Gularte
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September 16, 2013
Project No. 3581

Robert Poehnert
298 Warren Street
Martinez, CA 94553

PROJECT: 13125 BELL BROOK DRIVE – AUBURN

Re: Geotechnical Letter Report

Dear Robert:

At your request, we prepared this letter to provide grading and foundation recommendations for the proposed bridge crossing at 13125 Bell Brook Drive in Auburn, California.

Proposed Construction: Based on our discussion with you, we understand that you plan to construct a bridge to traverse an existing creek in order for passenger vehicles to access the future home site on the north side of the parcel. The proposed bridge will be 8 to 10 feet wide, and approximately 30 to 40 feet long. The bridge abutments will be reinforced concrete and the deck will be either steel frame or a repurposed railcar. The meandering creek generally runs east to west, in the southern portion of the parcel, approximately 100 feet from Bell Brook Drive.

Local Geology: We reviewed the 1981 Geologic Map of the Sacramento Quadrangle (1:250,000), prepared by the California Department of Mines and Geology (DMG). This source indicates that the site geology is composed of Mesozoic and Paleozoic (65 – 542 m.y.a.) period rocks. Specifically the site appears to be at the confluence of metavolcanic and ultramafic rock zones, between younger volcanic rocks to the west and older metavolcanic sediments to the east. This is in agreement with the soil/rock observed during our field exploration.

Faults: Based on the 1994 Fault Activity Map of California prepared by the Department of Mines and Geology, the nearest faults are the Willows Fault Zone and the Midland Fault, located approximately 10 miles east and 20 miles west-southwest of the subject property, respectively. The Willows Fault Zone is Pre-Quaternary (i.e. does not show recognized quaternary displacement), however, it is not necessarily inactive. The Midland fault shows stratigraphic and/or geomorphic evidence for displacement of late Miocene and Pliocene deposits. The Bear Mountains Fault Zone, located approximately 25 miles east, shows stratigraphic and/or geomorphic evidence for displacement of late Miocene and Pliocene deposits. The Vaca Fault located approximately 30 miles west-southwest, shows geomorphic evidence of Late Quaternary faulting (during past 700,000 years). The Green Valley Fault located approximately 45 miles southwest, shows geomorphic evidence of fault creep during Holocene time (during past 10,000 years). The Concord Fault located approximately 50 miles southwest, shows geomorphic evidence of historic creep as well as fault rupture during Holocene time. The Hayward Fault, located approximately 60 miles southwest, ruptured historically in 1836 and 1868, and shows geomorphic evidence of fault rupture during Holocene time. The San Andres Fault, located approximately 80 miles southwest, ruptured historically in 1838, 1906, and 1989.

According to the 1999 Seismic Shaking Hazard Maps of California prepared by the California Division of Mines and Geology, there is a 10 percent probability that the site will experience a horizontal ground acceleration of 0.1g to 0.2g in the next 50 years. This is a relatively low level of ground shaking for California.

Risk of lateral spreading from landslides and liquefaction is considered to be very low at the project site due to the relatively granular, dense to very dense nature of the native soil conditions.

Groundwater: We observed water infiltration in our exploratory trench at a depth of approximately 3 feet. This is likely due to the close proximity to the creek and not an indication of static groundwater conditions outside of this zone. The contractor should anticipate similar conditions during construction of the bridge abutments and plan to dewater the footing excavations accordingly.

Subsurface Conditions: We performed one exploratory trench parallel to the creek, approximately 3 to 4 feet from the southern bank to a depth of 7 feet. We generally encountered silty sand with very few cobbles in the upper 1-foot of the site. This was underlain by medium sized semi-rounded cobbles in a silty sand matrix. Cobble size increases with depth. We encountered water at approximately 3 feet below ground surface.

Clearing & Grubbing: The site is located in a dense, wooded area with a clearing for the proposed bridge crossing. Leaves and brush within the footprint of the proposed abutments should be stripped and hauled off site prior to construction.

Fill Slopes: Construct final slope gradients to 3:1 (horizontal:vertical) or flatter. Slope faces should be compacted and vegetated to reduce the effects of rutting from rainfall and overland water flow. If engineered fills will be exposed to water flow from the creek and/or subject to flooding, the slopes faces should be covered with Caltrans No. 1 rock slope protection for erosion control purposes. Refer to the 2010 Caltrans Standard Specification Placement Method B in section 72-2.02 thru 72-2.03 (attached) for rock gradation and construction.

Fill Compaction: Scarify the upper 6 to 8 inches of the site, moisture condition to within 0 to +4 percent of optimum, and recompact to at least 90 percent relative compaction prior to beginning fill placement.

Next, moisture condition fills to within 0 to +4 percent of optimum water content. Compact fills for structural areas such as pavements or fill slopes surrounding the bridge abutments to at least 90 percent relative compaction per ASTM D1557.

Foundations: The proposed bridge abutments can be supported on continuous footings and/or spread footings bearing in competent native soil or compacted fill.

Table 1 below provides maximum allowable bearing capacity for dead plus live loads. These bearing capacities may be increased by one-third for the short-term effects of wind or seismic loading. We recommend a minimum of 24 inches from the top of footing to adjacent grade.

Minimum Footing Dimensions	Allowable Bearing Capacity (PSF)
Strip Footings 18" W x 24" Deep	3,000
Spread Footing 18" SQ x 24" Deep	3,200

Table 1 –Footing Parameters

Reinforce all continuous footings with at least two #4 rebars top and two #4 rebars bottom. The structural engineer may increase these parameters based on anticipated loading.

Lateral loads may be resisted by friction along the base of footings and by passive pressure along the face of footings. We recommend a coefficient of friction equal to 0.39 and an equivalent passive fluid pressure of 405 pcf.

Retaining Walls (Wing Walls): Provided that adequate drainage is included, we recommend that walls subjected to active soil pressure be designed to resist an equivalent fluid pressure of 41 pounds per cubic foot (pcf). For at-rest conditions, we recommend an at-rest fluid pressure of 63 pcf with level backfill conditions. Retaining wall backfill should be native or predominantly granular, non-expansive import backfill. Frictional forces and passive pressure can be obtained from the Foundation Section of this report.

The above lateral earth pressures assume sufficient drainage behind the walls to prevent any build-up of hydrostatic pressures from surface water infiltration. Drainage of the walls may be accomplished by using aggregate drainage blanket or a pre-manufactured wall drainage system. Drainage blanket materials, if selected for use, should consist of Class 2 permeable material per Section 68 of the Caltrans Standard Specifications. The drainage blanket should be at least 12 inches thick and placed to within 12 inches of the top of the wall. If drain rock is used, we recommend a clean, ¾-inch crushed rock, which should be enveloped in a Mirafi 140N filter fabric. Water collected at the bottom of the drain system should be transmitted away from the wall by a perforated pipe or weep holes. The pipe should be at least four inches in diameter with the perforations placed down. The pipe should daylight to a lower grade or drain. If adequate drainage is not provided, we recommend that an additional equivalent fluid pressure of 40 pcf be added to the values recommended above. Damp-proofing of the walls should be included in areas where wall moisture would be problematic (e.g. stucco walls); we commonly recommend a waterproofing membrane such as Miradri 860/861.

CBC Seismic Parameters: We provide the 2010 California Building Code parameters in the table below.

Categorization	Design Value
Site Class	C
Mapped Acceleration Parameter (S_S)	0.426
Mapped Acceleration Parameter (S_1)	0.192
Site Class Factor, Fa	1.2
Site Class Factor, Fv	1.608
Spectral Response Acceleration (S_{MS})	0.511
Spectral Response Acceleration (S_{M1})	0.309

Table 2 – CBC Seismic Parameters

Limitations: The scope of this evaluation was limited to an evaluation of the load-carrying capabilities and stability of the subsoils. Oil, hazardous waste, radioactivity, irritants, pollutants, molds, or other dangerous substance and conditions were not the subject of this study. Their presence and/or absence is not implied or suggested by this report, and should not be inferred.

Please call if you have questions.

Respectfully,

Gularte & Associates, Inc.

Greg Gularte, G.E. No. 2633
President

Enclosed: Trench Log
Grain Size Analyses
Site Photographs
Excerpt from 2010 Caltrans Standard Specifications for Rock Slope Protection

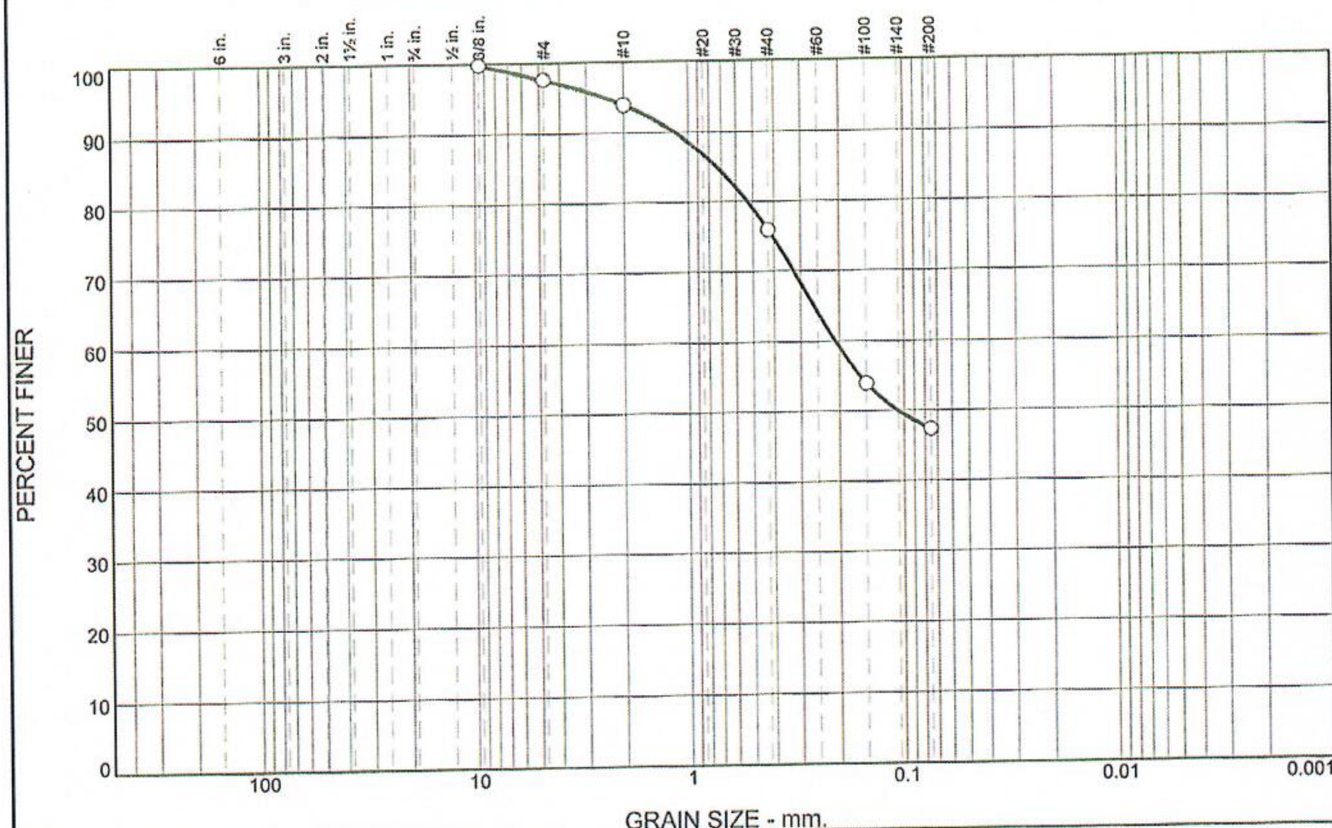
Drill Method Excavator		**Project No.**	3581
Auger Size 18" Bucket		**Project Name**	13125 Bell Brook Rd
Drill Bobcat Mini Excavator		**Elevation**	--
Logged By Rory Taylor		**Date**	8/2/13

Trench T-1

Depth (feet)	Sample No.	SPT/Cal Mod N-Value	Sample Type	Lithology	LITHOLOGIC DESCRIPTION	SPT or Cal Mod "N" Value (Uncorrected) 10 20 30 40 50 60 70	Depth (feet)
0					SM: Light Brown Silty Sand w/ Gravel; Medium Dense; Dry; Lots of roots		0
					SP: Blue/Grey Poorly graded sand; Wet		
					SW: Brown Well Graded Sand w/ Gravel; Wet; Dense Groundwater at 3'		
5					GP: Semi-Angular Poorly Graded Gravel and Cobbles; Wet; Hard Excavation Refusal at 6.5 feet		-5
10							-10

Client	Project	Sheet
Robert Poehner	13125 Bell Brook Rd	1 of 1

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
			3.6	18.0	28.6	47.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	99.8		
#4	97.5		
#10	93.9		
#40	75.9		
#100	53.9		
#200	47.3		

* (no specification provided)

Material Description

Silty Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.1533 D_{85}= 0.7329 D_{60}= 0.2082
D_{50}= 0.1072 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Sample Number: T1-1 Depth: 1' Date: 8/15/13

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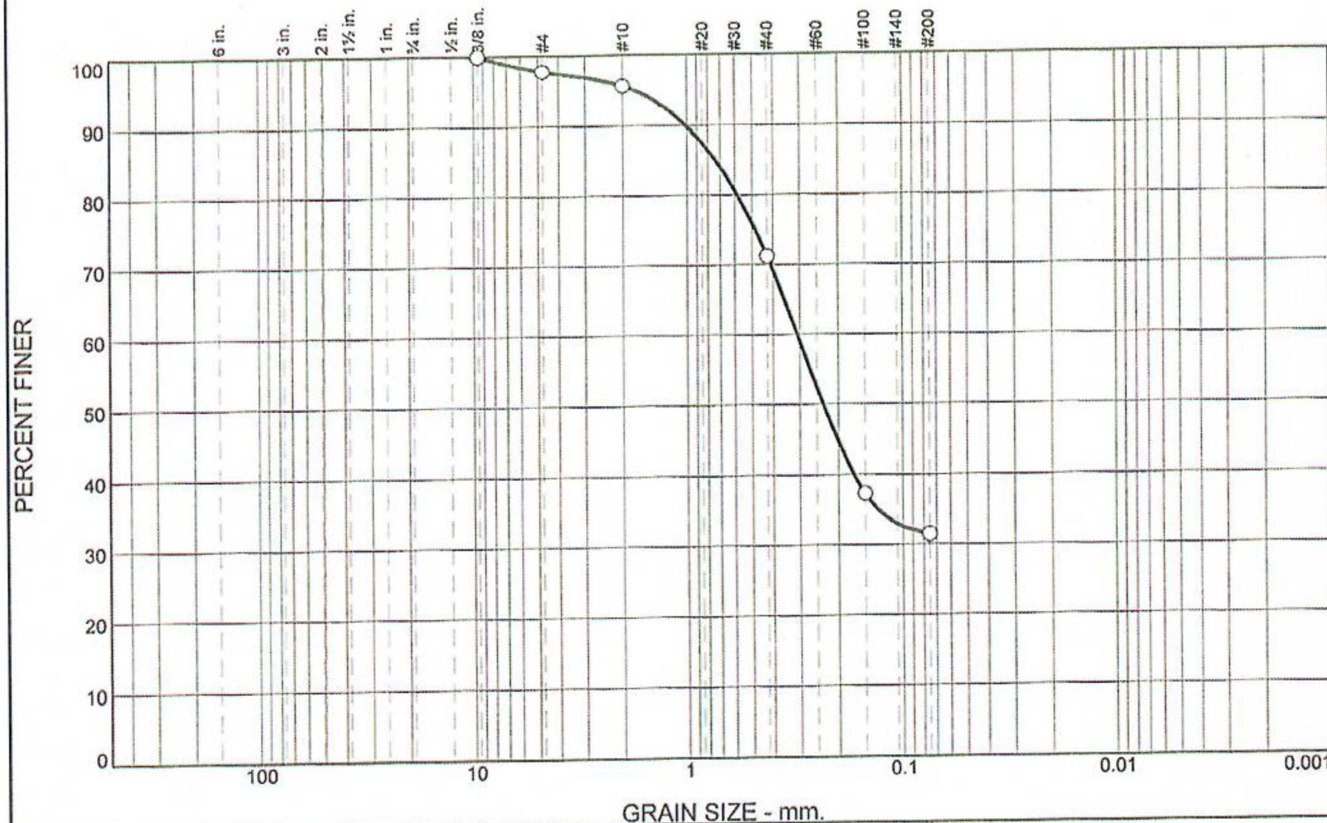
Client: Robert Poehner
Project: Bell Brook Road
Project No: 3581 Figure

Tested By: RT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.2	2.2	24.4	39.7	31.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
#4	97.8		
#10	95.6		
#40	71.2		
#100	37.3		
#200	31.5		

* (no specification provided)

Material Description

SM w/ Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.0115 D_{85}= 0.7376 D_{60}= 0.3085
D_{50}= 0.2341 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Sample Number: T1-2 Depth: 2' Date: 8/15/13

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Rocklin, CA

Client: Robert Poehner
Project: Bell Brook Road
Project No: 3581 Figure

Tested By: RT

DIVISION VIII MISCELLANEOUS CONSTRUCTION

72 SLOPE PROTECTION

72-1 GENERAL

72-1.01 GENERAL

Section 72-1 includes general specifications for constructing slope protection, concrete lining, slope paving, and gabions.

72-1.02 MATERIALS

Concrete shown for slope protection or slope paving must comply with the specifications for minor concrete.

Unless otherwise specified, fabric must be Class 8 RSP fabric.

72-1.03 CONSTRUCTION

If placement of fabric is required, place the fabric before placing slope protection, slope paving, and gabions.

Before placing the fabric, the surface of the slope must be free of loose or extraneous material and sharp objects that may damage the fabric.

Handle and place fabric in compliance with the manufacturer's instructions. Place the fabric loosely on the slope so that the fabric conforms to the surface without damage when the cover material is placed.

Join edges of the fabric with either overlapped joints or stitched seams.

If the fabric is joined with overlapped joints, adjacent borders of the fabric must be overlapped by at least 24 inches. Overlap in the same direction that the cover material is placed.

If the fabric is joined by stitched seams, stitch with contrasting colored yarn. Use the size and composition of yarn that is recommended by the fabric manufacturer. Use 5 to 7 stitches per inch of seam. The strength of a stitched seam must be the same as that specified for the fabric, except if the stitched seams are oriented up and down a slope, the strength may be reduced to a value that it is at least 80 percent of that specified for the fabric.

Do not operate equipment or drive vehicles directly on the fabric.

If the fabric is damaged and the Engineer determines that it cannot be repaired, replace the fabric.

If the Engineer determines that the fabric can be repaired, then repair it by covering the damaged area with new fabric. If the repair is made using overlapped joints, the overlap must be at least 3 feet.

72-1.04 PAYMENT

Payment is not made for the additional fabric used for overlaps.

72-2 ROCK SLOPE PROTECTION

72-2.01 GENERAL

Section 72-2 includes specifications for constructing RSP. RSP includes:

1. Excavating and backfilling the footing trench
2. Placing RSP fabric where shown
3. Placing revetment type rock courses on the slope

Use the class of rock and the method for placement described.

72-2.02 MATERIALS

72-2.02A Rock

For method A placement and the class of RSP described, comply with the rock grading shown in the following table:

Rock Grading for Method A Placement

Rock size	Percentage larger than[a]				
	Class				
	8T	4T	2T	1T	1/2 T
16 Ton	0–5	--	--	--	--
8 Ton	50–100	0–5	--	--	--
4 Ton	95–100	50–100	0–5	--	--
2 Ton	--	95–100	50–100	0–5	--
1 Ton	--	--	95–100	50–1	0–5
1/2 Ton	--	--	--	95–100	50–100
1/4 Ton	--	--	--	--	95–100

[a]For any class, the percentage of rock smaller than the smallest rock size must be determined on the basis of weight. For all other rock sizes within a class, the percentage must be determined on the basis of the ratio of the number of individual rocks larger than the smallest size shown for that class compared to the total number of rocks.

For method B placement and the class of RSP described, comply with the rock grading shown in the following table:

Rock Grading for Method B Placement

Rock size	Percentage larger than[a]							
	Class							
	1 T	1/2 T	1/4 T	Light	Facing	No. 1	No. 2	No. 3
2 ton	0–5	--	--	--	--	--	--	--
1 ton	50–100	0–5	--	--	--	--	--	--
1/2 ton	--	50–100	0–5	--	--	--	--	--
1/4 ton	95–100	--	50–100	0–5	--	--	--	--
200 lb	--	95–100	--	50–100	0–5	0–5	--	--
75 lb	--	--	95–100	--	50–100	50–100	0–5	--
25 lb	--	--	--	95–100	90–100	90–100	25–75	0–5
5 lb	--	--	--	--	--	--	90–100	25–75
1 lb	--	--	--	--	--	--	--	90–100

[a]For any class, the percentage of rock smaller than the smallest rock size must be determined on the basis of weight. For all other rock sizes within a class, the percentage must be determined on the basis of the ratio of the number of individual rocks larger than the smallest size shown for that class compared to the total number of rocks.

Rock must have the values for the material properties shown in the following table:

Rock Material Properties

Property	California Test	Value
Apparent specific gravity	206	2.5 minimum
Absorption	206	4.2% maximum[a]
Durability index	229	52 minimum[b]

Select rock so that shapes provide a stable structure for the required section. If the slope is steeper than 2:1, do not use rounded boulders and cobbles. Angular shaped rock may be used on any planned slope. Flat or needle shaped rock must not be used unless the individual rock thickness is greater than 0.33 times the length.

72-2.02B Fabric

Fabric must be RSP fabric that complies with the class shown in the following table:

Fabric Class

Class	Largest rock grading class used in slope protection
8	1 ton or smaller
10	Larger than 1 ton

72-2.03 CONSTRUCTION

72-2.03A General

Excavate the footing trench along the toe of the slope.

Local surface irregularities of the RSP must not vary from the planned slope by more than 1 foot as measured at right angles to the slope.

At the completion of slope protection work, fill voids in the footing trench with excavated material. Compaction is not required.

72-2.03B Placement Method A

Do not place rocks by dumping.

Place larger rocks in the footing trench.

Place rocks on the slope so that their longitudinal axis is normal to the face of the embankment.

Place foundation course rocks so that they are in contact with the ground surface.

For rocks above the foundation course, place them so that each rock has a 3-point bearing on underlying rocks; do not bear them on smaller rocks which may be used for chinking voids.

72-2.03C Placement Method B

Rocks may be placed by dumping and may be spread in layers by bulldozers or other suitable equipment.

Place rocks so that:

1. There is a minimum of voids
2. Larger rocks are in the toe course and on the outside surface of the slope protection

72-2.04 PAYMENT

If RSP is paid by the ton, the quantity is determined by weighing with a scale.

If RSP is paid by the cubic yard, the quantity is based on the dimensions shown or ordered.

72-3 CONCRETED-ROCK SLOPE PROTECTION

72-3.01 GENERAL

Section 72-3 includes specifications for constructing concreted-rock slope protection. Concreted-rock slope protection includes:

1. Excavating and backfilling the footing trench
2. Placing fabric and weep tubes where shown
3. Placing revetment type rock courses on the slope
4. Concreting the rock

Use the class of rock and the method for placement described.

72-3.02 MATERIALS

72-3.02A Concrete

If colored slope protection is described, color the concrete by mixing a fine ground, synthetic mineral oxide into the concrete. The synthetic mineral oxide must be specifically manufactured for coloring concrete. The color of the completed concrete after curing and when air dry must comply with color no. 30450 (tan) of FED-STD-595.