

APPENDIX C – SUMMARY OF RESPONSES TO QUESTIONNAIRE

This appendix presents a tabulated summary of the responses to the questionnaire (see Appendix B). The following points should be noted with respect to the information in this appendix.

- Descriptive answers and comments have been paraphrased for brevity. These paraphrased responses are indicated by an asterisk [“(*)”] in the forms presented in this appendix.
- Where no response was provided, “--” is used in the summary responses.
- Six of the respondents were contacted for clarification of their responses. The information included in this appendix contains the clarified responses.
- The original questionnaires with the full responses are available from CFLHD.
- Information that was requested to be kept confidential by respondents has been omitted from the summary.

A synthesis of the responses is presented in Chapter 4.

APPENDIX C – SUMMARY OF RESPONSES TO QUESTIONNAIRE

1: PREPARER/GENERAL INFORMATION		#1	
a	Firm	Con-Tech Systems LTD.	
b	Name/Title	Horst Aschenbroich, Pres./CEO	
c	Phone/E-mail	604.946.5571/ horst@contechsystems.com	
d	% HBSN use: temporary, permanent	90%	90%
e	Is lack of corrosion guidance an impediment to HBSN use? Would clear corrosion guidance help?	Yes	Yes
f	Could the preparer be further contacted?	Yes	
2: COATINGS			
a	Use of purple marine epoxy coating, thickness, application	Yes	8 mils Permanent
b	Use of green epoxy coating, thickness, application	No	-- --
c	Use of galvanization, thickness, application	Yes, with problems	10 mils Permanent
d	Have you exhumed HBSNs and could you provide findings?	Yes	Yes, many tests in Europe/North America shows 100% grout cover with Titan nails
3: SACRIFICIAL STEEL			
a	Aware of use of sacrificial steel? What thickness?	Yes	See Con-Tech brochure for guidance on sacrificial steel
4: GROUT			
a	Thickness	1.5 inches minimum	
b	Strength	3000 psi	
c	Cement type	Portland Cement, Type I	
d	Water:Cement (W:C) ratio	0.45 for final grout	
e	Type of mixer	Colloidal	
f	Final strength or diluted for drilling	Both in non-cohesive ground, diluted (w:c ratio=0.7 for flushing) and final (w:c ratio=0.4)	
5: EVALUATION OF SOIL CORROSIVITY			
a	By Assumptions or Data?	Assumptions	
b	Use guidance in GEC #4?	No	
c	Use guidance in GEC #7?	No	
d	Use guidance in some other reference?	DIN 50 929-3, Table 7(*)	
6: FIELD CORROSION TESTING PROGRAM			
a	Conducted a field program and have copy?	Yes	Yes (by Ischebeck)
7: LABORATORY CORROSION TESTING PROGRAM			
a	Conducted a lab program and have copy?	Yes	Yes (Swiss Test)
8: THREAD TYPE/CONFIGURATION			
a	Effect on corrosion rates? Supporting information?	Yes	See Brochure (Test by TUM, Germany)
9: ENCAPSULATED HBSNs			
a	Aware of encapsulated HBSNs? Have info?	Yes	Only with additional coating. Sometimes w/ corrugated short HDPE sheath
b	Are encapsulated HBSNs feasible from an economical and construction viewpoint?	No	With proper boring/grouting, grout cover is guaranteed over nail length; near top of nail encapsulated HBSN could be used
10: DRILL BIT AND CENTRALIZERS			
a	Drill bit:HBSN OD ratio	2" larger for sand; 3" larger for gravel	
b	Use centralizers? What % of jobs? Distance between centralizers and other info	Yes	100% Max Distance = 10'
11: AWARENESS OF OTHER CORROSION STUDIES			
	Aware of other corrosion studies? Where?	Yes	Switzerland
12: ADDITIONAL INPUT AND/OR SUGGESTIONS			
	Do you have additional input and/or suggestions for corrosion evaluation? Provide input/suggestions	Yes	In Germany min 35mm grout cover is used for permanent applications. Use INOX steel for extremely corrosive ground (*)

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1: PREPARER/GENERAL INFORMATION		#2	
a	Firm	Friedrich Ischebeck GmbH	
b	Name/Title	Ernst Ischebeck	
c	Phone/E-mail	0049.2333.8305-0/ ischebeck@ischebeck.de	
d	% HBSN use: temporary, permanent	90%	10%
e	Is lack of corrosion guidance an impediment to HBSN use? Would clear corrosion guidance help?	Yes	Yes
f	Could the preparer be further contacted?	Yes	
2: COATINGS			
a	Use of purple marine epoxy coating, thickness, application	Yes (blue epoxy aka "combi-coating")	@3.5 mils galvanize+@5 mils epoxy Permanent
b	Use of green epoxy coating, thickness, application	No	
c	Use of galvanization, thickness, application	Yes	@3.5 mils Permanent
d	Have you exhumed HBSNs and could you provide findings?	Yes	Yes (see 2007 ICE London Conference presentation by Ischebeck)
3: SACRIFICIAL STEEL			
a	Aware of use of sacrificial steel? What thickness?	No	
4: GROUT			
a	Thickness	20-50 mm (0.8 - 2.0 inches)	
b	Strength	35 N/mm ² (5076 psi)	
c	Cement type	Portland or HS-Cement	
d	Water:Cement (W:C) ratio	0.4 - 0.5	
e	Type of mixer	Colloidal	
f	Final strength or diluted for drilling	Both, diluted (w:c ratio=0.7 to 1.0 for flushing) and final (w:c ratio=0.4 to 0.5)	
5: EVALUATION OF SOIL CORROSIVITY			
a	By Assumptions or Data?	Water analysis and ranking as per DIM 50 929-3 Table 7	
b	Use guidance in GEC #4?	No	
c	Use guidance in GEC #7?	No	
d	Use guidance in some other reference?	DIN 50 929-3, Table 7	
6: FIELD CORROSION TESTING PROGRAM			
a	Conducted a field program and have copy?	Yes	Yes, but study incomplete (by Ischebeck)
7: LABORATORY CORROSION TESTING PROGRAM			
a	Conducted a lab program and have copy?	Yes	Yes (Swiss Test)
8: THREAD TYPE/CONFIGURATION			
a	Effect on corrosion rates? Supporting information?	Yes	See Brochure (Test by Schiessl)
9: ENCAPSULATED HBSNs			
a	Aware of encapsulated HBSNs? Have info?	Yes	Only with additional coating. Sometimes w/ corrugated short HDPE sheath (*)
b	Are encapsulated HBSNs feasible from an economical and construction viewpoint?	No	
10: DRILL BIT AND CENTRALIZERS			
a	Drill bit:HBSN OD ratio	50 mm (2") larger for Sand; 75 mm (3") larger for Gravel	
b	Use centralizers? What % of jobs? Distance between centralizers and other info	Yes	100% Max Distance = 10'
11: AWARENESS OF OTHER CORROSION STUDIES			
	Aware of other corrosion studies? Where?	No	
12: ADDITIONAL INPUT AND/OR SUGGESTIONS			
	Do you have additional input and/or suggestions for corrosion evaluation? Provide input/suggestions	Yes	In Germany min 35mm grout cover is used for permanent applications, Use DIN 50 929-3, Table 7 for guidance, use INOX steel for more corrosion resistance (*)

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1: PREPARER/GENERAL INFORMATION		#3	
a	Firm	DBM Contractors, Inc.	
b	Name/Title	Tom Armour	
c	Phone/E-mail	206.730.4591/ tarmour@dbm.com	
d	% HBSN use: temporary, permanent	0%	10%
e	Is lack of corrosion guidance an impediment to HBSN use? Would clear corrosion guidance help?	No	Yes
f	Could the preparer be further contacted?	Yes	
2: COATINGS			
a	Use of purple marine epoxy coating, thickness, application	No	
b	Use of green epoxy coating, thickness, application	No	
c	Use of galvanization, thickness, application	No	
d	Have you exhumed HBSNs and could you provide findings?	No	
3: SACRIFICIAL STEEL			
a	Aware of use of sacrificial steel? What thickness?	Yes	62.5 mils
4: GROUT			
a	Thickness	3 inches	
b	Strength	4000 psi	
c	Cement type	Type I/II	
d	Water:Cement (W:C) ratio	0.45	
e	Type of mixer	Colloidal	
f	Final strength or diluted for drilling	Both, diluted and final strength	
5: EVALUATION OF SOIL CORROSIVITY			
a	By Assumptions or Data?	Both	
b	Use guidance in GEC #4?	No	
c	Use guidance in GEC #7?	No	
d	Use guidance in some other reference?	Yes, Personal Experience with MSE walls	
6: FIELD CORROSION TESTING PROGRAM			
a	Conducted a field program and have copy?	No	
7: LABORATORY CORROSION TESTING PROGRAM			
a	Conducted a lab program and have copy?	No	
8: THREAD TYPE/CONFIGURATION			
a	Effect on corrosion rates? Supporting information?	No	Call Horst (604.946.5571)
9: ENCAPSULATED HBSNs			
a	Aware of encapsulated HBSNs? Have info?	No	
b	Are encapsulated HBSNs feasible from an economical and construction viewpoint?	No	
10: DRILL BIT AND CENTRALIZERS			
a	Drill bit:HBSN OD ratio	4:1	
b	Use centralizers? What % of jobs? Distance between centralizers and other info	No	
11: AWARENESS OF OTHER CORROSION STUDIES			
	Aware of other corrosion studies? Where?	No	Call Horst (604.946.5571)
12: ADDITIONAL INPUT AND/OR SUGGESTIONS			
	Do you have additional input and/or suggestions for corrosion evaluation? Provide input/suggestions	Yes	Be careful, starting to see a number of MSE walls failures due to corrosion. Biggest concern is installation damage (*)

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1: PREPARER/GENERAL INFORMATION		#4	
a	Firm	DYWIDAG Systems International, USA	
b	Name/Title	Lucian Bogdan, Chief Engineer	
c	Phone/E-mail	562.531.6161/ lucian.bogdan@dsiamerica.com	
d	% HBSN use: temporary, permanent	1%	5%
e	Is lack of corrosion guidance an impediment to HBSN use? Would clear corrosion guidance help?	Yes	Yes
f	Could the preparer be further contacted?	Yes	
2: COATINGS			
a	Use of purple marine epoxy coating, thickness, application	Yes	7 mils per ASTM A934 Permanent
b	Use of green epoxy coating, thickness, application	Yes, very rarely	7 mils per ASTM A775 Permanent
c	Use of galvanization, thickness, application	Yes	5 mils per ASTM A123
d	Have you exhumed HBSNs and could you provide findings?	No	
3: SACRIFICIAL STEEL			
a	Aware of use of sacrificial steel? What thickness?	Yes	There are no US standards; concern at coupler areas (*)
4: GROUT			
a	Thickness	N/A (not involved in grouting as a manufacturer)	
b	Strength	N/A (not involved in grouting as a manufacturer)	
c	Cement type	N/A (not involved in grouting as a manufacturer)	
d	Water:Cement (W:C) ratio	N/A (not involved in grouting as a manufacturer)	
e	Type of mixer	N/A (not involved in grouting as a manufacturer)	
f	Final strength or diluted for drilling	N/A (not involved in grouting as a manufacturer)	
5: EVALUATION OF SOIL CORROSIVITY			
a	By Assumptions or Data?	--	
b	Use guidance in GEC #4?	--	
c	Use guidance in GEC #7?	--	
d	Use guidance in some other reference?	Yes, PTI Rock and Soil Anchor Recommendations (*)	
6: FIELD CORROSION TESTING PROGRAM			
a	Conducted a field program and have copy?	No	
7: LABORATORY CORROSION TESTING PROGRAM			
a	Conducted a lab program and have copy?	No	Check with CALTRANS for their study
8: THREAD TYPE/CONFIGURATION			
a	Effect on corrosion rates? Supporting information?	No	There is no clear evidence
9: ENCAPSULATED HBSNs			
a	Aware of encapsulated HBSNs? Have info?	Yes, but used very rarely	Pregouted encapsulation was never used. At top end of bar pump grout in 3-ft long HDPE over bar in field (*)
b	Are encapsulated HBSNs feasible from an economical and construction viewpoint?	No	Encapsulation may be damaged during drilling; does not cover coupler area (*)
10: DRILL BIT AND CENTRALIZERS			
a	Drill bit:HBSN OD ratio	2.33:1	
b	Use centralizers? What % of jobs? Distance between centralizers and other info	Yes, if req'd	
11: AWARENESS OF OTHER CORROSION STUDIES			
	Aware of other corrosion studies? Where?	Yes	European/BS standards for solid bars (*)
12: ADDITIONAL INPUT AND/OR SUGGESTIONS			
	Do you have additional input and/or suggestions for corrosion evaluation? Provide input/suggestions	Yes	Galvanized+epoxied bars for permanent applications in non-corrosive soils. Define soil aggressivity. Do not use HBSNs in corrosive soils for permanent applications (*)

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1: PREPARER/GENERAL INFORMATION		#5		
a	Firm	Hayward Baker, Inc.		
b	Name/Title	John Wolosick		
c	Phone/E-mail	770.442.1801/ jrwolosick@haywardbaker.com		
d	% HBSN use: temporary, permanent	20%	25%	
e	Is lack of corrosion guidance an impediment to HBSN use? Would clear corrosion guidance help?	Yes	Yes	
f	Could the preparer be further contacted?	Yes		
2: COATINGS				
a	Use of purple marine epoxy coating, thickness, application	Yes	7-12 mils	Permanent
b	Use of green epoxy coating, thickness, application	No	--	--
c	Use of galvanization, thickness, application	Yes	4-7 mils	Permanent
d	Have you exhumed HBSNs and could you provide findings?	No	--	
3: SACRIFICIAL STEEL				
a	Aware of use of sacrificial steel? What thickness?	No	--	
4: GROUT				
a	Thickness	0.75 inches (rock bit) - 2.25 inches (clay bit)		
b	Strength	6000 psi		
c	Cement type	Type I/II		
d	Water:Cement (W:C) ratio	0.45 with water reducer		
e	Type of mixer	Colloidal		
f	Final strength or diluted for drilling	Both, or drill with water only and pump grout at the end		
5: EVALUATION OF SOIL CORROSIVITY				
a	By Assumptions or Data?	Usually only when we ask for it		
b	Use guidance in GEC #4?	No		
c	Use guidance in GEC #7?	Yes		
d	Use guidance in some other reference?	No		
6: FIELD CORROSION TESTING PROGRAM				
a	Conducted a field program and have copy?	No		
7: LABORATORY CORROSION TESTING PROGRAM				
a	Conducted a lab program and have copy?	No		
8: THREAD TYPE/CONFIGURATION				
a	Effect on corrosion rates? Supporting information?	No		
9: ENCAPSULATED HBSNs				
a	Aware of encapsulated HBSNs? Have info?	Yes	See CALTRANS detail at top of nail; can also use a trumpet as in ground anchors	
b	Are encapsulated HBSNs feasible from an economical and construction viewpoint?	Yes	Only for top 5 ft or so	
10: DRILL BIT AND CENTRALIZERS				
a	Drill bit:HBSN OD ratio	Varies by bit type/manufacturer. 3-6" for R38 bar		
b	Use centralizers? What % of jobs? Distance between centralizers and other info	No	80%	8-10 ft on centers; PVC spider types (*)
11: AWARENESS OF OTHER CORROSION STUDIES				
	Aware of other corrosion studies? Where?	Yes	PTI recommendations for anchors	
12: ADDITIONAL INPUT AND/OR SUGGESTIONS				
	Do you have additional input and/or suggestions for corrosion evaluation? Provide input/suggestions	Yes	Afraid to use metal centralizers due to concern with damage to epoxy during installation	

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1: PREPARER/GENERAL INFORMATION		#6	
a	Firm	FSI Geo-Con (Foundation Specialties, Inc.)	
b	Name/Title	Paul Gintonio	
c	Phone/E-mail	479.263.2969/ paul_gintonio@fspecinc.com	
d	% HBSN use: temporary, permanent	0%	100%
e	Is lack of corrosion guidance an impediment to HBSN use? Would clear corrosion guidance help?	No	--
f	Could the preparer be further contacted?	Yes	
2: COATINGS			
a	Use of purple marine epoxy coating, thickness, application	No	--
b	Use of green epoxy coating, thickness, application	No	--
c	Use of galvanization, thickness, application	No	--
d	Have you exhumed HBSNs and could you provide findings?	No	--
3: SACRIFICIAL STEEL			
a	Aware of use of sacrificial steel? What thickness?	No	--
4: GROUT			
a	Thickness	3 inches	
b	Strength	5000 psi	
c	Cement type	Type I	
d	Water:Cement (W:C) ratio	0.45	
e	Type of mixer	Colloidal	
f	Final strength or diluted for drilling	Water in rock, full strength in soil	
5: EVALUATION OF SOIL CORROSIVITY			
a	By Assumptions or Data?	Use assumptions	
b	Use guidance in GEC #4?	No	
c	Use guidance in GEC #7?	No	
d	Use guidance in some other reference?	No	
6: FIELD CORROSION TESTING PROGRAM			
a	Conducted a field program and have copy?	Yes	
7: LABORATORY CORROSION TESTING PROGRAM			
a	Conducted a lab program and have copy?	No	
8: THREAD TYPE/CONFIGURATION			
a	Effect on corrosion rates? Supporting information?	No	
9: ENCAPSULATED HBSNs			
a	Aware of encapsulated HBSNs? Have info?	No	
b	Are encapsulated HBSNs feasible from an economical and construction viewpoint?	No	
10: DRILL BIT AND CENTRALIZERS			
a	Drill bit:HBSN OD ratio	2.5:1	
b	Use centralizers? What % of jobs? Distance between centralizers and other info	Yes	100% Titan centralizers every 10'
11: AWARENESS OF OTHER CORROSION STUDIES			
	Aware of other corrosion studies? Where?	No	
12: ADDITIONAL INPUT AND/OR SUGGESTIONS			
	Do you have additional input and/or suggestions for corrosion evaluation? Provide input/suggestions	No	Corrosion seems dependent on the soil/rock material

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1:	PREPARER/GENERAL INFORMATION	#7		
a	Firm	Nicholson Construction		
b	Name/Title	Tom Richards, Chief Engineer		
c	Phone/E-mail	412.677.2224/ trichards@nicholsonconstruction.com		
d	% HBSN use: temporary, permanent	15%	0%	
e	Is lack of corrosion guidance an impediment to HBSN use? Would clear corrosion guidance help?	Yes	Yes	
f	Could the preparer be further contacted?	Yes		
2:	COATINGS			
a	Use of purple marine epoxy coating, thickness, application	Only for a test	Use supplier standard	Test nail
b	Use of green epoxy coating, thickness, application	No		
c	Use of galvanization, thickness, application	Only for a test	Use supplier standard	Test nail
d	Have you exhumed HBSNs and could you provide findings?	Yes	Contact Gary Lange (contact information not provided)	
3:	SACRIFICIAL STEEL			
a	Aware of use of sacrificial steel? What thickness?	Yes	63 mils (only on one job)	
4:	GROUT			
a	Thickness	Depends on bit size provided by supplier		
b	Strength	5000 psi		
c	Cement type	Type I/II		
d	Water:Cement (W:C) ratio	0.45		
e	Type of mixer	Colloidal		
f	Final strength or diluted for drilling	Typically final grout strength from start		
5:	EVALUATION OF SOIL CORROSIVITY			
a	By Assumptions or Data?	Typically not		
b	Use guidance in GEC #4?	No		
c	Use guidance in GEC #7?	Yes, if data is available		
d	Use guidance in some other reference?	No		
6:	FIELD CORROSION TESTING PROGRAM			
a	Conducted a field program and have copy?	Yes	ADSC/FHWA Study in Salt Lake City	
7:	LABORATORY CORROSION TESTING PROGRAM			
a	Conducted a lab program and have copy?	No		
8:	THREAD TYPE/CONFIGURATION			
a	Effect on corrosion rates? Supporting information?	No		
9:	ENCAPSULATED HBSNs			
a	Aware of encapsulated HBSNs? Have info?	No	Except PVC for free length	
b	Are encapsulated HBSNs feasible from an economical and construction viewpoint?	No		
10:	DRILL BIT AND CENTRALIZERS			
a	Drill bit:HBSN OD ratio	Supplier provided; depends on ground & desired bond		
b	Use centralizers? What % of jobs? Distance between centralizers and other info	Sometimes		
11:	AWARENESS OF OTHER CORROSION STUDIES			
a	Aware of other corrosion studies? Where?	Yes	ADSC/FHWA study by Schnabel	
12:	ADDITIONAL INPUT AND/OR SUGGESTIONS			
	Do you have additional input and/or suggestions for corrosion evaluation? Provide input/suggestions	Yes	Need more guidance because currently some ignore corrosion, some use sacrificial steel, some use with various justifications in permanent walls and GEC7 does not allow HBSN in permanent walls. (*)	

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1: PREPARER/GENERAL INFORMATION		#8	
a	Firm	Williams Form Engineering	
b	Name/Title	Tom Bird, VP-Sales	
c	Phone/E-mail	303.807.9945/ tbird@williamsform.com	
d	% HBSN use: temporary, permanent	15%	25%
e	Is lack of corrosion guidance an impediment to HBSN use? Would clear corrosion guidance help?	Yes	Yes
f	Could the preparer be further contacted?	Yes	
2: COATINGS			
a	Use of purple marine epoxy coating, thickness, application	Yes	7 mils Permanent
b	Use of green epoxy coating, thickness, application	Yes	7 mils Permanent
c	Use of galvanization, thickness, application	Yes	4 mils Permanent
d	Have you exhumed HBSNs and could you provide findings?	Yes	Yes, ADSC study, noted severe scratches on coating (purple/green/galvanized)
3: SACRIFICIAL STEEL			
a	Aware of use of sacrificial steel? What thickness?	Yes	1 size larger
4: GROUT			
a	Thickness	1-inch	
b	Strength	3500 psi	
c	Cement type	Portland Type I/II	
d	Water:Cement (W:C) ratio	0.45	
e	Type of mixer	Paddle is most common, I recommend colloidal	
f	Final strength or diluted for drilling	Varies by contractor	
5: EVALUATION OF SOIL CORROSIVITY			
a	By Assumptions or Data?	?	
b	Use guidance in GEC #4?	?	
c	Use guidance in GEC #7?	?	
d	Use guidance in some other reference?	?	
6: FIELD CORROSION TESTING PROGRAM			
a	Conducted a field program and have copy?	Yes, ADSC	Not yet
7: LABORATORY CORROSION TESTING PROGRAM			
a	Conducted a lab program and have copy?	No	
8: THREAD TYPE/CONFIGURATION			
a	Effect on corrosion rates? Supporting information?	Yes, but....	Data shows no difference in cracks
9: ENCAPSULATED HBSNs			
a	Aware of encapsulated HBSNs? Have info?	No	
b	Are encapsulated HBSNs feasible from an economical and construction viewpoint?	Yes	Drill to depth, extract 5'-10' replace with CALTRANS Soil Nail (3') DCP
10: DRILL BIT AND CENTRALIZERS			
a	Drill bit:HBSN OD ratio	2:1	
b	Use centralizers? What % of jobs? Distance between centralizers and other info	Not usually	5% 10' before couplers
11: AWARENESS OF OTHER CORROSION STUDIES			
	Aware of other corrosion studies? Where?	Yes	EN 14490 soil nail spec
12: ADDITIONAL INPUT AND/OR SUGGESTIONS			
	Do you have additional input and/or suggestions for corrosion evaluation? Provide input/suggestions	Yes	(1)Use <u>only</u> in non-aggressive ground; (2) galvanize or hot zinc spray (HZS); (3)evaluate galvanization vs HZS; (4)use DCP; (5)Use sacrificial steel; (6)verify grout strength; (7)ensure drill bit is 1.5" min larger than bar diameter

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1: PREPARER/GENERAL INFORMATION		#9	
a	Firm	Williams Form Engineering	
b	Name/Title	John White, VP East Coast Sales	
c	Phone/E-mail	616.866.0815/ jwhite@williamsform.com	
d	% HBSN use: temporary, permanent	0%	5%
e	Is lack of corrosion guidance an impediment to HBSN use? Would clear corrosion guidance help?	Yes	Yes
f	Could the preparer be further contacted?	Yes	
2: COATINGS			
a	Use of purple marine epoxy coating, thickness, application	No	--
b	Use of green epoxy coating, thickness, application	No	--
c	Use of galvanization, thickness, application	Yes	4-5 mils permanent
d	Have you exhumed HBSNs and could you provide findings?	No	--
3: SACRIFICIAL STEEL			
a	Aware of use of sacrificial steel? What thickness?	No	--
4: GROUT			
a	Thickness	--	
b	Strength	4000 psi	
c	Cement type	Type K (non-shrink)	
d	Water:Cement (W:C) ratio	0.4 - 0.45	
e	Type of mixer	Both	
f	Final strength or diluted for drilling	Both	
5: EVALUATION OF SOIL CORROSIVITY			
a	By Assumptions or Data?	Unknown	
b	Use guidance in GEC #4?	--	
c	Use guidance in GEC #7?	--	
d	Use guidance in some other reference?	--	
6: FIELD CORROSION TESTING PROGRAM			
a	Conducted a field program and have copy?	Yes	No
7: LABORATORY CORROSION TESTING PROGRAM			
a	Conducted a lab program and have copy?	No	--
8: THREAD TYPE/CONFIGURATION			
a	Effect on corrosion rates? Supporting information?	No	--
9: ENCAPSULATED HBSNs			
a	Aware of encapsulated HBSNs? Have info?	No	--
b	Are encapsulated HBSNs feasible from an economical and construction viewpoint?	Yes	Enables fast production rates in granular or problematic soils that are not conducive to open hole drilling
10: DRILL BIT AND CENTRALIZERS			
a	Drill bit:HBSN OD ratio	1.6:1 (min) to 2:1 (more common)	
b	Use centralizers? What % of jobs? Distance between centralizers and other info	Yes	-- Steel centralizers, 10' before couplers
11: AWARENESS OF OTHER CORROSION STUDIES			
	Aware of other corrosion studies? Where?	No	--
12: ADDITIONAL INPUT AND/OR SUGGESTIONS			
	Do you have additional input and/or suggestions for corrosion evaluation? Provide input/suggestions	Yes	We recommend galvanization instead of epoxy from a durability standpoint and since galvanization is a sacrificial coating.

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1: PREPARER/GENERAL INFORMATION		#10	
a	Firm	CALTRANS	
b	Name/Title	Kathryn Griswell, Earth Retaining Systems Specialist	
c	Phone/E-mail	916.227.7330/ kathryn_griswell@dot.ca.gov	
d	% HBSN use: temporary, permanent	Small % (*)	Small % (*)
e	Is lack of corrosion guidance an impediment to HBSN use? Would clear corrosion guidance help?	Yes	Yes
f	Could the preparer be further contacted?	Yes	
2: COATINGS			
a	Use of purple marine epoxy coating, thickness, application	Yes	12 mils Temporary
b	Use of green epoxy coating, thickness, application	No	--
c	Use of galvanization, thickness, application	No	--
d	Have you exhumed HBSNs and could you provide findings?	No	--
3: SACRIFICIAL STEEL			
a	Aware of use of sacrificial steel? What thickness?	No	--
4: GROUT			
a	Thickness	2 inches	
b	Strength	930 lbs/cy Type II w/ 5 gal per sack	
c	Cement type	Type II	
d	Water:Cement (W:C) ratio	5 gallons to 94 pounds	
e	Type of mixer	Do not specify	
f	Final strength or diluted for drilling	Drill diluted first then flush with final strength	
5: EVALUATION OF SOIL CORROSIVITY			
a	By Assumptions or Data?	Test for permanent walls, assumption for shoring systems	
b	Use guidance in GEC #4?	No	
c	Use guidance in GEC #7?	Yes (this is similar to CALTRANS guidance)	
d	Use guidance in some other reference?	Yes, guidance on culvert criteria for soil corrosion test	
6: FIELD CORROSION TESTING PROGRAM			
a	Conducted a field program and have copy?	No	--
7: LABORATORY CORROSION TESTING PROGRAM			
a	Conducted a lab program and have copy?	No	--
8: THREAD TYPE/CONFIGURATION			
a	Effect on corrosion rates? Supporting information?	No	--
9: ENCAPSULATED HBSNs			
a	Aware of encapsulated HBSNs? Have info?	No	--
b	Are encapsulated HBSNs feasible from an economical and construction viewpoint?	Yes	Maybe economical but durability issues need to be addressed
10: DRILL BIT AND CENTRALIZERS			
a	Drill bit:HBSN OD ratio	No typical value	
b	Use centralizers? What % of jobs? Distance between centralizers and other info	Yes	100% 5' spacing based on regular systems
11: AWARENESS OF OTHER CORROSION STUDIES			
	Aware of other corrosion studies? Where?	No	--
12: ADDITIONAL INPUT AND/OR SUGGESTIONS			
	Do you have additional input and/or suggestions for corrosion evaluation? Provide input/suggestions	Yes	Need better understanding of the size, shape and quality of grout column for proper selection of design assumptions for perm walls. Concern with build-up of cuttings at couplers creating porous pockets that promote corrosion (use heat shrink sleeve?) (*)

APPENDIX C – SUMMARY OF RESPONSES TO QUESTIONNAIRE

1: PREPARER/GENERAL INFORMATION		#11	
a	Firm	Iowa DOT	
b	Name/Title	Robert Stanley, Soil Design Engineer	
c	Phone/E-mail	515.239.1026/ robert.stanley@dot.iowa.gov	
d	% HBSN use: temporary, permanent	0%	0%
e	Is lack of corrosion guidance an impediment to HBSN use? Would clear corrosion guidance help?	No	Have not used HBSN
f	Could the preparer be further contacted?	Yes	
2: COATINGS			
a	Use of purple marine epoxy coating, thickness, application	--	--
b	Use of green epoxy coating, thickness, application	--	--
c	Use of galvanization, thickness, application	--	--
d	Have you exhumed HBSNs and could you provide findings?	--	--
3: SACRIFICIAL STEEL			
a	Aware of use of sacrificial steel? What thickness?	Yes	?
4: GROUT			
a	Thickness	Have had only 1 soil nail project, was not HBSN	
b	Strength	--	
c	Cement type	--	
d	Water:Cement (W:C) ratio	--	
e	Type of mixer	--	
f	Final strength or diluted for drilling	--	
5: EVALUATION OF SOIL CORROSIVITY			
a	By Assumptions or Data?	Soil can be tested if needed	
b	Use guidance in GEC #4?	Have not used HBSN	
c	Use guidance in GEC #7?	--	
d	Use guidance in some other reference?	--	
6: FIELD CORROSION TESTING PROGRAM			
a	Conducted a field program and have copy?	Not used HBSN	--
7: LABORATORY CORROSION TESTING PROGRAM			
a	Conducted a lab program and have copy?	Not used HBSN	--
8: THREAD TYPE/CONFIGURATION			
a	Effect on corrosion rates? Supporting information?	Not used HBSN	--
9: ENCAPSULATED HBSNs			
a	Aware of encapsulated HBSNs? Have info?	No	--
b	Are encapsulated HBSNs feasible from an economical and construction viewpoint?	Don't know	--
10: DRILL BIT AND CENTRALIZERS			
a	Drill bit:HBSN OD ratio	Have not used HBSN	
b	Use centralizers? What % of jobs? Distance between centralizers and other info	--	--
11: AWARENESS OF OTHER CORROSION STUDIES			
	Aware of other corrosion studies? Where?	No	--
12: ADDITIONAL INPUT AND/OR SUGGESTIONS			
	Do you have additional input and/or suggestions for corrosion evaluation? Provide input/suggestions	No	--

APPENDIX C – SUMMARY OF RESPONSES TO QUESTIONNAIRE

1: PREPARER/GENERAL INFORMATION		#12	
a	Firm	Missouri DOT	
b	Name/Title	Kevin McLain, Geotechnical Engineer	
c	Phone/E-mail	573.751.1044/ kevin.mclain@modot.mo.gov	
d	% HBSN use: temporary, permanent	0%	0%
e	Is lack of corrosion guidance an impediment to HBSN use? Would clear corrosion guidance help?	Yes	Yes
f	Could the preparer be further contacted?	Yes	
2: COATINGS			
a	Use of purple marine epoxy coating, thickness, application	--	--
b	Use of green epoxy coating, thickness, application	--	--
c	Use of galvanization, thickness, application	--	--
d	Have you exhumed HBSNs and could you provide findings?	--	--
3: SACRIFICIAL STEEL			
a	Aware of use of sacrificial steel? What thickness?	--	--
4: GROUT			
a	Thickness	--	
b	Strength	--	
c	Cement type	--	
d	Water:Cement (W:C) ratio	--	
e	Type of mixer	--	
f	Final strength or diluted for drilling	--	
5: EVALUATION OF SOIL CORROSIVITY			
a	By Assumptions or Data?	--	
b	Use guidance in GEC #4?	--	
c	Use guidance in GEC #7?	--	
d	Use guidance in some other reference?	--	
6: FIELD CORROSION TESTING PROGRAM			
a	Conducted a field program and have copy?	--	--
7: LABORATORY CORROSION TESTING PROGRAM			
a	Conducted a lab program and have copy?	--	--
8: THREAD TYPE/CONFIGURATION			
a	Effect on corrosion rates? Supporting information?	--	--
9: ENCAPSULATED HBSNs			
a	Aware of encapsulated HBSNs? Have info?	--	--
b	Are encapsulated HBSNs feasible from an economical and construction viewpoint?	--	--
10: DRILL BIT AND CENTRALIZERS			
a	Drill bit:HBSN OD ratio	--	
b	Use centralizers? What % of jobs? Distance between centralizers and other info	--	--
11: AWARENESS OF OTHER CORROSION STUDIES			
	Aware of other corrosion studies? Where?	--	--
12: ADDITIONAL INPUT AND/OR SUGGESTIONS			
	Do you have additional input and/or suggestions for corrosion evaluation? Provide input/suggestions	--	--

APPENDIX C – SUMMARY OF RESPONSES TO QUESTIONNAIRE

1: PREPARER/GENERAL INFORMATION		#13	
a	Firm	New Hampshire DOT	
b	Name/Title	Charles Dusseault, Geotechnical Engineer	
c	Phone/E-mail	603.271.3151/ cdusseault@dot.state.nh.us	
d	% HBSN use: temporary, permanent	0%	0%
e	Is lack of corrosion guidance an impediment to HBSN use? Would clear corrosion guidance help?	Yes	No
f	Could the preparer be further contacted?	Yes	
2: COATINGS			
a	Use of purple marine epoxy coating, thickness, application	No	--
b	Use of green epoxy coating, thickness, application	No	--
c	Use of galvanization, thickness, application	No	--
d	Have you exhumed HBSNs and could you provide findings?	No	--
3: SACRIFICIAL STEEL			
a	Aware of use of sacrificial steel? What thickness?	No	--
4: GROUT			
a	Thickness	--	
b	Strength	--	
c	Cement type	--	
d	Water:Cement (W:C) ratio	--	
e	Type of mixer	--	
f	Final strength or diluted for drilling	--	
5: EVALUATION OF SOIL CORROSIVITY			
a	By Assumptions or Data?	Yes	
b	Use guidance in GEC #4?	No	
c	Use guidance in GEC #7?	No	
d	Use guidance in some other reference?	FHWA-SA-96-069/FHWA-SA-93-068	
6: FIELD CORROSION TESTING PROGRAM			
a	Conducted a field program and have copy?	No	--
7: LABORATORY CORROSION TESTING PROGRAM			
a	Conducted a lab program and have copy?	No	--
8: THREAD TYPE/CONFIGURATION			
a	Effect on corrosion rates? Supporting information?	No	--
9: ENCAPSULATED HBSNs			
a	Aware of encapsulated HBSNs? Have info?	No	--
b	Are encapsulated HBSNs feasible from an economical and construction viewpoint?	No	--
10: DRILL BIT AND CENTRALIZERS			
a	Drill bit:HBSN OD ratio	N/A	
b	Use centralizers? What % of jobs? Distance between centralizers and other info	--	--
11: AWARENESS OF OTHER CORROSION STUDIES			
	Aware of other corrosion studies? Where?	Yes	NCHRP proposal (not funded)
12: ADDITIONAL INPUT AND/OR SUGGESTIONS			
	Do you have additional input and/or suggestions for corrosion evaluation? Provide input/suggestions	Yes	Long-term monitoring of a HBSN slope that used green epoxy per AASHTO M284 requirements

APPENDIX C – SUMMARY OF RESPONSES TO QUESTIONNAIRE

1: PREPARER/GENERAL INFORMATION		#14	
a	Firm	South Carolina DOT	
b	Name/Title	Jeff Sizemore, Geotechnical Design Support Eng.	
c	Phone/E-mail	-/ sizemorejc@scdot.org	
d	% HBSN use: temporary, permanent	<1%	N/A
e	Is lack of corrosion guidance an impediment to HBSN use? Would clear corrosion guidance help?	Yes	Yes
f	Could the preparer be further contacted?	No	
2: COATINGS			
a	Use of purple marine epoxy coating, thickness, application	No	? --
b	Use of green epoxy coating, thickness, application	Yes	? Permanent
c	Use of galvanization, thickness, application	No	-- --
d	Have you exhumed HBSNs and could you provide findings?	No	--
3: SACRIFICIAL STEEL			
a	Aware of use of sacrificial steel? What thickness?	No	--
4: GROUT			
a	Thickness	1 inch	
b	Strength	3000 psi	
c	Cement type	Type I or III	
d	Water:Cement (W:C) ratio	0.4 - 0.45	
e	Type of mixer	Colloidal	
f	Final strength or diluted for drilling	Final strength from start	
5: EVALUATION OF SOIL CORROSIVITY			
a	By Assumptions or Data?	Assumptions	
b	Use guidance in GEC #4?	No	
c	Use guidance in GEC #7?	Yes	
d	Use guidance in some other reference?	--	
6: FIELD CORROSION TESTING PROGRAM			
a	Conducted a field program and have copy?	--	--
7: LABORATORY CORROSION TESTING PROGRAM			
a	Conducted a lab program and have copy?	--	--
8: THREAD TYPE/CONFIGURATION			
a	Effect on corrosion rates? Supporting information?	--	--
9: ENCAPSULATED HBSNs			
a	Aware of encapsulated HBSNs? Have info?	--	--
b	Are encapsulated HBSNs feasible from an economical and construction viewpoint?	--	--
10: DRILL BIT AND CENTRALIZERS			
a	Drill bit:HBSN OD ratio	?	
b	Use centralizers? What % of jobs? Distance between centralizers and other info	Yes	100% --
11: AWARENESS OF OTHER CORROSION STUDIES			
	Aware of other corrosion studies? Where?	No	--
12: ADDITIONAL INPUT AND/OR SUGGESTIONS			
	Do you have additional input and/or suggestions for corrosion evaluation? Provide input/suggestions	No	--

APPENDIX C – SUMMARY OF RESPONSES TO QUESTIONNAIRE

1: PREPARER/GENERAL INFORMATION		#15	
a	Firm	Tennessee DOT	
b	Name/Title	Len Oliver, Civil Engineering Manager	
c	Phone/E-mail	615.350-4130/ Len.Oliver@state.tn.us	
d	% HBSN use: temporary, permanent	10%	50%
e	Is lack of corrosion guidance an impediment to HBSN use? Would clear corrosion guidance help?	No	
f	Could the preparer be further contacted?	Yes	
2: COATINGS			
a	Use of purple marine epoxy coating, thickness, application	No	--
b	Use of green epoxy coating, thickness, application	No	--
c	Use of galvanization, thickness, application	Yes	Unknown Semi-permanent landslide repair
d	Have you exhumed HBSNs and could you provide findings?	No	--
3: SACRIFICIAL STEEL			
a	Aware of use of sacrificial steel? What thickness?	Yes	Unknown
4: GROUT			
a	Thickness	1.5 inches	
b	Strength	Unknown	--
c	Cement type	Unknown	--
d	Water:Cement (W:C) ratio	Unknown	--
e	Type of mixer	Paddle mixers	
f	Final strength or diluted for drilling	Unknown	
5: EVALUATION OF SOIL CORROSIVITY			
a	By Assumptions or Data?	Can do tests, on 1 project, assumptions were made	
b	Use guidance in GEC #4?	--	
c	Use guidance in GEC #7?	Yes	
d	Use guidance in some other reference?	--	
6: FIELD CORROSION TESTING PROGRAM			
a	Conducted a field program and have copy?	No	--
7: LABORATORY CORROSION TESTING PROGRAM			
a	Conducted a lab program and have copy?	No	--
8: THREAD TYPE/CONFIGURATION			
a	Effect on corrosion rates? Supporting information?	No	--
9: ENCAPSULATED HBSNs			
a	Aware of encapsulated HBSNs? Have info?	No	--
b	Are encapsulated HBSNs feasible from an economical and construction viewpoint?	Unknown	--
10: DRILL BIT AND CENTRALIZERS			
a	Drill bit:HBSN OD ratio	2:1	
b	Use centralizers? What % of jobs? Distance between centralizers and other info	Yes	90% --
11: AWARENESS OF OTHER CORROSION STUDIES			
	Aware of other corrosion studies? Where?	No	--
12: ADDITIONAL INPUT AND/OR SUGGESTIONS			
	Do you have additional input and/or suggestions for corrosion evaluation? Provide input/suggestions	No	--

