

Clast Count 2								
Location: West Strat Column								
Bedding foliation: N75E 60SE								
Matrix: predominately coarse brick red sand, 1-2 mm grains, clast and matrix supported, subangular subrounded; varies								
Imbrication	Row 1	Size (mm)	Phi	Lithology	Clast Color	Lithology	Roundness	Matrix
N50E 32SE	20 mm volcanic, light tan, subangular	2	-1	fine pebbles	tan color	rhyolite	subangular	N
	coarse red sand matrix with 2-4mm grain, subangular/subrounded	2	-1	fine pebbles	brick red	BRSS	subangular/subrounded	Y
N10E 24SE	coarse red sand matrix with 2-4mm grain, subangular/subrounded	2	-1	fine pebbles	brick red	BRSS	subangular/subrounded	Y
	10mm volcanic	10	-3	med/coarse pebbles	--	volcanic	rounded	N
	10mm volcanic	10	-3	med/coarse pebbles	--	volcanic	rounded	N
	20mm volcanic	20	-4	coarse pebbles	--	volcanic	rounded	N
	50mm volcanic clasts with black and white crystals, subrounded	50	-6	very coarse pebbles	black and white	diorite	subrounded	N
	70mm volcanic clasts, subrounded	70	-6	small cobbles	--	volcanic	subrounded	N
	coarse red sand matrix with 2-4mm grain, subangular/subrounded	2	-1	fine pebbles	brick red	BRSS	subangular/subrounded	Y
	60mm volcanic clasts, rounded	60	-6	very coarse pebbles	--	volcanic	rounded	N
S221W 10NW	coarse red sand matrix with 2-4mm grain, subangular/subrounded	4	-2	fine pebbles	brick red	BRSS	subangular/subrounded	Y
	coarse red sand matrix with 2-4mm grain, subangular/subrounded	4	-2	fine pebbles	brick red	BRSS	subangular/subrounded	Y
	90mm volcanic clast	90	-7	med cobbles	black and white	volcanic	rounded	N
	80mm fine grained light gray - chert subangular/subrounded	80	-6	small cobbles	light gray	chert	subangular/subrounded	N
N65E 15SE								
Imbrication	Row 2	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S190W 25NW	40mm volcanic, rounded elongated, black	40	-5	very coarse pebbles	black	volcanic	rounded/ elongated	N
	coarse red sand matrix with 2-4mm grain, subangular/subrounded	4	-3	fine pebble with coarse pebbles	brick red	BRSS	subangular/subrounded	Y
S258W 23NW	10mm clasts volcanic rounded	10	-3	med/coarse pebbles	green	volcanic	rounded	N
	30mm subangular crystalline volcanic clast	30	-5	very coarse pebbles	white	diorite	subangular	N
	100mm subangular sed conglomerate with volcanic 2-5mm	100	-7	large cobbles	--	conglomerate	subangular	N
Imbrication	Row 3	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S170E 17SW	70mm gneiss subrounded	70	-6	small cobbles	black and white	gneiss	subrounded	N
	matrix with coarse red sand, 1-2 mm grains, clast and matrix supported, subangular subrounded	1	0	very coarse sand/ f pebbles	brick red	BRSS	subangular/subrounded	Y
S210W 16NW	60mm metaplutonic subangular, grey	60	-6	very coarse pebbles	grey	granodiorite	subangular	N
	240 mm volcanic with black and white crystals, subrounded	240	-8	large cobbles	black and white crystals	diorite	subrounded	N
	matrix with coarse red sand, 1-2 mm grains, clast and matrix supported, subangular subrounded	1	0	very coarse sand/ f pebbles	brick red	BRSS	subang/subrounded	Y
	50mm volcanic with high feldspar, grains 10-15mm	50	-6	coarse pebbles		felsic granite	--	N
	15mm volcanic	15	-3	med/coarse pebbles	--	volcanic	--	N
	matrix with coarse red sand, 1-2 mm grains, clast and matrix supported, subangular subrounded	2	-1	very coarse sand/ f pebbles	brick red	BRSS	subangular/subrounded	Y
	100mm volcanic/ angular, subangular	100	-7	large cobbles	--	volcanic	subangular	N
matrix with coarse red sand, 1-2 mm grains, clast and matrix supported, subangular subrounded	2	-1	very coarse sand/ f pebbles	brick red	BRSS	subangular/subrounded	Y	
Imbrication	Row 4	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N15E 35SE	matrix with finer grains 1mm or less, red, sunrounded, matrix supported	1	0	coarse sand	brick red	BRSS	subangular/subrounded	Y
	270mm matrix with finer grains 1mm or less	1	0	coarse sand	brick red	BRSS	subangular/subrounded	Y
	25mm quartzite, white, subrounded	25	-4	coarse pebbles	white	quartzite	subrounded	N
	40mm matrix with finer grains 1mm or less	1	0	coarse sand	brick red	BRSS	subangular/subrounded	Y
	30mm volcanic/ granite type, black and white crystals	30	-5	very coarse pebbles	black and white crystals	granodiorite	subangular/subrounded	N
	80mm matrix with finer grains 1mm or less	1	0	coarse sand	brick red	BRSS	subangular/subrounded	Y

Clast Count 2								
Location: West Strat Column								
Bedding foliation: N75E 60SE								
Matrix: predominately coarse brick red sand, 1-2 mm grains, clast and matrix supported, subangular subrounded; varies								
Imbrication	Row 5	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S241W 20NW	50mm matrix with coarse red sand, 1-2 mm grains, clast and matrix supported, subangular subrounded	2	-1	very coarse sand/ f pebbles	brick red	BRSS	subangular/subrounded	Y
	55mm gneiss, white and black crystals, angular	55	-6	very coarse pebbles	black and white crystals	gneiss	angular	N
	80mm volcanic fallout, desert varnish, rounded	80	-6	small cobbles	desert varnish	volcanic	rounded	N
	190mm matrix with coarse red sand, 1-2 mm grains, clast and matrix supported, subangular subrounded	1	0	very coarse sand/ f pebbles	brick red	BRSS	subangular/subrounded	Y
N8E 68SE	20mm red tuff, vesicular	20	-4	coarse pebbles	red	tuff	rounded/vessicular	N
	50mm matrix with coarse red sand, 1-2 mm grains, clast and matrix supported, subangular subrounded	8	-3	fine/med pebbles	brick red	BRSS	subangular/subrounded	Y
Imbrication	Row 6	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S223W 26NW	360mm matrix with coarse red sand, 1-2 mm grains, 5-10mm clast, clast and matrix supported, subangular subrounded	8	-3	fine/med pebbles	brick red	BRSS	subangular/subrounded	Y
	30mm volcanic, subrounded	30	-5	very coarse pebbles	white	volcanic	subrounded	N
	20mm pink tuff	20	-4	coarse pebbles	pink	tuff	rounded	N
	50mm matrix with coarse red sand, 1-2 mm grains, clast and matrix supported, subangular subrounded	8	-3	fine/med coarse	brick red	BRSS	subangular/subrounded	Y
Imbrication	Row 7	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N43E 26SE	matrix with coarse red sand, 1-2 mm grains, 10-20mm clast, clast and matrix supported, subangular subrounded	10	-3	coarse pebbles	brick red	BRSS	subangular/subrounded	Y
	12mm clast, subrounded	12	-3	med/coarse pebbles	black	volcanic	subrounded	N
	15mm volcanic	15	-3	med/coarse pebbles	--	volcanic	--	N
	19mm pink tuff	19	-4	med/coarse pebbles	pink	tuff	--	N
S230W 35NW	90mm volcanic, subangular, angular	90	-7	small cobbles	red	volcanic	angular/subangular	N
	45mm volcanic, rounded	45	-5	very coarse pebbles	--	volcanic	rounded	N
	35mm volcanic, rounded	35	-5	very coarse pebbles	black	volcanic	rounded	N
	270mm matrix with coarse red sand, 1-2 mm grains, clast and matrix supported, subangular subrounded	10	-3	med/coarse pebbles	brick red	BRSS	subangular/subrounded	N

**latitude**  
 33° 22' 43.8"  
**longitude**  
 114° 56' 39.6"

Appendix A. 1. West - Clast Count two (CC2) Unit R.

Clast Count 3								
Location: West Strat Column								
Bedding foliation: S245W 45NW								
Matrix: very fine with 1/4-1mm grains, rounded-subrounded, brick red								
ALL matrix, clasts roughly 50-100mm apart, very fine matrix 1/4 - 1mm in size, rounded/ subrounded grains, brick red color, largest clasts up to 30 - 80mm subangular, average 5-15mm volcanic subrounded. high silica sandstone & for overall count composition, contains volcanic grains but minor % in terms of overall clast count								
Imbrication	Row 1	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N45E 15SE	50mm matrix very fine 1/4-1mm grains, rounded/subrounded brick red	1/2	1	C/Vc sand	brick red	BRSS	rounded/subrounded	Y
	30mm volcanic	30	-5	coarse pebbles	--	volcanic	--	N
S225W 25NW	75mm matrix very fine 1/4-1mm grains, rounded/subrounded brick red	1/2	1	C/Vc sand	brick red	BRSS	rounded/subrounded	Y
	50mm volcanic	50	-6	V coarse peb	--	volcanic	--	N
	100mm matrix very fine 1/4-1mm grains, rounded/subrounded brick red	1/4	2	fine/med sand	brick red	BRSS	rounded/subrounded	Y
Imbrication	Row 2	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S193W 36NW	10mm matrix very fine 1/4-1mm grains, rounded/subrounded brick red	1/2	1	C/Vc sand	brick red	BRSS	rounded/subrounded	Y
	75mm volcanic black, subrounded	75	-6	small cobbles	black	black basalt	subrounded	N
N11E 21SE	25mm matrix very fine 1/4-1mm grains, rounded/subrounded brick red	1/2	1	C/Vc sand	brick red	BRSS	rounded/subrounded	Y
	80mm gneiss	80	-6	small cobbles	--	gneiss	subrounded	N
	90mm matrix very fine 1/4-1mm grains, rounded/subrounded brick red	1/4	2	fine/med sand	brick red	BRSS	rounded/subrounded	Y
Imbrication	Row 3	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S230W 7NW	42mm matrix very fine 1/4-1mm grains, rounded/subrounded brick red	1/2	1	C/Vc sand	brick red	BRSS	rounded/subrounded	Y
	30mm gneiss subrounded	30	-5	coarse pebbles	--	gneiss	subrounded	N
	80mm matrix very fine 1/4-1mm grains, rounded/subrounded brick red	1/2	1	C/Vc sand	brick red	BRSS	rounded/subrounded	Y
	20mm volcanic tuff, subrounded	20	-4	coarse pebbles	--	tuff	subrounded	N
	50mm matrix very fine 1/4-1mm grains, rounded/subrounded brick red	1/4	2	fine/med sand	brick red	BRSS	rounded/subrounded	Y
Imbrication	Row 4	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N282W 21NE	75mm matrix very fine 1/4-1mm grains, rounded/subrounded brick red	1/2	1	C/Vc sand	brick red	BRSS	rounded/subrounded	Y
	30mm augen gneiss	30	-5	coarse pebbles	--	augen gneiss	subrounded	N
	75mm matrix very fine 1/4-1mm grains, rounded/subrounded brick red	1/2	1	C/Vc sand	brick red	BRSS	rounded/subrounded	Y
	65mm volcanic	65	-6	very coarse pebbles	--	volcanic	--	N
	25mm matrix very fine 1/4-1mm grains, rounded/subrounded brick red	1/4	2	fine/med sand	brick red	BRSS	rounded/subrounded	Y
Imbrication	Row 5	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N355W 12NE	55mm matrix very fine 1/4-1mm grains, rounded/subrounded brick red	1/2	1	C/Vc sand	brick red	BRSS	rounded/subrounded	Y
	25mm chert	25	-4	coarse pebbles	black with crystals	chert	--	N
N12E 30SE	35mm matrix very fine 1/4-1mm grains, rounded/subrounded brick red	1/2	1	C/Vc sand	brick red	BRSS	rounded/subrounded	Y
	50mm volcanic	50	-6	V coarse peb	--	volcanic	--	N
	80mm matrix very fine 1/4-1mm grains, rounded/subrounded brick red	1/4	2	fine/med sand	brick red	BRSS	rounded/subrounded	Y
Imbrication	Row 6	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S130E 32SW	95mm matrix very fine 1/4-1mm grains, rounded/subrounded brick red	1/2	1	C/Vc sand	brick red	BRSS	rounded/subrounded	Y
	65mm volcanic, rounded black crystals	65	-6	very coarse pebbles	black with crystals	andesite	rounded	N
	75mm matrix very fine 1/4-1mm grains, rounded/subrounded brick red	1/2	1	C/Vc sand	brick red	BRSS	rounded/subrounded	Y
	30mm gneiss	30	-5	coarse pebbles		gneiss	subrounded	N
	100mm matrix very fine 1/4-1mm grains, rounded/subrounded brick red	1/4	2	fine/med sand	brick red	BRSS	rounded/subrounded	Y

latitude  
33° 22' 42.6"  
longitude  
114° 56' 36.3"

Appendix A. 2. West - Clast Count three (CC3) Unit R.

**Clast Count 4**

Location: West Strat Column

Bedding foliation: S177E 37SW

Matrix: predominantly vivid red matrix - contains red and white grains, angular and 2-3mm in grain size, large conglomerate/cobble sized clasts - very few clasts, matrix supported

Imbrication	Row 1	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N66E 17SE	120mm matrix, red and white grains, angular, 2-3mm with large conglomerate clasts	2	-1	VC sand/fine peb	vivid red	VRSS	angular	Y
	30mm volcanic subangular/ subrounded	30	-5	V/coarse peb	--	volcanic	subrounded	N
S200W 20NW S190W 35NW	280mm matrix, red and white grains, angular, subangular/subrounded	2	-3	med. pebbles	vivid red	VRSS	angular	Y
	10mm chert	10	-3	med. pebbles	--	chert	angular	N
	150mm matrix, red and white grains, angular, 2-3mm with large conglomerate clasts	2	-1	VC sand/fine peb	vivid red	VRSS	angular	Y
	60mm augen gneiss rounded	60	-6	V/coarse peb	--	augen gneiss	rounded	N
N88E 34SE	50mm chert	50	-6	V/coarse peb	--	chert	subrounded	N
	20mm chert brown, rounded subrounded	20	-4	coarse pebbles	brown	chert	subrounded	N
	30mm chert white, rounded subrounded	30	-5	V/coarse peb	white	chert	subrounded	N
	10mm chert black rounded subrounded	10	-3	med. pebbles	black	chert	subrounded	N
Imbrication	Row 2	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
	ALL matrix, red and white grains, angular, 2-3mm with large conglomerate clasts	2	-1	VC sand/fine peb	vivid red	VRSS	angular	Y
Imbrication	Row 3	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
	ALL matrix, red and white grains, angular, 2-3mm with large conglomerate clasts	2	-1	VC sand/fine peb	vivid red	VRSS	angular	Y
Imbrication	Row 4	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
	ALL matrix, red and white grains, angular, 2-3mm with large conglomerate clasts	2	-1	VC sand/fine peb	vivid red	VRSS	angular	Y
Imbrication	Row 5	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S233W 28NW	240mm matrix angular	3	-4	med. pebbles	vivid red	VRSS	angular	Y
	10mm schist subrounded	10	-3	med. pebbles	--	gneiss	subrounded	N
	12mm gneisses subrounded	12	-3	med. pebbles	--	gneiss	subrounded	N
	15mm gneisses subrounded	15	-4	med. pebbles	--	gneiss	subrounded	N
N10E 7NW	19mm schist subrounded	19	-4	med. pebbles	--	schist	subrounded	N
	20mm quartzite rounded, white	20	-4	coarse pebbles	white	quartzite	rounded	N
	40mm quartzite rounded, white	40	-5	V/coarse peb	white	quartzite	rounded	N
	55mm black slender volcanic, subangular	55	-6	V/coarse peb	black	volcanic	subangular	N
	10mm schist, rounded/subrounded	10	-3	med. pebbles	vivid red	schist	rounded/subrounded	Y
	12mm gneiss subrounded	12	-3	med. pebbles	--	gneiss	subrounded	N
	15mm gneiss subrounded	15	-4	med. pebbles	--	gneiss	subrounded	N
	19mm schist rounded	19	-4	med. pebbles	--	schist	subrounded	N
S215W 48NW	120mm gneiss, rounded	120	-7	med cobbles	--	gneiss	rounded	N
	10mm schist, rounded/subrounded	10	-3	med. pebbles	--	schist	rounded/subrounded	Y
	70mm metaplutonic rock, angular	70	-6	small cobbles	black and white	granodiorite	angular	N
	30mm augen gneiss	30	-5	V/coarse peb	--	augen gneiss	--	N

latitude  
33° 22' 42"  
longitude  
114° 56' 28.9"

Appendix A. 3. West - Clast Count four (CC4) Unit R.

Clast Count Trip 5								
Location: West Strat Column								
Bedding foliation: N9E 30SE								
Matrix: very fine- unconsolidated clay, tan sandstone								
ALL matrix, clasts roughly 30-70mm, very fine matrix- unconsolidated clay, tan sandstone - rounded/subrounded grains, very angular/subangular - gneiss and volcanic material, matrix supported rounded/subrounded grains, very angular/subangular - gneiss and volcanic material, matrix supported high clay rich sandstone & for overall count composition (roughly %), contains volcanic and metamorphic grains and clasts both roughly the same amounts in terms of overall clast count								
Imbrication	Row 1	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S149E 17SW	10mm matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
	30mm red volcanic subangular	30	-5	V coarse peb	red	rhyolite	subangular	N
	75mm matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
	10mm black volcanic angular	10	-3	med. pebbles	black	black basalt	angular	N
N32E 16SE	15mm matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
Imbrication	Row 2	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N325W 65NE	40mm matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
	5mm volcanic black, subrounded	5	-2	fine pebbles	black	black basalt	subrounded	N
	25mm matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
	60mm gneiss	60	-6	V coarse peb	black and white	gneiss	subangular	N
N320W 20NE	12mm chert brown, subangular	10	-3	med. pebbles	brown	chert	subangular	N
	5mm matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
N21E 55SE	13mm volcanic	13	-3	med. pebbles	--	volcanic	--	N
Imbrication	Row 3	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N79E 21SE	5mm volcanic subangular	5	-2	fine pebbles	--	volcanic	subangular	N
	22mm matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
	30mm green volcanic subrounded	30	-5	V coarse peb	green	green basalt	subrounded	N
	10mm matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
N311W 8NE	11mm volcanic black tuff, subrounded	11	-3	med. pebbles	black	tuff	subrounded	N
	25mm matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
Imbrication	Row 4	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S110E 21SW	75mm matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
	10mm augen gneiss subangular	10	-3	med. pebbles	black and pink	augen gneiss	subangular	N
S211W 51NE	5mm matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
	14mm volcanic subangular	4	-2	fine pebbles	--	volcanic	subangular	N
N85E 30SE	35mm matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
	65mm volcanic rounded	65	-6	V coarse peb	--	volcanic	rounded	N
	15mm chert rounded	15	-4	coarse pebbles	gray	chert	rounded	N
	25mm matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
Imbrication	Row 5	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N280W 12NE	15mm matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
	25mm chert	25	-4	coarse pebbles	--	chert	subangular	N
N15E 30SE	35mm matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
	5mm volcanic subrounded	5	-2	fine pebbles	--	volcanic	subrounded	N
N300W 16NE	10mm augen gneiss	10	-3	med. pebbles	--	augen gneiss		N
	50mm volcanic subangular	50	-6	V coarse peb	--	volcanic	subangular	N
	35mm matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y

latitude  
33° 22' 42.8"  
longitude  
114° 56' 31.2"

Appendix A. 4. West - Clast Count five (CC5) Unit L.

Clast Count Trip 6								
Location: West Strat Column								
Bedding foliation: N25E 75SE								
Matrix: dark red/purple color - fine/med sand with clear 2-5mm pebble grains and subrounded grains								
Large clasts, in arroyo/wash. dark red/purple color / matrix supported / Unit R								
Average: 100-400mm sized cobbles; matrix is fine/med sand with 2-5mm pebble grains and subrounded grains								
Imbrication	Row 1	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N315W 52NE	110mm matrix	2	-1	fine pebbles	dark red/ purple	DRSS	subrounded	Y
	40mm green volcanic	40	-5	coarse pebbles	green	green basalt	rounded	N
	240mm matrix	2	-1	fine pebbles	dark red/purple	DRSS	subrounded	Y
	200mm volcanic black fined grain	200	-8	large cobble	black	andesite	rounded	N
Imbrication	Row 2	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S205W 57NW	40mm matrix	2	-1	fine pebbles	dark red/purple	DRSS	subrounded	Y
	55mm black tuff	55	-6	V coarse peb	black	tuff	rounded	N
	30mm matrix	2	-1	fine pebbles	dark red/purple	DRSS	subrounded	Y
	90mm crystalline rock metavolcanic	90	-7	small cobbles	white crystalline	granodiorite	--	N
	140mm matrix with volcanic clasts roughly 20mm	2	-1	fine pebbles	dark red/purple	DRSS	subrounded	Y
N25E 55SE	110mm pink tuff	110	-7	med cobbles	pink	tuff	rounded	N
	45mm black/white volcanic	45	-5	coarse pebbles	black/white	diorite	rounded	N
Imbrication	Row 3	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S135E 45SW	110mm matrix	4	-2	fine pebbles	dark red/purple	DRSS	subrounded	Y
	85mm smooth black vesicular	85	-6	small cobble	black	pumice	rounded	N
	120mm pink tuff	120	-7	med cobbles	pink	tuff	rounded	N
	240mm matrix	4	-2	fine pebbles	dark red/purple	DRSS	subrounded	Y
Imbrication	Row 4	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N301W 34NE	180mm matrix	4	-2	fine pebbles	dark red/purple	DRSS	subrounded	Y
	55 mm volcanic	55	-6	V coarse peb	--	volcanic	rounded	N
	260mm matrix	4	-2	fine pebbles	dark red/purple	DRSS	subrounded	Y
Imbrication	Row 5	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S118E 35SE	100mm matrix	4	-2	fine pebbles	dark red/purple	DRSS	subrounded	Y
	110 crystalline rock black and white - rounded	110	-7	med cobbles	black/white	granodiorite	rounded	N
	240mm matrix	2	-1	fine pebbles	dark red/purple	DRSS	subrounded	Y
N13E 26SE	95mm green volcanic	95	-7	small cobbles	green	green basalt	rounded	N
Imbrication	Row 6	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N295W 38NE	75mm volcanic	75	-6	small cobbles	--	volcanic	rounded	N
	45mm gabbro	45	-5	coarse pebbles	black	gabbro	rounded	N
	360mm matrix	2	-1	fine pebbles	dark red/purple	DRSS	subrounded	Y
Imbrication	Row 7	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S155E 12SW	240mm matrix	2	-1	fine pebbles	dark red/purple	DRSS	subrounded	Y
	35mm black volcanic	35	-5	coarse pebbles	black	black basalt	rounded	N
	240mm matrix	2	-1	fine pebbles	dark red/purple	DRSS	subrounded	Y

latitude  
33° 23' 01.3"  
longitude  
114° 56' 20"

Appendix A. 5. West - Clast Count six (CC6) Unit R.

Clast Count 7								
Location: West Strat Column								
Bedding foliation: N45E 35SE								
Matrix: Matrix supported, fine/med sand matrix, rounded/ subrounded grains, orange/red color								
Matrix supported, fine/med sand matrix, rounded/ subrounded grains, red color, largest clasts up to 10 - 20mm rounded/subrounded, average 5-15mm volcanic subrounded.								
High silica sandstone & for overall count composition, contains volcanic grains but minor % in terms of overall clast count								
Imbrication	Row 1	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N332W 62NE	80mm matrix coarse/medium sand grains, rounded/subrounded	1	0	V/Coarse sand	orange/red	ORSS	subrounded	Y
	5mm volcanic subrounded	50	-6	V/coarse peb	--	volcanic	subrounded	N
	15mm volcanic black rounded	15	-3	med pebbles	black	black basalt	rounded	N
	120 mm matrix coarse/medium sand grains, rounded/subrounded	1/2	1	C/V sand	orange/red	ORSS	subrounded	Y
	10mm schist	10	-3	med pebbles	gray	schist	subangular	N
	55mm matrix coarse/medium sand grains, rounded/subrounded	55	-6	V/coarse peb	orange/red	ORSS	subrounded	Y
Imbrication	Row 2	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S152E 56SW	25mm gneiss	25	-4	coarse pebbles	--	gneiss	subrounded	N
	30mm matrix coarse/medium sand grains, rounded/subrounded	1	0	coarse sand	orange/red	ORSS	subrounded	Y
	3mm volcanic	3	-1	fine pebbles	--	volcanic	rounded	N
	7mm volcanic	7	-2	fine pebbles	--	volcanic	rounded	N
	65mm matrix coarse/medium sand grains, rounded/subrounded	2	-1	fine pebbles	orange/red	ORSS	subrounded	Y
	10mm volcanic rounded/ black and white	10	-3	med. pebbles	black and white	diorite	rounded	N
	240mm matrix coarse/medium sand grains, rounded/subrounded	2	-1	fine pebbles	orange/red	ORSS	subrounded	Y
Imbrication	Row 3	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
	12mm gray volcanic	12	-3	med. pebbles	gray	andesite	rounded	N
	25mm matrix coarse/medium sand grains, rounded/subrounded	1	0	coarse sand	orange/red	ORSS	subrounded	Y
	15mm volcanic subrounded	15	-3	med. pebbles	--	volcanic	subrounded	N
	80mm matrix coarse/medium sand grains, rounded/subrounded	1/2	1	C/V sand	orange/red	ORSS	subrounded	Y
	5mm volcanic	5	-2	fine pebbles	--	volcanic	rounded	N
	10mm augen gneiss rounded	10	-3	med. pebbles	pink and black	augen gneiss	rounded	N
Imbrication	Row 4	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S122E 75SW	10mm matrix coarse/medium sand grains, rounded/subrounded	1	0	coarse sand	orange/red	ORSS	subrounded	Y
	10mm augen gneiss subangular	10	-3	med. pebbles	black and white	augen gneiss	subangular	N
	80mm matrix coarse/medium sand grains, rounded/subrounded	2	-1	fine pebbles	orange/red	ORSS	subrounded	Y
	4mm volcanic subangular	4	-2	fine pebbles	--	volcanic	subangular	N
	90mm matrix coarse/medium sand grains, rounded/subrounded	1	0	coarse sand	orange/red	ORSS	subrounded	Y
N345W 32NE	25mm volcanic rounded	25	-4	coarse pebbles	--	volcanic	rounded	N
	15mm chert rounded	15	-3	med. pebbles	--	chert	rounded	N
	65mm matrix coarse/medium sand grains, rounded/subrounded	1	0	coarse sand	orange/red	ORSS	subrounded	Y
Imbrication	Row 5	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N272W 10NE	250mm matrix coarse/medium sand grains, rounded/subrounded	2	-1	fine pebbles	orange/red	ORSS	subrounded	Y
	6mm rounded green volcanic	6	-2	fine pebbles	green	green basalt	rounded	N
	110mm matrix coarse/medium sand grains, rounded/subrounded	1	0	coarse sand	orange/red	ORSS	subrounded	Y
	12mm pink tuff	12	-3	med. pebbles	pink	tuff	rounded	N
	75mm matrix coarse/medium sand grains, rounded/subrounded	1/2	1	C/V sand	orange/red	ORSS	subrounded	Y

latitude  
33° 22' 34.7"  
longitude  
114° 56' 20.1"

Appendix A. 6. West - Clast Count seven (CC7) Unit R.

Clast Count Trip 8								
Location: West Strat Column								
Bedding foliation: N65E 50SE								
Matrix: Matrix - light red ss, coarse grains 1-2mm tan red								
Matrix - light red ss, coarse grains 1-2mm tan red, going up - clast range 20-200mm in size - wackees, gneisses, tuff's and volcanics								
Imbrication	Row 1	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N69E 76SW	15mm matrix coarse sand 1mm grains, subangular/subrounded	2	-1	fine pebbles	light red	LRSS	subrounded	Y
	80mm pink tuff volcanic	80	-6	small cobble	pink	tuff	rounded	N
	95mm smooth black vesicular	95	-7	med. cobbles	black	pumice	rounded	N
	65mm gneiss	65	-6	V. Coarse	--	gneiss	subangular	N
	10mm matrix coarse sand 1mm grains, subangular/subrounded	1/2	1	C/Vcoarse sand	light red	LRSS	subrounded	Y
Imbrication	Row 2	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S205W 50NW	150 crystalline rock black and white - rounded	150	-7	med. cobbles	black and white	diorite	rounded	N
	20mm wackee	20	-4	coarse pebbles	--	wackee	subangular	N
	5mm matrix coarse sand 2mm grains, subangular/subrounded	2	-1	fine pebbles	light red	LRSS	subrounded	Y
	100mm gneiss	100	-7	med. cobbles	--	gneiss	subangular	N
	120mm pink tuff	120	-7	med. cobbles	pink	tuff	rounded	N
	70mm metaplutonic rock, angular	70	-6	small cobble	--	granodiorite	angular	N
	20mm matrix coarse sand 2mm grains, subangular/subrounded	2	-1	fine pebbles	light red	LRSS	subangular	Y
Imbrication	Row 3	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N30E 66SE	110mm pink tuff	110	-7	med. cobbles	pink	tuff	rounded	N
	65mm volcanic rounded	65	-6	V. coarse pebbles	--	volcanic	rounded	N
	10mm matrix 2mm grains, subangular/subrounded	2	-1	fine pebbles	light red	LRSS	subrounded	Y
	90mm gneiss	90	-7	med. cobbles	--	gneiss	subangular	N
	65mm smooth black vesicular	65	-6	V. coarse pebbles	black	tuff	rounded	N
S192W 57NW	110 crystalline rock black and white - rounded	110	-7	med. cobbles	black and white	diorite	rounded	N
Imbrication	Row 4	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S162E 55SW	100mm smooth black vesicular	100	-7	med. cobbles	black	tuff	rounded	N
	15mm matrix coarse sand 2mm grains, subangular/subrounded	2	-1	fine pebbles	light red	LRSS	subrounded	Y
	75mm gneiss	75	-6	small cobble	--	gneiss	subangular	N
	7mm matrix coarse sand 1mm grains, subangular/subrounded	7	-2	fine pebbles	light red	LRSS	subrounded	Y
	120mm pink tuff	120	-7	med. cobbles	pink	tuff	rounded	N
	85mm volcanic rounded	85	-6	small cobble	--	volcanic	rounded	N
	210mm augen gneiss	210	-8	large cobbles	pink and black	augen gneiss	subangular	N
	12mm matrix very fine 2mm grains, subangular/subrounded	2	-1	fine pebbles	light red	LRSS	subrounded	Y
Imbrication	Row 5	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N32E 8SE	70mm metaplutonic rock, angular	70	-6	small cobbles	--	granodiorite	angular	N
	95mm wackee subrounded	95	-7	med. cobbles	--	wackee	subrounded	N
	10mm matrix very fine 1mm grains, subangular/subrounded	1/2	1	C/Vcoarse sand	light red	LRSS	subrounded	Y
	60mm augen gneiss	60	-6	V. Coarse pebbles	pink and black	augen gneiss	subangular	N
	90mm pink tuff	90	-7	med. cobbles	pink	tuff	rounded	N
S178E 32SW	20mm matrix very fine 1mm grains, subangular/subrounded	2	-1	fine pebbles	light red	LRSS	subrounded	Y

latitude  
33° 23' 03.9"  
longitude  
114° 56' 00.1"

Appendix A. 7. West - Clast Count eight (CC8) Unit R.



Clast Count 9								
Location: West Strat Column								
Bedding foliation: N61E 44SE								
Matrix: Grain supported, fine grain - light tan clay matrix largest clasts up to 50 - 200mm								
Grain supported, fine grain - light tan clay matrix largest clasts up to 50 - 200mm subrounded/subangular, average 5-15mm volcanic subrounded.								
Large amounts of gneisses and volcanics, pink tuffs								
Imbrication	Row 1	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N24E 37SE	15mm matrix very fine 1/4-1mm grains, subangular/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	light tan	TSS	subrounded	Y
	80mm gneiss	80	-6	small cobble	--	gneiss	subangular	N
	5mm smooth black vesicular	5	-2	fine pebbles	black	pumice	rounded	N
	65mm chert brown	65	-6	V. Coarse pebble	brown	chert	subangular	N
	10mm matrix very fine 1/4-1mm grains, subangular/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	light tan	TSS	subrounded	Y
Imbrication	Row 2	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N62E 20SE	150 crystalline rock black and white - rounded	150	-7	med. cobbles	black	diorite	rounded	N
	20mm augen gneiss	20	-4	coarse pebbles	pink and black	augen gneiss	subangular	N
	5mm matrix very fine 1/4-1mm grains, subangular/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	light tan	TSS	subrounded	Y
	100mm gneiss	100	-7	med. cobbles	--	gneiss	subangular	N
	120mm pink tuff	120	-7	med. cobbles	pink	tuff	rounded	N
N315W 12NE	70mm metaplutonic rock, angular	70	-6	small cobble	--	granodiorite	angular	N
	20mm matrix very fine 1/4-1mm grains, subangular/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	light tan	TSS	subrounded	Y
Imbrication	Row 3	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N302W 11NE	110mm pink tuff	110	-7	med. cobbles	pink	tuff	rounded	N
	17mm volcanic rounded	15	-3	med. pebbles	--	volcanic	rounded	N
S162E 24SW	10mm matrix very fine 1/4-1mm grains, subangular/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	light tan	TSS	subrounded	Y
	90mm gneiss	90	-7	med cobbles	--	gneiss	subangular	N
	65mm smooth black vesicular	65	-6	V. coarse pebbles	black	pumice	rounded	N
	110 crystalline rock black and white - rounded	110	-7	med. cobbles	black and white	diorite	rounded	N
Imbrication	Row 4	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S158E 66SW	100mm smooth black vesicular	100	-7	med. cobbles	black	pumice	rounded	N
	15mm matrix very fine 1/4-1mm grains, subangular/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	light tan	TSS	subrounded	Y
	75mm gneiss	75	-6	small cobble	--	gneiss	subangular	N
N297W 18NE	7mm matrix very fine 1/4-1mm grains, subangular/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	light tan	TSS	subrounded	Y
	120mm chert black	120	-7	med. cobbles	black	chert	angular	N
N288W 21NE	85mm volcanic rounded	85	-6	small cobble	--	volcanic	rounded	N
	45mm augen gneiss	45	-5	coarse pebbles	pink and black	augen gneiss	angular	N
	12mm matrix very fine 1/4-1mm grains, subangular/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	light tan	TSS	subrounded	Y
Imbrication	Row 5	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S125E 32SW	70mm metaplutonic rock, angular	70	-6	small cobbles	--	granodiorite	angular	N
	95mm volcanic rounded	95	-7	med. cobbles	--	volcanic	rounded	N
	10mm matrix very fine 1/4-1mm grains, subangular/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	light tan	TSS	subrounded	Y
S110E 51SW	10mm augen gneiss	10	-3	med. pebbles	pink and black	augen gneiss	subangular	N
	90mm pink tuff	90	-7	med. cobbles	pink	tuff	rounded	N
	20mm matrix very fine 1/4-1mm grains, subangular/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	light tan	TSS	subrounded	Y
Imbrication	Row 6	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N47E 13SE	5mm rounded volcanic	5	-2	fine pebbles	--	volcanic	rounded	N
	10mm matrix very fine 1/4-1mm grains, subangular/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	light tan	TSS	subrounded	Y
	10mm subrounded gneiss	10	-3	med. pebbles	--	gneiss	subrounded	N
	8mm rounded volcanic	8	-3	med. pebbles	--	volcanic	rounded	N
S100E 21SW	10mm matrix very fine 1/4-1mm grains, subangular/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	light tan	TSS	subrounded	Y
	10mm volcanic	10	-3	med. pebbles	--	volcanic	rounded	N

latitude  
33° 23' 01.5"  
longitude  
114° 55' 57.9"

Appendix A. 8. West - Clast Count nine (CC9) Unit L.

Clast Count 10								
Location: West Strat Column								
Bedding foliation: N61E 44SE								
Matrix: 1/2 - 1mm brick red matrix, med/fine sand								
Matrix: 1/2 - 1mm brick red matrix, med/fine sand with vesicular basalt, augen gneiss, schists, gneiss, quartzite and has white layers								
Matrix sizes are getting coarser - med/coarse sand brick red ss outcrop with clasts ranging from 10mm-200mm. vesicular basalt, augen gneiss, schists, gneiss, quartzite - white thin layer on top								
	Row 1	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N312W 14NE	10mm augen gneiss	10	-3	med. pebbles	pink and black	augen gneiss	subangular	N
	30mm matrix 1/2 - 1mm brick red matrix, med/fine sand	1/2	1	C/Vcoarse sand	brick red	BRSS	subrounded	Y
	30mm quartzite	30	-5	V. coarse pebbles	white	quartzite	subrounded	N
	75mm basalt vesicular	75	-6	small cobbles	black	basalt	rounded	N
	55mm matrix 1/2 - 1mm brick red matrix, med/fine sand	1/2	1	coarse sand	brick red	BRSS	subrounded	Y
Imbrication	Row 2	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N11E 71SE	40mm matrix 1/2 - 1mm brick red matrix, med/fine sand	1/2	1	coarse sand	brick red	BRSS	subrounded	Y
	25mm volcanic rounded	25	-4	coarse pebbles	--	volcanic	rounded	N
	35mm matrix 1/2 - 1mm brick red matrix, med/fine sand	1/2	1	coarse sand	brick red	BRSS	subrounded	Y
	65mm gneiss subangular	65	-6	VC pebbles	--	gneiss	subangular	N
	80mm schist subangular	80	-6	small cobbles	--	schist	subangular	N
	10mm volcanic	10	-3	med. pebbles	--	volcanic	rounded	N
60mm matrix 1mm brick red matrix, med/fine sand	1	0	coarse sand	brick red	BRSS	subrounded	Y	
Imbrication	Row 3	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
	10mm volcanic	10	-3	med. pebbles	--	volcanic	rounded	N
	80mm matrix 1mm brick red matrix, med/fine sand	1	0	coarse sand	brick red	BRSS	subrounded	Y
	100 black and white crystals	100	-7	med. cobbles	black and white	diorite	rounded	N
	40mm pink tuff	40	-5	coarse pebbles	pink	tuff	rounded	N
	100mm matrix 1mm brick red matrix, med/fine sand	1	0	coarse sand	brick red	BRSS	subrounded	Y
	15mm volcanic	15	-3	med. pebbles	--	volcanic	rounded	N
Imbrication	Row 4	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S118E 15SW	35mm matrix 2mm brick red matrix, med/fine sand	2	-1	fine pebbles	brick red	BRSS	subrounded	Y
	135mm gray wackee	135	-7	med. cobbles	gray	wackee	sedimentary	N
	15mm matrix 2mm brick red matrix, med/fine sand	2	-1	fine pebbles	brick red	BRSS	subrounded	Y
	110mm augen gneiss	110	-7	med. cobbles	--	augen gneiss	subangular	N
	20mm matrix 2mm brick red matrix, med/fine sand	2	-1	fine pebbles	brick red	BRSS	subrounded	Y
	20mm volcanic rounded	20	-4	coarse pebbles	--	volcanic	rounded	N
	35mm schist gray	35	-5	V. coarse pebbles	gray	schist	metamorphic	N
15mm volcanic rounded	15	-3	med. pebbles	--	volcanic	rounded	N	
Imbrication	Row 5	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S126E 36SW N342W 22NE	40mm matrix 2mm brick red matrix, med/fine sand	2	-1	fine pebbles	brick red	BRSS	subrounded	Y
	55mm augen gneiss	55	-6	V. coarse pebbles	pink and black	augen gneiss	subangular	N
	80mm black and white crystals	80	-6	small cobbles	black and white	diorite	rounded	N
	15mm matrix 2mm brick red matrix, med/fine sand	2	-1	fine pebbles	brick red	BRSS	subrounded	Y
	60mm quartzite	60	-6	VC pebbles	white	quartzite	subrounded	N
	15mm wackee	15	-3	med. pebbles	--	wackee	subangular	N

latitude  
33' 22' 36.2"  
longitude  
114' 55' 33.4"

Appendix A. 9. West - Clast Count ten (CC10) Unit R.

Clast Count 22								
Location: West/ Unit L walking back towards Ted								
Bedding foliation: N9E 30SE								
Matrix: matrix supported and cemented								
Clasts in grains 5-50mm, subangular and subrounded gneiss and schist, tuffs, tan sandstone								
Imbrication	Row 1	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N320W 18NE	matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
	10mm gneiss	10	-3	med. pebbles	--	gneiss	subangular	N
	10mm schist	25	-4	coarse pebbles	gray	schist	subangular	N
	matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
	30mm schist	30	-5	V. coarse pebbles	gray	schist	subangular	N
	matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
Imbrication	Row 2	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N65E 21SE	40mm pink tuff	40	-5	coarse pebbles	pink	tuff	rounded	N
	matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
S210W 25NW	45mm schist	45	-5	V. coarse pebbles	gray	schist	subangular	N
	matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
	20mm schist	20	-4	coarse pebbles	gray	schist	subangular	N
	15mm schist	15	-3	med. pebbles	gray	schist	subangular	N
	matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	N
Imbrication	Row 3	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S186W 26NW	35mm tuff	35	-5	V/coarse peb	black	tuff	rounded	N
	matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
S120E 72SW	5mm chert	5	-2	fine pebbles	brown	chert	subangular	N
	matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
	35mm gneiss	35	-5	V. coarse pebbles	--	gneiss	subrounded	N
	20mm schist	20	-4	coarse pebbles	gray	schist	subangular	N
Imbrication	Row 4	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N12E 31SE	5mm granodiorite	5	-2	fine pebbles	--	granodiorite	--	N
	matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
	10mm schist	10	-3	med. pebbles	gray	schist	subangular	N
	25mm gneiss	25	-4	coarse pebbles	--	gneiss	subrounded	N
	matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
	50mm augen gneiss	50	-5	V. coarse pebbles	pink and black	augen gneiss	rounded	N
	40mm pink tuff	40	-5	coarse pebbles	pink	tuff	rounded	N
	matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
Imbrication	Row 5	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N7E 50SE	8mm quartzite	8	-3	med. pebbles	white	quartzite	subangular	N
	10mm volcanic	10	-3	med. pebbles	black	volcanic	subrounded	N
N297W 16NE	matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
	50mm augen gneiss	50	-5	V. coarse pebbles	pink and black	augen gneiss	rounded	N
	matrix very fine 1/4-1mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
	55mm black tuff	55	-6	V coarse peb	black	tuff	rounded	N
	5mm granodiorite	5	-2	fine pebbles	--	granodiorite	--	N

latitude  
33° 22' 47.3"  
longitude  
114° 55' 39.8"

Appendix A. 10. West - Clast Count twenty-two (CC22) Unit L.

Clast Count 11								
Location: East Stratigraphic Column								
Bedding foliation: S190W 3NW								
Matrix: Dark red matrix, grain supported, subangular/angular grains, has clasts ranging from 10-240mm								
Grain supported, clasts ranging from 10, 20, 30 to 240mm dark red matrix with angular/subangular grains 1-2mm in size, contains lineations of black crystals in matrix								
Not crumbly - lots of green clasts, ignimbrites, schists, augen gneiss, rounded/subrounded								
Imbrication	Row 1	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N15E 10SE	125mm schists rounded	125	-7	small cobbles	gray	schist	rounded	N
	matrix - dark red, angular/subangular	1	0	very coarse sand/ f pebbles	dark red	DRSS	angular/subangular	Y
	70mm volcanic subrounded	70	-6	small cobbles	--	volcanic	subrounded	N
	155mm schists subrounded	155	-7	small cobbles	--	schist	subrounded	N
	matrix - dark red, angular/subangular	1	0	very coarse sand/ f pebbles	dark red	DRSS	angular/subangular	Y
	100mm augen gneiss subrounded	100	-7	small cobbles	pink and black	augen gneiss	subrounded	N
Imbrication	Row 2	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S200W 40NW	matrix - dark red, angular/subangular	2	-1	very coarse sand/ f pebbles	dark red	DRSS	angular/subangular	Y
	145mm granodiorite	145	-7	small cobbles	--	granodiorite	--	N
	115mm schist subrounded	115	-7	small cobbles	gray	schist	subrounded	N
	100mm granodiorite	100	-7	small cobbles	--	granodiorite	--	N
	230mm rounded volcanic	230	-8	large cobbles	--	volcanic	rounded	N
	matrix - dark red, angular/subangular	2	-1	very coarse sand/ f pebbles	dark red	DRSS	angular/subangular	Y
	65mm augen gneiss subrounded	65	-6	small cobbles	pink and black	augen gneiss	subrounded	N
Imbrication	Row 3	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N5E 30SE	50mm meta subrounded	50	-5	very coarse pebbles	--	granodiorite	subrounded	N
	matrix - dark red, angular/subangular	1	0	very coarse sand/ f pebbles	dark red	DRSS	angular/subangular	Y
	210mm ignimbrite	210	-8	large cobbles	pink	ignimbrite	rounded	N
	35mm granodiorite	35	-5	very coarse pebbles	--	granodiorite	--	N
	95mm schist subrounded	95	-7	small cobbles	--	schist	subrounded	N
S265W 20NW	matrix - dark red, angular/subangular	1	0	very coarse sand/ f pebbles	dark red	DRSS	angular/subangular	Y
Imbrication	Row 4	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S302W 24NE	10mm volcanic rounded	10	-3	fine pebbles	--	andesite	rounded	N
	matrix - dark red, angular/subangular	2	-1	very coarse sand/ f pebbles	dark red	DRSS	angular/subangular	Y
	200mm augen gneiss	200	-8	large cobbles	pink and black	augen gneiss	rounded/subrounded	N
	30mm ignimbrite	30	-5	very coarse pebbles	pink	ignimbrite	rounded	N
	240mm schist subrounded	240	-8	large cobbles	gray	schist	subrounded	N
	matrix - dark red, angular/subangular	2	-1	very coarse sand/ f pebbles	dark red	DRSS	angular/subangular	Y
	65mm ignimbrite	65	-6	small cobbles	pink	ignimbrite	rounded	N
	125mm chert	125	-7	small cobbles	--	chert	--	N
Imbrication	Row 5	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N351W 51NE	100mm ignimbrite	100	-7	small cobbles	pink	ignimbrite	rounded	N
	matrix - dark red, angular/subangular	1	0	very coarse sand/ f pebbles	dark red	DRSS	angular/subangular	Y
N332W 40NE	45mm augen gneiss subrounded	45	-5	very coarse pebbles	pink and black	augen gneiss	subrounded	N
	160mm schists	160	-7	small cobbles	--	schist	subrounded	N
	120mm volcanic	120	-7	small cobbles	--	volcanic	--	N
	25mm meta subrounded	25	-4	coarse pebbles	--	granodiorite	subrounded	N
	175mm meta	175	-7	small cobbles	--	gneiss	--	N

latitude  
33° 22' 38.8"  
longitude  
114° 55' 12.6"

Appendix A. 11. East - Clast Count eleven (CC11) Unit R.

Clast Count 12									
Location: East									
Bedding foliation: S215W 76NW									
Matrix: dark red with angular/subangular grains, 1-2mm									
Grain supported, clasts are larger ranging from 50-100mm plus, dark red matrix with angular/subangular grains 1-2mm. contains lineations									
Becoming crumbly, lots of green clasts, ignimbrites, more cherts, schists, augen gneiss, volcanics - subrounded/rounded									
Imbrication	Row 1	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix	
N350W 55NE  N29E 32SE	matrix - dark red, angular/subangular	2	-1	very coarse sand/ f pebbles	dark red	DRSS	angular/subangular	Y	
	100mm ignimbrite	100	-7	small cobbles	pink	ignimbrite	rounded	N	
	75mm brown chert subangular/subrounded	75	-6	small cobbles	brown	chert	subrounded	N	
	20mm chert brown	20	-4	coarse pebbles	brown	chert	subrounded	N	
	matrix - dark red, angular/subangular	2	-1	very coarse sand/ f pebbles	dark red	DRSS	angular/subangular	Y	
	60mm green volcanic	60	-6	small cobbles	green	green basalt	rounded	N	
Imbrication	Row 2	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix	
N24E 66SE  N5E 43SE	45mm quartzite	45	-5	very coarse pebbles	white	quartzite	subrounded	N	
	15mm schist	15	-3	med. pebbles	gray	schist	subrounded	N	
	matrix - dark red, angular/subangular	2	-1	very coarse sand/ f pebbles	dark red	DRSS	angular/subangular	Y	
	120mm volcanic	120	-7	small cobbles	green	volcanic	rounded	N	
	80mm chert	80	-6	small cobbles	brown	chert	subangular	N	
	80mm volcanic	80	-6	small cobbles	black	andesite	rounded	N	
matrix - dark red, angular/subangular	2	-1	very coarse sand/ f pebbles	dark red	DRSS	angular/subangular	Y		
Imbrication	Row 3	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix	
N349W 54NE  N310W 57NE	50mm chert subrounded	50	-5	very coarse pebbles	brown	chert	subrounded	N	
	45mm ignimbrite	45	-5	very coarse pebbles	pink	ignimbrite	rounded	N	
	matrix - dark red, angular/subangular	2	-1	very coarse sand/ f pebbles	dark red	DRSS	angular/subangular	Y	
	30mm brown chert subangular	30	-5	very coarse pebbles	brown	chert	subangular	N	
	matrix - dark red, angular/subangular	2	-1	very coarse sand/ f pebbles	dark red	DRSS	angular/subangular	Y	
	30mm schist subrounded	30	-5	very coarse pebbles	gray	schist	subrounded	N	
Imbrication	Row 4	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix	
N56E 35SE  N68E 86SE	65mm augen gneiss	65	-6	small cobbles	pink and black	augen gneiss	subrounded	N	
	80mm grandodiorite	80	-6	small cobbles	--	granodiorite	rounded	N	
	110mm ignimbrite rounded	110	-7	small cobbles	pink	ignimbrite	rounded	N	
	matrix - dark red, angular/subangular	2	-1	very coarse sand/ f pebbles	dark red	DRSS	angular/subangular	Y	
	20mm brown chert subangular	20	-4	coarse pebbles	brown	chert	subangular	N	
	10mm wackee smooth angular	10	-3	med. pebbles	brown	wackee	angular	N	
	matrix - dark red, angular/subangular	2	-1	very coarse sand/ f pebbles	dark red	DRSS	angular/subangular	Y	
	10mm volcanic rounded	10	-3	med. pebbles	red	volcanic	rounded	N	
	Imbrication	Row 5	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
	S210W 45NW  N312W 57NE	95mm chert gray	95	-7	small cobbles	gray	chert	subangular	N
75mm ignimbrite		75	-6	small cobbles	pink	ignimbrite	rounded	N	
matrix - dark red, angular/subangular		2	-1	very coarse sand/ f pebbles	dark red	DRSS	angular/subangular	Y	
120mm schist		120	-7	small cobbles	gray	schist	subrounded	N	
30mm augen gneiss		30	-5	very coarse pebbles	pink and black	augen gneiss	subrounded	N	
110mm granodiorite		110	-7	small cobbles	--	granodiorite	subrounded	N	

latitude  
33° 22' 38.8"  
longitude  
114° 55' 12.1"

Appendix A. 12. East - Clast Count twelve (CC12) Unit R.

**Clast Count 13**

Location: East

Bedding foliation: S195W 34NW

Matrix: dark red matrix with subangular/subrounded grains 2-5mm in size, contains lineations of black crystals in matrix - becoming crumbly

Becoming more matrix supported, clasts are getting smaller ranging from 10 - 50mm plus

Dark red matrix with subangular/subrounded grains 2-5mm in size, contains lineations of black crystals in matrix - becoming crumbly

Lots of green clasts, ignimbrites, more cherts! schists, augen gneiss, vesiicular volcanics - black, brown, pink, green, rounded/subrounded clasts

Imbrication	Row 1	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N345W 52NE	matrix - dark red, angular/subangular	2	-1	very coarse sand/ f pebbles	dark red	DRSS	angular/subangular	Y
	10mm chert	10	-3	med. pebbles	brown	chert	subangular	N
	15mm volcanic	15	-3	med. pebbles	green	green basalt	subrounded	N
	matrix - dark red, angular/subangular	2	-1	very coarse sand/ f pebbles	dark red	DRSS	angular/subangular	Y
	35mm schist	35	-5	very coarse pebbles	gray	schist	subangular	N
	matrix - dark red, angular/subangular	2	-1	very coarse sand/ f pebbles	dark red	DRSS	angular/subangular	Y
Imbrication	Row 2	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N310W 47NE	20mm schist	20	-4	coarse pebbles	gray	schist	subangular	N
	matrix - dark red, angular/subangular	3	-1	very coarse sand/ f pebbles	dark red	DRSS	angular/subangular	Y
	55mm gneiss	55	-5	very coarse pebbles	--	gneiss	subrounded	N
	50mm schist	50	-5	very coarse pebbles	gray	schist	subangular	N
	matrix - dark red, angular/subangular	3	-1	fine pebbles	dark red	DRSS	angular/subangular	Y
	20mm ignimbrite	20	-3	med. pebbles	pink	ignimbrite	subrounded	N
	matrix - dark red, angular/subangular	3	-1	fine pebbles	dark red	DRSS	angular/subangular	Y
Imbrication	Row 3	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S105E 74SW	matrix - dark red, angular/subangular	4	-2	fine pebbles	dark red	DRSS	angular/subangular	Y
	15mm ignimbrite	15	-3	med. pebbles	pink	ignimbrite	subrounded	N
	30mm grandodiorite	30	-5	very coarse pebbles	--	granodiorite	subangular	N
	matrix - dark red, angular/subangular	4	-2	fine pebbles	dark red	DRSS	angular/subangular	Y
	45mm schist	45	-5	very coarse pebbles	gray	schist	subangular	N
	matrix - dark red, angular/subangular	4	-2	fine pebbles	dark red	DRSS	angular/subangular	Y
Imbrication	Row 4	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N70E 20SE	60mm augen gneiss	60	-6	small cobbles	pink and black	augen gneiss	rounded	N
	30mm volcanic	30	-5	very coarse pebbles	green	green basalt	subrounded	N
	matrix - dark red, angular/subangular	5	-2	fine pebbles	dark red	DRSS	angular/subangular	Y
	15mm augen gneiss	15	-3	med. pebbles	pink and black	augen gneiss	rounded	N
	matrix - dark red, angular/subangular	5	-2	fine pebbles	dark red	DRSS	angular/subangular	Y
	10mm schist	10	-3	med. pebbles	gray	schist	subangular	N
S215W 45NW	25mm wackee	25	-4	coarse pebbles	brown/gray	wackee	subrounded	N
	matrix - dark red, angular/subangular	5	-2	fine pebbles	dark red	DRSS	angular/subangular	Y
Imbrication	Row 5	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N12E 30SE	15mm chert	15	-3	med. pebbles	brown	chert	subangular	N
	matrix - dark red, angular/subangular	2	-1	very coarse sand/ f pebbles	dark red	DRSS	angular/subangular	Y
	45mm schists	45	-5	very coarse pebbles	gray	schist	subangular	N
	50mm volcanic	50	-5	very coarse pebbles	green	green basalt	subrounded	N
	matrix - dark red, angular/subangular	4	-2	fine pebbles	dark red	DRSS	angular/subangular	Y
	10mm ignimbrite	10	-3	med. pebbles	pink	ignimbrite	subrounded	N

latitude  
33° 22' 38.8"  
longitude  
114° 55' 11.9"

Appendix A. 13. East - Clast Count thirteen (CC13) Unit R.

Clast Count 14								
Location: East								
Bedding foliation: S183W 32NW								
Matrix: tan/light tan matrix - clay/vf sand/silt between ¼ - ½ mm								
Matrix - tan/light tan clay/vf sand/silt between ¼ - ½ mm. clasts range from 5-90mm all subrounded clasts / smaller grains (subangular)								
Smaller grains are more predominant than larger grains - has slight graded bedding								
Imbrication	Row 1	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N280W 30NE	matrix very fine 1/8 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/2	1	C/VC sand	light tan	TSS	subrounded	Y
	30mm volcanic subangular	30	-5	V/coarse peb	black	volcanic	subrounded	N
	matrix very fine 1/8 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/2	1	C/VC sand	light tan	TSS	subrounded	Y
	10mm volcanic angular	10	-3	med. pebbles	--	volcanic	angular	N
S117E 18SW	matrix very fine 1/8 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/2	1	C/VC sand	light tan	TSS	subrounded	Y
	75mm schist subangular	75	-6	small cobbles	gray	schist	subangular	N
Imbrication	Row 2	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S170E 45SW	80mm augen gneiss	80	-6	small cobbles	pink and black	augen gneiss	subangular	N
	matrix very fine 1/8 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/2	1	C/VC sand	light tan	TSS	subrounded	Y
	65mm volcanic rounded	65	-6	very coarse pebbles	green	green basalt	rounded	N
	matrix very fine 1/8 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	light tan	TSS	subrounded	Y
	20mm ignimbrite	20	-4	coarse pebbles	pink	ignimbrite	rounded	N
	35mm quartzite	35	-5	V/coarse peb	white	quartzite	--	N
	matrix very fine 1/8 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	light tan	TSS	subrounded	Y
Imbrication	Row 3	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N42E 61SE	matrix very fine 1/8 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	light tan	TSS	subrounded	Y
	15mm schist subangular	15	-4	coarse pebbles	gray	schist	subangular	N
	20mm volcanic	20	-4	coarse pebbles	green	green basalt	subrounded	N
	matrix very fine 1/8 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	light tan	TSS	subrounded	Y
N305W 30NE	5mm chert/hematite	5	-2	fine pebbles	brown/red	chert	--	N
	30mm ignimbrite	30	-5	V/coarse peb	pink	ignimbrite	rounded	N
Imbrication	Row 4	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N57E 60SE	10mm augen gneiss	10	-3	med. pebbles	pink and black	augen gneiss	rounded	N
	matrix very fine 1/8 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	light tan	TSS	rounded	Y
	25mm ignimbrite	25	-4	coarse pebbles	pink	ignimbrite	rounded	N
	matrix very fine 1/8 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/8	3	vf sand/coarse silt	light tan	TSS	rounded	Y
	5mm volcanic	5	-2	fine pebbles	black	volcanic	--	N
	8mm quartzite	8	-3	med. pebbles	white	quartzite	--	N
	10mm volcanic	10	-3	med. pebbles	black	volcanic	subrounded	N
	matrix very fine 1/8 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/8	3	vf sand/coarse silt	light tan	TSS	rounded	Y
Imbrication	Row 5	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N41E 52SE	matrix very fine 1/8 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/8	3	vf sand/coarse silt	light tan	TSS	rounded	Y
	5mm chert	5	-2	fine pebbles	brown	chert	--	N
	10mm volcanic	10	-3	med. pebbles	black	volcanic	--	N
	matrix very fine 1/8 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/8	3	vf sand/coarse silt	light tan	TSS	rounded	Y
	15mm schist	15	-4	coarse pebbles	gray	schist	subangular/subrounded	N
	7mm augen gneiss	7	-3	med. pebbles	pink and black	augen gneiss	rounded	N
	matrix very fine 1/8 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/8	3	vf sand/coarse silt	light tan	TSS	rounded	Y
	5mm schist	5	-2	fine pebbles	gray	schist	--	N
	3mm volcanic	3	-2	fine pebbles	green	green basalt	subrounded	N

latitude  
33° 22' 40.5"  
longitude  
114° 54' 56.0"

Appendix A. 14. East - Clast Count fourteen (CC14) Unit L.

Clast Count 15								
Location: East								
Bedding foliation: S195W 34NW								
Matrix: Grain supported, brick red crumbly matrix with grains 3-5mm, clasts angular/subangular.								
Clasts include greens, blacks, lots of schists, metas, augen gneiss, random sizes subrounded 10mm - 90mm sized								
Imbrication	Row 1	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N310W 45NE	83mm schist	83	-6	V coarse pebbles	gray	schist	subrounded	N
	23mm tuff pink	23	-4	fine/med peb	pink	tuff	subrounded	N
	matrix with grains 3-5mm, clasts angular/subangular grain supported, crumbly	3	-1	fine pebbles	brick red	BRSS	angular/subangular	Y
	10mm schist	10	-3	med. pebbles	gray	schist	subrounded	N
	matrix with grains 3-5mm, clasts angular/subangular grain supported, crumbly	3	-1	fine pebbles	brick red	BRSS	angular/subangular	Y
S208W 41NW	36mm volcanic	36	-5	coarse peb	green	green basalt	subrounded	N
Imbrication	Row 2	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N315W 45NE	15mm augen gneiss	15	-3	med. pebbles	pink and black	augen gneiss	subrounded	N
	91mm volcanic	91	-7	med. cobbles	black	volcanic	subrounded	N
	55mm schist	55	-6	V coarse pebbles	gray	schist	subrounded	N
	35mm gneiss	35	-5	coarse peb	--	gneiss	subrounded	N
	matrix with grains 3-5mm, clasts angular/subangular grain supported, crumbly	3	-1	fine pebbles	brick red	BRSS	angular/subangular	Y
	10mm schist	10	-3	med. pebbles	gray	schist	subrounded	N
50mm quartzite	50	-6	V coarse pebbles	white	quartzite	subrounded	N	
Imbrication	Row 3	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N355W 28NE	80mm schist	80	-6	V coarse pebbles	gray	schist	subrounded	N
	34mm augen gneiss	34	-5	coarse peb	pink and black	augen gneiss	subrounded	N
	matrix with grains 3-5mm, clasts angular/subangular grain supported, crumbly	4	-2	med. pebbles	brick red	BRSS	angular/subangular	Y
	72mm volcanic	72	-6	V coarse pebbles	black	volcanic	subrounded	N
	25mm schist	25	-4	fine/med peb	gray	schist	subrounded	N
matrix with grains 3-5mm, clasts angular/subangular grain supported, crumbly	4	-2	med. pebbles	brick red	BRSS	angular/subangular	Y	
Imbrication	Row 4	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S242E 75NW	13mm augen gneiss	13	-3	med. pebbles	pink and black	augen gneiss	subrounded	N
	27mm volcanic	27	-4	fine/med peb	black	volcanic	subrounded	N
	matrix with grains 3-5mm, clasts angular/subangular grain supported, crumbly	5	-2	med. pebbles	brick red	BRSS	angular/subangular	Y
	34mm schist	34	-5	coarse peb	gray	schist	subrounded	N
	45mm augen gneiss	45	-5	coarse peb	pink and black	augen gneiss	subrounded	N
N28E 77SE	58mm tuff	58	-6	V coarse pebbles	pink	tuff	subrounded	N
	62mm volcanic	62	-6	small cobbles	black	volcanic	subrounded	N
	79mm schist	79	-6	small cobbles	gray	schist	subrounded	N
Imbrication	Row 5	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N77E 12SE	82mm augen gneiss	82	-6	small cobbles	pink and black	augen gneiss	subrounded	N
	90mm schist	90	-7	med cobbles	gray	schist	subrounded	N
	30mm quartzite	30	-5	coarse pebbles	white	quartzite	subrounded	N
	25mm gneiss	25	-4	fine/med peb	--	gneiss	subrounded	N
N56E 30SE	matrix with grains 3-5mm, clasts angular/subangular grain supported, crumbly	5	-2	med pebbles	brick red	BRSS	angular/subangular	Y
	75mm augen gneiss	75	-6	small cobbles	pink and black	augen gneiss	subrounded	N
	85mm gneiss	85	-6	small cobbles	--	gneiss	subrounded	N
	60mm volcanic	60	-6	small cobbles	green	green basalt	subrounded	N

**latitude**  
 33° 22' 40"  
**longitude**  
 114° 54' 54.3"

Appendix A. 15. East - Clast Count fifteen (CC15) Unit R.



Clast Count 16								
Location: East								
Bedding foliation: S183W 32NW								
Matrix: brick red ss/ more crumbly, larger matrix grains ~ 5mm, matrix supported.								
Matrix - brick red ss/ more crumbly, larger matrix grains ~ 5mm, matrix supported. 10-15mm clasts, no bigger than 20mm. contains thin white layers								
Imbrication	Row 1	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N32E 54SE	matrix supported, grains 5mm, crumbly	5	-2	fine pebbles	brick red	BRSS	subangular	Y
	20mm schist	20	-4	coarse pebbles	gray	schist	subangular	N
	matrix supported, grains 5mm, crumbly	5	-2	fine pebbles	brick red	BRSS	subangular	Y
	12mm volcanic	12	-3	med. pebbles	red	volcanic	rounded	N
	15mm schist	15	-3	med. pebbles	gray	schist	subangular	N
	matrix supported, grains 5mm, crumbly	5	-2	fine pebbles	brick red	BRSS	subangular	Y
Imbrication	Row 2	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N280W 32NE	13mm augen gneiss	13	-3	med. pebbles	pink and black	augen gneiss	subrounded	N
	matrix supported, grains 5mm, crumbly	5	-2	fine pebbles	brick red	BRSS	subangular	Y
	10mm schist	10	-3	med. pebbles	gray	schist	subangular	N
	matrix supported, grains 5mm, crumbly	5	-2	fine pebbles	brick red	BRSS	subangular	Y
	15mm volcanic	15	-3	med. pebbles	black	volcanic	rounded	N
	N320W 24NE	20mm wackee	20	-4	coarse pebbles	brown	wackee	subangular
matrix supported, grains 5mm, crumbly		5	-2	fine pebbles	brick red	BRSS	subangular	Y
Imbrication	Row 3	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
	matrix supported, grains 5mm, crumbly	5	-2	fine pebbles	brick red	BRSS	subangular	Y
	20mm augen gneiss	20	-4	coarse pebbles	pink and black	augen gneiss	subrounded	N
	15mm schist	15	-3	med. pebbles	gray	schist	subangular	N
	matrix supported, grains 5mm, crumbly	5	-2	fine pebbles	brick red	BRSS	subangular	Y
	10mm gneiss	10	-3	med. pebbles	--	gneiss	--	N
	11mm volcanic	11	-3	med. pebbles	black	volcanic	rounded	N
Imbrication	Row 4	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S182W 21NW	12mm volcanic	12	-3	med. pebbles	green	green basalt	rounded	Y
	matrix supported, grains 5mm, crumbly	5	-2	fine pebbles	brick red	BRSS	subangular	N
	10mm gneiss	10	-3	med. pebbles	--	gneiss	--	N
	matrix supported, grains 5mm, crumbly	5	-2	fine pebbles	brick red	BRSS	subangular	Y
	18mm schist	18	-3	med. pebbles	gray	schist	subangular	N
	matrix supported, grains 5mm, crumbly	5	-2	fine pebbles	brick red	BRSS	subangular	Y
	12mm volcanic	12	-3	med. pebbles	black	volcanic	rounded	N
	10mm quartzite	10	-3	med. pebbles	white	quartzite	subangular	N
Imbrication	Row 5	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S260W 25NW	matrix supported, grains 5mm, crumbly	5	-2	fine pebbles	brick red	BRSS	subangular	Y
	10mm augen gneiss	10	-3	med. pebbles	pink and black	augen gneiss	subrounded	N
	matrix supported, grains 5mm, crumbly	5	-2	fine pebbles	brick red	BRSS	subangular	Y
	13mm volcanic	13	-3	med. pebbles	pink	volcanic	rounded	N
	20mm schist	20	-4	coarse pebbles	gray	schist	subrounded	N
	15mm schist	15	-3	med. pebbles	gray	schist	subangular	N
	matrix supported, grains 5mm, crumbly	5	-2	fine pebbles	brick red	BRSS	subangular	Y
	10mm volcanic	10	-3	med. pebbles	green	volcanic	rounded	N

latitude  
33° 22' 39.5"  
longitude  
114° 54' 52.6"

Appendix A. 16. East - Clast Count sixteen (CC16) Unit R.

Clast Count 17								
Location: East								
Bedding foliation: S183W 32NW								
Matrix: brick red ss/ matrix supported, hardly any clasts - roughly 100-200mm apart								
Matrix - brick red ss/ matrix supported, hardly any clasts - roughly 100-200mm apart. clasts 10-50mm angular/subangular, schists and gneisses everywhere								
Imbrication	Row 1	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S195W 15NW	60mm matrix supported, hardly any clasts	5	-2	fine pebbles	brick red	BRSS	subangular/subrounded	Y
	45mm schist	45	-5	V. coarse pebbles	gray	schist	subangular	N
	35mm matrix supported, hardly any clasts	5	-2	fine pebbles	brick red	BRSS	subangular/subrounded	Y
	10mm matrix supported, hardly any clasts	5	-2	fine pebbles	brick red	BRSS	subangular/subrounded	Y
	45mm matrix supported, hardly any clasts	5	-2	fine pebbles	brick red	BRSS	subangular/subrounded	Y
S210W 33NW	30mm gneiss	30	-5	V. coarse pebbles	--	gneiss	--	N
Imbrication	Row 2	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N315W 48NE	25 volcanic	25	-4	coarse pebbles	green	volcanic	rounded	N
	30mm matrix supported, hardly any clasts	5	-2	fine pebbles	brick red	BRSS	subangular/subrounded	Y
	10mm matrix supported, hardly any clasts	5	-2	fine pebbles	brick red	BRSS	subangular/subrounded	Y
	55mm matrix supported, hardly any clasts	5	-2	fine pebbles	brick red	BRSS	subangular/subrounded	Y
	80mm mm matrix supported, hardly any clasts	5	-2	fine pebbles	brick red	BRSS	subangular/subrounded	Y
	30mm gneiss	30	-5	V. coarse pebbles	--	gneiss	--	N
	45mm schist	45	-5	V. coarse pebbles	gray	schist	subangular	N
Imbrication	Row 3	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N355W 25NE	25mm matrix supported, hardly any clasts	5	-2	fine pebbles	brick red	BRSS	subangular/subrounded	Y
	60mm matrix supported, hardly any clasts	5	-2	fine pebbles	brick red	BRSS	subangular/subrounded	Y
	35mm schist	35	-5	V. coarse pebbles	gray	schist	subangular	N
	50mm matrix supported, hardly any clasts	5	-2	fine pebbles	brick red	BRSS	subangular/subrounded	Y
	40mm matrix supported, hardly any clasts	5	-2	fine pebbles	brick red	BRSS	subangular/subrounded	Y
	15mm gneiss	15	-3	fine/med sand	--	gneiss	--	N
Imbrication	Row 4	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S170E 20SW	10mm volcanic	10	-3	fine/med sand	black	volcanic	rounded	N
	matrix supported, hardly any clasts	5	-2	fine pebbles	brick red	BRSS	subangular/subrounded	Y
	40mm volcanic	40	-5	V. coarse pebbles	black	volcanic	rounded	N
	25mm matrix supported, hardly any clasts	5	-2	fine pebbles	brick red	BRSS	subangular/subrounded	Y
	35mm matrix supported, hardly any clasts	5	-2	fine pebbles	brick red	BRSS	subangular/subrounded	Y
	35mm gneiss	35	-5	V. coarse pebbles	--	gneiss	--	N
	10mm matrix supported, hardly any clasts	5	-2	fine pebbles	brick red	BRSS	subangular/subrounded	Y
	25mm gneiss	25	-4	coarse pebbles	gray	gneiss	subangular	N
Imbrication	Row 5	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S195W 18NW	30mm schist	30	-5	V. coarse pebbles	gray	schist	subangular	N
S165E 80SW	30mm matrix supported, hardly any clasts	5	-2	fine pebbles	brick red	BRSS	subangular/subrounded	Y
	60mm matrix supported, hardly any clasts	5	-2	fine pebbles	brick red	BRSS	subangular/subrounded	Y
	15mm matrix supported, hardly any clasts	5	-2	fine pebbles	brick red	BRSS	subangular/subrounded	Y
	50mm augen gneiss	50	-5	V. coarse pebbles	pink and black	augen gneiss	rounded	N
	matrix supported, hardly any clasts	5	-2	fine pebbles	brick red	BRSS	subangular/subrounded	Y
	25mm gneiss	25	-4	coarse pebbles	--	gneiss	--	N

latitude  
33° 22' 38.9"  
longitude  
114° 54' 50.5"

Appendix A. 17. East - Clast Count seventeen (CC17) Unit R.

Clast Count 18								
Location: East								
Bedding foliation: N10E 32SE								
Matrix: tan/matrix supported, uniform in sized grains - hardly any clasts. Clasts range from 30-50mm metamorphic - mudcracks visible and fractures in rock unit, cemented unit								
Matrix supported/ tan color, uniform in sized grains - hardly any clasts. Clasts range from 30-50mm metamorphic - mudcracks visible and fractures in rock unit, cemented unit								
Imbrication	Row 1	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N35E 10SE	matrix 1/2 - 1mm sized grains, matrix supported	1/2	1	C/Vc sand	tan	TSS	subangular/subrounded	Y
	30mm schist	30	-5	V. coarse pebbles	gray	schist	subangular	N
	10mm matrix 1/2 - 1mm sized grains, matrix supported	1/2	1	C/Vc sand	tan	TSS	subangular/subrounded	Y
	55mm matrix 1/2 - 1mm sized grains, matrix supported	1/2	1	C/Vc sand	tan	TSS	subangular/subrounded	Y
	20mm matrix 1/2 - 1mm sized grains, matrix supported	1/2	1	C/Vc sand	tan	TSS	subangular/subrounded	Y
	45mm volcanic	45	-5	V. coarse pebbles	black	volcanic	rounded	N
Imbrication	Row 2	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N20E 30SE	matrix 1/2 - 1mm sized grains, matrix supported	1/2	1	C/Vc sand	tan	TSS	subangular/subrounded	Y
	50mm augen gneiss	50	-5	V. coarse pebbles	pink and black	augen gneiss	subrounded	N
	matrix 1/2 - 1mm sized grains, matrix supported	1/2	1	C/Vc sand	tan	TSS	subangular/subrounded	Y
	matrix 1/2 - 1mm sized grains, matrix supported	1/2	1	C/Vc sand	tan	TSS	subangular/subrounded	Y
	35mm gneiss	35	-5	V. coarse pebbles	--	gneiss	--	N
	matrix 1/2 - 1mm sized grains, matrix supported	1/2	1	C/Vc sand	tan	TSS	subangular/subrounded	Y
N290W 32NE	42mm volcanic	42	-5	V. coarse pebbles	pink	volcanic	rounded	N
	Imbrication	Row 3	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness
N40E 60SE	32mm volcanic	32	-5	V. coarse pebbles	black	volcanic	rounded	N
	70mm matrix 1/2 - 1mm sized grains, matrix supported	1/2	1	C/Vc sand	tan	TSS	subangular/subrounded	Y
	10mm matrix 1/2 - 1mm sized grains, matrix supported	1	0	very coarse sand/ f pebbles	tan	TSS	subangular/subrounded	Y
	30mm gneiss	30	-5	V. coarse pebbles	--	gneiss	--	N
	15mm matrix 1/2 - 1mm sized grains, matrix supported	1	0	very coarse sand/ f pebbles	tan	TSS	subangular/subrounded	Y
	50mm schist	50	-5	V. coarse pebbles	gray	schist	subangular	N
	Imbrication	Row 4	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness
N322W 25NE	matrix 1/2 - 1mm sized grains, matrix supported	1	0	very coarse sand/ f pebbles	tan	TSS	subangular/subrounded	Y
	30mm volcanic	30	-5	V. coarse pebbles	green	green basalt	rounded	N
	matrix 1/2 - 1mm sized grains, matrix supported	1	0	very coarse sand/ f pebbles	tan	TSS	subangular/subrounded	Y
	matrix 1/2 - 1mm sized grains, matrix supported	1	0	very coarse sand/ f pebbles	tan	TSS	subangular/subrounded	Y
	35mm volcanic	35	-5	V. coarse pebbles	black	volcanic	rounded	N
N320W 30NE	matrix 1/2 - 1mm sized grains, matrix supported	1	0	very coarse sand/ f pebbles	tan	TSS	subangular/subrounded	Y
	69E 66SE	40mm schist	40	-5	V. coarse pebbles	gray	schist	subrounded
N355W 82NE	matrix 1/2 - 1mm sized grains, matrix supported	1	0	very coarse sand/ f pebbles	tan	TSS	subangular/subrounded	Y
	45mm volcanic	45	-5	V. coarse pebbles	black	volcanic	rounded	N
	50mm gneiss	50	-5	V. coarse pebbles	--	gneiss	--	N
	matrix 1/2 - 1mm sized grains, matrix supported	1	0	very coarse sand/ f pebbles	tan	TSS	subangular/subrounded	Y
	30mm augen gneiss	30	-5	V. coarse pebbles	pink and black	augen gneiss	subrounded	N
	25mm matrix 1/2 - 1mm sized grains, matrix supported	1	0	very coarse sand/ f pebbles	tan	TSS	subangular/subrounded	Y
N355W 82NE	40mm matrix 1/2 - 1mm sized grains, matrix supported	1	0	very coarse sand/ f pebbles	tan	TSS	subangular/subrounded	Y
	35mm schist	35	-5	V. coarse pebbles	gray	schist	subangular	N

latitude  
33° 22' 38.8"  
longitude  
114° 54' 48.5"

Appendix A. 18. East - Clast Count eighteen (CC18) Unit L.

Clast Count 19								
Location: East								
Bedding foliation: S245W 35NW								
Matrix: matrix with vf sand/clay/silt ~ ¼ to ½ mm								
Matrix with vf tan sand/clay/silt ~ ¼ to ½ mm. clasts ranging from 5, 10, 20 to 160mm, rounded/subrounded grains - mostly schists, gneisses, augen gneiss, ignimbrites								
Imbrication	Row 1	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N12E 40SE	matrix very fine 1/4 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/2	1	C/V/C sand	tan	TSS	subrounded	Y
	190mm gneiss subangular	190	-7	small cobbles	--	gneiss	subangular	N
	matrix very fine 1/4 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/2	1	C/V/C sand	tan	TSS	subrounded	Y
	90mm augen gneiss angular	90	-7	small cobbles	pink and black	augen gneiss	angular	N
N24E 10SE	matrix very fine 1/4 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/2	1	C/V/C sand	tan	TSS	subrounded	Y
	75mm schist subangular	75	-6	small cobbles	gray	schist	subangular	N
Imbrication	Row 2	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S100E 89NW	80mm augen gneiss	80	-6	small cobbles	pink and black	augen gneiss	subrounded	N
	matrix very fine 1/4 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/2	1	C/V/C sand	tan	TSS	subrounded	Y
	65mm schist rounded	65	-6	very coarse pebbles	gray	schist	rounded	N
	matrix very fine 1/4 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	subrounded	Y
	20mm ignimbrite	20	-4	coarse pebbles	pink	ignimbrite	rounded	N
	35mm quartzite	35	-5	V/coarse peb	white	quartzite	subrounded	N
N315W 30NE	matrix very fine 1/4 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	subrounded	Y
	matrix very fine 1/4 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	subrounded	Y
Imbrication	Row 3	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N15E 64SE	matrix very fine 1/4 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	subrounded	Y
	150mm schist subangular	150	-7	small cobbles	gray	schist	subangular	N
	20mm volcanic	20	-4	coarse pebbles	black	volcanic	angular	N
N315W 30NE	matrix very fine 1/4 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	subrounded	Y
	5mm chert/hematite	5	-2	fine pebbles	brown	chert	subangular	N
	30mm ignimbrite	30	-5	V/coarse peb	pink	ignimbrite	rounded	N
Imbrication	Row 4	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S115E 20SW	100mm augen gneiss	100	-7	small cobbles	pink and black	augen gneiss	rounded	N
	matrix very fine 1/4 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
	25mm gneiss	25	-4	coarse pebbles	--	gneiss	--	N
	matrix very fine 1/4 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
	5mm volcanic	5	-2	fine pebbles	green	green basalt	rounded	N
	8mm quartzite	8	-3	med. pebbles	white	quartzite	subangular	N
	110mm augen gneiss	110	-7	small cobbles	pink and black	augen gneiss	subrounded	N
	matrix very fine 1/4 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
Imbrication	Row 5	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S115E 20SW	matrix very fine 1/4 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
	5mm chert	5	-2	fine pebbles	brown	chert	--	N
	170mm schist	170	-7	small cobbles	gray	schist	subangular	N
	matrix very fine 1/4 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
	15mm schist	15	-4	coarse pebbles	gray	schist	subangular	N
	7mm augen gneiss	7	-3	med. pebbles	pink and black	augen gneiss	subrounded	N
	matrix very fine 1/4 - 1/2 mm grains, rounded/subrounded light tan/unconsolidated clay	1/4	2	fine/med sand	tan	TSS	rounded	Y
	5mm schist	5	-2	fine pebbles	gray	schist	subangular	N
3mm volcanic	3	-2	fine pebbles	black	volcanic	rounded	N	

**latitude**  
 33° 22' 34.0"  
**longitude**  
 114° 54' 39.0"

Appendix A. 19. East - Clast Count nineteen (CC19) Unit L.

Clast Count 1								
Location: Tadpole Tank Subunit R								
Bedding foliation: N20E 53SE								
Matrix: fine grain mixed with sand sized grains /subangular and subrounded grains inside matrix. Orange/red color								
Imbrication	Row 1	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S102E 68SW  N348W 68NE  N5E 27SE	30 mm green volcanic/ subrounded / rounded	30	-5	coarse pebbles	green	green basalt	subrounded/rounded	N
	matrix with 5mm grains/ angular	5	-2	fine pebbles	orange/red	ORSS	angular	Y
	10 mm clast / quartz	10	-3	med. pebbles	black	volcanic	subangular	N
	200 mm clast volcanic pink and white	200	-8	large cobbles	pink and white	felsic granite	rounded	N
	matrix with 5 mm grains/ angular	5	-2	fine pebbles	orange/red	ORSS	angular	Y
	matrix with 5 mm grains/ angular	5	-2	fine pebbles	orange/red	ORSS	angular	Y
	50 mm clast volcanic/ rounded/ green and black minerals	50	-6	V coarse peb	green and black minerals	andesite	rounded	N
	matrix with 5 mm grains/ angular	5	-2	fine pebbles	orange/red	ORSS	angular	Y
	110mm clasts	110	-7	med cobbles	red	volcanic	subangular	N
	30 mm volcanic with crystals 5mm in size/ subrounded subangular	30	-5	V/coarse peb	white	volcanic	subrounded/subangular	N
matrix with 5 mm grains/ angular	5	-2	fine pebbles	orange/red	ORSS	angular	Y	
10 mm clast volcanic	10	-3	med. pebbles	black	volcanic	angular	N	
10mm matrix with 5 mm grains/ angular	5	-2	fine pebbles	orange/red	ORSS	angular	Y	
15mm matrix with 5 mm grains/angular	5	-2	fine pebbles	orange/red	ORSS	angular	Y	
10mm matrix with 5 mm grains/angular	5	-2	fine pebbles	orange/red	ORSS	angular	Y	
Imbrication	Row 2	Size (mm)	Phi	Grade name	Color	Lithology	Roundness	Matrix
N12E 32SE  S200W 20NW  N4E 54SE  N322W 35NE  N7E 57SE	10mm sized clast volcanic	10	-3	med. pebbles	green	volcanic	subangular	N
	20mm volcanic with 10 mm clasts/ subrounded and rounded	20	-4	V. coarse pebbles	red	volcanic	subrounded/rounded	N
	30mm volcanic in NE orientation/ rounded	30	-5	coarse pebbles	black and green	volcanic	rounded	N
	10mm quartzite clast	10	-3	med. pebbles	white	quartzite	rounded	N
	10mm clast subangular	10	-3	med. pebbles	white	volcanic	subangular	N
	matrix with 5mm grains	5	-2	fine pebbles	orange/red	ORSS	subangular	Y
	20mm quartzite/ subrounded/rounded NW orientation	20	-4	coarse pebbles	white	quartzite	subrounded/rounded	N
	30mm volcanic / 70% black 30% white crystals	35	-5	V. coarse peb	black and white	diorite	rounded	N
	55mm quartzite/ rounded/subrounded	55	-6	V coarse peb	white	quartzite	subrounded/rounded	N
	20 mm clasts black and green/ rounded	20	-4	coarse pebbles	black and green	andesite	rounded	N
	20mm rounded chunky smashed into eachother --> augen gneiss	20	-4	coarse pebbles	pink and black	augen gneiss	rounded	N
	40mm augen gneiss/ rounded	40	-5	V coarse peb	pink and black	augen gneiss	rounded	N
	30mm rounded volcanic	30	-5	V/coarse pebbles	--	volcanic	rounded	N
	50mm rounded volcanic with 40% black grains with quartz and feldspars	50	-6	V coarse peb	black	granite	rounded	N
	25mm volcanic clast subrounded	25	-4	coarse pebbles	--	volcanic	subrounded	N
70mm augen gneiss/ rounded	70	-6	small cobbles	pink and black	augen gneiss	rounded	N	
25mm elongated grain	25	-4	coarse pebbles	--	volcanic	subangular	Y	
Imbrication	Row 3	Size (mm)	Phi	Grade name	Color	Lithology	Roundness	Matrix
N20E 45SE  N310W 45NE	70mm augen gneiss mostly feldspars/subrounded	70	-6	small cobbles	pink and black	augen gneiss	subrounded	N
	40mm volcanic/ 75%QF and biotite, fine grain black rock - Q grains 5mm	40	-5	V coarse peb	black	granite	rounded	N
	20mm clast with matrix	20	-4	coarse pebbles	--	volcanic	rounded	N
	60mm quartz volcanic/subrounded	60	-6	V coarse peb	--	granite	subrounded	N
	10mm clast	10	-3	med. pebbles	red	volcanic	subangular	N
	matrix with 10mm grains --> gradation between 5mm to 10mm	5	-3	med. pebbles	orange/red	ORSS	subangular	Y
	30mm volcanic black and white crystals/ subrounded	30	-5	V/coarse pebbles	black and white	diorite	subrounded	N
	matrix with 5-10mm grains	8	-3	fine/med peb	orange/red	ORSS	subangular	Y
	25mm black/ subrounded	25	-4	coarse pebbles	black	black basalt	subrounded	N
	80mm augen gneiss F grain 10+mm	80	-6	small cobbles	pink and black	augen gneiss	subrounded/subangular	N
10mm matrix with 5-10mm grains	8	-3	fine/med peb	orange/red	ORSS	subangular	Y	
20mm matrix with 5-10mm grains	8	-3	fine/med peb	orange/red	ORSS	subangular	Y	
Imbrication	Row 4	Size (mm)	Phi	Grade name	Color	Lithology	Roundness	Matrix
S174E 28SW  N355W 26NE	fine grain matrix 1mm or less	1	0	coarse sand	orange/red	ORSS	subangular	Y
	fine grain matrix 1mm or less	1	0	coarse sand	orange/red	ORSS	subangular	Y
	50mm augen gneiss with large feldspar/ angular	50	-6	V coarse peb	pink and black	augen gneiss	angular	N
	16mm clast with fine grain matrix 1mm or less	16	-4	coarse pebbles	brown	volcanic	subangular	N
	16mm clast with fine grain matrix 1mm or less	16	-4	coarse pebbles	black	volcanic	subangular	N
	100mm augen gneiss F crystals 60mm average/angular/subangular	100	-4	med cobbles	pink and black	augen gneiss	angular/subangular	N
	fine grain matrix 1mm or less	1	0	coarse sand	orange/red	ORSS	subangular	Y
	35mm quartz volcanic, 80% Q, 20% hornblende?	35	-5	V coarse peb	black	diorite	rounded	N
	5mm fine grain matrix 1mm or less	1	0	coarse sand	orange/red	ORSS	subangular	Y
	25mm fine grain matrix 1mm or less	1	0	coarse sand	orange/red	ORSS	subangular	Y
fine grain matrix 1mm or less --> begins to increase to 2mm	2	-1	VC sand/fine peb	orange/red	ORSS	subangular	Y	
15mm fine grain matrix 2mm or less	2	-1	VC sand/fine peb	orange/red	ORSS	subangular	Y	
10mm fine grain matrix 2mm or less	2	-1	VC sand/fine peb	orange/red	ORSS	subangular	Y	
20mm black volcanic with fine grain matrix 2mm or less	20	-4	coarse pebbles	black	andesite	rounded	N	

Clast Count 1								
Location: Tadpole Tank Subunit R								
Bedding foliation: N20E 53SE								
Matrix: fine grain mixed with sand sized grains /subangular and subrounded grains inside matrix. Orange/red color								
Imbrication	Row 5	Size (mm)	Phi	Grade name	Color	Lithology	Roundness	Matrix
S200W 70NW	16mm volcanic	16	-4	fine/med peb	red	volcanic	subangular	N
	120mm volcanic with 5mm quartz/subangular	120	-7	med cobbles	white	granite	subangular	N
	16 mm clast	16	-4	fine/med peb	orange/red	volcanic	subangular	N
	15 mm augen gneiss clast	15	-4	fine/med peb	pink and black	augen gneiss	subangular	N
	12 mm quartzite clast	12	-4	fine/med peb	white	quartzite	subangular	N
	10 mm clast	10	-4	fine/med peb	black	volcanic	subangular	N
	12 mm tuff clast	12	-4	fine/med peb	red	tuff	subangular	N
	16 mm clast	16	-4	fine/med peb	green	volcanic	subangular	N
	110mm red/fine grain no distinct crystals/elongated flat round	110	-7	med cobbles	black	rhyolite	flat/round/elongated	N
	16 mm clast	16	-4	fine/med peb	red	volcanic	subangular	N
	90mm augen gneiss	90	-7	small cobbles	pink and black	augen gneiss	subangular/subrounded	N
	20mm quartz, crystals around 15mm elongated augen gneiss	20	-4	coarse pebbles	pink and black	augen gneiss	enlongated	N
	Imbrication	Row 6	Size (mm)	Phi	Grade name	Color	Lithology	Roundness
N28E 77SE	30mm volcanic with 5-10mm matrix/subangular/subrounded	30	-5	V/coarse pebbles	--	volcanic	subangular/subrounded	N
	matrix with 5-10mm grains	16	-4	fine/med peb	orange/red	ORSS	subangular	Y
	50mm volcanic subrounded	50	-6	V coarse pebbles	--	volcanic	subrounded	N
	matrix with 5-10mm grains	3	-4	fine/med peb	orange/red	ORSS	subangular	Y
	12mm clast	12	-4	fine/med peb	orange/red	volcanic	subangular	N
	20mm grains/ angular subangular/ black fine grain rock with few Q crystals	20	-4	fine/med peb	orange/red	andesite	angular/subangular	N
	60mm smooth black rock	60	-6	V coarse pebbles	black	pumice	rounded	N
	110mm ignimbrite/rounded	110	-7	med cobbles	pink	ignimbrite	rounded	N
	matrix with 5-10mm grains	16	-4	fine/med peb	orange/red	ORSS	subangular	Y
	11 mm clast	11	-4	fine/med peb	red	volcanic	subangular	N
	50mm volcanic/rounded	50	-6	V coarse pebbles	--	volcanic	rounded	N
	80mm (of a 160mm clast) gneiss/black with white crystals and has striations	80	-6	small cobbles	black and white	gneiss	rounded	N
	Imbrication	Row 7	Size (mm)	Phi	Grade name	Color	Lithology	Roundness
S168E 65SW	20mm with 5-10mm matrix grains	20	-4	coarse pebbles	black	volcanic	rounded	N
	350mm cobble augen gneiss subrounded/rounded, feldspar grain 15mm	350	-8	small boulder	pink and black	augen gneiss	subrounded/rounded	N
	matrix with 5-10mm grains	2	-4	fine/med peb	orange/red	ORSS	subangular	Y
N311W 61SE	15 mm chert clast	15	-4	fine/med peb	brown	chert	subangular	N
	40mm volcanic clast/rounded	40	-5	V coarse pebbles	--	volcanic	rounded	N
	matrix with 5-10mm grains	2	-4	fine/med peb	orange/red	ORSS	subangular	Y
	16mm clast	16	-4	fine/med peb	black	volcanic	subangular	N
	50mm smooth black/rounded	50	-6	V coarse pebbles	black	pumice	rounded	N
	40mm volcanic black and white crystals rounded	40	-5	V coarse pebbles	black and white	diorite	rounded	N
	matrix with 5-10mm grains	2	-4	fine/med peb	orange/red	ORSS	subangular	Y
matrix with 5-10mm grains	16	-4	fine/med peb	orange/red	ORSS	subangular	Y	
Imbrication	Row 8	Size (mm)	Phi	Grade name	Color	Lithology	Roundness	Matrix
N46E 53SE	20mm clast with 5-10mm matrix grains	20	-4	coarse pebbles	red	volcanic	rounded	N
	matrix (matrix grains coarsening)	2	-4	fine/med peb	orange/red	ORSS	subangular	Y
	165mm black volcanic/ subangular/subrounded	165	-7	large cobble	black	black basalt	subrounded/subangular	N
	16 mm clast	16	-4	med/coarse peb	green	volcanic	subangular	N
	matrix with 5-10mm grains	3	-4	med/coarse peb	orange/red	ORSS	subangular	Y
	11 mm clast	11	-4	med/coarse peb	red	volcanic	subangular	N
	85mm clast with quartz crystals/ rounded	85	-6	small cobble	white quartz	granite	rounded	N
	10 mm augen gneiss clast	10	-4	med/coarse peb	pink and black	augen gneiss	subangular	N
	12 mm clast	12	-4	med/coarse peb	black	volcanic	subangular	N
matrix with 5-10mm grains	4	-4	med/coarse peb	orange/red	ORSS	subangular	Y	

latitude  
33' 24' 24.0"  
longitude  
114' 54' 14.3"

Appendix A. 20. Tadpole Tank - Clast Count one (CC21) Unit R.

Clast Count 20								
Location: BT unit, by tadpole creek								
Bedding foliation: N334W 10SW								
Matrix: cemented fine grain matrix, very light tan/buff gray with sand grains as large as 5mm in matrix.								
Cemented fine grain matrix, very light tan gray with sand grains as large as 5mm in matrix.								
Clasts average 90mm, range from 40-240mm in size, clast supported. multi-colored vesicular eroded clasts, granodiorites, volcanics								
Imbrication	Row 1	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
N278W 67NE	vessicular volcanic	35	-5	V/coarse peb	green	green basalt	rounded	N
	90mm granodiorite	90	-7	small cobbles	--	granodiorite	rounded	N
	matrix - light tan with 5mm grains	5	-2	fine pebbles	light tan/buff	BSS	subrounded/rounded	Y
	60mm granodiorite	60	-6	small cobbles	--	granodiorite	subrounded/rounded	N
	190mm vesicular volcanic	190	-7	small cobbles	red	andesite scoria	rounded	N
N348W 14NE	matrix - light tan with 5mm grains	5	-2	fine pebbles	light tan/buff	BSS	subrounded/rounded	Y
Imbrication	Row 2	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S215W 78NW	40mm vesicular volcanic	40	-5	V. coarse pebbles	pink	rhyolite	rounded	N
	matrix - light tan with 5mm grains	5	-2	fine pebbles	light tan/buff	BSS	subrounded/rounded	Y
	200mm vesicular volcanic	200	-8	large cobble	red	andesite scoria	rounded	N
	95mm granodiorite	95	-7	small cobbles	--	granodiorite	subrounded/rounded	N
	65mm vesicular volcanic	65	-6	very coarse pebbles	green	green basalt	rounded	N
	170mm granodiorite	170	-7	small cobbles	--	granodiorite	subrounded/rounded	N
	matrix - light tan with 5mm grains	5	-2	fine pebbles	light tan/buff	BSS	subrounded/rounded	Y
Imbrication	Row 3	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S190W 65NW	90mm granodiorite	90	-7	small cobbles	--	granodiorite	subrounded/rounded	N
	matrix - light tan with 5mm grains	5	-2	fine pebbles	light tan/buff	BSS	subrounded/rounded	Y
	110mm vesicular volcanic	110	-7	small cobbles	purple	andesite scoria	rounded	N
	80mm granodiorite	80	-6	small cobbles	--	granodiorite	subrounded/rounded	N
	240mm vesicular volcanic	240	-8	large cobbles	green	green basalt	rounded	N
	35mm vesicular volcanic	35	-5	V/coarse peb	red	andesite scoria	rounded	N
Imbrication	Row 4	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S166E 46SW	170mm vesicular volcanic	170	-7	small cobbles	gray	andesite	rounded	N
	65mm vesicular volcanic	65	-6	very coarse pebbles	black	black basalt	rounded	N
	matrix - light tan with 5mm grains	5	-2	fine pebbles	light tan/buff	BSS	subrounded/rounded	Y
	45mm granodiorite	45	-5	V. coarse pebbles	--	granodiorite	subrounded/rounded	N
	120mm vesicular volcanic	120	-7	small cobbles	green	green basalt	rounded	N
N15E 14SW	55mm vesicular volcanic	55	-6	V coarse pebbles	red	andesite scoria	rounded	N
	matrix - light tan with 5mm grains	5	-2	fine pebbles	light tan/buff	BSS	subrounded/rounded	Y
	90mm granodiorite	90	-7	small cobbles	--	granodiorite	subrounded/rounded	N
Imbrication	Row 5	Size (mm)	Phi	Grade name	Clast Color	Lithology	Roundness	Matrix
S164E 46SW	matrix - light tan with 5mm grains	5	-2	fine pebbles	light tan/buff	BSS	subrounded/rounded	Y
	40mm vesicular volcanic	40	-5	V. coarse pebbles	black	black basalt	rounded	N
	80mm granodiorite	80	-6	small cobbles	--	granodiorite	subrounded/rounded	N
	45mm vesicular volcanic	45	-6	V coarse pebbles	black	black basalt	rounded	N
	matrix - light tan with 5mm grains	5	-2	fine pebbles	light tan/buff	BSS	subrounded/rounded	Y
	120mm vesicular volcanic	120	-7	small cobbles	red	andesite scoria	rounded	N

latitude  
33° 24' 12.0"  
longitude  
114° 54' 27.0"

Appendix A. 21. Tadpole Tank - Clast Count twenty (CC20) Unit BT.

**Clast Count 21**

**Location:** West; BT unit, by tadpole creek

**Bedding foliation:** N334W 10SW

**Matrix:** cemented fine grain matrix, very light tan gray with sand grains as large as 5mm in matrix.

Clast supported, clasts range from 5mm - 300mm, predominantly contains vesicular volcanic rocks that have square shaped minerals

Rocks come in all colors (black, red, green, gray) - subrounded/rounded clasts

<b>Imbrication</b>	<b>Row 1</b>	<b>Size (mm)</b>	<b>Phi</b>	<b>Grade name</b>	<b>Clast Color</b>	<b>Lithology</b>	<b>Roundness</b>	<b>Matrix</b>
S251E 82NE	matrix - light tan with 5mm grains	5	-2	fine pebbles	light tan/buff	BSS	subangular/subrounded	Y
	100mm granodiorite	100	-7	small cobbles	--	granodiorite	subrounded	N
	230mm rounded volcanic	230	-8	large cobbles	red	rhyolite	rounded	N
	65mm vossicular	65	-6	VC pebbles	black	black basalt	rounded	N
	80mm volcanic	80	-6	small cobbles	green	green basalt	rounded	N
	matrix - light tan with 5mm grains	5	-2	fine pebbles	light tan/buff	BSS	subangular/subrounded	Y
<b>Imbrication</b>	<b>Row 2</b>	<b>Size (mm)</b>	<b>Phi</b>	<b>Grade name</b>	<b>Clast Color</b>	<b>Lithology</b>	<b>Roundness</b>	<b>Matrix</b>
N46E 22SE	145mm granodiorite	145	-7	small cobbles	--	granodiorite	subrounded	N
	6mm vossicular	60	-6	small cobbles	green	green basalt	rounded	N
	30mm vossicular	30	-5	very coarse pebbles	pink	rhyolite	rounded	N
	matrix - light tan with 5mm grains	5	-2	fine pebbles	light tan/buff	BSS	subangular/subrounded	Y
	75mm volcanic	75	-6	small cobbles	red	rhyolite	subrounded	N
	190mm vossicular	190	-7	small cobbles	black	black basalt	rounded	N
	13mm vossicular	13	-3	med. pebbles	black	black basalt	rounded	N
<b>Imbrication</b>	<b>Row 3</b>	<b>Size (mm)</b>	<b>Phi</b>	<b>Grade name</b>	<b>Clast Color</b>	<b>Lithology</b>	<b>Roundness</b>	<b>Matrix</b>
N70E 55SE	90mm granodiorite	90	-7	small cobbles	--	granodiorite	subrounded	N
	matrix - light tan with 5mm grains	5	-2	fine pebbles	light tan/buff	BSS	subangular/subrounded	Y
	110mm vossicular	110	-7	small cobbles	green	green basalt	rounded	N
	80mm granodiorite	80	-6	small cobbles	--	granodiorite	subrounded	N
	240mm vossicular	240	-8	large cobbles	red	andesite scoria	rounded	N
	35mm vossicular	35	-5	V/coarse peb	black	black basalt	rounded	N
<b>Imbrication</b>	<b>Row 4</b>	<b>Size (mm)</b>	<b>Phi</b>	<b>Grade name</b>	<b>Clast Color</b>	<b>Lithology</b>	<b>Roundness</b>	<b>Matrix</b>
S200W 45NW S222W 57NW	145mm granodiorite	145	-7	small cobbles	--	granodiorite	subrounded	N
	matrix - light tan with 5mm grains	5	-2	fine pebbles	light tan/buff	BSS	subangular/subrounded	Y
	15mm vossicular	15	-4	coarse pebbles	green	green basalt	rounded	N
	vossicular	7	-3	med. pebbles	red	andesite scoria	rounded	N
	matrix - light tan with 5mm grains	5	-2	fine pebbles	light tan/buff	BSS	subangular/subrounded	Y
	82mm vossicular	82	-6	small cobbles	green	green basalt	rounded	N
	90mm schist	90	-7	med cobbles	gray	schist	subrounded	N
	30mm quartzite	30	-5	coarse pebbles	white	quartzite	subrounded	N
<b>Imbrication</b>	<b>Row 5</b>	<b>Size (mm)</b>	<b>Phi</b>	<b>Grade name</b>	<b>Clast Color</b>	<b>Lithology</b>	<b>Roundness</b>	<b>Matrix</b>
S155E 41SW  N7E 18SE	125mm vossicular	125	-7	small cobbles	red	andesite scoria	rounded	N
	matrix - light tan with 5mm grains	5	-2	fine pebbles	light tan/buff	BSS	subangular/subrounded	Y
	170mm vossicular	170	-7	small cobbles	pink	rhyolite	rounded	N
	30mm volcanic	30	-5	coarse pebbles	black	volcanic	subrounded	N
	matrix - light tan with 5mm grains	5	-2	fine pebbles	light tan/buff	BSS	subangular/subrounded	Y
	30mm vossicular	30	-5	V. coarse pebbles	green	green basalt	rounded	N
	45mm vossicular	45	-5	V. coarse pebbles	black	black basalt	rounded	N

**latitude**  
33° 24' 10.6"  
**longitude**  
114° 54' 30.7"

Appendix A. 22. Tadpole Tank - Clast Count twenty-one (CC21) Unit BT.