rudow + berry
structural engineering
scottsdale, arizona 85251
t (480) 946-8171
f (480) 946-9480

job name:	CCW Powdercat			pg
job number:	17100			of
designed by:	MAR	date:	2/18	
checked by:		date:		

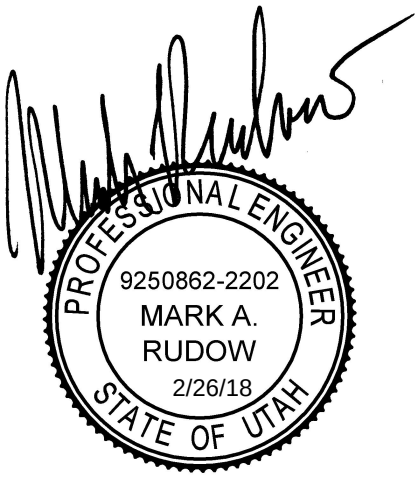
COPPER CREST WEST – POWDERCAT

Foundation Revisions

During the Initial construction period, the geotechnical engineer has reassessed the foundation conditions and has made supplemental recommendations. These new recommendations are significantly different than the original recommendations such that most footings can be decreased. The allowable soil bearing pressure has been increased from 2400 psf to 3700 psf and in addition, a 1.33 increase factor has been allowed for load cases that include wind and/or seismic loading.

The following calculations reflect the changes to the foundation design to incorporate these new recommendations. The slab support recommendations were also revised and the slab system called out on the foundation plans has been revised accordingly.

The geotechnical addendum has been attached following the revised calculations.



rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW

designed by: MAR date: May-17
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Typical Unit Far South Wall

Allow. Soil Pr. =	3.700	ksf		DL OTM =	0.00	f t - kips	
Fy =	60	ksi		FLR LL OTM =	0	f t - kips	
f 'c =	3000	psi		RF LL OTM =	0	f t - kips	
Wall DL =	0.61	klf		WIND OTM =	45.06	f t - kips	
Roof LL =	2.08	klf		Footing Length :	20.00	feet	
Floor LL =	0.24	klf		Footing Width :	0.81	feet	
Wall Length =	20.00	feet		Footing Thkness:	12	inches	
Wall Thickness =	8	inches		Footing DL :	0.636	klf	

OUTPUT DATA :

USE 1'-8" x 12" THK
(Min. per Geotech Report)
(2) #5 Longitudinal

EQ'N 16-11 : DL + .75(FL + RL):

P =	59.7	kips	P_{ult} =	85.6	kips		
OTM =	0.00	ft-kips	OTM_{ult} =	0	ft-kips		
e =	0.00	feet	X bar =	N/A	feet		
Soil Pr. =	3.68	ksf, max.,	5.28	ksf, ult.		Required Width =	0.81 feet

EQ'N 16-13: DL + .75(FL + RL + W)

P =	59.7	kips	P_{ULT} =	85.6	kips		
OTM =	33.8	ft-kips	OTM_{ULT} =	54.072	ft-kips		
e =	0.57	feet	X bar =	N/A	feet		
Soil Pr. =	4.31	ksf, max.,	6.18	ksf, ult.		Required Width =	0.71 feet

EQ'N 16-15: 0.6DL + W

P =	14.9	kips	P (ult) =	17.9	kips		
OTM =	45.1	ft-kips	OTM_{ULT} =	72.096	ft-kips		
e =	3.02	feet	X bar =	N/A	feet		
Soil Pr. =	1.75	ksf, max.,	2.11	ksf, ult.		Required Width =	0.29 feet

Resisting Moment = 248.37 ft-kips Factor of Safety = 7.87

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	12	inches					
Moment =	0.34	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	21 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	12	inches					
Moment =	0.50	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	30 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	12	inches			
Longitudinal Steel Required =	0.01	sq.in./ft.	v(longit.) =	0	psi
Transverse Steel Required =	0.01	sq.in./ft.	v(transv.)=	0	psi
			V(allow) =	93.1	psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW

designed by: MAR date: May-17
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 124 Far South Wall

Allow. Soil Pr. =	3.700	ksf		DL OTM =	0.00	f t - kips
Fy =	60	ksi		FLR LL OTM =	0	f t - kips
f 'c =	3000	psi		RF LL OTM =	0	f t - kips
Wall DL =	0.61	klf		WIND OTM =	42.56	f t - kips
Roof LL =	2.08	klf		Footing Length :	26.67	feet
Floor LL =	0.24	klf		Footing Width :	0.85	feet
Wall Length =	26.67	feet		Footing Thkness:	12	inches
Wall Thickness =	8	inches		Footing DL :	0.746	klf

OUTPUT DATA :

USE 1'-8" x 12" THK
(Min. per Geotech Report)
(2) #5 Longitudinal

EQ'N 16-11 : DL + .75(FL + RL):

P =	82.5	kips	P_{ult} =	117.6	kips
OTM =	0.00	ft-kips	OTM_{ult} =	0	ft-kips
e =	0.00	feet	X bar =	N/A	feet
Soil Pr. =	3.64	ksf, max.,	5.19	ksf, ult.	

Required Width = 0.84 feet

EQ'N 16-13: DL + .75(FL + RL + W)

P =	82.5	kips	P_{ULT} =	117.6	kips
OTM =	31.9	ft-kips	OTM_{ULT} =	51.072	ft-kips
e =	0.39	feet	X bar =	N/A	feet
Soil Pr. =	3.96	ksf, max.,	5.64	ksf, ult.	

Required Width = 0.68 feet

EQ'N 16-15: 0.6DL + W

P =	21.6	kips	P (ult) =	26.0	kips
OTM =	42.6	ft-kips	OTM_{ULT} =	68.096	ft-kips
e =	1.97	feet	X bar =	N/A	feet
Soil Pr. =	1.38	ksf, max.,	1.65	ksf, ult.	

Required Width = 0.24 feet

Resisting Moment = 480.77 ft-kips

Factor of Safety = 16.14

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	12	inches					
Moment =	0.31	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	19 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	12	inches					
Moment =	0.51	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	30 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	12	inches			
Longitudinal Steel Required =	0.01	sq.in./ft.	v(longit.) =	0	psi
Transverse Steel Required =	0.01	sq.in./ft.	v(transv.)=	0	psi
			V(allow) =	93.1	psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW

designed by: MAR date: May-17
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 124 North Wall

Allow. Soil Pr. =	3.700	ksf		DL OTM =	19.20	f t - kips
Fy =	60	ksi		FLR LL OTM =	3.39	f t - kips
f 'c =	3000	psi		RF LL OTM =	118.07	f t - kips
Wall DL =	0.27	klf		SEISMIC OTM =	163.52	f t - kips
Roof LL =	1.77	klf		Footing Length :	20.08	feet
Floor LL =	0.05	klf		Footing Width :	2.14	feet
Wall Length =	18.08	feet		Footing Thkness:	12	inches
Wall Thickness =	8	inches		Footing DL :	1.409	klf

OUTPUT DATA :

EQ'N 16-11 : DL + .75(FL + RL):

P =	57.9 kips	P_{ult} =	79.4 kips		
OTM =	110.30 ft-kips	OTM_{ult} =	168.79 ft-kips		
e =	1.90 feet	X bar =	N/A feet		
Soil Pr. =	2.11 ksf, max.,	2.89 ksf, ult.		Required Width =	1.22 feet

USE 2'-6" x 12" THK
(3) #5 Longitudinal
#5 @ 14 Transverse

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	57.9 kips	P_{ULT} =	79.4 kips		
OTM =	232.9 ft-kips	OTM_{ULT} =	365.02 ft-kips		
e =	4.02 feet	X bar =	6.02 feet		
Soil Pr. =	2.99 ksf, max.,	4.10 ksf, ult.		Required Width =	1.30 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	19.9 kips	P (ult) =	23.9 kips		
OTM =	175.0 ft-kips	OTM_{ULT} =	196.97 ft-kips		
e =	8.78 feet	X bar =	1.26 feet		
Soil Pr. =	4.91 ksf, max.,	5.89 ksf, ult.		Required Width =	2.14 feet

Resisting Moment = 333.70 ft-kips Factor of Safety = 2.65

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	16 inches				
Moment =	5.24 ft-kips/ft	Fb(allow)=	178 psi	fb(act.)=	160 psi
Shear =	0.00 kips/ft	Fv(allow)=	71 psi	fv(act.)=	0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	14 inches				
Moment =	3.39 ft-kips/ft	Fb(allow)=	178 psi	fb(act.)=	141 psi
Shear =	0.00 kips/ft	Fv(allow)=	71 psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	12 inches		
Longitudinal Steel Required =	0.14 sq.in./ft.	v(longit.) =	17 psi
Transverse Steel Required =	0.09 sq.in./ft.	v(transv.)=	2 psi
		V(allow) =	93.1 psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW

designed by: MAR date: May-17
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 124 South Wall

Allow. Soil Pr. =	3.700	ksf		DL OTM =	21.21	f t - kips
Fy =	60	ksi		FLR LL OTM =	11.13	f t - kips
f 'c =	3000	psi		RF LL OTM =	124.5	f t - kips
Wall DL =	1.99	klf		SEISMIC OTM =	246.9	f t - kips
Roof LL =	10.40	klf		Footing Length :	16.00	feet
Floor LL =	0.05	klf		Footing Width :	7.16	feet
Wall Length =	5.33	feet		Footing Thkness:	24	inches
Wall Thickness =	8	inches		Footing DL :	3.026	klf

OUTPUT DATA :

EQ'N 16-11 : DL + .75(FL + RL):

P =	100.8	kips	P_{ult} =	137.7	kips
OTM =	122.93	ft-kips	OTM_{ult} =	188.21	ft-kips
e =	1.22	feet	X bar =	N/A	feet
Soil Pr. =	1.28	ksf, max.,	1.75	ksf, ult.	

USE 16'-0" x 7'-2" x 12" THK
(10) #8 Longitudinal
(14) #7 Transverse

Required Width = 2.48 feet

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	100.8	kips	P_{ULT} =	137.7	kips
OTM =	308.1	ft-kips	OTM_{ULT} =	484.49	ft-kips
e =	3.06	feet	X bar =	4.94	feet
Soil Pr. =	1.90	ksf, max.,	2.59	ksf, ult.	

Required Width = 2.76 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	35.4	kips	P (ult) =	42.5	kips
OTM =	259.6	ft-kips	OTM_{ULT} =	291.8	ft-kips
e =	7.33	feet	X bar =	0.67	feet
Soil Pr. =	4.92	ksf, max.,	5.91	ksf, ult.	

Required Width = 7.16 feet

Resisting Moment = 472.27 ft-kips

Factor of Safety = 2.55

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	60	inches					
Moment =	94.90	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	169 psi
Shear =	1.98	kips/ft	Fv(allow)=	71	psi	fv(act.)=	4 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	38	inches					
Moment =	37.83	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	175 psi
Shear =	0.47	kips/ft	Fv(allow)=	71	psi	fv(act.)=	2 psi

Reinf. Thickness (if used) =	24	inches			
Longitudinal Steel Required =	1.09	sq.in./ft.	v(longit.) =	87	psi
Transverse Steel Required =	0.42	sq.in./ft.	v(transv.)=	37	psi
			V(allow) =	93.1	psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW

designed by: MAR date: May-17
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 125 & 126 South Walls

Allow. Soil Pr. =	3.700	ksf		DL OTM =	0.00	f t - kips
Fy =	60	ksi		FLR LL OTM =	0	f t - kips
f 'c =	3000	psi		RF LL OTM =	0	f t - kips
Wall DL =	1.54	klf		SEISMIC OTM =	343.42	f t - kips
Roof LL =	11.14	klf		Footing Length :	19.33	feet
Floor LL =	0.11	klf		Footing Width :	6.18	feet
Wall Length =	9.33	feet		Footing Thkness:	24	inches
Wall Thickness =	8	inches		Footing DL :	2.616	klf

OUTPUT DATA :

EQ'N 16-11 : DL + .75(FL + RL):

P =	143.7	kips	P_{ult} =	203.9	kips
OTM =	0.00	ft-kips	OTM_{ult} =	0.00	ft-kips
e =	0.00	feet	X bar =	N/A	feet
Soil Pr. =	1.20	ksf, max.,	1.71	ksf, ult.	

USE 19'-4" x 6'-0" x 12" THK
(10) #7 Longitudinal
(17) #7 Transverse
(Delta W = 3% - OK)

Required Width = 2.01 feet

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	143.7	kips	P_{ULT} =	203.9	kips
OTM =	257.6	ft-kips	OTM_{ULT} =	412.1	ft-kips
e =	1.79	feet	X bar =	N/A	feet
Soil Pr. =	1.87	ksf, max.,	2.66	ksf, ult.	

Required Width = 2.35 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	39.0	kips	P (ult) =	46.8	kips
OTM =	343.4	ft-kips	OTM_{ULT} =	384.63	ft-kips
e =	8.81	feet	X bar =	0.85	feet
Soil Pr. =	4.92	ksf, max.,	5.90	ksf, ult.	

Required Width = 6.18 feet

Resisting Moment = 627.86 ft-kips

Factor of Safety = 2.61

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	56	inches					
Moment =	83.97	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	173 psi
Shear =	1.97	kips/ft	Fv(allow)=	71	psi	fv(act.)=	4 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	34	inches					
Moment =	28.21	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	165 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	24	inches			
Longitudinal Steel Required =	0.95	sq.in./ft.	v(longit.) =	79	psi
Transverse Steel Required =	0.31	sq.in./ft.	v(transv.)=	25	psi
			V(allow) =	93.1	psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW

designed by: MAR date: May-17
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 125 North Wall

Allow. Soil Pr. =	3.700	ksf		DL OTM =	22.95	f t - kips
Fy =	60	ksi		FLR LL OTM =	2.7	f t - kips
f 'c =	3000	psi		RF LL OTM =	148.45	f t - kips
Wall DL =	0.32	klf		SEISMIC OTM =	114.79	f t - kips
Roof LL =	2.15	klf		Footing Length :	16.92	feet
Floor LL =	0.04	klf		Footing Width :	2.39	feet
Wall Length =	14.92	feet		Footing Thkness:	12	inches
Wall Thickness =	8	inches		Footing DL :	1.407	klf

OUTPUT DATA :

EQ'N 16-11 : DL + .75(FL + RL):

P =	53.1 kips	P_{ult} =	73.6 kips		
OTM =	136.31 ft-kips	OTM_{ult} =	208.92 ft-kips		
e =	2.56 feet	X bar =	N/A feet		
Soil Pr. =	2.51 ksf, max.,	3.48 ksf, ult.		Required Width =	1.62 feet

USE 2'-6" x 12" THK
(3) #5 Longitudinal
#5 @ 14 Transverse

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	53.1 kips	P_{ULT} =	73.6 kips		
OTM =	222.4 ft-kips	OTM_{ULT} =	346.67 ft-kips		
e =	4.18 feet	X bar =	4.28 feet		
Soil Pr. =	3.47 ksf, max.,	4.81 ksf, ult.		Required Width =	1.68 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	17.2 kips	P (ult) =	20.6 kips		
OTM =	128.6 ft-kips	OTM_{ULT} =	145.09 ft-kips		
e =	7.49 feet	X bar =	0.97 feet		
Soil Pr. =	4.93 ksf, max.,	5.91 ksf, ult.		Required Width =	2.39 feet

Resisting Moment = 242.12 ft-kips Factor of Safety = 2.57

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	16 inches				
Moment =	5.25 ft-kips/ft	Fb(allow)=	178 psi	fb(act.)=	161 psi
Shear =	0.00 kips/ft	Fv(allow)=	71 psi	fv(act.)=	0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	14 inches				
Moment =	4.21 ft-kips/ft	Fb(allow)=	178 psi	fb(act.)=	176 psi
Shear =	0.00 kips/ft	Fv(allow)=	71 psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	12 inches		
Longitudinal Steel Required =	0.14 sq.in./ft.	v(longit.) =	17 psi
Transverse Steel Required =	0.11 sq.in./ft.	v(transv.)=	9 psi
		V(allow) =	93.1 psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW

designed by: MAR date: May-17
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 126 North Wall

Allow. Soil Pr. =	3.700	ksf		DL OTM =	23.07	f t - kips
Fy =	60	ksi		FLR LL OTM =	2.23	f t - kips
f 'c =	3000	psi		RF LL OTM =	151.91	f t - kips
Wall DL =	0.33	klf		SEISMIC OTM =	135.46	f t - kips
Roof LL =	2.19	klf		Footing Length :	16.83	feet
Floor LL =	0.04	klf		Footing Width :	2.89	feet
Wall Length =	14.83	feet		Footing Thkness:	12	inches
Wall Thickness =	8	inches		Footing DL :	1.689	klf

OUTPUT DATA :

EQ'N 16-11 : DL + .75(FL + RL):

P =	58.0 kips	P_{ult} =	79.6 kips		
OTM =	138.68 ft-kips	OTM_{ult} =	212.65 ft-kips		
e =	2.39 feet	X bar =	N/A feet		
Soil Pr. =	2.21 ksf, max.,	3.03 ksf, ult.		Required Width =	1.73 feet

USE 3'-0" x 12" THK
(3) #5 Longitudinal
#5 @ 14 Transverse

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	58.0 kips	P_{ULT} =	79.6 kips		
OTM =	240.3 ft-kips	OTM_{ULT} =	375.2 ft-kips		
e =	4.14 feet	X bar =	4.28 feet		
Soil Pr. =	3.13 ksf, max.,	4.29 ksf, ult.		Required Width =	1.84 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	20.0 kips	P (ult) =	24.0 kips		
OTM =	149.3 ft-kips	OTM_{ULT} =	168.33 ft-kips		
e =	7.48 feet	X bar =	0.94 feet		
Soil Pr. =	4.92 ksf, max.,	5.91 ksf, ult.		Required Width =	2.89 feet

Resisting Moment = 279.94 ft-kips Factor of Safety = 2.58

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	16 inches				
Moment =	5.25 ft-kips/ft	Fb(allow)=	178 psi	fb(act.)=	161 psi
Shear =	0.00 kips/ft	Fv(allow)=	71 psi	fv(act.)=	0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	18 inches				
Moment =	6.17 ft-kips/ft	Fb(allow)=	178 psi	fb(act.)=	145 psi
Shear =	0.00 kips/ft	Fv(allow)=	71 psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	12 inches		
Longitudinal Steel Required =	0.14 sq.in./ft.	v(longit.) =	17 psi
Transverse Steel Required =	0.16 sq.in./ft.	v(transv.)=	23 psi
		V(allow) =	93.1 psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW

designed by: MAR date: May-17
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 127 & 128 South Walls

Allow. Soil Pr. =	3.700	ksf		DL OTM =	0.00	f t - kips
Fy =	60	ksi		FLR LL OTM =	0	f t - kips
f 'c =	3000	psi		RF LL OTM =	0	f t - kips
Wall DL =	1.55	klf		SEISMIC OTM =	333.47	f t - kips
Roof LL =	11.14	klf		Footing Length :	19.33	feet
Floor LL =	0.11	klf		Footing Width :	5.95	feet
Wall Length =	9.33	feet		Footing Thkness:	24	inches
Wall Thickness =	8	inches		Footing DL :	2.520	klf

OUTPUT DATA :

EQ'N 16-11 : DL + .75(FL + RL):

P =	141.8	kips	P_{ult} =	201.7	kips
OTM =	0.00	ft-kips	OTM_{ult} =	0.00	ft-kips
e =	0.00	feet	X bar =	N/A	feet
Soil Pr. =	1.23	ksf, max.,	1.75	ksf, ult.	

USE 19'-4" x 6'-0" x 12" THK
(10) #7 Longitudinal
(17) #7 Transverse

Required Width = 1.98 feet

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	141.8	kips	P_{ULT} =	201.7	kips
OTM =	250.1	ft-kips	OTM_{ULT} =	400.16	ft-kips
e =	1.76	feet	X bar =	N/A	feet
Soil Pr. =	1.91	ksf, max.,	2.71	ksf, ult.	

Required Width = 2.31 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	37.9	kips	P (ult) =	45.5	kips
OTM =	333.5	ft-kips	OTM_{ULT} =	373.49	ft-kips
e =	8.80	feet	X bar =	0.86	feet
Soil Pr. =	4.92	ksf, max.,	5.90	ksf, ult.	

Required Width = 5.95 feet

Resisting Moment = 610.27 ft-kips

Factor of Safety = 2.61

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	56	inches					
Moment =	83.93	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	173 psi
Shear =	1.97	kips/ft	Fv(allow)=	71	psi	fv(act.)=	4 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	32	inches					
Moment =	26.13	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	174 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	24	inches			
Longitudinal Steel Required =	0.95	sq.in./ft.	v(longit.) =	79	psi
Transverse Steel Required =	0.29	sq.in./ft.	v(transv.)=	22	psi
			V(allow) =	93.1	psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW

designed by: MAR date: May-17
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 127 North Wall

Allow. Soil Pr. =	3.700	ksf		DL OTM =	22.82	f t - kips
Fy =	60	ksi		FLR LL OTM =	1.71	f t - kips
f 'c =	3000	psi		RF LL OTM =	149.8	f t - kips
Wall DL =	0.32	klf		SEISMIC OTM =	136.16	f t - kips
Roof LL =	2.14	klf		Footing Length :	16.92	feet
Floor LL =	0.03	klf		Footing Width :	2.88	feet
Wall Length =	14.92	feet		Footing Thkness:	12	inches
Wall Thickness =	8	inches		Footing DL :	1.682	klf

OUTPUT DATA :

EQ'N 16-11 : DL + .75(FL + RL):

P =	57.4	kips	P_{ult} =	78.6	kips
OTM =	136.45	ft-kips	OTM_{ult} =	209.20	ft-kips
e =	2.38	feet	X bar =	N/A	feet
Soil Pr. =	2.17	ksf, max.,	2.97	ksf, ult.	

USE 3'-0" x 12" THK
(3) #5 Longitudinal
#5 @ 14 Transverse

Required Width = 1.69 feet

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	57.4	kips	P_{ULT} =	78.6	kips
OTM =	238.6	ft-kips	OTM_{ULT} =	372.59	ft-kips
e =	4.16	feet	X bar =	4.30	feet
Soil Pr. =	3.09	ksf, max.,	4.23	ksf, ult.	

Required Width = 1.81 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	19.9	kips	P (ult) =	23.9	kips
OTM =	149.9	ft-kips	OTM_{ULT} =	168.93	ft-kips
e =	7.52	feet	X bar =	0.94	feet
Soil Pr. =	4.92	ksf, max.,	5.91	ksf, ult.	

Required Width = 2.88 feet

Resisting Moment = 280.83 ft-kips

Factor of Safety = 2.58

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	16	inches					
Moment =	5.25	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	161 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	18	inches					
Moment =	6.13	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	144 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	12	inches			
Longitudinal Steel Required =	0.14	sq.in./ft.	v(longit.) =	17	psi
Transverse Steel Required =	0.16	sq.in./ft.	v(transv.)=	23	psi
			V(allow) =	93.1	psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW

designed by: MAR date: May-17
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 128 North Wall

Allow. Soil Pr. =	3.700	ksf	DL OTM =	22.59	f t - kips
Fy =	60	ksi	FLR LL OTM =	1.63	f t - kips
f 'c =	3000	psi	RF LL OTM =	148.52	f t - kips
Wall DL =	0.32	klf	SEISMIC OTM =	116.19	f t - kips
Roof LL =	2.15	klf	Footing Length :	16.83	feet
Floor LL =	0.03	klf	Footing Width :	2.45	feet
Wall Length =	14.83	feet	Footing Thkness:	12	inches
Wall Thickness =	8	inches	Footing DL :	1.444	klf

OUTPUT DATA :

EQ'N 16-11 : DL + .75(FL + RL):

P =	53.2	kips	P_{ult} =	73.6	kips
OTM =	135.20	ft-kips	OTM_{ult} =	207.29	ft-kips
e =	2.54	feet	X bar =	N/A	feet
Soil Pr. =	2.46	ksf, max.,	3.39	ksf, ult.	

USE 2'-6" x 12" THK
(3) #5 Longitudinal
#5 @ 14 Transverse

Required Width = 1.63 feet

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	53.2	kips	P_{ULT} =	73.6	kips
OTM =	222.3	ft-kips	OTM_{ULT} =	346.72	ft-kips
e =	4.18	feet	X bar =	4.24	feet
Soil Pr. =	3.41	ksf, max.,	4.72	ksf, ult.	

Required Width = 1.70 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	17.4	kips	P (ult) =	20.9	kips
OTM =	129.7	ft-kips	OTM_{ULT} =	146.4	ft-kips
e =	7.45	feet	X bar =	0.97	feet
Soil Pr. =	4.90	ksf, max.,	5.88	ksf, ult.	

Required Width = 2.44 feet

Resisting Moment = 244.26 ft-kips

Factor of Safety = 2.57

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	16	inches					
Moment =	5.23	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	160 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	16	inches					
Moment =	4.43	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	136 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	12	inches			
Longitudinal Steel Required =	0.14	sq.in./ft.	v(longit.) =	17	psi
Transverse Steel Required =	0.12	sq.in./ft.	v(transv.)=	11	psi
			V(allow) =	93.1	psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW

designed by: MAR date: May-17
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 129 & 130 South Walls

Allow. Soil Pr. =	3.700	ksf		DL OTM =	0.00	f t - kips
Fy =	60	ksi		FLR LL OTM =	0	f t - kips
f 'c =	3000	psi		RF LL OTM =	0	f t - kips
Wall DL =	1.55	klf		SEISMIC OTM =	333.17	f t - kips
Roof LL =	11.14	klf		Footing Length :	19.33	feet
Floor LL =	0.11	klf		Footing Width :	5.94	feet
Wall Length =	9.33	feet		Footing Thkness:	24	inches
Wall Thickness =	8	inches		Footing DL :	2.516	klf

OUTPUT DATA :

USE 19'-4" x 6'-0" x 12" THK
(10) #7 Longitudinal
(17) #7 Transverse

EQ'N 16-11 : DL + .75(FL + RL):

P =	141.8 kips	P_{ult} =	201.6 kips		
OTM =	0.00 ft-kips	OTM_{ult} =	0.00 ft-kips		
e =	0.00 feet	X bar =	N/A feet		
Soil Pr. =	1.23 ksf, max.,	1.75 ksf, ult.		Required Width =	1.98 feet

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	141.8 kips	P_{ULT} =	201.6 kips		
OTM =	249.9 ft-kips	OTM_{ULT} =	399.8 ft-kips		
e =	1.76 feet	X bar =	N/A feet		
Soil Pr. =	1.91 ksf, max.,	2.71 ksf, ult.		Required Width =	2.31 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	37.8 kips	P (ult) =	45.4 kips		
OTM =	333.2 ft-kips	OTM_{ULT} =	373.15 ft-kips		
e =	8.80 feet	X bar =	0.86 feet		
Soil Pr. =	4.93 ksf, max.,	5.91 ksf, ult.		Required Width =	5.95 feet

Resisting Moment = 609.64 ft-kips Factor of Safety = 2.61

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	56 inches				
Moment =	84.07 ft-kips/ft	Fb(allow)=	178 psi	fb(act.)=	173 psi
Shear =	1.97 kips/ft	Fv(allow)=	71 psi	fv(act.)=	4 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	32 inches				
Moment =	26.10 ft-kips/ft	Fb(allow)=	178 psi	fb(act.)=	174 psi
Shear =	0.00 kips/ft	Fv(allow)=	71 psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	24 inches			
Longitudinal Steel Required =	0.96 sq.in./ft.	v(longit.) =	79	psi
Transverse Steel Required =	0.29 sq.in./ft.	v(transv.)=	22	psi
		V(allow) =	93.1	psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW

project no. 17100

designed by: MAR date: May-17
checked by: date:

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 129 North Wall

Allow. Soil Pr. =	3.700	ksf		DL OTM =	22.70	f t - kips
Fy =	60	ksi		FLR LL OTM =	1.64	f t - kips
f 'c =	3000	psi		RF LL OTM =	149.8	f t - kips
Wall DL =	0.32	klf		SEISMIC OTM =	113.92	f t - kips
Roof LL =	2.14	klf		Footing Length :	16.92	feet
Floor LL =	0.03	klf		Footing Width :	2.38	feet
Wall Length =	14.92	feet		Footing Thkness:	12	inches
Wall Thickness =	8	inches		Footing DL :	1.399	klf

OUTPUT DATA :

USE 2'-6" x 12" THK
(3) #5 Longitudinal
#5 @ 14 Transverse

EQ'N 16-11 : DL + .75(FL + RL):

P =	52.6 kips	P_{ult} =	72.8 kips		
OTM =	136.28 ft-kips	OTM_{ult} =	208.97 ft-kips		
e =	2.59 feet	X bar =	N/A feet		
Soil Pr. =	2.51 ksf, max.,	3.48 ksf, ult.		Required Width =	1.61 feet

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	52.6 kips	P_{ULT} =	72.8 kips		
OTM =	221.7 ft-kips	OTM_{ULT} =	345.67 ft-kips		
e =	4.22 feet	X bar =	4.24 feet		
Soil Pr. =	3.48 ksf, max.,	4.81 ksf, ult.		Required Width =	1.68 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	17.0 kips	P (ult) =	20.4 kips		
OTM =	127.5 ft-kips	OTM_{ULT} =	143.93 ft-kips		
e =	7.49 feet	X bar =	0.97 feet		
Soil Pr. =	4.91 ksf, max.,	5.90 ksf, ult.		Required Width =	2.37 feet

Resisting Moment = 240.19 ft-kips Factor of Safety = 2.57

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	16 inches				
Moment =	5.24 ft-kips/ft	Fb(allow)=	178 psi	fb(act.)=	160 psi
Shear =	0.00 kips/ft	Fv(allow)=	71 psi	fv(act.)=	0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	14 inches				
Moment =	4.16 ft-kips/ft	Fb(allow)=	178 psi	fb(act.)=	173 psi
Shear =	0.00 kips/ft	Fv(allow)=	71 psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	12 inches		
Longitudinal Steel Required =	0.14 sq.in./ft.	v(longit.) =	17 psi
Transverse Steel Required =	0.11 sq.in./ft.	v(transv.)=	8 psi
		V(allow) =	93.1 psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW

designed by: MAR date: May-17
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 130 North Wall

Allow. Soil Pr. =	3.700	ksf		DL OTM =	22.45	f t - kips
Fy =	60	ksi		FLR LL OTM =	1.7	f t - kips
f 'c =	3000	psi		RF LL OTM =	148.52	f t - kips
Wall DL =	0.32	klf		SEISMIC OTM =	135.53	f t - kips
Roof LL =	2.15	klf		Footing Length :	16.83	feet
Floor LL =	0.03	klf		Footing Width :	2.90	feet
Wall Length =	14.83	feet		Footing Thkness:	12	inches
Wall Thickness =	8	inches		Footing DL :	1.692	klf

OUTPUT DATA :

EQ'N 16-11 : DL + .75(FL + RL):

P =	57.4	kips	P_{ult} =	78.5	kips
OTM =	135.12	ft-kips	OTM_{ult} =	207.20	ft-kips
e =	2.35	feet	X bar =	N/A	feet
Soil Pr. =	2.16	ksf, max.,	2.96	ksf, ult.	

USE 3'-0" x 12" THK
(3) #5 Longitudinal
#5 @ 14 Transverse

Required Width = 1.69 feet

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	57.4	kips	P_{ULT} =	78.5	kips
OTM =	236.8	ft-kips	OTM_{ULT} =	369.84	ft-kips
e =	4.13	feet	X bar =	4.29	feet
Soil Pr. =	3.08	ksf, max.,	4.21	ksf, ult.	

Required Width = 1.81 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	19.9	kips	P (ult) =	23.9	kips
OTM =	149.0	ft-kips	OTM_{ULT} =	167.96	ft-kips
e =	7.49	feet	X bar =	0.93	feet
Soil Pr. =	4.93	ksf, max.,	5.91	ksf, ult.	

Required Width = 2.90 feet

Resisting Moment = 279.17 ft-kips

Factor of Safety = 2.58

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	16	inches					
Moment =	5.26	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	161 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	18	inches					
Moment =	6.20	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	145 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	12	inches			
Longitudinal Steel Required =	0.14	sq.in./ft.	v(longit.) =	17	psi
Transverse Steel Required =	0.17	sq.in./ft.	v(transv.)=	24	psi
			V(allow) =	93.1	psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW - Revisions

designed by: MAR date: 2/24/18
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 124 West

Allow. Soil Pr. =	3.700	ksf		DL OTM =	198.04	f t - kips
Fy =	60	ksi		FLR LL OTM =	119.56	f t - kips
f 'c =	3000	psi		RF LL OTM =	1211.87	f t - kips
Wall DL =	0.90	klf		SEISMIC OTM =	282.38	f t - kips
Roof LL =	4.53	klf		Footing Length :	55.75	feet
Floor LL =	0.38	klf		Footing Width :	2.48	feet
Wall Length =	53.25	feet		Footing Thkness:	12	inches
Wall Thickness =	10	inches		Footing DL :	1.271	klf

OUTPUT DATA :

EQ'N 16-11 : DL + FL:

P =	360.1	kips	P_{ult} =	528.7	kips
OTM =	1409.9	ft-kips	OTM_{ult} =	2176.6	ft-kips
e =	3.91	feet	X bar =	N/A	feet
Soil Pr. =	3.70	ksf, max.,		5.44	ksf, ult.

USE 2'-6" x 12" THK
(3) #5 Longitudinal
#5 @ 14 Transverse

Required Width = 2.48 feet

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	314.9	kips	P_{ULT} =	456.4	kips
OTM =	1408.4	ft-kips	OTM_{ULT} =	2174.2	ft-kips
e =	4.47	feet	X bar =	N/A	feet
Soil Pr. =	3.37	ksf, max.,		4.89	ksf, ult.

Required Width = 1.70 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	71.2	kips	P (ult) =	85.5	kips
OTM =	401.2	ft-kips	OTM_{ULT} =	458.85	ft-kips
e =	5.63	feet	X bar =	N/A	feet
Soil Pr. =	0.83	ksf, max.,		0.99	ksf, ult.

Required Width = 0.42 feet

Resisting Moment = 3309.04 ft-kips

Factor of Safety = 10.46

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =		18	inches					
Moment =	6.78	ft-kips/ft		Fb(allow)=	178	psi	fb(act.)=	159 psi
Shear =	0.00	kips/ft		Fv(allow)=	71	psi	fv(act.)=	0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =		14	inches					
Moment =	3.58	ft-kips/ft		Fb(allow)=	178	psi	fb(act.)=	149 psi
Shear =	0.00	kips/ft		Fv(allow)=	71	psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	12	inches			
Longitudinal Steel Required =	0.18	sq.in./ft.	v(longit.) =	29	psi
Transverse Steel Required =	0.09	sq.in./ft.	v(transv.)=	6	psi
			V(allow) =	93.1	psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW - Revisions

designed by: MAR date: 2/24/18
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 124E/125W Lower Wall

Allow. Soil Pr. =	3.700	ksf		DL OTM =	83.47	f t - kips
Fy =	60	ksi		FLR LL OTM =	58.81	f t - kips
f 'c =	3000	psi		RF LL OTM =	356.71	f t - kips
Wall DL =	1.31	klf		SEISMIC OTM =	224.74	f t - kips
Roof LL =	4.29	klf		Footing Length :	25.00	feet
Floor LL =	0.69	klf		Footing Width :	2.45	feet
Wall Length =	22.75	feet		Footing Thkness:	12	inches
Wall Thickness =	16	inches		Footing DL :	0.686	klf

OUTPUT DATA :

USE 2'-6" x 12" THK
(3) #5 Longitudinal

EQ'N 16-11 : DL + .75(FL + RL):

P =	131.8	kips	P_{ult} =	192.2	kips
OTM =	395.11	ft-kips	OTM_{ult} =	598.79	ft-kips
e =	3.00	feet	X bar =	N/A	feet
Soil Pr. =	3.70	ksf, max.,	5.39	ksf, ult.	

Required Width = 2.45 feet

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	131.8	kips	P_{ULT} =	192.2	kips
OTM =	563.7	ft-kips	OTM_{ULT} =	868.48	ft-kips
e =	4.28	feet	X bar =	8.22	feet
Soil Pr. =	4.36	ksf, max.,	6.36	ksf, ult.	

Required Width = 2.17 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	28.1	kips	P (ult) =	33.8	kips
OTM =	274.8	ft-kips	OTM_{ULT} =	311.81	ft-kips
e =	9.77	feet	X bar =	2.73	feet
Soil Pr. =	2.80	ksf, max.,	3.36	ksf, ult.	

Required Width = 1.40 feet

Resisting Moment = 586.01 ft-kips

Factor of Safety = 2.83

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	18	inches					
Moment =	6.63	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	155 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	12	inches					
Moment =	2.38	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	143 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	12	inches			
Longitudinal Steel Required =	0.18	sq.in./ft.	v(longit.) =	26	psi
Transverse Steel Required =	0.06	sq.in./ft.	v(transv.)=	0	psi
			V(allow) =	93.1	psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW - Revisions

designed by: MAR date: 2/24/18
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 124E/125W Upper Wall

Allow. Soil Pr. =	3.700	ksf		DL OTM =	31.08	f t - kips
Fy =	60	ksi		FLR LL OTM =	182.18	f t - kips
f 'c =	3000	psi		RF LL OTM =	281.34	f t - kips
Wall DL =	1.56	klf		SEISMIC OTM =	160.1	f t - kips
Roof LL =	6.62	klf		Footing Length :	27.00	feet
Floor LL =	0.86	klf		Footing Width :	3.17	feet
Wall Length =	24.67	feet		Footing Thkness:	12	inches
Wall Thickness =	16	inches		Footing DL :	2.054	klf

OUTPUT DATA :

EQ'N 16-11 : DL + .75(FL + RL):

P =	232.3	kips	P_{ult} =	334.1	kips
OTM =	378.72	ft-kips	OTM_{ult} =	593.52	ft-kips
e =	1.63	feet	X bar =	N/A	feet
Soil Pr. =	3.70	ksf, max.,	5.32	ksf, ult.	

USE 3'-2" x 12" THK
(3) #5 Longitudinal
#5 @ 14 Transverse

Required Width = 3.17 feet

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	232.3	kips	P_{ULT} =	334.1	kips
OTM =	498.8	ft-kips	OTM_{ULT} =	785.64	ft-kips
e =	2.15	feet	X bar =	N/A	feet
Soil Pr. =	4.01	ksf, max.,	5.77	ksf, ult.	

Required Width = 2.58 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	56.3	kips	P (ult) =	67.6	kips
OTM =	178.7	ft-kips	OTM_{ULT} =	201.69	ft-kips
e =	3.17	feet	X bar =	N/A	feet
Soil Pr. =	1.12	ksf, max.,	1.35	ksf, ult.	

Required Width = 0.72 feet

Resisting Moment = 1267.32 ft-kips

Factor of Safety = 9.70

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	18	inches					
Moment =	6.40	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	150 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	16	inches					
Moment =	4.37	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	134 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	12	inches			
Longitudinal Steel Required =	0.17	sq.in./ft.	v(longit.) =	26	psi
Transverse Steel Required =	0.12	sq.in./ft.	v(transv.)=	12	psi
			V(allow) =	93.1	psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW - Revisions

designed by: MAR date: 2/24/18
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 125E/126W Lower Wall

Allow. Soil Pr. =	3.700	ksf		DL OTM =	98.61	f t - kips
Fy =	60	ksi		FLR LL OTM =	85.3	f t - kips
f 'c =	3000	psi		RF LL OTM =	331.39	f t - kips
Wall DL =	1.37	klf		SEISMIC OTM =	227.7	f t - kips
Roof LL =	3.07	klf		Footing Length :	25.00	feet
Floor LL =	0.95	klf		Footing Width :	2.32	feet
Wall Length =	22.75	feet		Footing Thkness:	12	inches
Wall Thickness =	16	inches		Footing DL :	0.653	klf

OUTPUT DATA :

USE 2'-6" x 12" THK
(3) #5 Longitudinal

EQ'N 16-11 : DL + .75(FL + RL):

P =	116.1 kips	P_{ult} =	166.8 kips		
OTM =	411.13 ft-kips	OTM_{ult} =	618.36 ft-kips		
e =	3.54 feet	X bar =	N/A feet		
Soil Pr. =	3.70 ksf, max.,	5.32	ksf, ult.	Required Width =	2.32 feet

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	116.1 kips	P_{ULT} =	166.8 kips		
OTM =	581.9 ft-kips	OTM_{ULT} =	891.6 ft-kips		
e =	5.01 feet	X bar =	7.49 feet		
Soil Pr. =	4.46 ksf, max.,	6.40	ksf, ult.	Required Width =	2.10 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	28.5 kips	P (ult) =	34.2 kips		
OTM =	286.9 ft-kips	OTM_{ULT} =	326.02 ft-kips		
e =	10.07 feet	X bar =	2.43 feet		
Soil Pr. =	3.37 ksf, max.,	4.05	ksf, ult.	Required Width =	1.59 feet

Resisting Moment = 593.24 ft-kips Factor of Safety = 2.71

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	18	inches			
Moment =	6.66 ft-kips/ft	Fb(allow)=	178 psi	fb(act.)=	156 psi
Shear =	0.00 kips/ft	Fv(allow)=	71 psi	fv(act.)=	0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	12	inches			
Moment =	2.04 ft-kips/ft	Fb(allow)=	178 psi	fb(act.)=	123 psi
Shear =	0.00 kips/ft	Fv(allow)=	71 psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	12	inches		
Longitudinal Steel Required =	0.18	sq.in./ft.	v(longit.) =	26 psi
Transverse Steel Required =	0.05	sq.in./ft.	v(transv.)=	0 psi
			V(allow) =	93.1 psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW - Revisions

designed by: MAR date: 2/24/18
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 125E/126W Upper Wall

Allow. Soil Pr. =	3.700	ksf		DL OTM =	35.60	f t - kips
Fy =	60	ksi		FLR LL OTM =	102.1	f t - kips
f 'c =	3000	psi		RF LL OTM =	334.58	f t - kips
Wall DL =	1.49	klf		SEISMIC OTM =	155.66	f t - kips
Roof LL =	6.47	klf		Footing Length :	25.75	feet
Floor LL =	0.75	klf		Footing Width :	3.08	feet
Wall Length =	22.75	feet		Footing Thkness:	12	inches
Wall Thickness =	16	inches		Footing DL :	2.003	klf

OUTPUT DATA :

EQ'N 16-11 : DL + .75(FL + RL):

P =	208.8	kips	P_{ult} =	299.9	kips
OTM =	363.11	ft-kips	OTM_{ult} =	566.74	ft-kips
e =	1.74	feet	X bar =	N/A	feet
Soil Pr. =	3.70	ksf, max.,	5.31	ksf, ult.	

USE 3'-2" x 12" THK
(3) #5 Longitudinal
#5 @ 14 Transverse

Required Width = 3.08 feet

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	208.8	kips	P_{ULT} =	299.9	kips
OTM =	479.9	ft-kips	OTM_{ULT} =	753.53	ft-kips
e =	2.30	feet	X bar =	N/A	feet
Soil Pr. =	4.04	ksf, max.,	5.81	ksf, ult.	

Required Width = 2.53 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	51.3	kips	P (ult) =	61.6	kips
OTM =	177.0	ft-kips	OTM_{ULT} =	199.97	ft-kips
e =	3.45	feet	X bar =	N/A	feet
Soil Pr. =	1.17	ksf, max.,	1.40	ksf, ult.	

Required Width = 0.73 feet

Resisting Moment = 1101.52 ft-kips

Factor of Safety = 8.45

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	22	inches					
Moment =	9.61	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	144 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	14	inches					
Moment =	4.04	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	168 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	12	inches			
Longitudinal Steel Required =	0.26	sq.in./ft.	v(longit.) =	45	psi
Transverse Steel Required =	0.11	sq.in./ft.	v(transv.)=	9	psi
			V(allow) =	93.1	psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW - Revisions

designed by: MAR date: 2/24/18
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 126 East (EQ OTM to North)

Allow. Soil Pr. =	3.700	ksf		DL OTM =	222.10	f t - kips
Fy =	60	ksi		FLR LL OTM =	-13.16	f t - kips
f 'c =	3000	psi		RF LL OTM =	-540.32	f t - kips
Wall DL =	1.15	klf		SEISMIC OTM =	193.57	f t - kips
Roof LL =	2.67	klf		Footing Length :	44.33	feet
Floor LL =	0.34	klf		Footing Width :	0.83	feet
Wall Length =	44.00	feet		Footing Thkness:	12	inches
Wall Thickness =	10	inches		Footing DL :	0.249	klf

OUTPUT DATA :

USE 1'-8" x 12" THK
(Min. per Geotech Report)
(2) #5 Longitudinal

EQ'N 16-11 : DL + FL:

P =	179.3	kips	P_{ult} =	262.2	kips
OTM =	-318.2	ft-kips	OTM_{ult} =	-598.0	ft-kips
e =	-1.77	feet	X bar =	N/A	feet
Soil Pr. =	3.70	ksf, max.,	5.41	ksf, ult.	

Required Width = 0.83 feet

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	161.0	kips	P_{ULT} =	233.0	kips
OTM =	-47.8	ft-kips	OTM_{ULT} =	-165.4	ft-kips
e =	-0.30	feet	X bar =	N/A	feet
Soil Pr. =	4.20	ksf, max.,	6.08	ksf, ult.	

Required Width = 0.71 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	37.0	kips	P (ult) =	44.4	kips
OTM =	326.8	ft-kips	OTM_{ULT} =	376.71	ft-kips
e =	8.83	feet	X bar =	13.33	feet
Soil Pr. =	2.23	ksf, max.,	2.68	ksf, ult.	

Required Width = 0.38 feet

Resisting Moment = 1367.33 ft-kips

Factor of Safety = 5.09

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	12	inches					
Moment =	0.75	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	45 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	12	inches					
Moment =	0.33	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	20 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	12	inches			
Longitudinal Steel Required =	0.02	sq.in./ft.	v(longit.) =	0	psi
Transverse Steel Required =	0.01	sq.in./ft.	v(transv.)=	0	psi
			V(allow) =	93.1	psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW - Revisions

designed by: MAR date: 2/24/18
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 126 East (EQ OTM to South)

Allow. Soil Pr. =	3.700	ksf		DL OTM =	-222.10	f t - kips
Fy =	60	ksi		FLR LL OTM =	13.16	f t - kips
f 'c =	3000	psi		RF LL OTM =	540.32	f t - kips
Wall DL =	1.15	klf		SEISMIC OTM =	193.57	f t - kips
Roof LL =	2.67	klf		Footing Length :	44.83	feet
Floor LL =	0.34	klf		Footing Width :	1.38	feet
Wall Length =	44.00	feet		Footing Thkness:	12	inches
Wall Thickness =	10	inches		Footing DL :	0.390	klf

OUTPUT DATA :

USE 1'-8" x 12" THK
(Min. per Geotech Report)
(2) #5 Longitudinal

EQ'N 16-11 : DL + FL:

P =	185.7	kips	P_{ult} =	269.9	kips
OTM =	318.2	ft-kips	OTM_{ult} =	598.0	ft-kips
e =	1.71	feet	X bar =	N/A	feet
Soil Pr. =	3.69	ksf, max.,	5.36	ksf, ult.	

Required Width = 1.38 feet

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	167.5	kips	P_{ULT} =	240.7	kips
OTM =	338.2	ft-kips	OTM_{ULT} =	629.94	ft-kips
e =	2.02	feet	X bar =	N/A	feet
Soil Pr. =	3.44	ksf, max.,	4.94	ksf, ult.	

Required Width = 0.96 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	40.9	kips	P (ult) =	49.1	kips
OTM =	60.3	ft-kips	OTM_{ULT} =	56.886	ft-kips
e =	1.48	feet	X bar =	N/A	feet
Soil Pr. =	0.79	ksf, max.,	0.95	ksf, ult.	

Required Width = 0.22 feet

Resisting Moment = 1527.03 ft-kips

Factor of Safety = 682

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	12	inches						
Moment =	1.50	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	90	psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0	psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	12	inches						
Moment =	0.98	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	59	psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0	psi

Reinf. Thickness (if used) =	12	inches			
Longitudinal Steel Required =	0.04	sq.in./ft.	v(longit.) =	0	psi
Transverse Steel Required =	0.03	sq.in./ft.	v(transv.)=	0	psi
			V(allow) =	93.1	psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW - Revisions

designed by: MAR date: 2/24/18
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 127 West (EQ OTM to North)

Allow. Soil Pr. =		3.700	ksf	DL OTM =	223.47	f t - kips
Fy =	60	ksi		FLR LL OTM =	-13.16	f t - kips
f 'c =	3000	psi		RF LL OTM =	-533.16	f t - kips
Wall DL =	1.15	klf		SEISMIC OTM =	186.4	f t - kips
Roof LL =	2.67	klf		Footing Length :	44.83	feet
Floor LL =	0.34	klf		Footing Width :	0.83	feet
Wall Length =		44.00	feet	Footing Thkness:	12	inches
Wall Thickness =		10	inches	Footing DL :	0.249	klf

OUTPUT DATA :

USE 1'-8" x 12" THK
(Min. per Geotech Report)
(2) #5 Longitudinal

EQ'N 16-11 : DL + FL:

P =	179.0	kips	P_{ult} =	261.8	kips
OTM =	-309.7	ft-kips	OTM_{ult} =	-584.9	ft-kips
e =	-1.73	feet	X bar =	N/A	feet
Soil Pr. =	3.70	ksf, max.,	5.41	ksf, ult.	

Required Width = 0.83 feet

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	160.8	kips	P_{ULT} =	232.6	kips
OTM =	-46.5	ft-kips	OTM_{ULT} =	-163.7	ft-kips
e =	-0.29	feet	X bar =	N/A	feet
Soil Pr. =	4.15	ksf, max.,	6.01	ksf, ult.	

Required Width = 0.70 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	37.0	kips	P (ult) =	44.4	kips
OTM =	320.5	ft-kips	OTM_{ULT} =	369.67	ft-kips
e =	8.66	feet	X bar =	13.76	feet
Soil Pr. =	2.16	ksf, max.,	2.59	ksf, ult.	

Required Width = 0.36 feet

Resisting Moment = 1382.59 ft-kips

Factor of Safety = 5.23

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =		12	inches				
Moment =	1.68	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	101 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =		12	inches				
Moment =	0.33	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	20 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	12	inches		
Longitudinal Steel Required =	0.04	sq.in./ft.	v(longit.) =	0 psi
Transverse Steel Required =	0.01	sq.in./ft.	v(transv.)=	0 psi
			V(allow) =	93.1 psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW - Revisions

designed by: MAR date: 2/24/18
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 127 West (EQ OTM to South)

Allow. Soil Pr. =		3.700	ksf	DL OTM =	-223.47	f t - kips
Fy =	60	ksi		FLR LL OTM =	13.16	f t - kips
f 'c =	3000	psi		RF LL OTM =	533.16	f t - kips
Wall DL =	1.15	klf		SEISMIC OTM =	186.4	f t - kips
Roof LL =	2.67	klf		Footing Length :	44.83	feet
Floor LL =	0.34	klf		Footing Width :	1.37	feet
Wall Length =		44.00	feet	Footing Thkness:	12	inches
Wall Thickness =		10	inches	Footing DL :	0.387	klf

OUTPUT DATA :

EQ'N 16-11 : DL + FL:

P =	185.2	kips	P_{ult} =	269.2	kips
OTM =	309.7	ft-kips	OTM_{ult} =	584.9	ft-kips
e =	1.67	feet	X bar =	N/A	feet
Soil Pr. =	3.69	ksf, max.,	5.36	ksf, ult.	

USE 1'-8" x 12" THK
(Min. per Geotech Report)
(2) #5 Longitudinal

Required Width = 1.37 feet

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	167.0	kips	P_{ULT} =	240.1	kips
OTM =	326.1	ft-kips	OTM_{ULT} =	611.1	ft-kips
e =	1.95	feet	X bar =	N/A	feet
Soil Pr. =	3.43	ksf, max.,	4.93	ksf, ult.	

Required Width = 0.95 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	40.7	kips	P (ult) =	48.9	kips
OTM =	52.3	ft-kips	OTM_{ULT} =	47.87	ft-kips
e =	1.28	feet	X bar =	N/A	feet
Soil Pr. =	0.78	ksf, max.,	0.93	ksf, ult.	

Required Width = 0.22 feet

Resisting Moment = 1521.50 ft-kips

Factor of Safety = 5.75

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =		12	inches				
Moment =	1.50	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	90 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =		12	inches				
Moment =	0.97	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	58 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	12	inches		
Longitudinal Steel Required =	0.04	sq.in./ft.	v(longit.) =	0 psi
Transverse Steel Required =	0.03	sq.in./ft.	v(transv.)=	0 psi
			V(allow) =	93.1 psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW - Revisions

designed by: MAR date: 2/24/18
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 127E/128W Lower Wall

Allow. Soil Pr. =	3.700	ksf		DL OTM =	98.93	f t - kips
Fy =	60	ksi		FLR LL OTM =	85.3	f t - kips
f 'c =	3000	psi		RF LL OTM =	331.39	f t - kips
Wall DL =	1.37	klf		SEISMIC OTM =	252.78	f t - kips
Roof LL =	3.07	klf		Footing Length :	25.00	feet
Floor LL =	0.95	klf		Footing Width :	2.38	feet
Wall Length =	22.75	feet		Footing Thkness:	12	inches
Wall Thickness =	16	inches		Footing DL :	0.668	klf

OUTPUT DATA :

USE 2'-6" x 12" THK
(3) #5 Longitudinal

EQ'N 16-11 : DL + .75(FL + RL):

P =	116.5 kips	P_{ult} =	167.3 kips		
OTM =	411.45 ft-kips	OTM_{ult} =	618.74 ft-kips		
e =	3.53 feet	X bar =	N/A feet		
Soil Pr. =	3.62 ksf, max.,	5.19 ksf, ult.		Required Width =	2.33 feet

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	116.5 kips	P_{ULT} =	167.3 kips		
OTM =	601.0 ft-kips	OTM_{ULT} =	922.08 ft-kips		
e =	5.16 feet	X bar =	7.34 feet		
Soil Pr. =	4.45 ksf, max.,	6.38 ksf, ult.		Required Width =	2.15 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	28.7 kips	P (ult) =	34.5 kips		
OTM =	312.1 ft-kips	OTM_{ULT} =	354.34 ft-kips		
e =	10.86 feet	X bar =	1.64 feet		
Soil Pr. =	4.92 ksf, max.,	5.90 ksf, ult.		Required Width =	2.38 feet

Resisting Moment = 598.61 ft-kips Factor of Safety = 2.53

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	18 inches				
Moment =	6.64 ft-kips/ft	Fb(allow)=	178 psi	fb(act.)=	156 psi
Shear =	0.00 kips/ft	Fv(allow)=	71 psi	fv(act.)=	0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	12 inches				
Moment =	2.19 ft-kips/ft	Fb(allow)=	178 psi	fb(act.)=	131 psi
Shear =	0.00 kips/ft	Fv(allow)=	71 psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	12 inches		
Longitudinal Steel Required =	0.18 sq.in./ft.	v(longit.) =	26 psi
Transverse Steel Required =	0.06 sq.in./ft.	v(transv.)=	0 psi
		V(allow) =	93.1 psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW - Revisions

designed by: MAR date: 2/24/18
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 127E/128W Upper Wall

Allow. Soil Pr. =	3.700	ksf		DL OTM =	33.38	f t - kips
Fy =	60	ksi		FLR LL OTM =	95.37	f t - kips
f 'c =	3000	psi		RF LL OTM =	315.05	f t - kips
Wall DL =	1.51	klf		SEISMIC OTM =	152.81	f t - kips
Roof LL =	6.58	klf		Footing Length :	25.75	feet
Floor LL =	0.75	klf		Footing Width :	3.04	feet
Wall Length =	22.75	feet		Footing Thkness:	12	inches
Wall Thickness =	16	inches		Footing DL :	1.980	klf

OUTPUT DATA :

EQ'N 16-11 : DL + .75(FL + RL):

P =	210.4	kips	P_{ult} =	302.4	kips
OTM =	341.20	ft-kips	OTM_{ult} =	532.56	ft-kips
e =	1.62	feet	X bar =	N/A	feet
Soil Pr. =	3.70	ksf, max.,	5.32	ksf, ult.	

USE 3'-2" x 12" THK
(3) #5 Longitudinal
#5 @ 14 Transverse

Required Width = 3.04 feet

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	210.4	kips	P_{ULT} =	302.4	kips
OTM =	455.8	ft-kips	OTM_{ULT} =	715.93	ft-kips
e =	2.17	feet	X bar =	N/A	feet
Soil Pr. =	4.04	ksf, max.,	5.81	ksf, ult.	

Required Width = 2.50 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	51.2	kips	P (ult) =	61.4	kips
OTM =	172.8	ft-kips	OTM_{ULT} =	195.18	ft-kips
e =	3.38	feet	X bar =	N/A	feet
Soil Pr. =	1.17	ksf, max.,	1.40	ksf, ult.	

Required Width = 0.72 feet

Resisting Moment = 1098.60 ft-kips

Factor of Safety = 8.65

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness = 22 inches

Moment =	9.63	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	144 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness = 14 inches

Moment =	3.92	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	163 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

Reinf. Thickness (if used) = 12 inches

Longitudinal Steel Required = 0.26 sq.in./ft.

Transverse Steel Required = 0.10 sq.in./ft.

v(longit.) = 45 psi
v(transv.)= 8 psi
V(allow) = 93.1 psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW - Revisions

designed by: MAR date: 2/24/18
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 128E/129W Lower Wall

Allow. Soil Pr. =	3.700	ksf		DL OTM =	78.88	f t - kips
Fy =	60	ksi		FLR LL OTM =	55.59	f t - kips
f 'c =	3000	psi		RF LL OTM =	315.64	f t - kips
Wall DL =	1.51	klf		SEISMIC OTM =	254.43	f t - kips
Roof LL =	4.92	klf		Footing Length :	25.00	feet
Floor LL =	0.87	klf		Footing Width :	2.56	feet
Wall Length =	22.75	feet		Footing Thkness:	12	inches
Wall Thickness =	16	inches		Footing DL :	0.714	klf

OUTPUT DATA :

EQ'N 16-11 : DL + .75(FL + RL):

P =	151.1 kips	P_{ult} =	220.8 kips		
OTM =	357.30 ft-kips	OTM_{ult} =	540.13 ft-kips		
e =	2.36 feet	X bar =	N/A feet		
Soil Pr. =	3.70 ksf, max.,	5.41	ksf, ult.	Required Width =	2.56 feet

USE 2'-6" x 12" THK
(Delta = 2.4% - OK)
(3) #5 Longitudinal

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	151.1 kips	P_{ULT} =	220.8 kips		
OTM =	548.1 ft-kips	OTM_{ULT} =	845.45 ft-kips		
e =	3.63 feet	X bar =	N/A feet		
Soil Pr. =	4.42 ksf, max.,	6.45	ksf, ult.	Required Width =	2.30 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	31.4 kips	P (ult) =	37.7 kips		
OTM =	301.8 ft-kips	OTM_{ULT} =	341.76 ft-kips		
e =	9.62 feet	X bar =	2.88 feet		
Soil Pr. =	2.83 ksf, max.,	3.40	ksf, ult.	Required Width =	1.47 feet

Resisting Moment = 653.68 ft-kips Factor of Safety = 2.90

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	18	inches			
Moment =	6.76 ft-kips/ft	Fb(allow)=	178 psi	fb(act.)=	159 psi
Shear =	0.00 kips/ft	Fv(allow)=	71 psi	fv(act.)=	0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	12	inches			
Moment =	2.77 ft-kips/ft	Fb(allow)=	178 psi	fb(act.)=	166 psi
Shear =	0.00 kips/ft	Fv(allow)=	71 psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	12	inches		
Longitudinal Steel Required =	0.18	sq.in./ft.	v(longit.) =	26 psi
Transverse Steel Required =	0.07	sq.in./ft.	v(transv.)=	0 psi
			V(allow) =	93.1 psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW - Revisions

designed by: MAR date: 2/24/18
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 128E/129W Upper Wall

Allow. Soil Pr. =	3.700	ksf		DL OTM =	20.12	f t - kips
Fy =	60	ksi		FLR LL OTM =	202.68	f t - kips
f 'c =	3000	psi		RF LL OTM =	171.79	f t - kips
Wall DL =	1.45	klf		SEISMIC OTM =	140.17	f t - kips
Roof LL =	5.94	klf		Footing Length :	25.75	feet
Floor LL =	0.75	klf		Footing Width :	2.78	feet
Wall Length =	22.75	feet		Footing Thkness:	12	inches
Wall Thickness =	16	inches		Footing DL :	1.830	klf

OUTPUT DATA :

EQ'N 16-11 : DL + .75(FL + RL):

P =	194.4	kips	P_{ult} =	279.0	kips
OTM =	300.97	ft-kips	OTM_{ult} =	473.51	ft-kips
e =	1.55	feet	X bar =	N/A	feet
Soil Pr. =	3.70	ksf, max.,	5.30	ksf, ult.	

USE 3'-0" x 12" THK
(3) #5 Longitudinal
#5 @ 14 Transverse

Required Width = 2.78 feet

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	194.4	kips	P_{ULT} =	279.0	kips
OTM =	406.1	ft-kips	OTM_{ULT} =	641.71	ft-kips
e =	2.09	feet	X bar =	N/A	feet
Soil Pr. =	4.04	ksf, max.,	5.79	ksf, ult.	

Required Width = 2.28 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	48.1	kips	P (ult) =	57.7	kips
OTM =	152.2	ft-kips	OTM_{ULT} =	171.48	ft-kips
e =	3.16	feet	X bar =	N/A	feet
Soil Pr. =	1.17	ksf, max.,	1.40	ksf, ult.	

Required Width = 0.66 feet

Resisting Moment = 1032.42 ft-kips

Factor of Safety = 9.37

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	20	inches					
Moment =	9.60	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	178 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	14	inches					
Moment =	3.10	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	129 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	12	inches		
Longitudinal Steel Required =	0.26	sq.in./ft.	v(longit.) =	45 psi
Transverse Steel Required =	0.08	sq.in./ft.	v(transv.)=	1 psi
			V(allow) =	93.1 psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW - Revisions

designed by: MAR date: 2/24/18
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 129E/130W Lower Wall

Allow. Soil Pr. =	3.700	ksf		DL OTM =	99.09	f t - kips
Fy =	60	ksi		FLR LL OTM =	85.3	f t - kips
f 'c =	3000	psi		RF LL OTM =	331.39	f t - kips
Wall DL =	1.37	klf		SEISMIC OTM =	254.43	f t - kips
Roof LL =	3.07	klf		Footing Length :	25.00	feet
Floor LL =	0.95	klf		Footing Width :	2.39	feet
Wall Length =	22.75	feet		Footing Thkness:	12	inches
Wall Thickness =	16	inches		Footing DL :	0.905	klf

OUTPUT DATA :

USE 2'-6" x 12" THK
(3) #5 Longitudinal

EQ'N 16-11 : DL + .75(FL + RL):

P =	122.5 kips	P_{ult} =	174.4 kips		
OTM =	411.61 ft-kips	OTM_{ult} =	618.94 ft-kips		
e =	3.36 feet	X bar =	N/A feet		
Soil Pr. =	3.70 ksf, max.,	5.27	ksf, ult.	Required Width =	2.39 feet

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	122.5 kips	P_{ULT} =	174.4 kips		
OTM =	602.4 ft-kips	OTM_{ULT} =	924.25 ft-kips		
e =	4.92 feet	X bar =	7.58 feet		
Soil Pr. =	4.51 ksf, max.,	6.42	ksf, ult.	Required Width =	2.19 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	32.3 kips	P (ult) =	38.8 kips		
OTM =	313.9 ft-kips	OTM_{ULT} =	356.31 ft-kips		
e =	9.72 feet	X bar =	2.78 feet		
Soil Pr. =	3.24 ksf, max.,	3.88	ksf, ult.	Required Width =	1.57 feet

Resisting Moment = 673.11 ft-kips Factor of Safety = 2.83

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	18 inches				
Moment =	6.68 ft-kips/ft	Fb(allow)=	178 psi	fb(act.)=	157 psi
Shear =	0.00 kips/ft	Fv(allow)=	71 psi	fv(act.)=	0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	12 inches				
Moment =	2.23 ft-kips/ft	Fb(allow)=	178 psi	fb(act.)=	134 psi
Shear =	0.00 kips/ft	Fv(allow)=	71 psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	12 inches		
Longitudinal Steel Required =	0.18 sq.in./ft.	v(longit.) =	26 psi
Transverse Steel Required =	0.06 sq.in./ft.	v(transv.)=	0 psi
		V(allow) =	93.1 psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW - Revisions

designed by: MAR date: 2/24/18
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 129E/130W Upper Wall

Allow. Soil Pr. =	3.700	ksf		DL OTM =	16.69	f t - kips
Fy =	60	ksi		FLR LL OTM =	95.37	f t - kips
f 'c =	3000	psi		RF LL OTM =	315.05	f t - kips
Wall DL =	1.51	klf		SEISMIC OTM =	153.73	f t - kips
Roof LL =	6.58	klf		Footing Length :	25.75	feet
Floor LL =	0.75	klf		Footing Width :	3.00	feet
Wall Length =	22.75	feet		Footing Thkness:	12	inches
Wall Thickness =	16	inches		Footing DL :	1.957	klf

OUTPUT DATA :

EQ'N 16-11 : DL + .75(FL + RL):

P =	209.8	kips	P_{ult} =	301.8	kips
OTM =	324.51	ft-kips	OTM_{ult} =	512.53	ft-kips
e =	1.55	feet	X bar =	N/A	feet
Soil Pr. =	3.69	ksf, max.,	5.31	ksf, ult.	

USE 3'-0" x 12" THK
(3) #5 Longitudinal
#5 @ 14 Transverse

Required Width = 3.00 feet

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	209.8	kips	P_{ULT} =	301.8	kips
OTM =	439.8	ft-kips	OTM_{ULT} =	697.01	ft-kips
e =	2.10	feet	X bar =	N/A	feet
Soil Pr. =	4.04	ksf, max.,	5.81	ksf, ult.	

Required Width = 2.46 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	50.9	kips	P (ult) =	61.0	kips
OTM =	163.7	ft-kips	OTM_{ULT} =	184.19	ft-kips
e =	3.22	feet	X bar =	N/A	feet
Soil Pr. =	1.15	ksf, max.,	1.38	ksf, ult.	

Required Width = 0.70 feet

Resisting Moment = 1091.57 ft-kips

Factor of Safety = 9.28

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	22	inches					
Moment =	9.63	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	145 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	14	inches					
Moment =	3.79	ft-kips/ft	Fb(allow)=	178	psi	fb(act.)=	158 psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	12	inches			
Longitudinal Steel Required =	0.26	sq.in./ft.	v(longit.) =	45	psi
Transverse Steel Required =	0.10	sq.in./ft.	v(transv.)=	7	psi
			V(allow) =	93.1	psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW - Revisions

designed by: MAR date: 2/24/18
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 130 East (EQ OTM to North)

Allow. Soil Pr. =	3.700	ksf		DL OTM =	223.02	f t - kips
Fy =	60	ksi		FLR LL OTM =	-13.16	f t - kips
f 'c =	3000	psi		RF LL OTM =	-533.68	f t - kips
Wall DL =	1.15	klf		SEISMIC OTM =	187.91	f t - kips
Roof LL =	2.67	klf		Footing Length :	44.83	feet
Floor LL =	0.34	klf		Footing Width :	0.83	feet
Wall Length =	44.00	feet		Footing Thkness:	12	inches
Wall Thickness =	10	inches		Footing DL :	0.249	klf

OUTPUT DATA :

USE 1'-8" x 12" THK
(Min. per Geotech Report)
(2) #5 Longitudinal

EQ'N 16-11 : DL + FL:

P =	179.1	kips	P_{ult} =	261.8	kips
OTM =	-310.7	ft-kips	OTM_{ult} =	-586.3	ft-kips
e =	-1.73	feet	X bar =	N/A	feet
Soil Pr. =	3.70	ksf, max.,		5.40	ksf, ult.

Required Width = 0.83 feet

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	160.9	kips	P_{ULT} =	232.7	kips
OTM =	-46.2	ft-kips	OTM_{ULT} =	-163.1	ft-kips
e =	-0.29	feet	X bar =	N/A	feet
Soil Pr. =	4.16	ksf, max.,		6.01	ksf, ult.

Required Width = 0.70 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	37.0	kips	P (ult) =	44.4	kips
OTM =	321.7	ft-kips	OTM_{ULT} =	371.03	ft-kips
e =	8.69	feet	X bar =	13.73	feet
Soil Pr. =	2.17	ksf, max.,		2.60	ksf, ult.

Required Width = 0.37 feet

Resisting Moment = 1383.57 ft-kips

Factor of Safety = 5.21

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness = 12 inches

Moment =	1.68	ft-kips/ft	Fb(allow)=	178	psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi

fb(act.)= 101 psi
fv(act.)= 0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness = 12 inches

Moment =	0.33	ft-kips/ft	Fb(allow)=	178	psi
Shear =	0.00	kips/ft	Fv(allow)=	71	psi

fb(act.)= 20 psi
fv(act.)= 0 psi

Reinf. Thickness (if used) = 12 inches
Longitudinal Steel Required = 0.04 sq.in./ft.
Transverse Steel Required = 0.01 sq.in./ft.

v(longit.) = 0 psi
v(transv.)= 0 psi
V(allow) = 93.1 psi

rudow + berry
structural engineering
scottsdale, arizona
(602) 946-8171

project name: Powdercat - CCW - Revisions

designed by: MAR date: 2/24/18
checked by: date:

project no. 17100

SHEAR WALL FOOTING DESIGN

INPUT DATA :

Unit 130 East (EQ OTM to South)

Allow. Soil Pr. =		3.700	ksf	DL OTM =	-223.02	f t - kips
Fy =	60	ksi		FLR LL OTM =	13.16	f t - kips
f 'c =	3000	psi		RF LL OTM =	533.68	f t - kips
Wall DL =	1.15	klf		SEISMIC OTM =	187.91	f t - kips
Roof LL =	2.67	klf		Footing Length :	44.83	feet
Floor LL =	0.34	klf		Footing Width :	1.37	feet
Wall Length =		44.00	feet	Footing Thkness:	12	inches
Wall Thickness =		10	inches	Footing DL :	0.387	klf

OUTPUT DATA :

USE 1'-8" x 12" THK
(Min. per Geotech Report)
(2) #5 Longitudinal

EQ'N 16-11 : DL + FL:

P =	185.3 kips	P_{ult} =	269.3 kips		
OTM =	310.7 ft-kips	OTM_{ult} =	586.3 ft-kips		
e =	1.68 feet	X bar =	N/A feet		
Soil Pr. =	3.69 ksf, max.,	5.37	ksf, ult.	Required Width =	1.37 feet

EQ'N 16-14: DL + .75(FL + RL + .7E)

P =	167.1 kips	P_{ULT} =	240.1 kips		
OTM =	328.0 ft-kips	OTM_{ULT} =	614.08 ft-kips		
e =	1.96 feet	X bar =	N/A feet		
Soil Pr. =	3.43 ksf, max.,	4.94	ksf, ult.	Required Width =	0.96 feet

EQ'N 16-16: 0.6DL + 0.7E

P =	40.8 kips	P (ult) =	48.9 kips		
OTM =	54.1 ft-kips	OTM_{ULT} =	49.885 ft-kips		
e =	1.33 feet	X bar =	N/A feet		
Soil Pr. =	0.78 ksf, max.,	0.94	ksf, ult.	Required Width =	0.22 feet

Resisting Moment = 1522.48 ft-kips Factor of Safety = 669

FOOTING REINFORCING:

LONGITUDINAL DIRECTION:

Req'd Unreinf Thickness =	12	inches			
Moment =	1.50 ft-kips/ft	Fb(allow)=	178 psi	fb(act.)=	90 psi
Shear =	0.00 kips/ft	Fv(allow)=	71 psi	fv(act.)=	0 psi

TRANSVERSE DIRECTION:

Req'd Unreinf Thickness =	12	inches			
Moment =	0.97 ft-kips/ft	Fb(allow)=	178 psi	fb(act.)=	58 psi
Shear =	0.00 kips/ft	Fv(allow)=	71 psi	fv(act.)=	0 psi

Reinf. Thickness (if used) =	12	inches		
Longitudinal Steel Required =	0.04	sq.in./ft.	v(longit.) =	0 psi
Transverse Steel Required =	0.03	sq.in./ft.	v(transv.)=	0 psi
			V(allow) =	93.1 psi

rudow + berry, inc.
4021 north 75th street, #101
scottsdale, arizona 85251
480.946.8171

Project Title: Powdercat
Engineer: MAR
Project Descr:

Project ID: 16126

Printed: 26 FEB 2018, 10:20AM

Cantilevered Retaining Wall

File = C:_jobs\17100C~1\ENG\LATERA~1\SPREAD~1\RETAIN~1\POWDER~1.EC6
ENERCALC, INC. 1983-2017, Build:10.17.12.10, Ver:10.17.12.10

Lic. # : KW-06002357 **Licensee : RUDOW & BERRY**

Description : Breezeway Ret. Wall w/ Basement Slab in place - Revised

Calculations per ACI 318-14, ACI 530-11, IBC 2015, CBC 2016, ASCE 7-10

Criteria

Retained Height	=	9.58 ft
Wall height above soil	=	0.33 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	12.00 in
Water height over heel	=	0.0 ft

Vertical component of active Lateral soil pressure options:
NOT USED for Soil Pressure.
NOT USED for Sliding Resistance.
NOT USED for Overturning Resistance.

Soil Data

Allow Soil Bearing	=	3,700.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	35.0 psf/ft
Toe Active Pressure	=	35.0 psf/ft
Passive Pressure	=	320.0 psf/ft
Soil Density, Heel	=	106.00 pcf
Soil Density, Toe	=	106.00 pcf
Friction Coeff btwn Ftg & Soil	=	0.000
Soil height to ignore for passive pressure	=	0.00 in

Surcharge Loads

Surcharge Over Heel	=	100.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
Used for Sliding & Overturning		

Lateral Load Applied to Stem

Lateral Load	=	0.0 plf
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Wind on Exposed Stem	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Axial Load Applied to Stem

Axial Dead Load	=	975.0 lbs
Axial Live Load	=	3,820.0 lbs
Axial Load Eccentricity	=	0.0 in

Design Summary

Wall Stability Ratios

Overturning	=	1.64	OK
Sliding	=	0.29	OK

Slab Resists All Sliding !

Total Bearing Load	=	7,730	lbs
...resultant ecc.	=	2.86	in
Soil Pressure @ Toe	=	1,104 psf	OK
Soil Pressure @ Heel	=	1,988 psf	OK
Allowable	=	3,700 psf	

Soil Pressure Less Than Allowable

ACI Factored @ Toe	=	1,543 psf	
ACI Factored @ Heel	=	2,778 psf	
Footing Shear @ Toe	=	45.2 psi	OK
Footing Shear @ Heel	=	5.7 psi	OK
Allowable	=	82.2 psi	

Sliding Calcs Slab Resists All Sliding !

Lateral Sliding Force	=	2,238.2	lbs
less 100% Passive Force	= -	640.0	lbs
less 100% Friction Force	= -	0.0	lbs
Added Force Req'd	=	1,598.2 lbs	NG
....for 1.5 : 1 Stability	=	2,717.3 lbs	NG

Load Factors

Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.600
Seismic, E	1.000

Stem Construction

Top Stem

Stem OK

Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Thickness	in =	10.00
Rebar Size	=	# 5
Rebar Spacing	in =	10.00
Rebar Placed at	=	User Spec

Design Data

fb/FB + fa/Fa	=	0.821
Total Force @ Section	lbs =	3,047.9
Moment....Actual	ft-l =	10,621.0
Moment.....Allowable	ft-l =	12,932.7
Shear.....Actual	psi =	31.7
Shear.....Allowable	psi =	94.9
Wall Weight	psf =	125.0
Rebar Depth 'd'	in =	8.00
Lap splice if above	in =	18.50
Lap splice if below	in =	7.82
Hook embed into footing	in =	7.82

Concrete Data

f'c	psi =	4,000.0
Fy	psi =	

rudow + berry, inc.
4021 north 75th street, #101
scottsdale, arizona 85251
480.946.8171

Project Title: Powdercat
Engineer: MAR
Project Descr:

Project ID: 16126

Printed: 26 FEB 2018, 10:20AM

Cantilevered Retaining Wall

File = C:_jobs\17100C~1\ENG\LATERA~1\SPREAD~1\RETAIN~1\POWDER~1.EC6
ENERCALC, INC. 1983-2017, Build:10.17.12.10, Ver:10.17.12.10

Lic. # : KW-06002357 — Licensee : RUDOW & BERRY

Description : Breezeway Ret. Wall w/ Basement Slab in place - Revised

Footing Dimensions & Strengths

Toe Width	=	3.67 ft
Heel Width	=	1.33
Total Footing Width	=	5.00
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 3,000 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 3.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	1,543	2,778	psf
Mu' : Upward	=	12,406	407	ft-lb
Mu' : Downward	=	2,065	195	ft-lb
Mu: Design	=	10,340	212	ft-lb
Actual 1-Way Shear	=	45.22	5.67	psi
Allow 1-Way Shear	=	82.16	82.16	psi

Toe Reinforcing = # 5 @ 10.00 in
Heel Reinforcing = None Spec'd
Key Reinforcing = # 5 @ 16.00 in

Other Acceptable Sizes & Spacings

Toe: #4@ 7.25 in, #5@ 11.00 in, #6@ 15.75 in, #7@ 21.25 in, #8@ 28.00 in, #9@ 35
Heel: Not req'd, Mu < S * Fr
Key: No key defined

Summary of Overturning & Resisting Forces & Moments

		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-lb			.....RESISTING..... Force lbs	Distance ft	Moment ft-lb
Heel Active Pressure	=	1,958.9	3.53	6,908.3	Soil Over Heel	=	507.4	4.75	2,410.2
Surcharge over Heel	=	349.3	5.29	1,848.0	Sloped Soil Over Heel	=			
Toe Active Pressure	=	-70.0	0.67	-46.7	Surcharge Over Heel	=	50.0	4.75	237.3
Surcharge Over Toe	=				Adjacent Footing Load	=			
Adjacent Footing Load	=				Axial Dead Load on Stem	=	975.0	4.08	3,981.6
Added Lateral Load	=				* Axial Live Load on Stem	=	3,820.0	4.08	15,599.6
Load @ Stem Above Soil	=				Soil Over Toe	=	388.7	1.83	712.7
					Surcharge Over Toe	=			
					Stem Weight(s)	=	1,238.8	4.08	5,058.6
					Earth @ Stem Transitions	=			
Total	=	2,238.2	O.T.M. =	8,709.7	Footing Weight	=	750.0	2.50	1,875.0
					Key Weight	=			
					Vert. Component	=			
					Total	=	3,909.8 lbs	R.M. =	14,275.5

Resisting/Overturning Ratio = 1.64
Vertical Loads used for Soil Pressure = 7,729.8 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

APPENDIX: Geotechnical Report Revisions

Intermountain GeoEnvironmental Services, Inc.
12429 South 300 East, Suite 100, Draper, Utah 84020 ~ T: (801) 748-4044 ~ F: (801) 748-4045

January 30, 2018

Powder Cat Townhomes, LLC
c/o Mr. David Orr
11180 Sunrise Valley Drive, #300
Reston, VA 20191

IGES Project No. 02579-001

Subject: Supplemental Subsurface Assessment
Copper Crest West Townhomes
Summit Powder Mountain Resort
Weber County, Utah

Reference: IGES, Inc., 2017a, Geotechnical and Geologic Hazard Investigation, Copper Crest West, Summit Powder Mountain Resort, Weber County, Utah, Project No. 01628-022, dated January 16, 2017

Mr. Orr:

As requested, IGES has conducted a supplemental subsurface assessment to further evaluate subsurface conditions for the remaining units of the Copper Crest West Townhomes. The purpose of our work is to further quantify the elevation of various geologic units within the footprint of the townhomes, provide data with which the Client can more accurately estimate quantities with respect to over-excavation, and to provide supplemental recommendations for foundations, as warranted by the new data. The following letter provides a summary of our findings, conclusions, and recommendations.

Method of Study

On January 9, 2018, Mr. Peter Doumit, P.G. and Mr. David Glass, P.E., of IGES visited the site to assess further assess the subsurface conditions at the site. At the time of our visit IGES met with Mr. Tyler Orr, the Client's representative. Also on site was Mr. Greg Chambers, the excavator subcontracting for the Client. Several test pit locations had been surveyed and located with stakes by the project surveyor; elevation control was also provided.

At, or approximately near the pre-determined locations, test pits were excavated down to bedrock (Wasatch Formation). Utilizing a survey rod and known elevation points, the elevation of various earth strata was recorded, including:

- Contact between undocumented fill and underlying colluvium
- Contact between colluvium and bedrock

Since the presence of utilities precluded the ability to excavate the test pits at all of the exact pre-marked locations, for each test pit the location where the strata elevations were obtained was recorded with a hand-held GPS device.

Copyright 2018 IGES, Inc.

Findings

The findings are summarized on the test pit logs/fence diagrams, attached. On the diagrams, the elevations of the various strata are recorded. Figure 1, attached, provides a *Geotechnical Map*, illustrating the locations of the test pits. These test pits have been located on the map based on GPS units and comparison with a Google Earth image – the project civil engineer should verify the accuracy of test pit location. It should be noted that the data obtained from Test Pit 4 was inconclusive, since this area appears to expose mostly fill from a utility trench.

To visualize the depth to various strata with respect to the proposed foundations, five cross-sections were prepared, designated A-A' through E-E', shown on Figure 1. Information regarding the elevation of the bottom of footings was evaluated based on Sheets S1.01, S1.02, S1.11, and S1.12 (Foundation Plans), prepared by Studio MA, dated June 1, 2017. The resultant cross-sections are illustrated on Sheet 1, attached. These sections illustrate the locations of footings with respect to the various strata contacts – the ground surface is not shown.

The building footprint is overlain by a few feet of undocumented fill. Underlying the fill, we observed coarse colluvium. This unit was of variable character, grading from clayey gravel to gravel and cobbles with minimal matrix material. For some colluvium, voids could be seen between the cobble-size rocks – this likely represents a buried talus deposit. This material appeared loose, and readily raveled from the test pit walls. Also, topsoil was observed underlying the undocumented fill; the thickness of the topsoil was variable, ranging from negligible to as much as 10 inches locally.

Conclusions and Recommendations

Based on our observations, placing the proposed townhomes on conventional spread footings is feasible. However, at some locations, the depth of undocumented fill underlying proposed foundations is as deep as 3½ feet. In many locations, the foundations are underlain by a sliver of undocumented fill, and only partially penetrate into the underlying colluvium. At the currently proposed footing elevations, IGES does not anticipate the footings will bear directly on bedrock, except perhaps at very localized areas.

In consideration of our findings, IGES recommends the following:

a) All undocumented fill and topsoil shall be removed from beneath structural elements. Removals shall extend 1 foot horizontally for every foot of depth below the bottom footing elevation.
b) All foundation elements shall be underlain by a minimum of 2 feet of structural fill. It should be noted that the depth of structural fill may be greater, depending on the required over-excavation to remove deleterious earth materials, upwards of 4 feet in limited areas should be anticipated.
c) Structural fill (as defined in IGES, 2017) shall consist of a coarse, granular material – excavated site material is largely expected to meet this criterion. Material classifying as topsoil is not suitable for use as structural fill; this material, where encountered, should be segregated, and must be kept out of the soil stockpiles to be utilized as structural fill.
d) In consideration that the entire structure will be supported by a relatively uniform bearing stratum (granular structural fill), the allowable bearing capacity may be

Copyright 2018 IGES, Inc.

increased to 3,700 psf. This is for live plus dead loads; the allowable bearing capacity may be increased by 1/3 for transient loads such as wind or seismic.

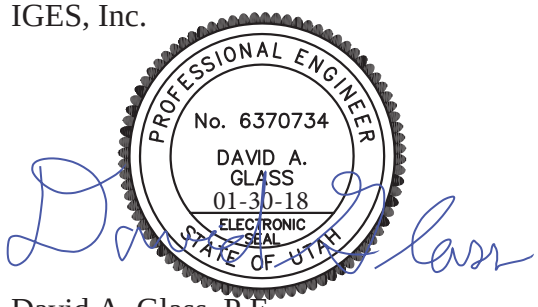
e) Prior to placement of structural fill, the exposed subgrade shall be compacted in-place to approximately 92% of the Modified Proctor (ASTM D1557).
f) An IGES representative should observe the foundation subgrade prior to placement of structural fill to assess removal of deleterious earth materials (undocumented fill, topsoil).

All other recommendations presented in our referenced geotechnical report remain valid and should be implemented into the design and construction of the project, except as superseded herein.

Closure

We appreciate the opportunity to provide you with our services. If you have any questions please contact the undersigned at your convenience (801) 748-4044.

Respectfully Submitted,
IGES, Inc.

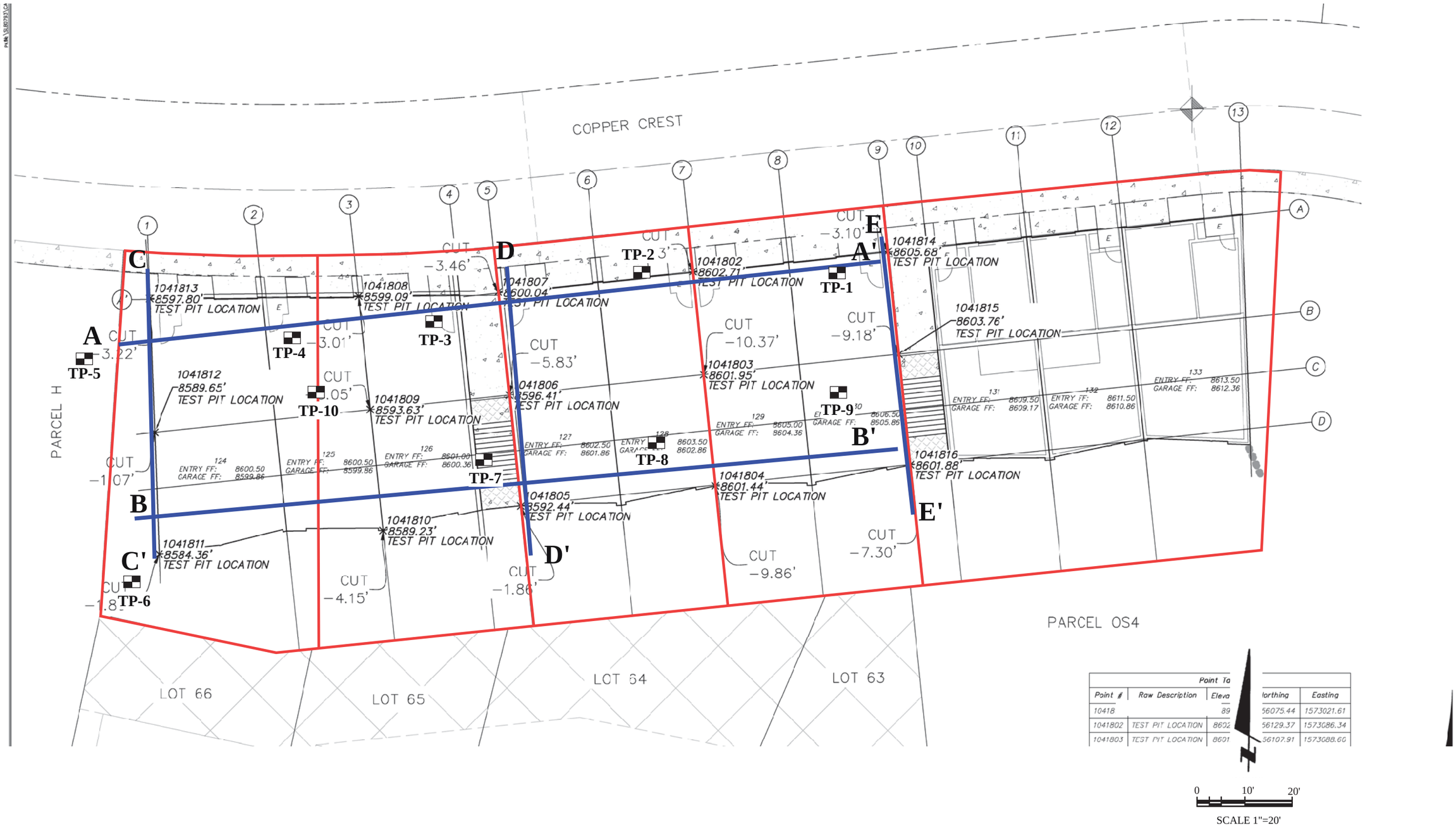


David A. Glass, P.E.
Senior Geotechnical Engineer

Attachment:

Figure 1 – Geotechnical Map
Test Pit Logs/Fence Diagram
Sheet 1 – Geotechnical Cross-Sections

Copyright 2018 IGES, Inc.



Point #	Raw Description	Elevation	Northing	Easting
10418		89	56075.44	1573021.61
1041802	TEST PIT LOCATION	8602	56129.37	1573086.34
1041803	TEST PIT LOCATION	8601	56107.91	1573088.60

Basemap: Sheet 1, “Powdercat Test Pit Locations”, prepared by Talisman, dated 01-09-18

IGES®

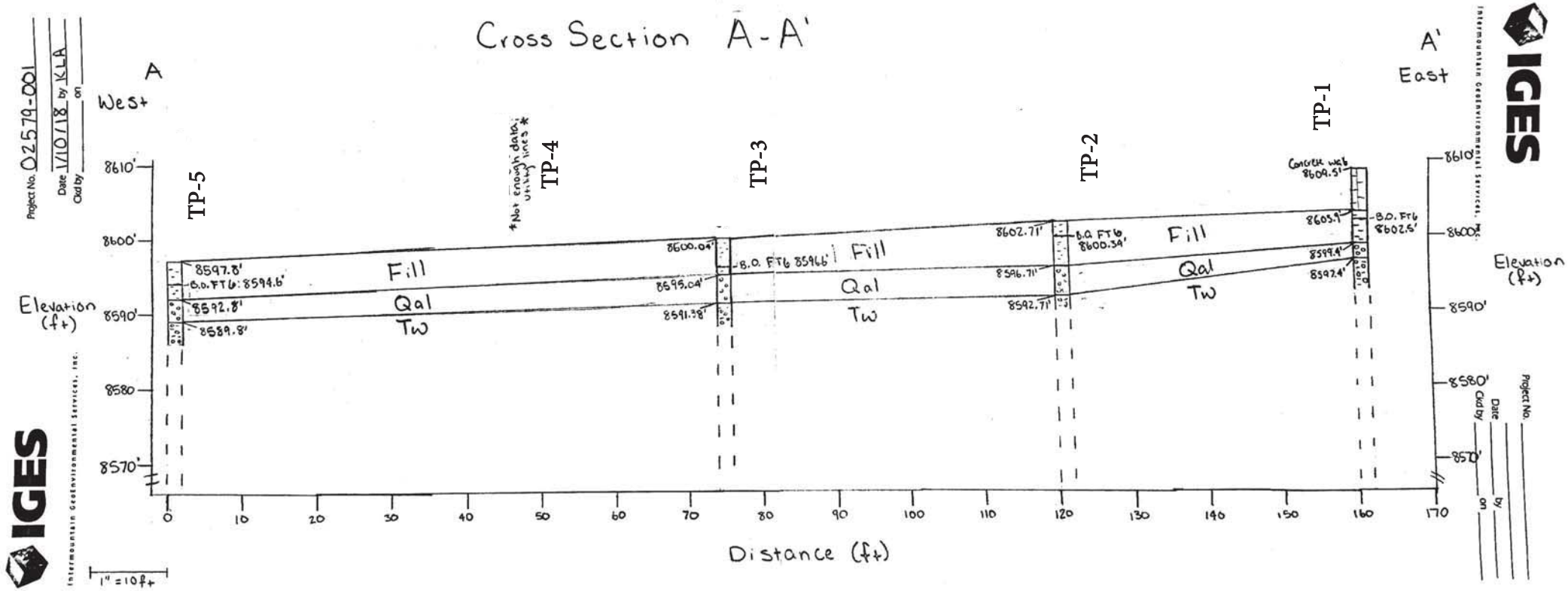
Project No. 02579-001

Supplemental Subsurface Data
Copper Crest West Townhomes
Summit Powder Mountain Resort
Weber County, Utah

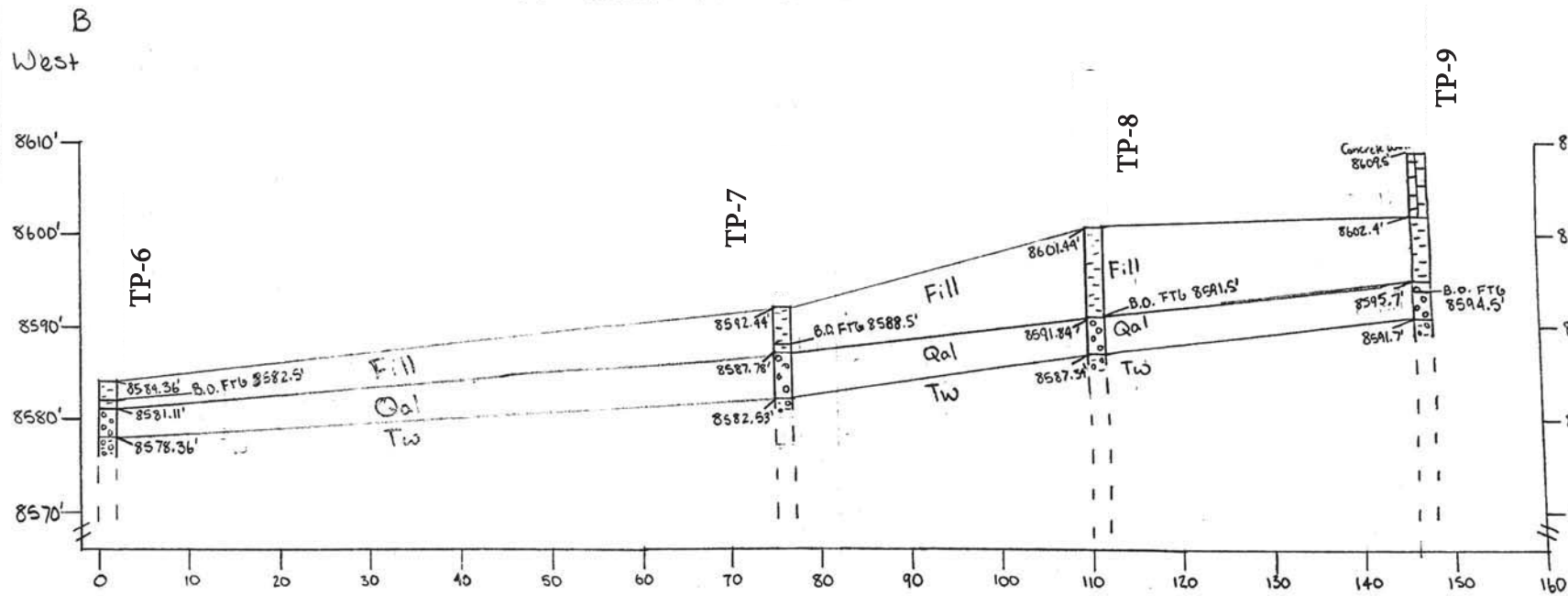
GEOTECHNICAL MAP

Figure 1

Cross Section A-A'



Cross Section B - B'



1" = 10 ft

Project No. 02579-001
Date 1/10/18 by KLA
Ckd by ____ on ____

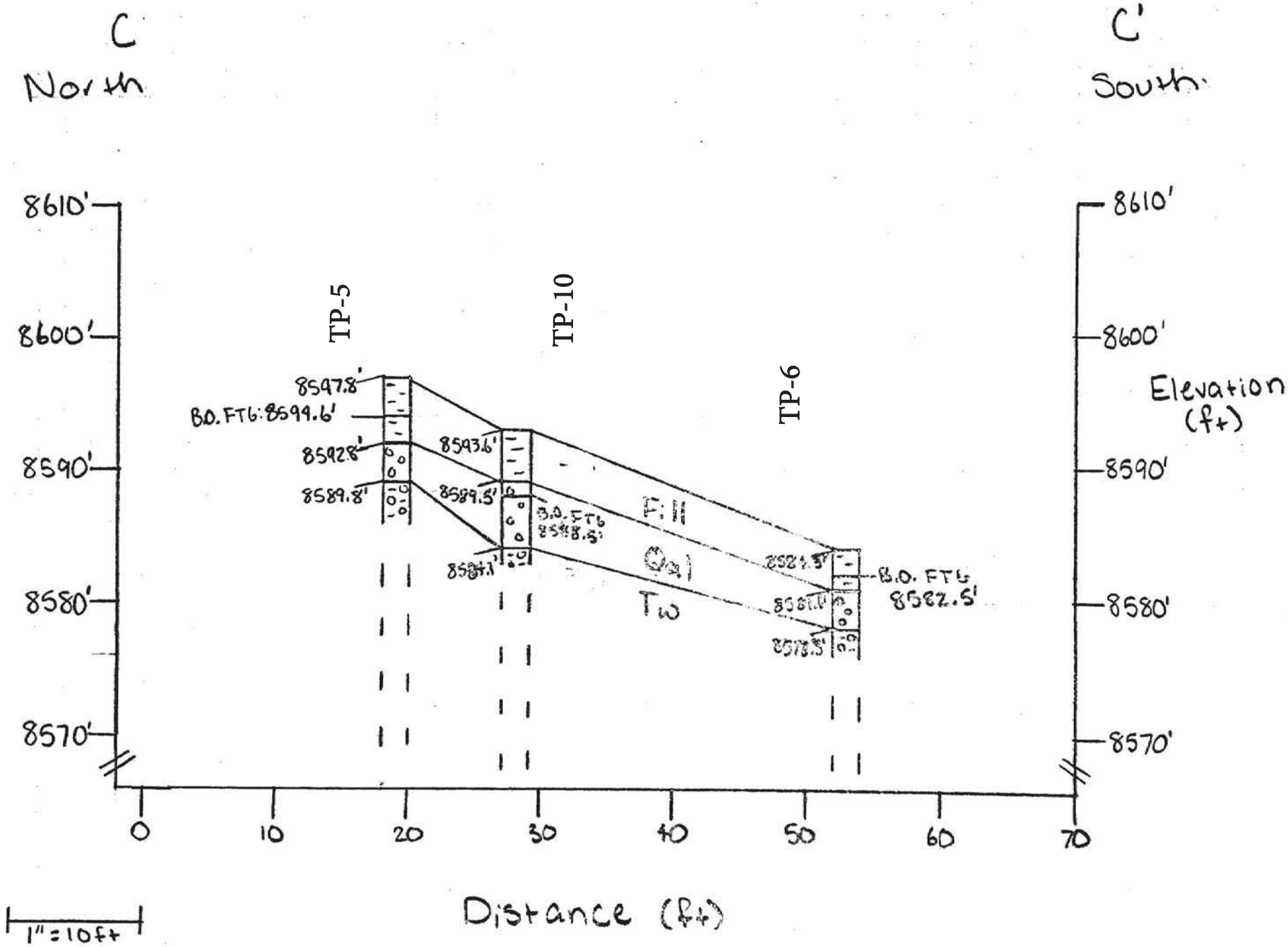
IGES
Intermountain GeoEnvironmental Services, Inc.

Cross Section C - C'

Project No. 025579-001

Date 1/11/18 by KLA

Ckd by _____ on _____

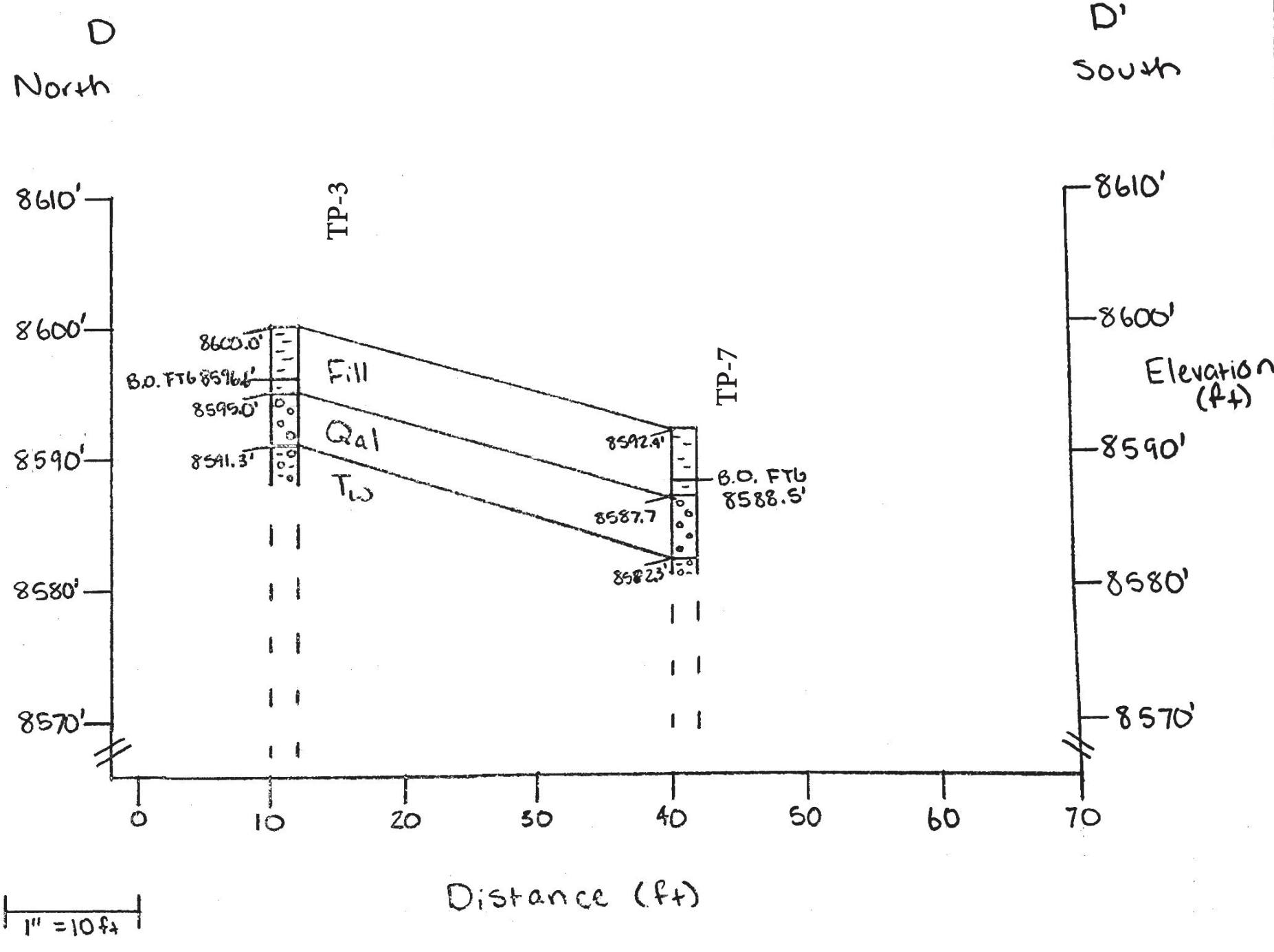


IGES

Intermountain GeoEnvironmental Services, Inc.

Cross Section D - D'

Project No. 025579-001
Date 1/11/18 by KLA
Ckd by _____ on _____



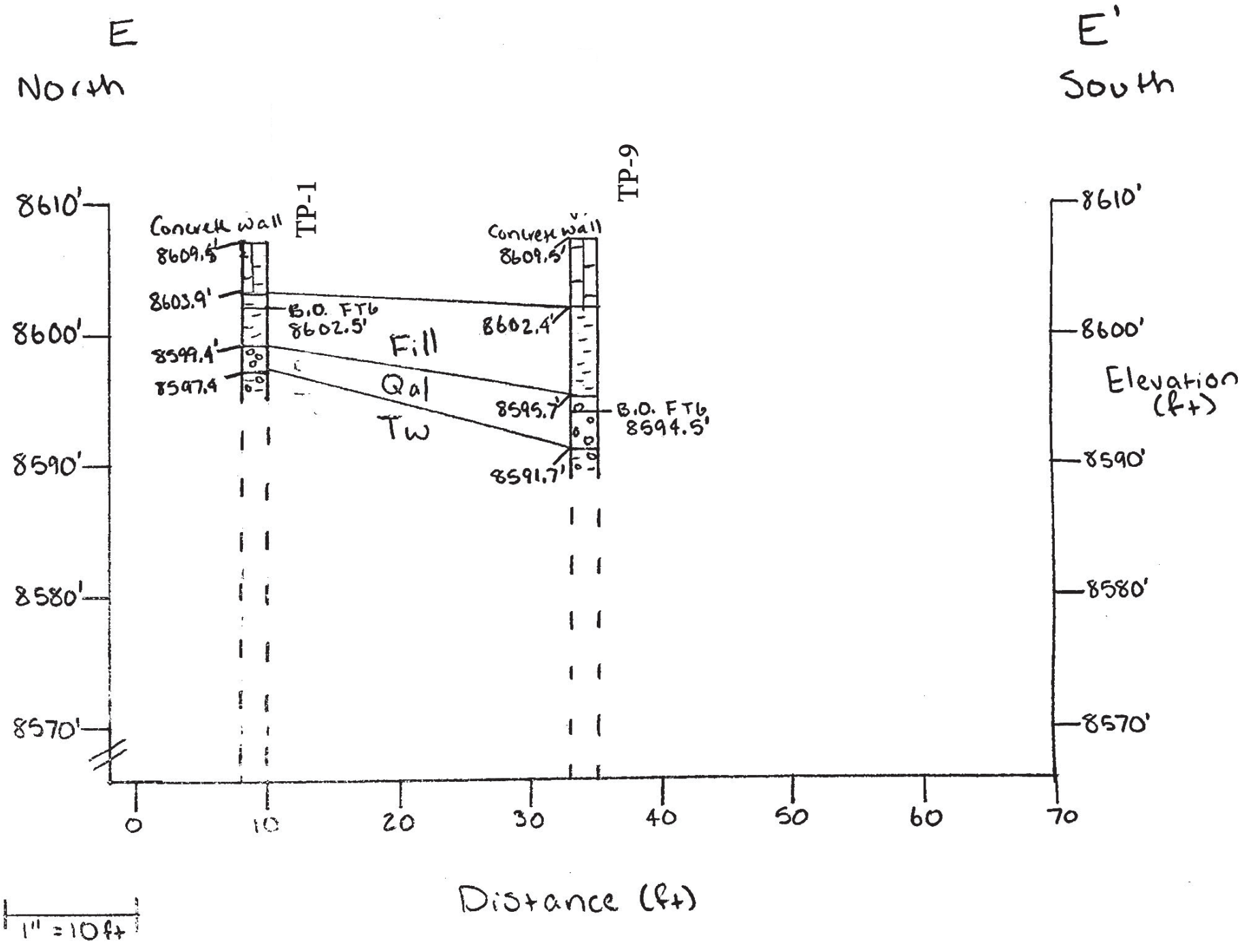
IGES
Intermountain GeoEnvironmental Services, Inc.

Project No. 025579-001

Date 1/11/18 by KLA

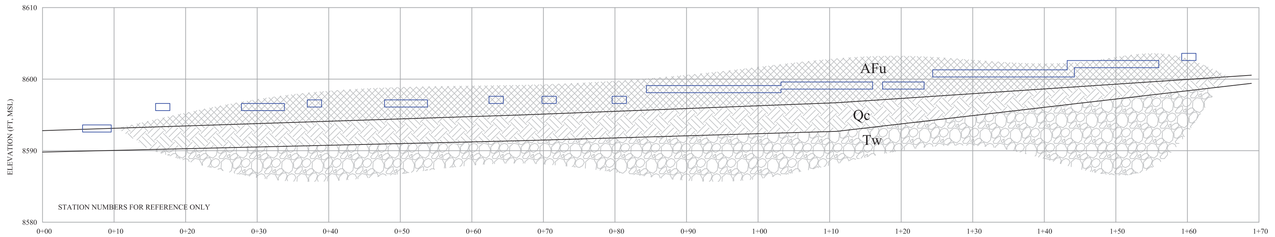
Ckd by _____ on _____

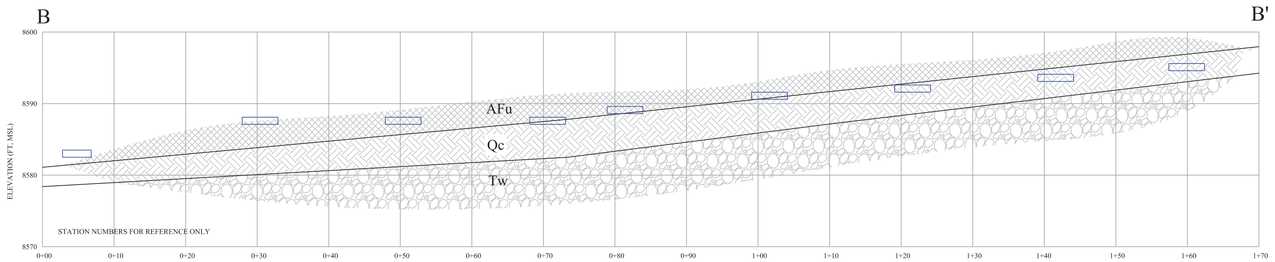
Cross Section E - E'

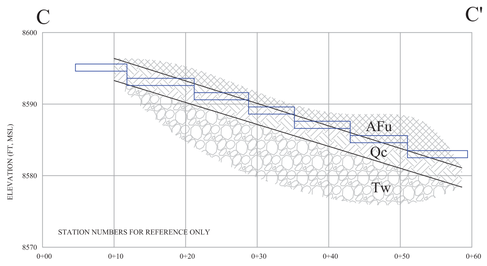


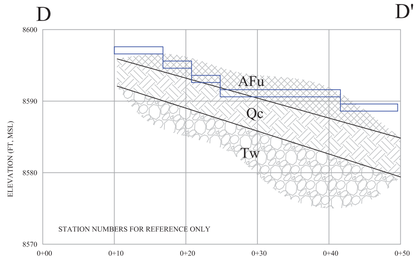
IGES

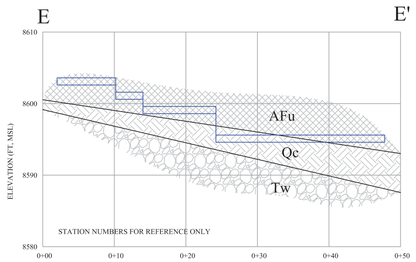
Intermountain GeoEnvironmental Services, Inc.











LEGEND

- Afu - undocumented fill
- Qc - Colluvium
- Tw - Wasatch Formation (conglomerate)
- Proposed foundation element

Ground surface not shown

0 5 10 20
SCALE: 1" = 10'

APPROXIMATE GRAPHICAL SCALE: 1 INCH = 10 FEET (24X36 ONLY)

PLOT DATE: JAN 28, 2018

MARK	DATE	BY	CHK

REVISIONS

IGES®
12429 SOUTH 300 EAST, STE. 100
DRAPER, UTAH 84020
(801) 748-4044 FAX: (801) 748-4045

COPPER CREST WEST TOWNHOMES
SUMMIT POWDER MOUNTAIN RESORT
WEBER COUNTY, UTAH

CONCEPTUAL CROSS-SECTIONS

DESIGNED BY: DAG JAN 28, 2018	PLOT SCALE 1=1	
DRAWN BY: DAG JAN 28, 2018	DWG SCALE 1"=10'	
IGES PROJECT NO. 02130-005	SHEET NO. 1	REV. N/A

Intermountain GeoEnvironmental Services, Inc.
12429 South 300 East, Suite 100, Draper, Utah 84020 ~ T: (801) 748-4044 ~ F: (801) 748-4045

February 21, 2018

Powder Cat Townhomes, LLC
c/o Mr. David Orr
11180 Sunrise Valley Drive, #300
Reston, VA 20191

IGES Project No. 02579-001

Subject: Additional Grading Recommendations
Copper Crest West Townhomes
Summit Powder Mountain Resort
Weber County, Utah

Reference: IGES, Inc., 2017, Geotechnical and Geologic Hazard Investigation, Copper Crest West, Summit Powder Mountain Resort, Weber County, Utah, Project No. 01628-022, dated January 16, 2017.

IGES, Inc., 2018, Supplemental Subsurface Assessment, Copper Crest West Townhomes, Summit Powder Mountain Resort, Weber County, Utah, Project No. 02579-001, dated January 30, 2018.

Mr. Orr:

Based on on-going discussions with the Client regarding anticipated grading for the Copper Crest West project, the following recommendations are made:

- Over-excavation below structural elements should extend ½ feet laterally for every foot of over-excavation. The minimum lateral distance is 1 foot.

- Below slab-on-grade, where undocumented fill and/or topsoil is exposed on the subgrade, a minimum over-excavation of 2 feet below slab-on-grade *finish floor* is recommended. Prior to placing engineered fill, the exposed subgrade should be scarified a minimum of 6 inches, moisture-conditioned as necessary, and compacted to approximately 93% of the maximum dry density (modified Proctor). If particularly soft, loose, or otherwise deleterious material is exposed, particularly where the exposed soils appear consist of topsoil, additional over-excavation may be warranted.

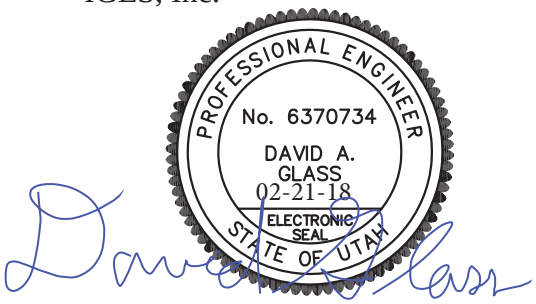
All other recommendations presented in the referenced geotechnical reports remain valid and should be implemented into the design and construction of the project, except as superseded herein.

Copyright 2018 IGES, Inc.

Closure

We appreciate the opportunity to provide you with our services. If you have any questions please contact the undersigned at your convenience (801) 748-4044.

Respectfully Submitted,
IGES, Inc.



David A. Glass, P.E.
Senior Geotechnical Engineer

Copyright 2018 IGES, Inc.