JAN 18 1974

PREPARATION OF

ENVIRONMENTAL REPORTS

FOR

NUCLEAR FUEL FABRICATION PLANTS

DRAFT Dec. 31, 1973

uranium is processed at the facility. The guide does not indicate when an exception may be taken to the requested information since it would become unnecessarily wordy if the attempt were made to cover all possible situations with a single guide. It is left up to the applicant to decide when a specific request for information is not applicable to their plant.

Descriptive and/or narrative text as well as tables, charts, graphs, etc. should be used in the Report. Each subject should be treated in sufficient depth to permit the Commission to evaluate independently the extent of the environmental impact. In cases where test results are needed to support conclusions, test data, procedures, techniques, and equipment used to perform tests should be included. Tables, line drawings, and photographs should be used wherever contributory to the clarity of the Report. Descriptive and narrative passages should be brief and concise.

Pertinent published information relating to the site, the plant, and its surroundings should be referenced. Where published information or assumptions are essential to evaluate specific environmental effects of the proposed activities, they should be included in summary or verbatim form in the Environmental Report or as an appendix to the report.

Some of the information to be included in the Environmental Report may have already been prepared by the applicant during consideration of the safety aspects of the proposed plant. In such cases, this information (whether in the form of text, tables, or figures) should be incorporated in the Environmental Report where appropriate in order to provide a complete document.

The site for a fuel fabrication plant may already contain other sources of environmental impact, including other plants which utilize chemical or radioactive materials. The applicant, in preparing the Environmental Report relating to such a plant, should consider the effects of the proposed plant in conjunction with the effects of such other facilities and potential interactions between them.

INITIATION OF PLANT CONSTRUCTION

Section 23(7) of 10 CFR Part 70 states that, for a proposed fuel fabrication plant

"the Director of Regulation of the Commission or his designee, before commencement of construction of the plant or facility which the activity will be conducted, on the basis of information filed and evaluation made pursuant to Appendix D of Part 50 of this chapter, has concluded, after weighing the environmental, economic, technical, and other benefits against environmental costs and considering available alternatives, that the action called for is the issuance of the proposed license, with any appropriate conditions to protect environmental values. Commencement of the construction prior to such conclusion may be grounds for denial of a license to possess and use special nuclear material in such plant."

STANDARD FORMAT AND CONTENT OF ENVIRONMENTAL REPORTS FOR FUEL FABRICATION PLANTS

ABSTRACT

The intent of this section which should take the form of an abstract preceding the body of the report is to provide a summary of the pertinent data, narrative, and evaluations included in the applicant's Environmental Report. This summary would be used by organizations, individuals, and the general public whose primary interest is to rapidly assimilate the significant features and conclusions of the Report in order to validate that the applicant has complied with the environmental goals of NEPA as implemented by the Commission in Appendix D of 10 CFR 50. This summary, preferably in tabular form, should include the following information.

(a) A concise description of the significant characteristics of the proposed fuel fabrication facility including the major site features, and the major plant design and operating parameters.

(b) A comparison of substantive site, and plant alternatives to proposed action as extracted from the material prepared in Sections 7.

(c) A listing of significant effects of the proposed plant as extracted from the benefit-cost analysis of Section 8 and the conclusions drawn from weighing the aggregate of these effects. This should include both adverse and beneficial environmental and socio-economic impacts which would occur should the proposal be implemented.

1.0 PROPOSED ACTIVITIES[1]

1.1 BACKGROUND INFORMATION

In this section the applicant should discuss the scope of its business, its location, and organizational structure. The applicant should also identify the architectural, engineering, and construction firms and consultants that will be working on the project.

The type of nuclear fuel and other products to be fabricated at the proposed facility should be described and a 20-year projection of requirements for the products should be supplied. Alternative sources of the products, including plant location, should be identified.

If delay of the proposed project would have effects on the nation's energy program and/or the applicant's business such as loss of contracts, job, future business, etc., these effects should be discussed.

If other objectives are to be met by the proposed plant, such as obtaining commercial and technical experience from the operation of a demonstration facility, or from the performance of research and development, a description of these should be given.

1.2 REGIONAL SITE LOCATION

The applicant's rationale for the selection of the region in which the proposed fuel fabrication plant is to be located should be discussed. The information presented should include locations of potential customers, sources of the special nuclear and other specialized materials, methods of transportation, company related considerations, and unique socio-economic factors.

1.3 PROPOSED PROJECT SCHEDULE

The applicant should present a proposed project schedule showing, as a minimum, the dates for initiation of site preparation, plant construction, and operation.

1.4 PREVIOUS ACTION ON APPLICATION

Briefly describe, chronologically, significant prior actions by the applicant and the Atomic Energy Commission with regard to the license for operation of this plant, or other facilities on the proposed site which release effluents into the same environment as the proposed plant.

(1) If the applicant considers any information requested by this or any other section of the guide to be "company confidential", the requested information should be submitted as a separate proprietary document in accordance with 10CFR2.

2.0 THE SITE

In this section the applicant should present the basic, relevant information concerning those physical, biological, and human characteristics of the area environment that might be affected by the construction and operation of a fuel fabrication plant on the designated site. To the extent possible, the information presented should reflect observations and measurements made over as long a period of years as data is available. Where appropriate, the data should be tabulated.

2.1 SITE LOCATION AND LAYOUT

Provide a map(2) showing the site and its location with respect to State, county and other political subdivisions. On other detailed maps show location of the plant perimeter; applicant's property; abutting and adjacent properties, including water bodies, wooded areas, and farms; nearby settlements; industrial plants, parks and other public facilities; and transportation links (railroads, highways, airports, waterways). Indicate total acreage owned by the applicant and that part occupied by the fuel fabrication plant facilities. Indicate other existing and proposed uses of applicant's property and the acreage devoted to these uses. Describe any plans for site modifications. Contour maps showing the plant location should also be supplied.

2.2 REGIONAL DEMOGRAPHY, LAND AND WATER USES

Provide a map which covers an area of five miles radius centered at the proposed plant location and indicates all inhabited locations. This five-mile map should have circles of 1, 2, 3, 4, and 5 mile radii, (centered at the plant location) and each circle should be divided into 22.5° segments, with each segment centered on one of the 16 cardinal compass points (N, NNE, NE, etc.). The permanent and transient populations within each of the sectors formed by the concentric circles and the radial lines should be estimated and tabulated for the last year in which affected populations were not influenced by the proposed activities and for the census years through the anticipated life of the plant.

Tables should be included giving population and visitor statistics of neighboring schools, plants, hospitals, sports facilities, residential areas, parks, etc., within five miles of the plant. Indicate the nature and extent of present land use (agriculture, livestock raising, dairies, residences, industries, recreation, transportation, etc.).

Describe the nature and tabulate the amounts of present water use (water supplies, irrigation, reservoirs, recreation, etc.) within the plant site and out to a distance of 5 miles from the plant.

Note on the maps the locations of other industrial facilities including other existing plants utilizing nuclear materials. Identify effluents from these industrial facilities which could interact with the proposed plant or with its effluents.

(2) All maps included in the environmental report should indicate distance scale and compass north (at least). Coordinates should be UTM.

The degree of detail to be provided in this section will generally depend upon the potential for interaction of the plant and its surroundings.

2.3 REGIONAL HISTORIC, SCENIC, CULTURAL, AND NATURAL LANDMARKS

Areas valued for either their historic, scenic, cultural, or natural significance may be affected. The Environmental Report should include a brief discussion of the historic, scenic, cultural, and natural significance, if any, of the site and nearby areas with specific attention to the sites and areas listed in the National Register of Historic Places(3) and the National Registry of Natural Landmarks(4). Also the applicant should discuss its consultation with the appropriate State Liaison Officer for Historic Preservation(5) concerning properties under consideration for nomination to the National Register of Historic Places. The Environmental Report should contain evidence of contact with the Historic Preservation Officer for the State involved and a copy of his comments concerning the effect of the undertaking on historic, archaeological, and cultural resources. In addition, indicate whether or not the site has any archaeological significance and explain how conclusions were reached. If such significance or value is present, describe plans to ensure its preservation.

State whether new roads, pipelines, and utilities to be constructed in support of the proposed project will pass through or near any area or location of know historic, scenic cultural, natural, or archaeological significance.

2.4 GEOLOGY

A description of the major geological aspects of the site and its immediate environs should be provided. The level of detail presented should be appropriate to the proposed plant design. For example, if holding ponds are to be created, a detailed description of soil and bedrock types, etc. should be provided. Except for those specific features that are relevant to the environmental impact assessment, the discussion may be limited to noting the broad features and general characteristics of the site and environs (topography, stratigraphy, soil and rock types).

The location of ground water with respect to all potential sources of contamination such as liquid impoundments, sanitary landfills, and sewage disposal facilities is important for the assessment of possible groundwater contamination. The discussion should include a statement concerning the hydraulic properties (permeability and porosity) of the materials between the groundwater and the above facilities. Contours of the groundwater should be provided.

(3) The 1973 cumulative revision of the National Register of Historical Places was published in the Federal Register of February 28, 1973, 38 FR 5386, additions are published in the Federal Register on the first Tuesday of each month.

(4) The National Registry of Natural Landmarks appeared in the Federal Register of September 5, 1973.

(5) State Liaison Officers are listed in the Federal Register of March 15, 1972 and supplemented in December 1972.

2.5 HYDROLOGY

The effects of plant construction and operation on ground and surface water sources are of prime importance. Accordingly, describe the physical, chemical, biological and hydrological characteristics (and their seasonal variations) of surface and ground waters of the site and the immediate environs. Where a stream or other water body is to be used by the plant, the observed 7-day 10-year low flow value should be provided. Only those waters that may affect plant effluents or that may be affected by the construction or operation of the proposed plant, should be discussed. Where pollution exists, the applicant should estimate the extent and nature of the pollutants (see Section 6.1.1). Knowledge of the pollutant level will assist the applicant and the Commission in evaluating the effects of plant construction and operation under existing conditions of water quality and under conditions expected to exist as a result of the enforcement of national water pollution controls. Include a description of significant tributaries above and below the site and the pattern and gradients of drainage in the area. Note that information relating to water characteristics should include measurements, to the extent possible, made on or in close proximity to the site.

In view of their importance in environmental impact assessment, the water quality standards or requirements applicable to any of the waters that may be affected by plant construction and operation should be cited. Relevant texts of the Federal, State and local laws, regulations or ordinances should be included as an appendix to the Report.

2.6 METEOROLOGY

Present the following data on site meteorology:

(1) monthly wind characteristics including speeds, directions, frequencies and joint wind speed, stability category, wind direction frequencies;

(2) data on precipitation;

(3) frequency of occurence and effects of storms.

(In the first item, the joint wind speed-stability-direction frequencies should be presented in tabular form, giving the frequencies as fractions. The data should be presented for each of the 16 cardinal compass directions, and the stability categories should be established to conform as closely as possible with those of Pasquill.)

If sufficient site data is not available at the time of filing the Environmental Report, the applicant may use data from 5-year U.S. Weather Bureau Summaries[6] or other authoritative sources provided that applicability of this data to the site is established.

(6) National Climatic Center, Federal Building, Asheville, NC.

2.7 ECOLOGY

In this section the applicant should provide a general characterization of the flora and fauna of the area, and should identify and discuss those species in the vicinity of the site which could be affected by the proposed plant (see Section 6.1.4). The discussion should include species that migrate through the area or use it for breeding grounds.

The applicant should pay particular attention to the organisms which are rare or endangered species (as officially designated by the U. S. Fish & Wildlife Service) or which may be involved in the radiological exposure of man via the food chain route.

Factors which should be discussed are as follows:

(a) area usage (habitat, breeding, etc.)
(b) distribution
(c) life histories
(d) population fluctuations (including those caused by infestations, epidemics, catastrophes)
(e) food chains and interspecies relationships
(f) preexisting environmental stresses
(g) status of ecological succession

The sources of information should be identified. As part of this identification, list any published material dealing with the ecology of the region. Locate and describe any ecological or biological studies of the site or its environs now in progress.

2.8 BACKGROUND CHARACTERISTICS

Regional radiological data should be reported, including both background radiation levels and results of measurements of any concentrations of radioactive materials occurring in important biota, in soil and rocks, and in surface and local ground waters. This data, whether determined during the applicant's preoperational surveillance program (see Section 6.1) or obtained from other sources, should be referenced.

Similarly background concentrations of chemical constituents in the immediate plant environment which may interact with the plant effluents should be reported and the sources of the data referenced. For example, the background concentration of sulfur oxides should be given to allow a determination of the production and deposition of sulfuric acid and ammonium sulfate resulting from releases of nitrogen oxides and ammonia.

2.9 OTHER ENVIRONMENTAL FEATURES

For certain sites, some relevant information on the plant environs may not clearly fall within the scope of the preceding topics. Additional information may be required with respect to some environmental features in order to reflect the value of the site and site environs to important segments of the population. Such information should be included here.

3.0 THE PLANT

The fuel fabrication plant is to be described in this section. Since the environmental effects are the primary concern of the report, the plant effluents and related systems that interact with the environment should be described in particular detail.

3.1 EXTERNAL APPEARANCE

Provide a general description of the site and the plant facilities. The description should be accompanied by a site plan showing the plant perimeter and the size and location of all plant buildings, chemical and waste storage areas, settling ponds, substations and cooling tower. A plant profile should be shown to scale by line drawings or other illustrative techniques.

The architectural design and efforts to make the structures and grounds aesthetically pleasing should be noted.

3.2 PLANT OPERATION

Describe the chemical, mechanical and scrap processing operations comprising fuel manufacturing in sufficient depth both qualitatively and quantitatively to permit the identification of all sources of radioactive and non-radioactive chemical wastes and effluents as well as the locations and the elevations of their release points. The description should include flow diagrams and tables, if necessary, which indicate major process equipment, chemical reactants, intermediate products, final products; and, the origin, form, concentration and daily quantity of all plant effluents. Flow rates should be given for the design capacity of the plant. The quantities of individual radionuclides that are contained in gaseous, liquid and solid wastes and effluents should be specified taking into consideration the variations in isotopic ratios due to handling reprocessed fuel at the plant. The quantities of non-process effluents such as laundry and sanitary wastes should be estimated and pollutant concentrations, oxygen demand, and other relevant data should be given. This section should also provide data, using diagrams if possible, on the intake quantity, consumption, and discharge of water; and, the usage of electrical power, natural gas, etc., for operation of the plant at its design capacity.

3.3 WASTE CONFINEMENT AND EFFLUENT CONTROL

Describe the equipment and design features which have been incorporated into the plant to reduce the release of gaseous, liquid and solid effluents to limits specified in applicable regulations or to conserve depletable resources. This section should include a comprehensive description of the building and process effluent systems, for example, the ventilation systems; liquid recycle systems; liquid collection, treatment and disposal systems; and solid collection, recovery and disposal systems. The quantities and concentrations of all materials both prior to treatment, and upon release to the environment, should be tabulated. If discharges to the environment are intermittent, the concentration peaks as well as annual averages should be estimated. Supporting information should be provided regarding the effectiveness of each system to control the effluents at the stated levels.

4.0 ENVIRONMENTAL EFFECTS OF SITE PREPARATION

PLANT CONSTRUCTION AND OPERATION

The preparation of the site and the construction and operation of a fuel fabrication plant and related facilities will inevitably affect the environment; some of the effects will be adverse and some will be beneficial. Effects are considered adverse if environmental change or stress lessens a desirable characteristic of an important biotic population or natural resource (e.g., safety, health, abundance, productivity, aesthetics); or, if the change or stress tends to lower the quality of renewable resources or to impair the recycling of depletable resources; or, if the change or stress reduces the diversity and variety of individual choice, the standard of living or the extent of sharing life's amenities. Effects are considered beneficial if they enhance the characteristics just enumerated.

In the applicant's discussion of adverse environmental effects, it should be made clear which of these are considered unavoidable and subject to later amelioration and which are regarded as unavoidable and irreversible. Those effects which represent an irretrievable commitment of resources should receive detailed consideration in Sections 4.1 and 4.2. (In the context of this discussion, "irretrievable commitment of resources" alludes to natural sources and means a permanent impairment of these, e.g., loss of wildlife habitat; destruction of nesting, breeding or nursing areas; interference with migratory routes; loss of valuable or aesthetically treasured natural areas.)

Measures planned to reduce any undesirable effects of the total project on the environment should be described in detail.

The impacts of construction and operation of the proposed plant should be, to the fullest extent practicable, quantified and systematically presented. In the discussion of each impact, the applicant should make clear whether the supporting evidence is based on theoretical, laboratory, on-site, or field studies undertaken on this or previous occasions. The source of each impact and the population or resource affected should be made clear. The impacts on water, air, land, and biota should be distinguished and any changes which may be brought about in the ecological system due to these impacts should be defined.

The applicant should discuss the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity. As used in this Guide, "short-term" may be taken to refer to the operating life of the proposed facility and "long-term" to refer to time periods extending beyond this life. The applicant should assess the cumulative and long-term effects of the action from the point of view that each generation is trustee of the environment for each succeeding generation.

4.1 EFFECTS OF SITE PREPARATION AND PLANT CONSTRUCTION

The applicant should organize the discussion in terms of the effects of site preparation and plant construction on (a) land use and (b) water use. The applicant should consider consequences to both human and wildlife populations and indicate which are unavoidable, reversible, etc., according to the categorization set forth earlier in this section.

4.1.1 Land Use

In the land use discussion, describe how construction activities may disturb the existing terrain and wildlife habitats. Consider the effects of such activities as creating building material supply areas, building temporary or permanent roads, and disposing of trash. Indicate proximity of human populations and identify undesirable impacts on their environment arising from noise, from inconvenience due to movement of men, material, machines, including activities associated with any provision of housing, transportation, and educational facilities for workers and their families. A schedule of the estimated work force to be involved in site preparation and plant construction should be presented. Describe any expected changes in accessibility of historical and archaeological sites in the region. Discuss measures designed to mitigate or reverse undesirable effects, such as erosion control, dust stabilization, landscape restoration, control of truck traffic, and restoration of affected animal habitat.

The discussion should also include any effects of site preparation and plant construction activities whose consequences may be beneficial to the region.

4.1.2 Water Use

The water use discussion should describe the impact of site preparation and construction activities on area water sources. The applicant should describe the effects of these activities on fish and wildlife resources, water quality, water supply, aesthetics, and so on as applicable. Measures to mitigate undesirable effects, such as pollution control and other procedures for habitat improvement, should be described.

4.2 EFFECTS OF PLANT OPERATION

The applicant should organize this section in terms of the radiological, chemical, biological and any other impacts that plant operation may have on human and wildlife populations and indicate which of these impacts are unavoidable, reversible, etc. The parameters of plant operation which may be capable of producing an undesirable impact should be tabulated along with the limits that are not to be exceeded under normal operating conditions. The actions planned in the event the limits are exceeded should be noted.

4.2.1 Effects of Radiation

In this section the applicant should consider the radiological effects of plant operation and transportation(7) of radioactive materials on man. Estimates of the radiological impact on man via various exposure pathways should be provided. The various pathways should be identified and described in textual and flowchart format. The critical nuclide and critical exposure pathway should be identified.

(7) See "Environmental Survey of Transportation of Radioactive Materials To And From Nuclear Power Plant." U. S. Atomic Energy Commission, Dec. 1972.

4.2.1.1 Liquid Effluents

Estimate the expected annual average concentrations of radioactive nuclides (listed in Section 3.3) in receiving water at locations where water is consumed or otherwise used by human beings or where it is inhabited by biota of significance to human food chains. Specify the dilution factors used in preparing the estimates and the locations where the dilution factors are applicable.

Determine the expected radionuclide concentrations in aquatic and terrestrial organisms significant to human food chains. Reference bioaccumulation factors (8) used.

Using the above information and any other necessary supporting data, estimate the annual whole body and significant organ dose commitments (mrem) to individuals in the population (discussed in Section 2.2) from all receiving-water-related exposure pathways, i.e., all sources of internal and external exposure. Provide details and models of the calculation as an appendix.

4.2.1.2 Airborne Effluents

From release rates of airborne radioactivity and meteorological data (see Sections 2.6 and 3.2), estimate annual whole body and significant organ dose commitments (mrem) to: individuals exposed at the point of maximum ground level concentrations off site; individuals exposed at the site boundary in the direction of the prevailing wind; individuals exposed at the site boundary nearest to the sources of emission; and individuals exposed at the nearest existing residence in the direction of the prevailing wind. Assume annual average meteorological conditions for the sectors of concern. Identify locations and elevations of points of release used in calculations.

Estimate deposition of radioactive materials on food crops and pasture grass. Estimate annual whole body and significant organ dose commitments to an individual (mrem) received via such potential pathways.

Provide an appendix describing the models used in all of the above calculations.

4.2.1.3 Summary of Radiation Dose Commitments

The applicant should present a table that summarizes the estimated annual radiation dose commitments to individuals and to the regional population from fuel fabrication plant-related sources using values calculated in previous sections. The tabulation should include the annual whole body dose commitments to the population (man-rem) from all receiving water and airborne-related pathways. The regional population should be that population which is located within the area in which the radionuclide continues to be available for intake, taking into consideration depositions, depletion by ion exchange, etc.

(8) The bioaccumulation factor is the equilibrium ratio: (concentration in organism) / (concentration in water).

4.2.2 Effects of Chemical Discharges

In this section, the quantities and specific concentrations of non-radioactive wastes in gaseous and liquid effluents at the points of discharge and in the plant environs should be compared with Federal and State air and water quality standards, Occupational Safety and Health Administration standards or other published standards and should be compared with the ambient quantities and concentrations which prevail prior to plant operation. The projected effects of the effluents in terms of perception, adverse response or chronic exposure of the biota (including any long-term buildup in soils, sediments and biota) should be identified and discussed. The projected effects of the effluents on man-made structures should be identified and discussed, taking into consideration such factors as increased electrochemical corrosion, direct chemical attack or an indirect chemical attack. Dilution and mixing of discharges into the receiving environs should be discussed in detail and estimates of concentrations at various distances from the point of discharge should be provided. The effects on terrestrial and aquatic environments from chemical wastes that could contaminate groundwater should be included.

4.2.3 Effects of Sanitary and Other Waste Discharges

Describe and discuss the environmental impact associated with sanitary and other waste systems.

4.2.4 Other Effects

The applicant should discuss any effects of plant operation that do not clearly fall under any single topic of Sections 4.2.1 to 4.2.3. These may include changes in land and water use at the plant site, interaction of the plant with other neighboring plants, disposal of solid and liquid wastes other than those discussed in Sections 4.2.1 through 4.2.3 and other effects which tend to diminish the quality of the environment such as noise, visual impact increased traffic, etc.

4.3 RESOURCES COMMITTED

Discuss any irreversible and irretrievable commitments of resources due to site preparation and plant construction and operation. This discussion should include both direct commitments and irreversible environmental losses, such as destruction of wildlife habitat.

In this discussion, the applicant should consider lost resources from the viewpoints of both relative impacts and long-term net effects. As an example of relative impact assessment, the loss of a few animals of a given species could represent quite different degrees of significance, depending on the total population in the immediate region. Such a loss in the case of small local population, would be less serious if the same species were abundant in neighboring regions. Similarly, the loss of a given area of highly desirable land should be evaluated in terms of the total amount of such land in the environs. These relative assessments should accordingly include statements expressed in percentage terms in which the amount of expected resource loss is related to the total resource in the immediate region and in which the total in the immediate region is related to that in surrounding regions. The latter should be specified in terms of areas and distances from the site.

4.4 DECOMMISSIONING AND DISMANTLING

The applicant should describe its plans and policies regarding the actions to be taken at the end of the plant's useful life. Information should be provided on the long-term uses of the land; the amount of land irretrievably committed, if any; the expected environmental consequences of decommissioning; and an estimate of the monetary cost involved discounted to today's cost.

The applicant should also discuss the consideration given in the design of the plant and its auxiliary systems relative to eventual decommissioning, the amount of equipment and buildings to be removed, and the expected condition of the site after decommissioning.

Since the environmental impact of terminating plant operation is, in part, determined by plant design, applicants should give attention to the subject early in the project planning.

5.0 ENVIRONMENTAL EFFECTS OF ACCIDENTS

The applicant should discuss the environmental effects of possible accidents which may occur at the fuel fabrication plant or during the transportation of materials to or from the plant whether or not these accidents produce an impact on the site and/or its environs.

5.1 FUEL FABRICATION PLANT ACCIDENTS

The applicant should analyze and present in tabular form a spectrum of accidents involving not only radiochemical materials, but also chemical materials since the latter may prove to have consequences more severe than those which would be encountered with the radiochemicals. These accidents should range in severity from trivial to serious.

To the extent possible these accidents, which may be caused by human error, equipment failure, utility failure, or natural phenomena such as floods, earthquakes, tornadoes, etc., should be characterized according to their probability of occurrence.

The serious radiochemical accidents which should be considered are the design basis accidents cited by ANSI Subcommittee N46-4 in its "Criteria for Siting, Design, Construction and Operation of Plutonium Fuel Fabrication Facilities". These design basis accidents (DBA) are defined as follows:

The DBA-Fire is defined as the fire which results from the burning of all flammable materials within an area enclosed by a two-hour fire resistant barrier (ASTM E119-71). The rates of combustion for the flammable materials shall be as specified by the Fire Protection Handbook, 13th Edition, National Fire Protection Association.

The DBA-Explosion is defined as the rupture of a primary containment at an internal pressure of 105 psi. It should be noted that this accident would result not only in a pressure wave, but could generate missiles within the process area.

The DBA-Criticality is defined as an accidental excursion of a heterogeneous liquid-powder mixture with a neutron spike yield of 10^{18} fissions, releasing about 30,000 BTU in less than one second, or an accidental pulsating excursion with a total yield of 10^{20} fissions. It should be noted that such an energy release could disperse unencapsulated Pu from a typical glove box and could under optimum conditions, pressurize a 35' x 20' x 20' room to about 1.5 psi.

The DBA-Power Failure is defined as the loss of total electric power for not more than 60 sec., and the loss of normal electric power for more than 48 hours. Please note that total electric power means all sources of electric energy delivered, as well as auxiliary and standby. Normal electric power means the services usually supplied by a utility company.

The DBA-Water Failure is defined as the credible mishap which may occur to an external source of water supply and which, results in a water release in such a manner that it causes the loss of a system, sub-system, structure or component important to the confinement integrity of the plant. It should be noted that this concept includes the loss of feedwater to any equipment which, without adequate water supply, would prevent the function of the confinement system.

The serious accidents which may involve chemicals such as, UF_6, H_2SO_4, HF, NH_3, H_2, Zr, etc., and which should be considered are the same as those stated above except for criticality. Particular attention should be paid to potential accidents in outside chemical storage areas.

If the fuel fabrication plant utilizes a waste settling pond, the consequences of its rupture should be considered in terms of both chemical and radiochemical toxicity.

The source terms applicable to the analyses of the accidents should be derived as follows:

(a) Tabulate all chemical and radiochemicals used in the operation;

(b) List the physical form of each material, i.e., liquid, gas, or solid;

(c) List the largest in-process and in-storage inventory for each form of each material, and;

(d) Specify those properties of each material which are important with regard to its dispersibility and its effects, e.g., particle size distribution, solubility, concentration, isotopic ratio, etc.

After compiling the above tabulation subject each inventory to assumed credible accidents and, taking credit for surviving engineered safety features, use as the source terms from which the release fractions are determined the inventories which would yield the most damaging effects.

The applicant should state the radiological and chemical standards which have been utilized to judge the consequences of the spectrum of accidents analyzed.

The applicant should in the case of airborne releases use an aeolian dilution factor (X/Q) of 10^{-3} sec/m^3 to calculate the off-site concentrations that would result from in-plant accidents. A larger dilution factor may be used if justified by site characteristics or plant design. The value of 10^{-3} has been selected because in-plant accidents at this type of plant would in general result in puff releases at ground level about 100 meters from the nearest plant boundary.

5.2 TRANSPORATION ACCIDENTS

The potential environmental effects from transportation accidents involving chemical and radiochemical [7] materials should be evaluated. Even though the probability of such an accident may be low and its consequences small, the applicant should identify the environmental effects that might result. Adequate documentation should be presented to provide assurance that all safety requirements will be met prior to transporting chemical and radiochemical materials.

6.0 EFFLUENT AND ENVIRONMENTAL MEASUREMENTS AND MONITORING PROGRAMS

The purposes of this section are to describe the means by which the applicant collected the baseline data presented in other sections and to describe the applicant's plans and programs for monitoring the environmental impacts of site preparation, plant construction and plant operation.

Section 6.1 is addressed to the measurement of preexisting characteristics of the site and the surrounding region. This program will establish a reference framework for assessing subsequent environmental effects attributable to the activity. The applicant's attention is directed to two considerations pertinent to this section. First, the term "preexisting" refers to the characteristics of the site prior to plant construction and operation. A given characteristic or parameter may or may not require assessment prior to site disturbance and plant construction, depending on whether that particular characteristic may be altered at these stages. Second, in most instances this guide indicates the specific environmental effects to be evaluated; consequently, the parameters to be measured will be apparent. In some cases, it may be necessary for the applicant to establish a monitoring program based on his own identification of potential or possible effects and to provide his underlying rationale for such. Accordingly, the applicant should carefully review the plans for measurement of preexisting conditions to ensure that these plans include all factors that must be subsequently monitored, as discussed in Section 6.2.

The sampling program including sample characteristics, frequency, methodology, calibration and checks with standards, and instrumentation for collection and analysis should be discussed as applicable. Information should be provided on accuracy, sensitivity, and especially for highly automated systems, reliability. Where standard analytical or other techniques are used, they need only be identified and referenced.

6.1 APPLICANT'S PRE-OPERATIONAL ENVIRONMENTAL PROGRAMS

The programs for collection of initial or baseline environmental data prior to operation should be described in sufficient detail to make it clear that the applicant has established a thorough and comprehensive approach to environmental assessment. The description of these programs should be confined principally to technical description of technique, instrumentation, scheduling and procedures.

Where information from the literature has been used by the applicant, it should be concisely summarized and documented by reference to original data sources. Where the availability of original sources that support important conclusions is limited, the applicant should provide either extensive quotations or references to accessible secondary sources [9]. In all cases, information derived from published results should be clearly distinguished from information derived from the applicant's field measurements.

Models may be used to predict the dispersion of contaminants into surface or ground water or into the atmosphere. Such models should be described and supporting evidence of their reliability and validity presented.

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(9) Any reports of work (e.g., ecological surveys) supported by the applicant that are significant value in assessing the environmental impact of the facility should be included as appendices or supplements to the Environmental Report, if these reports are not otherwise generally available.

6.1.1 Water

When surface or ground water may be affected by the proposed activities, the applicant should describe the programs by which the background condition of the water was determined. In cases where a natural water body has already been subjected to environmental stress from pollutant sources, the nature of the stress and its consequences should be evaluated and the quality of the affected water body determined.

6.1.1.1 Physical and Chemical Parameters

The properties and configuration of surface and ground water will have been defined in sufficient detail (in Section 2.5) to permit a reasonable projection of effects of the proposed activities on these water bodies from an existing baseline. Methods for obtaining baseline information (oxygen demand, fluoride concentration, etc.)should be described.

6.1.1.2 Radiological Parameters

Baseline levels of natural and man-made radioactivity in surface and ground water should be identified to assess future contribution from plant operation. Analytical methods used should be described in detail particularly with respect to accuracy and sensitivity.

6.1.2 Air

The applicant should describe the program for obtaining information on local air quality and local meteorology. The description should present the methodology for gathering baseline data and show the basis for predicting the dispersion of gaseous effluents.

6.1.3 Land

Data collection programs concerning the terrestrial environment of the proposed facility should be described and justified with regard to both scope and methodology.

6.1.3.1 Geology and Soils

Those geological and soil studies designed to determine the environmental impact of the construction and operation of the plant should be described. The description should include identification of the sampling pattern and justification for its selection, the sampling method, holding periods and preanalysis treatment, and analytic techniques.

6.1.3.2 Land Use and Demographic Surveys

The applicant should describe its program for identifying the actual land use in the site environs and for acquiring demographic data for the region as reported in Section 2.2. Sources of information should be identified and their accuracy assessed. Methods used to forecase from data should be described.

6.1.3.3 Radiological Parameters

Natural and man-made radioactivity in soil, rocks and sediments should be identified to assess future contribution from plant operation. For mixed oxide fuel fabrication plants the vertical distribution of plutonium should be determined by core sampling. Analytical methods used should be described particularly with respect to accuracy and sensitivity.

6.1.4 Biota

In this section the applicant should discuss the program used to determine baseline ecological information on biota (see Section 2.7). In addition, the programs for determining concentrations of chemical pollutants and radioactivity in biota should be noted.

6.2 APPLICANT'S PROPOSED OPERATIONAL MONITORING PROGRAMS

The applicant should present the proposed operational monitoring program for the plant. Review of this description will be facilitated if the applicant includes maps of observation sites and tabular presentation of summary descriptors of such factors as frequency, types of samples, method of collection, analytic method, preanalysis treatment, instrumentation, and minimum sensitivities.

6.2.1 Radiological Monitoring

The applicant should describe the proposed operational monitoring systems and programs. The description should include routine effluent monitoring and environmental monitoring.

6.2.1.1 Effluent Monitoring Systems

Describe the systems to be used for monitoring radioactive liquid and gaseous effluents. Discuss the sensitivity limits for detecting radioactivity corresponding to routinely expected release rates. Identify the effluent streams, if any, that will not be continuously monitored and provide the rationale for the absence of such monitoring.

6.2.1.2 Environmental Monitoring

Describe the operational surveillance program for radioactive materials in detail, with specific attention given to the types of samples to be collected, sampling locations and frequency, the analyses to be performed on each sample, and the criteria for investigating increases of concentration of material detected in the environs. The analytical sensitivity (detection threshold) for each analysis and the schedule for reporting data collected from the surveillance program should be discussed. Rationale for the choice of sampling locations, frequency, and types of samples to be collected should be presented.

6.2.2 Chemical Monitoring

The applicant's operational monitoring program for chemical effects should be described for both the routine effluent monitoring systems and the environmental monitoring program.

6.2.2.1 Effluent Monitoring Systems

Describe the systems for monitoring liquid, gaseous and solid chemical effluents. Identify monitoring procedures prescribed by local, State or Federal agencies as conditions of operation. Discuss the sensitivity and reliability of the monitoring systems.

6.2.2.2 Environmental Monitoring

Describe the operational surveillance program for chemicals with specific attention given to the types of samples to be collected, sampling locations and frequency, the analyses to be performed on each sample, and the criteria for investigating increases of concentration of material detected in the environs. The analytical sensitivity (detection threshold) for each analysis and the schedule for reporting data collected from the surveillance program should be discussed. Rationale for the choice of sampling locations, frequency, and types of samples to be collected should be presented.

6.2.3 Meteorological Monitoring

The applicant's program for monitoring meteorological phenomena during plant operation should be described. The information should include the locations of observation stations, instrumentation, and frequency and duration of measurements on which the applicant intends to rely. The basis for each of the applicant's choices should be stated.

6.2.4 Biota Monitoring

In the preoperational surveillance program the applicant will have established methodology for determining the ecological characteristics of the region. In principle, this methodology should be appropriate for the subsequent monitoring program to be maintained during plant operation. However, the applicant may choose to modify some aspects of his methodology in view of the requirement for protracted monitoring. Such aspects may include frequency, observation sites, and so forth. These should be described and justified.

6.3 RELATED ENVIRONMENTAL MEASUREMENT AND MONITORING PROGRAMS

When the applicant's site lies within a region for which environmental measurement and/or monitoring programs are carried out by public or other agencies not directly supported by the applicant, these programs should be identified and discussed. Relevance of such independent findings to the proposed facility should be described, and plans for exchange of information should be presented. Agencies responsible for the programs should be identified, and to the extent possible, the procedures and methodologies employed should be briefly described.

7.0 PLANT SITING AND DESIGN ALTERNATIVES

During the selection of a site and a specific plant design, an applicant utilizes many criteria to choose among the various available alternatives. Some of these criteria are the result of management decisions while others are established to comply with local, state and federal regulatory requirements. In this section the applicant should tabulate the criteria used to evaluate alternative sites and designs and, in a side by side comparison, show the results of the evaluation. Table I presents several factors which should be considered when comparing alternative sites. Table II lists several environmental impacts which could lead to exceeding regulatory criteria and which should be considered when comparing alternative plant designs.

Many of the criteria established by management for a nuclear fuel fabrication plant are the same as those for any manufacturing plant in the chemical industry. Often these criteria may be met by several alternatives. If this occurs the applicant should discuss in detail the reasons for selecting the particular alternative.

Similarly many regulatory criteria are in terms of quantitative standards and several alternatives will comply with these standards. If this occurs the most the applicant should discuss in detail the reasons, including cost effectiveness, for choosing the particular design alternative.

Some criteria particularly those dealing with environmental impacts are not currently quantified because there is insufficient data on the effects of these impacts. In such cases the applicant should show the incremental increase in cost for an incremental decrease in impact and should discuss why the alternative selected provides adequate fulfillment of the criteria.

Plant design alternatives which should be considered should include designs of the systems described in Section 3 namely, the chemical, mechanical and scrap processing operations; the building and process ventilation systems; the waste handling systems; and the plant utility systems.

TABLE I FACTORS TO BE CONSIDERED IN COMPARING ALTERNATIVE PLANT SITES

1. The physical characteristics of the area particularly if the plant is being designed to process plutonium fuels. The characteristics to be considered are demography, geology, hydrology, meteorology and seismology of the site and surrounding area.

2. Location of the major product market.

3. Location of the raw materials and components sources of supply.

4. Availability of air, rail, road and water for transport of raw materials and supplies, finished products and solid wastes.

5. Commitment of natural resources for site preparation and plant construction including but not limited to the destruction or diminution of wildlife habitats, flora, woodlands and marshlands.

6. Commitment of capital for site preparation and plant construction.

7. The cost of operating including consideration of prevailing regional wage rates and other recurring or non-recurring costs.

8. Availability of municipal services and facilities or conversely the cost of providing services such as health, educational, housing, water treatment, sewage treatment etc.

9. Requirements for relocating homes and families.

10. Existing land-use and economic status of the community i.e. rural-industrial-economically depressed, urban-industrial-stable, rural-agricultural-unstable, rural-recreational, etc.

11. Aesthetic impact.

12. Change in accessibility to historical and/or archaeological sites.

TABLE II ENVIRONMENTAL FACTORS TO BE USED IN COMPARING ALTERNATIVE PLANT SYSTEMS

Primary Impact	Population or Resource Affected	Effect and Method of Computation	Unit of Measure[1]
1.1 Discharge of chemicals to surface and/or ground water.	Water supply of other users.	Water quality may be impaired. Calculate the volume of water required to dilute chemical releases to values called for by applicable standards or to values estimated as lethal to important species in receiving waters. Express the volumes required for adequate dilution as a percentage of the annual minimum value of the daily net flow and indicate highest such percentage. Include the total solids if this is a limiting factor.	Acre-feet,%
	Fish[2] and wildlife.	Water bodies and wetlands may be made uninhabitable for fish and wildlife due to excessive concentrations of chemical, a reduction in dissolved oxygen concentration or a reduction in food resources. Calculate the area impaired due to chemical discharges and estimate loss of fish and wildlife.	Acres, pounds/yr. (by species).
	Plants	Ground water contamination may affect trees and deep-rooted vegetation. Estimate area affected and report separately by land use. Specify such uses as recreational, agricultural and residential.	Acres.
	People	Ground water contamination may affect nearby drinking water supplies. Compute annual loss of potable water.	Gallons/yr.
		Recreational water uses (boating, fishing, swimming) may be inhibited. Using factors such as stream cross section and annual minimum flow characteristics determine on the basis of the daily chemical discharge the surface area or feet of shoreline required for dilution of chemicals to accepted water quality standards. Based on annual number of visitors to the affected shoreline estimate the number of lost user-days per year. Any possible eutrophication effects should be estimated and include as a degradation of quality.	Shoreline distance, loss annual user-days.

[1] Applicant may substitute an alternative unit of measure, where convenient. Such a measure should be related quantitatively to the unit of measure shown in this table.
[2] "Fish" as used in this table includes shellfish and other aquatic invertebrates harvested by man.

TABLE II (CONTINUED)*

Primary Impact	Population or Resource Affected	Effect and Method of Computation	Unit of Measure[1]
1.2 Discharge of radioactive materials to surface and/or ground waters.	Water supply of other users.	Water quality may be impaired. Calculate the concentration of each isotope of uranium, thorium, plutonium and transuranics at the point of discharge and at approximately 1000-foot intervals for a distance of 1-mile from the point of discharge. On a percentage basis compare the calculated concentrations with the values given for each of the radioisotopes in 10 CFR 20. Appendix B, Table II.	%
	Plants, fish, wildlife and animals.	Radionuclides discharged to surface waters or which enter ground water supplies may reconcentrate in plants, fish, wildlife and animals. Estimate the uptake in different species and transfer between species. Sum dose contributions for radionuclides expected to be released.	Rad/yr.
	People	Radionuclides ingested with food and water will add to natural background radiation. Estimate biological accumulation in foods and intake by individuals and population groups. Sum dose contributions for radionuclides ingested.	Rem/yr. for individuals and Man-rem/yr. for population.
1.3 Water consumption.	Agriculture	Water may be withdrawn from agricultural usage and use of remaining water may be degraded. Calculate the volume of irrigation water withdrawn and the volume of dilution water required to reduce the dissolved solids concentration in the remaining water to an agriculturally acceptable level.	Acre-feet/yr.
	Industry	Water may be withdrawn from industrial usage. Calculate annual volume consumed.	Gallons/yr.
	People	Drinking water supplies may be diminished. Estimate the volume lost and the cost of replacement water.	Gallons/yr.

* See footnotes at the beginning of table

TABLE II (CONTINUED)*

Primary Impact	Population or Resource Affected	Effect and Method of Computation	Unit of Measure
1.4 Site preparation and plant construction.	Water quality	Physical properties such as turbidity and color or chemical properties of natural waters may be impaired due to plant construction. Estimate the surface area of the affected water and calculate the volume of dilution water required to meet applicable water quality standards. (See 1.1).	Acres, and acre-feet.
2.1 Discharge of chemicals to ambient air.	Air quality, chemical.	Pollutant emissions may diminish the quality of the local ambient air. The actual concentration of each pollutant in ppm for maximum daily emission rate should be expressed as a percentage of the applicable emission standard. Report weight for expected annual emissions.	% and lbs. or tons.
	Air quality, odor.	Odor in gaseous discharge or from discharge to water body may be objectionable. A statement should be made as to whether odor originating in plant is perceptible at any point off-site.	Statement.
2.2 Discharge of radionuclides to ambient air.	Plants and animals.	Radionuclide discharge may add to natural background radioactivity of local plant and animal life. Estimate deposit of radionuclides on, and uptake in plants and animals. Sum dose expected to be released.	Rad per yr.
	People, ingestion.	Radionuclide discharge may add to the natural radioactivity in water bodies, soil, vegetation and animal life. For radionuclides expected to be released estimate deposit and accumulation in foods. Estimate intakes by individuals and populations and sum results for all expected radionuclides.	Rem per yr. for individuals (whole body and organ); man-rem per yr. for population.
3.1 Land use during plant construction and operation.	Land area.	Land will be preempted for construction and operation of the plant. State the type and amount of land preempted according to its use i.e. scenic, shoreline, wetland, forest, farm land, etc. and during both construction and operational phases.	Acres.
	Land erosion.	Cut and fill operations may increase erosion potential. Estimate the area and the amount of soil displaced and discuss detrimental and/or beneficial effects.	Acres, cubic yds., and statement.

* See footnotes at the beginning of table

TABLE II (CONTINUED)*

Primary Impact	Population or Resource Affected	Effect and Method of Computation	Unit of Measure[1]
3.2 Loss of amenities during plant construction and operation due to noise and traffic.	People	Noise and traffic may introduce undesirable qualities in the local environment. Estimate the number of residences, schools, hospitals and population in each which will be affected and the duration of the effect for both construction and operational phases. Use proposed HUD Criterion Guideline for Non Aircraft Noise to establish the degree of acceptability of noise.	Total population affected, years of duration.
3.3 Aesthetic appeal.	People	The landscape may be changed beneficially or detrimentally by the construction and operation of the facility. Qualified opinions including those of local and regional authorities should be rendered.	Statements.
3.4 Accessibility to historical or archeological sites.	People	Access to historical and/or archeological sites may be impeded or improved. Estimate the change in the annual number of visitors to historical sites and obtain qualified opinions from local, state and Federal agencies regarding the change in the archeological value of the site.	Visitors/yr. and Statements.
3.5 Change in area of wildlife habitat.	Wildlife	The effects of plant construction and operation may be detrimental or beneficial. Obtain qualified opinions from local and State wildlife authorities.	Statements.

*See footnotes at the beginning of table

8.0 BENEFIT-COST ANALYSIS

The first six sections of the environmental report have described the site, the plant, the environmental effects of normal operation and accident conditions, and the monitoring program for the proposed facility. The seventh section describes why the specific plant design on the particular site is in the applicant's judgement the most desirable combination of alternatives. This section should demonstrate through a benefit-cost analysis of the proposed fuel fabrication plant why in the applicants judgement the aggregate benefits outweigh the aggregate costs. Even though the Commission will independently prepare a benefit-cost analysis of the proposed plant in its Environmental Statment, the applicant should perform its own analysis in order to aid the Commission in its evaluation.

It should be noted by the applicant that the major objective of the preparation of the Environmental Report is demonstration that the aggregate benefits outweigh the aggregate costs for the proposed plant. Therefore, the tabulation and assessment of costs and benefits must be thorough and complete. The commission also recognizes that a simple numerical weighing of benefits against costs is not feasible here because the majority of these impacts cannot be monetized, and the selected criteria for assessment are not directly comparable. However, it is incumbent on the applicant to utilize all the material developed for this report and presented in Sections 1 through 7 to provide his best documented judgement of the aggregate plant impact.

In presenting the benefit-cost analysis for the proposed plant, the applicant should consider both the socio-economic and environmental effects of plant construction and operation. Table III lists many, but by no means all, of the economic and social impacts that should be assessed in terms of benefits and costs. The applicant should evaluate his particular situation, adding or subtracting items from the lists as is necessary for his use. The environmental factors to be considered have been discussed in Section 4, and a checklist prepared in Table IV.

The benefit and cost factors for the plant should be summarized in a tabulation. The tabular presentation should make clear what the applicant considers to be the important benefits and costs of the proposed plant and in subsequent narrative why, in the judgement of the applicant, the former outweigh the latter.

In developing its tabular comparison the applicant should utilize the methods and units indicated in the second column of Tables III and IV for assessing and comparing benefits and costs where these are expressed in non-monetary or qualitative terms. The tabulation should also indicate, for each benefit or cost where applicable, who is likely to be affected and for how long; the section and page number in the Report where it is discussed; and any special measures to be taken to alleviate an impact.

The applicant should carefully describe in narrative form, any aggregation of effects and discuss in detail the trade-offs that were made to justify the proposed plant. If any of the benefits or costs specified in Tables III and IV are not used in the applicant's analysis, the rationale for doing so should be explained.

TABLE III BENEFITS/(COSTS) OF SOCIO-ECONOMIC FACTORS ASSOCIATED WITH PLANT CONSTRUCTION AND OPERATION

1.0	Quantitative Factors	Method of Determining Benefits/(Costs) (1)
1.1	Value of fuel produced.	Dollars
1.2	Tax revenues to be received by local, state, and federal government.	"
1.3	New jobs (payroll) created at plant (T,P) (2)	"
1.4	Increased employment opportunities resulting from purchase of goods and services locally.	"
1.5	Increased local income resulting from purchase of goods and services locally.	"
1.6	Incremental change in regional product.	"
1.7	Capital costs of land acquisition and improvement.	"
1.8	Capital costs of plant construction.	"
1.9	Operating and maintenance costs.	"
1.10	Plant decommissioning costs.	"
1.11	Research and development costs associated with potential future improvements in the plant.	"
1.12	Increased costs to local government for the services required by the permanent increase in local workers and their families.	"
1.13	Other	

(1) When benefits/(costs) are expressed in dollars they should be discounted to present worth and annualized.

(2) T - temporary (during construction and start-up)
P - permanent (during operation)

(Continued)

TABLE IV BENEFITS/(COSTS) OF ENVIRONMENTAL FACTORS ASSOCIATED WITH PLANT CONSTRUCTION AND OPERATION

1.14	Access roads (T,P)	Provide map showing location of each
1.15	Noise and vibration from equipment or explosives. (T)	Discuss level (db), frequency and distance to nearest population (see 2.4.3)
1.16	Change in local traffic patterns and volume (T,P)	No. of vehicles affected; problems of congestion, safety, pollution
1.17	Control of construction truck traffic (T)	Discuss measures taken
1.18	Trash and spoil disposal (T)	Volume; type; location; problems of safety; pollution
1.19	Building supply or staging areas (T)	Location; acreage; type of materials
1.20	Change in water quality (T)	Type of impurity; concentration; change in usability of water to each species; extent (acre-ft)
1.21	Change in water supply (T)	Volumetric change, species affected; alternatives
1.22	Pollution control measures (T)	Discuss-state degree of control over each source
1.23	Inconvenience created by movement of men, materials, and machines (T)	Discuss affect on individuals and community (include secondary affects)
1.24	Provision for housing for workers and families (T)	Discuss affect on individuals and community (include secondary affects)
1.25	Provision of transportation for workers and families (T)	Discuss affect on individuals and community (include secondary affects)
1.26	Provision of services (including health and educational facilities) for workers and families (T)	Discuss affect on individuals and community (include secondary affects)
1.27	Other	

(Continued)

TABLE IV BENEFITS/(COSTS) OF ENVIRONMENTAL FACTORS ASSOCIATED WITH PLANT CONSTRUCTION AND OPERATION

2.0	Effects Of Plant Operation	Method of Determining Benefits/(Costs)
2.1	Chemical Impacts	
2.1.1	Impairment of water quality	Concentrations above natural ambient at discharge and at specified distances compared with standards; dilution volume required to meet standards for each chemical
2.1.2	Effect on aquatic organisms by toxic levels of discharge or by reduced oxygen concentrations	Estimate effect (reduction in number, vigor, size, etc.) on individual species
2.1.3	Impairment of recreational water uses (boating, fishing, swimming).	Lost annual user days; area (acres); shoreline miles effected
2.1.4	Contamination of drinking water of nearby communities through contamination of ground water	Annual loss of potable water (gallons/yr)
2.1.5	Impairment of usability of wildlife habitats	Area (acres) of wet land, water surface or terrestrial habitats by species
2.1.6	Effects on plant life of contamination of ground water	Area (acres) adversely effected; distinguish acreage by use
2.1.7	Impairment of quality of local ambient air through emission of pollutants	Percentage of allowable daily emission standard released for each pollutant
2.1.8	Impairment of quality of life or aesthetics through perception of chemical release in air, or water	Discuss - include data on distance from site at which release is perceived
2.1.9	Long term effect of effluents on man-made structures	Discuss - provide accepted industry data and standards

(Continued)

TABLE IV BENEFITS/(COSTS) OF ENVIRONMENTAL FACTORS ASSOCIATED WITH PLANT CONSTRUCTION AND OPERATION

2.2	Radiological Impacts	
2.2.1	Radionuclide discharge to receiving water which adds to natural background radiation level in;	
	(a) Aquatic and terrestrial organisms significant to human food chains	Radionuclide concentrations (rad/year)
	(b) People through ingestion of food and water	Estimate accumulation in food; whole body and organ doses on intake (rem/year-individuals; man-rem/year-population)
2.2.2	Radionuclide discharge to ambient air which adds to natural background radiation level in;	
	(a) Plants and animals significant to human food chains	Radionuclide concentrations (rad/year)
	(b) People through ingestion of food crops and animals	Estimate deposition on and accumulation in foods; whole body and organ does on intake (rem/yr-individual; man rem/yr-population)
2.3	Biological Impacts; Sanitary and other waste discharges	Discuss - describe types, quantity of discharge; points of discharge and dilution. Compare with accepted standards; where discharge is chemical relate to impacts in 2.1 above. Estimate biological effect on local flora and fauna; discuss perception off site, etc.
2.4	Other Effects of Plant Operation	
2.4.1	Increased knowledge of environment, from plant operation and R&D	Discuss - include specific types of data to be accumulated and where info is applicable
2.4.2	Consumptive use of water at plant which diminishes supply available from the water body for people or agricultural use.	Potential water withdrawn (gallons/yr); estimate cost of replacement

(Continued)

TABLE IV BENEFITS/(COSTS) OF ENVIRONMENTAL FACTORS ASSOCIATED WITH PLANT CONSTRUCTION AND OPERATION

2.4.3	Noise from plant operation	Classify noise levels by category (use HUD guidelines) include no. of residences, school population; hospital beds
2.4.4	Interaction of the plant with other neighboring plants to effect the radiological, chemical biological, or other impacts.	Use appropriate standard for each impact
2.4.5	Combined effects of a number of impacts (where measure of separate impacts does not adequately measure total effects).	Use appropriate standard for each impact
2.4.6	Other	

9.0 ENVIRONMENTAL APPROVALS AND CONSULTATIONS

List all licenses, permits, and other approvals of construction and operation required by Federal, State, local, and regional authorities for the protection of the environment. List those Federal and State approvals that have already been received, and indicate the status of matters regarding approvals yet to be obtained. For general background, submit similar information regarding approvals, licenses, and contacts with local authorities.

Discuss the status of efforts to obtain a water quality certification under Section 401 of the Federal Water Pollution Control Act, as amended. If not already obtained, indicate when certification is expected. If certification is not required, explain.

In view of the effects of the plant on the economic development of the region in which it is located, the applicant should also note the State, local, and regional planning authorities contacted or consulted. OMB Circular A-95 identifies the State, metropolitan, and regional clearinghouses. (A listing of applicable clearinghouses may be obtained from the AEC.)

Cite meetings held with environmental and other citizen groups with reference given to specific instances of the applicant's compliance with citizen group recommendations.

10.0 REFERENCES

The applicant should provide a bibliography of all sources used in preparation of the Environmental Report. References cited should be keyed to the specific sections and page numbers to which they apply.

APPENDIX I

METHOD OF ASSESSING THE COST OF TRAFFIC CONGESTION (1)

1. The first step is to determine if the facility has enough of an impact to warrent a comprehensive cost estimate. A definite cutoff point must be set so that beyond this point the facility will be considered to have a severe impact on the existing roads (freeway and local).

The estimates should be divided into the Construction Phase (Temporary) and Operations Phase (Permanent). If the cost of constructing a new lane is accepted as the cost of congestion in the Construction Phase, the new capacity should be utilized for the Operations Phase estimates, being careful not to double count such costs.

The Construction Phase should be estimated over the whole period of construction. But the Operations Phase should be estimated for 15(2) years after the start of operations with readjustments of non-facility generated traffic made every five years.

All final costs should be properly discounted to present value.

A. Estimate average peak hour and off-peak hour number of vehicles on relevant roads.

B. State the practical or design capacity of the roads by number of vehicles per lane mile and the optimum speed.

C. Estimate the number of vehicle trips generated by the plant in peak and off-peak hours. These trips should then be loaded onto the roads specified in (A) allowing for some diversion to comparable alternate routes when capacity is saturated.

D. State whether the number of vehicles (A+C) exceed the practical capacity of the roads and brings average speed below design standards.

2. If practical capacity is exceeded on any route, the facility is considered to have a significant impact on the roads and the costs of traffic congestion must then be determined:

A. How many hours per year will practical capacity be exceeded.

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(1) There are other more complex costs associated with traffic congestion which are not included in the analysis described. It is not clear whether the value of such data is worth the cost of obtaining the estimates. These costs would include: the added hazards on the road; the value of time lost to truck freight; increased vehicle operating costs; and added insurance costs.

(2) Fifteen years has been given as the maximum timing of congestion costs due to the lack of dependable projection methods beyond that period. After this time, the possible multiplier effects of the plant by the introduction of ancillary firms, would complicate the analysis.

B. Estimate the total hours lost per vehicle per year due to the reduction in speed caused by the plant.

C. Determine the total number of vehicles affected. Estimate what percentage are trucks and what percentage are automobiles.

Truck Costs:

A. Estimate the regional average wage per hour of a truck driver.

B. Find the total cost of congestion to trucks:

$$V \times H \times W = TC_t$$

where TC_t = the total cost to trucks
V = the number of trucks
H = the hours lost per year
W = the average wage per hour

Automobile Costs:

A. Estimate the regional wage rate.

B. Determine average number of passengers per vehicle.

C. Find the total cost of congestion to automobiles by:

$$V \times P \times H \times W - TC_a$$

where TC_a = the total cost to cars
V = the number of automobiles
P = the ratio of passengers to cars
H = the hours per year
W = the regional wage rate

Total cost can now be estimated by:

$$TC_t + TC_a = TC^{(3)}$$

3. A second estimate [4] of traffic congestion cost should be made in order to put the wage per hour calculations into a broader perspective. This estimate would total the costs of road improvements which would restore the roads affected back to normal flows prior to the facility.

As the wage per hour costs come nearer or exceed the new construction costs, the latter should be used as a proper estimate of traffic congestion costs.

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(3) Though the wage theory has been criticized as an ineffective measure of travel time values, in this case, where most congestion will occur during rush hour, wages are valid. Most vehicle trips affected will be work trips, and wage becomes a proper estimate of the opportunity costs.

(4) The reason for the use of a second measurement is to provide a range of costs, the highest being the cost of bringing the facility back to normal traffic moment. If the hourly wage estimate exceeds this cost, it is too high to be accepted since for less money the problem of congestion could be removed.

APPENDIX II

METHOD OF ASSESSING THE POTENTIAL OVERTAXING OF MUNICIPAL SERVICES AND HOUSING

1. The main objective is to determine an explicit point at which municipal services are considered "overtaxed". It is important to the approving agency and to the local community to have a valid projection as to the demands that the facility will make of local services.

Two representative years should be extimated for each public service. The first estimate will be for the peak activity year of the Construction Phase when the labor force will be at its peak. Similarly, estimates must be made for a normal operating year of the facility.

For each phase the following data and impact must be determined:

A. Number of employees required.

B. How much of this labor force will be from the local labor pool, from outside the area (new residents), and commuters. Of the new residents, how many will be transient requiring only temporary housing. The local labor pool area should be considered the area within a 75(1) miles radius or 1 1/2 hours from the site, the maximum acceptable commuter time. Outside labor is considered necessary if the facilities demand is for more than 5% of the appropriate profession's labor pool in the area. If the profession has a high unemployment rate in the area, that higher percentage can be used as the breaking point beyond which new labor will be induced.

C. Estimate how many will move into the facility's area and what their average household size will be.

D. Estimate the average salary of the new residents.

2. Housing Impact:

A. Assuming a rental capacity of 25% of the worker's income, the housing opportunities, both rental and "for sale" units, should be described. Especially relevant is the condition of the housing within various municipalities within the 75 mile radius (such as plumbing facilities) and the average cost.

B. Determine if the influx of new workers will decrease the vacancy rate to below 5% (2) for rental units in the region or below 1% of "for sale" units in the region. Such a finding will signify a critical impact on the housing supply.

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(1) Several numbers are suggested in determining the impact. The choice of a 75 mile radius as defining the regional area and the labor pool source, is from several studies, the most recent being HUD-1967.

(2) The use of 5% and 1% vacancy rates as a cutoff point are based on findings reported by the American Institute of Planners and Dr. George Sternlieb.

3. Education: The impact should be measured for two possible situation. The first situation should be considered the worst possible condition under which all new households will locate within a 10 mile (3) radius of the plant. The second estimate will load these households within 20 miles of the plant, a more conservative estimate.

A. Estimate the average number of school age children per new household.

B. Determine the present location and enrollment of schools.

C. How much of an increase in enrollment in each school will be caused by the new residents.

D. What is the capacity of each school and in what schools will capacity be exceeded by the new households.

4. Sewer and water facilities: Again, load the households under the two alternatives: 10 and 20 miles.

A. Estimate average labor per household on sewage treatment plant (if there is a public facility).

B. Determine how much the new households will add to the treatment plant's load.

C. What is the capacity of the plant and by how much will the new load exceed capacity.

D. Estimate average per household demand for water.

E. How much does this increase present demand.

F. By how much will capacity be exceeded.

5. Police: Calculate the impact under the two alternatives: 10 and 20 miles.

A. Estimate the region's (75 miles radius) average ratio of policemen to population.

B. Estimate the police force within the two alternative areas.

C. Assuming the regional ratio as the proper relationship of population to police force, would the influx of new households necessitate an increased police force under the two alternatives.

6. Fire Department: Calculate impact under the two alternatives: 10 and 20 miles. (4)

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(3) Finally, in the use of two areas for estimating possible impact, the cutoff points are arbitrarily drawn. Ten miles is the area within which demographic projections for fuel fabrication plants are very detailed. Twenty miles allows for a more conservative estimate of impact.

(4) A more explicit but complex formula for finding the necessary amount of fire equipment and firemen necessary for a type of area has been produced by the Insurance Underwriters Association but not included here.

A. Calculate the regional average ratio of firemen and equipment to population.

B. Estimate the number of firemen and equipment within the two alternative areas.

C. Assuming the regional ratio as the proper relationship, would the influx of new households necessitate the expansion of existing facilities.

7. Health: Calculate the impact under the two alternatives: 10 and 20 miles.

A. Calculate the regional average ratio of hospital beds to population.

B. Determine the capacity within the two alternative areas.

C. What percentage expansion in health facilities will be needed to serve the new households.

The results should be a chart of municipal services which will be overtaxed during each phase and under both alternatives:

SERVICE	CONSTRUCTION PHASE		OPERATIONS PHASE	
	10 mi.	20 mi.	10 mi.	20 mi.
Housing				
Education				
Sewage Treatment				
Water				
Police				
Fire				
Health				

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INTRODUCTION

NATIONAL ENVIRONMENTAL GOALS

Prior to the issuance of a license authorizing fuel fabrication plant operation, the U.S. Atomic Energy Commission is required to assess the potential environmental effects of the proposed activities in order to assure that issuance of the license is consistent with the national environmental goals as set forth by the National Environmental Policy Act of 1969 (Public Law 91-190). In order to obtain information essential to this assessment, the Commission requires each applicant for a license to submit a report on the potential environmental impact of the proposed plant.

The national environmental goals as expressed by the National Environmental Policy Act (NEPA) are as follows:

"...it is the continuing responsibility of the Federal Government to use all practical means, consistent with other essential considerations of national policy, to improve and coordinate Federal plans, functions, programs, and resources to the end that the Nation may-

"(1) fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;

"(2) assure for all Americans safe, healthful, productive and esthetically and culturally pleasing surroundings;

"(3) attain the widest range of beneficial use of the environment without degradation or risk to health, or safety, or other undesirable and unintended consequences;

"(4) preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment which supports diversity and variety of individual choice;

"(5) achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities; and,

"(6) enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources."

APPLICANT'S ENVIRONMENTAL REPORTS

Appendix D of the Commission's regulation 10 CFR Part 50, entitled "Interim Statement of General Policy and Procedure: Implementation of the National Environmental Policy Act of 1969 (Public Law 91-190)," specifies in paragraph A.14, that each applicant for a license authorizing fuel fabrication plant operation submit with his license application two hundred copies of a separate document entitled "Applicant's Environmental Report", which discusses the following environmental considerations:

"(a) the environmental impact of the proposed action,

"(b) any adverse environmental effects which cannot be avoided should the proposal be implemented,

"(c) alternatives to the proposed action,

"(d) the relationship between local short-term used of man's environment and the maintenance and enhancement of long-term productivity, and

"(e) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented."

For nuclear fuel fabrication plants the discussion of alternatives to the proposed action should be limited to comparative evaluations of available alternative sites and plant designs. These comparative evaluations should be sufficiently complete to permit the AEC to independently determine which alternatives will most effectively reduce or avoid adverse environmental effects expected to result from construction and operation of the plant.

The Environmental Report should also include a cost-benefit analysis which considers and balances the environmental, and socio-economic effects, of the facility. The cost-benefit analysis should, to the fullest extent practicable, quantify the various factors considered. To the extent that such factors cannot be quantified, they should be discussed in qualitative terms. The Environmental Report should contain sufficient data to aid the Commission in its development of an independent cost-benefit analysis covering the factors specified.

The Environmental Report should further include a discussion of the status of compliance of the facility with applicable environmental quality standards and requirements which have been imposed by Federal, State, and regional agencies having responsibility for environmental protection. In addition, the environmental impact of the facility should be fully discussed with respect to matters covered by such standards and requirements irrespective of whether a certification from the appropriate authority has been obtained (including, but not limited to, any permit or certification obtained pursuant to section 401 of the Federal Water Pollution Control Act, as amended). Such discussion should be reflected in the cost-benefit analysis section of this report. While compliance with AEC standards and criteria pertaining to radiological effects will be necessary to meet the licensing requirements of the Atomic Energy Act, the cost-benefit analysis should, for the purposes of the National Environmental Policy Act, consider the radiological effects together with other environmental effects of the facility.

PREPARATION OF ENVIRONMENTAL REPORTS

Appendix D of 10 CFR Part 50 provides general information concerning the content of an applicant's Environmental Report. To provide specific and detailed guidance, the following "Standard Format and Content of Environmental Reports for Fuel Fabrication Plants" has been prepared.

If any topics in this guide relate to information not available at the time the environmental report is prepared, the applicant should indicate when the information will be available.

The following guidelines have been written to assist in the preparation of Environmental Reports for new fuel fabrication plants which produce a nuclear fuel that is a mixture of plutonium and uranium oxides. Accordingly, applicants preparing environmental reports for existing fuel fabrication plants which produce a low-enriched uranium oxide fuel, will have to take exception to this guide on either or both of two basic issues, namely, that the information or data requested was not collected prior to construction of the plant or that the radiological consequences of an event cannot be measured because only low enriched