APPENDIX A

PROJECT TIME LINE AND FIELD REPORTS

Project Time Line

Preproject

November 30 – December 8, 1998	Placed 25 monitoring wells in connection with a manure-handling facility at CREC
November 12, 1999	Placed one load of bottom ash on a feed road in front of pens B1–B4 at CREC site
December 9, 1999	Conducted groundwater sampling
December 10, 1999	Introduced bison to control pens B5–B8
January 7, 2000	Technical group meeting
February 9, 2000	EERC project staff – NDDH meeting

Year 1

February 16, 2000	Official project start date
March 10, 2000	Project technical group planning meeting
March 2000	Laboratory preliminary mix design testing
May 2000	Bulk oxide composition of project soil and ashes determined
June 26, 2000	Groundwater samples collected by EERC staff
June 26–28, 2000	Placed Otter Tail Power Company Hoot Lake ash on pens B9–B12
July 19–20, 2000	Placed Stanton Station fly ash on pens B13–B16
July – September 2000	Laboratory leaching of project fly ashes
August 2, 2000	Project team and NDDH meeting
August 24, 2000	Technical group meeting
September 7, 2000	Placed 25 tons of Great River Energy Coal Creek Station ash in pens B1 and B2

September 11, 2000	Placed eight loads of controlled low-strength material (CLSM) in a silage bunker at Herman Mayer Ranch
September 19, 2000	Placed 12 loads of CLSM for the aprons in pens B9–B16
September 26, 2000 Year 1 Annual Meeting	Placed Great River Energy Coal Creek Station ash in pens B3 and B4

Note: Bison were reintroduced to pens B1–B4 following placement.

Year 2

January 2001	Animals weighed
January 5, 2001	Technical group meeting
January 9, 2001	Groundwater samples collected by EERC staff
January – March 2001	Laboratory leaching of project soil and ashes
March 2001	Trace elemental composition of project ashes determined
April 2001	Animals weighed
May 2001	Core samples taken at CREC site
June 2001	Year 1 project summary prepared
June 2001	Drainage ditches cut for individual pen runoff on all 16 pens
June 7, 2001	NDDH visit to Carrington site
June 7, 2001	Runoff collected by NDDH staff
July 2001	Animals weighed
July 17, 2001	Runoff collected by CREC staff
July 19, 2001	Field Day at Carrington
July 23, 2001	Pond and individual pen runoff collected by EERC staff
July 25, 2001	Groundwater samples collected by EERC staff

August 2001	Pens B1–B8 were cleaned, and field tests were performed. Manure samples were collected.
August 2001	Field testing of ash surfaces was initiated with nuclear testing on pens B9–B16.
August 2001	Ash–soil mixtures were prepared in the laboratory. Mixtures were cured at optimum moisture.
August – October 2001	Laboratory leaching of project soil and ash–soil mixtures
September 27, 2001	Year 2 annual meeting
September 28, 2001	Bison placed in pens B9–B16
October 2001	Runoff pens pumped; animals weighed
November 2, 2001	NDDH meeting with project sponsors and researchers
November 19, 2001	Runoff and groundwater samples collected by EERC staff Soil samples obtained from pens B1–B4 and B6–B8
November 30, 2001	pH of soil samples from pens B1–B8 determined
December 18, 2001	Bison placed in pens B1–B8

Year 3

January 2002	Animals weighed
February 2002	Nutrient analysis of manure samples
March 8, 2002	NDDH meeting with project sponsors and researchers Ash content of manure samples determined
April 1, 2002	Runoff and groundwater samples collected by EERC staff
April 2002	Animals weighed
April – August 2002	Laboratory leaching of project ashes
July 2002	Animals weighed
July 16, 2002	Field Day at Carrington
September 2002	Field cores obtained

September 30, 2002	Animals removed from pens B9–B16
October 2002	Animals weighed
November 14, 2002	Year 3 annual meeting
December 2002	Draft “How-To” Brochure prepared
December 2, 2002	Animals removed from pens B1–B8
December 9, 2002	Project researchers met with North Dakota Agriculture Commissioner Roger Johnson to gain support for the project.

Year 4

January 28, 2003	Project sponsors and research team met to review a draft project summary and supporting data.
January 28, 2003	Presented information on use of fly ash in feedlots at the NDSU Feedlot School, CREC.
February 4, 2003	Radio spot on fly ash use, KSJB, Jamestown, ND
February 7, 2003	Presented information on use of fly ash in feedlots to Central Dakota Feeder Calf Club, Turtle Lake, ND
February 14, 2003	Released a project summary and supporting data to the NDDH, project sponsors, and the North Dakota Agriculture Department (NDAD)
February 25, 2003	Project team provided a decision briefing to the NDAD
March 14, 2003	Research team, project sponsors, and the NDAD met at the NDDH
March 21, 2003	Runoff pond samples and manure from pens and piled pen scrapings were collected by the NDDH
May 13, 2003	Submitted final report to the NDDH
May 19, 2003	Presented information on use of fly ash in feedlots to NC-185 North Central Region Feedlot Research Committee meeting, Fargo, ND

May 23 – October 6, 2003	Cattle were fed in all 16 test pens, with observations after rainfall events of drier surface in fly ash-treated pens compared to the control.
June 19, 2003	Participated in North Dakota Feeder Council Tour and conveyed information on use of fly ash to numerous producers
June 24, 2003	Presented information on use of fly ash in feedlots to CREC Advisory Board
July 15, 2003	Beef Production Field Day at the CREC. Presented information on the placement of fly ash and improved animal performance in pens with fly ash due to faster drying and less mud. Two papers were included in the proceedings.
September 11, 2003	Presented information on the use of fly ash in stabilizing feedlot pens at the NDSU Feedlot School, Northern Crops Institute, Fargo
September 12, 2003	Research team, project sponsors, NDDA, and NDDH met at the CREC to discuss the approval process and finalized the feedlot manual
	Demonstrated out-of-pen placement at the CREC beef pens
September 18, 2003	Submitted draft final instruction manual to the NDDH for approval
October 13, 2003	Feeder cattle (n=176, 11 head per pen) placed on feed in all fly ash-treated and control pens. More erosion of the surface area and around the perimeter of the pens noted in control pens vs. pens with fly ash.
November 19, 2003	Submitted revised final instruction manual to the NDDH for approval

Year 5

January 13, 2004	Presented information on the benefits and placement of fly ash to producers at the Jamestown Ag Expo
January 15, 2004	Presented information on the benefits and placement of fly ash at Marketplace 2004

January 16, 2004	AS-1258, the “Instructions for Use of Fly Ash to Stabilize Soil in Livestock Facilities,” jointly released by UND EERC and NDSU CREC.

Carrington Feedlot
Fly Ash Demo

Date:	Monday, June 26, 2000
Weather:	p.m. – 70°, sunny, windy – 30+ mph
Equipment:	Tractor and disc
Work Performed:	Pens 9 and 10 are disced and ready for ash placement. The pens were staked out and prepped. Hackney carriage loaded two trucks with fly ash at the Hoot Lake Plant and staged them in Fargo for tomorrow's placement.
Date:	Tuesday, June 27, 2000
Weather:	a.m. – 55°, clear and calm; p.m. – 75°, sunny, calm
Equipment:	Tractor and disc rubber-tired roller, tractor with box scraper, tractor with tiller, tractor for compaction, hackney carriage, and hopper truck
Work Performed:	Worked from 7:00 a.m. to 5:00 p.m. Watered Pens 9 and 10 starting at 7:00 a.m.. Placed the first load of ash, 28 tons, in Pens 9 and 10 starting at 8:30 a.m.. Utilized the disc in both pens for three passes, tilled the outer perimeter, leveled with the box scraper, rubber tire rolled Pen 10, and tractor rolled Pen 9. Pens 9 and 10 completed by 11:30 a.m. Placed 18 tons of ash in Pen 11 at 3:00 p.m., did three passes with the disc, leveled with the box scraper, watered the surface, and rubber-tire rolled the pen. Pen 11 completed by 5:00 p.m.. Pen 12 was set up for water with a sprinkler for several hours in the evening. Mr. Al Christianson of Great River Energy and Mr. Brian Jost of Jost Cement were on site in the morning to observe the ash placement. Mr. Vern Anderson had several members of his Advisory Board visit the site in the afternoon to observe the placement of ash.

Carrington Feedlot
Fly Ash Demo

Date:	Wednesday, June 28, 2000
Weather:	a.m. – 55°, clear, light wind; p.m. – 75°, sunny, light wind
Equipment:	Tractor and disc, rubber tired roller, tractor with box scraper, tractor with tiller, tractor for compaction, hackney carriage, and hopper truck
Work Performed:	Hackney carriage delayed delivery because of a flat tire on their truck; ash arrived at the site at 11:30 a.m. Ash was placed in Pen 12; three passes of the disc were made; a complete tilling was done with watering; the box scraper leveled the area, and it was compacted with the tractor tires. The pen was completed at 1:30 p.m. Midwest Testing arrived at 1:45 p.m. and took three nuclear density tests in each pen; all of the tests were 89%–96% compaction with moistures of 7.5%–9.5%, with 8.5% giving the best densities. Discussions were held with Casper at Camas Ready-Mix Plant in Carrington about the potential to have them provide roller-compacted concrete for testing in several of the aprons. They are interested and will work with the project team to get this done.

Carrington Feedlot
Fly Ash Demo

Date:	Wednesday, July 19, 2000
Weather:	a.m. – cloudy, and cool – 50°; p.m. – 50°, light rain, light wind
Equipment:	Tractor and disc, rubber-tired roller, tractor with box scraper, tractor with tiller, tractor for compaction, hackney carriage, and hopper truck
Work Performed:	Carrington Field Day activities – had a tour group out in the morning to look at the work done on Pens 9–12. Presentations were given by Mr. Vern Anderson, Mr. Scott Birchall, and Ms. Debbie Hassett. The afternoon consisted of a demonstration placement in Pens 13 and 14 which was attended by approximately 50 people. The pens were heavily watered, and the ash truck actually got stuck at several points. Placed the Great River Energy Stanton ash, 26 tons, in Pens 13 and 14 starting at 12:30 p.m.. Utilized the disc in both pens for three passes; tilled the outer perimeter leveled with the box scraper; rubber-tire rolled Pen 13, and tractor rolled Pen 14. Pens 13 and 14 completed by 3:30 p.m.
Date:	Thursday, July 20, 2000
Weather:	a.m. – 55°, clear, calm; p.m. – 75°, sunny, calm
Equipment:	Tractor and disc, rubber-tired roller, tractor with box scraper, tractor with tiller, tractor for compaction, hackney carriage, and hopper truck
Work Performed:	Worked from 8:00 a.m. to 5:00 p.m.. Placed 26 tons of ash in Pen 15 at 8:30 a.m., did three passes with the disc; tilled the entire pen; leveled with the box scraper and tractor-tire rolled the pen. Pen 15 completed by 10:30 a.m. Pen 15 was extremely dry and the set up was questionable; we set up Pen 16 for water with a sprinkler for several hours. Placed 17 tons of ash in Pen 16 at 3:30 p.m., did three passes with the disc; tilled the entire pen; leveled with the box scraper; and rubber-tire rolled the pen. Pen 16 completed by 5:00 p.m. Midwest Testing arrived at 4:15 p.m. and took three nuclear density tests in each pen; all of the tests were over 100% compaction, with moistures of 9.0% in Pens 13 and 14, 5% in Pen 15, and 6% in Pen 16.

Carrington Feedlot
Fly Ash Demo

Date:	Wednesday, September 6, 2000
Weather:	a.m. – cloudy and cool – 50°; p.m. –70°, strong wind
Equipment:	Tractor with tiller and hand tiller
Work Performed:	Pens 1 and 2 pens were prepared over the last week and heavily watered by hose and rain. Contacted the contractor regarding forming for Pens 9–16, and found that nothing would be done until next week. The flowable fill pour for the aprons was delayed by 1 week; however, hackney carriage continued delivery of bottom ash to the Camas Ready-Mix Plant in Carrington.
Date:	Thursday, September 7, 2000
Weather:	a.m. – 55°, clear, NW wind; p.m. – 75°, sunny, NW wind
Equipment:	Tractor and disc, tractor with blade, tractor with tiller, tractor for compaction and hand tiller Jost Cement – pneumatic truck
Work Performed:	Worked from 8:00 a.m. to 2:00 p.m. Placed 25 tons of Great River Energy's Coal Creek Station ash in Pens 1 and 2 by blowing it in with a hose from the pneumatic truck starting at 10:15 a.m. The pens had the fencing installed, so conditions were very tight. The crew had to move the fly ash to the south end of the pens, and then made three passes with the small disc, tilled both pens, and tractor tire rolled the pen. Pens completed by 3:30 p.m.
Date:	Monday, September 11, 2000
Weather:	a.m. – 55°, clear and calm; p.m. – 70°, sunny, calm
Equipment:	Tractor and bucket STRATA – ready-mix trucks
Work Performed:	Worked from 8:00 a.m. to 3:00 p.m. Placed 8 loads of controlled low-strength materials (CLSM) in a silage bunker at the Herman Mayer Ranch near Flasher, North Dakota. The bunker had sidewalls in place, and the CLSM was poured directly from the ready-mix trucks onto the earthen floor and allowed to self-level. One load was placed at the ramp to the bunker, and this load was extremely wet as delivered. The silage bunker was 15 feet wide and 140 feet long with a 5-inch slope from east to west.

Carrington Feedlot
Fly Ash Demo

Date:	Tuesday, September 19, 2000
Weather:	a.m. – 45°, partly cloudy and NW wind; p.m. – 55°, cloudy, NW wind
Equipment:	Concrete forms for feedlot aprons, and finishing tools Aggregate Industries – ready-mix trucks
Work Performed:	Worked from 8:00 a.m. to 4:00 p.m. Placed 12 loads of CLSM for the aprons in Pens 9–16. Contractor had five people working to screed and finish the CLSM; finishing consisted of utilizing an expanded metal stamp to create the necessary roughness for the surface to be nonskid. Took four test cylinders of the material to determine the strength of the field mix.
Date:	Thursday, September 28, 2000
Weather:	a.m. – 45°, clear and light SE wind; PM – 75^{o}, sunny, SW wind
Equipment:	Tractor with blade, tractor with tiller, tractor for compaction, and hand tiller Jost Cement – two pneumatic trucks
Work Performed:	Worked from 8:00 a.m. to 4:00 p.m. Placed 18 tons of Great River Energy's Coal Creek Station ash in Pen 3 by blowing it in with a hose from the pneumatic truck beginning at 10:45 a.m. Placed 25 tons of Great River Energy's Coal Creek Station ash in Pen 4 by blowing it in with a hose from the pneumatic truck beginning at 12:00 p.m. The pens had the fencing installed, so conditions were very tight. Unloading progressed very slowly because of the wind direction and an effort to minimize the dusting created by air unloading. Dusting was a real problem at higher flow rates. The crew made three passes with the small disc, tilled both pens, leveled with the box scraper and tractor tire rolled the pen. The material was very dry and will need to be watered heavily over the next day or so. Pens completed by 4:00 p.m. Midwest Testing will take nuclear density tests in each pen.