ACKNOWLEDGEMENTS

The authors would like to recognize the efforts of Mr. Daniel Alzamora, P.E., who while he was with the FHWA-CFLHD initially was the FHWA's Contracting Officer's Technical Representative (COTR) for this work. Then subsequently with the FHWA's Resource Center, Mr. Alzamora's guidance and input during the development of this report have been invaluable. His assistance with the distribution of the survey was also very much appreciated. Mr. Roger Surdahl, P.E. who then assumed the COTR role, provided extensive comments on the report which contributed to the clarity of the technical presentation. This report also benefited from the reviews provided by the FHWA's Technical Advisory Panel members of Scott Anderson, Mike Voth, Khamis Haramy, Marilyn Dodson, Steve Deppmeier, Heidi Hirsbrunner, Gary Evans, Barry Siel, and Luis Rodriguez.

The authors further acknowledge the efforts of Mr. Ben Possiel, a graduate student at North Carolina State University. His assistance in compiling the survey results and with some of the legwork of the literature review were very helpful.

This project was funded under the FHWA's Federal Lands Highway Technology Deployment Initiatives and Partnership Program (TDIPP).

REFERENCES

AASHTO (1993). *AASHTO Guide for Design of Pavement Structures*. American Association of State Highway and Transportation Officials, Washington, DC.

AASHTO (2001). "Geosynthetic Reinforcement of the Aggregate Base Course for Flexible Pavement Structures." *AASHTO Provisional Standards*, PP 46-01, American Association of State Highway and Transportation Officials, Washington, DC.

AASHTO (2002). *Standard Specifications for Highway Bridges*, 16th Edition, American Association of State Highway and Transportation Officials, Washington, DC.

ADAMA Engineering, Inc. (2006). Software Manuals: ReSSA 2.0 and MSEW 3.0. Newark, DE. <u>http://www.reslope.com</u>.

Adams, M.T., and Collin, J.C. (1997) "Large Model Spread Footing Load Tests on Geogrid-Reinforced Soil Foundations." *Journal of Geotechnical and Geoenvironmental Engineering*, Vol. 123, No.1, American Society of Civil Engineers, Reston, VA, pp. 66–72.

Ahn, T.B., Cho, S.D., and Yang, S. C. (2002). "Stabilization of Soil Slope Using Geosynthetic Mulching Mat." *Geotextiles and Geomembranes*, Vol. 20, No. 2, International Geosynthetics Society, Kingston, ON, pp. 135–146.

Al-Qadi, I. L. (2002). "The Proper Use of Geosynthetics in Flexible Pavements." *7th International Conference on Geosynthetics*, Ph. Delmas and P. G. Grous, Eds., Nice, France, September 22-27, pp. 913-916.

Al-Qadi, I. L. and Appea, A. K. (2003). "Eight-Year Field Performance of Secondary Road Incorporating Geosynthetics at Subgrade-Base Interface." *Transportation Research Record*, No. 1849, National Academy Press, Washington, DC, pp. 212-220.

Al-Qadi, I. L., Coree, B. J., Brandon, T. L., Bhutta, S. A., and Appea, A. K. (1998). "Quantifying the Separation Characteristics of Geosynthetics in Flexible Pavements." *6th International Conference on Geosynthetics*, Atlanta, GA, March 25-29, pp. 945-950.

Allen, T.A. (2006). "Real Time Deformation Monitoring for Wall Construction." <u>http://www.wsdot.wa.gov/biz/mats/Geotech/RealTimeMonitoring.ppt#465,53</u>. Washington State Department of Transportation, Olympia, Washington.

Allen, T.M. and Bathurst, R.J. (2002) "Observed Long-Term Performance of Geosynthetic Walls and Implications for Design." *Geosynthetics International*, Vol. 9, No. 5-6, Thomas Telford, London, England, pp. 567-606.

Allen, T.M., Bathurst, R.J., and Berg, R.R. (2002). "Global Level of Safety And Performance of Geosynthetic Walls: A Historical Perspective." *Geosynthetics International*, Vol. 9, No. 5–6, Thomas Telford, London, England, pp 395–450.

Alzamora, D. (2006). Personal Communication.

Amini, F. (2005). "Potential Applications of Paving Fabrics to Reduce Reflective Cracking." Report, No. FHWA/MS-DOT-RD-05-174, Federal Highway Administration, 39 pgs.

Army Corps of Engineers. (2003). "Use of Geogrids in Pavement Construction." *Engineer Technical Letter*, No. 1110-1-189, US Army Corps of Engineers, Washington DC, 38 pgs. <u>http://www.usace.army.mil/publications/eng-tech-ltrs/etl1110-1-189/entire.pdf</u>.

Ausilio, E., Conte, E., and Dente, G. (2000). "Seismic Stability Analysis of Reinforced Slopes." *Soil Dynamics and Earthquake Engineering*, Vol. 19, No. 3, Elsevier, pp. 159–172.

Barksdale, R. D. (1991). "Fabrics in Asphalt Overlays and Pavement Maintenance." *National Cooperative Highway Research Program Report 171*, Transportation Research Board, National Research Council, Washington, DC, 72 pgs.

Barrows, R. J., and Lofgren, D. C. (1993). "Salmon-Lost Trail Pass Highway Idaho Forest Highway 30 Earth Retention Structures Report." *Geotechnological Report No. 20-92*, Federal Highway Administration, Washington, DC.

Bathurst, R.J., Holtz, R.D., Lee, W.F., Allen, T.M. and Walters, D. (2003). "A New Working Stress Method for Prediction Of Reinforcement Loads in Geosynthetic Walls." *Canadian Geotechnical Journal*, Vol. 40, No. 5, National Research Council of Canada, Ottawa, ON, pp. 976-994.

Berg, R. R., Christopher, B. R., and Perkins, S. (2000). "Geosynthetic Reinforcement of the Aggregate Base/Subbase Courses of Pavement Structures." *Geosynthetics Materials Association*, Roseville, MN. <u>http://www.gmanow.com/pdf/WPIIFINALGMA.pdf</u>.

Binquet, J. and Lee, K. (1975a). "Bearing Capacity Tests on Reinforced Earth Slabs." *Journal of Geotechnical and Geoenvironmental Engineering*, Vol. 101, No.12, American Society of Civil Engineers, Reston, VA, pp. 1241-1255.

Binquet, J. and Lee, K. (1975b). "Bearing Capacity Analysis on Reinforced Earth Slabs." *Journal of Geotechnical and Geoenvironmental Engineering*, Vol. 101, No. 12, American Society of Civil Engineers, Reston, VA, pp. 1257-1276. Boardman, B. T., and Daniel, D. E. (1996). "Hydraulic Conductivity of Desiccated Geosynthetic Clay Liners." *Journal of Geotechnical and Geoenvironmental Engineering*, Vol. 122, No. 3, American Society of Civil Engineers, Reston, VA, pp. 204-208.

Bonaparte, R. and Christopher, B. R. (1987). "Design and Construction of Reinforced Embankments Over Weak Foundations." *Transportation Research Record*, No. 1153, National Academy Press, Washington, DC, pp. 25-39.

British Standards Institution (BSI). (1995). BS8006: 1995. Code of Practice of Strengthened/Reinforced Soils and Other Fills, London, England.

Brown, N. R. (2003). "Solution for Distressed Pavements and Crack Reflection." *Transportation Research Record*, No. 1819, National Academy Press, Washington, DC. pp. 313-317.

Bueno, B. S., Benjamim, C., Vinicius, S., and Zornberg, J. G. (2005). "Field Performance of a Full-Scale Retaining Wall Reinforced with Nonwoven Geotextiles." *Geotechnical Special Publication*, No. 130-142, *Geo-Frontiers 2005*, American Society of Civil Engineers, Reston, VA, pp. 2617-2625.

Carmichael, R. F. and Marienfeld, M. L. (1999) "Synthesis and Literature Review of Nonwoven Paving Fabrics Performance in Overlays." *Transportation Research Record* No. 1687, National Academy Press, Washington, DC, pp. 112-124.

Christopher, B. R., Leshchinsky, D. and Stulgis, R. (2005). "Geosynthetic-Reinforced Soil Walls and Slopes: US Perspective." *Geotechnical Special Publication*, No. 130-142, *Geo-Frontiers 2005*, American Society of Civil Engineers, Reston, VA, pp. 3197-3208.

Cleveland, G. S., Button, J. W. and Lytton, R. L. (2002). "Geosynthetics in Flexible and Rigid Pavement Overlay Systems to Reduce Reflection Cracking." Report No. FHWA-TX-02/1777-1. Texas Transportation Institute, 298 pgs. http://tti.tamu.edu/documents/1777-1.pdf.

Collin, J. G. (1996) "Controlling Surficial Stability Problems on Reinforced Steepened Slopes." *Geotechnical Fabrics Report*, Industrial Fabrics Association International, St. Paul, MN.

Collin, J. G. (2003). NHI Ground Improvement manual – Technical Summary #10.

Collin, J. G., Watson, C. H., and Han, J. (2005). "Column-Supported Embankment Solves Time Constraint for New Road Construction." *Geotechnical Special Publication*, No. 130-142, *Geo-Frontiers 2005*, American Society of Civil Engineers, Reston, VA, pp. 437-446. Crouse, P. E., Jacobs, B. S., Corser, P. G., and Redmond, J. V. (2000). "Field Performance of Geomembrane and GCL at Two Mine Sites." *Geotechnical Special Publication*, No. 103, American Society of Civil Engineers, Reston, VA, pp. 94-105.

Crouse, P. E. and Wu, J. T. H. (2003). "Geosynthetic-Reinforced Soil Walls." *Transportation Research Record*, No. 849, National Academy Press, Washington, DC, pp. 53-58.

CRREL (2004). "Base-Course Reinforcement: Proposed FHWA Pooled Fund Study." <u>http://www.crrel.usace.army.mil/pavement_geosynthetics/br_reinforcement.htm</u>.

Das, B. M. (1995). *Principles of Foundation Engineering*. 3rd Edition. PWS Publishing Company, Massachusetts. 828 pgs.

Davis, L. (2005). "Chip Sealing Over Fabric in Borrego Springs, California." *Geotechnical Special Publication*, No. 130-142, *Geo-Frontiers 2005*, American Society of Civil Engineers, Reston, VA, pp. 311-322.

Drumm, E. C., Kane, W. F., Ketell, R. H., Ben-Hassine, J., and Scarborough, J. A. (1990). "Subsidence of Residual Soils in a Karst Terrain." Report No. ORNL/TM-11525, Oak Ridge National Laboratory, Tennessee. 91 pgs.

Egloffstein, T.A. (2001). "Natural Bentonites - Influence of the Ion Exchange and Partial Desiccation on Permeability and Self-Healing Capacity of Bentonites Used in GCLs." *Geotextiles and Geomembranes*, Vol. 19, No. 7, Elsevier, pp. 427-444.

Elias, V. (2000). "Corrosion/Degradation of Soil Reinforcements for Mechanically Stabilized Earth Walls and Reinforced Soil Slopes." Report No. FHWA-RD-00-044, Federal Highway Administration, Washington, DC.

Elias, V. (2001). "Long-Term Durability of Geosynthetics Based on Exhumed Samples from Construction Projects." Report No. FHWA RD-00-157, Federal Highway Administration, Washington, DC, 53 pgs.

Elias, V., Carlson, D., Bachus, R. C. and Giroud, J. P. (1998c). "Stress Cracking Potential of High-Density Polyethlene Geogrids." Report No. FHWA-RD-97-142, Federal Highway Administration, Washington, DC. 196 pgs.

Elias, V., Christopher, B.R. and Berg, R.R. (2001). "Mechanically Stabilized Earth Walls and Reinforced Soil Slopes Design and Construction Guidelines." Report No. FHWA-NHI-00-043, Federal Highway Administration, Washington, DC, 420 pgs.

Elias, V., Salman, A., Juran, I., Pearce, E., and Lu, S. (1998a). "Testing Protocols for Oxidation and Hydrolysis of Geosynthetics." Report No. FHWA-RD-97-144, Federal Highway Administration, Washington, DC. 202 pgs.

Elias, V., Welsh, J., Warren, J., Lukas, R., Collin, J. G. and Berg, R. R. (2004). "Ground Improvement Methods." Report No. FHWA-NHI-04-001, Federal Highway Administration, Washington, DC.

Elias, V., Yuan, Z., Swan, R. H. and Bachus, R. C., (1998b). "Development of Protocols for Confined Extension/Creep Testing of Geosynthetics for Highway Applications." Report No. FHWA-RD-97-143, Federal Highway Administration, Washington, DC. 214 pgs.

Evans, M. D., Henry, K. S., Hayden, S.A. and Reese, M. (2002). "The Use of Geocomposite Drainage Layers to Mitigate Frost Heave in Soils." *Proceedings, 11th International Conference, Cold Regions Engineering*, American Society of Civil Engineers, Reston, VA, pp. 323-335.

Fannin, R. J. (2000). "Basic geosynthetics: A Guide to Best Practices." BiTech Publishers Ltd., Richmond, BC, 85 pgs.

Fannin, R. J. (2001a). "Long-Term Variations of Force and Strain in A Steep Geogrid -Reinforced Soil Slope." *Geosynthetics International*, Vol. 8, No. 1, Thomas Telford, London, England, pp. 81-96.

Fannin, R. J. (2001b). "Basic Geosynthetics: A Guide to Best Practices in Forest Engineering." *Proceedings: The International Mountain Logging and 11th Pacific Northwest Skyline Symposium 200*, pp. 145-151. http://depts.washington.edu/sky2001/proceedings/papers/Fannin.pdf.

Federal Highway Administration (FHWA) (2003). *FHWA Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects (FP-03)*. Federal Highway Administration, Federal Lands Highway, Washington, DC, 700 pgs.

Federal Lands Highway Division (FLHD CTIP). (2006). "Deep Patch Shoulder Repair." <u>http://www.fhwa.dot.gov/flh/ctipprojects/project28.htm</u>., Washington, D.C.

Forsman, J., Honkala, A., and Smura, M. (1999). "Hertsby Case: A Column Stabilised and Geotextile Reinforced Road Embankment on Soft Subsoil." *Dry Mix Method for Deep Soil Stabilization*, Bredenberg, Holm, and Broms (eds), Balkema, Rotterdam, pp. 263–268.

Gabr, M. A. (2001). "Cyclic Plate Loading Tests on Geogrid Reinforced Roads." *Research Report to Tensar Earth Technologies, Inc.*, North Carolina State University, Raleigh, NC.

Gabr, M. A. and Han, J. (2005). "Advances in Reinforcements for Embankments and Shallow Foundation on Soft Soils." *Geotechnical Special Publication*, No. 130-142, *Geo-Frontiers 2005*, American Society of Civil Engineers, Reston, VA, pp. 3095-3114.

Ghiassian, H., Gray, D. H., and Hryciw, R. D. (1997). "Stabilization of Coastal Slopes by Anchored Geosynthetic Systems." *Journal of Geotechnical and Geoenvironmental Engineering*, Vol. 123, No. 8, American Society of Civil Engineers, Reston, VA, pp. 736-743.

Giroud, J. P. and Han, J. (2006). Closure to "Design Method for Geogrid-Reinforced Unpaved Roads. I: Development of Design Method." *Journal of Geotechnical and Geoenvironmental Engineering.*, Vol. 132, No. 4, American Society of Civil Engineers, Reston, VA, p 549.

Giroud, J. P. and Han, J. (2004a). "Design Method for Geogrid-Reinforced Unpaved Roads –Part I: Theoretical Development." *Journal of Geotechnical and Geoenvironmental Engineering*, Vol. 130, No. 8, American Society of Civil Engineers, Reston, VA, pp. 776-786.

Giroud, J. P. and Han, J. (2004b). "Design Method for Geogrid-Reinforced Unpaved Roads –Part II: Calibration And Verification." *Journal of Geotechnical and Geoenvironmental Engineering*, Vol. 130, No. 8, American Society of Civil Engineers, Reston, VA, pp. 787-797.

Giroud, J. P. and Noiray, L. (1981). "Geotextiles-Reinforced Unpaved Road Design." *Journal of Geotechnical and Geoenvironmental Engineering*, Vol. 107, No. 9, American Society of Civil Engineers, Reston, VA, pp. 1233-1253.

Giroud, J. P., Bonaparte R., Beech, J. F., and Gross, B. A. (1990). "Design of Soil Layer Geosynthetic Systems Overlying Voids." *Geotextiles and Geomembranes* Vol. 9, No. 1, Elsevier, pp. 11-50.

Han, J. and Gabr, M. A. (2002). "A Numerical Study of Load Transfer Mechanisms in Geosynthetic Reinforced and Pile Supported Embankments Over Soft Soil." *Journal of Geotechnical and Geoenvironmental Engineering*, Vol. 128, No. 1, American Society of Civil Engineers, Reston, VA, pp. 44-53.

Han, J., Huang, J. and Porbaha, A. (2005). "2D Numerical Modeling of a Constructed Geosynthetic-Reinforced Embankment Over Deep Mixed Columns." *Geotechnical Special Publication*, No. 130-142, *Geo-Frontiers 2005*, American Society of Civil Engineers, Reston, VA, pp. 511-521.

Heerten, G. and List, F. (1990). "Rehabilitation of Old Liner Systems in Canals." 4th International Conference on Geotextiles, Geomembranes and Related Products. Rotterdam: A.A. Balkema, pp. 453-456.

Henry, K. S.; Olson, J. P.; Farrington, S. P.; and Lens, J. (2005). "Improved Performance of Unpaved Roads During Spring Thaw." USACE ERDC/CRREL Report TR-05-1. http://www.crrel.usace.army.mil/techpub/CRREL_Reports/reports/TR05-1.pdf. Henry, K. S. ,and Holtz, R. D. (2001). "Geocomposite Capillary Barriers to Reduce Frost Heave In Soils." *Canadian Geotechnical Journal*, Vol. 38, No. 4, August, National Research Council of Canada, Ottawa, ON, pp. 678-694.

HITEC (Highway Innovative Technology Evaluation Center). (1998). "Guidelines for Evaluating Earth Retaining Systems." *CERF Report 40334*. American Society of Civil Engineers, Reston, VA, 32 pgs.

HITEC (2003). "Evaluation of Anchor Wall Systems' Landmark Reinforced Soil Wall System with T.C. Mirafi's Miragrid[®] & Miratex[®] Geogrid Reinforcement: Final Report." *CERF Report 40677*, American Society of Civil Engineers, Reston, VA.

Holtz, R. D., Christopher, B. R., and Berg, R. R. (1998). "Geosynthetic Design and Construction Guidelines." Publication No. FHWA HI-95-038. Federal Highway Administration, Washington, DC, 459 pgs.

Huang, C. C., and Menq, F. Y., (1997). "Deep Footing and Wide-Slab Effects on Reinforced Sandy Ground." *Journal of Geotechnical and Geoenvironmental Engineering*, Vol. 123, No. 1, American Society of Civil Engineers, Reston, VA, pp. 30– 36.

Huang, J., Han, J., and Collin, J. G. (2005). "Geogrid-Reinforced Pile-Supported Railway Embankments – Three Dimensional Numerical Analysis." *Journal of Transportation Research Board*, No. 1936, National Academy Press, Washington, DC, pp. 221-229.

Illinois Department of Transportation, IDOT. (2005). "Subgrade Stability Manual." Bureau of Bridges and Structures, Springfield, IL, 34 pgs. http://www.dot.state.il.us/bridges/geotechdocuments.html.

Itasca Consulting Group. (2005). "FLAC v 5.0 Manual." Minneapolis, MN. <u>http://www.itascacg.com/flac.html</u>.

Jo, H. Y., Benson, C. H., Shackelford, C. D., Lee, J. M., and Edil, T. B. (2005). "Long-Term Hydraulic Conductivity of a Geosynthetic Clay Liner Permeated with Inorganic Salt Solutions." *Journal of Geotechnical and Geoenvironmental Engineering*, Vol. 131, No. 4, American Society of Civil Engineers, Reston, VA. pp. 405-417.

Jones, C. J. F. P. (2005). "Geosynthetic-Reinforced Soil Walls and Slopes: European Perspectives." *Geotechnical Special Publication*, No. 130-142, *Geo-Frontiers 2005*, American Society of Civil Engineers, Reston, VA. pp. 3183-3195.

Jones, C. J. F. P. and Cooper, A. H. (2005). "Road Construction Over Voids Caused by Active Gypsum Dissolution, with an Example from Ripon, North Yorkshire, England." *Environmental Geology* 48 (3), Elsevier, pp. 384-394.

Kestler, M. A. and Berg, R. L. (1995). "Case Study of Insulated Pavement in Jackman, Maine." *Transportation Research Record*, No. 1481, National Academy Press, Washington, DC, July, pp. 47-55.

Koerner, R. M. (1998). *Designing with Geosynthetics*. 4th Edition. Prentice Hall, New Jersey, 761 pgs.

Konrad, J.-M., Dore, G. and Roy, M. (1996). "Field Observations of Instrumented Highway Sections with Different Frost Protections." *Proceedings of the International Conference on Cold Regions Engineering*, American Society of Civil Engineers, Reston, VA, pp. 652-663.

Lee, J. M., and Shackelford, C. D. (2005). "Impact of Bentonite Quality on Hydraulic Conductivity of Geosynthetic Clay Liners." *Journal of Geotechnical and Geoenvironmental Engineering*, Vol. 131 No. 1, American Society of Civil Engineers, Reston, VA, pp. 64-77.

Leng, J. and Gabr, M. A. (2002). "Characteristics of Geogrid-Reinforced Aggregate under Cyclic Load." *Journal of Transportation Research Board*, No. 1786, November, National Research Council, Washington, DC, pp. 29-35.

Leng, J. and Gabr, M. A. (2005). "Numerical Analysis of Stress-Deformation Response in Reinforced Unpaved Road Sections." *Geosynthetics International*, Vol. 12, No. 2, Thomas Telford, London, England, pp. 111-119.

Leong, K. W., Tan, S. A., Chew, S. H., Karunaratne, G. P., Chia, W. Y., and Thein, P. (2000). "Anchored and Pre-Tensioned Geosynthetics in Unpaved Roads." *Geotechnical Special Publication*, No. 103, 2000, American Society of Civil Engineers, Reston, VA, pp. 383-397.

Leshchinsky, D. and Han, J. (2004). "Geosynthetic Reinforced Multitiered Walls." *Journal of Geotechnical and Geoenvironmental Engineering* Vol. 130, No. 12, American Society of Civil Engineers, Reston, VA, pp. 1225-1235.

Leu, W. and Tasa, L. (2001). "Application of Geotextiles, Geogrids and Geocells in Northern Minnesota." *Geosynthetics Conference 2001*. <u>http://mnroad.dot.state.mn.us/research/mnroad_project/mnroadreports/mnroadonlinerepor</u> ts/applications_of_geotextiles, geogrids, and geocells_in_northern_minnesota.pdf.

Li, A. L., and Rowe, R. K. (2001). "Combined Effects of Reinforcement and Prefabricated Vertical Drains on Embankment Performance." *Canadian Geotechnical Journal*, Vol. 38, No. 6, National Research Council of Canada, Ottawa, ON, pp. 1266-1282.

Lin, L. and Benson, C. H. (2000). "Effect of Wet-Dry Cycling on Swelling and Hydraulic Conductivity of GCLs." *Journal of Geotechnical and Geoenvironmental Engineering*, Vol. 126, No. 1, American Society of Civil Engineers, Reston, VA. pp. 40-49.

Ling, H., Leshchinsky, D., and Perry, E. (1996). "A New Concept of Seismic Design of Geosynthetic-Reinforced Soil Structures: Permanent Displacement Limit." *Proceedings of the Third International Symposium on Earth Reinforcement*, Ochai et al., eds., Rotterdam, Balkema, pp. 797–802.

Ling, H., Leshchinsky, D., and Perry, E. (1997). "Seismic Design And Performance of Geosynthetic-Reinforced Soil Structures." *Geotechnique*, 47, 5, Thomas Telford Journals, London, England, pp. 933–952.

Lo Grasso, A. S., Maugeri, M., and Recalcati, P. (2005). "Seismic Behaviour of Geosynthetic-Reinforced Slopes with Overload by Shaking Table Tests." *Geotechnical Special Publication*, No. 130-142, *Geo-Frontiers 2005*, American Society of Civil Engineers, Reston, VA, pp. 2667-2680.

Lytton, R. L. (1989) "Use of Geotextiles for Reinforcement and Strain Relief in Asphalt Concrete." *Geotextiles and Geomembranes*, Vol. 8, Elsevier, pp. 217-237.

Mankbadi, R., Mansfield, J., Wilson-Fahmy, R., Hanna, S., and Krstic, V. (2004). "Ground Improvement Utilizing Vibro-Concrete Columns." *Geotechnical Special Publication* No. 124, *Geo-Institute*, American Society of Civil Engineers, Reston, VA, pp. 473-484.

Marienfeld, M. L. and Smiley, D. (1994) "Paving Fabrics: The Why and the How To." *Geotechnical Fabrics Report*, June/July, pp. 24-29.

Maxim (1997). "Nonwoven Paving Fabrics Study, Final Report." *Industrial Fabrics Association International, Geotextile Division*, December, 62 pgs.

Maxwell, S., Kim, W. H., Tuncer, B. E, and Benson, C. H. (2005). "Effectiveness of Geosynthetics in Stabilizing Soft Subgrades." Wisconsin Department of Transportation, Report No. 0092-45-15. <u>http://www.whrp.org/Research/Geotechnics/geo_0092-45-15/0092-45-15-Geosynth%20Final%20%20Report%2010-31-05-.pdf</u>.

Mendonca, A., Lopes, M., and Pinho-Lopes, M. (2003). "Construction and Post-Construction Behavior of a Geogrid-Reinforced Steep Slope." *Geotechnical and Geological Engineering*, Vol. 21, No. 2, Springer Netherlands, pp. 129-147.

Michalowski, R. L. (2004). "Limit Loads on Reinforced Foundation Soils." *Journal of Geotechnical and Geoenvironmental Engineering*, Vol. 130, No. 4, American Society of Civil Engineers, Reston, VA, pp. 381-390.

Miki, H. (2005). "Geosynthetic reinforcement for soft foundations: Japanese perspectives" Geotechnical Special Publication, n 130-142, Geo-Frontiers 2005, ASCE Press, Reston, Virginia, 3077-3093.

Mohney, J., et al. (1994). "Retaining Wall Design Guide." *EM-7170-14*. U.S. Department of Agriculture, Forest Service, Washington, DC, 542 pgs.

Morrison, K. F., Harrison, F. E., Collin, J. G., Dodds, A. D. and Arndt, B. (2006). "Shored Mechanically Stabilized Earth (SMSE) Wall Systems Design Guidelines." Report No. FHWA-CFL/TD-06-001, Federal Highway Administration, Central Federal Lands Highway Division, Lakewood, CO. http://www.cflhd.gov/techDevelopment/completed_projects/geotech/smse/.

Munfakh, G., Arman, A., Collin, J. G., Hung, J. C., and Brouillette, R. P. (2001). "Shallow Foundations Reference Manual." Report No. FHWA-NHI-01-023, Federal Highway Administration, Washington, DC, 222 pgs.

Musser, S. W. and Denning, C. (2005). "Deep Patch Road Embankment Repair Application Guide." United States Department of Agriculture, Washington, D.C. 32 pgs. <u>http://www.fs.fed.us/eng/pubs/pdf/05771204.pdf</u>.

National Concrete Masonry Association (NCMA). 2002. *Design Manual For Segmental Retaining Walls*, Second Edition. J.G. Collin (ed.). Herndon, VA, 289 pgs.

NCHRP (2005). "Selection, Calibration, and Validation of a Reflective Cracking Model for Asphalt Concrete Overlays." *NCHRP Project 1-41*, Washington, D.C. <u>http://www4.trb.org/trb/crp.nsf/All+Projects/NCHRP+1-41</u>.

Nova-Roessig, L., and Sitar, N. (2006). "Centrifuge Model Studies of the Seismic Response of Reinforced Soil Slopes." *Journal of Geotechnical and Geoenvironmental Engineering*, Vol. 132, No. 3, American Society of Civil Engineers, Reston, VA, pp. 388-400.

Palmeira, E.M. (2005). "Geosynthetic reinforcement for soft foundations: Brazilian perspectives" Geotechnical Special Publication, n 130-142, Geo-Frontiers 2005, ASCE Press, Reston, Virginia, 3065-3075.

Perkins, S. W. and Edens, M. Q. (2003). "Finite Element and Distress Models for Geosynthetic-Reinforced Pavements." *International Journal of Pavement Engineering* 3(4), Taylor and Francis Journals, London, England, pp. 239–250.

Perkins, S. W., and Edens, M. Q. (2003). "A Design Model for Geosynthetic-reinforced Pavements." *International Journal of Pavement Engineering*, 4(1), Taylor and Francis Journals, London, England, pp. 37-50.

Perkins, S. W., Bowders, J. J., Christopher, B. R., and Berg, R. R. (2005a). "Geosynthetic reinforcement for pavement systems: US perspectives." *Geotechnical Special Publication*, No. 130-142, *Geo-Frontiers 2005*, American Society of Civil Engineers, Reston, VA, pp. 3039-3063.

Perkins, S. W., Christopher, B. R., Eiksund, G. R., Schwartz, C. S., and Svano, G. (2005b). "Modeling Effects of Reinforcement on Lateral Confinement of Roadway Aggregate." *Geotechnical Special Publication*, No. 130-142, *Geo-Frontiers 2005*, American Society of Civil Engineers, Reston, VA, pp. 283-296.

Pham, H. T. V., Suleiman, M. T., and White, D. J. (2004). "Numerical Analysis of Geosynthetic-Rammed Aggregate Pier Supported Embankment." *Proceedings of Geo-Trans 2004 Conference*, Los Angeles, CA, July. pp 657-664.

Powell, W., Keller, G. R. and Brunette, B. (1999). "Applications for Geosynthetics on Forest Service Low-Volume Roads." *Transportation Research Record*, No. 1652. National Academy Press, Washington, DC, pp. 113-120.

Queensland Department of Main Roads (2001). "Paving Geotextiles in Asphalt and Sprayed Seal Surfacings." Technical Note Issue No. 8. 14 pages.

Queensland Department of Main Roads (1999). "Main Road Standard Specifications— Geotextiles (Separation and Filtration)" MRS11.27

Schlosser, F. Jacobsen, H. M. and Horii, N. (1983). "Soil Reinforcement." *General Report, 8th European Conference on Soil Mechanics And Foundation Engineering,* Balkema, Helsinki, pp. 83-103.

Shahgholi, M, Fakher, A and Jones, C. J. F. P. (2001). "Horizontal Slice Method of Analysis." *Geotechnique* 51, No. 10, Thomas Telford Journals, London, England, pp. 881-885.

Sharma, J. S., and Bolton, M. D. (2001). "Centrifugal and Numerical Modeling of Reinforced Embankments on Soft Clay Installed with Wick Drains." *Geotextiles and Geomembranes*, Vol. 19, No. 1, Elsevier, pp. 23-44.

Sprague, C. J. (2005). "Flexible Pavement Rehabilitation Using Paving Fabric -Quantifying the Benefit." *Geotechnical Special Publication*, No. 130-142, *Geo-Frontiers* 2005, American Society of Civil Engineers, Reston, VA, pp. 323-332.

Steinberg, M. L. (1998). *Geomembranes and the control of expansive soils in construction*. McGraw-Hill, New York. 222 pgs.

Steward, J., Williamson, R. and Mohney, J. (1977). "Guidelines for Use of Fabrics in Construction and Maintenance of Low-Volume Roads." USDA, Forest Service, Portland, OR. Also reprinted as Report No. FHWA-TS-78-205, Federal Highway Administration, Washington, DC.

Stewart, M. E., Navin, M. P., and Filz, G. M. (2004). "Analysis of a Column Supported Test Embankment at The I-95/Route 1 Interchange." *Proceedings of Geo-Trans 2004 Conference*, Los Angeles, CA, July. pp. 1337-1346.

Storsteen, M. and Rumpca, H. (2000). "Evaluation of Geosynthetics in Asphalt Overlays of Jointed Concrete Pavements." Report No. SD95-23-X, South Dakota Department of Transportation, Pierre, SD.

http://www.state.sd.us/Applications/HR19ResearchProjects/Projects/SD1995_23_final_r eport.pdf.

Thiel, R., Criley, K., and Bryk, J. (2005). "Practical Guidelines for Specifying GCL Overlaps." *GFR Engineering Solutions for Roads, Soil, Water and Waste* Vol. 23, No. 8.

Tingle, J. S. and Webster, S. L. (2003). "Corps of Engineers Design of Geosynthetic-Reinforced Unpaved Roads." *Transportation Research Record*, No. 1849, National Academy Press, Washington, D.C. pp. 193-201.

Transportation Research Board (2005). Research in Progress <u>http://rip.trb.org/browse/dproject.asp?n=11055</u>.

Turner, J. P. and Jensen, W. G. (2005). "Landslide Stabilization Using Soil Nail and Mechanically Stabilized Earth Walls: Case Study." *Journal of Geotechnical and Geoenvironmental Engineering* Vol. 131, No. 2, American Society of Civil Engineers, Reston, VA, pp. 141-150.

Varadarajan, A., Sharma, K. G., and Aly, M. A. A. (1999). "Finite Element Analysis of Reinforced Embankment Foundation." *International Journal for Numerical and Analytical Methods in Geomechanics*, Vol. 23, No. 2, John Wiley & Sons Ltd, Chichester, England, pp. 103-114.

Vic Roads (Undated). "Geotextile Reinforced Bituminous Surfacing." Vic Roads Technical Note No. 14. 3 pages. Distributed by GeoPave Materials Technology.

Villard, P., Gourc, J. P., and Giraud, H. (2000). "Geosynthetic Reinforcement Solution to Prevent the Formation of Localized Sinkholes." *Canadian Geotechnical Journal*, Vol. 37, No. 5, National Research Council of Canada, Ottawa, ON, pp. 987-999.

Vischer, W. (2003). "Low-Volume Road Flexible Pavement Design with Geogrid-Reinforced Base." *Transportation Research Record*, No. 1819, Volume 1, *Eighth International Conference on Low-Volume Roads*, National Academy Press, Washington DC, pp. 247-254. Watn, A., Gudmund, E., Jenner, C. and Rathmayer, H. (2005). "Geosynthetic Reinforcement for Pavement Systems: European Perspectives." *Geotechnical Special Publication*, n 130-142, *Geo-Frontiers 2005*, American Society of Civil Engineers, Reston, VA, pp. 3019-3037.

Watts, G. R. A., Blackman, D. I., and Jenner, C. G. (2004). "The performance of reinforced unpaved sub-bases subjected to trafficking." Flos, Brau, Nussbaumer, and Laackmann _eds._ *Proc.*, *EUROGEO 3 Third European Geosynthetics Conference*, German Geotechnical Society and Zentrum Geotechnik, pp. 261–266.

Whyte, D. (2005). "The Overriding Aspects of the Design of Geosynthetic-Reinforced Pile Supported Embankments." *Geotechnical Special Publication*, No. 130-142, *Geo-Frontiers 2005*, American Society of Civil Engineers, Reston, VA. pp. 475-486

Wright, S. G. (2005). "Design Guidelines for Multi-Tiered MSE Walls." Report 0-4485-2, *Center For Transportation Research*, University of Texas at Austin, 118 pgs. http://www.utexas.edu/research/ctr/pdf_reports/0_4485_2.pdf.

Wu, J. T., and Helwany, S. M. B. (2001). "Examining the Effects of Reinforcement in US. Forest Service Deep-Patch Landslide Repair Technique: Full-Scale Model Tests." *Transportation Research Record*, No. 1772, National Academy Press, Washington, DC, pp. 203-210.

Zhang, Z., Farrag, K., and Morvant, M. (2003). "Evaluation of the Effect of Synthetic Fibers of Nonwoven Geotextile Reinforcement on the Stability of Heavy Clay Embankments." Report No. FHWA/LA.03/373, Louisiana Transportation Research Center, Baton Rouge, LA. 78 pgs.

Zornberg, J. G., McCartney, S., and Swan, R. H. (2005). "Analysis of a Large Database of GCL Internal Shear Strength Results." *Journal of Geotechnical and Geoenvironmental Engineering* Vol. 131, No. 3, American Society of Civil Engineers, Reston, VA, pp. 367-380.