GAI-LAP
Initial: CVZ #:0.13
DATE: 05/09/2014

May 9, 2014

Allan Brantley
Brantley Engineering, LLC
13933 Tree Loft Road
Milton, GA, 30004

Re: FINAL LABORATORY TEST REPORT

Dear Mr. Brantley:

Thank you for consulting TRI California for your material testing needs.

Enclosed is the ***final*** laboratory report for the seam testing of eleven (11) HDPE seam samples.

PROJECT NAME: JED Cell 10 DATE REPORTED: **May 9, 2014**

REFERENCE TRI JOB NO.: G140394

DATE RECEIVED: May 7, 2014

SAMPLES SENT BY: Brantley Engineering

SAMPLE IDENTIFICATIONS:

SAMPLE ID	*TRI-CA CONTROL NUMBER*
1. DS35 87/ 88	97661
2. DS36 90/ 92	97662
3. DS37 92/ 94	97663
4. DS38 93/ 96	97664
5. DS39 96/ 98	97665
6. DS40 98/ 100	97666
7. DS41 100/ 101	97667
8. DS42 102/ 104	97668
9. DS43 104/ 106	97669
10. DS44 107/ 108	97670
11. DS45 108/ 110	97671

TESTS REQUIRED / PERFORMED:

TEST METHOD	*DESCRIPTION*
1. ASTM D6392	Shear Bond Strength
2. ASTM D6392	Peel Bond Adhesion

TEST RESULTS: The test results are summarized in the attached Tables 1 to 6.

Respectfully,

TRI Environmental, Inc. - California

Maria Espitia
Quality Assurance

Carmelo V. Zantua
Technical Director

Signatures are on file

7 Pages Total

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TABLE 1.
SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Brantley Engineering, LLC**
PROJECT: **JED Cell 10**
DATE REC'D: **9-May-14**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **G140394**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 9-May-14

Crosshead Speed: 2 in/min		SHEAR EVALUATION				Crosshead Speed: 2 in/min	PEEL EVALUATION			
SAMPLE ID	TRI CONTROL #	MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)
DS-35	**97661**	170	> 50%	BRK		1 Outside	119	0	SE1	
P87/ 89		167	> 50%	BRK		2 Outside	134	0	SE1	
		167	> 50%	BRK		3 Outside	123	0	SE1	
		170	> 50%	BRK		4 Outside	128	0	SE1	
		169	> 50%	BRK		5 Outside	125	0	SE1	
						AVG:	**126**			91
						STD. DEV.	**6**			
						1 Inside	116	0	SE1	
						2 Inside	127	0	SE1	
						3 Inside	117	0	SE1	
						4 Inside	125	0	SE1	
						5 Inside	112	0	SE1	
	AVG.	**169**			120	**AVG:**	**119**			91
	STD. DEV.	**2**				STD. DEV.	**6**			
DS- 36	**97662**	157	> 50%	BRK		1 Outside	113	0	SE1	
P90/ 92		158	> 50%	BRK		2 Outside	117	0	SE1	
		157	> 50%	BRK		3 Outside	113	0	SE1	
		163	> 50%	BRK		4 Outside	115	0	SE1	
		161	> 50%	BRK		5 Outside	114	0	SE1	
						AVG:	**114**			91
						STD. DEV.	**2**			
						1 Inside	111	0	SE1	
						2 Inside	110	0	SE1	
						3 Inside	111	0	SE1	
						4 Inside	113	0	SE1	
						5 Inside	117	0	SE1	
	AVG:	**159**			120	**AVG:**	**112**			91
	STD. DEV.	**3**				STD. DEV.	**3**			

BREAK DESCRIPTION (ASTM D6392 FUSION):

AD	ADHESION FAILURE.
BRK	BREAK IN SHEETING.
SE1	BREAK AT OUTER EDGE OF SEAM.
SE2	BREAK AT INNER EDGE OF SEAM.
AD-BRK	BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.
SIP	SEPARATION IN THE PLANE OF THE SHEET.

EXTRUSION:

AD1	ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD.
AD2	ADHESION FAILURE.
AD-WLD	BREAK THROUGH THE FILLET.
SE1	BREAK AT BOTTOM EDGE OF SEAM.
SE2	BREAK AT TOP EDGE OF SEAM.
SE3	BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)
BRK1	BREAK IN BOTTOM SHEETING.
BRK2	BREAK IN TOP SHEETING.
AD-BRK	BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.
HT	BREAK AT EDGE OF HOT TACK
SIP	SEPARATION IN THE PLANE OF THE SHEET.

(End of Table 1)

GAI-LAP

TABLE 2.
SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: ***Brantley Engineering, LLC***
PROJECT: ***JED Cell 10***
DATE REC'D: ***9-May-14***

MATERIAL: ***HDPE SEAM***
SEAM TYPE: ***Fusion Weld***
TRI JOB #: ***G140394***

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 9-May-14

Crosshead Speed: 2 in/min		SHEAR EVALUATION				Crosshead Speed: 2 in/min	PEEL EVALUATION			
SAMPLE ID	TRI CONTROL #	MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)
DS-37	**97663**	159	> 50%	BRK		1 Outside	123	0	SE1	
P92/ 94		158	> 50%	BRK		2 Outside	116	0	SE1	
		156	> 50%	BRK		3 Outside	112	0	SE1	
		161	> 50%	BRK		4 Outside	111	0	SE1	
		159	> 50%	BRK		5 Outside	111	0	SE1	
						AVG:	**115**			91
						STD. DEV.	**5**			
						1 Inside	131	0	SE1	
						2 Inside	116	0	SE1	
						3 Inside	119	0	SE1	
						4 Inside	122	0	SE1	
						5 Inside	118	0	SE1	
	AVG.	**159**			120	**AVG:**	**121**			91
	STD. DEV.	**2**				STD. DEV.	**6**			
DS-38	**97664**	157	> 50%	BRK		1 Outside	137	0	SE1	
P93/ 96		157	> 50%	BRK		2 Outside	122	0	SE1	
		157	> 50%	BRK		3 Outside	121	0	SE1	
		161	> 50%	BRK		4 Outside	128	0	SE1	
		157	> 50%	BRK		5 Outside	117	0	SE1	
						AVG:	**125**			91
						STD. DEV.	**8**			
						1 Inside	140	0	SE1	
						2 Inside	134	0	SE1	
						3 Inside	129	0	SE1	
						4 Inside	121	0	SE1	
						5 Inside	129	0	SE1	
	AVG:	**158**			120	**AVG:**	**131**			91
	STD. DEV.	**2**				STD. DEV.	**7**			

BREAK DESCRIPTION (ASTM D6392 FUSION):

AD	ADHESION FAILURE.
BRK	BREAK IN SHEETING.
SE1	BREAK AT OUTER EDGE OF SEAM.
SE2	BREAK AT INNER EDGE OF SEAM.
AD-BRK	BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.
SIP	SEPARATION IN THE PLANE OF THE SHEET.

EXTRUSION:

AD1	ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD.
AD2	ADHESION FAILURE.
AD-WLD	BREAK THROUGH THE FILLET.
SE1	BREAK AT BOTTOM EDGE OF SEAM.
SE2	BREAK AT TOP EDGE OF SEAM.
SE3	BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)
BRK1	BREAK IN BOTTOM SHEETING.
BRK2	BREAK IN TOP SHEETING.
AD-BRK	BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.
HT	BREAK AT EDGE OF HOT TACK
SIP	SEPARATION IN THE PLANE OF THE SHEET.

(End of Table 2)

GAI-LAP

TABLE 3.
SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Brantley Engineering, LLC**
PROJECT: **JED Cell 10**
DATE REC'D: **9-May-14**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **G140394**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 9-May-14

Crosshead Speed: 2 in/min		SHEAR EVALUATION				Crosshead Speed: 2 in/min	PEEL EVALUATION			
SAMPLE ID	TRI CONTROL #	MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)
DS-39	**97665**	166	> 50%	BRK		1 Outside	115	0	SE1	
P96/ 98		166	> 50%	BRK		2 Outside	113	0	SE1	
		162	> 50%	BRK		3 Outside	111	0	SE1	
		169	> 50%	BRK		4 Outside	125	0	SE1	
		166	> 50%	BRK		5 Outside	110	0	SE1	
						AVG:	**115**			91
						STD. DEV.	**6**			
						1 Inside	118	0	SE1	
						2 Inside	116	0	SE1	
						3 Inside	112	0	SE1	
						4 Inside	114	0	SE1	
						5 Inside	136	0	SE1	
	AVG.	**166**			120	**AVG:**	**119**			91
	STD. DEV.	**2**				STD. DEV.	**10**			
DS-40	**97666**	169	> 50%	BRK		1 Outside	116	0	SE1	
P98/ 100		167	> 50%	BRK		2 Outside	108	0	SE1	
		170	> 50%	BRK		3 Outside	113	0	SE1	
		174	> 50%	BRK		4 Outside	125	0	SE1	
		174	> 50%	BRK		5 Outside	112	0	SE1	
						AVG:	**115**			91
						STD. DEV.	**6**			
						1 Inside	104	0	SE1	
						2 Inside	111	0	SE1	
						3 Inside	105	0	SE1	
						4 Inside	106	0	SE1	
						5 Inside	102	0	SE1	
	AVG:	**171**			120	**AVG:**	**106**			91
	STD. DEV.	**3**				STD. DEV.	**3**			

BREAK DESCRIPTION (ASTM D6392 FUSION):

AD	ADHESION FAILURE.
BRK	BREAK IN SHEETING.
SE1	BREAK AT OUTER EDGE OF SEAM.
SE2	BREAK AT INNER EDGE OF SEAM.
AD-BRK	BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.
SIP	SEPARATION IN THE PLANE OF THE SHEET.

EXTRUSION:

AD1	ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD.
AD2	ADHESION FAILURE.
AD-WLD	BREAK THROUGH THE FILLET.
SE1	BREAK AT BOTTOM EDGE OF SEAM.
SE2	BREAK AT TOP EDGE OF SEAM.
SE3	BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)
BRK1	BREAK IN BOTTOM SHEETING.
BRK2	BREAK IN TOP SHEETING.
AD-BRK	BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.
HT	BREAK AT EDGE OF HOT TACK
SIP	SEPARATION IN THE PLANE OF THE SHEET.

(End of Table 3)

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TABLE 4.
SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Brantley Engineering, LLC**
PROJECT: **JED Cell 10**
DATE REC'D: **9-May-14**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **G140394**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 9-May-14

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min				
		SHEAR EVALUATION				PEEL EVALUATION				
SAMPLE ID	TRI CONTROL #	MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)
DS-41	**97667**	174	> 50%	BRK		1 Outside	134	0	SE1	
P100/ 101		173	> 50%	BRK		2 Outside	142	0	SE1	
		173	> 50%	BRK		3 Outside	116	0	SE1	
		177	> 50%	BRK		4 Outside	123	0	SE1	
		175	> 50%	BRK		5 Outside	127	0	SE1	
						AVG:	**128**			91
						STD. DEV.	**10**			
						1 Inside	131	0	SE1	
						2 Inside	132	0	SE1	
						3 Inside	120	0	SE1	
						4 Inside	134	0	SE1	
						5 Inside	131	0	SE1	
	AVG.	**174**			120	**AVG:**	**130**			91
	STD. DEV.	**2**				STD. DEV.	**6**			
DS-42	**97668**	160	> 50%	BRK		1 Outside	119	0	SE1	
P101/ 104		174	> 50%	BRK		2 Outside	130	0	SE1	
		175	> 50%	BRK		3 Outside	110	0	SE1	
		174	> 50%	BRK		4 Outside	111	0	SE1	
		175	> 50%	BRK		5 Outside	114	0	SE1	
						AVG:	**117**			91
						STD. DEV.	**8**			
						1 Inside	112	0	SE1	
						2 Inside	115	0	SE1	
						3 Inside	105	0	SE1	
						4 Inside	113	0	SE1	
						5 Inside	106	0	SE1	
	AVG:	**172**			120	**AVG:**	**110**			91
	STD. DEV.	**7**				STD. DEV.	**4**			

BREAK DESCRIPTION (ASTM D6392 FUSION):

AD	ADHESION FAILURE.
BRK	BREAK IN SHEETING.
SE1	BREAK AT OUTER EDGE OF SEAM.
SE2	BREAK AT INNER EDGE OF SEAM.
AD-BRK	BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.
SIP	SEPARATION IN THE PLANE OF THE SHEET.

EXTRUSION:

AD1	ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD.
AD2	ADHESION FAILURE.
AD-WLD	BREAK THROUGH THE FILLET.
SE1	BREAK AT BOTTOM EDGE OF SEAM.
SE2	BREAK AT TOP EDGE OF SEAM.
SE3	BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)
BRK1	BREAK IN BOTTOM SHEETING.
BRK2	BREAK IN TOP SHEETING.
AD-BRK	BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.
HT	BREAK AT EDGE OF HOT TACK
SIP	SEPARATION IN THE PLANE OF THE SHEET.

(End of Table 4)

GAI-LAP

TABLE 5.
SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Brantley Engineering, LLC**
PROJECT: **JED Cell 10**
DATE REC'D: **9-May-14**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **G140394**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 9-May-14

Crosshead Speed: 2 in/min		SHEAR EVALUATION				Crosshead Speed: 2 in/min	PEEL EVALUATION			
SAMPLE ID	TRI CONTROL #	MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)
DS-43	**97669**	176	> 50%	BRK		1 Outside	138	0	SE1	
P104/ 106		174	> 50%	BRK		2 Outside	125	0	SE1	
		174	> 50%	BRK		3 Outside	125	0	SE1	
		175	> 50%	BRK		4 Outside	131	0	SE1	
		173	> 50%	BRK		5 Outside	126	0	SE1	
						AVG:	**129**			91
						STD. DEV.	**6**			
						1 Inside	131	0	SE1	
						2 Inside	132	0	SE1	
						3 Inside	123	0	SE1	
						4 Inside	131	0	SE1	
						5 Inside	133	0	SE1	
	AVG.	**174**			120	**AVG:**	**130**			91
	STD. DEV.	**1**				STD. DEV.	**4**			
DS-44	**97670**	159	> 50%	BRK		1 Outside	123	0	SE1	
P107/ 108		158	> 50%	BRK		2 Outside	131	0	SE1	
		161	> 50%	BRK		3 Outside	109	0	SE1	
		156	> 50%	BRK		4 Outside	108	0	SE1	
		155	> 50%	BRK		5 Outside	112	0	SE1	
						AVG:	**117**			91
						STD. DEV.	**10**			
						1 Inside	137	0	SE1	
						2 Inside	132	0	SE1	
						3 Inside	127	0	SE1	
						4 Inside	121	0	SE1	
						5 Inside	119	0	SE1	
	AVG:	**158**			120	**AVG:**	**127**			91
	STD. DEV.	**2**				STD. DEV.	**7**			

BREAK DESCRIPTION (ASTM D6392 FUSION):

AD	ADHESION FAILURE.
BRK	BREAK IN SHEETING.
SE1	BREAK AT OUTER EDGE OF SEAM.
SE2	BREAK AT INNER EDGE OF SEAM.
AD-BRK	BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.
SIP	SEPARATION IN THE PLANE OF THE SHEET.

EXTRUSION:

AD1	ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD.
AD2	ADHESION FAILURE.
AD-WLD	BREAK THROUGH THE FILLET.
SE1	BREAK AT BOTTOM EDGE OF SEAM.
SE2	BREAK AT TOP EDGE OF SEAM.
SE3	BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)
BRK1	BREAK IN BOTTOM SHEETING.
BRK2	BREAK IN TOP SHEETING.
AD-BRK	BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.
HT	BREAK AT EDGE OF HOT TACK
SIP	SEPARATION IN THE PLANE OF THE SHEET.

(End of Table 5)

GAI-LAP

TABLE 6.
SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Brantley Engineering, LLC**
PROJECT: **JED Cell 10**
DATE REC'D: **9-May-14**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **G140394**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 9-May-14

Crosshead Speed: 2 in/min		SHEAR EVALUATION				Crosshead Speed: 2 in/min	PEEL EVALUATION			
SAMPLE ID	TRI CONTROL #	MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)
DS-45	**97671**	157	> 50%	BRK		1 Outside	117	0	SE1	
P108/ 110		157	> 50%	BRK		2 Outside	116	0	SE1	
		156	> 50%	BRK		3 Outside	123	0	SE1	
		160	> 50%	BRK		4 Outside	112	0	SE1	
		159	> 50%	BRK		5 Outside	111	0	SE1	
						AVG:	**116**			91
						STD. DEV.	**5**			
						1 Inside	116	0	SE1	
						2 Inside	115	0	SE1	
						3 Inside	108	0	SE1	
						4 Inside	112	0	SE1	
						5 Inside	115	0	SE1	
	AVG.	**158**			120	**AVG:**	**113**			91
	STD. DEV.	**2**				STD. DEV.	**3**			

BREAK DESCRIPTION (ASTM D6392 FUSION):

AD	ADHESION FAILURE.
BRK	BREAK IN SHEETING.
SE1	BREAK AT OUTER EDGE OF SEAM.
SE2	BREAK AT INNER EDGE OF SEAM.
AD-BRK	BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.
SIP	SEPARATION IN THE PLANE OF THE SHEET.

EXTRUSION:

AD1	ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD.
AD2	ADHESION FAILURE.
AD-WLD	BREAK THROUGH THE FILLET.
SE1	BREAK AT BOTTOM EDGE OF SEAM.
SE2	BREAK AT TOP EDGE OF SEAM.
SE3	BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)
BRK1	BREAK IN BOTTOM SHEETING.
BRK2	BREAK IN TOP SHEETING.
AD-BRK	BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.
HT	BREAK AT EDGE OF HOT TACK
SIP	SEPARATION IN THE PLANE OF THE SHEET.

(End of Table 6)