



Rating form completed by:

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Evaluator: BL

Date: 06/28/2019

*Text in green is to be part of UC Santa Cruz building database and may be part of UCOP database*

DATE: 2018-06-28

**UC Santa Cruz building seismic ratings**  
**Mt. Hamilton Garage – Res #7**

CAAN #7231

7281 Mt. Hamilton Road, Santa Cruz, CA 95140

UCSC Campus: Mt. Hamilton



Plan



North Elevation (Looking Southwest)



Rating summary	Entry	Notes
UC Seismic Performance Level (rating)	V (Poor)	
Rating basis	Level 1	FEMA P-154 <sup>1</sup>
Date of rating	2019	
Recommended UC Santa Cruz priority category for retrofit	B	Priority A=Retrofit ASAP Priority B=Retrofit at next permit application
Ballpark total construction cost to retrofit to IV rating <sup>2</sup>	Very High	Location is remote. Building is very small.
Is 2018-2019 rating required by UCOP?	Yes	Building was not previously rated
Further evaluation recommended?	No	

<sup>1</sup> We translate this FEMA 154 evaluation to a Seismic Performance Level rating using professional judgment. Non-compliant items or a certain score in the FEMA 154 evaluation do not automatically put a building into a particular rating category, but we evaluate such items along with the combination of building features and potential deficiencies, focused on the potential for collapse or serious damage to the gravity supporting structure that may threaten occupant safety. See Section III.B of the 19 May 2017 *UC Seismic Safety Policy* and Method B of Section 321 of the 2016 *California Building Code*.

<sup>2</sup> Per Section III.A.4.i of the 26 March 2019 *UC Seismic Program Guidebook, Version 1.3*, the cost includes all construction cost necessitated by the seismic retrofit, including restoration of finishes and any triggered work on utilities or accessibility. It does not include soft costs such as design fees or campus costs. The cost is in 2019 dollars.

#### **Building information used in this evaluation**

- None

#### **Additional building information known to exist**

- None

#### **Scope for completing this form**

A site observation was completed on 11 June 2019, and a FEMA P-154 Level 1 evaluation was completed.

#### **Brief description of structure**

The Mt. Hamilton Garage is a one-story wood framed building with a hipped roof that was constructed in 1949. It contains a rectangular footprint with an area of approximately 240 square feet, and it is located in the Lick Observatory complex in Mt. Hamilton, California. The building was formerly utilized as a storage facility, but it has since been boarded up and abandoned.

The roof diaphragm is comprised of wood shingles over straight wood sheathing. The walls are horizontal wood siding over building paper and diagonal sheathing with let-in braces on the inside. The shingles, siding, and paper are significantly warped and deteriorated; nails are rusted. If continued occupancy is required, this structure may be a candidate for demolition, or removal and replacement of the existing roof, wall finishes, and sheathing down to the rafter and studs could be performed.

The structure utilizes the exterior sheathed walls as the primary lateral force-resisting system. A large garage door opening located on one exterior wall creates a "C"-shaped lateral system. As such, the building is torsionally irregular.

#### **Brief description of seismic deficiencies and expected seismic performance including mechanism of nonlinear response and structural behavior modes**

Identified seismic deficiencies of the building include the following:

- The Mt. Hamilton Garage is torsionally irregular. It contains solid exterior walls on three sides; however, a large door opening is located one elevation which creates a "C"-shaped lateral force-resisting system. The deficiency is not considered significant because of the small size of the building and the relatively solid wall at the rear of the structure.

**FEMA P-154 Score**

BASIC SCORE, MODIFIERS, AND FINAL LEVEL 1 SCORE, $S_{L1}$																		
FEMA BUILDING TYPE	Do Not Know	W1	W1A	W2	S1 (MRF)	S2 (BR)	S3 (LM)	S4 (RC SW)	S5 (URM INF)	C1 (MRF)	C2 (SW)	C3 (URM INF)	PC1 (TU)	PC2	RM1 (FD)	RM2 (RD)	URM	MH
<b>Basic Score</b>		2.1	1.9	1.8	1.5	1.4	1.6	1.4	1.2	1.0	1.2	0.9	1.1	1.0	1.1	1.1	0.9	1.1
Severe Vertical Irregularity, $V_{1,1}$		-0.9	-0.9	-0.9	-0.8	-0.7	-0.8	-0.7	-0.7	-0.7	-0.8	-0.6	-0.7	-0.7	-0.7	-0.7	-0.6	NA
Moderate Vertical Irregularity, $V_{2,1}$		-0.6	-0.5	-0.5	-0.4	-0.4	-0.5	-0.4	-0.3	-0.4	-0.4	-0.3	-0.4	-0.4	-0.4	-0.4	-0.3	NA
Plan Irregularity, $P_{1,1}$		-0.7	-0.7	-0.6	-0.5	-0.5	-0.6	-0.4	-0.4	-0.4	-0.5	-0.3	-0.5	-0.4	-0.4	-0.4	-0.3	NA
Pre-Code		-0.3	-0.3	-0.3	-0.3	-0.2	-0.3	-0.2	-0.1	-0.1	-0.2	0.0	-0.2	-0.1	-0.2	-0.2	0.0	0.0
Post-Benchmark		1.9	1.9	2.0	1.0	1.1	1.1	1.5	NA	1.4	1.7	NA	1.5	1.7	1.6	1.6	NA	0.5
Soil Type A or B		0.5	0.5	0.4	0.3	0.3	0.4	0.3	0.2	0.2	0.3	0.1	0.3	0.2	0.3	0.3	0.1	0.1
Soil Type E (1-3 stories)		0.0	-0.2	-0.4	-0.3	-0.2	-0.2	-0.2	-0.1	-0.1	-0.2	0.0	-0.2	-0.1	-0.2	-0.2	0.0	-0.1
Soil Type E (> 3 stories)		-0.4	-0.4	-0.4	-0.3	-0.3	NA	-0.3	-0.1	-0.1	-0.3	-0.1	NA	-0.1	-0.2	-0.2	0.0	NA
Minimum Score, $S_{MIN}$		0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.5	0.3	0.3	0.3	0.2	0.2	0.3	0.3	0.2	1.0
<b>FINAL LEVEL 1 SCORE, <math>S_{L1} \geq S_{MIN}</math>:</b>		<b>1.9</b>																
<b>UCOP SEISMIC PERFORMANCE LEVEL (OR "RATING") V</b>																		

**Summary of review of nonstructural life-safety concerns, including at exit routes.<sup>3</sup>**

The are no falling hazards that pose a risk to the building occupants.

UCOP nonstructural checklist item	Life safety hazard?	UCOP nonstructural checklist item	Life safety hazard?
Heavy ceilings, feature or ornamentation above large lecture halls, auditoriums, lobbies or other areas where large numbers of people congregate	None observed	Heavy partitions braced by ceilings	None observed
Heavy masonry or stone veneer above exit ways and public access areas	None observed	Appendages	None observed
Unbraced masonry parapets, cornices or other ornamentation above exit ways and public access areas	None observed	Unrestrained hazardous materials storage	None observed
Masonry chimneys	None observed	Unrestrained natural gas-fueled equipment such as water heaters, boilers, emergency generators, etc.	None observed

**Discussion of rating**

A Seismic Performance Level rating of V is assigned to this structure due to the significant level of deterioration of the roof diaphragm, wall sheathing and nailing. Had it been in better condition, it would have received a rating of IV. Although the building is likely torsionally irregular, the wall piers that remain adjacent to the door opening are deemed sufficient, and, given its compact geometry, the roof diaphragm likely would have contained sufficient capacity to distribute the rotational forces to the remaining walls.

**Recommendations for further evaluation or retrofit**

No further analysis is required.

**Peer review of rating**

This seismic evaluation was discussed in a peer review meeting on 24 June 2019. Reviewers present were Robert Graff of Degenkolb Engineers and Joe Maffei of Maffei Structural Engineering. Comments from the reviewers have been incorporated into this report. The reviewers agreed with the assigned rating.

Additional building data	Entry	Notes
Latitude	37.342748	
Longitude	-121.637910	
Are there other structures besides this one under the same CAAN#	No	

<sup>3</sup> For these Tier 1 evaluations, we do not visit all spaces of the building; we rely on campus staff to report to us their understanding of if and where nonstructural hazards may occur.

Number of stories above lowest perimeter grade	1	
Number of stories (basements) below lowest perimeter grade	0	
Building occupiable area (OGSF)	240	
Risk Category per 2016 CBC Table 1604.5	None	Structure is abandoned
<b>Site data</b>		
Site class	B	
Site class basis	Inferred	The Lick Observatory complex is built on a rocky outcropping at the top of Mt. Hamilton. Fractured rock is visible adjacent to the building.
Liquefaction potential	Low	
Liquefaction assessment basis	Inferred	Engineering judgment given the lack of surficial soils and mountaintop location.
Landslide potential	Low	
Landslide assessment basis	Inferred	Engineering judgment given the building site is relatively level.
Active fault rupture identified at site?	No	
Fault rupture assessment basis	CGS Website	The Earthquake Zones of Required Investigation Lick Observatory Quadrangle has no Earthquake Fault Zones near Mt. Hamilton. The Mt. Hamilton area was "not evaluated for liquefaction or landslides." See <a href="http://gmw.conservation.ca.gov/SHP/EZRIM/Maps/LICK_OBSERVATORY_EZRIM.pdf">http://gmw.conservation.ca.gov/SHP/EZRIM/Maps/LICK_OBSERVATORY_EZRIM.pdf</a>
<b>Applicable code</b>		
Applicable code or approx. date of original construction	Built: 1949 Code: Unknown	
Applicable code for partial retrofit	None	No partial retrofit
Applicable code for full retrofit	None	No full retrofit
<b>Model building data</b>		
Model building type North-South	W1 – Wood Frame	
Model building type East-West	W1 – Wood Frame	
FEMA P-154 score	1.9	
<b>Previous ratings</b>		
Most recent rating	None	
Date of most recent rating		
2 <sup>nd</sup> most recent rating	-	
Date of 2 <sup>nd</sup> most recent rating	-	
3 <sup>rd</sup> most recent rating	-	
Date of 3 <sup>rd</sup> most recent rating	-	

**Report attachments**

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P 154 Level 1 Form and  
Additional Photos

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## APPENDIX A

### FEMA P-154 Form and Site Map



**Rapid Visual Screening of Buildings for Potential Seismic Hazards**  
FEMA P-154 Data Collection Form

**Level 1**  
**VERY HIGH Seismicity**



**Address:** 7281 Mt. Hamilton Road  
San Jose, CA **Zip:** 95140

**Other Identifiers:** CAAN 7231 Mt Hamilton Garage - Res #7

**Building Name:**

**Use:** Formerly storage; now boarded and abandoned.

**Latitude:** 37.342748 **Longitude:** -121.637910

**Ss:** 1.653g (MCE<sub>R</sub> Site Class B) **Sr:** 0.539g (MCE<sub>R</sub> Site Class B)

**Screener(s):** Bret Lizundia/Jin Yu **Date/Time:** 6/11/19 / 2:45 PM

**No. Stories:** Above Grade: 1 Below Grade: 0 **Year Built:** 1949  EST

**Total Floor Area (sq. ft.):** 240 **Code Year:** Unknown

**Additions:**  None  Yes, Year(s) Built:

**Occupancy:** Assembly  Commercial  Emer. Services  Historic  Shelter  
Industrial  Office  School  Government  
 Utility Warehouse Residential, # Units: \_\_\_\_\_

**Soil Type:**  A  B  C  D  E  F  DNK  
Hard Avg Dense Stiff Soft Poor DNK  
Rock Rock Soil Soil Soil Soil If DNK, assume Type D.

**Geologic Hazards:** Liquefaction: Yes  No  DNK Landslide: Yes  No  DNK Surf. Rupt.: Yes  No  DNK

**Adjacency:**  Pounding  Falling Hazards from Taller Adjacent Building

**Irregularities:**  Vertical (type/severity)  
 Plan (type) Torsion ("C"-shaped lateral system)

**Exterior Falling Hazards:**  Unbraced Chimneys  Heavy Cladding or Heavy Veneer  
 Parapets  Appendages  
 Other:

**COMMENTS:**

1. Roof diaphragm is wood shingles over straight sheathing. Walls are horizontal wood siding over building paper over diagonal sheathing with let-in braces on inside. Shingles, siding, and paper are significantly warped and deteriorated; nails are rusted. Garage door is boarded shut, and building is abandoned.

2. Note that FEMA P-154 uses the MCE<sub>R</sub> Site Class B site parameters to determine the Seismicity Region. The Very High Seismicity Region applies here since S<sub>s</sub> = 1.65 > 1.5 (though S<sub>r</sub> = 0.54 < 0.6).

Additional sketches or comments on separate page

**BASIC SCORE, MODIFIERS, AND FINAL LEVEL 1 SCORE, S<sub>L1</sub>**

FEMA BUILDING TYPE	Do Not Know	W1	W1A	W2	S1 (MRF)	S2 (BR)	S3 (LM)	S4 (RC SW)	S5 (URM INF)	C1 (MRF)	C2	C3 (URM INF)	PC1 (TU)	PC2	RM1 (FD)	RM2 (RD)	URM	MH
<b>Basic Score</b>		2.1	1.9	1.8	1.5	1.4	1.6	1.4	1.2	1.0	1.2	0.9	1.1	1.0	1.1	1.1	0.9	1.1
Severe Vertical Irregularity, V <sub>L1</sub>		-0.9	-0.9	-0.9	-0.8	-0.7	-0.8	-0.7	-0.7	-0.7	-0.8	-0.6	-0.7	-0.7	-0.7	-0.7	-0.6	NA
Moderate Vertical Irregularity, V <sub>L1</sub>		-0.6	-0.5	-0.5	-0.4	-0.4	-0.5	-0.4	-0.3	-0.4	-0.4	-0.3	-0.4	-0.4	-0.4	-0.4	-0.3	NA
Plan Irregularity, P <sub>L1</sub>		-0.7	-0.7	-0.6	-0.5	-0.5	-0.6	-0.4	-0.4	-0.4	-0.5	-0.3	-0.5	-0.4	-0.4	-0.4	-0.3	NA
Pre-Code		-0.3	-0.3	-0.3	-0.3	-0.2	-0.3	-0.2	-0.1	-0.1	-0.2	0.0	-0.2	-0.1	-0.2	-0.2	0.0	0.0
Post-Benchmark		1.9	1.9	2.0	1.0	1.1	1.1	1.5	NA	1.4	1.7	NA	1.5	1.7	1.6	1.6	NA	0.5
Soil Type A or B		0.5	0.5	0.4	0.3	0.3	0.4	0.3	0.2	0.2	0.3	0.1	0.3	0.2	0.3	0.3	0.1	0.1
Soil Type E (1-3 stories)		0.0	-0.2	-0.4	-0.3	-0.2	-0.2	-0.2	-0.1	-0.1	-0.2	0.0	-0.2	-0.1	-0.2	-0.2	0.0	-0.1
Soil Type E (> 3 stories)		-0.4	-0.4	-0.4	-0.3	-0.3	NA	-0.3	-0.1	-0.1	-0.3	-0.1	NA	-0.1	-0.2	-0.2	0.0	NA
Minimum Score, S <sub>MIN</sub>		0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.5	0.3	0.3	0.3	0.2	0.2	0.3	0.3	0.2	1.0

**FINAL LEVEL 1 SCORE, S<sub>L1</sub> ≥ S<sub>MIN</sub>:** 1.9

**UCOP SEISMIC PERFORMANCE LEVEL (OR "RATING")** V

**EXTENT OF REVIEW**

**Exterior:**  Partial  All Sides  Aerial  
**Interior:**  None  Visible  Entered

**Drawings Reviewed:**  Yes  No

**Soil Type Source:** Rock is visible

**Geologic Hazards Source:** Geotech Report/CGS website

**Contact Person:** Joe Halay

**LEVEL 2 SCREENING PERFORMED?**

Yes, Final Level 2 Score, S<sub>L2</sub> \_\_\_\_\_  No

Nonstructural hazards?  Yes  No

**OTHER HAZARDS**

**Are There Hazards That Trigger A Detailed Structural Evaluation?**

Pounding potential (unless S<sub>L2</sub> > cut-off, if known)

Falling hazards from taller adjacent building

Geologic hazards or Soil Type F

Significant damage/deterioration to the structural system

**ACTION REQUIRED**

**Detailed Structural Evaluation Required?**

Yes, unknown FEMA building type or other building

Yes, score less than cut-off

Yes, other hazards present

No

**Detailed Nonstructural Evaluation Recommended? (check one)**

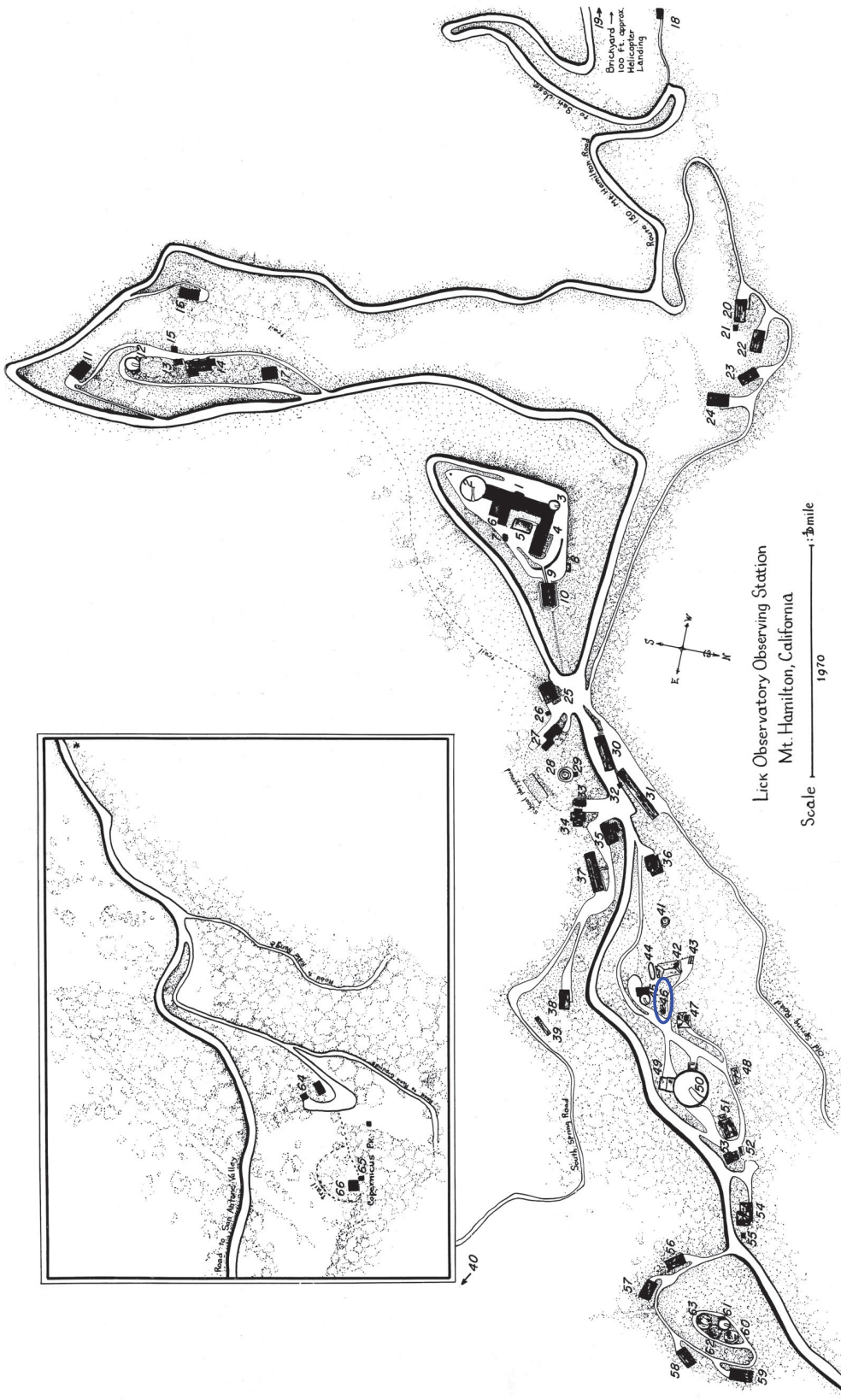
Yes, nonstructural hazards identified that should be evaluated

No, nonstructural hazards exist that may require mitigation, but a detailed evaluation is not necessary

No, no nonstructural hazards identified  DNK

Where information cannot be verified, screener shall note the following: EST = Estimated or unreliable data OR DNK = Do Not Know

Legend: MRF = Moment-resisting frame RC = Reinforced concrete URM INF = Unreinforced masonry infill MH = Manufactured Housing FD = Flexible diaphragm  
BR = Braced frame SW = Shear wall TU = Tilt up LM = Light metal RD = Rigid diaphragm



Lick Observatory Station  
Mt. Hamilton, California

Scale 1970 1/4 mile

- Road continued  
shown on
- 1. 7240 Main Building
  - 2. 7240 36-inch Refracting Telescope
  - 3. 7240 12-inch Refracting Telescope
  - 4. 7279 Laboratory and Measuring Bldg.
  - 5. 7260 Photographic Bldg. and Plate Vault
  - 6. 7239 Library Building
  - 7. 7298 Transformer Vault
  - 8. 7287 Water Booster Pump
  - 9. 7298 Heating Plant Building
  - 10. 7213 Old Dormitory (No. 1)
  - 11. 7214 Res. # 10 - Vacant
  - 12. 7211 Crossley 39-inch Reflecting Telescope
  - 13. 7234 Garage - Res. # 1
  - 14. 7266 Res. # 1 - Dietsch
  - 15. 7285 Transformer Vault
  - 16. 7220 Res. # 15 - Stone
  - 17. 7271 Res. # 2 - Vacant
  - 18. 7237 Incinerator
  - 19. 7262 Pump House - North Spring
  - 20. 7225 Res. # 20 - Gehri
  - 21. 7295 Transformer - Vault
  - 22. 7224 Res. # 19 - Roessler
  - 23. 7223 Res. # 18 - Sunzerl
  - 24. 7222 Res. # 17 - Hansen
  - 25. 7202 Dining Hall and Rec. Room
  - 26. 7286 Transformer Vault
  - 27. 7272 Res. # 3 - Guest House
  - 28. 7209 Tauchmann 22-inch Reflecting Telescope
  - 29. 7273 Reservoir and Pump House - Huygen Peak
  - 30. 7281 Shop Building
  - 31. 7282 Garage, Shop, and Storage Building
  - 32. 7297 Water Booster Pump
  - 33. 7235 Fire Truck Garage
  - 34. 7260 School House
  - 35. 7267 Res. # 4 - Clark
  - 36. 7268 Res. # 5 - Owens
  - 37. 7212 New Dormitory (No. 2)
  - 38. 7219 Res. # 14 - Harlan
  - 39. 7229 Quonset Hut - Storage
  - 40. 7261 Pump House - South Spring
  - 41. 7210 Crocker Dome
  - 42. 7269 Res. # 6 - Vacant
  - 43. 7232 Garage - Res. # 6
  - 44. Swimming Pool
  - 45. 7215 Carnegie Twin 20-inch Refracting Telescope
  - 46. 7231 Garage - Res. # 7
  - 47. 7265 Res. # 7 - Vacant
  - 48. 7264 Annex from Res. # 7 - Vacant
  - 49. 7276 Coude Auxiliary Telescope (CAT)
  - 50. 7276 120-inch Reflecting Telescope
  - 51. 7270 Res. # 8 - Vacant
  - 52. 7233 Garage - Res. # 8
  - 53. 7226 Annex to Res. # 8 - Kron Annex
  - 54. 7205 Res. # 9 - Bumgarner
  - 55. 7289 Transformer Vault
  - 56. 7217 Res. # 12 - Sylvester
  - 57. 7216 Res. # 11 - Miller
  - 58. 7218 Res. # 13 - Hinkley
  - 59. 7221 Res. # 16 - Loub
  - 60. 7274 Reservoir - Kepler Peak
  - 61. 7208 24-inch Photometric Reflecting Telescope
  - 62. 7293 Water Tank - Kepler Peak
  - 63. 7294 Water Tank - Repler Peak
  - 64. Santa Clara Co. Communications Bldg.
  - 65. Fire Lookout Bldgs. - State Div. of Forests
  - 66. 7275 Reservoir - Copernicus Peak
- A. Bumgarner 11-1970  
F. Greedy 12-1973