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ENERGY NORTHWEST

INTEROFFICE MEMORANDUM

DATE: March 19, 2001

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FROM: Vicenta Deheon
Procedure Control, Administrative Services, (927A)

SUBJECT: **PLANT PROCEDURES MANUAL - VOLUME 13**
Distribution Package: 2001-157

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The following Procedure(s) have been revised/approved and are to be inserted in your controlled copy of the Manual and the superseded revisions are to be removed and destroyed:

Procedure	Rev.	Title
13.13.3	13	INTERMEDIATE PHASE MUDAC OPERATIONS

Also included in this package are **EDITORIAL CHANGES**, please replace the pages located in your manual with the attached pages:

Procedure	Rev.	Page(s)
13.10.1	20	2, 9

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ENERGY NORTHWEST		USE CURRENT REVISION
COLUMBIA GENERATING STATION PLANT PROCEDURES MANUAL		
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1.0 PURPOSE

This procedure describes MUDAC operations for the intermediate phase of emergency response. This procedure provides direction for evaluating post accident radiological conditions and for developing recommendations that lead to protection of the public from chronic radiation exposure and return of population to unaffected areas.

2.0 REFERENCES

2.1 FSAR, Chapter 13.3, Columbia Generating Station Emergency Plan

2.2 Washington State Fixed Nuclear Facility Emergency Response Plan

2.3 Radiological Emergency Response Plan and Procedures (WA DOH documents)

2.4 Oregon Columbia Generating Station Emergency Response Plan

2.5 Oregon State Health Division Response Procedures for Radiation Emergencies

2.6 PPM 13.8.1, Emergency Dose Projection System Operations

2.7 PPM 13.9.1, Environmental Field Monitoring Operations

2.8 PPM 13.9.5, Environmental Sample Collection

2.9 PPM 13.2.1, Emergency Exposure Levels/Protective Action Guides

2.10 PPM 13.2.2, Determining Protective Action Recommendations

2.11 EPA 400-R-92-001, Manual of Protective Action Guides and Protective Guides and Protective Actions for Nuclear Incidents, October 1991.

2.12 Cooper, J., Goevelinger, N., "A Methodology to Allow the Rapid Development of Post-Plume Protective Action Recommendations for the Ingestion Pathway", Lessons Learned from the 1991 Trojan Nuclear Plant Post-Emergency Exercise, 2nd Edition, April 1993; Oregon Department of Energy, Oregon State Health Division, Columbia County Oregon Emergency Services.

2.13 Intermediate Phase Duties Checklist, Part 1, Transfer of Leadership, 968-25975

2.14 Intermediate Phase Duties Checklist, Part 2, Dose Assessment Coordinator, 968-25978

2.15 Intermediate Phase Duties Checklist, Part 3, Dose Assessor, 968-25980

2.16 Intermediate Phase Duties Checklist, Part 4, Field Team Coordinator, 968-25981

3.0 DISCUSSION

During the intermediate phase, offsite activities focus on relocation and return, and ingestion (food control) concerns. The Washington State staff in the EOF should at this time assume leadership from Energy Northwest for MUDAC and EOF offsite operations in the following roles; a Washington State Health Liaison, a Washington State Dose Assessment Coordinator, a Washington State Field Team Coordinator, a Washington State Dose Assessor, and a Protective Actions Decision Group (PADG) Chairperson. The PADG Chairperson is normally the Dose Assessment Coordinator but may be any individual appointed by the PADG. If the State of Oregon is affected, then a representative(s) from the State of Oregon may respond to the EOF and assist in this process for the State of Oregon.

The first objective of field monitoring is to determine contaminated areas and those areas not affected by plume deposition. Existing field data may provide verification of unaffected upwind areas. Allowing displaced people to return to their homes is a high priority. As soon as field data verifies the unaffected, evacuated, or sheltered areas, the MUDAC may issue an initial Return PAR.

An Isopleth Survey Plan provides the blueprint to obtain data to characterize "clean" or unaffected areas, the Relocation Area and the Food Control Area. The amount of time required to complete the field team monitoring depends on extent of the land area affected, the number of available field teams and the levels of contamination. When the data acquisition from the Isopleth Survey Plan is complete and has been plotted on a map, several actions occur concurrently in the MUDAC; a Relocation isopleth is drawn (if applicable), a Revised Return PAR may be developed, approved and issued, and the food control isopleth is calculated and/or projected. The Interim sampling plan is drawn up and initiated while the Food Control PAR is developed, approved and issued, and the recommendation is made to reopen affected transportation corridors.

After the Relocation Boundary and Food Control Boundary are decided by the county and received in the MUDAC, the Sampling Plan is developed to verify the food control boundary and identify via laboratory analyses, quantitative levels of radionuclides, if any, in milk, pasture, agricultural crops and products, water and/or soil. The laboratory analyses provide the technical basis for agricultural embargoes, total population dose assessment and reduction of the food control boundary. The Sampling Plan is a living document which may be revised and added to obtain the level of comprehensive coverage desired.

4.0 DEFINITIONS

4.1 Relocation Area is a geographical area where ground deposition levels would expose a resident to greater than 2 rem during the first year following the accident; greater than 0.5 rem during the second year; or more than 5 rem TEDE over 50 years. (This is synonymous with the Environmental Protection Agencies "Restricted Zone" as defined in EPA-400-R-92-001.) Access to the Relocation Area is controlled. Residents not previously evacuated from these areas are relocated if their calculated dose will exceed these guidelines.

- Relocation Area = Relocation Isopleth + buffer

4.2 Food Control Area: A geographical area in which food control measures may be implemented. Measures are enacted due to potential or actual contamination of food products above State intervention levels. The food control area includes the relocation area, if a relocation decision is appropriate.

- Food Control Area = Food Control Isopleth + buffer

4.3 Food Control Isopleth: The calculated and/or projected isopleth used to determine the food control area.

4.4 20 microR/hr Isopleth: A measurable reference isopleth used to calculate the Food Control Isopleth.

4.5 Relocation Isopleth: The measured isodose line used to determine the relocation area.

4.6 Relocation Boundary: A geo-political designation which defines and surrounds the Relocation area and includes a buffer area. Residents will be relocated from this area to avoid chronic radiation exposure.

4.7 Food Control Boundary: A geo-political designation which defines and surrounds the Food Control area, where food control measures may be implemented.

4.8 Protective Action Decision Group (PADG): Technical group of Dose Assessment experts assigned by Washington State, DOE-RL and when applicable, State of Oregon. The PADG Chairperson is normally the Dose Assessment Coordinator.

4.9 Radioactive Hot Spot(s): Areas radioactively contaminated to levels exceeding relocation or food control limits that are outside of the already established Relocation or Food Control Areas.

5.0 PREREQUISITES

MUDAC operations officially enter the intermediate phase when the plant has stabilized to the point that no further release that could approach accepted plume exposure Protective Action Guides (PAGs) is expected and plant conditions will have no further impact on offsite protective action decisions.

6.0 PRECAUTIONS AND LIMITATIONS

None

7.0 PROCEDURE

NOTE: The Checklist for Intermediate Phase MUDAC Activities may be used as deemed necessary to track the actions that have been accomplished. It is a controlled form.

7.1 Transfer of MUDAC Leadership

7.1.1 The transfer of MUDAC Leadership occurs after the radiological conditions move from the plume to the ingestion pathway (intermediate phase) and the Emergency Operations Facility (EOF) Manager verifies the following conditions:

a. Plant conditions stabilize, and 1) no further release threat exists that could exceed the plume exposure PAGs, and 2) Plant conditions will no longer have an effect on offsite protective action decision making.

b. The plume has dispersed and it no longer poses a threat that could approach the plume exposure PAGs.

7.1.2 Energy Northwest formally transfers lead offsite responsibility to the State of Washington when:

a. The Radiological Emergency Manager (REM) has provided documentation and status for all previously issued Protective Actions Recommendations (PARS) to the Washington State Dose Assessment Coordinator, and

b. The REM briefs and turns over leadership responsibility to the Washington State Dose Assessment Coordinator for all MUDAC activities, and

c. The REM assures continued Energy Northwest technical, administrative, and field monitoring support for ingestion pathway actions, and

d. The REM and the EOF Manager brief and turn over leadership responsibility to the State Health Liaison for all offsite activities.

7.1.3 Energy Northwest assumes a support role with continued availability of qualified MUDAC staff. The REM is the EOF Manager's representative for offsite radiological matters and for coordination with onsite activities. If the ingestion pathway threat involves the State of Oregon, a representative from Oregon may join the Protective Action Decision Group in MUDAC and participate in development of protective action recommendations.

7.1.4 The State Health Liaison and EOF Manager brief the EOF staff on the transfer of leadership.

7.1.5 The State Health Liaison or EOF Manager notifies the State and affected County Emergency Operations Centers (EOCs) when the transfer of leadership occurs.

7.1.6 The State Health Liaison coordinates requesting the following resources:

a. Washington State Agriculture Representative be dispatched to MUDAC, if not already present.

b. FRMAC (Federal Radiological Monitoring and Assessment Center) assets, in accordance with DOH procedures, if not previously requested.

7.1.7 The Field Team Coordinator contacts the Washington State Lab Liaison at the Public Health Lab (206-361-2891) to verify contact with all sample laboratories to:

a. Confirm contact phone and fax numbers.

b. Provide alternate lab locations or addresses.

c. Review the expected distribution of sample analysis data.

7.1.8 The Field Team Coordinator or designee coordinates sample transfer operations from the field and transfer locations to laboratories. Consider logistics for all parties involved as well as radiological and weather conditions.

7.2 Initial Return Protective Action Recommendations (PARs) for Radiologically Unaffected Areas

7.2.1 The PADG evaluates the feasibility of recommending the release of clearly unaffected areas previously evacuated or sheltered.

Consider the following:

a. Other available meteorological data: US DOE Hanford site; Richland Airport; Pasco Airport, etc.

b. Available upwind field team monitoring data.

c. Initial return should be considered only if sufficient data is available to verify unaffected areas. The Initial Return PAR should be initiated only when sufficient data supports the recommendations.

d. Discontinue sheltering unless resuspension could occur because of meteorological conditions.

e. Open air space and Columbia River corridors using the Reopening of the Transportation Corridor Recommendation, Attachment 8.8.

f. Status of roads in areas marked for the initial return and roads that may be used for access to return areas.

7.2.2 The PADG completes and concurs with the Initial Return PAR, Attachment 8.1.

7.2.3 The Dose Assessment Coordinator approves the Initial Return PAR.

7.2.4 The Dose Assessment Coordinator briefs the State Health Liaison the REM, and the affected state and county representatives.

7.2.5 The Dose Assessment Coordinator or State Health Liaison will conduct periodic briefings of the facility staff, including PAR disposition, utilizing guidance contained in Update Briefing Guide, Attachment 8.12.

7.2.6 The State Health Liaison ensures transmission of the Initial Return PAR to the State/County Emergency Centers and the Joint Information Center, and verifies receipt of the PAR package.

7.2.7 If incorrect information is issued, a written correction shall be distributed to all of the original recipients, and receipt of the correction verified.

7.3 Isopleth Survey Plan Development

7.3.1 The PADG assisted by the Field Team Coordinator, develops the "Isopleth Survey Plan" (Attachment 8.2). The plan designates the geographical areas where field teams will monitor to identify the 500 microR/hr and 20 microR/hr isopleths. Refer to Attachment 8.13 for hot spot management.

Consider the following:

a. Obtain a dose projection map depicting the 10 μR and 500 μR line ground shine exposure lines per PPM 13.8.1, Attachment 5.1.

b. Projected and actual field team monitoring data of plume travel paths.

c. The number of available field teams and their present locations and mission.

d. Minimize the number of teams assigned to monitor known contaminated areas.

e. Laboratory analysis of plume samples.

7.3.2 The Dose Assessment Coordinator reviews and approves the Isopleth Survey Plan.

7.3.3 The Dose Assessment Coordinator provides the Isopleth Survey Plan to the Field Team Coordinator for implementation.

7.3.4 The Dose Assessment Coordinator briefs the State Health Liaison and the REM.

7.4 Isopleth Survey Plan Implementation

7.4.1 The Field Team Coordinator assigns and directs the field teams to specified areas to identify gross 500 microR/hr and gross 20 microR/hr isopleths. The readings should be based on waist high, closed window readings. The Field Team Coordinator needs to consider the following points when making assignments:

a. Keep the number of teams assigned to determine the relocation area to a reasonable minimum because of contamination.

b. The Field Team(s) assigned to locate the 500 microR/hr isopleth should not be the same Team(s) assigned to locate the 20 microR/hr

isopleth. If resources permit, teams should be instructed to approach the assigned isopleth until the 500 microR/hr or 20 microR/hr reading is registered, then retreat to lower contamination levels to begin the next survey track.

NOTE: Transmit and receive field team and sampling locations using latitude and longitude readings. Use map grid coordinates when Global Positioning System (GPS) is not available. Supplement location descriptions with geo-political landmarks to clarify locations.

c. The Field Teams and Field Team Dispatcher will use the Isopleth Survey Log, Attachment 8.6, to document field team data.

7.4.2 The Field Team Coordinator ensures that field team data is plotted properly on the map(s) and verifies any questionable information. Ensure that background readings are noted when plotting data.

7.4.3 The Field Team Coordinator will update the PADG on field data and information from evacuated areas not yet released for return.

7.5 Constructing the Relocation Area Isopleth

7.5.1 The Field Team Coordinator ensures incoming isopleth field data points are plotted and labeled on the appropriate map. The Field Team Coordinator may request additional monitoring in areas of uncertainty or where data is lacking.

7.5.2 The emergency dose assessor plots the 500 μR/hr field team isopleth survey data points on the map using Street Atlas. Refer to Attachment 8.14.

7.5.3 Once sufficient points are plotted, the Dose Assessor or designee draws the isopleth(s) connecting the relocation area (500 microR/hr) data points. Consider the guidelines contained in Attachment 8.13 for hot spot management.

a. The Dose Assessor adds an appropriate buffer zone considering wind, stability class, quantity of field team data available, etc., to form the Relocation Area.

b. The Dose Assessor or designee prepares a map of the Relocation Area for transmission with the Relocation Area PAR paperwork and the associated Revised Return PAR.

7.6 Revised Return PAR

7.6.1 The Dose Assessment Coordinator initiates the Revised Return PAR, Attachment 8.3, based on Relocation Area determination. It is recommended that this PAR be sent with the Relocation PAR paperwork, when the return recommendation is based upon the Relocation PAR map. Refer to Attachment 8.13 for hot spot management guidelines.

7.6.2 The PADG determines those geographic areas that were previously evacuated which exhibit a verified dose of less than 2 rem for the first year.

7.6.3 The PADG completes a Revised Return PAR, Attachment 8.3, and provides a written description of the area(s) released for return in terms of geographic landmarks. If applicable, check "map attached" box. (This means a map is not always required).

7.6.4 The Dose Assessment Coordinator reviews and approves the Revised Return PAR.

7.6.5 The Dose Assessment Coordinator briefs the State Health Liaison the REM, and the affected state and county representatives.

7.6.6 The State Health Liaison ensures the transmission of the Revised Return PAR package to the State/County Emergency Centers and the Joint Information Center and verifies receipt of the PAR package.

7.6.7 If incorrect information is issued, a written correction shall be distributed to all of the original recipients, and receipt of the correction verified.

7.7 Relocation Area PAR

7.7.1 The PADG prepares a Relocation Area PAR, Attachment 8.4, based on the measured data points, the plotted relocation isopleth and the added buffer zone.

Consider the following:

a. The gamma exposure rate will decrease rapidly if deposited material includes a significant fraction of short-lived radionuclides.

b. Until additional radiological data is available, the relocation isopleth plus buffer zone represents a conservative relocation area and serves

as the basis for affected County EOC to determine and the State EOC to endorse the Relocation Boundary.

c. It is essential to complete this task in a timely manner.

d. A relocation area prohibits immediate residency, but may allow local industry and possibly interstate commerce

7.7.2 The Dose Assessment Coordinator reviews and approves the Relocation PAR package, Attachment 8.4, and attaches the relocation map as prepared in Section 7.5.

7.7.3 The Dose Assessment Coordinator briefs the State Health Liaison the REM, and the affected state and county representatives.

7.7.4 The State Health Liaison ensures transmission of the Relocation PAR to the State/County Emergency Centers, the Laboratory Liaison at the Public Health Laboratory, the Joint Information Center, and the FRMAC (if activated), with receipt verification.

7.7.5 If incorrect information is issued, a written correction shall be distributed to all of the original recipients, and receipt of the correction verified.

7.8 Constructing the Food Control Isopleth

7.8.1 The Dose Assessor constructs the Food Control Isopleth as follows:

a. The emergency dose assessor plots the 20 μR/hr field team isopleth survey data points on the map using Street Atlas. Refer to Attachment 8.14.

b. Draw an isopleth connecting the 20 microR/hr data points when sufficient points are plotted on the ingestion map. Consider the hot spot management guidance in Attachment 8.13 when performing this step.

c. Construct a minimum of five to seven radial lines originating from the accident release site (more frequently for complex patterns), and extend the lines through the 20 microR/hr isopleth.

d. Determine d_1 as the distance from the source (point of release) to the intersect of the Relocation Isopleth (500 microR/hr) and d_2 as the distance from the source to the intersect of the 20 microR/hr isopleth.

NOTE: The following reference to values of d_3 in Attachment 8.5 is only valid for the initial calculation based on the default Food Control Boundary (FCA) value of 0.4 microR/hour. Subsequent calculations will be based on laboratory analysis and may vary significantly from the default.

e. Determine the value of d_3 using the values contained in Attachment 8.5. Skip to step 7.8.1.h. Otherwise, continue with step 7.8.1.f.

f. Alternately, determine the value of "x" using equation 1 (see equations for calculating the Food Control area) and proceed to Step 7.8.1.g.

g. Using Equation 2, calculate the location of the Food Control isopleth points. Use this calculated point as the center line point. Then using the <u>same</u> value of "x," calculate the location for each of the remaining radial lines using their respective d_1, d_2 distances.

h. Plot and draw the food control area isodose rate line.

i. For areas within the State of Washington, add an appropriate buffer area considering EDPS and the quantity of field team data available, etc. For areas within the State of Oregon, do not specify any additional buffer areas.

j. The Dose Assessor prepares a map of the Food Control Area (Isopleth plus buffer zone).

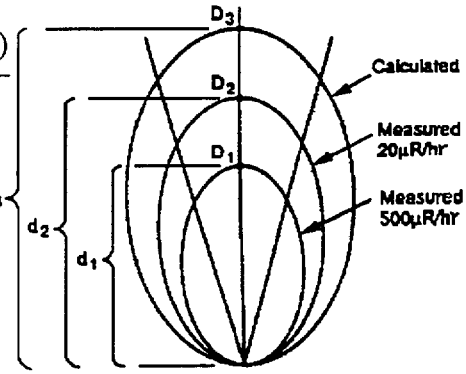
k. The Dose Assessor labels the FCA map with a specific dose rate prior to sending the map to the State and Counties EOCs.

ALTERNATE METHOD

Equations for Calculating the Food Control Area

Equation 1: $$x = \frac{\ln((D_2-10)/D_1)}{\ln(d_1/d_2)}$$

Equation 2: $$d_3 = d_2\left[\frac{D_3}{D_2-10}\right]^{-\frac{1}{x}}$$



Where:
D_1 = Dose rate (500 microR/hr)
d_1 = Distance from source to D_1
D_2 = Dose rate (20 microR/hr)
d_2 = Distance from source to D_2
D_3 = Dose rate (0.4 microR/hr)
d_3 = Distance from source to D_3
x = Constant related to atmospheric conditions

7.9 Food Control Area PAR

7.9.1 The Dose Assessment Coordinator initiates the preparation of a Food Control Area PAR based on the recommended food control isopleth developed by the Dose Assessor.

7.9.2 The PADG prepares Food Control Area PAR paperwork using Attachment 8.7 and attaches the Food Control Isopleth map developed in Section 7.8.1.

7.9.3 The Dose Assessment Coordinator reviews and approves the PAR package.

7.9.4 The Dose Assessment Coordinator briefs the State Health Liaison the REM, and the affected state and county representatives.

7.9.5 The State Health Liaison ensures transmission of the Food Control Area PAR paperwork to the State/County Emergency Centers, the Laboratory Liaison at the Public Health Laboratory, the Joint Information Center, and the FRMAC (if activated), with receipt verification.

7.9.6 The State Health Liaison informs the EOF of PAR disposition.

7.9.7 If incorrect information is issued, a written correction shall be distributed to all of the original recipients, and receipt of the correction verified.

7.10 Re-opening Transportation Corridor Recommendation

7.10.1 The PADG determines what transportation corridors are located entirely or partially within the recommended relocation area.

7.10.2 The PADG evaluates available radiological data from along the corridors.

7.10.3 The Field Team Coordinator obtains additional radiological data from the field teams, if necessary to adequately assess the situation.

7.10.4 The PADG assesses the situation and recommends action(s) to facilitate transportation corridor use, e.g., additional field sampling if more data is needed, restricting only portions of the corridor to traffic flow, etc.

7.10.5 The PADG completes a Reopening Transportation Corridor Recommendation (Attachment 8.8) and considers the following:

a. Release all transportation corridors in unaffected areas.

b. Reopen the airspace (if closed) and river to unrestricted use once the plume has dissipated. Contact the REM for this information, if needed.

c. Other than the river and airspace, do not reopen any transportation corridor for restricted or unconditional use until the Dose Assessment Coordinator has issued the Relocation PAR.

d. Be aware that the Relocation Boundary set by the county may include transportation corridors not previously identified in the Relocation Area determined by MUDAC.

e. Reopen a transportation corridor to unrestricted use only when the recommended relocation area does not encompass any part of the transportation corridor.

f. Boats docked or moored within the recommended relocation area should be surveyed prior to leaving. If contamination is found, the field team member conducting the survey should contact the Field Team Coordinator for further instructions.

7.10.6 The Dose Assessment Coordinator reviews and approves the reopening of the Transportation Corridor Recommendation, Attachment 8.8.

7.10.7 The Dose Assessment Coordinator briefs the State Health Liaison the REM, and the affected state and county representatives.

7.10.8 The State Health Liaison ensures transmission of the Transportation Corridor PAR to the State/County Emergency Centers and the Joint Information Center, and verifies receipt of the PAR package.

7.10.9 If incorrect information is issued, a written correction shall be distributed to all of the original recipients, and receipt of the correction verified.

7.11 Interim Sampling Plan

The Field Team Coordinator determines and assigns the Interim Sampling Plan, Attachment 8.9, when the Monitoring Plan is complete and the Relocation and Food control PARs have been issued, but not yet decided upon. This is an opportunity to obtain additional data to get an overall "thumb-nail sketch" of the affected area, isolated "hot spots", areas of concern, areas upwind, or areas where data has yet to be collected. The Interim Sampling Plan does not require a PAR. Obtain input from the Washington State Department of Agriculture and/or County Agriculture Representatives.

The Interim Sampling plan is a broad based, generalized information sweep. This plan relies on the field teams to carry out any of the following requests from MUDAC:

- General Area dose rates
- General deposition readings
- Hot spots and other areas of concern
- Deposition in soil
- Deposition on pasture grass
- Clean Area Survey (Negative data)
- Collection and replacement of environmental thermoluminescent dosimeters (TLDs)
- Collection of air samples in areas where re-suspension is suspected
- Surveys/smears of contaminated road and rail surfaces, and vehicle filters
- Collection of samples, e.g. "Hot" samples, etc.
- Other duties as requested

7.11.1 The Field Team Coordinator directs a field team to obtain a soil and/or vegetation sample from a highly contaminated location for source term evaluation.

7.11.2 The Field Team Coordinator arranges distributions to appropriate laboratories with the Laboratory Liaison.

7.11.3 The Field Team Coordinator or designee coordinates sample transfer operations from the field and transfer locations to laboratories.

a. Sample transfer locations may vary due to radiological conditions and sampling locations. (Consider Emergency Worker Assistance Centers (EWACs) and other easily accessible locations.)

b. Ensure the area reads background and that no contamination is present.

7.11.4 The Field Team Coordinator assigns the field teams to geographical areas to obtain general dose rate and deposition readings, and to take soil, vegetation and air samples as appropriate.

7.11.5 The Field Team Coordinator instructs the teams to report their data every hour, or as appropriate.

7.12 Detailed Sampling Plan

7.12.1 The second phase of the sampling plan is more formal and is developed after the relocation and food control boundaries are approved. The PADG with the assistance of the Washington State Department of Agriculture and the Field Team Coordinator develop the Detailed Sampling Plan, Attachment 8.10.

a. The Washington State Department of Agriculture agents and/or the County Extension Agents provide information on crops in harvest and farm locations inside and outside the Food Control Boundary.

b. The DOH Drinking Water staff provides locations of any potentially affected open drinking water supplies to the PADG.

c. The Field Team Coordinator will assign sampling points nearest to the Food Control boundary, working in toward the center and outward from the boundary to verify clean areas and appropriate boundary placement.

d. The Field Team Coordinator notifies the Laboratory Liaison of the estimated time of arrival and the number of samples for analysis.

e. The Field Team Coordinator or WA dose assessment staff is the point of contact for all in-coming laboratory analyses.

7.12.2 The PADG with the assistance of the Washington State Department of Agriculture and the Field Team Coordinator establish the sample collection priorities and locations.

Considering the following:

a. Begin sampling of pasture grass, foodstuffs and open sources of drinking water supplies as soon as possible following the plume.

b. Begin routine milk monitoring 12 to 18 hours after plume passage.

c. Sample and monitor the most perishable crops first.

d. Sample harvested food ready for market before other foodstuffs and crops requiring harvest within 30 days.

e. Sampling of above ground crops should have priority over root crops.

7.12.3 The Field Team Coordinator and PADG should select broad based, general monitoring and/or sampling locations.

7.12.4 The Field Team Coordinator or designee records the coordinates of these sampling locations for the Detailed Sampling Plan, Attachment 8.10.

7.12.5 The PADG reviews and assembles the pages of the Detailed Sampling Plan for completeness and presents it to the Dose Assessment Coordinator.

7.12.6 The Dose Assessment Coordinator reviews the Detailed Sampling Plan with the PADG to ensure it adequately addresses all credible short-term potential direct exposure and ingestion pathways.

7.12.7 The Dose Assessment Coordinator approves and signs the Detailed Sampling Plan.

7.12.8 The Dose Assessment Coordinator provides the approved Detailed Sampling Plan to the Field Team Coordinator for implementation in accordance with Step 7.13.

7.12.9 The Dose Assessment Coordinator briefs the State Health Liaison the REM, and the affected state and county representatives.

7.12.10 The State Health Liaison should ensure that a copy of the Detailed Sampling Plan is transmitted to the Health Physicist (HP) at the State EOC, the DOH

Laboratory Liaison, the FRMAC Liaison (if applicable), and the County EOCs with receipt verification.

7.12.11 The PADG, with Department of Agriculture assistance, updates the sampling plan as needed:

a. Incorporates appropriate feedback received from the HP at the State EOC; the DOH Laboratory Liaison; the Dose Analyst at the Oregon EOC; the FRMAC Liaison (if applicable); and County EOCs, into the Detailed Sampling Plan.

b. Provides updates and revisions as approved to the Field Team Coordinator for immediate implementation.

c. Periodically updates the plan to accommodate unexpected data results, meteorological conditions.

d. Provides copies of periodic revisions to the DOH Laboratory Liaison; the HP at the State EOC; the Dose Analyst at the Oregon EOC; the FRMAC Liaison (if applicable); and county EOCs. Incorporate appropriate feedback from these agencies into revisions of the Detailed Sampling Plan.

7.13 Detailed Sampling Plan Implementation

7.13.1 To implement the "Sampling Plan" the Field Team Coordinator performs the following:

a. Assigns and dispatches field teams to selected monitoring and/or sampling locations. Instruct field teams to collect specified samples from assigned locations and call in their information.

b. Confirms the arrangements made for transporting samples from transfer locations to laboratories using one or more of the following:

- Washington State Patrol
- Local Sheriff's office
- National Guard
- FRMAC
- others, as available

c. Reviews personnel and equipment resources available for monitoring, sampling, and analysis. Advise the Dose Assessment Coordinator of any needs.

7.13.2 The Field Team Dispatcher or designee logs the field team data on a Sample Data and Analysis Summary (Attachment 8.11) as follows; the sample tag number, the field team designation, the location in grid coordinates plus any other designation. Also check the sample type, recording only one type of sample per line. Record the time that the sample was taken, the area dose rate and the deposition reading.

7.13.3 The Field Team Coordinator plots the sample location using sequentially numbered color discs and marks the correlating disc number on the Sample Data and Analysis Summary (Attachment 8.11) in the first column on the same line with the sample information.

7.13.4 The Field Team Coordinator and PADG identify locations for boundary adjustments based on dose rates or where additional sampling is necessary.

7.13.5 The PADG initiates revised PARs when appropriate. (See Relocation, Return and Food Control PARs.)

7.13.6 The Field Team Coordinator briefs the PADG on the results of the field team dose rate and deposition data.

7.13.7 If incorrect information is issued, a written correction shall be distributed to all of the original recipients, and receipt of the correction verified.

7.14 Laboratory Analysis Data

Decisions on Relocation Areas and Food Control Areas are initially determined using field team readings. Once sufficient lab results (from samples of milk and food for food control, and soil for relocation) are available, MUDAC must reevaluate these areas with the intent to reduce the affected areas.

For Food Control, lab results will focus on the four isotopes of I-131, Cs-134, Cs-137 and Sr-90. While concentrations of other isotopes will be calculated by the labs, and may even be reported to MUDAC, Dose Assessors should limit their analysis to these four primary isotopes.

Ratios for these four isotopes should be determined by dividing the lab result by the corresponding Derived Intervention Level (refer to Appendix A of the DOH Plan and Procedures Manual). If any one of the four ratios for a specific sample is >1, interdiction of all food in that area should continue. The ratios of Washington State DILs are not summed.

Lab results may include other radionuclides. These values may be entered into a computer spreadsheet for analysis as described below in 7.14.7.

7.14.1 Distribution of lab sample analyses data is as follows: (2 or more copies)

a. Original to the WA State Dose Assessor

b. Copy to WA State Dose Assessment Coordinator

c. Copy to the WA State Field Team Coordinator

d. Other copies as needed or requested

e. If time allows, the MUDAC staff should consolidate lab sample analysis data and the field team sample data on the Sample Data and Analysis Summary Form, Attachment 8.11.

7.14.2 The Dose Assessor reviews laboratory analyses of samples and identifies samples with activities above the affected state's Derived Intervention Levels found in the Department of Health Procedures for that state.

7.14.3 The Dose Assessor also reviews the laboratory analyses for the uniformity of the isotopic mix. If the results are not uniform, take these results into consideration to define the Food Control Area.

7.14.4 The Field Team Coordinator posts the Limiting DIL Ratio for each sample on an ingestion EPZ map. Use different colored symbols to identify less than 1.0 and greater than or equal to 1.0, e.g., less than 1.0 = green dot and greater than or equal to 1.0 = red dot. Identify dot with map disk number.

7.14.5 The State Health Liaison verifies that the data is received by radiological counterparts at the State Emergency Centers.

7.14.6 The PADG performs "groundshine" calculations using a soil isotopic analysis computer program. Review enough sample calculations to determine a representative mix of radionuclides.

Use the soil sample analyses from the laboratory to calculate gamma exposures. These exposures are compared to the first year relocation PAG, or the second year and fifty year remediation guidelines. If calculated exposures are less than the corresponding PAGs, consider reducing the Relocation Area.

7.14.7 Groundshine calculation results will be entered on the Sample Data and Analysis Summary form, Attachment 8.11, as time permits. If any exposures are greater than or equal to the first year PAGs, consider the need for relocation of residents, pets, or livestock. If any exposures are greater than or equal to the second year or 50 year PAGs, consider mitigation actions such as relocation, embargo of crops or foodstuffs, or other alternatives as needed.

7.14.8 The Field Team Coordinator and PADG identify locations for boundary adjustments based on dose rates and/or sample results, or where additional sampling is necessary.

7.14.9 The PADG prepares PARs to refine, i.e., relax or rescind, existing relocation and/or ingestion PADs as necessary, based on sampling results.

7.14.10 If incorrect information is issued, a written correction shall be distributed to all of the original recipients, and receipt of the correction verified.

8.0 ATTACHMENTS

8.1 Initial Return Protective Action Recommendation
8.2 Isopleth Survey Plan
8.3 Revised Return Protective Action Recommendation
8.4 Relocation Area Protective Action Recommendation
8.5 Determining the Value of d (3)
8.6 Isopleth Survey Log
8.7 Food Control Area Protective Action Recommendation
8.8 Reopening of the Transportation Corridor Recommendation
8.9 Interim Sampling Plan
8.10 Detailed Sampling Plan
8.11 Sample and Data Analysis Summary
8.12 Update Briefing Guide
8.13 Hot Spot Management And Control
8.14 Plotting and Transmitting Ingestion Data Points

INITIAL RETURN
PROTECTIVE ACTION RECOMMENDATION

Date _____

The following areas have been evacuated/sheltered. Time

Section 1		Section 2		Section 3		Section 4	
evacuated	sheltered	evacuated	sheltered	evacuated	sheltered	evacuated	sheltered
☐ 0 - 2 miles ☐ 2 - 10 miles	☐ 0 - 2 miles ☐ 2 - 10 miles	☐ 0 - 2 miles ☐ 2 - 10 miles ☐ Schools	☐ 0 - 2 miles ☐ 2 - 10 miles ☐ Schools	☐ 0 - 2 miles ☐ 2 - 10 miles	☐ 0 - 2 miles ☐ 2 - 10 miles	☐ 0 - 2 miles ☐ 2 - 10 miles	☐ 0 - 2 miles ☐ 2 - 10 miles

☐ No change at this time

The Protective Action Decision Group Recommends the Following Actions:

☐SECTION 1	RETURN	DISCONTINUE SHELTERING
0 - 2 MILES	☐	☐
2 - 10 MILES	☐	☐
Ringold Fishing Area	☐	☐
Wahluke Hunting Area	☐	☐

☐SECTION 2	RETURN	DISCONTINUE SHELTERING
0 - 2 MILES	☐	☐
2 - 10 MILES	☐	☐
Schools	☐	☐

☐SECTION 3	RETURN	DISCONTINUE SHELTERING
0 - 2 MILES	☐	☐
2 - 10 MILES	☐	☐
Horn Rapids Recreational Area and ORV Park	☐	☐

☐SECTION 4	RETURN	DISCONTINUE SHELTERING
0 - 2 MILES	☐	☐
2 - 10 MILES	☐	☐

☐ Map attached

Approved by: (signature)
PADG Chairperson/Dose Assessment Coordinator _____
_____

Concurred by: (signature)
WA State Health Liaison _____

Attachment 8.1

ISOPLETH SURVEY PLAN

Date: Time: Page of

Field Team	GENERAL LOCATION: Grid/landmarks /Latitude & Longitude	Instructions

Monplan.2

APPROVED:_____ _____ DISPATCHED:_____

PADG Chairperson/Dose Assessment Coordinator Date/Time FIELD TEAM COORDINATOR _____/_____ Date / Time

Attachment 8.2

REVISED RETURN
PROTECTIVE ACTION RECOMMENDATION Date: _____

The following areas are still evacuated: Time:

Section 1	Section 2	Section 3	Section 4
☐ 0 - 2 miles ☐ 2 - 10 miles	☐ 0 - 2 miles ☐ 2 - 10 miles ☐ Schools	☐ 0 - 2 miles ☐ 2 - 10 miles	☐ 0 - 2 miles ☐ 2 - 10 miles

☐ No change at this time

The Protective Action Decision Group recommends the following actions:

☐ SECTION 1: RETURN
☐ 0 - 2 miles ☐ 2 - 10 miles
☐ OTHER _____

☐ SECTION 2: RETURN
☐ 0 - 2 miles ☐ 2 - 10 miles ☐ Schools
☐ OTHER _____

☐ SECTION 3: RETURN
☐ 0 - 2 miles ☐ 2 - 10 miles
☐ OTHER _____

☐ SECTION 4: RETURN
☐ 0 - 2 miles ☐ 2 - 10 miles
☐ OTHER _____

Approved by: (signature)
PADG Chairperson/Dose Assessment Coordinator_____
Concurred by: (signature)
WA State Health Liaison _____

Map attached ☐

Attachment 8.3

RELOCATION AREA
PROTECTIVE ACTION RECOMMENDATION

Date _____

☐ Initial ☐ Revised

Time _____

Establish/Revise (circle one) the relocation area boundary in accordance with the attached map.

☐ Relocate persons not yet evacuated from the relocation area.

☐ Change the status of those already evacuated from the Relocation Area to relocation status.

☐ Establish access control points around the Relocation Area and limit access to Emergency workers, residents with radiation protection escorts, and persons with temporary Emergency worker status.

Initial PAR Monitoring and Decontamination

☐ Establish monitoring stations at appropriate locations, (e.g., Access Control Points and Emergency Worker/Assistance Centers).

Revised PAR Monitoring and Decontamination

☐ Establish monitoring stations at access control points, and send those requiring decontamination to an Emergency Worker/Assistance Center.

☐ Have all monitoring and decontamination conducted at Emergency Worker/Assistance Centers.

☐ Establish monitoring and decontamination stations at access control points to the Relocation Area.

Initial PAR Dose Tracking

Establish Dose tracking at appropriate locations for any persons entering the relocation area, (e.g. Access Control Points and Emergency Worker/Assistance Centers).

Revised PAR Dose Tracking

☐ Establish Dose tracking at Emergency Worker/Assistance Centers.

☐ Establish dose tracking at access control points.

Other:

☐ Cancel PAR for administering KI to emergency workers.

☐ Terminate the relocation PAR.

Approved by:
PADG Chairperson/Dose Assessment Coordinator _____

Concurred by:
WA State Health Liaison _____

Attachment 8.4

DETERMINING THE VALUE OF d(3)

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
5.0	5.5	5.9
5.0	6.0	7.0
5.0	6.5	8.1
5.0	7.0	9.2
5.0	7.5	10.5
5.0	8.0	11.8
5.0	8.5	13.2
5.0	9.0	14.6
5.0	9.5	16.1
5.0	10.0	17.7
5.0	10.5	19.3
5.0	11.0	21.0
5.0	11.5	22.8
5.0	12.0	24.7
5.0	12.5	26.6
5.0	13.0	28.5
5.0	13.5	30.6
5.0	14.0	32.7
5.0	14.5	34.8
5.0	15.0	37.0
5.0	15.5	39.3
5.0	16.0	41.7
5.0	16.5	44.1
5.0	17.0	46.5
5.0	17.5	49.1
5.0	18.0	51.6
5.0	18.5	54.3
5.0	19.0	57.0
5.0	19.5	59.8
5.0	20.0	62.6
5.0	20.5	65.5
5.0	21.0	68.4
5.0	21.5	71.4
5.0	22.0	74.5
5.0	22.5	77.6
5.0	23.0	80.7
5.0	23.5	84.0
5.0	24.0	87.2
5.0	24.5	90.6

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
5.5	6.0	6.4
5.5	6.5	7.5
5.5	7.0	8.5
5.5	7.5	9.7
5.5	8.0	10.9
5.5	8.5	12.2
5.5	9.0	13.5
5.5	9.5	14.9
5.5	10.0	16.4
5.5	10.5	17.9
5.5	11.0	19.5
5.5	11.5	21.1
5.5	12.0	22.8
5.5	12.5	24.6
5.5	13.0	26.4
5.5	13.5	28.3
5.5	14.0	30.2
5.5	14.5	32.2
5.5	15.0	34.2
5.5	15.5	36.4
5.5	16.0	38.5
5.5	16.5	40.7
5.5	17.0	43.0
5.5	17.5	45.4
5.5	18.0	47.7
5.5	18.5	50.2
5.5	19.0	52.7
5.5	19.5	55.2
5.5	20.0	57.9
5.5	20.5	60.5
5.5	21.0	63.2
5.5	21.5	66.0
5.5	22.0	68.8
5.5	22.5	71.7
5.5	23.0	74.6
5.5	23.5	77.6
5.5	24.0	80.7
5.5	24.5	83.8
5.5	25.0	86.9

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
6.0	6.5	6.9
6.0	7.0	7.9
6.0	7.5	9.0
6.0	8.0	10.1
6.0	8.5	11.3
6.0	9.0	12.6
6.0	9.5	13.9
6.0	10.0	15.2
6.0	10.5	16.6
6.0	11.0	18.1
6.0	11.5	19.6
6.0	12.0	21.2
6.0	12.5	22.9
6.0	13.0	24.6
6.0	13.5	26.3
6.0	14.0	28.1
6.0	14.5	30.0
6.0	15.0	31.9
6.0	15.5	33.8
6.0	16.0	35.9
6.0	16.5	37.9
6.0	17.0	40.1
6.0	17.5	42.2
6.0	18.0	44.4
6.0	18.5	46.7
6.0	19.0	49.1
6.0	19.5	51.4
6.0	20.0	53.9
6.0	20.5	56.3
6.0	21.0	58.9
6.0	21.5	61.4
6.0	22.0	64.1
6.0	22.5	66.8
6.0	23.0	69.5
6.0	23.5	72.3
6.0	24.0	75.1
6.0	24.5	78.0
6.0	25.0	80.9
6.0	25.5	83.9

DETERMINING THE VALUE OF d(3)

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
6.5	7.0	7.4
6.5	7.5	8.4
6.5	8.0	9.5
6.5	8.5	10.6
6.5	9.0	11.8
6.5	9.5	13.0
6.5	10.0	14.3
6.5	10.5	15.6
6.5	11.0	17.0
6.5	11.5	18.4
6.5	12.0	19.9
6.5	12.5	21.4
6.5	13.0	23.0
6.5	13.5	24.6
6.5	14.0	26.3
6.5	14.5	28.1
6.5	15.0	29.8
6.5	15.5	31.7
6.5	16.0	33.6
6.5	16.5	35.5
6.5	17.0	37.5
6.5	17.5	39.5
6.5	18.0	41.6
6.5	18.5	43.7
6.5	19.0	45.9
6.5	19.5	48.2
6.5	20.0	50.4
6.5	20.5	52.7
6.5	21.0	55.1
6.5	21.5	57.5
6.5	22.0	60.0
6.5	22.5	62.5
6.5	23.0	65.1
6.5	23.5	67.7
6.5	24.0	70.3
6.5	24.5	73.0
6.5	25.0	75.7
6.5	25.5	78.5
6.5	26.0	81.4

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
7.0	7.5	7.9
7.0	8.0	8.9
7.0	8.5	10.0
7.0	9.0	11.1
7.0	9.5	12.2
7.0	10.0	13.4
7.0	10.5	14.7
7.0	11.0	16.0
7.0	11.5	17.3
7.0	12.0	18.7
7.0	12.5	20.1
7.0	13.0	21.6
7.0	13.5	23.2
7.0	14.0	24.8
7.0	14.5	26.4
7.0	15.0	28.1
7.0	15.5	29.8
7.0	16.0	31.6
7.0	16.5	33.4
7.0	17.0	35.3
7.0	17.5	37.2
7.0	18.0	39.2
7.0	18.5	41.2
7.0	19.0	43.2
7.0	19.5	45.3
7.0	20.0	47.4
7.0	20.5	49.6
7.0	21.0	51.9
7.0	21.5	54.1
7.0	22.0	56.4
7.0	22.5	58.8
7.0	23.0	61.2
7.0	23.5	63.7
7.0	24.0	66.1
7.0	24.5	68.7
7.0	25.0	71.3
7.0	25.5	73.9
7.0	26.0	76.5
7.0	26.5	79.2

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
7.5	8.0	8.4
7.5	8.5	9.4
7.5	9.0	10.5
7.5	9.5	11.5
7.5	10.0	12.7
7.5	10.5	13.8
7.5	11.0	15.1
7.5	11.5	16.3
7.5	12.0	17.7
7.5	12.5	19.0
7.5	13.0	20.4
7.5	13.5	21.9
7.5	14.0	23.4
7.5	14.5	24.9
7.5	15.0	26.5
7.5	15.5	28.2
7.5	16.0	29.8
7.5	16.5	31.6
7.5	17.0	33.3
7.5	17.5	35.1
7.5	18.0	37.0
7.5	18.5	38.9
7.5	19.0	40.8
7.5	19.5	42.8
7.5	20.0	44.8
7.5	20.5	46.9
7.5	21.0	49.0
7.5	21.5	51.1
7.5	22.0	53.3
7.5	22.5	55.6
7.5	23.0	57.8
7.5	23.5	60.1
7.5	24.0	62.5
7.5	24.5	64.9
7.5	25.0	67.3
7.5	25.5	69.8
7.5	26.0	72.3
7.5	26.5	74.9
7.5	27.0	77.5

DETERMINING THE VALUE OF d(3)

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
8.0	8.5	8.9
8.0	9.0	9.9
8.0	9.5	10.9
8.0	10.0	12.0
8.0	10.5	13.1
8.0	11.0	14.3
8.0	11.5	15.5
8.0	12.0	16.8
8.0	12.5	18.0
8.0	13.0	19.4
8.0	13.5	20.8
8.0	14.0	22.2
8.0	14.5	23.7
8.0	15.0	25.2
8.0	15.5	26.7
8.0	16.0	28.3
8.0	16.5	29.9
8.0	17.0	31.6
8.0	17.5	33.3
8.0	18.0	35.1
8.0	18.5	36.9
8.0	19.0	38.7
8.0	19.5	40.6
8.0	20.0	42.5
8.0	20.5	44.5
8.0	21.0	46.5
8.0	21.5	48.5
8.0	22.0	50.6
8.0	22.5	52.7
8.0	23.0	54.8
8.0	23.5	57.0
8.0	24.0	59.3
8.0	24.5	61.5
8.0	25.0	63.8
8.0	25.5	66.2
8.0	26.0	68.6
8.0	26.5	71.0
8.0	27.0	73.5
8.0	27.5	76.0

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
8.5	9.0	9.4
8.5	9.5	10.4
8.5	10.0	11.4
8.5	10.5	12.5
8.5	11.0	13.6
8.5	11.5	14.7
8.5	12.0	15.9
8.5	12.5	17.2
8.5	13.0	18.4
8.5	13.5	19.8
8.5	14.0	21.1
8.5	14.5	22.5
8.5	15.0	23.9
8.5	15.5	25.4
8.5	16.0	26.9
8.5	16.5	28.5
8.5	17.0	30.1
8.5	17.5	31.7
8.5	18.0	33.4
8.5	18.5	35.1
8.5	19.0	36.8
8.5	19.5	38.6
8.5	20.0	40.4
8.5	20.5	42.3
8.5	21.0	44.2
8.5	21.5	46.1
8.5	22.0	48.1
8.5	22.5	50.1
8.5	23.0	52.2
8.5	23.5	54.3
8.5	24.0	56.4
8.5	24.5	58.5
8.5	25.0	60.7
8.5	25.5	63.0
8.5	26.0	65.2
8.5	26.5	67.5
8.5	27.0	69.9
8.5	27.5	72.3
8.5	28.0	74.7

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
9.0	9.5	9.9
9.0	10.0	10.9
9.0	10.5	11.9
9.0	11.0	13.0
9.0	11.5	14.1
9.0	12.0	15.2
9.0	12.5	16.4
9.0	13.0	17.6
9.0	13.5	18.8
9.0	14.0	20.1
9.0	14.5	21.5
9.0	15.0	22.8
9.0	15.5	24.2
9.0	16.0	25.7
9.0	16.5	27.2
9.0	17.0	28.7
9.0	17.5	30.2
9.0	18.0	31.8
9.0	18.5	33.5
9.0	19.0	35.1
9.0	19.5	36.8
9.0	20.0	38.6
9.0	20.5	40.4
9.0	21.0	42.2
9.0	21.5	44.0
9.0	22.0	45.9
9.0	22.5	47.8
9.0	23.0	49.8
9.0	23.5	51.8
9.0	24.0	53.8
9.0	24.5	55.9
9.0	25.0	57.9
9.0	25.5	60.1
9.0	26.0	62.2
9.0	26.5	64.4
9.0	27.0	66.7
9.0	27.5	68.9
9.0	28.0	71.2
9.0	28.5	73.6

DETERMINING THE VALUE OF d(3)

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
9.5	10.0	10.4
9.5	10.5	11.4
9.5	11.0	12.4
9.5	11.5	13.5
9.5	12.0	14.5
9.5	12.5	15.7
9.5	13.0	16.8
9.5	13.5	18.0
9.5	14.0	19.3
9.5	14.5	20.5
9.5	15.0	21.8
9.5	15.5	23.2
9.5	16.0	24.6
9.5	16.5	26.0
9.5	17.0	27.4
9.5	17.5	28.9
9.5	18.0	30.5
9.5	18.5	32.0
9.5	19.0	33.6
9.5	19.5	35.2
9.5	20.0	36.9
9.5	20.5	38.6
9.5	21.0	40.3
9.5	21.5	42.1
9.5	22.0	43.9
9.5	22.5	45.7
9.5	23.0	47.6
9.5	23.5	49.5
9.5	24.0	51.4
9.5	24.5	53.4
9.5	25.0	55.4
9.5	25.5	57.5
9.5	26.0	59.5
9.5	26.5	61.6
9.5	27.0	63.8
9.5	27.5	65.9
9.5	28.0	68.1
9.5	28.5	70.4
9.5	29.0	72.6

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
10.0	10.5	10.9
10.0	11.0	11.9
10.0	11.5	12.9
10.0	12.0	13.9
10.0	12.5	15.0
10.0	13.0	16.1
10.0	13.5	17.3
10.0	14.0	18.5
10.0	14.5	19.7
10.0	15.0	20.9
10.0	15.5	22.2
10.0	16.0	23.6
10.0	16.5	24.9
10.0	17.0	26.3
10.0	17.5	27.7
10.0	18.0	29.2
10.0	18.5	30.7
10.0	19.0	32.2
10.0	19.5	33.8
10.0	20.0	35.4
10.0	20.5	37.0
10.0	21.0	38.7
10.0	21.5	40.4
10.0	22.0	42.1
10.0	22.5	43.8
10.0	23.0	45.6
10.0	23.5	47.5
10.0	24.0	49.3
10.0	24.5	51.2
10.0	25.0	53.1
10.0	25.5	55.1
10.0	26.0	57.1
10.0	26.5	59.1
10.0	27.0	61.1
10.0	27.5	63.2
10.0	28.0	65.3
10.0	28.5	67.5
10.0	29.0	69.6
10.0	29.5	71.8

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
10.5	11.0	11.4
10.5	11.5	12.4
10.5	12.0	13.4
10.5	12.5	14.4
10.5	13.0	15.5
10.5	13.5	16.6
10.5	14.0	17.7
10.5	14.5	18.9
10.5	15.0	20.1
10.5	15.5	21.4
10.5	16.0	22.6
10.5	16.5	23.9
10.5	17.0	25.3
10.5	17.5	26.6
10.5	18.0	28.0
10.5	18.5	29.5
10.5	19.0	31.0
10.5	19.5	32.5
10.5	20.0	34.0
10.5	20.5	35.5
10.5	21.0	37.1
10.5	21.5	38.8
10.5	22.0	40.4
10.5	22.5	42.1
10.5	23.0	43.8
10.5	23.5	45.6
10.5	24.0	47.4
10.5	24.5	49.2
10.5	25.0	51.0
10.5	25.5	52.9
10.5	26.0	54.8
10.5	26.5	56.8
10.5	27.0	58.7
10.5	27.5	60.7
10.5	28.0	62.8
10.5	28.5	64.8
10.5	29.0	66.9
10.5	29.5	69.0
10.5	30.0	71.2

DETERMINING THE VALUE OF d(3)

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
11.0	11.5	11.9
11.0	12.0	12.9
11.0	12.5	13.9
11.0	13.0	14.9
11.0	13.5	16.0
11.0	14.0	17.1
11.0	14.5	18.2
11.0	15.0	19.4
11.0	15.5	20.6
11.0	16.0	21.8
11.0	16.5	23.0
11.0	17.0	24.3
11.0	17.5	25.6
11.0	18.0	27.0
11.0	18.5	28.4
11.0	19.0	29.8
11.0	19.5	31.2
11.0	20.0	32.7
11.0	20.5	34.2
11.0	21.0	35.8
11.0	21.5	37.3
11.0	22.0	38.9
11.0	22.5	40.5
11.0	23.0	42.2
11.0	23.5	43.9
11.0	24.0	45.6
11.0	24.5	47.3
11.0	25.0	49.1
11.0	25.5	50.9
11.0	26.0	52.8
11.0	26.5	54.6
11.0	27.0	56.5
11.0	27.5	58.4
11.0	28.0	60.4
11.0	28.5	62.4
11.0	29.0	64.4
11.0	29.5	66.4
11.0	30.0	68.5
11.0	30.5	70.6

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
11.5	12.0	12.4
11.5	12.5	13.4
11.5	13.0	14.4
11.5	13.5	15.4
11.5	14.0	16.5
11.5	14.5	17.5
11.5	15.0	18.7
11.5	15.5	19.8
11.5	16.0	21.0
11.5	16.5	22.2
11.5	17.0	23.4
11.5	17.5	24.7
11.5	18.0	26.0
11.5	18.5	27.4
11.5	19.0	28.7
11.5	19.5	30.1
11.5	20.0	31.5
11.5	20.5	33.0
11.5	21.0	34.5
11.5	21.5	36.0
11.5	22.0	37.5
11.5	22.5	39.1
11.5	23.0	40.7
11.5	23.5	42.3
11.5	24.0	44.0
11.5	24.5	45.6
11.5	25.0	47.4
11.5	25.5	49.1
11.5	26.0	50.9
11.5	26.5	52.7
11.5	27.0	54.5
11.5	27.5	56.3
11.5	28.0	58.2
11.5	28.5	60.1
11.5	29.0	62.1
11.5	29.5	64.0
11.5	30.0	66.0
11.5	30.5	68.1
11.5	31.0	70.1

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
12.0	12.5	12.9
12.0	13.0	13.9
12.0	13.5	14.9
12.0	14.0	15.9
12.0	14.5	16.9
12.0	15.0	18.0
12.0	15.5	19.1
12.0	16.0	20.3
12.0	16.5	21.4
12.0	17.0	22.6
12.0	17.5	23.9
12.0	18.0	25.1
12.0	18.5	26.4
12.0	19.0	27.7
12.0	19.5	29.1
12.0	20.0	30.4
12.0	20.5	31.9
12.0	21.0	33.3
12.0	21.5	34.7
12.0	22.0	36.2
12.0	22.5	37.7
12.0	23.0	39.3
12.0	23.5	40.9
12.0	24.0	42.5
12.0	24.5	44.1
12.0	25.0	45.7
12.0	25.5	47.4
12.0	26.0	49.1
12.0	26.5	50.9
12.0	27.0	52.6
12.0	27.5	54.4
12.0	28.0	56.2
12.0	28.5	58.1
12.0	29.0	59.9
12.0	29.5	61.8
12.0	30.0	63.8
12.0	30.5	65.7
12.0	31.0	67.7
12.0	31.5	69.7

DETERMINING THE VALUE OF d(3)

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
12.5	13.0	13.4
12.5	13.5	14.4
12.5	14.0	15.4
12.5	14.5	16.4
12.5	15.0	17.4
12.5	15.5	18.5
12.5	16.0	19.6
12.5	16.5	20.7
12.5	17.0	21.9
12.5	17.5	23.1
12.5	18.0	24.3
12.5	18.5	25.5
12.5	19.0	26.8
12.5	19.5	28.1
12.5	20.0	29.4
12.5	20.5	30.8
12.5	21.0	32.2
12.5	21.5	33.6
12.5	22.0	35.0
12.5	22.5	36.5
12.5	23.0	38.0
12.5	23.5	39.5
12.5	24.0	41.1
12.5	24.5	42.6
12.5	25.0	44.2
12.5	25.5	45.8
12.5	26.0	47.5
12.5	26.5	49.2
12.5	27.0	50.9
12.5	27.5	52.6
12.5	28.0	54.4
12.5	28.5	56.2
12.5	29.0	58.0
12.5	29.5	59.8
12.5	30.0	61.7
12.5	30.5	63.5
12.5	31.0	65.5
12.5	31.5	67.4
12.5	32.0	69.4

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
13.0	13.5	13.9
13.0	14.0	14.9
13.0	14.5	15.9
13.0	15.0	16.9
13.0	15.5	17.9
13.0	16.0	19.0
13.0	16.5	20.1
13.0	17.0	21.2
13.0	17.5	22.3
13.0	18.0	23.5
13.0	18.5	24.7
13.0	19.0	26.0
13.0	19.5	27.2
13.0	20.0	28.5
13.0	20.5	29.8
13.0	21.0	31.2
13.0	21.5	32.5
13.0	22.0	33.9
13.0	22.5	35.3
13.0	23.0	36.8
13.0	23.5	38.3
13.0	24.0	39.7
13.0	24.5	41.3
13.0	25.0	42.8
13.0	25.5	44.4
13.0	26.0	46.0
13.0	26.5	47.6
13.0	27.0	49.3
13.0	27.5	50.9
13.0	28.0	52.6
13.0	28.5	54.4
13.0	29.0	56.1
13.0	29.5	57.9
13.0	30.0	59.7
13.0	30.5	61.5
13.0	31.0	63.4
13.0	31.5	65.2
13.0	32.0	67.1
13.0	32.5	69.1

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
13.5	14.0	14.4
13.5	14.5	15.4
13.5	15.0	16.4
13.5	15.5	17.4
13.5	16.0	18.4
13.5	16.5	19.5
13.5	17.0	20.6
13.5	17.5	21.7
13.5	18.0	22.8
13.5	18.5	24.0
13.5	19.0	25.2
13.5	19.5	26.4
13.5	20.0	27.6
13.5	20.5	28.9
13.5	21.0	30.2
13.5	21.5	31.5
13.5	22.0	32.9
13.5	22.5	34.3
13.5	23.0	35.7
13.5	23.5	37.1
13.5	24.0	38.5
13.5	24.5	40.0
13.5	25.0	41.5
13.5	25.5	43.0
13.5	26.0	44.6
13.5	26.5	46.2
13.5	27.0	47.8
13.5	27.5	49.4
13.5	28.0	51.0
13.5	28.5	52.7
13.5	29.0	54.4
13.5	29.5	56.1
13.5	30.0	57.9
13.5	30.5	59.6
13.5	31.0	61.4
13.5	31.5	63.3
13.5	32.0	65.1
13.5	32.5	67.0
13.5	33.0	68.9

DETERMINING THE VALUE OF d(3)

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
14.0	14.5	14.9
14.0	15.0	15.9
14.0	15.5	16.9
14.0	16.0	17.9
14.0	16.5	18.9
14.0	17.0	19.9
14.0	17.5	21.0
14.0	18.0	22.1
14.0	18.5	23.3
14.0	19.0	24.4
14.0	19.5	25.6
14.0	20.0	26.8
14.0	20.5	28.1
14.0	21.0	29.3
14.0	21.5	30.6
14.0	22.0	31.9
14.0	22.5	33.2
14.0	23.0	34.6
14.0	23.5	36.0
14.0	24.0	37.4
14.0	24.5	38.8
14.0	25.0	40.3
14.0	25.5	41.8
14.0	26.0	43.3
14.0	26.5	44.8
14.0	27.0	46.4
14.0	27.5	47.9
14.0	28.0	49.5
14.0	28.5	51.2
14.0	29.0	52.8
14.0	29.5	54.5
14.0	30.0	56.2
14.0	30.5	57.9
14.0	31.0	59.6
14.0	31.5	61.4
14.0	32.0	63.2
14.0	32.5	65.0
14.0	33.0	66.8
14.0	33.5	68.7

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
14.5	15.0	15.4
14.5	15.5	16.4
14.5	16.0	17.3
14.5	16.5	18.4
14.5	17.0	19.4
14.5	17.5	20.4
14.5	18.0	21.5
14.5	18.5	22.6
14.5	19.0	23.7
14.5	19.5	24.9
14.5	20.0	26.1
14.5	20.5	27.3
14.5	21.0	28.5
14.5	21.5	29.7
14.5	22.0	31.0
14.5	22.5	32.3
14.5	23.0	33.6
14.5	23.5	35.0
14.5	24.0	36.3
14.5	24.5	37.7
14.5	25.0	39.1
14.5	25.5	40.6
14.5	26.0	42.0
14.5	26.5	43.5
14.5	27.0	45.0
14.5	27.5	46.6
14.5	28.0	48.1
14.5	28.5	49.7
14.5	29.0	51.3
14.5	29.5	52.9
14.5	30.0	54.6
14.5	30.5	56.2
14.5	31.0	57.9
14.5	31.5	59.6
14.5	32.0	61.4
14.5	32.5	63.1
14.5	33.0	64.9
14.5	33.5	66.7
14.5	34.0	68.6

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
15.0	15.5	15.9
15.0	16.0	16.9
15.0	16.5	17.8
15.0	17.0	18.8
15.0	17.5	19.9
15.0	18.0	20.9
15.0	18.5	22.0
15.0	19.0	23.1
15.0	19.5	24.2
15.0	20.0	25.3
15.0	20.5	26.5
15.0	21.0	27.7
15.0	21.5	28.9
15.0	22.0	30.1
15.0	22.5	31.4
15.0	23.0	32.7
15.0	23.5	34.0
15.0	24.0	35.3
15.0	24.5	36.7
15.0	25.0	38.1
15.0	25.5	39.5
15.0	26.0	40.9
15.0	26.5	42.3
15.0	27.0	43.8
15.0	27.5	45.3
15.0	28.0	46.8
15.0	28.5	48.3
15.0	29.0	49.9
15.0	29.5	51.5
15.0	30.0	53.1
15.0	30.5	54.7
15.0	31.0	56.3
15.0	31.5	58.0
15.0	32.0	59.7
15.0	32.5	61.4
15.0	33.0	63.1
15.0	33.5	64.9
15.0	34.0	66.7
15.0	34.5	68.5

DETERMINING THE VALUE OF d(3)

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
15.5	16.0	16.4
15.5	16.5	17.4
15.5	17.0	18.3
15.5	17.5	19.3
15.5	18.0	20.4
15.5	18.5	21.4
15.5	19.0	22.5
15.5	19.5	23.6
15.5	20.0	24.7
15.5	20.5	25.8
15.5	21.0	27.0
15.5	21.5	28.1
15.5	22.0	29.3
15.5	22.5	30.6
15.5	23.0	31.8
15.5	23.5	33.1
15.5	24.0	34.4
15.5	24.5	35.7
15.5	25.0	37.0
15.5	25.5	38.4
15.5	26.0	39.8
15.5	26.5	41.2
15.5	27.0	42.6
15.5	27.5	44.1
15.5	28.0	45.5
15.5	28.5	47.0
15.5	29.0	48.6
15.5	29.5	50.1
15.5	30.0	51.7
15.5	30.5	53.2
15.5	31.0	54.8
15.5	31.5	56.5
15.5	32.0	58.1
15.5	32.5	59.8
15.5	33.0	61.5
15.5	33.5	63.2
15.5	34.0	64.9
15.5	34.5	66.6
15.5	35.0	68.4

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
16.0	16.5	16.9
16.0	17.0	17.9
16.0	17.5	18.8
16.0	18.0	19.8
16.0	18.5	20.8
16.0	19.0	21.9
16.0	19.5	22.9
16.0	20.0	24.0
16.0	20.5	25.1
16.0	21.0	26.3
16.0	21.5	27.4
16.0	22.0	28.6
16.0	22.5	29.8
16.0	23.0	31.0
16.0	23.5	32.2
16.0	24.0	33.5
16.0	24.5	34.8
16.0	25.0	36.1
16.0	25.5	37.4
16.0	26.0	38.8
16.0	26.5	40.1
16.0	27.0	41.5
16.0	27.5	42.9
16.0	28.0	44.4
16.0	28.5	45.8
16.0	29.0	47.3
16.0	29.5	48.8
16.0	30.0	50.3
16.0	30.5	51.9
16.0	31.0	53.4
16.0	31.5	55.0
16.0	32.0	56.6
16.0	32.5	58.2
16.0	33.0	59.9
16.0	33.5	61.5
16.0	34.0	63.2
16.0	34.5	64.9
16.0	35.0	66.6
16.0	35.5	68.4

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
16.5	17.0	17.4
16.5	17.5	18.4
16.5	18.0	19.3
16.5	18.5	20.3
16.5	19.0	21.3
16.5	19.5	22.4
16.5	20.0	23.4
16.5	20.5	24.5
16.5	21.0	25.6
16.5	21.5	26.7
16.5	22.0	27.9
16.5	22.5	29.0
16.5	23.0	30.2
16.5	23.5	31.4
16.5	24.0	32.7
16.5	24.5	33.9
16.5	25.0	35.2
16.5	25.5	36.5
16.5	26.0	37.8
16.5	26.5	39.1
16.5	27.0	40.5
16.5	27.5	41.9
16.5	28.0	43.3
16.5	28.5	44.7
16.5	29.0	46.1
16.5	29.5	47.6
16.5	30.0	49.1
16.5	30.5	50.6
16.5	31.0	52.1
16.5	31.5	53.6
16.5	32.0	55.2
16.5	32.5	56.8
16.5	33.0	58.4
16.5	33.5	60.0
16.5	34.0	61.6
16.5	34.5	63.3
16.5	35.0	65.0
16.5	35.5	66.7
16.5	36.0	68.4

DETERMINING THE VALUE OF d(3)

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
17.0	17.5	17.9
17.0	18.0	18.9
17.0	18.5	19.8
17.0	19.0	20.8
17.0	19.5	21.8
17.0	20.0	22.9
17.0	20.5	23.9
17.0	21.0	25.0
17.0	21.5	26.1
17.0	22.0	27.2
17.0	22.5	28.3
17.0	23.0	29.5
17.0	23.5	30.7
17.0	24.0	31.9
17.0	24.5	33.1
17.0	25.0	34.3
17.0	25.5	35.6
17.0	26.0	36.9
17.0	26.5	38.2
17.0	27.0	39.5
17.0	27.5	40.9
17.0	28.0	42.2
17.0	28.5	43.6
17.0	29.0	45.0
17.0	29.5	46.4
17.0	30.0	47.9
17.0	30.5	49.3
17.0	31.0	50.8
17.0	31.5	52.3
17.0	32.0	53.8
17.0	32.5	55.4
17.0	33.0	57.0
17.0	33.5	58.5
17.0	34.0	60.1
17.0	34.5	61.8
17.0	35.0	63.4
17.0	35.5	65.1
17.0	36.0	66.7
17.0	36.5	68.4

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
17.5	18.0	18.4
17.5	18.5	19.4
17.5	19.0	20.3
17.5	19.5	21.3
17.5	20.0	22.3
17.5	20.5	23.4
17.5	21.0	24.4
17.5	21.5	25.5
17.5	22.0	26.6
17.5	22.5	27.7
17.5	23.0	28.8
17.5	23.5	30.0
17.5	24.0	31.1
17.5	24.5	32.3
17.5	25.0	33.5
17.5	25.5	34.8
17.5	26.0	36.0
17.5	26.5	37.3
17.5	27.0	38.6
17.5	27.5	39.9
17.5	28.0	41.2
17.5	28.5	42.6
17.5	29.0	43.9
17.5	29.5	45.3
17.5	30.0	46.7
17.5	30.5	48.2
17.5	31.0	49.6
17.5	31.5	51.1
17.5	32.0	52.6
17.5	32.5	54.1
17.5	33.0	55.6
17.5	33.5	57.2
17.5	34.0	58.7
17.5	34.5	60.3
17.5	35.0	61.9
17.5	35.5	63.5
17.5	36.0	65.2
17.5	36.5	66.8
17.5	37.0	68.5

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
18.0	18.5	18.9
18.0	19.0	19.9
18.0	19.5	20.8
18.0	20.0	21.8
18.0	20.5	22.8
18.0	21.0	23.8
18.0	21.5	24.9
18.0	22.0	25.9
18.0	22.5	27.0
18.0	23.0	28.1
18.0	23.5	29.3
18.0	24.0	30.4
18.0	24.5	31.6
18.0	25.0	32.8
18.0	25.5	34.0
18.0	26.0	35.2
18.0	26.5	36.4
18.0	27.0	37.7
18.0	27.5	39.0
18.0	28.0	40.3
18.0	28.5	41.6
18.0	29.0	42.9
18.0	29.5	44.3
18.0	30.0	45.7
18.0	30.5	47.1
18.0	31.0	48.5
18.0	31.5	49.9
18.0	32.0	51.4
18.0	32.5	52.8
18.0	33.0	54.3
18.0	33.5	55.8
18.0	34.0	57.4
18.0	34.5	58.9
18.0	35.0	60.5
18.0	35.5	62.1
18.0	36.0	63.7
18.0	36.5	65.3
18.0	37.0	66.9
18.0	37.5	68.6

DETERMINING THE VALUE OF d(3)

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
18.5	19.0	19.4
18.5	19.5	20.4
18.5	20.0	21.3
18.5	20.5	22.3
18.5	21.0	23.3
18.5	21.5	24.3
18.5	22.0	25.4
18.5	22.5	26.4
18.5	23.0	27.5
18.5	23.5	28.6
18.5	24.0	29.7
18.5	24.5	30.9
18.5	25.0	32.0
18.5	25.5	33.2
18.5	26.0	34.4
18.5	26.5	35.6
18.5	27.0	36.9
18.5	27.5	38.1
18.5	28.0	39.4
18.5	28.5	40.7
18.5	29.0	42.0
18.5	29.5	43.3
18.5	30.0	44.7
18.5	30.5	46.0
18.5	31.0	47.4
18.5	31.5	48.8
18.5	32.0	50.2
18.5	32.5	51.7
18.5	33.0	53.1
18.5	33.5	54.6
18.5	34.0	56.1
18.5	34.5	57.6
18.5	35.0	59.1
18.5	35.5	60.7
18.5	36.0	62.3
18.5	36.5	63.8
18.5	37.0	65.4
18.5	37.5	67.1
18.5	38.0	68.7

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
19.0	19.5	19.9
19.0	20.0	20.9
19.0	20.5	21.8
19.0	21.0	22.8
19.0	21.5	23.8
19.0	22.0	24.8
19.0	22.5	25.9
19.0	23.0	26.9
19.0	23.5	28.0
19.0	24.0	29.1
19.0	24.5	30.2
19.0	25.0	31.3
19.0	25.5	32.5
19.0	26.0	33.7
19.0	26.5	34.8
19.0	27.0	36.1
19.0	27.5	37.3
19.0	28.0	38.5
19.0	28.5	39.8
19.0	29.0	41.1
19.0	29.5	42.4
19.0	30.0	43.7
19.0	30.5	45.0
19.0	31.0	46.4
19.0	31.5	47.7
19.0	32.0	49.1
19.0	32.5	50.5
19.0	33.0	52.0
19.0	33.5	53.4
19.0	34.0	54.9
19.0	34.5	56.4
19.0	35.0	57.9
19.0	35.5	59.4
19.0	36.0	60.9
19.0	36.5	62.5
19.0	37.0	64.0
19.0	37.5	65.6
19.0	38.0	67.2
19.0	38.5	68.8

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
19.5	20.0	20.4
19.5	20.5	21.4
19.5	21.0	22.3
19.5	21.5	23.3
19.5	22.0	24.3
19.5	22.5	25.3
19.5	23.0	26.3
19.5	23.5	27.4
19.5	24.0	28.5
19.5	24.5	29.6
19.5	25.0	30.7
19.5	25.5	31.8
19.5	26.0	32.9
19.5	26.5	34.1
19.5	27.0	35.3
19.5	27.5	36.5
19.5	28.0	37.7
19.5	28.5	38.9
19.5	29.0	40.2
19.5	29.5	41.5
19.5	30.0	42.8
19.5	30.5	44.1
19.5	31.0	45.4
19.5	31.5	46.7
19.5	32.0	48.1
19.5	32.5	49.5
19.5	33.0	50.9
19.5	33.5	52.3
19.5	34.0	53.7
19.5	34.5	55.2
19.5	35.0	56.6
19.5	35.5	58.1
19.5	36.0	59.6
19.5	36.5	61.1
19.5	37.0	62.7
19.5	37.5	64.2
19.5	38.0	65.8
19.5	38.5	67.4
19.5	39.0	69.0

DETERMINING THE VALUE OF d(3)

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
20.0	20.5	20.9
20.0	21.0	21.9
20.0	21.5	22.8
20.0	22.0	23.8
20.0	22.5	24.8
20.0	23.0	25.8
20.0	23.5	26.8
20.0	24.0	27.9
20.0	24.5	29.0
20.0	25.0	30.0
20.0	25.5	31.1
20.0	26.0	32.3
20.0	26.5	33.4
20.0	27.0	34.6
20.0	27.5	35.7
20.0	28.0	36.9
20.0	28.5	38.1
20.0	29.0	39.4
20.0	29.5	40.6
20.0	30.0	41.9
20.0	30.5	43.2
20.0	31.0	44.5
20.0	31.5	45.8
20.0	32.0	47.1
20.0	32.5	48.5
20.0	33.0	49.8
20.0	33.5	51.2
20.0	34.0	52.6
20.0	34.5	54.0
20.0	35.0	55.5
20.0	35.5	56.9
20.0	36.0	58.4
20.0	36.5	59.9
20.0	37.0	61.4
20.0	37.5	62.9
20.0	38.0	64.4
20.0	38.5	66.0
20.0	39.0	67.6
20.0	39.5	69.2

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
20.5	21.0	21.4
20.5	21.5	22.4
20.5	22.0	23.3
20.5	22.5	24.3
20.5	23.0	25.3
20.5	23.5	26.3
20.5	24.0	27.3
20.5	24.5	28.4
20.5	25.0	29.4
20.5	25.5	30.5
20.5	26.0	31.6
20.5	26.5	32.7
20.5	27.0	33.9
20.5	27.5	35.0
20.5	28.0	36.2
20.5	28.5	37.4
20.5	29.0	38.6
20.5	29.5	39.8
20.5	30.0	41.0
20.5	30.5	42.3
20.5	31.0	43.6
20.5	31.5	44.9
20.5	32.0	46.2
20.5	32.5	47.5
20.5	33.0	48.8
20.5	33.5	50.2
20.5	34.0	51.6
20.5	34.5	52.9
20.5	35.0	54.4
20.5	35.5	55.8
20.5	36.0	57.2
20.5	36.5	58.7
20.5	37.0	60.1
20.5	37.5	61.6
20.5	38.0	63.1
20.5	38.5	64.7
20.5	39.0	66.2
20.5	39.5	67.8
20.5	40.0	69.3

(d1)	(d2)	(d3)
500 uR/hr	20 uR/hr	0.4 uR/hr
21.0	21.5	21.9
21.0	22.0	22.9
21.0	22.5	23.8
21.0	23.0	24.8
21.0	23.5	25.8
21.0	24.0	26.8
21.0	24.5	27.8
21.0	25.0	28.9
21.0	25.5	29.9
21.0	26.0	31.0
21.0	26.5	32.1
21.0	27.0	33.2
21.0	27.5	34.3
21.0	28.0	35.5
21.0	28.5	36.6
21.0	29.0	37.8
21.0	29.5	39.0
21.0	30.0	40.2
21.0	30.5	41.5
21.0	31.0	42.7
21.0	31.5	44.0
21.0	32.0	45.3
21.0	32.5	46.6
21.0	33.0	47.9
21.0	33.5	49.2
21.0	34.0	50.5
21.0	34.5	51.9
21.0	35.0	53.3
21.0	35.5	54.7
21.0	36.0	56.1
21.0	36.5	57.5
21.0	37.0	59.0
21.0	37.5	60.4
21.0	38.0	61.9
21.0	38.5	63.4
21.0	39.0	64.9
21.0	39.5	66.4
21.0	40.0	68.0
21.0	40.5	69.5

ISOPLETH SURVEY LOG

Page _ of _

LOCATION (Grid coordinates/Landmarks)		TIME 24 hr. clock	LAT/LONG		μR/hr @ 1 meter	REMARKS Indicate environmental, special conditions, or other pertinent data
Field Team Number	Location					

Field Team DispatcherDate_____

FOOD CONTROL AREA
PROTECTIVE ACTION RECOMMENDATION

☐Washington ☐Oregon

☐ Establish or reduce the Food Control Area boundary in accordance with the attached map.

☐ Establish or modify food control points around the Food Control Area.

☐ Restrict Agricultural products from leaving the food control boundary until they are sampled and determined to be below protective action guidelines.

☐ Advise farms and dairies to place or maintain all milk producing animals and livestock on stored feed and covered water.

☐ Advise residents within the food control boundary to:

☐ 1. Drink only bottled water or water from covered sources.

☐ 2. Not consume milk or produce from their family farm or garden until monitoring can be done.

☐ Rescind the Food Control PAR.

ther:

_____

_____

_____

_____

Approved by: PADG Chairperson/Dose Assessment Coordinator _____

Concurred by: WA State Health Liaison _____

Concurred by: OR Senior State Official _____
(only if Oregon box above is checked)

Attachment 8.7

REOPENING OF THE TRANSPORTATION CORRIDOR RECOMMENDATION

Date _____ Time _____

The following modifications to the existing Transportation Corridor PAR are recommended to the State of Washington:

Airspace

☐ Reopen all airspace to unrestricted use, if applicable. Confer with the REM for this information, as needed.

Columbia River

☐ Reopen the Columbia River to unrestricted use.

☐ Reopen the Columbia River to restricted use, as follows:

☐ Commercial or private boats moored within the relocation zone are surveyed prior to leaving and any contamination found is less than 1,000 dpm/100cm^2, if applicable.

☐ Commercial ships and private boats are advised to navigate the river through the relocation area without docking or disembarking.

☐ Other:_____

_____

_____

_____

Highways

☐ Reopen the following highways to unrestricted use:

☐ Reopen the following highways to restricted use:_____

_____

_____

_____

☐ Barricade and post all exits within the relocation area to prohibit stopping or exiting to secondary roads.

Approved by: PADG Chairperson/Dose Assessment Coordinator _____

Concurred by: WA State Health Liaison _____

Attachment 8.8

INTERIM SAMPLING PLAN

Date:Time:Date Time

Field Team Name	GENERAL LOCATION: Grid Coordinates geographical landmarks Latitude & Longitude	Sampling Instructions General: General Area dose rates, general deposition readings, deposition in soil, deposition on pasture grass, re-suspension, hot spots and other areas of concern.

Dispatched:_____ _____/_____

Field Team Coordinator Date / Time

Attachment 8.9

Revision #:_____

DETAILED SAMPLING PLAN

Date: Time: Page of

Field Team Name	SPECIFIC LOCATION: (Street Address, Grid Coordinates, landmarks, Latitude & Longitude)	Sample Types						Priority
		Grass	Soil	Water	Milk	Air	Other	

Approved:_____
PADG Chairperson

Dispatched:_____ _____/_____
Field Team Coordinator Date / Time

Concurred by:_____
WA State Health Liaison

Concurred by:_____
OR Senior State Official (If Oregon locations included.)

Attachment 8.10

SAMPLE DATA AND ANALYSIS SUMMARY

DATE:

Page ____ of ____

Map *disk #	Sample ID #	Field Team Name	LOCATION: Grid/landmarks Latitude & Longitude	Sample Types					TIME (Military) Sample Collected	General Area γ Dose Rate (μR/hr)	β,γ Ground Deposition (cpm) (optional)	Ingestion Dose Analysis Limiting DIL Ratio		Relocation Dose Analysis "Groundshine" (REM)		
				Grass	Soil	Water	Milk	Other				Nuclide	DIL Ratio	1st yr	2nd yr	50 yrs

* EOF use only

SDAS.FORM(6/94)

UPDATE BRIEFING GUIDE

A. FREQUENCY

If at all possible, the briefings should be conducted at least every 30 minutes by the Washington State PADG Representative, especially during the most active stages of the event. Then regular briefing intervals should be established and announced.

B. ATTENDANCE

The MUDAC staff members listed below should be requested to provide a short status report on their activities or pertinent events in their areas of responsibility, as applicable.

C. ATTENDEES

- Washington State PADG Representative
- Energy Northwest PADG Representative
- Dept of Energy PADG Representative
- Oregon PADG Representative
- Dose Projection Health Physicist
- Field Team Coordinator

HOT SPOT MANAGEMENT AND CONTROL

If after defining the Relocation Area (RA) boundary and/or the Food Control Area (FCA) boundary, radioactively contaminated areas meeting the definition in 4.9 of this document will be controlled as RA or FCA hot spots. Modification of the 500 microR/hr or FCA isopleth boundaries to incorporate hot spots is the preferred control method. Controlled areas do not have to be gaussian footprints and should evolve and be modified in a strictly empirical manner by grid surveys/samples.

During the Intermediate Phase, the normal field team survey procedure is to monitor readings continuously, at no less than one-half mile increments.

It is recommended that location of all hot spots be completed before beginning individual hot spot area reductions.

For each hot spot, overlay a one mile grid centered on the hot spot:

a. Transfer a 16 by 16 grid (for each square mile) to an appropriate scale map
b. Have the field teams post the area for RA or FCA, as appropriate.
c. Posting density and control should be determined by ease of access by the public.
d. Develop a field control system to manage the elimination of clean areas of approximately 100 meters square by detailed survey.
e. Concentrate hot spot reduction priorities to developed or easily accessible areas. Consider transportation corridors a high priority.

For each hot spot, develop short and long term recommendations for return to use:

a. Perform a detailed sample analysis of each hot spot.
b. Consider whether removal, decay in place, or burial is recommended for the area

For hot spots less than one mile apart, develop the grid pattern to avoid duplicate surveys to eliminate clean areas.

PLOTTING AND TRANSMITTING INGESTION DATA POINTS AND ISOPLETHS

1.0 Start MUDAC 1 computer.

2.0 Log onto the LAN using your own user ID & password.

3.0 Go to "Start" then "Programs" then "Microsoft Office" and select "Excel".

4.0 On a blank spread sheet, type in the latitude, longitude and the radiation readings as they are received from the environmental field teams.

The readings should be in microR.

EXAMPLE:

46 27.673N	119 20.574W	500 microR
46 27.113N	119 20.02W	20 microR
46 26.55N	119 21.553W	20 microR
46 23.1N	119 10.5W	500 microR
46 34.1N	119 22.75W	20 microR

Note the latitude and longitude is written as the field teams transmit it to you; i.e., degrees, then a space, then minutes followed by direction.

5.0 When finished typing in the data from the field team:

1) Save the Excel file:

a. Go to "File", select "Save As"

b. In "FILE NAME" type the date and the sequence number of the data. Example: 1-23-991

c. In "SAVE AS TYPE:" select "TEXT (TAB DELIMITED)"

d. Save the file to "D:\INGEST"

2) Close Excel.

6.0 Open the mapping program by double clicking "Street Atlas USA 6.0" on the desktop.

7.0 Overlay the Excel file on the map.

1) Go to "FILE" and select "IMPORT LAT/LON FILE"

2) Select the text file you saved above in "D:\INGEST"

3) The Field Team LAT/LON data will appear on the map as blue flags. The radiation data will be printed on the map next to the flags.

8.0 Draw the 500 microR isopleth

1) Click on the pencil symbol in the tool bar at the top of the page. A toolbar will appear on the screen.

2) Click and hold the left mouse button down on the symbol in the drawing toolbar that looks like an open triangle.

3) Move the mouse to the first point on the outer boundary 500 microR points and release the left mouse button.

4) Move the mouse to each of the other 500 microR outer boundary points (in sequence) and click once.

5) When finished clicking on each of the outer boundary points, double click, using the left mouse button.

6) Label each isopleth by clicking once on the "Draw Map Note" icon in the drawing toolbox (the icon is a small document with a tail on the lower left side). In the "Map Note Properties" box; type in the name of the isopleth; i.e., 500 microR Isopleth. Set the text to "Very Small" and click on "OK".

7) With the left mouse button, click and hold on the icon, drag the icon to the desired location on the map and release the mouse button.

9.0 Construct the relocation isopleth.

1) Draw an appropriate buffer zone around the 500 microR zone considering wind, stability class, quality of Field Team data, etc., to form the relocation area.

10.0 Print the relocation isopleth

1) Go to "FILE" then select "PRINT CURRENT MAP".

2) Type in the map name; e.g., February 23, 1999 RELOCATION ISOPLETH.

3) Set the scale to approximately 1 inch = 13 miles.

4) Click on "Low Detail".

5) Click on "Print".

6) Give the map to the Dose Assessment Coordinator. The PADG will determine if the isopleth needs to be adjusted.

11.0 Save the relocation isopleth drawing

1) Go to "FILE" and select "SAVE AS"

2) In "FILE NAME" type "LOC" then the month and year.
Example: LOCFEB99

3) The "SAVE AS TYPE" will be "STREET ATLAS USA 6.0 (*.sa6)"

12.0 Minimize the Street Atlas USA program

NOTE: the Dose Assessment Coordinator will prepare the Revised Return PAR and the Relocation Area PAR. When the Coordinator faxes the PARs and the map you provide, email the map to Benton and Franklin County EOCs.

13.0 Call the Benton County EOC (628-0303 or 628-2600) and the Franklin County EOC (545-3546). Let the EOCs know you are sending the isopleth information via email.

14.0 OPEN Outlook

15.0 If you have an existing profile in Outlook, enter your user name. Otherwise, create a new profile:

Close Outlook.
Access the V:\Exchange folder in My Computer.
Double click the "makeprof.bat" file.
Close My Computer.
Open Outlook.
Select OK on the "name cannot be matched" window.
Verify that the Microsoft Exchange server is Server97.

Type your last name ONLY.
Select "check name".
Select the correct name.
Verify that the name and server are both underlined.
Select Apply, and then OK.

16.0 Mail the STREET ATLAS file you created above (*.sa6) to the Benton County EOC and Franklin County EOC.

Benton County:

ops@bces.wa.gov
ag@bces.wa.gov
facility@bces.wa.gov

Franklin County:

eoc@co.franklin.wa.us

Attach the *.sa6 file with the isopleth data.

Write a short note in the email explaining what the file is, who sent it, and a phone number you can be reached at. Include your Energy Northwest email address in the note.

17.0 Construct the food control isopleth

1) If the Relocation Isopleth is still on the map, go to "FILE" and select "NEW". Answer "OK" if the question "Do you want to clear your draw objects" appears on screen.

18.0 Overlay the Excel file on the map

1) Go to "FILE" and select "IMPORT LAT/LON FILE"

2) Select the text file you saved in "D:\INGEST"

3) The Field Team LAT/LON data will appear on the map as blue flags. The radiation data will be printed on the map next to the flags.

4) Click on the pencil symbol in the tool bar at the top of the page. A toolbar will appear on the screen.

5) Click and hold the left mouse button down on the symbol in the drawing toolbar that looks like an open triangle.

6) Move the mouse to the first point on the outer boundary 20 mircoR points and release the left mouse button.

7) Move the mouse to each of the other 20 microR outer boundary points (in sequence) and click once.

8) When finished clicking on each of the outer boundary points, double click, using the left mouse button.

19.0 Calculate the Food Control Isopleth

1) Draw a line from Columbia Generating Station to the farthest point on the 20 microR footprint.

2) Click and hold the left mouse button down on the symbol in the drawing toolbar that looks like an open triangle.

3) Move the mouse to the plant and release the left mouse button.

4) Move the mouse to the farthest point on the footprint and click the left button.

5) Draw two additional lines, one to each side of the first line, to the edge of the footprint.

6) Determine the distance of the three lines by placing the mouse on each line and clicking the right mouse button. From the menu that appears, select "Properties". That selection will indicate the distance in miles the radial lines extend from the plant.

7) Refer to Attachment 8.5 to determine d3. Note that this applies only to the initial calculations using default values.

8) Extend the radial lines drawn previously to the d3 distances.

9) Draw the Food Control Isopleth using the d3 distances.

DATE: 03/19/01

EDITORIAL

13.10.1

1.0 PURPOSE

To describe the responsibilities of the Shift Manager, Control Room Operators, and Shift Technical Advisor, and actions to be taken in the event it becomes necessary to activate and operate the Control Room as an emergency response facility during an emergency.

2.0 REFERENCES

2.1 10CFR50.72, Immediate Notification Requirements for Operating Nuclear Power Reactors {R-1932}

2.2 10CFR50, Appendix E (IV)(A) {R-5695, R-5708}

2.3 FSAR, Chapter 13.3, Emergency Plan

2.4 Technical Specification 5.1.2 {R1343}

2.5 OER 79071C, Unauthorized Forced Entry into the Protected Area at Three Mile Island Unit 1 on February 7, 1993

2.6 PPM 1.3.1, Operating Policies, Programs, and Practices

2.7 PPM 1.9.14, Onsite Medical Emergencies

2.8 PPM ABN-RAD-CR, Control Room HVAC High Radiation

2.9 PPM 5.7.1, Severe Accident Guidelines

2.10 Technical Memorandum 2117, Technical Support Guidelines for Core Thermal Engineer

2.11 PPM 13.1.1, Classifying the Emergency

2.12 PPM 13.10.2, TSC Manager Duties

2.13 PPM 13.2.1, Emergency Exposure Levels/Protective Action Guides

2.14 PPM 13.2.2, Determining Protective Action Recommendations

2.15 PPM 13.4.1, Emergency Notifications

2.16 PPM 13.5.1, Localized and Protected Area Evacuations

2.17 PPM 13.5.3, Evacuation of Exclusion Area and/or Nearby Facilities

2.18 PPM 13.5.5, Personnel Accountability, Search and Rescue

c) Deliver all After Action Reports to the Operations Manager.

4.2 Control Room Supervisor Actions

4.2.1 Advise the Shift Manager of abnormal conditions and perform duties as directed.

4.2.2 Take actions to terminate the conditions causing the emergency.

4.2.3 Continuously monitor the Control Room habitability in accordance with PPM ABN-RAD-CR.

NOTE: If you initiate PPM ABN-RAD-CR while the TSC is occupied, notify the TSC Manager that an air stagnation condition will exist.

4.2.4 If the TSC is determined to be uninhabitable, initiate TSC isolation actions specified in PPM ABN-RAD-CR.

4.2.5 In the absence of the Shift Manager or higher authority, assume Shift Manager responsibilities, including Emergency Director responsibilities and authority as per Section 4.7. {R1343}

4.2.6 Direct the activities of Control Room Operators and Equipment Operators.

4.2.7 Refer any incoming media calls to the Joint Information Center.

4.3 Control Room Operator Actions

4.3.1 Recognize unusual plant conditions and take necessary actions under direction of Control Room Supervisor and/or Shift manager to terminate the condition causing the emergency.

4.3.2 Keep the Control Room Supervisor informed of unusual conditions.

4.3.3 Refer any incoming media calls to the Joint Information Center.

4.4 Shift Technical Advisor Actions

4.4.1 If an off-normal condition is indicated, or if directed by the Shift Manager, man the duty station in the control room and maintain a log of your actions.

4.4.2 Assist the Shift Manager in evaluating plant conditions relative to preestablished emergency action levels and initiating conditions and in declaring the appropriate emergency classification. Refer to PPM 13.1.1.