Title 118 - NEBRASKA DEPARTMENT OF ENVIRONMENTAL QUALITY

Appendix B - REMEDIAL ACTION PROTOCOL FOR PETROLEUM RELEASES

Procedures for Determining Needed Action for Point Source Pollution Occurrences From Petroleum Releases Using

Risk-Based Corrective Action (RBCA)

## Part I. IMMEDIATE ACTION

### Step 1. Initial Review

An initial review will be performed to determine whether immediate action is needed, and if so, what actions are required. The amount of time spent for this review may range from a field decision requiring only minutes to a more involved office decision taking a few days. The review will be based on as many of the items addressed in Step 6 as possible.

The determination as to whether immediate action is needed may include consideration of at least the following two factors:

1) Existence or likelihood of an imminent and substantial threat to the public health and welfare or the environment

a) imminent - a short time span (i.e., less than 90 days)
b) substantial - a significant impact on the public or environment (e.g., human illness or death, serious financial loss, severe ecological damage)

2) Significantly increasing difficulty of cleanup if action is delayed (e.g., if action delayed, cleanup costs increase by one or two orders of magnitude).

The type and extent of immediate action to be taken will, at a minimum, satisfy the following:

1) eliminate imminence or substantiality of threat

2) result in significantly less cleanup difficulty than if action delayed.

If the need for immediate action is apparent or if the need cannot be readily determined, proceed to Step 2 and work in conjunction with Department's Emergency Response Plan. If at a later time it becomes apparent that immediate action is not needed, proceed to Step 4.

In some cases, it may be obvious that immediate action will not be necessary due to the nature of the pollution occurrence (e.g., developed over many years, moving slowly). If no immediate action is necessary, proceed to Step 4.

### Step 2. Implementation of Immediate Actions

Immediate actions may include cleanup to at least an initial level, stabilization or containment, monitoring, shutdown/termination of facility/activity, or any combination of measures. These actions will be carried out by the responsible party.

Proceed to Step 3.

**Step 3. Evaluation of Immediate Actions**

After immediate action has been taken, a determination will be made as to whether or not it successfully met the requirements of Steps 1 and 2.

If requirements were not met, return to Steps 1 and 2 for reassessment.

If requirements were met, proceed to Step 4.

**Step 4. No Immediate Threat Present**

Immediate action is not now needed, but additional measures for complete and permanent resolution of the problem may be required. Further assessment is necessary to determine the need for any final remedial action.

Proceed to Part II, Step 5.

**Part II. FINAL REMEDIAL ACTION**

Note: If at any time during the Part II assessment an immediate threat is identified, return to Step 1 (Part I).

**Step 5. Preliminary Assessment**

A preliminary assessment will be undertaken to evaluate the possible threat of contamination to soils and ground water and threat to public health and welfare. This assessment is to involve a review of existing information and require the collection of minimal or no field data. If it can be determined by the Department from this preliminary assessment that there is limited soil contamination and no threat of ground water contamination or threat to human health and welfare, proceed to Step 12. If soil contamination is extensive or its extent is unknown or ground water contamination is possible or likely, proceed to Step 6.

**Step 6. RBCA Tier 1 Site Assessment**

If not already known, the Department will identify, if possible, the source(s) of contamination and the responsible party (or parties). The Department will notify the responsible party after the determination has been made. The responsible party will be required to perform the risk-based corrective action (RBCA) Tier 1 site assessment as described in this Step.

The purpose of the site assessment will be to gather information in order to incorporate principles of RBCA into the Department's petroleum release corrective action process. Site assessment data collected will be reported in a format specified by the Department. Site assessment data reported to the Department will include, but not be limited to, the following types of information, as specified by the Department:

1. historical information;

2. site information;

3. contamination characteristics;

4. aquifer characteristics.

The following potential exposure pathways are to be investigated:

1. Dermal contact with and ingestion of chemicals of concern from contaminated surface soils;

2. Enclosed space inhalation of chemicals of concern from contaminated subsurface soils;

3. Leaching of chemicals of concern from contaminated surface and subsurface soils to ground water;

4. Enclosed space inhalation of chemicals of concern from contaminated, shallow ground water; and,

5. Ingestion of chemicals of concern from contaminated ground water.

The Department will specify sampling and analysis requirements. Individual chemicals of concern are designated based on the petroleum product(s) released at the site and include, but are not limited to, the following:

**Light Distillates (e.g., gasoline, JP-4)**

| | |
|---|---|
| Benzene | Total Xylenes |
| Toluene | n-Hexane |
| Ethylbenzene | Methyl tertiary-Butyl Ether (MTBE) |

**Middle Distillates (e.g., diesel fuel, kerosene)**

| | |
|---|---|
| Benzene | Naphthalene |
| Toluene | Pyrene |
| Ethylbenzene | Benzo(a)pyrene (BaP) |
| Total Xylenes | |

**Waste Oil**

| | | |
|---|---|---|
| Benzene | Naphthalene | Chlorinated solvents* |
| Toluene | Pyrene | Metals* |
| Ethylbenzene | BaP | Ethylene glycol* |
| Total Xylenes | | |

*To be determined on a case-by-case basis as directed by the Department. The Department will provide investigative and sampling requirements for these chemicals as needed.

The responsible party will identify land use within 500 feet and all water supply wells within 2000 feet of a source area of contamination.

Before this or any subsequent assessments are started, the responsible party should discuss their plans with the Department to make sure they understand what information must be collected.

Proceed to Step 7.

**Step 7. Evaluation of RBCA Tier 1 Investigation Results**

In evaluating the RBCA Tier 1 investigation results, the contamination levels found during the site investigation will be compared to risk-based screening levels (RBSLs) which will be established by the Department using the following criteria:

1. Remedial Action Classifications.

Most ground water in the principal aquifer (closest underlying major aquifer) is of drinkable quality and is used by nearly all Nebraskans as drinking water. Water of drinking water quality is usually suitable for all other beneficial uses. For these reasons, protecting ground water for drinking water use is most important and normally protects it for all uses. A remedial action class (RAC) is defined for pollution occurrences in three types of ground water (or overlying soils) depending on the degree (or potential) of use of the ground water as drinking water. The extent of remedial action recommended will differ depending on the RAC of the contaminated (or likely to be contaminated) ground water. (Note that the RAC assigned will be determined from the condition of the ground water prior to the pollution occurrence. The Department will do this based on information submitted by the responsible party in the RBCA Tier 1 site assessment and other available information.) Below are definitions of the three RAC categories followed by some further explanation.

RAC-1. This category includes ground waters of Class GA and a portion of Class GB, a 500-foot radius (or greater, if determined necessary by the Department) around all private drinking water supply wells. In addition, RAC-1 shall be automatically assigned anytime a public or private drinking water supply well has been polluted. RAC-1 will usually receive the most extensive remedial action measures.

RAC-2. This category includes ground waters of Class GB (except for the portion of Class GB placed in RAC-1) and Class GC(R).

RAC-3. This category includes, but is not limited to, ground waters of Class GC (except for Class GC(R) which was placed in RAC-2). RAC-3 will usually receive the least extensive remedial action measures.

The RAC categories are not intended to represent a ground water classification system but rather a pollution occurrence ranking scheme. It gives the Department a method to determine the importance of remedial action based on the use of the ground water. For instance RAC-1 is the category of highest rank; it represents that ground water actually being used for drinking water and that ground water intended to be used in a public drinking water supply. Therefore, RAC-1 occurrences will normally receive the most extensive remedial action measures.

RAC-2 occurrences involve ground water not now directly used as drinking water but having a reasonable potential to be used in the future. The potential for use exists if the ground water is located in a highly populated area or is part of a regional, high-yielding aquifer or if otherwise justified. The RAC-2 category also includes ground water with prior contamination that may be easily or cost-effectively treated to drinking water quality.

Pollution occurrences will be of lowest importance, RAC-3, if the ground water involved is not used, or likely to be used, as drinking water. Generally remedial action measures will be least extensive for this category since the future use of ground water for drinking is improbable. Justification for assigning occurrences to RAC-3 will be based on a combination of several different reasons. One reason for unusability is poor natural quality which makes the ground water unfit for human consumption. Insufficient yield is another reason the ground water may

not be used for drinking. A third reason is historical contamination that occurred prior to the pollution event currently being investigated (see NRS § 81-1505(2)(d)). This past contamination may have rendered ground water unsuitable for drinking and uneconomical to treat. Past and present intensive land use is also a reason why ground water could be unusable as drinking water. This includes areas of concentrated industrial development or densely populated areas where ground water is likely to be contaminated or will not be used as drinking water.

The ranking of some occurrences as RAC-3 does not mean there will be places in the State where wholesale contamination of ground water will be allowed. Departmental authority through its various programs to control practices or discharges that may contaminate ground water will still be in effect. RAC-3 occurrences, in general, will be given a lower priority and less staff effort by the Department than RAC-1 or RAC-2 occurrences; however, cleanup of a RAC-3 occurrence may be required due to concerns about enclosed space inhalation exposure pathways and vapors threatening public health and welfare.

RACs were developed primarily for use with the principal aquifer--the ground water commonly used for drinking. They will also be adapted for use with both deeper and perched ground water. When doing so, interconnections with overlying or underlying ground water of different quality will be considered.

Some contamination threats may occur in which the use potential of the ground water would be RAC-1 or RAC-2, but the soil, geology, and other site-specific characteristics are such that ground water contamination is virtually impossible. After an appropriate assessment, the occurrence may be downgraded to RAC-3.

In every ground water contamination occurrence, certain minimum requirements will be imposed upon the responsible party, depending on the RAC. In RAC-1 and RAC-2, cleanup of readily removable contaminants (e.g., free product) will be required. Additional cleanup and/or mitigation may also be required. If additional cleanup is not required, the remaining contaminated ground water will be managed and monitored to prevent any further damage.

In RAC-3, cleanup of readily removable contaminants (e.g., free product) will be required. Additional cleanup of a RAC-3 occurrence may be required due to concerns about enclosed space inhalation exposure pathways and public health and welfare. Monitoring may also be necessary. Because RAC-3 ground water is generally not used for drinking water, the ground water ingestion and soil leaching to ground water pathways are considered to be incomplete in RAC-3 and not subject to this RBCA assessment.

2. Carcinogenic and non-carcinogenic health effects.

A. Carcinogenic effects

Chemical-specific Maximum Contaminant Levels (MCLs) (see Chapter 4) will be used to calculate the appropriate RBSL for a carcinogen for the groundwater ingestion and soil-leaching to groundwater exposure pathways of concern for a RAC-1 release.

An Excess Lifetime Cancer Risk (ELCR) of 10-6 will be used in the calculation of the RBSLs for a carcinogen for the dermal contact/soil ingestion exposure pathway and for inhalation pathways in the presence of subsurface structures for all releases.

An ELCR of 10-5 will be used in the calculation of the RBSLs for a carcinogen for the groundwater ingestion and soil-leaching to groundwater exposure pathways of concern for a RAC-2 release and for the inhalation exposure pathways when no subsurface structures are present for all releases.

B. Non-carcinogenic effects

Chemical-specific MCLs (or a health-based standard where an MCL has not been promulgated for a particular chemical) will be used to calculate the RBSL for a non-carcinogen for the groundwater ingestion and soil-leaching to groundwater exposure pathways of concern for a RAC-1 release.

RBSLs for non-carcinogens for the groundwater ingestion and soil-leaching to groundwater exposure pathways of concern for a RAC-2 release, for the dermal contact/soil ingestion exposure pathway for all releases, and for the enclosed space inhalation pathways for all releases will be established by the Department using the following criteria:

1. exposure pathway;

2. RAC designation;

3. level of exposure based on the ratio of the observed concentration of a chemical of concern to a chemical-specific reference concentration.

For purposes of the RBCA Tier 1 assessment, toluene, ethylbenzene and total xylenes are considered to have additive health effects.

3. Fate and transport models. The Department will select various models and model default values to calculate RBSLs for use in evaluating the RBCA Tier 1 data.

4. Land use. Residential land use refers to the presence of dwellings (e.g., houses, apartments) and sensitive population centers (e.g., schools, daycare centers, hospitals, nursing homes) within 500 feet of a source area. Commercial land use will be any land use not meeting the criteria of residential land use.

5. Location of water supply wells.

6. Other criteria as determined by the Department.

Upon comparing the RBSLs to the actual contamination levels found during the site investigation and consideration of other pertinent factors, the Department will determine if additional remedial actions will be required. If additional remedial actions are not required, proceed to Step 11. Otherwise, proceed to Step 8.

**Step 8. RBCA Tier 2 Site Assessment**

A RBCA Tier 2 site assessment will be performed by the responsible party for those exposure pathways where actual site contamination levels were greater than the Tier 1 RBSLs under Step 7. This investigation will be geared towards defining the extent of contamination from the release and collecting site-specific parameters to use in the Tier 2 evaluation performed under Step 9. Site assessment data collected will be reported in a format specified by the Department. For ground water or soil

contamination occurrences, site assessment data reported to the Department may include, but not be limited to, the following types of information, as specified by the Department:

- soil characteristics - texture, permeability, porosity, thickness, chemical/physical properties of materials (e.g., soil bulk density, fractional organic carbon) from the land surface to the water table

- hydrogeologic characteristics - depth to ground water, direction and rate of ground water flow, permeability, transmissivity, aquifer interconnections, perched ground water, recharge area and rate

- contaminant characteristics - toxicity, health risks, concentration, amount, mobility, areal extent, source characterization

- site characteristics - climate information, topography, accessibility, proximity to water supply well and its recharge area or cone of influence, land use

- background water quality and use - background levels of conventional parameters and additional contaminants of concern, existing or potential use

- background soil quality or use - background levels of conventional parameters and additional contaminants of concern, existing or potential use of soil

The Department may, at any time, request additional information.

Step 9. Evaluation of RBCA Tier 2 Investigation Results, Determination of Site-Specific Target Limits, and Review of Proposed Remedial Actions

In evaluating the RBCA Tier 2 investigation report, the results of the site-specific physical and chemical assessment found during the investigation will be used to establish site-specific target limits (SSTLs) using the same fate and transport models previously used to establish the RBCA Tier 1 RBSLs. The contamination levels found during the investigation will be compared to the SSTLs in a manner similar to that performed for the RBCA Tier 1 evaluation.

Upon comparing the SSTLs to the actual contamination levels found during the site investigation and consideration of other pertinent factors, the Department will determine if additional remedial actions will be required. If additional remedial actions are not required, proceed to Step 11.

The Department will set a preliminary cleanup level for any additional cleanup required. The level will normally be set at the appropriate SSTL(s).

In some cases soil and/or ground water cleanup based on drinking water use may not be sufficient to maintain other beneficial uses or protect human health and welfare. For these instances, preliminary cleanup levels will be based on the level needed to maintain the uses other than drinking water. This may necessitate cleanup even in RAC-3 occurrences. Cleanup of a RAC-3 occurrence may be required due to concerns about enclosed space inhalation exposure pathways and/or fire and explosion. Although the ground water in RAC-3 areas is not used as drinking water, it may serve other important uses (e.g., irrigation, industrial). It may also be necessary to set cleanup levels which protect streams and lakes from a contaminated ground water discharge that would violate surface water standards. Finally, the proximity to RAC-1 or RAC-2 areas, the likelihood of slow but eventual migration to these areas, and the

cumulative effects of a series of contamination events must be considered when setting the preliminary cleanup level for RAC-3.

After the responsible party is notified of the preliminary cleanup level, they have the right to agree or propose an alternate level. If a different cleanup level is proposed, it must be based on a technological, risk, or economic analysis completed by the responsible party. The Department may also propose an alternate level.

The technological analysis will determine if technologies exist to clean up the soil and/or ground water to the preliminary cleanup level. If cleanup to the preliminary level is not technologically possible, the responsible party should report what level of cleanup is attainable. As part of this analysis, the technological feasibility of various mitigative actions (e.g., supplying new sources of water and point-of-use treatment) should be investigated.

The risk analysis may include other factors, information, or evaluations not previously considered. Other ELCR target levels may be considered if appropriate.

In their economic analysis, the responsible party must examine the economics of cleaning up to the preliminary level. If it is impossible to reach the preliminary cleanup level, the responsible party will report what level of cleanup is economically possible. The economic feasibility of mitigation instead of cleanup should also be analyzed.

If cleanup to the preliminary level is not attainable based on one or more of the foregoing analyses, the responsible party will report what portion of the soil and/or ground water will remain contaminated following a lesser degree of cleanup. Given the technological considerations of cleanup, the appropriate calculations should be used in an attempt to define the three-dimensional boundary of the contamination plume under different remedial action scenarios (including no cleanup). The contamination plume, in this case, is defined as soil and/or ground water where the concentrations of identified contaminants exceed their preliminary cleanup levels. For every cleanup scenario assessed, the economic impacts are to be defined. The relationship of the contaminated media (i.e., ground water, soils, soil gas) boundaries to existing users and potential points of exposure must be described.

Justification for an alternate cleanup level, a contamination maintenance program, a mitigation plan, or a combination of these will be submitted to the Department. The Department will consider the information contained in the justification on a case-by-case basis and establish a proposed final cleanup level or action. The level may be the same as the Department's preliminary cleanup level, the same as the responsible party's alternate cleanup level, or some other level.

The time frame for required action (including cleanup) will be the period of potential exposure to the contamination in the absence of any remedial action or 20 years, whichever is less. On a case-by-case basis, a longer period of time may be allowed if adequately justified by the responsible party.

The Department's decision on the remedial action necessary, including the proposed final cleanup level, will be placed on public notice. Any person may submit written comments on the proposed action or may request a hearing.

Following the Department's final decision (including changes made as a result of a hearing), a workplan and schedule for performance of the final remedial action will be prepared by the responsible party. The workplan is subject to the Department's approval.

Proceed to Step 10.

**Step 10. Implementation and Review of Remedial Actions**

The remedial actions approved in the workplan are to be implemented by the responsible party. The responsible party will keep the Department apprised of their cleanup efforts, and the Department will periodically review the effectiveness of the remedial actions. If the long-term needs of protecting the public health and welfare and the environment have not been, or are not being, satisfied or if additional remedial action is necessary, reassess the situation in Steps 8 and 9.

Any request by the responsible party to modify the required final remedial action during the implementation process must be accompanied by additional justification as described in Step 9. The Department may propose modifications to the required final remedial action. If a change is appropriate, a public notice will be issued.

If the remedial action needs have been satisfied, proceed to Step 11.

**Step 11. Final Review**

A final review will be performed by the Department to determine the need for any ongoing actions. These may include long-term monitoring to insure cleanup levels are stabilized and maintained, periodic sampling of nearby supply wells, maintenance of installed structures, and annual case review. If established cleanup levels were never reached, ongoing monitoring or maintenance may be necessary to insure other soil and/or ground water does not become contaminated and/or public health and welfare threats do not exist. Such ongoing actions should be continued until ground water and soil contamination is no longer a concern.

If ground water is no longer threatened by contamination and a threat to public health and welfare does not exist, as determined by the Department, proceed to Step 12.

**Step 12. Closure**

The situation does not pose a threat to ground water quality or public health and welfare.