December 21, 2006

Michael Kohn, President
Pa'ina Hawaii, LLC
P.O. Box 30542
Honolulu, Hawaii 96820

SUBJECT: DRAFT ENVIRONMETNAL ASSESSMENT AND INFORMATION RELATED TO UPCOMING PUBLIC MEETING FOR PROPOSED PA'INA HAWAII, LLC IRRADIATOR

Dear Mr. Kohn:

The U.S. Nuclear Regulatory Commission staff has completed its draft environmental assessment for the proposed underwater irradiator in accordance with the terms of a March 20, 2006 settlement agreement with Concerned Citizens of Honolulu, the interveners in the adjudicatory hearing to be held on the license application. Enclosed are the Federal Register notice announcing the staff's preliminary "Finding of No Significant Impact" and the complete draft environmental assessment. In addition, the notice details the staff's plan to hold a public meeting on February 1, 2007, in Honolulu, Hawaii, to accept comments. If you have any questions, please contact Matthew Blevins at (301) 415-7684 or by email at mxb6@nrc.gov.

Sincerely,

/RA/

B. Jennifer Davis, Branch Chief
Environmental Review Branch
Division of Waste Management
and Environmental Protection
Office of Federal and State Materials
and Environmental Management Programs

Docket No.: 030-36974

Enclosures:
1. *Federal Register Notice*
2. Draft Environmental Assessment

Cc: Enclosed list

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DRAFT ENVIRONMENTAL ASSESSMENT
RELATED TO
THE PROPOSED PA'INA HAWAII, LLC UNDERWATER IRRADIATOR IN HONOLULU, HAWAII

PREPARED BY
THE U.S. NUCLEAR REGULATORY COMMISSION
DIVISION OF WASTE MANAGEMENT AND ENVIRONMENTAL PROTECTION
OFFICE OF FEDERAL AND STATE MATERIALS AND
ENVIRONMENTAL MANAGEMENT PROGRAMS

U.S. NUCLEAR REGULATORY COMMISSION
DOCKET NO. 030-36974

DRAFT ENVIRONMENTAL ASSESSMENT RELATED TO THE PROPOSED PA'INA HAWAII, LLC UNDERWATER IRRADIATOR IN HONOLULU, HAWAII

Introduction

The U.S. Nuclear Regulatory Commission (NRC) is in receipt of a license application dated June 23, 2005, from Pa'ina Hawaii, LLC, that would authorize the possession and use of sealed radioactive sources in an underwater irradiator for the production and research irradiation of food, cosmetic, and pharmaceutical products (Pa'ina, 2005a). The proposed irradiator would be located immediately adjacent to Honolulu International Airport on Palekona Street near Lagoon Drive. The irradiator would primarily be used for phytosanitary treatment of fresh fruit and vegetables bound for the mainland from the Hawaiian Islands and similar products being imported to the Hawaiian Islands as well as irradiation of cosmetics and pharmaceutical products. The irradiator would also be used by the applicant to conduct research and development projects, and irradiate a wide range of other materials as specifically approved by the NRC on a case-by-case basis.

The NRC has completed its initial evaluation of the proposed irradiator against the requirements found in the NRC's regulations at Title 10 of the Code of Federal Regulations, Part 36, "Licenses and Radiation Safety Requirements for Irradiators," (i.e., 10 CFR Part 36). Typically, the licensing of irradiators is categorically excluded from detailed environmental review as described in the NRC regulations at 10 CFR 51.22(c)(14)(vii). However, the NRC staff entered into a settlement agreement (NRC, 2006a) with Concerned Citizens of Honolulu, the interveners in the adjudicatory hearing to be held on the license application. The settlement agreement included a provision for the NRC staff to prepare this environmental assessment and hold a public comment meeting in Honolulu, Hawaii prior to making a final decision.

The Proposed Action

Pa'ina Hawaii, LLC has submitted a license application (Pa'ina, 2005a) for the possession and use of cobalt-60 (Co-60) sealed sources in an underwater irradiator. In this type of irradiator the sealed sources remain at the bottom of the irradiator pool at all times (i.e., approximately 12-18 feet below the pool surface) (See Figures A-1 and A-2 in Appendix A). Human access to the sealed sources and the space subject to irradiation is not physically possible without entering the irradiator pool. The product to be irradiated is placed in a water-tight container (i.e., product bell) and lowered into the irradiator pool water.

The proposed Pa'ina irradiator, was designed by Gray*Star, Inc. for use with two different types of radioactive cobalt-60 sealed source assemblies. Both source assemblies are doubly encapsulated. The inner capsule contains nickel coated Co-60 metal discs. The inner capsule is either stainless steel or zircalloy and has two welded

end caps. The inner capsule is then placed in the stainless steel outer capsule which also has two welded end plugs. The Co-60 sealed source assemblies (i.e., sealed sources or sources) are of robust construction and meet the NRC regulations (i.e., 10 CFR 36.21) for leak tests, corrosion, temperature shock, pressure, impact, vibration, puncture, and bending.

The irradiator has several main components including a pool, source holders and rack, plenum, surge tank, and a hoist and transfer system. The irradiator pool is made of two steel tanks, one inside the other. (See Figures A-2 and A-3 in Appendix A) The inner tank, which is in contact with the pool water, is constructed of one-quarter inch thick stainless steel. Steel separators, or I-beams, connect the inner-tank to the outer-tank. The outer-tank is constructed of one-quarter inch carbon steel and is externally coated with a polyurethane material (Pa'ina, 2005; NRC, 2006b) designed to protect against underground environmental conditions, (e.g. salt water). The steel separators, or I-beams, provide for strength and the ability to independently conduct hydrostatic pressure testing of the two tanks. Both tanks are leak checked off-site by filling the gap between the tanks with water and inspecting for leaks both inside and outside the pools. The irradiator pool is fabricated off-site and shipped to the proposed site and re-inspected for any damage that may have occurred during shipment.

During on-site construction activities, the pool formed from the two tanks is lowered into the excavation. A concrete foundation is placed underneath the pool and allowed to cure. The pool is then filled with water and the space between the inner and outer pools is checked for water leakage. After the leak test, the six-inch space between the tanks is filled with concrete. Finally, the area surrounding the pool is backfilled, based on site-specific back fill procedures and materials. To account for seismic activity and to separate any floor motion from the pool, a six-inch space between the pool/surge tank and the surrounding floor slab is present.

The pool is installed primarily below ground level with a 42" [3.5 feet] upper lip extending above the facility floor (See Figure A-2 in Appendix A). This lip serves as a barrier to prevent personnel from accidentally falling into the pool. This 42" inch upper lip also helps prevent any water or dirt on the floor from entering the pool. The three layers of the pool's construction provide barriers to any water leaking from the pool to the surrounding environment. As described above, this pool construction method permits verifying the integrity of the pool's steel layers prior to and during installation on-site.

The Co-60 sealed sources are placed in the pool, or removed, in highly-shielded transportation casks. The hoist and cables associated with the overhead trolley system can adequately support the heaviest transportation cask. During source loading the plenum and source rack will be removed to provide space to position the shipping cask at the bottom of the pool. Any sources already present in the pool are placed at the other end of the pool away from the area where the shipping cask is lowered. The shipping cask does not travel over the sources at any time.

During routine operations, the Co-60 sources are locked in place at the bottom of the irradiator pool underneath the plenum (i.e., a watertight box open on the bottom) (See Figure A-4 in Appendix A). The plenum is sealed on the top and sides and contains helium gas under pressure to keep the sources dry during normal operations and to minimize water attenuation of the gamma photons during irradiation. Helium was selected because it is an inert element, will not chemically react with the source encapsulations, has excellent thermal transfer capabilities, and will not significantly dissolve in water. The plenum is constructed of stainless steel, compatible with the stainless steel source encapsulations. There are five vertical enclosures placed side by side (See Figure A-4 in Appendix A). The enclosures are welded to a top manifold that allows helium to freely pass from one enclosure to another. The plenum is completely sealed by welding on the top and sides. The bottom of the plenum is open to allow it to be placed over the source holders. Helium gas enters the plenum through a helium supply tube located on the top of the top manifold. The helium gas is under pressure that is equal to the pressure at the bottom of the plenum. This helium under pressure forces the pool water out of the bottom of the plenum and keeps the interior of the plenum dry. Gas pressure is monitored to assure that the water level does not rise within the plenum so that the sources remain dry.

As described above, the radioactive material is comprised of activated Co-60 disks doubly encapsulated within the source assembly (i.e., sealed source). The individual Co-60 sealed sources (i.e., source assemblies or sources) are positioned vertically in source holders. Each stainless steel source holder is compatible with both the source encapsulation and the plenum material.

The source holders are stacked on guide rods in the source rack. A source holder may hold multiple sources (i.e., has numerous openings to hold Co-60 sealed sources) (See Figure A-5 in Appendix A). There are three source holders (in the vertical dimension) per enclosure and five enclosures (in the horizontal dimension) for a total of fifteen source holders. These source holders are placed on the source rack which has a stainless steel base plate. Stainless steel guide rods are vertically welded to the base plate. The source rack is independent (not physically attached) to the plenum. Once the source holders are loaded onto the rack by sliding them down the guide rods, the plenum is lowered over the source rack, source holders, and Co-60 sources. Guides and clearances are built into the system to assure that there is never any contact or force on the sealed sources during all phases of loading and operation.

A stainless steel surge tank is located on one side of the pool near floor level. The primary purpose of the surge tank is to compensate for varying water levels due to pool water displacement from bell (i.e., product container) movement. The surge tank is connected to the pool through a transfer opening at or above the minimum water level. The minimum water level is the lowest amount of water in the pool that will retain shielding integrity.

A water purification system that includes filtration, de-ionization, and a water radiation monitor (WRM) is mounted above the surge tank. The WRM is located on the filter

system. The purification system's placement over the surge tank prevents any water loss from the water purification system should a leak occur. Although the Co-60 sources are not normally in contact with the pool water during routine operations, the water purification system is designed and maintained with the assumption that the pool water comes in direct contact with the sources (e.g., during source loading, unloading, or reconfiguration). The discharge pipe from the water purification system to the main irradiator pool terminates above the minimum water level. The inlet pipe from the surge tank to the water purification system is located in the surge tank and water access, via the transfer opening, is at or above the minimum water level. The WRM continuously monitors the filter housing to detect any accumulation of radioactive material. An inline conductivity monitor provides feedback for the prevention of electrolytic corrosion of the irradiator pool or source plenum.

A make-up water line is connected to an external water supply. A manual valve is used to add water to make up for water loss due to evaporation loss and a check valve prevents pool water from inadvertently traveling back into the external water supply. There are no water effluent discharges to State waters from the water purification system (Pa'ina, 2005b).

Bells (i.e., product containers) are lowered to either side of the stationary plenum. Limiters (i.e., significant steel structures) prevent the bells from coming in contact with the plenum, and thus protecting the individual Co-60 sources. The plenum is secured at the bottom of the irradiator pool by a stainless steel retaining mechanism that extends from the top of the plenum to the surface of the pool. The retaining mechanism is bolted, padlocked, and tamper sealed at the pool surface. The primary purpose of the retaining mechanism is to assure that the plenum, and the sources, can't be raised to the pool surface under any conditions when the sources are present in the plenum. Plenum inspection and maintenance, should it be necessary, is conducted by breaking the tamper seals, unlocking and unbolting the retaining mechanism, removing the retaining mechanism, and then raising the plenum. After the source holders are removed, the source rack can also be removed for inspection. In addition to the WRM, an area radiation monitor (ARM) is located over the surface of the pool. The ARM has remote visual alerts and is audible at all Restricted Area personnel entries. The ARM is directly wired to the hoist system (as described below). In the event that the ARM, in combination with the WRM, detects the presence of radiation (above the threshold setting), the power to the hoist system is shut off and all hoist movement ceases.

The product to be irradiated is brought into the Restricted Area on carts (i.e., stacked product carriers). Open-bottomed bells are suspended from a hoist system and moved by the overhead rail and trolley. Three hoist/bell assemblies are used. To load the irradiator, the operator lowers a bell enveloping/engaging a cart full of product at a loading station. The bell containing the product is then raised. The operator pushes and holds a button to activate the trolley and move the loaded bell to a "START" position on one side of the pool. A computer detects the bell in the "START" position and when ready, automatically moves the bell over the pool. The bell is then automatically lowered into the pool at one side of the source plenum. After irradiation

(of one side of the product), the bell is raised out of the pool water, moved further along the rail over the pool, and lowered to the second side of the plenum for completion of the irradiation cycle. After completion, the bell is automatically raised by the hoist system and moved by trolley to the “FINISH” position on the opposite side of the pool from the “START” position. The “FINISH” position is located above the surge tank to recycle water runoff from the bell. The operator then pushes and holds a button to activate the trolley and move the finished bell to an unloading station where the bell is lowered, detached from the product cart, and sent to the initial loading station.

Product irradiation takes place only near the pool bottom (i.e., under 12-18 feet of water) around the plenum. The product is moved to the bottom of the pool in the bells. All components of the bells in contact with the pool water are made of stainless steel. The bells, even if empty, are heavy enough to prevent them from floating in the pool. They are raised and lowered with conventional hoists and stainless steel cable. The safety factor on all lifting components such as the cable is a factor greater than five times the materials’ yield strength. Should the cables or their attachments fail, the bells might drop into the pool; however, the limiters, which position the bells, keep them clear of the plenum and sources. The retaining mechanism that locks the plenum into position occupies the space in the pool from the plenum to the surface. Therefore, a bell cannot fall and impact the plenum.

The bell is water tight on all sides except for the open bottom. As the bells are lowered into the pool, the increased water pressure tries to force the water level in the bell to rise. However, each bell has a compressed air supply line. The purpose of this compressed air line is to maintain the water level in the bell below the product. The compressed air supply line runs from the hoist mechanism to each bell. A stainless steel pipe on the top of each bell extends above the bell. This pipe is connected to the flexible air supply line. The flexible air line is connected to a retractable reel system located at the hoist mechanism. The purpose of the stainless steel extension, which is curved to prevent radiation streaming, is to prevent radiation damage to the flexible air line. If the air supply line fails and is open to the water, air would come out of the exposed line and bubble through the water. At no time could pool water be drained through the air supply line. The compressed gas supplied through the flexible air line equalizes the pressure and maintains the water level at the bottom of the bell. As the bell rises out of the pool, the decreased water pressure causes air to escape from the bottom of the bell.

Also, as the bells descend into the pool, the water pressure increases slightly at the bottom of the pool which causes water to be pushed up slightly into the plenum. The plenum is designed with a buffer space below the source holders to allow for water levels to vary and yet keep the source encapsulations dry. All moving parts of the irradiator can be maintained and replaced above the pool and outside the irradiation zone.

The Need for the Proposed Action

The proposed irradiator would be mainly used for the production and research irradiation of food and cosmetic products (Paina, 2005). The irradiator would satisfy several needs related to the control of invasive pest species (Wong, 2006). Specific uses would include (Kohn, 2006):

- Centrally located treatment of Hawaiian products for export,
- Centrally located treatment of products for import to Hawaii,
- Sterilization of fruit fly pupae for preventative release programs, and
- Use as a research tool.

Hawaii currently has four treatment facilities, all located on the big island of Hawaii. These existing facilities consist of three heat treatment facilities and one electron beam irradiator facility. However, some producers are precluded from using these facilities for various reasons including product restrictions and high shipping costs (Wong, 2006). A treatment facility located on Oahu, the central hub for air and sea transportation, is considered to be most useful as it would provide access to the widest range of mainland and foreign destinations with the shortest time delays from field to market (Wong, 2006).

During peak import seasons (e.g., Mother's Day) it is difficult for the Hawaii Department of Agriculture to conduct inspections due to the large volumes of products. Treatment by irradiation in lieu of inspections would allow immediate release of the products and provide benefits to importers (Kohn, 2006).

There is major effort underway to establish a new biosecurity system for the state of Hawaii (Wong, 2006). Invasive species pose a large threat to Hawaii's native ecology. When invasive species are found there are typically three options for importers, 1) return the product to the sender, 2) destroy the product, or 3) treat with methyl bromide. Shipping the product back to the sender involves additional freight cost and increased product degradation due to time delays, while destruction results in the total loss of the product. Treatment by methyl bromide is an alternative; however it has some drawbacks such as increased cost, product degradation, and potential damage to the Earth's ozone layer (see discussion under Alternatives). The Hawaii Department of Agriculture believes irradiation has the broadest application for post entry quarantine treatment (Wong, 2006).

The California Department of Agriculture operates a Mediterranean fruit fly sterilization facility on Oahu which provides sterile fruit fly pupae for preventative release programs in California. Currently, California intends to increase the size of this facility and will need additional treatment capacity. The proposed Pa'ina irradiator could potentially be used to meet this need. (Wong, 2006)

Finally, Pa'ina Hawaii has formed the Pacific Agriculture Research Company to conduct research for the benefit of Hawaii agriculture. The proposed irradiator could also serve the University of Hawaii for its research needs (Kohn, 2006).

Environmental Impacts of the Proposed Action

Construction and Normal Operations

The proposed irradiator is expected to have no significant impacts during construction for any resource areas due its small size and the limited type of construction activities. The NRC staff also considered operational impacts. The proposed irradiator would occupy a small percentage of existing industrial space at the airport. Additionally, there are no known land use restrictions that would be created by construction and operation of the proposed Pa'ina irradiator. The NRC has completed consultation requirements under Section 106 of the National Historic Preservation Act. The Hawaii State Historic Preservation Officer responded to NRC staff that the proposed irradiator will have "no effect" on historic properties (Young, 2005). The proposed irradiator would produce very little noticeable noise as the primary moving parts are the overhead hoist and trolley system and the routine product deliveries via truck. Additionally, noise from the proposed irradiator is expected to be negligible when compared to the other noise present at the proposed airport location. There are no air effluents from the proposed irradiator. The proposed irradiator would be enclosed in an industrial-type building of similar size and color to other buildings at the Honolulu International Airport; therefore no visual impacts are expected. The NRC staff finds that the proposed irradiator would have no significant impacts on land use, historical and cultural resources, noise, air quality, or visual quality during operation.

As described in the Proposed Action, there are no liquid effluents from the proposed irradiator to State waters (Pa'ina, 2005b). Once the pool is filled, only small amounts of water (relative to general industrial users) would be needed to compensate for evaporation. Additionally, the irradiator pool consists of multiple layers of steel and concrete which makes pool leakage highly unlikely. However, even if the pool were to leak water, the radioactive source encapsulation would also have to fail in order to generate any groundwater contamination. If a source encapsulation were to leak into the pool water, the radiation monitors would be activated and the irradiator would be shut down and the leaking sources would be removed. The three layers of the pool's construction provide barriers to any water leaking from the pool to the surrounding environment. The pool construction method permits verification of the pool integrity prior to and during installation on-site. The NRC staff finds that the proposed irradiator would have no significant impacts on water quality or water use.

Public and occupational health impacts are expected to be small as the expected doses would be well below regulatory standards. For example, the maximum dose at the pool surface would be well below 1 mrem/hour (NRC, 2003; NRC, 2006c). Considering the location of personnel and operational practices of the irradiator, it is improbable that an employee could receive more than the occupational dose limit which is 5,000 mrem/year. The expected dose rate approximately 20-25 feet from the pool edge is expected to be indistinguishable from background radiation. The expected dose rates outside the building are expected to be indistinguishable from naturally occurring

background radiation, therefore it is unlikely that a member of the public could receive more than the public limit which is 100 millirem/year. The NRC staff finds that the proposed irradiator would have no significant impacts on public or occupational health.

Transportation impacts from normal operations would be small. Radioactive Co-60 sealed sources would be shipped approximately once per year. Using RADTRAN 5.3, staff estimated the maximum dose for a full initial shipment would be 3.7×10^{-2} mrem/year. For this calculation, the staff assumed each source contained the maximum allowable activity, 10 sources per cask, one cask per shipment, and six total shipments (NRC, 2006d). Additionally, shipments of various commodities might shift locations (i.e., starting and ending points) however; total shipments are not expected to significantly increase. The NRC staff finds that the proposed irradiator would have no significant impacts from transportation of the sources or additional products.

The proposed irradiator would potentially have small beneficial impacts to socioeconomics. For example, operation of the proposed irradiator would provide Hawaiian sweet potato farmers with an effective and potentially cheaper alternative to fumigation with methyl bromide (APHIS, 2004). Likewise, banana farmers, and importers of fresh flowers and foliage could benefit economically from potentially cheaper treatment alternatives (APHIS, 2006). In approving irradiation treatments for various types of produce, the Animal and Plant Health Inspection Service (APHIS) stated the result of irradiation treatments would be lower costs and increased flexibility for importers, gains which could be realized by U.S. consumers through lower prices (APHIS, 2006). The NRC staff finds that the proposed irradiator would have no significant impacts on socioeconomics.

The proposed irradiator would also have small beneficial impacts to ecology in regard to controlling invasive species. Invasive species are those species non-native to the reference ecosystem and whose introduction causes economic, environmental or human health harm (USDA, 2006). It has been estimated that over 2,500 insect species have been introduced to Hawaii and account for 98% of the pest species in the state (Pimentel et al., 2005). In California, over 600 invasive pests account for 67% of all crop losses (Pimentel et al., 2005). While the proposed irradiator will not diminish the existing population of invasive species, it is seen as one tool in preventing the further introduction and spread of invasive pests. For example, APHIS passed irradiation treatment rules to provide effective quarantine treatment for the mango seed weevil and various forms of the fruit fly (APHIS, 2003). Additionally, the Hawaii Department of Agriculture has stated that an additional irradiator would be a benefit to the “preventative release” program whereby fruit fly pupae are sterilized to prevent the establishment of the fruit fly in California (Wong, 2006). The NRC staff finds that the proposed irradiator would have no significant impacts on ecology.

Aviation Accidents, Natural Phenomena and Abnormal Events

As described in more detail in the Safety Topical Report (CNWRA, 2006), the probability of an aircraft crash into the proposed facility is 2.1×10^{-4} (i.e., about once every five

thousand years). It should be noted that the probability that an aircraft will crash into the proposed facility does not reflect the potential for release or dispersal of the radioactive Co-60 from the doubly-encapsulated sources. The source plenum is located under approximately 12-18 feet of water. Additionally, the Co-60 sealed sources in the source plenum are not mechanically coupled to the plenum structure and the plenum structure is not coupled to the rest of the building. In the event of damage to the plenum structure the sources would either remain in the source rack/holder or fall to the floor of the irradiator pool. The Co-60 sources are doubly-encapsulated and have been tested to withstand significant forces. A significantly larger force must be generated by an aircraft crash because much of the force will result in damage to the building and other ground-level structures of the pool. Transferring the force to the bottom of the pool will also result in significant absorption of the force. It is highly unlikely that a Co-60 sealed source would be breached in the event that an aircraft crashes into the proposed facility. The NRC staff finds that potential aviation accidents would have no significant impacts on public health and safety from the proposed irradiator.

As described in more detail in the Safety Topical Report (CNWRA, 2006), a seismically-induced radiological accident is considered negligible due to the nature of the facility and the seismic hazard for the site. The radiological sources at the facility are passive and shielding or containment of the Co-60 sources does not rely on active systems to mitigate potential radiological releases. The earthquake ground motions for the site are insufficient to damage the proposed facility to the degree necessary to dislodge Co-60 sources from the pools. The NRC staff finds that potential seismic activity would have no significant impacts on public health and safety from the proposed irradiator.

As described in more detail in the Safety Topical Report (CNWRA, 2006), fluid dynamic calculations were conducted to determine impacts from potential tsunami-generated wave run-ups. These calculations were performed to determine the wave velocity necessary to pull a Co-60 source up to the pool opening. These wave velocities were then evaluated with respect to potential tsunami-generated waves. The calculations are considered bounding because they assume the irradiator plenum and source holder have all failed releasing the Co-60 sources to the floor of the irradiator. The model assumed a wave of water will induce a shear force that will create a vortex inside the pool. This vortex will exert forces (i.e., a vertical velocity) on the released Co-60 sources and cause them to be displaced in the water. Under limiting conditions, the weight of the Co-60 source must be the same as the drag induced by the rotating fluid in order to be displaced. The calculations showed that a vertical velocity of 115 feet/second is required to induce a drag force sufficient to lift the Co-60 source to the surface of the pool. This vertical velocity would thus require a shear velocity of 389 feet/second to produce this upward velocity. However, water velocities at the shore for tsunami waves up to 32.8 feet reach 42.6 feet/second, well below necessary shear velocity. Additionally, this wave will have a fraction of this velocity as it reaches the irradiator pool because the distance between the coast and the irradiator facility and the barriers to water flow imposed by near shore obstructions, including the building facility, and the presence of other debris. Water velocities for smaller tsunami waves more

typical for Oahu would be substantially slower than for the large waves and would likely not even reach the facility. Thus, there is a negligible potential for tsunami waves which could produce wave velocities that would lift and relocate the Co-60 sources from the irradiator pool. The NRC staff finds that potential tsunami activity would have no significant impacts on public health and safety from the proposed irradiator.

A more complete description of hurricanes around Hawaii is provided in the Safety Topical Report (CNWRA, 2006). In summary, the wave velocity associated with a storm surge is significantly less than that associated with a tsunami. As discussed above, the probability of a large tsunami removing a Co-60 source from the bottom of the proposed irradiator pool is considered negligible. Therefore, the likelihood of a storm surge associated with a hurricane resulting in the release of a Co-60 source is also considered negligible. It is also noted that the upper lip of the irradiator pool, which is constructed of ¼" stainless steel, extends 42" above floor level and helps prevent minor flooding from entering the pool. The NRC staff finds that potential hurricane activity would have no significant impacts on public health and safety from the proposed irradiator.

Other abnormal conditions were also considered. If an air supply line fails and is open to the water, air would come out of the exposed line and bubble through the water. At no time could pool water be 'drained' through the air supply line. The product would become wet but would not present any immediate impact to water quality as the product could still be removed from the pool. This type of scenario is not expected to significantly affect worker health. Also, a curved stainless steel extension is fitted to the top of each bell to prevent radiation streaming and radiation damage to the flexible air line.

Additionally, a gauge is located on the top of the irradiator on the helium supply tube that allows for monitoring of helium pressure in the plenum (which corresponds to water level in the plenum). If a helium leak occurred, either in the plenum or helium line, helium would bubble through the water, but at no time could pool water be 'drained' through the helium supply line. The Co-60 sealed sources would become wet but would not present any immediate impact to water quality as the sources are doubly-encapsulated in stainless steel. It is anticipated that the plenum could be raised to the surface and repaired as necessary with no significant impacts to sources or worker health.

Environmental Impacts of the Alternatives to the Proposed Action

The staff considered several different alternatives to the proposed action including denying Pa'ina's license application (i.e., the no-action alternative), and use of alternative quarantine control technologies.

Denial of the application (i.e., the no-action alternative) would result in small changes in current environmental impacts. Fruit and other perishable commodities would have to be treated in a manner consistent with current practice at existing facilities. The primary impact of this no-action alternative is the small economic impacts from limiting the

expansion of the sale and distribution of certain fruits and vegetables from Hawaii along with the associated benefits of helping control invasive species. APHIS has recently passed regulations allowing irradiation of sweet potatoes, bell peppers, and bananas (APHIS, 2003; APHIS, 2004; APHIS, 2006). In addition to be being a safe treatment method, irradiation would afford farmers from the various Hawaiian islands a potentially more cost-effective means of distributing their products to markets outside of Hawaii. Currently, there is one irradiation facility on the big island of Hawaii. Transportation costs of shipping produce from other islands to the big island of Hawaii and back to Oahu for out-of-state distribution are considered prohibitive (APHIS, 2004; Wong, 2006). While, the environmental impacts of the proposed action and the no-action alternative are similar (i.e., neither alternative has significant environmental impacts), small economic benefits would be foregone by the decreased market outlets available for fruit and vegetable producers on islands other than Hawaii.

Alternative quarantine control technologies include the use of methyl bromide gas and various types of heat treatments. Methyl bromide fumigation is the most common method for controlling quarantine pests. However, methyl bromide is limited to certain commodities at specific temperatures because some commodities are highly sensitive, including certain Hawaiian tropical fruits (EPA, 2006a). Methyl bromide is also known to contribute to the destruction of the Earth's ozone layer and is currently being phased out of production. While quarantine uses are exempted, it is expected that the cost of methyl bromide will increase significantly (APHIS, 2004) as the number of manufactures decrease and others phase back production.

There are currently several different methods of heat treatments available. Hot-water immersion consists of submerging the fruit in a hot-water bath at a specific temperature and time based on the fruit being treated and the pests that may be present. This method is also useful for cut flowers and bulbs. While useful for many fruits, this method is not approved for papayas and guavas and is not recommended for fruits such as grapefruits, plums, and peaches due to unacceptable fruit damage (EPA, 2006b).

While the environmental impacts of the proposed action and the alternatives are similar, small economic benefits would be foregone by the decreased market outlets available for fruit and vegetable producers on islands other than Hawaii (APHIS, 2003; APHIS, 2004; APHIS, 2006). Additional small economic benefits would be foregone from potentially lower-priced and more rapid quarantine treatments (APHIS, 2003; APHIS, 2004; APHIS, 2006).

Agencies and Persons Consulted

The NRC has consulted with the Hawaii State Historical Preservation Officer. The NRC followed this consultation with a request for information to several Native Hawaiian groups and organizations. On December 8, 2005, the Hawaii State Historic Preservation Officer responded to NRC staff that the proposed irradiator project would have "no effect" on historic properties (Young, 2005), thus completing NRC's Section 106 consultation requirements under the National Historic Preservation Act.

The NRC has requested endangered species information from the U.S. Fish and Wildlife Service (FWS). The FWS responded that no listed endangered species or critical habitat occur at the proposed irradiator site (FWS, 2005), thus completing NRC's Section 7 consultation requirements under the Endangered Species Act.

The Hawaii Department of Business, Economic Development & Tourism has indicated to NRC staff that a federal consistency review is not required by the Hawaii Coastal Zone Management Program (Thielen, 2005).

The NRC staff is also providing this draft EA to the State of Hawaii, Pa'ina Hawaii, Concerned Citizens of Honolulu, and members of the public for review and comment.

Conclusion

The NRC staff has concluded that the proposed action will comply with the licensing requirements found in 10 CFR Part 20, "Standards for Protection Against Radiation," and 10 CFR Part 36, "Licensing and Radiation Safety Requirements for Irradiators." Occupational and public exposure to radiation will be significantly less than the limits in 10 CFR Part 20.

The NRC staff has prepared this EA in support of the proposed action to issue a license to Pa'ina Hawaii for the possession and use of sealed radioactive sources in an underwater irradiator for the production and research irradiation of food, cosmetic, and pharmaceutical products. On the basis of this EA, NRC has concluded that there are no significant environmental impacts and the license application does not warrant the preparation of an Environmental Impact Statement. Accordingly, it has been determined that a Finding of No Significant Impact is appropriate.

Sources Used

This environmental assessment was prepared by Matthew Blevins, Senior Project Manager, in the Office of Federal and State Materials and Environmental Management Programs (FSME), with technical input from Elaine Keegan, Transportation Project Manager, in the Office of Nuclear Material Safety and Safeguards and Anita Gray Turner, Health Physicist, in FSME.

Additionally, the Center for Nuclear Waste Regulatory Analyses provided technical support in aircraft crash hazard analysis and natural phenomena under NRC Contract # NRC–02–04–014.

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(APHIS, 2004) "Irradiation of Sweetpotatoes from Hawaii, Final Rule." Federal Register 69 (February 18, 2004): 7541-7547.

(APHIS, 2006) "Treatments for Fruits and Vegetables, Final Rule." Federal Register 71 (January 27, 2006): 4451-4464.

(CNWRA, 2006) "Draft Topical Report on Aircraft Crash and Natural Phenomena Hazard at the Pa'ina Hawaii, LLC Irradiator Facility." Center for Nuclear Waste Regulatory Analysis, December 2006.

(EPA, 2006a) "U.S. EPA: Pesticides – Methyl Bromide," U.S. Environmental Protection Agency. <http://www.epa.gov/pesticides/factsheets/chemicals/methylbromide_factsheet.htm>, accessed on September 7, 2006.

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(Kohn, 2006) Email from M. Kohn (Pa'ina Hawaii) to M. Blevins (NRC) "Honolulu irradiator impacts," August 29, 2006.

(NRC, 2003) "Inspection 03036239/2003001, CFC Logistics, Inc., Quakertown, Pennsylvania," November 4, 2003.

(NRC, 2006a) "NRC Staff and Concerned Citizens of Honolulu Joint Motion to Dismiss Environmental Contentions," March 20, 2006

(NRC, 2006b) "Note to file: Highlights of August 22, 2006 site visit to CHL Systems, Souderton, Pennsylvania, and email coordinating meeting." Undated.

(NRC, 2006c) Email from A. Turner Gray to M. Blevins: "Mircoshield calculation review." November 27, 2006.

(NRC, 2006d) Email from E. Keegan to M. Blevins "Pa'ina Irradiator SER Input." December 6, 2006.

(Pa'ina, 2005a) "Application for Materials License," June 23, 2005.

(Pa'ina, 2005b) Letter from A. Buchan (Pa'ina) to D. Lau (Hawaii State Department of Health, Clean Water Branch). Undated.

(Pimentel et al., 2005) "Update on the environmental and economic costs associated with alien-invasive species in the United States." Ecological Economics 52(2005):273-288.

(Thielen, 2005) Letter from L. Thielen (Hawaii Department of Business, Economic Development and Tourism) to J. Whitten (NRC). "U.S. Nuclear Regulatory Commission (NRC) License Request for Pa'ina Hawaii, LLC, Irradiator in Honolulu, Hawaii,"

(USDA, 2006) "Invasive Species: About NISIC – What is an Invasive Species?" <http://www.invasivespeciesinfo.gov/whatis.shtml> accessed on November 28, 2006.

(Wong, 2006) Letter from L. Wong (Hawaii Department of Agriculture) to M. Kohn (Pa'ina Hawaii). August 28, 2006.

(Young, 2005) Letter from P. Young (Hawaii State Historic Preservation Officer) to J. Whitten (NRC). "National Historic Preservation Act Section 106 Initiation-Pa'ina Hawaii, LLC Industrial Pool-Type Irradiator to be Built at the Honolulu International Airport Kona District, Moanalua Ahuppua'a, Island of O'ahu, Hawaii'I TMK(1)1-1-076:009 & 10," December 8, 2005.

Appendix A: Figures

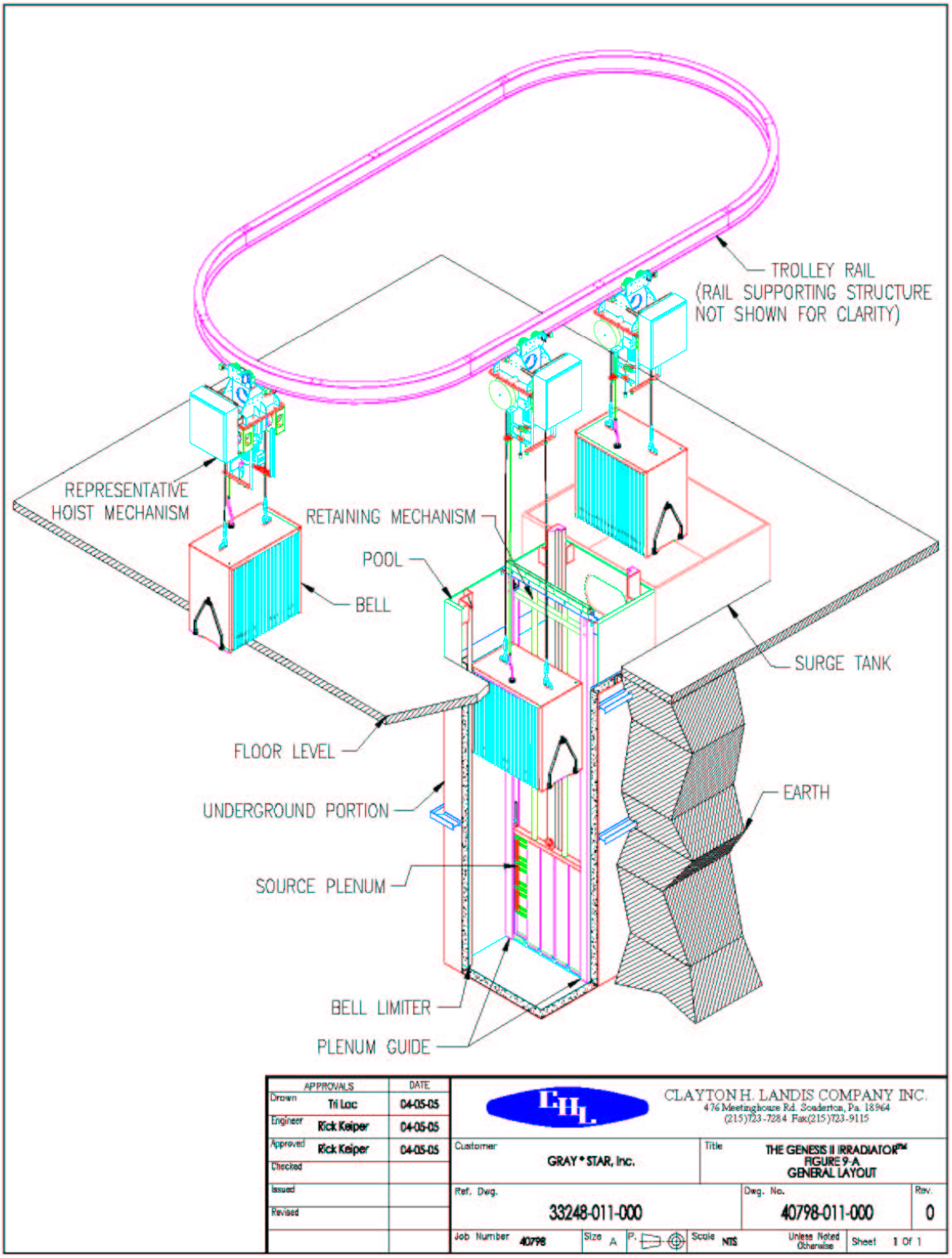

Figure A-1: General Layout of proposed irradiator (Pa'ina, 2005a).

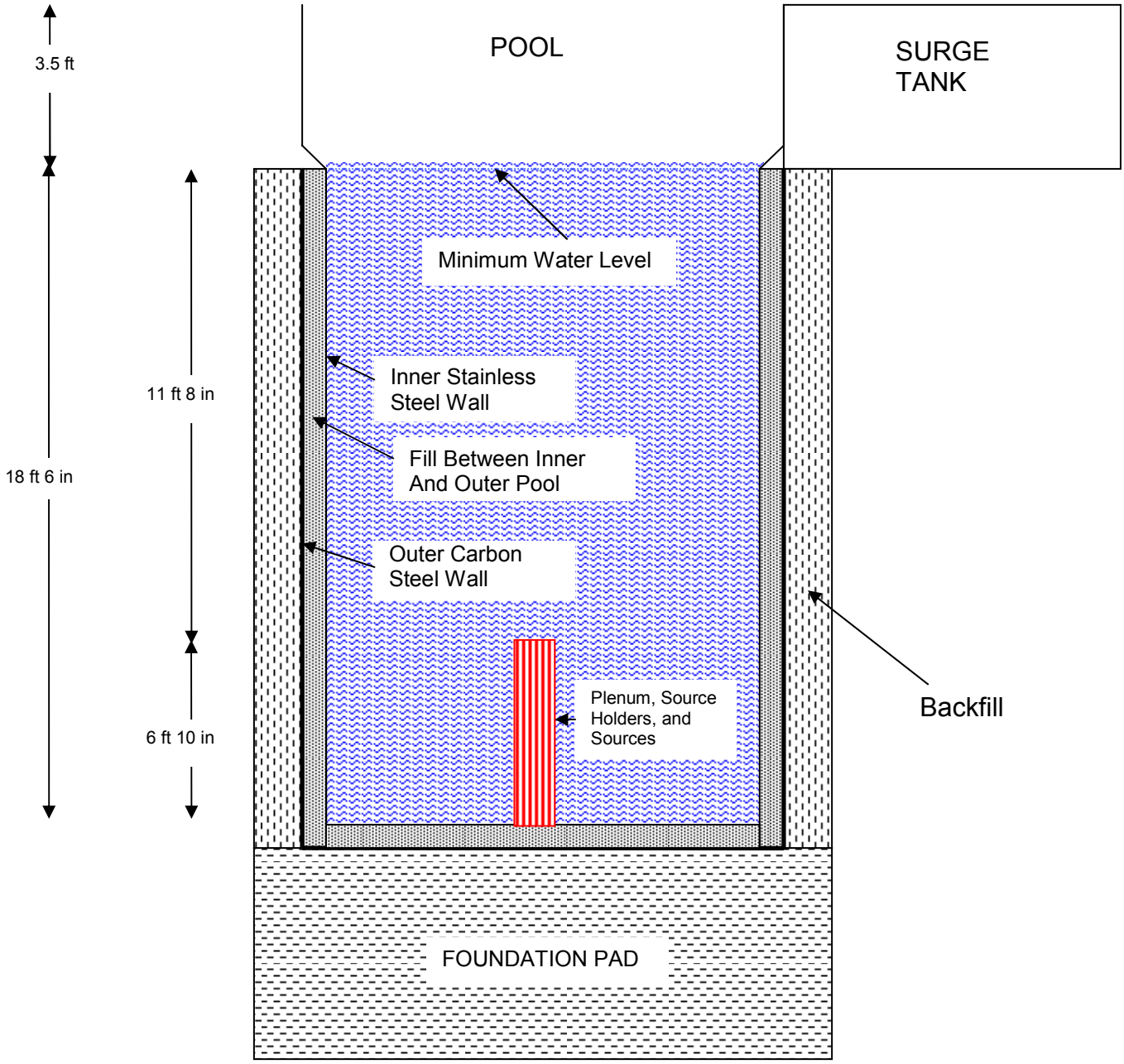

Figure A-2: Simplified schematic of proposed Pa'ina irradiator.

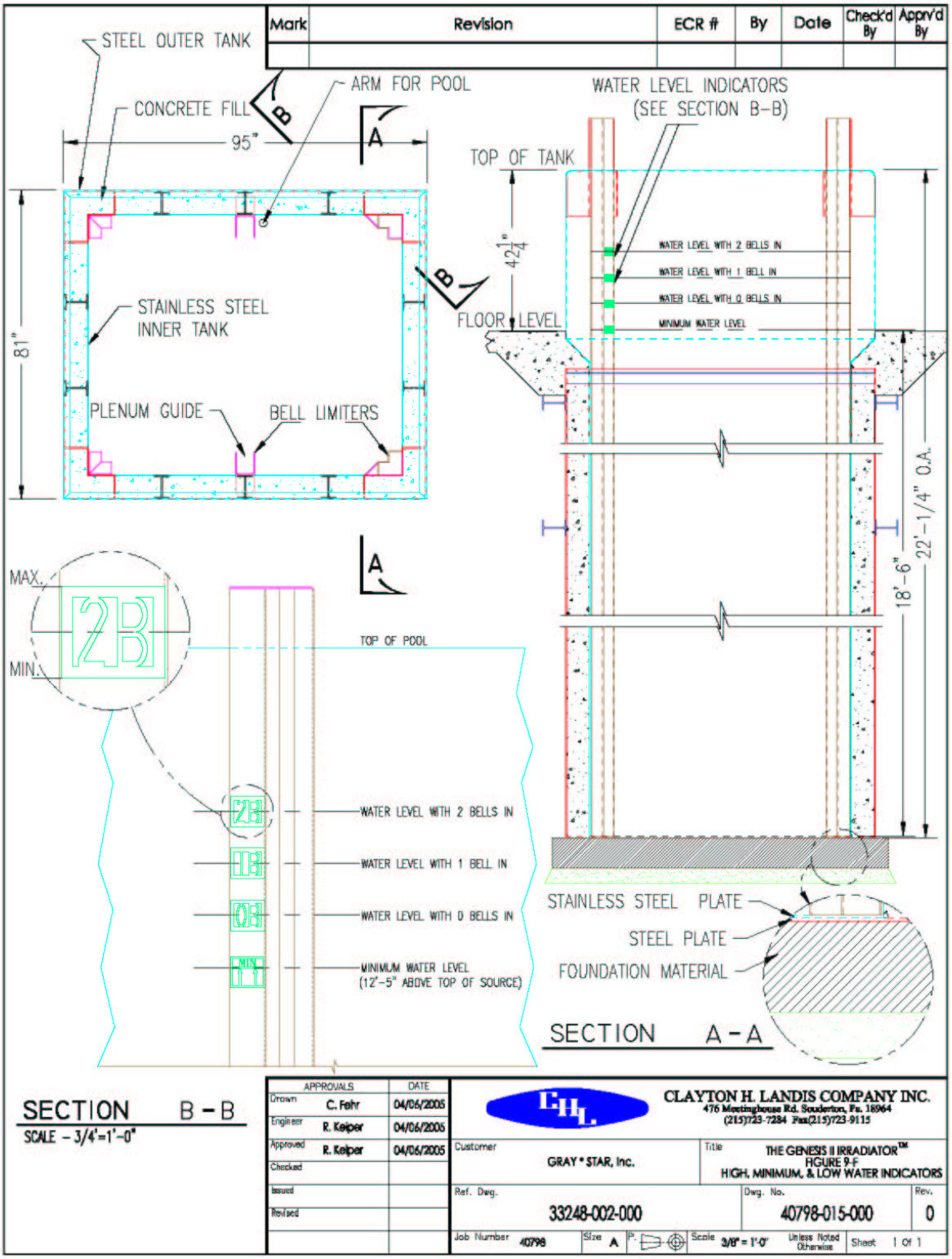

Figure A-3: Details of irradiator design (Pa'ina, 2005a).

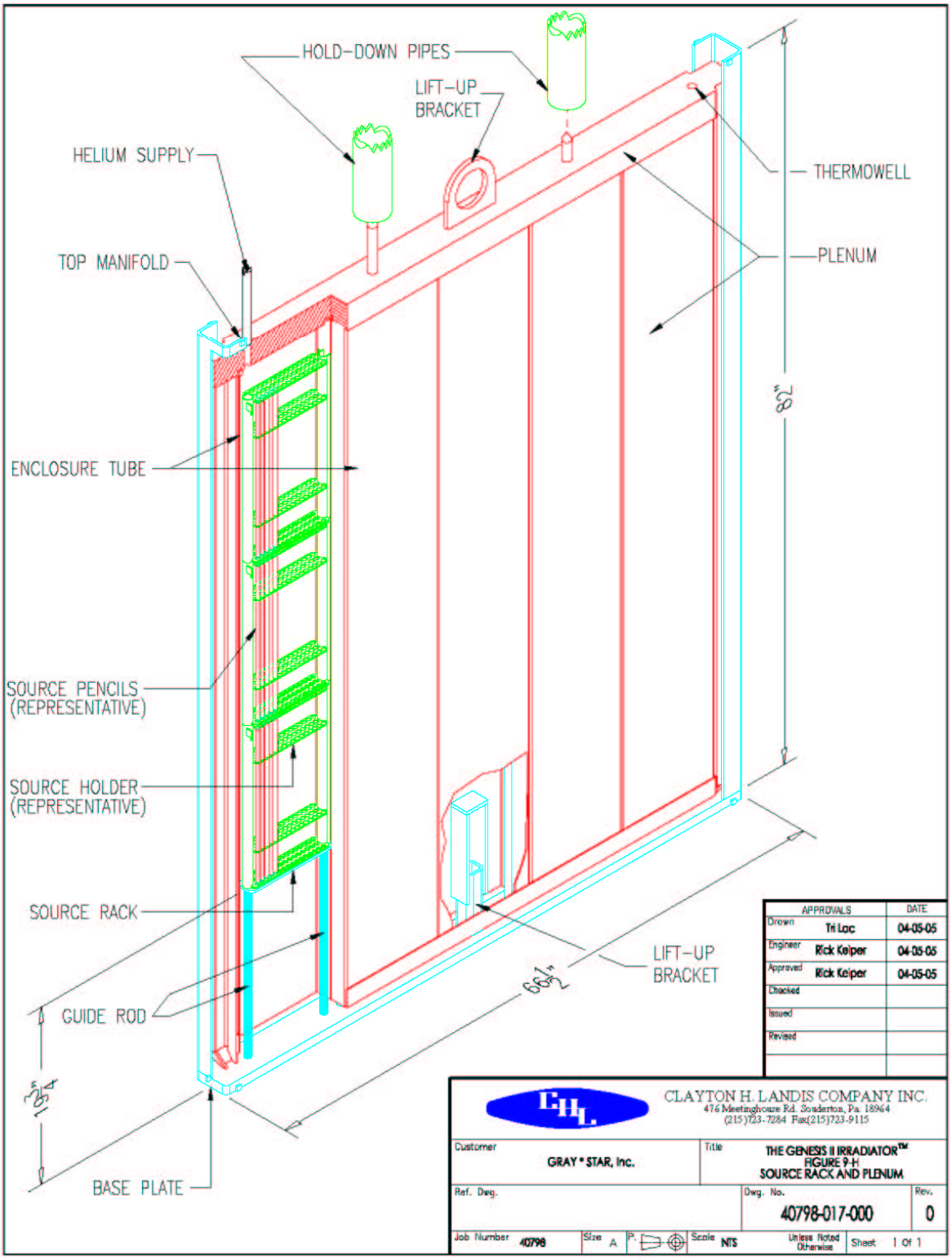

Figure A-4: Irradiator source rack and plenum (Pa'ina, 2005a).

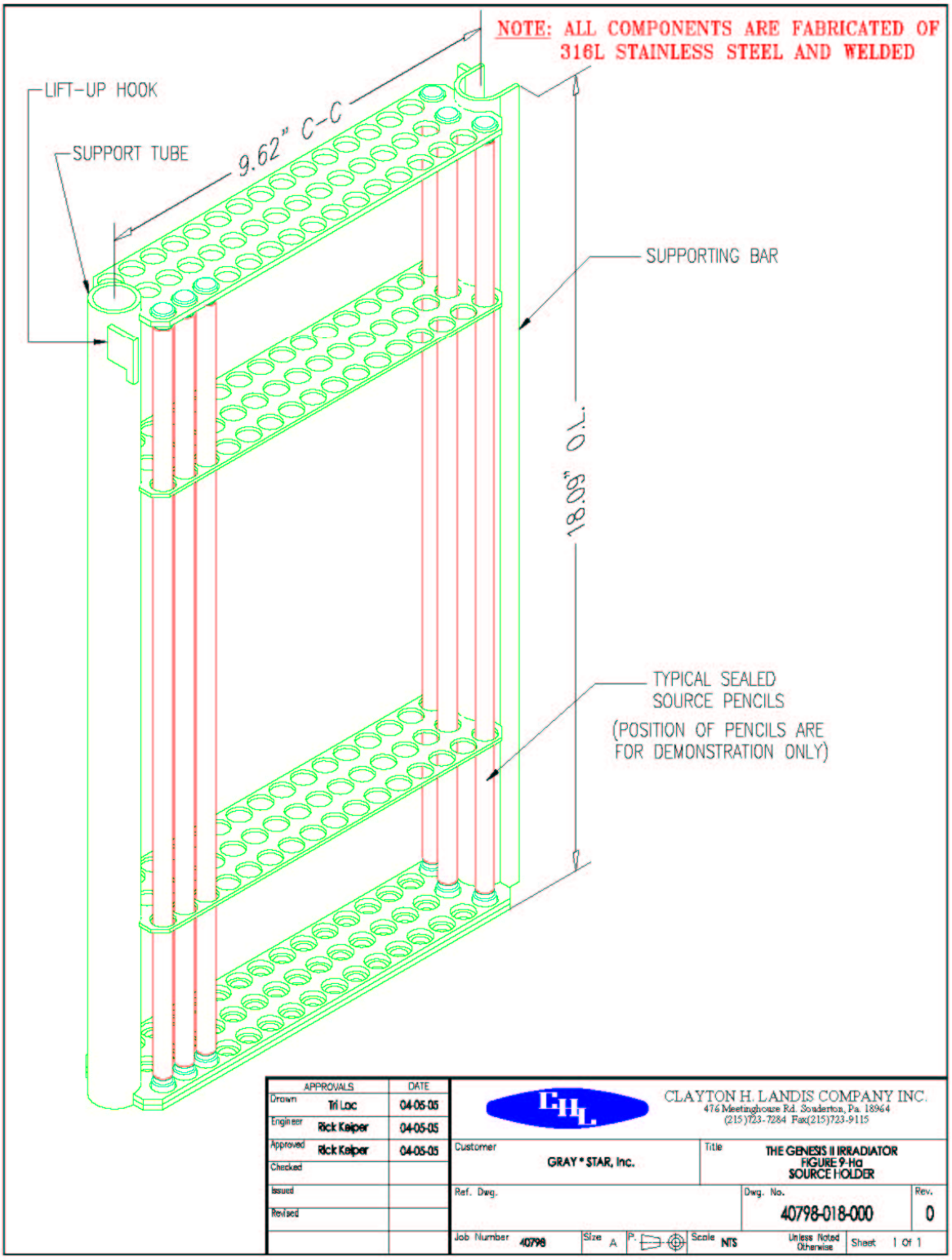

Figure A-5: Irradiator source holder (Pa'ina, 2005a).