GAI-LAP
Initial: CVZ #:0.13
DATE: 05/29/2014

May 29, 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 nine (9) HDPE seam samples.

PROJECT NAME: JED Cell 10 DATE REPORTED: **May 29, 2014**

REFERENCE TRI JOB NO.: G140456

DATE RECEIVED: May 28, 2014

SAMPLES SENT BY: Brantley Engineering

SAMPLE IDENTIFICATIONS:

SAMPLE ID	*TRI-CA CONTROL NUMBER*
1. DSP-52	97973
2. DSP-53	97974
3. DSP-56	97975
4. DSP-54	97976
5. DSP-57	97977
6. DSP-55	97978
7. DSP-51	97979
8. DSP-50	97980
9. DSP-49	97981

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 5.

Respectfully,

TRI Environmental, Inc. - California

Maria Espitia
Quality Assurance

Carmelo V. Zantua
Technical Director

Signatures are on file

It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. TRI neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself. It is our policy to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. ***Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks.*** On the other hand, should you need us to keep them at a longer period, please advise us in writing.

6 Pages Total

GAI-LAP

TABLE 1.
SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Brantley Engineering, LLC**
PROJECT: **JED Cell 10**
DATE REC'D: **28-May-14**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **G140456**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 29-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)
DSP-52	**97973**	160	> 50%	BRK		1 Outside	142	0	SE1	
		150	> 50%	BRK		2 Outside	135	0	SE1	
		153	> 50%	BRK		3 Outside	141	0	SE1	
		153	> 50%	BRK		4 Outside	143	0	SE1	
		154	> 50%	BRK		5 Outside	133	0	SE1	
						AVG:	**139**			91
						STD. DEV.	**4**			
						1 Inside	116	0	SE1	
						2 Inside	116	0	SE1	
						3 Inside	115	0	SE1	
						4 Inside	118	0	SE1	
						5 Inside	118	0	SE1	
	AVG.	**154**			120	**AVG:**	**117**			91
	STD. DEV.	**4**				STD. DEV.	**1**			
DSP-53	**97974**	151	> 50%	BRK		1 Outside	93	0	SE1	
		157	> 50%	BRK		2 Outside	98	0	SE1	
		153	> 50%	BRK		3 Outside	125	0	SE1	
		140	> 50%	BRK		4 Outside	94	0	SE1	
		141	> 50%	BRK		5 Outside	112	0	SE1	
						AVG:	**104**			91
						STD. DEV.	**14**			
						1 Inside	116	0	SE1	
						2 Inside	118	0	SE1	
						3 Inside	122	0	SE1	
						4 Inside	119	0	SE1	
						5 Inside	119	0	SE1	
	AVG:	**148**			120	**AVG:**	**119**			91
	STD. DEV.	**8**				STD. DEV.	**2**			

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: **28-May-14**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **G140456**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 29-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)
DSP-56	**97975**	155	> 50%	BRK		1 Outside	109	0	SE1	
		153	> 50%	BRK		2 Outside	114	0	SE1	
		149	> 50%	BRK		3 Outside	111	0	SE1	
		149	> 50%	BRK		4 Outside	115	0	SE1	
		147	> 50%	BRK		5 Outside	111	0	SE1	
						AVG:	**112**			91
						STD. DEV.	**2**			
						1 Inside	110	0	SE1	
						2 Inside	119	0	SE1	
						3 Inside	119	0	SE1	
						4 Inside	115	0	SE1	
						5 Inside	116	0	SE1	
	AVG.	**151**			120	**AVG:**	**116**			91
	STD. DEV.	**3**				STD. DEV.	**4**			
DSP-54	**97976**	157	> 50%	BRK		1 Outside	120	0	SE1	
		157	> 50%	BRK		2 Outside	121	0	SE1	
		153	> 50%	BRK		3 Outside	127	0	SE1	
		155	> 50%	BRK		4 Outside	119	0	SE1	
		150	> 50%	BRK		5 Outside	109	0	SE1	
						AVG:	**119**			91
						STD. DEV.	**6**			
						1 Inside	119	0	SE1	
						2 Inside	122	0	SE1	
						3 Inside	115	0	SE1	
						4 Inside	113	0	SE1	
						5 Inside	112	0	SE1	
	AVG:	**154**			120	**AVG:**	**116**			91
	STD. DEV.	**3**				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 2)

GAI-LAP

TABLE 3.
SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Brantley Engineering, LLC**
PROJECT: **JED Cell 10**
DATE REC'D: **28-May-14**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **G140456**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 29-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)
DSP-57	**97977**	162	> 50%	BRK		1 Outside	128	0	SE1	
		161	> 50%	BRK		2 Outside	148	0	SE1	
		157	> 50%	BRK		3 Outside	153	0	SE1	
		157	> 50%	BRK		4 Outside	127	0	SE1	
		155	> 50%	BRK		5 Outside	122	0	SE1	
						AVG:	**136**			91
						STD. DEV.	**14**			
						1 Inside	157	0	SE1	
						2 Inside	115	0	SE1	
						3 Inside	117	0	SE1	
						4 Inside	124	0	SE1	
						5 Inside	125	0	SE1	
	AVG.	**158**			120	**AVG:**	**128**			91
	STD. DEV.	**3**				STD. DEV.	**17**			
DSP-55	**97978**	150	> 50%	BRK		1 Outside	117	0	SE1	
		153	> 50%	BRK		2 Outside	114	0	SE1	
		150	> 50%	BRK		3 Outside	131	0	SE1	
		148	> 50%	BRK		4 Outside	126	0	SE1	
		146	> 50%	BRK		5 Outside	111	0	SE1	
						AVG:	**120**			91
						STD. DEV.	**8**			
						1 Inside	113	0	SE1	
						2 Inside	113	0	SE1	
						3 Inside	130	0	SE1	
						4 Inside	126	0	SE1	
						5 Inside	118	0	SE1	
	AVG:	**149**			120	**AVG:**	**120**			91
	STD. DEV.	**3**				STD. DEV.	**8**			

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)

GAI-LAP

TABLE 4.
SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: ***Brantley Engineering, LLC***
PROJECT: ***JED Cell 10***
DATE REC'D: ***28-May-14***

MATERIAL: ***HDPE SEAM***
SEAM TYPE: ***Fusion Weld***
TRI JOB #: ***G140456***

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 29-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)
DSP-51	**97979**	166	> 50%	BRK		1 Outside	144	0	SE1	
		166	> 50%	BRK		2 Outside	151	0	SE1	
		162	> 50%	BRK		3 Outside	150	0	SE1	
		162	> 50%	BRK		4 Outside	148	0	SE1	
		159	> 50%	BRK		5 Outside	147	0	SE1	
						AVG:	**148**			91
						STD. DEV.	**3**			
						1 Inside	151	0	SE1	
						2 Inside	147	0	SE1	
						3 Inside	152	0	SE1	
						4 Inside	158	0	SE1	
						5 Inside	155	0	SE1	
	AVG.	**163**			120	**AVG:**	**153**			91
	STD. DEV.	**3**				STD. DEV.	**4**			
DSP-50	**97980**	152	> 50%	BRK		1 Outside	134	0	SE1	
		152	> 50%	BRK		2 Outside	134	0	SE1	
		149	> 50%	BRK		3 Outside	139	0	SE1	
		151	> 50%	BRK		4 Outside	137	0	SE1	
		148	> 50%	BRK		5 Outside	144	0	SE1	
						AVG:	**138**			91
						STD. DEV.	**4**			
						1 Inside	131	0	SE1	
						2 Inside	134	0	SE1	
						3 Inside	142	0	SE1	
						4 Inside	138	0	SE1	
						5 Inside	131	0	SE1	
	AVG:	**150**			120	**AVG:**	**135**			91
	STD. DEV.	**2**				STD. DEV.	**5**			

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: **28-May-14**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **G140456**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 29-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)
DSP-49	**97981**	175	> 50%	BRK		1 Outside	161	0	SE1	
		171	> 50%	BRK		2 Outside	158	0	SE1	
		168	> 50%	BRK		3 Outside	161	0	SE1	
		169	> 50%	BRK		4 Outside	160	0	SE1	
		163	> 50%	BRK		5 Outside	154	0	SE1	
						AVG:	**159**			91
						STD. DEV.	**3**			
						1 Inside	160	0	SE1	
						2 Inside	152	0	SE1	
						3 Inside	168	0	SE1	
						4 Inside	150	0	SE1	
						5 Inside	144	0	SE1	
	AVG.	**169**			120	**AVG:**	**155**			91
	STD. DEV.	**4**				STD. DEV.	**9**			

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)