

**U.S. Environmental Protection Agency
Office of Federal Activities**

**POLLUTION PREVENTION - ENVIRONMENTAL IMPACT REDUCTION
CHECKLISTS FOR NEPA/309 REVIEWERS
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Prepared by

**SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
7600-A LEESBURG PIKE
FALLS CHURCH, VA 22043
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1.0 INTRODUCTION

The environmental review process under the National Environmental Policy Act (NEPA) provides a valuable opportunity for Federal agency NEPA/309 reviewers to incorporate pollution prevention and environmental impact reduction into actions (or projects). This guidance was prepared to assist NEPA/309 reviewers in incorporating pollution prevention into each step of the environmental review process, including scoping, mitigation, monitoring, and enforcement.

1.1 What Is Pollution Prevention?

Pollution prevention refers to the use of materials, processes, and practices that reduce or eliminate the creation of pollutants at the source of generation through increased efficiency in the use of raw materials, energy, water, or other resources or through the protection of natural resources by conservation. Pollution prevention is a multimedia approach that reduces waste generation and the emission of pollutants released to land, air, and water without transferring pollutants from one medium to another. Pollution prevention techniques include:

- Modifying equipment or technology
- Modifying processes or procedures
- Reformulating or redesigning products
- Substituting raw materials
- Improving housekeeping, maintenance, training, or inventory control
- Incorporating demand-side management when designing or renewing projects
- Incorporating integrated resource planning into project planning.

The definition of pollution prevention provided by the U.S. Environmental Protection Agency (EPA) encompasses source reduction, increased efficiency, and conservation activities that lead to the reduction in the amount of any hazardous substance, pollutant, or contaminant entering any waste stream prior to recycling, treatment, or disposal. This definition does not include such activities as recycling (except in-process recycling), procurement of recycled content products, and energy recovery. While EPA recognizes that these practices are important components of an environmental management program and can help reduce waste, they should not be the ultimate goal of pollution prevention activities. While the checklists in Chapter 3.0 focus on pollution prevention, they also address other environmental impact reduction techniques, such as recycling. This is because the goal of NEPA is to identify any techniques (pollution prevention, recycling, or control) that will ultimately minimize environmental impacts.

1.2 Why Practice Pollution Prevention?

A number of recent Federal statutes and Executive Orders mandate the incorporation of pollution prevention concepts and techniques into the operations and activities of the Federal Government. A few of these concepts and techniques are discussed below.

The Pollution Prevention Act (PPA), signed by President George Bush on November 5, 1990, established a national policy, known as the *waste management hierarchy*, that stated:

- Pollution should be prevented or reduced at the source
- Pollution that cannot be prevented should be recycled in an environmentally safe manner
- Pollution that cannot be prevented or recycled should be treated in an environmentally safe manner
- Disposal or other releases into the environment should be used "only as a last resort" and should be conducted in an environmentally safe manner.

Executive Order 12844, Federal Use of Alternatively Fueled Vehicles, directs the Federal Government to take a leading role in the purchase and use of alternatively fueled vehicles. This Executive Order asks each Federal agency to adopt plans to exceed the purchasing requirements for alternatively fueled vehicles established in the Energy Policy Act of 1992.

Executive Order 12845, Requiring Agencies to Purchase Energy Efficient Computer Equipment, directs the Federal Government to participate in the Energy Star Computer program. This program encourages the purchasing of energy-efficient computers, monitors, and printers to the maximum extent possible.

Executive Order 12856, Federal Compliance with Right-To-Know Laws and Pollution Prevention Requirements, commits Federal agencies to pollution prevention through source reduction and requires all Federal facilities to comply with the PPA and the Emergency Planning and Community Right-To-Know Act (EPCRA), including Toxic Release Inventory (TRI) reporting. The Executive Order also requires all Federal agencies to develop plans and set voluntary goals to reduce (1) total releases and offsite transfers of TRI toxic chemicals or toxic pollutants by 50 percent by 1999 and (2) the manufacturing, processing, or use of extremely hazardous substances and toxic chemicals by Federal facilities.

Executive Order 12873, Federal Acquisition, Recycling, and Waste Prevention, directs Federal agencies to review and revise specifications, product descriptions, and standards to increase procurement by the Federal Government of recycled or environmentally preferable (EP) products. The Executive Order also sets agency goals for waste reduction and procurement of EP/recycled products, establishes minimum content standards for printing and writing paper, and promotes the purchasing of re-refined oil and retread tires.

Executive Order 12902, Energy Efficiency and Water Conservation, directs Federal agencies and facilities to increase efforts to conserve energy and water by improving efficiency. Under this Executive Order, each agency will conduct a survey of all its facilities and develop a 10-year plan to conduct comprehensive energy and water audits. Every Federal facility is required to contribute toward agency-wide conservation and reduction goals.

Each of these requirements emphasizes the importance of pollution prevention in environmental protection. Pollution prevention considerations must be incorporated into all environmental protection tools, including NEPA review.

The remaining two chapters in this document provide the following:

- **Chapter 2.0** - A brief overview of how NEPA relates to pollution prevention.
- **Chapter 3.0** - Checklists for 30 types of project activities that specify questions NEPA/309 reviewers should ask to incorporate pollution prevention into designing alternatives and avoiding and mitigating environmental effects. References are included for each checklist. The checklists are the heart of this reference.

2.0 INCORPORATING POLLUTION PREVENTION INTO NEPA

NEPA provides significant opportunities for pollution prevention in project siting, design, construction, and operation. Indeed, NEPA's very purpose is "to promote efforts which will prevent or eliminate damage to the environment..." (42 U.S.C 4321). Section 101 of NEPA stipulates that the Federal Government "use all practical means and measures ... to create and maintain conditions under which man and nature can exist in productive harmony..." (42 U.S.C 4331(a)). To carry out this environmental policy, Congress required all Federal agencies to act to preserve, protect, and enhance the environment (42 U.S.C. 4331(b)). Also, Section 102 of NEPA requires Federal agencies to document the consideration of environmental consequences of their decision making in environmental impact statements (EISs) or environmental assessments (EAs). Additionally, NEPA's implementing regulations are designed with the goal of preventing or minimizing environmental degradation.

Exhibit 2-1 highlights opportunities to incorporate pollution prevention into the NEPA environmental review process. There are wide ranging opportunities in project scoping and mitigation. Further, NEPA provides opportunities to implement pollution prevention through "action-forcing" procedures, such as records of decision, that set forth monitoring and enforcement programs. Records of decision also can be a means to inform the public of the extent to which pollution prevention measures are included in the decision and how they will be implemented.

When providing comments during any stage of a review conducted under NEPA, it is important to tailor the remarks to the level of review contained in the review process. For example, if a review document focuses on the environmental impacts of a proposed dam, comments concerning the use of fluorescent lighting (as opposed to less energy-efficient incandescent lights) in buildings should be directed at the entire project, rather than at individual structures or sections of structures. However, it is appropriate to provide the lead agency with copies of the

checklists given in Chapter 3.0 and to ask agency personnel to consider the pollution prevention/environmental impact reduction techniques identified in these checklists when undertaking specific mitigation strategies based on the more general comments provided during the NEPA review process.

Exhibit 2-1.

Opportunities to Incorporate Pollution Prevention

into the NEPA Environmental Review Process

NEPA Process Step

Pre-Scoping:

Prior to initiating formal scoping by issuing a notice of intent to prepare an EIS*, the Federal agency can conduct pre-scoping activities to identify significant issues.

Scoping:

The Federal agency proposing the action is required to issue a notice of intent to prepare an EIS* and conduct a scoping process to discuss the issues to be addressed in the EIS (40 CFR 1501.7).

DEIS/FEIS Review:

NEPA/309 reviewers focus on the significance of environmental effects in the DEIS/FEIS and the adequacy of the documents. Reviewers are responsible for identifying environmental effects that should or must be avoided to protect the environment and the sufficiency of the effects analysis and alternatives.

How To Incorporate Pollution Prevention

NEPA/309 reviewers can use their authority to promote pollution prevention during informal discussions with the lead agency prior to scoping.

NEPA/309 reviewers can identify pollution prevention as an issue and encourage lead agencies to consider pollution prevention in selecting and designing alternatives (e.g., project siting, design, construction, and operation).

In comments to the lead agency concerning the DEIS and FEIS, NEPA/309 reviewers can promote the inclusion of pollution prevention practices into the development of alternatives.

Mitigation of Adverse Impacts:

As part of DEIS/FEIS review, identifying mitigation is an important activity (40 CFR 1502.14(f), 1502.16(h), 1508.20).

Record of Decision:

When an agency reaches a decision on an action for which an EIS was completed, a record of decision must be prepared that provides information on the alternatives considered and the factors weighed in the decision-making process.

Monitoring and Enforcement Program:

A monitoring and enforcement program must be adopted if appropriate for mitigation (40 CFR 1505.2(c)).

* There are also opportunities to incorporate pollution prevention into environmental assessments (EAs).

NEPA/309 reviewers can identify mitigation measures that incorporate pollution prevention to avoid or reduce adverse impacts (e.g., avoid using pesticides to prevent non-point source water pollution).

Records of decision should state whether all practical means to avoid or minimize environmental impacts were adopted and if not, why they were not. Records of decision present an opportunity to document the incorporation of pollution prevention techniques into the EIS and a means to ensure that pollution prevention is considered.

Integrating pollution prevention techniques into a monitoring and enforcement program is an effective way to ensure they are implemented.

Source: Council on Environmental Quality, Memorandum to Heads of Federal Departments and Agencies regarding Pollution Prevention and the National Environmental Policy Act, Federal Register, Vol. 58, No. 18, January 29, 1993.

3.0 POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLISTS FOR NEPA REVIEWERS

The purpose of the checklists given in this chapter is to assist NEPA/309 reviewers in incorporating pollution prevention into the environmental review process. Each checklist is a compilation of available pollution prevention opportunities that could be incorporated into project plans. In addition to traditional pollution prevention techniques, the checklists provide environmental impact reduction opportunities (e.g., reuse, recycling) that are consistent with the goal to minimize environmental impacts. These opportunities are identified with an asterisk (*) to differentiate them from opportunities that fall within the definition of pollution prevention. Two categories of checklists were developed: (1) general topic checklists that discuss opportunities that may be common to a number of industry sectors/activities (e.g., energy

management) and (2) specific topic checklists that address pollution prevention and environmental impact reduction opportunities that are unique to a specific sector or activity.

The general topic area checklists presented in this chapter address:

- Energy Management Siting
- Habitat Preservation and Protection Vehicle Maintenance
- Landscaping Water Use.
- Pest Management

The specific topic area checklists cover:

- Agricultural Irrigation
- Airports
- Building/Housing Construction
- Chemical Demilitarization
- Coal-fired Power Plants
- Dams, Hydropower, and Water Supply Reservoirs
- Defense Testing and Related Activities
- Dredging
- Flood Control Projects
- Forestry Activities
- Grazing
- Hazardous Waste Incinerators
- Hazardous Waste Storage and Treatment Facilities
- Highways and Bridges
- Military Base Closure and Reutilization
- Mining Projects
- Natural Gas Pipelines
- Nuclear Decommissioning
- Oil and Gas Projects
- Recreation and Tourism
- Rocketry/Missile Projects
- Solid Waste Landfills
- Waste Site Cleanup Activities.

Each checklist begins with a brief discussion of the types of effects that the specified industry

sector or activity can have on the environment. Possible pollution prevention and environmental impact reduction opportunities to avoid/mitigate these effects are then discussed. Opportunities to include pollution prevention and environmental impact reduction in the review process are presented in questions that can be asked by reviewers during NEPA and Section 309 review processes. For example, a question in one checklist asks, "Are there opportunities to reduce the amount of hazardous and toxic materials used as part of the project?" Where necessary for clarity, a brief rationale is also provided of why it is important to use the recommended pollution prevention/environmental impact reduction technique and how it can help minimize an operation's impact on the environment. The checklists also include references for reviewers to obtain additional information about pollution prevention and environmental impact reduction techniques for a given topic area or sector.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR ENERGY MANAGEMENT

How Can Energy Management Affect the Environment?

The generation of electricity accounts for 35 percent of all U.S. emissions of carbon dioxide, the most prevalent greenhouse gas. Electricity generation also accounts for 75 percent of U.S. sulfur dioxide emissions and 38 percent of nitrogen oxides emissions. These gases can cause smog, acid rain, and global warming. The pollution associated with these greenhouse gases can be reduced by applying energy efficient technologies and practices. These techniques, which include using compact, long-lasting fluorescent lighting as an alternative to incandescent bulbs and using fuel efficient vehicles and alternative transportation methods, can have a significant impact on the environment.

What Questions Should Be Asked To Ensure That These Effects Are Minimized Or Eliminated?

Executive Order 12902, Energy Efficiency and Water Conservation, directs all Federal agencies and facilities to increase efforts to conserve energy and increase energy efficiency. Other Executive Orders, such as 12844 and 12845, call on Federal agencies and facilities to increase their purchasing of alternatively

fueled vehicles and energy-efficient computers.

Lighting. Lighting consumes about 20 to 25 percent of the electricity generated in the United States. In commercial buildings, lighting accounts for 40 percent of overall electricity usage. Lighting is one of the easiest areas where energy conservation and efficiency techniques can be applied to save energy.

Will an assessment be performed to determine the best number, location, and type of lighting fixtures for the facility? A well-designed lighting assessment prevents the installation of excessive lighting fixtures and should incorporate the use of task-specific lighting (e.g., desk lamps) where possible rather than relying on overhead lighting.

Can motion sensors or timers be used to turn lights off automatically when they are not needed? Motion sensors are widely used in European countries in such areas as hallways, stairwells, and restrooms, as well as work spaces. The use of these sensors is growing in the United States as well.

Will the most efficient lighting equipment available be used? Optical reflectors and electronic ballasts can improve the efficiency of lower wattage lighting.

Will the facility take advantage of the lighting provided by natural sunlight through building design, orientation, and internal layout? Other opportunities to maximize the use of natural light include utilizing top-silvered blinds and light colored finishes to reflect light and installing glass skylights or panels on top of office partitions to increase ambient lighting.

Will the use of external lighting be minimized to reduce impacts to nearby sensitive habitats?

Will the facility prepare an energy awareness campaign to educate

employees about the importance of energy conservation?

Electrical Products and Equipment. A facility's energy consumption can be reduced greatly by purchasing energy-efficient products, such as energy-efficient computers and appliances. Computers alone are believed to account for 5 percent of commercial electricity consumption. The selection of energy efficient products can, then, help reduce a facility's energy consumption.

Will the facility use energy efficiency as a criterion in purchasing electrical equipment?

Will commercially available appliances with high energy ratings be selected?

Will the project make use of high-efficiency, adjustable-speed motors in machinery and equipment applications when possible?

Can timers be used to turn off computers or equipment automatically when they are not in use?

Heating and Cooling. Improvements in heat, ventilation, and air conditioning (HVAC) systems can lead to significant energy savings.

Will heat and/or air conditioning thermostat settings be either manually or automatically changed at night, weekends, or at other times when the facility is not in use?

Will the facility employ a computerized energy management system (EMS) to control heating or cooling systems or lighting?

Can outside air be intentionally drawn into the facility for cooling

purposes during cool weather?

Can a system to bring warm air down to floor level from the underside of the roof be installed for heating purposes during the winter (e.g., ceiling fans)?

If the facility will utilize electric chillers, will the chilled water lines be properly insulated?

If the facility will use a boiler, will the steam/hot water lines be properly insulated?

Will energy efficient windows or reflective films, such as "low-emissivity" or "low-e" coatings, be installed?

Could solar panels be integrated into the building design to reduce reliance on electricity or fossil fuels?

Will the smallest, most-efficient HVAC system possible be used to regulate building temperature properly?

Will load sharing be used to reduce energy consumption? Shutting down HVAC systems for non-critical uses for short periods can result in significant savings.

Will the facility use natural shading from trees and shrubbery to reduce heating and air conditioning needs?

Will appropriate building materials be selected to minimize energy use from heating and air conditioning (e.g., using light colored paint, paving, and roofing materials and not designing a building with large glass facades in hot, sunny areas)?

Insulation Concerns. Insufficient insulation can result in the loss of large amounts of energy. For example, the poor insulation of windows is responsible for approximately 25 percent of all heating and cooling requirements. The insulation of heat-generating equipment also reduces the need for building cooling.

Will hot or cold equipment surfaces and the building walls and roof be well insulated?

If this is a manufacturing or industrial environment, will any heat exchangers for heat recovery be installed?

Will building doors opening to the environment minimize energy losses? Proper weather stripping reduces energy losses, as do revolving and double doors.

Will insulated windows be used? Such windows employ a gas, such as argon, between two coated panes of glass to minimize energy losses.

Where appropriate, will energy efficient insulation materials fabricated from recycled materials be used?

Hot Water. Reducing the use of hot water can help conserve energy by decreasing the amount of energy that must be expended to heat water.

Will water-efficient showerheads be installed?

Will faucet aerators be installed?

Will water heaters be sufficiently insulated?

Will energy-efficient water heaters be purchased?

In manufacturing facilities, can the heat radiated from hot water pipes be used for other purposes?

Fuel and Gasoline. Increasing fuel efficiency and using alternatively fueled vehicles helps reduce our reliance on fossil fuels, which cause air pollution when burned.

If the facility requires the use of fleet vehicles, will fuel-efficient, cleaner burning vehicles be purchased?

Has the use of alternatively fueled (e.g., electric, solar electric, compressed natural gas, ethanol, or methanol) vehicles been considered? Alternatively fueled vehicles have proved successful for short distance purposes. They can be used as fleet vehicles for facility maintenance or for short trips around a large facility.

Are there provisions to encourage facility employees to reduce motor vehicle use? These provisions can include installing bike racks and showers, providing shuttle service between the facility and public transportation stops, promoting carpooling by maintaining ride boards, and subsidizing public transportation costs.

Energy Production Facilities. The design, construction, and operation of energy production facilities presents a number of opportunities to reduce pollution and environmental impacts.

In constructing or operating energy production facilities, will rate structures be considered that will reduce peak loads?

Are co-generation activities included in facility design?

Other References

Northeast Sustainable Energy Association. 23 Ames Street,
Greenfield, MA 01301.

Telephone No. (413) 774-6051.

Rocky Mountain Institute. 1739 Snowmass Creek Road,
Snowmass, CO 81654-9199. Telephone No. (303) 927-3851, Fax
No. (303) 927-4178.

U.S. Department of Energy, Federal Energy Management Program.
CE-44, 1000 Independence Avenue, SW, Washington, DC 20585.
Telephone No. (202) 586-5772.

U.S. EPA, Energy Star Buildings Program. Telephone No. (202)
233-9146.

U.S. EPA, Energy Star Computers Program. Telephone No. (202)
233-9114.

U.S. EPA, Green Lights Program. Telephone No. (202) 233-9065.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR HABITAT PRESERVATION AND PROTECTION

How Can Ecosystem Preservation and Protection Affect the Environment?

In the face of development activities, populations of indigenous plants and wildlife can be protected only through the protection and preservation of ecosystems necessary for their survival. Ecosystem requirements are species-specific and can include a variety of factors, such as soil type, water regime, climate, and plant and animal associations. Ecosystems are defined by the structure and function of plant and animal communities and by the habitats they utilize. The protection and preservation of ecosystems are important for a number of reasons, which include the protection of wildlife, climate control, maintenance of biodiversity sources, pollutant detoxification, erosion control, and CO₂ sequestration.

Wetlands are ecosystems necessary for the survival of a host of aquatic and terrestrial species. In addition, wetlands are integral parts of the hydrological system and are necessary for the maintenance of water supplies and water quality.

Ecosystems face a number of threats that reduce the area available

for wildlife, change the character of the species that inhabit particular habitats, or change their form through the alteration of features, including topography or water regime. Ecosystem preservation efforts are generally directed at protecting particular species, such as endangered or threatened species, recreationally or aesthetically important species, or commercially important species. It should be noted, however, that habitat preservation (or creation or enhancement) for one species can adversely affect other species.

Also see checklists on Pest Management, Siting, Landscaping, Water Use, Grazing, and Forestry Activities.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Habitat Fragmentation Concerns. Existing habitats are typically damaged through fragmentation, often due to encroachment. Reduction in the size of an existing habitat can reduce the number of individual organisms, as well as the diversity of species, that it can support. A number of techniques can help mitigate/reduce the effects of fragmentation.

Have other sites been considered as an alternative to encroaching on the existing habitat? (*)

Has the critical area necessary for survival of the ecosystem been determined? Can the area of the habitat that will be altered be minimized? *

Has the project been designed to avoid the fragmentation of existing habitats into a number of smaller areas? *

Have transportation corridors, such as roads and power lines, been designed to avoid encroaching on sensitive habitats? *

Does the project establish a system of natural corridors (which take into consideration the behavior of the species in question) to link habitat areas? *

Will landscaping activities use native shrubs and other vegetation with high wildlife value (e.g., browse or cover)? (*)

Will landscaping be designed to minimize grassy areas and maximize use of native habitats? *

Will the effects of habitat encroachment on wildlife be mitigated by the installation of feeding stations for target species? *

Habitat Alteration Concerns. Existing habitats can be altered through changes in a number of abiotic factors. Wetlands are prone to destruction through inadvertent drainage or changes in the hydrological regime. Stream habitats can be damaged by increased siltation, reduced shading from overhanging trees, or pollution.

Does the project include mitigation measures, such as restoration of damaged habitats or the creation of new habitats? *

Does the project/development include adequate buffer zones between the developed area and wetlands or other habitats? *

Has the potential to minimize hydrological impacts on wetlands through measures to reduce or control stormwater runoff and drainage been considered?

Has project planning considered sources of water and controls of water flow to wetlands or other habitats?

Have tree and vegetation buffer areas been maintained around

streams to provide shading and reduce siltation and pollutant loadings?

Has the project planning evaluated the vulnerability of the surrounding habitats to alterations in land use? [*](#)

Has the timing and location of construction or other human activity included consideration of animal migrations and activity patterns? [*](#)

Has the timing of construction or earth removal operations considered seasonal rainfall patterns to avoid sediment runoff to sensitive aquatic habitats?

Will the project minimize the introduction of pollutants that bioaccumulate?

Has the project considered possible impacts from increased activity or access to sensitive habitats, such as an increase in the numbers of pets and people near a wetland area? [*](#)

Has the project considered impacts from habitat conversion? [*](#)

Has the project considered impacts to habitats due to the air pollution it will generate? [*](#)

Species Introduction Concerns. The structure and function of existing habitats can be drastically altered through the inadvertent introduction of non-indigenous species. These species may be able to better compete for resources than can the local species.

Will landscaping activities avoid (or at least minimize) the use of exotic species? [\(*\)](#)

Will the spread of exotic weed species be monitored and controlled? *

Have buildings and structures been designed to minimize nesting and brooding areas for undesirable species, such as pigeons, starlings, rats, and raccoons? *

Have corridors designated or created to mitigate for habitat fragmentation been evaluated for potential negative effects? Do the benefits of having the corridors override other possible negative effects? *

Other References

Marsh, W.M. 1993. *Landscape Planning. Environmental Applications*. Second Edition. John Wiley and Sons.

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR LANDSCAPING

How Can Landscaping Affect the Environment?

Landscaping wastes currently account for approximately 20 percent (or 31 million tons) of the municipal solid waste (MSW) generated in the United States each year. This makes landscape trimmings the second largest component (by weight) of the MSW stream. Because of their high bulk and density, landscaping wastes consume a disproportionate amount of landfill space. In addition, these wastes, as well as other organic matter disposed of in the landfill, can generate methane and acidic leachate when they decompose. When incinerated, the high moisture content and high nitrogen levels of these wastes can interfere with the combustion process and contribute to the formation of smog-causing nitrogen oxides.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

On April 26, 1994, President Clinton signed a Presidential Memorandum calling for the establishment of guidelines for Federal facility managers on how to increase the use of native species, reduce the use of chemical fertilizers and pesticides,

implement water conservation techniques, and promote awareness of the environmental and economic benefits of better landscaping techniques. These guidelines will be proposed by a Federal interagency workgroup established by the Federal Environmental Executive. The following questions address the concept delineated in the Presidential Memorandum, as well as additional opportunities to prevent pollution and reduce waste generation associated with landscaping operations.

Ecosystem Concerns. Landscaping activities can affect the environment through the release of toxic pesticides and excess nutrients, as well as the destruction of wildlife habitat and ecologically sensitive areas. However, proper landscape design and maintenance can help reduce these environmental impacts and can help minimize the effects of other activities as well.

Will landscape development be integrated with existing natural resources? Such integration may include the use of a Geographic Information System (GIS) that incorporates physical and natural features of the area to be developed (e.g., tidal and non-tidal wetlands, steep slopes, and natural riparian buffers). (*)

Will the landscape plan incorporate the use of plants that require little water and minimal fertilizer, herbicide, and pesticide use?

Does the landscape plan encourage the use of Integrated Pest Management (IPM)?

Will the landscape plan ensure that rare, threatened, and endangered wildflowers and other species are adequately protected? *

Does the landscape plan consider materials other than asphalt for constructing walkways across lawns (i.e., using wood chips, flag stones, and other materials that have less environmental impact than asphalt)?

Will the landscape plan include the planting of primarily native trees, shrubs, and perennials? (*)

Will the introduction of invasive species be avoided? *

Will the plantings be arranged in a natural manner and in naturally associated groupings? *

Does the landscaping plan incorporate features to minimize solar radiation or heat sinks, such as planting shade trees and avoiding overly large areas of asphalt? *

Will the plant species used in the landscape plan provide food or cover for desirable wildlife? *

Will the landscape plan call for fertilizing lawns only when grass roots will take up nutrients? These times are late summer-fall for cool season grasses and early summer for warm season grasses.

Will lawns be watered at the optimal time of day to promote healthy growth and conserve water?

Does the landscape plan take advantage of vegetation's natural properties? Planting shade trees near building windows can reduce energy consumption associated with air conditioning needs and serve as effective wind barriers.

Will species of vegetation that support wetlands development be planted on the edges of waterbodies? These species may help break down pollutants carried in non-point source runoff and also can prevent soil and debris from polluting waterbodies.

Will lawn areas be kept to a minimum with the remainder planted/retained as native meadows and woodlands to minimize air impacts associated with power maintenance equipment and the need for pesticides?

Does the facility design reduce the impact of lighting on critical habitats and scenic areas?

Reducing Landscape Wastes. A number of steps can be taken during project planning, design, and operation and maintenance to reduce or avoid the generation of landscaping wastes. These techniques include landscape development and alteration, grass-cycling, composting, and mulching. They can be tailored to specific characteristics of a landscape, such as climate and geography, and can be mixed in any number of combinations.

Will the landscape plan incorporate the planting of native and indigenous trees and plants that require less attention and maintenance? *

Will trees and shrubs be pruned only on an as needed basis? *

Will grass-cycling be practiced as part of project landscape maintenance operations? Grass-cycling is a process in which grass clippings are left in place on a lawn after mowing instead of being raked and bagged. Grass-cycling requires that no more than one third of the blade is cut off and that no more a 1-inch total be cut at any one time. This process improves lawn quality by returning important nutrients from the decaying clippings to the soil and lawn. When grass-cycling is practiced, less money is spent on fertilizers, disposable collection bags, labor costs, and waste disposal. (*)

Will composting be practiced as part of project landscaping maintenance operations? Composting is a process using microorganisms (generally bacteria or fungi) in the presence of

oxygen and moisture to break down organic wastes into a humus-like product. Compost is a superior soil conditioner or mulch suitable for most landscaping and gardening uses. Using compost will help reduce reliance on phosphate and nitrogen fertilizers that may be detrimental to the surrounding ecosystems. Compostable materials include grass clippings, seaweed, leaves, sawdust, chipped or shredded brush, cow and horse manure, chipped or shredded logs, weeds, pine needles, hay, straw, shredded newspaper, and wool and cotton rags. Weeds with many seeds, diseased plants, and manure from meat-eating animals should not, however, be composted.

Will mulching be practiced as part of project landscaping maintenance? Mulching is the practice of spreading or mixing organic material, such as wood chips, leaves, or compost, over soil surfaces. Mulch reduces moisture evaporation from the soil surfaces, reduces soil erosion and compaction from heavy rains, moderates soil temperature, provides optimal conditions for soil enhancing organisms, protects young tree trunks, and provides nutrients as it decays. Furthermore, mulch inhibits weed growth, thereby decreasing the need for constant landscaping care and weed disposal.

Landscape Product Purchasing and Management. Lawn and plant care products, such as fertilizers and pesticides, are also considered as wastes that result from landscape operations. Spoilage of these materials and the packaging left after use should be minimized to reduce an operation's impact on the environment.

Will landscape products be purchased in bulk or concentrate to reduce packaging waste?

Will strict inventory control practices be adopted to prevent material expiration and, thus, waste generation?

Will the use of gas-powered landscape maintenance equipment (which account for 5 percent of our air pollution) be kept to a minimum? Executive Order 12844 calls on Federal facilities to

increase their purchase of alternatively fueled motor vehicles.

Other References

"Presidential Memorandum for the Heads of Executive Departments and Agencies on Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds." August 22, 1994. *Federal Register* Vol. 59, No. 161.

U.S. EPA. "Environmental Fact Sheet: Recycling Grass Clippings." July 1992. EPA/530-F-92-012.

U.S. EPA. "Environmental Fact Sheet: Yard Waste Composting." May 1991. EPA/530-SW-91-009.

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR PEST MANAGEMENT

How Can Pest Management Affect the Environment?

Pest management is often necessary to protect lawns, trees, shrubs, and crops from weeds, diseases, insects, and other animals. Pest management may also be used to control pest populations inside buildings and other structures. However, the same characteristics that make chemical pesticides effective in the control of pests often present risk of injury to humans, as well as non-target animals and plants. These characteristics also create the possibility of general environmental contamination. For the purposes of this checklist, the environmental impacts of pest management requirements will be evaluated on the basis of minimizing acute and chronic risks to populations onsite and downstream from the evaluated area. The selection of pest management techniques is directly related to pest, host, site, and state of development.

There are a large number of pest management techniques: cultural change, plant selection, exclusion, physical removal, repellents, biologics, conservation and augmentation of natural predators, and chemical pesticide application. New projects must be planned to minimize the need for chemical controls. All pest management methods, including chemical pesticides, may be used as part of a pest management program to control weed, disease, insect, and

other animal damage to lawns, trees, shrubs, and crops. Chemicals may be required in managing structural pests, as well as controlling human and animal disease vectors. Potential side effects of the use of chemical pesticide products can include contamination of surface and groundwater, as well as negative impacts on human health and safety. Some pesticides are toxic in small quantities to humans and animals. While many pesticides break down in a few months, others may persist in the environment over time under certain conditions. For the purposes of this checklist, the term "pesticide" refers to herbicides, fungicides, germicides, insecticides, and other substances or mixtures that are used to prevent, destroy, repel, or mitigate any pest.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

On April 26, 1994, President Clinton signed a Presidential Memorandum calling for the establishment of guidelines for Federal facility managers on how to reduce the use of chemical fertilizers and pesticides. The memorandum also discussed the development of guidelines for other environmentally preferable landscaping practices. These guidelines will be proposed by a Federal interagency workgroup established by the Federal Environmental Executive. The following questions address the some of the concepts delineated in the Presidential Memorandum, as well as additional opportunities to prevent pollution and reduce waste generation associated with pest management.

General Concerns. Chemical pesticides are used as a part of pest management programs in the maintenance of lawns, crops, trees, shrubs, and structures. For many pests, alternatives to the use of traditional chemical products are available that are equally effective and are cost-competitive with chemical control methods.

Will an Integrated Pest Management (IPM) program be implemented and supported with continuing personnel training? Facilities should consider implementing IPM programs to combine cultural, biological, and chemical techniques to control pests and minimize the use of toxic/leachable pesticide products. IPM

practices can reduce the risk of exposure to chemical pesticides both on-site and in the general environment.

Has the plan identified facility or project access to expertise in Integrated Pest Management?

Will project construction, operation, and/or maintenance require the use of chemical pesticides as a part of a pest management program?

Will the need for chemical pesticides be reduced through careful selection of pest resistant vegetation, plant and hardware selection to minimize requirements for irrigation, best mowing practices, and planned elimination of pest habitats (e.g., standing water that may attract mosquitoes, cracks and crevices in structures that will admit and harbor cockroaches)? It is important to consider the ecosystem and the compatibility of introduced chemicals with wildlife, including predators and beneficial insects.

Are there less toxic pesticide alternatives? Local agriculture extension agencies, Master Gardener clubs, and lawn and landscape product suppliers often have information about best management practices (BMPs). For example, they will recommend the use of cultural and biologic strategies to avoid the use of chemical pesticides.

Will the facility design and operation accommodate pest management practices that are less susceptible to offsite transport of chemicals, such as pesticides and fertilizers (thereby reducing the potential for groundwater contamination)?

Will less persistent pesticides be identified and used only when needed, in spot application to specific targets, and at minimum required application levels?

Material Storage, Handling, and Use Concerns. The storage,

handling, and use of pesticides can lead to environmental degradation through the interaction of incompatible chemicals due to improper storage, expiration of materials (which subsequently become wastes), spills and other uncontrolled releases, employee exposure to toxic chemicals, and pesticide runoff into environmentally sensitive areas.

Will precautions be taken to purchase only as much pesticide as will be needed for a season and limit the amount of pesticides purchased? Unused or mishandled pesticides may expire and need to be handled as waste (certain waste pesticide mixes are considered hazardous). Some leftover pesticides may, however, be used the following year if properly stored. Containers should be sealed or closed and kept in a dry, well-ventilated area that is locked to prevent unauthorized and child access. All containers storing pesticides should be clearly labeled with product name and all U.S. EPA and locally required information, including hazards and expiration dates.

Will employees be trained in the proper storage, handling, and disposal of pesticides? Employees should be instructed on how to maintain pesticide supplies properly and to wear protective equipment when working with pesticides to limit exposure. (*)

Will the facility use safe pesticide mixing techniques? Safe mixing techniques include ensuring that pesticides are mixed in clear and open areas that can be easily cleaned and avoiding mixing upstream from waterbodies (including drains leading to surface water bodies and groundwater aquifers). Other techniques include mixing the least amount of pesticide possible and using closed mixing systems that reduce the potential for release and exposure. *

Does the facility have a pesticide spill prevention and control plan? Pesticide spill prevention and control plans should be prepared to teach employees how to prevent spills. These plans should be kept onsite for employee reference should a spill occur.

Will precautions be taken to minimize the amount of pesticide

mixed and applied? Facilities should have a program to ensure that employees are aware of when, where, and how much pesticide is necessary for a given pest control situation. The program should also provide employees with training in how to apply pesticides, requirements for posting and notification, methods to reduce application overlapping, and instruction to avoid exceeding recommended application rates.

Will the facility ensure that pesticides are applied only under the optimal weather conditions (e.g., not spraying on windy days and just before or after heavy rainfall)?

Does the facility pesticide application program require the use of techniques to minimize the amount of pesticide applied? These techniques include using applicators (e.g., proper orifice spray nozzles at the correct pressure) to minimize the amount of pesticide needed to treat a given area and control pesticide droplet size and deposition, as well as following correct application timing and sequencing procedures.

Will the facility employ techniques to reduce pesticide runoff? Pesticide runoff and leachate can negatively affect groundwater and surface waters and can be reduced by practicing spot application whenever possible, using row banding application techniques to limit the amount of pesticides applied, using contact pesticides that do not have to be incorporated into the sod, and not spraying in potentially sensitive areas.

Will measures be taken to minimize/eliminate the effects of pesticides on non-target species, such as local, resident wildlife and beneficial insects? *

Pesticide Application Residuals Concerns. The potential for pesticide application activities to affect the environment does not end after a pesticide has been applied. The residuals resulting from the use of pesticides, such as wastewater and empty pesticide containers, must be properly managed to ensure that the

environment is not negatively affected.

Will the facility minimize the number of pesticide containers requiring disposal? Options to reduce the volume of this waste stream include purchasing products in bulk, refillable or returnable containers, and products with water soluble packaging.

Will all empty pesticide containers be triple-rinsed and disposed of properly? Federal regulations require rinsing empty pesticide containers at least three times before disposal. Pesticide containers must not be buried or burned, even after triple-rinsing. Rinsed containers can be disposed of at a sanitary landfill or often may be returned to the supplier for reuse. Reusable containers reduce the need for rinsing and disposal. (*)

Will the facility properly manage pesticide rinse waters? Pesticide-contaminated rinse waters can be used in future pesticide mixing and application as an alternative to disposal, or can be applied in onsite landscape applications. *

Other References

North Carolina Agriculture Extension Service. Series of Fact Sheets on Pollution Prevention Opportunities and Safe Pesticide Management. (Available through the Pollution Prevention Information Clearinghouse (PPIC), Tel No. 202/260-1023.

Presidential Memorandum on guidelines for Federal facility managers on reducing chemical fertilizer and pesticide use, signed by President Clinton on April 26, 1994.

U.S. EPA, Office of Pesticides and Toxic Substances. July 1992. "Urban Integrated Pest Management: A Guide for Commercial Applicators." EPA 735-B-92-001.

U.S. EPA, Office of Pesticide Programs. March 1989.
"Recognition and Management of Pesticide Poisonings." EPA-540/9-88-001.

U.S. EPA, Risk Reduction Engineering Laboratory. July 1993.
"Guides to Pollution Prevention: Non-Agricultural Pesticide Users." EPA/625/625/R-93/009.

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR SITING

How Can Siting Affect the Environment?

Siting a building, facility, or project can affect the environment in a number of ways. Direct impacts can include destruction of existing habitats, alterations in topography and hydrology, and the introduction of pollutants into the environment. Indirect impacts include energy use and infrastructure construction for transporting people and materials to the facility, as well as environmental impacts from use and waste disposal activities.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Sensitive Ecosystems Concerns. Siting facilities in close proximity to sensitive ecosystems can result in damage or destruction of these areas. Improper siting with regard to slope and hydrology can affect sensitive areas through alterations in the hydrological regime, increased runoff and erosion, and destabilization of slopes or shorelines.

Is it feasible to use or retrofit an existing building, structure, or

developed site to locate the facility, rather than create new development and construction?

Will facility siting avoid or maximize the distance away from sensitive areas, such as wildlife habitats, wetlands, streambanks, and other sensitive ecosystems? (*)

Is the project site located away from streambanks/beds, shorelines, and flood-prone areas to avoid affecting these areas?

Will buffers, such as forests or wetlands, be used between the development site and streams or shorelines to minimize impacts on aquatic systems? *

If the development is linear (e.g., a road, bridge, or pipeline), does it take advantage of existing rights of way to avoid disturbing additional habitats?

Water and Air Quality Concerns. The siting and location of a development may increase the effects on water and air quality. Siting is particularly important if pollutants cannot be contained within the development. The potential for impact depends on the nature of water (e.g., existing drinking water sources) and air quality in an area and its potential to be affected by pollutants (e.g., depth to groundwater).

If the project has the potential to affect groundwater quality through the use or disposal of chemicals or nutrients, has consideration been given to avoiding placement over aquifer recharge areas? *

Will facility siting avoid direct contact with groundwater resulting from deep footings, foundation work, tunneling, or underground utilities?

Is the project site designed to avoid or mitigate storm water impacts through the use of retention basins, infiltration fields, or other methods to reduce runoff?

Will siting facilities/buildings avoid steep slopes to prevent erosion or slope failures?

Will erosion control measures be used if facilities are sited on slopes? Erosion control measures include maintaining vegetation cover and timing construction activities to avoid heavy seasonal rainfall.

If siting must take place in an aquifer recharge area, will protective measures, such as liners and containment areas, be used to prevent the migration of wastes into groundwater?

For major sources of air pollutants, such as refineries and incinerators, has the attainment status of the area for criteria air pollutants, including ozone and pm₁₀, been considered in the siting decision? (*)

Transportation Concerns. The siting of a facility should include consideration of the impacts of transporting workers, raw materials, finished products, and energy sources (electricity, natural gas). Efficiency is increased for facilities that are located in proximity to suppliers and to existing transportation corridors and infrastructure. Transportation savings can also be accomplished by concentrating development on a site rather than spreading services across many widely separated buildings

Is the site located in proximity to existing rail lines, roads, and highways?

Is the site located near an existing public transportation system that can be used by the workforce to access the facility?

Can the facility take advantage of existing power lines and pipeline rights-of-way to supply its energy needs?

Does the development design consider increased density to avoid the need for transportation within the facility?

Is the site located near sources of raw materials, personnel, or markets?

Energy Concerns. Energy use within a facility often can be minimized through design and siting features. The orientation of buildings to take advantage of natural lighting, solar heating, and/or cooling can increase energy efficiency.

Has the siting considered orientation for passive heating and cooling?

Does the siting reduce solar radiation by shading critical surfaces and increasing the amount of vegetation surrounding the facility?

Does the siting take advantage of natural topography features to increase shading during periods when cooling is required?

Does the siting take advantage of natural wind patterns for cooling?

Other References

American Planning Association. The Transportation/Land Use Connection. Planners Advisory Service Report. Telephone No. (312) 955-9100.

Marsh, W.M. 1993. *Landscape Planning. Environmental Applications*. Second Edition. John Wiley and Sons.

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR VEHICLE MAINTENANCE

How Can Vehicle Maintenance Affect the Environment?

Vehicle maintenance shops can generate a variety of solid and hazardous wastes. Commonly generated wastes include out-of-date supplies, wastewater, oils, petroleum products and greases, solvents (both waste liquids and vapors), paints, and tires, as well as waste metal, cardboard, and paper. Each of these wastes has the potential to negatively affect one or more of the environmental media (i.e., land, water, and air). However, such activities and practices as segregating wastes, using proper inventory control, preventing spills, practicing preventive maintenance, improving process efficiency, and recycling can help minimize these impacts.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Procurement Concerns. Purchasing decisions are an important element of pollution prevention. Making environmentally sound purchasing decisions can help reduce the amount of waste generated by a vehicle maintenance shop. In addition, the purchasing of recycled content products helps support markets for

materials collected for recycling.

Executive Order 12873, Federal Acquisition, Recycling, and Waste Prevention, directs Federal agencies to increase their purchases of recycled or environmentally preferable (EP) products.

Will the facility use recycled automotive maintenance products and retread tires? Such products as refiltered or re-refined oil and hydraulic fluids, as well as recycled antifreeze and solvent, are available for use in vehicle maintenance operations.

Will the facility identify and use the least toxic product available to complete a job? Many automotive maintenance products are formulated with high percentages of volatile organic compounds (VOCs) and toxic constituents. Safer, more environmentally sound materials are, however, available and perform as well as traditional products. For example, non-chlorinated solvents can be substituted for chlorinated solvents, detergent-based solutions can be substituted for caustic solutions in many applications, and water-based cleaners often can be used instead of organic solvents.

Will long-lasting or synthetic oils be used when possible? Long-lasting oils reduce waste generation because they do not need to be replaced as often.

Hazardous Materials Storage. Vehicle maintenance operations often involve the use of hazardous materials. The use of these materials can affect the environment through improper storage, air emissions of volatile chemicals, and spills and other uncontrolled releases, as well as the potential generation of toxic waste materials.

Will hazardous materials be properly stored and handled? Proper storage and handling can include labeling containers, protecting materials from the elements, maintaining secondary containment, ensuring the compatibility of stored materials to avoid explosion hazards, and following instructions on the product's Material Safety

Data Sheets (MSDSs). (*)

Will the access to hazardous materials be limited? Limiting the access to hazardous materials allows a shop to keep track of chemical usage more easily and helps reduce unnecessary waste generation.

Will a first-in, first-out inventory control system be used? This type of system helps prevent materials from expiring prior to use and becoming unnecessary waste. Efforts should also be made to minimize inventory levels by purchasing only the amount of material that will be needed in a reasonably short period of time (e.g., 30 days) to reduce loss from spoilage. At the same time, however, materials should be purchased in the largest containers appropriate to minimize excessive packaging.

Operating Practices. The use of oils, solvents, and other vehicle maintenance products can have significant effects on human health and the environment. The adoption of environmentally conscious operating practices can, however, reduce these impacts.

Will vehicle maintenance bays be located to minimize the potential impacts of maintenance activities on the surrounding environment?

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Will the facility avoid unnecessary maintenance on vehicles? One of the biggest sources of waste generated from vehicle maintenance shops comes from unneeded maintenance activities. An example of a way to minimize this waste is to change vehicle fluids on an as-needed basis rather than according to a fixed maintenance schedule not based on vehicle usage.

Does the facility operating plan specify reducing the number and types of products, such as solvent, that will be used at the shop? Minimizing the types of different solvents used can simplify inventory procedures, reduce waste management issues, and facilitate recycling.

Does the facility keep copies of its spill control and countermeasure plan for hazardous materials in each shop?

Will the facility use drip pans, secondary containment, and other collection devices to help reduce the impact of spills and the use of absorbent products?

Will a bulk fluids distribution system be cost effective? This type of system allows employees to dispense only as much product as is necessary for a job, in addition to reducing the potential for spills associated with the use of large, unwieldy containers. *

Will the facility's solvent sink be operated to reduce environmental impacts? Environmentally preferable operating practices include pre-rinsing parts with dirty solvent before using fresh solvent to extend solvent life, removing parts from the sink slowly to reduce solvent dragout, using drip racks to reduce solvent loss, keeping sink lids closed when not in use to minimize the evaporation of solvent, not leaving solvent streams running, and cleaning out sludges regularly to maintain fresh solvent.

Vehicle Washing Activities. Vehicle washing can generate a large quantity of wastewater that may be contaminated with oils, greases, and dirt, as well as washing soaps and detergents. In some States, it is illegal to wash vehicles without wastewater recycling equipment under certain conditions.

Does vehicle washing need to take place onsite? In some instances, offsite washing is a more efficient and environmentally preferable option. However, if properly implemented, onsite washing can be preferable since it can reduce the amount of fuel used expressly for moving the vehicle for washing.

Will vehicle washing take place at a centralized, enclosed, and contained area to reduce potential impacts to the surrounding

environment from runoff?

Will vehicle washing be conducted on an as-needed basis, rather than according to a fixed schedule? Reducing unnecessary vehicle washing can significantly reduce wastewater generation.

Will the wastewater from the wash rack's floor drains be properly treated onsite (e.g., by removing oils, greases, and other contaminants) prior to discharge to a waterbody? Will an oil/water separator be used?

Will the wash rack use detergents that do not contain phosphates or toxics?

Can water from the wash rack be captured, filtered, and reused rather than being released? If a facility will maintain a large fleet of vehicles that require washing, a custom designed washing facility may be cost effective. If vehicle washing must be performed by hand, a high volume, low pressure washer system will be more cost effective than a simple hose in terms of reduced personnel hours and energy usage.

Reuse and Recycling. Many of the waste materials generated during vehicle maintenance activities can be reused or recycled into usable products. Reuse and recycling are preferable to treatment and disposal because they remove materials that would otherwise become waste.

Are there plans for adequate segregation and containment of waste oil, antifreeze, and solvent? Each of these materials can be reclaimed or recycled if segregated. However, commingling these wastes makes recovery more difficult or impossible and dramatically increases waste disposal costs. (*)

Will the facility use solvent or antifreeze reclamation units? The onsite recycling of fluids is often a cost-effective pollution

prevention option for larger shops. When onsite recycling is not cost effective, these materials can be segregated and picked up by a contractor for offsite recycling. *

Will the facility collect scrap metals generated at the shop (e.g., used parts, empty material storage drums) for recycling? In some instances, punctured aerosol spray cans and drained oil filter casings may also be recycled as scrap. *

Will automotive batteries be collected and stored for recycling? *

Will the facility reuse cardboard and other packaging received in the delivery of parts and materials or collect it for recycling? (*)

Will tires be collected and stored for recycling? *

Painting Operations. Wastes associated with painting operations include unused paints and dirty thinner. Thinners and solvents can also be sources of VOC emissions. Used spray booth filters are also waste products that may be generated from these shops. Proper training of employees and the use of high efficiency equipment can help reduce waste generation.

Can water-based coatings be used instead of solvent-based coatings? The automobile industry is working closely with paint manufacturers to develop acceptable substitutes for solvent-based paints.

Will the facility use high efficiency painting technologies? When properly used, high volume, low pressure (HVLP) and electrostatic painting systems can reduce the amount of paint needed for a job and the amount of VOCs released to the air.

Will employees be trained to use as little solvent/thinner as

possible to clean up after painting activities?

Will the facility employ a gun cleaning station? Gun cleaning stations capture the thinner/solvent shot through the gun and condense it for reuse instead of venting the substance to the air. In some cases, it may be possible to use water-based gun cleaners as an alternative to solvent thinner. *

Will the paint shop utilize reusable polystyrene booth filters? Traditional paint booth filters often must be handled as hazardous waste because of the presence of wet paint or paint containing lead or chromium. Polystyrene filters can be cleaned with compressed air and reused (with the paint residue captured for disposal). Once it can no longer be used, the cleaned filter often can be disposed of by dissolving it in a waste thinner drum.

Will painting operations be located in an enclosed and properly ventilated area to reduce potential environmental releases?

Will employees be trained to minimize the amount of waste paint generated by mixing only the amount of paint needed for a job?

Pollution Prevention/Environmental Reduction Impact Training. Pollution prevention and environmental impact reduction in vehicle maintenance shops is closely linked with employee attitudes toward their work and the environment. A facility that provides basic environmental awareness/pollution prevention training and enthusiastically supports pollution prevention on a daily basis will have a noticeable effect on worker attitudes and can help reduce vehicle maintenance waste streams through such procedures as good housekeeping, spill prevention, and improved materials handling.

Other References

U.S. Environmental Protection Agency, Office of Research and Development. October 1991. "Guides to Pollution Prevention: The Automotive Refinishing Industry." EPA/625/7-91/016.

U.S. Environmental Protection Agency, Office of Research and Development. October 1991. "Guides to Pollution Prevention: The Automotive Repair Industry." EPA/625/7-91/013.

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR WATER USE

How Can Water Use Affect the Environment?

The procurement and delivery of water for domestic, commercial, and industrial use, as well as the treatment of wastewater generated by these users, affect the environment. Water procurement can affect the quality and quantity of both surface water and groundwater, cause land subsidence from groundwater overdraft, and destroy habitat. Water delivery systems can destroy habitat and ecosystems from canal and pipeline construction and consume energy for pumping. Wastewater affects surface water quality and habitats and requires energy to treat. The employment of water conservation techniques can reduce the environmental effects of water use.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Executive Order 12902, Energy Efficiency and Water Conservation, directs all Federal agencies and facilities to improve their water efficiency. Every Federal facility is required to contribute toward agency water use reduction and conservation goals.

Heating and Cooling. A study by Denver Water, supplier to Denver, Colorado, determined that 48 percent of the water used by manufacturers is used for heating and cooling purposes. A significant amount of water use and wastewater production can be minimized by increasing the efficiency of heating and cooling equipment and by decreasing heating and cooling requirements.

Will energy conservation measures be employed to reduce the need for heating or cooling?

Will the most efficient heating and cooling equipment available be used to reduce water needs?

Can air-cooled equipment be used instead of water-cooled?

Will heating and cooling equipment be maintained according to manufacturer recommendations and will leaks be repaired in a timely manner? Proper maintenance can help reduce the use of water by this equipment.

Will once-through cooled water be used? If once-through cooling is used, will the water be reused for irrigation or make-up water? Whenever feasible, once-through cooling should be eliminated from any facility design.

Sanitary and Kitchen Fixtures. Water conserving fixtures can significantly reduce water use in sanitary and kitchen facilities in commercial offices, industrial buildings, and residential dwellings.

Are ultra-low flush toilets specified for installation?

Will flow restrictors be installed on faucets and showers?

Will notices be posted to encourage minimizing shower time and turning the tap off when the water is not needed?

Will aerators be used on all faucets?

Will fixtures be routinely inspected for leaks and other problems, and will they be repaired promptly?

Process Water. Manufacturers, food and beverage processors, schools, health care facilities, and laundries use substantial amounts of water in their processes. Reductions can be achieved in the amount of water used by installing water saving devices, implementing new or modified processes, and reusing water.

Have process modifications that would use less or no water been evaluated for implementation? Have water-less processes been considered?

Could rates be structured to reduce peak water demand?

Will automatic valves and water level sensors be employed to turn water off when not in use and to provide the precise amount when needed?

Will process water be recirculated until it is too dirty for use?

Will process water be recycled onsite and returned to the process or used to meet other onsite needs (e.g., landscaping)? [\(*\)](#)

Landscaping. Landscaping plans tailored to the specific nature of the local environment can greatly reduce water use. Appropriate landscaping includes using water conserving plants in hot and dry regions. Landscape irrigation is also a key area where water use

can be reduced.

President Clinton recently signed a Presidential Memorandum calling for the establishment of guidelines for Federal facility managers on how to implement water conservation techniques in conjunction with landscaping activities.

Will vegetation be planted that is drought tolerant and uses low levels of water?

Depending on the type of landscaping, is the most efficient type of water application specified for use?

Will daytime watering be prohibited?

Will automatic timers be employed, and will watering duration be monitored to prevent overwatering?

Can non-potable, treated wastewater be used for irrigation? *

Other References

Maddaus, W.O. 1989. *Water Conservation*. American Water Works Association.

Water Efficiency: A Resource for Utility Managers, Community Planners, and Other Decisionmakers. 1991. The Water Program, Rocky Mountain Institute.

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR AGRICULTURAL IRRIGATION

How Can Irrigation Affect the Environment?

The construction and operation of agricultural irrigation systems can have a variety of impacts on the environment. Additionally, the environment can be affected in areas where the land is irrigated. The effects of agricultural irrigation include destruction or alteration of habitat, water and wind erosion, and ground and surface water depletion. Impacts also result from the use of energy and pesticides, as well as herbicides and fertilizers, from salinity buildup, and from contaminated agricultural runoff. The use of pollution prevention in irrigation can reduce these environmental effects.

Also see checklists on Ecosystem Preservation and Protection, Water Use, Pest Management, and Landscaping.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Water Supplies. Irrigation systems rely on water supplies obtained

from either groundwater pumping or surface water impoundment. The water supply can be augmented by using return flows. The types of environmental impacts and their significance depend on where irrigation water is obtained and how it is delivered to the irrigated land. Water supply quality can affect the land that is irrigated, as well as the land from where it is obtained. Environmental impacts related to irrigation water supply can be reduced or eliminated by implementing pollution prevention techniques.

Are there provisions to ensure that the quality of the supplied water does not contribute to salinity buildup on the irrigated land?

Will groundwater extraction rates be kept at or below recharge rates to prevent drawdown and related subsidence and habitat destruction?

Will surface water diversion be from an existing impoundment or reservoir? Will the diversion rate have an adverse effect on downstream flow rates or downstream water temperature?

Will surface water diversion reduce groundwater discharge?

Delivery Systems. Pollution prevention can reduce or eliminate the environmental effects of delivering irrigation water from where the water is obtained to the irrigated land. A delivery system can incorporate canals, piping, and pumps, depending on the system.

Will reclaimed and/or recycled construction materials be used, including aggregate, rebar, lumber, and asphalt? [\(*\)](#)

Will construction materials used in building the delivery system be reclaimed and reused in future projects rather than being disposed of? *

Are there alternative materials available to reduce hazardous and toxic materials use during construction?

Does the construction plan provide for erosion and sediment control, does it minimize the disturbance of vegetation and soil, and does it include revegetation of disturbed areas?

Does the delivery system use existing structures to the extent possible and avoid sensitive habitats?

Will seepage be minimized or eliminated by selecting canal and ditch materials that prevent seepage?

Irrigated Areas. The environment of an area can be significantly affected by irrigation and its related practices. The impacts typically include habitat alteration and destruction, soil erosion and loss, soil and water contamination, and air quality degradation. Pollution prevention can minimize these impacts.

Is there a need for irrigation? Can a crop be selected that does not require irrigation, or can the selected crop be grown in an area where irrigation is not needed?

Will measures be taken to limit pesticide, herbicide, and petroleum-based fertilizer use, including using organic fertilizer, planting pest-resistant crops, and alternating crops and planting cycles?

Will soil loss prevention measures be taken to prevent wind and water erosion, including planting vegetative windbreaks, practicing contour plowing, and maintaining soil moisture? These practices reduce offsite sedimentation, nutrient pollution, and water quality degradation.

Application. Consideration should be given to irrigation application methods and their potential to reduce or eliminate impacts that can

result from excessive water use, erosion, agricultural runoff, and soil leaching. Evaluate the proposed action for the following:

Will irrigation periods be restricted to evenings, nights, and early mornings to prevent excessive water loss due to evaporation and reduce peak power demands?

Will water application rates be minimized to prevent surface runoff, over watering, and nutrient leaching?

Will soil moisture content, temperature, humidity, time of day, wind, and evapotranspiration rate be considered in determining the most efficient time to irrigate? Computerized irrigation systems are available that take into account all of these factors and more.

Have drip irrigation and other water conserving application techniques been evaluated for implementation?

Do water cost and allotment factors encourage conservation? Are financial incentives or disincentives, such as an increasing per unit cost, provided to promote conservation?

Runoff/Drainage Water Management. A variety of techniques can be employed to prevent drainage water from causing environmental impacts, including sedimentation caused by erosion and surface and groundwater quality degradation.

Will agricultural runoff be managed to prevent impacts from excess nutrients and chemical pesticides and herbicides?

Will filter strips or other methods be used to remove sediments, organic matter, and other pollutants from runoff and waste water?

Can the drainage water be reclaimed and reused? (*)

Will water from subsurface drainage systems be evaluated for contaminant levels and the best management practice selected for its handling? *

Other References

Evans, R.O., D.K. Cassel, and R.E. Sneed. 1991. *Irrigation Scheduling to Improve Water- and Energy-Use Efficiencies*. North Carolina Cooperative Extension Service. AG-452-4.

U.S. EPA, Office of Water. January 1993. *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*. 840-B-92-002.

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR AIRPORTS

How Can Airports Affect the Environment?

The planning, design, construction, and operation/maintenance of airports can have a variety of impacts on the environment. These impacts include destruction or alteration of wildlife habitats, erosion, sedimentation, soil compaction, noise pollution, chemical pollution resulting from aircraft maintenance and deicing, aircraft emissions, contaminated runway runoff, and the generation of waste construction materials, as well as litter and other debris from administrative and food service operations. The implementation of pollution prevention strategies can help reduce the volume and toxicity of waste generated by an airport, minimize environmental effects, and reduce operating costs.

Also see checklists on Ecosystem Preservation and Protection, Siting, Energy Management, Vehicle Maintenance, Building/Housing Construction, Highways and Bridges, and Water Use.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Have other forms of mass transit been considered as an alternative to constructing a new airport? Expansion/improvement of commuter rail service may, for example, reduce the need for building new airports.

Noise Concerns. Noise pollution from airports can represent a significant negative impact on human and wildlife health and welfare. Concerns related to noise pollution can include noise-induced hearing loss, annoyance, and sleep disturbance. A number of techniques are, however, available to reduce noise pollution associated with airport operations.

Does the airport construction and operation plan explain noise and noise analysis methodologies? Are single-event and cumulative noise metrics defined and used in the analysis? (*)

Are potential noise effects on human health and welfare analyzed? Have the locations of all noise-sensitive areas (e.g., residences, schools, parks, and ecologically sensitive wildlife areas) been identified? *

Does the airport operation plan include provisions to increase the distance between the source of noise and sensitive areas? Techniques include changing flight corridors and flight altitudes, gate locations, and taxiway and runup pad patterns. *

Does the airport construction plan include the use of noise barriers (e.g., berms, hush houses) to reduce impacts on the surrounding environment? *

Does the airport operation plan include provisions to reduce noise pollution by reducing the number of operations that produce noise, reducing the duration of noise-making events, or limiting the operation of noisier aircraft types at the airport?

Does the aircraft operation plan reduce the number of operations or noise making events that occur at night? Techniques include rescheduling night arrivals and departures to daytime, limiting engine maintenance at night, limiting the use of auxiliary and ground power units, providing preferential runway use based on time of day, and limiting nighttime departures and arrivals based on sound level of the aircraft.

Aircraft Maintenance. Wastes generated as a result of aircraft maintenance activities can include organic solvents, oil and grease, tires, and batteries. Some of these wastes can be toxic or otherwise hazardous, and uncontrolled releases can contaminate surface waters, groundwater, and soils.

Will aircraft maintenance hangars be located to minimize the potential impacts of maintenance activities? [\(*\)](#)

Is there a plan for spill reduction and collection in maintenance areas (such as the use of drip pans, secondary containment, and absorbent products)?

Will spill prevention and control plans for hazardous materials be located in aircraft service hangars?

Will aircraft maintenance be conducted on an as-needed basis? Performing maintenance on an as-needed basis rather than on a set schedule can help reduce waste generated by unnecessary maintenance and fluid changes.

Will aircraft maintenance shops use recycled maintenance products when possible? [*](#)

Will the facility collect engine and hydraulic oil for recycling? Segregating and recycling used oil can significantly reduce the quantity of waste generated and managed at an airport. [*](#)

Will the facility reuse or recycle spent antifreeze? Onsite antifreeze recycling units can be a cost-effective alternative to disposing of spent antifreeze for larger operations. *

Will precautions be taken to segregate oils and other hydraulic fluids from other waste streams (including solvents)? Oils and hydraulic fluids that are not commingled can be recycled into usable products.*

Will a bulk fluids distribution system be cost effective? These distribution systems allow employees to dispense only as much product as is necessary for a job, and they reduce the potential for spills associated with the use of large, unwieldy containers.

Will the facility's solvent sink be operated to reduce environmental impacts? Environmentally preferable operating practices include pre-rinsing parts with dirty solvent before using fresh solvent to extend solvent life, removing parts from the sink slowly to reduce solvent dragout, using drip racks to reduce solvent loss, keeping sink lids closed when not in use to minimize evaporation of solvent, not leaving solvent streams running, and cleaning out sludges regularly to maintain fresh solvent.

Will the facility use aqueous or semi-aqueous cleaners as an alternative to solvents when possible? Aqueous and semi-aqueous cleaners already are being used by several major air carriers to reduce solvent use.

Will tires removed from aircraft or service vehicles be recapped or recycled for use in other applications? (*)

Will lead-acid, lithium, and nickel-cadmium batteries be collected and stored for recycling and metals recovery? *

Will the facility collect and recycle scrap metals generated at shops (e.g., used parts, empty material storage drums)? In some instances, punctured aerosol spray cans and drained oil filter casings may also be recycled as scrap. *

Will hazardous materials be properly stored and handled? Proper storage and handling can include labeling containers, protecting materials from the elements, maintaining secondary containment, ensuring the compatibility of stored materials to avoid explosion hazards, and following instructions on the product's Material Safety Data Sheets (MSDSs). *

Will access to hazardous materials be limited? Limiting access to hazardous materials allows for easier tracking of chemical usage and helps reduce unnecessary waste generation.

Aircraft Painting. Wastes associated with aircraft painting operations include unused paints, dirty thinner, and emissions of volatile organic compounds (VOCs) from thinners and solvents. Used spray booth filters are also waste products that may be generated. Proper training of employees and the use of high efficiency equipment can help reduce waste generation.

Will aircraft painting operations be located and enclosed to minimize the potential impacts of painting activities?

Will a non-solvent based paint stripping system be used? Media blast systems have proven to be an effective alternative to solvent strippers.

Will employees be trained to minimize the amount of waste paint generated by mixing only the amount of paint needed?

Will the facility employ high efficiency painting technologies? When properly used, high volume, low pressure (HVLP) and electrostatic painting systems can reduce the amount of paint

needed for a job and reduce the amount of VOCs released to the air.

Will employees be trained to use as little solvent/thinner as possible to clean up after painting activities?

Would it be cost effective to install a distillation unit to recover solvents for reuse? *

Will the facility employ a gun cleaning station? Gun cleaning stations capture the thinner/solvent shot through the gun and condense it for reuse instead of venting to the air. In some cases, it may be possible to use water-based gun cleaners as an alternative to solvent thinner.

Will the paint shop utilize reusable polystyrene booth filters? Traditional paint booth filters often must be handled as hazardous waste because of the presence of wet paint or paint containing lead or chromium. Polystyrene filters can be cleaned with compressed air and reused (with the paint residue captured for disposal). Once it can no longer be used, the cleaned filter can often be disposed of by dissolving it in a waste thinner drum.

Aircraft Washing. Aircraft washing typically involves pressure spraying the aircraft with cleaning agents, brushing surfaces with an alkaline water-based cleaner, and rinsing with hot or cold water. This activity can generate large quantities of wastewater that may be contaminated with oils, grease, dirt, and detergent.

Will a centralized, stationary washpad area be located to reduce impacts to the surrounding environment?

Will washwaters be contained to reduce runoff to the surrounding environment? Will an oil/water separator be used? [\(20\)](#)

Can water from the aircraft washpad be captured, filtered, and reused in aircraft washing or other activities? *

Will the facility use the least toxic cleaner/detergent necessary to effectively clean the aircraft?

Will equipment (such as flow restrictors) be used to control the amount of water used to wash aircraft?

Deicing Activities. The chemicals used in aircraft and runway deicing activities are a glycol/water mixture that can be released to the environment (soils, surface water and groundwater) via stormwater runoff. Deicing chemicals also may be ingested by deer and other wildlife.

Will deicing operations be located at a centralized, stationary position to allow aircraft to stop over a drain that captures the glycol-based fluids? Mobile deicers typically do not have secondary containment systems and thus can release deicing chemicals into the environment.

Can deicing chemicals be collected and reused in aircraft deicing or other purposes? Deicing chemicals can be reused in aircraft applications if they meet performance specifications. *

Would it be cost effective to install a computerized spraying system to apply deicing chemicals? These systems, which are in use today, are more efficient and require less chemicals per square foot.

Does the facility construction plan call for the installation of in-pavement heating elements (e.g., tubing filled with heated liquid or gas and electrical elements) to aid in taxiway deicing? The use of this type of equipment can reduce the quantity of deicing chemicals that need to be applied.

Concession/Food Services. Concession shops and food service operations can generate significant quantities of solid waste, such as corrugated cardboard, paperboard, office paper, newspapers, magazines, wooden pallets, aluminum, plastic, and glass containers, as well as leftover food. The application of pollution prevention techniques to these operations can help reduce the volume of waste that an airport must dispose of, as well as associated waste management costs.

Will the facility be designed and constructed to facilitate an in-terminal recycling program for such materials as cardboard, beverage containers, and newspapers that will be convenient and easy to follow for both passengers and shop keepers? [\(21\)](#)

Administrative Offices. Airports, like other administrative offices, can generate large quantities of waste paper and consume large amounts of energy from lighting, heating and cooling systems, and computers.

Will office paper generated in the airport's administrative offices be collected for recycling? *

Will the airport administration facilities specify the purchase of recycled content paper and other office products? *

Will the facility plan call for the purchase of energy efficient computers that shut off when not in use? Executive Order 12845 committed the Federal Government to purchase energy-efficient computers, monitors, and printers to the maximum extent possible.

Can motion sensors and other energy conservation techniques be used to reduce energy usage?

Other References

Federal Interagency Committee on Noise (FICON). August 1992. "Federal Agency Review of Selected Airport Noise Analysis Issues."

National Research Council (NRC), Assembly of Behavioral and Social Sciences, Committee on Hearing, Bioacoustics, and Biomechanics (CHABA). 1977. "Guidelines for Preparing Environmental Impact Statements on Noise." Report of Working Group 69.

U.S. Department of Transportation, Federal Aviation Administration. 1989. "Final Environmental Impact Statement for Baltimore/Washington International Airport Extension of Runway 15L/33R."

U.S. Department of Transportation, Federal Aviation Administration. February 1991. "Management of Airport Industrial Waste." AC: 150/5320-15.

U.S. EPA. October 1993. "Eliminating CFC-113 and Methyl Chloroform in Aircraft Maintenance Procedures." EPA-430-B-93-006.

U.S. EPA, Region VIII. March 1992. "Operational Approach for Developing a Pollution Prevention by Design Project: A Model Developed from the Denver International Airport's Pollution Prevention Project."

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR BUILDING/HOUSING CONSTRUCTION

How Can Building/Housing Construction Affect the Environment?

Wastes associated with building/housing construction include unused and excess material generated during site excavation, site clearance, construction, and renovation activities. These wastes may be rubble (concrete, bricks, and asphalt), wood and wood products, plaster, metals, plastics, and insulation. These materials (commonly referred to as C&D debris) comprise approximately 15 to 30 percent of all waste disposed of in landfills. Further, some of these waste products may contain toxic constituents that pose a risk to human health and the environment. Many local governments have passed ordinances that restrict or prohibit the disposal of C&D debris in landfills and require the recycling of many of these materials. In addition, purchasing decisions associated with building/housing construction projects can affect the amounts of waste generated, as well future energy requirements (e.g., from lighting and heating).

Also see checklists on Ecosystem Preservation and Protection, Siting, Landscaping, Pest Management, and Energy Management.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Ecosystem Concerns. The clearing of lands for construction can lead to the loss of wildlife habitats, erosion and sedimentation associated with the use of heavy machinery, loss of native plant life, and contamination of soils and surface and groundwater. However, proper design and planning can help reduce these impacts.

Is the construction project necessary? Is the project over-designed? In some cases, the construction of additional structures is not needed and minor alterations to existing facilities may be sufficient.

Have attempts been made to avoid construction in environmentally sensitive areas (such as wetlands and threatened or endangered species habitats)? (*)

Are specifications for construction practices designed to control and exclude pest entry in contained habitats? *

Does the construction contract specify that contractors should cause the least possible disturbance to the site's vegetation? For example, under certain circumstances, it may be possible to preserve individual trees or stands of old-growth that would otherwise be destroyed.

Does the construction plan provide for erosion and sediment control during construction as well as after? Uncontrolled soil erosion can have adverse effects on local waterbodies and aquatic life.

Will soil excavated from the construction site be reused? Topsoil can be respread in areas to be landscaped to enhance plant health. *

Does the plan include the revegetation of areas disturbed by construction? *

Is there a plan to reduce the use of materials containing constituents that can negatively affect the environment?

Is there a spill control and countermeasure plan to properly address spills of hazardous construction materials?

Will hazardous materials be stored properly at the construction site? Hazardous materials should be kept in storage buildings (with secondary containment and hard stands) located away from the active construction zone. Examples of hazardous materials typically found at construction sites are petroleum products (lubricating oils and greases), fuels (gasoline, kerosene), solvents, paints, batteries, and miscellaneous equipment maintenance supplies.

Procurement Concerns. Environmentally sound purchasing decisions are an important element of pollution prevention, helping reduce the amount of waste generated by a building/housing construction project. In addition, the purchasing of recycled-content material helps support markets for materials collected for recycling.

Executive Order 12873 directs all Federal agencies to review and revise their specifications, product descriptions, and standards to increase their purchase of environmentally preferable and recycled products.

Will the project include the use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time?

Are there provisions for the proper storage of construction

materials to reduce the amount of waste caused by damage or exposure to the elements?

Will perishable construction materials (such as paints) be purchased incrementally to ensure reduced spoilage of unused materials?

Will the project use building materials that have minimal packaging to avoid the generation of excessive packaging waste?

Will the project use building materials that are produced locally to avoid energy use and pollution generated from transportation?

Will the project use construction materials containing recycled content when possible and in accordance with accepted standards? Examples of recycled-content materials include concrete containing fly ash and thermal insulation containing cellulose (i.e., recovered newspaper with fire retardant). (*)

Does the construction plan include the use of alternative, environmentally preferable construction materials? Alternative construction materials include lumber products containing recycled plastic and/or wood, lead-free and low-VOC paints and coatings, and recycled steel for use in building frame applications.

Does the construction plan call for the use of refurbished construction materials? Purchasing and using once-used or recovered construction materials can often save money and reduce the amount of C&D debris disposed of as waste.

Reuse and Recycling. Many of the waste materials generated as a result of building/housing construction can be reused, refurbished, or recycled into usable products. The benefit of these practices is that materials that would otherwise be disposed of from the waste stream are diverted for productive uses.

Will the construction contract specify that construction materials left over at the end of the project be reused in other projects rather than be disposed of? (*)

Will the construction contract specify that construction materials that are damaged or wasted be recovered for refurbishing and use in other construction projects? Such items as cabinets, doors, plumbing and lighting fixtures, tile, carpeting, door hinges, wall paneling, restroom mirrors, and stairway banisters can be recovered and renovated for use. Local community groups or individual homeowners may also be interested in reusing these items. *

Is there a plan to use or sell trees cut down during construction activities as lumber or compost? *

Will any metal, wood, or packaging wastes generated as a result of construction activities be collected for reuse or recycling into other usable products? Commonly recycled construction materials include concrete, asphalt roofing material, metals, and structural wood. *

Will mercury-containing materials recovered in any renovations of existing structures be recycled?

Energy Efficiency. Employing energy efficient technologies and practices can have a significant positive effect on the environment. There are a number of opportunities to include energy efficiency in building/housing construction projects.

Executive Order 12902 calls on Federal agencies and facilities to increase energy conservation efforts and improve energy efficiency.

Does the construction plan specify the use of "low-embodied

energy" construction products whenever possible? The energy required to make a product should be considered in making purchasing decisions.

Does the construction plan specify the use of energy efficient lighting systems?

Will preference be given to purchasing energy-efficient electric products and equipment (such as appliances and heating and cooling systems)?

Does the construction plan call for sufficient insulation to reduce heat loss and conserve energy?

Will the proposed facility participate in the EPA Energy Star Buildings program?

Other References

"Environmental Building News: A Bimonthly Newsletter on Environmentally Sustainable Design & Construction." RR1 Box 161, Brattleboro, VT 05301. Telephone No. (802) 257-7300.

Metropolitan Council of the Twin Cities Area. "Construction Materials Recycling Guidebook - A guide to reducing and recycling construction and remodeling waste."

National Association of Home Builders. 1201 15th Street, NW, Washington, DC 20005-2800. Telephone No. (202) 822-0200/(800) 368-5242, Fax No. (202) 822-0559.

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR CHEMICAL DEMILITARIZATION

How Can Chemical Demilitarization Affect the Environment?

Chemical demilitarization consists of three phases: (1) construction or modification of chemical munitions disposal facilities, (2) incineration of chemical munitions (mustard and nerve agents) and decontamination of ancillary materials, and (3) handling and disposal of solid wastes generated from the incineration of chemical agents and ancillary materials. Chemical munitions are disposed of by the incineration of chemical agents, explosive materials, munitions hardware, and handling/transportation dunnage. The munitions and related material are incinerated in one of four controlled incinerators, depending on the specific waste, followed by treatment of all process wastes and residues. The four types of incinerators are (1) liquid incineration furnaces (LIC) for the destruction of liquid nerve or mustard agents drained from the munitions, (2) deactivation furnace systems (DFS) for the destruction of explosive materials and decontamination of munitions bodies, (3) metal parts furnaces (MPF) for the decontamination of ton chemical agent containers, and (4) dunnage furnaces (DUN) for thermal decontamination of other materials that become contaminated with chemical agents. Solid wastes, such as scrap metal, are recycled where possible, and the ash is disposed of as either solid or hazardous waste, depending on ash

characteristics.

During chemical demilitarization operations, impacts to the environment may be caused by the construction and decommissioning of chemical demilitarization facilities, facility maintenance operations, plant emissions from normal operations, transportation of chemical agents and munitions from storage sites to the disposal facility, and solid wastes generated from incineration of chemical agents.

Also see checklists on Siting, Building/Housing Construction, and Hazardous Waste Incinerators.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Construction and Decommissioning. The construction and decommissioning of chemical demilitarization facilities can affect the environment through land disturbances from construction and demolition activities. Decommissioning will result in the removal or decontamination of all process equipment, structures, soils, or other materials containing or contaminated with hazardous wastes or constituents.

Will the chemical demilitarization facility be sited to avoid or reduce impacts to land and air and water quality?

Are procedures in place to minimize impacts to land, air, and water quality during construction and decommissioning of chemical demilitarization facilities? These disturbances may include destruction of wildlife habitat, erosion and sedimentation, and spills and releases of chemicals.

Does the construction plan specify that preference will be given to environmentally preferable construction materials whenever possible? Environmentally preferable construction materials include long-lasting products that do not need to be replaced as

often, materials that do not contain hazardous or toxic chemicals, and materials that contain recycled content.

Will construction and demolition debris be collected for refurbishing, reuse, or recycling where markets for these materials exist? (*)

Facility Maintenance Operations. Routine activities associated with chemical agent storage include surveillance, maintenance, and inventorying of stored munitions. All chemical munitions storage facilities are inspected at least quarterly. The inspections consist of internal and external visual examinations for structural integrity, as well as monitoring the air inside storage buildings for the presence of nerve or mustard agent. Chemical munitions storage buildings undergo regular maintenance to ensure proper storage of munitions and structural integrity. The primary maintenance activity associated with chemical weapons consists of repalletizing items when pallets deteriorate and periodic cleaning of munitions.

Can less- or non-toxic products be used in maintenance activities and for cleaning and painting munitions? These products can include cleaners that are non-solvent based.

Are there procedures to ensure that hazardous supplies are properly managed and do not become unnecessary waste? Techniques include practicing first in, first out inventory control, limiting access to hazardous materials, and properly labeling all supplies with contents and expiration dates.

Are procedures in place to ensure that any hazardous wastes from maintenance activities are segregated from nonhazardous wastes? When a hazardous waste is mixed with a nonhazardous waste, the entire quantity of waste is considered hazardous. *

Air Emissions from Normal Operations. Under normal operating circumstances, emissions from incineration should meet the RCRA Part 264 Subpart O standard of 99.99 percent destruction and

removal efficiency (DRE) of principal organic hazardous constituents (POHCs).

Are operating procedures adequate to ensure continuous operation of incinerators at 99.99 percent DRE? *

Are procedures in place to minimize emissions of pollutants during non-routine incidents? Such procedures can include automatic feed cutoff and automatic shutdown systems. *

Are wastes that are expected to be hazardous (e.g., incinerator ash) segregated from clean (e.g., decontaminated) wastes? *

Transportation of Chemical Agents and Munitions from Storage Sites to the Disposal Facility. The chemical munitions stockpile will be disposed of through the construction and operation of eight chemical munitions incineration facilities sited at each location where chemical munitions are stored. All incinerators will be constructed near or at the site of chemical munitions storage.

Are procedures in place to minimize the possibility of a release of chemical agents during the transportation of munitions from storage to the incinerator? When hazardous chemicals are released to the environment, all of the materials that the chemical comes into contact with will require management as hazardous waste, thus significantly increasing the volume of waste that must be treated and disposed of. *

Other References

Army Regulation 200-1, Environmental Protection and Enhancement.

Army Regulation 220-2, Environmental Affects of Army Actions.

Chemical Stockpile Disposal Program. January 1988. Final Programmatic Environmental Impact Statement.

U.S. Department of the Interior, Denver Service Center. September 1993. "Guiding Principles of Sustainable Design." National Park Service (NPS) publication number NPSD-902; GPO publication number GPO 777442.

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR COAL-FIRED POWER PLANTS

How Can Coal-Fired Power Plants Affect the Environment?

The planning, design, construction, operation/maintenance, and dismantling of coal-fired power plants can have a variety of impacts on the environment. This checklist deals primarily with identifying pollution prevention opportunities in the operation and maintenance of coal-fire power plants. Impacts from operation and maintenance can include gaseous and particulate emissions, wastewater discharges, destruction or alteration of wildlife habitats, erosion, contaminated runoff, the generation of waste materials and release of waste materials to the environment, etc.

Also see checklists on Siting, Building/Housing Construction, and Water Use.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Siting. All coal-fired power plants require substantial quantities of water for cooling, as well as power generation. Accordingly, plants

are often located near waterbodies or wetlands, or they require the construction of artificial lakes or ponds.

Will construction in wetland areas or other sensitive ecosystems be avoided? Can site preparation and construction activities be timed to avoid disturbing plants and animals during crucial seasons in their life cycles, such as during mating or spawning?

Will the development of coal receiving areas from barges entail significant impacts to the watercourse? If so, is rail transport of coal a feasible alternative?

Will all fuel and chemical storage areas, as well as active and inactive coal storage areas, be diked and/or lined to prevent contamination of nearby water systems in the event of a release or spill?

Can thermal discharges from plant cooling structures be anticipated to prevent low risk to receiving waters?

Will plant air emissions potentially influence air quality in Prevention of Significant Deterioration (PSD) airsheds?

Can the facility purchase low sulfur coal to decrease air emissions?

Materials Handling

Will coal off-loading areas, crushers, screens, and conveyors be covered to reduce dust emissions?

Will storage piles be covered or coated to minimize water infiltration and dust?

Will coal pile monitoring be employed to alert operators to the potential for auto-combustion?

Can the piles be sprayed with an anionic detergent to reduce bacterial oxidation of sulfide minerals, thereby reducing the acidic content of pile drainage?

Will storage piles be configured to control/collect runoff? Will the slope of the pile create a primary accumulation area for collecting runoff?

Will runoff be diverted from storage piles into retention/settling ponds separate from other contaminated water? If so, the facility may be able to use dredgings from the pond as fuel.

Can the facility minimize the purchase of certain types of coal that can lead to acidic runoff (e.g., coal with a high pyritic content)?

Can lime/limestone be added to the storage pile runoff ponds to reduce acid coal pile drainage? (*)

Can storage piles be located inside (e.g., in silos)? Moving piles inside would help control fugitive dust, minimize runoff, and increase Btu value by preventing coal weathering.

Does the operator's spill prevention and response plan include installation of secondary containment for all above-ground fuel and reagent storage tanks and vessels?

Operation/Maintenance

Can the plant monitor and reduce excess air flow in the boiler to ensure good combustion efficiency while reducing NO_x emissions?

Can the use of clean water be replaced in the scrubber systems by the use of wastewater from FGD sludge landfill runoff collection, limestone handling area runoff collection, and/or other facility wastewaters?

Can the facility use chlorinated biocides instead of brominated biocides to reduce the toxicity of biocides used to control the growth of aquatic organisms within intake cooling water structures? Are other physical or chemical treatment systems available?

Has the plant investigated the recirculation of cooling water?

Can the plant use frequent low dose applications as opposed to infrequent high dose treatments to reduce the peak concentration of chlorine in cooling water discharge?

Have opportunities to reduce corrosion in the cooling towers been explored (e.g., substituting for better corrosion inhibitors)? Can chromate corrosion inhibitors be replaced with less toxic poly- or organophosphate inhibitors?

Can boiler water blowdown be used for ash transport and cooling tower water makeup? *

If boiler water treatment includes water softening, can the facility use the softening sludge dewatering wastewater for neutralization of boiler cleaning and demineralizer regenerant wastes? *

Can the facility use demineralizer regenerant waste for sidestream treatment of cooling wastes to remove solids and to adjust pH, thereby reducing chemical inputs into cooling water and the rate of cooling water blowdown? *

Are there opportunities to reduce the amount of hazardous and toxic materials used in the plant (e.g., for structural maintenance and for equipment and vehicle maintenance/repair)?

Can the design/operation of boiler makeup water treatment systems be modified to improve boiler water quality, thereby reducing the required frequency of boiler chemical cleanings?

Can the toxicity of boiler chemical cleaning solvent be reduced by using organic acids as an alternative to inorganic acids?

Can fly ash be used for FGD sludge stabilization? (*)

Have alternative uses of fly ash and bottom ash been evaluated? Is there a local market for construction material additives, road base materials, abrasives, soil amendments, or acid neutralizing materials (e.g., mine backfill materials)? *

Other References

Electric Power Research Institute. 1993. *Guidelines for Cleaning of Fossil Fuel Steam Generating Equipment*. EPRI TR-102401. Palo Alto, CA.

Electric Power Research Institute. 1987. *Manual for Management of Low-Volume Wastes from Fossil-Fuel-Fired Power Plants*. EPRI CS-5281. Palo Alto, CA.

Electric Power Research Institute. 1993. *Options for Handling Non-Combustion Wastes*. EPRI TR-103010. Palo Alto, CA.

Electric Power Research Institute. 1987. *Water Management in Ash Handling Systems*. EPRI CS-5369. Palo Alto, CA.

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR DAMS, HYDROPOWER, AND WATER SUPPLY RESERVOIRS

How Can Dams, Hydropower, and Water Supply Reservoirs Affect the Environment?

The construction and operation of dams and water supply reservoirs and the operation of hydropower facilities can have a variety of effects on the environment. Dam construction can increase downstream turbidity and sedimentation, disturb large areas of vegetation and soil, and introduce fuel, lubricants, and other materials into the surface water. Operational impacts of dams, reservoirs, and hydropower facilities include increased biological oxygen demand (BOD) and nitrogen and phosphorus levels, reduced flushing and dissolved oxygen, erosion of downstream beaches and other habitat changes, and reduced freshwater in coastal zones. The use of pollution prevention/environmental impact reduction techniques can reduce or eliminate some environmental effects.

Also see checklists on Ecosystem Preservation and Protection, Siting, Flood Control Projects, and Dredging Projects.

What Questions Should Be Asked To Ensure That These Effects

Are Minimized or Eliminated?

Ecosystem/Siting Concerns.

Are methods proposed to remove suspended materials from drainage before it is discharged? These methods can include settling basins, flocculation, or chemical precipitating agents. (*)

Will site access routes and equipment storage areas be planned and located to minimize erosion potential? Access routes and storage areas should be kept away from steep slopes, unstable soil areas, and areas with inadequate vegetation density.*

Are reservoir watershed land use plans, which guide permissible uses within the watershed, established and in effect? *

Have watershed areas of concern, including septic tank systems, animal wastes, soil erosion, and abandoned mines, been identified and targeted as needed for pollutant discharge reduction measures?*

Are groundwater protection and management practices, particularly in recharge areas, in effect? Polluted groundwater has the potential to contribute to water pollution in reservoirs. *

Will riparian vegetation protection measures be utilized to prevent shoreline soil erosion?*

Are stream flows adequate to maintain downstream wetlands and riparian areas, which provide stream filtering?*

Construction. Construction activities for dams and water supply reservoirs include vegetation clearing, soil and rock excavation,

concrete mixing, equipment operations, and energy, water, and hazardous materials use, all of which can cause pollution. Runoff from construction areas can affect drinking water supplies, irrigation systems, and river ecology. Pollution prevention and environmental impact reduction techniques can reduce or eliminate some pollutants.

Will measures be taken to prevent surface water from entering construction areas? [\(*\)](#)

Will construction take place during dry seasons?

Will areas be exposed only for the minimum amount of time required to complete the needed activity? Will vegetation removal and soil excavation be kept to the minimum area necessary?

Will construction workers be required to limit activities to designated, controlled areas to prevent vegetation destruction and soil disturbance?

Will secondary containment be provided in equipment fueling areas to control fuel spills? Is a spill control plan specified?

Will access to materials and equipment storage areas be controlled? Will material storage areas be covered? Will materials be ordered only when necessary to prevent inventory from expiring?*

Will the cleaning of construction equipment be conducted in a controlled area away from surface water? Will the washwater be prevented from entering the stream?

Will washout from concrete trucks and equipment be confined to a designated area where it can harden and later be covered or removed and disposed of? *

Will construction materials be reused in other projects rather than be disposed of? *

Will reclaimed and/or recycled construction materials be used, including aggregate, rebar, lumber, and asphalt?*

Reservoir and Dam Operation. Drinking water supplies and downstream water quality can be affected by reservoir and dam operations.

What measures will be taken to minimize waste from boats?

Is artificial circulation through aeration or other methods included in the operations plan to reduce internal phosphorus loading and to eliminate problems with iron and manganese in drinking water reservoirs?*

Will surface runoff from marina and recreation parking areas be diverted to wastewater treatment facilities to remove pollutants?

Will marina fueling areas be regularly maintained and checked for leaks? Will boat owners be required to remove their craft from waterways before conducting engine and other boat repairs using hazardous materials?

Will the use of chemicals to control weeds and algae be minimized?

Hydropower Operations. Pollution prevention techniques for hydropower operations can reduce downstream impacts associated with hydropower generation. The impacts from hydropower operations typically result from decreased flushing and peak discharge rates.

Have energy conservation measures been implemented in areas that will draw electricity from the hydropower facility to reduce peak power demands?

Will periodic flushing be used to remove downstream sediments from stream bottoms, particularly gravel beds?

Will source reduction and recycling techniques be applied to the management of hazardous materials used to maintain turbines (e.g., lubricants, oils, solvents)? [\(*\)](#)

Will limits on the rate of change of flow and on the stage of the stream or river be imposed to prevent downstream damage from erosion and sedimentation?

Other References

Maine Department of Environmental Protection, Bureau of Water Quality, and York County Soil and Water Conservation District. 1990. *Best Management Practices for Stormwater Management*.

Peters, J.C. 1978. *Environmental Effects of Large Dams*. American Society of Civil Engineers.

U.S. Army Corps of Engineers Waterways Experiment Station. 1984. *Environmental Features for Streambank Protection Projects*. Written by J.E. Henderson and F.D. Shields, Jr. Technical Report E-84-11.

U.S. Department of Energy. 1991. *Environmental Mitigation at Hydroelectric Projects: Volume I, Current Practices for In-stream Flow Needs, Dissolved Oxygen, and Fish Passage*. DOE/ID-10360.

U.S. EPA. 1988. *Flushing and Scouring Flows for Habitat Maintenance in Regulated Streams*. Written by W.R. Nelson, J.R. Dwyer, and W.E. Greenberg.

U.S. EPA, Office of Water. January 1993. *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*. 840-B-92-002.

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR DEFENSE TESTING AND RELATED ACTIVITIES

How Can Defense Testing and Related Activities Affect the Environment?

Testing and evaluation projects for Department of Defense programs can have a variety of effects on the environment. These effects include air quality impacts from launch vehicle exhaust, potential depletion of stratospheric ozone levels, electromagnetic radiation hazards, generation of hazardous materials and wastes, noise impacts, pollution of surface water and groundwater sources, impacts to biological resources, and soil erosion and contamination.

Also see checklists on Rocketry/Missile Projects, Ecosystem Preservation and Protection, and Siting.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Air Quality Concerns. Routine releases of rocket testing propellant combustion products (including carbon dioxide, carbon monoxide,

hydrogen gas, hydrogen chloride, nitrogen gas, chlorine, and aluminum oxide) can cause adverse human health effects and contribute to acid rain. Also of concern is the volatilization of hazardous chemicals from accidental spills and leaks.

Are there opportunities to reduce the adverse effects of air emissions by the relocation of test facilities to areas where air quality impacts would be less serious?

Will the project use enclosed test facilities equipped with vapor recovery systems and oxidizer vapor scrubber systems? [\(31\)](#)

Will the number of test launches be minimized? Will the timing of test launches be restricted to avoid occasions of damp weather and low-level inversions?

Are there provisions for reducing potential spills and uncontrolled releases of hazardous materials? Has a spill prevention and control plan been written?

Upper Atmosphere Concerns. Test rocket exhaust compounds (including hydrogen chloride, metallic oxide particulates, ice, soot, nitrogen compounds, and hydrogen compounds) can lead to stratospheric ozone destruction. Combustion gases (including carbon dioxide, nitrous oxide, and water vapor) from missile launches absorb infrared radiation and can contribute to global warming.

Will the number of rocket/missile launches be minimized to the greatest extent feasible? One technique is to rely on test simulations whenever possible.

Does the project suggest any alternatives to the use of hydrogen chloride (a major ozone-depleting chemical)?

Electromagnetic Radiation Concerns. Communication systems, transmitters, and ground-based radar systems used to guide missiles produce electromagnetic radiation (EMR) that could result in adverse impacts on humans and the environment.

Does the project consider coordinating with the U.S. Fish and Wildlife Service to site radar systems away from established migratory bird flyways to avoid exposure to EMR from the trajectory beams?

Will power densities of EMR be controlled to acceptable safety levels? Have standoff distances from EMR power sources been specified?

Hazardous Material/Waste Management Concerns. Testing and evaluation projects involve the use of hazardous materials, including reactive solid rocket propellants, toxic solvents, oxidizers, and toxic liquid rocket fuel. The use of these materials can affect the environment through improper storage, air emissions of volatile chemicals, routine releases (i.e., evaporation, transportation, combustion, test launch debris), and accidental spills and other uncontrolled releases.

Are there opportunities to reduce the amount of hazardous and toxic materials used as part of the project? For example, will the use of such compounds as beryllium and mercury be minimized?

Are there provisions for reducing potential spills and uncontrolled releases of hazardous materials? Has a spill prevention and control plan been developed?

Is there a plan for expeditious recovery of flight test vehicles and debris containing hazardous materials? [\(32\)](#)

Noise Concerns. Noise associated with military testing activities (such as testing launches and detonation of explosives) can affect

both humans and wildlife. Sonic booms generated from the flight of test missiles can interrupt the breeding habits of some wildlife species.

Does the project specify adequate buffer zones around explosion sites or rocket/missile test sights?

Are a wide range of sound attenuation measures, such as noise barriers, concrete bunkers, and water damping, included as part of the project?

Surface Water Concerns. Surface water quality near launching and test-firing facilities and below rocket/missile trajectories could be affected by the deposition of contaminants from exhaust clouds, contamination from fallen rocket/missile debris, spills or leaks of propellant, and contaminated stormwater runoff.

Does the project require the preparation of Spill Prevention Control and Countermeasures Plans, Stormwater Pollution Prevention Plans, and Soil Erosion and Sediment Control Plans?

Are proposed testing facilities located away from surface waterbodies?

Groundwater Concerns. Military testing and evaluation projects involve the use of hazardous materials, including reactive solid rocket propellants, toxic solvents, oxidizers, and toxic liquid rocket fuel. Groundwater aquifers could be contaminated by spilled or leaked hazardous materials.

Will closed-looped fueling systems be used to minimize the potential for spills and leaks of propellants or other hazardous liquids?

If wells are required for groundwater withdrawal, will they be

constructed to prevent the intermixing of high-quality groundwater with lower quality groundwater in the aquifer?

Biological Resources Concerns. The construction of new or expanded facilities for military testing and evaluation activities could require the filling of wetlands and could result in habitat loss from the siting of structures and utility lines. Potential impacts to terrestrial and aquatic biota could result from noise and exhaust emissions during rocket testing and from electromagnetic radiation.

Does siting of the project take into consideration avoiding proximity to wetlands, surface waterbodies, and migratory bird flyways?

Are mitigation measures included to avoid water pH reduction from settled rocket/missile exhaust clouds that could result in fish kills?

Are adequate sound attenuation measures, such as noise barriers, concrete bunkers, and water damping, proposed to avoid or reduce impacts to wildlife in the vicinity of the test area?

Geology/Soils Concerns. Defense testing activities that involve blasting, detonation, or intensive earthmoving activities in areas of weakly consolidated soils or highly fissured rock could cause landslides and other geologic hazards. In addition, soil erosion and contamination could result from test firing, debris craters, and off-road travel associated with testing.

Can existing facilities and roads be used to minimize the energy used in construction and soil disturbance caused by new construction?

Does the project call for the preparation of soil erosion and sediment control plans? Are specific control measures suggested (e.g., seeding exposed soil, watering to prevent fugitive dust)?

Other References

Army Regulation 200-1, Environmental Protection and Enhancement.

Army Regulation 220-2, Environmental Effects of Army Actions.

U.S. Department of the Interior, Denver Service Center. September 1993. *Guiding Principles of Sustainable Design*. National Park Service (NPS) publication number NPS D-902; GPO publication number GPO 777443.

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR DREDGING

How Can Dredging Affect the Environment?

Dredging activities in fresh and salt water environments can have a variety of impacts on the environment. These impacts can include benthic disturbances, water quality degradation and impacts on aquatic organisms, and water and soil contamination resulting from marine and upland disposal of dredged materials. Impacts can also result from the potential release of hazardous constituents to marine and terrestrial environments. Dredging activities require the transportation of dredged materials and the use of energy resources.

Also see checklists on Dams, Hydropower, and Water Supply Reservoirs, Ecosystem Preservation and Protection, and Flood Control Projects.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Beneficial Use Options. Beneficial use options for dredged materials include beach nourishment and habitat restoration or enhancement. The beneficial use of dredged materials prevents the

material from consuming limited upland landfill capacity and from having adverse impacts on the marine environment.

Have specific beneficial use options been identified for dredged materials to reduce or eliminate the volume of waste that would otherwise be disposed of? (*)

Will dredged materials be sampled and analyzed for particle size and evaluated for use as beach nourishment? Dredged materials should be sampled and analyzed for hazardous constituents to ensure that their use will not introduce pollution into the environment?*

Does the project consider options to "clean" toxic dredged materials, thereby rendering them safe for beneficial use?*

Ecosystem Concerns/Dredging. Two dredging alternatives, mechanical and hydraulic, are practiced to remove sediments from marine environments. Mechanical dredging uses hoppers to dig and remove sediments. Hydraulic dredging uses a great deal of water to create suction to remove sediments and generates a much greater volume of dredged material that must be disposed of or used otherwise. This additional volume becomes a problem particularly when upland disposal is the only option.

When considering dredging alternatives, has emphasis been placed on reducing or eliminating the amount of disturbance to the marine environment?*

Will the selection of the dredging alternative (mechanical or hydraulic) be based on factors that will reduce or eliminate the generation of pollution and minimize the impacts on the environment?

Will the dredging alternative be selected based on pollution

prevention criteria that minimize energy consumption?

Are sediment flushing or pass through alternatives being considered?

Will measures be taken to minimize potential impacts on fisheries and aquatic resources?

Have alternatives to dredging or alternatives that would reduce the amount of material to be disposed of, habitat destruction, and/or disposal-related impacts been considered? Options might include choosing an alternative site, extending the length of the pier to reach deep water, or reconfiguring dockage space to accommodate vessels into a smaller area.

Have all environmentally sensitive areas been characterized? Have attempts been made to avoid dredging in environmentally sensitive areas? [\(*\)](#)

Are measures considered to reduce or eliminate the pollution generated from dredging equipment and operations? Will sediments containing hazardous constituents be contained during dredging operations?

Will hazardous materials needed for onsite heavy equipment maintenance and operation (e.g., fuels, solvents, greases) be properly stored and managed?

Ecosystem Concerns/Disposal of Dredged Materials. Dredging and dredged materials disposal in marine environments may have significant effects, including the disturbance of benthic environments, suspension of sediments, plume migration and introduction of potentially hazardous constituents (including heavy metals), and other negative impacts on water quality. By implementing various techniques, however, these impacts may be reduced or eliminated.

Will measures be taken to minimize the introduction of contaminated dredged materials to benthic and other aquatic environments?

Will techniques be used to reduce or minimize the suspension of sediments during dredging and or dredge disposal?

Does the selection of marine disposal sites include criteria to create the least impact on aquatic life, water quality, plume migration, and sediment suspension?

Has clean material been identified for use as a cap on toxic materials deposited in marine disposal?

Transporting Dredged Materials. Dredged materials must be transported from the original dredge site to the location of beneficial use or to disposal in either upland or marine disposal sites. The transportation of toxic materials presents significant threats to the environment in the event of a spill, accident, or other release. By addressing and utilizing pollution prevention techniques, these threats can be reduced or minimized.

Has the dredging plan considered the need to transport potentially toxic dredged materials and taken steps to prevent spills during transportation?

Have the safest and least populated routes of travel been identified for transporting toxic dredged materials that are unsuitable for beneficial use to the ultimate disposal site?

Does the plan for the transportation of dredged materials to marine disposal sites consider minimizing the disruption of benthic environments and the dispersal of dredged materials in the water column during deposition?

Will the method for transporting dredged materials minimize energy consumption?

Other References

U.S. Environmental Protection Agency. January 1994. Final EIS for the Designation of a Deepwater Disposal Site.

U.S. Army Corp of Engineers. January 1994. EIS/EIR for the Oakland Harbor Deep-Draft Navigation Improvements.

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR FLOOD CONTROL PROJECTS

How Can Flood Control Projects Affect the Environment?

Flood control projects can include channelization and channel modification activities and levee construction. Such activities can change the ability of natural systems to filter pollutants from surface waters; alter the rates and paths of sediment erosion, transport, and deposition; increase the movement of pollutants from the upper reaches of watersheds into coastal waters; lower dissolved oxygen levels; increase salinity in marshes; reduce freshwater availability; and accelerate the delivery rate of pollutants to downstream sites. Pollution prevention techniques can reduce or eliminate some environmental effects.

Also see checklists on Ecosystem Preservation and Protection, Siting, Building/Housing Construction, Dredging Projects, Dams, Hydropower, and Water Supply Reservoirs.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Ecosystem Concerns

Has the use of alternatives involving levee setbacks or the use of floodways been considered?

Will the flood control project lead to land use changes in the watershed, particularly those changes that result in increased surface water runoff and nonpoint source pollution?

Have modifications to existing flood control structures been evaluated to determine if they can eliminate the need for the new channelization or channel modification project?

Have all environmentally sensitive areas been characterized? Have attempts been made to avoid construction in environmentally sensitive areas? (*)

Does the project minimize construction parallel to rivers or streams to reduce the potential for direct runoff discharge from the roadway?

Does the project make use of existing roadway alignments (if possible) to reduce the amount of waste generated as a result of clearing and construction activities?

Has the project incorporated mitigation measures to reduce the impact of pollution runoff from the roadway? These measures may include stabilizing cut and fill slopes, shoulders, and medians with perennial vegetation and non-erosive materials, such as rip-rap or geotextiles, or establishing permanently controlled discharge points for storm water.

Does the plan include native plant revegetation of areas disturbed by construction to minimize erosion and sedimentation?

Have safe wildlife crossing structures and appropriate fencing been incorporated into the project to accommodate the movements and needs of resident wildlife and mitigate habitat fragmentation? *

Project Design and Planning. Flood control projects can affect the physical characteristics of surface waters and modify in-stream and riparian habitat.

Have alternatives, such as upstream watershed management and floodplain widening, been considered? (*)

Are land use and agricultural practices, as well as their potential for contributing pollutants to surface waters, considered in channel design?*

Will building be prohibited within a defined distance from the streambed to protect the streambank?

Are streambank protection measures, such as stone riprap, vegetation, erosion control fabrics, cellular concrete blocks, and gabions, included in the design?

Will levees and flood walls be sited outside riparian areas and wetlands?

Are channel slopes graded so that animals can crawl or climb out?*

Construction. Construction activities for channel modification include vegetation clearing, soil and rock excavation and placement, equipment operations, and energy, water, and hazardous materials use, all of which can cause pollution. Effects on river and coastal area ecology from increased sediment loads and the release of hazardous constituents can occur during construction. Pollution prevention techniques can reduce or eliminate some pollutants.

Will measures be taken to prevent surface water from entering construction areas?

Will construction take place during dry seasons?

Will site access routes and equipment storage areas be planned and located to minimize erosion potential? Will existing roadways be used to gain site access?

Will construction workers be required to limit activities to designated, controlled areas to prevent vegetation destruction and soil disturbance? *

Will secondary containment be provided in equipment fueling areas to control fuel spills? Is a spill control plan specified?

Will access to materials and equipment storage areas be controlled and limited? Will material storage areas be covered? Will materials be ordered only when necessary to prevent inventory from expiring?

Will the cleaning of construction equipment be conducted in a controlled area away from surface water? Will the washwater be prevented from entering the stream?

Will reclaimed and/or recycled construction materials be used, including aggregate, rebar, lumber, and asphalt? (*)

Are alternative materials available to reduce hazardous and toxic materials use during construction?

Will construction and storage areas be sited away from critical

habitats? *

Will biotechnical methods, such as vegetated gabions, be used to stabilize levee and channel banks?

Maintenance. Pollution prevention can reduce or eliminate the environmental effects of flood control project maintenance. Maintenance generally consists of vegetation management, burrowing animal control, upkeep of recreational areas, and levee repairs. In-stream and riparian habitats, which provide soil erosion protection, and pollutant filtering can be affected by maintenance activities.

Will vegetation removal methods that use chemicals, grazing, or burning be prohibited? Chemical herbicide residuals and animal wastes can be washed into waterways during rainy periods. Burning can negatively affect air quality.

Will burrowing animals be controlled by non-chemical means? Burrowing animals can affect the integrity of structures, leading to significant reconstruction requirements.

Will native plant species be used for revegetation of disturbed areas? *

Will marina fueling areas be regularly maintained and checked for leaks? Will boat owners be required to remove their craft from waterways before conducting engine and other boat repairs using hazardous materials?

Will measures be taken to prevent downstream sediment loading during dredging operations?

Will dredging spoils be evaluated for nutrient and contaminant content before they are applied to land areas?*

Other References

Federal Interagency Floodplain Management Review Committee. August 1994. "Sharing the Challenge: Floodplain Management into the 21st Century."

Federal Interagency Floodplain Management Task Force. 1992. "Floodplain Management in the United States: An Assessment Report."

U.S. EPA, Office of Water. January 1993. *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*. 840-B-92-002.

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POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR FORESTRY ACTIVITIES

How Can Timber Harvesting Affect the Environment?

Forestry activities can have a variety of impacts on the environment. Sediment concentrations can increase in waterbodies due to accelerated erosion; water temperatures can increase due to removal of overstory riparian shade; slash and other organic debris can accumulate in waterbodies, depleting dissolved oxygen; organic and inorganic chemical concentrations in the environment can increase due to harvesting and fertilizer and pesticide applications; and air quality can be affected by dust from road construction, site preparation, harvesting, and hauling activities and by particulate release from prescription slash burning. A major consideration in many ecosystems is the impact of monoculture forestry that simplifies the ecosystem, leaving it vulnerable to disease and other environmental factors. The use of pollution prevention in forestry activities can reduce these environmental effects.

Also see checklists on Ecosystem Preservation and Protection, Pest Management, and Highways and Bridges.

What Questions Should Be Asked To Ensure That These Effects

Are Minimized or Eliminated?

Preharvest Planning. It is important to consider pollution prevention measures during the planning stage to avoid or reduce some of the environmental impacts of forestry activities. Seasonal factors and road and harvest unit layouts can cause significant environmental effects if not addressed with pollution prevention techniques.

Have the potential environmental impacts of monoculture forestry been considered? (*)

Is the forestry activity scheduled during dry periods/seasons? Is the activity timed for the least impact?*

Have the impacts of prescribed burning or other pre-harvest activities been considered?*

Will waterbodies and sensitive areas be avoided?*

Will endangered or threatened species of wildlife or flora be adversely affected by the project? *

Has a study of the area been conducted to identify unique natural resources and critical wildlife habitat areas and wildlife movement patterns?*

Will existing roadways be used? Will new roadway construction be minimized?

Have the harvest units been laid out to minimize the number of stream crossings? *

Will skid trails and landings be located on stable soils and will steep gradients, landslide prone areas, high-erosion-hazard areas, and poor-drainage areas be avoided? -*

Will skid roads/trails be designed to follow contours to minimize the alteration of natural features? (*)

Will transportation systems be designed to minimize total mileage?

Is the design of the road prism and road surface drainage and the type of road surface suitable to avoid surface erosion? *

Have Streamside Management Areas (SMAs) been established? Are strict measures to restrict activity in the SMAs in place to maintain their integrity? *

Are SMAs wide enough and populated with sufficient canopy species to (1) buffer changes in temperature, (2) provide streambank stability, and (3) withstand wind damage? *

Road Construction and Management. Roadways can significantly affect forest habitats. The environmental impacts of road construction and management include erosion, soil and vegetation loss, dust generation, and stream sedimentation. Wise construction can reduce or eliminate some of the environmental effects of road construction.

Will the discharge from road surfaces be routed from drainage structures onto the forest floor so that water will disperse and infiltrate without flowing into streams?

Will disturbed areas, particularly stream crossings, be stabilized and revegetated? Will straw bales, silt fences, mulching, and/or other practices be used on disturbed soils on cuts and fills?

Will erosion prevention measures be in place to guard against sediment production when installing stream crossings and bridges?

Will slash and debris be prevented from disturbing surface waters?

Will temporary roads be closed and removed after use? Will public access be denied?

Will dust control measures, such as watering, be employed?

Timber Harvesting. Wise harvesting practices can reduce or eliminate the environmental effects of timber cutting. The impacts from harvesting include stream sedimentation and temperature elevation, soil and water contamination from hazardous materials, dust generation, habitat destruction, and loss of forest area.

Can selective cutting or other alternative forestry/silvicultural techniques be practiced instead of clear cutting? *

Will waters be protected from the sedimentation resulting from all timber harvesting operations?

Will stream channels and significant ephemeral drainages be protected from logging debris and slash material?*

Have appropriate areas for petroleum storage, draining, and dispensing been established and fitted with containment features? Will spill prevention and proper materials handling practices be implemented to reduce accidental releases? Will measures be adopted to contain and treat petroleum spills? Will hazardous wastes, such as oil and antifreeze, be recycled or properly disposed of? Will equipment and vehicles be inspected prior to arrival in the field to prevent onsite maintenance and repair work? (*)

Will landings and other affected work areas be cleaned up, regraded, and revegetated? ^{*}₋

Will yarding corridor gouge or soil plowing be prevented by appropriate measures? ^{*}₋

Will harvesting be conducted at the time of the year when the least impact to the environment will be realized (such as dry periods or winter)?

Has post harvest management been considered?

Will dust generation during harvesting activities be minimized? ^{*}₋

If prescription burning of slash is part of the operations, will methods be employed (such as fuel treatment, pile burning, chipping, or lop and scatter) that minimize or eliminate smoke emissions? ^{*}₋

Will meteorological conditions be considered when conducting burns? ^{*}₋

Do fire protection prescriptions protect against excessive erosion or sedimentation to the extent practical?

Will some logs and slash remain onsite after harvesting to maintain structure and habitat for the subsistence of vegetation, important to forest regeneration and health? ^{*}₋

Will measures be employed to minimize dust generation and erosion during dicing and mechanical site preparation activities? ^{*}₋

Forest Chemical Management. Chemicals used in forest management are generally pesticides (insecticides, herbicides, and fungicides) and fertilizers. Since pesticides may be toxic, they must be mixed, transported, loaded, and applied properly and their containers disposed of properly to prevent release to soil, groundwater, and surface water.

Will the use of pesticides and chemical fertilizers be prohibited or minimized?

Will runoff containing chemical fertilizer residue be prevented from entering surface waters?

For aerial spray applications, will a buffer area of at least 50 feet be marked and maintained around all watercourses and waterbodies to avoid drift or the accidental application of chemicals directly to surface water?

Will pesticides and fertilizers be applied only during favorable atmospheric conditions?

Will mixing and loading areas be located where residues will not enter streams or other waterbodies?

Will precautionary measures be specified to avoid leaks and spills? Is a spill contingency plan in place that provides for immediate spill containment and cleanup?

Will minimum amounts of fertilizers be applied to prevent the migration of nutrients to groundwater (e.g., slow-release fertilizers, application during maximum plant uptake periods, fertilizer type and application rate on soil and/or foliar analysis)?

Will the least toxic pesticide be applied? Is pesticide use minimized

and part of an overall program to control pest problems? Integrated Pest Management plans can significantly reduce reliance on chemical products.

Other References

Casa-Guard Timber Sale Environmental Impact Statement, Tongass National Forest, April 4, 1992.

Deforestation, Technical Support Document, International Training Workshop, Principles of Environmental Enforcement, Review. April 1994. Apogee Research, Inc., and TCI Systems.

U.S. Environmental Protection Agency, Office of Water. January 1993. *Guidance Specifying Management Measures for Sources of Non-point Pollution in Coastal Waters*. EPA No. 840-B-92-002.

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POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR GRAZING

How Can Grazing Affect the Environment?

Rangelands support native vegetation or introduced species for the grazing of livestock. Livestock use of rangelands for grazing can have significant impacts on the environment. Grazing causes water quality and quantity impacts, destruction or alteration of wildlife habitats, erosion, sedimentation, and soil compaction. Grazing animals may be a component of rangeland ecosystems, and appropriate grazing management can meet environmental objectives. Pollution prevention techniques as an integral part of grazing management can prevent or minimize environmental impacts.

Also see checklist on Ecosystem Preservation and Protection.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Protection of Sensitive Areas. Sensitive areas, including streambeds, wetlands, estuaries, ponds, lakeshores, and any other riparian zones, are of particular concern. Areas where endangered

species are found are also of special concern. Minimizing erosion from rangelands above the riparian zone is important in its potential for impact on those sensitive areas.

Have sensitive habitats and impaired waterbodies been identified, and will these habitats be excluded from livestock grazing areas? [\(*\)](#)

Will riparian areas be fenced to create a barrier to livestock?*

Has consideration been given to the location of the fence and the possibility that a fence might cause livestock to concentrate in small areas? Livestock tend to walk along fences, thereby causing paths to become bare channels that lead to erosion, especially if paths channel to streambeds.*

Will controlled stream crossings be provided for livestock? *

Will controlled watering access for drinking be provided for livestock? *

Will alternative drinking water locations be provided for livestock use? *

Will salt licks and shade areas be available to keep livestock away from sensitive areas?*

Grazing Management System. Grazing management systems can incorporate pollution prevention and ensure proper grazing use. Proper grazing use will protect against soil erosion, sedimentation, and contamination of riparian resources, as well as maintain or improve the quality of rangeland vegetation.

Will a grazing management system be implemented?*

Will deferred grazing, a practice whereby grazing is postponed or grazing land is rested for a prescribed period, be included?*

Will a planned grazing system be put in place in which two or more grazing units are alternately rested and grazed in a planned sequence for a defined period? (*)

Have such factors as livestock stocking rates, livestock distribution, timing (season of forage use) and duration of rest and grazing periods, livestock kind and class, and forage use allocation for livestock and wildlife been considered? *

Will recycled materials be used in the construction of rangeland structures, such as fencing or water delivery systems?*

Provision of Alternative Water Supplies. Alternate water sources will keep livestock away from streambanks and riparian zones and prevent the destruction of habitat and pollution of surface water by manure solids, nutrients, and bacteria.

Has a type of alternate water supply been identified? Does the water supply reduce the concentration of livestock in any one given area?*

Will adequate water control and wastewater disposal devices be installed?

Will irrigated rangeland be managed to reduce water use?

Stabilizing Rangeland Vegetation. A number of practices can be employed to prevent the erosion of rangeland and to reduce

vegetation destruction and the need for revegetation.

Will rangeland quality be restored through revegetation if quality deteriorates as a result of poor management? *

Will adapted plants be established by seeding on native grazing land? Can native grazing land be used without requiring seeding of forage plants?*

Will range seeding require the use of chemicals (fertilizers, herbicides)? Can the use of chemicals be reduced or eliminated?

Will prescribed burning be used to stabilize vegetation? Will all prescribed burn activities be conducted so that ash and exposed soil will not be mobilized during a runoff event? *

Will prescribed burning be conducted consistent with the Clean Air Act and/or local air quality regulations? *

Other References

U.S. Environmental Protection Agency, Office of Water. January 1993. *Guidance Specifying Management Measures for Sources of Non Point Pollution in Coastal Waters*. EPA No. 840-B-92-002.

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POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR HAZARDOUS WASTE INCINERATORS

How Can Hazardous Waste Incinerators Affect the Environment?

The planning, design, construction, operation/maintenance, and decommissioning of hazardous waste incinerators can have a variety of impacts on the environment. Various forms of hazardous waste (i.e., liquids, solids, sludges, slurries, and fumes) may be processed by incinerators. Environmental impacts from the hazardous waste incineration process include air pollution from gaseous and particulate emissions, soil contamination due to the deposition of airborne particulates and spills and associated contaminated runoff, and hazards associated with the handling, transportation, and disposal of hazardous residue materials. This checklist focuses on pollution prevention and environmental impact reduction opportunities available in the operation/maintenance of hazardous waste incinerators.

Also see checklist on Chemical Demilitarization.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Transport and Storage of Hazardous Wastes and Fuels. Many, if not most, hazardous waste incinerators are located offsite from where the waste is generated. Consequently, hazardous wastes, as well as the fuel used to supplement the combustion process, must be transported to the incinerator facility. Most of the transportation is done in large bulk tankers. At the incinerator, the wastes and fuels are transferred to one or more onsite storage containers. The following opportunities can help reduce the environmental impact of the transport/handling and storage activities.

Will incoming wastes be inspected and characterized (chemical composition, viscosity, ash, calorific-value, etc.) to allow the incinerator operator to maximize fuel efficiency?

Will the facility screen/filter incoming hazardous wastes to identify unacceptable materials (by using radioactivity or metal detectors, strainers, etc.)? [\(43\)](#)

Will the facility custom blend wastes to maximize efficiency and minimize environmental risks? Will multiple storage tanks be constructed to allow the facility to segregate incoming wastes to facilitate such blending?

Will storage tanks be designed to prevent difficult-to-process sludges from building up at the bottom (e.g., agitation)? Will mixers or recirculators be used? *

Will storage and transport systems be designed to manage and/or reduce the buildup of volatile emissions?

Is it possible to use a filtration system to eliminate dirt and other non-combustible materials from incoming wastes and thus reduce incinerator ash residue?

Operation/Maintenance. From the storage system, the hazardous wastes and auxiliary fuels are transported to the incinerator via a system of pipes. At the incinerator, the hazardous wastes and fuels are combusted. Several environmental impacts can result from the incineration process. They include gaseous and particulate emissions, soil contamination and contaminated runoff, and pollutant releases associated with waste materials/packaging.

Will the facility have preventive maintenance and inspection programs to help ensure that leaks will not occur? For example, will pump bearings be repacked on a regular basis to prevent possible leaking?

Will the facility's pollution control equipment be tailored to meet the combustion emissions resulting from the specific hazardous wastes the plant is combusting? [\(44\)](#)

Will the facility routinely inspect emission control equipment? *

Are there opportunities to reduce the environmental impacts associated with cleaning materials, packaging, and other items coming into the facility (e.g., buy in bulk, purchase reusable containers, examine recycling options)?

Are there provisions for the proper storage of materials to reduce spoilage, damage, and exposure to the elements?

Does the facility have an adequate stormwater runoff and run-on plan. For example, how does the management address runoff from such potentially contaminated areas as the off-loading pad? *

Are there provisions for reducing the potential for spills of hazardous wastes? Is there a spill prevention and control plan?

Will the facility use supplies containing recycled content when

possible and in accordance with accepted standards? Examples of materials/packaging that can be obtained with recycled-content include cleaning supply bottles, shop towels, and plastic wrap. *

Are there opportunities to reduce the amount of hazardous and toxic materials used at the facility (specifically, items other than the hazardous waste being processed at the facility)? For example, will the least toxic paints and cleaning chemicals be used at the facility?

Will the facility blend incoming hazardous wastes and auxiliary fuels to achieve the most complete and cleanest combustion? Will wastes be mixed to create a constant Btu burn and thus increase incineration efficiency?

Does the facility have a preventive program to minimize the environmental effects from the generation of wastewater from the incineration process.

Residuals From the Incineration Process. The generation of ash usually results from the incineration of most hazardous wastes. Ash generation volumes are waste-dependent. The environmental concern with ash is the retention of heavy metals.

Has consideration been given to techniques to reduce ash generation?

Has the facility explored the economic feasibility of recovering precious metals from incinerator ash? [\(45\)](#)

How will the ash be managed after generation? For example, are ash storage facilities lined and covered? *

Will the ash be disposed of in a manner that limits potential

environmental impacts? *

Other References

Freeman, Harry, Editor in Chief. 1989. *Standard Handbook of Hazardous Waste Treatment and Disposal*.

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR HAZARDOUS WASTE STORAGE AND TREATMENT FACILITIES

How Can Hazardous Waste Storage and Treatment Facilities Affect the Environment?

The construction and operation of hazardous waste storage and treatment facilities can have a variety of effects on the environment. Construction impacts may include the destruction or alteration of wildlife habitats, wind and water erosion of soils, compaction of soils, and sedimentation of waterbodies. Operations may introduce chemical pollution to soils, groundwater, surface waters, or air resulting from spills, equipment failures, improper handling, or fires. Facility processes may consume energy and water and require the transportation of hazardous wastes to and from the facility. New roadways may need to be constructed depending on the selected site location, as waste facilities are often sited in remote or undeveloped areas.

Also see checklists on Hazardous Waste Incinerators, Waste Site Investigation and Cleanup Activities, Chemical Demilitarization, Base Closure and Reutilization, Solid Waste Landfills, Highways and Bridges, and Water Use.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Facility Construction. The construction of hazardous waste storage and treatment facilities can have significant impacts on the environment, such as degradation of wildlife habitats, erosion and/or compaction of soils, dust and noise, and discharges of sediments to surface water. Pollution prevention techniques can help mitigate or reduce construction effects.

Have attempts been made to avoid construction in environmentally sensitive areas? (*)

Does the project minimize construction activities in the vicinity of rivers or streams that could be affected by runoff or the erosion of construction wastes?

Does the project make use of existing roadway alignments (if possible) to reduce the amount of waste generated as a result of construction activities?

Does the construction plan provide for erosion (wind and water) and sediment control during and after construction?

Are the effects of soil compaction, which result from construction activities, minimized to prevent an increase in runoff?

Does the construction plan include revegetation of areas disturbed by construction to minimize erosion and sedimentation?

Facility Operation. Operation of a hazardous waste storage and treatment facility could potentially introduce chemical or other pollution to soils, groundwater, surface waters, or air resulting from leaks, spills, equipment failures, or fires. These facilities usually are regulated under the Resource Conservation and Recovery Act

(RCRA) and closely monitored and inspected by regulatory agencies. Facility processes may consume energy and water resources and may require the transportation of hazardous wastes to and from the facility.

Have measures been considered to promote the reduction and minimization of wastes generated prior to treatment and disposal?

Has the containment system been designed to be compatible with the types of wastes to be treated and/or stored at the facility?

Are spill control materials and equipment adequate and compatible with the hazardous wastes treated or stored at the facility?

Have procedures been established to ensure that wastes are properly handled by facility personnel?

Have facility personnel been trained in spill and emergency response procedures, as well as techniques to prevent pollution and minimize the generation of excess waste?

Have adequate fire suppression equipment and materials been included in the spill control and emergency response measures to prevent the accidental release of hazardous constituents to the environment?

Have emission control mechanisms been installed on treatment process equipment, ancillary equipment, and storage tanks to prevent releases? [\(*\)](#)

Facility Processes. Processes common to hazardous waste treatment and storage facilities consume water and energy resources, as well as generate wastes. Such processes as flocculation, neutralization, chemical reduction, oil-water separation, dewatering, and filter pressing can generate wastewater

and sludge residues that may be hazardous.

Will the facility employ processes to recycle and reuse wastes (or waste components, such as heavy metals) brought to the facility and wastes (or waste components) generated by the facility? *

Have waste treatment processes been assessed to consider the amount of water and energy that will be consumed and how much waste (wastewater/sludge) will be generated?

Have measures been considered to minimize the amount of treatment materials used and the amount of wastes generated from treatment processes?

Will the facility apply pollution prevention techniques to secondary processes, such as facility maintenance, equipment, and vehicle maintenance, to minimize releases to the environment?

Will the facility maintain the smallest possible inventory of shelf life sensitive hazardous materials to prevent the disposal of expired chemicals?

Transportation of Hazardous Wastes to and from the Facility.

Hazardous wastes must be delivered to the facility for treatment and or storage, either by roadway (trucks) or rail (railcars). The transportation of hazardous wastes presents significant threats to the environment in the event of a crash or spill, which could cause a release of hazardous constituents to soils, surface waters, air, or groundwater. The transportation of wastes from regulated facilities usually is closely monitored by regulatory agencies.

Has the facility been located to minimize transport requirements to and from the facility?

Have measures been considered to minimize the potential for

releases resulting from crashes or problems while transporting waste to or from the facility (such as choosing the safest and least populated routes of travel for the transportation of hazardous wastes)?

For facilities with rail transport capabilities, has the facility rail spur been built with secondary containment to prevent releases during the transfer of wastes?

Other References

Lawrence Livermore National Laboratory. May 1988. Environmental Assessment for the Environmental Compliance and Cleanup Project.

Lawrence Livermore National Laboratory. July 1990. CERCLA Feasibility Study for the LLNL-Livermore Site (including a NEPA Environmental Assessment).

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR HIGHWAYS AND BRIDGES

How Can Highways And Bridges Affect the Environment?

The planning, design, construction, and operation/maintenance of highways and bridges can have a variety of effects on the environment. They include the destruction or alteration of wildlife habitats, erosion, sedimentation, soil compaction, chemical pollution resulting from deicing activities, gaseous and particulate emissions from vehicles, contaminated roadway runoff, the generation of waste construction materials (including asphalt, concrete, metals, and wood), material from worn brake lining, and scrap rubber tires, as well as litter and other debris.

Also see checklists on Ecosystem Preservation and Protection, Vehicle Maintenance, Siting, Landscaping, and Pest Management.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Ecosystem Concerns. Highways and bridges can have significant effects on the ecosystems in which they are built. These impacts

can include fragmentation and degradation of wildlife habitats, contamination of surface water and groundwater, and soil contamination, erosion, and sedimentation. Techniques can help to mitigate/reduce these effects, however.

Have other transportation options or pricing structures (i.e., mass transit or improved traffic management) been considered as alternatives to constructing a new highway or bridge?

Have all environmentally sensitive areas been characterized? Have attempts been made to avoid construction in environmentally sensitive areas? Construction footprints in such areas as floodplains and wetlands should be avoided whenever possible.

Does the project minimize construction parallel to rivers or streams to reduce the potential for direct runoff discharge from the roadway?

Does the project make use of existing roadway alignments (if possible) to reduce the amount of waste generated as a result of clearing and construction activities?

Does the project include provisions for curb design and catchment basins to reduce pollution impacts associated with runoff and debris from the roadway?

Has the project incorporated mitigation measures to reduce the impact of pollution runoff from the roadway? These measures may include stabilizing cut and fill slopes, shoulders, and medians with perennial vegetation and non-erosive materials, such as rip-rap or geotextiles, or establishing permanently controlled discharge points for stormwater.

Does the construction plan provide for erosion and sediment control during and after construction? This may include the installation of mitigation measures, such as erosion curtains and/or

settling ponds.

Will stream crossings be designed to enable fish passage and to maintain natural in-stream structures, such as large culverts? (*)

Does the plan include native plant revegetation of areas disturbed by construction to minimize erosion and sedimentation?

Have safe wildlife crossing structures and appropriate fencing been incorporated into the project to accommodate the movements and needs of resident wildlife and to mitigate habitat fragmentation? Have bridge structures been designed to accommodate wildlife passage, thereby providing a dual purpose?*

Does the project include the use of noise walls or other techniques to reduce the impacts of noise pollution?*

Does the project include the planting and maintenance of grass covers or other indigenous plant material to reduce pollutant concentrations in roadway runoff?

Does the project provide for regular preventive maintenance of the highway or bridge to reduce the potential amount of waste generated by reconstructing portions of the roadway? *

Can existing roadways or bridges be closed and reclaimed as a result of the construction and opening of the new project?*

Hazardous Material Concerns. The construction of highways and bridges can involve the use of hazardous materials. The use of these materials can affect the environment through improper storage, air emissions of volatile chemicals, and spills and other uncontrolled releases, as well as the potential for the generation of toxic waste materials.

Are there opportunities to reduce the amount of hazardous and toxic materials used as part of the project? For example, will the least toxic paints and deicing chemicals be used?

Are there provisions for reducing any potential spills of hazardous materials? Is there a spill prevention and control plan?

Is there a plan for properly managing the storage, handling, and application of deicing chemicals, salts, and sand?

Is there an Integrated Pest Management (IPM) plan to reduce the use of chemical pesticides and to minimize human and wildlife exposure?

Procurement Concerns. Purchasing decisions are an important element of pollution prevention. Making environmentally sound purchasing decisions can help reduce the amount of waste generated by a highway or bridge project. In addition, the purchasing of recycled-content material helps support markets for materials collected for recycling.

Executive Order 12873 directs all Federal agencies to review and revise their specifications, product descriptions, and standards to increase their purchase of environmentally preferable and recycled products.

Are there provisions for the proper storage of construction materials to reduce the amount of waste generated by damage or exposure to the elements?

Will perishable construction materials, such as paints, be purchased incrementally to ensure reduced spoilage of unused materials?

Will the project include the use of durable, long-lasting materials that will not need to be replaced as often, thus reducing the amount of construction waste generated over time?

Will the project use construction materials containing recycled content when possible and in accordance with accepted standards? Examples of recycled-content materials include concrete containing fly ash, as well as asphalt containing "waste" asphalt, glass, roofing materials, or recovered scrap tires. (*)

Reuse and Recycling. Many of the waste materials generated as a result of highway and bridge projects can be reused or recycled into usable products. The benefit of reuse and recycling is that it removes materials that would otherwise be disposed of from the waste stream.

Does the construction contract specify that construction materials not used in this project be reused in other projects rather than be disposed of? _*

Will trees cut down during construction activities be used or sold for lumber or compost? *

Will any metal, wood, or packaging wastes generated as a result of construction activities be collected for recycling into other usable products? _*

If the project is a repair of an existing highway or bridge, are there provisions for the reuse or recycling of "waste" materials? *

Other References

U.S. Environmental Protection Agency, Office of Federal Activities. April 1994. "Evaluation of Ecological Impacts From

Highway Development."

U.S. Environmental Protection Agency, Office of Water.
September 1992. "Storm Water Management For Industrial
Activities: Developing Pollution Prevention Plans and Best
Management Practices."

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR MILITARY BASE CLOSURE AND REUTILIZATION

How Can Military Base Closure and Reutilization Affect the Environment?

Military base closure and reutilization projects can have a variety of effects on the environment. These impacts may include air quality effects from demolition/construction dust and increased vehicle/aircraft emissions, hazardous materials and waste management concerns (including Installation Restoration Program sites, unexploded ordnance, PCBs, asbestos, lead-based paint, and underground storage tanks), noise impacts, pollution of surface water and groundwater sources, impacts to biological resources, and soil erosion and contamination.

Also see checklists on Ecosystem Preservation and Protection, Energy Management, Water Use, Landscaping, Waste Site Investigations and Cleanup Activities, Solid Waste Landfills, Building/Housing Construction, Airports, and Water Use.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Air Quality Concerns. Demolition and construction as part of military base closure activities can cause air quality impacts from fugitive dust and construction equipment emissions. In addition, proposed base reuse plans may result in an increase of air pollutants from mobile sources (e.g., vehicles and aircraft) and point sources (e.g., generators, incinerators, and storage tanks).

Are there opportunities to reduce the adverse effects of air emissions by considering alternative reuse plans for the military base?

Will fugitive dust reduction measures (such as ground watering and reduced speed limits on unpaved roads) be incorporated into demolition/construction activities?

Are adequate containment measures specified to avoid the accidental release of friable asbestos during demolition or modification of structures?

Hazardous Material/Waste Management Concerns. Concerns associated with military base closure and reuse projects include the management of hazardous materials and wastes (such as solvents, pesticides, aviation fuels, POL, and heavy metals), remediation of existing Installation Restoration Program (IRP) sites, removal of unexploded ordnance, and management of asbestos, PCBs, lead-based paint, and underground storage tanks.

Are there provisions for reducing potential spills and uncontrolled releases of hazardous materials? Is there a spill prevention and control plan?

Will new and reused underground storage tanks be equipped with leak detection mechanisms, secondary containment systems, spill and overflow protection, and cathodic protection?

Will PCB-contaminated equipment be removed prior to base

closure? Will remaining PCB-contaminated equipment be routinely inspected for leaks? Will transformers be retrofilled with non-PCB-containing oils? (*)

Are measures specified for the proper removal and disposal of structural material containing toxic lead-based paint associated with demolition activities? *

Noise Concerns. Noise associated with demolition/construction equipment and planned land uses, such as airfields or industrial activities, can affect both humans and wildlife.

If aircraft operations are planned to continue, are noise buffer zones and a wide range of sound attenuation measures, such as noise barriers and concrete bunkers, included to reduce noise impacts?

Surface Water Concerns. Surface water quality could be affected by spills or leaks of hazardous materials and by contaminated storm water runoff.

Does the project require the preparation of Spill Prevention Control and Countermeasures Plans, Stormwater Pollution Prevention Plans, and Soil Erosion and Sediment Control Plans?

Will oil/water separators be installed to prevent fuels, oils, and other residual contaminants in storm water runoff from contaminating any nearby streams or other surface water?

Do construction designs incorporate provisions to reduce storm water runoff/sediment transport? Such designs include creating landscaped areas that are pervious to surface water, minimizing areas of surface disturbance, and constructing runoff/sediment transport barriers around soil stockpiles.

New Use Concerns. Public utilities, such as wastewater treatment facilities, solid waste landfills, and electricity/natural gas supplies, may be affected by military base closure and reuse projects. Reuse plans may propose new commercial and residential uses that would increase water and electricity/natural gas consumption and increase wastewater and solid waste disposal requirements.

Does the project require the collection of inert demolition/construction wastes, such as wood, metals, concrete, and asphalt, for reuse or recycling to decrease potential impacts on landfills?

Will energy efficiency and water conservation devices be incorporated into all new residential and commercial structures?

Biological Resources Concerns. The construction of new or expanded facilities could require the filling of wetlands and could result in habitat loss from the siting of structures and utilities. Potential impacts to wildlife could result from noise and dust during demolition/construction activities.

Does the siting of any new construction take into consideration avoiding proximity to wetlands, wildlife habitat, and ecologically sensitive areas?*

Are measures included to avoid disturbing the habitat of any threatened or endangered species located on or in the vicinity of the military base? (*)

Are measures specified to control construction runoff, such as the use of berms, silt curtains, straw bales, and other erosion control techniques?

Will native trees and vegetation be planted to increase favorable habitat for wildlife and help prevent erosion?*

Geology/Soils Concerns. Demolition/construction activities may cause soil erosion and soil contamination.

Can existing facilities and paved areas be remodeled and used to minimize soil disturbance caused by extensive new construction?

Does the project call for preparation of soil erosion and sediment control plans? Are specific control measures suggested, such as seeding exposed soil, watering to prevent fugitive dust, and using sediment basins and fences?

Other References

Army Regulation 200-1, Environmental Protection and Enhancement.

Army Regulation 220-2, Environmental Effects of Army Actions.

U.S. Department of the Interior, Denver Service Center. September 1993. *Guiding Principles of Sustainable Design*. National Park Service (NPS) publication number NPS D-902; GPO publication number GPO 777442.

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR MINING PROJECTS

How Can Mining Affect the Environment?

Exploration, development, extraction, beneficiation, processing, and waste management activities associated with mining projects can have a variety of impacts on the environment. The potential effects include destruction or alteration of wildlife habitats, erosion, sedimentation, generation of windblown particulates, pollutant loading to groundwater and surface water from acid mine/rock drainage, and/or process solution leaks, spills, and surface subsidence.

Also see checklists on Ecosystem Preservation and Protection, Building/Housing Construction, Water Conservation, Highways and Bridges, and Water Use.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Siting. By their nature, mines must be located where the mineral deposits are located, with cost considerations generally favoring the co-location of mines and beneficiation mills because of the quantity

of materials to be transported from mine to mill. Additionally, methods of extraction (e.g., open pit, underground, in-situ) and beneficiation (e.g., heap/dump leach, vat leach, froth flotation) depend on many factors, such as mineralization and depth to the ore body. However, the siting of roads, disposal units, personnel housing, laboratories, and ancillary facilities may provide opportunities to minimize the impacts on surrounding areas, such as human populations, wetlands, sensitive ecosystems, and pristine areas.

Are waste rock, spent ore, tailings piles, smelter slag, and other waste management units located near the head of drainage basins to minimize run-on and the need for construction of run-on diversions? (*)

Are mine access roads, haul roads, mill facilities, and disposal facilities located so as to minimize impacts on sensitive ecosystems, such as endangered species habitats, fish spawning grounds, and wildlife migration routes?*

Will mine subsidence (in cases of underground or solution mining) potentially affect local waterbodies or constructed structures, such as dams, bridges, and dwellings?

Mine Development/Extraction. Extraction operations typically involve the removal of overburden, blasting, hauling, and gross sizing of ores. These activities can result in the generation of dust and vehicle exhausts, noise, mine water, and mine ventilation exhausts.

Will the facility collect/utilize mine degasification exhaust in advance of or during mining (surface or underground coal)? Methane from coal seams can sometimes be repressurized for sale to natural gas pipelines or collected for use in onsite heating or power generation equipment. Alternatively, vented air can be used as an input to power generation facilities. *

Can in-situ recovery methods, such as in-situ leaching, be performed in lieu of extraction followed by surface beneficiation (e.g., vat leach, dump leach, froth flotation) to reduce negative environmental impacts?

Will mine water be collected for use in beneficiation operations? (*)

Will the facility perform dust suppression activities to minimize the generation of windblown particulates?

Will mine wastes be backfilled into pits or underground mine workings to avoid the development of spent ore and/or waste rock disposal areas at the surface? *

Will mine water contain metals, sulfates, or other contaminants? Does the mineralogy of the deposit present the potential for acid mine drainage? If so, will the facility minimize mine water discharges and/or treat acidic mine water prior to discharge? Is the exposure of pyritic materials minimized or avoided in mine development? *

Does the facility's storm-water management plan include provisions to contain runoff and divert run-on away from pits, mine openings, and other areas where overland flow may contact contaminants?

Will the facility segregate overburden/top soil for use in reclamation activities? *

Will mined land reclamation be conducted concurrently with mine development? *

Beneficiation/Processing. Beneficiation/processing may include mechanical, gravitational, magnetic, chemical, electrochemical,

and/or thermal methods of separating target minerals from wastes and concentrating values prior to sale.

Does the process solution cycle incorporate the recirculation of wastewaters to the mill circuit to minimize discharges?

Do all leach pad and mill areas include run-on diversion ditches to minimize the contamination of overland flow?

Do all process ponds, pads, and piping structures containing process solutions incorporate drainage ditches and containment ponds/surge ponds to prevent releases of process solutions?

Do sizing, grinding, and crushing machinery include dust collection/suppression equipment to reduce airborne contaminants?

Do leach and/or dump heap designs provide suitable stability to prevent local/general slope failure?

Do all pregnant and barren process solution ponds include liners and/or leak detection/collection systems?

Does the facility's solution management plan call for maintenance of sufficient freeboard in all process ponds to prevent overtopping in storm events and/or snow melt events?

Does the facility incorporate the use of netting, fencing, and/or other strategies to minimize the exposure of local/migratory wildlife species to solution ponds? (*)

Will excavation pits intercept aquifers or affect local waterbodies or seeps?

Do reagent storage areas include secondary containment to prevent spills? *

Is there a recycling program for used piping (generated in large quantities at mines with extensive slurry/water transport systems)?

Waste Management

Will the facility use mine development rock/other wastes in the construction of roads, etc., to minimize the use of virgin materials? This should, however, be avoided where the potential of acid generation is high.*

Will tailings impoundments incorporate liners to prevent the migration of waste constituents to groundwater? Will the facility recycle tailings water to the maximum extent practical?

Will waste rock, tailings piles/ponds, and/or leach units include seepage collection and return systems down gradient of embankments?

Other environmental impact reduction opportunities:

Does the facility waste management plan include encapsulation of acid generating wastes in materials with high neutralization potential? Have acid generation prediction tests revealed the potential for acid generation in waste piles? Does the waste management plan include any passive or active acid neutralization strategy (e.g., constructed wetland treatment, seepage pump collection and treatment)?

Does the facility's waste management plan include an approach for cyanide detoxification in leach piles and ponds? Are cyanide-

bearing tailings to be detoxified prior to disposal?

Are tailings impoundments or waste rock piles to be located in areas of seismic activity? If so, do waste unit designs account for the potential loss of stability/liquefaction under seismic loading events?*

Does the facility's waste management plan call for dust suppression activities on tailings and waste rock disposal areas?

Is mine backfilling a disposal alternative to constructing waste rock piles? *

Can coal ash or other alkaline materials be backfilled into mine workings to minimize acidic drainage?

Will heap leach piles be rinsed to avoid subsequent pollution?

Other References

Proceedings of the International Conference on Pollution Prevention in Mining and Mineral Processing, Snowmass Village, CO, August 24-27, 1993. Colorado School of Mining, Golden, Colorado.

U.S. Environmental Protection Agency, Office of Water. September 1992. "Storm Water Management For Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices."

Note that mining operations present a wide range of pollution prevention opportunities relating to used lubricants, used vehicle fluids, greases, painting wastes, solvents and process solutions, and other "traditional" industrial materials. For more information see:

Pollution Prevention and Waste Minimization Opportunities for the Mining Industry. October 1993. Front Range Community College, Westminster, Colorado. Prepared for U.S. EPA, Region VIII.

U.S. EPA, Office of Water. January 1993. *Guidance Specifying Management Measures for Sources of Non-point Pollution in Coastal Waters.* 840-B-002.

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR NATURAL GAS PIPELINES

How Can Natural Gas Pipelines Affect the Environment?

The siting, construction, operation, and maintenance of natural gas pipelines and associated systems can pose several risks to the environment. The risks from pipelines derive primarily from the operation and maintenance of compressor stations required to push gases through pipe bores over considerable distances. Such risks include releases of oxides of nitrogen, metals, formaldehyde, and BETX from combustion-powered compressors, generation of used oils and solvents from maintenance of compressors, and releases of fuel oils and other materials stored onsite. The potential impacts of pipelines may also include destruction or alteration of wildlife habitats, erosion, sedimentation, releases of product or fires resulting from pipeline ruptures, and generation of pipeline cleaning wastes. Some pipeline compression operations may include substantial capacity for underground and/or tank storage of the product. Such stations, therefore, may perform gas conditioning activities in addition to compression. The risks from gas condition operations may include releases of dehydrator regeneration condensate (containing BETX and other hydrocarbon contaminants), releases of hydrogen sulfide gas and/or products of incomplete combustion, generation of used oils, solvents, and filter media from conditioning circuit operation and maintenance, and

generation of used desiccants and sweetening agents.

Also see checklists on Ecosystem Preservation and Protection, Siting, Oil and Gas Projects, and Highways and Bridges.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Siting

Will pipeline segments transect sensitive ecosystems? Can these segments be rerouted to avoid sensitive areas to the maximum extent possible? Can underground or elevated structures be employed to minimize impacts? [\(*\)](#)

Can site preparation and construction activities be timed to avoid disturbing plants and animals during crucial seasons in their life cycles, such as mating? [*](#)

Will access points be limited as practicable to minimize disturbance? [*](#)

Will roads be built according to best management practices (BMPs)?

Are compression, storage, and conditioning stations, as well as site access roads, located away from wetlands and other sensitive areas?

Can conditioning activities be minimized or avoided by controlling pipeline feed quality? [*](#)

Can any of the pipeline be co-located with existing pipelines or

other rights of ways to minimize the disturbance of other undeveloped lands?

What additional measures will be taken to protect stream crossings and other critical habitats from the risk of leakage and/or explosion?

Compressor Operation

Does the operator's waste minimization plan include the use of drip pans for compressors, storage vessels, valves, and product pipeline junctions to reduce uncontrolled releases? [\(*\)](#)

Does the operator's waste minimization plan call for the segregation and collection of used oils, lubricants, and coolants generated by compressors for recycling? [*_](#)

Does the operator's spill prevention and response plan include the installation of secondary containment for all above-ground fuel storage tanks and vessels?

Will monitoring systems be installed for underground pipelines to prevent soil/groundwater contamination?

Storage and Conditioning Operation

Does the site include installation of a Claus or another system to recover sulfur removed from the production stream? Is a tail gas scrubber installed to further increase total sulfur recovery? Sulfur recovered from oil and gas operations represents more than 50 percent of all domestically produced sulfur.

Can formaldehyde-based sweetening solvents be replaced with less

toxic alternatives?

Will the operator utilize efficient filtration systems and amine and/or glycol reclaimers to extend the useful life of these materials and reduce the quantity of used conditioning fluids to be disposed of?

Will water and/or regenerator condensate pits, flare pits, and other process pits include liners to prevent releases of contaminants? Can enclosed tanks be substituted for pits to reduce the potential for environmental release?

Will wastes be injected to reduce discharges of contaminants? If so, will the operator perform periodic well casing integrity tests to reduce the potential for the migration of fluids between disposal and freshwater zones?*

What quality assurance and maintenance procedures will be used to ensure pipeline integrity? *

Other References

American Gas Association. 1985. *Gas Engineering and Operating Practices. Volume II, Book T-2: Compressor Station Operations.*

American Petroleum Institute. November 1991. "Waste Minimization in the Petroleum Industry: A Compendium of Practices." API, Washington, DC.

Society of Petroleum Engineers. March 1993. Proceedings of Society of Petroleum Engineers/EPA Exploration and Production Environmental Conference, San Antonio, TX.

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR NUCLEAR DECOMMISSIONING

How Can Nuclear Relicensing And Decommissioning Affect the Environment?

Upon the expiration of the 40-year license term of a nuclear facility, the facility must either apply for license renewal or undergo decommissioning and license termination. Relicensing allows plant operation for an additional 20-year period. If the plant does not qualify for relicensing, or the plant owner/operator does not apply for license renewal, the nuclear facility must be decommissioned. The purpose of decommissioning a nuclear facility is to safely remove the facility from service and to reduce residual radioactivity to levels that permit license termination and release of the property for unrestricted use. Decommissioning activities do not include the removal and disposal of spent nuclear fuel (which is an operational activity), nor do they include the removal and disposal of nonradioactive structures and materials beyond what is necessary to terminate a NRC license. Nuclear facility relicensing and decommissioning can affect the physical environment surrounding the facility if construction or demolition is required as a condition of license renewal or decommissioning. The potential effects include impacts on aquatic systems from soil erosion or spills, on groundwater (particularly for inland sites, sites using cooling ponds, and sites with groundwater wells), and on

plant and wildlife habitats and wetlands.

The decommissioning of a nuclear facility can also generate low level radioactive waste (LLW) and transuranic (TRU) waste. If these wastes are not handled properly, residual radioactive contamination of the facility can result. LLW is defined as waste containing radioactive material other than transuranic radionuclides, spent nuclear fuel, or byproduct material. TRU waste is defined as waste containing alpha-emitting radionuclides with an atomic number greater than 92 and half-lives greater than 20 years, in a concentration greater than 100 nCi/g of the waste matrix.

Also see checklists on Ecosystem Preservation and Protection, Siting, and Waste Site Cleanup Activities.

What Questions Should Be Asked To Ensure That These Effects Are Minimization or Eliminated?

Radioactive Waste. LLW and TRU waste (collectively referred to as "radioactive waste") are generated both by operating nuclear facilities and nuclear facilities undergoing decommissioning. The only option currently available for disposal of LLW is burial, and the only disposal option for TRU waste is long-term storage pending the development of disposal capacity. Any item that contacts radioactive contamination can become a LLW or TRU waste. Items that cannot be disposed of must be decontaminated. Decontamination activities can generate residues that must be disposed of as radioactive waste. Consequently, an important method of reducing the amount of radioactive waste is to prevent the release of radioactive contamination.

Are procedures in place to ensure that decontamination activities are conducted to minimize the generation of radioactive decontamination residues? Selecting an appropriate decontamination process can help reduce the amount of residue generated. For example, scraping or sand-blasting may generate less radioactive residue than a liquid wash, which can generate

large volumes of contaminated wastewater.

Are project controls and procedures in place to ensure that radioactive waste and decontamination residues are segregated from non-radioactive waste? If non-radioactive waste becomes contaminated with radioactive waste or radioactive materials (including radioactive decontamination residues), the resulting mixture can become a radioactive waste. (*)

Are demolition activities conducted to minimize the dispersion of radioactive contamination? Construction and demolition debris can normally be disposed of in a rubble or industrial landfill. Construction and demolition debris that becomes contaminated with radioactive materials must be handled and disposed of as a radioactive waste or be decontaminated prior to disposal. Such cross contamination can be reduced through careful segregation of wastes. *_

Are controls and procedures in place to ensure that transportation methods for radioactive waste will minimize the potential for release of radioactive waste into the environment and minimize the amount of equipment requiring decontamination? Transportation accidents account for a significant percentage of uncontrolled releases. Transportation vehicles should avoid urban areas to the greatest extent possible to reduce the potential for exposure. Radioactive waste released during transport can contaminate whatever it comes into contact with, thereby creating more waste. Equipment used in transportation also must be decontaminated. *_

Will safeguards (e.g., barriers, fences, surveillance equipment) be constructed and sited to minimize the potential for contamination? Safeguards that become contaminated must be handled as radioactive waste and may need to be decontaminated, thus creating more waste in the form of decontamination residues. *_

Are project controls and procedures in place to minimize the potential for contamination of tools and equipment used in

construction and demolition activities? -*

Will the access of personnel and materials into radiation control areas (RCAs) be limited? Limiting access can help reduce the potential for radioactive contamination of personnel, tools, and equipment. -*

Surface Water Quality and Aquatic Ecology. Licensing, refurbishing, and decommissioning of a nuclear facility can affect the aquatic ecology of surface waters surrounding the nuclear facility through cooling water requirements, entrainment and impingement of organisms on intake grates, accumulation of contaminants in sediments and biota, and heat shock. If major construction activities are required as a condition of relicensing or decommissioning, sedimentation and spills of hazardous materials can degrade soils, groundwater, and surface water.

Are procedures in place to reduce the entrainment and impingement of aquatic organisms in cooling water intake grates during the relicensing period? *

Are procedures in place to reduce the amount of chemical contaminants (including biocides, water softeners, and chlorine) released through cooling water effluent during the relicensing period?

Are project controls and procedures in place to ensure that best management practices are implemented to reduce soil erosion and to control spills and the introduction of pollutants into surface waters?

Will the temperature and volume of heated water released to surface waters during the relicensing period be minimized to the greatest extent possible? The introduction of heated water into surface waterbodies can negatively affect aquatic communities.

During facility refurbishing, will less toxic herbicides be used and will the application of herbicides be reduced to the minimum? Will the runoff of herbicides into surface waters be minimized?

Groundwater Quality. The relicensing, refurbishing, and decommissioning of a nuclear facility can cause or increase groundwater-use conflicts and contaminate groundwater aquifers.

Are project controls and procedures in place for construction and demolition activities to minimize spills and the potential introduction of pollutants to groundwaters?

If a relicensed plant will pump 100 or more gpm from a well and private wells are located within the cone of depression of the reactor well(s), are procedures in place to minimize the groundwater-use conflict? (*)

If surface water is used to recharge a groundwater aquifer, are controls in place to reduce pollutants in the surface water that could potentially contaminate the groundwater aquifer?

Wetlands. Periodic vegetation control is necessary in forested wetlands underneath powerlines. Wetlands are particularly sensitive areas that can be disturbed as a result of industrial and other activities. Refurbishment or decommissioning may also require the repair or removal of powerlines, which may necessitate the use of heavy equipment.

Are procedures in place to employ best management practices to minimize disturbance and potential pollutant loadings from required vegetation control in forested wetlands underneath powerlines?

Are procedures in place to employ best management practices to minimize disturbance and potential pollutant loadings where heavy

equipment must enter a wetland to repair or remove powerlines?

Air Quality. Refurbishment and decommissioning activities can increase the levels of air pollutants and particulates from construction and demolition activities.

Are project controls and procedures in place to ensure the implementation and use of best management practices to minimize the generation of particulates and dust emissions during construction and demolition activities?

Other References

Nuclear Regulatory Commission. September 17, 1991. "Environmental Review for Renewal of Operating Licenses, Proposed Rule." 56 FR 47016.

Nuclear Regulatory Commission. August 1988. *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities*. NUREG-0586.

Nuclear Regulatory Commission. December 13, 1991. "Nuclear Power Plant License Renewal, Final Rule." 56 FR 64943.

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR OIL AND GAS PROJECTS

How Can Oil and Gas Exploration and Production Affect the Environment?

Exploration, development, production, product treatment, and waste management activities associated with oil and gas production projects can have a variety of impacts on the environment. They include destruction or alteration of wildlife habitats, erosion, sedimentation, pollutant loading of groundwater and surface water from product and/or waste leaks and spills, groundwater contamination from communication between production or waste injection zones and underground sources of drinking water, release of hydrocarbons and hydrogen sulfide to the atmosphere, and decreased soil productivity from land spreading and/or releases of reserve/mud pit contents.

Also see checklists on Ecosystem Preservation and Protection, Building/Housing Construction, and Siting.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Siting. Oil and gas exploration and production sites are situated by necessity near petroleum-bearing formations. Such formations may be located in nearly any climate and topographical setting and may be either remote from or near the population centers. The siting of roads, disposal units, personnel housing, laboratories, and ancillary facilities may provide opportunities to minimize impacts to surrounding areas, such as human populations, wetlands, and sensitive ecosystems.

Do siting considerations include the possible impacts of operations (such as platform construction, NPDES discharges, tankering, air emissions, and spills) on marine mammals, birds, fish, and benthic organisms?

Are site access roads, haul roads, product treatment facilities, and disposal facilities located to minimize the effects on sensitive ecosystems? Are existing roads adequate for site development?

Can directional drilling be employed to reduce impacts in sensitive areas? Directional drilling places the bottom of the well under an inaccessible surface location (i.e., under a river, lake, city, or other occupied place), where vertical drilling is impractical or undesirable.

Exploration. Oil and gas exploration includes all activities from geophysical exploration for petroleum deposits to wildcat well drilling and production well drilling and installation. Such activities involve site clearing and preparation, the installation of mud pits and reserve pits, construction of the drilling pad and ancillary facilities, and operation of the drilling rig.

Does the drill site preparation plan include the construction of diversion ditches and containment berms to reduce site run-on and prevent release of contaminated runoff?

Has the use of closed mud systems to reduce land disturbance and decrease the chances for mud releases been considered?

Will separation systems for filters and solids be employed to increase the lifetime of drilling muds, thereby reducing the total quantity of muds to be employed?

Can mud additives of known or suspected hazard be replaced with less toxic additives?

Are reserve and mud pits to be constructed to contain total expected mud column volumes plus rainfall, and will there be adequate freeboard to minimize chances of pit overtopping?

Are reserve and mud pits to be constructed with compacted clays or other liner materials to minimize the downward migration of fluid constituents?

Is surface casing to be installed to a depth below the deepest Underground Source of Drinking Water (USDW)?

Have cement job specifications been established to ensure the protection of ground water resources? The running of bond logs and/or temperature surveys may help in ensuring the quality of cement jobs.

Do drilling plans call for squeezing fresh water sands with cement while drilling to inhibit the migration of contaminants into the zone and inhibit groundwater draw down?

Can site preparation and drilling activities be timed to avoid disturbing plants and animals during crucial seasons in their life cycles, such as mating? (*)

Lease Development and Production. Oil and gas production typically begins with well completion (preparing the well to allow

formation fluids to flow into the bore) and extends through primary production (produced fluids enter the well without the addition of mechanical energy), secondary production (some external "lift" is applied to force formation fluids into the bore and to the surface, such as water flooding), and tertiary production (thermal lift methods). Production activities include all onsite treatment of produced fluids, including phase separations (solids removal, produced water separation, and gas phase and liquid phase separation), emulsion cracking, sweetening and dehydration, and compression, as well as equipment maintenance activities, such as workovers and completions, pipeline pigging, storage tank bottoms removal, pit skimming and closure, and the injection of produced fluids.

Does the operator's spill prevention and response plan include the installation of secondary containment for all above-ground storage tanks and vessels?

Do produced water pits/tanks include oil skimming capability to increase product recovery and reduce the toxicity of the produced water?

Do site dehydration and sweetening units systems include efficient filtration systems to reduce the degradation of these materials?

Does the site include installation of a Claus or other sulfur recovery system for recovery of sulfur removed from the production stream? Is a tail gas scrubber installed to further increase total sulfur recovery? Sulfur recovery at oil and gas projects now represents more than 50 percent of domestic elemental sulfur production.

Can formaldehyde-based sweetening solvents be replaced with less toxic alternatives?

Will the operator utilize the services of amine and/or glycol reclaimers to extend the useful life of these materials and reduce the quantity of used conditioning fluids to be disposed of?

Will production and injection wells be installed with casing-head gas recovery systems to reduce emissions of hydrocarbons? Will casing head gases and other gas wastes be flared at high temperatures to reduce emissions of products of incomplete combustion?

Will the operator perform periodic well casing integrity tests to reduce the potential for the migration of fluids between production and freshwater zones?

During secondary production, will operation plans include the monitoring of production water percentage to alert the operator of any injection water or formation water migration so that remedial measures can be rapidly taken?

Will injection well tracer surveys, in conjunction with injection or disposal wells, be conducted to reduce the potential for injected water/wastes going into thief zones? Temperature logs before and after injection may also be effective in determining whether unintended migration has occurred.

Will all workover and completion fluids be managed separately from produced fluids? (*)

Will monitoring systems be installed for underground pipelines to prevent soil/groundwater contamination? Underground piping may also be made of corrosion resistant materials or be protected using cathodic protection or other devices.

Waste Management

Does the pit management system provide for the separation of wastes of known or suspected hazard from nonhazardous wastes to reduce the total quantity of materials requiring special handling?*

Will the operator utilize the services of a crude oil reclaimer for reduction of the quantity of tank bottoms and oily debris requiring disposal? Can tank bottoms be safely used for onsite road spreading? Do product storage tanks incorporate recirculation pumps to reduce the settling of heavy hydrocarbons on tank bottoms?*

Does the operator's waste minimization plan include the use of drip pans for all treatment vessels, valves, and product pipeline junctions to reduce uncontrolled environmental releases?

Do pit closure plans call for the dewatering of mud and reserve pit contents before burial to reduce the chance of the downward transport of contaminants to shallow aquifers. The grading of soils covering pits may reduce the chances of infiltration of rain water, which may migrate to groundwater.*

Other References

American Petroleum Institute. January 1989. "API Environmental Guidance Document Onshore Solid Waste Management in Exploration and Production Operations." API, Washington, DC.

American Petroleum Institute. November 1991. "Waste Minimization in the Petroleum Industry: A Compendium of Practices." API, Washington, DC.

Society of Petroleum Engineers. March 1993. Proceedings of Society of Petroleum Engineers/EPA Exploration and Production Environmental Conference, San Antonio, TX.

Spell, R., C. Hall, D. Pontiff, et al. September 1990. "Evaluation of

the Use of a Pit Management System." In: *Proceedings of the First International Symposium on Oil and Gas Exploration and Production Waste Management Practices*, Sponsored by U.S. Environmental Protection Agency. September 10-13, 1990, New Orleans, LA, pp. 491-501.

Thurber, N. September 1990. "Waste Minimization in E&P Operations." In: *Proceedings of the First International Symposium on Oil and Gas Exploration and Production Waste Management Practices*, Sponsored by U.S. Environmental Protection Agency. September 10-13, 1990, New Orleans, LA, pp. 491-501.

U.S. Environmental Protection Agency, Office of Water. September 1992. "Storm Water Management For Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices."

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR RECREATION AND TOURISM

How Can Recreation And Tourism Affect the Environment?

Recreation and tourism can affect the environment through alteration or destruction of wildlife habitats and ecologically valuable areas during construction activities, as well as through the direct impact caused by recreators and tourists (e.g., destruction of sensitive sand dunes, damage to coral reefs, increased air emissions, and littering). Recreational areas can also affect the environment by putting additional stress on local infrastructure, such as roads and publicly owned treatment work (POTWs), that may not have been designed and constructed to handle the increased volume of users that tourism and recreation can bring to an area.

Also see checklists on Highways and Bridges, Siting, Ecosystem Preservation and Protection, Landscaping, Pest Management, Building/Housing Construction, and Water Use.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Siting Concerns. The location of a recreation area can influence the nature and extent of any environmental impacts caused by the facility. The development of construction plans that consider the potential impacts of siting and construction can help minimize environmental degradation.

Will construction be avoided in areas that are home to threatened species of flora and fauna or that have unique features (e.g., thermal springs)? [\(61\)](#)

Does the construction plan minimize the potential for erosion and sedimentation? Methods to reduce this potential include avoiding construction in erosion-sensitive areas, leaving vegetation in place or replanting after construction, and using erosion controls to prevent releases to the environment.

Will the facility be sited to make use of natural topography and vegetation features to reduce alteration or destruction of natural environments? [*](#)

Will roadways in and around the facility be sited and constructed to minimize runoff to the surrounding environment? Will construction roadways be kept to a minimum? Roads disrupt wildlife territories, movement, and migration patterns. They also alter lighting, temperature, and rainfall patterns and may introduce weed species into the ecosystem.

Does the project include plans to upgrade, if necessary, the infrastructure surrounding the facility? Increased traffic and usage of public facilities often are a result of recreation and tourism projects. For example, POTWs, local landfills, and roads may need to be improved or replaced to prevent overuse. In some cases, larger facilities may need to construct onsite treatment plants to reduce stress on local POTWs. [*](#)

If the project is water intensive (e.g., ski resorts), will a water

recycling system be used? For example, gray water collected can be treated and combined with snowmelt to make new snow for reuse on ski trails or in other operations, such as vehicle washing or irrigation. (*)

Will the facility set aside wildlife conservation or park areas that will be free of development?

Does the construction plan minimize the need for current and future use of chemical pesticides and fertilizers?

Will the project employ public transportation to the maximum degree possible? Many recreational facilities provide shuttle bus service to limit the use of private vehicles and the need for roadways and parking lots in and around the recreation area.

Will the number of trails and paths in natural areas be limited to minimize the destruction of vegetation, erosion and sedimentation, and disturbance of wildlife? *

Will facilities be located to minimize impacts on sensitive habitats?

Operating Concerns and Visitor Management. Recently, the environmental quality of many recreation areas across the country has significantly deteriorated because of overuse. Restricting visitors from certain areas or regulating visitor numbers can help reduce damage to the environment.

Will tourists and recreators be informed about how they can help reduce their impact on the environment? Rules and recommended practices may be posted or distributed to educate visitors about environmental issues and pollution prevention techniques that should be practiced. Parks may mail information on low-impact uses to visitors who have made reservations to visit the park. Mailing the literature prior to the visitors' arrival enables them to prepare and pack accordingly.*

Will lodging and other visitor services (e.g., restaurants, concessions stands, recreation centers) be constructed and operated to minimize their environmental impact through pollution prevention? Such incentives as price discounts for consumers who bring their own containers and rebates for container returns can help encourage source reduction and recycling. [_*](#)

Will sensitive areas be restricted from tourists and recreators to protect these areas from damage? Examples include limiting the use of off-road vehicles on sand dunes, prohibiting hiking in certain areas, and ensuring that boaters do not drop anchor above coral formations or delicate aquatic fauna. [_*](#)

If the site being developed is in a sensitive area, are there provisions to limit the number of visitors to the facility to ensure that natural habitats are not permanently damaged by increased visitors? One technique to limit the number of visitors to an area is to institute a reservation or permit system. Another technique is to raise user fees. [_*](#)

Will the collection or sale of coral, wildlife, or other natural items be limited or prohibited? Such restrictions help ensure that the natural environment is not degraded. [_*](#)

Will physical barriers be constructed, where needed, to restrict visitor access to sensitive areas and prevent damage? [\(*\)](#)

Will campfires and firewood collection be restricted or prohibited in fire-prone areas? Forest fires can destroy wildlife habitats and also result in significant air emissions. Liquid fuel-burning camping stoves are a practical alternative.

Will camping be localized or concentrated to reduce the area affected by recreation activities? [_*](#)

Is there a plan to ensure that the facility, and its guests or visitors, recycle materials to the greatest degree possible? *

Will the facility provide trash bags, along with trash and recycling bins, to reduce littering by recreators? To reduce the littering problem around Mount Everest, the Nepalese Department of Tourism requires tour guides to account for every item carried to the region. Returning groups are inspected and national park guards can fine hikers heavily for missing items. *

Will adequate outhouse facilities be provided to prevent recreators from defecating and urinating near trailways? Human septic waste is not just unsightly; it may pose human health and environmental threats.

Recreational Vehicles and Boats. Recreational vehicles (RVs), motor homes, boats, and other motorized vehicles used by facility visitors can result in the generation of waste and environmental degradation. The proper management of these wastes and materials can reduce the potential impacts of these vehicles.

Will the discharge of sewage from RVs and boats be prohibited? In many cases, sewage pump-out stations should be constructed to manage sewage from boats and RVs and ensure that the environment is not contaminated.

Will gray water from boats or RVs be collected for reuse? *

Will containment structures be constructed in marina and RV areas to reduce the potential impact of oil or fuel spills? Will spill response and control equipment be kept onsite?

Will sanitary cleaners that are compatible with local water treatment systems be used? *

Will trash and recycling facilities be conveniently accessible at marinas and RV areas to prevent illegal dumping?*

Horses and Pack Animals. Horses and other pack animals, which are commonly found at recreation areas, can affect the environment as a result of their manure. Manure from animal trails and stables can enter nearby waterways via runoff and lead to nutrient loading and algal and aquatic plant blooms. Manure can also cause nuisance problems, such as odors and pests.

Will animal trails be located away from streams and other sensitive waterways to minimize the potential for nutrient loading?

Will efforts be made to limit the number of pack animals and riding tours to reduce impacts to critical habitats and water supplies (such as erosion)?

When necessary, will manure be collected from trails or stables and reused as fertilizer or compost? (*)

Other References

U.S. EPA, Office of Enforcement and Compliance Assurance.
"Tourism - Technical Support Document, International Training Workshop Principles of Environmental Enforcement."

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR ROCKETRY/MISSILE PROJECTS

How Can Rocketry/Missile Projects Affect the Environment?

The testing, production, maintenance, and decommissioning of rockets/missiles for Department of Defense programs can have a variety of impacts on the environment. These impacts include air quality effects from launch vehicle exhaust, potential depletion of stratospheric ozone levels, electromagnetic radiation hazards, generation of hazardous materials and wastes, noise impacts, pollution of surface water and groundwater sources, effects on biological resources, and soil erosion and contamination.

Also see checklists on Defense Testing and Related Activities, Ecosystem Preservation and Protection, and Siting.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Air Quality Concerns. Routine releases of rocket propellant combustion products (including carbon dioxide, carbon monoxide, hydrogen gas, hydrogen chloride, nitrogen gas, chlorine, and

aluminum oxide) during testing can cause adverse human health effects and contribute to acid rain. In addition, the production, maintenance, and decommissioning of rockets/missiles can cause harmful routine air emissions and the risk of chemical volatilization from accidental spills and releases.

Are there opportunities to reduce the adverse effects of air emissions by relocation of rocket/missile test facilities to areas where air quality impacts would be less serious? [\(*\)](#)

Will the project use enclosed test facilities equipped with vapor recovery systems and oxidizer vapor scrubber systems?*

Will solvents (such as butyl alcohol and Freon-113) used in electronic parts production be routinely recovered?*

Are there provisions for minimizing the removal of vegetation and the generation of dust during construction activities for rocket ground entry points?

Does the project include provisions for reducing air emissions from rocket/missile decommissioning activities (e.g., the emissions caused by the open detonation of rocket motors and incineration of rocket fuel)?

Upper Atmosphere Concerns. Rocket exhaust compounds (including hydrogen chloride, metallic oxide particulates, ice, soot, nitrogen compounds, and hydrogen compounds) can lead to stratospheric ozone destruction. Combustion gases (including carbon dioxide, nitrous oxide, and water vapor) from missile launches absorb infrared radiation and can contribute to global warming.

Will the number of rocket/missile launches be minimized to the greatest extent feasible? One technique is to rely on test simulations whenever possible.

Does the project suggest any alternatives to the use of hydrogen chloride, which is a major ozone-depleting chemical?

Will ozone-depleting solvents, such as chloroform, be used in electronics production? Are there provisions for phasing-out the use of these solvents?

Electromagnetic Radiation Concerns. Communication systems, transmitters, and ground-based radar systems used to guide missiles produce electromagnetic radiation (EMR) that could result in adverse impacts to humans and the environment.

Does the project consider coordinating with the U.S. Fish and Wildlife Service to site radar systems away from established migratory bird flyways to avoid exposure to EMR from the trajectory beams? (*)

Will the power densities of EMR be controlled to acceptable safety levels? Have standoff distances from EMR power sources been specified? *

Hazardous Material/Waste Management Concerns. The testing, production, maintenance, and decommissioning of rockets/missiles involves the use of hazardous materials (including reactive solid rocket propellants, toxic solvents, oxidizers, and toxic liquid rocket fuel) and generates hazardous wastes. The use of hazardous materials can affect the environment through air emissions of volatile chemicals, accidental spills, and other uncontrolled releases. In addition, the disassembly and destruction of rockets/missiles may generate large quantities of hazardous wastes.

Are there opportunities to reduce the amount of hazardous and toxic materials used in the fabrication and operation of the rockets/missiles? For example, will the use of such compounds as

beryllium and mercury be minimized?

Are there provisions for reducing potential spills and uncontrolled releases of hazardous materials? Is there a spill prevention and control plan?

Is there a plan for the expeditious recovery of flight test vehicles and debris containing hazardous materials?

Noise Concerns. Noise associated with rocket engine testing and rocket launches is a potential concern for humans and wildlife. Sonic booms generated from rocket launches and the flight of test missiles can interrupt the breeding habits of some wildlife species.

Does the project specify adequate buffer zones around rocket/missile test sights? *

Are a wide range of sound attenuation measures (such as noise barriers, concrete bunkers, and water damping) included as part of the project?

Surface Water Concerns. Surface water quality near launching and test-firing facilities and below rocket/missile trajectories could be affected by the deposition of contaminants from exhaust clouds, contamination from fallen rocket/missile debris, spills or leaks of propellant, and contaminated storm-water runoff. In addition, the production, maintenance, and decommissioning of rockets/missiles could use large amounts of water and adversely affect surface water quality.

Does the project require the preparation of Spill Prevention Control and Countermeasures Plans, Storm-water Pollution Prevention, and Soil Erosion and Sediment Control Plans?

Are proposed testing facilities located away from surface waterbodies?

Will the amount of water required for production and decommissioning activities be minimized?

Groundwater Concerns. The testing, production, maintenance, and decommissioning of rockets/missiles all have the potential to adversely affect groundwater quality. Rocket/missile testing and production would involve the use of hazardous materials, including reactive solid rocket propellants, toxic solvents, oxidizers, and toxic liquid rocket fuel. Such hazardous materials could contaminate groundwater aquifers through leakage or accidental spills.

Will closed-looped fueling systems be used to minimize the potential for spills and leaks of propellants or other hazardous liquids?

Are Spill Prevention Control and Countermeasures Plans required to reduce the likelihood of contaminants escaping from confined areas and to specify procedures for cleaning up contaminated soil?

Biological Resources Concerns. The construction of new or expanded facilities for rocket/missile testing and launches could require the filling of wetlands and could result in habitat loss from the siting of structures and utility lines. Potential impacts to terrestrial and aquatic biota could result from noise and exhaust emissions during rocket/missile launches and from electromagnetic radiation emitted from radars and transmission devices.

Does siting of the project take into consideration avoiding proximity to wetlands, surface waterbodies, and migratory bird flyways?

Are mitigation measures included to avoid water pH reduction from settled rocket/missile exhaust clouds that could result in fish kills?

Are adequate sound attenuation measures, such as noise barriers, concrete bunkers, and water damping, proposed to avoid or reduce impacts to surrounding wildlife?

Will sensitive habitats be avoided if trenching to install utilities and/or fiber-optic communication lines is necessary?

Geology/Soils Concerns. Rocket/missile launches or intensive earthmoving activities in areas of weakly consolidated soils or highly fissured rock could cause landslides and other geologic hazards. In addition, soil erosion and contamination could result from rocket/missile launches, debris craters, and off-road travel associated with testing. Decommissioning activities, such as open detonation, could introduce contaminants to adjacent soils.

Can existing facilities and roads be used to minimize soil disturbance caused by new construction?

Does the project call for preparation of soil erosion and sediment control plans? Are specific control measures suggested (e.g., seeding of exposed soil, watering to prevent fugitive dust)?

Have alternatives to the open detonation of rocket motors and incineration of rocket fuel been considered to minimize potential soil contamination?

Other References

Army Regulation 200-1, Environmental Protection and

Enhancement.

Army Regulation 220-2, Environmental Effects of Army Actions.

U.S. Department of the Interior, Denver Service Center. September 1993. *Guiding Principles of Sustainable Design*. National Park Service (NPS) publication number NPS D-902; GPO publication number GPO 77443.

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR SOLID WASTE LANDFILLS

How Can Solid Waste Landfills Affect the Environment?

Landfills can pose environmental risks to human health and the environment. In fact, 22 percent of the 850 sites on the Superfund National Priorities List were identified as municipal landfills (however, many of these sites were operated before restrictions limiting the disposal of hazardous wastes were enacted). While modern landfills are equipped with pollution control devices that minimize environmental releases, several potential environmental effects exist. These include groundwater pollution, surface water contamination (from runoff and leachate), explosion hazards, impacts to unique areas (such as wetlands or habitats for endangered species), and nuisance factors (such as noise pollution, dust, and blowing litter). Wastes that either contain hazardous constituents or that can mobilize hazardous constituents in landfilled wastes present the most environmental risk.

Also see checklists on Ecosystem Preservation and Protection, Vehicle Maintenance, Siting, Highways and Bridges, and Hazardous Waste Storage and Treatment Facilities.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Many of the questions and concerns discussed below are now included in the EPA Federal minimum national requirements for municipal landfills. These questions are also relevant to other nonhazardous landfills, especially industrial and commercial waste landfills and construction/demolition debris landfills, and are in the regulations of many States.

Siting Concerns. The siting of a new landfill can have significant impacts on the surrounding ecosystem, as well as local communities. However, proper siting considerations can help mitigate these concerns.

Will construction in ecologically sensitive areas (such as wetlands and threatened or endangered species habitats) be avoided? (*)

Will construction in hazard prone areas, such as flood zones and earthquake zones, be avoided? *

Will construction over groundwater aquifers and near surface waters used as sources of drinking water be avoided? The potential for groundwater contamination can also be reduced by siting a facility in an area with clay soil (or installing a clay liner) and in locations where the groundwater aquifer is not immediately below the landfill. Surface water contamination can be minimized by siting landfills far from lakes and rivers.

Will waste transportation corridors be located to minimize impacts on the surrounding environment and the community?

If the proposed landfill will be serviced by transfer stations or other interim collection points, are there plans or policies to assure that the transfer stations will be sited and operated in a manner that will prevent pollution and protect the environment?

Operating Concerns. An operating landfill has the potential to affect both air and water quality. However, a number of operating techniques are available to help mitigate these negative impacts.

Will facility personnel question waste haulers and conduct random checks of incoming loads to ensure that hazardous wastes and other banned materials are not inadvertently disposed of in the landfill? The easiest way to reduce the potential for releases that contaminate groundwater is to ensure that hazardous wastes are not accepted at the landfill. Solid waste landfills often are banned from accepting hazardous wastes generated by facilities above a specified threshold quantity, as well as other materials, such as lead-acid batteries, tires, landscaping wastes, recyclables, white goods, and some PCB-containing materials and containerized liquids. (*)

Will the facility provide training for personnel in waste identification and safe waste handling practices? These training programs can help reduce negative environmental effects and employee exposure. *

Does the proposed landfill have a groundwater monitoring plan? Groundwater monitoring can help ensure early detection of releases of contaminants to the environment and, thus, prevent the generation of additional waste material.

Will plastic liners or clay soils be employed to minimize the migration of leachate to groundwater aquifers and surrounding soils?

Will daily cover be used? Applying a layer of soil over disposed waste at the end of the day can help limit rodent problems, minimize the potential for fires, reduce odors and airborne pathogens, and prevent blowing litter. Cover materials can include earthen soil or alternative materials, such as foams or tarps.

Will precautions be taken to reduce landfill run-on and runoff? Run-on controls, such as perimeter berms, swales, and canals, divert or redirect precipitation to a holding pond to reduce the quantity of liquid that must be treated as leachate. Run-on/runoff controls should also be designed and constructed for haul roads and other associated areas.

Will measures be taken to reduce fugitive dust emissions from haul roads? Non-chemical alternatives to dust suppression include keeping haul roads damp with water and reducing haul road speed limits.

Does the facility's operating plan minimize the movement of solid waste through the facility? Limiting the transport of wastes within the landfill reduces the potential for blowing litter, as well as air emissions associated with vehicle use.

Will the facility take steps to control, capture, and/or reuse methane and other landfill gases? *

What steps will be taken to prevent noxious or toxic fumes from entering surrounding residential areas?

Does the facility plan specify adequate noise buffer zones and sound attenuation measures to reduce the potential for noise pollution in surrounding areas?

Does the operating plan call for the composting of yard and landscaping wastes received at the landfill? Landfills may have an associated composting program to divert compostable materials from disposal. The resulting compost can be used in landscaping and other applications. (*)

Will the landfill's staff work closely with community recycling programs? Close cooperation between landfill staff and community

recycling coordinators will help divert recyclable materials from the landfill. Potential landfill operators should demonstrate a commitment to removing recyclables from the trash through a combination of random inspections during trash pickup and sorting at the landfill facility. Depending on the proximity to the local community, it may be feasible for the landfill to provide collection facilities for used oil, batteries, and other household hazardous wastes that may otherwise be disposed of in the landfill. ^{*}

Will the landfill assist State or local environmental programs to encourage large users to reduce their waste streams? Publicly owned treatment plants (POTWs) across the country are assisting municipalities in identifying the dischargers of large volumes of toxic constituents. Municipalities contact the dischargers and offer free technical assistance to reduce the waste streams through onsite pollution prevention efforts. Potential landfill operators should express a willingness to participate in similar efforts for solid waste.

Closure and Final Use Concerns. Solid waste landfill areas, once filled, properly capped, reclaimed, and vegetated, can be used in other ways that benefit society.

Are there provisions for closure and final use in the facility plan? Landfill design plans should include provisions for alternative uses once the landfill is full. Former landfills have been converted into usable real estate (primarily recreational properties and wildlife preserves). However, because of continued stabilization and subsidence of landfills, former landfill sites often are not suitable as building sites. ^{*}

Other References

U.S. EPA. November 1993. "Solid Waste Disposal Facility Criteria - Technical Manual."

U.S. EPA, Office of Enforcement and Compliance Assurance.
Undated. "Residential and Industrial Waste Disposal - Technical
Support Document, International Training Workshop, Principles
and Environmental Enforcement."

* Indicates an environmental impact reduction opportunity.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR WASTE SITE INVESTIGATIONS AND CLEANUP ACTIVITIES

How Can Waste Site Cleanup Activities Affect the Environment?

The activities associated with waste site investigations and cleanups can have a variety of impacts on the environment. Activities may include the construction of roadways or trenches, installation and operation of remediation and treatment systems, soil/waste sampling and groundwater well installation and monitoring, and removal and transportation/cleanup of contaminated soils and groundwater. Effects may include wildlife habitat alteration or destruction, wind and water erosion of soils, soil compaction, and sedimentation of waterbodies. The extraction of contaminated groundwater can cause land subsidence from groundwater overdraft. Waste site cleanup operations may introduce chemical pollution to soils, groundwater, surface waters, or air resulting from excavations, soil groundwater treatment, spills, improper drilling techniques, equipment failures, or fires. Cleanup operations may consume energy and water resources and could require the transportation of wastes that contain hazardous constituents to and from the site.

Also see checklists on Hazardous Waste Incinerators, Waste Treatment and Storage Facilities, Chemical Demilitarization, Base

Closure and Reutilization, Solid Waste Landfills, Building/Housing Construction, Highways and Bridges, and Water Use.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Site Access and Construction. Construction activities can have significant impacts on the environment, including degradation of wildlife habitats, erosion and/or compaction of soils, dust and noise pollution, and sedimentation of surface waters. Pollution prevention techniques can help mitigate or reduce construction effects.

Have attempts been made to minimize or avoid construction in environmentally sensitive areas? (*)

Will the project make use of existing roadway alignments (if possible) to reduce the amount of waste resulting from road construction activities?

Does the construction plan provide for erosion (wind and water) and sediment control during and after construction?

Do construction plans consider the effects of soil compaction on runoff quantity from the site?

Does the construction plan include revegetation of areas disturbed by construction to minimize erosion and sedimentation?

Will material and waste storage areas be adequately contained to reduce exposure? *

Will site access routes and equipment storage areas be planned and located to minimize erosion potential?

Will secondary containment be provided in equipment fueling areas?

Waste Site Investigation and Cleanup Operations. Waste site investigation and cleanup operations could introduce chemical or other pollution to soils, groundwater, surface waters, or air resulting from inadequate containment of processes, spills, equipment failures, or fires. Cleanup operations may consume energy and water resources and may require the transportation of wastes that could contain hazardous constituents to and from the site.

Have efforts been taken to prevent or minimize the introduction of hazardous constituents to soils, groundwater, surface waters, and air before, during, and after waste site investigation and cleanup activities?

Have measures been considered to prevent the release of pollutants from contaminated soils at the cleanup site to surface water via runoff and air via wind?

Will the site be capped with a natural or synthetic protective covering?

Have measures been considered to prevent spills or releases of contaminated groundwater that has been extracted from the site?

Does the cleanup plan prevent noxious or hazardous gas emissions, including volatile organic compounds, from being vented or released to the air?

Are leachate collection systems designed to prevent spills or releases after the leachate has been extracted?

Have measures been considered to provide for the safe transportation of leachate from the site?

Have the proposed waste site cleanup operations been assessed to consider the amount of water and energy that will be consumed and how much waste (wastewater/sludge) the processes may generate?

Have measures been considered to minimize the amount of water and energy resources that will be consumed?

Have measures been considered to minimize the amount of materials used during cleanup and the amount of wastes generated from materials usage?

Transportation of Cleanup Wastes from the Site. Cleanup wastes may contain hazardous constituents that will have to be transported from the site for treatment, storage, or disposal. The transportation of hazardous wastes presents significant threats to the environment in the event of a crash or spill, which could cause a release of hazardous constituents to soils, surface waters, air, or groundwater.

Have measures been considered to minimize the potential for releases resulting from crashes or problems while transporting waste from the site?

Have the safest and least populated routes of travel been identified for the transportation of wastes from the facility by trucks?

Are the transporters of cleanup site wastes certified to transport those wastes?

Are wastes transported in a contained manner (i.e., contaminated soils properly covered and secured)?

Have waste treatment, storage, or disposal destinations been chosen to minimize the potential for the release of contaminants to the environment?

Other References

Lawrence Livermore National Laboratory. May 1988.
Environmental Assessment for the Environmental Compliance and
Cleanup Project.

* Indicates an environmental impact reduction opportunity.