Development of A Roadmap for Updating GeoTechTools

Sponsored by the ASCE Geo-Institute

Managed by the ASCE Geo-Institute Soil Improvement Committee

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1 Introduction

GeoTechTools is a comprehensive online interactive geotechnology selection system used by practicing engineers, educators, regulators, and students. The majority of the geotechnologies included in GeoTechTools are ground improvement technologies. The GeoTechTools system was developed in 2011 by geotechnology experts, many of whom are members of the Soil Improvement Committee.

The Soil Improvement Committee successfully organized a China Scan Tour on Ground Improvement Technologies in 2018 and completed a scan tour report in 2019. Recent advances and case histories of some ground improvement technologies (e.g., vacuum preloading) gathered during this scan tour can be used to update the GeoTechTools system.

There have been minor updates to GeoTechTools since its development. Considering most of these technologies have been advanced and a few new technologies have emerged, for example, rigid inclusions, it is essential and necessary to review each of the technologies and update them. This special project was to develop a roadmap for updating GeoTechTools.

2 GeoTechTools Subject Matter Classification

The GeoTechTools (https://www.geoinstitute.org/geotechtools/) encompasses 47 technologies that can be sorted into 11 categories. For ease of review, these 47 technologies were categorized into five subject matters based on their applications. The classifications and associated subject matters include the following:

1. **Densification Methods (7)**
    a. Blast Densification
    b. Deep Dynamic Compaction (DDC)
    c. High-Energy Impact Rollers
    d. Intelligent Compaction
    e. Rapid Impact Compaction
    f. Traditional Compaction
    g. Vibrocompaction
2. **Replacement Methods (9)**
    a. Aggregate columns

b. Combined soil stabilization with vertical columns
c. Continuous Flight Augers (CFA)
d. Excavation and replacement
e. Geotextile Encased Columns
f. Lightweight Fill
g. Onsite Use of Recycled Pavement Materials
h. Sand Compaction Piles
i. Vibro-Concrete Columns

3. **Drainage and Consolidation Methods (7)**
   a. Electro-Osmosis
   b. Geosynthetic Separation in Pavement Systems
   c. Geosynthetics in Pavement Drainage
   d. Hydraulic Fill with Geocomposite and Vacuum Consolidation
   e. Partial Encapsulation
   f. Prefabricated Vertical Drains and Fill Preloading
   g. Vacuum Preloading with/without Prefabricated Vertical Drains
4. **Reinforcement Methods (14)**
   a. Fiber reinforcement of pavements
   b. Geocell confinement for pavements
   c. Geosynthetic Reinforcement Construction Platforms
   d. Geosynthetic Reinforced Embankments
   e. Geosynthetic Reinforcement in Pavement Systems
   f. Mechanical Stabilization of Subgrades and Bases
   g. Mechanically Stabilized Earth Wall System
   h. Reinforced Soil Slopes
   i. Shored Mechanically Stabilized Earth Wall System
   j. Micropiles
   k. Drilled/Grout and Hollow Bar Soil Nailing
   l. Screw-in Soil Nailing
   m. Shoot-in Soil Nailing
   n. Column Supported Embankments
5. **Chemical, Thermal and Biological Methods (8)**
   a. Bulk-infill grouting
   b. Chemical grouting/injection system
   c. Deep Mixing Method
   d. Jet Grouting

e. Mass Mixing Methods
f. Compaction grouting
g. Injected Lightweight Foam Fill
h. Bio-treatment for subgrade stabilization
i. Chemical Stabilization of Subgrades and Bases

6. **New Technology**

3 Task Objective

To effectively and efficiently update the GeoTechTools system, the Soil Improvement Committee developed a plan to create a process roadmap, which is shown in Figure 1. To ensure a successful execution, eight core tasks of the process are listed below, which are used as key milestones to monitor the progress:

TASKS

1. Develop inventory survey form
2. Preliminary review of technologies
3. Identify Technology Leaders
4. Identify Subject Matter Experts
5. Subject Matter Expert Review
6. Process survey forms
7. Prioritize edits
8. Create Report

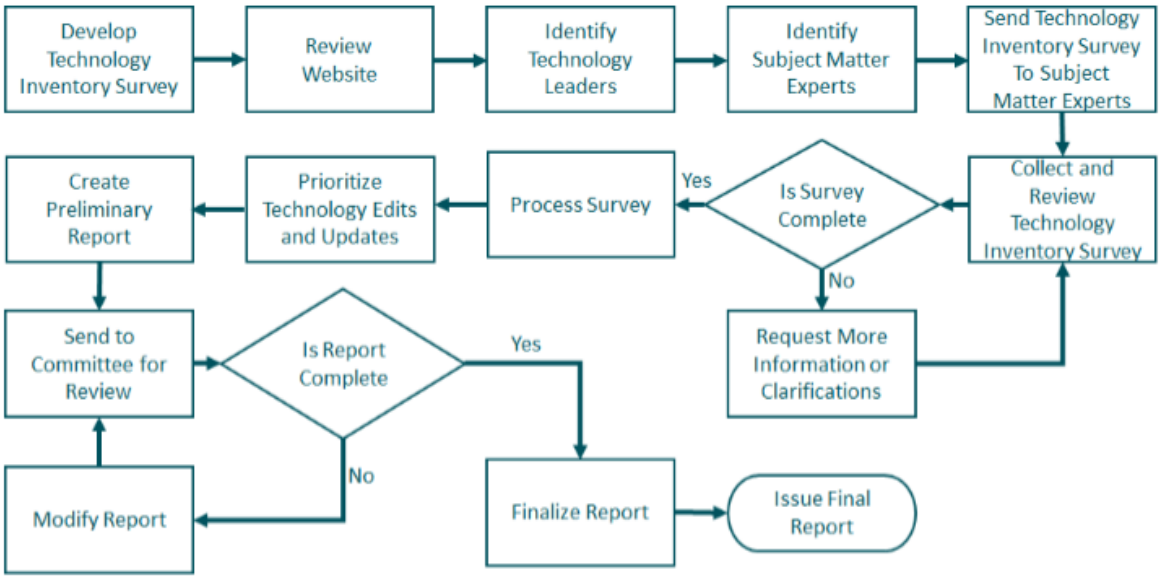

Figure 1 Process Roadmap

4 GeoTechTools Subject Matter Website Structure

Each of the technologies is found in the Technology Catalog on the website. When a technology is selected the Overview web-page for that technology is loaded. As an example, the webpage for the Micropiles technology is shown in Figure 2.

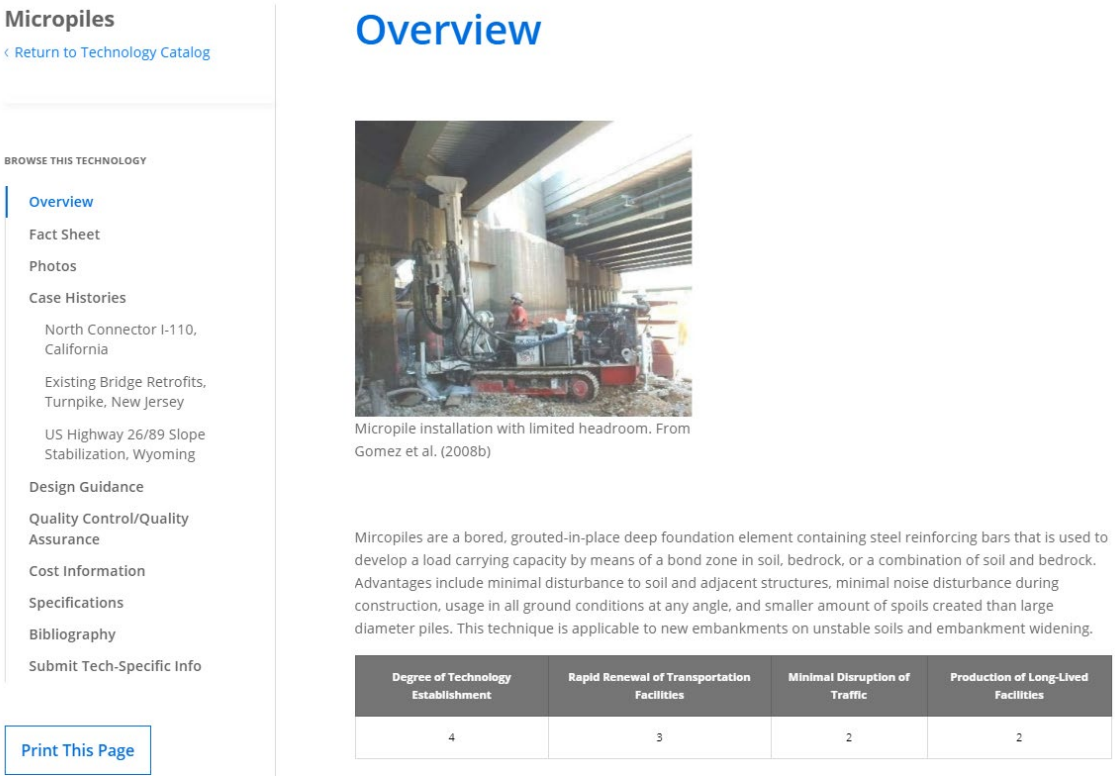

Figure 2 Subject Matter Lead Web-Page

To the left of the main body of the specific technology is a task pane that is titled "Browse This Technology". Each of the items in the task-pane opens a webpage when selected. The "Browse This Technology" groupings include the following:

1. Overview
2. Fact Sheet
3. Photos
4. Case Histories
5. Design Guidance
6. Quality Control/Quality Assurance

7. Cost Information
8. Specifications
9. Bibliography
10. Submit Tech-Specific Info

5 Technology Survey

Nation-wide renowned experts in soil improvement have been invited as subject matter experts during the review and assessment process. A technology survey form was developed to aid the subject matter expert in the review process and to assure that a consistent review process was followed. The survey consisted of a fillable PDF form titled "Subject Matter Review Form". The subject matter expert was tasked with reviewing each of the technologies in his/her subject matter. Each of these categories was listed on the Subject Matter Review Form. During the review, the Subject Matter Expert was tasked with determining if changes to the specific webpage were warranted. If changes were considered necessary, the Subject matter expert was asked to determine the degree of modifications that was required. The degree of modifications was based on the following ranking system.

- No Change – leave category as is
- Low – Some minor changes to category – spelling, grammar, format
- Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
- High – Completely redo the category – replace category information
- Add – Addition of new material

The Subject Matter Review Form contained a comment section for each of the groupings. The comment section was used to list any information that was relevant and that would help with the final review and modification. The last comment box at the end of the Subject Matter Review Form was used to summarize the technology review.

6 Subject Matter Review Metrics

The subject matter review of each of the technologies and the associated metrics are shown in the following tables. The scoring is based on the following:

- No Change = 0
- Low = 1

- Moderate = 2
- High = 3
- Add = 1 for information needed and = 0 for no information needed

The scores were added together and then ranked. The higher the score the higher the update priority.

6.1 Total Subject Matter Scoring

	Overview		Technology Fact Sheet		Photos		Case Histories		Design Guidance		Quality Control/Quality Assurance		Cost Information		Specifications		Bibliography		Submit Tech-Specific Info				
	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Socre Sum	Add Sum	Total Sum
Geosynthetics in Pavement Drainage	3	1	3	1	3	1	3	1	2	1	2	1	3	1	2	1	3	1	2	1	26	10	36
Combined Soil Stabilization with Vertical Columns	3	1	2	1	2	1	2	1	2	1	2	1	2	0	2	0	2	1	2	1	21	8	29
Mechanically Stabilized Earth Wall System	3	0	1	0	3	1	2	0	3	0	0	0	3	0	3	0	3	0	0	0	21	1	22
Intelligent Compaction	3	1	2	1	0	0	2	1	3	1	2	1	2	1	2	0	2	1	2	1	20	8	28
Onsite Use of Recycled Pavement Materials	2	1	2	1	2	1	2	1	2	0	2	0	2	0	2	0	2	1	2	1	20	6	26
Aggregate Columns	2	1	2	1	2	1	2	1	2	0	2	1	2	0	1	0	2	1	2	1	19	7	26
Deep Dynamic Compaction	2	1	2	1	2	1	2	1	0	0	2	1	2	0	2	0	2	1	2	1	18	7	25
Vibrocompaction	0	0	2	0	3	1	2	0	0	0	2	1	2	0	2	0	2	1	2	1	17	4	21
Bulk-Infill Grouting	2	0	0	0	3	1	0	0	0	0	2	0	2	0	2	0	2	0	2	1	15	2	17
Geosynthetic Separation in Pavement Systems	1	0	1	0	2	1	2	1	1	0	1	0	2	0	1	0	2	1	2	1	15	4	19
Shored Mechanically Stabilized Earth Wall System	1	0	2	0	1	1	1	1	3	0	0	0	3	1	2	0	2	0	0	0	15	3	18
Blast Densification	0		0		2	1	2	1	0		2	1	2		2		2	1	2	1	14	5	19
Drilled/Grouted and Hollow Bar Soil Nailing	0	0	2	0	1	1	1	1	3	0	0	0	3	1	2	0	2	0	0	0	14	3	17
Geocell Confinement in Pavement Systems	2	0	2	0	1	0	2	0	1	0	2	0	2	0	2	0	0	0	0	0	14	0	14
Vibro-Concrete Columns	0	0	2	0	2	1	0	0	0	0	2	0	2	0	2	0	2	1	2	1	14	3	17
Shoot-in Soil Nailing	0	0	1	0	1	1	2	1	1	0	0	0	3	1	3	0	2	0	0	0	13	3	16
Fiber Reinforcement in Pavement Systems	2	0	2	0	1	0	2	0	2	0	0	0	3	1	0	0	0	0	0	0	12	1	13
Geosynthetic Reinforcement in Pavement Systems	2	0	2	0	0	0	1	0	2	0	2	0	2	0	0	0	1	0	0	0	12	0	12
High-Energy Impact Rollers	0	0	2	1	0	1	2	1	0	0	0	1	2	1	2	1	2	1	2	1	12	8	20
Deep Mixing Methods	2	0	1	1	0	0	0	0	0	0	0	0	2	0	2	0	2	1	2	1	11	3	14
Hydraulic Fill with Geocomposite and Vacuum Consolidation	2	0	2	0	1	0	2	0	2	0	0	0	0	0	0	0	2	0	0	0	11	0	11
Jet Grouting	0	0	1	1	0	0	2	1	0	0	0	0	2	0	2	0	2	1	2	1	11	4	15
Screw-in Soil Nailing	0	0	1	0	1	0	2	0	1	0	0	0	1	0	3	0	2	0	0	0	11	0	11
Electro-Osmosis	2	0	0	0	2	0	2	0	2	0	0	0	2	0	0	0	0	0	0	0	10	0	10
Geotextile Encased Columns	0	0	2	1	0	0	0	0	2	1	2	1	0	0	0	0	2	1	2	1	10	5	15
Geosynthetic Reinforced Embankments	1	1	1	1	1	1	2	1	1	1	0	0	1	1	0	0	1	1	0	1	8	8	16
Mechanical Stabilization of Subgrades and Bases	1	0	0	0	2	1	2	1	1	0	0	0	1	0	0	0	1	0	0	0	8	2	10
Beneficial Reuse of Waste Materials	1	0	1	0	0	0	1	1	2	0	0		0	0	0	0	2	1	0	0	7	2	9
Chemical Grouting/Injection Systems	3	0	1	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	7
Traditional Compaction	2	0	1	0	1	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	7	0	7
Bio-Treatment for Subgrade Stabilization	2	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	6
Lightweight Fill	1	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	5	0	5
Geosynthetic Reinforced Construction Platforms	0	0	0	0	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	4	0	4
Rapid Impact Compaction	1	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	4	0	4
Reinforced Soil Slopes	0	0	1	0	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	4	1	5
Column-Supported Embankments	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	4
Chemical Stabilization of Subgrades and Bases	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
Compaction Grouting	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	2
Partial Encapsulation	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	2
Vacuum Preloading with and without Prefabricated Vertical Drains	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0	2
Excavation and Replacement	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Mass Mixing Methods	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Micropiles	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Prefabricated Vertical Drains and Fill Preloading	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Continuous Flight Auger Piles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Injected Lightweight Foam Fill	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sand Compaction Piles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 3 Master Technology Review Ranked by Score

6.2 Scoring by Technology

DENSIFICATION METHODS	A		B		C		D		E		F		G		H		I		J				
	Overview		Technology Fact Sheet		Photos		Case Histories		Design Guidance		Quality Control/Quality Assurance		Cost Information		Specifications		Bibliography		Submit Tech-Specific Info				
	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score Sum	Add Sum	Total Sum
Intelligent Compaction	3	1	2	1	0	0	2	1	3	1	2	1	2	1	2	0	2	1	2	1	20	8	28
Deep Dynamic Compaction	2	1	2	1	2	1	2	1	0	0	2	1	2	0	2	0	2	1	2	1	18	7	25
Vibrocompaction	0	0	2	0	3	1	2	0	0	0	2	1	2	0	2	0	2	1	2	1	17	4	21
Blast Densification	0	0	0	0	2	1	2	1	0	0	2	1	2	0	2	0	2	1	2	1	14	5	19
Hydraulic Fill with Geocomposite and Vacuum	2	0	2	0	1	0	2	0	2	0	0	0	0	0	0	0	2	0	0	0	11	0	11
Traditional Compaction	2	0	1	0	1	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	7	0	7
Rapid Impact Compaction	1	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	4	0	4
Average Score	1.43		1.43		1.29		1.86		0.86		1.14		1.14		1.14		1.57		1.14		13.00	3.43	16.43

Figure 4 Densification Technology Review Ranked by Score

REPLACEMENT METHODS	A		B		C		D		E		F		G		H		I		J				
	Overview		Technology Fact Sheet		Photos		Case Histories		Design Guidance		Quality Control/Quality Assurance		Cost Information		Specifications		Bibliography		Submit Tech-Specific Info				
	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score Sum	Add Sum	Total Sum
Combined Soil Stabilization with Vertical Columns	3	1	2	1	2	1	2	1	2	1	2	1	2	0	2	0	2	1	2	1	21	8	29
Onsite Use of Recycled Pavement Materials	2	1	2	1	2	1	2	1	2	0	2	0	2	0	2	0	2	1	2	1	20	6	26
Aggregate Columns	2	1	2	1	2	1	2	1	2	0	2	1	2	0	1	0	2	1	2	1	19	7	26
Vibro-Concrete Columns	0	0	2	0	2	1	0	0	0	0	2	0	2	0	2	0	2	1	2	1	14	3	17
Geotextile Encased Columns	0	0	2	1	0	0	0	0	2	1	2	1	0	0	0	0	2	1	2	1	10	5	15
Lightweight Fill	1	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	5	0	5
Excavation and Replacement	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Continuous Flight Auger Piles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sand Compaction Piles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average Score	1.00		1.11		0.89		0.89		0.89		1.33		0.89		0.78		1.11		1.11		10.00	3.22	13.22

Figure 5 Replacement Technology Review Ranked by Score

DRAINAGE AND CONSOLIDATION METHODS

	A		B		C		D		E		F		G		H		I		J				
	Overview		Technology Fact Sheet		Photos		Case Histories		Design Guidance		Quality Control/Quality Assurance		Cost Information		Specifications		Bibliography		Submit Tech-Specific Info				
	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score Sum	Add Sum	Total Sum
Geosynthetics in Pavement Drainage	3	1	3	1	3	1	3	1	2	1	2	1	3	1	2	1	3	1	2	1	26	10	36
Geosynthetic Separation in Pavement Systems	1	0	1	0	2	1	2	1	1	0	1	0	2	0	1	0	2	1	2	1	15	4	19
Hydraulic Fill with Geocomposite and Vacuum	2	0	2	0	1	0	2	0	2	0	0	0	0	0	0	0	2	0	0	0	11	0	11
Electro-Osmosis	2	0	0	0	2	0	2	0	2	0	0	0	2	0	0	0	0	0	0	0	10	0	10
Partial Encapsulation	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	2
Prefabricated Vertical Drains and Fill Preloading	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Average Score	1.33		1.17		1.33		1.67		1.33		0.50		1.17		0.50		1.17		0.67		10.83	2.33	13.17

Figure 6 Drainage Technology Review Ranked by Score

Reinforcement Methods

	A		B		C		D		E		F		G		H		I		J				
	Overview		Technology Fact Sheet		Photos		Case Histories		Design Guidance		Quality Control/Quality Assurance		Cost Information		Specifications		Bibliography		Submit Tech-Specific Info				
	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score Sum	Add Sum	Total Sum
Mechanically Stabilized Earth Wall System	3	0	1	0	3	1	2	0	3	0	0	0	3	0	3	0	3	0	0	0	21	1	22
Geosynthetic Separation in Pavement Systems	1	0	1	0	2	1	2	1	1	0	1	0	2	0	1	0	2	1	2	1	15	4	19
Shored Mechanically Stabilized Earth Wall System	1	0	2	0	1	1	1	1	3	0	0	0	3	1	2	0	2	0	0	0	15	3	18
Drilled/Grouted and Hollow Bar Soil Nailing	0	0	2	0	1	1	1	1	3	0	0	0	3	1	2	0	2	0	0	0	14	3	17
Geocell Confinement in Pavement Systems	2	0	2	0	1	0	2	0	1	0	2	0	2	0	2	0	0	0	0	0	14	0	14
Shoot-in Soil Nailing	0	0	1	0	1	1	2	1	1	0	0	0	3	1	3	0	2	0	0	0	13	3	16
Fiber Reinforcement in Pavement Systems	2	0	2	0	1	0	2	0	2	0	0	0	3	1	0	0	0	0	0	0	12	1	13
Geosynthetic Reinforcement in Pavement Systems	2	0	2	0	0	0	1	0	2	0	2	0	2	0	0	0	1	0	0	0	12	0	12
Screw-in Soil Nailing	0	0	1	0	1	0	2	0	1	0	0	0	1	0	3	0	2	0	0	0	11	0	11
Geosynthetic Reinforced Embankments	1	1	1	1	1	1	2	1	1	1	0	0	1	1	0	0	1	1	0	1	8	8	16
Mechanical Stabilization of Subgrades and Bases	1	0	0	0	2	1	2	1	1	0	0	0	1	0	0	0	1	0	0	0	8	2	10
Geosynthetic Reinforced Construction Platforms	0	0	0	0	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	4	0	4
Reinforced Soil Slopes	0	0	1	0	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	4	1	5
Column-Supported Embankments	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	4
Micropiles	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1

Figure 7 Reinforcement Technology Review Ranked by Score

CHEMICAL, THERMAL, AND BIOLOGICAL METHODS

	A		B		C		D		E		F		G		H		I		J				
	Overview		Technology Fact Sheet		Photos		Case Histories		Design Guidance		Quality Control/Quality Assurance		Cost Information		Specifications		Bibliography		Submit Tech-Specific Info				
	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score	Add	Score Sum	Add Sum	Total Sum
Bulk-Infill Grouting	2	0	0	0	3	1	0	0	0	0	2	0	2	0	2	0	2	0	2	1	15	2	17
Deep Mixing Methods	2	0	1	1	0	0	0	0	0	0	0	0	2	0	2	0	2	1	2	1	11	3	14
Jet Grouting	0	0	1	1	0	0	2	1	0	0	0	0	2	0	2	0	2	1	2	1	11	4	15
Chemical Grouting/Injection Systems	3	0	1	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	7
Bio-Treatment for Subgrade Stabilization	2	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	6
Compaction Grouting	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	2
Mass Mixing Methods	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Injected Lightweight Foam Fill	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average Score	1.25		0.63		0.50		0.75		0.25		0.25		0.75		0.75		0.75		0.75		6.63	1.13	7.75

Figure 8 Chemical, Thermal, and Biological Technology Review Ranked by Score

7 New Technologies

The following are technologies have been identified as new and that will need to be added to the website.

1. Ground Freezing
2. Tunneling

GeoTechTools was developed for the transportation sector. Additional sectors should be added such as ports and buildings.

8 Pathway Forward

Soil improvement technologies are constantly evolving, which need to update timely to bring the most benefit to technical community. In the future, three different approaches can be used to update GeoTechTools, as listed below, to ensure the latest development are included:

1. Special project with funding
2. Special project without funding
3. Update by GI Committee without funding

The Soil Improvement committee shall re-visit all the technologies on a yearly basis to determine the necessity to update any technology and categorize the identified projects into the above-list three types based on the following criteria:

- Urgency of update
- Scope of update
- Popularity of the technology
- Resources needed for the update

8.1 Special Project with Funding

Special project with funding would be used to update technologies that were determined to be outdated and need immediate and extensive updating. The updating shall need significant resources including personnel hours.

8.2 Special Project Without Funding

Special projects that would not need funding would be requests to update photos, case studies and references for each of the categories, which usually need limited hours and limited resources. Request could be made by the different committees.

8.3 Update by GI Committee without funding

Several of the technologies are related directly to several of the GI committees. These committees could be asked to update and maintain the particular webpage. The committee can decide if they want to ask for special funding or do it as an unfunded project. These committees include the following:

- Deep Foundations
- Earth Retaining Structures
- Embankments Dams and Slopes
- Geosynthetics
- Ground Improvement
- Grouting
- Pavements
- Rock Mechanics

- Soil Improvement
- Underground Engineering and Construction
- Earthquake Engineering and Soil Dynamics

9 Recommended for Updates

Based on the technology survey there are five technologies that require immediate update. These technologies had total scores of 20 or greater , out of a possible total score equal to 30. These technologies include the following:

1. Geosynthetics in Pavement Drainage [26]
2. Combined Soil Stabilization with Vertical Columns [21]
3. Mechanically Stabilized Earth Wall System [21]
4. Intelligent Compaction [20]
5. Onsite Use of Recycled Pavement Materials [20]

There were technologies that had specifications that were not correct and also require immediate update. These include the following:

1. Shoot-In Soil Nail – specification is for screw in soil nail.
2. Screw-In soil nail specification is for compacted sand-columns

The final ranking of the technologies is shown below.

Rank	Technology	Score
1	Geosynthetics in Pavement Drainage	26
2	Combined Soil Stabilization with Vertical Columns	21
3	Mechanically Stabilized Earth Wall System	21
4	Intelligent Compaction	20
5	Onsite Use of Recycled Pavement Materials	20
6	Aggregate Columns	19
7	Deep Dynamic Compaction	18
8	Vibrocompaction	17
9	Bulk-Infill Grouting	15
10	Geosynthetic Separation in Pavement Systems	15
11	Shored Mechanically Stabilized Earth Wall System	15
12	Blast Densification	14
13	Drilled/Grouted and Hollow Bar Soil Nailing	14
14	Geocell Confinement in Pavement Systems	14
15	Vibro-Concrete Columns	14
16	Shoot-in Soil Nailing	13
17	Fiber Reinforcement in Pavement Systems	12
18	Geosynthetic Reinforcement in Pavement Systems	12
19	High-Energy Impact Rollers	12
20	Deep Mixing Methods	11

Rank	Technology	Score
21	Hydraulic Fill with Geocomposite and Vacuum Consolidation	11
22	Jet Grouting	11
23	Screw-in Soil Nailing	11
24	Electro-Osmosis	10
25	Geotextile Encased Columns	10
26	Geosynthetic Reinforced Embankments	8
27	Mechanical Stabilization of Subgrades and Bases	8
28	Beneficial Reuse of Waste Materials	7
29	Chemical Grouting/Injection Systems	7
30	Traditional Compaction	7
31	Bio-Treatment for Subgrade Stabilization	6
32	Lightweight Fill	5
33	Geosynthetic Reinforced Construction Platforms	4
34	Rapid Impact Compaction	4
35	Reinforced Soil Slopes	4
36	Column-Supported Embankments	3
37	Chemical Stabilization of Subgrades and Bases	2
38	Compaction Grouting	2
39	Partial Encapsulation	2
40	Vacuum Preloading with and without Prefabricated Vertical Drains	2
41	Excavation and Replacement	1
42	Mass Mixing Methods	1
43	Micropiles	1
44	Prefabricated Vertical Drains and Fill Preloading	1
45	Continuous Flight Auger Piles	0
46	Injected Lightweight Foam Fill	0
47	Sand Compaction Piles	0

10 Special Project Team

10.1 Project Leaders

- Thomas Taylor, Ph.D. P.E., P.Eng., D.G.E.
- Jie Huang, Ph.D., P.E.

10.2 Technology Experts

- Densification Methods – Jie Huang, Ph.D., P.E.
- Replacement Methods - Lisheng Shao, Ph.D., P.E., G.E
- Drainage and Consolidation Methods - Fathey Elsaid, Ph.D., P.E.
- Reinforcement Methods - Thomas P Taylor, Ph.D., P.E., D.G.E.
- Chemical, Thermal, and Biological Methods - David Yang, Ph.D., P.E., G.E

10.3 Technical Reviewers

- Gary Taylor, L.G., L.E.G.
- Alan Ringen, P.E.
- Peter Cali, Ph.D., P.E.
- Donald Bruce, Ph.D., P.E.

- Rakshya Shrestha, Ph.D.
- E. A. Stern
- Jie Han, Ph.D., P.E.
- Jie Huang, Ph.D., P.E.
- Lisheng Shao, Ph.D., P.E., G.E.
- Chris Woods, P.E., G.E., D.GE.
- John Lustumbo, P.E.
- Anand J. Puppala, Ph.D., P.E., D.GE.
- Barry Christopher, Ph.D., P.E.
- Thomas Taylor, Ph.D., P.E., D.GE

11 Acknowledgment

This project is financially supported by Geo-Institute through the committee special project program. The financial support is crucial, which made this project possible. Dr. Vernon R. Schaefer of Iowa State University, who led the team developing the GeoTechTools through SHRP2 funding years ago, provided valuable suggestions. Dr. Jose Clemente, Ms. Sonia Sorabella Swift, and Mr. Chris Woods provided valuable review comments on this report. A number of members of the Soil Improvement Committee also provided timely feedback and input during this process. Their effort is greatly appreciated. In addition, many other technical experts outside soil improvement committee helped with this project. We should like express our sincere gratitude for their kind assistance.

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Appendix A

Subject Matter Inventory

Technology Blast Densification **Reviewer** Jie Han

Category	No Change	Low	Moderate	High	Add
Overview	◉	○	○	○	☐
Comments: This overview looks good.					
Technology Fact Sheet	◉	○	○	○	☐
Comments: The Fact Sheet looks good.					
Photos	○	○	◉	○	☑
Comments: New photos may be added in the current GeoTechTools.					
Case Histories	○	○	◉	○	☑
Comments: The case histories in the current GeoTechTools look good. New case history may be added: Narsilio, G.A., Santamarina, J.C., Hebeler, T.,and Bachus, R. (2009). "Blast Desification: Multi-Instrumented Case History." Journal of Geotechnical and Geoenvironmental Engineering, 135 (6) 723-734.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments: The design guidance looks good.					
Quality Control/Quality Assurance	○	○	◉	○	☑
Comments: The quality control/assurance section in the current GeoTechTools looks good. New references may be added. For example, Richard J. Finno, M.ASCE; Aaron P. Gallant, M.ASCE; and Paul J. Sabatini, M.ASCE. Evaluating Ground Improvement after Blast Densification: Performance at the Oakridge Landfill. Journal of					
Cost Information	○	○	◉	○	☐
Comments: The cost information should be updated if available.					
Specifications	○	○	◉	○	☐
Comments: The specifications may be updated if available.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	◉	○	☑

Comments:

There have been quite a few new publications available in the literature, which may be added.

Category	No Change	Low	Moderate	High	Add
Submit Tech-Specific Info	○	○	◉	○	☑

Comments:

Researchers and users may submit tech-specific info available to them

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Deep Dynamic Compaction **Reviewer** Jie Han

Category	No Change	Low	Moderate	High	Add
Overview	○	○	◉	○	☑
Comments: This overview looks good and may be updated with the use of DDC with dewatering from the China Scan Tour report.					
Technology Fact Sheet	○	○	◉	○	☑
Comments: The Fact Sheet looks good and may be updated with the use of DDC with dewatering from the China Scan Tour report.					
Photos	○	○	◉	○	☑
Comments: A new photo may be added in the current GeoTechTools from the China Scan Tour report.					
Case Histories	○	○	◉	○	☑
Comments: The case histories in the current GeoTechTools look good. A new case history from the China Scan Tour report may be added.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments: The design guidance looks good.					
Quality Control/Quality Assurance	○	○	◉	○	☑
Comments: The quality control/assurance section in the current GeoTechTools looks good. New FHWA Ground Modification Manual may be added.					
Cost Information	○	○	◉	○	☐
Comments: The cost information should be updated if available.					
Specifications	○	○	◉	○	☐
Comments: The specifications may be updated if available.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	◉	○	☑

Comments:

There have been quite a few new publications available in the literature, which may be added.

Category	No Change	Low	Moderate	High	Add
Submit Tech-Specific Info	○	○	◉	○	☑

Comments:

Researchers and users may submit tech-specific info available to them

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Dynamic Compaction **Reviewer** Chris Woods

Category	No Change	Low	Moderate	High	Add
Overview	○	○	◉	○	☐

Comments:

A few comments. First, in parentheses on the second line it would be better to read (predominantly granular soils, but also landfill material, karst sites, and mine spoil materials). Third line "suitability" not suitable. In terms of rankings, I would suggest that Minimal Disruption of traffic should be a 3 at the lowest. Production of long lived facilities should be a 4 or a 5. Also, the picture on the overview is quite old and could be updated.

Technology Fact Sheet	○	○	◉	○	☐

Comments:

The n-value in the top image should vary from 0.3 to 0.5, not 0.8. Under advantages - first bullet should simply read "Suitable for many types of soils". Fourth bullet should read "Few specialty contractors perform this work".
Geologic Applicability - fourth bullet - insert "saturated" before silty.

Photos	○	◉	○	○	☐

Comments:

Photos are quite old. Could provide updated ones if requested.

Case Histories	○	○	◉	○	☐

Comments:

FL and SC Case Histories - Image needs to be fixed as well to "0.3<n<0.5"

Overall, the case histories are quite elementary, and could also use supplementing. If I had more time, I would be happy to provide one or two, if requested.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments:					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments:					
Cost Information	○	○	◉	○	☐
Comments: Mob costs - low $30,000, high $100,000 DDC cost - low $10, high $15					
Specifications	○	○	○	◉	☐
Comments: Table 1 appears to be incomplete, and to be honest, I'm really not sure what information is trying to be conveyed. Overall, i think this section is entirely too cumbersome, listing almost a literature review worth of specs, with no consistent guidance as to what the main parts of the specifications should be. I think this part probably needs a complete overhaul.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments:					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

Overall, not a bad overview of the dynamic compaction process. There are aspects to the "art" side of things such as tamper size and dimensioning that may be too in the weeds for this application. I think that if recommended edits outlined herein are addressed, this section is in pretty good shape.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology High-Energy Impact Rollers **Reviewer** Jie Han

Category	No Change	Low	Moderate	High	Add
Overview	◉	○	○	○	☐
Comments: This overview looks good.					
Technology Fact Sheet	○	○	◉	○	☑
Comments: The Fact Sheet looks good and may be updated with new references.					
Photos	◉	○	○	○	☑
Comments: Photos look good.					
Case Histories	○	○	◉	○	☑
Comments: New case histories in the US should be added.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments: The design guidance looks good.					
Quality Control/Quality Assurance	◉	○	○	○	☑
Comments: The quality control/assurance section in the current GeoTechTools looks good.					
Cost Information	○	○	◉	○	☐
Comments: The cost information should be updated if available.					
Specifications	○	○	◉	○	☐
Comments: The specifications may be updated if available.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	◉	○	☑

Comments:

There have been quite a few new publications available in the literature, which may be added.

Category	No Change	Low	Moderate	High	Add
Submit Tech-Specific Info	○	○	◉	○	☑

Comments:

Researchers and users may submit tech-specific info available to them

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Intelligent Compaction **Reviewer** Jie Han

Category	No Change	Low	Moderate	High	Add
Overview	○	○	○	◉	☑
Comments: There have been a lot of new research and applications in this technology. The rating level for this technology should be updated.					
Technology Fact Sheet	○	○	◉	○	☑
Comments: The fact sheet in the current GeoTechTools looks good. New Example Successful Applications and References may be added.					
Photos	◉	○	○	○	☐
Comments: All the photos in the current GeoTechTools look good.					
Case Histories	○	○	◉	○	☑
Comments: There have been quite a few new case histories, which may be added.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	○	○	◉	☑
Comments: There is very limited design guidance available in the current GeoTechTools. New design guidance should be added.					
Quality Control/Quality Assurance	○	○	◉	○	☑
Comments: The quality control/assurance section in the current GeoTechTools is comprehensive. May add some new references.					
Cost Information	○	○	◉	○	☐
Comments: The cost information should be updated due to the time change and more common use of this technology.					
Specifications	○	◉	○	○	☐
Comments: The specifications may be updated with the new references available in FHWA and DOTs.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	◉	○	☑

Comments:

There have been several new publications including the NCHRP reports available in the literature, which can be added.

Category	No Change	Low	Moderate	High	Add
Submit Tech-Specific Info	○	○	◉	○	☑

Comments:

Researchers and users may submit tech-specific info available to them

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Rapid Impact Compaction **Reviewer** Chris Woods

Category	No Change	Low	Moderate	High	Add
Overview	○	○	◉	○	☐
Comments: Rapid Renewal of Transportation Facilities - should probably be a 3					
Technology Fact Sheet	○	○	◉	○	☐
Comments: Advantages: first bullet point is categorically wrong. energy application is limited compared to dynamic compaction. Potential Disadvantages: Depth of compaction is very limited compared to alternative technologies, not that it can't be controlled.					
Photos	◉	○	○	○	☐
Comments:					
Case Histories	○	◉	○	○	☐
Comments: Not sure the fourth case history offers very much.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	○	◉	○	☐

Comments:

There are actually calculations that are involved, at least preliminarily, when it comes to RIC design that could be included in this section. They are outlined in Principles and Practice of Ground Improvement by Dr. Han.

Quality Control/Quality Assurance	◉	○	○	○	☐

Comments:

Not sure that Piezometers are a necessary add on to the QA/QC list of methods. Yes, if conducting multiple passes, it could be helpful if shallow groundwater, but in practice, I've never seen them used on a compaction job.

Cost Information	◉	○	○	○	☐

Comments:

Specifications	◉	○	○	○	☐

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments:					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

Not sure any signficant changes are required here - although the design discussion could be enhanced by included Dr. Han's calculation methods if desired.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Rapid Impact Compaction **Reviewer** Jie Huang

Category	No Change	Low	Moderate	High	Add
Overview	○	◉	○	○	☐
Comments: It covers the technology well.					
Technology Fact Sheet	○	◉	○	○	☐
Comments: Probably, some items shall be added to the disadvantage section such as suitable soil condition, possible ground vibration, not good in ground water condition etc.					
Photos	◉	○	○	○	☐
Comments: good					
Case Histories	○	◉	○	○	☐
Comments: The latest case history was 10 years ago. Do we want to add some latest ones?					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	◉	○	○	☐
Comments: There is essential no detailed guideline provided by the technology, except some references. The table should be re-created.					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments:					
Cost Information	◉	○	○	○	☐
Comments:					
Specifications	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments:					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Traditional Compaction **Reviewer** Jie Huanhg

Category	No Change	Low	Moderate	High	Add
Overview	○	○	◉	○	☐
Comments: Missing case histories.					
Technology Fact Sheet	○	◉	○	○	☐
Comments: Construction Methods: additional blank line to be deleted.					
Photos	○	◉	○	○	☐
Comments: Add rubber-tired rollers because rubber-tire rollers was discussed in the fact sheet.					
Case Histories	○	○	◉	○	☐
Comments: Case histories to be added.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments:					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments:					
Cost Information	◉	○	○	○	☐
Comments:					
Specifications	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	◉	○	○	☐

Comments:

Add
Principles and Practice of Ground Improvement by Jie Han

Submit Tech-Specific Info	◉	○	○	○	☐

Comments:

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Traditional Compaction **Reviewer** Chris Woods

Category	No Change	Low	Moderate	High	Add
Overview	◉	○	○	○	☐
Comments:					
Technology Fact Sheet	◉	○	○	○	☐
Comments:					
Photos	◉	○	○	○	☐
Comments:					
Case Histories	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments:					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments:					
Cost Information	◉	○	○	○	☐
Comments:					
Specifications	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments:					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

No comments.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Vibrocompaction **Reviewer** Jie Han

Category	No Change	Low	Moderate	High	Add
Overview	◉	○	○	○	☐
Comments: This overview looks good.					
Technology Fact Sheet	○	○	◉	○	☐
Comments: The Fact Sheet looks good and may be updated with the new FHWA manual.					
Photos	○	○	○	◉	☑
Comments: All the photos should be replaced between the existing photos are for vibro-concrete columns.					
Case Histories	○	○	◉	○	☐
Comments: The illustration for both case histories is mis-displayed and should be corrected.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments: The design guidance looks good. The FHWA manual should be updated to 2017.					
Quality Control/Quality Assurance	○	○	◉	○	☑
Comments: The quality control/assurance section in the current GeoTechTools looks good. Schaefer et al. (2016) should be updated to Schaefer et al. (2017).					
Cost Information	○	○	◉	○	☐
Comments: The cost information should be updated if available.					
Specifications	○	○	◉	○	☐
Comments: The specifications may be updated if available.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	◉	○	☑

Comments:

There have been quite a few new publications available in the literature, which may be added.

Category	No Change	Low	Moderate	High	Add
Submit Tech-Specific Info	○	○	◉	○	☑

Comments:

Researchers and users may submit tech-specific info available to them

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Aggregate Columns **Reviewer** Jie Han

Category	No Change	Low	Moderate	High	Add
Overview	○	○	◉	○	☑
Comments: There has been development of new installation equipment for rammed aggregate piers using the displacement. Update is needed.					
Technology Fact Sheet	○	○	◉	○	☑
Comments: An illustration for the new installation method for rammed aggregate piers may be added. The FHWA ground modification manual should be updated to the 2017 version.					
Photos	○	○	◉	○	☑
Comments: Photos for the new installation method for rammed aggregate piers may be added.					
Case Histories	○	○	◉	○	☑
Comments: The case histories available in the current GeoTechTools are before 2004. New case histories may be added.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	○	◉	○	☐

Comments:

The design guidance in the current GeoTechTools is comprehensive. However, there has been some new understanding about the analysis of slopes stabilized by aggregate columns, especially regarding the consideration of stress concentration ratio. The FHWA ground modification manual should be updated from 2016 to 2017.

Quality Control/Quality Assurance	○	○	◉	○	☑

Comments:

The quality control/assurance section is comprehensive. May add quality control/assurance about the displacement installation method.

Cost Information	○	○	◉	○	☐

Comments:

The cost information should be updated due to the time change and more common use of this technology.

Specifications	○	◉	○	○	☐

Comments:

The specifications may be updated with the new references available in FHWA and DOTs.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	◉	○	☑

Comments:

There have been several new publications available in the literature, which can be added.

Category	No Change	Low	Moderate	High	Add
Submit Tech-Specific Info	○	○	◉	○	☑

Comments:

Researchers and users may submit tech-specific info available to them

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Combined Soil Stabilization with Ver **Reviewer** Jie Han

Category	No Change	Low	Moderate	High	Add
Overview	○	○	○	◉	☑
Comments: The overview is not correct. "In this technique, a seamless geotextile is inserted into the ground and filled with sand or gravel. The geotextile casing around the column provides additional lateral confinement for the column in very soft soils." seems to be copied from the "Geotextile-encased columns". This overview needs be completely written. This technology may be regrouped into the "Rigid Inclusions" technology.					
Technology Fact Sheet	○	○	◉	○	☑
Comments: The fact sheet in the current GeoTechTools needs to be updated and grouped in the "Rigid Inclusions" technology.					
Photos	○	○	◉	○	☑
Comments: The photos in the current GeoTechTools need to be updated or new photos need be added.					
Case Histories	○	○	◉	○	☑
Comments: There have been more case histories in the US and should be added.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	○	◉	○	☑
Comments: The design guidance available in the current GeoTechTools mostly follows that for aggregate columns, which may not be correct. This design guidance should be updated and revised considering that for rigid inclusions. The French manual may be referenced.					
Quality Control/Quality Assurance	○	○	◉	○	☑
Comments: The quality control/assurance section in the current GeoTechTools hould be updated and revised considering that for rigid inclusions. . May add some new references.					
Cost Information	○	○	◉	○	☐
Comments: The cost information should be updated.					
Specifications	○	○	◉	○	☐
Comments: The specifications should be updated.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	◉	○	☑

Comments:

There have been quite a few new publications available in the literature, which can be added.

Category	No Change	Low	Moderate	High	Add
Submit Tech-Specific Info	○	○	◉	○	☑

Comments:

Researchers and users may submit tech-specific info available to them

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Continuous Flight Auger **Reviewer** Jie Huang

Category	No Change	Low	Moderate	High	Add
Overview	◉	○	○	○	☐
Comments:					
Technology Fact Sheet	◉	○	○	○	☐
Comments:					
Photos	◉	○	○	○	☐
Comments:					
Case Histories	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments:					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments:					
Cost Information	◉	○	○	○	☐
Comments:					
Specifications	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments:					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Excavation and replacement **Reviewer** Jie Huang

Category	No Change	Low	Moderate	High	Add
Overview	○	◉	○	○	☐
Comments: missing case histories. Otherwise, it is good.					
Technology Fact Sheet	◉	○	○	○	☐
Comments:					
Photos	◉	○	○	○	☐
Comments:					
Case Histories	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments:					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments:					
Cost Information	◉	○	○	○	☐
Comments:					
Specifications	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments:					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Geotextile Encased Columns **Reviewer** Jie Han

Category	No Change	Low	Moderate	High	Add
Overview	◉	○	○	○	☐
Comments: Even though there have been quite a lot of publications in this technology, there is almost no application in the US; therefore, the current overview is adequate.					
Technology Fact Sheet	○	○	◉	○	☑
Comments: The fact sheet in the current GeoTechTools looks good. New references may be added and the FHWA manual may be updated to the 2017 version.					
Photos	◉	○	○	○	☐
Comments: The photos in the current GeoTechTools look good.					
Case Histories	◉	○	○	○	☐
Comments: There is no case history in the US so far.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	○	◉	○	☑
Comments: The design guidance available in the current GeoTechTools is comprehensive. New references may be added.					
Quality Control/Quality Assurance	○	○	◉	○	☑
Comments: The quality control/assurance section in the current GeoTechTools is comprehensive. May add some new references.					
Cost Information	◉	○	○	○	☐
Comments: There is no case history in the US so far.					
Specifications	◉	○	○	○	☐
Comments: There is no case history or specification in the US so far.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	◉	○	☑

Comments:

There have been quite a few new publications available in the literature, which can be added.

Category	No Change	Low	Moderate	High	Add
Submit Tech-Specific Info	○	○	◉	○	☑

Comments:

Researchers and users may submit tech-specific info available to them

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Lightweight Fill **Reviewer** Jie Huang

Category	No Change	Low	Moderate	High	Add
Overview	○	◉	○	○	☐
Comments:					
Technology Fact Sheet	◉	○	○	○	☐
Comments: General Description: It will be good if the densities of different lightweight materials can be provided.					
Photos	◉	○	○	○	☐
Comments: The quality of some photos are not very good. If high quality photos are available, they shall be replaced.					
Case Histories	○	○	◉	○	☐
Comments: Different lightweight materials are discussed. Maybe each case history for each lightweight material shall be provided.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments:					
Quality Control/Quality Assurance	○	○	◉	○	☐
Comments: The QC/QA for different methods shall be described separately and maybe tabulated for easy reference.					
Cost Information	◉	○	○	○	☐
Comments:					
Specifications	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments:					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Onsite Use of Recycled Pavement M **Reviewer** Jie Han

Category	No Change	Low	Moderate	High	Add
Overview	○	○	◉	○	☑
Comments: This overview needs to be updated. There have been more uses of recycled pavement materials with geosynthetics onsite. "applicable new embankments" is typo					
Technology Fact Sheet	○	○	◉	○	☑
Comments: The fact sheet in the current GeoTechTools looks good but may be updated with the use of recycled material with geosynthetics. New references should be added.					
Photos	○	○	◉	○	☑
Comments: Some of the photos in the current GeoTechTools need to be updated with new photos.					
Case Histories	○	○	◉	○	☑
Comments: There have been more case histories in the US, which should be added.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	○	◉	○	☐
Comments: The design guidance looks good overall, but may be updated.					
Quality Control/Quality Assurance	○	○	◉	○	☑
Comments: The quality control/assurance section in the current GeoTechTools should be updated. May add some new references.					
Cost Information	○	○	◉	○	☐
Comments: The cost information should be updated.					
Specifications	○	○	◉	○	☐
Comments: The specifications should be updated with latest DOTs' specifications.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	◉	○	☑

Comments:

There have been quite a few new publications available in the literature, which can be added.

Category	No Change	Low	Moderate	High	Add
Submit Tech-Specific Info	○	○	◉	○	☑

Comments:

Researchers and users may submit tech-specific info available to them

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Sand Compaction Pile **Reviewer** Jie Huang

Category	No Change	Low	Moderate	High	Add
Overview	◉	○	○	○	☐
Comments: it seems it is in good shape.					
Technology Fact Sheet	◉	○	○	○	☐
Comments:					
Photos	◉	○	○	○	☐
Comments:					
Case Histories	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments:					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments:					
Cost Information	◉	○	○	○	☐
Comments:					
Specifications	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments:					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Vibro-Concrete Columns **Reviewer** Jie Han

Category	No Change	Low	Moderate	High	Add
Overview	◉	○	○	○	☐
Comments: This overview looks good.					
Technology Fact Sheet	○	○	◉	○	☐
Comments: The FHWA manual may be updated to the 2017 version.					
Photos	○	○	◉	○	☑
Comments: The two photos in the current GeoTechTools are for stone columns and should be replaced with new photos.					
Case Histories	◉	○	○	○	☐
Comments: The case histories in the current GeoTechTools look good.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments: The design guidance looks good.					
Quality Control/Quality Assurance	○	○	◉	○	☐
Comments: The quality control/assurance section in the current GeoTechTools looks good. The FHWA manual should be updated.					
Cost Information	○	○	◉	○	☐
Comments: The cost information should be updated.					
Specifications	○	○	◉	○	☐
Comments: The specifications should be updated with latest DOTs' specifications.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	◉	○	☑

Comments:

There have been quite a few new publications available in the literature, which may be added.

Category	No Change	Low	Moderate	High	Add
Submit Tech-Specific Info	○	○	◉	○	☑

Comments:

Researchers and users may submit tech-specific info available to them

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Electro-Osmosis **Reviewer** Jie Huang

Category	No Change	Low	Moderate	High	Add
Overview	○	○	◉	○	☐

Comments:

There is some new development in China and Europe, which should be added.

Technology Fact Sheet	◉	○	○	○	☐

Comments:

General Description:
To add that "this method has also been widely used to removal contamination in soils."

Potential Disadvantages:
Remove "Lack of detailed case history data demonstrating the cost benefits in comparison with

Photos	○	○	◉	○	☐

Comments:

New photos from the report of China Scan tour report can be added to here.

Case Histories	○	○	◉	○	☐

Comments:

The two case histories are from 1960s and 1970s. Newer ones shall be added.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	○	◉	○	☐
Comments: The table shall be re-created. More details of how to estimate the time and energy consumption need to be added.					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments:					
Cost Information	○	○	◉	○	☐
Comments: More information can be added based on Chinese experience.					
Specifications	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments: More references to be added.					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Geosynthetic Separation in Paveme

Reviewer John Lostumbo

Category	No Change	Low	Moderate	High	Add
Overview	○	○	○	◉	☐

Comments:

The information provided is very dated it will require significant review. The summary statement "This technique is mainly applicable to stabilization of the pavement working platform" is not accurate. Some state DOT's now require separator geotextiles anytime base aggregate is placed on subgrade, regardless of condition. Separation and Stabilization/Reinforcement ore different. All pictures are very old. In my opinion, all ratings should be 5 for this technology. Additional

Technology Fact Sheet	○	◉	○	○	☐

Comments:

The AASHTO M288 reference of 2006 is old, that standard was updated in 2015 and again in 2017. Current version is M288-17. Geogrids and composites are not complementary technologies to separation. Maybe for drainage or reinforcement, but not separation, they are not cost effective for separation only. Potential disadvantages, last 2 bullets should be removed.

Photos	○	○	○	◉	☐

Comments:

Only 2 photos are provided and the photos are very old. We can provide updated photos.

Case Histories	○	◉	○	○	☐

Comments:

More case studies needed.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	○	○	◉	☐

Comments:

The overarching guidance is AASHOT M288 (2017), this should be placed at the top of the Design Guidance page. Most all State DOT's have a standard geotextile separation specification, these should also be referenced.

Category	No Change	Low	Moderate	High	Add
Quality Control/Quality Assurance	○	○	○	◉	☐

Comments:

NTPEP is not mentioned at all in the QA/QC section. NTPEP GTX is required by many DOT's for geotextile separation applications and should be outlined in this section. There are also several ASTM standards that cover sampling and testing of geosynthetics that are not included on this page.

Category	No Change	Low	Moderate	High	Add
Cost Information	○	○	○	◉	☐

Comments:

The statement about "woven fabrics are more expensive than nonwoven fabrics" is not accurate. There is a wide range of both and in some cases woven are less expensive and in some cases nonwovens are. The pricing is probably on the high side, $2.50 for separator geotextiles is too high. Low end could be under $1.00/SY.

Category	No Change	Low	Moderate	High	Add
Specifications	○	○	○	◉	☐

Comments:

This section references an old version of AASHTO M288. The current version is 2017. There is no mention of DOT specifications. Most DOT's have a standard separation geotextile spec, these should be added.

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	○	◉	☐

Comments:

The first link on the page is not valid. All other references do not have a link to the reference.

Submit Tech-Specific Info	◉	○	○	○	☐

Comments:

Comments:

It appears this Technology has not be reviewed or updated in over 10 years. There is significant information available to include on this Technology but it would take significant time. I would be happy to help update it to current standards.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Geosynthetic Separation in Paveme **Reviewer** Jie Han

Category	No Change	Low	Moderate	High	Add
Overview	○	◉	○	○	☐
Comments: The overview for this technology looks good. There may be limited updates based on some new research.					
Technology Fact Sheet	○	◉	○	○	☐
Comments: The fact sheet looks good. There may be limited updates based on some new research.					
Photos	○	○	◉	○	☑
Comments: There have been quite a few good photos available on geosynthetics used for separation. May include a photo with a geogrid-geotextile composite.					
Case Histories	○	○	◉	○	☑
Comments: Currently two case histories with paved roads are included in the GeoTechTools. It will be good to include a case history with an unpaved road.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	◉	○	○	☐
Comments: The current design guidance looks good. There may be limited update based on new research.					
Quality Control/Quality Assurance	○	◉	○	○	☑
Comments: The quality control/assurance section looks good. May add or replace the references associated with this section.					
Cost Information	○	○	◉	○	☐
Comments: The cost information should be updated due to the time change.					
Specifications	○	◉	○	○	☐
Comments: The specifications may be updated with the new references available in DOTs.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	◉	○	☑

Comments:

There have been several new reports and papers (e.g., Hoppe et al. 2019 and Xiao et al. 2016) available in the literature, which can be included.

Edward J. Hoppe, M. Shabbir Hossain, Audrey K. Moruza, and Chaz B. Weaver (2019). Use of Geosynthetics for Separation and Stabilization in Low-Volume Roadways. FHWA/VTRC20-R8.

Xiao, M., Stoffels, S., Qui, T., and Kermani, B., Evaluation of Geotextile Separation to Prevent

Submit Tech-Specific Info	○	○	◉	○	☑

Comments:

Researchers and users may submit tech-specific info available to them

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Geosynthetics in Pavement Drainag **Reviewer** John Lostumbo

Category	No Change	Low	Moderate	High	Add
Overview	○	○	○	◉	☐

Comments:

Geosynthetics for pavement drainage is one of the most common uses of geosynthetic material. The rating table for this should be 5 for all categories. Overall, the information provided is good but dated. There should be more clear differentiation between geotextiles for subsurface drainage, drainage composites, French drains/trench drains, etc.

Technology Fact Sheet	○	○	◉	○	☐

Comments:

More detail is needed for geotextiles, geocomposites and drainage systems.

Photos	○	○	○	◉	☐

Comments:

Only 1 photo that is showing just one type of pavement drainage. This section should have several photos showing different pavement drainage materials and methods.

Case Histories	○	○	○	◉	☐

Comments:

Only 2 old case histories are provided.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	○	◉	○	☐

Comments:

AASHTO M288 reference of 2006 version is old, should be updated to 2017. The design summary is fine but does not provide users with a clear method to apply to a project. AASHTO M288-17 should also be discussed in more detail. This is the default standard for geotextile selection for subsurface drainage for pavement applications.

Category	No Change	Low	Moderate	High	Add
Quality Control/Quality Assurance	○	○	◉	○	☐

Comments:

This section should include detailed discussion of AASHTO NTPEP GTX for use of geotextiles in subsurface drainage applications.

Category	No Change	Low	Moderate	High	Add
Cost Information	○	○	◉	○	☐

Comments:

OK but should be checked and updated.

Category	No Change	Low	Moderate	High	Add
Specifications	○	○	○	◉	☐

Comments:

Needs to be updated to current specs, ie. M288-17. More discussion about NTPEP GTX.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	◉	○	○	☐
Comments:					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Geosynthetics in Pavement Drainag **Reviewer** Jie Han

Category	No Change	Low	Moderate	High	Add
Overview	○	○	○	◉	☑
Comments: Wicking geotextile for pavement drainage is not included in the current GeoTechTools. This product has been introduced to the market, researched, and increasingly used in projects since the development of the GeoTechTools. Therefore, the overview should be updated by adding the information about this product and applications.					
Technology Fact Sheet	○	○	○	◉	☑
Comments: The fact sheet should be updated by adding the facts of using wicking geotextile for pavement drainage.					
Photos	○	○	○	◉	☑
Comments: There have been quite a few good photos available about wicking geotextile and applications.					
Case Histories	○	○	○	◉	☑
Comments: There have been at least three well-documented case histories about the use of wicking geotextile to mitigate pavement problems related to drainage.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	○	◉	○	☑
Comments: Design guidance for the use of wicking geotextile for pavement drainage is still under development. There is limited information available for update.					
Quality Control/Quality Assurance	○	○	◉	○	☑
Comments: Quality control/assurance for the use of wicking geotextile is important, but there is limited information available to date.					
Cost Information	○	○	○	◉	☑
Comments: Several DOTs (e.g., Alaska, Montana, Missouri, Kansas, Texas) have used this product; therefore, there should be some cost information available from them.					
Specifications	○	○	◉	○	☑
Comments: There is limited information available about specifications to date.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	○	◉	☑

Comments:

There have been several reports and papers available in the literature, which can be included.

Category	No Change	Low	Moderate	High	Add
Submit Tech-Specific Info	○	○	◉	○	☑

Comments:

Researchers and users may submit tech-specific info available to them

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Hydraulic Fill with Geocomposite an **Reviewer** Jie Huang

Category	No Change	Low	Moderate	High	Add
Overview	○	○	◉	○	☐

Comments:

This technology has been frequently in Asia. Therefore, more details can be found in literature, which shall be added here.

Technology Fact Sheet	○	○	◉	○	☐

Comments:

Construction Methods:
" Vacuum loads of 80 to 100 kPa are applied to the drains are used to induce consolidation in the soils." According to the existing report, it is very hard to reach 80 kPa or above.

Photos	○	◉	○	○	☐

Comments:

More photos to be added.

Case Histories	○	○	◉	○	☐

Comments:

More case histories shall be added, which shall include more details such as:
1. spacing and depth of the PVD s
2. the vacuum was applied
3. more monitoring data shall be added if available.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	○	◉	○	☐
Comments: The table shall be reorganized. More references should be provided since there is significant application in Asia such as Singapore, China.					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments:					
Cost Information	◉	○	○	○	☐
Comments: Maybe there is something in the literature in recent years. It is worth looking into it.					
Specifications	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	◉	○	☐
Comments: Needs to be updated with recent advance in this technology.					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Partial Encapsulation **Reviewer** Jie Huang

Category	No Change	Low	Moderate	High	Add
Overview	◉	○	○	○	☐
Comments:					
Technology Fact Sheet	○	◉	○	○	☐
Comments: Construction Methods: An additional blank line needs to be removed.					
Photos	◉	○	○	○	☐
Comments:					
Case Histories	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	◉	○	○	☐
Comments: The table is to be reorganized.					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments:					
Cost Information	◉	○	○	○	☐
Comments: It is not common that so many state DOTs provided cost information but not providing case histories.					
Specifications	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments:					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Prefabricated Vertical Drains and Fil **Reviewer** Jie Huang

Category	No Change	Low	Moderate	High	Add
Overview	◉	○	○	○	☐
Comments: Overall, this technology is covered very well in terms of design, construction, cost, materials, QC/QA. This sets a good example for other technology.					
Technology Fact Sheet	◉	○	○	○	☐
Comments:					
Photos	◉	○	○	○	☐
Comments:					
Case Histories	○	◉	○	○	☐
Comments: Maybe one or two more case histories should be added.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments:					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments:					
Cost Information	◉	○	○	○	☐
Comments:					
Specifications	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments:					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Vacuum Preloading with and withou

Reviewer Jie Huang

Category	No Change	Low	Moderate	High	Add
Overview	◉	○	○	○	☐
Comments: In general, this technology is covered well except the case histories are rather old. And more recent ones can be added. It is my personal opinion that this technology can be combined with "Hydraulic Fill with Geocomposite and Vacuum Consolidation". It is also convenient for the users to find the relevant information easily.					
Technology Fact Sheet	◉	○	○	○	☐
Comments:					
Photos	◉	○	○	○	☐
Comments:					
Case Histories	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments:					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments:					
Cost Information	○	○	◉	○	☐
Comments: This technology is advantageous compared with other loading method; thus, the cost information is very critical for this technology. If possible, it shall be added.					
Specifications	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments:					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Fiber reinforcement in pavement sy **Reviewer** Anand J. Puppala

Category	No Change	Low	Moderate	High	Add
Overview	○	○	◉	○	☐

Comments:

1. The overview section only mentions about the potential use of fibers in pavements. The use of fibers to reduce shrinkage cracks and failure of highway embankments may be added.
2. Nothing is mentioned about resistance to tension cracks.

Technology Fact Sheet	○	○	◉	○	☐

Comments:

1. Reduction in shrinkage characteristics may be added in the 'Advantages' section.
2. Other case studies may be included in 'Example successful applications' section.
3. Durability issues of natural fibers may be added in 'Potential disadvantages' section.

Photos	○	◉	○	○	☐

Comments:

Photos from other case studies may be added.

Case Histories	○	○	◉	○	☐

Comments:

Only a case study from 1993 is provided on the website. Recent case studies should be updated.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	○	◉	○	☐
Comments: The durability aspects are not covered.					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments:					
Cost Information	○	○	○	◉	☑
Comments: No cost estimates are provided					
Specifications	◉	○	○	○	☐
Comments: More comprehensive specification is needed.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments: Other case studies should be added.					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Geocell Confinement in Pavement S **Reviewer** Anand J. Puppala

Category	No Change	Low	Moderate	High	Add
Overview	○	○	◉	○	☐

Comments:

1. The benefits of using Geocell to increase the stiffness properties of Recycled Asphalt Pavement (RAP) aggregate bases should be included in this section.
2. Recent laboratory and field implementation studies may be added.

Technology Fact Sheet	○	○	◉	○	☐

Comments:

1. Geometric specifications of commercially available Geocell may be included in the 'Additional Information' section.
2. Details of recent case studies may be updated in 'Example successful applications' section.
3. Practicing engineers and construction crew may be unfamiliar with Geocell-reinforced pavement systems – may be added in the 'Potential disadvantages' section.

Photos	○	◉	○	○	☐

Comments:

Recent photos may be included.

Case Histories	○	○	◉	○	☐

Comments:

A case study from 1995 is just provided. Recent case studies may be added.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	◉	○	○	☐

Comments:

Following reference may be added.
Yang, Xiaoming, Jie Han, Dov Leshchinsky, and Robert L. Parsons. "A three-dimensional mechanistic-empirical model for geocell-reinforced unpaved roads." Acta Geotechnica 8, no. 2 (2013): 201-213.

Quality Control/Quality Assurance	○	○	◉	○	☐

Comments:

1. Proper stretching of Geocells and preventing damage to the Geocell while compacting – may be added to QC process control.
2. The utilization of advanced monitoring tools such as UAV-CRP and LIDAR to monitor pavement cracking or rutting could be included in the QA/QC sections.

Cost Information	○	○	◉	○	☐

Comments:

The unit cost of pavement with HDPE and NPA type Geocells should be included, separately.

Specifications	○	○	◉	○	☐

Comments:

Latest reference of 2011 is provided. Most recent references should be included.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments:					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Geosynthetic Reinforced Constructi

Reviewer Barry Christopher

Category	No Change	Low	Moderate	High	Add
Overview	○	◉	○	○	☑
Comments: Remove the word "temporary" from the first sentence, and modify last sentence as follows: ..... applicable to stabilization of the working platform for "temporary and permanent roads"					
Technology Fact Sheet	○	◉	○	○	☑
Comments: Remove the word "temporary" from the first sentence, as this application is for both temporary and permanent applications as indicated in the following recommendation for the General Description and Geologic Applications. Under General Description, after third sentence, add: There is also a potential for improved support for permanent unpaved and paved roads as indicated in the design references.					
Photos	○	◉	○	○	☑
Comments: Add a few photos					
Case Histories	○	◉	○	○	☑
Comments: Should add a DOT case history on long term performance in a permanent roadway application (e.g., Washington DOT - see					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐

Comments:

In the table of FHWA design guidelines add:

Geotechnical Aspects of Pavement - 2010 - FHWA-NHI-132040 - Yes it is available for download
Ground Improvement Methods, Vol. II - 2015 - FHWA-NHI-16-028 and FHWA GEC13 - Yes - GEC13

Quality Control/Quality Assurance	◉	○	○	○	☐

Comments:

Cost Information	○	◉	○	○	☑

Comments:

Update

Specifications	○	◉	○	○	☑

Comments:

Should Include reference to AASHTO M288 (2017) Standard Specifications for Transportation Materials and Methods of Sampling and Testing, specially the specifications for subgrade stabilization. This is an update from the FHWA 2008 manual.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	◉	○	☐

Comments:

Should update the Bibliography - There have been a number of new test sections constructed, e.g., Montana DOT (Cuelho and Perkins, 2009 and Cuelho et al., 2014) and Washington DOT has a project with long-term monitoring that is not included in the references.
AASHTO must also be updated - AASHTO Designation: R 50-09 "Geosynthetic Reinforcement of the Aggregate Base Course of Flexible Pavement Structures"
and AASHTO M288 - 2017 which includes subgrade stabilization

Submit Tech-Specific Info	◉	○	○	○	☐

Comments:

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Geosynthetic reinforcement constru **Reviewer** Anand J. Puppala

Category	No Change	Low	Moderate	High	Add
Overview	◉	○	○	○	☐
Comments:					
Technology Fact Sheet	◉	○	○	○	☐
Comments: 1. Include the following in the 'Advantages' section: i) Reduction in thickness of the platform ii) Significant reduction in materials iii) Creates a safe and durable working surface iv) Increased bearing capacity					
Photos	○	◉	○	○	☐
Comments: Recent photos may be included.					
Case Histories	○	◉	○	○	☐
Comments: Recent case studies may be included.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments:					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments:					
Cost Information	○	◉	○	○	☐
Comments: Cost information for recently developed geocomposite might be included.					
Specifications	○	◉	○	○	☐
Comments: Recent specifications may be added.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments:					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Geosynthetic Reinforcement in Pave **Reviewer** Anand J. Puppala

Category	No Change	Low	Moderate	High	Add
Overview	○	○	◉	○	☐

Comments:

The figures from recent case studies using geotextiles may be included.

Technology Fact Sheet	○	○	◉	○	☐

Comments:

1. Include the following in the 'Advantages' section:
i) Manufactured product with higher quality control.
ii) Drainage of subgrade moisture through gravity and capillary action.
iii) Elaborate database for design available.
iv) Carbon footprint is minimum.

Photos	◉	○	○	○	☐

Comments:

Recent photos may be included.

Case Histories	○	◉	○	○	☐

Comments:

Following paper may be included.

Zornberg, Jorge G., Marcelo Azevedo, Mark Sikkema, and Brett Odgers. "Geosynthetics with enhanced lateral drainage capabilities in roadway systems." Transportation Geotechnics 12 (2017): 85-100.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	○	◉	○	☐

Comments:

Some recent advances in MEPDG design guidelines should be included.

Category	No Change	Low	Moderate	High	Add
Quality Control/Quality Assurance	○	○	◉	○	☐

Comments:

1. The utilization of advanced monitoring tools such as UAV-CRP and LIDAR to monitor pavement cracking or rutting could be included in the QA/QC sections

2. Automated Plate Load Test (APLT) for the monitoring of base and subgrade performance may be included in the 'Method Summary' section

Category	No Change	Low	Moderate	High	Add
Cost Information	○	○	◉	○	☐

Comments:

1. Cost ranges are based on data from 2009 through 2010. Some recent data should be included.

2. The cost of recently developed geosynthetics/ geocomposites should be included.

Category	No Change	Low	Moderate	High	Add
Specifications	◉	○	○	○	☐

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	◉	○	○	☐

Comments:

Latest reference of 2010 is provided. Most recent references should be included.

Submit Tech-Specific Info	◉	○	○	○	☐

Comments:

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Geosynthetic Reinforced Pavement **Reviewer** Taylor

Category	No Change	Low	Moderate	High	Add
Overview	◉	○	○	○	☐
Comments: Possible picture update.					
Technology Fact Sheet	◉	○	○	○	☐
Comments: Newer references?					
Photos	◉	○	○	○	☐
Comments: Possible update?					
Case Histories	○	◉	○	○	☑
Comments: Two case studies.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	○	◉	○	☐
Comments: Update to newer design standards.					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments: Update in referecnes.					
Cost Information	○	◉	○	○	☐
Comments: Cost information up to 2010.					
Specifications	○	◉	○	○	☐
Comments: Specification identification table is blank. Update reference to specifications					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	◉	○	○	☐

Comments:

There are a lot of references. Check for more recent references. Latest date 2010.

Submit Tech-Specific Info	◉	○	○	○	☐

Comments:

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Geosynthetic Reinforced Embankme

Reviewer Barry Christopher

Category	No Change	Low	Moderate	High	Add
Overview	○	◉	○	○	☑

Comments:

Note, missing from this application is use of this technology for reinforced embankments over local anomalies (i.e., locally weak soils and karst topography) as noted in the FHWA reference cited in the design section. As the design methods for this application are completely different, this would require a new technology be added to GeoTechTools or this technology could be extended to include that application and a separate design section added.

Technology Fact Sheet	○	◉	○	○	☑

Comments:

Note, as indicated above, the use of this technology for reinforced embankments over local anomalies (e.g., locally weak soils and karst topography) is missing. If the technology is modified to include this application, then add it to the General Description section of fact sheet. Also under Geological Conditions: need to add locally weak soils and karst topography as a special application area.

Photos	○	◉	○	○	☑

Comments:

Update photos showing recent projects: e.g. include photos from Woodrow Wilson Bridge (see reference

Case Histories	○	○	◉	○	☑

Comments:

Add short write-up on Woodrow Wilson Bridge Project based on the paper by Paylor, Christopher, and Nyren (2008) cited in the bibliography. Note that this projects required the highest strength geosynthetics ever used in the US for the reinforced embankments and the project was fully instrumented. There is also a 2nd reference listed below in the Bibliography section with additional instrumentation results.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	◉	○	○	☑

Comments:

Need to add software to Step 7 of the design (e.g., ReSSA could be used for the rotational stability analysis in determining the reinforcement requirements).

See previous comment on fact sheet, and if included in the description of the technology, also add design method and references for reinforced embankments over local anomalies.

Quality Control/Quality Assurance	◉	○	○	○	☐

Comments:

In Table 1, Material Related, add reference to AASHTO's National Transportation Product Evaluation Program (NTPEP) on Geosynthetic Reinforcement

Cost Information	○	◉	○	○	☑

Comments:

Should add additional DOT cost information, if available.

Specifications	◉	○	○	○	☐

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	◉	○	○	☑
Comments: Perform reference search and update as required					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

Note, missing from this application is use of this technology for reinforced embankments over local anomalies (i.e., locally weak soils and karst topography) as noted in the FHWA reference cited in the design section. As the design methods for this application are completely different, this would require a new technology to be added to GeoTechTools or this technology could be extended to include that application and a separate design section added.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Reinforced Soil Slopes **Reviewer** Barry Christopher

Category	No Change	Low	Moderate	High	Add
Overview	◉	○	○	○	☐
Comments:					
Technology Fact Sheet	○	◉	○	○	☑
Comments: Under General Description, add composite geosynthetics that provide lateral drainage have also been used for reinforcement of wet, marginal soils reduce pore pressure during construction due to compaction and accelerate post construction consolidation. Geocells have also been used as reinforcement and for constructing the face in reinforced soil slopes,					
Photos	○	◉	○	○	☑
Comments: Photos of recent projects should be added along with photo's of projects that are over 20 to 30 years old to demonstrate long term performance and aesthetics.					
Case Histories	○	◉	○	○	☑
Comments: Add updated long term performance information to Salmon Lost Trail Case History from Collins, B.M., Christopher, B.R., and Barrows, R.J., "Monitoring Data over a Twenty Year Period for a 50 Foot High Reinforced Soil Slope," Proceedings of Geosynthetics 2015, Portland, Oregon, 2015					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	◉	○	○	☑
Comments: At the end of design need to note that software is available (e.g., ReSSA plus others) and add the software to the design references					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments: In Table 1, under Material Related, add requirement for AASHTO's National Transportation Product Evaluation Program (NTPEP) certification of geosynthetic reinforcement properties.					
Cost Information	◉	○	○	○	☐
Comments:					
Specifications	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐

Comments:

add Collins, B.M., Christopher, B.R., and Barrows, R.J., "Monitoring Data over a Twenty Year Period for a 50 Foot High Reinforced Soil Slope," Proceedings of Geosynthetics 2015, Portland, Oregon, 2015

Submit Tech-Specific Info	◉	○	○	○	☐

Comments:

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology MSE **Reviewer** Taylor

Category	No Change	Low	Moderate	High	Add
Overview	○	◉	○	○	☐
Comments: The text is not complete, it is missing some words. Needs revision. Cross section could be updated.					
Technology Fact Sheet	○	◉	○	○	☐
Comments: Spelling errors in document. Remove proprietary name Tecco Mesh. Example successful applications are old. Update key reference date for AASHTO.					
Photos	○	◉	○	○	☑
Comments: Project are old - add more pictures.					
Case Histories	○	○	◉	○	☐
Comments: Too many GRS compared to standard MSE. Needs to be updated. No metion of GRS in the overview or the fact sheet.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	◉	○	○	☐
Comments: Update reference dates. Material characteristics for geosynthetic only, should include steel.					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments: Summary of FHWA documents					
Cost Information	○	◉	○	○	☐
Comments: Costs may need to be update.					
Specifications	◉	○	○	○	☐
Comments: Specification is directed toward the simplified method presented in FHWA and is the Arizona DOT specification.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments:					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

Technology should have all references to AASHTO updated.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Shored MSE **Reviewer** Taylor

Category	No Change	Low	Moderate	High	Add
Overview	○	◉	○	○	☐
Comments: Picture shows shored gravity T-Wall. Update picture.					
Technology Fact Sheet	○	○	◉	○	☐
Comments: Reference 2003 soil nail.					
Photos	○	◉	○	○	☑
Comments: Modify to newer pictures?					
Case Histories	○	◉	○	○	☑
Comments: Two case studies. first is 1997. Second is same case study as soil nail. Update and add new case studies.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	○	○	◉	☐
Comments: Link to reference manual is not active. "Supporting References" needs to be on own line. Some links are not active. Minor formatting issues, i.e sentence return, etc.					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments: References the FHWA MSE manual and the Soil Nail manual for QA/QC.					
Cost Information	○	○	○	◉	☑
Comments: No cost information.					
Specifications	○	○	◉	○	☐
Comments: Link to this specification? Needs update of vendors shown in the specification. This should be removed.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	◉	○	☐

Comments:

Check for more recent references. Latest date 2015. Gap between 2009 and 2015.

Submit Tech-Specific Info	◉	○	○	○	☐

Comments:

Comments:

Specification is for screw-in nails.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Micropiles **Reviewer** Jie Huang

Category	No Change	Low	Moderate	High	Add
Overview	◉	○	○	○	☐
Comments:					
Technology Fact Sheet	◉	○	○	○	☐
Comments:					
Photos	◉	○	○	○	☐
Comments:					
Case Histories	○	◉	○	○	☐
Comments: Micropiles are often used in underpinning. Probably, a case history of such application can be added.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments:					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments:					
Cost Information	◉	○	○	○	☐
Comments:					
Specifications	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments:					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Drilled and Grouted Soil Nail **Reviewer** Taylor

Category	No Change	Low	Moderate	High	Add
Overview	◉	○	○	○	☐
Comments: Update picture?					
Technology Fact Sheet	○	○	◉	○	☐
Comments: Pictures from 2003 manual. Update to new manual pictures. Hollow-bars are referenced as "still being developed", add new developments. Potential Disadvantages are for aggregate piers?					
Photos	○	◉	○	○	☑
Comments: Modify to newer pictures?					
Case Histories	○	◉	○	○	☑
Comments: Two case studies. Modify to add more and newer? Some minor adjustment to paragraph spacing in first case study. Second case study has minor grammatical erros.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	○	○	◉	☐
Comments: Design guidance is from 2003, link is not active. Revise to latest Soil Nail specification. References up to 2010. Add new references.					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments: References the FHWA Soil Nail manual for QA/QC 2015. Under cube test micropile is referenced in the General Comments.					
Cost Information	○	○	○	◉	☑
Comments: Cost information summary is from the Geocell Confinement Pavement System and is not cost for soil nail. Historical cost is from 2010. Update.					
Specifications	○	○	◉	○	☐
Comments: Table appears to be incomplete. There are Edit links that go to About Page. Specifications reference FHWA 2003, and DFI 2009. Summary has minor spacing issues.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	◉	○	☐
Comments: Check for more recent references. Latest date 2015. Gap between 2010 and 2015.					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

Specification is for screw-in nails.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Screw-In Soil Nail **Reviewer** Taylor

Category	No Change	Low	Moderate	High	Add
Overview	◉	○	○	○	☐
Comments: Picture could be better, maybe with a cross section that is on fact sheet.					
Technology Fact Sheet	○	◉	○	○	☐
Comments: There are minor grammatical errors and missing punctuation.					
Photos	○	◉	○	○	☑
Comments: Project are old - add more pictures.					
Case Histories	○	○	◉	○	☐
Comments: Only two case histories.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	◉	○	○	☐
Comments: Uses proprietary design for Hubble and Chance anchor. References FHWA					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments: Summary of FHWA documents					
Cost Information	○	◉	○	○	☐
Comments: Costs may need to be update.					
Specifications	○	○	○	◉	☐
Comments: Specification is directed toward sand compacted piles.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	◉	○	☐

Comments:

References pertain mostly to soil-nail and not screw in soil nail. Update with reference papers on screw in nails.

Submit Tech-Specific Info	◉	○	○	○	☐

Comments:

Comments:

Specification is for sand-compacted columns.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Shoot-In Soil Nail **Reviewer** Taylor

Category	No Change	Low	Moderate	High	Add
Overview	◉	○	○	○	☐
Comments:					
Technology Fact Sheet	○	◉	○	○	☐
Comments: Key references my need to be updated.					
Photos	○	◉	○	○	☑
Comments: Add newer pictures.					
Case Histories	○	○	◉	○	☑
Comments: Only one case histories.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	◉	○	○	☐
Comments: Design guidance is from 1992. References back to FHWA Soil Nail Wall GEC-7. Check for updates. References that is temporary. Is new data available to supplement this?					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments: References the FHWA Soil Nail manual for QA/QC. Verification and Proof testing references gout to ground bond value (remove).					
Cost Information	○	○	○	◉	☑
Comments: No cost information					
Specifications	○	○	○	◉	☐
Comments: Specification is directed toward screw-in nails.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	◉	○	☐

Comments:

Check for more recent references. Latest date 2015. Gap between 2008 and 2015.

Submit Tech-Specific Info	◉	○	○	○	☐

Comments:

Comments:

Specification is for screw-in nails.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Column-Supported Embankments **Reviewer** Jie Huang

Category	No Change	Low	Moderate	High	Add
Overview	○	◉	○	○	☐
Comments:					
Technology Fact Sheet	○	◉	○	○	☐
Comments: Column supported embankment can be with or without geosynthetic reinforcement. It shall be made clear in the fact sheet.					
Photos	○	◉	○	○	☑
Comments: Adding more photos to show the columns.					
Case Histories	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments:					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments:					
Cost Information	◉	○	○	○	☐
Comments:					
Specifications	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments:					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Mechanical Stabilization of Subgrad **Reviewer** Jie Huang

Category	No Change	Low	Moderate	High	Add
Overview	○	◉	○	○	☐
Comments:					
Technology Fact Sheet	◉	○	○	○	☐
Comments:					
Photos	○	○	◉	○	☑
Comments: More updated photos can be added					
Case Histories	○	○	◉	○	☑
Comments: Only one case history is currently included and is a 24-year old project. More recent case histories shall be added.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	◉	○	○	☐
Comments: need some update.					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments:					
Cost Information	○	◉	○	○	☐
Comments: Cost information is at least 10-year old. If possible, it shall be updated					
Specifications	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	◉	○	○	☑
Comments: updated					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Bulk-Infill Grouting **Reviewer** Jie Han

Category	No Change	Low	Moderate	High	Add
Overview	○	○	◉	○	☐
Comments: This overview looks good. The figure may be improved by redrawing.					
Technology Fact Sheet	◉	○	○	○	☐
Comments: The Fact Sheet looks good.					
Photos	○	○	○	◉	☑
Comments: An illustration included (no photo) should be replaced with a photo.					
Case Histories	◉	○	○	○	☐
Comments: The case histories look ok, but may be improved with new case histories if available..					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments: The design guidance looks good.					
Quality Control/Quality Assurance	○	○	◉	○	☐
Comments: The quality control/assurance section in the current GeoTechTools looks good. Schaefer et al. (2016) should be updated to Schaefer et al. (2017). Ohio Department of Transportation (1998) may be updated if a new version is available.					
Cost Information	○	○	◉	○	☐
Comments: The cost information should be updated if available.					
Specifications	○	○	◉	○	☐
Comments: The specifications may be updated if available.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	◉	○	☑

Comments:

There have been quite a few new publications available in the literature, which may be added.

Category	No Change	Low	Moderate	High	Add
Submit Tech-Specific Info	○	○	◉	○	☑

Comments:

Researchers and users may submit tech-specific info available to them

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Chemical Grouting **Reviewer** Dr. Donald A. Bruce

Category	No Change	Low	Moderate	High	Add
Overview	○	○	○	◉	☐

Comments:

Current Version is outdated and urgently needs newer information. Much can be found in the ASCE Grouting Conferences in New Orleans, as noted below. Too much reliance on Hayward Baker's info which is a little dated.

Technology Fact Sheet	○	○	○	◉	☐

Comments:

There are incorrect statements relating to soil permeability ("low"), depth (30 meters is wrong) "significant" setting time and pre-grouting (9C-B grout) is typically used. Also the Kidd Creek case history was not a chemical project (silicate used as an accelerant only).

Photos	○	○	○	◉	☐

Comments:

Out of date and commercial.

Case Histories	○	○	○	◉	☐

Comments:

Only one provided (archaic). There are many more available in the ASCE Grouting Conference Proceedings 1992, 2003, 2012, and 2017 amongst others.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	○	◉	○	☐

Comments:

FHWA/NIH document is more recent. See also Xanthakos, Abramson, and Bruce book (1994) Chapter 7. Also ASCE Conferences.

Category	No Change	Low	Moderate	High	Add
Quality Control/Quality Assurance	○	◉	○	○	☐

Comments:

Same comment about the need for more recent references. Also some of the References quoted are not for chemical grouting.

Category	No Change	Low	Moderate	High	Add
Cost Information	○	○	○	◉	☐

Comments:

Price should NOT be based on volume of chemicals used, but on volume of ground treated. Drilling and sleeved pipe costs are also significant. More recent data are required.

Category	No Change	Low	Moderate	High	Add
Specifications	○	○	◉	○	☐

Comments:

More sources needed. Focus on performance based specs as opposed to prescriptive.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	◉	○	☐

Comments:

Needs updating - nothing is less than 13 years old.

Submit Tech-Specific Info	◉	○	○	○	☐

Comments:

Urgent need for newer references.

Comments:

Major revision and update required. Use the ASCE Grouting Conferences 1982, 1992, 2003, 2012, and 2017 as main data sources. Use of chemical grouting is declining, with rise of microfine materials, jet grouting and Deep Mixing.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Chemical Grouting/Injection System **Reviewer** Jie Huang

Category	No Change	Low	Moderate	High	Add
Overview	○	○	○	◉	☐

Comments:

This technology probably needs a comprehensive modification and addition to include missing information as well as latest development. Chemical grouting uses a wide range of chemicals including salts, resins etc., which shall be discussed in details separately.

Chemical grouting

Technology Fact Sheet	○	◉	○	○	☐

Comments:

Advantages:
More advantages to be added.

Chemical grouting involves injecting a variety of chemicals into the soil; therefore, they all should be discussed to give users a good background.

Photos	○	◉	○	○	☐

Comments:

More photos are needed.

Case Histories	○	○	◉	○	☐

Comments:

The case history is a little old. Maybe some recent ones shall be added.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments:					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments:					
Cost Information	◉	○	○	○	☐
Comments:					
Specifications	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments:					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Deep Mixing Methods **Reviewer** Jie Han

Category	No Change	Low	Moderate	High	Add
Overview	○	○	◉	○	☐
Comments: The photo should be replaced with better illustration. The rating may be updated.					
Technology Fact Sheet	○	◉	○	○	☑
Comments: The "SHRP2 Applications" may be changed to "Applications" and add "Excavation support" and "Cutoff curtains".					
Photos	◉	○	○	○	☐
Comments: The photos look good.					
Case Histories	◉	○	○	○	☐
Comments: The case histories look good.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments: The design guidance looks good.					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments: The quality control/assurance section in the current GeoTechTools looks good. .					
Cost Information	○	○	◉	○	☐
Comments: The cost information should be updated if available.					
Specifications	○	○	◉	○	☐
Comments: The specifications may be updated if available.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	◉	○	☑

Comments:

There have been quite a few new publications available in the literature, which may be added.

Category	No Change	Low	Moderate	High	Add
Submit Tech-Specific Info	○	○	◉	○	☑

Comments:

Researchers and users may submit tech-specific info available to them

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Jet Grouting **Reviewer** Dr. Donald A. Bruce

Category	No Change	Low	Moderate	High	Add
Overview	○	◉	○	○	☐
Comments: Could be expanded to include an indication of the range of properties of the treated soil.					
Technology Fact Sheet	○	◉	○	○	☐
Comments: Needs updated references. Also Xanthakos, Abramson, and Bruce (1994), Chapter 8.					
Photos	○	○	◉	○	☐
Comments: Add photos of batching/pump equipment and spoils return during jetting. Keller also have good photos of the jets operating in air.					
Case Histories	○	○	○	◉	☐
Comments: Recent case histories are essential - see ASCE New Orleans Conferences.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	○	◉	○	☐
Comments: This should focus more on the design of the jet grouting itself, and not on the application design. Triple fluid jetting is not now common. Update required.					
Quality Control/Quality Assurance	○	○	◉	○	☐
Comments: Update required.					
Cost Information	○	○	◉	○	☐
Comments: Unit costs (c.y.) are high. Costs do NOT necessarily decrease with depth. Different systems have different unit costs. Needs updating.					
Specifications	○	○	◉	○	☐
Comments: A "clean" copy of the Grouting Committee document should be provided ie without comments from individual members. I think there is a new version.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	◉	○	☐

Comments:

Some references are NOT for jet grouting. Updating needed.

Submit Tech-Specific Info	◉	○	○	○	☐

Comments:

Comments:

This document is considerably further advanced and up to date than the "Chemical Grouting" one. However, updating would be useful. The Grouting Committee document should be used as a basis for many sections.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Jet Grouting **Reviewer** Jie Han

Category	No Change	Low	Moderate	High	Add
Overview	◉	○	○	○	☐
Comments: The overview looks good.					
Technology Fact Sheet	○	◉	○	○	☑
Comments: The "SHRP2 Applications" may be changed to "Applications" and other applications may be added, e.g., underpinning. Schaefer et al. (2016) should be updated to Schaefer et al. (2017).					
Photos	◉	○	○	○	☐
Comments: The photos look good.					
Case Histories	○	○	◉	○	☑
Comments: The illustration does not make any sense for this case study and should be replaced. Other case histories (e.g., underpinning) may be added.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments: The design guidance looks good.					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments: The quality control/assurance section in the current GeoTechTools looks good.					
Cost Information	○	○	◉	○	☐
Comments: The cost information should be updated if available.					
Specifications	○	○	◉	○	☐
Comments: The specifications may be updated if available.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	◉	○	☑

Comments:

There have been quite a few new publications available in the literature, which may be added.

Category	No Change	Low	Moderate	High	Add
Submit Tech-Specific Info	○	○	◉	○	☑

Comments:

Researchers and users may submit tech-specific info available to them

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Mass Mixing Methods **Reviewer** Jie Huang

Category	No Change	Low	Moderate	High	Add
Overview	○	◉	○	○	☐
Comments: Case histories shall be modified to include other applications of this technology.					
Technology Fact Sheet	◉	○	○	○	☐
Comments:					
Photos	◉	○	○	○	☐
Comments:					
Case Histories	◉	○	○	○	☐
Comments: Case 1: the figure showing the formula can be removed or reduce its size. This technology can be used increasing soil strength, mitigation expansion or soil collapse. Three case histories are all about improving soil strength. Maybe different case histories can be added to cover other applications.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments:					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments:					
Cost Information	◉	○	○	○	☐
Comments:					
Specifications	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments:					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Compaction Grouting **Reviewer** Jie Huang

Category	No Change	Low	Moderate	High	Add
Overview	◉	○	○	○	☐
Comments:					
Technology Fact Sheet	◉	○	○	○	☐
Comments: Potential disadvantages: Maybe listed two items, i.e., (1)QA/QC procedures need to be further developed; and (2) Design methodology is not well articulated, shall be removed. These two items apply to many of the technology in GeotechTools. But they are not listed here but not others.					
Photos	◉	○	○	○	☐
Comments:					
Case Histories	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	○	◉	○	☐
Comments:					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments: The monitoring the grouting pressure shall be discussed in details in this section. Also it shall discuss the curing time for the grout. In addition, it will be good if the criteria for quality of grout can be discussed.					
Cost Information	◉	○	○	○	☐
Comments:					
Specifications	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments:					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Injected Lightweight Foam Fill **Reviewer** Jie Huang

Category	No Change	Low	Moderate	High	Add
Overview	◉	○	○	○	☐
Comments:					
Technology Fact Sheet	◉	○	○	○	☐
Comments: More details of injected materials shall be provided, such as chemical names or chemical structures. In addition, it shall discuss about the pot life and curing time of the injected chemicals. Potential disadvantages are not discussed.					
Photos	◉	○	○	○	☐
Comments:					
Case Histories	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments:					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments:					
Cost Information	◉	○	○	○	☐
Comments:					
Specifications	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments:					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Bio-Treatment for Subgrade Stabiliz **Reviewer** Jie Huang

Category	No Change	Low	Moderate	High	Add
Overview	○	○	◉	○	☐

Comments:

This method probably can be expanded to include bio-induced gel to reduce permeability and bio-induced gas to mitigate liquefaction. Bio-geotechnology is new but promising technology. Even though it has not been adopted by real project in U.S., GeotechTools may serve as a vehicle to inform practitioners.

Technology Fact Sheet	○	○	◉	○	☐

Comments:

Geologic Applicability:
Both cohesive and cohesionless soils can be improved with bio-treatment

As a matter of fact, it is very hard to use in cohesive soil.

Photos	◉	○	○	○	☐

Comments:

Case Histories	○	○	◉	○	☐

Comments:

There is no case history in U.S. It deserves the effort to check if Europe and Japan have case histories.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments:					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments:					
Cost Information	◉	○	○	○	☐
Comments:					
Specifications	◉	○	○	○	☐
Comments:					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Chemical Grouting **Reviewer** Gary Taylor

Category	No Change	Low	Moderate	High	Add
Overview	○	◉	○	○	☐

Comments:

Consider mentioning chemical grouting is intended to some or all available pore spaces in granular soils depending on the application. Partial pore space infilling is typically needed for structural applications to improve strength or add cohesion to prevent raveling. Infilling of most pore spaces may be required to reduce / mitigate groundwater or gas permeability.

Technology Fact Sheet	○	○	◉	○	☐

Comments:

Basic Functions have more applications that should be added including but not limited to liquefaction mitigation, temporary excavation support, encapsulation of contaminated soil, etc. Also this paragraph states it can treat relatively coarse soil which is not the case (add graphic with gradation ranges for typical grouts)
Advantages also include produces less waste than jet grouting, can use a variety of chemical grouts

Photos	○	◉	○	○	☐

Comments:

Could use additional photos from case histories showing actual grouted soil.

Case Histories	○	◉	○	○	☐

Comments:

Perhaps more recent and major case histories should be considered.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments: No comments here					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments: No comments here					
Cost Information	◉	○	○	○	☐
Comments: Pricing for sodium silicate is dependent upon the proximity to the chemical manufacturing plant since the material has a unit weight of 11.6 lbs/gallon, shipping costs must be considered. Perhaps unit pricing for mobilization, cost per lineal foot of TAM, and cost per gallon of grout injected could be considered.					
Specifications	◉	○	○	○	☐
Comments: Note example specifications from past projects (i.e. LA Metro) need to be reviewed as several mention the use of ordinary portland cement and microfine, which in most cases is not applicable. Also sampling frequency (i.e. every 250 gallons is excessive).					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐

Comments:

Perhaps reference ICOG (New Orleans conferences) and RETC papers

Submit Tech-Specific Info	◉	○	○	○	☐

Comments:

Comments:

Perhaps consider this section as Permeation Grouting and include microfine / ultrafine cements. Polyurethane applications are very rare in chemical grouting and cement or cement/silicate grouts are more typical. Polyurethane injections is typically for lifting applications only since post verification testing such as SPT / CPT is not applicable.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Deep Soil Mixing **Reviewer** Dr. Peter Cali

Category	No Change	Low	Moderate	High	Add
Overview	○	○	◉	○	☐
Comments: The photographs are mostly of Treviicos equipment. As the first exposure of the viewer to the DSM site, this overview may inject a bias of contractor selection. Consider raising the level of Disruption of Traffic to account for spoil removal in urban environments.					
Technology Fact Sheet	◉	○	○	○	☐
Comments: No comments.					
Photos	○	◉	○	○	☑
Comments: See comment in Overview.					
Case Histories	◉	○	○	○	☐
Comments: Good assortment of applications.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments: Good references 0 no recommendations for change.					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments: Consider adding guidance to the user that QA/QC testing in type and frequency of testing should match the design intent and acceptable risk. Strength testing is less important than hydraulic conductivity testing for a seepage control application while permeability may be unimportant for embankment reinforcement applications.					
Cost Information	◉	○	○	○	☐
Comments: Good general guidance on cost so that alternate technologies can be compared.					
Specifications	◉	○	○	○	☐
Comments: No comments.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments: Good references. No comments.					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments: No comments.					

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Deep Mixing Methods **Reviewer** Rakshya Shrestha

Category	No Change	Low	Moderate	High	Add
Overview	○	○	◉	○	☑

Comments:

More than one picture could be added. Recent pictures showing different DMM equipments currently in use could be added. The Rating Table can be updated based on the recent applications of DMM.

Technology Fact Sheet	○	○	◉	○	☑

Comments:

The photo can be replaced with other recent photos.

Basic Function: Reduction of permeability could also be listed as one of the basic function as DMM have been used for cut-off wall applications.

Photos	○	○	◉	○	☑

Comments:

Photos from more recent projects including different DMM applications could be added.

Case Histories	○	○	◉	○	☑

Comments:

The six case histories presented look ok, but this section may be improved with new available case histories including other DMM application such as ports, shorelines and dams.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	◉	○	○	☑

Comments:

References: Book entitled 'The Deep Mixing Method' by Masaki Kitazume and Masaaki Terashi was published in 2013. This book includes very useful information about engineering properties of soil-cement, QC/QA and case examples. Therefore, recommend adding it in the References section.

Quality Control/Quality Assurance	○	○	◉	○	☑

Comments:

Individual QC/QA Methods> QC/QA Method: Coring> Adequacy of Coverage: For core sampling frequency, due to the recent development of more efficient mixing tools such as large diameter multi-axis mixing tools, it is more representative to identify the coring frequency as 2% to 4% of the number of DMM elements installed rather than relying on the area of coverage described in paragraph two of this section.

Cost Information	◉	○	○	○	☐

Comments:

Specifications	○	◉	○	○	☐

Comments:

FHWA Deep Mixing Guide Specifications is the most suitable specification for DMM. However, based on the recent developments of more efficient mixing tools such as large diameter multi-axis mixing tools, it is more representative to identify the coring frequency as 2% to 4% of the number of DMM elements installed rather than relying on the area of coverage described in Section 3.6 QC, G. Coring. of the FHWA DMM Guide Specifications.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	◉	○	☑

Comments:

There are some good publications such as the Book entitled 'The Deep Mixing Method' by Masaki Kitazume and Masaaki Terashi published in 2013 that can be added in the list of References.

Category	No Change	Low	Moderate	High	Add
Submit Tech-Specific Info	◉	○	○	○	☑

Comments:

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Jet Grouting **Reviewer** Alan Ringen

Category	No Change	Low	Moderate	High	Add
Overview	◉	○	○	○	☐
Comments: The overview looks good.					
Technology Fact Sheet	○	◉	○	○	☐
Comments: The term "soilcrete" has been used as a trade name, suggest replacing with "soil cement" as a more generic term in all locations throughout the document.					
Photos	○	○	◉	○	☑
Comments: The photos look good, but additional photos of the support equipment (batch plant, grout pump, etc.) would be useful to show the scope of the overall operation.					
Case Histories	○	○	○	◉	☑
Comments: The illustration should be replaced with depictions of the work. Other case histories demonstrating various applications (shoring, underpinning, ground improvement, etc.) should be added.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments: The design guidance looks good.					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments: The QC/QA section looks very thorough.					
Cost Information	○	○	○	◉	☑
Comments: The cost information needs to be significantly updated. I have seen pricing for mobilization range from ~$50,000 to over $250,000, and unit prices for jet grout production from ~$100.00 to $1,000.00 per cubic yard depending on volume, depth, and technical risk.					
Specifications	○	◉	○	○	☐
Comments: The ASCE Geo-Institute Committee - Jet Grouting Task Force members need to be updated.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	○	◉	○	☑

Comments:

Many new publications are available in the literature, and should be added.

Category	No Change	Low	Moderate	High	Add
Submit Tech-Specific Info	◉	○	○	○	☑

Comments:

It's good that researchers and users may submit tech-specific info available to them.

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Jet Grouting **Reviewer** Dr. Peter Cali

Category	No Change	Low	Moderate	High	Add
Overview	○	○	◉	○	☐
Comments: The photographs are mostly of Treviicos equipment. As the first exposure of the viewer to the DSM technology portal, this overview could inject a bias of contractor selection. Consider raising the level of impact on Disruption of Traffic for removal of spoil materials in an urban environment.					
Technology Fact Sheet	◉	○	○	○	☐
Comments: No comments.					
Photos	○	◉	○	○	☑
Comments: See comments on Overview.					
Case Histories	◉	○	○	○	☐
Comments: Good assortment of applications.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments: Good references.					
Quality Control/Quality Assurance	○	◉	○	○	☐
Comments: Consider adding guidance that the design intent of the DMM should dictate the type and level of QA/QC testing. Compressive strength is less important than hydraulic conductivity for a seepage cutoff application whereas the opposite would be true for reinforcement applications. The type and frequency of laboratory and in situ testing should be based on the design intent and risk tolerance.					
Cost Information	◉	○	○	○	☐
Comments: Instructive on the wide range of costs, but good for comparison to alternate technologies.					
Specifications	◉	○	○	○	☐
Comments: Good guidance.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments: References are a bit dated (only one post-2010).					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments: No comments.					

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Mass Mixing Methods **Reviewer** E. A. Stern

Category	No Change	Low	Moderate	High	Add
Overview	○	○	○	◉	☐

Comments:

I am commenting on this section as the last section to be read based on all the other sections after this. It seems that this overview is really specific for highway SSM and MS. I don't think this was the overall intention of this module since the other moduels go into some very good details on other applications - not just highway. Right off the bat it gets a "1" for traffic disruption? Not sure you want to go there if you are promoting SSM and MS in the "Overview" - It seems that perhaps we can grab ⊞

Technology Fact Sheet	○	○	◉	○	☑

Comments:

Suggestion is to add recent phtographs for SSM (anything more up to date since 1992?) as well as for mass stabilization. Having a schematic illustration along with a process photo could be helpful - including a process flow since many of these applications are just not the stabilization equipment itself.
Tvically in soil engineering circles the use of the term dredged "soils" in incorrect. If the material is ⊞

Photos	○	○	◉	○	☑

Comments:

Honestly just doing my own internet search on "Mass Stabilization" of soils and sediments there were a number of images that seemed more clearer and "instructive" than what is presented on the website. These include schematics that also could be helpful. The black and white photos may convey a larger area of mass stabilization if that was the purpose. Otherwise those photos may want to be replaced with more up to date photos as well as photos that show vertically what is going on ⊞

Case Histories	○	○	◉	○	☑

Comments:

US Highway 1 is an excellent example. Geotech with environmental restoration at a high volume of soils treated.
Highway 12 (Finland) is a good example also - application of geotextile along with using Granulated Glass Furnace Slag which is used more in Europe than in the US. There is quite a bit of Mass Stabilization work coming out of Finland - primarily by Ramboll. This may be a reference that can ⊞

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Category	No Change	Low	Moderate	High	Add
Design Guidance	○	◉	○	○	☐

Comments:

FHWA published... (spell out the 1st time used - not every reader knows what this is).
The procedures summarized in this document... (what document? this webpage? website?)
Dredged fill stabilization... (Dredged Material Stabilization for fill applications and beneficial use)
Under Applications: Environmental Restoration and Beneficial Use, Dikes and behind Bulkheads. My impression is that this concept and/or application could be stated more since in reality - this is where the applications and market is - especially in attracring new and younger engineers into this

Quality Control/Quality Assurance	○	◉	○	○	☐

Comments:

Preferred QC/QA Procedures: Isn't is usually QA/QC?
There are three primary goals of the QC/QA program: Compliance with regulatory controls? Many agencies ask for QA/QC as well as HASPs as part of the regulatory record and/or permitting.
This is a strong section in general. I am not sure if you want to add "Leachability Considerations" as part of this module. As this relates to the effect on groundwater and/or upland mixing "capping" etc

Cost Information	○	○	◉	○	☐

Comments:

The costs of using mass mixing methods on a highway project ....(do we want to come right out and say that these costs are specific to highway projects??) - perhaps say "as an example". I magine using DOT Highway projects for costs is that they are open bids and not confidential to a specific company. With that said, the cost ranges presented in this document are based on data from 2009 through 2011 for deep mixing methods....Any projects that have a more up to date reference? 2011 is nearly 10 years ago? Surely there must be more recent costing data - specifically with regard to the cost of

Specifications	○	◉	○	○	☐

Comments:

Check wrap around formatting (spaces)
The reviewed specifications and their associated performance levels are listed in Table 1 on the next page. (there is no page - are listed in Table 1 BELOW).
Shouldn't the 3 specifications in the text be actually on the table?

This is a general questiion related to Specifications but could probably be considered in some of the

No Change – leave category as is
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Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	◉	○	○	☐

Comments:

Jasperse, B.H. (). In-Situ Stabilization Using Shallow Soil Mixing and Deep Soil Mixing. Geo-Con, Inc. (date?)
Lahtinen, P. and Niutanen, V. (). "Development of In-Situ Mass Stabilization Technique in Finland." (date?) incomplete ref?
I would suggest the Maher et al (2014) reference if it's decided to use it as a ref for Processed Dredged Material. I should mention that in that reference there also is some pricing that may be abl

Submit Tech-Specific Info	◉	○	○	○	☐

Comments:

This is an excellent dashboard! Many of my individual comments will be addressed by practitioneer submissions - Case Studies, costs etc.

Comments:

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Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Compaction Grouting **Reviewer** Lisheng Shao

Category	No Change	Low	Moderate	High	Add
Overview	○	◉	○	○	☐
Comments: Needs to extend the application to liquefaction mitigation, for building foundations, levees, excavation supports, etc.					
Technology Fact Sheet	○	◉	○	○	☐
Comments: Need to add application in liquefaction mitigation, and building foundations.					
Photos	○	◉	○	○	☑
Comments: Need to add mass mixing wet method.					
Case Histories	○	◉	○	○	☐
Comments: Need to add a few new project case histories.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments:					
Quality Control/Quality Assurance	○	◉	○	○	☐
Comments: Add data acquisition as part of QA/QC					
Cost Information	○	◉	○	○	☐
Comments: The cost information should be updated.					
Specifications	○	◉	○	○	☐
Comments: Minor changes in sample spec					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	◉	○	○	☑
Comments: A few new publications available in the literature, which may be added.					
Submit Tech-Specific Info	◉	○	○	○	☑
Comments: Looks good					

Comments:

Relative minor update in the application.

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Compaction Grouting **Reviewer** Alan Ringen

Category	No Change	Low	Moderate	High	Add
Overview	○	◉	○	○	☐
Comments: The illustration is not correctly sequenced. The middle illustration should be the first one on the left, as it is in the Fact Sheet.					
Technology Fact Sheet	◉	○	○	○	☐
Comments: This section is reasonably complete.					
Photos	◉	○	○	○	☐
Comments: The photos look good, and show the scope of the overall operation.					
Case Histories	○	○	○	◉	☑
Comments: The illustrations should be added to better explain the work. Otherwise, these are good examples of compaction grouting.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	◉	○	○	○	☐
Comments: The design guidance looks good.					
Quality Control/Quality Assurance	◉	○	○	○	☐
Comments: The QC/QA section looks very thorough.					
Cost Information	◉	○	○	○	☑
Comments: The cost information looks reasonable.					
Specifications	○	○	◉	○	☑
Comments: The ASCE Geo-Institute Committee - Compaction Grouting Task Force has developed a consensus guide for compaction grouting that should be referenced here. The guide specification provided are good too.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	◉	○	○	☑

Comments:

There are many new publications available in the literature that could be added, but there are quite a few already here.

Category	No Change	Low	Moderate	High	Add
Submit Tech-Specific Info	◉	○	○	○	☑

Comments:

It's good that researchers and users may submit tech-specific info available to them.

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Subject Matter Inventory

Technology Compaction Grouting **Reviewer** Lisheng Shao

Category	No Change	Low	Moderate	High	Add
Overview	○	◉	○	○	☐
Comments: Needs to extend the application to liquefaction mitigation, in dams, tanks, etc.					
Technology Fact Sheet	○	◉	○	○	☐
Comments: Need to add application in dams, liquefaction mitigation, and deep mine backfill.					
Photos	○	◉	○	○	☑
Comments: Need to add new drill technologies, such as sonic drilling, vibrating push, etc.					
Case Histories	○	◉	○	○	☐
Comments: Need to add compaction grouting application in dams, and buildings.					

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Design Guidance	○	○	◉	○	☐
Comments: Need to add ASCE GI 53-19, Compaction Grouting Consensus Guide (2019)					
Quality Control/Quality Assurance	○	○	◉	○	☐
Comments: Need to incorporate with ASCE GI 53-19, Compaction Grouting Consensus Guide (2019)					
Cost Information	○	○	◉	○	☐
Comments: The cost information should be updated. Add monitoring requirements.					
Specifications	○	○	◉	○	☐
Comments: Need to add sample spec in ASCE GI 53-19, Compaction Grouting Consensus Guide (2019)					

No Change – leave category as is
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Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	○	◉	○	○	☑
Comments: A few new publications available in the literature, which may be added.					
Submit Tech-Specific Info	◉	○	○	○	☑
Comments: Looks good					

Comments:

In general, the application of compaction grouting should be extended outside transportation related projects. More advanced drilling technologies, computerized monitoring and presentation, liquefaction mitigation, etc, should be updated.

No Change – leave category as is
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High – Completely redo the category – replace category information
Add – Addition of new material

Category	No Change	Low	Moderate	High	Add
Bibliography	◉	○	○	○	☐
Comments: More references can be added.					
Submit Tech-Specific Info	◉	○	○	○	☐
Comments:					

Comments:

No Change – leave category as is
Low – Some minor changes to category – spelling, grammar, format
Moderate – Medium changes to category – spelling, grammar, format, revision, removal, replacement
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