Environmental Appraisal

on

Federal Land Ownership Requirement

For Anaconda Copper Company's

Rhode Ranch Project

Project WM-38

June 1, 1981

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Section 83 of the Atomic Energy Act (the Act) as amended by the Uranium Mill Tailings Radiation Control Act of 1978 (P.L. 95-604, requires that ownership of uranium mill tailings and land on which they are disposed be transferred to a state or the Federal Government upon completion of milling operations and final reclamation of the tailings disposal area. However, the Act also provides for exemption from this requirement if the NRC determines that government ownership is not necessary or desirable to protect the public health and safety. Anaconda has applied for exemption from this requirement on the grounds that it is not required for public health and safety. This report documents the NRC Uranium Recovery Licensing Branch (the staff) assessment and determination on this matter.

Regardless of the land ownership situation, the Act (Section 83) requires also that the tailings disposal site be maintained pursuant to a license issued by NRC over the long term. The staff has, therefore, evaluated the various options for satisfying this requirement in a manner which is consistent with the conclusions drawn about the land ownership issue.

The essential question to be answered in making this determination is whether, upon completion of milling and mill tailings disposal operations, long term surveillance and monitoring of the reclaimed disposal site is necessary to protect public health and safety. If long term surveillance and monitoring is necessary, then government ownership of the disposal site is also necessary. As discussed in NUREG-0706 (Final Generic Environmental Impact Statement on Uranium Milling), it is not reasonable to expect that any private person or institution would have the longevity and resources required to provide a reliable and continuing surveillance over a very long period of time.

Because of the very long time over which tailings will remain hazardous, there is inevitably uncertainty both with regard to long term containment of tailings contaminants undergoing natural processes, such as erosion, and with regard to the consequences of human activities at the site. In view of this, the staff has taken the approach that a tailings disposal program should provide a wide margin of safety and protection with regard to the various potential human exposure pathways before it can be exempted from land ownership requirements. In all cases, tailings disposal requirements of the NRC call for returning sites to passive conditions where the need for active maintenance to preserve tailings isolation is eliminated. However, as discussed in NUREG-0706, some limited, ongoing site surveillance has been deemed appropriate for routine cases. To dispense with this kind of surveillance requires that isolation provided by a proposed scheme be even more protective than the already high degree of protection routinely required.

The staff has reviewed Anaconda's proposed tailings disposal program, and has determined sufficient grounds exist for dispensing with the government land ownership requirement subject to the conditions stated below. It is a unique case where the tailings will be dewatered and returned to the original ore zone which is virtually free of any groundwater. The proposed program, as modified by conditions specified in Section 4.6 of this report, meets with an appreciable margin the requirements related to long-term tailings containment and groundwater protection specified in regulations recently issued by the NRC (10 CFR 40, Appendix A).

More specifically, the disposal program involves deep burial (at least 30 and as much as 120 feet below surface) of tailings. The closest significant groundwater bearing hydrostratigraphic unit in underlying formations is isolated by a massive clay strata which is a minimum of about 500 feet thick. In general, the formations at the site have high clay contents so that potential for infiltration through tailings by precipitation should be low. However, as an added precautionary measure, the tailings will be encapsulated by low permeability liners to preclude recharge through the tailings at some time in the future. Given these conditions, the staff has concluded that long term surveillance and monitoring of the disposal site will not be needed to assure stability and isolation of the tailings impoundment. Consequently, with requirements for recording the presence of tailings in surface and subsurface land records, government ownership of the site is not necessary to protect the public health and safety.

Without government ownership of the land, the staff has determined, certain conditions, stated generally as follows, must be imposed to assure the long term stability and isolation of the impoundment. (See Section 4.6 for a complete statement of these conditions.)

1. Anaconda shall provide a 30-foot thick minimum cover, the bottom three feet of which must be compacted so that its permeability is less than 10-7 cm/s, over the tailings, as described in Sections 4.1 and 4.6 of this report.

2. Anaconda shall encapsulate the tailings within sidewall liners, constructed from compacted overburden material, in a manner described in Sections 4.1 and 4.6 of this report. More specifically, the liners shall have a minimum thickness of three feet and shall have permeabilities less than 10-7 cm/s. In addition, the liners shall overlap nonlined areas and shall also be keyed into underlying clay formations to assure that, in transition zones, there is continuity of material which is equivalent in hydraulic conductivity properties to material placed as liner.

3. The tailings shall be dewatered before leaving the mill, or if not dewatered at the mill, through an in-situ drain system that will be capable of providing rapid dewatering of tailings. Before abandonment and termination of license, Anaconda shall operate the drain system (if installed) to maximize removal of free draining solutions from the

tailings. That is, the moisture content of the tailings should be sufficiently low to avoid significant (resaturation in tailings in thicknesses greater than about 5 feet) resaturation within the tailings after they have become compacted under loads of cover.

4. Anaconda shall develop and implement a quality assurance testing and inspection program during liner (and drain system if used) installation to assure that design specifications are met. This will include permeability and soils testing, and visual inspections which meet minimum requirements specified in Section 4.6. The liner and drain system installation shall be done under supervision of a qualified, independent professional geotechnical engineer, hydrogeologist, or other such qualified professional.

5. Anaconda shall have recorded in the land records for all surface and subsurface rights within 100 m of the boundaries of the disposal area a notice of the presence of tailings. The nature of the tailings shall be described in the land records and notice given that the rights are held subject to a general NRC license.

The program proposed by Anaconda is conceptual in nature. Anaconda has sought a determination of the land ownership matter before making substantial investment in design work for this program. In fact, because the project is still in the early stage of development certain aspects of the program have changed since it was first presented by Anaconda. For example, Anaconda has pursued several options for dewatering the tailings. Therefore, the conditions identified above constitute a strict, general envelope of performance standards within which the final design must fall. The staff has taken steps to assure, however, that methods exist for meeting the performance standards. The staff is concerned that later compromises not be made in the criteria and conditions that are being stipulated in making the present determination. While meeting certain of the conditions being stipulated may be costly, they are practicable and must be met. For example, areas along the sidewall that do not meet minimum permeability requirements may require liners that are much thicker than the minimum three feet for purposes of geotechnical stability and liner installation.

Since the Act (Section 83) also requires that the site be maintained over the long term pursuant to a license issued by the Nuclear Regulatory Commission (NRC), the staff has analyzed the options under which a license may be issued (see Section 4.5 of this report). The three options for a license are the following: (1) a specific license; (2) a general license; and (3) exemption from a license. The staff has determined that a general license in this case would be the most reasonable and appropriate. Furthermore, Anaconda must assure that land records, both surface and subsurface, are amended to state the nature and extent of the tailings impoundment. As discussed more fully in Section 4.5, this option is considered to be most consistent with the dispensation of land ownership requirements.

This NRC action is not a licensing action. It is a determination which presumes that one of the tailings disposal alternatives evaluated in the report is selected after completing the full licensing process to be conducted by the state of Texas. Texas is an Agreement State pursuant to Section 274 of the Atomic Energy Act as amended and is responsible for the licensing of the milling (source material) operations and tailings (byproduct material) disposal. As required by the Act, the State must prepare and circulate for public comment an independent, documented assessment of alternatives in connection with Anaconda's proposed project. This Texas evaluation will have to be much more detailed and comprehensive than the review conducted here by the staff. It will, of course, include assessment of alternative tailings disposal sites and methods. It is possible a better alternative will be identified in the licensing process, in which case the NRC determination will not have any effect.

This exemption shall have no effect if the conditions delineated in Section 4.6 are not met. The Commission expects that the state of Texas, which is responsible for licensing of the byproduct (uranium mill tailings) material in this case, will make the conditions stipulated in this report specific conditions in any license it grants to Anaconda. It will be extremely difficult, if not impracticable, to remedy any situation of non-compliance at the time that milling operations cease, given the large volume of tailings that will be accumulated, and the overburden returned to place. As a consequence, TDH should continue oversight of this project during construction and operations phases to assure that the conditions of this determination are being met. For example, in order for this determination to remain, TDH approval of specific liner designs and testing and inspection procedures will be required prior to any construction work as delineated in Section 4.6 below. TDH field inspection may also be conducted. In this case, NRC will work closely with the TDH to avoid any unnecessary disruption to its licensing activities.

Finally, the requirements of Section 83 of the Act involving land ownership transfer of tailings disposal areas do not take effect until November 8, 1981. Therefore, this staff action constitutes a preliminary determination on the Anaconda proposal. The staff intends to affirm this determination when the requirements take effect in 1981. No later public notice of this action will be made.

1.0 DESCRIPTION OF PROPOSED ACTION

1.1 Proposed Action

By letter dated February 28, 1980, the Anaconda Copper Company (Anaconda) requested exemption from the requirement of land ownership by the government of tailings disposal sites for Anaconda's proposed Rhode Ranch Project in McMullen County, Texas.

Section 83 of The Atomic Energy Act (the Act), as amended by Title II of the Uranium Mill Tailings Radiation Control Act, requires that title to uranium mill tailings and land on which they are disposed be tranferred to either the Federal Government or to the state in which such land is located, at the option of the state, upon cessation of milling operations and completion of site reclamation and decontamination. However, the Act (Section 83) also provides for exemption from this requirement if the NRC determines that transfer of title to the land and tailings "is not necessary or desirable to protect the public health, safety, or welfare or to minimize or eliminate danger to life or property." The Act provides for only NRC to grant such exemptions. Anaconda has applied to the NRC for exemption from the land transfer requirement based on this provision.

Anaconda has stated that it cannot obtain title of the proposed disposal land for transfer to the government, and that it needs to receive a determination now, prior to committing to the development of the Rhode Ranch Project, on whether or not the requirement would be exempted. This report discusses the staff's position regarding exemption of Anaconda's Rhode Ranch Project from the land ownership requirement, and the environmental impacts of exemption.

The proposed action is to exempt Anaconda from the land transfer requirement for the Rhode Ranch Project. However, since Section 83 of the Act does not become effective until November 198', it will be necessary for the staff after that date to affirm this determination.

1.2 Background

The Anaconda Copper Company (Anaconda) is proposing to conduct uranium mining and milling operations at its Rhode Ranch site in southeast McMullen County in Texas. The state of Texas, as an Agreement State under Section 274 of the Atomic Energy Act has the authority and responsibility (Texas Department of Health, TDH) for licensing of source and byproduct materials associated with uranium milling operations and mill tailings disposal. In addition, the Texas Railroad Commission (TRC) is responsible for issuing a permit to Anaconda for mining and land reclamation.

At the request of Anaconda, discussions have been held between Anaconda, TDH, and the staff of NRC's Division of Waste Management, Uranium Recovery Licensing Branch (WMUR or the staff), to consider the possibility of waiving the land transfer requirement for Anaconda's Rhode Ranch Project. Pursuant to these discussions, Anaconda formally submitted a request on February 28, 1980, to the NRC (and the TDH) for exemption from the land transfer requirement of the Act, under Section 202(a).

In making its request for exemption, Anaconda has proposed to dispose of tailings in the surface mine pits at the approximate depth from which uranium ore will be excavated. The proposed disposal site is located on land owned by parties other than Anaconda. As a basis for making its request, Anaconda asserts that any success in its attempt at acquisition of title to the mine and proposed disposal site from the other parties for purposes of transfer to the government is highly improbable, and has submitted documentation to substantiate this assertion. In view of the current land ownership situation at the site, the staff has performed this evaluation in consideration of the Anaconda request.

The staff received and agreed to review this request because of the unique features of the tailings disposal program which offered significant potential for avoiding the problems which lead to the general requirement for government land ownership. The chief features are deep burial of dewatered tailings in geologic formations which are absent of saturated groundwater conditions and which will provide a very thick clay encapsulating barrier.

In this evaluation, the staff has determined that the basic issue to be addressed is whether or not continued monitoring or control of the site will be necessary. If no ongoing surveillance or other types of controls are needed to assure the long term stability of the tailings impoundment, then, the staff has concluded, government ownership of the site is not necessary to protect the public health and safety, and the requirement may be exempted. Since Anaconda cannot obtain land ownership for transfer to the government, exemption of this requirement will allow Anaconda to return the site to the land owner, without any provisions for conducting monitoring or surveillance of the site.

In making this determination, the staff has taken the general approach that there must be a wide margin of conservatism in the safety and stability related aspects of the tailings disposal scheme. The staff considers a high degree of conservatism to be essential because the tailings must be effectively isolated from any credible release mechanism for a very long time (the half-life of thorium is about eighty thousand years). The tailings disposal site will be left unattended, as a result of the exemption from the government land ownership requirement, following the termination of operations.

There are large uncertainties about future events, especially with respect to human activities, that may occur at the site which may alter the capabilities of the impoundment to contain the tailings. The staff considers the requested dispensation can reasonably be granted only where a wide margin of safety is provided to account for this uncertainty.

In conducting this appraisal, the staff considered the following:

- Information and supplements submitted in correspondence (February 14 and 28; April 28; and June 16, of 1980; February 16, 1981) and in meetings with the staff (February 5, 1981) by Anaconda to support the request for exemption.

- Information submitted (September 1979) to the state of Texas by Anaconda to support its applications for a mining permit.

- Site visit conducted on February 14, 1980 by personnel from the state of Texas, Anaconda, and the staff to the Rhode Ranch Project location.

- Report and Proposal for Decision issued (July 17, 1980) by the Examiner of the Texas Railroad Commission regarding Anaconda's application for a mining permit (TRC Docket No. 027).

1.3 Scope of Review, Relationship to Texas Licensing Activities and Subsequent NRC Actions

An impact appraisal supporting the staff determination has been performed by the staff. This report documents that appraisal.

The staff has performed the appraisal on environmental considerations associated with the proposed action in accordance with Title 10, Code of Federal Regulations (10 CFR), Part 51, Licensing and Regulatory Policy and Procedures for Environmental Protection, and of the National Environmental Policy Act of 1969 (NEPA). Because the subject request is not regarded as a major action that could significantly affect the quality of the human environment, an environmental impact statement will not be prepared.

The staff action in this case is limited to the consideration of the request for exemption of the land transfer requirement; it is not an NRC licensing action. The staff's review in this case has focused on the long term stability and isolation of the tailings isolation. It considers tailings disposal program defined in conceptual terms by Anaconda. The state of Texas (through TDH) is responsible for licensing the proposed (source material) operations and tailings (byproduct material) disposal program. Under the requirements of UMTRCA (Atomic Energy Act Section 274o), the TDH must perform an independently documented review of the proposed operations and alternatives before issuing a source and byproduct materials license to Anaconda for milling and tailings disposal. It will be circulated for public comment and opportunity for public hearing provided.

This NRC action is based upon the assumption that one of the proposed disposal programs is the one licensed by Texas. However, This NRC determination does not in any way determine the conclusions of state of Texas licensing process. It is possible another alternative will be selected.

Finally, the requirements of Section 83 of the Act involving land ownership transfer of tailings disposal areas do not take effect until November 8, 1981. Therefore, this staff action constitutes a preliminary determination on the Anaconda proposal. The staff intends to affirm this determination when the requirements take effect in 1981. No later public notice of this action will be made.

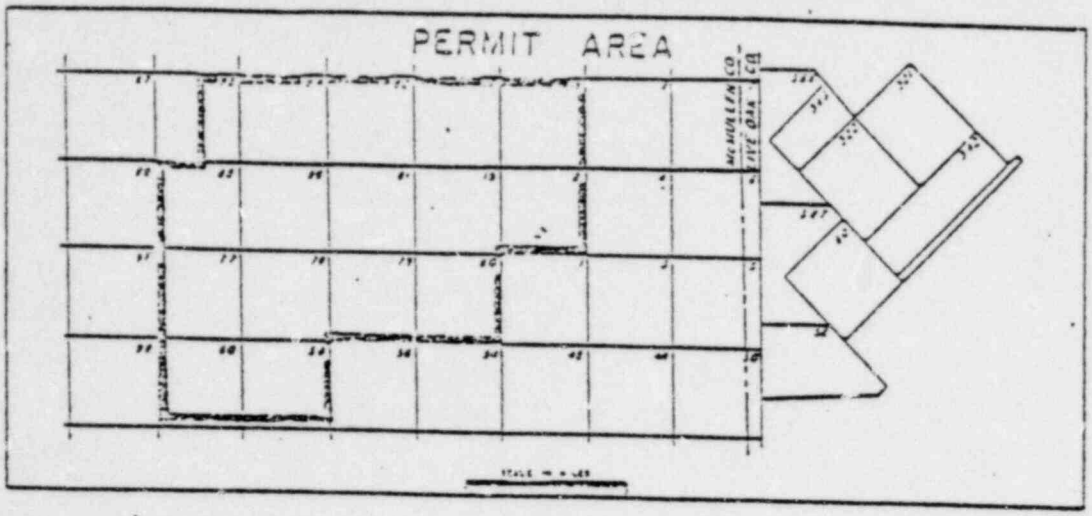
This exemption shall have no effect if the conditions delineated in Section 4.6 are not met. The Commission expects that the state of Texas, which is responsible for licensing of the byproduct (uranium mill tailings) material in this case, will make the conditions stipulated in this report specific conditions in any license it grants to Anaconda. The TDH will, under Section 83 of the Act, be required to determine after milling operations cease and before license termination that Anaconda has met all those requirements concerning tailings disposal (see Section 4.5). However, it will be extremely difficult, if not impracticable, to remedy any situation of non-compliance at that time given the large volume of tailings that will be accumulated and the overburden returned to place. As a consequence, TDH shall continue oversight of this project during construction and operations phases to assure that the conditions of this determination are being met. For example, TDH approval of specific liner designs and testing and inspection procedures will be required prior to any construction work as delineated in Section 4.6 below. TDH inspection may also be conducted. In this case, NRC will work closely with the TDH to avoid any unnecessary disruption to its licensing activities.

2.0 DESCRIPTION OF SITE ENVIRONMENT

2.1 Site Location, Demography, And Land Use

The Rhode Ranch Project site is located in southeastern McMullen County, Texas. Figure 1 illustrates the location of the proposed state mining permit area.

The Rhode Ranch Project, including mine and mill, will be located approximately 20 miles northeast of the town of Freer, the closest population center. The nearest residence is approximately five miles northeast of the proposed mill site. McMullen County is sparsely populated, with a population density of less than one person per square mile. The population of the county is expected to remain fairly constant through the year 2000 (based on projections by U. S. Census Bureau and Texas Department of Water Resources).



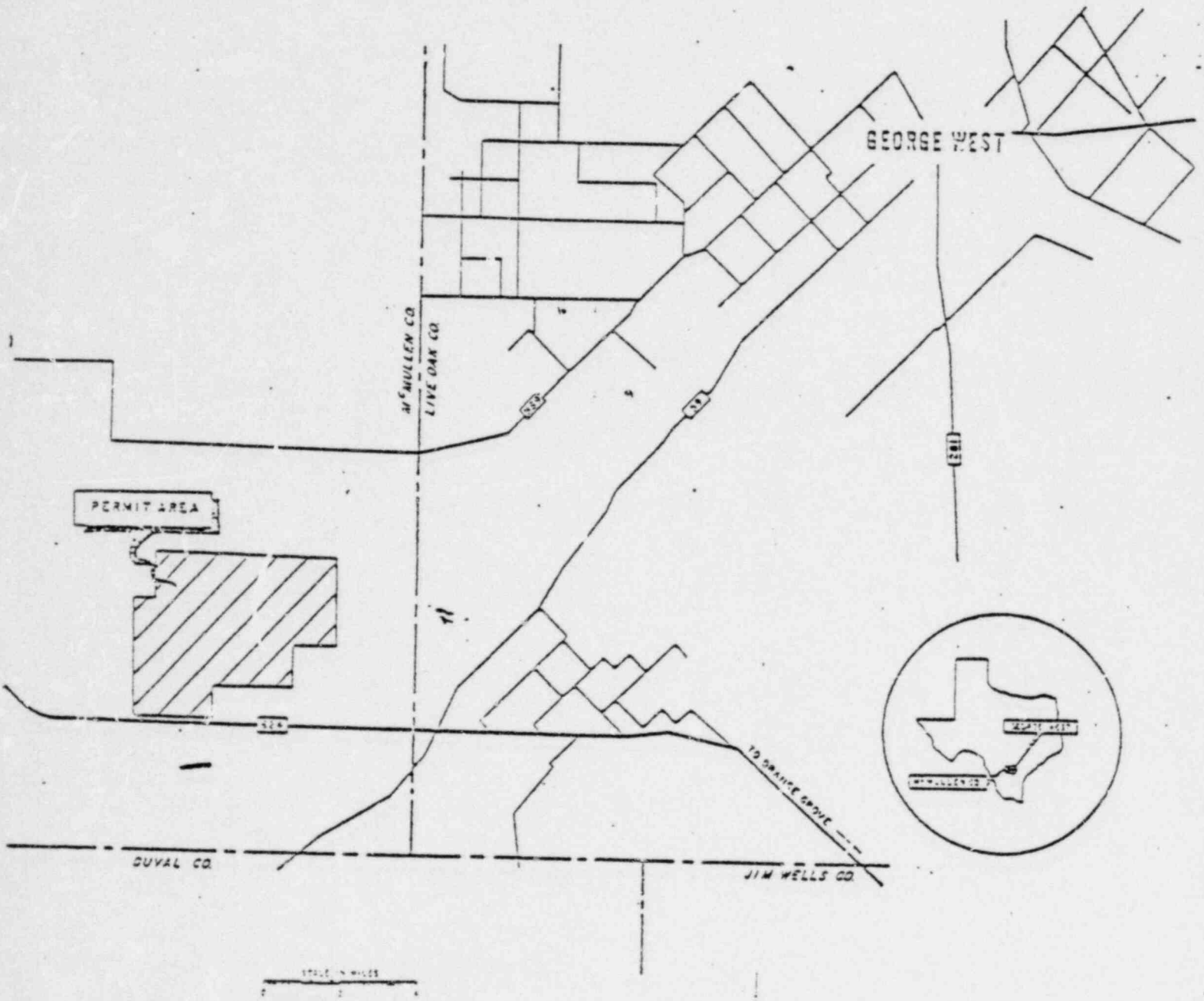


Figure 1 Site Location

Land in the county is used mainly as rangeland. Use of land for dry cropland farming is also significant. The land in the permit area is used mostly as pasture for cattle. There is some hunting in the area, including deer and small game. Use of the land is expected to remain unchanged through the year 2000 (according to Texas Department of Water Resources).

2.2 Topography, Geology, And Hydrology

The Rhode Ranch site is located on terrain that generally has a very gentle slope (roughly 2 percent). The area slopes northward toward the Nueces River, approximately 25 km north of the site. The southeast portion of McMullen County is divided by a northeast trending topographic divide; the mine area is situated on the northwest side of the divide. Northwestward drainage from the divide drains into the Nueces River. Several minor drainage ways are located in the vicinity of the mine. Drainage from these areas are into a small surface creek, which eventually flows into the Nueces River. Following mining, tailings disposal, and subsequent reclamation as proposed by the applicant, the surface of the mine will be restored as closely as possible to the present topography. The terrain of the region is relatively flat and dips gently southeastward toward the Gulf of Mexico.

Runoff from the project area during operations will be directed by diversion dikes and runoff control dikes to the site collecting ponds, for use as mill process water or for evaporation. The average annual rainfall is about 23 inches at the site. The total annual evaporation for the area is 66 inches per year. Hence, net evaporation rate is about 43 inches per year. The 10-, 25-, 50-, and 100-year maximum 24-hour rainfall for McMullen County is 7.0, 8.2, 9.2, and 10.7 inches, respectively.

The area is generally dry and is a net evaporating area, with no standing water bodies except for a few scattered rainwater collecting ponds. These ponds are usually filled following rainfall but become dry with an extended period of dryness. Most of the water from rainfall is lost due to evaporation although some is drained from the areas as runoff. Borehole tests indicate percolation of rainwater in the area usually has penetrated only a few feet below the surface, due to the high clay content of the rock formation beneath the soil.

The uranium ore at the Rhode Ranch site is located within two sand beds of the Miocene-age Oakville Sandstone, which dominates at the surface in the vicinity of the site. The Oakville formation in the mine area is exposed at the surface, and can be locally subdivided into three members. The uppermost member has been named the Magnolia, which varies in thickness from 20 to 50 feet and consists of beds of clay, silt, and fine sands.

The second member of the Oakville has been named the Manuel, which is approximately 40 feet thick and consists of a clay formation above a sand formation. The oldest member of the Oakville, which is about 40 feet thick in the northeast and absent in the southwest, has been named the Rincon. It consists mainly of clay in the upper portion and sand in the lower portion. The Oakville rests on a lower geological formation named the Catahoula, which principally consists of a clay layer extending from the Oakville--Catahoula contact to more than 500 feet below the contact point, and of a sand layer below the clay to a depth of about 1400 feet below the surface. Where the Rincon is absent, the Manuel member rests directly on the Catahoula. The uranium deposit is located within and between the Manuel and the Rincon sands. Figure 2 shows the various layers and the ore deposits within the Oakville formation.

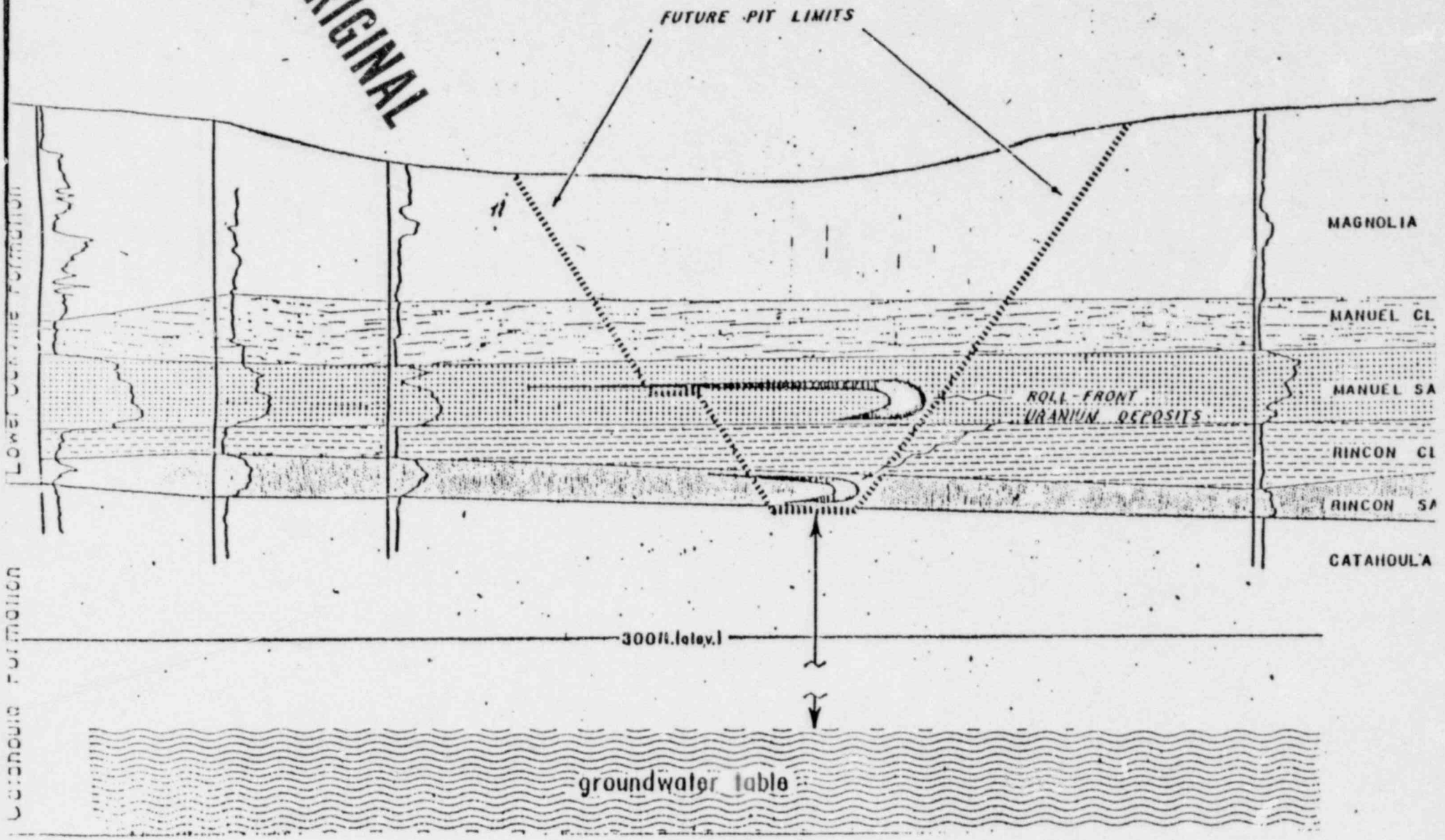
The clays of the Oakville formation are mainly montmorillonitic. The sands are usually unconsolidated and medium grained quartzose. The Magnolia consists mainly of a mix between silty and clayey materials, with minor amounts of gypsum. Although the main layers of clay or sand, such as the Manuel clay and the Manuel sand, in the Oakville are distinguishable from each other, there are lenses of inhomogeneities (mostly sandy materials or pyrite) within the clay layers which are typically several inches thick. Such lenses within both the Manuel clay and the Rincon clay layers have been detected with borehole logging and can be observed visually. The Oakville is approximately 500 feet thick in the southeast corner of McMullen County, southeast of the site, and thins out at a rate of 10 to 70 feet per mile towards the west, so that it completely disappears at approximately 2 miles west of the mine area. The Catahoula formation is exposed at the surface further to the west.

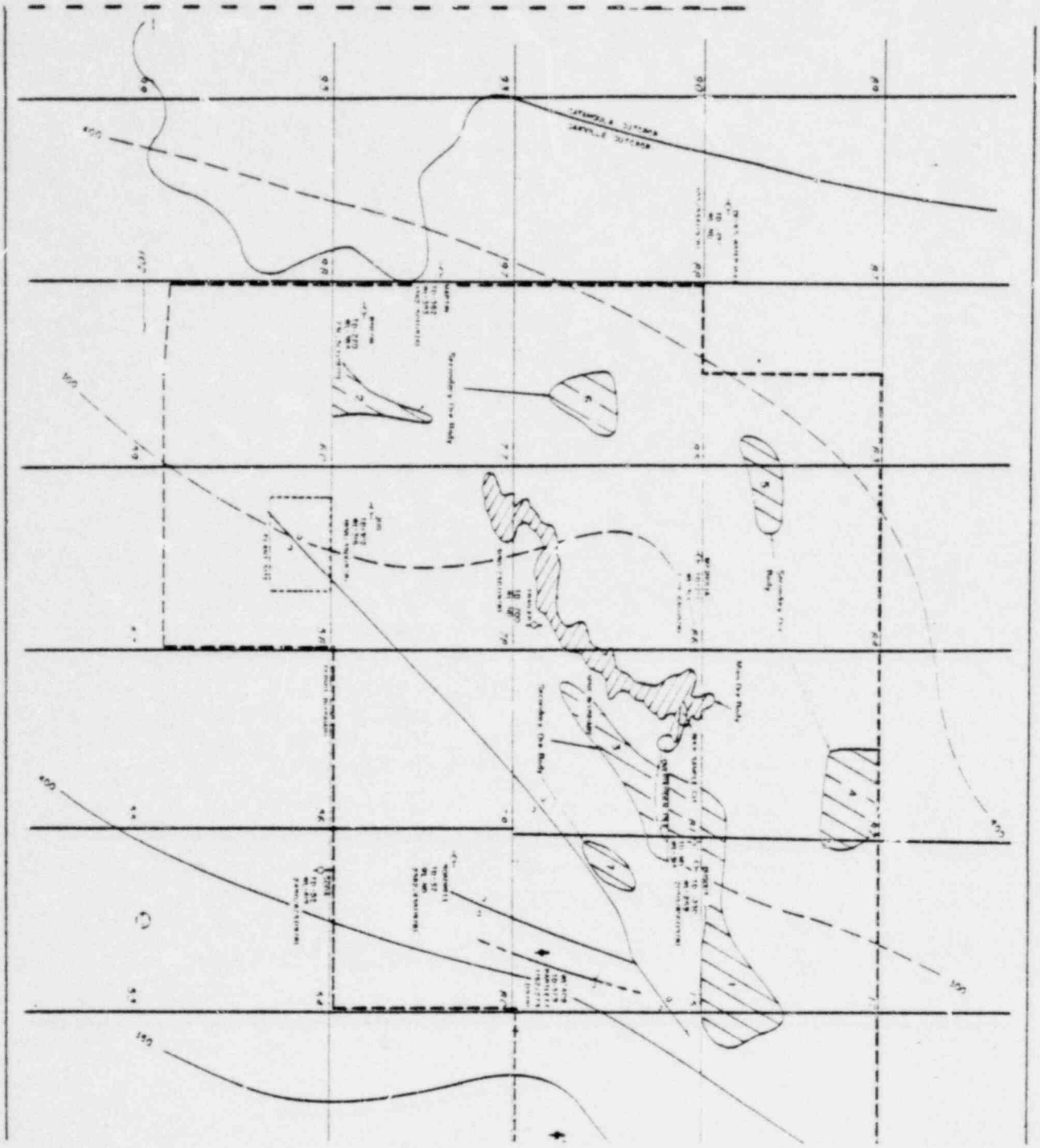
Permeability (saturated hydraulic conductivity) exhibited by selected clayey materials within the Oakville formations which are to be used as tailings disposal area liners average about 8×10^{-8} cm/sec. Average permeability of the Catahoula clays have been measured to be about 1×10^{-8} cm/sec, indicating the highly impermeable nature of the Catahoula. (See Table 1.)

A northwest trending normal fault lies about one mile southeast of the mine area. The Oakville on the southeast side of the fault is downthrown by about 60 feet. On the northwest side of the fault, that is in the mine area, the Oakville is unsaturated. The fault is shown in Figure 3.

The Oakville becomes a major (artesian) aquifer in Live Oak County, east of McMullen County, with transmissivities of up to 50,000 gpd/ft and storage coefficients of about 10^{-4}. However, the capacity of the Oakville in the vicinity of the mine is much less than this (about 100 gpd estimated transmissivity based upon Anaconda pump tests) and only a few wells have been completed in this area.

Figure 2 Ore Deposits





GEOHYDROLOGIC AND WATER QUALITY
SUMMARY OF KEY PARAMETERS - OAKVILLE
AND CATAHOULA FORMATIONS[1,2]

	Permeability (cm/sec)	Transmissivity (gpd/ft)	CL mg/l	504 mg/l	TDS mg/l
Catahoula	1.7 x 10-7 - 3.5 x 10-11 (1.4 x 10-8)	low yield wells	730-2568 (1754)	380-856 (569)	2280-5060 (3910)
Oakville					
overburden[3]	2.4 x 10-7 - 1.9 x 10-9 (5 x 10-8)	--	--	--	--
in-situ[4]	3.8 x 10-7 - 6 x 10-9 (1.7 x 10-7)	100 gpd/ft	496-4964 (2407)	8-273 (159)	--

[1]Ranges of measured values are given; numbers in parentheses ae averages. Geology of Oakville and Catahoula formations is described in Section 2.2.

[2]Data was gathered from wells shown on Figure and from borehole testing performed by Anaconda on the Oakville and Catahoula in the near vicinity of the mine.

[3]Measured values from selected overburden samples. The overburden was from a test pit excavated to the ore zone and, therefore, is Oakville formation material Anaconda proposes that this overburden material be used for tailings disposal area liners.

[4]Permeabilities are for samples selected from strata within the Oakville which Anaconda proposes not be lined.

Recharge of the Oakville aquifer (in Live Oak County) is mainly from percolation of rainwater through the Oakville Sandstones in both the McMullen and Live Oak counties. Therefore, although the Oakville formation is unsaturated in the vicinity of the mine, seepage from rainwater may in fact intermittently percolate down through the unsaturated Oakville sands. Nevertheless, the Oakville sands in the vicinity of the mine are relatively shallow and have remained drained of recharge waters. It is only to the southeast of the fault that saturation has occurred in the Oakville sands.

Water quality of the Oakville, as measured at the few wells which exist in the vicinity (within about five miles--see Figure 3), is poor and not used for human consumption; some of the wells have been used at times for stock watering. Chloride concentrations are typically greater than 1000 mg/l. See Table 1 which presents key summary data on geohydrology and water quality of the Oakville and Catahoula formations.

The Catahoula contains water bearing strata. There are some wells tapping the Catahoula in the vicinity of the mine (within a range of from about 1/2 to 3 miles of the mine as shown in Figure 3). These nearby wells tap water bearing strata at depths which are within about 100 feet of the Catahoula/Oakville interface. These wells are reported to have very small capacity and contain poor quality, moderately saline water which is used for stockwatering. Chloride, sulfate and total dissolved concentrations average about 1800 mg/l, 600 mg/l, and 3900 mg/l respectively. (See Table 1).

3.0 DESCRIPTION OF PROPOSED OPERATIONS

The surface mines will be located in the middle portions of the permit area. The primary mine, where most of the ore will be extracted, will be approximately four miles long and roughly a quarter-mile wide. Other secondary mines that may possibly be excavated in the future will be located around the same general vicinity (see Figure 6). The ore zone is located at depths varying from 20 feet to 120 feet; the shallowest ores are generally in the northeast sections and the deepest in the southwest.

Mining will begin at the northeast corner and will be accomplished with open pit mining methods. The topsoil will be removed and stored next to the pit areas. The overburden will be removed by bulldozers, front-end loaders, trucks, and conveyor systems. Mining will be conducted in staggered stages. Overburden from the initial section will be stored adjacent to the pit. The ore zone will be excavated from the first section and, following processing, the tailings will be returned to the opened section as the next stage of the mine is worked on. Overburden from the latter sections will be removed and deposited onto an earlier segment after it has been filled with tailings. Thus, mine refilling and excavating will proceed concurrently. The total amount of ore is estimated to be roughly 2.9 million tons.

The excavated ore will be hauled to the mill, which is located at the south end of the permit area, and stockpiled prior to milling. Milling would be accomplished with conventional carbonate-leaching methods. The tailing would have a moisture content of 25 to 50 percent, and would be coarse grained (only about 30% passing a #200 sieve). Anaconda has not made a firm commitment regarding the procedures of deposition of the tailings into the pit, but has pursued several options. One method would involve the installation of an in-situ drain system in the bottom of the pit, and subsequent deposition of slurried tailings over it. The drain system would allow for dewatering to enable cover material to be placed over tailing and compacted. Another method would utilize belt-filter drying of the tailings in the milling process. Anaconda has stated that the tailing treated in this manner, and then mixed with crushed cap rock which was associated with the ore, would contain a low enough moisture content to allow emplacement in the pit without the need for further dewatering via underdrains. Anaconda has further stated that because of the coarse nature of the tailings and their low moisture content when belt-filter drying is incorporated, and due to the fact that the tailing will be placed in layers no thicker than 15 to 20 feet, compaction of the material (from heavy equipment and loading of overburden) will not result in any significant resaturation. Regardless of which method of tailings disposal is ultimately selected, Anaconda has agreed to return the tailing to the approximate depth at which the original ore existed prior to mining, provided no tailings are closer to the surface than 30 feet, and tailings will be deposited in layers of approximately the same thickness as the original ore.

Recently geotechnical tests* performed on samples of Rhode Ranch ore tailings showed that this material, when deposited as a slurry (41% solids) and allowed to drain over a period of seven weeks, remained in a loose and saturated state and exhibited low strengths. The conclusion of the tests was that this method of deposition of tailings is not a feasible alternative in the proposed Anaconda project. It would not be possible to place a cover over the tailings given the low strength expected shortly after deposition. Further investigation into feasible methods of tailings disposal is continuing.

Anaconda proposes to line the pit walls with compacted overburden material from either the Manuel clay or the Rincon clay layer (Figure 5). The pit wall liner in any particular section of the mine will be installed by digging a bulldozer-width (approximately 8 feet) trench into the first clay formation immediately underlying that section of the mine. Anaconda has not indicated how deep the trench will be keyed into the clay formations. Anaconda proposes to deposit overburden into the trench and compact it by bulldozer to form the liner material. Based on tests, Anaconda expects this compacted overburden will have a permeability of roughly 5×10^{-5} cm/s. However, Anaconda proposes to line the sides of the mine only opposite those portions of the pit walls that contain predominantly sand, as determined visually and supplementd by tests. If the pit walls

consist mostly of clay material, such as the Manuel clay layer which occurs at a depth roughly in the middle part of the ore zone, then the compacted liner will only extend into the base of the clay layer, and there will be no extensive overlapping of liner materials and clay sidewalls.

Once the tailings have been emplaced in the pit, Anaconda has proposed, a 3-foot minimum thick compacted overburden layer will be placed over the tailings. Again, compaction will be done with bulldozers and the compacted material has been shown with laboratory permeability tests to have permeabilities of roughly 10^{-8} cm/s. In addition, non-compacted overburden backfill with a permeability of about 10^{-7} cm/s as indicated above will be deposited as cover fill material over the compacted layer. Anaconda has proposed to place the tailings into the pit at depths equivalent to the ore zone; hence no tailings will be closer to the surface than the ore itself had been originally. Anaconda has proposed the tailings will therefore be covered with a minimum of 30 feet of overburden, the lowest 3 feet of which will have been compacted. Once the overburden has been backfilled, the surface will be slightly mounded to compensate for an expected additional compaction of about 5% of loose bulk density. The mounding will be done in such a way that contours will maintain premining topographic gradients through drainage channels so as to prevent ponding. Following this contouring, the surface will be seeded with native vegetation. Throughout the mining life of the property, Anaconda proposes to recontour areas as necessary to prevent excessive ponding.

Anaconda has proposd that the overburden excavated during mining will be stockpiled in the order with which they are excavated; i.e., the Magnolia will be excavated and stored first, the Manuel clay will be stored on top of the excavated Magnolia, and the Manuel sand stored on top of the Manuel clay, etc. These materials will be returned in the reverse order once the tailings have been deposited. Where single handling is possible, these materials will be redeposited directly after excavation, either as fill material or as compacted liners.

The materials from the clay layers will be used to provide the liner and compacted cover materials, but the sands will be returned to the pit either with the tailings or as part of the overburden (e.g., as fill) over the compacted cover. However, segregation between clay and other types of materials will be made only between the main layers of the formation; no

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* Pincock, Allen, and Holt, Inc., Geotechnical Testing, Experimental Tailings Deposit, Uranium Ore, Rhode Ranch, McMullen County, Texas. Prepared for Ed L. Reed & Associat Corpus Christie, Texas.

segregation will be made between materials within the same general layer. Any lenses of sands within clay layers (for instance, the Manuel clay or the Rincon clay) will be mixed during excavation with the clays, and the mixture, predominantly clay, will be returned to the pit as liner material or cover.

4.0 STAFF EVALUATION

In evaluating the Anaconda proposal and the need for ongoing surveillance and monitoring, the staff has evaluated primarily three matters: (1) the potential for groundwater contamination over the long-term, (2) the potential for radon releases and disruption by erosion or other natural phenomena, and (3) the potential for consequences of intrusion at the site.

4.1 Potential for Groundwater Contamination

Groundwater contamination may occur in several ways. The source of impoundment seepage may be solutions initially present in the tailings slurry, or waters which may migrate through the impoundment over the long-term either directly downward from the surface or horizontally through the generally flat lying sandy strata in the Oakville. The potential paths of contaminated seepage migration away from the impoundment are downward through the Catahoula to water bearing strata or horizontally to locations east of the site on the down thrown side of the nearby fault where the Oakville is saturated and yields water.

Control of Infiltration and Sources of Contaminated Seepage

If the absence of ponding on the surface (such as may occur due to settlement and consolidation of overburden) is assured (see further discussion in this section), significant downward infiltration of precipitation from immediately above the tailings is unlikely given the large quantity of overburden which is to be placed over the tailings, the dry climate, the impermeable nature of many of the overburden materials and the placement of a low permeability clay cap directly on the tailings. The outcrops of Oakville sandstones in the vicinity of the disposal site, however, are the recharge areas for the lower Oakville to the east of the mine. Even though the Oakville is unsaturated in the vicinity of the mine, it is likely that groundwater perched on clays within the Oakville percolates intermittently through the otherwise unsaturated zones. Despite the low rainfall conditions at the site, this lateral percolation of Oakville water is a potential source of water for infiltration through the tailings which must be dealt with in containing seepage.

Because of the potential for infiltration through the sidewalls of the pit it is essential that minimum specifications on liner design and performance be established. The staff has concluded that a liner which is at least three

feet thick and which has bulk hydraulic conductivity properties of less than 10^{-7} cm/sec will eliminate the potential for significant sidewall infiltration and should be specified. It is also essential that installation of liner materials be done under a strict quality assurance (inspection and testing) program and such a program is delineated in Section 4.6. Furthermore, the staff considers it important for there to be segregation of materials during excavation, transporting, and stockpiling of overburden materials that will be used for liners to assure that sandy, porous materials in the overburden are excluded. Mixing of these materials as proposed by Anaconda does not provide sufficient assurance that minimum liner requirements will be met uniformly.

Anaconda proposes to provide compacted overburden lining only opposite those areas of the pit walls that are predominantly sand, but proposes not to line the clay areas. Thin lenses of inhomogeneous, sandy and other types of potentially porous materials have been observed visually and detected with borehole logs in the predominantly clay layers. Therefore, the installation program must be supervised by a qualified, independent person who can evaluate through inspection and testing the potential of such areas to be sources of significant side wall groundwater infiltration, and who can direct that areas needing lining are lined. Such a person shall direct that those zones within the predominantly clay layers which are potential problems are lined. Anaconda has stated that visual inspections during the installation procedure will be conducted of the pit walls to determine the areas that would need to be lined, and that such visual observations will be supplemented with soil sample testing when deemed necessary. However, the staff considers that a more strict liner installation program and written procedures for such a program must be provided to assure that the compacted liner materials are installed as required. Anaconda does not propose lining the bottom of the impoundment. Their plan relies on the fact that the sidewall liners will be keyed into underlying clay where necessary, and this should provide adequate protection against seepage.

Anaconda has proposed, as one option, to dewater tailings in the pit during operations by depositing tailings slurry via pipeline, and diverting to low areas in the pit the liquids drained from the tailings. These liquids would then be pumped out of the pit to collecting tanks for evaporation or recycling into the mill process. This method of dewatering may be relatively slow and incomplete. A more effective method for dewatering of tailings in the pit is by dewatering with an in-situ drain system. Installation of such a system is warranted in that it will assure that tailings solutions are removed from the tailings impoundment to the maximum degree practicable. Reduction of the total inventory of solutions remaining in the pit (virtual elimination of freedraining solutions) following operations is essential given the longevity of the hazards involved.

Anaconda has not developed any plans for such a system. The staff is, therefore, including in the conditions for exemption (Section 4.6) the requirement for Anaconda to develop and implement plans for the installation of such a system if tailings are deposited in a slurried condition.

In addition to minimizing the amount of tailings solutions that can seep and cause groundwater problems, dewatering the tailings is essential in assuring stability of the clay cover which will be placed over the tailings to prevent infiltration of water into the tailings from above. Reducing water content of the tailings to much less than saturation is important because, while the clay liner may be stable when initially placed on top of tailings that are at the 100 percent saturation level, they will become further compacted when the very thick cover is placed on top of them and as a consequence pore water pressures will rise. Cracking or disruption of the liner could then occur due to differential settlement when loaded. This may occur under normal loading by overburden, and would be quite severe under earthquake conditions.

Considerable settling and densification will take place in overburden materials which will be placed over the tailings. (A total settlement of as much as 10 to 20 percent of total backfill volume can be expected.) A certain degree of this settlement will result from the compaction during initial cover placement by heavy earthmoving equipment which will be driven over cover material as it is placed. The lower parts of the cover may also be compacted rapidly due to the weight of the overlying overburden which is substantial under the proposed program. Nevertheless, there will continue to be settling of materials after the site is decommissioned, and therefore, a topographic depression could form at the surface above the tailings. Such a depression could in turn cause ponding of water above the tailings which would be a source of water that may infiltrate downward through the tailings. The existing topography of the site must be taken into consideration also. Several small drainages cross over the proposed mine area. While mounding of overburden would compensate for settlement, it would also impound surface waters in these drainage areas. In both cases, potential for seepage through the burried tailings exists.

It is apparent that natural drainage areas must be returned to original contours to facilitate runoff of surface water, and that areas away from these drainages should be slightly mounded to prevent settlement from resulting in depressions. It is recognized by the staff that surface waters may be present temporarily in these drainage areas, but significant impounding of water in depressions must not occur. Such impoundment and subsequent infiltration through tailings, and the resulting mobilization of contaminants which eventually would adversely affect groundwater, must be avoided. The staff feels that the following factors, unique to Anaconda's proposed Rhode Ranch Project, will provide for the successful isolation of tailings and prevention of seepage of contaminants:

1) thin layers of tailings totally encapsulated in impermeable material (underlying clays, sidewall liners, compacted clay cap)
2) absence of groundwater
3) deep burial of tailings (30 to 120 feet)
4) recontouring as necessary during the life of the project to prevent excessive ponding

Catahoula Water

The depths of major sand strata within the Catahoula which could yield significant quantities of water (greater than 400 feet below the Oakville contact point) and impermeable nature of the clays in the formation make certain that there will be no contamination of such waters. The risk of contaminating shallow, lower yield water bearing strata within the Catahoula is also negligible. The precise depth of strata yielding water to wells in the area is not known but geophysical logs confirm they are not of any appreciable thickness and have very limited capacity for storing water. Based on this factor, the overall impermeable nature of the Catahoula, the poor quality of the water, and the requirements for in-situ dewatering and for lining impoundment discussed above, it is concluded that there should be no significant contamination of these shallow Catahoula zones.

Oakville Water

The greatest potential for groundwater contamination under the proposed tailings disposal program is from lateral seepage that might occur through the Oakville sands in the disposal area to the saturated, lower Oakville to the east. However, based upon the liner requirements and other seepage control measures being prescribed, the generally dry climate that exists in the area, and the low capacity, poor quality of the lower Oakville groundwaters, the staff concludes there will be no significant contamination of such supplies.

4.2 Radon Releases and Long Term Stability

With the thick earthen cover laced over the tailings (which are being returned to the original ore zone), surface radon releases from the tailings at the disposal area will be eventually the same as it is before mining. The surface radon releases will be essentially zero or non-detectable. The milling process which involves crushing and grinding of the ore will certainly increase surface area of the radium bearing ore materials and, thus, increase to some extent the amount of radon released for migration in the ore zone itself. However, utilizing radon diffusion theory as presented in Appendix P of the uranium milling GEIS (NUREG-0706), the radon will decay before it reaches the surface. Therefore, with regard to radon releases, there would be no reason to require surveillance and government land ownership of the site.

The tailings will be isolated from erosion and other natural phenomena that could potentially disrupt and disperse the tailings to the same degree as was the ore before mining. Furthermore, most of the tailings will be deposited at depths much deeper than the 30 feet minimum. If erosion rates were the same as average denudation rates measured in dry climates (where erosion is greatest) and reported in Section 9.4.1 of NUREG-0706, it would take 120,000 years to uncover material at the ore zone level (30 feet minimum depth assumed). This period of time is far in excess of the time over which institutional surveillance (government ownership) could be reasonably assured to be provided and, therefore, there would be no use or need for government site control to monitor for erosion. From the point of view of isolation from erosion, the proposed Anaconda program provides the maximum degree of protection that can be provided the tailings.

4.3 Intrusion Risks

Intrusion into the tailings zone may occur inadvertently following the termination of institutional controls at the disposal site. However, probabilities of intrusion into the tailings zone by animals are considered remote and inconsequential due to the extensive cover thickness. Human activities are also expected to be low due to the low population density in the area. However, certain activities, such as well-drilling or minerals exploration, are not predictable and may become more likely in the future as population expansion or land development occurs. Drilling of a well is considered to be the only serious intrusion scenario given the depth at which the tailings can be buried. Exposures could then occur through ingestion of contaminants in the tailings. However, given the steps which will be taken to dewater the tailings and preclude significant infiltration of groundwater into the tailings as described in Section 4.1, the tailings should remain near an unsaturated condition and, thus, wells dug into the tailings zone will not be production wells. Hence, no liquids could be pumped out through these wells.

There is a very remote possibility that over a long period of time, small amounts of seepage could enter the tailings and cause some resaturation. In such a case, a limited amount of solutions could be pumped from a well in the unlikely event it were to be dug into the tailings. This residual risk is considered to be negligible, however, and certainly not sufficient by itself to warrant government land ownership. To prevent this sort of intrusion, land record control would be equally as effective as land ownership control.

4.4 Minimum Cover

It would be prudent to specify a minimum thickness of cover to assure there is a minimum level of protection against intrusion, erosion forces and downward infiltration of surface waters. Virtually all of the ore is located more than 30 feet below the surface. Therefore, it appears reasonable to require the tailings to be placed in the intital ore zone but not closer to

the surface than 30 feet. Tailings can be deposited in slghtly greater thicknesses than the initial ore body thickness in deep pit areas to make this possible. Average depth of tailing disposal appears to be about 100 feet.

Anaconda has stated that there is a possibility that as much as two times the ore present at the Rhode Ranch site may be milled at the site. The project may be a toll milling center for a number of small mines in the area. The 30 foot minimum cover will assure that tailings from such toll milled ores are not disposed of at the shallow end of the open pit where the least amount of isolation is provided.

4.5 Legal Options On Post-Operational Licensing

Section 83(b)2 of the Atomic Energy Act states that "notwithstanding any other provision of law or any such determination, such property and materials shall be maintained pursuant to a license issued by the Commission pursuant to Section 81 in such manner as will protect the public health, safety and the environment." Several options are available for meeting this requirement and this section evaluates them to determine which is most appropriate and consistent with the determination being made to exempt Anaconda from land ownership transfer requirements.

Before evaluating options for licensing over the long term a review of key [illegible]vents is necessary. Anaconda will be licensed (source and byproduct materials licenses) by the state of Texas if it conducts any milling operations as discussed in Section 1.3 above. The license will contain specific requirements and conditions concerning how the milling and associated tailings disposal operations are to be conducted, including conditions specified by the Commission in this NRC action. Before its tailings (byproduct materials) license is terminated, Anaconda will have to demonstrate that all of the license conditions are fully met and the state, and NRC pursuant to Section 83 of the Atomic Energy Act, will have to verify that such conditions have been met. Financial sureties provided by Anaconda will have to remain in effect through license termination. Therefore, Anaconda will not be released from its obligations at the Rhode Ranch site if it were to be licensed until it is established that the passive containment prescribed by this action have been established. It will likely be at least several years after Anaconda completes its reclamation program, that the monitoring programs conducted by Anaconda, the State and NRC to verify compliance with license requirements are completed.

When it is determined that the site is abandoned and no further monitoring of the site is needed, Anaconda's license will be terminated by the state. NRC will then be faced with a licensing decision. Should it issue a general or specific license to owners of the disposal site or should it exempt owners from license from licensing. A specific license is appropriate where

a high degree of control on an operation or possession and transfer of a material is needed. The general license appears to be the appropriate mechanism for meeting the long-term licensing requirement. The most sensible arrangement would be to require that records be made in the land records (for both surface and all subsurface rights) that tailings are buried at the disposal site and are possessed under a general license with the NRC which prohibits any excavation, exploratory drilling or other activity at the site which would penetrate or disrupt the tailings or tailings containment. It is not anticipated that any specific monitoring requirement would be a part of the general license. The general license will be issued in the form of a regulation after notice and public comment.

Although the option of exempting owners from license exists and this would in one sense be consistent with the determination that ongoing government ownership of the disposal site is not necessary, the staff considers the added measure of protection provided by a general license and land records is desirable.

4.6 Conditions for Exemption

Some of the conditions below require submitting technical specifications and designs to TDH for approval (see Section 1.3). This is in addition to what might be required by the TDH in its licensing activities. NRC will work closely with TDH to avoid any unnecessary disruptions in its licensing activities.

1. Anaconda shall develop technical specifications which define the specific design for the liners. The technical specification shall include at a minimum the following:

   A. Specifications of what areas in the pit shall be lined. At a minimum these shall include:

      (1) Areas of the pit bottom where there is less than three feet of material having saturated hydraulic conductivity more than 10^{-7} cm/s. The minimum thickness of material serving the purpose of liner material shall be three feet. These bottom areas need not be lined where it can be demonstrated that sidewall liners are keyed into underlying clay horizons, preventing the possibility of lateral seepage.

      (2) Sidewall areas of mine pits when these sidewalls have a saturated hydraulic conductivity more than 10^{-7} cm/sec. Sidewall areas which would provide less isolation than is provided by three feet of material having permeability less than 10^{-7} cm/s shall be lined.

B. Technical criteria for the liners. At a minimum these shall include:

(1) Bottom and sidewall liners shall be at least 3 feet thick.

(2) Saturated hydraulic conductivity of the liners shall be less than 10^{-7} cm/s.

(3) The sidewall liners shall extend beyond those areas of low permeability clay that are not to be lined, and shall be entrenched, into the underlying low permeability clay formations, a sufficient amount to provide hydraulic conductivities which are equivalent to materials placed pursuant to parts 2. B(1) and (2) above.

C. Overburden materials to be used as liner material shall be segregated during stripping, handling, stockpiling, and installation to assure that a material with a saturated hydraulic conductivity of 10^{-7} cm/sec or less is made available and used in all liners. This segregation will also be provided where stockpiling is done (if it is done).

Liner design technical specifications shall be submitted to the TDH by Anaconda; TDH approval shall be required prior to liner installation. This can be done in connection with TDH licensing action on Anaconda's milling application for the Rhode Ranch Project.

2. Anaconda shall develop technical specifications for, and implement, a quality assurance, testing and inspection program which assures the liner design specifications are met. These technical specifications require as a minimum the following:

A. Installed liner material -- At a minimum the following shall be included in the technical specifications:

(1) Visual inspections and measurements to (a) assure material to be used as liner material is segregated as required, and (b) confirm that minimum liner thicknesses are achieved.

(2) Permeability tests performed on undisturbed samples taken by a Shelby Tube. Such tests shall be done with a falling head permeameter. One sample shall be taken for every 5000 yd^3 of installed liner materials to confirm that permeability specifications are met.

(3) Field testing shall be performed to determine moisture-density, Atterberg limits, and percentage of material passing a No. 200 sieve. The moisture-density tests performed at a frequency of one test per 1,000 cubic yards of material placed shall be adequate. The Atterberg limits and No. 200 sieve tests performed at a frequency of one of each test per 5,000 cubic yards of material placed shall be adequate. Based on correlations established in laboratory tests, permeabilities shall be estimated for materials being placed to confirm they are adequate. (Direct permeability testing performed, as described in item B(3) below, would be an acceptable substitute for these Atterberg limit and particle size determinations.)

B. Areas not being lined -- At a minimum the following shall be included in the technical specifications:

(1) Visual inspection by qualified personnel shall be performed over the entire bottom and sidewall surfaces.

(2) Shallow soil borings shall be drilled to a depth of approximately four feet over a predetermined grid. Spacing of about 100 yards (one boring per 11,000 square yards of area) shall be acceptable. Borings shall be inspected for homogeneity of material and samples taken to be used as part of the soils testing program.

(3) Permeability tests shall be performed in the field or on undisturbed samples in the laboratory to confirm that the materials meet the required hydraulic conductivity limits and to establish a correlation between permeability and soils parameters being measured in other testing such as Atterberg limits. (The permeability test methods performed on each boring shall be demonstrated to be of sufficient accuracy, through correlations with falling head permeability tests on split samples, to determine when material has greater than 10^{-7} cm/sec permeability). A sufficient number of permeability tests shall be performed to establish needed correlations. One test in approximately every 10 acres shall be sufficient.

(4) Atterberg limits and percent of material passing a No. 200 sieve shall be checked; one of each test shall be performed at each boring as a minimum and more frequently where field inspection identifies significant unhomogeneities in materials. These properties shall be correlated to permeabilities and used to supplement the permeability test program in determining adequacy of the lining materials. (Direct permeability testing performed, as described in item B(3) above, would be an acceptable substitute for these Atterberg limit and particle size determinations.)

If any borings indicate materials of greater than the required hydraulic conductivity, a more thorough investigation of the situation shall be conducted to fully chara terize the nature and extent of such materials. This may include a more concentrated (smaller spacing) shallow boring program in affected areas. Any such areas delineated should require replacement with an acceptable engineered liner.

3. In the event that tailings are deposited in slurry form, a drainage system for dewatering shall be designed as an integral part of the tailings management program. In this case, Anaconda shall develop and submit to the TDH technical specifications for (A) the design of an in-situ drain system, (B) a quality assurance program for implementation during the installation of such a system, and (C) deposition of tailings slurry and operation of the drain system. This drain system shall be placed above the bottom liner and be capable of providing for the rapid drainage of tailings in the pit. Anaconda shall await TDH approval of the drain system design and the quality assurance program prior to installation of the system.

   A. The technical specifications for the design of the drain system shall include at a minimum the following:

      (1) Area and configuration of the drain system.

      (2) Filter criteria for the material used a filter medium, such as density, minimum particle size, thickness of filter medium, etc.

      (3) Size of the piping (perforated) used to collect drained liquids, spacing between drain pipes, and the installed slopes of the pipes.

   B. The quality assurance program shall include at a minimum inspections of the drain system piping and filter materials to assure that they are installed according to design specifications.

   C. Written procedures shall be developed for tailings slurry deposition which assure that drains are not blinded or clogged by fine particle material, or that by differential settlement of tailings materials, slimes do not form layers which prevent rapid draining of solutions.

   Prior to termination of license, Anaconda shall operate the drain system until the tailings moisture content is reduced to less than saturation conditions and as close to the specific retention as is reasonably achievable. Anaconda shall demonstrate by tests that 75 percent of the moisture that is free draining (below the saturation moisture content for the final tailings density) is removed prior to site closure. [That is the moisture content shall (on average through

the tailings) be less than 0.25 θ where: (1) $\theta_{sr} = \theta_s - \theta_r$; (2) θ_s is the volumetric water content at 100 percent saturation for the tailings at final density; and (3) θ_r is the volumetric specific retention of the tailings at final density]. The above items (#3) will apply only if tailings are slurried to the mine.

4. Testing and inspection of liner (and drains if incorporated) installation should be performed by a professional geotechnical engineer or person similarly qualified in earthwork testing and inspection. The specific qualifications of this person shall be approved by the TDH. (This person must be independent of construction supervisors. These supervisors must themselves be sufficiently experienced / trained to assure that liner installation meets technical specifications.)

5. Anaconda shall, during the course of mining and tailings disposal, submit a summary report to the TDH and NRC on a yearly basis of inspection and testing results, testing techniques, testing and inspection program of liner and drain installation. This report shall reflect the installed conditions of the seepage control system, identify any unanticipated or unusual problems encountered during the installation process, and describe the actions taken to resolve such problems. Anaconda shall submit photographs in the summary report, of sidewall and bottom areas of the impoundent before and after the liners have been installed. Furthermore, Anaconda shall provide schedules of liner and drain system installation to TDH indicating the dates that such installation will occur, in order to permit TDH to inspect installation. Anaconda shall retain on site for TDH inspectors records of testing and inspections performed. (TDH must perform periodic inspections of liner and drain installation.)

6. Anaconda shall return tailings to approximately the same depth below the surface as original ore, provided no tailings are covered with less than 30 feet of overburden. The tailings shall be deposited in approximately the same thickness as the original ore. The bottom 3 feet of the cover must be compacted so that its permeability is less than 10^{-7} cm/s over the tailings.

7. Anaconda shall have recorded, in the land records for all surface and subsurface rights within 100 m of the boundaries of the disposal area, a notice of the presence of tailings. The nature of the tailings shall be described in the land records and notice given that the rights are held subject to NRC general license which prohibits disturbance of tailings without notification of and approval from the U. S. Nuclear Regulatory Commission, Washington, DC.

8. A technical specification shall be written delineating the design of the final tailings impoundment cover which assures that, by either compaction of overburden or mounding of tailings cover or both, any settlement that would result in formation of a topographic depression be minimized to the maximum extent reasonably achievable. This specification shall be submitted to TDH for approval prior to licensing of the operation.

9. The quality assurance programs which are instituted must be conducted completely independently of organizations having construction, production or operational functions; quality assurance staff must report on quality assurance matters directly to the highest level management on site (such as site manager) or to equivalent or higher level corporate management.

   Testing and inspection performed must be conducted using preestablished test methods and acceptance criteria. The frequency of, or hold points for, tests and inspections must be clearly established in appropriate technical specifications and written procedures to asure they are performed. Successful completion of such tests and inspections must be documented.

10. Anaconda shall keep records on and plug all holes drilled at the site for exploration, site development or monitoring to assure they are not conduits for water into or out of the tailings.