

Cleanup Technologies

Remedial technologies must prevent direct human exposure to contaminants (particularly dioxins) in the soils and prevent impacts to natural resources in the surrounding area. There are four primary "technologies" that could address these issues. Remedial alternatives for the project site will likely be developed utilizing the four technologies listed below. Combinations of and variations among the four technologies may also be examined.

Excavation and Offsite Treatment: This technology involves the excavation and removal of contaminated soils. Contaminated soils would be disposed of, or transported to a facility for treatment, if necessary, prior to disposal.

Onsite Treatment: With this technology, soils may be treated in place or after excavation. Thermal desorption methods would be used to drive contaminants from the soil, and treated soils would remain at the Project Site.

Onsite Solidification: This technology involves the installation of on-site equipment to electrically heat contaminated soils to temperatures high enough to

melt the soil media. Contaminants are trapped and immobilized in place in a "glassified" subsurface matrix.

Isolation and Capping: This technology involves the installation of an impermeable liner and clean soil barrier to "cap" contaminated soils. Contaminated soils would remain in place, isolated beneath the protective cap.

Evaluation of remedial alternatives will be performed as part of the cleanup project. Several factors must be considered in evaluating remedial alternatives. These factors include, but are not limited to: long-term effectiveness of the technology to protect human health and the environment; capability of the technology to support the community's desired use of the Project Site; time required for the technology to be implemented and effectuate cleanup; and overall cost to implement technology and complete site cleanup.

The evaluation of remedial alternatives will involve the solicitation of input from the community in consideration of the types of land uses ultimately desired for development on the Project Site. Selection of the preferred remedial alternative will consider community input and the practicality and feasibility of alternatives, as determined through discussions with the regulatory agencies.

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Get Involved!

You will have several opportunities to participate in this cleanup project. DHHL will be providing you with more information on the events listed below. In the interim, please review the information in this Project Fact Sheet and return your completed Project Comment Form. Additional information is available at the Kapolei Public Library and on DHHL's website: <http://hawaii.gov/dhhl> (click on "Library," then "East Kapolei Pesticide Mixing and Loading Site").

January 2010 – Project Plan Overview Meeting: This meeting will convene future residents, neighbors, and community members to introduce the cleanup project within the context of the "East Kapolei II" master-planned community. The overall master plan, the homes, and the brownfield condition associated with the Project Site will be discussed, as well as the proposed process for ongoing community engagement.

February 2010 – Project Status Update: An update on project activities and a comment form will be distributed to all parties on the project mailing list. Soil sampling information, hazard evaluation, and more detail on potential cleanup alternatives will be provided.

April 2010 – Eco-Charrette: This workshop will provide foundational knowledge on residential green building strategies that may be applied at "East Kapolei II". Attendees will be asked to collaboratively identify desired green building features for homes. Participants will also identify desired uses for the remediated brownfield, given an accurate understanding of the 0.634-acre site, viable remedial alternatives, and the range of potential corresponding redevelopment options.

May/June 2010 – Draft Remedial Action Memorandum (RAM): The Draft RAM will present the analysis of alternative cleanup options and identify the recommended cleanup action. The community will be notified of the availability of this document for review and comment. A public information session will also be held to explain the various alternatives and receive comments on the recommended cleanup action.

July 2010 – Final RAM: The Final RAM will incorporate comments on the Draft Ram and present the selected cleanup action. The community will be notified of the availability of this document for review.

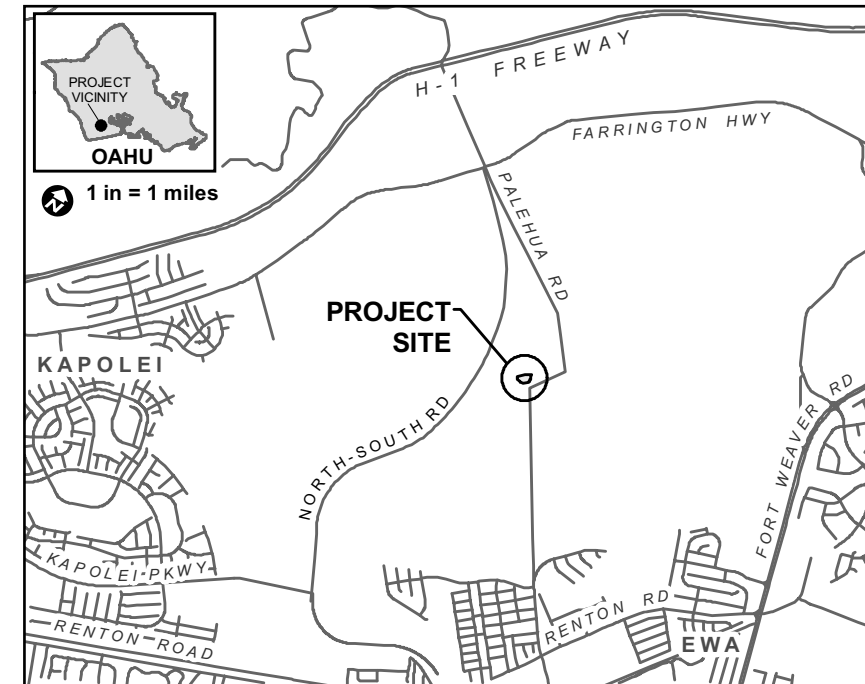
Department of Hawaiian Home Lands "East Kapolei II" Community REMEDICATION OF FORMER PESTICIDE MIXING & LOADING SITE

PROJECT FACT SHEET

November 2, 2009

DHHL plans to remediate pesticide and pesticide-related soil contamination on approximately 0.634-acres of land at the former Oahu Sugar Company pesticide mixing and loading site. Contamination at the Project Site is the result of pesticide storage, mixing, and loading activities conducted during plantation operations.

In the coming months, important decisions must be made regarding the cleanup of the Project Site and its ultimate redevelopment within DHHL's "East Kapolei II" community. As community members, you are invited to take part in the decision-making process.



The Project Site is a *brownfield site*, where redevelopment is complicated by the presence of soil contamination (see page 3 for a discussion of contaminants and health risks). DHHL has secured the majority of the funding required for cleanup of the site through a loan from the Hawaii Brownfields Cleanup Revolving Loan Fund program and a U.S. Environmental Protection Agency Brownfields Cleanup Grant.

The Project Site is located within the future DHHL "East Kapolei II" community (see map on page 2). "East Kapolei II" will provide approximately 1,000 single-family affordable for-sale homes to be constructed by DHHL for native Hawaiian beneficiaries and 1,000 multi-family affordable rental units to be constructed by other agencies for the general public. DHHL's master plan for "East Kapolei II" shows the Project Site as located within a five-acre lot. No residential units will be located on the Project Site itself. Future land uses at the site are contingent upon site cleanup and consultation with the community.

Please review the information presented in this Project Fact Sheet and provide your comments on the enclosed form. DHHL seeks to incorporate efficient land and energy usage practices in this brownfield revitalization project to help maintain Hawaii's natural environment while allowing for beneficial reuse of the site. A schedule of upcoming events and opportunities for you to participate in project planning is provided on page 4.

Your Participation is Critical!

Please complete and return the enclosed pre-addressed project comment form to stay informed of the cleanup process and opportunities for you to participate in decisions affecting your community. See **page 4** for a schedule of upcoming events.

Questions About the Project?

Have a question and don't know who to call? A list of project contacts is provided on **page 4**. Information about the project is also available for viewing on DHHL's website (see link below).

Access Project Information at:

DHHL's website: <http://hawaii.gov/dhhl>
Click on link to "Library," then link to "East Kapolei II Pesticide Mixing and Loading Site"

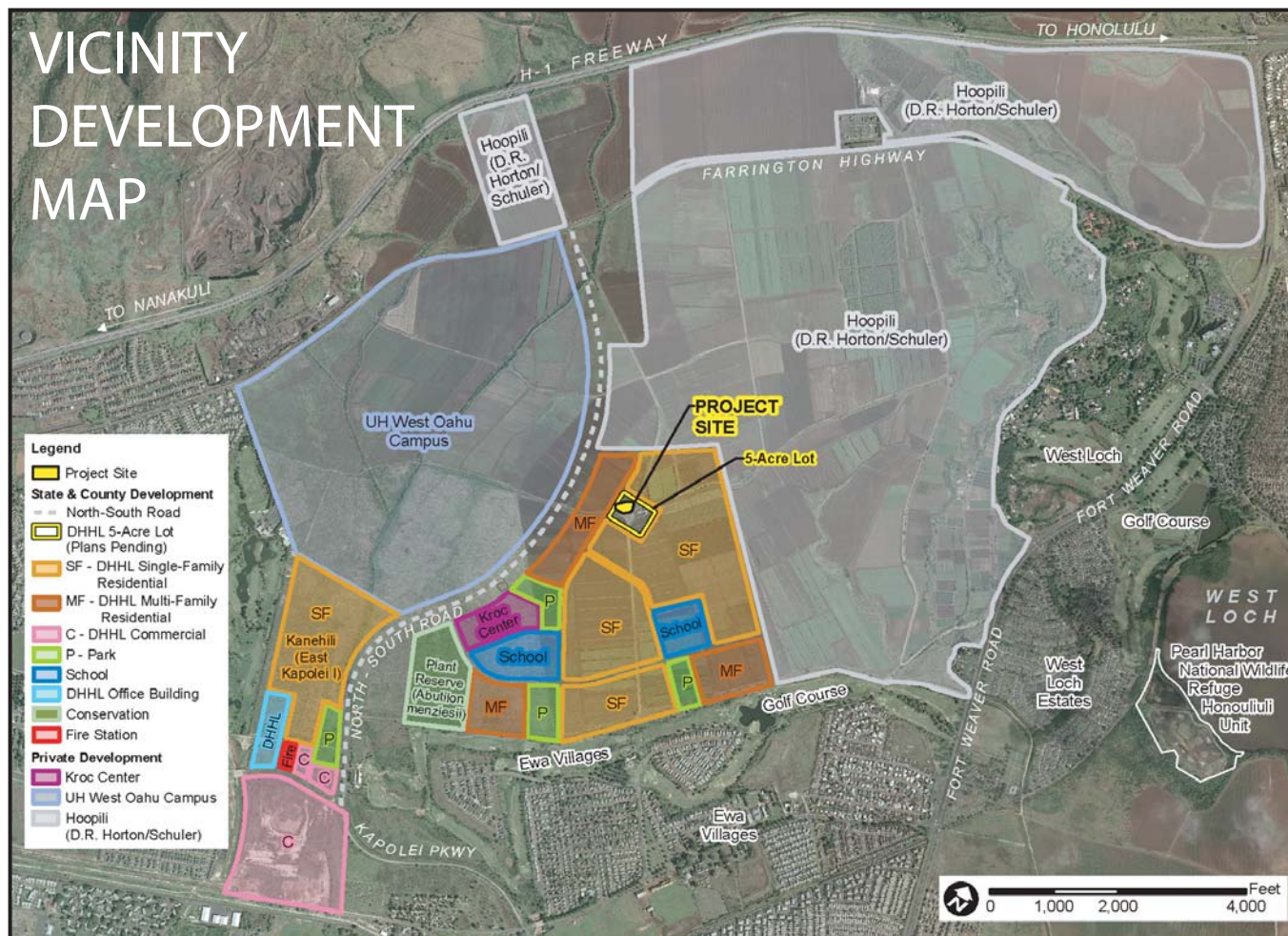
Kapolei Public Library

1020 Manawai Street
Kapolei, HI 96707
Phone: (808) 693-7050
Mon., Thur., Fri., & Sat.: 10 a.m. to 5 p.m.
Tue. & Wed.: 10 a.m. to 8 p.m.; Sun.: Closed

SITE MAP



VICINITY DEVELOPMENT MAP



CONTAMINANTS OF CONCERN

Summary of Potential Health Risks

Environmental investigations performed throughout the Project Site and surrounding areas indicate the presence of various pesticides and pesticide-related chemicals at elevated concentrations in site soils. The primary contaminants of concern (COC) at the Project Site include arsenic, dioxins/furans, pentachlorophenol, and triazine pesticides (ametryn, atrazine, simazine, trifluralin). Below are brief discussions of these COC, including health effects as they pertain to humans.

Arsenic. Arsenic is a naturally occurring element found in the Earth's crust. Inorganic arsenic compounds were widely used in the past to preserve wood. Inorganic arsenic has been determined to be a known human carcinogen. Organic arsenic compounds were used in the past as pesticides, such as sodium arsenate, which had documented use in the Hawaii sugar industry. Arsenic contamination is typically identified as a soil contamination issue. Since it is an element, arsenic contamination is very persistent in the environment; arsenic cannot be destroyed; it can only change in form.

Inhalation of particulate matter entrained with arsenic and ingestion of arsenic are the primary routes of exposure. Health effects of exposure to arsenic include throat and lung irritation, nausea, vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet. Little is known about health effects of organic arsenic compounds in humans.

Dioxins. Chlorinated dibenzo-p-dioxins, or dioxins, are a family of 75 chemically-related compounds collectively referred to as chlorinated dioxins. One of these compounds, 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) is one of the most toxic, and has been determined to be a carcinogen. Dioxins are persistent in the environment, with many of the compounds attaching to soil and sediment. For the Project Site, it is suspected that the dioxins in the site soils are byproducts or manufacturing impurities of certain organic pesticides previously used and stored at the site.

Dioxin is a common contaminant in foods such as meats, dairy products, and fish. Other means of human exposure include inhalation of particulates, consumption of low levels of dioxins in water, skin contact with certain pesticides and herbicides, living near an uncontrolled contaminated site or incinerator releasing dioxins, and/or working in industries producing dioxins. In general, health effects associated with exposure to high doses of dioxins include the development of chloracne (acne-like lesions that occur mainly on the face and upper body) skin rashes, discoloration, and excessive body hair. Changes in blood and urine that may indicate liver damage have also been observed in people exposed to high doses of dioxin compounds.

Pentachlorophenol. Pentachlorophenol is a chlorinated hydrocarbon and probable human carcinogen that was generally manufactured as an insecticide and fungicide, but was also used as a wood preservative, pre-harvest defoliant, pre-emergence herbicide, and biocide. In Hawaii's sugar industry, it was the key ingredient in the formulation known as "Cade," which was widely used at various plantations. Pentachlorophenol enters the environment through evaporation from treated wood surfaces, industrial spills, and disposal at waste sites. It is moderately persistent in soils and breaks down mainly through anaerobic biodegradation. It is relatively mobile and can leach to

groundwater. In the water environment, it primarily binds to sediments and suspended particles in the water.

For the general population, exposure to low levels of pentachlorophenol may be through breathing contaminated indoor and outdoor air, consumption of food and water, and exposure to affected soils. Exposure to high levels of pentachlorophenol may cause a very high fever, profuse sweating, and difficulty breathing. Fever may damage organs and tissue, and may even result in death. Long term exposure to high levels of pentachlorophenol may result in liver effects and immune system damage.

Ametryn: Ametryn is a general use pesticide in the triazine pesticide family of chemicals. It has not been determined whether ametryn is a human carcinogen, however, toxicity to aquatic organisms is a concern. Ametryn is commonly used to control broadleaf weeds and annual grasses. In Hawaii's sugar industry, ametryn is typically applied as a mixture with diuron. Ametryn is moderately persistent in the environment, highly soluble, and highly mobile. Therefore, ametryn impacts to groundwater and surface water are of concern.

Ametryn is considered slightly toxic to humans. Acute exposure to high doses of ametryn can cause nausea, vomiting, diarrhea, muscle weakness, and salivation. It is mildly irritating to the eyes, skin, and respiratory tract.

Atrazine: Atrazine is a restricted use pesticide in the triazine pesticide family. It has not been determined whether atrazine is a human carcinogen. It is commonly used by certified applicators to control broadleaf and grassy weeds. Atrazine is both a soil and groundwater contaminant. It is highly persistent in the environment and is moderately to highly mobile in soil. Leaching of atrazine to groundwater is a concern. People may also be exposed to atrazine via contaminated soils or through industrial exposures. Ingestion of food and drinking water containing low levels of atrazine is the most common route of exposure, although exposure via contaminated soils or through industrial exposures is also possible.

Atrazine is considered slightly to moderately toxic to humans and other animals. Acute symptoms of atrazine poisoning include abdominal pain, diarrhea/vomiting, eye and mucous membrane irritation, and skin reactions.

Simazine: Simazine is a general use pesticide in the triazine pesticide family. It is commonly used to control broadleaf weeds and annual grasses and, prior to 1992, was used to control submerged leaves and algae. Simazine is moderately persistent in the environment. It does not bind well to soil, is poorly soluble, and has limited risk of leaching to groundwater.

Simazine is considered practically non-toxic to humans; there have been no reported cases of simazine poisoning. It is slightly toxic to practically non-toxic to birds and aquatic organisms.

Trifluralin: Trifluralin is a general use pesticide in the dinitroaniline family of chemicals. It is a selective herbicide applied prior to sprouting to control broadleaf weeds and annual grasses. It is considered to be moderately to highly persistent in soil, adsorbs strongly to soil particles, and is nearly insoluble in water. Leaching to groundwater is unlikely, and any trifluralin found in water would likely be bound to soils and solid particles.

Ingestion of high doses of trifluralin can cause nausea and severe gastrointestinal discomfort. Inhalation of high doses can cause mucous membrane irritation. Prolonged or repeated skin contact has resulted in allergic dermatitis. Although human toxicity is only slight, trifluralin is highly toxic to fish and aquatic organisms.