HOMESTAKE MINING COMPANY OF CALIFORNIA
GRANTS PROJECT

COMMENTS AND RESPONSES ON THE COMPLETION REPORT FOR RECLAMATION OF OFF-PILE AREAS AT THE HOMESTAKE MINING COMPANY URANIUM MILL AND MILL DECOMMISSIONING COMPLETION REPORT

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COMMENTS AND RESPONSES ON THE
COMPLETION REPORT FOR RECLAMATION OF OFF-PILE AREAS
AT THE HOMESTAKE MINING COMPANY URANIUM MILL
AND
MILL DECOMMISSIONING COMPLETION REPORT

By letter dated December 18, 1995, the Homestake Mining Company of California (HMC) submitted, as required by License Condition 29F, the Completion Report documenting soil cleanup and verification for the uranium mill site at Grants, New Mexico. Also, by letter dated March 7, 1996, HMC provided the Mill Decommissioning Completion Report and requested an amendment to remove license conditions 29, 29D, and 29F. The staff has reviewed these documents and has the following comments. Homestake responses are based upon comments received from NRC before and during the September 30 through October 2, 1996 inspection.

Completion Report for Off-Pile Areas

Comment No. 1
Page four of the report discusses the Ra-226 cleanup criteria. This section of the report should have included characterization information and cleanup criteria for U-nat, and possibly Th-230. Specifically, HMC should address areas where yellowcake or crushed ore could result in the soil Ra-226 standard being met, but elevated levels of U-nat could remain. Also, HMC should indicate if there are areas with potential for elevated Th-230 to remain after cleanup of Ra-226, and if so, what criteria would be applied. HMC states on page 16 that U-nat below 35 pCi/g is a value normally accepted for unrestricted release of property. HMC should be aware that a guideline limit of 30 pCi/g U-nat is applicable only when Ra-226 is at background levels, otherwise a value approaching 10 pCi/g U-nat must be considered.

Response No. 1
Licensees are expected to follow cleanup criteria as specified in their NRC-approved reclamation plans. Cleanup criteria for radionuclides other than Ra-226 have not been specified by the NRC for mill sites. However, the operational history and the alkaline leach extraction method for this site suggest that meeting the cleanup criterion for Ra-226 should eliminate the concerns for other radionuclides as well. For instance, the ore storage areas should be primarily natural ore with some increase in Ra-226 on the very surface. Cleanup to 5 pCi/g would necessarily reduce the U-nat to 10 pCi/g or less. Also, since the raffinate was pumped into ponds built on top of the tailings pile, no residual radionuclides from that source exists off the pile. HMC cannot envision an occurrence during operations that would have enhanced the Th-230 concentration relative to Ra-226 since in the alkaline-leach process, both the Th-230 and the Ra-226 are entrapped in the tailings sands. Therefore, the removal of off pile contaminated material using the Ra-226 criterion should insure that all other radionuclides are removed to acceptable levels. See attachment number 8 from response number 26.

Comment No. 2
Page 14 indicates that the trucking yard had elevated gamma counts due to shine from water processing equipment stored on the site. Figure C-1 demonstrates three areas of

elevated gamma and Table C-1 indicates the highest Ra-226 value was 6.9 pCi/g. HMC should indicate the soil sample results from the three areas, as the grid numbering system is difficult to follow. Also, HMC should indicate the gamma level on the equipment.

Response No. 2
The soil samples of interest for the elevated gamma exposure area were taken in the area bounded by AE17.2-AE18.1 and AS2.1-AS3.0. The Ra-226 values for these samples are 6.91, 1.56, 0.61, 0.44, 0.59 and 0.63 pCi/g. HMC measured the exposure rate from the vessels, piping and other items stored in the Trucking Yard which ranged from 40 to 150 μR/h at one meter from the vessel. After removed from the site, HMC will resurvey general area and take soil samples if required.

Comment No. 3
Page 15 indicates that two samples from the North Toe Area (large pile) had elevated Ra-226 levels, but were covered by the apron. Appendix D indicates Ra-226 levels of 0.4 to 27.6 pCi/g (wet chem 39.1) and U-nat 0.4 to 69.6 pCi/g. HMC should indicate if the full cell cover (e.g., radon barrier layer) was included in the apron.

Response No. 3
The Completion Report assumed that the north apron (an extension of radon barrier and erosion protection on the north side of the large pile) of the Large Tailings Pile covered the Line A. A review made in preparation to this response revealed that Line A lies a few feet away from the toe of the apron. HMC staff remembers further decontamination efforts in this area but cannot find soil sample results that verify the further cleanup efforts. HMC has resampled these areas in response to NRC's comment on October 2, 1996. The areas are identified as AS1.1E10.2 and AS1.1+50E14.2.

Comment No. 4
Page 15 also states that near the north ore pad, one sample indicated 13.5 pCi/g, but the location "reportedly" was resampled and the result was 3.3 pCi/g Ra-226. HMC should provide the data sheets for both analyses.

Response No. 4
The lab sheets for samples 3901 and 4240 are enclosed. See Attachment No. 1.

Comment No. 5
Page 16 states that contamination along State Highway 605 north of the mill site is due to ore spillage and is not the responsibility of HMC. Also, Section 6.2.4 (pages 18 and 19) states that ore spillage along this highway north of County Road 63 is up to 2 feet deep. HMC should indicate what criteria were used to distinguish ore contamination from tailings, how ore spillage came to be at a depth of two feet, and how the northern cleanup boundary (north of County Road 63) was chosen.

Response No. 5
HMC removed the top layer of soil from the Highway 605 right-of-way extending north of the County Road 63 extension. The work was halted when it was realized that the right-of-way

was contaminated with ore that had evidently fallen from trucks hauling uranium ore. A Ludium 2221 rate meter/scaler and a Ludium 44-10 NaI detector with a lead collimating shield was used with an action level of 10,000 cpm. Perhaps our assessment of the depth of contamination along Highway 605 was an overstatement. The uranium ore that was hauled on the road would act like gravel and migrate to the shoulder of the road. As vehicles travel on the shoulder the ore(limestone and sandstone rock containing uranium) would be pushed into the soft shoulder dirt. The cleanup boundary was established by the close proximity of the shoulder to HMC ore pads. The northern cleanup boundary established at County Road 63 was based upon the over 400 feet from the ore pad at the large mill and about 400 feet from the small mill ore pad. State Road 605 was used as a main haulage route since early 1950's, with an AEC buying station at the corner of the road and old 66, and multiple mills and mines in the area. See attachment number -- for the analysis of a uranium ore sample, note that the U-238 analysis is about 25% of the U-nat and 50% of the Ra-226 analysis. We should have said that 10 of the 24 samples taken at the 2-ft depth were above the surface cleanup criterion of 10.5 pCi/g. The twelve samples sent to the laboratory for uranium and radium analysis were believed to be sufficient to support the contention that the material was principally ore. There was also visible evidence of small pieces of uranium bearing rock throughout the top layer of soil that had evidently fallen from the trucks.

Comment No. 6

Page 17 indicates that for the State Highway 605 right-of-way along the mill site, one sample exceeded the cleanup criterion. The 29.3 pCi/g value apparently is due to HMC staff misreading the spectrometer (deleting one digit of the read out). HMC should provide the data sheet, or more detail to justify that 6 pCi/g is the actual value for this sample.

Response No. 6

The spectrometer used on site required the operator to write the number in a log book. Unfortunately, the spectrum could not be saved on floppy disk as is the case for the more modern spectrometers. A copy of the log for Sample I.D. 3743 taken at Station 446 is attached. See Attachment No. 2. Note that the gamma count rate at Station 446 was 3960 cphm, which is similar to the other values measured in the area. The TH(ROI) recorded at 3570 is to low, and should have been a larger number.

Comment No. 7

Page 17, Section 6.2.2, refers to the entrance to the Hamilton Construction Company and samples taken south of this landmark. HMC should indicate what figure demonstrates this landmark.

Response No. 7

A map showing the entrance to Hamilton Construction Company is attached. See Attachment No. 3.

Comment No. 8

Page 18 states that the county road cleanup resulted in one subsurface sample with values of 23.8 pCi/g Ra-226 and 14.3 pCi/g U-nat. HMC explained that the sample was

probably taken from the original road base material. HMC should indicate how the area of this sample can be accepted as meeting cleanup criteria.

Response No. 8

The explanation in the text for why HMC believes that the cleanup of the road base meets the intent of the standard is considered complete. HMC did not have the luxury of waiting for the results prior to rebuilding the county road. If we had, we would have removed additional material near the one sample out of 154 samples that was elevated. One might argue that since the uranium in the sample was 14.3 pCi/g, 7.1 pCi/g of the radium arose from natural ore and 16.7 pCi/g arose from windblown tailings sands (23.8-7.1=16.7). This meets the 20.5 pCi/g radium cleanup criteria for subsurface material. We should point out that the Ra-226 content of the road base material in the area normally exceeds the cleanup criteria for this site and we believe that the sample actually represents the original road base material. Gravel for road construction, typically comes from limestone sources that are also sources of natural uranium material. See attachment number 4. There is no doubt that the reconstructed road north of the large tailings pile lies on a clean base compared to other nearby roads.

Comment No. 9

Page 18 states that no gamma levels were measured (June 1994) for county road 63 (north of the large pile), because of the shine from the uncovered north side of the large pile. HMC should indicate why meters shielded with a sheet of lead were not used to provide supporting verification data.

Response No. 9

Lead shields were not available to us at the time County Road 63 was remediated. Later, lead shields were used to support the cleanup of Highway 605 and other areas near the piles. Gravel for road construction typically comes from limestone sources that are also sources of natural uranium. See attachment number 4 and response number 8.

Comment No. 10

The title to Section 6.2.4 (page 18) should indicate County Road 63, not County Road 93.

Response No. 10

We agree, the title for Section 6.2.4 should indicate Country Road 63, not 93.

Comment No. 11

Page 27 states that all soil verification results for the outer zone were less than 8 pCi/g Ra-226. However, Appendix G sheet 5, indicates that sample D022109 resulted in 11.1 pCi/g (HMC value). HMC should explain this inconsistency and why this grid value above the criterion is acceptable. It is noted that the ERG value for that sample is 8.6 pCi/g, but details (method, precision, accuracy) of that analysis were not provided.

Response No. 11

We regret not explaining the format of Appendix G. Appendix G consists of the data search sheets for the grid blocks used for the outer zone statistical test. The data search sheet lists the grid block with the highest average gamma and the number of data points in the grid. In this

case the 500-ft grid block was E032. The sheet that follows that sheet is a sheet showing the on-site spectrometer result for a soil sample taken from that grid block (i.e., the verification sample results). The sheet also includes other sample results that are not necessarily verification sample results but were analyzed in the same batch. These include samples that did not pass and additional excavation was required followed by verification. For the example you mentioned, the Grid E032142 was the grid of interest; the 5th sheet shows that the Ra-226 concentration for that grid was 1.21. The last column was added as a QC check to the HMC results. A different algorithm was added to the spreadsheet that was less sensitive to gain shifts that may occur in the spectrometer. The laboratory technician was alerted to a possible gain shift if the numbers were significantly different. If a gain shift occurred, the spectrometer was normally recalibrated and the sample rerun. The sample D022109 reported at 11.1 pCi/g is in this case a verification sample which is discussed further below. See response number 21.

Comment No. 12
Page 28 states that results of the quality control (QC) program were evaluated and agreement was within normal analytical accuracy and precision. HMC should indicate how this was determined, i.e., what degree of agreement was necessary to accept on-site measured values as valid.

Response No. 12
The Radiation Protection Administrator reviewed the results of the QC program at least monthly. Most laboratories report an error at the 95% confidence level of 1 pCi/g for low activity samples. As can be seen for the data, commercial laboratory results often differ by up to 3 pCi/g or more at levels of approximately 10 pCi/g. During the review any analysis that differed by 3 to 4 pCi/g was flagged. The outside lab was requested to review calculations used in the flagged analysis.

Comment No. 13
Staff notes that Appendix A contains pertinent License Amendments and that license condition 37C states that "The licensee shall submit a construction quality control program.... that will ensure that the specification which limits the activity of the radon barrier material to 5 pCi/g above background is not exceeded." HMC should indicate when this construction program was submitted and how they will demonstrate that the average Ra-226 level in the radon barrier meets Part 40 Appendix A Criterion 6(5) cover to contain essentially background level of radioactivity).

Response No. 13
The Ra-226 characterization of the radon barrier was done and reported in the report, "Final Radon Barrier Design for the Large Tailings Pile", June 1995. Soil samples were taken on a predetermined grid so as to sample the barrow areas before utilizing the soils for cover material. Table 3-1 shows that 21 samples taken from the north borrow averaged 1.3 pCi/g Ra-226 with a standard deviation of 0.5 pCi/g. Cover that had already been placed had similar Ra-226 concentrations. These levels are considered below background for surface soils in the area.

Comment No. 14
The data presented in the tables of Appendices B through G should include the associated analytical errors. Without this information, a thorough comparison of the data presented by HMC and their QA/QC contract laboratory cannot be performed.

Response No. 14
A consultant developed the spread sheets for calculating the Ra-226 concentrations and unfortunately did not include error calculations. It would be a large effort for HMC to modify the spread sheets, reenter the data and present the results. It is our belief that the errors in the individual reported values from the HMC spectrometer are approximately 2 pCi/g, at the 95% confidence level for values below 20 pCi/g. The dominant factor making up the error term is the obvious bias that occurred during a few occasions where the background run (taken early in the morning) was too high due to high local radon concentrations. Looking at the results, it appears that this resulted in a bias of up to 1.5 to 2 pCi/g on a few occasions (see below for further discussion). The error for each reported value would then be the linear addition of the bias and the statistical terms. The statistical term is estimated to be 0.5 pCi/g for values below 1 pCi/g, increasing to approximately 1 pCi/g at the 20 pCi/g. Since the bias is the dominant error, assigning an error term to this set of data would essentially be assigning an error term (95% confidence level) of approximately 2 pCi/g for all values less than 20 pCi/g. At this time, HMC does not believe that further definition of the error is possible. The error term is significant only if the data values approach the cleanup criteria. A cursory look at the verification data taken during the early part of the cleanup (time at which the bias was noticed) indicate that less than five percent of the values are within 2 pCi/g of the cleanup criteria. For the major portion of the site where the GPS-based survey and verification procedures were applicable, only two values exceeded 8 pCi/g. See also response number 12.

Comment No. 15
The sketch at the end of Appendix B (Borrow Areas) does not clearly indicate where samples were taken and HMC should provide a legend to explain the symbols used.

Response No. 15
A revised sketch of the figure in Appendix B is attached. See Attachment No. 5.

Comment No. 16
Appendix D, Table D-2, contains characterization data for the West Borrow Area. HMC should explain why most of these Ra-226 values are negative numbers, and why data from the off-site laboratories are higher for the same samples.

Response No. 16
The negative data in Appendix D, Table D-2, are recognized by HMC to be beyond the normal statistical fluctuations for low activity samples. The data shows a bias estimated to be up to 2 pCi/g compared to the QA/QC samples. While this is undesirable, HMC decided to use the data since all values were well within the cleanup criteria. The negative values probably arose from an overestimate of the contribution of background in the 609 keV photopeak. It was discovered later that the Grants area occasionally has inversions where the radon levels remain high until midmorning. If the background determination was made early on such mornings, an over subtraction would occur for samples analyzed later in the day.

Comment No. 17
Appendix E contains verification data obtained near the north ore pad. HMC should explain why, unlike most other data in this report, there are many negative Ra-226 values.

Response No. 17
Appendix E negative data-see above discussion for Appendix D.

Comment No. 18
Appendix F, Table F-1 date indicates that State Highway 605 along the mill site had gamma levels mostly in the range of 2500-4000 cphm. However, 29 grids had values greater than 5000 cphm (over the 10,000 cpm guideline) with a high value of 9962 cphm. According to page 17, grab soil samples were taken at these "few" elevated gamma areas, and if the Ra-226 value approached the limit, additional soil was removed. HMC should indicate the measured Ra-226 levels for these high gamma grids.

Response No. 18
Appendix F data are related to the State Highway 605 cleanup. The gamma count rates that are reported are for the shielded detector. The gamma exposure rate action level of 10,000 cpm was developed using a shielded detector on the surface away from significant sources of shine using 10.5 pCi/g cleanup criterion. The cleanup of the right-of-way resulted in excavation to several feet in depth along the highway. In many cases, the excavated cut went to the edge of the pavement where the road base produced a significant source of shine. As mentioned previously, the road base was taken from a local quarry which normally contains elevated Ra-226 activity. Since the road was paved prior to the commencing of milling activities at the HMC Mill, the road base cannot be attributable to HMC operations. The additional shine due to the geometry of operating in a trench as well as the shine from the road base required HMC to increase the action level. Since the action level varied from location to location, soil samples were taken and immediately analyzed to provide guidance on what to use as an action level. In reviewing the report in preparing our response, we realized additional drawings are required to explain State Road 605. Note: Area cleaned north of County Road 63 along shoulder of State Road 605. Attached are six original full size drawings. See Attachment No. 6.

Comment No. 19
Table F-5 (e.g., page 5-5) presents questionable data for the uranium activity. For example, sample number 3132 shows U-238 activity of 7.6 pCi/g and U-nat 1.7 pCi/g. HMC should clarify this apparent discrepancy.

Response No. 19
Apparent discrepancies between laboratory results, especially for uranium, do exist. HMC could have asked the laboratories to reanalyze the sample until a value "acceptable to HMC" was obtained. This approach does, however, introduce a bias and reflects a better accuracy than actually exists. Since no apparent bias existed between the two laboratory results, the

actual results were reported. It is HMC's opinion that these variations represent "state of the art" vendor laboratory results.

Comment No. 20
HMC should indicate if Appendix G includes more data than that associated with the 52 statistical study grids.

Response No. 20
Appendix G contains the results of the study grids for those areas highlighted in Figure 6-3. The page following the data sort page consists of data corresponding the maximum gird within the 500-ft grid block. What has led to confusion is that the second page contains data for other samples not related to the discussion at hand. It was merely a convenient way for HMC to show the results using original data sheets. The same data are presented in Table 6-1 on page 26.

Comment No. 21
The highest Ra-226 (HMC) values in the outer zone are for grids D113195 (10.1 pCi/g) and D022109 (11.1 pCi/g, also in Appendix H), but these are not the grids with the highest gamma levels in that block. HMC should provide the gamma levels for these two grids.

Response No. 21
From the data presented in the report, the gamma count rate for D113195 is less than 20,785. The gamma count rate for D022109 is less than 16,000 cpm. The data are available on disk and with considerable effort, the values may be developed. A less costly option is to use the large data map sheets to obtain an estimate of the average gamma count rate.

Comment No. 22
Appendix I gamma data is elevated for outer zone grids B103215 (20,531 cpm); D102147 (22,336 cpm); D102223 (22,371 cpm); D102235 (21,944 cpm); D104176 (21,963 cpm); and E101114 (21,766 cpm). HMC should indicate the Ra-226 values for these grids. The staff also notes that in block D102, 6 grids failed the gamma guideline; in D104, 14 grids failed; and in E101, 3 failed.

Response No. 22
Grids exceeding the gamma action level in the outer zone were either further decontaminated or sampled and found to meet the criterion. Table H-2 contains the soil sample results for grids that failed the gamma action level.

Comment No. 23
Gamma data is elevated for inner zone blocks H064 (11 grids in that block failed); H073053 (11 grids failed); and H074 (9 grids failed). HMC should indicate if all of these elevated grids will be addressed when the small disposal cell is completed.

Response No. 23
The data referred to lie beneath features on the site that will be decommissioned at a later date. Figure 6-1 does not show gamma count rates that were taken on the small tailings pile or beneath the newly constructed Evaporation Pond No. 2. The text

indicates that the collection ponds and Evaporation Pond No. 2 will be placed on the Small Tailings Pile upon completion of the ground water restoration program and the area verified as meeting the cleanup criteria. The northern portion of the small tailings embankments are constructed of tailings sands with interim cover nominal one foot thickness, giving rise to the high gamma count rates. The elevated areas were sampled to demonstrate that the grids meet the cleanup criteria. The area just north of the Small Tailings Pile northern toe was not sampled due to water standing in the area. When the small pile is remediated the toe of the pile will be extended to cover most if not all of this area. The entire periphery of the small tailings pile as well as the areas where the collection ponds and Evaporation Pond No. 2 will require verification that all are below surface cleanup criterion of 10.5 pCi/g.

Comment No. 24
HMC should clarify if the data provided in the report for U-nat are alpha spectrometry results for total uranium (U-235 + U-234 + U-238).

Response No. 24
U-nat values reported in this report are the sums of the three isotopes. The wet chemistry analytical method is fluorimetric.

Comment No. 25
HMC should indicate what controls were used to prevent re-contamination during site decommissioning of previously verified areas (e.g., Trucking Yard Area).

Response No. 25
HMC used a well defined process to handle tailings material and windblown material. First the tailings piles were recontoured utilizing heavy earth moving equipment. As the equipment completed moving tailings sands and slimes, there were washed and scanned. Once the equipment was determined clean, it was used to haul interim or radon barrier to cover the large tailings pile. Not all equipment was used to haul interim or radon barrier, some remained with the retrieval of wind blown material. After completing retrieval and placement of windblown, the equipment was again checked. Note, the haul roads were also rechecked after completion of the retrieval of windblown material. The trucking yard area was decontaminated and restored by placing clean crushed rock on the area. Toward the end of the reclamation, a gamma survey was made on the area and any haul road and indicated no new contamination. Gamma surveys were also done on other previously covered areas such as the area north of the mill site. While some reclamation activities continue, HMC operates under a Radiation Work Permit program that requires equipment and personnel to be scanned for all intrusive activities. Vehicles and personnel are scanned to assure that the contamination is controlled at the source.

Comment No. 26
HMC should reference any NUREGs that pertain to the site (e.g., environmental assessments), or any data that indicates the Ra/Th ratio in the ore that was processed, or in the slurry liquid. Such data should support the HMC assumption that these radionuclides were in equilibrium. Also, please indicate the date of the report on the cleanup of the 1977 slurry line spill.

Response No. 26
HMC has found an analysis that shows the equilibrium between Ra and Th. See attachment number 7. Attached is the cleanup report, dated February 28, 1978, for the 1977 slurry line spill. See cleanup report, attachment number 8.

Mill Decommissioning Completion Report

Comment No. 27
Page two indicates that the maintenance shop was decontaminated and released for later removal from the property. HMC should provide the surface activity data to NRC as an addendum to this report to verify that the cleanup meets the guidelines.

Response No. 27
Surface contamination data for the maintenance shop is contained in Attachment Number 9.

Comment No. 28
The burial pits are discussed on page three. HMC should indicate how the guidelines/criteria for disposal have been met. In particular, discuss how the pit outside the boundary meets release criteria, or reference previous relevant submittals.

Response No. 28
The NRC-approved decommissioning plan was followed in that the concentrated residues were placed in the tailings impoundments and the debris buried with the mill tailings ponds, the mill yard area, or in Pit No. 4, 5 and P5 south of the Large Tailings Pile. All of the pit areas will be in the land transfer to DOE. Additionally another pit number 8 was placed in the mill area and contains only non radiological material from the demolition of and associated milling complex(rail siding that handled chemicals used in the milling process). While the Decommissioning Plan did not require the removal of contaminated soil from the mill yard area prior to applying the cover, HMC elected to remove an average of 2 feet of contaminated soil from the area. This was done to assure that the major radon source term had been removed. Confirmation that this was done is evident from the flux measurements on the mill yard area. Cover was then applied per the plan. Since the mill yard met the flux standard without cover, HMC is presenting these results as disposal site radon flux verification data for the mill yard. Radon flux measurements on Disposal Pit No. 4, 5 and P5 along with final gamma exposure rate measurements on the two areas complete the verification of these two disposal areas. The other disposal areas are within the tailings piles. Soil contamination contiguous to the Mill Yard and Pit No. 4, 5 and P5 was removed and verified using the removal criteria and verification procedures for windblown tailings.

Comment No. 29
Page four states that after soil removal from the mill site, radon flux measurements were made. HMC should indicate if this area is to be considered a disposal cell for

waste byproduct material per Part 40 Appendix A Criterion 6(1), and if so, how it meets the other criteria such as stability.

Response No. 29
HMC considers the Mill Yard Area and Disposal Pit Nos. 4, 5 and P5 as byproduct material disposal areas. These areas meet the radon flux criterion as well as the exposure rate criterion. The mill site reclamation design included a levee used to divert surface water flow away from the mill site. There is an average of 4.7 feet of soil placed over the mill site. A layer of soil/rock mulch was also placed over the mill site to reduce surface erosion. With all of the above factors, the mill site will be stable for at least 200 years. Disposal pit number 4 has an average of 4.5 feet of cover and pit 5 and P5 has 5.4 feet of cover. This cover will provide the necessary long term protection because of the flat slope and very little surface water flow across the pits.

Comment No. 30
Table 1 provides Ra-226 and U-nat values for windblown contaminated soil. The samples were obtained before soil removal, apparently to characterize the contamination. HMC should indicate why, compared to the HMC value, the wet chemistry values are low for Ra-226 but high for U-nat. Also, indicate where the different types of analyses are discussed.

Response No. 30
Table 1 data was collected to characterize the mill area so that most of the contaminated soils could be removed. Most of the QC samples sent to vendor laboratories were in reasonable agreement. See response number 32.

Comment No. 31
Table 1 indicates sample 1072 had a wet chemistry result of Ra-226 1.2 pCi/g, but U-nat was 53 pCi/g. HMC should demonstrate how this meets cleanup guidelines.

Response No. 31
The sample 1072 was taken at 6"-12" and reflects the concentration of radionuclides in material that has been removed. As with all the Mill Yard. no confirmation samples were required by the plan or otherwise taken. HMC believes that all soils having significant concentrations of uranium and Ra-226 in soil were removed from the Mill Yard. Since the reclaimed Mill Yard is a byproduct disposal area, decontamination to any level was not required. This area will be included in the area to be transferred to the government.

Comment No. 32
HMC should explain the wide variation of results, in Table 1, with different type of analyses. For example, sample 1372 has 321 pCi/g Ra-226 (not windblown), yet wet chemistry result is 2.2 pCi/g. Also, sample 1092 has U-238 <7.3, and wet chemistry result is 78.3 pCi/g; and sample 1352 Ra-226 is 35.0, but wet chemistry result is 0.7 pCi/g.

Response No. 32
Of the 15 samples analyzed by the three laboratories, an apparent problem exists with sample no. 1092, U-238 analysis using radiometric for one of the samples. HMC reviewed Table 1 "Results of Radiological Testing of Soil Samples Before Removal of Contaminated Soil" and found errors. Please use revised Table 1 (Attachment Number 11). Sample no. 1352, 1362 and 1372 Energy Lab wet chemistry radium 226 analysis were correctly posted per the lab analytical sheet. We can see that they correlate closely.

General Responses
Attachment number 11 is five pages from original data sheets. The bottom of each page is a brief description of each column.

Attachment number 12 is revised Table B-3 " Soil Sample Results Taken from the Near North Barrow Area". The fifth column has been changed from Ra238 to correct label of U238.

Attachment number 13 are the sample results of 28 individual samples taken in the offset (200 foot wide area) outside scraped areas. This gave Homestake confidence that all areas were cleaned to site standards. Note that these are all quick readings (no ingrowth) and a very conservative factor of 1.5 was applied to quick readings so as to estimate full ingrowth reading.

TABLE OF CONTENTS

ATTACHMENTS

Location: Wind Blown 1994

Date Collected: AUG 1994

Date Sealed: Aug 15, 1994

Date Read: Sept 9 & 12, 1994

Attachment No. 1 - Lab Sheets for Samples 3901 and 4240 With Location Map

BORE SAMPLES

1994

SOIL SAMPLES

LAB ID	Wind Blown Samples ID.	TOTAL COUNTS RA(ROI) 609KEV CH549-CH658	TH(ROI)911KEV CH861-CH961	K(ROI)1406KEV CH1338-CH1458	COUNT TIME SECONDS	CPS RA 609 KEV CH549-CH658	TH 911 KEV CH861-CH961	K 1460 KEV CH1338-CH1458	SAMPLE WT.	TRUE SAMPLE CT. RATE	HMC Ra 226 pCi/g
3	C N5 2/ W 4 6 *	4422	3114	3284	1002	4.41	3.11	3.28	1499.00	-0.25	-0.69
3879	C N5 2/ W 4 1/ 6	5227	3668	2668	1271	4.11	2.89	2.10	1562.00	-0.35	-0.92
3880	C N5 2/ W 3 1/ 6	6878	5176	3621	1426	4.82	3.63	2.54	1631.00	-1.02	-2.59
3881	C N5 2/ W 3 2/ 6	11105	8412	6104	2363	4.70	3.56	2.58	1746.00	-1.01	-2.40
3882	C N5 1/ W 2 1/ 6	5050	3681	2709	1209	4.18	3.04	2.24	1535.00	-0.59	-1.59
3883	C N5 1/ W 2 2/ 6	6030	4112	2770	1001	6.02	4.11	2.77	1438.00	-0.54	-1.57
3884	C N5 1/ W 3 6 *	174864	122583	91575	54000	3.24	2.27	1.70	1606.00	-0.15	-0.36
3885	C N5 1/ W 3 1/ 6	8126	5990	3827	1266	6.42	4.73	3.02	1611.00	-1.38	-3.55
3886	C N5 1/ W 3 2/ 6	12005	8870	5684	1868	6.43	4.75	3.04	1554.00	-1.40	-3.74
3887	C N5 1/ W 4 6 *	1986	1042	1046	1029	1.93	1.01	1.02	1578.00	0.87	2.30
3888	C N5 1/ W 4 1/ 6	8877	4943	3216	900	9.86	5.49	3.57	1502.00	1.32	3.63
3889	C N5 W 4 6 *	10126	7360	4848	1539	6.58	4.78	3.15	1667.00	-1.27	-3.15
3890	C N5 W 2 1/ 6 *	8156	5826	3811	1181	6.91	4.93	3.23	1419.00	-1.18	-3.45
3891	C N5 W 2 2/ 6 *	15186	11311	7204	2254	6.74	5.02	3.20	1441.00	-1.58	-4.55
[illegible]	C N5 W 3 6 *	7305	5378	3447	1066	6.85	5.05	3.23	1398.00	-1.49	-4.43
3893	C N5 W 3 1/ 6 *	9707	7322	4688	1454	6.68	5.04	3.22	1566.00	-1.69	-4.48
3894	C N5 W 3 2/ 6 *	6628	4922	3104	1018	6.51	4.83	3.05	1517.00	-1.49	-4.06
3895	C N4 2/ W 2 1/ 6	7095	5133	3260	1041	6.82	4.93	3.13	1456.00	-1.31	-3.72
3896	C N4 2/ W 2 2/ 6	11803	8995	5545	1722	6.85	5.22	3.22	1436.00	-1.89	-5.44
3897	C N4 2/ W 3 6 *	10320	7653	4816	1480	6.97	5.17	3.25	1412.00	-1.62	-4.75
3898	C N4 2/ W 3 1/ 6	24950	18476	11705	3584	6.96	5.16	3.27	1399.00	-1.60	-4.72
3899	C N4 2/ W 3 2/ 6	8116	6074	3802	1174	6.91	5.17	3.24	1407.00	-1.70	-5.01
3900	C N4 2/ W 4 6 *	6449	2129	1825	1367	4.72	1.56	1.34	1460.00	3.19	9.05
3901	C N4 1/ W 2 2/ 6	9272	4142	2658	654	14.18	6.33	4.06	1503.00	4.90	13.52
3902	C N4 1/ W 3 6 *	7510	5270	3435	1001	7.50	5.26	3.43	1439.00	-1.14	-3.27
3903	C N4 1/ W 3 1/ 6	7009	5104	3290	1019	6.88	5.01	3.23	1448.00	-1.38	-3.96
3904	C N4 - W 3 6 *	4373	2505	2438	2348	1.86	1.07	1.04	1567.00	0.68	1.78

Attachment No. 1 - Lab Sheets for Samples 3901 and 4240 With Location Map

Location: #1 Mill [illegible] Pad Area

Date Collected: November 9,1994

Date Sealed: November 11,1994

Date Read: NOVEMBER 28, 1994

1994

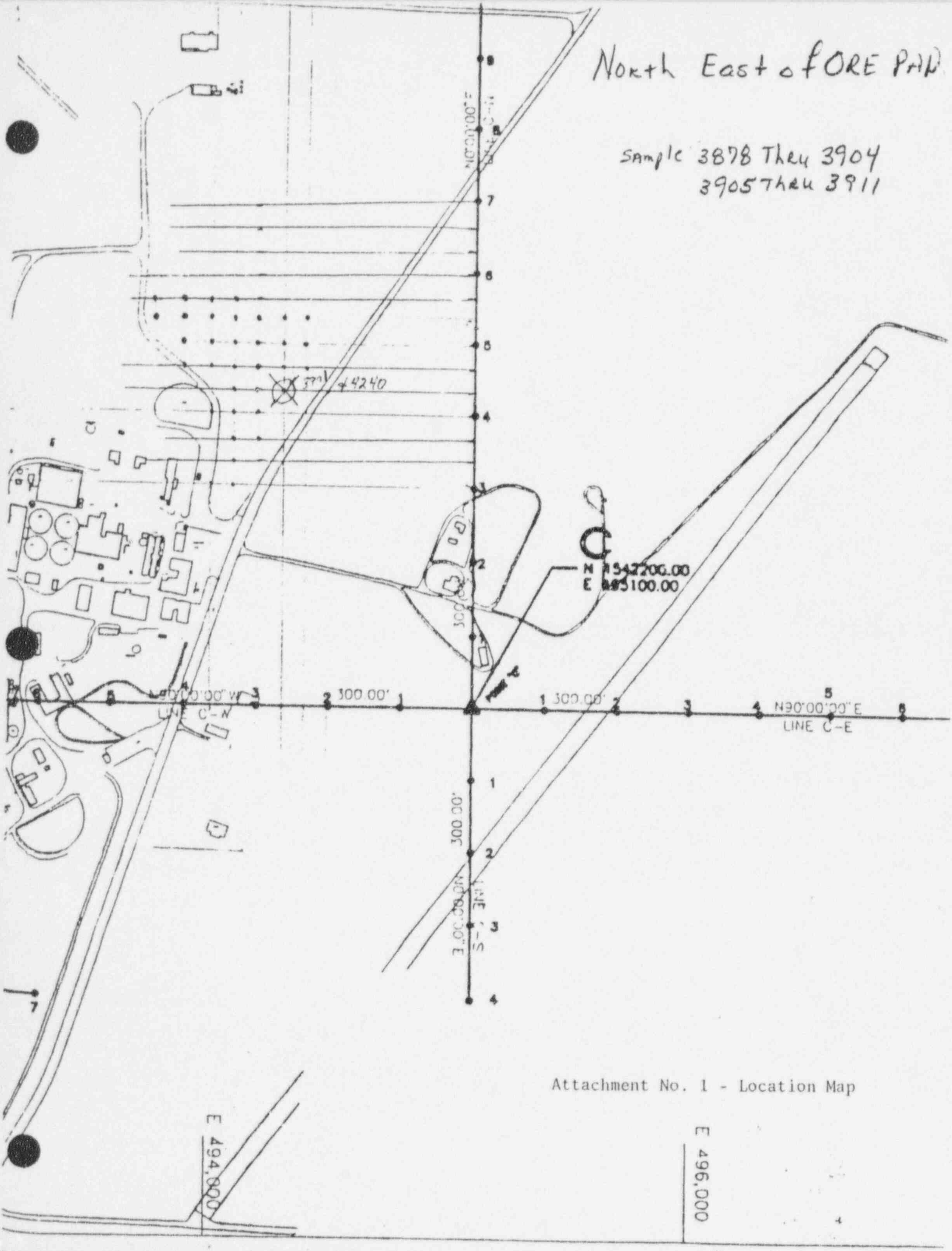
SOIL SAMPLES

LAB ID	Wind Blown Samples ID.	TOTAL COUNTS RA(ROI) 609KEV CH549-CH658	TH(ROI)911KEV CH861-CH961	K(ROI)1406KEV CH1338-CH1458	COUNT TIME SECONDS	CPS RA 609 KEV CH549-CH658	TH 911 KEV CH861-CH961	K 1460 KEV CH1338-CH1458	SAMPLE WT.	TRUE SAMPLE CT. RATI	HMC Ra 226 pCi/g
4234	CN3-W 3.1	1803	1002	992	1006	1.79	1.00	0.99	1576.20	0.20	0.41
4235	CN 3.1- W3.1	2031	1092	1204	1047	1.94	1.04	1.15	1611.80	0.31	0.63
4236	CN 3.2- W3	2062	1090	1079	1071	1.93	1.02	1.01	1667.10	0.32	0.63
4237	CN 3.2- W3.1	8838	4688	4871	3999	2.21	1.17	1.22	1594.30	0.37	0.76
4238	CN-4 W3.1	9502	5078	5908	5367	1.77	0.95	1.10	1682.10	0.30	0.59
4239	CN-4 W 3.1	5449	2802	2980	2375	2.29	1.18	1.25	1580.80	0.47	0.96
4240	CN-4.1 W2.2	3459	1300	1246	1012	3.42	1.28	1.23	1594.60	1.62	3.33
4241	CN-4.1 W-3	3735	1941	2040	1635	2.28	1.19	1.25	1597.20	0.44	0.89
4242	CN-4.1-W3.1	5840	2856	3188	2564	2.28	1.11	1.24	1601.60	0.59	1.20
4243	CN-4.2-W2.1	6343	2867	3019	2560	2.48	1.12	1.18	1621.60	0.81	1.64
4244	CN-4.2-W2.2	5451	2192	2295	1760	3.10	1.25	1.30	1613.10	1.33	2.69
4245	CN-4.2-W3	4018	1830	1880	1458	2.76	1.26	1.29	1578.30	0.88	1.82
4246	CN-4.2-W3.1	2898	1380	1489	1215	2.39	1.14	1.23	1585.10	0.67	1.38

resample 3901 is 4240

North East of ORE PAD

Sample 3878 Thru 3904
3905 Thru 3911



Attachment No. 1 - Location Map

Location: Wind Blown 1994

Attachment No. 2 - Lab Sheets for Sample 3743

Date Collected: July 26, Aug 2, 1994

Date Sealed: Aug 8, 1994

Date Read: Started Aug 24, 1994

1994

SOIL SAMPLES

LAB ID	Wind Blown Samples ID.	TOTAL COUNTS RA(ROI) 609KEV CH549-CH658	TH(ROI)911KEV CH861-CH961	K(ROI)1406KEV CH1338-CH1458	COUNT TIME SECONDS	CPS RA 609 KEV CH549-CH658	TH 911 KEV CH861-CH96	K 1460 KEV CH1338-CH1458	SAMPLE WT.	TRUE SAMPLE CT. RATE	HMC Ra 226 pCi/g
	STA. # 298 0"-6"	7020	3970	2602	495	14.18	8.02	5.26	1684.00	3.22	7.09
3729	STA. # 304 0"-6"	11815	6839	4514	888	13.31	7.70	5.08	1577.00	2.81	6.59
3730	STA. # 230 0"-6"	13818	7737	5293	1030	13.42	7.51	5.14	1631.00	3.37	7.66
3731	STA. # 234 0"-6"	8414	6113	3939	859	9.80	7.12	4.59	1543.00	-0.35	-0.84
3732	STA. # 240 0"-6"	7008	4335	2827	580	12.08	7.47	4.87	1576.00	1.75	4.12
3733	STA. # 246 0"-6"	7831	4351	2890	562	13.93	7.74	5.14	1667.00	3.51	7.80
3734	STA. # 252 0"-6"	25771	14979	9669	1953	13.20	7.67	4.95	1578.00	2.72	6.38
3735	STA. # 258 0"-6"	10638	6897	4565	939	11.33	7.35	4.86	1608.00	1.10	2.54
3736	STA. # 264 0"-6"	7322	4887	3220	654	11.20	7.47	4.92	1351.00	0.67	1.82
3737	STA. # 270 0"-6"	10489	5086	3299	592	17.72	8.59	5.57	1455.00	6.41	16.33
3738	STA. # 276 0"-6"	7170	4466	2795	574	12.49	7.78	4.87	1354.00	1.58	4.34
	STA. # 282 0"-6"	12666	8858	5867	1217	10.41	7.28	4.82	1327.00	0.10	0.27
3740	STA. # 288 0"-6"	11559	7154	4805	930	12.43	7.69	5.17	1346.00	1.75	4.83
3741	STA. # 434 0"-6"	11892	6718	4408	827	14.38	8.12	5.33	1675.00	3.25	7.20
3742	STA. # 440 0"-6"	21295	13579	9002	1810	11.77	7.50	4.97	1676.00	1.31	2.91
3743	STA. # 446 0"-6"	16254	3570	6386	1244	13.07	2.87	5.13	1665.00	13.15	29.27
3744	STA. # 452 0"-6"	43364	30473	20405	4237	10.23	7.19	4.82	1663.00	0.07	0.16
3745	STA. # 469 0"-6"	40800	27582	18330	3788	10.77	7.28	4.84	1600.00	0.54	1.26
3746	STA. # 464 0"-6"	20872	12037	7942	1543	13.53	7.80	5.15	1576.00	2.87	6.76
3747	STA. # 475 0"-6"	36479	26888	18085	3874	9.42	6.94	4.67	1580.00	-0.42	-0.98
3748	STA. # 481 0"-6"	17599	10046	6599	1295	13.59	7.76	5.10	1568.00	3.04	7.18

HOMESTAKE MINING COMPANY

EDF – I SOIL SAMPLES

Attachment No. 2 - Lab Sheets for Sample 3743

Location Highway R.O.W

Date Sampled 8-2-94 Tech DWR Tech

Date Sealed 8-8-94 Tech RG Tech LJ

Date To Be Read

Lab ID	SAMPLE ID	GROSS WT.	TARE WT.	SAMPLE WT.	RA – 226 TOTAL CTS. RA(ROI)609KEV CH549–CH658	TH – 230 TOTAL CTS. TH(ROI)911KEV CH861–CH961	K – 40 TOTAL CTS. K(ROI)1406KEV CH1338–CH1458	COUNT TIME (SEC.)	RA–226 pCi/g FROM GAMMA
3738	Stake# 276 - 6" 3076 cphm	1490.5	137		7170	4466	2795	574	
3739	Stake# 282 - 6" 3206 cphm	1463.6	137		12666	8858	5867	1217	
3740	Stake# 288 - 6" 9-11 μR/hr	1481.6	136		11559	7154	4805	930	
3741	Stake# 434 - 6" 3812 cphm	1812.2	137		11892	6718	4408	827	
3742	Stake# 440 - 6" 3782 cphm	1812.8	137		21295	13579	9002	1810	
3743	Stake# 446 - 6" 3960 cphm	1802.1	137		16254	3570	6386	1244	
3744	Stake# 452 - 6" 3724 cphm	1799.3	136		43364	30473	20465	4237	
3745	Stake# 469 - 6" 4523 cphm	1737.2	137		40800	27582	18330	3788	
3746	Stake# 464 - 6" 3489 cphm	1712.6	137		20872	12037	7942	1543	
3747	Stake# 475 - 6" 2816 cphm	1717.8	138		36479	26888	18085	3874	

Date Read Tech. Tech Tech

Comments

Attachment No. 3 - Hamilton Construction Company Entrance

Attachment No. 4

ENERGY LABORATORIES

ENERGY LABORATORIES, INC.
P.O. BOX 3258 • CASPER, WY 82602 • PHONE (307) 235-0515
254 NORTH CENTER, SUITE 100 • CASPER, WY 82601 • FAX (307) 234-1639

SOIL ANALYSIS REPORT - HOMESTAKE MINING

PO #161143

Date Submitted: 10-06-94
Date Received: 10-10-94
Report Date: 10-27-94

LAB I.D.	Sample Date	Sample I.D.	U-Nat pCi/g	Ra226 Chemical pCi/g	Ra226 Prec pCi/g
94-48404	10-05-94	S-4084	10.1	15.3	0.7
94-48405	10-05-94	S-4085	10.2	0.5	0.2
94-48406	10-05-94	S-4086	30.7	41.8	1.1
94-48407	10-05-94	S-4087	56.9	36.6	0.9
94-48408	10-05-94	S-4088 - limestone	3428	1558	5.3

Report Approved by: R.A. Searling
kmk s448404.hsm

Enter 11-7-94

Rec. 11-7-94
Inv. 94103303
315.00

ELI

QUALITY ASSURANCE REPORT – HOMESTAKE MINING COMPANY

Report Date: 10–28–94
ELI #(s): 94:48404–08

RADIOMETRIC:	METHOD	Dup #1 %	Dup #2 %	Spk #1 %	Spk #2 %	ANALYST	DATE ANALYZED
Uranium	EPA–908.1	85	–	98	–	DB	10–14–94
Ra226	EPA–903.0	90	–	88	–	DB	10–21–94

Report Approved By: DB Ras

dmc 94:48404–08

Attachment No. 4

ENERGY LABORATORIES, INC.
254 North Center Street
Casper, WY 82601
fax 307-234-1639
voice 307-235-0515

CHAIN OF COUSTODY RECORD

PLEASE PRINT OR TYPE ALL INFORMATION EXCEPT SIGNATURES

P.O. # 16443

Project Name / Address: Homestake Mining Co P.O. Box 98 Grants N.M. 87020

Contact Name & Phone: 287-4456

Sampler's signature: [signature]

Invoice to: MARIE - Adrian - Joe

Report to: SAME AS Above

DATE	TIME	composite	grab sample	SAMPLE I.D.	number of containers	Sample Type: A W S V U O (Air Water Soils/solids Vegetation Urine Other)	Analysis Requested: U - Nat	Ra 226						Comments, Special Instructions, etc.
10-5-94				S - 4084	1	S	X	X						Wet Chem
↓				S - 4085	1	S	X	X						↓
↓				S - 4086	1	S	X	X						↓
↓				S - 4087	1	S	X	X						↓
↓														↓
↓				S - 4088 (Lime Stone)	1	S	X	X						↓

	Relinquished (signature)	Date	Time	Received by: (signature)		Relinquished (signature)	Date	Time	Received by (signature):
1.	Adrian	10-6-94	9:00 AM		3.				
2.					4.		10-6-94	1300	Received for laboratory by (signature): Marty [illegible]

Attachment No. 4

ALBUQUERQUE LABORATORY

REPORT OF ANALYSIS

CUSTOMER Homestake Mining Co.
ATTENTION Marie Mazon
ADDRESS Hwy 605, P.O.Box 98
CITY Grants NM 87020-0011
P.O. NO. 94-10-144

Soils-Gamma
TYPE OF ANALYSIS

161169
CUSTOMER ORDER NUMBER

10/20/94
SAMPLES RECEIVED

Level II,K40,Ra226,U238

Customer Identification	Date Collected	Type of Analysis	Sample Weight(g)	pCi/g
S-4088	10/05/94	K40	797	<15
		Ra226		1284±7.5
		U238		863±35
		Bi214		1323±7.8
		Pb214		1469±8.2
S-4098	10/10/94	K40	716	13±2.1
		Ra226		8.68±0.39
		U238		<3.1
		Bi214		8.9±0.40
		Pb214		9.9±0.40
S-4108	10/11/94	K40	641	14±2.0
		Ra226		12±0.41
		U238		<2.5
		Bi214		12±0.43
		Pb214		13±0.46
S-4118	10/11/94	K40	615	15±2.2
		Ra226		13±0.44
		U238		<3.3
		Bi214		13±0.46
		Pb214		15±0.47
S-4128	10/12/94	K40	632	14±2.0
		Ra226		10±0.40
		U238		<2.9
		Bi214		10±0.41
		Pb214		1.0±0.17

Ente 11-18-94 N

REPORTED VIA TELEPHONE ☐ FAX

TMA Eberline
Thermo Analytical Inc.
221 PAN AMERICAN FREEWAY, N.E.
ALBUQUERQUE, NEW MEXICO 87109
PHONE (505) 345-3461
FAX (505) 761-5416

APPROVED BY Mary Kamoss, Data Analyst DATE

Mary Kamoss 11/14/94

Attachment No. 4

ALBUQUERQUE LABORATORY

REPORT OF ANALYSIS

CUSTOMER Homestake Mining Co.
ATTENTION Marie Mazon
ADDRESS Hwy 605, P.O.Box 98
CITY Grants NM 87020-0011
P.O. NO. 94-10-144

Soils-Gamma
TYPE OF ANALYSIS

161169
CUSTOMER ORDER NUMBER

10/20/94
SAMPLES RECEIVED

Level II,K40,Ra226,U238

Customer Identification	Date Collected	Type of Analysis	Sample Weight (g)	pCi/g
S-4138	10/12/94	K40	631	16±1.9
		Ra226		10±0.38
		U238		<2.7
		Bi214		10±0.39
		Pb214		12±0.44
S-4148	10/12/94	K40	321	27±3.1
		Ra226		25±0.71
		U238		<5.3
		Bi214		26±0.74
		Pb214		29±0.77
S-4158	10/12/94	K40	678	12±1.7
		Ra226		7.1±0.35
		U238		<1.6
		Bi214		7.3±0.36
		Pb214		7.9±0.37
S-4168	10/12/94	K40	636	15±2.0
		Ra226		15±0.46
		U238		<4.5
		Bi214		15±0.48
		Pb214		17±0.50
S-4198	10/18/94	K40	616	14±1.8
		Ra226		9.5±0.39
		U238		5.4±2.1
		Bi214		9.7±0.40
		Pb214		10±0.42
S-4208	10/18/94	K40	690	12±1.5
		Ra226		1.9±2.0
		U238		<1.1
		Bi214		2.0±2.1
		Pb214		1.0±0.20

REPORTED VIA TELEPHONE ☐ FAX

TMA Eberline
Thermo Analytical Inc.
2021 PAN AMERICAN FREEWAY, N.E.
ALBUQUERQUE, NEW MEXICO 87109
PHONE (505) 345-3461
FAX (505) 761-5416

APPROVED BY Mary Kamoss, Data Analyst
Mary Kamoss 11/10/94
DATE

Attachment No. 4

ALBUQUERQUE LABORATORY

REPORT OF ANALYSIS

CUSTOMER	Homestake Mining Co.
ATTENTION	Marie Mazon
ADDRESS	Hwy 605, P.O.Box 98
CITY	Grants NM 87020-0011
.O. NO.	94-10-144

Soils-Gamma
TYPE OF ANALYSIS

161169
CUSTOMER ORDER NUMBER

10/20/94
SAMPLES RECEIVED

Level II,K40,Ra226,U238

Customer Identification	Date Collected	Type of Analysis	Sample Weight(g)	pCi/g
S-4218	10/18/94	K40	698	12±1.5
		Ra226		1.6±0.18
		U238		<1.8
		Bi214		1.7±0.19
		Pb214		1.9±0.20
DUPLICATE S-4218	10/18/94	K40	698	11±1.5
		Ra226		1.8±0.20
		U238		<1.6
		Bi214		1.8±0.21
		Pb214		1.8±0.26
K		K40		<2.0
		Ra226		<0.21
		U238		<1.1
SPIKE KNOWN VALUE				
16±1.0		Am241		16±0.47
16±0.99		Cs137		16±0.54
14±0.59		Ra226		15±0.62
16±0.50		Ra228		18±1.2

ORTED VIA TELEPHONE ☐ FAX

PAGE 3 OF 3

TMA Eberline
Thermo Analytical Inc.
'021 PAN AMERICAN FREEWAY, N.E.
ALBUQUERQUE, NEW MEXICO 87109
PHONE (505) 345-3461
FAX (505) 761-5416

APPROVED BY Mary Kamoss, Data Analyst

DATE 11/14/94

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BARRINGER LABORATORIES INC.
15000 W. 6TH AVE., SUITE 300 GOLDEN, CO 80401 (303) 277-1687 FAX (303) 277-1689

7-Jan-94
Page: R-1
Copy: 1 of 2
Status: Final

HOMESTAKE MINING

Sample Id: Tailing Pond Sand (A)
Lab Id: 939303-1
Date Sampled: 10-Dec-93
Project:
Matrix: Sand

Analyte	Fraction	Conc. ± 2σ		LLD	Date Analyzed
Ra-226	Total	620±10	pCi/g	0.3	12/21-12/23
Th-230	Total	540±10	pCi/g	0.4	12/21-12/23
U	Total	61	μg/g	0.3	12/20-12/21
Po-210	Total	700±10	pCi/g	1	12/21-12/22

Sample Id: Tailing Pond Sand (B)
Lab Id: 939303-2
Date Sampled: 10-Dec-93
Project:
Matrix: Sand

Analyte	Fraction	Conc. ± 2σ		LLD	Date Analyzed
Ra-226	Total	560±10	pCi/g	0.3	12/21-12/23
Th-230	Total	470±10	pCi/g	0.4	12/21-12/23
U	Total	73	μg/g	0.3	12/20-12/21
Po-210	Total	690±10	pCi/g	1	12/21-12/22

BARRINGER LABORATORIES INC.
15000 W. 6TH AVE., SUITE 300 GOLDEN, CO 80401 (303) 277-1687 FAX (303) 277-1689

HOMESTAKE MINING

QUALITY CONTROL REPORT

Sample Id	Ra-226 Total pCi/g	± 2σ	Th-230 Total pCi/g	± 2σ	U Total μg/g
Duplicate	1.2	±0.5	1.6	±0.5	226
Duplicate	0.8	±0.5	1.2	±0.4	231
RER	0.38		0.50		0.11
Std (found value)	108	±7	280	±11	44.5
Std (true value)	99		305		49.0
Std % rec.	109		92		91
Blank	0.1	±0.2	0.4	±0.3	U
Spike % rec.	83		107		92

Sample Id	Po-210 Total pCi/g	± 2σ
Duplicate	710	±10
Duplicate	690	±10
RER	0.15	
Std (found value)	80	±4
Std (true value)	84	
Std % rec.	95	
Blank	0.4	±0.2
Spike % rec.	95	

UNITED NUCLEAR-HOMESTAKE PARTNERS
P. O. BOX 98
GRANTS, NEW MEXICO
87020

February 28, 1978

Certified Mail #476450

Mr. Theodore A. Wolff
Radiation Protection Section
New Mexico Environmental
Improvement Agency
P. O. Box 2348
Santa Fe, New Mexico 87503

Dear Ted:

This letter is written pursuant to United Nuclear-Homestake Partner's Application for Radioactive Material License Renewal, pages 40 and 41, which require the Partnership to submit results from soil and air samples collected in evaluating the thoroughness in which the area contaminated by the February 5, 1977, tailings washout was cleaned up.

Water penitration in the areas covered by tailings material was measured on February 7, 1977, and the maximum depth of penitration measured was 16 inches. The Partnership commenced immediate clean up operation and scraped up all of the material to a depth of at least 24 inches below the original ground level.

Attached is a map indicating the approximate area covered by the spill and an estimate of the physical nature of the tailings material reaching different areas. Also shown are the approximate sectors which were used in the clean up schedule.

The following information was generated in evaluating the thoroughness in which the area covered by tailings material was cleaned up:

1. Soil samples were collected during August and October, 1977, and January, 1978, by compositing 30-40 small samples taken randomly throughout each sampling area. The samples collected exhibited the following information:

	%U			Ra-226 (pCi/gm)			Th-230 (pCi/gm)		
Location*	Aug.	Oct.	Jan.	Aug.	Oct.	Jan.	Aug.	Oct.	Jan.
A	.0072	.0061	.0051	7.1	7.2	7.7	.0062	.0047	.0039
B	.0072	.0058	.0054	48.8	41.3	39.0	.0072	.0095	.0090
C	.0084	.0072	.0086	72.9	61.3	67.9	.0097	.0119	.0113
South of Contaminated Area	.0037	.0049	.0041	6.7	7.4	7.1	.0069	.0038	.0042

*Station Locations are illustrated on attached map.

2. Duplicate one hour high volume air samples were collected during August, 1977, in various vicinities of the spill area. The wind direction was from the SW at about 10 miles per hour. The air samples exhibited the following information:

Location	U-Nat ($uCi x 10^{-12}/ml$)	Ra-226 ($uCi x 10^{-12}/ml$)	Th-230 ($uCi x 10^{-13}$
A	0.026	0.025	0.0006
B	0.026	0.020	0.0011
C	0.034	0.027	0.0014
South of Contaminated Area	0.019	0.027	0.0011

3. Duplicate Radon daughter samples were collected during August, 1977. The following results were exhibited:

Location	Working Levels
A	<0.001
B	<0.001
C	0.0014
South of Contaminated Area	<0.001

Beta-Gamma radiation measurements were collected during February and August, 1977, and exhibited the following results:

Location	Beta (mR/hr)		Gamma (mR/hr)	
	Feb.	Aug.	Feb.	Aug.
A	0.01	0.01	0.05	0.05
B	0.01	0.01	0.05	0.05
C	0.01	0.01	0.06	0.05
South of Contaminated Area	0.005	0.01	0.05	0.05

If you have any questions on the above information, please don't hesitate to contact me.

Very truly yours,

UNITED NUCLEAR-HOMESTAKE PARTNERS

Edward E. Kennedy

Edward E. Kennedy
Environmental Coordinator

EEK:sm

cc: Patrick F. Donahoe
John M. Parker
G. Stanley Crout
Radiation Protection Section-Milan Office


Tailings Pond
D
C
B
A
Old Tailings Pile
United Nuclear-Homestake Partne
Tailings Spill
Legend
Solutions
Slimes
Sand-Slimes
No Spill

Attachment No. 9-Addendum to Mill Decommissioning Report

HMC Maintenance Shop building was part of the Grants Mill site buildings but did not have mill solutions, yellowcake or other byproduct process material in the building. This building contained maintenance equipment, records, offices, parts storage and lunch room. If mill process equipment needed to be repaired then it was washed prior to repair in the shop building. To verify the shop was approved for release the building was scanned following "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted use or Termination of Licenses for Byproduct or Source Materials" USNRC September 1984. Since this building was not used in the mill circuit but was within the restricted area, the maintenance shop was surveyed with gamma and alpha survey meters for yellowcake and tailings material. (See HMC Equipment Release Survey Forms.) Attached is the HMC Equipment Release Survey Forms for the Maintenance Shop. All readings were below NRC release standards.

EDF-5 - HMC EQUIPMENT RELEASE SURVEY

Location (Source of equipment) Old Maintance Shop Surveyed by: [signature] RWP No.: N/A
Equipment being surveyed Insulation from building Date: 3-13-96

EQUIPMENT DESCRIPTION	#	GAMMA µR/HR METER READING	GAMMA/BETA [(2)µR/HR BACKGROUND]	TOTAL ALPHA CPM	TOTAL ALPHA DPM/100CM²	REMOVABLE ALPHA CPM	REMOVABLE ALPHA DPM/100CM²	RELEASE YES	RELEASE NO
Insulation from		10	12	10	71.4			✓	
shop building.		8	8	20	142.8			✓	
Material has very		10	12	30	214.3			✓	
fine dust trapped in		10	12	30	214.3			✓	
it.		12	16	20	142.8			✓	
		10	12	20	142.8			✓	
		8	8	10	71.4			✓	
		10	12	20	142.8			✓	
		10	12	20	142.8			✓	

	Gamma	Total Alpha	Removable Alpha
...NT SERIAL NO:	207	102859	
DATE CALIBRATED	1-8-96	12-14-95	
EFFICIENCY	60 µR/HR	0.28	
BACKGROUND	8 µR/HR	0	
LIMITS	40 µR/HR Above Background	250 DPM MAX / 100 CM²	250 DPM MAX / 100 CM²

HMC EQUIPMENT RELEASE SURVEY FORM EDF-5 (07-12-93)

Location (Source of equipment) HMC MAINT. SHOP Surveyed by: Dark [illegible]
Equipment being surveyed HMC SHOP INTERIOR/EXTERIOR Date: 12-18-95

EQUIPMENT DESCRIPTION	#	GAMMA µR/HR METER READING	GAMMA/BETA [(2)µR/HR -BACKGROUND]	TOTAL ALPHA CPM	DPM/100CM²	REMOV. ALPHA CPM	DPM/100CM²	RELEASE YES	NO
SHOP - EAST STORAGE Room #2		9	11	10	91			✓	
— MAINT. OFFICES		9	11	10	91			✓	
— LUNCH ROOM		8	9	10	91			✓	
— ACID STORAGE Room		8	9	10	91			✓	
— WEST STORAGE Room		8	9	10	91			✓	
— LOFT ABOVE MAINT. OFFICE, FLOOR		10	13	10	91			✓	
— ↓ ↓ ↓ ↓ WALLS		10	13	10	91			✓	
INSTRUMENT SERIAL NO:		PRM-7 207		83238		SAC 4 - 305			
DATE CALIBRATED		1-3-96		7-3-95		7-12-95			
EFFICIENCY		60 µR/hr		0.22		0.35			
BACKGROUND		7 µR/hr		0		1.8 CPM			
LIMITS		µR/HR 200 AVE 1000 MAX		5000 DPM/100 CM² AVE 15000 DPM/100 CM² MAX		1000 DPM/100 CM² MAX			

Attachment No. 9

HMC EQUIPMENT RELEASE SURVEY FORM EDF-5 (07-12-93)

Location (Source of equipment) HMC MAINT. SHOP Surveyed by: Dann Rocha
Equipment being surveyed HMC SHOP INTERIOR / EXTERIOR Date: 12-18-95

EQUIPMENT DESCRIPTION	#	GAMMA μR/HR METER READ-ING	GAMMA/BETA [(2)μR/HR -BACK-GROUND]	TOTAL ALPHA CPM	DPM/100CM²	REMOV. ALPHA CPM	DPM/100CM²	RELEASE YES	NO
SHOP - EAST EXTERIOR WALL, NORTH END	1	7	7	60	545	17.2	49	✓	
SOUTH END		15	23	40	364			✓	
SHOP - NORTH EXTERIOR WALL, EAST END		8	9	100	909			✓	
WEST END	2	10	13	120	1091	49.2	141	✓	
SHOP - WEST EXTERIOR WALL, NORTH END	3	13	19	40	364	6.2	18	✓	
SHOP - SOUTH EXTERIOR WALL, WEST END	4	9	11	120	1091	99.2	292	✓	
SHOP - MAIN WORK AREA, INTERIOR, NORTH WALL		8	9	20	182			✓	
EAST WALL		8	9	10	91			✓	
SOUTH WALL		8	9	10	91			✓	
WEST WALL		7	7	10	91			✓	
SHOP BATHROOM		8	9	10	91			✓	
CRANE ROOM (SHOP)	5	17	27	30	273	18.2	52	✓	
SHOP - EAST STORAGE ROOM #1		8	9	10	91			✓	
INSTRUMENT SERIAL NO:		PRM-7 207		83238		SAC 4 - 385			
DATE CALIBRATED		1-3-96		7-3-95		7-12-95			
EFFICIENCY		60 c/.1 HR		0.22		0.35			
BACKGROUND		7 μR/hr		0		1.8 CPM			
LIMITS		μR/HR 200 AVE 1000 MAX		5000 DPM/100 CM² AVE 15000 DPM/100 CM² MAX		1000 DPM/100 CM² MAX			

Attachment No. 9

Table 1. Results of Radiological Testing of Soil Samples Before Removal of Contaminated Soil (Revised 9/16/96)

LAB ID	Wind Blown Samples ID.	HMC Ra 226 pCi/g	TMA Eberline Ra 226 pCi/g	Energy Gamma Ra 226 pCi/g	Energy Wet Chem. Ra 226 pCi/g	TMA Eberline U 238 pCi/g	Energy Wet Chem. Unat pCi/g
1061	CW 4.2 - 6"	49.90					
1062	CW 4.2 - 12"	-0.93	0.83	4.10		2.20	
1063	CW 4.2 - CS0. 1-6"	30.50					
1064	CW 4.2 - CS0. 1-12"	-0.85					
1065	CW 5 - 6"	65.21					
1066	CW 5 - 12"	-0.60					
1067	CW 5 - CSO.1-6 6"	-0.34					
1068	CW 5 - CSO.1-6 12"	1.06					
1069	CW 5 - CSO.2-6"	52.18					
1070	CW 5 - CSO.2-12"	-0.54					
1071	CW 5 - CS1-6"	19.23					
1072	CW 5 - CS1-12"	-0.03	0.82	3.70	1.20	6.70	53.20
1073	CW 5 - CS 1.1 6"	8.77					
1074	CW 5 - CS 1.1 12"	-0.84					
1075	CW 5 - CS 1.2 6"	11.94					
1076	CW 5 - CS 1.2 12"	-0.94					
1077	CW 5 - CS 2 6"	35.75					
1078	CW 5 - CS 2 12"	-1.16					
1079	CW 5.1 - 6"	29.66					
1080	CW 5.1 - 12"	-0.63					
1081	CW 5.1 - CSO .1 - 6"	-0.79					
1082	CW 5.1 - CSO .1 - 12"	-0.93	0.55	3.10		5.40	
1083	CW 5.1 - CSO .2 - 6"	11.60					

Soil samples taken from March 15, 1994 thru April 5, 1994.

Attachment No. 10

Table 1. Results of Radiological Testing of Soil Samples Before Removal of Contaminated Soil (Revised 9/16/96)

LAB ID	Wind Blown Samples ID.	HMC Ra 226 pCi/g	TMA Eberline Ra 226 pCi/g	Energy Gamma Ra 226 pCi/g	Energy Wet Chem. Ra 226 pCi/g	TMA Eberline U 238 pCi/g	Energy Wet Chem. Unat pCi/g
1084	CW 5.1 - CSO .2 - 12"	-1.70					
1085	CW 5.1 - CS 1 - 6"	29.78					
1086	CW 5.1 - CS 1 - 6"	1.50					
1087	CW 5.1 - CS 1.1 -6"	92.38					
1088	CW 5.1 - CS 1.1-12"	37.04					
1089	CW 5.1 - CS 1.2 -6"	56.20					
1090	CW 5.1 - CS 1.2 -12"	3.29					
1091	CW 5.1 - CS 2 -6"	121.70					
1092	CW 5.1 - CS 2 -12"	50.10	41.67	55.90	42.60	<7.3	78.30
1093	CW 5.1 - CS 2.1 -6"	62.35					
1094	CW 5.1 - CS 2.1-12"	5.65					
1095	CW 5.1 - CS 2.2 -6"	35.50					
1096	CW 5.1 - CSO 2.2 -12"	29.91					
1097	CW 5.2 - 6"	4.81					
1098	CW 5.2 - 12"	-0.92					
1099	CW 5.2 - CSO .1 -6"	4.50					
1100	CW 5.2 - CSO .1 -12"	-1.10					
1101	CW 5.2 - CSO .2 -6"	54.56					
1102	CW 5.2 - CSO .2 -12"	1.13	2.41	3.20		4.40	
1103	CW 5.2 - CS 1 -6"	46.95					
1104	CW 5.2 - CS 1 -12"	6.91					
1105	CW 5.2 - CS 1.1 -6"	30.99					
1106	CW 5.2 - CS 1.1-12"	144.04					

Soil samples taken from March 15, 1994 thru April 5, 1994.

Attachment No. 10

Table 1. Results of Radiological Testing of Soil Samples Before Removal of Contaminated Soil (Revised 9/16/96)

LAB ID	Wind Blown Samples ID.	HMC Ra 226 pCi/g	TMA Eberline Ra 226 pCi/g	Energy Gamma Ra 226 pCi/g	Energy Wet Chem. Ra 226 pCi/g	TMA Eberline U 238 pCi/g	Energy Wet Chem. Unat pCi/g
1107	CW 5.2 - CS 2.1 -6"	46.27					
1108	CW 5.2 - CS 2.1 -12"	0.10					
1109	CW5.2 - CS2.2-6"	90.54					
1110	CW5.2 - CS2.2-12"	-0.36					
1111	CW 6 - 6"	24.44					
1112	CW 6 - 12"	57.14	50.62	64.60	50.40	19.40	54.00
1113	CW 6 - CSO.1-6"	23.73					
1114	CW 6 - CSO.1-12"	-0.65					
1115	CW 6 - CSO.2-6"	13.76					
1116	CW 6 - CSO.2-12"	9.85					
1117	CW 6 - CS1 - 6"	4.34					
1118	CW 6 - CS1 - 12"	68.85					
1119	CW 6 - CS 1.1 - 6"	10.02					
1120	CW 6 - CS 1.1 - 12"	-0.35					
1121	CW 6 - CS 1.2 - 6"	107.05					
1122	CW 6 - CS 1.2 - 12"	145.91	120.00	170.00		88.30	
1123	CW 6 - CS 2.1 - 6"	87.10					
1124	CW 6 - CS 2.1 - 12"	0.04					
1125	CW 6 - CS 2.2 - 6"	81.79					
1126	CW 6 - CS 2.2 - 12"	92.23					
1127	CW 7 - 6"	267.63					
1128	CW 7 - 12"	29.22					
1129	CW 7 - CSO.1-6"	47.05					

Soil samples taken from March 15, 1994 thru April 5, 1994.

Attachment No. 10

Table 1. Results of Radiological Testing of Soil Samples Before Removal of Contaminated Soil (Revised 9/16/96)

LAB ID	Wind Blown Samples ID.	HMC Ra 226 pCi/g	TMA Eberline Ra 226 pCi/g	Energy Gamma Ra 226 pCi/g	Energy Wet Chem. Ra 226 pCi/g	TMA Eberline U 238 pCi/g	Energy Wet Chem. Unat pCi/g
1130	CW 7 - CSO.1-12"	67.95					
1131	CW 7 - CSO.2-6"	6.79					
1132	CW 7 - CSO.2-12"	37.27	32.98	38.40	37.80	<3.7	10.30
1133	CW 7 - CS 1 - 6"	21.83					
1134	CW 7 - CS 1 - 12"	2.37					
1135	CW 7 - CS 1.1 - 6"	0.48					
1136	CW 7 - CS 1.1 - 12"	-1.19					
1137	CW 7 - CS 1.2 - 6"	14.63					
1138	CW 7 - CS 1.2 - 12"	8.69					
1139	CW 7 - CS 2 - 6"	76.82					
1140	CW 7 - CS 2 - 12"	7.13					
1141	CW 7 - CS 2.1 - 6"	96.66					
1142	CW 7 - CS 2.1 - 12"	13.81	13.06	17.20		5.90	
1143	CW 7 - CS 2.2 - 6"	-0.84					
1144	CW 7 - CS 2.2 - 12"	-1.24					
1145	CW 7.1 - 6"	67.40					
1146	CW 7.1 - CS 0.2 - 6"	32.19					
1147	CW 7.1 - CS 0.2 - 12"	-0.17					
1148	CW 7.1 - CS 1 - 6"	22.99					
1149	CW 7.1 - CS 1 - 12"	79.00					
1150	CW 7.1 - CS 1.1 - 6"	25.42					
1151	CW 7.1 - CS 1.1 - 12"	-0.39					
1152	CW 7.1 - CS 1.2 - 6"	6.44	7.03	12.80	7.70	11.60	28.70

Soil samples taken from March 15, 1994 thru April 5, 1994.

Attachment No. 10

Table 1. Results of Radiological Testing of Soil Samples Before Removal of Contaminated Soil (Revised 9/16/96)

LAB ID	Wind Blown Samples ID.	HMC Ra 226 pCi/g	TMA Eberline Ra 226 pCi/g	Energy Gamma Ra 226 pCi/g	Energy Wet Chem. Ra 226 pCi/g	TMA Eberline U 238 pCi/g	Energy Wet Chem. Unat pCi/g
1153	CW 7.1 - CS 1.2 - 12"	-0.59					
1154	CW 7.1 - CS 2 - 6"	3.73					
1155	CW 7.1 - CS 2 - 12"	-1.01					
1156	CW 7.1 - CS 2.1 - 6"	3.16					
1157	CW 7.1 - CS 2.1 - 12"	-0.67					
1158	CW 7.1 - CS 2.2 - 6"	19.74					
1159	CW 7.1 - CS 2.2 - 12"	-0.83					
1160	CW 8 - 6"	128.54					
1161	CW 8 - 12"	67.71					
1162	CW 8 - CS 0.1 - 6"	72.81	53.54	71.20		34.20	
1163	CW 8 - CS 0.1 - 12"	-0.34					
1164	CW 8 - CS 0.2 - 6"	-1.23					
1165	CW 8 - CS 0.2 - 12"	-1.11					
1166	CW 8 - CS 1 - 6"	-1.58					
1167	CW 8 - CS 1 - 12"	-1.01					
1168	CW 8 - CS 1.1 - 6"	0.34					
1169	CW 8 - CS 1.1 - 12"	-1.35					
1170	CW 8 - CS 1.2 - 6"	1.60					
1171	CW 8 - CS 1.2 - 12"	0.04					
1172	CW 8 - CS 2 - 6"	0.28	1.80	2.80	1.90	7.70	22.80
1173	CW 8 - CS 2 - 12"	-0.74					
1174	CW 8 - CS 2.2 - 6"	1.31					
1175	CW 8 - CS 2.2 - 12"	-1.11					

Soil samples taken from March 15, 1994 thru April 5, 1994.

Attachment No. 10

Table 1. Results of Radiological Testing of Soil Samples Before Removal of Contaminated Soil (Revised 9/16/96)

LAB ID	Wind Blown Samples ID.	HMC Ra 226 pCi/g	TMA Eberline Ra 226 pCi/g	Energy Gamma Ra 226 pCi/g	Energy Wet Chem. Ra 226 pCi/g	TMA Eberline U 238 pCi/g	Energy Wet Chem. Unat pCi/g
1176	CW 8 - CS 2.2 - 6"	0.04					
1177	CW 8 - CS 2.2 - 12"	-1.63					
1178	CW 8.1 - CS 2.2 - 6"	136.78					
1179	CW 8.1 - CS 2.2 - 12"	141.68					
1346	CW 4.1 - CN 2.1 - 6"	17.28					
1347	CW 4.1 - CN 2.1 -12"	0.84					
1348	CW 4.1 - CN 2.2 - 6"	18.44					
1349	CW 4.1 - CN 2.2 - 12"	0.87					
1350	CW 4.1 - CN 3.0 - 6"	41.73					
1351	CW 4.1 - CN 3.0 -12"	1.38					
1352	(S1)Near Gas meter 6"	35.04	30.78	45.00	33.7	<6.0	19.06
1353	(S1)Near Gas meter 12"	3.25					
1354	(S2)Office - Lab 6"	31.66					
1355	(S2)Office - Lab 12"	14.08					
1356	(S3)Guard Shack 6"	29.94					
1357	(S3)Guard Shack 12"	12.51					
1358	BW 3.0 / BN 4.2 - 6"	4.35					
1359	BW 3.0 / BN 4.2 - 12"	0.14					
1360	BW 3.05 / BN 4.2 - 6"	101.61 *					
1361	BW 3.05 / BN 4.2 - 12"	26.01					
1362	BW 3.05 / BN 4.25 - 6"	72.99	58.67	78.40	73.5	6.20	14.90
1363	BW 3.05 / BN 4.25-12"	29.71					
1364	BW 3.1 / BN 4.25 - 6"	2.22					

Soil samples taken from March 15, 1994 thru April 5, 1994.

Attachment No. 10

Table 1. Results of Radiological Testing of Soil Samples Before Removal of Contaminated Soil (Revised 9/16/96)

LAB ID	Wind Blown Samples ID.	HMC Ra 226 pCi/g	TMA Eberline Ra 226 pCi/g	Energy Gamma Ra 226 pCi/g	Energy Wet Chem. Ra 226 pCi/g	TMA Eberline U 238 pCi/g	Energy Wet Chem. Unat pCi/g
1365	BW 3.1 / BN 4.25 - 12"	0.07					
1366	(S4)Special Sample 6"	26.94		42.10			
1367	(S4)Special Sample 12"	4.11		8.90			
1368	(S5)Special Sample 6"	3.21		6.20			
1369	(S5)Special Sample 12"	13.13		24.30			
1370	(S6)Special Sample 6"	10.02		13.60			
1371	(S6)Special Sample 12"	9.07		14.30			
1372	(S7)Special Sample 6"	321.40	284.80	344.00	345	67.30	193.00
1373	(S7)Special Sample 12"	203.62		229.00			
1374	(S8)Special Sample 6"	57.22		67.00			
1375	(S8)Special Sample 12"	23.78		26.70			
1376	(S9)Special Sample 6"	-1.16		1.10			
1377	(S9)Special Sample 12"	-1.07		1.70			
1378	(S10)Special Sample 6"	0.81		2.10			
1379	(S10)SpecialSample 12"	35.39		32.40			
1380	(S11)Special Sample 6"	60.66		70.50			
1381	(S11)SpecialSample 12"	6.77		10.50			

Soil samples taken from March 15, 1994 thru April 5, 1994.

Attachment No. 10

TABLE OF CONTENTS

ATTACHMENTS

Date Collected: May 19,23,24,1995

Date Sealed: May 25,1995

Date Read: JUNE 12,1995

SAMPLED BY LJ. PREP SAMPLES RO. 15 DAY READING SEALED 1995 SOIL SAMPLES

LAB ID	Wind Blown Samples ID.	TOTAL COUNTS RA(ROI) 609KEV CH549-CH658	TH(ROI)911KEV CH881-CH981	K(ROI)1460KEV CH1338-CH1458	COUNT TIME SECONDS	CPS RA 609 KEV CH549-CH658	TH 911 KEV CH881-CH981	K 1460 KEV CH1338-CH1458	SAMPLE WT.	TRUE SAMPLE CT. RAT	HMC Ra 226 pCi/g	ERG
4933	PT-20	4008	1296	1299	1053	3.81	1.23	1.23	1681.56	2.20	4.28	3.58
4934	PT-26	2715	1307	1347	1145	2.37	1.14	1.18	1337.00	0.61	1.49	1.43
4935	PT-27	2598	1280	1214	1018	2.55	1.26	1.19	1321.90	0.58	1.44	1.87
4938	JO44238	3888	1550	1377	1001	3.86	1.55	1.38	1381.20	1.60	3.79	4.14
4937	JO34101	2878	1457	1305	1142	2.52	1.28	1.14	1480.40	0.49	1.09	1.49
4938	JO42092	3173	1493	1244	1027	3.09	1.45	1.21	1576.40	0.82	1.70	2.40
4939	HO43239	3130	1284	1218	1002	3.12	1.28	1.21	1501.70	1.29	2.79	2.28
4940	JO52237	1875	1014	826	1057	1.87	0.96	0.68	1491.00	0.33	0.73	1.24
HMC Lab Identification Tracking Number	Detailed Sample Identification	Raw Data Used To Calculate Concentration									Official Radiometric HMC Ra-226 Analysis	ERG Calculation is a Second Method to Check HMC Analysis

Homestake Mining Company - Grants Operation
Table B-1 Soil Sample Results For North Borrow Pit

HMC Lab ID	HMC Sample ID	Energy Lab ID	Ra-226 Chem. pCi/g	Ra-226 Prec. pCi/g
3421	AN-12-AE-12	94-32126	1.5	0.3
3422	AN-9-AE-12	94-32127	2.0	0.3
3423	AN-10-AE-14	94-32128	0.5	0.2
3424	AN-13-AE-10	94-32129	1.7	0.3
3425	AN-11-AE-12	94-32130	1.0	0.2
3426	AN-14-AE-9	94-32131	1.8	0.3
3427	AN-14-AE-14	94-32132	1.4	0.3
3428	AN-13-AE-13	94-32133	1.1	0.2
3429	AN-12-AE-10	94-32134	0.1	0.1
3430	AN-9-AE-14	94-32135	1.4	0.3
3431	AN-14-AE-15	94-32136	1.7	0.3
3432	AN-12-AE-14	94-32137	1.3	0.3
3433	AN-12-AE-8	94-32138	1.7	0.3
3434	AN-14-AE-8	94-32139	1.2	0.2
3435	AN-8-AE-12	94-32140	2.5	0.3
3436	AN-12-AE-14	94-32141	1.3	0.3
3437	AN-9-AE-9	94-32142	1.5	0.3
HMC Lab Identification Tracking Number	Detailed Sample Identification	Energy Lab (Outside Lab) Tracking Number	Wet Chemistry Analysis by Energy Labs (outside lab) for Ra-226	Precision of Wet Chemistry Analysis

Homestake Mining Company - Grants Operation

Table C-1 Soil Sample Results Taken in The Trucking Yard

LAB ID	Wind Blown Samples ID.	HMC Ra 226 pCi/g	TMA Eberline Ra 226 pCi/g	Energy Gamma Ra 226 pCi/g	Energy Wet Chem. Ra 226 pCi/g	TMA Eberline U 238 pCi/g	Energy Wet Chem. Unat pCi/g
3930	STA. # AE-17 - AS-3	1.66					
3931	STA. # AE-18 - AS-2.1	0.61					
3932	STA. # AE-18.2 - AS-3	4.18					
3933	STA. # AE-18.2 - AS-2.2	5.07					
3934	STA. # AE-18.1 - AS-3	0.44					
3935	STA. # AE-18.1- AS-1.2	0.62					
3936	ST.# AE-18.1-AS-1.2 30'	0.70					
3937	STA. # AE-17.1- AS-2.1	3.16					
3938	STA. # AE-18- AS-2.2	0.59	0.58		0.50	1.88	3.00
3939	STA. # AE-18.1- AS-1.1	1.60					
3940	STA. # AE-17.1 - AS-3	1.62					
3941	STA. # AE-18.1- AS-2.2	0.63					
3942	STA. # AE-18 - AS-2	1.58					
3943	STA. # AE-17.1- AS-2.2	-3.23					
HMC Lab Identification Tracking Number	Detailed Sample Identification	Official Radiometric HMC Ra-226 Analysis	Radiometric Analysis by TMA Eberline (outside lab) for Ra-226	Radiometric Analysis by Energy Lab (outside lab) for Ra-226	Wet Chemistry Analysis by Energy Lab (outside lab) for Ra-226	Radiometric Analysis by TMA Eberline (outside lab) for U-238	Wet Chemistry Analysis by Energy Lab (outside lab) for U-nat

Homestake Mining Company - Grants Operation
Table F-1 Gamma Readings For State Hwy. 605 Right-of-Way Along Mill Site

Station Number	Gamma Reading in cphm	Gamma Reading in µR/hr	Station Number	Gamma Reading in cphm	Gamma Reading in µR/hr	Station Number	Gamma Reading in cphm	Gamma Reading in µR/hr
100	5236		122	3507		144	3525	
101	3600		123	3269		145	3236	
102	3367		124	3114		146	3070	
103	3398		125	3206		147	2987	
104	3334		126	3079		148	2918	
105	3486		127	3133		149	3065	
106	3486		128	3146		150	3108	
107	3154		129	3102		151	3203	
108	3167		130	3049		152	2892	
109	3255		131	3238		153	2899	
110	3623		132	3238		154	2781	
111	3622		133	2992		155	3043	
112	3836		134	3318		156	2939	
113	3549		135	3523		157	2987	
114	3540		136	3416		158	2833	
115	3366		137	3443		159	3078	
116	3514		138	3145		160	3541	
117	2532		139	2965		161	3570	
Location or Station Number in right-of-way of State Road 605 Surveyed and Marked in Field	Gamma Reading Taken in field by Field Tech. During Soil Cleanup Taken on Clean Soil		Location or Station Number in right-of-way of State Road 605 Surveyed and Marked in Field	Gamma Reading Taken in field by Field Tech. During Soil Cleanup Taken on Clean Soil		Location or Station Number in right-of-way of State Road 605 Surveyed and Marked in Field	Gamma Reading Taken in field by Field Tech. During Soil Cleanup Taken on Clean Soil	

Attachment No. 11

Homestake Mining Company - Grants Operation

Table H-1 Soil Sample Results of Inner Zone Surveyed by GPS

LAB ID	Wind Blown Samples ID.	HMC Ra 226 pCi/g	TMA Eberline Ra 226 pCi/g	Energy Gamma Ra 226 pCi/g	Energy Wet Chem. Ra 226 pCi/g	TMA Eberline U 238 pCi/g	Energy Wet Chem. Unat pCi/g
4801	H034057	2.86					
4803	H043039	2.56					
4804	H032106	4.56					
4805	H041065	2.62					
4806	H042246	1.09					
4807	H051252	2.80	2.70			4.20	
4808	H063056	0.48					
4809	H064026	3.02					
4810	H062258	0.41					
4811	H074034	0.67					
4812	H072237	1.15					
4813	H074011	0.90					
4814	H073053	3.43	3.10			<3.1	
4815	H071175	0.30					
4816	H061259	1.18					
4817	H054046	0.98					
HMC Lab Identification Tracking Number	Detailed Sample Identification	Official Radiometric HMC Ra-226 Analysis	Radiometric Analysis by TMA Eberline (outside lab) for Ra-226	Radiometric Analysis by Energy Lab (outside lab) for Ra-226	Wet Chemistry Analysis by Energy Lab (outside lab) for Ra-226	Radiometric Analysis by TMA Eberline (outside lab) for U-238	Wet Chemistry Analysis by Energy Lab (outside lab) for U-nat

Homestake Mining Company - Grants Operation
Table B-3 Soil Sample Results Taken From The Near North Barrow Area

HMC Lab ID	HMC Sample ID	HMC Ra 226 pCi/g	TMA Eberline Ra 226 pCi/g	TMA Eberline U 238 pCi/g	Energy Gamma Ra 226 pCi/g	Energy Wet Chem. Unat pCi/g
662	AN - 1, AE-7, 6"	3.08				
663	AN - 1, AE-7, 12"	-0.39	0.87	<1.10		
664	AN - 1, AE-8, 6"	6.90				
665	AN - 1, AE-8, 12"	1.25				
666	AN - 1, AE-9, 6"	9.77				
667	AN - 1, AE-9, 12"	1.06				
668	AN - 1, AE-10, 6"	1.82				
669	AN - 1, AE-10, 12"	-0.37				
670	AN - 1, AE-11, 6"	-0.20				
671	AN - 1, AE-11, 12"	-1.30				
672	AN - 1, AE-12, 6"	4.01				
673	AN - 1, AE-12, 12"	0.15	2.64	<2.00	2.4	1.9
674	AN - 1, AE-13, 6"	2.92				
675	AN - 1, AE-13, 12"	-0.81				
729	AN - 2, AE-7, 6"	0.16				
730	AN - 2, AE-7, 12"	-0.91				

HMC Lab ID	HMC Sample ID	HMC Ra 226 pCi/g	TMA Eberline Ra 226 pCi/g	TMA Eberline U 238 pCi/g	Energy Gamma Ra 226 pCi/g	Energy Wet Chem. Unat pCi/g
731	AN - 2, AE-8, 6"	0.31				
732	AN - 2, AE-8, 12"	-0.61				
733	AN - 2, AE-9, 6"	0.86	2.13	2.70	2.7	7.2
734	AN - 2, AE-9, 12"	-0.23				
735	AN - 2, AE-10, 6"	0.79				
736	AN - 2, AE-10, 12"	-0.79				
737	AN - 2, AE-11, 6"	-0.86				
738	AN - 2, AE-11, 12"	-0.64				
739	AN - 2, AE-12, 6"	2.31				
740	AN - 2, AE [illegible] 2"	-0.93				
741	AN - 2, AE-13, 6"	0.19				
742	AN - 2, AE-13, 12"	-0.31				
837	AN - 3, AE-7, 6"	9.26				
838	AN - 3, AE-7, 12"	0.10				
839	AN - 3, AE-8, 6"	1.68				
840	AN - 3, AE-8, 12"	-0.98				
841	AN - 3, AE-9, 6"	29.66				
842	AN - 3, AE-9, 12"	3.86				
843	AN - 3, AE-10, 6"	7.07	8.71	<3.40		

HMC Lab ID	HMC Sample ID	HMC Ra 226 pCi/g	TMA Eberline Ra 226 pCi/g	TMA Eberline U 238 pCi/g	Energy Gamma Ra 226 pCi/g	Energy Wet Chem. Unat pCi/g
844	AN - 3, AE-10, 12"	3.55				
845	AN - 3, AE-11, 6"	22.12				
846	AN - 3, AE-11, 12"	7.07				
847	AN - 3, AE-12, 6"	-0.22				
848	AN - 3, AE-12, 12"	-0.60				
849	AN - 3, AE-13, 6"	0.96				
850	AN - 3, AE-13, 12"	-1.00				
877	AN - 4, AE-7, 6"	1.56				
878	AN - 4, AE-7, 12"	-0.82				
879	AN - 4, AE-8, 6"	2.56				
880	AN - 4, AE-8, 12"	1.22				
881	AN - 4, AE-9, 6"	15.27				
882	AN - 4, AE-9, 12"	-0.28				
883	AN - 4, AE-10, 6"	11.05	11.81	<5.20		
884	AN - 4, AE-10, 12"	0.21				
885	AN - 4, AE-11, 6"	11.50				
886	AN - 4, AE-11, 12"	4.77				
887	AN - 4, AE-12, 6"	8.24				
888	AN - 4, AE-12, 12"	-0.83				

HMC Lab ID	HMC Sample ID	HMC Ra 226 pCi/g	TMA Eberline Ra 226 pCi/g	TMA Eberline U 238 pCi/g	Energy Gamma Ra 226 pCi/g	Energy Wet Chem. Unat pCi/g
889	AN - 4, AE-13, 6"	19.58				
890	AN - 4, AE-13, 12"	-0.78				
917	AN - 5, AE-7, 6"	4.21				
918	AN - 5, AE-7, 12"	-1.34				
919	AN - 5, AE-8, 6"	23.34				
920	AN - 5, AE-8, 12"	-0.26				
921	AN - 5, AE-9, 6"	4.54				
922	AN - 5, AE-9, 12"	-0.93				
923	AN - 5, AE-10, 6"	4.84	6.08	<2.20		
924	AN - 5, AE-10, 12"	-1.26				
925	AN - 5, AE-11, 6"	16.25				
926	AN - 5, AE-11, 12"	-0.62				
927	AN - 5, AE-12, 6"	7.05				
928	AN - 5, AE-12, 12"	2.77				
929	AN - 5, AE-13, 6"	9.70				
930	AN - 5, AE-13, 12"	9.86				
931	AN - 5, AE-14, 6"	10.18				
932	AN - 5, AE-14, 12"	-1.05				
957	AN - 6, AE-7, 6"	4.22				

HMC Lab ID	HMC Sample ID	HMC Ra 226 pCi/g	TMA Eberline Ra 226 pCi/g	TMA Eberline U 238 pCi/g	Energy Gamma Ra 226 pCi/g	Energy Wet Chem. Unat pCi/g
958	AN - 6, AE-7, 12"	-0.79				
959	AN - 6, AE-8, 6"	3.73				
960	AN - 6, AE-8, 12"	-1.04				
961	AN - 6, AE-9, 5"	1.21				
962	AN - 6, AE-9, 12"	-1.05				
963	AN - 6, AE-10, 6"	2.74	3.81	<1.70		
964	AN - 6, AE-10, 12"	-0.58				
965	AN - 6, AE-11, 6"	1.95				
966	AN - 6, AE-11, 12"	-0.89				
967	AN - 6, AE-12, 6"	1.94				
968	AN - 6, AE-12, 12"	-0.44				
969	AN - 6, AE-13, 6"	1.20				
970	AN - 6, AE-13, 12"	-0.25				

Location: HMC EAST BOUNDRY GRASS SPECIAL SAMPLE FOR QUICK READING

Attachment No. 13

Date Collected: FEBUARY 21,1995

Date Sealed: FEBUARY 21,1995

Date Read : FEBUARY 21,1995

IV ANND LJ PICK UP SAMPLE QUICK READING

LAB ID	Wind Blown Samples ID.	TOTAL COUNTS RA(ROI) 609KEV CH549-CH658	TH(ROI)911KEV CH861-CH961	K(ROI)1406KEV CH1338-CH1458	COUNT TIME SECONDS	1995 CPS RA 609 KEV CH549-CH658	TH 911 KEV CH861-CH961	K 1460 KEV CH1338-CH1458	SOIL SAMPLES SAMPLE WT.	TRUE SAMPLE CT. RATE	HMC Ra 226 pCi/g	Ken Ra 226 pCi/g	Factor x1.5 Ra 226 pCi/g
1	EAST BOUNDRY GRASS	3317	1309	1341	1295	2.56	1.01	1.04	1322.70	1.12	2.80	2.01	4.2
2	EAST BOUNDRY GRASS	2207	1004	954	1002	2.20	1.00	0.95	1277.50	0.68	1.76	1.30	2.64
3	EAST BOUNDRY GRASS	2307	1085	1040	1032	2.24	1.05	1.01	1269.30	0.62	1.62	0.87	2.43
4	EAST BOUNDRY GRASS	3718	1377	1397	1208	3.08	1.14	1.16	1314.00	1.49	3.77	3.26	5.66
5	EAST BOUNDRY GRASS	2346	988	998	1022	2.30	0.97	0.98	1289.20	0.87	2.25	1.70	3.38
6	EAST BOUNDRY GRASS	4239	1652	1440	1469	2.89	1.12	0.98	1230.60	1.26	3.39	2.31	5.09
7	EAST BOUNDRY GRASS	3830	1496	1304	1321	2.90	1.13	0.99	1346.90	1.26	3.10	2.40	4.65
8	EAST BOUNDRY GRASS	2814	1254	1144	1154	2.44	1.09	0.99	1291.60	0.79	2.03	1.42	3.05

Attachment No. 13

Location: HMC NORTH EAST BOUNDRY GRASS SPECIAL SAMPLE FOR QUICK READING

Date Collected: FEBUARY 22,1995

Date Sealed: FEBUARY 22,1995

Date Read : FEBUARY 22,1995

RG ANND LJ PICK UP SAMPLE QUICK READING

1995 SOIL SAMPLES

LAB ID	Wind Blown Samples ID.	TOTAL COUNTS RA(ROI) 609KEV CH549-CH658	TH(ROI)911KEV CH861-CH961	K(ROI)1406KEV CH1338-CH1458	COUNT TIME SECONDS	CPS RA 609 KEV CH549-CH658	TH 911 KEV CH861-CH961	K 1460 KEV CH1338-CH1458	SAMPLE WT.	TRUE SAMPLE CT. RAT	HMC Ra 226 pCi/g	Kew Ra226 pCi/g	factor x1.5 Ra226 pCi/g
1	N.E BOUNDRY GRASS	2467	1137	1052	1112	2.22	1.02	0.95	1114.30	0.65	1.93	1.80	2.89
2	N.E BOUNDRY GRASS	3231	1265	1162	1082	2.99	1.17	1.07	1006.30	1.30	4.29	3.92	6.4
3	N.E BOUNDRY GRASS	2778	1180	1054	1060	2.62	1.11	0.99	1053.30	0.96	3.02	1.56	4.53
4	N.E BOUNDRY GRASS	4110	1698	1547	1517	2.71	1.12	1.02	1015.30	1.06	3.46	3.34	5.19
5	N.E BOUNDRY GRASS	3235	1249	1074	1062	3.05	1.18	1.01	1038.80	1.35	4.31	4.38	6.46
6	N.E BOUNDRY GRASS	4050	1559	1379	1340	3.02	1.16	1.03	1086.30	1.35	4.13	3.71	6.19
7	N.E BOUNDRY GRASS	5604	2292	2049	1944	2.88	1.18	1.05	1111.40	1.15	3.43	3.13	5.14
8	N.E BOUNDRY GRASS	3090	1258	1061	1014	3.05	1.24	1.05	1196.50	1.22	3.37	3.32	5.06

Attachment No. 13

Location: HMC NORTH EAST BOUNDRY GRASS SPECIAL SAMPLE FOR QUICK READING

Date Collected: FEBUARY 25,1995

Date Sealed: FEBUARY 25,1995

Date Read : FEBUARY 25,1995

RG ANND LJ PICK UP SAMPLE QUICK READING

1995

SOIL SAMPLES

LAB ID	Wind Blown Samples ID.	TOTAL COUNTS RA(ROI) 609KEV CH549-CH658	TH(ROI)911KEV CH861-CH961	K(ROI)1406KEV CH1338-CH1458	COUNT TIME SECONDS	CPS RA 609 KEV CH549-CH658	TH 911 KEV CH861-CH961	K 1460 KEV CH1338-CH1458	SAMPLE WT.	TRUE SAMPLE CT. RAT	HMC Ra 226 pCi/g	Rew Ra 226 pCi/g	X Factor 1.5 Ra 226 pCi/g
1	N.H.Y BOUNDRY GRASS	4513	1714	1508	1442	3.13	1.19	1.05	1186.00	1.43	3.93	4.53	5.89
2	N.H.Y BOUNDRY GRASS	3106	1309	1294	1321	2.35	0.99	0.98	1291.00	0.89	2.24	1.31	3.36
3	N.H.Y BOUNDRY GRASS	2707	1096	1007	1067	2.54	1.03	0.94	1271.40	1.03	2.64	2.95	3.96
4	N.H.Y BOUNDRY GRASS	3273	1309	1207	1154	2.84	1.13	1.05	1297.40	1.18	2.98	2.70	4.43
5	N.H.Y BOUNDRY GRASS	6492	2762	2656	2640	2.46	1.05	1.01	1282.80	0.90	2.30	2.04	3.45
6	N.H.Y BOUNDRY GRASS	6784	2024	1916	1471	4.61	1.38	1.30	1205.90	2.90	7.85	7.48	11.78
7	N.H.Y BOUNDRY GRASS	10022	3561	3423	2901	3.45	1.23	1.18	1253.40	1.77	4.61	4.86	6.92

Attachment No. 13

Location: HMC NORTH OF MAP GRASS SPECIAL SAMPLE FOR QUICK READING

Date Collected: FEBUARY 27,1995

Date Sealed: FEBUARY 27,1995

Date Read : FEBUARY 27,1995

RG ANND LJ PICK UP SAMPLE QUICK READING 1995 SOIL SAMPLES

LAB ID	Wind Blown Samples ID.	TOTAL COUNTS RA(ROI) 609KEV CH549-CH658	TH(ROI)911KEV CH861-CH961	K(ROI)1406KEV CH1338-CH1458	COUNT TIME SECONDS	CPS RA 609 KEV CH549-CH658	TH 911 KEV CH861-CH961	K 1460 KEV CH1338-CH1458	SAMPLE WT.	TRUE SAMPLE CT. RAT	HMC Ra 226 pCi/g	Ken Ra226 Pci/g	k Factor x1.5 Ra 226 pCi/g
1	NORTH OF MAP GRASS	2924	1243	1257	1233	2.37	1.01	1.02	1076.00	0.88	2.67	2.69	4.00
2	NORTH OF MAP GRASS	3533	1473	1342	1330	2.66	1.11	1.01	997.20	1.01	3.32	3.39	4.98
3	NORTH OF MAP GRASS	3327	1237	1111	1002	3.32	1.23	1.11	1140.60	1.57	4.51	3.86	6.15
4	NORTH OF MAP GRASS	3346	1291	1188	1079	3.10	1.20	1.10	1152.30	1.36	3.92	3.41	5.88
5	NORTH OF MAP GRASS	2670	1129	997	1001	2.67	1.13	1.00	1180.59	0.98	2.71	2.73	4.07