



STATE OF MINNESOTA

ENVIRONMENTAL QUALITY COUNCIL
CAPITOL SQUARE BUILDING
550 CEDAR STREET
ST. PAUL, 55101

Dear Interested Party:

This letter and the accompanying documents include all items but one constituting the Final Environmental Impact Statement (EIS) in the Matter of the Application by Reserve Mining Company for Permits for the Mile Post 7 On-land Tailings Disposal Plan at Silver Bay, Minnesota, as required under MEQC 33 of the Rules and Regulations of the Minnesota Environmental Quality Council.

The remaining item necessary to constitute the Final EIS is the notice of completion from the MPCA. This will be mailed to you as soon as it is received, together with a notification of the time and place at which the MEQC will consider the Final EIS. The Draft EIS in the Reserve Mining Company matter dated October 1975, is incorporated into the Final EIS and is supplemented by the materials contained herein.

Enclosed with this letter you will find the findings and conclusions by Hearing Officer Wayne Olson concerning the Draft EIS, a list of witnesses appearing and testifying in the Reserve hearings, a list of exhibits received into evidence at the Reserve hearings, an index of items to be found in the hearings, and the Midway Supplement to the Draft EIS. The complete record of the permit proceedings may be reviewed in Duluth and Minneapolis by contacting William Gordon, Director of Libraries, Duluth Public Library, Duluth, Minnesota, or Julie Copeland, Environmental Library, Minneapolis Public Library, Minneapolis, Minnesota.

Very truly yours,

A handwritten signature in cursive script that reads "Peter L. Vanderpoel".

Peter Vanderpoel, Chairman
Environmental Quality Council

In the Matter of the Applications
of Reserve Mining Company for All
Necessary Permits, Approvals and
Certifications for the Mile Post
7 (Lax Lake) On-land Tailings
Disposal System Near Silver Bay,
Minnesota

NOTICE OF COMPLETION
OF FINAL EIS

PLEASE TAKE NOTICE that pursuant to MEQC 26(j)(1) of the
Rules and Regulations of the Minnesota Environmental Quality
Council, the Minnesota Department of Natural Resources, one of
the Responsible Agencies for the purpose of preparing the Final
Environmental Impact Statement in the above-entitled matter, does
hereby deem the Final Environmental Impact Statement to be complete
as of June 2, 1976 and does transmit the same to the Minnesota
Environmental Quality Council for its review.

MINNESOTA DEPARTMENT OF NATURAL RESOURCES


By Robert L. Herbst, Commissioner

STATE OF MINNESOTA

DEPARTMENT OF NATURAL RESOURCES

POLLUTION CONTROL AGENCY

Reserve Mining Company, On-land Tailings Disposal

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Pursuant to notice, public hearings commenced at Roseville, Minnesota before Wayne H. Olson, Hearing Officer/Referee on June 2, 1975 on the applications of Reserve Mining Company [Reserve] for permits for the construction and operation of facilities for on land disposal of tailings at a site in Lake County, Minnesota, designated as Mile Post 7. Public hearings on the draft environmental impact statement relating to the applications were incorporated into the hearings on the applications and commenced pursuant to notice on December 1, 1975.

By orders previously filed, applications to intervene on behalf of the following parties were granted:

Armco Steel Corporation (Armco)
Republic Steel Corporation (Republic)
City of Silver Bay, City of Beaver Bay, Town of
Beaver Bay, Lake County, St. Louis County,
Northeastern Minnesota Development Association
(NEMDA) Duluth Area Chamber of Commerce, City
of Babbitt and Range League of Municipalities,
Lax Lake Property Owners Association, and Silver
Bay Chamber of Commerce, (Northeastern Minnesota
Intervenors)
United Steel Workers of America (Steel Workers)

Minnesota Public Interest Research Group (MPIRG)
Minnesota Environmental Control Citizens
Association (MECCA)
Sierra Club
Save Lake Superior Association (SLSA)
Rodney B. Nelson

The following appearances were entered:

On behalf of Reserve Mining Company:
Edward T. Fride and Raymond Erickson of Hanft,
Frider, O'Brien and Harries and Maclay R. Hyde,
Timothy Butler and Lawrence Waldock of Lindquist
and Vennum.

On behalf of Armco: G. Alan Cunningham
and John Gordon of Faegre and Benson.

On behalf of Republic: William T. Egan and
Richard Nygaard of Rider, Egan, Johnson and Arundel.

On behalf of Northeastern Minnesota Inter-
venors: Wayne G. Johnson of Johnson and Thomas
and Fred Cina.

On behalf of United Steel Workers of America:
John G. Engberg of Helgesen, Peterson, Engberg and
Spector.

On behalf of MPIRG and MECCA: Elliot C.
Rothenberg.

On behalf of Sierra Club and SLSA: Charles
K. Dayton and John H. Herman of Dayton, Herman
and Graham.

On behalf of the State of Minnesota: Byron
E. Starns, Chief Deputy Attorney General.

On behalf of Minnesota Department of Natural
Resources: Morris M. Sherman, Special Attorney,
James M. Schoessler, Special Assistant Attorney Gen-
eral, and Edward M. Moersfelder, Special Attorney.

On behalf of Minnesota Pollution Control Agency:
Eldon G. Kaul, Special Assistant Attorney General,
and Paul G. Zerby, Special Assistant Attorney General.

Testimony was taken at Roseville and Silver Bay, Minnesota beginning June 23, 1975 and ending March 18, 1976. Armco and Republic, while not applicants, technically, have participated interchangeably with Reserve in the hearings and therefore, unless otherwise noted, the term Reserve herein includes Armco and Republic. Sworn statements were filed by several persons and are part of the record.

Reserve filed its brief and suggested findings on March 18, 1976. Northeastern Minnesota Intervenors filed their brief on March 24, 1976 and United Steel Workers of America filed their brief on March 31, 1976. Minnesota Department of Natural Resources filed its brief on April 5, 1976. Minnesota Pollution Control Agency and Sierra Club, Save Lake Superior Association filed their respective briefs on April 8, 1976. Reserve filed its rebuttal brief, together with affidavits of Merlyn G. Woodle, C. William Verity and William J. DeLancey, drawing of the revised Mile Post 7 site tailings disposal area, and final report on costal investigations, on April 15, 1976.

Having heard and considered all of the testimony, having considered all of the exhibits received in evidence and all sworn statements filed, and having read and considered all of the briefs submitted by the parties and arguments of counsel, I make the following findings, conclusions and recommendations:

FINDINGS

Present Operations

1. Reserve obtains all of its ore from the Peter Mitchell Mine located near Babbitt, Minnesota. After removal of the glacial till which lies above the ore body, blasting operations are conducted to break the ore into sizes which can be carried by truck to the crushers which are located near the mine. The crushing process reduces the rock to sizes of four inches or less. The ore is then loaded into railroad cars and transported 47 miles to Silver Bay.

2. The Peter Mitchell Mine is approximately ten miles in length, 2800 feet in width and 175 feet deep at its deepest locations. Due to the varying nature of the taconite rock, the ore must be blended in order that a uniformity in the end pellet product can be obtained. The ore is blended according to four parameters: iron content, grindability (hardness), concentratability and hauling distance to the crushers. The blending of the ore is a prerequisite to the continued successful operation of Reserve. Under the mining plan presently in use the entirety of the mine is in operation.

3. At Silver Bay, the taconite ore is dumped from the railroad cars and subjected to various crushing, grinding and milling processes. During the milling process, water

is introduced into the system and various stages of magnetic separation are used to separate the iron-bearing materials from the ore. The remaining materials constitute the tailings. Under the present method of discharge, the tailings are carried via tailings launders to the delta, and the tailings which are not deposited on the delta enter Lake Superior.

4. The iron ore concentrate which results from the separation processes is then fed into a filter where approximately 90 percent of the excess water in the concentrate is removed. The concentrate at about 10 percent moisture content is then conveyed to the pelletizing buildings where it is rolled into pellets in the balling drums. At this stage, 25 to 30 pounds of a fine clay called "Bentonite" is added to each ton of concentrate to bind the material into pellet form. The pellets are then heated to 2,300 degrees which converts the material from the magnetite to the hematite form. The pellets which are approximately one-quarter inch in diameter are then cooled and conveyed to the dock area for transportation by ore boat to the steel mills.

Mile Post 7 Proposal

Changes in Operations

5. Reserve's Mile Post 7 Plan for on land tailings disposal would involve major changes in the concentrating

and separating processes at Silver Bay. Reserve proposes construction of a "dry cobbing" building which would be located between the fine crusher and the concentrator building. The dry cobber would separate approximately 22 percent of the crushed ore material as dry cobber tailings. The dry cobber tailings would be placed on conveyers and transported to loading bins from which they would be hauled by railroad approximately 12 miles to the tailings basin. The concentrate from the dry cobber building would then be fed into the rod mills which presently are fed directly from the fine crusher. The tailings from the concentrating equipment would be separated into fine tailings and filtered tailings portions by hydraulic and cyclone separation. The coarser fraction of concentrator tailings would be put through a filter which would reduce the moisture content to about ten percent. These filtered tailings would then be conveyed along with the dry cobber tailings to loading bins for transportation by railroad to the tailings basin. These combined dry cobber and filtered tailings would be the "coarse tailings," part of which would be used in dam construction.

6. The fine tailings which would remain, approximately 59 percent of the total tailings, would then be pumped approximately five miles to the tailings basin in a 24 inch slurry pipeline.

7. In addition to the changes designed to accomodate on land disposal of tailings, the proposed plan includes major changes in plant operations to improve the physical and chemical quality of Reserve's pellets by increasing the iron content and reducing the silica content.

8. Reserve's current 40 year mining plan provides for mining approximately 30,000,000 tons of ore per year. The ore body being mined is sufficient for 50 to 60 years of open pit mining. In addition the mine contains extensive reserves of ores which will likely be useable in the relatively near future as new processes are perfected.

9. The proposed tailings disposal facility would store only 40 years of tailings from Reserve's operations, and the possibilities for expansion in the original design have been eliminated by design revisions. There is no evidence that Reserve plans to terminate operations at the end of its current 40 year mining plan.

Description of Proposal

10. The on land disposal plan is designed as a closed-circuit system with no intentional discharge of water or tailings to Lake Superior or any streams flowing into the lake, except for relatively small amounts of uncollected seepage.

11. The proposed tailings disposal area occupies a portion of the Beaver River watershed approximately 14.3

square miles in size, including approximately six square miles for a tailings basin and the remainder for the necessary roads, railroad tracks, pipeline terminus and other related facilities and buffer areas.

12. The proposed tailings basin would require construction of four dams, the designs for which have been substantially modified since the preparation of the draft environmental impact statement. The south dam, the largest structure in the plan was originally designed to be about 12,600 feet along and about 150 feet high. The most recent modifications would increase the length to nearly 14,000 feet and the height to about 180 feet. The north dam as originally designed would have been 5,200 feet long and about 120 feet high, the Bear Lake dam 2,800 feet long and about 130 feet high, and the northeast saddle dam 1,700 feet long and about 80 feet high. The modified design would require comparable increases in the height and some adjustment in the length of these dams. In addition, seepage recovery dams, diversion dikes and saddle dikes would be constructed.

13. Prior to the start of construction of the main north and south dams, starter dams would be constructed of material from a borrow pit at Mile Post 32 on the Reserve railroad. This construction would take two to three years to complete.

14. The modified dam design provides that the upstream faces of all dams would be covered with a blanket of clay-glacial till approximately 15 feet thick to reduce seepage through the dams and allow for elimination of the tailings beaches.

Dam Construction

15. Four principal concerns in dam construction, in addition to location, are foundation, design, construction material and construction procedures.

16. The proposed design utilizes the "downstream" method of dam construction, which is desirable from an engineering standpoint. As the height of the dam increases, the dam is constructed in the direction away from (or downstream from) the basin. Thus, in contrast with the upstream method of dam construction which had been used in prior years, the downstream method avoids the placement of dam construction materials on previously deposited fine materials, which would be unsuitable as a base for the dam. The slopes of the dams are relatively flat, a conservative design. The modified design provides for temporary use of steeper slopes to achieve greater height in a shorter period of time in order to permit placement of nearly all fine tailings underwater. While the state's dam design consultants have not reviewed the modified design, it is the opinion of Reserve's consultant, and it is not contradicted, that the modified design is conservative.

17. The coarse tailings and borrow material which will be used for dam construction is suitable material for that purpose.

18. Construction must be carried out in accordance with the dam design. Where, as in this case, construction is extended over a period of many years, the possibility of errors and omissions is increased. Assurance of full compliance with design requirements throughout the construction period would be possible only through close cooperation and an open, forthright relationship among the owner, the designer, the builder and the public agencies involved.

19. The structural quality and stability of the bed-rock underlying portions of the proposed disposal area was investigated by core drilling. The geological evidence indicates that there are no structural problems in the bed-rock which would affect dam stability. Reserve did not have access to the two proposed dam sites at the east side of the area, and specific geological information for those is not available. Information presently available does not indicate foundation problems at those locations, but no such determination can now be made.

20. A substantial portion of the foundation material at the proposed site of the south and largest dam is clay material, up to 30 to 40 feet in thickness, which is saturated with water and will provide suitable dam foundation only if the water is expelled and the clay consolidated.

21. Laboratory tests conducted by separate consultants for Reserve and the state on a limited number of clay samples indicate that the clay would consolidate during an appropriate construction period so as to provide suitable foundation for the dams as originally proposed.

22. Reserve's consultant testified that, in his opinion, the modification in dam design, height and construction schedule now proposed would not alter that conclusion.

23. Additional testing is required to establish the effects, if any, of dam modifications and changes in rates of construction on consolidation of foundation clays.

24. Contingent plans for installation of sand drains to facilitate consolidation, if needed, originally proposed by Reserve, were deleted from the design as a result of the doubts expressed by the state's consultants as to their necessity and desirability.

25. Instrumentation would be built into the south starter dam to measure the rate of consolidation of the clay in actual field conditions to determine if the clay reacts in accordance with present predictions. At the end of two years, additional tests would be conducted to determine the actual extent of the strength gain resulting from the consolidation process. Results of those tests would determine whether construction would proceed in accordance with the design or whether modifications were

required. Further monitoring would be required during construction.

Effects of Dam Failure

26. Careful investigation, design and construction greatly reduces but does not eliminate the risk of dam failure. Despite all efforts to avoid it, dams designed to be safe do fail because of accidents, errors, oversights and other causes.

27. Examination of the consequences of dam failure is required in order to determine whether the level of risk resulting from the location of the dam, as distinguished from its design, is acceptable.

28. The Mile Post 7 site is located some 600 feet vertically above Lake Superior and approximately three miles from the shore of the lake.

29. Sudden failure of a section one thousand feet long out of the more than 13,000 feet long south dam at Mile Post 7 would produce a wall of water twenty-eight feet high traveling at over 20 miles per hour down the Beaver River valley to Lake Superior. Only eight residences are presently located within the area which the water would occupy. No calculations were made of the additional flow which would result from the movement of tailings with the water. No calculations were made of the effects of a failure of the entire dam.

30. Failure at Mile Post 7, whether it occurred during operation or years after, would frustrate the sole objective of its construction, the termination of tailings disposal in Lake Superior, since stored tailings would be carried to the lake with no opportunity for recapture.

31. Risk of dam failure would not end when operations cease, but would continue in perpetuity.

Water Resource Effects

32. The proposed Mile Post 7 tailings disposal area is located within the drainage area of Big Thirty-nine Mile Creek and Little Thirty-nine Mile Creek, both of which comprise a portion of the Beaver River watershed.

33. Since the proposal contemplates a closed circuit system, it would be necessary to divert as much of the natural runoff as possible to reduce the amount of water being stored in the tailings basin. Little Thirty-nine Creek would be diverted into Big Thirty-nine Creek and Big Thirty-nine Creek would be diverted at a point farther south into the west branch of the Beaver River. The diverted flow of these creeks will continue into the Beaver River downstream of the seepage recovery dam at the south dam.

34. The diversions would remove eight square miles from the Beaver River watershed area. While the approximate mean flow on Thirty-nine Mile Creek prior to diversion would be slightly lower after diversion, the greatest

potential for detrimental effects caused by reduced watershed area lies in the further reduction of flow during critical periods of low flow.

35. Waters downstream from the diversions will be adversely affected by periods of increased turbidity during and following construction of the diversions and will be subject to the more prolonged adverse effects of increased sedimentation.

36. The waters of the state located within the proposed disposal area would be obliterated. The total amount involved is relatively small, however they are of relatively high quality and include designated trout waters, a limited state resource.

37. The amount of seepage through the dams would be relatively small. The seepage recovery ponds have been designed to contain all runoff from a storm of such magnitude as is likely to occur only once every 500 years. Such storms do occur, and at any given location they can occur at intervals greater or less than 500 years. Waters which could not be contained by the seepage collection system would enter Lake Superior via the Beaver River. The seepage water would be largely runoff from the coarse tailings dams and would contain varying amounts of tailings material.

38. A relatively small amount of water would seep through the ground underlying the tailings basin and be

transported slowly with the ground water beyond the seepage collection system and remain uncollected.

39. Calculations by Reserve's consultant indicate that uncollected seepage may be approximately 170 gallons per minute or 250,000 gallons per day.

40. Present information suggests that uncollected seepage would be filtered to some degree by the soils through which it travels but the information is inconclusive as to the water quality which filtration would achieve. Additional investigation is required to insure that any uncollected seepage is of a quality that is satisfactory for the receiving waters.

41. Waters outside the tailings basin may be adversely affected by accidental spillage resulting from pipeline rupture. Collection facilities would be incorporated into the pipeline design to minimize spillage from this cause. The proposed pipeline system which would pump the tailings slurry has been designed according to the normal methods, and has presented no unique or difficult problems. The pipeline design uses a dual pipeline structure, incorporating monitoring and testing devices. In the event of a break or leak in the pipeline, automatic monitoring and periodic patrols would indicate the existence of such a break. The pipeline flow would be automatically switched from the damaged pipeline to the standby line.

42. Waters outside the tailings basin would also be adversely affected if accidental other spillage should occur such as through dams failure.

43. Waters outside the tailings basin may also be adversely affected by the deposition of fugitive dust emanating from the tailings area.

Air Quality Effects

44. Construction and operation of the proposed on land tailings system would result in the distribution of air borne dust containing asbestiform fibers outside the limits of the tailings area. The principal source would be fugitive dust generated by construction activity, transporting and movement of coarse tailings and wind action on exposed areas.

45. Use of water sprinkling or chemical treatment can reduce, but cannot eliminate fugitive dust. The evidence on the effectiveness of revegetation of dam slopes in reducing fugitive dust is inconclusive.

46. One of the major potential sources of fugitive dust in the original design of the Mile Post 7 disposal area would be the fine tailings beach between the water surface and the outer limits of the basin.

47. Following preparation of the draft environmental impact statement, Reserve in January, 1976, revised its design to eliminate the beach by raising the height of the

dams, adding an impervious blanket of earth material on the upstream face of the dams and maintaining the water level in the basin so as to cover the fine tailings. Some small areas of exposed fine tailings may develop at points of discharge into the basin.

48. Another major potential source of fugitive dust would be the fines which form a part of the coarse tailings used for dam construction or stored in disposal area.

49. In a further effort to reduce fugitive dust, Reserve in February, 1976, revised its proposed process by incorporating air elutriation, which, if successful, would separate a greater portion of the fine tailings from the coarse tailings at the plant.

50. Extremely limited laboratory investigation of the air elutriation process was conducted by Reserve. That investigation demonstrated that the process is not feasible unless the tailings are relatively dry.

51. There is no reliable evidence that air elutriation can be successfully incorporated into Reserve's process and fugitive dust emissions from coarse tailings significantly reduced thereby.

52. At the suggestion of the Pollution Control Agency, Reserve further revised its design for the Mile Post 7 disposal area in March 1976, during the last week of testimony, by incorporating coarse tailings disposal into the

fine tailings basin, thereby eliminating the separate coarse tailings storage area adjacent to the basin. This revision significantly modified the configuration of the disposal area and required further modification of the south dam and provision of additional dikes. The purpose of the revision was to place coarse tailings underwater to further reduce fugitive dust emissions.

53. The latest revision was further modified following the close of testimony in a drawing prepared by Reserve's consultant, numbered X-1965-41, and submitted with Reserve's rebuttal brief on April 15, 1976. The modified design would reduce the number of coarse tailings dikes within the tailings basin along which both fine tailings and coarse would be transported, by pipeline and railroad respectively.

54. While the April modification has not been subjected to cross-examination, it has been reviewed and considered.

55. The letter from its consultant Klohn to Reserve dated April 14, 1976, which was submitted with drawing X-1965-41, explains the drawing and indicates that small lateral dikes, in addition to those shown in the drawing, may also be required.

56. Reserve's estimate of the maximum acreage of exposed coarse tailings dikes under the last modification appear to be optimistic, but even assuming it to be accurate, it would not substantially reduce the estimated total

dust emissions from the estimates made for the design submitted during the last week of testimony.

57. Estimates of total expected fugitive dust emissions by both Reserve and the State agencies are below the levels of emission which can reasonably be expected to occur.

58. Reserve's estimates of dust emissions are unduly optimistic in that they unjustifiably assume highly effective incorporation of the air elutriation process, assume no emissions from distribution dikes (which would have been required for fine tailings distribution even before the latest design revision), assume no emissions from small fine tailings deltas within the tailings basin, assume only one transfer or turnover of coarse tailings at the disposal area (most tailings would be moved a substantially greater distance), assume that snow cover would eliminate 100 percent of wind erosion during five months of the year, and unjustifiably assumed wind erosion of coarse tailings for only one year after storage.

59. The state's estimates of dust emissions are likewise optimistic for the same reasons, except that the state did not assume effectiveness of air elutriation, and correctly assumed continued wind erosion of coarse tailings beyond the first year of storage.

60. The state's estimates for the latest design are optimistic for the additional reason that time did not

permit estimates to be made for additional construction activity and coarse tailings transfers associated with the construction and raising of the dikes within the basin.

61. The climatological dispersion modeling used by both Reserve and the state to estimate concentrations of fugitive dust at population centers is subject to error due to inability to duplicate actual conditions precisely. The modeling used by the state assumes emissions throughout the basin during construction and more nearly represents actual conditions. Reserve's modeling for Mile Post 7 assumes concentration of emissions at a point generally more distant from Silver Bay and Beaver Bay and thereby underestimates concentrations of dust at those population centers.

62. While the state's estimates of fugitive dust emissions and annual mean concentrations at population centers are conservative, they are adequate for purposes of these proceedings and represent the best available information considering the uncertainties as to final design of the disposal area. No estimates have been made of maximum daily concentrations.

63. Fugitive dust concentrations at population centers is critical because of the presence of potentially hazardous fibers.

64. Estimates of the number of fibers per unit of dust vary widely depending on methods of estimating and capabilities of equipment and personnel.

65. Estimates of fiber content based on counting fibers in samples of dust are conservative since only identified fibers are counted and not all fibers are identifiable with equipment presently in use at various laboratories. Techniques used in sampling and in handling samples can result in the loss of fibers, further reducing fiber counts.

66. Estimates of the number of fibers based on computation of the total fiber mass and average fiber size probably more accurately reflect the actual number of fibers present, but proof is more difficult.

67. Estimates of amphibole fiber content by the Pollution Control Agency staff were based on the count of only positively identified amphibole fibers.

68. Both Reserve's consultant and the state's consultant agreed that most fibers in Reserve's tailings which cannot be positively identified are, in fact, amphibole. Both included most such ambiguous fibers in their estimates of total amphibole fibers.

69. While the Pollution Control Agency staff estimates of fiber content are significantly low, they are valid for the purpose for which they were prepared, namely the comparison of the projected impact at various population centers which would result from the various disposal sites.

70. The testimony of Dr. Phillip Cook is the best evidence on fiber content per unit of dust emanating from a

tailings disposal area. Dr. Cook estimated the fiber content at 900,000 fibers per microgram of dust and testified that the actual number that might be present was probably closer to 2,900,000 per microgram.

71. The state's projected increases of annual geometric mean concentrations of total suspended particulates at Silver Bay resulting from the Mile Post 7 disposal area are 15 micrograms per cubic meter during construction, one microgram per cubic meter during the first 10 years of operation and one to three micrograms per cubic meter during the last 30 years of operation.

72. Reserve contends that the combined effects of the installation of improved dust collection facilities at the processing plant, pursuant to stipulation with the Pollution Control Agency, and implementation of the Mile Post 7 disposal area, including the doubtful air elutriation process, would result in a net annual reduction of total suspended particulates at Silver Bay of approximately fifty percent. Assuming the validity of that contention, Mile Post 7 emissions, even as optimistically estimated by Reserve, would negate approximately one half of the benefits flowing from stipulation, since the improved dust collectors will eliminate about 97 percent of stack emissions.

73. The Reserve estimate of 50 percent overall improvement is based on the unjustified assumption that air

elutriation would be effective. Immediately prior to formulation of the air elutriation proposal, Reserve's consultant computed the effects of Mile Post 7 without elutriation and concluded that on an annual basis the total suspended particles at Silver Bay contributed by Mile Post 7 would be equal to or greater than that presently contributed by stack emissions. Annual geometric mean concentrations of total suspended particles at Silver Bay would not be materially reduced by the combined effects of implementation of the Mile Post 7 proposal and stack emission controls.

74. There is no evidence that fiber concentrations at Silver Bay would be reduced below a medically significant level by the combined effects of reduced stack emissions and implementation of the Mile Post 7 disposal area.

Other Natural Resource Effects

75. The mineral potential at the Mile Post 7 site is low and development of a tailings disposal area would not interfere with any potential mineral development. No significant amounts of peat are present at the site.

76. Existing timber resources at the Mile Post 7 site would be harvested. The potential for timber production within the disposal area, which is relatively high, would be eliminated. The site would not return to anything similar to its present vegetated condition for several hundred years. Covering the tailings with soil material would speed

revegetation, and some vegetation can be grown directly on the tailings provided there is adequate fertilization and moisture.

77. The Mile Post 7 site provides a modest amount of habitat for various species of wildlife. The habitat would be destroyed, and most wildlife would migrate to other suitable areas.

78. Fishery resources within the disposal area will be destroyed, including 9.7 miles of trout streams. Streams downstream from the disposal area would be adversely affected by erosion at construction areas, including stream diversion dikes and channels, roadways, railroads and pipelines, causing turbidity and sedimentation which would adversely affect the fishery resource. Loss of a portion of the watershed could result in reduction in flow and rise in temperature to critical levels adversely affecting the fishery resource downstream from the site, including the anadromous fishery of the lower portion of the Beaver River. Windblown dust, nutrients related to revegetation efforts, seepage and accidental spillage could adversely affect the fishery resource in the vicinity of the site.

79. Construction and operation of the tailings disposal system at Mile Post 7 would cause pollution, impairment, and destruction of the air, water, land and other natural resources located within the state.

Alternatives

80. The draft environmental impact statement examines in detail three alternative locations for tailings disposal designated the Embarrass site, the Colvin (Mile Post 42) site, and the Snowshoe site, and a supplement examined in detail the Midway (Mile Post 20) site.

In Pit Disposal

81. In addition the draft examines in less detail the alternative of disposal in the Peter Mitchell mine. The evidence relating to that alternative is sufficient to require its rejection at least for the present, because of the limited capacity, delays that would be inherent in the further complication of Reserve's operations and lease restrictions on placing waste on potentially merchantable ore.

82. No detailed review of Reserve's mining plan was made by the state to determine whether adjustments could be made to accommodate in pit disposal of tailings without jeopardizing Reserve's requirements for blending of ores and other operational concerns.

83. In view of the future need for tailings disposal sites, it would be desirable to ascertain the feasibility and desirability of using both depleted and operating pits for that purpose, and to evaluate the relative costs of covering potentially merchantable ores versus the use of additional land areas for tailings disposal.

Changes in Operations for Alternatives

84. Operation of the mine and processing plant and handling of tailings would be identical for the Midway and Mile Post 7 sites except for the greater distance to Midway. Midway would require longer pipeline, more pumping stations and longer haul roads.

85. Use of the Embarrass, Colvin or Snowshoe sites would require construction of new fine crushing and concentrating facilities in the vicinity of the site and transport of only the concentrates to Silver Bay for pelletizing. Transport of the concentrates could be either as a slurry by pipeline or by railroad after reducing moisture content to an appropriate level. Present fine crushing and concentrating facilities at Silver Bay would be dismantled. The process is technically feasible with transport of concentrates by either pipeline or railroad. Questions as to various technical problems raised by Reserve do not establish infeasibility, and the evidence is to the contrary.

Comparison of Environmental Effects

86. Longer dams would be required at the alternative sites than at Mile Post 7. All alternative sites have suitable foundation for dam construction. Dams of the same design and construction would have higher safety factors at each alternative site than at Mile Post 7. The consequences of a dam failure would be significantly lower at each

alternative than at Mile Post 7. Approximately 100 residences that would be affected by a dam failure at Embarrass, but the depth and velocity of water movement resulting from a 1,000 foot breach is much less: 4 feet depth and 2.7 miles per hour at Embarrass; 28 feet depth and 21.1 miles per hour at Mile Post 7. No residences would be affected at Colvin, Snowshoe or Midway. In the event of dam failure at any of the alternatives, stored tailings would not be deposited directly into Lake Superior, and opportunity for corrective measures to protect Lake Superior and other waters would be available. Failure at Snowshoe could affect the Boundary Waters Canoe area. The risk of overtopping the dams as a result of unusually heavy rainfall is greater at Mile Post 7 than at the alternative sites.

87. Construction and operation of tailings disposal facilities at any of the alternative sites would also destroy or degrade, or have the potential for the destruction or degradation of some portion of the waters of the state.

88. Contrary to the contentions of Reserve, the waters affected or potentially affected at the various sites are substantially different in character and quality notwithstanding some similarities in individual characteristics.

89. Classification of waters by the Pollution Control Agency and designation of waters as trout streams reasonably

reflect the character and quality of those waters and their susceptibility to damage from disturbance of the natural conditions.

90. Individual water temperatures do not establish whether a stream or body of water is to be considered "cold" or "warm" water; rather it is the characteristic of the waters to remain below critical levels of temperature beyond which certain aquatic life does not survive.

91. Placement of tailings at any of the alternative sites would result in the destruction of less waters of the state than would occur at Mile Post 7.

92. The quality of the waters which would be destroyed is lower at each alternative site than at Mile Post 7.

93. The quality of the waters in the vicinity of each alternative site is lower and less susceptible to degradation than at Mile Post 7.

94. None of the alternative sites, except Colvin, requires diversion of streams and no degradation of downstream waters by siltation and sedimentation resulting from stream diversion would occur. Degradation resulting from stream diversion would be less at Colvin than at Mile Post 7.

95. The potential for harmful effects resulting from reduction of stream flow is less at each of the alternatives than at Mile Post 7.

96. The potential for degradation of waters resulting from erosion at construction areas and from fugitive dust is less at each alternative than at Mile Post 7.

97. The expected uncollected seepage would be lower at Mile Post 7 than at some alternative sites, but if the quality of the seepage water is lower than anticipated, the potential for degradation of water would be higher at Mile Post 7. If the quality of the seepage water is acceptable, additional seepage would not be harmful and could aid in maintaining proper water balance.

98. The increase in total suspended particulates and potentially hazardous fibers at population centers resulting from fugitive dust would be less for each alternative site than for Mile Post 7. Increases at Silver Bay from Mile Post 7 would be approximately three times that from Midway. Existing levels at Babbitt from mining operations in that area make Embarrass, Colvin and Snowshoe less desirable than Midway from the standpoint of air pollution unless mitigating measures are instituted at existing sources.

99. The potential for mineral development is greatest at Snowshoe and Colvin where the possibility of future underground copper-nickel mining exists. Development of a tailings disposal area could conflict with the development of surface facilities associated with underground mining.

No conflict with potential mineral development exists at Embarrass, Midway or Mile Post 7.

100. Adequate water resources are available for the operation of each of the alternatives. Use of Embarrass, Colvin or Snowshoe would require accommodation with other water users in the area. Use of pit water from the Peter Mitchell mine would end discharge of waters containing fibers which might otherwise require treatment.

101. Use of the Embarrass site would require accommodation with the potential use of a small part of the site for tailings disposal by Erie Mining Company.

102. Destruction of timber resources would be less at Snowshoe than at Mile Post 7 and would be comparable to Mile Post 7 at Embarrass, Colvin and Midway.

103. Damage to wildlife resources would be lowest at Snowshoe and highest at Colvin, Midway and Mile Post 7.

104. Damage to the fishery resources would be lower at each of the alternative sites than at Mile Post 7.

105. Energy consumption per ton of pellets produced would be greater with disposal at the Midway site than at Mile Post 7 because of the greater distance to transport tailings. Energy consumption at Embarrass, Colvin and Snowshoe would depend upon final design, but would be roughly comparable per ton of pellets produced as for the Mile Post 7 plan.

106. Use of the Embarrass, Colvin or Snowshoe site would be preferable from the standpoint of land use because of their proximity to existing mining operations. The Midway site is more distant from existing mining operations except for the proximity of Reserve's railroad on the west and south. The Duluth, Masabi and Iron Range railroad is adjacent to the site on west and north. Some timber has been harvested at the Midway location. The Mile Post 7 site is the most distant from existing mining operations except for the Silver Bay plant and Reserve's railroad. The Midway site is preferable to Mile Post 7 based on existing and potential land use of the areas.

107. Use of the Embarrass, Colvin or Snowshoe site would require the transfer of approximately 400 jobs from Silver Bay to the Babbitt site in addition to those who would be added for construction on operation of the tailings disposal systems.

108. Commuting from Silver Bay to a near Babbitt site, while not beyond reason, would constitute a significant, detrimental change in the pattern of life of a substantial number of people. Construction of proposed Forest Road 11 would ameliorate the effects to some degree. Use of Reserve's railroad could speed commuting but at substantial cost.

109. Many transferred employees would ultimately relocate near Babbitt with substantial impacts for both Babbitt and Silver Bay.

Economic Feasibility of Alternatives

110. Officials of Reserve, Armco and Republic testified that rejection of Mile Post 7 would likely lead to shut down of Reserve's operations because no alternative site is economically feasible.

111. It is fruitless to speculate as to the motives for such testimony or its accuracy in predicting future events. It is accepted as the opinions held by those officials based on the information then available to them.

112. It is reasonable to assume that the corporate determination as to whether to continue Reserve's operations in Minnesota will, and perhaps must, be made largely on the basis of economics.

113. It is reasonable to assume that there is a level of cost beyond which Reserve will not go. That level will vary depending upon all of the other factors which must be taken into account at the time the decision is made, including market conditions, alternate sources of supply, and cost of termination.

114. There is no evidence that a corporate determination has been made as to the level of cost which would trigger termination of operations. Presumably, any such

determination would be premature unless and until a decision is necessary and, in any event, would be subject to change if circumstances changed.

115. It is impossible to determine in advance whether the opinions of the officials who testified as to the consequences of rejection of Mile Post 7 will or will not be the same when and if a decision is required.

116. It is appropriate to give consideration to the opinions of such officials, and the basis for those opinions as reflected in the record. However such opinions are not determinative of the question of whether there are feasible and prudent alternatives to Mile Post 7, a determination which rests by law with the responsible state officials.

117. The cost estimates for the construction and operation of the Mile Post 7 proposal and all of the alternative sites are inexact and subject to change depending on numerous factors including final design, presently unknown geologic data and future rates of inflation.

118. All cost estimates introduced in evidence include substantial amounts to cover unknown contingencies and cost escalation.

119. Reserve's financial analysis anticipates, to some extent, future increases in costs without anticipating increases in the price of taconite pellets, or even taking

into account price increases already in effect. The result is an understatement of the economic benefits to Armco and Republic which would flow from the Mile Post 7 proposal and all alternatives.

120. Reserve's estimates of the pellet supply requirements of Armco and Republic ignores the growth trends in the industry and Reserve's own testimony of anticipated industry growth.

121. Reserve's contention that none of the alternative sites is economically feasible is contrary to recent experience in the expansion of taconite facilities in Minnesota.

122. The cost estimates for the alternative sites in the draft environmental impact statement are based on more detailed analysis and are generally more reliable than Reserve's estimates for those sites.

123. Based on present knowledge and design, the costs for construction at Mile Post 7 are considerably less than at the alternative sites, and construction costs at Midway are substantially less than at Embarrass, Colvin or Snowshoe. Operating costs per ton of pellets produced would be higher at Midway and probably lower at Embarrass, Colvin or Snowshoe than at Mile Post 7.

124. Whether 100 percent debt financing would be available for any of the sites would depend on market conditions

at the time, but it is unlikely for the alternative sites and more likely for Mile Post 7.

125. Unavailability of 100 percent debt financing, taken alone, does not render a project economically infeasible.

126. Recognizing the possibility of increased costs based on final design and more detailed information, the Embarrass, Colvin, Snowshoe and Midway sites are, nevertheless, economically feasible alternatives.

Effects of Termination

127. It must nevertheless be assumed that Reserve's operations may be terminated if permits for Mile Post 7 are not granted.

128. The draft environmental impact statement did not address the effects of termination on the theory that termination was not a feasible and prudent alternative. Those effects have been adequately addressed in testimony both before and following preparation of the draft.

129. The permanent shut down of the Reserve operations would have major detrimental effects.

130. Loss of employment provided by Reserve would directly affect most of the population of Silver Bay, a substantial part of the population of Babbitt, many in Ely and other areas of Lake and St. Louis Counties.

131. Indirect effects on suppliers and other related industries would be substantially more widespread.

132. Loss of federal, state and local tax revenues would be substantial.

133. During 1974, Reserve produced 10,367,000 tons of taconite pellets and employed an average of 2,843 persons. Reserve's employment costs for the year were \$46,780,000. The company purchased \$50,529,000 worth of materials and supplies during 1974. Approximately \$37,000,000 of the \$50,000,000 in total purchases were made in Minnesota, with the majority occurring in the northeastern Minnesota area and the Twin Cities.

134. During the period between 1955 and 1974, Reserve's total taxes amounted to \$70,757,673. Reserve's tax liability for 1975 was approximately \$15,000,000, or about double the liability for 1974. During the next four to five years Reserve's tax obligations will total approximately \$70,000,000.

135. Reserve paid \$7,775,000 in Minnesota taxes, both state and local, during 1974. In addition, federal income taxes withheld from Reserve employees in 1974 totaled \$5,638,607, while state income taxes withheld from Reserve employees totaled \$2,245,984.

136. Royalties paid by Reserve to the owners of the ore body at the Peter Mitchell mine totaled \$16,000,000 in 1974.

137. Unemployment compensation and other forms of substituted income would only partially and temporarily alleviate the economic effects on the employees and their families and would in no way alleviate the social and psychological effects inherent in the loss of employment.

138. The possibility of obtaining other employment in the Silver Bay and Babbitt areas is remote.

139. It is likely that many new jobs will become available during the next several years due to the current and proposed expansion in the taconite industry in Minnesota. However, the possibility, or even likelihood, of obtaining employment in other locations in northeastern Minnesota, with the resulting uprooting of families, loss of seniority and multiple side effects, is a bleak substitute for the relative security provided by the continuation of Reserve's operations.

140. Consideration must also be given to the difficulties associated with retraining, loss of pension rights, loss of health and welfare benefits, loss of vacation and holiday benefits, and losses associated with decreases in values of worker's homes and similar economic losses which would result.

Time Required to Implement

141. The time required to implement the Mile Post 7 plan and end discharge to Lake Superior is estimated to be approximately three years, while the time required for the alternative sites is estimated at more than four years.

142. All time estimates are based on only a 40 hour weekly work schedule and could be reduced, at some additional cost, by utilizing additional shifts or overtime.

143. While much more information has been gathered by Reserve at Mile Post 7 than at the alternative sites, all sites possess the potential for delay in gathering additional data, solving known and presently unknown technical problems, and acquiring land.

144. Most of the investigation and analysis required to determine the environmental impacts attributable to the alternative sites has been completed and need not be repeated.

145. Despite assurances by Reserve that it wishes to end discharge to Lake Superior as soon as possible, economic considerations are a powerful incentive to continue present operations as long as possible. Net profit to the owners resulting from Reserve's present operations are estimated by Reserve's consultant at \$40 million per year during construction of on land disposal facilities. The evidence establishes that that is a conservative estimate.

Delta Stabilization

146. Reserve proposes to construct certain structures necessary for its Mile Post 7 plan on the existing tailings delta near the natural shore of Lake Superior, and to stabilize the delta by depositing large rock transported from the Peter Mitchell mine on the delta to construct a

breakwater, using Beaver Island on the west and a rock point on the east as anchor points. The rock used for the stabilization process would be obtained from material stripped from the ore body preparatory to mining taconite. The rock is very hard and would be resistant to wave action and deterioration.

147. The plan contemplates placement of the rock about 600 feet back from the present shore of Lake Superior at the edge of the delta. Wave action would scour out the tailings delta to the rock. The lakeward portion of the rock would then move over the new slope of the delta under the surface of the water to form a rock armor over the tailings beach.

148. The concept of a self-armoring beach has been used in several parts of the world, but chiefly for controlling river bank erosion.

149. The primary concerns related to the delta are its erosional patterns as they relate to the potential health problem, the safety of the structures proposed to be built on its surface, and the control of the littoral drift or movement of tailings in Lake Superior.

150. Because of inadequate sampling and analysis, the asbestiform fiber content of the delta is not known. Until it is known, the quantity of asbestiform fibers which will be liberated by delta erosion cannot be determined and a

decision cannot be made on whether it is necessary to remove the delta material quickly or over a long time period.

151. No consideration has been given to the potential for breakdown of the coarser particles in the delta by wave action and the generation of additional fines, nor to the effect termination of discharge will have on the delta.

152. Reserve's three dimensional model studies, made on a scale of 1 to 50 and for only isolated portions of the delta, are inadequate to establish that the proposed beach armoring will function as planned.

Adequacy of Environmental Impact Statement

153. The draft EIS, including the Midway Supplement, the public comment on the draft EIS, and the other testimony and exhibits introduced in evidence in these hearings provide the decision-makers with as complete information regarding the environmental and other impacts of an on-land disposal site for Reserve's tailings as can reasonably be obtained at this time.

154. The agencies responsible for the drafting of the EIS have fulfilled their responsibilities with good faith objectivity.

155. All other issues raised by the parties have been considered but findings thereon are deemed unnecessary to the determination of this matter and would not affect the result.

Conclusions

1. Dust emissions from Mile Post 7 would cause substantial numbers of potentially hazardous fibers to reach Silver Bay, at least partially negating the effect of planned emission controls at the processing plant. There is no evidence that the fiber concentrations emanating from Mile Post 7, even after installation of planned emission controls, would be medically insignificant.

2. Precautions taken in the design and construction of dams can greatly reduce, but cannot eliminate, the risk of failure.

3. The Mile Post 7 site is located approximately three miles from Lake Superior and 600 feet vertically above the lake level.

4. A 1,000 foot breach in the 13,000 foot south dam at Mile Post 7 would produce a 28 foot high wall of water moving down the Beaver River valley at more than 20 miles per hour to Lake Superior.

5. Major failure at Mile Post 7 would thwart the entire purpose of on land disposal by emptying stored tailings into Lake Superior. The threat to Lake Superior would not end when operations cease, but would persist indefinitely.

6. Significant water resources would be destroyed, impaired and polluted by implementation of the Mile Post 7 proposal.

7. Implementation of on land tailings disposal at alternative sites designated Embarrass, Colvin, Snowshoe and Midway would cause significantly less pollution, impairment, or destruction of air, water, land and other natural resources located within the state than would Mile Post 7.

8. Fugitive dust and fiber concentration at Silver Bay resulting from tailings disposal at Midway would be substantially lower than for Mile Post 7 because of its greater distance. Existing dust emissions affecting Babbitt should be mitigated if Embarrass, Colvin or Snowshoe were to be used for disposal.

9. Dams of the same design and construction at each of the alternative sites would have a greater safety factor than at Mile Post 7.

10. The effects of dam failure would be significantly less at each of the alternative sites than at Mile Post 7.

11. Failure at any of the alternative sites would not deposit stored tailings in Lake Superior.

12. Destruction, impairment or pollution of water resources would be significantly less at each of the alternative sites, and the waters which would be affected are of lower quality.

13. From the standpoint of land use planning, Embarrass, Colvin and Snowshoe are located near concentrations of existing mining operations and are significantly better locations for tailings disposal than Mile Post 7; Midway is clearly preferable to Mile Post 7, but less desirable than the other alternatives.

14. Expansion of the tailings disposal area to accommodate tailings produced after the present 40 year mine plan would be feasible at the alternative sites. Expansion would not be possible at Mile Post 7 and the operations during the remaining 10 to 20 years of mine life would require development of another disposal area.

15. Construction costs would be higher for each of the alternative sites than for Mile Post 7 but all are economically feasible. Construction costs for the Midway site would be substantially less than for Embarrass, Colvin or Snowshoe, but operating costs would be higher.

16. Tailings disposal at Embarrass, Colvin or Snowshoe would result in serious dislocation resulting from the transfer of some 400 employees from Silver Bay to the Babbitt area.

17. Energy consumption per ton of pellets produced would be comparable to Mile Post 7 at Embarrass, Colvin and Snowshoe, and would be somewhat higher at Midway.

18. The use of the Midway site would avoid the employee dislocation and greater air pollution problems which would result from the use of Embarrass, Colvin or Snowshoe, and is therefore preferred despite its lower ranking from the land use standpoint and its higher energy consumption.

19. The Environmental Impact Statement has been properly prepared in accordance with the provisions of Minn. Stat. 116D.04 and the applicable regulations of the Environmental Quality Council.

20. The draft EIS has been reviewed in accordance with the procedures established by the Environmental Quality Council. Comments have been received from public agencies. Members of the public, and particularly those members of the public in the counties affected by the proposed action, have had access to the draft EIS and have had an opportunity to comment upon the document in writing and in public hearings.

21. Public hearings have been held on the contents of the draft EIS in conjunction with the permit hearings and the record on the draft EIS has been held open for the requisite time period established by regulation. The draft EIS and the procedures in relation thereto fully meet the requirements of the Environmental Policy Act and the applicable regulations.

MEMORANDUM

Since June 23, 1975, when evidentiary hearings opened in Silver Bay in these proceedings, testimony covering 17,884 pages of transcript has been taken from 160 witnesses during 82 days of hearings. More than 600 exhibits have been received in evidence, ranging from single photographs to reports covering several hundred pages.

Throughout the hearing and consideration of this complex matter, one objective has predominated: to bring an end to the agony of uncertainty which grips the people of Silver Bay. I am compelled, instead, to add to the uncertainty.

With the benefit of thirty years of hindsight, it is painfully apparent that Reserve Mining Company, its owners and its employees were not well served by the original decision to allow tailings disposal in Lake Superior. If the mistake of 1947 teaches nothing else, we should have learned that even risks which appear relatively small cannot be taken when the consequences are catastrophic and irreversible.

The record in this proceeding clearly establishes that Mile Post 7 is not a suitable location for disposal of Reserve's tailings and would be contrary to law. Those who believe that the tailings pose no health hazard, that disposal in Lake Superior is minor pollution at the most, will

be puzzled by concerns about blowing dust reaching Silver Bay and possibilities of dam failure which could flush 40 years of stored tailings into Lake Superior. But questions of health hazard and pollution have been determined by the United States Court of Appeals. We are bound by those determinations.

In my judgment, tailings disposal at the Midway alternative site could be implemented speedily and Reserve Mining Company could move forward as a profitable and respected operation in Minnesota. If Midway is not implemented and Reserve's operations are terminated, the consequences would be horrendous for a great many people, but the Mile Post 7 site would be no more suitable and no more legal.

Officers of Reserve and its owners, Armco Steel Corporation and Republic Steel Corporation, have testified that rejection of Mile Post 7 would likely result in termination of Reserve's operations. I accept their testimony as their honestly held opinions based on information available to them at that time.

I do not assume that they will re-examine their positions and seek to find a way to move to on land disposal at Midway. But I believe that they should, and I respectfully request that they do.

If Reserve is to continue operations in Minnesota, solution to its problems can only be reached through mutual

respect and confidence between the company and the state regulatory agencies. That respect and confidence can be established if procedures can be developed by the parties which guarantee an open and forthright exchange of information. I commend the parties, their counsel and their witnesses for their conduct during these proceedings. Except for occasional lapses, which I specifically refrain from itemizing, they have pointed the way toward the desired goal.

Respectfully submitted,

A handwritten signature in cursive script, reading "Wayne W. Olson". The signature is written in dark ink and is positioned above a horizontal line.

Wayne W. Olson
Hearing Officer/Referee

STATE OF MINNESOTA

DEPARTMENT OF NATURAL RESOURCES

POLLUTION CONTROL AGENCY

In the Matter of the Applications by Reserve Mining
Company for Permits for the Mile Post 7 (Lax Lake)
On-land Tailings Disposal Plan at Silver Bay, Minnesota

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STATE OF MINNESOTA

DEPARTMENT OF NATURAL RESOURCES

POLLUTION CONTROL AGENCY

In the Matter of the Applications by Reserve Mining
Company for Permits for the Mile Post 7 (Lax Lake)
On-land Tailings Disposal Plan at Silver Bay, Minnesota

LISTING OF EXHIBITS

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RESERVE MINING COMPANY EXHIBITS

MATTHEW R. BANOVETZ

1. Witness Statement of Matthew R. Banovetz
2. Reserve's Application to the Minnesota Water Pollution Control Commission dated January 28, 1947.
3. Reserve's Application to the Minnesota Department of Conservation dated January 28, 1947.
4. Reserve's Application to the United States Army Corps of Engineers dated January 28, 1947.
5. Reserve's Permit from the Minnesota Water Pollution Control Commission dated December 16, 1947.
6. Reserve's Permit from the Minnesota Department of Conservation dated December 18, 1947.
7. Reserve's Permit from the Department of the Army dated April 22, 1948.
8. Letter of November 30, 1950 - Modification of Reserve's Federal Permit to extend time for construction of docks to December 31, 1960.
9. Letter of July 23, 1952 - Modification of Reserve's Federal Permit approving revised plans for the construction of breakwaters.
10. Reserve's Amendment to its permit from the Minnesota Water Pollution Control Commission dated November 12, 1956.
11. Reserve's Amendment to its permit from the Minnesota Department of Conservation dated July 6, 1956.
12. Reserve's Application to the United States Army Corps of Engineers dated June 20, 1960.
13. Reserve's Supplemental Application to the United States Army Corps of Engineers dated August 19, 1960.
14. Reserve's Amendment to its Permit from the Minnesota Water Pollution Control Commission dated September 8, 1960.
15. Reserve's Amendment to its Permit from the Minnesota Department of Conservation dated September 29, 1960.
16. Reserve's Amendment to its Permit from the United States Army Corps of Engineers dated October 11, 1960.
17. Map - Peter Mitchell Mine plan.

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- 18. Cross-section of the East pit - Peter Mitchell Mine.
- 18A. Cross-section of the East pit - Peter Mitchell Mine (overlay--original topography).
- 19. Cross-section of the West pit - Peter Mitchell Mine.
- 19A. Cross-section of the West pit - Peter Mitchell Mine(overlay--original topography).
- 20. Schematic representation of Reserve's existing taconite process.
- 21. Schematic representation of Silver Bay operations.
- 22. Schematic representation of the modifications proposed as a part of the Mile Post 7 plan.
- 23. Reserve's slide program - Mile Post 7 Plan.
- 23A. Script - Reserve's Mile Post 7 slide program.
- 24. Movie - Research and Development overview.
- 24A. Script - Reserve's Research and Development movie.
- 25. Letter of the Honorable Wendell R. Anderson, Governor of State of Minnesota, to E. M. Furness dated August 16, 1974.
- 26. Letter of Reserve Mining Company to Commissioner Robert L. Herbst dated October 21, 1974, which furnished the Agencies preliminary drafts of Reserve's principal documents to its Mile Post 7 Permit Applications.
- 27. Letter of Reserve Mining Company to Agencies dated November 18, 1974, with Reserve's Applications and Appendices for the requisite permits relating to its Mile Post 7 On-Land Tailings Disposal and Air Quality Plan.
- 27A. Application for Permits for Mile Post 7 On-Land Tailings Disposal Plan to Department of Natural Resources.
- 27B. Application for Permits for Appropriation, Consumptive and Non-Consumptive Use of Water, Peter Mitchell Mine, Babbitt, Minnesota to Department of Natural Resources.
- 27C. Application for Permits for Mile Post 7 On-Land Tailings Disposal Plan to Minnesota Pollution Control Agency.
- 27D. Application for Permits for Operations at Peter Mitchell Mine, Babbitt, Minnesota to Minnesota Pollution Control Agency.
- 27E. Application for Permits to U. S. Army Corps of Engineers.
- 27F. Appendix 1 - Feasibility Report On-Land Tailings Disposal Study - Mile Post 7 Site - Klohn Leonoff Consultants Ltd.
- 27G. Appendix 3 - Consultant Reports - Mile Post 7 Site.
- 27H. Engineering Report - On-Land Tailings Disposal and Air Quality Facilities - Mile Post 7.

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- 27I. Appendix 5 - General Arrangement Drawings - On-Land Tailings Disposal and Air Quality Facilities - Mile Post 7.
- 27J. Appendix 6 - Appendix A(Volume 1) - Feasibility Report On-Land Tailings Disposal Study- Mile Post 7 Site - Klohn Leonoff Consultants Ltd.
- 27J-1, J-2, J-3 - Revised (August, 1975) versions of Appendixes 6 and 7 (now expanded to three volumes -- 6, 7, and 7-A), Klohn Feasibility Report.
- 27K. Appendix 7 - Appendix A(Volume 2) - Feasibility Report On-Land Tailings Disposal Study - Mile Post 7 Site - Klohn Leonoff Consultants Ltd.
- 27L. Appendix 8 - Environmental Assessment of Mile Post 7 Plan Pursuant to MEQC25, State of Minnesota - Arthur D. Little, Inc.
- 27M. Reserve Mining Company Mile Post 7 On-Land Tailings Disposal and Air Quality Plan - Revised May 26, 1975.
- 27N. Appendix 2 - Reserve Mining Company Environmental Monitoring Program - Revised May 26, 1975.
- 28. Letter of Reserve Mining Company to Commissioner Robert L. Herbst and Agencies dated November 21, 1974, correcting November 18 Applications.
- 29. Letter of Reserve Mining Company to Grant J. Merritt and Agencies dated November 25, 1974, correcting November 18 Applications.
- 30. Letter of Reserve Mining Company to Minnesota Pollution Control Agency dated January 20, 1975, correcting November 18 Applications.
- 31. Letter from Messrs. Merritt and Herbst dated December 7, 1974, requesting additional information from Reserve.
- 32. Reserve's letter of December 19, 1974, providing additional information to Agencies.
- 32A. Reserve's letter of February 1, 1975, providing additional information to Agencies.
- 33. Reserve's letter to Agencies dated February 6, 1975.
- 34. Reserve's letter to Agencies dated March 7, 1975.
- 35. Reserve's letter to Agencies dated March 27, 1975.
- 36. Reserve's letter to Agencies dated April 21, 1975, attaching Klohn Leonoff Design Report (April 1975).

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- 37. Reserve's letter of April 30, 1975, with Arthur D. Little Environmental Report enclosure.
- 37A. Arthur D. Little Environmental Report - Volume I.
- 37B. Arthur D. Little Environmental Report - Volume II.
- 37C. Arthur D. Little Environmental Report - Volume III.
- 37D. Arthur D. Little Environmental Report - Appendix.
- 37E. Arthur D. Little Supplemental Report - August, 1975.
- 38. Supplemental Air Quality Stipulation Agreement dated May 21, 1975.
- 38A. Amended Supplemental Air Quality Stipulation Agreement dated Dec., 1975.
- 39. Reserve's letter to Agencies dated May 30, 1975, with revised Mile Post 7 On-Land Tailings Disposal and Air Quality Plan and Environmental Monitoring Program.
- 40. Map reflecting the location of the ten surface water sampling stations, 14 ground water stations, pipeline routes and air monitoring stations.
- 41. Chart listing the 43 separate parameters which will be monitored monthly under the Environmental Monitoring Program proposed by Reserve.
- 41A. Sample - Dry cob tailings.
- 41B. Sample - Filtered tailings.
- 41C. Sample - Fine tailings.
- 42. Model representation of the Mile Post 7 site viewed pre-operationally.
- 43. Model representation of the Mile Post 7 site viewed post-operationally.
- 44. Model representation of a cross-section of the South Dam reflecting the various components of dam construction.
- 45. Reserve's preliminary construction schedule.
- 46. Chart reflecting the estimated project cost including financing and land acquisition.
- 47. Chart reflecting the additional net operating cost of the Mile Post 7 plan.

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JOHN A. HOLMQUIST

- 48. Witness Statement - John A. Holmquist.
- 49. Poster depicting "Seismic Risk Map for Conterminous U. S." developed by ESSA/Coast and Geodetic Survey.
- 50. A map depicting the Mile Post 7 site with the location of the cross-section lines.
- 51. Chart of the "Geologic Column."
- 52. Chart of the "Cross-Section Photo Alignment--Section A-A."
- 53. Chart of the "Cross-Section Photo Alignment--Section B-B."
- 54. Chart of the "Cross-Section Photo Alignment--Section C-C."
- 55. Chart of the "Cross-Section Photo Alignment--Section D-D."
- 56. Mosaic photo overview of the present Mile Post 7 site.
- 57. Report of Eugene A. Hickok and Associates dated January, 1975, entitled "General Geology of the Mile Post 7 Site."
- 57A Report of E. A. Hickok and Associates dated November, 1975, entitled "Ground Water Investigation - Milepost 7 Site."
- 57B Report of E. A. Hickok and Associates dated November, 1975, entitled "Dike Rock Investigation Delta Stabilization."
- 57C Chart - "Approximate Location of Ground Water Wells."
- 57D Chart - "Monitoring Well Design."
- 57E Chart - "Deep Seepage Analysis."
- 57F Chart - "Groundwater Map - Dam 1 - Glacial Till Formation."

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EARLE J. KLOHN

58. Witness Statement - Earle J. Klohn.
59. Slides of typical tailings grain size curves.
60. Slide of the upstream and downstream methods of tailings dam construction.
61. Slide of the water balance for typical "closed-circuit" tailings dam.
62. Slide of the upstream method of tailings dam construction.
63. Slide of tailings dam construction using upstream spigotting and wooden forms to support downstream dikes.
64. Photograph of dam being built upstream by spigotting.
65. Slide photograph of tailings dam construction using wooden forms to support downstream dike.
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68. Slide photograph of a tailings dam utilizing cyclones in upstream construction.
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- 122. Slide of "Lacustrine Clay at Mile Post 7 Site--Lake Drains Exposing Clay Deposit."
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- 125. Slide of "Sand Drains."
- 126. Slide of "Sand Drains to Speed Up Consolidation--Case One."
- 127. Slide of "Sand Drains to Speed Up Consolidation--Case Two."
- (RMC 447. "Report on Foundation Clay Characteristics - On-Land Tailings Disposal Milepost #7 Site for Reserve Mining Company" - Klohn Leonoff)
- 127A "Progress Report Mile Post 7 On-Land Tailings Disposal for Reserve Mining Company, Silver Bay, Minnesota - January 9, 1976," Klohn, Leonoff Consultants Ltd.
- 127B Sketch plan for proposed coarse tailings immersion.
- 127C "Dike Surface Areas" computations -- proposed coarse tailings immersion.
- 127D Engineering Drawing - #VA-1965-38 - dikes, etc., re proposed coarse tailings immersion. Includes E. Klohn's pencilled notes.

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EUGENE A. HICKOK

- 128. Witness Statement - Eugene A. Hickok.
- 129. Poster of "Major Watersheds."
- 130. Poster of "Mile Post 7 Site" depicting coarse and fine tails storage.
- 131. Poster - Annual Flow Hydrograph.
- 132. Poster - "Mile Post 7 Site--Infiltration Locations."
- 133. Poster - "Mile Post 7 -- Geologic Cross-Section - Saturated Thickness - Dam 1."
- 134. Poster - "Mile Post 7 -- Geologic Cross-Section - Saturated Thickness - Dam 2-3."
- 135. Poster - "Bear Lake Diversions."
- 136. Report - "Hydrological Analysis of the Mile Post 7 Site" - October, 1974 - Eugene A. Hickok and Associates.
- 137. Report - "Hydrological Analysis of the Beaver River Watershed" - January 8, 1975 - Eugene A. Hickok and Associates.
- 138. Infiltration Test - January 17, 1975.
- 139. Seepage Estimates - January 20, 1975.

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RESERVE MINING COMPANY EXHIBITS DR. GERALD A. PLACE

140. Witness Statement - Dr. Gerald A. Place.
141. Slide photograph of "Establishment of Vegetation on Taconite Tailings."
142. Slide of "Typical Soil Factors Limiting Plant Growth."
143. Slide of "Soil Test Explanation (pH)."
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180. Slide of "Predominant Vegetation Observed at Cleveland Cliffs Iron Company."
181. Slide of "Erie Mining Company."
182. Slide of revegetation equipment at Erie Mining Company.-

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183. Slide of test plots at Erie Mining Company.
184. Slide of vegetation at Erie Mining Company.
185. Slide of vegetation at Erie Mining Company.
186. Slide photograph of closeup of vegetation at Erie Mining Company.
187. Slide photograph of root development on north slope of Erie Mining Company's tailings basin.
188. Slide photograph of uprooted vegetation at Erie Mining Company's tailings basin.
189. Slide photograph of conifer tree on Erie's basin.
190. Slide photograph of tree vegetation on Erie Mining Company's basin.
191. Slide photograph of farm equipment utilized at Erie Mining Company.
192. Slide photograph of cultivation of vegetation site at Erie Mining Company.
193. Slide photograph of feeder at Erie Mining Company.
194. Slide photograph of cultipacking of alfalfa and rye at Erie Mining Company.
195. Temporary seeding near water's edge at Erie Mining Company.
196. Slide photograph of vegetation at Erie Mining Company.
197. Slide photograph of temporary vegetation near Erie Mining Company's tailings pond.
198. Slide photograph of geese in Erie Mining Company's tailings pond.
199. Slide photograph of deer on Erie Mining Company's basin.
200. Slide of "Predominant Vegetation Observed at Erie Mining Company."
201. Slide of "Effective Varieties Observed at All Sites."
202. Slide photograph of slopes at each of the tailings basins observed.
203. Slide of "Reserve Mining Company Vegetation Research Program Designed By Dr. Gerald A. Place."
204. Slide of "Objectives" of Reserve Mining Company's Vegetation Research Program.

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- 205. Slide photograph of location of test plot.
- 206. Slide of "Test Plot Diagram for One Slope."
- 207. Slide of "Experimental Design."
- 208. Slide of "Varieties X Fertilizer X Fertilizer Application Time."
- 209. Slide of "Fertilizer Recommendations for Tailings Based on Soil Test Results."
- 210. Slide of "Varieties X Fertilizer X Fertilizer Application Time."
- 211. Slide of "Varieties X Mulch."
- 212. Slide of "Variables to Be Measured."
- 213. Slide of "Reserve's Test Plot."
- 214. Slide of seeding of Reserve's test plot.
- 215. Slide of plotting of seeds at Reserve's test plot.
- 216. Slide of seeding of Reserve's test plot.
- 217. Slide of quarter on coarse cobs at Reserve's test plot.
- 218. Slide of cross-section view of alternate tailings dam.
- 219. Slide of vegetation at Reserve's tailings basin in Babbitt, Minnesota.
- 220.) Errors in numbering.
- 221.)
- 222. Report - "Reserve Mining Company Vegetation Research Program,"
Designed by Dr. Gerald A. Place.
- 223. Sample - Foote Mineral Company Bare Sand.
- 224. Sample - Foote Mineral Company Bare Sand.
- 225. Sample - Great Canadian Oil Sands Fresh Tailings.
- 226. Sample - Great Canadian Oil Sands - Below Root Zone - Creeping
Red Fescue.

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- 227. Sample - Great Canadian Oil Sands, Ltd. - Root Zone - Creeping Red Fescue.
- 228. Sample - Cleveland Cliffs Iron Company - Below Root Zone - Reed Canary Grass - Republic Site.
- 229. Sample - Cleveland Cliffs Iron Company - Fines - Humboldt, West Basin.
- 230. Sample - Cleveland Cliffs Iron Company - Root Zone - Reed Canary Grass - Republic Site.
- 231. Sample - Cleveland Cliffs Iron Company - Root Zone - Reed Canary Grass - Republic Site.
- 232. Sample - Erie Mining Company - Below Root Zone - Reed Canary Grass.
- 233. Sample - Erie Mining Company - Root Zone - Reed Canary Grass.
- 234. Sample - Erie Mining Company - Root Zone - Reed Canary Grass.
- 234A. Report - "Tailings Dam Revegetation Research Plot Plans for Reserve Mining Company by Gerald A. Place and Vernon L. Hall" - October 8, 1974.
- 234B. Report - "Tailings Dam and Pond Vegetation Program for Reserve Mining Company at Silver Bay, Minnesota By Gerald A. Place" - October 8, 1974.
- 234C. Report - "Experimental Vegetation of Taconite Tailings" - RMC #23-3113 November 10, 1975.

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DUNCAN HAY

- 235. Witness Statement - Duncan Hay.
- 236. Slide of "Wave Definitions."
- 237. Withdrawn.
- 238. Slide depicting breaking waves on a flat beach.
- 239. Slide of breaking waves on a steep beach.
- 240. Withdrawn.
- 241. Slide of "Beach Development and Stabilization--Stage One Present Condition."
- 242. Slide of "Beach Development and Stabilization--Stage Two Rubble Seawall in Place."
- 243. Slide of "Beach Development and Stabilization--Stage Three Armoring Process."
- 244. Slide of "Plan of Beach Development."
- 245. Slide of "Beach Development and Stabilization--Stage Four Final Beach Profile."
- 246. Photograph of 40-inch mine quarry rock.
- 247. Poster depicting the three-dimensional model apparatus.
- 248. Poster depicting the purposes of the hydraulic model studies.
- 249. Film of the Development and Stabilization of Nearshore Beach. (39 still shots from the film are also available.)
- 250. Script for the film of "Development and Stabilization of Nearshore Beach."
- 251. Poster depicting "Proposed Delta Stabilization Plan and Sections."
- 251A Report - "Draft of Final Report - Hydraulic Model Studies of Tailings Delta Stabilization" - Western Canada Hydraulic Laboratories, Ltd., September, 1975.

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DR. ROBERT A. RAGOTZKIE

- 252. Witness Statement - Dr. Robert A. Ragotzkie
- 253. Poster depicting aqua temp and current meter locations.
- 253A Drill hole logs and laboratory test results for delta stabilization project - May 16, 1975.
- 254. Poster depicting "Upwelling. "
- 255. Poster depicting "Downwelling. "
- 256. Poster depicting "Vertical Motions Near Silver Bay."
- 257. Report - "Water Motions in Lake Superior" - Robert A. Ragotzkie dated July 31, 1973.
- 257A Report - #23-1112-1 - October 19, 1973 - "In Situ Current Meter Studies - Silver Bay Area - 1973." WITHDRAWN
- 258. Report - "Hydrography Near Silver Bay" - Robert A. Ragotzkie - July 30, 1973.
- 259. Report - "Temperature Regime of Lake Superior at Silver Bay, 1971-1973" - Robert A. Ragotzkie dated August 7, 1973.

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RESERVE MINING COMPANY EXHIBITS LEIF K. JACOBSEN

- 260. Witness Statement - Leif K. Jacobsen.
- 261. Kaiser Engineers' "Proposal for Engineering, Procurement and Construction," dated June, 1974.
- 261A Kaiser Engineers' "Proposal" dated December 19, 1974.
- 261B Kaiser Engineers' "Proposal" dated February 14, 1975.
- 262. Kaiser Engineers' Agreement with Reserve Mining Company dated May 20, 1975.
- 263. Poster of "Tailings Pumping Diagram. "
- 264. Poster of "Tailings Pumping Station Diagram. "
- 265. Poster of "Proposed Typical Cross Section of Tailings Pipeline System. "
- 266. Poster of "Tailings Line Road Crossing Sketch - Short Cross Section. "
- 267. Poster of "Tailings Line Road Crossing Sketch - Long Cross Section. "
- 268. Poster of "East Beaver Creek Crossing. "
- 269. Poster of "Tailings Pipeline Profile, Highway #4 to Beaver River. "
- 270. Poster of "Proposed Project Schedule - Mile Post 7. "
- 271. Poster of "Flowsheet Preparation of an Estimate. "
- 272. Poster of "Escalation Forecast - Industrial Construction Project. "
- 273. Poster of "Escalation Study - Mile Post 42. "
- 274. Poster of "Estimate Types. "
- 275. Poster of "Contingency Variation. "
- 276. Poster of "Estimate Accuracy Variation. "
- 277. Kaiser Engineers' report entitled "Preliminary Estimate for Mile Post 20," dated April 21, 1975.
- 278. Kaiser Engineers' report entitled "Preliminary Estimates for Alternative Schemes for Transporting of Concentrate From Mile Post 42 to Silver Bay," dated April 16, 1975.
- 279. Letter from L. K. Jacobsen to M. G. Woodle dated April 21, 1975, in regard to "Preliminary Review of the Embarrass Site for Construction of an Iron Ore Concentrator. "
- 280. Poster of "Summary of Capital Costs. "
- 280A. Engineering Drawing #22-3154 - General Plant Arrangement

RESERVE MINING COMPANY EXHIBITS
LEIF K. JACOBSEN

- 280B "Engineering Report - Volume I - Draft - On-Land Tailings Disposal and Air Quality Control Facilities for Reserve Mining Company" - Kaiser Engineers - January, 1976.
- 280C "Engineering Report - Volume II - Draft - On-Land Tailings Disposal and Air Quality Control Facilities for Reserve Mining Company" - Kaiser Engineers - January, 1976.
- 280D "Design Criteria - Reserve Mining Company Taconite Ore Preparation Plant - Silver Bay, Minnesota" - October 17, 1975; Revised January 5, 1976 - Kaiser Engineers.
- 280E Engineering Drawing - CPM Summary - Construction Schedule - Mile Post 7.
- 280F Kaiser Engineers Memorandum - D. E. Cardarelle to L. K. Jacobsen and A. A. Wallach - June 30, 1975 - re "Reserve Mining Company Iron Ore Project Dust Control Program During Construction."
- 280G L. K. Jacobsen hand-written "Construction Schedule Comments and Comparison."
- 280H Letter - A. A. Wallach, Kaiser Engineers, to R. L. Reed, Reserve, re construction schedule.
- 280I New Construction Dates - revised dates from Exhibit 280B.

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ROBERT A. LEE

- 281. Witness Statement - Robert A. Lee
- 282. "Reserve Mining Company Various Statistics - 1969-1974."
- 283. "Income Taxes Withheld From Reserve Employees in 1974."
- 284. "Purchases in Excess of \$5,000 From Minnesota Vendors."
- 285. "Distribution of 1974 Tax Liability - Minnesota Taxes."
- 286. Chart - "Distribution of Tax Liability - 1955-74 Inclusive - Minnesota Taxes."
- 287. Chart - "Summary of Minnesota State and Local Taxes - 1975 Estimated Liability Compared With 1974 Liability."
- 288. Table 2.3.3.1-A from Arthur D. Little Environmental Report - "Financial Position - Reserve Mining Company - Years Ended December 31, 1974 and December 31, 1973."

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DR. WILLIAM MARSHALL

- 289. Witness Statement - Dr. William Marshall.
- 290. Chart - "Ratings of Big Game Habitats on the Mile Post 7 Site."
- 291. Chart - "Ratings of Game Bird Habitats on the Mile Post 7 Site."
- 292. Chart - "Ratings of Big Game Habitats on the Colvin Site."
- 293. Chart - "Ratings of Game Bird Habitats on the Colvin Site."

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RICHARD L. REED

- 294. Witness Statement - Richard L. Reed.
- 295. Topographic map (enlarged to: 1" = 2,000') of the Silver Bay Quadrangle.
- 296. Topographic map (identified as Reserve Drawing No. 292-0003) of the Mile Post 7 site.
- 297. Engineering Drawing No. 292-0041 of Dam No. 1.
- 298. Engineering Drawing No. 292-0050 of Dam No. 2-3.

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WILLIAM F. WILSON

299. Witness Statement - William F. Wilson.

299A. "Reserve Mining Company Detailed Cost Estimate - Mile Post 7."

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ROBERT S. LEMIRE

- 300. Witness Statement - Robert S. Lemire.
- 301. Withdrawn.
- 302. Memorandum - J. R. Oxberry to A. H. Samuel - "Data From Stream Biota Monitoring of Mile Post 7 - May, 1975," dated June 25, 1975.
- 303. Memorandum - D. M. Wagner to A. H. Samuel - "Recycled Water Chemistry: Evaluation of Calcium Chloride Addition Rates and Various Flotation Reagents on Water Quality Parameters," dated June 23, 1975.
- 304. Research and Development Division Report No. 23-2103 - "Filter Bed for Tailings Thickener Overflow," July 10, 1974.
- 305. Photograph - Research and Development - Tailings Clarification Pond.
- 306. "Table 1, Pilot Plant Tailings Circuit Water Chemistry," page 3 of Research and Development Division Report No. 23-2103, "Filter Bed for Tailings Thickener Overflow," July 10, 1974.
- 307. "Table 2, Pilot Plant Tailings Circuit Water Chemistry," page 5 of Research and Development Division Report No. 23-2103, "Filter Bed for Tailings Thickener Overflow," July 10, 1974.
- 308. Research and Development Division Report No. 23-5106-2 "Effect of of Pilot Plant Discharge on Rainbow Trout," June 26, 1975.
- 309. Research and Development Division Photograph - Pilot Plant Pond.
- 310. Research and Development Division Photograph - Pilot Plant Pond With Spawning Stream.
- 311. Research and Development Division Photograph - Mature Trout From Pilot Plant Pond.
- 312. Research and Development Division Photograph - Mature Trout From Pilot Plant Pond.
- 313. Research and Development Division Photograph - Mature Trout From Pilot Plant Pond.

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314. Research and Development Division Photograph - Close-up of Mature Male Trout.
315. Research and Development Division Photograph - Pilot Plant Spawning Stream.
316. Research and Development Division Photograph - Close-up of Pilot Plant Spawning Stream.
317. Research and Development Division Photograph - Stripping of Fish Eggs From Mature Trout.
318. Research and Development Division Photograph - Fertilized Trout Eggs.
319. Research and Development Division Photograph - Sac Fry.
320. Research and Development Division Photograph - Sac Fry.
321. Research and Development Division Photograph - Sac Fry.
322. Research and Development Division Photograph - Kam Loops Rainbow Trout and Regular Rainbow Trout.
323. Research and Development Division Report No. 23-5104 - "Fish Bioassay-Azamine A-3 and Superfloc 330," April 5, 1973.
324. Research and Development Division Report No. 23-5111 - "Trout Eggs and Sac Fry Bioassay of Tailings," April 24, 1973.
325. Research and Development Division Report No. 23-5111-1 - "Trout Eggs and Sac Fry Bioassay of Tailings," March 25, 1974.
326. Research and Development Division Report No. 23-5112 - "Trout Eggs and Sac Fry Bioassay of Flocculated Tailings," July 27, 1973.
327. Research and Development Division Report No. 23-5113 - "Juvenile Brook Trout and Yellow Perch Bioassay of Tailings," March 27, 1973.
328. Research and Development Division Report No. 23-5114 - "Trout Larvae Bioassay of Azamine A-3," May 4, 1973.
329. Research and Development Division Report No. 23-5118 - "Exposure of Rainbow Trout to Reserve's Suspended Solids From Tailings Effluent," August 23, 1974.
330. Research and Development Division Report No. 23-5120 - "Diatom Bioassay Study," January 28, 1974.

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ROBERT S. LEMIRE

- 330A. Research and Development Division Report No. 23-7103 - "Mile Post 7 Water Quality Monitoring," November 4, 1975.
- 330B. Research and Development Division Report No. 23-0100 - "Particle Analyses of Delta Tailings," November 15, 1975.
- 330C. Research and Development Division Report No. 23-7102 - "Mile Post 7 Ground Water Monitoring - 1975," November 5, 1975.
- 330D. Research and Development Division Report No. 23-3110 - "Fine Tailings Filter Tests," November 18, 1975.
- 330E. Research and Development Division Report No. 23-7104 - "Mile Post 7 Stream Biota Monitoring - 1975," November 17, 1975.
- 330F. Letter and attachments - R.S. Lemire to Eldon G. Kaul - December 11, 1975.
- 330G. Research and Development Division Report No. 23-3107 - "Closed Circuit Water System," January 7, 1976.
- 330H. Research and Development Division Report No. 23-7101 - "Ambient Air Quality Monitoring - 1975," January 7, 1976.
- 330 I. Drawing - Superior Water, Light and Power Company - Wells - Minnesota Point - December 31, 1956.
- 330J. Letter - Dr. Philip M. Cook to Fred E. Stout re analyses of Superior well water samples.

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FATHER WILLIAM T. HOGAN

331. Witness Statement - Father William T. Hogan.

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DR. RICHARD LICHTY

- 332. Witness Statement - Dr. Richard W. Lichty.
- 333. "The Employment Impact of Reserve Mining Company on the Arrow-head Region of Northeast Minnesota Plus Douglas County, Wisconsin," by Wayne A. Jesswein and Richard W. Lichty, University of Minnesota, Duluth.

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JEAN F. BASGEN

- 334. Witness Statement - Jean F. Basgen.
- 335. Slide - Aerial view - Silver Creek - 7-13-74.
- 336. Slide - Aerial view - Encampment River - 7-13-74.
- 337. Slide - Aerial view - Beaver River Valley - 7-13-74.
- 338. Slide - Aerial view - East Beaver Bay - 7-13-74.
- 339. Slide - Aerial view - Silver Bay - 7-13-74.
- 340. Slide - Aerial view - Mount Rockwood Ski Hill and Williams Creek - 7-13-74.
- 341. Slide - Aerial view - Baptism River and Illgen Falls - 7-13-74.
- 342. Slide - Aerial view - Temperance River - 7-13-74.
- 343. Slide - Aerial view - Carlton Peak - 7-13-74.
- 344. Slide - Aerial view - Onion River - 7-13-74.
- 345. Slide - Aerial view - Poplar River, Lutsen Ski Hills - 7-13-74.
- 346. Slide - Aerial view - Cascade River Valley - 7-13-74.
- 347. Slide - Aerial view - Grand Marais - 7-13-74.
- 348. Slide - Aerial view - Brule River - 7-13-74.
- 349. Slide - Aerial view - Dutchman Lake Behind Ridge - 7-13-74.
- 350. Slide - Aerial view - Hat Point From Grand Portage Bay - 7-13-74.
- 351. Slide - Aerial view - Teal Lake - 7-13-74.
- 352. Slide - Aerial view - Pigeon River and Falls - 7-13-74.
- 353. Slide - Aerial view - Looking northeast with Reserve railroad in foreground; Bear Lake in extreme center right - May 9 and 16, 1975.
- 354. Slide - Aerial view - Similar to #354 - Looking a bit more north - May 9 and 16, 1975.
- 355. Slide - Aerial view - Looking north-northeast with golf course in lower right corner - May 9 and 16, 1975.

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- 356. Slide - Aerial view - Looking west-northwest - Airplane just about over Beaver Bay - May 9 and 16, 1975.
- 357. Slide - Aerial view - Looking west-northwest showing city of Silver Bay and part of Reserve plant - May 9 and 16, 1975.
- 358. Slide - Aerial view - Looking west - Mile Post 7 area - May 9 and 16, 1975.
- 359. Slide - Aerial view - Looking approximately north - Mile Post 20 area - Duluth, Missabe and Iron Range Railroad tracks on left side of slide - June 26, 1975.
- 360. Slide - Aerial view - Looking southwest with Katherine Lake in foreground; Cloquet Lake in middleground - Mile Post 20 area - June 26, 1975.
- 361. Slide - Aerial view - Similar to #360 - Mile Post 20 area - Lillian Lake upper left side - June 26, 1975.
- 362. Slide - Aerial view - Looking to the northeast with Cloquet and Katherine Lakes in upper center - June 26, 1975.
- 363. Slide - Aerial view - Mile Post 20 area - general view looking north - June 26, 1975.
- 364. Slide - Aerial view - Looking south - Highway #104 in very extreme lower right; DM&IR tracks on right side of slide; Cloquet Lake just west of slide - June 26, 1975.
- 365. Slide - Aerial view - Culkin Lake area - general view of the area with Culkin Lake in center looking southeast - June 26, 1975.
- 366. Slide - Aerial view - Looking approximately east with Lobo Lake in upper right center; a portion of Culkin Lake on lower left side - June 26, 1975.
- 367. Slide - Aerial view - Similar to #366 - lower altitude - June 26, 1975.
- 368. Slide - Aerial view - Culkin Lake - June 26, 1975.
- 369. Slide - Aerial view - Looking north-northwest with Sand Lake across center of slide; Lobo Lake upper right of slide - June 26, 1975.
- 370. Slide - Aerial view - Looking southwest - Sand Lake - Lobo Lake in upper right hand corner; Cougar Lake upper left and Seven Beaver and Big Lakes on horizon.

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- 371. Slide - Aerial view - Mile Post 42 area - Looking north-northeast - Reserve railroad on right-hand side; Long Lake in lower left corner; Stone Lake in center of slide; portion of Seven Beaver Lakes on center right - May 9 and 16, 1975.
- 372. Slide - Aerial view - Looking northeast - Seven Beaver Lakes in foreground; Big Lake in upper right; Long Lake middle left - May 9 and 16, 1975.
- 373. Slide - Aerial view - Generally the same direction as slide #372 with most of Seven Beaver Lakes in foreground. Upper right shows junction of Reserve and Erie Mining Company crossing of railroads - May 9 and 16, 1975.
- 374. Slide - Aerial view - Looking to northeast from approximately Skybo area with Big Lake in upper center and Long Lake on upper right edge - May 9 and 16, 1975.
- 375. Slide - Aerial view - Same general view as slide #374 looking a little more to the north - May 9 and 16, 1975.
- 376. Slide - Aerial view - Looking north-northeast with Highway #133 in foreground - May 9 and 16, 1975.
- 377. Slide - Aerial view - Embarrass area - Looking to southwest with Highway #104 making right angle in foreground; Erie Mining Company tailings pond upper left side - June 26, 1975.
- 378. Slide - Aerial view - Same general view as slide #377 with camera slightly farther west - June 26, 1975.
- 379. Slide - Aerial view - Looking south and east with Reserve pit across top of slide - June 26, 1975.
- 380. Slide - Aerial view - Embarrass area - looking to southwest - June 26, 1975.
- 381. Slide - Aerial view - Looking west with Highway #1 on right side; Highway #104 on left side - June 26, 1975.
- 382. Slide - Aerial view - Looking east with Mud Lake on center right side - June 26, 1975.
- 382A. U. S. Forest Service map showing proposed tailings disposal sites.

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CHAKRA J. SANTHANAM

- 383. Witness Statement - Chakra J. Santhanam.
- 384. Brochure - "ADL Today" - Arthur D. Little, Inc.
- 385. Annual Report, 1974 - Arthur D. Little, Inc.
- 386. Brochure - "ADL Qualifications in Environment."
- 387. Chart - "Impacts Studied."
- 388. Chart - "I. Physical Environmental Impacts - Mile Post #7, Colvin."
- 389. Chart - "II. Biotic Environmental Impacts - Mile Post #7, Colvin."
- 390. Chart - "III. Social Impacts - Mile Post #7, Colvin."
- 391. Chart - "Visibility and Aesthetics" - Mile Post #7.
- 392. Chart - "IV. Economic Impacts - Mile Post #7, Colvin."
- 393. Chart - "Economic Comparison of Plans - Mile Post #7, Mile Post #20, Colvin."
- 393A. Chart - "Basic Economic Data - MP 20, Colvin Plans."
- 394. Chart - "V. Energy Related Impacts - Mile Post #7, Colvin."
- 395. Chart - Map showing copper nickel drill holes, Reserve's mine, Colvin site, and BWCA in Northern Minnesota.
- 396. Revised Cost Evaluations - Mile Post #7, 20 and 42 - July, 1975.
- 397. Table 3.9.2.3-A - Energy Requirements for Construction of Milepost #7 and Colvin Assuming Recycle of Materials. WITHDRAWN
- (37E Arthur D. Little Supplemental Report - August, 1975.)
- 397A Arthur D. Little, Inc. "Comments Report on Draft Environmental Impact Statement" - January, 1976.

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JAMES I. STEVENS

- 398. Witness Statement - James I. Stevens.
- 399. Diagram - Filtration Systems - I.
- 400. Diagram - Filtration Systems - II.

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DR. CHARLES B. WURTZ

401. Witness Statement - Dr. Charles B. Wurtz.

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DR. RICHARD L. MEYER

- 402. Witness Statement - Dr. Richard L. Meyer.
- 402A. Memorandum - J. R. Oxberry to K. M. Haley - January 21, 1975.
- 402B. Memorandum - J. R. Oxberry to K. M. Haley - February 19, 1975.
- 402C. Memorandum - J. R. Oxberry to A. H. Samuel - June 12, 1975.
- 402D. Memorandum - J. R. Oxberry to A. H. Samuel - June 26, 1975.
- 402E. "Compilation of Algal Genera."
- 402F. "Stream Biota Monitoring."

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RICHARD W. HYDE

- 403. Witness Statement - Richard W. Hyde.
- 404. Chart - "Total Shipments of Iron-Bearing Raw Materials By
 CVRD and Its Associated Companies. "

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G. RICHARD YOUNG

- 405. Witness Statement - G. Richard Young.
- 406. Figure 3.8.2.2-A - Net Income Per Year - Republic Steel - 1950-1975.
- 407. Figure 3.8.2.2-B - Net Income Per Year - Armco Steel - 1950-1975.
- 408. Table 3.8.2.4-A - Funds Available for Capital Expenditures - Armco and Republic.
- 409. Table 3.8.2.4-B - Average Annual Funds Flow and Capital Expenditures - Milepost #7, Milepost #20, Colvin.
- 410. Table 3.8.2.4-C - Effect on Income Before Taxes - Armco, Republic.
- 411. Table 3.8.2.4-D - Ratios of Market Value to Equity - Armco, Republic.
- 412. Table 3.8.2.4-F - Republic Debt Interest Coverage - Milepost #7, Milepost #20, Colvin.

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DR. WILLIAM REINFELD

- 413. Witness Statement - Dr. William Reinfeld.
- 414. "Chart I: Reserve's Linkage to the Economy."
- 415. "Chart IIA: Impact of Reserve and Industries Related to It - Minnesota."
- 416. "Chart IIB: Impact of Reserve and Industries Related to It - Total United States."
- 417. "Chart III: Reserve's Linkage to Armco and Republic."
- 418. "Chart IVA: Possible Consequences of Shutdown of Reserve."
- 419. "Chart IVB: Possible Consequences of Shutdown of Reserve."

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JUDITH F. CAMPBELL

- 420. Witness Statement - Judith F. Campbell.
- 420A. Table 2.3.3.2-A "Summary of Economic Impact--Reserve Mining Company in the State of Minnesota, 1973."
- 420B. Table 2.3.3.2-F "Total Minnesota Taxes Attributable to Reserve Mining, 1973."
- 420C. "Correspondence Between Estimates Presented in Exhibits 415 and 416 and comparable data in ADL Report (Exhibit 37)."

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RESERVE MINING COMPANY EXHIBITS

JOHN REED

- 421. Witness Statement - John Reed.
- 422. (Foden)
- 423. "Direct and Indirect Employment Wages Attributable to Reserve Mining Company in the State of Minnesota and Selected Sub-Areas."
- 424. "Purchases By Area - Reserve Mining Company - 1973."
- 425. "Summary of Minnesota Taxes Paid By Reserve Mining Company - 1955-1975."
- 426. Withdrawn.
- 427. "Estimated Value of Silver Bay Townsite."

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HARRY G. FODEN

- 422. Witness Statement - Harry G. Foden.
- 423. (Reed)
- 424. (Reed)
- 425. (Reed)
- 426. Withdrawn.
- 427. (Reed)
- 428. Chart - "Summary of Human Impacts."
- 429. Chart - "Summary of Local Economic Effects."

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DR. BRUCE S. OLD

- 430. Witness Statement - Dr. Bruce S. Old.
- 431. Slide - "Process Unit Interrelationships."
- 432. Slide - "1975-83 Capital Requirements - Millions of 1975 Dollars - Armco, Republic."
- 433. Slide - "Demand and Supply of Funds - 1974-1985."
- 434. Slide - "Private Investment - 1962-1973; 1974-1985."
- 435. Slide - "Ratio of External to Internal Funds."
- 436. Slide - "Internal Funds as Percent of Capital Spending - 1960-1974."
- 437. Slide - "Increase in Corporate Debt - 1968-1974."
- 438. Slide - "Corporate Financial Ratios - 1968-1974; Interest Coverage - 1955-1974."
- 439. Slide - "Debt/Equity Ratio - 1955-1974."
- 440. Slide - "Value of New Stock Issues and Number of Stock Underwritings - 1965-1974."

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DAVID L. DINGEMAN

- 441. Witness Statement - David L. Dingeman.
- 442. Chart - "Babbitt Area - Potential Copper-Nickel Deposits."
- 442A. Research and Development Report No. 23-3112 - "Rougher Magnetic Separator Tailings Sump Test," November 14, 1975.

LISTING OF EXHIBITS

RESERVE MINING COMPANY EXHIBITS

DR. CHARLES J. KENSLER

- 443. Witness Statement - Dr. Charles J. Kensler.
- 444. Organization chart - Arthur D. Little, Inc. - June, 1975.

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RESERVE MINING COMPANY EXHIBITS

MERLYN G. WOODLE

445. Witness Statement - Merlyn G. Woodle

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RESERVE MINING COMPANY EXHIBITS

- 446. Table prepared by George Weaton - "Pellet Quality: Tons, Iron, Silica, Rice Ratio - Rank" - July 24, 1975 (lists all pellet producers).
- 447. "Report on Foundation Clay Characteristics - On-Land Tailings Disposal Milepost #7 Site for Reserve Mining Company" - Klohn Leonoff Consultants Ltd.
- 448. Page 20 of Reserve Mining Company On-Land Tailings Disposal & Air Quality Plan" (Palisade) - shows geographic location only.
- 449. Witness Statement - Dr. Robert Vranka.
- 450. Letter - A. J. Jermann, Republic Steel Corporation to J. A. Lowey - April 2, 1975 - Table of data attached to letter.
- 451. "A Preliminary Report of Fiber Analyses Conducted on Samples Submitted by Reserve Mining Company" by Edward T. Peters, ADL.
- 452. Superior National Forest Map.
- 453. Memorandum from L. K. Jacobsen to E. T. Fride - 12-4-75 - "Recommended Cost Adjustments to Torkelson's Estimate for the Embarrass Plant."
- 453A. Memorandum - D. L. Dingeman & L. K. Jacobsen to E. T. Fride - November 12, 1975 - "Preliminary Critique of the Torkelson Engineering Report for Embarrass Site (moist concentrate handling only)."
- 453B. Memorandum - D. L. Dingeman to E. T. Fride - November 12, 1975 - "Torkelson Report -- Embarrass Concentrator."
- 454. "Feasibility of Alternate Tailings Disposal Site - Draft Copy - June 15, 1974" - Barr Engineering Company.
- 455. Topographic Map - Isaac Lake Quadrangle - Minnesota-St.Louis County.
- 456. Witness Statement - Donald G. Bonamer.
- 457. Letter - Charles Czako, McKee, to K. M. Haley - January 29, 1975.
- 458. Witness Statement - Jerome C. Motz.

LISTING OF EXHIBITS
RESERVE MINING COMPANY EXHIBITS

- 459. Letter - J. C. Motz, Rexnord, to David L. Dingeman - January 9, 1976.
- 460. Resume - Chester A. Rowland, Jr.
- 461. Report - "Reserve Mining Company - Grinding Study - Proposed Embarrass Plant Site" - Allis Chalmers - January 5, 1976.
- 462. Resume - Yves Bajard.
- 463. Report - "Surficial and Bedrock Geology - On-Land Tailings Disposal - Milepost 7 Site" - January, 1976 - Klohn Leonoff Consultants Ltd.
- 464. Report - "Data From October-December, 1975 Drilling and Testing Program - On-Land Tailings Disposal - Milepost 7 Site" - January, 1976 - Klohn Leonoff Consultants, Ltd.
- 465. Research and Development Division Report No. 23-7102 - "Mile Post 7 Ground Water Monitoring - 1975" - January 28, 1976.
- 466. Letter - October 3, 1975 - Robert A. Lee to M. R. Hyde - with attachments re: operating costs, etc.
- 467. Letter - December 31, 1975 - Northern Natural Gas to Federal Power Commission.
- 468. Five-page letter - February 5, 1976 - L. K. Jacobsen, Kaiser, to R. L. Reed re Mile Post 20 Estimate.
- 469. Letter - February 5, 1976 - L. K. Jacobsen, Kaiser, to R. L. Reed, attaching backup information used in preparation of Mile Post 20 estimate.
- 470. Letter - no date (received 12-13-71) from Elwood Rafn to Melroy Peterson, Lake County re tax forfeited lands.
- 471. Excerpts - Upper Great Lakes Regional Commission information from Coastal Zone Management Economic Volume.
- 472. Excerpts from Volume 2 - Highway Planning Studies Upper Great Lakes Region - Compatibility of Leisure and High Mobility Traffic in a Scenic Corridor - Minnesota.
- 473. Excerpts from "Minutes of Meeting North Shore Drive From Duluth to Canadian Border" - State Highway Department Building - November 16, 1960.
- 474. Excerpts from "Minnesota Horizons" sponsored by Legislature, State Planning Agency, Commission on Minnesota's Future.
- 475. "Report on Examination of Certain Electron Microscope Grids Carried Out for the Pollution Control Agency, State of Minnesota.

LISTING OF EXHIBITS
RESERVE MINING COMPANY EXHIBITS

- 476. Arthur D. Little Report "Air Quality Impacts - Reserve Mining Company's Proposed On-Land Disposal Plan" - February 28, 1976.
- 477. Data relating to sampling procedures for samples used in A. D. Little report - Exhibit #476 ("Samples Utilized by ADL for Air Quality Impacts Study," "Vegetation Plot Particle Size Analysis Data Relating to Sampling Procedures").
- 478. Letter - February 27, 1976 - Dr. Edward Peters to Arthur Samuel - re: results of fiber analysis on first set of test bed soil seepage experiments.
- 479. Letter - February 27, 1976 - Dr. Edward Peters to Arthur Samuel re: results of fiber analysis for glacial til and transition zone.
- 480. State of Minnesota Office Memorandum - March 2, 1976 - to MPCA Board from Peter L. Gove re: Results of Air Sampling for Amphibole Fibers (attaches tabulation of data).
- 481. Letter - M. R. Banovetz to Peter L. Gove - 12-11-75 - re Minnesota Department of Health air samples; attaches Lemire comments on various reports of fibers in public water supplies, etc.

LISTING OF EXHIBITS

UNITED STEELWORKERS OF AMERICA EXHIBITS

JAMES SMITH

1. "Earnings of Hourly Employees - Reserve Mining Company - Effective August 1, 1975."
2. "Pension Rights and Pension Credit Loss Potential of Reserve Mining Company Employees Represented By United Steelworkers of America - 6-20-75."
3. Table - "Iron Ore Consumption and Imports - 1969 through 1974."
4. Letter - June 30, 1975 - I. W. Abel to Wayne Olson, Hearing Officer.

JACK JONES

5. Letter - July 8, 1975 - Jack Jones to John Engberg re evaluation of Mile Post 7 plan by Harza Engineering Company.
- 5A. Witness Statement - Jack Jones.

DAVID ROE

6. Resolution - 1974 State AFL-CIO Convention.

NORTHEASTERN MINNESOTA INTERVENORS LISTING OF EXHIBITS

MARVIN MAKI

1. Aerial mosaic of Mile Post 7 area with legal descriptions superimposed
2. Timber Type Map of Mile Post 7
3. Appraisal of Lake County Tax Forfeited Land, Timber
4. Compilation of total timber volume and value as shown on Timber Type Map within the proposed tailings basin at Mile Post 7

ARTHUR LORNTSON

5. Section of County Map in Mile Post 7 area

BEACHER ELAM

6. Northshore Snowmobile Trails, Division of Land and Forestry
7. Silver Bay area snowmobile trails
8. Lake County Five-Year Outdoor Recreation Plan

MELROY PETERSON

9. Taxes paid by Reserve Mining Company to governmental subdivisions in Lake County 1956-1974
10. Lake County 1972 effect of loss of Taconite Revenue on tax levy
11. Comparative analysis of effect of Taconite Tax on home owners tax-1973
12. Lake County Census Report

MELVIN KOEPKE

13. Village of Silver Bay Taconite Tax Receipts and Budget
14. Silver Bay Municipal Sewer & Water Operating Budget

RICHARD MAHAL

15. City of Babbitt Taconite Tax Revenues and Budget

ROBERT GINTHER

16. Independent School District No. 692, Babbitt - Receipts and Expenditures for 1975-76 School Year.
17. Independent School District No. 692, Babbitt - Revenues Derived From Reserve Mining Company; State Aid; Local Debt Service

NORTHEASTERN MINNESOTA INTERVENORS
LISTING OF EXHIBITS

CLEM COSSALTER

- 18. Letter - March 6, 1941 - E. W. Davis to Blatnik, Lommen, Herried, Vukelich, Huhtala, Peterson, Berlin, Montague, Cina, MacGraw - re taconite tax bill.
- 19. "Estimated Tax and Economic Losses to Iron Range and Northeastern Minnesota From Closing of Reserve Taconite Operation."

FRANK RUKAVINA

- 20. Tax Levy - 1974 - Independent School District No. 381, Lake County.
- 21. Newspaper Clippings - Silver Bay News - 11-22-72; 12-6-72; 12-13-72; 3-7-73; 4-4-74.

LLOYD HOULE

- 22. 1975 Lake County Budget.

DR. FRED POST

- 23. "Economic Impact of Reserve Mining Company." by Dr. Fred Post - June 30, 1975.
- 24. "Demographic and Economic Characteristics for the Coastal Areas of the Minnesota Portion of the North Shore of Lake Superior."
- 25. "Index for Reserve Mining Company Payments to Governmental Sub-Divisions in St. Louis County."
- 26. Comments by Arthur Lorntson re Draft EIS and Greenwood Trail. WITHDRAWN (Used as comment on EIS)
- 26A. Map showing location of Greenwood Trail.
- 26B. Trygg Composite Map.
- 27. "Lorntson" photos - Wieland homesite, etc. (10 photos). WITHDRAWN (Used as comment on EIS)
- 28. Map - "Proposed Embarrass Disposal Site" - location of homes and farms within area.
- 29. 39 photos of residences within Embarrass site and less than mile from site.

LISTING OF EXHIBITS

MPING INTERVENORS
EXHIBITS

1. Letter - Eldon G. Kaul and Morris M. Sherman to Merlyn G. Woodle, dated November 18, 1975
 2. Witness Statement - Professional Activity -- Donald E. Olson
 3. "A Report on Inadvertant Weather Modifications in the Silver Bay Area and Related Topics" - January 21, 1976
-

DR. RODNEY NELSON
INTERVENOR EXHIBITS

1. Photograph - taken from Dr. Nelson property.
 2. " " " " "
 3. " " " " "
 4. " " " " "
-

SAVE LAKE SUPERIOR
INTERVENORS EXHIBITS

1. Witness Statement - Charles H. Stoddard.
2. Witness Statement - Alden E. Lind
3. Outline of Testimony on Land Use in MP 7 Vicinity - Alden E. Lind. WITHDRAWN.
4. Eight slides of the Mile Post 7 site.
- 4A. Description of slides (SLSA Exhibit 4).
5. Silver Bay Quadrangle Map.
6. Outline of Testimony on State's EIS - Alden E. Lind. WITHDRAWN.
7. Homestake Study
8. The New Yorker Magazine - November 12, 1973
9. The New Yorker Magazine - November 19, 1973

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STATE OF MINNESOTA

DNR/PCA EXHIBITS

1. Reserve Mining Company News Letter - August 30, 1973.
2. Opening Statement of Reserve Mining Company - Federal District Court - August, 1973.
3. "Preliminary Report Re Suitability of Tailings for Dam Construction - Reserve Mining Company" - Parsons Jurden (November 17, 1970 - Klohn).
4. "Reserve Mining Company - Size Analysis of Tailings in Tailings Slurry Standard Circuit vs. Dry Cobber Circuit" - March 18, 1969; week of May 19, 1969; week of July 13, 1970. WITHDRAWN.
5. Ripley, Klohn & Leonoff Report - "Reserve Mining Company On-Land Tailings Disposal Facilities - Preliminary Report" - January 15, 1973 (Palisade Creek area).
6. "Reserve Mining Company Comments on the Draft of a 'Summary Report on Environmental Impacts From Taconite Waste Disposal in Lake Superior' and on the Drafts of Various Reports From Different Federal Agencies Submitted Therewith. "
7. Portion of Reserve Mining Company Report to Technical Committee -- February 3, 1971.
- 7A. "Reserve Mining Company Response to Inquiry From Lake Superior Enforcement Conference Technical Committee" - February 3, 1971 - full report.
8. Portion of Reserve Mining Company Engineering Task Force Progress Report - Revised August 10, 1970. WITHDRAWN
9. E. A. Hickok & Associates field notes - 1974-75 - Geological Reconnaissance - Mile Post 7 site.
10. "Reserve Mining Company - Tailings Disposal - Alternate Studies - Final Recommendation - July 7, 1972"
11. U. S. Department of Commerce - Weather Bureau "Technical Paper No. 37 - Evaporation Maps for United States - 1959" (three maps).
12. "100-Year 24-Hour Rainfall (Inches)"

DNR/PCA EXHIBITS

13. "Minnesota Soil Atlas - Hibbing Sheet" - Report 110, 1971.
14. University of Minnesota Extension Bulletin No. 278 - June, 1963 - "Soils of Minnesota."
15. Minnesota Highway Department - Design Discharge Curves - Drainage Manual - Figure F5-294.223 - July 1, 1963.
16. Approximate Water Balance - Mid-Project (Mile Post 7).
17. Map - Partridge River Watershed.
18. Map - Baptism River Watershed; Beaver River Watershed.
19. "Figure 6 - Maximum Discharge From Small Drainage Areas in Hydrologic Region V."
20. Paper - "Design & Construction of Tailings Dams" - October, 1972 - Earle Klohn.
21. Letter - November 17, 1971 - C. H. Maartman, Ripley, Klohn & Leonoff to K. M. Haley, Reserve.
22. Copy of teletype from Earle Klohn to Reserve - June 24, 1974 - re DNR reports.
23. Letter - William Notz, W. A. Wahler & Associates, to Morris Sherman - August 29, 1975 - attaches resume of William A. Wahler.
24. List of papers and articles by William A. Wahler.
25. W. A. Wahler & Associates Report - August, 1975 - "Review of Reserve Mining Company's Preliminary Mile Post 7 Tailings Disposal Plan."
- 25A. Project Summary 328 - Evaluation of Mile Post 7 On-Land Tailings Disposal Plan - W. A. Wahler & Associates.
26. Witness Statement - Leo Casagrande.
27. Table - "Range of Shear Strength of Samples From Casa Borings" - Casagrande Consultants.
28. Casagrande Consultants Report - August, 1975 - "Final Report on Evaluation of Proposed Design Milepost 7 Project."
29. Water Balance Chart - Silver Bay Facilities (prepared by State)

DNR/PCA EXHIBITS

30. Witness Statement Dr. James Hamel.
31. Michael Baker, Jr., Inc. Report - "Geo-Technical Evaluation On-Land Tailings Disposal Plan - Reserve Mining Company - Mile Post No. 7 Site" - August, 1975.
32. Slides (17) and descriptions - Dr. James Hamel.
33. Curriculum Vitae - Dr. James R. Kramer.
34. Dr. James Kramer report - "Analysis of Fibres in Reserve Tailings"
- 34A. Photograph - Reserve Tailings - Typical Aggregate of Fibrous and Non-Fibrous Particles (#803948)
- 34B. Photograph - Reserve Tailings - Cleavage and Breakage of Fibres (#8034949)
- 34C. Photograph - Reserve Tailings - Different Fiber Lengths, Diameter, Shapes (#803950)
- 34D. Photograph - Reserve Tailings - Ground Sample, Typical Particles (#803951)
- 34E. Photograph - Reserve Tailings - Splitting Fibers (#803952)
- 34F. Photograph - Reserve Tailings - Ground Sample, Disintegrating Fiber (#803953)
- 34G. Photograph - Reserve Tailings - Fibers (#803954)
- 34H. Photograph - Reserve Tailings - Typical Aggregate of Particles (#803955)
35. Memorandum - Memos Katsoulis to Dr. Ronald Hays - August 4, 1975 - "Soil Sampling at RMC Facilities" (attaches sampling location map)
36. Reserve Mining Company Purchase Order No. RJ-75-34999-B to Kaiser Engineering - June 28, 1974 - Authorizes to Proceed With Preliminary Engineering
37. Kaiser Engineers "Interim Report" - Engineering Report for Disposal of Taconite Tailings at MilePost #20
38. Letter - December 19, 1974 - Merlyn G. Woodle to Messrs. Herbst, Merritt, Christenson requesting meeting.
39. Portions of Kaiser Engineers Preliminary Estimate for Concentrator and Pellet Plant Mile Post 42 dated July 31, 1974.

DNR/PCA EXHIBITS

- 40. Portions of Kaiser Engineers Estimate Details - Mile Post 42 - July, 1974.
- 41. Letter - August 16, 1974 - L. K. Jacobsen, Kaiser Engineers, to Merlyn G. Woodle attaching original invoice for Preliminary Engineering Services (Invoice dated August 16, 1974 - #22-8-5.
- 42. Kaiser Engineers Invoice #74-08-020 - August 21, 1974.
- 43. Portions of Kaiser Engineerings Mile Post 42 Alternate Estimates Backup and Mile Post 20 Estimate Backup.
- 44. Kaiser Engineers Invoice #22-4-35 - May 12, 1975.
- 45. Telex - Kaiser Engineers (R. J. Wolf) to Messrs. Banovetz, Kraus, Browning re factors which could terminate project.
- 45A. Letter - R. J. Wolf, Kaiser Engineers, to Merlyn Woodle re Proposed Engineering and Construction Program at Silver Bay (attaches "Reimbursement Terms").
- 45B. Memorandum - to A. A. Wallach from L. K. Jacobsen, Kaiser - 7-26-74 re Capital Cost Estimate - Pelletizing Facilities - Mile 42.
- 45C. Engineering Drawing - #50-1001 - stamped July, 1974 - Plan re Mile Post 42 Estimate.
- 45D. Kaiser back-up material to Mile Post 20 estimates - April 20, 1975.
- 45E. Letter - L. K. Jacobsen, Kaiser to M. G. Woodle - 8-5-74 re preliminary estimate - Mile Post 42.
- 45F. Letter - L. K. Jacobsen, Kaiser, to M. G. Woodle - 8-16-74 - re preliminary estimate for Mile Post 42.
- 45G. Research and Development Report #17-2901 - June 24, 1970 - "Dry Cobbing of Rod Mill Feed."
- 45H. Article - "On the Strength of Unfired Pellets" by D. A. Rice and R. L. Stone - Society of Mining Engineers, AIME - March, 1972.
- 46. Confidential - "Comments on Reserve Mining Study" - 8-22-74.
- 47. "Blast Furnace Savings With Lower Silica in Reserve Pellets" - R. E. Phillips - 8-22-74 - Confidential.

DNR/PCA EXHIBITS

48. Memorandum - S. R. Crooks, Republic Steel, to J. D. Heckerman - 8-22-74 - "Blast Furnace Savings With Lower SiO₂ in Reserve Pellets." Confidential.
49. Letter - J. R. Lowey to Bruce S. Old - 3-27-75 - re tabulation of average coke sulphurs on Republic blast furnaces for past five years. Confidential.
50. Memorandum - R. E. Kusner, Republic - "Comments on ADL's Silica Related Issues - Reserve Mining - K. M. Haley Version" 3-26-75. Confidential.
51. Memorandum - K. M. Haley to E. M. Furness - 2-20-75 - "Silica Related Issues" - attaches portion of ADL's Environmental Report re subject. Confidential.
52. Memorandum - N. W. Lamb to M. J. Netzly, Republic - 2-24-75 - "Comments of J. Fischley on ADL Study." Confidential.
53. Memorandum - S. R. Crooks to J. J. Loftus, Republic - 5-1-74 - "Blast Furnace Savings With Lower SiO₂ in Reserve Pellets." Confidential.
54. "Changes in Annual Operating Costs - Lax Lake Plan - 8-21-74.
55. "Reserve Mining Company Estimated Project Cost - Mile Post 7" - September 19, 1974.
56. "Effect of Various Reserve Mining Proposals on Republic" - attaches schedule - "Table 5 - Estimated Capital Cost for Plan With Fine Crushing Plant, Concentrator and Pellet Plant at Mile Post 42 Plant Site." December 17, 1974
57. Memorandum - Michael Singerman to M. J. Netzly, Republic - 8-21-74 - "Reserve Mining - Escalation Factors."
58. Letter - Rodger Johnson, Wyatt Company, to R. A. Lee re RMCO pension plans in event of plant shutdown - attaches four-page report.
59. Memorandum - R. M. Fletcher to H. B. Phillips - April 9, 1975 - Re: "Iron Ore Costs - 1975." Confidential.
60. Memorandum - R. M. Fletcher to H. B. Phillips - April 9, 1975 - Re: "Iron Ore Costs - 1975." (Same as #59 with certain figures blocked out.)
61. Memorandum - R. M. Fletcher to G. J. Arnold - May 30, 1975 - Re: "Iron Ore - Blast Furnace Burden Costs." Confidential.

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62. Memorandum - R. M. Fletcher to G. J. Arnold - May 30, 1975 -
Re: "Iron Ore - Blast Furnace Burden Costs. (Same as #61 with
certain figures blocked out.)
63. "Modified Colvin Site - Pumping Concentrate to Silver Bay Pelletizing."
64. Reserve Mining Company - Cash Flow Calculations - 8-21-74.
Confidential.
65. Pages 9 and 10 of R. R. Dailey's letter dated 12-3-74 to Commissioner,
Internal Revenue - re: Reserve Mining Company pollution control
facilities.
66. Attachment A - page 2 to C. S. Robertson's letter dated March 7, 1975,
to R. A. Kraus - Invitation to Submit Proposal - RMCO.
67. "Modified Colvin Site - Pumping Concentrate to Silver Bay for Pelletizing"
12-16-74.
68. "Reserve Mining Company - Mile Post #7 (Lax Lake) On Land Tailings
Disposal and Product Improvement Plan" (Board of Directors, Armco) -
4-23-75. Confidential.
69. Program Request - Reserve Mining Company - Supplement to Request
dated September 19, 1974. Confidential.
70. "Reserve Mining Company - Lax Lake - 9.25% Interest with Escalation
Financial Review" - Armco - K. E. Reiser - 9-13-74. Confidential.
71. "Iron Ore Pellet Price" - description of pellet price changes, reasons
why prices will hold or fall, etc. Confidential.
72. Prospectus - Armco Steel Corporation - July 22, 1975 - pages 13 and 14.
73. Official Statement - Armco Steel Corporation - Gulf Coast Waste Disposal
Authority - August 14, 1975.
74. State of Minnesota Occupation Tax Report of Reserve - 1974. Confidential.
75. Minnesota Corporate Income Tax Return of Reserve - 1974. Confidential.
76. U. S. Corporation Income Tax Return of Reserve - 1974. Confidential.
77. Reserve Mining Company Operating Costs - January-December, 1974
(Before Audit). Confidential.

DNR/PCA EXHIBITS

- 78. Reserve Mining Company Operating Costs - January-June, 1975.
Confidential.
- 79. Reserve Mining Company Operating Costs - July, August, September, October, 1975. Confidential.
- 79A. Reserve Mining Company Operating Costs - Nov. and Dec., 1975
- 80. Reserve Mining Company - Estimated Book Depreciation - Tax Depreciation - Depletion - 1975-1990. Confidential.
- 81A. Reserve Mining Company Books - Depreciation - Tax Depreciation - Investment Credit and Interest - Mile Post 7. Confidential.
- 81B. Reserve Mining Company Books - Depreciation - Tax Depreciation - Investment Credit and Interest - Mile Post 20. Confidential.
- 81C. Reserve Mining Company Books - Depreciation - Tax Depreciation - Investment Credit and Interest - Mile Post 42 Slurry Pumping. Confidential.
- 82. Reserve Mining Company - Tonnage Basis Assets as at December 31, 1974. Confidential.
- 83. Reserve Mining Company - 1974 Shipments for Account of Mesabi Trust. Confidential.
- 83A. Reserve Mining Company - Crude Ore Reserve Estimates at January 1, 1975. Confidential.
- 84. Reserve Mining Company - Estimated Capital Expenditures - 1975 (7-22-75). Confidential.
- 85. Reserve Mining Company - Audited Financial Statements - December 31, 1974 - Ernst & Ernst.
- 86. Size Distribution Charts Compiled From DNR/PCA Exhibit 88, RMC Exhibit 104, Drawing 292-0030 from RMC Exhibit 112, Table 1.2.5.2-A from A. D. Little Report (RMC 37A).
- 87. Letter - Gerald A. Place to M. R. Hyde - August 26, 1975 - re additional information on vegetation program.
- 88. Chemical and physical analysis of various disposal sites prepared by Dames & Moore.
- 89. Brown, Place and Pettiet, "The Effect of Soil Moisture Upon Cation Exchange in Soils and Nutrient Uptake by Plants". WITHDRAWN.

DNR/PCA EXHIBITS

90. Brown and Place, "The Relation Between Soil Moisture and Efficiency of Fertilizer Usage." WITHDRAWN.
91. Memorandum - C. W. Maxwell to R. L. Reed - November 19, 1973 - "History of Delta Seeding and Planting.
92. Photograph of Babbitt Pilot Plant Area.
93. Photograph of Babbitt Pilot Plant Area.
94. Photograph of Babbitt Pilot Plant Area.
95. "Experiments in Propagating Plant Cover at Tailing Basins" by Sam Dickinson, Erie Mining Company - Mining Congress Journal, October, 1972.
96. Excerpts "Preliminary Comments on Weston Report." WITHDRAWN.
97. Witness Statement - Richard P. Braun.
98. Witness Statement - John C. Mullan.
99. Witness Statement - Dennis E. Hawker.
100. Brochure - Barton-Aschman Associates, Inc.
101. Brochure - Professional Staff - Barton-Aschman Associates, Inc.
102. Draft Environmental Impact Statement for Reserve's Proposed On-Land Tailings Disposal Plan Prepared for State of Minnesota - October, 1975.
103. Draft Environmental Impact Statement - Appendix.
104. Witness Statement - Ronald M. Hays.
105. State of Minnesota Notice of Completion of Draft Environmental Impact Statement and Hearing - November 5, 1975.
106. Witness Statement - A. Eugene Vandegrift.
107. Fact Sheet - "Facts About Midwest Research Institute."
108. Brochure - "Toward a Better Environment - Environmental Impact Studies" - Midwest Research Institute.
109. (there is no #109 - mis-numbering)

DNR/PCA EXHIBITS

- 110. Witness Statement - Edward J. Samuelli.
- 111. Brochure - "Engineering and construction from concept to reality..." F. C. Torkelson Company.
- 112. F. C. Torkelson Company - "Functional Specifications."
- 113. Witness Statement - Leonard A. West.
- 114. Contract - Barton-Aschman & Associates and F. C. Torkelson - July 1, 1975.
- 115. Invoice - F. C. Torkelson to Barton-Aschman - October 16, 1975.
- 116. Torkelson Manpower Forecast.
- 117. Witness Statement - Gorden F. Johnson.
- 118. F. C. Torkelson - Operating Costs - Embarrass Site - Scheme A. Confidential.
- 119. F. C. Torkelson - Operating Costs - Mile Post 7 Site - Confidential.
- 120. Witness Statement - Douglas W. Barr.
- 121. Barr Engineering Company's Staff Resume and Projects List.
- 122. Witness Statement - Lawrence R. Molsather.
- 123. Curriculum Vitae - Dr. Donald H. Yardley.
- 124. Dr. Donald Yardley's "Addendum Report - Alternative No. 1."
- 124A. Dr. Donald Yardley's "Memorandum Notes" - January 3, 1976.
- 125. Witness Statement - Dr. R. Glen Berryman.
- 126. "Effect of Different Financing Methods on the Profitability of Mining Investments" - by E. P. Pfleider - 30th Annual Mining Symposium - 1969.
- 127. "Metal Prices" - Skillings' Mining Review - July 5, 1975, July 12, 1975, July 19, 1975.
- 128. Memorandum - Paul Zerby to Ronald M. Hays - "Royalties Paid by Reserve for Computer Program" - August 29, 1975.
- 128A. Letter - Robert A. Lee to Maclay R. Hyde - September 26, 1975 - enclosing operating cost reports for July and August, 1975.
- 129. Memorandum - Paul Zerby to Ronald M. Hays - "Variable in Minnesota Taconite and Royalty Taxes Paid by Reserve for Computer Program" - August 29, 1975.
- 130. Curriculum Vitae - John D. Rogers.

DNR/PCA EXHIBITS

- 131. Letter - Douglas Barr to John Mullan - July 9, 1975 - re Erie concern - Embarrass site water problems.
- 132. Curriculum Vitae - Robert J. Reid.
- 133. Witness Statement - Ralph Warner.
- 134. Witness Statement - Donn R. Wiski.
- 135. Witness Statement - Timothy W. Joseph.
- 136. Witness Statement - J. Michael Dolan, III.
- 136A. Letter - Dr. J. Michael Dolan to Edward Moersfelder - 2-20-76 re variation in water quality parameters.
- 137. Witness Statement - Roderick E. Athey.
- 138. Roderick Athey "Addenda/Errata for the Energy Evaluation of Alternate Sites - Reserve Mining Company Environmental Impact Statement."
- 139. Curriculum Vitae - Chatten Cowherd, Jr.
- 140. "Projections of Air Quality Impact of On-Land Disposal of Taconite Tailings - Midwest Research Institute - January 19, 1976."
- 140A. Letter - Chatten Cowherd, MRI, to Eldon Kaul re calculation of percentages of dust emissions from tailings - January 30, 1976.
- 140B. Letter - Chatten Cowherd, MRI, to Eldon Kaul re revision to projection of air quality impact of on-land disposal at Midway - February 3, 1976.
- 140C. Letter - Chatten Cowherd, MRI, to Eldon Kaul re revision to projection of air quality impact of on-land disposal at Snowshoe - February 5, 1976.
- 140D. Letter - Chatten Cowherd, MRI, to Eldon Kaul re corrections to reports dated February 3 and February 5, 1976. (Letter of 2-11-76)
- 140E. Chart - "Comparison of MRI and ADL Data/Results" - Air Emissions - Dr. Chatten Cowherd, MRI.
- 140F. Chart - "Effect of MRI/ADL Modeling Differences (Source Distribution at MilePost 7" - 3-6-76 - Dr. Chatten Cowherd, MRI.
- 141. Colored photo - Erie Mining Company tailings pond - shows dust.
- 142. Colored photo - Erie Mining Company tailings pond - shows dust.
- 143. Colored photo - Erie Mining Company tailings pond - shows dust.
- 144. Colored photo - Erie Mining Company tailings pond - shows dust.
- 145. Colored photo - Erie Mining Company tailings pond - shows dust.
- 146. Colored photo - Erie Mining Company tailings pond - shows dust.

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147. Curriculum Vitae - Dr. Philip M. Cook.
148. Report - "Prediction of Fiber Concentrations Associated With Fugitive Dust Emissions From Land Disposal of RMC Taconite Tailings" - Dr. Philip M. Cook.
149. Curriculum Vitae - Rudolph Pinola.
150. "Benefits Received by a Typical Union (Non-Salaried) Reserve Mining Company Employee in the Event of a Plant Shutdown."
151. "Scheduled Startups of New and Expanded Taconite Processing Facilities in St. Louis County, Minnesota and Estimated New Permanent Employment."
152. "Benefits Available to Employees in the Event of a Permanent Shutdown" - D. J. DeLeo.
- 152A. Letter - Rudolph Pinola, Minnesota Department of Employment Services, to Edward Moersfelder attaching draft "Benefits Available to RMC Employees in Event of Shutdown" etc.
153. "Midway Supplement - Draft Environmental Impact Statement" - DNR/PCA - February, 1976.
154. Witness Statement - William C. Brice.
155. Planning and Environmental Review Team (PERT).
156. Department of Natural Resources "Operational Order No. 40" - May 1, 1975.
157. Reserve Mining Company Project - List of Contacts.
158. Office Memorandum - Department of Natural Resources - June 9, 1975 - From Robert Herbst - re Reserve Mining Studies.
159. Office Memorandum - Department of Natural Resources - July 28, 1975 - From Robert Herbst to Archie Chelseth, Dick Myshak, etc. Re: Review of Draft Documents Related to the Reserve EIS.
160. Memorandum dated August 6, 1975, to Messrs. Sherman, Hays, Brice, etc., from Robert Herbst re Reserve Mining On-Land Disposal.
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162. DNR Regional Map - Detail Study Area.
163. DNR Detail Map - Tailings Sites.
- 163A. Photograph of "Reserve Lax Lake" Model.
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- 170A. Revision of DNR/PCA Exhibit #170.
171. DNR Detail Map - Mineral Potential.
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184. Witness Statement - Thomas F. Waters.
185. Resume - C. R. Burrows.
186. State of Minnesota, Department of Natural Resources - Commissioner's Order No. 1852 - Regulations Designating Trout Streams.
187. DNR Detail Map - Aquatic Habitat.
188. DNR Detail Map - Aquatic Habitat (Ecological).
189. 1975-77 Acquisition Program for Fisheries - attached to letter dated April 2, 1975, from Commissioner Herbst to Minnesota Legislature.
190. Memorandum - February 23, 1942 from T. R. Evans to Mandt Torrison re Lake County trout streams.
191. Lake County Resolution - April 22, 1942 - Re lands classified as conservation lands.
192. Lake County "Certificate of Acceptance of Lands for Conservation Purposes" - July 29, 1942.

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193. DNR Detail Map - Acquired Conservation Lands.
- 193 A. DNR Detail Map - Acquired Conservation Lands - Ownership.
194. "Data on Waters in and Near Proposed Tailings Basins."
- 194A. DNR Detail Map - Aquatic Habitat (Ecological).
195. Witness Statement - Alfred B. Pennell.
196. Reserve Mining Company - Appropriation Permits for Mine Pit De-watering.
197. Resume - Eugene R. Gere.
198. State of Minnesota, Counties of St. Louis and Lake, Department of Highways - Project Development Report & Preliminary Location Report for National Forest Highway 11.
199. "Commuting Characteristics of the Employees of Minntac, Erie, and Eveleth Taconite Operations."
200. "Distribution of Taconite Tax and Additional Taconite Tax."
201. "Distribution of Supplementary Additional Taconite Tax."
202. DNR Regional Map - Existing Land Use.
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239. Historical Perspective of Land Use: North Shore of Lake Superior; Mesabi Iron Range Northern Minnesota.
240. Curriculum Vitae - John R. Borchert.
241. Resume - Paul Eger.

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- 242. DNR Detail Map - Water Discharge.
- 243. Report - "Fiber Analysis of Water Samples From Reserve Mining Company's Peter Mitchell Pit," - February 23, 1976 - Philip M. Cook.
- 243A. Photograph - RMC-1 - Crusher #2 - 1-14-76 - Fibers.
- 243B. Photograph - Figure 2 - Fibers.
- 243C. Photograph - Figure 3 - SAED of Fiber Bundle in Figure 2.
- 244. "Summary of Superior, Wisconsin Water Supply Data."
- 245. Resume - Daniel F. Bigalke.
- 246. Charts - Comparison of Disposal Sites (Mile Post 7, Embarrass, Snowshoe, Colvin, Midway).
- 247. DNR Detail Map - Flood Path.
- 248. DNR Detail Map - Transportation/Utilities.
- 249. Witness Statement - Gene Hollenstein.
- 250. Chart - Positive Amphibole Fibers - Silver Bay From MP 7.
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- 259. Chart - Total Fibers - Babbitt From Embarrass.
- 260. Witness Statement - Louis J. Breimhurst.
- 261. "Water Use Classification at Proposed Site and Alternatives - Reserve Mining Company's Draft Environmental Impact Statement - January 7, 1976."
- 262. MPCA Division of Water Quality - Major considerations re comparison of Mile Post 7, Embarrass, Colvin, Snowshoe, Midway.

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- 263. Witness Statement - Curtis J. Sparks.
- 264. Witness Statement - M. P. Katsoulis.
- 265. Witness Statement - Colin F. Harwood.
- 266. Witness Statement - Gary S. Eckhardt.
- 266A. Table I - prepared by EPA - "Summary of Simulation Model Characteristics."
- 266B. Table 3 - "Comparison of TSP Levels - Northeastern Minnesota."
- 267. Table 4 - "Summary of Amphibole Fiber Sampling Programs" - attaches various statistics, reports, 3-2-76 Gove memo to Agency members.
- 268. Table 5 - "Amphibole Fiber Size Distribution."
- 269. Table 6 - "Extrapolated OSHA Standard."
- 270. Table 7 - "Projected Impact on TSP Levels in Population Centers" (Without Mitigation).
- 271. Table 8 - "Projected Impact on TSP Levels in Population Centers" (With Mitigation).
- 272. Table 9 - Computer printout giving average volume calculation for amphibole fibers detected in Silver Bay samples analyzed by Battelle.
- 273. Table 10 - "Projected Impact of Amphibole Fiber Levels in Population Centers" (Without Mitigation).
- 274. Table 11 - "Projected Impact of Amphibole Fiber Levels in Population Centers" (With Mitigation).
- 275. Table 12 - "Exposure, Fiber-Years Per Cubic Centimeter" (Without Mitigation).
- 276. Table 14 - WITHDRAWN.
- 277. Computer Printout "Frequency Distribution of Amphibole Fiber Sizes for Silver Bay" - WITHDRAWN.
- 278. Figure 11 - "Number of Standard Deviations From Mean - Projected 24-Hour Levels of Total Suspended Particulates - Assumption Standard Geometric Deviation of 1.5."
- 279. Report of Dr. Philip M. Cook - March 8, 1976 - "Analysis of RMC Coarse Taconite Tailings for Fiber Concentrations."
- 280. Resume - Tibor Kosa.

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- 281. Memorandum to MPCA Board Members - 2-28-76 - From Peter Gove - Re: "Analysis of Reserve Mining Company Health Evidence."
- 282. Memorandums - 11-26-75 from Governor Anderson to Highway Commissioner Frank Marzitelli; 12-3-75 from Highway Commissioner Marzitelli to Governor Anderson; 12-3-75 from W. C. Merritt, Deputy Commissioner of Highways to Highway Department Administration; Letter 12-19-75 from Peter Gove to Lloyd Houle, Lake County Board of Commissioners; all re use of tailings.
- 283. Memorandums - 11-27-74 to Lewis Barbe from Memos Katsoulis re violation of WPC regulations at Mile Post 7; 11-26-74 to John McGuire from Memos Katsoulis re Field Investigations of Reserve Mining Mile Post 7 Monitoring Stations.
- 284. Letter - W. T. Egan to Paul Zerby - 3-8-76 - attaches confidential Republic Steel Corporation documents.
- 285. Overlay to RMC0 Exhibit #40 used in cross examination of Dr. Vranka.
- 285A. Overlay to RMC0 Exhibit #40.
- 285B. Overlay to RMC0 Exhibit #40.
- 285C. Overlay to RMC0 Exhibit #40.
- 285D. Overlay to RMC0 Exhibit #40.

INDEX

This Index contains a list of those items which may be of general interest to persons wishing to review proceedings in the Reserve permit application hearings for an on-land tailings disposal facility. These items are located both in Duluth and Minneapolis and may be reviewed by contacting William Gordon, Director of Libraries, Duluth Public Library, Duluth, Minnesota, or Julie Copeland, Environmental Library, Minneapolis Public Library, Minneapolis, Minnesota.

A. Complete Transcripts and Exhibits from the Permit and Environmental Impact Statement Hearings including:

1. The EIS presentation by responsible agencies is found in Transcript Vols. 34 through 51, and 57, 58 and 61; see DNR/PCA Exhs. 97-152.
2. Rebuttal testimony presented by applicant in response to the State's EIS is found in Transcript Vols. 52-56, 59-60, 64, 73-77, and 81; see RMC Exhs. 383-469.
3. Testimony and evidence presented prior to the EIS presentation are found in Transcript Vols. 1-33; see RMC Exhs. 1-382A, Union Exhs. 1-6; Dr. Rodney Nelson (Intervenor) Exhs. 1-4; and NMI Exhs. 1-24.
4. The Agencies' policy and supplemental EIS presentation are found in Transcript Vols. 62 and 63 (supp. EIS presentation) and Transcript Vols. 65-72, 78-80 and 82-A and B; see DNR/PCA Exhs. 153-283.

B. Written and Oral Comments from the General Public and Commenting Agencies.

1. Written and oral comments from general public and commenting agencies are found in Transcript Vols. 41 and 44; see NMI Exhs. 28 and 29.
2. Written comments were made by the following general public and commenting agencies and may be found in the folder labeled "Written Comments from the General Public and Commenting Agencies":
 - (1) Lloyd Houle, Chairman, Lake County Board of Commissioners - 12/11/75
 - (2) Robert A. Murdock - 12/12/75
 - (3) Warner Buhman - 12/13/75

- (4) Federal Interagency Reserve Mining Task Force - 12/15/75
- (5) Mrs. Lillian M. Ruby - 12/15/75
- (6) Mrs. Lillian Salo - 12/15/75
- (7) Undated petition signed by 93 Waasa Township residents
- (8) Mr. and Mrs. Ronald E. Salo - 12/15/75
- (9) Mr. and Mrs. Helge Taapa - 12/15/75
- (10) Mr. and Mrs. Walter Mattson - 12/15/75
- (11) Barney Bischoff, Executive Secretary, Range Municipalities and Civic Association - 12/17/75
- (12) James R. Coleman - 12/26/75
- (13) John H. Jeffries - 12/27/75
- (14) Ms. Ethel Thorniley; 8 additional signatures - 12/29/75
- (15) Howard and Alice Pierce - 1/9/76
- (16) Forrest T. Gay, III, Colonel, Corps of Engineers, St. Paul District - 1/12/76
- (17) Frant T. Marzifelli, Commissioner, State of Minnesota, Dept. of Highways - 1/14/76
- (18) Francis T. Mayo, Regional Administrator, U.S.E.P.A., Region V - 1/21/76
- (19) Jim Lord, Treasurer, State of Minnesota - 1/27/76
- (20) John P. Millhone, Director, Minnesota Energy Agency - 1/28/76
- (21) Warren R. Lawson, Commissioner of Health - 1/28/76
- (22) Milton Mattson, S.L.S.A. - 1/28/76
- (23) Robert W. Mattson, State Auditor - 1/28/76
- (24) Arthur Lorntson, for Northeastern Minnesota Intervenors - 1/28/76
- (25) Alden E. Lind - undated
- (26) Jack Hemphill, Regional Director, U.S. Dept. of Interior, Fish & Wildlife Service - 2/5/76

C. Comments Submitted by Parties Including Briefs Addressing the Adequacy and Substance of the Draft EIS.

Parties to the hearings submitted statements to the Hearing Officer regarding the adequacy of the Environmental Impact Statement and briefs addressing the substance of that statement prior to the Hearing Officer's recommendations concerning the Draft EIS and the siting decision. These statements and briefs in part represent comments by the parties to the hearings on the Draft EIS and consist of the following documents:

1. Comments with Respect to Inadequacies of Environmental Impact Statement, by MPIRG and MECCA - 1/21/76
 2. Letter from counsel for Dr. Rodney Nelson, Intervenor - 1/21/76
 3. Comments by Intervenors SLSA and Sierra Club - 1/23/76
 4. Response to Hearing Officer's Request for a Statement of Inadequacies in the Draft EIS, by Reserve - 1/23/76
 5. Brief of Reserve Mining Company in Support of Applications for Permits for Mile Post 7 On-land Disposal and Air Quality Plan - 3/18/76
 6. Brief of Northeastern Minnesota Intervenors - 3/23/76
 7. Brief of United Steelworkers of America, AFL-CIO, In Support of Applications for Permits for Mile Post 7 On-land Tailings Disposal - 3/31/76
 8. Brief of Minnesota Public Interest Research Group (MPIRG) and Minnesota Environmental Control Citizens Association (MECCA) - 4/2/76
 9. Brief of Intervenors Save Lake Superior Association and Sierra Club - 4/8/76
 10. Rebuttal Brief of Reserve Mining Company, Armco and Republic - 4/15/76
- D. Response of Responsible Agencies to Comments from the Public, Commenting Agencies, and the Parties to the Hearings Including Agency Briefs, Written Responses to Specific Points Raised, and Response on the Record to Said Comments.
1. DNR Response to Comments is contained in Procedural Conference transcript dated 2/4/76.
 2. Brief of MDNR - 4/5/76
Brief of MPCA - 4/8/76
 3. Discussion on the record between Hearing Officer and parties regarding treatment of the MP 20 site (Midway) may be found in Transcript Vol. 36, and Procedural Conference transcript dated January 9, 1976.