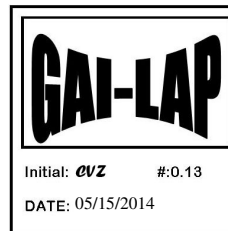




May 15, 2014

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 ten (10) HDPE seam samples.

**PROJECT NAME:** JED Cell 10

**DATE REPORTED:** May 15, 2014

**REFERENCE TRI JOB NO.:** G140417

**DATE RECEIVED:** May 15, 2014

**SAMPLES SENT BY:** Brantley Engineering

**SAMPLE IDENTIFICATIONS:**

**SAMPLE ID**

1. DXP-2 EX/ 60
2. DS-53 P138/ 141
3. DSP-18 P37/ 60
4. DSP-20 P63/ 64
5. DSP-21 P64/ 65
6. DSP-23 P66/ 67
7. DSP-24 P70/ 71
8. DSP-22 P65/ 66
9. DSP-19 P60/ 61
10. DSP-25 P72/ 73

**TRI-CA CONTROL NUMBER**

- 97782
- 97783
- 97784
- 97785
- 97786
- 97787
- 97788
- 97789
- 97790
- 97791

**TESTS REQUIRED / PERFORMED:**

**TEST METHOD**

1. ASTM D6392
2. ASTM D6392

**DESCRIPTION**

- Shear Bond Strength
- 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**



**TABLE 1.**  
**SEAM PEEL AND SHEAR TEST RESULTS**

CLIENT: **Brantley Engineering, LLC**  
PROJECT: **JED Cell 10**  
DATE REC'D: **15-May-14**

MATERIAL: **HDPE SEAM**  
SEAM TYPE: **Fusion Weld**  
TRI JOB #: **G140417**

QC'd By: *Maria Espitia*  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **15-May-14**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min				
SAMPLE ID	TRI CONTROL #	SHEAR EVALUATION				PEEL EVALUATION				
		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)
DXP-2 EX/ 60  Extrusion	97782	154	> 50%	BRK		1 Outside	153	0	SE3	
		151	> 50%	BRK		2 Outside	177	0	SE3	
		153	> 50%	BRK		3 Outside	155	0	SE3	
		152	> 50%	BRK		4 Outside	160	0	SE3	
		156	> 50%	BRK		5 Outside	153	0	SE3	
		AVG: STD. DEV.	160 10			78				
		1 Inside	N/A				2 Inside			
		2 Inside					3 Inside			
3 Inside				4 Inside						
4 Inside				5 Inside						
AVG. STD. DEV.		153 2	120			AVG: STD. DEV.				
DS-53 P138/ 141  Fusion	97783	177	> 50%	BRK		1 Outside	138	0	SE1	
		174	> 50%	BRK		2 Outside	129	0	SE1	
		173	> 50%	BRK		3 Outside	127	0	SE1	
		173	> 50%	BRK		4 Outside	134	0	SE1	
		177	> 50%	BRK		5 Outside	126	0	SE1	
		AVG: STD. DEV.	131 5			91				
		1 Inside	127 136 132 127 131	0 0 0 0 0		SE1 SE1 SE1 SE1 SE1				
		2 Inside								
		3 Inside								
		4 Inside								
		5 Inside								
		AVG: STD. DEV.		175 2		120			AVG: STD. DEV.	131 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 1)

(Sheet 1 of 1)

By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit.



**TABLE 2.**  
**SEAM PEEL AND SHEAR TEST RESULTS**

CLIENT: **Brantley Engineering, LLC**  
PROJECT: **JED Cell 10**  
DATE REC'D: **15-May-14**

MATERIAL: **HDPE SEAM**  
SEAM TYPE: **Fusion Weld**  
TRI JOB #: **G140417**

QC'd By: *Maria Espitia*  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **15-May-14**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min				
SAMPLE ID	TRI CONTROL #	SHEAR EVALUATION				PEEL EVALUATION				
		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-18 P37/ 60	97784	153	> 50%	BRK		1 Outside	125	0	SE1	
		144	> 50%	BRK		2 Outside	133	0	SE1	
		147	> 50%	BRK		3 Outside	124	0	SE1	
		153	> 50%	BRK		4 Outside	125	0	SE1	
		155	> 50%	BRK		5 Outside	134	0	SE1	
		AVG:	128			91				
		STD. DEV.	5							
		1 Inside	115	0		SE1				
		2 Inside	113	0		SE1				
		3 Inside	114	0		SE1				
		4 Inside	105	0		SE1				
		5 Inside	116	0		SE1				
AVG.		150	120		AVG:	113		91		
STD. DEV.		5			STD. DEV.	4				
DSP-20 P63/ 64	97785	146	> 50%	BRK		1 Outside	115	0	SE1	
		153	> 50%	BRK		2 Outside	119	0	SE1	
		153	> 50%	BRK		3 Outside	120	0	SE1	
		157	> 50%	BRK		4 Outside	123	0	SE1	
		159	> 50%	BRK		5 Outside	129	0	SE1	
		AVG:	121			91				
		STD. DEV.	5							
		1 Inside	115	0		SE1				
		2 Inside	117	0		SE1				
		3 Inside	119	0		SE1				
		4 Inside	110	0		SE1				
		5 Inside	119	0		SE1				
AVG:		154	120		AVG:	116		91		
STD. DEV.		5			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)

(Sheet 1 of 1)

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**TABLE 3.**  
**SEAM PEEL AND SHEAR TEST RESULTS**

CLIENT: **Brantley Engineering, LLC**  
PROJECT: **JED Cell 10**  
DATE REC'D: **15-May-14**

MATERIAL: **HDPE SEAM**  
SEAM TYPE: **Fusion Weld**  
TRI JOB #: **G140417**

QC'd By: *Maria Espitia*  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **15-May-14**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min				
SAMPLE ID	TRI CONTROL #	SHEAR EVALUATION				PEEL EVALUATION				
		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-21 P64/ 65	97786	150	> 50%	BRK		1 Outside	107	0	SE1	
		149	> 50%	BRK		2 Outside	102	0	SE1	
		149	> 50%	BRK		3 Outside	105	0	SE1	
		155	> 50%	BRK		4 Outside	106	0	SE1	
		159	> 50%	BRK		5 Outside	109	0	SE1	
		AVG:	106			91				
		STD. DEV.	3							
		1 Inside	110	0		SE1				
		2 Inside	107	0		SE1				
		3 Inside	104	0		SE1				
		4 Inside	105	0		SE1				
		5 Inside	108	0		SE1				
AVG.		152	120			AVG:	107		91	
STD. DEV.		4				STD. DEV.	2			
DSP-23 P66/ 67	97787	151	> 50%	BRK		1 Outside	122	0	SE1	
		152	> 50%	BRK		2 Outside	119	0	SE1	
		150	> 50%	BRK		3 Outside	109	0	SE1	
		153	> 50%	BRK		4 Outside	113	0	SE1	
		155	> 50%	BRK		5 Outside	111	0	SE1	
		AVG:	115			91				
		STD. DEV.	5							
		1 Inside	119	0		SE1				
		2 Inside	116	0		SE1				
		3 Inside	110	0		SE1				
		4 Inside	108	0		SE1				
		5 Inside	106	0		SE1				
AVG:		152	120			AVG:	112		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 3)

(Sheet 1 of 1)

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**TABLE 4.**  
**SEAM PEEL AND SHEAR TEST RESULTS**

CLIENT: **Brantley Engineering, LLC**  
PROJECT: **JED Cell 10**  
DATE REC'D: **15-May-14**

MATERIAL: **HDPE SEAM**  
SEAM TYPE: **Fusion Weld**  
TRI JOB #: **G140417**

QC'd By: *Maria Espitia*  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **15-May-14**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min				
SAMPLE ID	TRI CONTROL #	SHEAR EVALUATION				PEEL EVALUATION				
		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-24 P70/ 71	97788	157	> 50%	BRK		1 Outside	118	0	SE1	
		153	> 50%	BRK		2 Outside	113	0	SE1	
		153	> 50%	BRK		3 Outside	116	0	SE1	
		156	> 50%	BRK		4 Outside	111	0	SE1	
		156	> 50%	BRK		5 Outside	111	0	SE1	
						AVG:	114			91
						STD. DEV.	3			
						1 Inside	116	0	SE1	
						2 Inside	115	0	SE1	
						3 Inside	114	0	SE1	
						4 Inside	107	0	SE1	
						5 Inside	110	0	SE1	
		AVG:				AVG:	112			91
		STD. DEV.				STD. DEV.	4			
						1 Outside	114	0	SE1	
						2 Outside	111	0	SE1	
						3 Outside	117	0	SE1	
DSP-22 P65/ 66	97789	156	> 50%	BRK		4 Outside	108	0	SE1	
		153	> 50%	BRK		5 Outside	105	0	SE1	
		155	> 50%	BRK		AVG:	111			91
		158	> 50%	BRK		STD. DEV.	5			
		159	> 50%	BRK		1 Inside	110	0	SE1	
						2 Inside	108	0	SE1	
						3 Inside	107	0	SE1	
						4 Inside	123	0	SE1	
						5 Inside	125	0	SE1	
		AVG:				AVG:	115			91
		STD. DEV.				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 4)

(Sheet 1 of 1)

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**TABLE 5.**  
**SEAM PEEL AND SHEAR TEST RESULTS**

CLIENT: **Brantley Engineering, LLC**  
PROJECT: **JED Cell 10**  
DATE REC'D: **15-May-14**

MATERIAL: **HDPE SEAM**  
SEAM TYPE: **Fusion Weld**  
TRI JOB #: **G140417**

QC'd By: *Maria Espitia*  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **15-May-14**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min				
SAMPLE ID	TRI CONTROL #	SHEAR EVALUATION				PEEL EVALUATION				
		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-19 P60/ 61	97790	144	> 50%	BRK		1 Outside	111	0	SE1	
		148	> 50%	BRK		2 Outside	108	0	SE1	
		149	> 50%	BRK		3 Outside	107	0	SE1	
		158	> 50%	BRK		4 Outside	105	0	SE1	
		152	> 50%	BRK		5 Outside	105	0	SE1	
						AVG:	107			91
						STD. DEV.	2			
						1 Inside	101	0	SE1	
						2 Inside	102	0	SE1	
						3 Inside	98	0	SE1	
						4 Inside	98	0	SE1	
						5 Inside	102	0	SE1	
		AVG:				AVG:	100			91
		STD. DEV.				STD. DEV.	2			
						1 Outside	126	0	SE1	
						2 Outside	124	0	SE1	
						3 Outside	117	0	SE1	
						4 Outside	125	0	SE1	
						5 Outside	130	0	SE1	
						AVG:	124			91
						STD. DEV.	5			
						1 Inside	134	0	SE1	
						2 Inside	132	0	SE1	
						3 Inside	125	0	SE1	
						4 Inside	126	0	SE1	
						5 Inside	130	0	SE1	
		AVG:				AVG:	129			91
		STD. DEV.				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 5)

(Sheet 1 of 1)

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