction organic carbon in soil	0.001	0.001

Chemical Data (see below)		1,2-DCP
Kh	atm m^3/mole	0.0028
Kh	dimensionless	0.1145
Koc	ml/g	44

SITE NAME: DOH ID NO. _____
SITE ADDRESS:

SPREADSHEET PREPARED BY: _____ DATE: _____
SIGNATURE: _____

SUPPORTING SITE INVESTIGATION REPORT(S) (Note report title, date, and preparer's name and address):

Calculations:	
Soil porosity - total	0.43
Soil porosity - air-filled	0.28
Soil porosity - water-filled	0.15

Notes:
1. Equation modified after ASTM. 1994. *Emergency Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites*. Designation ES 38-94. Philadelphia, Pennsylvania. (Table X2.1. Dilution factor omitted.)
2. Target concentration of contaminant in leachate at the point the leachate passes into groundwater. Target leachate concentration should equal contaminant MCL or surface water standard, as determined by the location of the site (refer to *Determination of Groundwater Utility at Leaking Underground Storage Tank Sites (September 19, 1995)*: Hawai'i Department of Health, Environmental Management Division).
3. For soils with mixtures of contaminants, assume that no more than 10% of the total organic carbon (foc) is available for adsorption of any one contaminant.

Reference:

HIDOH. 1995. *Risk-Based Corrective Action And Decision Making At Sites With Contaminated Soil And Groundwater*: Hawai'i Department of Health, Environmental Management Division.

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HAWAII 96801-3378

CHIYOME L. FUKINO, M.D.
DIRECTOR OF HEALTH

MAY 11 2007

In reply, please refer to:
EMD/SHWB

May 11, 2007

U0526DP

Mr. Richard K. Mirikitani
Vice President & Corporate Counsel
Castle & Cooke Resorts, LLC
100 Kahelu Avenue
Mililani, Hawaii 96879

Dear Mr. Mirikitani:

SUBJECT: Dole Lanai Plantation, Former Emulsion Plant
Facility ID No. 9-402424 / Release ID No. 900128

The Department of Health (DOH) has reviewed the document, *Response and Clarification Letter*, dated March 19, 2007, and prepared by EnviroServices & Training Center, LLC. Please note the letter has been placed with the public record.

Please note that the groundwater at the subject site is irreplaceable and a currently used drinking water source. Gross contaminated soil containing 1,2-dichloropropane (1,2-DCP) remains in place at the subject facility. A soil sample collected from the bottom of Test Pit 6 (15 feet) contained 230 mg/kg of 1,2-DCP, exceeding the 2006 DOH Groundwater Protection Action Level of 0.12 mg/kg by 2,000 times.

Vertical delineation of soil contaminated by 1,2-DCP to concentrations lower than the DOH Tier 1 action level has not been performed. DOH requires two soil borings within the former location of Test Pit 6. Borings should attain a minimum depth of 60 to 80 feet below ground surface where the basalt layer was encountered during previous subsurface investigations. Soil samples should be taken from the borings at consistent intervals of 5 feet and analyzed for 1,2-DCP.

An Exposure Prevention Management Plan (EPMP) is not a valid cleanup option for confirmed UST release sites, but can be used in conjunction with other remedial options. In addition, an EPMP is not valid unless complete vertical and horizontal delineation of soil and groundwater contamination has been achieved.

As already requested in the DOH letter dated September 7, 2006, DOH requests that Castle & Cooke Resorts prepare and submit a site-specific Tier 2 risk-based

assessment for the non-basalt vadose zone to be completed following the requested soil boring and analyses of soil samples. DOH's *Technical Guidance Manual* and the companion Risk-Based Corrective Action document contain guidance for preparing a site-specific Tier 2 or Tier 3 risk-based assessment. Both documents are available for download from our website at http://www.hawaii.gov/health/environmental/waste/ust/index.html.

If you have any questions regarding this letter, please contact Dr. Darren Park of our Underground Storage Tank Section at (808) 586-4375 or e-mail at darren.park@doh.hawaii.gov.

Sincerely,

STEVEN Y.K. CHANG, P.E., CHIEF
Solid and Hazardous Waste Branch

MAR 2 1 2007
3/23/07

EnviroServices & Training Center, LLC

2850 Pas Street, Suite 150 • Honolulu, Hawaii 96819 • Tel: (808) 839-7222 • Fax: (808) 839-4455 • E-mail: info@gotoetc.com

March 19, 2007

DP

Hawaii Department of Health
Solid and Hazardous Waste Branch, UST Section
919 Ala Moana Boulevard, Suite 212
Honolulu, Hawaii 96814

Attention: Dr. Darren Park

Reference: Response and Clarification Letter
Dole Lanai Plantation
Former Emulsion Plant
DOH Facility ID 9-402424 / Release ID 900128

EnviroServices & Training Center, LLC (ETC) has prepared this letter on behalf of our Client, Castle & Cooke Resorts, LLC (CCR) in response to the September 7, 2006 letter from Mr. Steven Y.K. Chang of the Hawaii Department of Health (DOH) Solid and Hazardous Waste Branch (SHWB) to Richard K. Mirikitani, Esq. of CCR. ETC has reviewed the DOH letter. Basically, the DOH is requesting that two (2) issues be addressed 1) An Exposure Pathway Assessment Report be prepared for the release; and 2) A site-specific Tier 2 risk-based assessment be prepared for the elevated concentration of 1,2-dichloropropane (DCP) in a soil sample collected at a depth of 15 feet from Test Pit 6 (documented in ETC's April 16, 2003 *Soil Sampling Report – Former Emulsion Plant*).

ETC respectfully requests that the DOH SHWB reconsider its' position based in part on the additional information provided herein; particularly, the site's future use as an employee parking area for nearby warehouses and offices; as well as the fact that 1) the data indicates elevated DCP concentrations are constrained to a limited quantity of soil, 2) the site is underlain by hard basalt, and 3) the depth to groundwater at the site is estimated to be at least 600 feet below ground surface. On behalf of our client, CCR, ETC is requesting that a finding of "no further action" be made for the site at this time.

Exposure Pathway Assessment Report

An Exposure Pathway Assessment Report (EPAR) as described in Appendix 5-I of the DOH's *Technical Guidance Manual (TGM), 2nd Edition* should include:

1) preparing an executive summary and an introduction/purpose to establish the site background (Section 2.0);
2) providing a description of the contaminants released (Sections 2.4, 2.5, 3.1 and Appendix I);
3) providing a description of the exposure setting (Sections 2.2, 3.2, and Appendix I);
4) identifying exposure pathways (Section 3.2 and Appendix I);
5) identifying uncertainties and major assumptions (Appendix I);
6) providing a summary (Section 3.2 and Appendix I); and
7) preparing worksheets for the EPAR (Appendix I).

ETC believes that the essential elements of the EPAR have been presented in the June 2005 Exposure Prevention Management Plan (EPMP) previously provided to the DOH. The information is located in the corresponding sections of the EPMP that are described in parentheses after each item listed above. Since ETC believed that an EPAR would not satisfy the DOH and that an EPMP would be inevitable, ETC elected to include the elements of the EPAR within the EPMP based on efficiency and value to our Client.

Site-Specific Tier 2 Risk-Based Assessment

Available data for the site gathered from past investigation reports and physical features at the site are presented below.

1) Analytical data documented in the April 16, 2003 *Soil Sampling Report – Former Emulsion Plant* prepared by ETC indicate that in Test Pit 6, a soil sample collected at 12 feet below ground surface (bgs) had DCP concentrations of 0.054 mg/kg and that a soil sample collected at 15 feet bgs from the adjacent Test Pit 5 had DCP concentrations of 0.007 mg/kg.
2) Boring logs from the July 13, 1993 *Further Phase II Site Characterization Report* prepared by Brewer Environmental Services (BES) indicate that basalt layers were encountered in three of the borings nearest to and surrounding the area where the sample with elevated DCP concentrations was encountered. Boring logs for B-9 and B-10 indicate a silty clay-clayey silt grading to weathered basalt lithology, underlain by a basalt layer encountered at 60 to 75 feet below ground surface (bgs). The boring log for B-11 indicates a silty clay-clayey silt grading to weathered basalt lithology, underlain by a basalt layer at approximately 80 feet bgs. Furthermore, all soil samples collected and analyzed for DCP indicated DCP concentrations well below the EPA Region 9 Preliminary Remediation Goal (PRG) for industrial soils (referred to herein as the "industrial PRG") of 0.74 mg/kg.
3) The estimated depth to groundwater is at least 600 feet bgs, and may be in the range of 800 to 900 feet bgs, based on the estimated mean sea level elevation of 1550 feet and the static head elevations of nearby wells documented in the August 26, 1993 *Hawaii Groundwater Index and Summary* prepared by the State of Hawaii Department of Land and Natural Resources, Division of Water Resource Management.

ETC does not believe the site-specific Tier 2 risk-based assessment approach is applicable to this project given the proposed future use of the site as an employee parking area for nearby warehouses and offices. The direct exposure model assumes that a reasonable exposure pathway to the contaminant of concern exists. In this specific case, ETC believes that the direct exposure pathway is broken, since there was only one sample with DCP concentrations exceeding the default industrial PRG and this sample was collected at a depth of 15 feet bgs (Test Pit 6). A sample collected immediately above this sample at a depth of 12 feet bgs (Test Pit 6) indicates DCP concentrations at an order of magnitude below the industrial PRG. All other samples collected in the vicinity indicate DCP concentrations well below the industrial PRG. Therefore, any potential transport of DCP in the vapor phase through the soil pore space would originate from a very limited area. Since there are no structures on site that could collect such vapor (and since there are no plans to build such structures), ETC considered the upward migration of DCP in the vapor phase a broken direct exposure pathway.

The leaching (QUICKSOIL) model does not seem appropriate for this particular site since 1) basalt was encountered at depths of approximately 60 feet in previous investigations; 2) the dilution-attenuation factor (DAF) does not seem to take into account the depth to groundwater; and 3) the model is considered inappropriate for sites where the base of impacted soils are greater than 10 meters to groundwater. Although leaching of DCP to the underlying groundwater formation is a possibility, such occurrence would be improbable based on the basalt layer situated at depths ranging from 60 to 75 feet bgs. Furthermore, even if it were assumed that the DCP could leach to groundwater, the mass of potentially impacted soil is limited and the effects of such leaching would be minimal.

Overall, the general conclusion (based on one elevated sample concentration) is that a "hot spot" exists at a depth of approximately 15 feet bgs. Based on an area between clean sampling points, a conservative estimate of the lateral extent of impacted soil would be an approximate 10-foot by 25-foot area. Similarly, an estimate of the depths impacted would be 15 feet bgs to 60 feet bgs. The resulting volume of soil potentially-impacted with elevated DCP concentrations would be conservatively calculated to be 450 cubic yards.

Since a decision is being rendered on the environmental impacts from the site as a whole, the average DCP concentrations across the site should be considered rather than the highest concentration detected in a single discrete sample. Other data obtained (visual/olfactory, volatile organic compounds in soil vapor headspace, and laboratory data from previous investigations), coupled with site specific conditions, also indicate that potentially-impacted soil is limited to a very small portion of the overall site.

Based on the information presented herein, ETC believes that adherence to the EPMP prepared for the site would serve as a sufficient control assuming the continuation of its current use as an open parking area. Therefore, on behalf of our Client, ETC requests that a finding of "no further action" be made for the site at this time.

If there are any questions regarding the site and/or the information presented in this letter, please contact me at 839-7222.

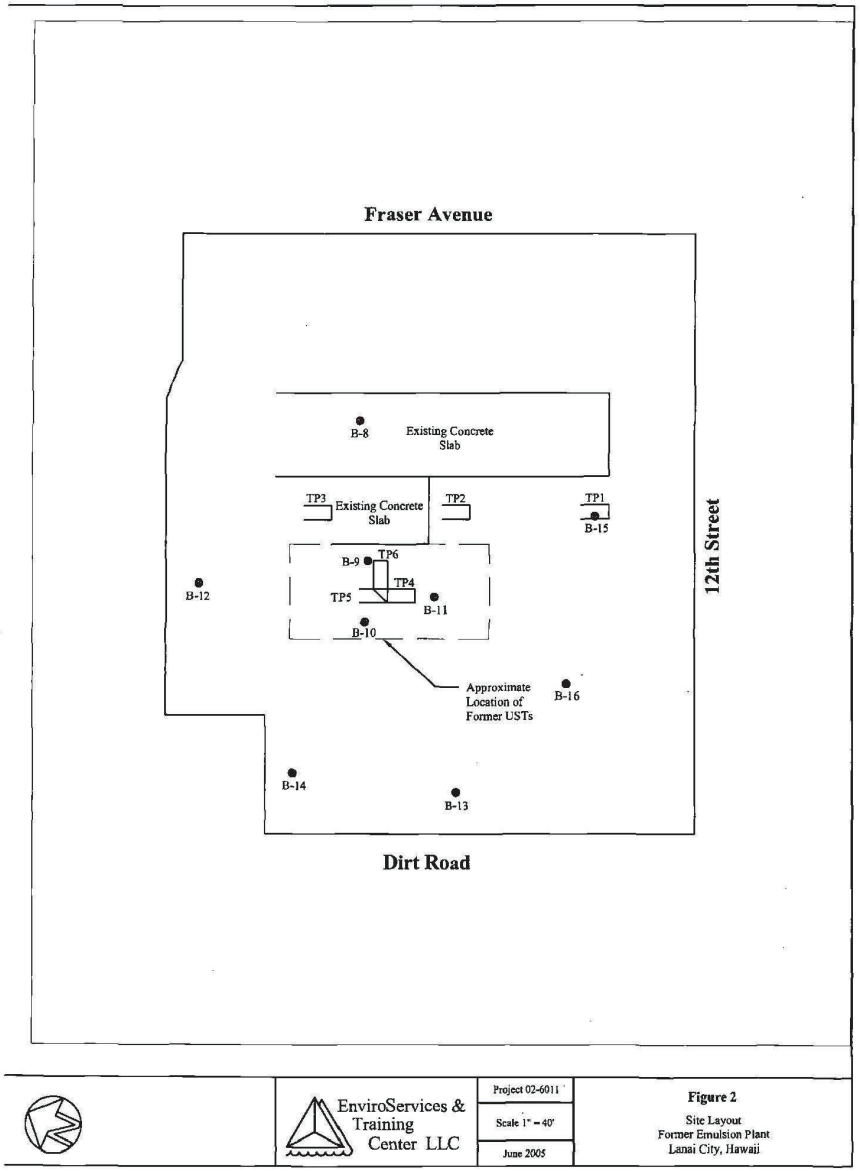
Respectfully,

ENVIROSERVICES & TRAINING CENTER, LLC

Damon Hamura
Principal

Enclosures: Site Layout
Summary of Historic Data

CC: R. Mirikitani, Esq., Castle & Cooke Resorts, LLC



EnviroServices & Training Center LLC

Project 02-6011
Scale 1" = 40'
June 2005

Figure 2
Site Layout
Former Emulsion Plant
Lanai City, Hawaii