CHAPTER 1 – INTRODUCTION AND BACKGROUND

SURFACE STABILIZATION PROJECTS

The Federal Highway Administration (FHWA), Federal Lands Highway (FLH) designs, administers, and oversees an increasing amount of aggregate surfacing roadwork for clients in remote locations throughout the western United States. There are approximately 6,359,568 km (3,950,042 mi[1]) of road in the United States. Of this total, about 2,327,332 km (1,445,548 mi), or 37% are unpaved. More specifically as Table 1 shows, of the 987,518 km (613,365 mi) of roads that serve Federal and Indian lands, 825,247 km (512,576 mi) or 83.6% are unpaved.

While the percentage of unpaved roads varies for each agency, each one shares in the problems of dust generation from road user traffic and maintaining unpaved roads for traffic access. Stabilizing these unpaved roads and controlling dust is becoming a high priority as maintenance budgets continue to be woefully inadequate, as environmental concerns become more prevalent, and as quality road building materials are depleted and harder to procure. Maintenance of these unpaved roads for their intended use is also a big challenge because traffic on unpaved roads breaks down the surfacing materials, resulting in raveling of the larger rocks once the binding material is gone, and promotes rutting or deformation of the underlying roadway materials as well as washboarding and potholing that make for a very uncomfortable ride. Owners of unpaved roadways face a big challenge and identifying methods to effectively control dust and prevent raveling, rutting, washboarding and potholing on these roads is a goal of the FLH.

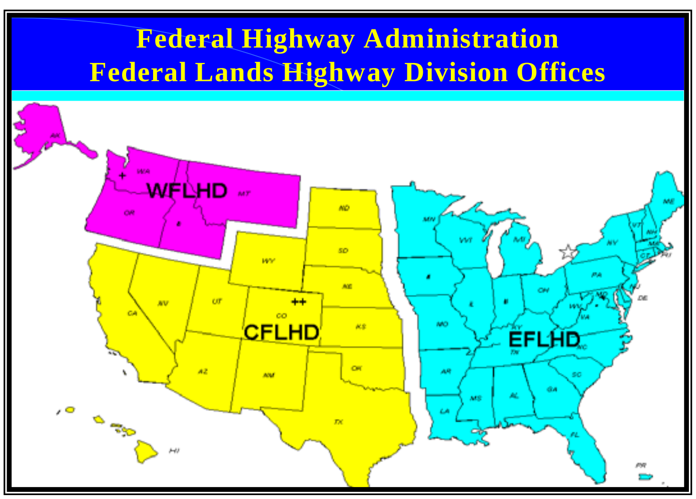

Figure 1. Map. FHWA FLH Divisions.

One of three Federal Lands Highway offices, the Central Federal Lands Highway Division (CFLHD) specifically oversees the construction of highways on Federal Lands in 14 western states as shown in Figure 1. This study conducted at the Seedskadee National Wildlife Refuge (NWR) in southwest Wyoming is the second project undertaken by the CFLHD to broaden the base of knowledge about dust control products and application methods. A report on the first study at Buenos Aires NWR, in south-central Arizona, is available.[2]

Currently in the FHWA FLH's FP-03 Standard Specifications for Highway Construction[3] the dust abatement options provided are water, magnesium chloride, lignosulfonate, calcium chloride, and emulsified asphalt. The FLH recognizes that there are many other options available that may be viable solutions for controlling dust and stabilizing surfacing materials, thus reducing maintenance costs.

Table 1. Summary of Federal Roads.

Federal Lands Served	Road Category	Owner	Length Miles	Unpaved Miles	Percent Unpaved
Department of Agriculture					
National Forests	Forest Highways	State and Local	29,200	7,800	26.7%
	Forest Development Roads (60,000 miles Public Roads)	Forest Service	385,000	357,000	92.7%
Department of Interior					
National Parks	Park Roads and Parkways	National Park Service	8,127	2,988	36.8%
Indian Lands	Indian Reservation Roads	Bureau of Indian Affairs and Tribes	23,000	17,500	76.1%
	Indian Reservation Roads	State and Local	25,600	15,450	60.4%
Wildlife Refuges	Wildlife Refuge Roads	Fish and Wildlife Service	5,900	5,400	91.5%
	Administrative Roads	Fish and Wildlife Service	3,100	3,100	100%
Public Lands (BLM lands)	Land Management Highways	State and Local	7,200	3,600	50.0%
	Public Lands Development Roads (Administrative Roads)	Bureau of Land Management	83,000	81,300	98.0%
Reclamation Projects	Reclamation Roads (Intended for Public Use)	Bureau of Reclamation	1,980	980	49.5%
	Administrative Roads	Bureau of Reclamation	8,000	7,200	90.0%
Department of Defense					
Military Installations	Military Installation Roads	Department of Defense	23,000	0	0%
	Missile Access Defense (Malmstrom, Minot, and Warren)	State and Local	1,858	1,858	100%
U.S. Army Corps of Engineers					
Corps of Engineers Recreation Areas	Corps Recreation Roads	Corp of Engineers	4,800	4,800	100%
	Corps Leased Roads	State and Local	3,600	3,600	100%
		TOTAL	613,365	512,576	83.6%

The First Study – Buenos Aires National Wildlife Refuge

In 2002, the CFLHD applied six different road stabilizer or dust palliative products on a road reconstruction project at the Buenos Aires NWR in south-central Arizona. The purpose of the study was to evaluate the six products for long-term performance and to recommend those products with acceptable performance for use on other CFLHD projects. This evaluation addressed each product's performance for dust control, rutting, washboarding, raveling, and soil stabilization over a 24-month period.

The study showed that each product's performance was fully acceptable throughout the 24-month study although, based on the levels of observed washboarding, some sections appeared to need a reapplication and blading to bring them back to full performance. Before stabilization, the owner agency had to grade, blade, or work the roadway at least every three months. During the entire 24-month study, they were requested not to maintain the roadway surface at all. Though some sections needed grading after 24 months, the owner agency had been saved from performing its typical six to seven grading maintenance events.

The Second and Current Study – Seedskadee National Wildlife Refuge

The primary objective of the Seedskeedee project, covered in this report, was to test the same six products that were used at Buenos Aires in a different road surfacing material at a different stabilization depth and in a different climate. The evaluation again addressed each product's performance for dust control, rutting, washboarding, raveling, and soil stabilization over a 24-month period. The products with acceptable performance would again be recommended for use on other CFLHD projects.

An additional objective for this project was to carry out some of the recommendations from the Buenos Aires study. Those recommendations are listed below along with a progress update:

1. **Develop SCRs to specify and allow the use of various dust and roadway stabilization products.** Developing a new Special Contract Requirement (SCR) to specify and allow use of new road stabilizer products is not an easy task because an SCR cannot specify any brand name product. However, the performance monitoring at Seedskadee has resulted in changes to the maximum size of aggregate and the minimum plasticity index allowed by CFLHD construction contracts calling for aggregate surfacing. Both the Buenos Aires and Seedskadee studies have stimulated discussion about how to write a performance specification for stabilizer products.

2. **Develop and employ a process for continued evaluation and validation of these and other products available in the FLH's jurisdictions. Include studies to define a minimum effective depth of stabilization to provide for cost effective treatments or to determine the cost effective balance between full depth stabilization and repeated applications of surface treatments.** These recommended studies are aimed at long-term needs. The current road stabilizer investigation at Seedskadee NWR provides data that can be used to help meet these long term needs. Whereas the depth of stabilization was 150 mm (6 in) at Buenos Aires, a 125-mm (5-in) depth was used at Seedskadee.

3. **Perform further investigations using these same products with different types of soils, climates, and conditions to refine product selection processes. Further refine assessment parameters to strengthen objectivity and performance tracking over time.** The Seedskadee project provided a great deal more objective data to track performance of the products over time. This additional data was the result of a new objective assessment method developed for the Seedskadee project to strengthen objectivity and track performance over time.

4. **Collect additional information to develop more precise economic product comparisons based on initial and installation costs; application rates; and product effectiveness in terms of stability, dust mitigation, and longevity.** As pointed out in the Buenos Aires report, a detailed economic comparison of stabilizer products is not possible. In general, the electrochemical enzyme products (Terrazyme and Permazyme in this study) are sold on the market at a cost significantly less than all the other products used in this study. For a standard application, the enzyme products might cost approximately one-third the cost of the chloride and organic products (DC Caliber 2000, Mag/Lig, and Lignosulfonate) and one-fourth to one-fifth the cost of the Soil Sement. These comparisons are suggestions based on general cost data and are subject to many variations. Contractors or other agencies that use this study should perform their own market analysis of product costs based on the proposed application, climate, specifications requirements, availability, and project location.

5. **Develop a selection chart for the optimum match of a product category with the site-specific parameters of soil type, composition, classification, climate, traffic, and environment.** A selection process for road designers to select a suitable stabilizer product category is proposed in the final appendix following this report.

6. Develop and provide training for designers and field personnel on the application and use of these products. The project engineers who were assigned to the Buenos Aires and Seedskadee projects have given presentations on the application method used on their project so as to pass on their experience and insights. The authors of these studies have also shared this information at conferences, workshops, and in published papers.

7. In partnership with the F&WS, incorporate environmental effects testing into future product comparison and monitoring projects on Federal Lands. Subsequent to the contract being signed for the Seedskadee product application, the Fish and Wildlife Service (F&WS) issued direction that any further F&WS projects using dust stabilizers must include a minimum three-year environmental monitoring plan to include monitoring during the year prior to application, the year of application, and a year following the application. Thus, the FHWA did not incorporate strict environmental monitoring into this study. Visual observations for product leaching were done, but no other physical monitoring for ground water quality, fresh water aquatic environment, or plant community was conducted to document any environmental effect of the products. To address this issue, the F&WS initiated an Environmental Protection Agency study, which is now being conducted by the US Geological Survey. It is the hope that future NWR projects that use road stabilizer products will be able to incorporate a more rigorous product selection and environmental examination in partnership with the F&WS.

The performance of the products used for the Seedskadee project as a whole were considered, by the evaluation team, to be less effective than at the Buenos Aires project. After two years of monitoring, both dust production and washboarding were considered to be unacceptable in some of the product sections. There were, however, obstacles that affected performance, and they need to be recognized. First, the percentage passing the 75 µm (No. 200) sieve for the aggregate surfacing material was low at 0% to 4%, coupled with a PI of non-plastic (NP) to 4. So some of the products that react with clay fines could have no stabilizing effect. Second, a very harsh winter and rapid spring thaw damaged one of the sections and severely reduced its monitoring area. Nonetheless, Refuge personnel have been pleased with the project as a whole. The Refuge Headquarters parking area, which was stabilized with the Caliber product, has remained smooth and produced very little dust. Since washboarding of Refuge roads has traditionally been a big problem requiring maintenance blading three or four times per year, the full depth stabilization performed in this project using a pulverizing machine has substantially alleviated this problem. Therefore, this project was considered a success.

PROJECT BACKGROUND

Figure 2. Photo. Bluffs above the Green River at the boat launch.

The project site selected for this evaluation, shown in Figure 2, was located in the Seedskadee NWR in southwest Wyoming as. Seedskadee NWR was established in 1965 through the Colorado River Storage Project Act of 1956 that authorized construction of Colorado River storage facilities and also provided for wildlife habitat development areas to offset the loss of wildlife habitat resulting from reservoir construction.[(4)] The Seedskadee Reclamation Act of 1958 specifically authorized acquisition of lands for Seedskadee NWR. The northern boundary of the Refuge is 11 km (7 mi) downstream of Fontenelle Dam on the Green River and extends 60 km (37 mi) downstream and further south. Its width ranges from 1.5 to 3 km (1 to 2 mi) and its total relief is 90 m (300 ft) from an elevation of 1,980 m (6,490 ft) near the north end to 1,890 m (6,190 ft) at the south end.

The Seedskadee NWR manages for a variety of native plants and wildlife with emphasis on migratory birds and threatened and endangered species. The Refuge also provides interpretation of the natural and human history of the area and provides access for wildlife-dependent recreation that is compatible with Refuge purposes. These uses include floating and fishing on the Green River and viewing wildlife in the wetland areas, on the river, and along the Refuge

Tour Routes in the upland sagebrush habitat. The name Seedskadee is derived from the Shoshone Indian name for the river “Sisk-a-dee-agie” or “river of the prairie hen.”

On average, the traffic counts on the roads maintained by the Seedskadee NWR are very low. No traffic counts were available, but the road maintenance foreman on the Refuge estimated that the average annual daily traffic is about four vehicles per day. However during high-use seasons, hunting in the fall and fishing in the spring and summer, traffic is estimated to be ten to fifteen vehicles per day. Since the town of Rock Springs has been booming with new oil exploration, campgrounds have been full and traffic is generally higher on the Refuge than in past decades. As long as the oil boom continues, traffic on this Refuge’s roads is expected to remain above historic levels.

The Seedskadee reconstruction project, Wyoming RRP SEED 12(1),[5] was designed and constructed by the CFLHD. The CFLHD Construction Branch was responsible for contract negotiations and project layout, and also provided the construction inspection, reporting and initial materials sampling. The stabilization portion of the project was primarily financed under the FLH Technology Deployment Initiatives and Partnership Program (TDIPP) that promotes deployment of transportation-related research and technology, and the monitoring was funded by the FLH Coordinated Technology Implementation Program (CTIP). The construction contractor was Desert Sage Contractors, Inc., Idaho Falls, Idaho. Construction of the project, including the application of the roadway dust stabilizers, was completed in October 2004.

This project was carried out using mostly English measurements, and reference material typically also used English measurement units. Therefore, for the most part, the English measurements in parentheses are the true measurements, and the metric units are hard conversions (not exact) based on reasonableness. Distances in this report are shown to a precision of hundredths of a mile as a surveyor’s wheel was used to locate the monitoring areas.

PROJECT LAYOUT AND PRODUCTS

The Seedskadee project site is shown in Figure 3. One area of the Refuge called Dodge Bottoms is situated in the northern end of the Refuge and contained five of the six monitoring sections. Near the southern end of the Refuge, 27 km (17 mi) away, was Six Mile Hill Road where the sixth section was located. The stabilizer products applied in each section are shown in Table 2. The surfacing aggregate was 125 mm (5 in) deep, and the stabilizer products were milled together with the aggregate to this full 125-mm (5-in) depth using a CMI 650 pulverizer.

The categories listed in the third column of the table refer to the seven basic categories presented in the United States Forest Service’s (USFS) *Dust Palliative Application and Selection Guide*[6]. The Seedskadee project evaluation team found this guide to be a very valuable resource in that it not only presents dust suppressant category information - attributes, limitations, applications, origin, and environmental impact - but also showed the various types of suppressants within each category and offers a list of specific product names and manufactures. A product selection flowchart was also used from the USFS publication.

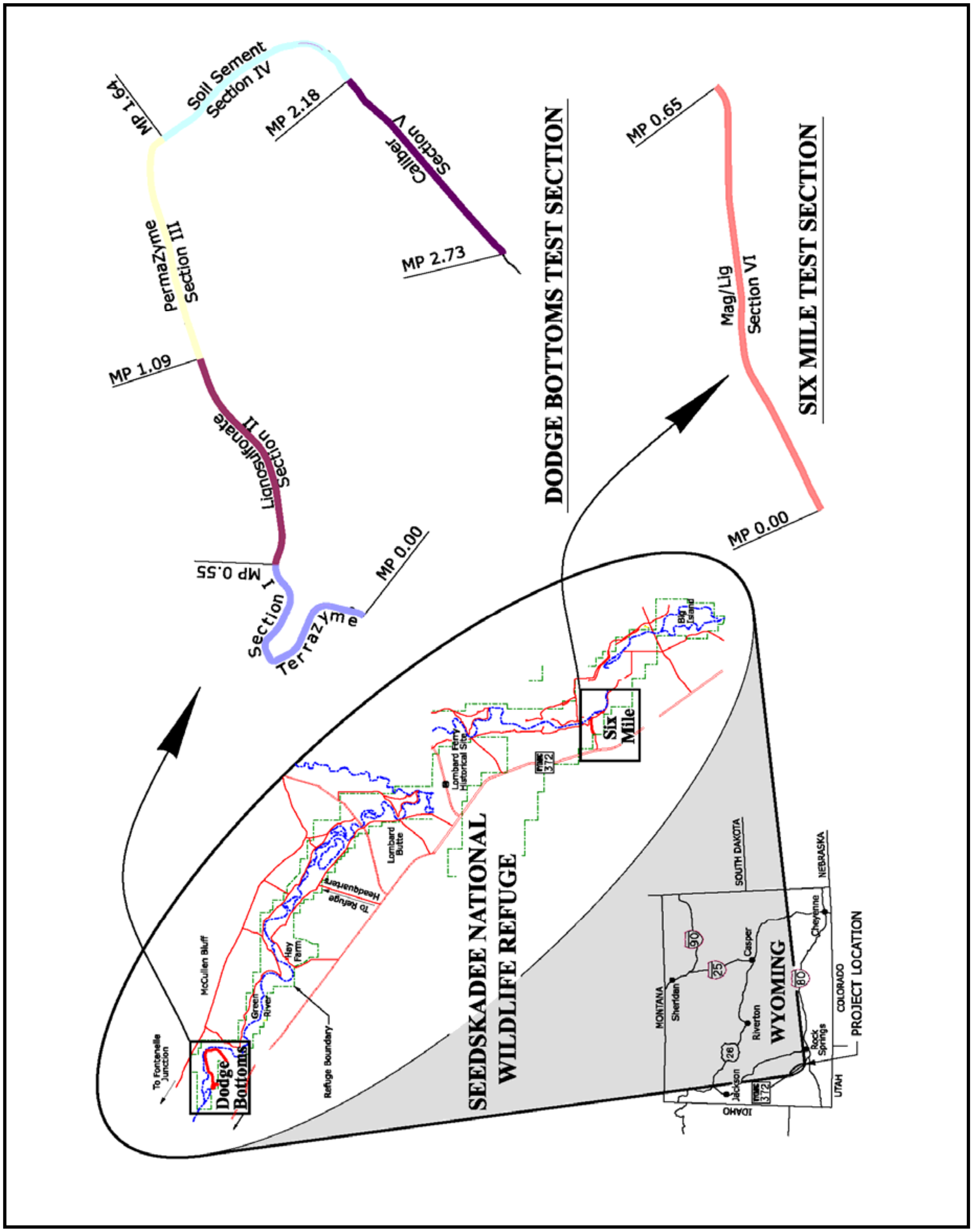

Figure 3. Map. Location and layout for Seedskadee National Wildlife Refuge road stabilization project.

Table 2. Test sections, locations, products, and suppliers.

Test Section	Approximate Milepost Locations	Product and Category	Manufacturer's Undiluted Application Rate	Supplier
I	0.00 – 0.55 Dodge Bottom N.	TerraZyme *(Electrochemical Enzyme)*	0.006 gal/yd^3	Nature Plus, Inc 555 Lordship Blvd. Stratford, CT 06615
II	0.55 – 1.09 Dodge Bottom N.	Lignosulfonate *(Organic non-Petroleum)*	5.6 gal/yd^3	DustPro, Inc. 725 S. 12th Place Phoenix, AZ 85034
III	1.09 – 1.64 Dodge Bottom N. and S.	PermaZyme 11x *(Electrochemical Enzyme)*	0.006 gal/yd^3	Idaho Enzymes, Inc. 1010 W. Main Jerome, ID 83338
IV	1.64 – 2.18 Dodge Bottom S.	Soil Sement *(Synthetic Polymer Emulsion Vinyl Acrylic)*	2.9 gal/yd^3	Earth Care Consultants 285 N. Meyer, Suite 1 Tucson, AZ 85701
V	2.18 – 2.73 Dodge Bottom S.	DCA - 2000 Caliber *(Organic non-Petroleum (vegetable corn oil) + water absorbing (Mag/Cl))*	7.2 gal/yd^3	Desert Mountain Corp. P.O. Box 1633 Kirkland, NM 87417
VI	0.00 – 0.65 Six Mile Hill Road	DMC 820 Magnesium/ Lignosulfonate *(Water adsorbing + Organic non-Petroleum)*	7.2 gal/yd^3	Desert Mountain Corp. P.O. Box 1633 Kirkland, NM 87417

1. **Water** acts to bind material together by surface tension. As such, dust will not float into the air while attached to larger particles. Water is easy to apply but it tends to dry or evaporate quickly. When the material loses its surface tension, dusting and other surface deterioration will occur.
2. **Water Absorbing** products include various chlorides of salt. These materials have the ability to absorb moisture from the air and retain that moisture in the soil. Aggregates treated with these products can be re-wetted and re-worked. Their effectiveness is a function of the air temperature and relative humidity.
3. **Organic Petroleum** products include asphalt emulsions, cutback asphalts, and dust oils. These tend to bind particles together through adhesion, and can waterproof the road. They are relatively insensitive to moisture but under dry conditions may not retain their resilience. In thin layers, they may form a crust and fragment under traffic and could be difficult to maintain.
4. **Organic Non-Petroleum** products include lignin derivatives, tall-oil derivatives, sugar beet extracts, and vegetable oils. These products bind aggregates in much the same way that petroleum products do, but they may be less effective because they are more water-soluble and oxidize more rapidly. These products are more environmentally friendly than the Organic Petroleum products.
5. **Electrochemical** products include enzymes, ionic compounds and sulfonated oils. Their performance depends on the clay mineralogy, and they need time to react with the clay fraction. Some of the products are highly acidic in their undiluted form.
6. **Synthetic Polymer** emulsions include polyvinyl acetate, vinyl acrylic, and polymer combinations. These emulsions bind aggregates together through the polymer's adhesive

properties. These too, once applied and set in place as thinner layers, may crust and fragment under traffic and be difficult to maintain.

7. **Clay Additives** are natural clays such as bentonite and montmorillonite. These materials gather together the fine dust particles of the aggregate. They tend to increase the dry strength of the aggregate under dry conditions. However, if too much product is applied, the roadway surface may become slippery when wet.

GENERAL PRICE ANALYSIS AND SAVINGS

As with the Buenos Aires study, the cost of the products varied widely, and it was difficult to develop a detailed comparison of product costs that would apply to any locale. Each product manufacturer recommended a specific application rate for the type of soil being stabilized. Since no two manufactures recommended the exact same application rate, a direct comparison was not possible. In addition to application rates, a simple price per gallon figure is difficult to pin point because manufacturers typically quoted prices by the job depending upon the amount of product required. In other words, there usually is a unit cost savings as the product quantity increases. The comparison by price per gallon was further complicated because of varying market conditions such as demand, economy, competition, project location, and many other factors.

Nevertheless, for the 125-mm (5-in) stabilization depth, the actual material unit costs from low to high for the six products procured under this project were: Permazyme - $1.10/m^3 ($0.84/yd^3); Terrazyme - $1.95/m^3 ($1.49/yd^3); Mag/Lig - $8.00/m^3 ($6.11/yd^3), Lignosulfonate $9.55/m^3 ($7.30/yd^3); Caliber $11.00/m^3 ($8.42/yd^3); and Soil Sement $16.55/m^3 ($12.66/yd^3).

A historical maintenance cost per mile to maintain roads at Seedskadee NWR also has not been developed because of many variables. The Seedskadee Refuge maintenance crew tries to keep down road maintenance costs by coordinating their efforts with the weather. They do not have a water truck and depend on rainfall to moisten the roads for blading. They usually use a loaded dump truck to compact the surface after blading, as they do not own a roller. They often rent a roller when Refuge funds are available. They like to blade their roads three times per year or four times if the moisture is right. Washboarding is the main problem. They have 48 to 56 km (30 to 35 mi) of road, and to blade them all takes about 40 hours and uses about 760 L (200 gal) of fuel. For a dust suppressant, they typically use Magnesium Chloride (Mag Water) and the cost is approximately $930 per km ($1,500 per mi). Its major drawback is that it is corrosive to vehicles. They use 8,220 to 14,100 L per km (3,500 to 6,000 gal per mi) of Magnesium Chloride depending on its concentration in water. They have also found that Lignosulfonate (Tree Sap) also works quite well.

In the report covering the similar Buenos Aires NWR project(2), a general analysis using average maintenance costs from a study(7) of Minnesota counties revealed a benefit to cost ratio of 1.0 or slightly better for that project. When the same methodology and assumptions was used in the Seedskadee NWR study, a much lower benefit to cost ratio resulted. Specifically, for the total of 5.43 km (3.37 mi) of gravel road in the Seedskadee study, and assuming a cost of $3,105 /km ($5,000/mi) for the Refuge due to its remoteness, the savings are estimated at $33,710 over the two years of the study. The cost that the contractor was paid to procure and incorporate the products was $62,538. Thus the benefit to cost ratio is only about 0.5.

The difference in the two benefit/cost ratios can be traced to two specific elements and some intangible elements. First, there were increased costs for some of the stabilizer products that had been nearly donated for the earlier Buenos Aires project. Second, the application methods were entirely different. Buenos Aires used a windrow method – requiring only a grader, water truck, and roller – that cost approximately $1730 per km ($2800 per mi). At Seedskadee, however, a tiller method was used – requiring a specialized reclamation machine in addition to a grader, distributor truck, and roller – and this process cost $5,000 per km ($8,000 per mi).

One of the intangible elements that should be considered is that resurfacing of gravel roads is generally expected to last more than two years. The facts that the surfacing was stabilized to full depth and that residual stabilizer product remains in the surfacing material below the exposed road surface would increase that expectation. The benefit to cost comparison above only considered the two years of monitoring that was carried out for both projects.

Washboarding has traditionally been the primary maintenance problem at Seedskadee necessitating maintenance grading three or four times per year. After two years, some of the full depth stabilized sections still showed only minimal washboarding. Whereas surface applications of Magnesium Chloride can control dust, they do not control washboarding. It appears that the full depth stabilization using the reclamation machine is a major breakthrough in controlling washboarding at Seedskadee NWR.

A final intangible benefit to both of the Refuges is the knowledge of which stabilizer products work well in the particular locale for controlling dust, reducing maintenance efforts, and side-stepping the corrosive effects of continuous use of Magnesium Chloride. These intangible elements are difficult to measure but should be taken into account as significant benefits outweighing the costs on both projects.

MONITORING PROGRAM

Once the road construction and product application was completed in September 2004, a 24-month monitoring period followed consisting of four monitoring events during which the sections were observed, measured, and field-tested for strength, silt loading, and the degree of dusting, washboarding, raveling, rutting, and potholing. The monitoring efforts are covered in four topic areas in the report, and a chapter is devoted to each topic. They are:

- Chapter 3 – Laboratory Analysis of Materials
- Chapter 4 – Subjective Observations
- Chapter 5 – Objective Measurements
- Chapter 6 – Onsite Physical Testing

Table 3 lists the standard specifications and tests used to characterize the material and also the monitoring activities that were performed. The table also shows when the tests and inspection activities were carried out. Due to seasonal concerns, it was decided to conduct the biannual monitoring in May and August each year. The Seedskadee NWR experiences extremes of climate. Some winters have a large snow pack and others very little snow. Winds can be light

Table 3. Standard specifications and monitoring activities.

Test Number	Description	Initial	8-month	11-month	20-month	23-month
AASHTO T 11	Material Finer Than 75-um (No. 200) Sieve in Mineral Aggregate by Washing	X	X	X	X	X
AASHTO T 27	Sieve Analysis of Fine and Coarse Aggregate	X	X	X	X	X
AASHTO T 88	Particle size Analysis of Soils	X	X	X	X	X
AASHTO T 89	Determining the Liquid Limit of Soils	X				
AASHTO T 90	Determining the Plastic Limit and Plasticity Index of Soils	X				
AASHTO T 180	Moisture-Density Relations of Soils Using 4.54 Kg (10 lb) Rammer and 457 mm (18 in) Drop	X				
AASHTO T 190	Resistance R-value and Expansion Pressure of Compacted Soils	X				
AASHTO T 193	The California Bearing Ratio	X				
AASHTO T 310	In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Method	X				
AASHTO M 145	Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes	X				
ASTM D 2487	Standard Practice for Classification of Soils for Engineering Purposes (Unified System)	X				
ASTM D 2974	Moisture, Ash, and Organic Matter of Peat and Other Organic Soils	X				
Dust	Comparative visual rating & agreed objective rating based on visual observation		X	X	X	X
Washboarding	Comparative visual rating & objective rating based on field measurements		X	X	X	X
Raveling	Comparative visual rating & objective rating based on field measurements		X	X	X	X
Rutting	Comparative visual rating & objective rating based on field measurements		X	X	X	X
Potholing	Comparative visual rating & objective rating based on field measurements		X	X	X	X
ASTM D 6951	Standard Test Method for Use of Dynamic Cone Penetrometer	X	X	X	X	X
40 CFR	Silt Loading, 40 CFR 52.128(b)(16)(i)(B)		X	X	X	X

but often are strong and unrelenting. Refuge personnel advised that monitoring not take place any earlier than late May and no later than early September to assure decent weather. That is why the monitoring events were spaced unequally at 8, 11, 20, and 23 months after application of the products in late September of 2004.

All available weather data for the monitoring period is on file at CFLHD. However, for this report, only a simple review of the weather during the monitoring events or a few days before the events was deemed relevant. Generally, rainfall was very light or non-existent prior to all the monitoring events except for the first one on October 20, 2004, shortly after product installation.

Conditions were wet during this initial, 1-month, monitoring event. Prior to the 8-month event that occurred on May 18 and 19, 2005, minimal precipitation occurred about once per week. The previous morning, on May 17, 1.5 mm (0.06 in) of rain fell. Before the 11-month event that occurred on
August 29 and 30, 2005, there was no precipitation for 11 days. Before the 20-month event that occurred on May 17 and 18, 2006, no rain had fallen for 12 days and the road surface was dry. However, humidity was building on the second day of monitoring and it rained 4 mm (0.16 in) in the early evening after all monitoring had been completed. In addition, just prior to this 20-month event, there was significantly more traffic using the Section VI Six Mile Hill Road stabilized with the Mag/Lig product. This was because the Refuge maintenance crew did some work on a road accessed through Section VI, and multiple loaded dump trucks went up and down this section. Measurable but again very little rain fell two and three days before the final 23-month monitoring event on August 28 and 29, 2006. On August 26, 2006, there was 2 mm (0.08 in) of rain and on August 25, 3 mm (0.12 in) of rain.

Winds were generally light in the mornings but increased in intensity in the afternoons making some of the sampling conditions less than optimal. Though the monitoring team assured that no sampling for dust or other monitoring for dust occurred early in the morning when dew might be on the ground, in the case of Seedskadee, the occurrence of dew was never a problem because there was very little moisture and the dew point was always significantly below early morning temperatures.

The severe winter snows of 2005 and the rapid spring melt caused damage to one of the newly-constructed sections at Seedskadee. This Section V, stabilized with the Caliber product, was damaged and required some drainage corrections to avoid future erosion problems. Two repair areas within the section, MP 0.20 to 0.34 and MP 0.46 to 0.52, required re-grading and application of additional aggregate base. But since during the July 2005 repair additional Caliber product was not available to add to these repair areas, these repaired sites were excluded from the monitoring program. The area between the two repair areas (MP 0.34 to 0.46) was not new material; this area was re-graded and was retained for monitoring performance of the Caliber product. No other maintenance or repairs were done to any of the remaining project sections throughout the two-year monitoring period.