DRAFT Environmental Assessment for Deployment of a Backscatter X-Ray Inspection System, Wellton Station, Yuma County, Arizona

October 2010

U.S. Customs and Border Protection

DEPARTMENT OF HOMELAND SECURITY
U.S. CUSTOMS AND BORDER PROTECTION
OFFICE OF INFORMATION AND TECHNOLOGY
LABORATORIES AND SCIENTIFIC SERVICES
INTERDICTION TECHNOLOGY BRANCH

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Lead Agency: U.S. Department of Homeland Security
U.S. Customs and Border Protection
Office of Information and Technology
Laboratories and Scientific Services
Interdiction Technology Branch
1300 Pennsylvania Ave., N.W.
Washington, DC 20229

Point of Contact: Guy Feyen
Office of Information and Technology
Laboratories and Scientific Services
Interdiction Technology Branch
1300 Pennsylvania Avenue NW, Suite 1575
Washington, DC 20229

U.S. Department of Homeland Security
Washington, DC 20229

U.S. Customs and
Border Protection

November 1, 2010

Subject: Notice of Availability of the Draft Environmental Assessment for Deployment of a Backscatter X-Ray Inspection System, Wellton Station, Yuma County, Arizona

Dear Reader,

The U.S. Customs and Border Protection (CBP), Office of Information and Technology (OIT), Laboratories and Scientific Services (LSS), Interdiction Technology Branch (ITB) has prepared a Draft Environmental Assessment (EA) to address the potential effects of deploying a backscatter X-ray inspection system at Wellton Station, to be operated in Yuma County, Arizona. The purpose of the Proposed Action is to non-intrusively inspect vehicles for the presence of low density objects such as explosives, organics, and plastics.

The Draft EA will be available for a 30-day review beginning November 1 and ending December 1, 2010. The Draft EA will be available during the review period at the Yuma County Library, 185 Main Street, Yuma AZ 85364 and the Cocopah Tribal Library, 14250 S. Avenue I, Somerton, AZ 85350. The Draft EA can also be obtained from CBP/OIT/LSS/ITB, 1300 Pennsylvania Avenue, NW, Suite 1575, Washington, DC 20229, telephone (202) 344-1531, facsimile (202) 344-1418. The Draft EA can also be viewed and downloaded via the internet at the following address: http://ecso.swf.usace.army.mil/Pages/Publicreview.cfm.

Comments must be postmarked, e-mailed or faxed by December 1, 2010 to ensure that they receive full consideration. Please address all comments to the attention of Mr. Guy Feyen at the above address or facsimile number.

Executive Summary

Introduction

This Draft Environmental Assessment (EA) evaluates the environmental consequences expected to result from the deployment of one backscatter X-ray inspection system by the U.S. Customs and Border Protection (CBP) at Wellton Station, to be operated in Yuma County, Arizona.

Proposed Action

The Proposed Action is to field and operate one backscatter X-ray inspection system at Wellton Station, to be operated in Yuma County, Arizona for the purpose of conducting non-intrusive inspections (NIIs) of vehicles for the presence of illegal substances, such as drugs and explosives, as well as for persons attempting to enter the country illegally. The system is a mobile scanning system, mounted on a truck or van type platform. The system may be operated in stationary mode, where it is parked and can scan vehicles as they pass, or in mobile mode, where it can be driven along parked vehicles and scan them as it drives by. The system will be operated on developed surfaces[1], such as checkpoints and parking areas by CBP personnel. As a best management practice (BMP), the system will be set up with an established controlled area to ensure radiation exposure levels remain within standards set by Nuclear Regulatory Commission (NRC). No additional employees, construction or infrastructure are required for the operation or storage of the system.

Purpose and Need

The purpose of the Proposed Action is to non-intrusively scan vehicles for the presence of low density objects not normally seen with a transmission X-ray system, such as explosives and drugs. Backscatter X-ray technology has a unique capacity to detect objects that are not effectively visualized by other NII technologies currently employed by CBP. Backscatter X-ray technology allows increased officer safety by eliminating the need for officers to manually enter vehicles to inspect for contraband. The technology gives a clear image of low density objects that may be hidden in car fenders, tires, trunks, gas tanks, and under hoods.

Alternatives Considered

Nine alternatives were initially evaluated to determine whether they could meet the purpose and need:

- Alternative 1: Fielding and operation of one backscatter X-ray inspection system at the POE. This was identified as the preferred alternative;
- Alternative 2: No Action Alternative (status quo). Inspections will continue at the POE using existing technologies, as well as manual inspections by CBP officers;

[1] Developed surfaces are areas that have been subject to grading and/or filling and may be covered with gravel, asphalt or concrete.

- Alternative 3: X-Ray Imaging Systems;
- Alternative 4: Gamma Imaging Systems;
- Alternative 5: Trace-Chemical Detection Systems;
- Alternative 6: Millimeter Wave Systems;
- Alternative 7: Low-power Microwave Systems;
- Alternative 8: Ultrasonic Imaging Systems; and
- Alternative 9: Quadrupole Resonance Imaging Systems.

Of the nine alternatives, only Alternative 1 (preferred alternative) was identified as being capable of generating efficient, quality images of low density objects. Alternative 2, the No Action Alternative, has been carried forward for analysis as required by the Council on Environmental Quality (CEQ) regulations. Under the No Action Alternative, CBP inspections would continue at the station by conducting visual and manual inspections using existing equipment and methods. This Draft EA evaluates both the Proposed Action and No Action Alternative. See section 2.4 for detailed information on other alternatives that were considered.

Environmental Consequences of the Proposed Action

This Draft EA documents that the Proposed Action will result in no significant environmental impacts, direct, indirect, cumulative, or otherwise. Impacts to the majority of resource categories are not anticipated as a result of the Proposed Action and were therefore eliminated from further discussion. The only resource categories evaluated in detail in this Draft EA are air quality, human health and safety in the context of radiological impacts, and national security.

Air Quality

Air quality impacts resulting from the Proposed Action would be associated with emissions generated by the system's diesel engine and the system's onboard auxiliary power unit. There is also potential for increased idling emissions from inspected vehicles. Projected emissions were determined to be below levels that would cause measurable air quality degradation or require a conformity analysis under the Clean Air Act (CAA) (see section 3.3).

Radiological Health and Safety

Human Irradiation

While the use of any NII system must be evaluated to ensure that there are no adverse impacts to the health and safety of the public and CBP and station employees, backscatter X-ray inspection systems are designed and operated to avoid these impacts. As promulgated by the NRC in title 10 of the Code of Federal Regulations (CFR) part 20, the maximum permissible level of radiation dose to the general public is 0.1 rem in a year. This same standard has been adopted by the State of Arizona. CBP will use this protective limit for the public, CBP employees, and other station employees. The results of various tests conducted by CBP's Radiation Safety Officer (RSO) concluded that the maximum dose of radiation from the system, are expected to range from 118,483 to 0.25 times below CBP's annual radiation dose standard of 0.1 rem.

Food Irradiation

Additionally, the RSO conducted tests to determine the worst-case scenario of dose to food from system operations and it was determined that the total absorbed dose to food from a scan would be 59 million times less than the Federal Drug Administration's (FDA's) dose to food limit of 50 rem (21 CFR 179.21).

In summary, analysis and testing presented in this Draft EA shows that exposures from the system are expected to be well below the maximum levels of radiation exposure for humans and food adopted by the NRC, the Occupational Safety and Health Administration, the State of Arizona, and the FDA to protect workers and the general public. Therefore, no significant health effects from radiation exposure are expected as a result of the implementation of the Proposed Action.

National Security

Beneficial impacts to national security will occur as a result of implementing the Proposed Action by increasing interception of low density objects, including explosives, drugs and weapons, that are not effectively seen by current technologies, and preventing their entry into the United States.

Best Management Practices

In association with the Proposed Action, CBP identified a number of BMPs that would be implemented with the Proposed Action. These measures are designed to avoid, remedy, or reduce adverse impacts. These measures are not required as mitigation to reduce impacts to below significance thresholds.

Findings and Conclusions

Based upon the results of this Draft EA, it has been concluded that the Proposed Action, conducted in a manner consistent with applicable regulatory requirements, would not result in a significant impact on the quality of the environment, as defined in 40 CFR 1508.27 of the CEQ's regulations for implementing NEPA, as long as identified BMPs are followed. Therefore, issuance of a Finding of No Significant Impact is warranted, and preparation of an Environmental Impact Statement is not required.

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1 Introduction

This Draft Environmental Assessment (EA) reviews the environmental consequences expected to result from the deployment of one backscatter X-ray inspection system by the U.S. Customs and Border Patrol (CBP) at Wellton Station, to be operated in Yuma County, Arizona. This Draft EA is written to fulfill the requirements of the National Environmental Policy Act of 1969 (NEPA), 42 USC 4321 *et seq.*, as amended; the Council on Environmental Quality (CEQ) regulations implementing the procedural provisions of NEPA, title 40 of the Code of Federal Regulations (CFR) parts 1500-1508, and U.S. Department of Homeland Security (DHS) Management Directive (MD) 023-01 (formerly 5100.1) "Environmental Planning Program," which establishes policy and procedures to ensure the integration of environmental considerations into the Department of Homeland Security's mission planning and project decision making (DHS 2006).

1.1 Background

At the ports of entry (POEs), CBP's Office of Field Operations (OFO) secures the flow of people and cargo into and out of the country, while facilitating legitimate travel and trade. OFO's Strategic Plan, *Securing America's Borders at Ports of Entry, Office of Field Operations Strategic Plan FY 2007–2011*, defines CBP's national strategy for securing America's borders specifically at the POEs. OFO's strategic plan includes a mission statement that fully supports CBP's mission statement, but narrows the scope to POEs. *"Ports of entry are America's gateways. At ports of entry, CBP prevents entry of people and goods that are prohibited or threaten our citizens, infrastructure, resources, and food supply, while efficiently facilitating legitimate trade and travel.*"

Backscatter X-ray inspection systems directly support the four elements outlined below in the operational vision for secure borders at the POEs. The successful combination of these elements creates POEs where only lawful border crossers and legitimate goods are allowed to enter the United States:

> **Deterrence** – Potential violators are unwilling to attempt to enter the country through the POEs.
>
> **Interception** – Dangerous and inadmissible people and goods are detected and prevented from entry.
>
> **Facilitation** – Known low-risk people and goods are separated from those of higher risk and moved quickly and securely through the POE.
>
> **Consistency** – Violators have an equal risk of detection and prevention regardless of mode of transportation or port of entry.

1.2 Purpose and Need

The purpose of the Proposed Action is to non-intrusively scan vehicles for the presence of low density objects not normally seen with a transmission X-ray system, such as explosives and drugs. Backscatter X-ray technology is needed because it has a unique capacity to detect such objects that are not effectively visualized by other non-intrusive inspection (NII) technologies currently employed by CBP. Backscatter X-ray technology allows increased officer safety by inspecting vehicles, eliminating the need for officers to manually enter and inspect for contraband. Backscatter X-ray technology gives a clear image of the low density objects that may be hidden in car fenders, tires, trunks, gas tanks, and under hoods.

1.3 Public Involvement

In keeping with established policy regarding an open decision-making process, this Draft EA will be made available for a 30 day review period. Notice of Availability (NOA) of the Draft EA will be published in local newspapers. Following the Draft EA review period, a resulting decision document of either a Finding of No Significant Impact (FONSI) or a Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) will be made available to agencies and the general public for review and comment for 30 days. A NOA for the Draft EA and for the subsequent decision document will be published in local newspapers. Copies of the Draft EA and the decision document will be made available to the general public at local libraries (listed in the Distribution List of this document) and the following public review website: http://ecso.swf.usace.army.mil/Pages/Publicreview.cfm. The NOA will be inserted in the decision document as an appendix.

For further information on the Proposed Action or to request a copy of the Draft EA, please contact Mr. Guy Feyen, Project Manager, Office of Information and Technology, Laboratories and Scientific Services, Interdiction Technology Branch, 1300 Pennsylvania Avenue, NW, Suite 1575, Washington, DC 20229.

1.4 Agency Coordination

CBP consulted the State Historic Preservation Office (SHPO), the U.S. Fish and Wildlife Service (USFWS) and various Native American tribes regarding the Proposed Action. CBP determined that there were no historic, cultural, or biological resources within the station property that could be affected by the Proposed Action. Correspondence related to these determinations is included in Appendix A.

1.5 Framework for Analysis

This Draft EA was prepared in compliance with section 102 of NEPA, CEQ regulations for implementing the procedural provisions of NEPA (40 CFR parts 1500-1508) and DHS MD 023-01 (formerly 5100.1), Environmental Planning Program. NEPA directs Federal agencies to fully understand and take into consideration during decision-making, the environmental consequences of proposed Federal actions. This Draft EA is intended to be a concise public document that provides sufficient evidence and analysis for determining whether to prepare an EIS or a FONSI.

In addition to the evaluation for potential direct and indirect impacts, the Proposed Action was also evaluated for cumulative impacts on the environment as described later in chapter 4, “Cumulative Impacts,” of this Draft EA.

2 The Proposed Action and Alternatives

Under NEPA, the proponent for an action is responsible for considering a reasonable range of alternatives for achieving a goal or implementing a project or program. This section provides a description of the Proposed Action and alternatives considered in order to identify potentially affected environments and potential impacts to these environments. Nine alternatives were given an initial evaluation, but seven were rejected from further detailed consideration in this Draft EA, as discussed in section 2.4 below. Two alternative action scenarios were evaluated in detail for this Draft EA.

- Alternative 1: Fielding and operation of one backscatter X-ray inspection system at the station.
- Alternative 2: No Action Alternative. Inspections will continue at the station using existing technologies, as well as hands-on inspections by CBP officers.

Fielding and Operation of the system was chosen as the preferred alternative and is presented as the Proposed Action in this Draft EA, along with the No Action Alternative.

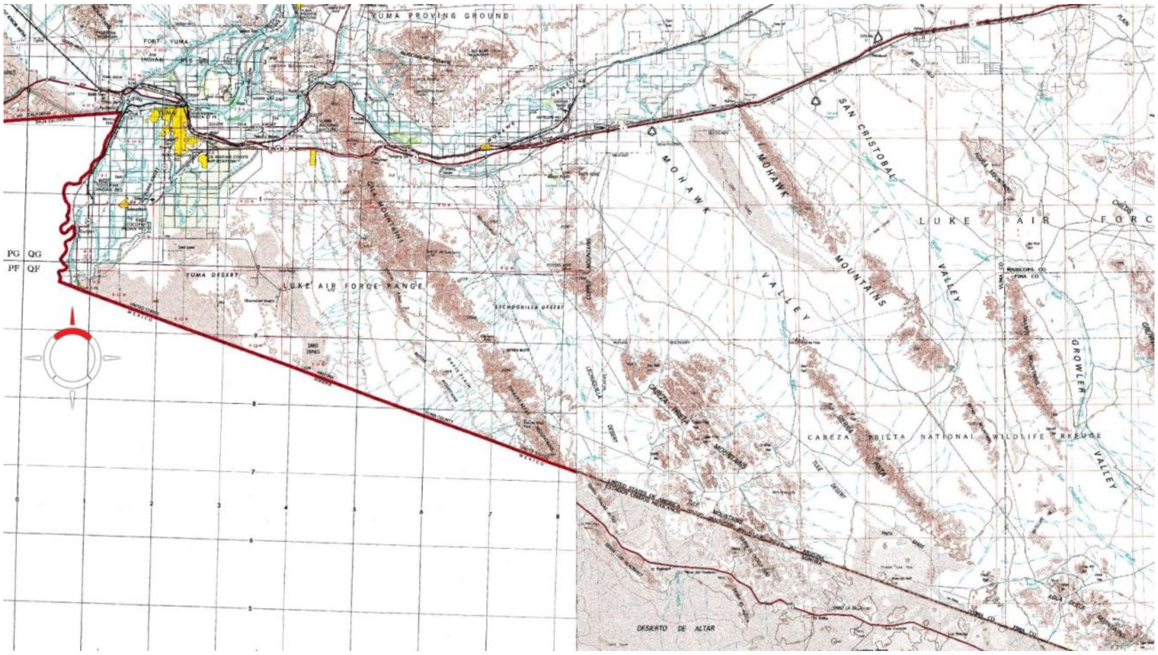
2.1 Alternative 1 – Proposed Action

The Proposed Action is to field and operate one backscatter X-ray inspection system at Wellton Station, to be operated in Yuma County, Arizona, for the purpose of conducting NIIs of vehicles for the presence of illegal substances, such as drugs and explosives, as well as for persons attempting to enter the country illegally. The system is a mobile scanning system, mounted on a truck or van type platform. The system may be operated in stationary mode, where the van is parked and can scan vehicles as they pass, or in mobile mode, where it can be driven along parked vehicles and scan them as it drives by. The system will be operated on developed surfaces[2] such as checkpoints and parking areas by CBP personnel. As a best management practice (BMP), the system will be set up with an established controlled area to ensure radiation exposure levels remain within standards set by the Nuclear Regulatory Commission (NRC). No additional employees, construction or infrastructure are required for the operation or storage of the system.

Wellton Station is located at 29820 Frontage Road, Wellton, Arizona. The station's area of responsibility covers approximately 65 miles of international boundary with Mexico, and a checkpoint on Interstate 8 (Figure 1) in Yuma County. The station's area of responsibility is arid, characterized by dry-desert vegetation and limited water resources.

[2] Developed surfaces are areas that have been subject to grading and/or filling and may be covered with gravel, asphalt or concrete.

Figure 1: Topographical View of Wellton Station's Area of Operations



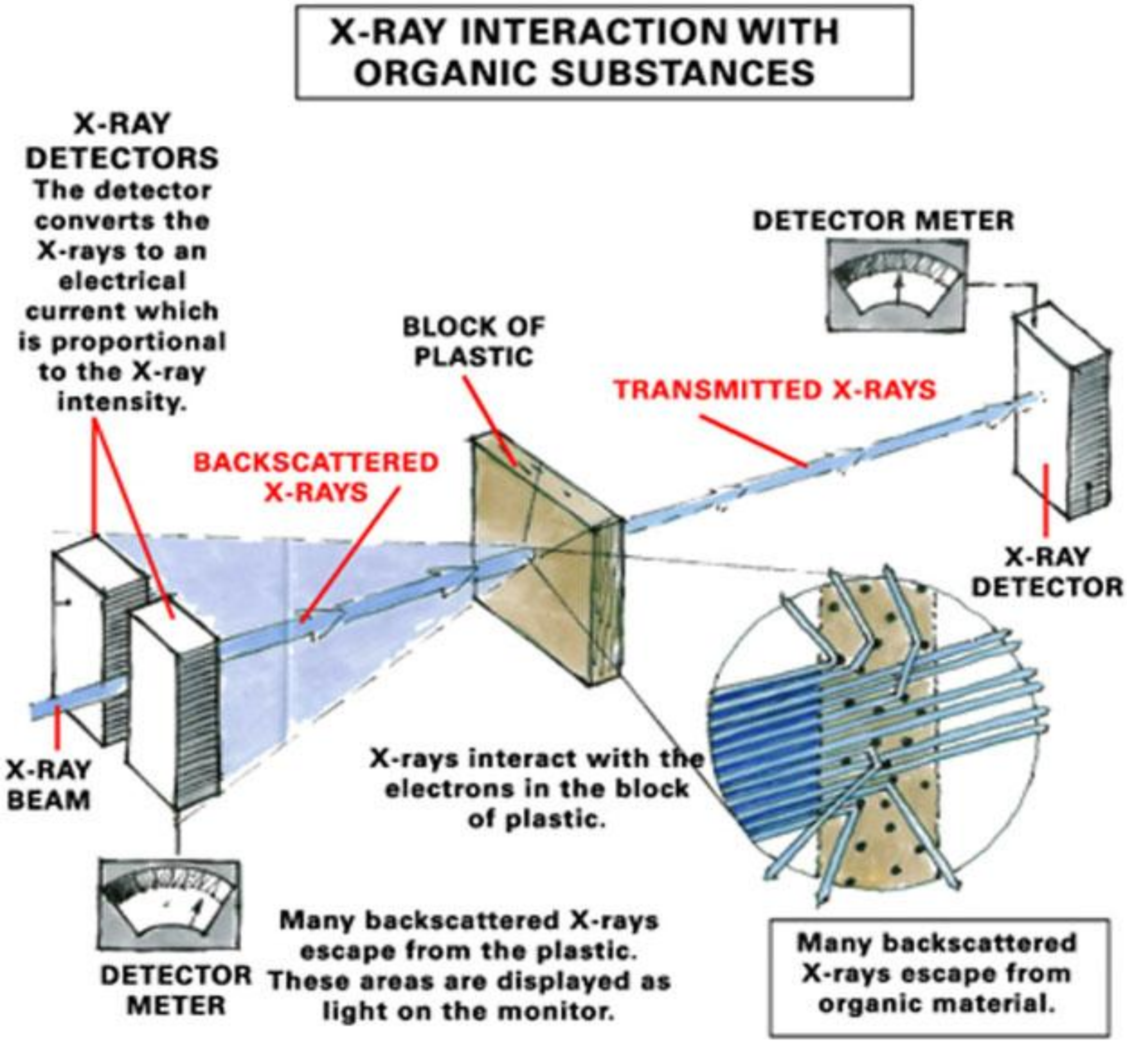
USGS

2.2 Description of the Backscatter X-Ray Technology

As radiation-producing devices, backscatter X-ray inspection systems are subject to review by Federal radiation protection authorities. These include the Occupational Safety and Health Administration (OSHA) and the Food and Drug Administration (FDA). The Arizona Radiation Regulatory Agency also regulates radiation-producing devices. It should be noted, however, that radiation equipment being operated by a Federal agency is not subject to state regulation. In view of that, information in this Draft EA about radiation regulation by the State of Arizona is provided for informational and comparative purposes only.

Although the system uses X-rays in the imaging process, it does not use X-rays in the same way that traditional systems do. The following paragraphs briefly describe technical and scientific features of the "backscatter" X-ray technology. A visual representation of the backscatter effect is presented in Figure 2 below.

Figure 2: Concept of Backscatter X-Ray Technology



When X-rays are directed at an object, there are generally three possible results:

- The X-rays pass through the object
- The X-rays are absorbed by the object
- The X-rays are scattered by the object

As a general rule, objects with high density absorb more X-rays than objects with low density. This attribute of X-rays is the basis for the creation of medical X-rays, or shadowgrams. In contrast low density materials scatter the X-rays, a phenomenon that is known as "Compton Scattering." High density number materials or elements are more likely to absorb X-rays rather than scatter them.

The system analyzes these "backscatter" photons to create their unique images. In doing so, the system utilizes a patented "Flying Spot," which allows the position of the X-ray beam to be defined at every instant of time. This capability allows any backscatter signal that is received to be easily correlated with the particular region of the vehicle undergoing inspection. This enables the system to generate high quality images of organic and low density materials even when such substances are hidden in a complex environment. This capability distinguishes the system from traditional X-ray inspection systems, which are suited to creating images of much denser substances.

Organic materials are effectively imaged by backscatter X-ray inspection systems because they contain low density elements such as carbon, oxygen, hydrogen, and nitrogen. This ability to create images of low density materials makes the system a valuable tool for intercepting such materials.

2.2.1 The Backscatter X-Ray Inspection System

Figure 3 shows a photograph of representative backscatter X-ray inspection system. The van is a Dodge/Freightliner/Mercedes Sprinter van equipped with a diesel engine and an automatic transmission, although the vehicle make and model are not critical to the functionality of the "backscatter" X-ray technology that is on board.

Figure 3: Typical Backscatter X-Ray Inspection System

2.2.2 Radiation Controlled Area

To meet the threshold radiation dose limit for CBP officers, station personnel, and the general public, CBP establishes controlled areas. "Controlled Area" is defined by 10 CFR 20.1003 as "an area, outside of a restricted area but inside the site boundary, access to which can be limited by the licensee for any reason." CBP has elected to use the term "controlled area" rather than "restricted area" as the systems are not in continuous scanning mode.

The controlled area limits the potential radiation dose to humans to below 0.00005 rem in any one hour. Personnel are required to remain behind a marker delineating a controlled area. This dose is inclusive of background radiation,[3] which accounts for approximately half (0.00002 to 0.00003 rem in any one hour) of the radiation dose. By controlling the hourly dose, CBP can effectively limit the annual cumulative dose (based on an annual maximum of 2,000 work hours of exposure time) to below the NRC's public annual radiation dose standard of 0.1 rem. See Appendix B and Appendix C for detailed information about radiation regulations and occupational risks.

The dimensions for the backscatter X-ray inspection system controlled area are 30 feet in length and 36 feet in width. The radiation controlled area travels with the system, is 24 feet from the side with the X-ray beam (the passenger side), and is 5 feet from the other three sides of the vehicle as shown in Figure 4. The vertical dimension of the system radiation controlled area is 24 feet. At the edges of this controlled area the radiation dose will not exceed 0.00005 rem in any one hour. The radiation dose of 0.00005 rem in any one hour includes background radiation.

The location of the controlled area can vary, depending on the needs of the station. Controlled area dimensions may be adjusted by using other shielding such as masonry walls or cargo containers. When adjustments to the radiation controlled area are required or requested, the CBP Radiation Safety Officer (RSO) will be on site in order to limit radiation exposure to 0.00005 rem in any one hour and 0.1 rem per year.

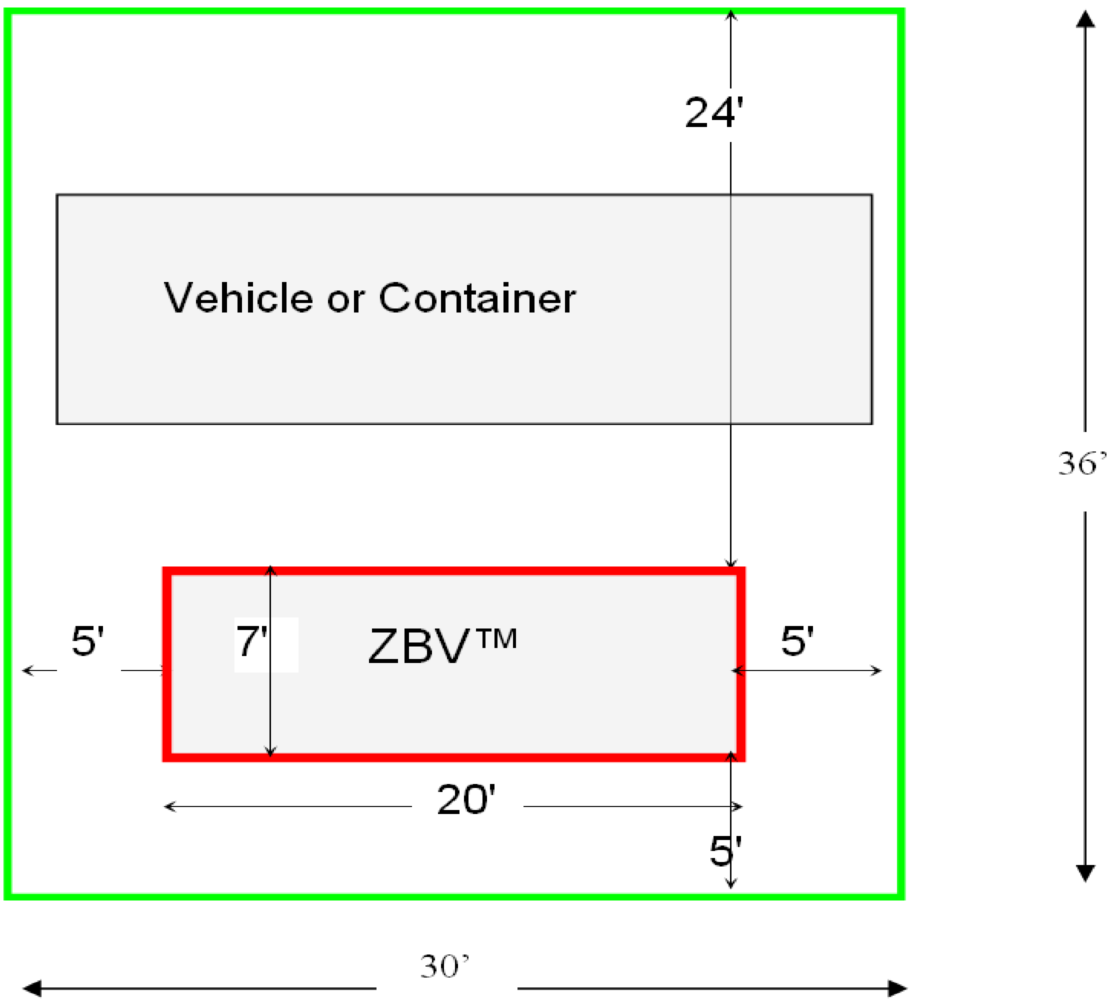
In the extreme, a system operator (or a member of the general public) could be situated at the edge of the controlled area 8 hours a day, every workday of the year (that is to say, 2,000 hours per year) and not exceed the annual radiation dose limits prescribed by the NRC and the State of Arizona. The controlled area ensures that the system conforms to the radiation protection guidelines of reducing the radiation levels to "As Low as is Reasonably Achievable" (ALARA).

ALARA is defined in 10 CFR 20.1003 as:

> *"making every reasonable effort to maintain exposures to radiation as far below the dose limits in this part as is practical consistent with the purpose for which the licensed activity is undertaken, taking into account the state of technology, the economics of improvements in relation to the state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed materials in the public interest."* In addition, 10 CFR 20.1101(b) requires that: *"[t]he licensee shall use, to the extent practical, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are as low as is reasonably achievable (ALARA)."*

[3] Naturally occurring radiation coming from outer space as cosmic radiation, or from naturally occurring radioactive elements such as uranium and radium in the materials of the earth.

Figure 4: Radiation Controlled Area



2.2.3 Radiation Safety Engineering Controls

The system incorporates redundant safety controls, such as emergency shutoff pushbuttons, at several locations on the systems. The personnel assigned to operate the system will be specifically trained for safe X-radiation system operations according to standards established by CBP's Office of Training and Development. Training for the system operators will consist of lectures, courses and a written examination in basic radiation physics, radiation safety, biological effects of radiation, instrumentation, radiation control and operating procedures during normal and emergency conditions.

2.3 Alternative 2 – No Action Alternative

The No Action Alternative is to continue to inspect cargo containers entering the United States at the station with existing equipment and methods. This inspection process involves visual and manual inspections with a limited number of tools. This approach is not as efficient and effective at detecting the range of materials that could be detected with backscatter X-ray technology in addition to current inspection techniques. Furthermore, it would not reduce the need for CBP officers to enter potentially dangerous situations to carry out these inspections. The No Action Alternative does not meet the purpose and need; however, it serves as a basis of comparison to the Proposed Action as required by CEQ regulations.

2.4 Other Alternatives Considered

Seven additional alternatives were evaluated on their ability to provide CBP with the capability to inspect vehicles for low density contraband and hidden persons:

- Alternative 3: X-Ray Imaging Systems
- Alternative 4: Gamma Imaging Systems (^{137}Cs/^{60}Co)
- Alternative 5: Trace-Chemical Detection Systems
- Alternative 6: Millimeter Wave Systems
- Alternative 7: Low-power Microwave Systems
- Alternative 8: Ultrasonic Imaging Systems
- Alternative 9: Quadrupole Resonance Imaging Systems

Each of the alternatives was evaluated on its ability to provide the required functional capability to support CBP's mission. All of the additional alternatives were determined to not be functionally viable in meeting the mission requirement for the following reasons and therefore were not carried forward for detailed analyses:

- Alternative (3), X-ray imaging systems, and Alternative (4), gamma imaging systems are less effective at identifying low density material; they require control areas that could not be accommodated within the limited space available at the station.
- Alternative (5), trace-chemical detection systems, requires either physical contact to collect samples of trace materials or uses gentle streams of air to dislodge and collect particles from the exterior surfaces of objects. Trace-chemical detection systems would not be able to determine the presence of contraband that may be concealed inside a vehicle where physical contact or use of a gentle stream of air was not possible. The possibility of contamination would need to be resolved.
- Alternative (6), millimeter wave systems, and Alternative (7), low-power microwave systems, do not have the power to penetrate metal objects, such as vehicles. They are further limited in their ability to scan vehicles in motion. While some are under review by DHS, none are likely to be available for fielding for years to come, if ever, and at this time do not appear to work for the needed operation at this location.
- Alternative (8), ultrasonic imaging systems require contact with the target. This is not practical for cargo and vehicle inspections.
- Alternative (9), quadrupole resonance imaging is susceptible to radio frequency interference from far field sources, such as AM radio transmitters, and near field sources, such as automobile ignitions and computers. This interference can be within the frequency regime of interest for substances such as TNT, whose

detection frequencies are below 1 MHz, right in the AM band. Quadrupole resonance imaging requires that the radio frequency field must penetrate to the contraband, and so no quadrupole signal is obtained from a metal cased object or vehicle. Therefore, quadrupole resonance imaging does not appear to meet the requirements of the agency at this location.

Given these limitations, backscatter X-ray technology is the only available technology that meets CBP's need.

3 The Affected Environment and Consequences

3.1 Introduction

This section describes the current condition of environmental resources at the operational sites of Wellton Station; where the system will be deployed and operated, and the possible impacts to these resources from the Proposed Action and alternatives. The descriptions represent baseline conditions for the comparison of changes caused by implementation of the Proposed Action and alternatives. Potential changes or impacts to the resources are described in each section as potential consequences. Cumulative impacts, or impacts attributable to the Proposed Action when combined with other past, present or reasonably foreseeable future impacts regardless of the source are presented in chapter 4.

3.1.1 Impact Characterization

Impacts include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health. Impacts may also include those resulting from actions which may have both beneficial and detrimental effects.

Direct impact - A direct impact is one that would be caused directly by implementing the alternative and that would occur at the same time and place.

Indirect Impact - An indirect impact is one that would occur later in time or farther removed in distance, but are still a reasonably foreseeable outcome of implementing an alternative. For example, indirect impacts are those that induce changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

3.1.2 Significance

Significance as used in NEPA requires considerations of both context and intensity. Context means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the Proposed Action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant. Intensity refers to the severity of impact. The following should be considered in evaluating intensity.

1. Impacts that may be both beneficial and adverse.
2. The degree to which the Proposed Action affects public health or safety.
3. Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.
4. The degree to which the effects on the quality of the human environment are likely to be highly controversial.

5. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.
6. The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.
7. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts.
8. The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.
9. The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.
10. Whether the action threatens a violation of Federal, state, or local law or requirements imposed for the protection of the environment.

3.1.3 Best Management Practices

CBP identified a number of BMPs that will be implemented for the Proposed Action. These practices are designed to ensure protection of the health and safety of CBP and station employees and the general public, and to avoid, remedy, or reduce adverse impacts associated with operation of the backscatter X-ray inspection system. BMPs are discussed in chapter 5.

3.2 Preliminary Impact Scoping

This section of the Draft EA describes the natural and human environment that exists within the project area and the potential impacts of the Proposed Action and No Action Alternative outlined in chapter 2 of this document. In keeping with the CEQ guidelines (40 CFR 1500.4) on reducing paperwork and focusing the analysis on issues of concern to the public and policymakers, only those environmental resources that could potentially be affected by any of the alternatives are provided. Some topics are limited in scope due to the lack of effect from the Proposed Action on the resource or because that particular resource is not located within the project area. Table 1 presents the results of the preliminary impact scoping and explains why various resource categories were excluded from further discussion in this Draft EA.

Table 1: Preliminary Impact Scoping

Resource	Description	Potential Impact (Yes/No)
Climate	The system's engine and onboard generator, as well as vehicles moving through the inspection process, will emit small amounts of air pollutants and greenhouse gases as a	No

Resource	Description	Potential Impact (Yes/No)
	result of the Proposed Action. Emissions will be *de minimis*, as defined by the Clean Air Act. Accordingly, effects on the climate are expected to be negligible.	
Geology and Soils	The system will be deployed on developed surfaces. No construction is required for the fielding or operation of the system. Therefore no impact to soils or geology is anticipated from the Proposed Action.	No
Hydrology and Water Quality	If a water resource exists near the system, then the system will not affect the resource because there will be no construction or ground disturbance, no direct or indirect contact with the resource, and the system will be operated only on developed surfaces.	No
Floodplains	There will be no construction or ground disturbance, therefore the Proposed Action will not affect floodplains. As a mobile asset, the system can be moved out of the area should a flood occur.	No
Wetlands	If wetlands exist near the system, then the system will not affect the resources because there will be no construction or ground disturbance, no direct or indirect contact with the resource, and the system will be operated only on developed surfaces.	No
Coastal Zone	The station is not in a coastal zone. The Proposed Action will not affect any coastal zone resources.	No
Vegetation and Wildlife	The system will be deployed and operated on developed surfaces and will not impact vegetation or wildlife resources.	No
Threatened and Endangered Species	The Proposed Action will take place upon developed surfaces where critical habitats have not been designated and suitable habitat does not exist. The Proposed Action will have no effect on threatened or endangered species. Correspondence related to this determination is included in Appendix A.	No
Air Quality	Air quality impacts associated with the Proposed Action would be limited to localized effects associated with emissions generated by the engine and diesel generator	Yes

Resource	Description	Potential Impact (Yes/No)
	on the system, as well as any idling vehicles during operations. Although emission levels are expected to be well below prescribed limits, further evaluation is warranted. See section 3.3 for further discussion of air quality.	
Noise	Noise conditions at the station's operational sites are typical of those associated with transportation hubs and industrial development. The deployment and operation of the system will not produce any significant noise.	No
Land Use and Zoning	The Proposed Action is consistent with current land use and zoning practices.	No
Aesthetics and Visual Resources	The station's operational sites are established transportation and industrial sites. The system is a mobile asset and its presence will be consistent with current aesthetics of the sites.	No
Infrastructure/Utilities	Adequate utilities exist at the station to support the Proposed Action.	No
Traffic / Transportation	The station's operational sites are located at existing transportation corridors. The Proposed Action will benefit the flow of traffic at the station by reducing wait times for inspections.	No
Hazardous Materials	The system might contain materials that could be hazardous if the materials are handled improperly. An example of such a material would be lead metal which is used for radiation shielding. As a system component, the lead will be innocuous and will provide protection from ionizing radiation. As a CBP asset, all materials within the system will be in use for their intended purpose, under the supervision of appropriately trained personnel. Under this scenario, there is no hazard to the human environment because the materials will be contained within the system as functional components of the system. In the event of an accident, hazardous materials would not be expected to cause any significant harm to the	No

Resource	Description	Potential Impact (Yes/No)
	human environment, because the amount of materials is small and most materials will be in solid form, which would be readily contained and recovered. In contrast to other NII systems such as gamma imaging systems, there is no radioactive source or byproduct material used in the system; therefore, there is no risk of a release of radioactive materials. Accident response procedures are in place at the station to contain and remove fluids such as lubricants and fuel. The most important action to ensure that hazardous materials have no significant effect on the human environment will be upon the replacement or decommissioning of a component or system. Appropriate disposition will depend upon type and quantity of materials involved and the applicable regulations. If a component is replaced or decommissioned, the handling, storage, use, transfer, and disposal of all materials will comply with all applicable Federal, state, or local environmental laws and regulations. These BMPs will prevent human exposure and releases to the environment of any hazardous material.	
Historic and Archeological (Cultural) Resources	The system is mobile and will be operated upon developed surfaces. There is no construction or excavation related to the Proposed Action. Implementing the Proposed Action will not have a significant impact on sites that are listed on, or potentially eligible for listing on, the National Register of Historic Places. Correspondence related to this determination is included in Appendix A.	No
Socioeconomics	The Proposed Action will not affect employment, housing, or demographics in the local area or region. Implementation of the Proposed Action may produce indirect socioeconomic effects by deterring the movement of illicit drugs, explosives, firearms, or other contraband into the United States. Similar indirect effects could result if the Proposed Action led to the apprehension of criminals or terrorists attempting to enter the United States. Such effects, however, are only theoretical and will not be further evaluated in this document.	No

Resource	Description	Potential Impact (Yes/No)
Environmental Justice	Implementation of the Proposed Action will not have any negative effect on minority and low-income populations or children.	No
Irreversible and Irretrievable Commitment of Resources	No sensitive environmental resources will be lost or permanently altered due to the Proposed Action.	No
Radiological Health and Safety	High levels of radiation have the potential to impact the health and safety of operators, officers, and the general public. Although exposures from the system are expected to be well below limits prescribed by the Environmental Protection Agency (EPA) and OSHA, further evaluation is warranted. See section 3.4 for further discussion.	Yes
National Security	Impacts to national security may occur by increasing interception of low density objects, including explosives, drugs and weapons that are not effectively seen by current technologies, and preventing their entry into the United States. See section 3.5 for further discussion.	Yes

3.3 Air Quality

3.3.1 The Affected Environment

Some areas of the station's area of operations are located in a nonattainment area for particulate matter less than 10 microns in diameter (PM-10) (EPA 2010).

3.3.2 Potential Consequences

Significance of potential impacts to air quality is based on whether the Proposed Action could result in air pollution that would violate prescribed limits in the region where the station exists. Air quality impacts could be considered significant if:

1. The Proposed Action resulted, directly or indirectly, in an exceedance of one or more of the NAAQS for criteria pollutants within the region of concern.
2. The Proposed Action is not in conformity with section 176 of the Clean Air Act (CAA) which requires Federal actions to conform to a state implementation plan (SIP) if such a plan is in effect in the area of the station.

3.3.2.1 Proposed Action

Direct Impacts

- The system's vehicle and diesel generator produce emissions that will directly impact air quality.

Indirect Impacts

- When operating in stationary mode, the system could contribute to increased idling times for vehicles waiting to be scanned. This scenario would indirectly impact air quality due to increased idling emissions from other vehicles.

ANALYSIS

The operation of the system will generate emissions from the vehicle's diesel engine, as well as an on-board diesel generator. The amount of emissions will be influenced by a number of factors, including the habits of the driver, the particular engine in the vehicle, engine maintenance, the hours of operation, and other variables. In view of these unknowns, the emissions analysis presented below will be based on maximizing assumptions in order to present the greatest foreseeable level of emissions. If these maximizing assumptions do not produce projected emissions levels that approach thresholds levels that trigger a conformity analysis, it will support a conclusion that the Proposed Action will not create significant air quality effects.

The system's vehicle is a Dodge/Freightliner/Mercedes Sprinter van that can be equipped with one of four different CDI (common-rail direct injection) diesel engines. The units available to CBP have the largest engine available, which is 156 horsepower (hp). For the sake of this analysis, it is assumed that the system will be equipped with this particular engine and operated 24 hours a day, either idling or moving at slow speed.

The second source of emissions will be the onboard generator that powers the scanning equipment. This generator is 15 kilowatt (kW) single phase and uses diesel fuel from the system's main fuel tank. The generator's engine is a Kubota V2203 diesel engine that produces 32.5 standby hp.

When the system is operated in stationary mode, vehicles are scanned as they proceed past the system. This scenario could cause vehicles waiting to be scanned to increase idling time and emissions. Emission estimates for vehicles that will be scanned assume that the system operates continually in stationary mode, and the system processes an average of 60 vehicles per hour (i.e. processing time equals 1 minute per vehicle and each system processes 1,440 vehicles per day). Idling emissions estimates are maximized here because:

- The system will not be operated continually in stationary mode.
- Local idling controls are not taken into account.
- The system will not be operated 24 hours per day.
- The system is able to process vehicles quickly and therefore it is not likely that vehicles will be idling in a queue awaiting inspection.

The EPA has determined that for an analysis not requiring detailed specific emission estimates tailored to local conditions, the summary of idle emission factors contained in EPA420-F-98-014 can be used to obtain first-order approximations of emissions under idling conditions. Idling emissions are summarized below in Table 2.

Table 2 also presents NOx, VOC, CO and PM-2.5 emissions estimates for the system's vehicle engine and onboard generator. Since actual emissions data from the system are not presently available, it is necessary to estimate emissions for these two engines using test data from other sources. For reasons stated above, the data and operational assumptions should overstate the actual emissions, which will help support a conclusion of "no significant effect" in cases where specific data are not available. The following is a list of assumptions and data sources used to generate emissions estimates provided in Table 2:

- Emissions estimates for the system's engine were derived from actual idling emissions samples from heavy heavy duty diesel vehicles (HHDDVs – greater than 8,500 pounds.) calculated by the Center for Alternative Fuels, Engines and Emissions (CAFEE) in 2005.
- Emissions estimates for the system's generator were derived from "emissions factors" used by the EPA for small diesel engines (AP-42)
- The system will be operated for 24 hours per day

With one exception, these data sources and assumptions will have the effect of overestimating the system's emissions. For instance, CAFEE test data from HHDDVs is based on tests on a variety of large diesel trucks with engines that are both older and larger than the CDI diesel engine. In addition, the CDI engine is continually being redesigned with emissions-reducing technologies that don't exist on older, large diesel engines. In contrast, one factor in the analysis will probably understate the system's emissions. Although the emissions estimates are based on idling emissions, the system will also "creep" as it moves past a vehicle during a scan. Creep is defined as moving between zero and ten miles per hour. Specific data on creep emissions are not available, although an analysis of data from the California Air Resources Board (CARB) indicates that NOx emissions in HHDDVs during low-speed transient operations are approximately double NOx idling emissions across the same time frame (Huai 2006). Since the system will creep for only brief periods as it scans vehicles, a failure to account for increased emissions during such low speed operations could potentially understate emissions by a small amount. However, since all other data and assumptions used in the analysis tend to overstate potential emissions to a considerable degree, failure to account for increased emissions under low speed transient operations should be more than offset by the other factors that are overestimating emissions.

Table 2: Emissions Estimate for Backscatter X-Ray Inspection System Operations

Source	NOx (tons/yr)	VOC (tons/yr)	CO (tons/yr)	PM-10 (tons/yr)	PM-2.5 [1] (tons/yr)
System Vehicle Emissions[2] (tons per year)	0.804	0.0917	0.225	0.0136	0.0125
System Generator Emissions[3] (tons per year)	4.39	0.377	0.951	0.314	0.289
Idling Emissions[4] (tons per year)	0.539	0.121	0.911	0.0250	0.0230
Total (tons/yr):	**5.74**	**0.589**	**2.09**	**0.352**	**0.324**

[1]Final PM-2.5 Calculation Methodology and PM-2.5 Significance Thresholds, South Coast Air Quality Management District. October 2006.
[2]Emission factor source for vehicles, "Idle Emissions from Heavy-Duty Diesel Vehicles" (CAFEE 2005).
[3]Emission factor source for generators, AP 42, Fifth Edition, Volume I, chapter 3, Gasoline and Diesel Industrial Engines (EPA 1996).
[4]Emission factor source for vehicles, "Idling Vehicle Emissions" (EPA 1998). Average of winter and summer factors for HDDV were used

These levels from direct and indirect consequences of the Proposed Action are not expected to result in air quality or SIP violations. These levels of emissions are *de minimis* relative to the conformance criteria that are applicable to nonattainment and maintenance areas for all pollutants as specified in 40 CFR 93.153(b)(1)(2). Therefore the Proposed Action is not anticipated to cause an exceedance of any standards for criteria pollutants.

3.3.2.2 No Action Alternative

Under the No Action Alternative, the inspection process at the station will be conducted with current techniques and equipment, including visual and manual inspections. There would be no direct or indirect impacts to air quality as a result of implementing the No Action Alternative.

3.4 Radiological Health and Safety

3.4.1 The Affected Environment

The affected environment is consistent with industrial areas. The affected environment includes the location at the station where the vehicles would be scanned, as well as the area immediately surrounding the backscatter X-ray inspection system itself. For purposes of discussion, people are classified into three categories:

1. General public, including vehicle occupants
2. CBP and station employees
3. Maintenance personnel

Cumulative effects of multiple NII are addressed in chapter 4.

3.4.1.1 Radiation Dose Standards

CBP Employees, Station Employees and the General Public: For its own employees, as well as station personnel and the general public, CBP has adopted the same radiation dose limit of 0.1 rem that the NRC prescribes for members of the general public. This same radiation dose limit has also been adopted by the State of Arizona, although the state has no regulatory jurisdiction over radiation producing equipment operated by CBP. CBP has adopted the NRC standard because OSHA only addresses "occupational dose" exposure limits. As defined by the International Commission on Radiological Protection (ICRP 2007), CBP officers could be considered "occupationally exposed," and therefore subjected to higher levels of radiation, because their assigned duties involve exposure to radiation or to radioactive material. Notwithstanding this standard, CBP has elected to limit the officers "occupational dose" to no more than that allowable for the general public, which is 50 times more stringent than occupational dose limits.

This limit applies to all CBP employees or contractors who operate the system. This means that, as far as radiation dose standards are concerned, CBP system operators are the same as members of the general public. For a more detailed discussion of dose standards, see Appendix B. Occupational exposure to the effective radiation dose standard CBP has adopted is not expected to cause a significant increase in the risk of cancer. For a more detailed discussion of information concerning health risks from occupational radiation exposure, see Appendix C.

Food: The FDA at 21 CFR 179.21 requires a label be affixed to each machine stating that no food shall be exposed to X-ray radiation sources to receive an absorbed dose in excess of 50 rem.

3.4.2 Potential Consequences

The radiation exposure pathway for the general public, and CBP and station employees is created from exposure to scattered radiation from the X-ray source during scanning operations. Significance of impacts to radiological health and safety is based on both the potential for an accident, and the consequences of any project-related effect associated with normal operations. An alternative could have a significant impact if it would increase or decrease the risk of exposure of personnel, the public, or food to health hazards including radiation, explosives, and drugs. BMPs described in chapter 5 will be implemented in a number of ways to ensure safety to CBP and station personnel, and the general public (including vehicle occupants), by limiting and preventing when possible, radiation exposure levels.

3.4.2.1 Proposed Action

Direct Impacts

- There would be direct adverse radiological impacts as a result of implementing the Proposed Action by increasing radiation exposure to both persons attempting to illegally enter the United States by hiding inside vehicles being scanned, as well as system maintenance personnel.

Indirect Impacts

- There could be indirect adverse radiological impacts as a result of implementing the Proposed Action by increasing the risk for CBP and station personnel, and members of the public, to develop negative health effects from radiation exposure if operational guidelines, and BMPs are not adhered to.

ANALYSIS

CBP and Station Personnel **-** CBP's RSO conducted testing to determine the absorbed dose that CBP officers could receive while operating the backscatter X-ray inspection system. This testing determined that the measured dose for system operators is 0.000000493 rem per scan, or an average of 0.000012 rem per hour. If the maximizing assumption is made that a CBP officer could spend 2,000 hours operating the system in a year, the greatest potential exposure in a year would be 0.024 rem (0.000012 rem per hour x 2,000 hours = 0.024 rem). This is less than one fourth the permissible maximum exposure rate of 0.1 rem in a year and one fourth of the maximum exposure rate of 0.00005 rem in any one hour that has been established by CBP.

As an additional precaution, as the system is delivered, exposure measurements will be made in all cabs and work-station areas to ensure that the systems are in compliance with exposure limits.

All other CBP and station personnel not involved in the operation of the system will be outside of the controlled area at all times. Therefore their exposure to radiation would be no more than that of system operators.

General Public **-** During backscatter X-ray inspection system operations, all vehicle occupants will be escorted to waiting areas outside the controlled area boundary where X-radiation from the system has diminished to negligible levels. In view of this, there is no health risk of radiation exposure to the general public who may be passing through the station, even if a person passes through the station numerous times in a year.

> **Stowaways** - However, there is the risk of radiation exposure to persons who might be hidden inside vehicles and attempting to enter the United States illegally. On rare occasions, people will hide themselves inside a vehicle or cargo container in order to surreptitiously enter the United States. A person concealed in a vehicle or cargo container that is scanned by a system will be exposed to radiation as a direct consequence of the inspection process.
>
> CBP's RSO conducted testing to determine the dose that a person hidden in a vehicle or cargo container would receive from a scan. This was determined to be approximately 0.000000844 rem. This dose is 426,540 times less than the average annual background dose in the United States of 0.360 rem and 118,483 times below levels permissible to the general public. Assuming 0.000000844 rem per scan, a person would have to be scanned 118,483 times in a year to reach the maximum allowable yearly dose of 0.1 rem. Since the chance of this frequency of

exposure is remote, it is concluded that radiation from the system will not have a significant impact on persons hidden in scanned vehicles or cargo containers.

Maintenance Personnel **-** All maintenance personnel who maintain the X-ray source components are employees of the equipment manufacturer. Due to the nature of their jobs, they have the potential to be exposed to a higher level of radiation than CBP and station personnel and other members of the general public. Their potential exposure levels are monitored by their employers. Maintenance of the X-ray source components will comply with the EPA, OSHA, and State of Arizona's strict occupational dose standards for radiation workers. For a more detailed discussion of dose standards, see Appendix B.

CBP officers will not perform any maintenance of the X-ray source components. CBP officers will periodically perform maintenance of the detectors and test the system using procedures described in the operator's manual. Non-routine maintenance of X-ray source components will be performed by the manufacturer.

Food **-** The CBP RSO conducted tests to determine the worst-case scenario for radiation doses to food from backscatter X-ray inspection system operations. The total absorbed dose to food was 0.000000844 rem per scan. This is minute relative to the average annual background dose in the United States of 0.360 rem. It is also much lower than the FDA's dose to food limit of 50 rem (21 CFR 179.21). The absorbed dose to food from a scan would be approximately 59 million times less than this limit.

Based on these measurements and in compliance with the provisions of 21 CFR 179.21 it is concluded that radiation from the Proposed Action will have no significant impact on food that may be located in scanned vehicles.

3.4.2.2 No Action Alternative

Under the No Action Alternative, the inspection process at the station will be conducted with current techniques and equipment, including visual and manual inspections. Persons entering the United States would not be exposed to radiation levels above those that are naturally occurring if the No Action Alternative is implemented. There would be no direct or indirect radiological impacts to human health and safety as a result of implementing the No Action Alternative.

3.5 National Security

3.5.1 The Affected Environment

CBP officers use a variety of methods and technologies to prevent illegal contraband and persons from entering the United States. Consequently, the state of national security is positively impacted when additional inspection tools and methodologies are used in this effort. Currently, officers conduct inspections manually and by using other types of NII equipment.

3.5.2 Potential Consequences

Significance of impacts to national security is based on the potential for low density objects to enter the United States. An alternative could have a significant impact if it would either increase or decrease the risk of public exposure to low density materials including contraband, explosives and drugs.

3.5.2.1 Proposed Action

Direct Impacts

- There would be direct beneficial impacts to national security as result of implementing the Proposed Action by increasing the interception of low density materials including contraband, explosives, and drugs entering the United States.

3.5.2.2 No Action Alternative

Indirect Impacts

- There would be indirect adverse impacts to national security as a result of implementing the No Action Alternative by not decreasing the potential for interception of low density materials including contraband, explosives, and drugs to enter the United States.

- There could be indirect adverse impacts to national security as a result of implementing the No Action Alternative by increasing the potential for terrorist acts using weapons of mass destruction within the United States and abroad.

4 Cumulative Impacts

4.1 Introduction

The CEQ regulations stipulate that the cumulative effects analysis in an Draft EA should consider the potential environmental impacts resulting from "the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions" (40 CFR 2508.7). Recent CEQ guidance (CEQ 1997) regarding cumulative effects affirms this requirement, stating that the first steps in assessing cumulative effects involves defining the scope of the other actions and their interrelationship with the Proposed Action. The scope must consider other projects that coincide with the location and timetable of the Proposed Action and other actions. Cumulative effects analysis must also evaluate the nature of interactions among these actions.

In this Draft EA, an effort has been made to identify all actions that are being considered and are in the planning phase at this time that could result in direct or indirect impacts to environmental resources in the vicinity of the proposed backscatter X-ray inspection system at Wellton Station. To the extent that details regarding such actions exist and the actions have a potential to interact with the Proposed Action in this Draft EA, these actions are included in this cumulative analysis. This approach enables decision-makers to have the most complete information available so that they can evaluate the environmental consequences of a Proposed Action in relation to other projects that may affect the same region of influence.

Cumulative Impacts - A cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Past and Present Actions - Past and present actions refer to actions that have taken place in the past or in the present that can have direct or indirect impacts that could combine with the impacts of the Proposed Action to produce cumulative impacts.

Reasonably Foreseeable Actions - Reasonably foreseeable actions refer to actions that will take place in the future that could have direct or indirect impacts that could combine with the impacts of the Proposed Action to produce cumulative impacts.

4.2 Past and Present Actions Relevant to the Proposed Action and Alternative

CBP operates presently, or plans to operate in the near future, other NII technologies suited to the various inspection needs at the station. This may lead to an increased potential for exposure of CBP officers, station personnel and the general public to additional sources of radiation. Additionally more space at the station will be utilized to include controlled areas for each system.

4.3 Reasonably Foreseeable Actions that Could Interact with the Proposed Action and Alternative

Over the course of time, there is the potential to deploy additional NII technologies at the station. Depending on which systems are deployed, this may lead to an increased potential for exposure of CBP officers, station personnel and the general public to additional sources of radiation. Additionally, as more systems are deployed, more space at the station will be utilized to include controlled areas for each system and consequently increased potential for human exposure to radiation.

4.4 Summary of Cumulative Effects

The potential for cumulative impacts resulting from the actions described above when combined with the Proposed Action in this Draft EA are summarized here. The scope of the cumulative effects analysis is limited to radiological health and safety, and spatial consideration of multiple NII systems. Other resources described in section 3.2 will not be impacted by the Proposed Action and therefore will not contribute to cumulative impacts.

Aside from NII equipment operated or proposed by CBP, there is no other known NII equipment at the station that could combine with the Proposed Action and cause a significant cumulative effect. NII equipment has little potential to create cumulative health impacts under normal operating conditions when the equipment is used for its intended purpose by qualified personnel under the supervision of a RSO in accordance with applicable health and safety regulations.

Controlled areas are determined for each NII system and are designed to provide adequate separation from other NII operating areas, adjacent structures, work areas and traffic flows to protect workers and the general public. Limiting access to the controlled areas ensures that the public (which includes system operators and station personnel) are not exposed to radiation levels exceeding those prescribed by state and Federal regulations (see Appendix B and Appendix C). In the event other NII technologies are planned for operation at the station, CBP will ensure that controlled areas for each technology are adequately designated and do not overlap with one another to prevent any cumulative radiological health and safety impacts.

The system and associated controlled area will occupy a maximum of 1,080 square feet of space at the station during operations. There are no other NII systems requiring controlled areas at the project site. The station has adequate space to accommodate the system.

5 Best Management Practices

CBP identified a number of BMPs that will be implemented for the Proposed Action. These measures are designed to avoid, remedy, or reduce adverse impacts associated with operation of the backscatter X-ray inspection system.

BMP for Radiological Health and Safety – BMPs for Radiological Health and Safety include but are not limited to:

- Incorporation of safety warnings and precautions into technical manuals and operator manuals.
- Training of operators and supervisors in the hazards associated with radiation producing equipment.
- Incorporation of emergency stop buttons on the equipment.
- Training operators and supervisors in the location and use of emergency stop buttons.
- The establishment of a radiation "controlled area" during operations.

The combination of these precautions will ensure that the cumulative radiation dose to officers and the general public will not exceed 0.00005 rem in any one hour or 0.1 rem per year.

BMPs for Wastes - Wastes associated with the Proposed Action are used oil and lubricants for the operation and maintenance of the system. These will be accumulated in approved containers at or near the point of generation and recycled for use again by a licensed waste recycling company. 40 CFR 279 exempts used oil and lubricants from consideration as a hazardous waste if they are managed through a used oil recycler and are not mixed with any other hazardous wastes. The operation and maintenance of the system would not result in generation rates that would exceed 100 kilograms (220 pounds) of waste in any calendar month (conditionally exempt generator).

BMPs for Air - To reduce emissions from the Proposed Action, vehicles waiting for inspection by the system will comply with all applicable federal, state, or local environmental laws and regulations regarding the control of idling times. The system's vehicle meets the Best Available Control Technology as defined by the EPA.

6 Findings and Conclusions

Based upon the analysis in this Draft EA, it is concluded that the Proposed Action, conducted in a manner consistent with applicable regulatory requirements and BMPs would not result in a significant impact on the quality of the environment, as defined in 40 CFR 1508.27 of the CEQ's regulations for implementing NEPA. Therefore, issuance of a FONSI is warranted, and preparation of an EIS is not required.

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8 Acronyms and Abbreviations

^{137}Cs	Cesium 137
^{60}Co	Cobalt 60
µrad	microrad
µrem	microrem
AAC	Arizona Administrative Code
ALARA	As Low As is Reasonably Achievable
AM	Amplitude Modulation
ARS	Arizona Revised Statute
BEIR	Biological Effects of Ionizing Radiation
BMP	Best Management Practice
CAA	Clean Air Act
CAFEE	Center for Alternative Fuels, Engines and Emissions
CARB	California Air Resources Board
CBP	Customs and Border Protection
CCR	California Code of Regulations
CDI	Common-rail Direct Injection
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CSI	Container Security Initiative
DHS	Department of Homeland Security
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
erg	an erg is a small but measurable amount of energy
FDA	Food and Drug Administration
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
FR	Federal Register
GSA	Government Services Administration
Gy	Gray
HDD	Heavy Duty Diesel
HDDV	Heavy Duty Diesel Vehicle
HHDDV	Heavy Heavy Duty Diesel Vehicle
hp	horsepower
H_T	Dose equivalent
Hz	Hertz
ICRP	International Commission on Radiological Protection
INS	Immigration and Naturalization Service
ITB	Interdiction Technology Branch
lb	pound
LSS	Laboratories and Scientific Services
MD	Management Directive
MHz	Megahertz
mrad	millirad
mrem	millirem

NAA	Nonattainment Area
NAAQS	National Ambient Air Quality Standards
NCRP	National Council on Radiation Protection
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NII	Non-Intrusive Inspection
NOA	Notice of Availability
NOI	Notice of Intent
NRC	Nuclear Regulatory Commission
NRCS	Natural Resources Conservation Service
OFO	Office of Field Operations
OIT	Office of Information and Technology
ONDCP	Office of National Drug Control Policy
OSH Act	Occupational Safety and Health Act
OSHA	Occupational Safety and Health Administration
PEA	Programmatic Environmental Assessment
POE	Port of Entry
rad	radiation absorbed dose
rem	roentgen equivalent man
rpm	revolutions per minute
R	Roentgen
RSO	Radiation Safety Officer
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
Sv	sievert
TEDE	Total Effective Dose Equivalent
UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation
USC	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

9 List of Preparers

Name	Discipline/Expertise	Experience	Role
Gary Armstrong	Environmental Planning/NEPA Analyst	17 Years in NEPA and related studies	Impact analysis, technical review
Darrell Mensel	Environmental Planning/Natural Resources	15 years in NEPA and related studies	Research, impact analysis
Kathryn Child	Chemistry, Licensed Environmental Health Scientist	16 years in environmental science and regulatory compliance	Technical review and editing
Anneke Frederick	Environmental Scientist	16 years in environmental science	Technical review and editing
Wes Johnson	Environmental Analyst/GIS Specialist	21 years in NEPA and related studies	Research, impact analysis

10 Distribution List

Field Supervisor
U.S. Fish and Wildlife Service
Southwest Region Ecological Services
2321 W. Royal Palm Rd, Ste 103
Phoenix, AZ 85021-4957

JoAnne Medley
Arizona State Parks
State Historic Preservation Office
1300 W. Washington
Phoenix, AZ 85007

The Honorable Sherry Cordova, Chairperson
Cocopah Tribe of Arizona
County 15th & Avenue G
Somerton, AZ 85350

The Honorable Daniel Eddy, Jr. Chairman
Colorado River Indian Tribes
26600 Mohave Road
Parker, AZ 85344

The Honorable Mike Jackson, Sr., President
Quechan Tribe of the Fort Yuma Indian Reservation
P.O. Box 1899
Yuma, AZ 85366

Station Director
Wellton Station
U.S. Customs and Border Protection
P. O. Box 128
Wellton, AZ 85356

Librarian
Yuma county Library
185 Main Street
Yuma, AZ 85364

Librarian
Cocopah Tribal Library
14250 S. Avenue I
Somerton, AZ 85350

The Honorable Jon Kyl
United States Senate
730 Hart Senate Office Building
Washington, DC 20510-0001

The Honorable John McCain
United States Senate
241 Russell Senate Office Building
Washington, DC 20510-0001

The Honorable Raul M. Grijalva
United States House of Representatives
1440 Longworth House Office Building
Washington, DC 20515-0001

The Honorable Jan Brewer
Office of the Governor
1700 West Washington
Phoenix, AZ 85007

Jennifer Hass
Environmental Program Office
U.S. Customs and Border Protection
1300 Pennsylvania Avenue, NW
Suite 1220
Washington, DC 20229

Steve Tilden
Radiation Safety Officer
US Customs and Border Protection
7799 Leesburg Pike, Room 6213
Falls Church, VA 20598

Carolyn Whorton
NII Program Manager
U.S. Customs and Border Protection
Interdiction Technology Branch
1300 Pennsylvania Avenue NW, Suite 1575
Washington, DC 20229

Ed Mata
13635 Antelope Station
Poway, CA 92064

James Wall
1441 Cedar Lane
Estes Park, CO 80517

Joe Beaver
2506 East Sauk Court
Sierra Vista, AZ 85650

Scott Stovin
282 Crooked Gulley Circle
Sunset Beach, NC 28468

Tom Duncan
20543 Crescent Pointe Place
Ashburn, VA 20147

Troy Freeman
7820 NW 25th Terrace
Bethany, OK 73008

Ken Studt
45870 Broun Terrace
Great Mills, MD 20634-2542

Pat Kelly
1006 E. Henry Street
Hamilton, TX 76531

Appendix A: Correspondence

U.S. Department of Homeland Security
Washington, DC 20229

U.S. Customs and
Border Protection

September 7, 2010

Field Supervisor
U.S. Fish and Wildlife Service
Southwest Region Ecological Services
2321 W. Royal Palm Rd, Ste 103
Phoenix, AZ 85021-4957

SUBJECT: Deployment and Operation of a Mobile Backscatter X-Ray Inspection System at Wellton Station, Yuma County, Arizona

Dear Supervisor:

The U.S. Customs and Border Protection (CBP), Office of Information and Technology, Laboratories and Scientific Services, Interdiction Technology Branch is notifying you of the proposed action noted above which consists of the deployment and operation of a backscatter X-ray inspection system at Wellton Station to be operated in Yuma County, Arizona. The station is located at 29820 Frontage Road, Wellton, Arizona. The station's area of responsibility covers approximately 65 miles of international boundary with Mexico, and a checkpoint on Interstate 8 in Yuma County

The purpose of the proposed action is to enable CBP to non-intrusively screen vehicles and cargo for the presence of low density objects, such as explosives and drugs. The system uses standard transmission X-rays combined with a backscatter capability that detects low density objects such as explosives, organics, and plastics, which are not normally seen when using a transmission X-ray. No X-rays will be produced when the system is not operated. The system is mobile and will be deployed and operated on developed surfaces (at the station's checkpoint for example). No construction is required.

The locations where the system will be operated do not have suitable habitat conditions for any threatened or endangered species that may occur in the vicinity, nor are they considered critical habitat for any species. Therefore, CBP has determined that no threatened or endangered species will be affected by the proposed action. We request your concurrence with this determination.

Please provide your response and/or questions to me at: 1300 Pennsylvania Ave, NW, Suite 1575, Washington, DC 20229; fax (202) 344-1418; telephone (202) 344-1531; or e-mail guy.feyen@dhs.gov. Thank you in advance for your assistance.

Sincerely,

Guy
Feyen

Guy Feyen
Project Manager
Office of Information and Technology
Laboratories and Scientific Services
Interdiction Technology Branch

Enclosures

U.S. Department of Homeland Security
Washington, DC 20229

U.S. Customs and
Border Protection

September 1, 2010

JoAnne Medley
Arizona State Parks
State Historic Preservation Office
1300 W. Washington
Phoenix, AZ 85007

SUBJECT: Deployment and Operation of a Mobile Backscatter X-Ray Inspection System at Wellton Station, Yuma County, Arizona

Dear Ms. Medley:

The U.S. Customs and Border Protection (CBP), Office of Information and Technology, Laboratories and Scientific Services, Interdiction Technology Branch is notifying you of the proposed action noted above which consists of the deployment and operation of a backscatter X-ray inspection system at Wellton Station to be operated in Yuma County, Arizona. The station is located at 29820 Frontage Road, Wellton, Arizona. The station's area of responsibility covers approximately 65 miles of international boundary with Mexico, and a checkpoint on Interstate 8 in Yuma County

The purpose of the proposed action is to enable CBP to non-intrusively screen vehicles and cargo for the presence of low density objects, such as explosives and drugs. The system uses standard transmission X-rays combined with a backscatter capability that detects low density objects such as explosives, organics, and plastics, which are not normally seen when using a transmission X-ray. No X-rays will be produced when the system is not operated. The system is mobile and will be deployed and operated on developed surfaces (at the station's checkpoint for example). No construction is required.

No properties or items of historic significance are known to exist at locations where the system will be operated. Therefore, we have determined that no historic properties listed or eligible for listing within the National Register of Historic Places will be affected by the proposed undertaking. We request your concurrence with our determination.

Please provide your response and/or questions to me at: 1300 Pennsylvania Ave, NW, Suite 1575, Washington, DC 20229; fax (202) 344-1418; telephone (202) 344-1531; or e-mail guy.feyen@dhs.gov. Thank you in advance for your assistance.

Sincerely,

Guy Feyen Digitally signed by Guy Feyen
DN: cn=Guy Feyen, c=US, o=Interdiction Technology Branch, ou=OIT/LSS/ITB, email=guy.feyen@dhs.gov
Date: 2010.09.08 08:11:18 -04'00'

Guy Feyen
Project Manager
Office of Information and Technology
Laboratories and Scientific Services
Interdiction Technology Branch

Enclosures

U.S. Department of Homeland Security
Washington, DC 20229

U.S. Customs and
Border Protection

September 1, 2010

The Honorable Daniel Eddy, Jr. Chairman
Colorado River Indian Tribes
26600 Mohave Road
Parker, AZ 85344

SUBJECT: Deployment and Operation of a Mobile Backscatter X-Ray Inspection System at Wellton Station, Yuma County, Arizona

Dear Chairman Eddy:

The U.S. Customs and Border Protection (CBP), Office of Information Technology, Laboratories and Scientific Services, Interdiction Technology Branch is notifying you of the proposed action noted above. In accordance with Section 106 of the National Historic Preservation Act and its implementing regulations, 36 CFR Part 800, CBP wishes to continue our consultation process with the appropriate federally recognized Native American tribes who historically used this region or continue to use this area. We welcome your comments on this undertaking and look forward to hearing from you regarding known sacred sites or other traditional cultural properties within the proposed project area.

The proposed action consists of the deployment and operation of a backscatter X-ray inspection system at Wellton Station to be operated in Yuma County, Arizona. The station is located at 29820 Frontage Road, Wellton, Arizona. The station's area of responsibility covers approximately 65 miles of international boundary with Mexico, and a checkpoint on Interstate 8 in Yuma County

The purpose of the proposed action is to enable CBP to non-intrusively screen vehicles and cargo for the presence of low density objects, such as explosives and drugs. The system uses standard transmission X-rays combined with a backscatter capability that detects low density objects such as explosives, organics, and plastics, which are not normally seen when using a transmission X-ray. No X-rays will be produced when the system is not operated. The system is mobile and will be deployed and operated on developed surfaces (at the station's checkpoint for example). No construction is required.

If you have any questions or responses to the above, please feel free to contact me at: 1300 Pennsylvania Ave, NW, Suite 1575, Washington, DC 20229; fax (202) 344-1418; telephone (202) 344-1531; or e-mail guy.feyen@dhs.gov.

Sincerely,

Guy Feyen Digitally signed by Guy Feyen

Guy Feyen
Project Manager
Office of Information and Technology
Laboratories and Scientific Services
Interdiction Technology Branch

Enclosures

U.S. Department of Homeland Security
Washington, DC 20229

U.S. Customs and
Border Protection

September 1, 2010

The Honorable Sherry Cordova, Chairperson
Cocopah Tribe of Arizona
County 15th & Avenue G
Somerton, AZ 85350

SUBJECT: Deployment and Operation of a Mobile Backscatter X-Ray Inspection System at Wellton Station, Yuma County, Arizona

Dear Chairperson Cordova:

The U.S. Customs and Border Protection (CBP), Office of Information Technology, Laboratories and Scientific Services, Interdiction Technology Branch is notifying you of the proposed action noted above. In accordance with Section 106 of the National Historic Preservation Act and its implementing regulations, 36 CFR Part 800, CBP wishes to continue our consultation process with the appropriate federally recognized Native American tribes who historically used this region or continue to use this area. We welcome your comments on this undertaking and look forward to hearing from you regarding known sacred sites or other traditional cultural properties within the proposed project area.

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Guy Feyen Digitally signed by Guy Feyen
DN: cn=Guy Feyen, c=US, o=Interdiction Technology Branch, ou=OIT/LSS/ITB, email=guy.feyen@dhs.gov
Date: 2010.09.09 08:11:35-04'00'

Guy Feyen
Project Manager
Office of Information and Technology
Laboratories and Scientific Services
Interdiction Technology Branch

Enclosures

U.S. Department of Homeland Security
Washington, DC 20229

U.S. Customs and
Border Protection

September 1, 2010

The Honorable Mike Jackson, Sr., President
Quechan Tribe of the Fort Yuma Indian Reservation
P.O. Box 1899
Yuma, AZ 85366

SUBJECT: Deployment and Operation of a Mobile Backscatter X-Ray Inspection System at Wellton Station, Yuma County, Arizona

Dear President Jackson:

The U.S. Customs and Border Protection (CBP), Office of Information Technology, Laboratories and Scientific Services, Interdiction Technology Branch is notifying you of the proposed action noted above. In accordance with Section 106 of the National Historic Preservation Act and its implementing regulations, 36 CFR Part 800, CBP wishes to continue our consultation process with the appropriate federally recognized Native American tribes who historically used this region or continue to use this area. We welcome your comments on this undertaking and look forward to hearing from you regarding known sacred sites or other traditional cultural properties within the proposed project area.

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If you have any questions or responses to the above, please feel free to contact me at: 1300 Pennsylvania Ave, NW, Suite 1575, Washington, DC 20229; fax (202) 344-1418; telephone (202) 344-1531; or e-mail guy.feyen@dhs.gov.

Sincerely,

Guy Feyen
Digitally signed by Guy Feyen
DN: cn=Guy Feyen, c=US, o=Interdiction Technology Branch, ou=OIT/LSS/ITB, email=guy.feyen@dhs.gov
Date: 2010.09.08 08:11:58 -04'00'

Guy Feyen
Project Manager
Office of Information and Technology
Laboratories and Scientific Services
Interdiction Technology Branch

Enclosures

Appendix B: Background Information on Ionizing Radiation

The background material contained in this appendix is excerpted from information found in National Council on Radiation Protection and Measures (NCRP) *Uncertainties in Fatal Cancer Risk Estimates Used in Radiation Protection, NCRP Report Number 126*, and is intended to provide the user with the best available background and regulatory information on ionizing radiation.

• Measurement of Radiation Dose

Radiation is measured using units that people seldom encounter. It is important to relate the amount of radiation received by the body to its physiological effects. Two terms used to relate the amount of radiation received by the body are "absorbed dose" and "dose equivalent."

Absorbed dose means the energy imparted by ionizing radiation per unit mass of irradiated material. The units of absorbed dose are the rad and the gray (Gy).

The term "rad" (radiation absorbed dose) is the special unit of absorbed dose of 100 ergs per gram. Different materials that receive the same exposure may not absorb the same amount of energy. The rad is the basic unit of the absorbed dose of radiation (i.e., alpha, beta, gamma, and neutron) to the energy they impart in materials. The dose of one rad indicates the absorption of 100 ergs (an erg is a small but measurable amount of energy) per gram of absorbing material. To indicate the dose an individual receives in the unit rad, the word "rad" follows immediately after the magnitude, for example "50 rad." One thousandth of a rad (millirad) is abbreviated "mrad," and one millionth of a rad (microrad) is abbreviated "µrad."

Dose equivalent (H_T) means the product of the absorbed dose in tissue, quality factor, and all other necessary modifying factors at the location of interest. The units of dose equivalent are the rem and sievert (Sv). At the present time, rem is used in the United States while sieverts are used internationally. Eventually, the United States will adopt these international terms.

The term "rem" (Roentgen equivalent man) is a special unit used for expressing dose equivalent. Some types of radiation produce greater biological effects for the same amount of energy imparted than other types. The rem is a unit that relates the dose of absorbed radiation to the biological effect of that dose. Therefore, to relate the absorbed dose of specific types of radiation, a "quality factor" must be multiplied by the dose in rad. To indicate the dose an individual receives in the unit rem, the word "rem" follows immediately after the magnitude, for example "50 rem." One thousandth of a rem (millirem) is abbreviated "mrem," and one millionth of a rem (microrem) is abbreviated "µrem." The quality factor allows for the effect of higher energy deposition along particle tracks produced by various radiation types such as neutrons or alpha particles.

Regulations Covering Radiation Dose

Regulations pertaining to radiation exposure are administered by many different Federal and state agencies under a variety of legislative authorities.

- **Nuclear Regulatory Commission (NRC) (10 CFR Part 20)**

The Nuclear Regulatory Commission (NRC) promulgates regulations and establishes standards for protection against radiation arising out of activities conducted under licenses issued by the Commission. NRC regulations control the receipt, possession, use, transfer, and disposal of licensed material by any licensee. CBP currently holds an NRC Materials License for ^{137}Cs/ ^{60}Co sealed sources. Backscatter X-ray inspection systems do not require source or byproduct material for their operation; therefore these regulations do not apply. However, as discussed above; CBP uses the levels provided by the NRC as a conservative approach for limiting radiation exposure by the systems.

- **Occupational Safety and Health Administration (OSHA) (29 CFR 1910.1096)**

OSHA regulations establish standards for protection against ionizing radiation that result in an occupational risk, but do not regulate the safety of licensed radioactive materials.

- **Food and Drug Administration (FDA) (21 CFR 1020) Performance Standards for Ionizing Radiation Emitting Products)**

The Food and Drug Administration (FDA) promulgates regulations and establishes standards for the protection against radiation by setting performance standards that manufacturers of ionizing radiation emitting products must meet.

- **Environmental Protection Agency (EPA) (Radiation Protection Guidance to Federal Agencies for Occupational Exposure FR 52 2822 January 27, 1987)**

Federal radiation exposure protection guidance for occupational exposure is defined in *Radiation Protection Guidance to Federal Agencies for Occupational Exposure.* Administered by the EPA, the guidance was developed cooperatively by the NRC, the Occupational Safety and Health Administration, the Mine Safety and Health Administration, the Department of Defense, the Department of Energy, the National Aeronautics and Space Administration, the Department of Commerce, the Department of Transportation, the Department of Health and Human Services, and the Environmental Protection Agency. The guidance provides general principles, and specifies the numerical primary guides for limiting worker exposure. It applies to all workers who are exposed to radiation in the course of their work, either as employees of institutions and companies subject to Federal regulation or as Federal employees. It is expected that individual Federal agencies, on the basis of their knowledge of specific worker exposure situations, will use the guidance as the basis upon which to revise or develop detailed standards and regulations to the extent that they have regulatory or administrative jurisdiction.

- **State Regulations**

Many states have adopted regulations modeled on the *Suggested State Regulations for Control of Radiation.*

State of Arizona (Arizona Administrative Code R12-1 and Arizona Revised Statute 30-651)

The Arizona Radiation Regulatory Agency regulates ionizing and non-ionizing sources of radiation to the extent authorized by the NRC. The Arizona Administrative Code (AAC) R12-1, "Radiation Regulatory Agency" and Arizona Revised Statute (ARS) 30-651 govern the regulatory program for any person who is licensed to receive or process radioactive materials, as defined, and not exempted.

Without Congressional expression that sovereign immunity is waived, a federal agency would not be subject to these state regulations. The state implicitly recognizes this in their regulations which exclude federal government agencies from the scope of the state's radiation regulations (AAC R12-1-102 and ARS 30-651).

Regulatory Jurisdiction

As it applies to the operation of backscatter X-ray inspection systems, the applicable regulations are FDA (21 CFR Part 1020) and OSHA (29 CFR 1910.1096).

- The NRC Guidance provided in 10 CFR Part 20 Standards for Protection Against Radiation apply to persons licensed by the Commission to receive, possess, use , transfer, or dispose of byproduct, source, or special nuclear material or to operate a production or utilization facility.
- The EPA guidance provided in FR 52 2822, *Radiation Protection Guidance to Federal Agencies for Occupational Exposure,* is to be used as the basis upon which individual Federal agencies revise or develop detailed standards and regulations to the extent that they have regulatory or administrative jurisdiction.

Dose Limits

Dose limits represent the upper bound limit below which risks from radiation exposure are deemed to be acceptable. Various Federal and state regulations establish dose limits for occupational exposures that occur as a result of a person's employment, and limits for the total exposures received by the public in general.

In 10 CFR Part 20 and AAC 12-1-102, the NRC and the State of Arizona identify two classifications of radiation dose to people.

The first classification, "occupational dose," is

> *"the dose received by an individual in the course of employment in which the individual's assigned duties involve exposure to radiation or to radioactive material from licensed and unlicensed sources of radiation, whether in the possession of the*

> *licensee or other person. Occupational dose does not include doses received from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released under §35.75, from voluntary participation in medical research programs, or as member of the public"* (20 CFR. 20.1003 and AAC 12-1-102).

The individuals subject to the occupational dose classification must closely monitor their degree of radiation exposure using dosimeters. The annual occupational dose limit for adults shall not exceed whichever is the more limiting of: a total effective dose equivalent of 5 rems or the sum of the deep-dose equivalent and the committed dose equivalent to any individual organ or tissue other than the lens of the eye being equal to 50 rem (10 CFR. 20.1201 and AAC 12-1-408).

The second radiation dose classification, "public dose," is

> *"the dose received by a member of the public from exposure to radiation or to radioactive material released by a licensee, or to another source of radiation under the control of a licensee. Public dose does not include occupational dose or doses received from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released under §35.75 or from voluntary participation in medical research programs"* (10 CFR. 20.1003 and AAC 12-1-102).

The total effective dose equivalent to individual members of the general public from the licensed operations shall not exceed 0.1 rem in a year (10 CFR 20.1301 and AAC 12-1-408). A summary of pertinent dose limits is presented below in Table 3.

Table 3: Summary of Regulatory Dose Limits

Dose Limit by Agency and Regulation (rem in a year)				
	NRC 10 CFR 20	**EPA 52 FR 2822**	**Arizona AAC 12-1-408, 414, 415, 416**	**OSHA 29 CFR 1910.1096**
"Occupational Dose" = "Radiation Workers" in "Restricted Areas"				
Whole Body	5	5	5	5 (1.25 rem/calendar quarter)
Lens of Eye	15	15	15	5 (1.25 rem/calendar quarter)
Skin, Hands and Feet	50	50	50	
Skin of Whole Body				30 (7.5 rem/calendar quarter)
Hands and forearms; feet and ankles				75 (18.75 rem/calendar quarter)
Minors	10% of above limits	10% of above limits	10% of above limits	10% of above limits
Pregnant Women [a]	10% of above limits	10% of above limits	0.5	Not Addressed
"Non-Occupational Dose" = "Controlled Area"				
Member of the General Public	0.1 rem in a year	Not Addressed	0.1 rem in a year	Not Addressed
Radiation Levels in Unrestricted (Uncontrolled) Areas				
Member of the General Public	0.002 rem in any one hour		0.002 rem in any one hour	Not Addressed

[a] Applicable period is nine months, or during the entire length of the pregnancy, rather than 1 year.

Radiation Protection Principles

In the United States and most other countries, three basic principles have governed radiation protection of workers and members of the general public:

1. Any activity involving occupational exposure should be useful enough to society to warrant the exposure of the worker. This same principle applies to virtually any human endeavor that involves some risk of injury.
2. For justified activities, exposure of the work force should be as low as reasonably achievable (ALARA).

3. To provide an upper limit on risk to individual workers, "limitation" of the maximum allowed dose is required. This is required above the protection provided by the first two principles because their primary objective is to minimize the total harm from occupational exposure to the entire work force; they do not limit the way that harm is distributed among individual workers.

As Low as is Reasonably Achievable (ALARA)

"As Low as is Reasonably Achievable" (ALARA) means making every reasonable effort to maintain exposures to ionizing radiation as far below the dose limits as practical, consistent with the purpose for which the licensed activity is undertaken, taking into account the state of technology, the economics of improvements in relation to the state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed materials in the public interest. This common sense approach means that radiation doses for both workers and the general public are typically kept lower than their regulatory limits.

The principle reduction of exposure to levels that are "as low as is reasonably achievable" is typically implemented in four different ways:
1. Shielding of the source holder.
2. Selection of as small of an amount of source material as is needed.
3. Designing facilities to reduce the anticipated exposure.
4. Designing work practices to reduce the anticipated exposure.

Effective implementation of the ALARA principle involves most facets of an effective radiation protection program: education of workers concerning the health risks of exposure to radiation; training in regulatory requirements and procedures to control exposure; monitoring, assessment and reporting of exposure levels and doses; management and supervision of radiation protection activities (including the choice and implementation of radiation control measures).

A comprehensive radiation protection program will also include, as appropriate: properly trained and qualified radiation protection personnel; adequately designed, operated and maintained facilities and equipment; and quality assurance and audit procedures.

Customs and Border Protection Dose Limits

In conformance with ALARA principles, CBP has adopted of its workers the same dose limit as the NRC and the State of Arizona prescribe for the general public – i.e. 0.1 rem in a year. As a result, CBP establishes a controlled area around each system as described in the section 2.2.2 to equally protect the CBP officers, station personnel and the general public from radiation emissions in accordance with the maximum dose permitted under Federal and state regulations. CBP has taken care to model and explore potential exposure to employees working around these systems, and has even made measurements if someone were to be scanned by this or other NII systems. See "Radiation Dose Equivalent to Stowaways in Vehicles," Khan, et al, Health Physics Journal, Volume 86, No. 5, p. 483, May 2004.

Health Risks

In their August 2004 revised position statement on radiation risk, the Health Physics Society recommended against the quantitative estimation of health risks below an individual dose of 5 rem in a year or a lifetime dose of 10 rem above that received from natural sources. Doses from natural background radiation in the United States average about 0.360 rem per year. Estimation of health risks associated with radiation doses that are of similar magnitude as those received from natural sources should be strictly qualitative and encompass a range of hypothetical health outcomes, including the possibility of no adverse health effects at such low levels.

The Society further states "While there is substantial and convincing scientific evidence for health risks following high-dose exposures, below 5-10 rem (which includes occupational and environmental exposures), risks of health effects are either too small to be observed or nonexistent."

The Society has concluded that estimates of risk should be limited to individuals receiving a dose of 5 rem in any one year or a lifetime dose of 10 rem in addition to natural background. Below these doses, risk estimates should not be used. Expressions of risk should only be qualitative, that is, a range based on the uncertainties in estimating risk (NCRP 1997) emphasizing the inability to detect any increased health detriment (that is zero health effects is a probable outcome).

References

National Council on Radiation Protection and Measures (NCRP). (1997) Uncertainties in fatal cancer risk estimates used in radiation protection. Bethesda, MD: NCRP; NCRP Report No. 126.

Appendix C: Background Information Concerning Risks from Occupational Radiation Exposure

The background material contained in this appendix is an excerpt of information found in United States Nuclear Regulatory Commission Regulatory Guide 8.29, *Instruction Concerning Risks from Occupational Radiation Exposure,* February 1996 and is intended to provide the user with the best available information about the health risks from occupational exposure to ionizing radiation. Ionizing radiation consists of energy or small particles, such as gamma rays and beta and alpha particles, emitted from radioactive materials, which can cause chemical or physical damage when they deposit energy in living tissue. A question and answer format is used. Many of the questions or subjects were developed by the NRC staff in consultation with workers, union representatives and licensee representatives experienced in radiation protection training.

How Is Radiation Measured?

In the United States, radiation dose or exposure is measured in units called rad, rem, or roentgen (R). For practical purposes with gamma and X-rays, these are considered equal: 1 R = 1 rad = 1 rem.

Milli (m) means 1/1000. For example, 1,000 mrad = 1 rad. Micro (μ) means 1/1,000,000. So, 1,000,000 μrad = 1 rad, or 10 μR = 0.000010 R.

The International System of Units (SI system) for radiation measurement use "gray" and "sievert."
1 Gy = 100 rad
1 mGy = 100 mrad
1 Sv = 100 rem
1 mSv = 100 mrem

Is It Safe To Be Around Sources Of Radiation?

High-level radiation exposure (i.e., greater than 10,000 mrem acute) may have potential health risks. From follow-up of the atomic bomb survivors, we know acutely delivered very high radiation doses can increase the occurrence of certain kinds of disease (e.g., cancer) and negative genetic effects. To protect the public, radiation workers and environment from the potential effects of low-level exposure (i.e., less than 10,000 mrem), the current radiation safety practice is to prudently assume similar adverse effects are possible with low-level protracted exposure to radiation. Thus, the risks associated with low-level medical, occupational and environmental radiation exposure are conservatively calculated to be proportional to those observed with high-level exposure. These calculated risks are compared to other known occupational and environmental hazards, and appropriate safety standards have been established by international and national radiation protection organizations (e.g., ICRP and NCRP) to control and limit potential harmful radiation effects.

Total Body Radiation Exposure Limits

Limit	Amount of Exposure in a Year
Occupational dose limit	5000 mrem
Public dose limit	100 mrem

Both public and occupational dose limits are set to limit cancer risk. It is important to remember when dealing with radiation sources in other materials or waste that there may be chemical or biological hazards separate and distinct from the radiation hazard. These chemical or biological hazards are often more dangerous to humans than the radiation hazard.

What Is Meant By Health Risk?

A health risk is generally thought of as something that may endanger health. Scientists consider health risk to be the statistical probability or mathematical chance that personal injury, illness, or death may result from some action. Most people do not think about health risks in terms of mathematics. Instead, most of us consider the health risk of a particular action in terms of whether we believe that particular action will, or will not, cause us some harm. The intent of this appendix is to provide estimates of, and explain the basis for, the risk of injury, illness, or death from occupational radiation exposure. Risk can be quantified in terms of the probability of a health effect per unit of dose received.

When X-rays, gamma rays, and ionizing particles interact with living materials such as our bodies, they may deposit enough energy to cause biological damage.

Radiation can cause several different types of events such as the very small physical displacement of molecules, changing a molecule to a different form, or ionization, which is the removal of electrons from atoms and molecules. When the quantity of radiation energy deposited in living tissue is high enough, biological damage can occur as a result of chemical bonds being broken and cells being damaged or killed. These effects can result in observable clinical symptoms.

The basic unit for measuring absorbed radiation is the rad. One rad (0.01 gray in the International System of units) equals the absorption of 100 ergs (a small but measurable amount of energy) in a gram of material such as tissue exposed to radiation. To reflect biological risk, rads must be converted to rems. The new international unit is the sievert (100 rem = 1 Sv). This conversion accounts for the differences in the effectiveness of different types of radiation in causing damage. The rem is used to estimate biological risk. For beta and gamma radiation, a rem is considered equal to a rad.

What Are The Possible Health Effects Of Exposure To Radiation?

Health effects from exposure to radiation range from no effect at all to death, including diseases such as leukemia or bone, breast and lung cancer. Very high (100s of rads), short-term doses of radiation have been known to cause prompt (or early) effects, such as vomiting and diarrhea, skin burns, cataracts and even death. It is suspected that radiation exposure may be linked to the potential for genetic effects in the children of exposed parents. Also, children who were exposed to high doses (20 or more rads) of radiation prior to birth (as an embryo/fetus) have shown an increased risk of mental retardation and other congenital malformations. These effects (with the exception of genetic effects) have been observed in various studies of medical radiologists, uranium miners, radium workers, radiotherapy patients and the people exposed to radiation from atomic bombs dropped on Japan. In addition, radiation effects studies with laboratory animals, in which the animals were given relatively high doses, have provided extensive data on radiation-induced health effects, including genetic effects.

It is important to note that these kinds of health effects result from high doses, compared to occupational levels, delivered over a relatively short period of time.

Although studies have not shown a consistent cause-and-effect relationship between current levels of occupational radiation exposure and biological effects, it is prudent from a worker protection perspective to assume that some effects may occur.

Who Developed Radiation Risk Estimates?

Radiation risk estimates were developed by several national and international scientific organizations over the last 40 years. These organizations include the National Academy of Sciences (which has issued several reports from the Committee on the Biological Effects of Ionizing Radiations, BEIR), the National Council on Radiation Protection and Measurements (NCRP), the International Commission on Radiological Protection (ICRP), and the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR). Each of these organizations continues to review new research findings on radiation health risks.

Several reports from these organizations present new findings on radiation risks based upon revised estimates of radiation dose to survivors of the atomic bombing at Hiroshima and Nagasaki. For example, UNSCEAR published risk estimates in 1988 and 1993 (UNSCEAR 1988, UNSCEAR 1993). The NCRP also published a report in 1988, “New Dosimetry at Hiroshima and Nagasaki and Its Implications for Risk Estimates” (NCRP 1988). In January 1990, the National Academy of Sciences released the fifth report of the BEIR Committee, “Health Effects of Exposure to Low Levels of Ionizing Radiation,” National Research Council, 1990). Each of these publications also provides extensive bibliographies on other published studies concerning radiation health effects for those who may wish to read further on this subject.

What Are The Estimates Of The Risk Of Fatal Cancer From Radiation Exposure?

We don’t know exactly what the chances are of getting cancer from a low-level radiation dose, primarily because the few effects that may occur cannot be distinguished from normally occurring cancers. However, we can make estimates based on extrapolation from extensive knowledge from scientific research on high dose effects. The estimates of radiation effects at high doses are better known than are those of most chemical carcinogens (NCRP 1989).

From currently available data, the NRC has adopted a risk value for an occupational dose of 1 rem (0.01 Sv) Total Effective Dose Equivalent (TEDE) of 4 in 10,000 of developing a fatal cancer, or approximately 1 chance in 2,500 of fatal cancer per rem of TEDE received. The uncertainty associated with this risk estimate does not rule out the possibility of higher risk, or the possibility that the risk may even be zero at low occupational doses and dose rates.

The radiation risk incurred by a worker depends on the amount of dose received. A worker who receives 5 rems (0.05 Sv) in a year incurs 10 times as much risk as another worker who receives only 0.5 rem (0.005 Sv). Only a very few workers receive doses near 5 rems (0.05 Sv) per year (Raddatz et al 1995).

According to the BEIR V report (National Research Council 1990), approximately one in five adults normally will die from cancer from all possible causes such as smoking, food, alcohol, drugs, air pollutants, natural background radiation and inherited traits. Thus, in any group of 10,000 workers, we can estimate that about 2,000 (20%) will die from cancer without any occupational radiation exposure.

To explain the significance of these estimates, we will use as an example a group of 10,000 people, each exposed to 1 rem (0.01 Sv) of ionizing radiation. Using the risk factor of 4 effects per 10,000 rem of dose, we estimate that 4 of the 10,000 people might die from delayed cancer because of that 1 rem dose (although the actual number could be more or less than 4) in addition to the 2,000 normal cancer fatalities expected to occur in that group from all other causes. This means that a 1 rem (0.01 Sv) dose may increase an individual worker's chances of dying from cancer from 20 percent to 20.04 percent. If one's lifetime occupational dose is 10 rem, we could raise the estimate to 20.4 percent. A lifetime dose of 100 rem may increase chances of dying from cancer from 20 to 24 percent. Given CBP's standard of 0.1 rem (0.001 Sv) exposure in any one year, the risk would equate to 4 effects per 100,000. This means that a 0.1 rem (0.001 Sv) dose may increase an individual workers chance of dying from cancer from 20 percent to 20.005 percent. The average measurable dose for radiation workers reported to the NRC was 0.31 rem (0.0031 Sv) for 1993 (Raddatz et al 1995). Today, very few CBP employees ever accumulate 100 rem (1 Sv) in a working lifetime, and the average career dose of workers at NRC-licensed facilities is 1.5 rem (0.015 Sv), which represents an estimated increase from 20 to about 20.06 percent in the risk of dying from cancer.

It is important to understand the probability factors here. A similar question would be, "If you select one card from a full deck of cards, will you get the ace of spades?" This question cannot be answered with a simple yes or no. The best answer is that your chance is 1 in 52. However, if 1000 people each select one card from full decks; we can predict that about 20 of them will get an ace of spades. Each person will have 1 chance in 52 of drawing the ace of spades, but there is no way we can predict which persons will get that card. The issue is further complicated by the fact that in a drawing by 1000 people, we might get only 15 successes, and in another, perhaps 25 correct cards in 1000 draws. We can say that if you receive a radiation dose, you will have increased your chances of eventually developing cancer. It is assumed that the more radiation exposure you get, the more you increase your chances of cancer.

The normal chance of dying from cancer is about one in five for persons who have not received any occupational radiation dose. The additional chance of developing fatal cancer from an occupational exposure of 1 rem (0.01 Sv) is about the same as the chance of drawing any ace from a full deck of cards three times in a row. The additional chance of dying from cancer from an occupational exposure of 10 rem (0.1 Sv) is about equal to your chance of drawing two aces successively on the first two draws from a full deck of cards.

It is important to realize that these risk numbers are only estimates based on data for people and research animals exposed to high levels of radiation in short periods of time. There is still uncertainty with regard to estimates of radiation risk from low levels of exposure. Many difficulties are involved in designing research studies that can accurately measure the projected small increases in cancer cases that might be caused by low exposures to radiation as compared to the normal rate of cancer.

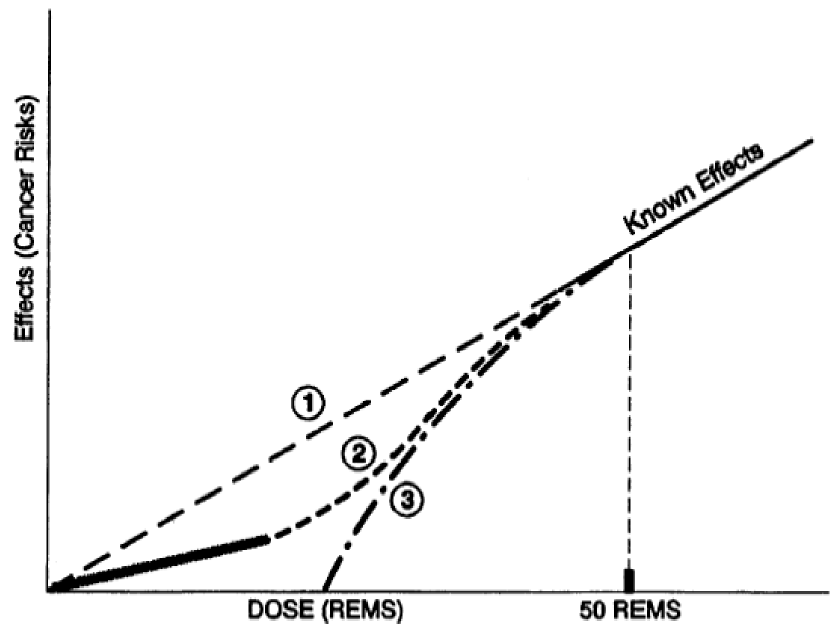
These estimates are considered by the NRC staff to be the best available for the worker to use to make an informed decision concerning acceptance of the risks associated with exposure to radiation. A worker who decides to accept this risk should try to keep exposure to radiation as low as is reasonably achievable (ALARA) to avoid unnecessary risk.

If I Receive A Radiation Dose That Is Within Occupational Limits, Will It Cause Me To Get Cancer?

Probably not. Based on the risk estimates previously discussed, the risk of cancer from doses below the occupational limits is believed to be small. Assessment of the cancer risks that may be associated with low doses of radiation are projected from data available at doses larger than 10 rems (0.1 Sv) (ICRP 1991). For radiation protection purposes, these estimates are made using the straight line portion of the linear quadratic model (See Figure 5 below). We have data on cancer probabilities only for high doses, as shown by the solid line. Only in studies involving radiation doses above occupational limits are there dependable determinations of the risk of cancer, primarily because below the limits the effect is small compared to differences in the normal cancer incidence from year to year and place to place. The ICRP, NCRP and other standards-setting organizations assume for radiation protection purposes that there is some risk, no matter how small the dose (Curves 1 and 2). Some scientists believe that the risk drops off to zero at some low dose (Curve 3), the threshold effect, The ICRP and NCRP endorse the linear quadratic model as a conservative means of assuring safety (Curve 2).

For regulatory purposes, the NRC uses the straight line portion of Curve 2, which shows the number of effects decreasing linearly as the dose decreases. Because the scientific evidence does not conclusively demonstrate whether there is or is not an effect at low doses, the NRC assumes for radiation protection purposes, that even small doses have some chance of causing cancer. Thus, a principle of radiation protection is to do more than merely meet the allowed regulatory limits; doses should be kept as low as is reasonably achievable (ALARA). This is as true for natural carcinogens such as sunlight and natural radiation as it is for those that are manmade, such as cigarette smoke, smog and X-rays.

Figure 5: Some Proposed Models for How the Effects of Radiation Vary with Doses at Low Levels



How Can We Compare The Risk Of Cancer From Radiation To Other Kinds Of Health Risks?

One way to make these comparisons is to compare the average number of days of life expectancy lost because of the effects associated with each particular health risk. Estimates are calculated by looking at a large number of persons, recording the age when death occurs from specific causes, and estimating the average number of days of life lost as a result of these early deaths. The total number of days of life lost is then averaged over the total observed group.

Several studies have compared the average days of life lost from exposure to radiation with the number of days lost as a result of being exposed to other health risks. The word "average" is important because an individual who gets cancer loses about 15 years of life expectancy, while his or her coworkers do not suffer any loss. Some representative numbers are presented in Table 5. For categories of NRC-regulated industries with larger doses, the average measurable occupational dose in 1993 was 0.31 rem (0.0031 Sv). A simple calculation based on the article by Cohen and Lee (Cohen et al 1991) shows that 0.3 rem (0.003 Sv) per year from age 18 to 65 results in an average loss of 15 days. These estimates indicate that the health risks from occupational radiation exposure are smaller than the risks associated with many other events or activities we encounter and accept in normal day-to-day activities.

It is also useful to compare the estimated average number of days of life lost from occupational exposure to radiation with the number of days lost as a result of working in several types of industries. Table 6 shows average days of life expectancy lost as a result of fatal work-related accidents. Table 6 does not include non-accidental types of occupational risks such as occupational disease and stress because the data are not available.

These comparisons are not ideal because we are comparing the possible effects of chronic exposure to radiation to different kinds of risks such as accidental death, in which death is inevitable if the event occurs. This is the best we can do because good data are not available on chronic exposure to other workplace carcinogens. Also, the estimates of loss of life expectancy for workers from radiation-induced cancer do not take into consideration the competing effect on the life expectancy of the workers from industrial accidents.

Table 4: Estimated Loss of Life Expectancy from Health Risks

Health Risks	Estimate of Life Expectancy Lost (Average)
Smoking 20 cigarettes a day	6 years
Overweight (by 15%)	2 years
Alcohol consumption (U.S. average)	1 year
All accidents combined	1 year
Motor vehicle accidents	207 days
Home accidents	74 days
Drowning	24 days
All natural hazards (earthquake, lightning, flood, etc.)	7 days
Medical radiation	6 days
Occupational Exposure	
0.3 rem/y from age 18 to 65	15 days
1 rem/y from age 18 to 65	51 days

(Cohen et al 1991)

Table 5: Estimated Loss of Life Expectancy from Industrial Accidents

Industry Type	Estimated Days of Life Expectancy Lost (Average)

All Industries	60
Agriculture	320
Construction	227
Mining and Quarrying	167
Transportation and Public Utilities	160
Government	60
Manufacturing	40
Trade	27
Services	27

(Cohen et al 1991)

What Are The Health Risks From Radiation Exposure To The Embryo/Fetus?

During certain stages of development, the embryo/fetus is believed to be more sensitive to radiation damage than adults. Studies of atomic bomb survivors exposed to acute radiation doses exceeding 20 rads (0.2 Gy) during pregnancy show that children born after receiving these doses have a higher risk of mental retardation. Other studies suggest that an association exists between exposure to diagnostic X-rays before birth and carcinogenic effects in childhood and in adult life. Scientists are uncertain about the magnitude of the risk. Some studies show the embryo/fetus to be more sensitive to radiation-induced cancer than adults, but other studies do not. In recognition of the possibility of increased radiation sensitivity, and because dose to the embryo/fetus is involuntary on the part of the embryo/fetus, a more restrictive dose limit has been established for the embryo/fetus of a declared pregnant radiation worker. See Regulatory Guide 8.13, “Instruction Concerning Prenatal Radiation Exposure.”

If an occupationally exposed woman declares her pregnancy in writing, she is subject to the more restrictive dose limits for the embryo/fetus during the remainder of the pregnancy. The dose limit of 500 mrems (5 mSv) for the total gestation period applies to the embryo/fetus and is controlled by restricting the exposure to the declared pregnant woman. Restricting the woman’s occupational exposure, if she declares her pregnancy, raises questions about individual privacy rights, equal employment opportunities and the possible loss of income. Because of these concerns, the declaration of pregnancy by a female radiation worker is voluntary. Also, the declaration of pregnancy can be withdrawn for any reason, for example, if the woman believes that her benefits from receiving the occupational exposure would outweigh the risk to her embryo/fetus from the radiation exposure.

Can A Worker Become Sterile Or Impotent From Normal Occupational Radiation Exposure?

No. Temporary or permanent sterility cannot be caused by radiation at the levels allowed under NRC’s occupational limits. There is a threshold below which these effects do not occur. Acute doses on the order of 10 rems (0.1 Sv) to the testes can result in a measurable but temporary reduction in sperm count. Temporary sterility (suppression of ovulation) has been observed in women who have received acute doses of 150 rads (1.5 Gy). The estimated threshold (acute) radiation dose for induction of permanent sterility is about 200 rads (2 Gy) for men and about 350 rads (3.5 Gy) for women (National Research Council 1990, Scott et al 1993). These doses are far greater than the NRC's occupational dose limits for workers.

Although acute doses can affect fertility by reducing sperm count or suppressing ovulation, they do not have any direct effect on one's ability to function sexually. No evidence exists to suggest that exposures within the NRC's occupational limits have any effect on the ability to function sexually.

What Are Background Radiation Exposures?

The average person is constantly exposed to ionizing radiation from several sources. Our environment and even the human body contain naturally occurring radioactive materials (e.g., potassium-40) that contribute to the radiation dose that we receive. The largest source of natural background radiation exposure is terrestrial radon, a colorless, odorless, chemically inert gas, which causes about 55 percent of our average, non-occupational exposure. Cosmic radiation originating in space contributes additional exposure. The use of X-rays and radioactive materials in medicine and dentistry adds to our population exposure. As shown below in Table 7, the average person receives an annual radiation dose of about 0.360 rem (3.6 mSv). By age 20, the average person will accumulate over 7 rems (70 mSv) of dose. By age 50, the total dose is up to 18 rems (180 mSv). After 70 years of exposure this dose is up to 25 rems (250 mSv).

Table 6: Average Annual Effective Dose Equivalent to Individuals in the United States

Source		Effective Dose Equivalent (mrems)	
Natural			
	Radon	200	
	Other than Radon	100	
	Total Natural		300
Nuclear Fuel Cycle			0.05
Consumer Products[b]			9
Medical			
	Diagnostic X-Rays	39	
	Nuclear Medicine	14	
	Total Medical		53
Total			About 360 mrems/year

(NCRP 1987).

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