AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
GPO

(2)(i) Testing may be performed for biological responses that have satisfied the acceptance criteria of § 11.62(f)(2) of this part.

(ii) Testing methodologies that have been documented and are applicable to the biological response being tested may be used.

(3) Injury to biological resources, as such injury is defined in § 11.62(f)(1)(ii) of this part, may be determined by using methods acceptable to or used by the Food and Drug Administration or the appropriate State health agency in determining the levels defined in that paragraph.

§ 11.70 Quantification phase—general.

(a) *Requirement*. (1) Upon completing the Injury Determination phase, the authorized official shall quantify for each resource determined to be injured and for which damages will be sought, the effect of the discharge or release in terms of the reduction from the baseline condition in the quantity and quality of services, as the phrase is used in this part, provided by the injured resource using the guidance provided in the Quantification phase of this part.

(2) The Quantification phase consists of § 11.70—general; § 11.71—service reduction quantification; § 11.72—baseline services determination; and § 11.73—resource recoverability analysis, of this part.

(b) *Purpose*. The purpose of the Quantification phase is to quantify the effects of the discharge or release on the injured natural resources for use in determining the appropriate amount of compensation.

(c) *Steps in the Quantification phase*. In the Quantification phase, the extent of the injury shall be measured, the baseline condition of the injured resource shall be estimated, the baseline services shall be identified, the recoverability of the injured resource shall be determined, and the reduction in services that resulted from the discharge or release shall be estimated.

(d) *Completion of Quantification phase*. Upon completing the Quantification phase, the authorized official shall make a determination as to the reduction in services that resulted from the discharge or release. This Quantification Determination shall be used in the Damage Determination phase and shall be maintained as part of the Report of Assessment described in § 11.90 of this part.

§ 11.71 Quantification phase—service reduction quantification.

(a) *Requirements*. (1) The authorized official shall quantify the effects of a discharge of oil or release of a hazardous substance by determining the extent to which natural resource services have been reduced as a result of the injuries determined in the Injury Determination phase of the assessment.

(2) This determination of the reduction in services will be used in the Damage Determination phase of the assessment.

(3) Quantification will be done only for resources for which damages will be sought.

(b) *Steps*. Except as provided in § 11.71(f) of this part, the following steps are necessary to quantify the effects:

(1) Measure the extent to which the injury demonstrated in the Injury Determination phase has occurred in the assessment area;

(2) Measure the extent to which the injured resource differs from baseline conditions, as described in § 11.72 of this part, to determine the change attributable to the discharge or release;

(3) Determine the services normally produced by the injured resource, which are considered the baseline services or the without-a-discharge-or-release condition as described in § 11.72 of this part;

(4) Identify interdependent services to avoid double counting in the Damage Determination phase and to discover significant secondary services that may have been disrupted by the injury; and

(5) Measure the disruption of services resulting from the discharge or release, which is considered the change in services or the with-a-discharge-or-release condition.

(c) *Contents of the quantification*. The following factors should be included in the quantification of the effects of the discharge or release on the injured resource:

(1) Total area, volume, or numbers affected of the resource in question;

(2) Degree to which the resource is affected, including consideration of subunits or subareas of the resource, as appropriate;

(3) Ability of the resource to recover, expressed as the time required for restoration of baseline services as described in § 11.73 of this part;

(4) Proportion of the available resource affected in the area;

(5) Services normally provided by the resource that have been reduced as a result of the discharge or release; and

(6) Factors identified in the specific guidance in paragraphs (h), (i), (j), (k), and (l) of this section dealing with the different kinds of natural resources.

(d) *Selection of resources, services, and methodologies.* Specific resources or services to quantify and the methodology for doing so should be selected based upon the following factors:

(1) Degree to which a particular resource or service is affected by the discharge or release;

(2) Degree to which a given resource or service can be used to represent a broad range of related resources or services;

(3) Consistency of the measurement with the requirements of the economic methodology to be used;

(4) Technical feasibility, as that phrase is used in this part, of quantifying changes in a given resource or service at reasonable cost; and

(5) Preliminary estimates of services at the assessment area and control area based on resource inventory techniques.

(e) *Services.* In quantifying changes in natural resource services, the functions provided in the cases of both with- and without-a-discharge-or-release shall be compared. For the purposes of this part, services include provision of habitat, food and other needs of biological resources, recreation, other products or services used by humans, flood control, ground water recharge, waste assimilation, and other such functions that may be provided by natural resources.

(f) *Direct quantification of services.* The effects of a discharge or release on a resource may be quantified by directly measuring changes in services provided by vhe resource, instead of quantifying the changes in the resource itself, when it is determined that all of the following conditions are met:

(1) The change in the services from baseline can be demonstrated to have resulted from the injury to the natural resource;

(2) The extent of change in the services resulting from the injury can be measured without also calculating the extent of change in the resource; and

(3) The services to be measured are anticipated to provide a better indication of damages caused by the injury than would direct quantification of the injury itself.

(g) *Statutory exclusions.* In quantifying the effects of the injury, the following statutory exclusions shall be considered, as provided in sections 107 (f), (i), and (j) and 114(c) of CERCLA, that exclude compensation for damages to natural resources that were a result of:

(1) An irreversible and irretrievable commitment of natural resources identified in an environmental impact statement or other comparable environmental analysis, and the decision to grant the permit or license authorizes such a commitment, and the facility was otherwise operating within the terms of its permit or license, so long as, in the case of damages to an Indian tribe occurring pursuant to a Federal permit or license, the issuance of that license or permit was not inconsistent with the fiduciary duty of the United States with respect to such Indian tribe; or

(2) The damages and the release of a hazardous substance from which such damages resulted have occurred wholly before the enactment of CERCLA; or

(3) The application of a pesticide product registered under the Federal Insecticide, Fungicide, and Rodenticide Act, 7 U.S.C. 135–135k; or

(4) Any other federally permitted release, as defined in section 101(10) of CERCLA; or

(5) Resulting from the release or threatened release of recycled oil from a service station dealer as described in section 107(a) (3) or (4) of CERCLA if such recycled oil is not mixed with any other hazardous substance and is

stored, treated, transported or otherwise managed in compliance with regulations or standards promulgated pursuant to section 3014 of the Solid Waste Disposal Act and other applicable authorities.

(h) *Surface water resources.* (1) The area where the injured surface water resource differs from baseline shall be determined by determining the areal extent of oil or hazardous substances in the water or on the sediments.

(2)(i) Areal variation in concentrations of the discharged or released substances dissolved in or floating on water, adhering to suspended sediments, or adhering to bed, bank, or shoreline sediments from exposed areas should be determined in sufficient detail to approximately map the boundary separating areas with concentrations above baseline from areas with concentrations equal to or less than baseline.

(ii) The size, shape, and location of the plume may be estimated using time of travel and dispersion data obtained under § 11.63 of this part, since plumes of dissolved or floating substances may be rapidly transported and dispersed in surface water.

(3) Water and sediment samples may be collected and chemically analyzed and stage, water discharge, or tidal flux measurements made, as appropriate, to collect new data required by this section.

(4)(i) Within the area determined in paragraph (h)(2) of this section to be above baseline, the services provided by the surface water or sediments that are affected should be determined. This determination may include computation of volumes of water or sediments affected, total areas of water or sediment affected, volume of water used from the affected surface water resource, or other appropriate measures.

(ii) The services should be determined with consideration of potential effects on downstream or downcurrent resources during the recovery period, as determined in § 11.73 of this part, resulting from transport of dissolved substances and of substances adhering to sediments.

(i) *Ground water resources.* (1) The area where the injured ground water resource differs from baseline should be determined by determining the areal extent of oil or hazardous substances in water or geologic materials in the unsaturated zone and identified geohydrological units, which are aquifers or confining layers, within the assessment area.

(2)(i) The lateral and vertical extent of discharged or released substances in the unsaturated zone, if it is known to be exposed, should be determined.

(ii) The lateral and vertical extent of plumes within geohydrologic units known to be exposed should be determined. Concentrations of substances within and adjacent to each plume should be determined in sufficient detail to approximately locate the boundary separating areas with concentrations above baseline from areas with concentrations equal to or less than baseline.

(3) Water or geologic materials may be sampled and chemically analyzed, or surface-geophysical techniques may be used for collecting new data required by this section. General verification of the plume boundaries by chemical analysis of selected water samples should be done if boundary locations are initially determined by surface-geophysical measurements.

(4)(i) Within the area determined in paragraph (i)(2)(ii) of this section to be above baseline, the services provided by the ground water that is affected should be determined. This determination may include computation of the volume of water affected, volume of affected ground water pumped from wells, volume of affected ground water discharged to streams or lakes, or other appropriate measures.

(ii) The services should be determined with consideration of potential enlargement of the plume during the recovery period, as determined in § 11.73 of this part, resulting from ground water transport of the substances.

(iii) The effects on the ground water resource during the recovery period resulting from potential remobilization of discharged or released substances that may be adhering, coating, or otherwise bonding to geologic materials should be considered.

(j) *Air resources.* The area where the injured air resource differs from baseline should be determined by determining the geographical area affected, the degree of impairment of services, and the period of time impairment occurred.

(k) *Geologic resources.* The area where the injured geologic resource differs from baseline should be determined by determining:

(1) The surface area of soil with reduced ability to sustain the growth of vegetation from the baseline level;

(2) The surface area or volume of soil with reduced suitability as habitat for biota from the baseline level;

(3) The volume of geologic resources that may act as a source of toxic leachate;

(4) The tonnage of mineral resources whose access, development, or use is restricted as a result of the discharge or release.

(l) *Biological resources.* (1) The extent to which the injured biological resource differs from baseline should be determined by analysis of the population or the habitat or ecosystem levels. Although it may be necessary to measure populations to determine changes in the habitats or ecosystems, and vice versa, the final result should be expressed as either a population change or a habitat or ecosystem change in order to prevent double counting in the economic analysis. This separation may be ignored only for resources that do not interact significantly and where it can be demonstrated that double counting is being avoided.

(2) Analysis of population changes or habitat or ecosystem changes should be based upon species, habitats, or ecosystems that have been selected from one or more of the following categories:

(i) Species or habitats that can represent broad components of the ecosystem, either as representatives of a particular ecological type, of a particular food chain, or of a particular service;

(ii) Species, habitats, or ecosystems that are especially sensitive to the oil or hazardous substance and the recovery of which will provide a useful indicator of successful restoration; or

(iii) Species, habitats, or ecosystems that provide especially significant services.

(3) Analysis of populations, habitats, or ecosystems shall be limited to those populations, habitats, or ecosystems for which injury has been determined in the Injury Determination phase or those that can be linked directly through services to resources for which injury has been so determined. Documentation of the service link to the injured resource must be provided in the latter case.

(4) Population, habitat, or ecosystem measurement methods that provide data that can be interpreted in terms of services must be selected. To meet this requirement, a method should:

(i) Provide numerical data that will allow comparison between the assessment area data and the control area or baseline data;

(ii) Provide data that will be useful in planning efforts for restoration, rehabilitation, replacement, and/or acquisition of equivalent resources, and in later measuring the success of those efforts, and, where relevant, will allow calculation of compensable value; and

(iii) Allow correction, as applicable, for factors such as dispersal of organisms in or out of the assessment area, differential susceptibility of different age classes of organisms to the analysis methods and other potential systematic biases in the data collection.

(5) When estimating population differences of animals, standard and widely accepted techniques, such as census, mark-recapture, density, and index methods, and other estimation techniques appropriate to the species and habitat shall be used. Frequencies of injury observed in the population shall be measured as applicable.

(i) In general, methods used for estimates of wildlife populations should follow standard and widely accepted techniques such as those recommendations provided in the ''Wildlife Management Techniques Manual'' (4th edition, Wildlife Society, 1980, available from the Wildlife Society, 5410 Grosvenor Lane, Bethesda, MD 20814), including references cited and recommended in that manual. The specific technique used need not be cited in that manual, but should meet its recommendations

for producing reliable estimates or indices.

(ii) Measurement of age structures, life table statistics, or age structure models generally will not provide satisfactory measurement of changes due to a discharge of oil or release of a hazardous substance unless there is clear evidence that the oil or hazardous substance has differentially affected different age classes and there are reliable baseline age structure data available for the population being assessed.

(iii) Mortality from single incidents may be used to estimate changes in populations only when there are available baseline population data for the area, so that the proportion lost can be estimated, and when corrections can be made for potential sampling biases, such as natural mortality and factors influencing distribution of carcasses and ability of investigators to find them. Specific techniques for measuring mortality include the following:

(A) Fish mortality in freshwater areas may be estimated from counts of carcasses, using methods and guidelines for estimating numbers of fish killed contained in Part II (Fish-Kill Counting Guidelines) of the ''Monetary Values of Freshwater Fish and Fish-Kill Counting Guidelines,'' American Fisheries Society Special Publication Number 13, 1982 (incorporation by reference, see § 11.18), including use of appropriate random sampling methods and tagged carcasses as identified and discussed in Part II of that publication.

(B) The authorized official may adapt the techniques discussed in paragraph (l) (5) (iii) (A) of this section for counting dead aquatic birds or for counting marine or estuarine fish or birds. Such adaptation will require the documentation of the methods used to avoid sampling biases.

(C) Fish mortality may also be estimated by use of an in situ bioassay technique that is similar to that identified in § 11.62(f)(4)(i)(C) of this part, if the oil or hazardous substance is still present at levels that resulted in injury and if appropriate instream controls can be maintained at control areas.

(6) Plant populations may be measured using standard techniques, such as population density, species composition, diversity, dispersion, and cover,

(7) Forest and range resources may be estimated by standard forestry and range management evaluation techniques.

(8) Habitat quality may be measured using techniques such as the Habitat Evaluation Procedures (HEP) developed and used by the U.S. Fish and Wildlife Service.

[51 FR 27725, Aug. 1, 1986, as amended at 53 FR 5175, Feb. 22, 1988; 59 FR 14283, Mar. 25, 1994]

§ 11.72 Quantification phase—baseline services determination.

(a) *Requirements*. The authorized official shall determine the physical, chemical, and biological baseline conditions and the associated baseline services for injured resources at the assessment area to compare that baseline with conditions found in § 11.71 of this part.

(b) *General guidelines*. Baseline data shall be selected according to the following general guidelines:

(1) Baseline data should reflect conditions that would have been expected at the assessment area had the discharge of oil or release of hazardous substances not occurred, taking into account both natural processes and those that are the result of human activities.

(2) Baseline data should include the normal range of physical, chemical, or biological conditions for the assessment area or injured resource, as appropriate for use in the analysis in § 11.71 of this part, with statistical descriptions of that variability. Causes of extreme or unusual value in baseline data should be identified and described.

(3) Baseline data should be as accurate, precise, complete, and representative of the resource as the data used or obtained in § 11.71 of this part. Data used for both the baseline and services reduction determinations must be collected by comparable methods. When the same method is not used, comparability of the data collection methods must be demonstrated.

(4) Baseline data collection shall be restricted to those data necessary for conducting the assessment at a reasonable cost. In particular, data collected should focus on parameters that are directly related to the injuries quantified