

County of Santa Clara

Department of Planning and Development Planning Office

County Government Center, East Wing, 7th Floor
70 West Hedding Street
San Jose, California 95110-1705
(408) 299-5770 FAX (408) 288-9198
www.sccplanning.org



MEMORANDUM

Date: January 26, 2011

To: Jody Hall Esser, Director, Department of Planning and Development

From: James Baker (CEG1021), County Geologist *JBS*

Subject: Analysis of Limestone Mapping and Historic Air-photos (taken in 1939, 1948, 1955 and 1960) of the Permanente Quarry, Santa Clara County Planning Office File# 2250-13-66-09P-10P

Introduction

I have examined air-photos taken on 8-1-1939, 9-26-1948, 6-8-1955, and 8-22-1960 in order to determine the nature and extent of ground disturbances that existed within the area of the Permanente Quarry in those years. I also reviewed several historic reports that contain descriptions and maps regarding the locations of limestone bodies and quarry-related activities. (A list of the sources of the air-photos and the historic reports is at the end of this memo.)

Sources of Information Used

An electronic version of the 1939 air-photo was provided by the County Archivist who scanned the 9x9-inch paper contact print retained in the County archives. The 1948 air-photo was taken by the U. S. Department of Agriculture and the electronic image was downloaded from Google Earth as several "screen capture" files. Paper contact prints of two frames of 1955 air-photos were purchased from Pacific Aerial Surveys and scanned by me to create an electronic image file. The electronic image file of the 1960 air-photo was purchased from Pacific Aerial Surveys who scanned the paper contact print in their archive.

I used the ESRI "rubber sheeting" tool to geo-register the electronic images in our Geographic Information System (GIS) by linking uniquely identifiable features (such as trees, roads, and buildings) to their locations on 2006 ortho-photos which were previously geo-registered in our GIS. I also geo-registered electronic images (scans) of Tolman's 1939 Sample Location Map, Matheison's 1982 Geologic Map, and Hammon, Jensen & Wallen's 1955 photogrammetric topographic map provided by the applicant. I overlaid historic lot lines of lands acquired by Kaiser. In addition, I referred to descriptive information presented in several historic reports (1939, 1946, and 1982) provided by the applicant. (See list at the end of this memo.)

Mapped Limestone

Limestone mined at the Permanete Quarry is used for production of cement in the nearby plant. The limestone exists in large, isolated bodies situated within the Franciscan Assemblage which is a complex assemblage of various rock types that were brought together by tectonic plate motions. Approximately 75 to 120 million years ago, subduction of the basaltic Pacific Oceanic Plate forced the sediments that would

become sandstone, claystone, limestone, and chert beneath the westward drifting North American Continental Plate, where they were compressed, mixed, and sheared between faults. As a result of this geologic history, limestone and other rock types occur in isolated bodies and are typically not found in extensive, continuous layers within the Franciscan Assemblage.

Eventually, uplift and erosion of overburden exposed the varied bedrock at the ground surface. Mapping and sampling over time by several geologists has determined the location and quality (calcium carbonate content) of the limestone bodies in the vicinity of the Permanente Quarry. Figure A-2 shows the areas of limestone mapped by others (Tolman in 1939; Mathieson in 1982; and Dibblee in 2007) within the area of interest.

Method of Interpretation and Notation

By correlating the written information and historic maps with the air-photos, I was able to identify the extent and probable use of disturbed ground visible from the air in 1939, 1948, 1955, and 1960. Such areas typically have a distinctively lighter shade of gray than surrounding brush-covered areas. In our GIS, I drew outlines on air-photos to indicate the locations of areas I interpret to have been disturbed by human activities related to roads (light and heavy use), exploration, mineral extraction, and cut/fill (for mining or construction of structures).

“Roads” (light-use) appear as narrow (less than 20 feet wide), moderately light “trails” with tight turns in some places and appear to have been used infrequently by light trucks or cars. “Roads” (heavy-use) appear as wider than 20 feet, very light “roadways” with wider turns; these roads appear to have been used frequently by heavy trucks or excavation equipment.

“Exploration” scars appear as very irregularly outlined light areas. These appear to have consisted of hiking trails for surface mapping, drilling pads for coring, or trenches for sampling. Most of the areas I interpreted as “exploration” disturbances line-up with reported digging or drilling locations documented in historic reports. (e.g., Tolman; 1939.)

“Mineral Extraction” areas appear as very light areas with dark shadows where there were steep cut slopes as their edges. These appear to be excavated “pits” where limestone was being quarried. (Heavy use roads usually approach them from one or more directions.)

“Cut and Fill” areas appear to have been made for construction of buildings or conveyor belt systems; they have a bright to mottled grey appearance with streaks indicating the direction of equipment spreading or downhill rolling of large rocks. Such areas tend to be broader in extent than the other categories of ground disturbances.

The attached figures are maps that include overlays showing the following types of disturbances on the corresponding air-photos: roads (light or heavy-use); exploration; mineral extraction; and cuts and fills (mining-related or construction-related). In addition, lots acquired by Permanente are outlined and numbered for reference on the attached Index Map (Figure A-1) and Disturbed Ground Maps (Figures B-2, C-2, D-2, and E-2). The following text and tables summarize my interpretations of ground disturbances that I see in each of the air-photos; the lot numbers used in the text are the same as those shown in the tables and on the maps.

Geographic Analysis and “Buffer” Overlay Maps

In order to display the areal extent of ground disturbances I see in each of the air-photos, we used an ArcMap tool to create 50-foot “buffer” zones around each of the interpreted polygons (excluding those related to the Cement Plant and Metals Factory). (The buffers effectively enlarge the width of the disturbed areas so that they are large enough to be perceived at the small map scale necessary to show the

entire area of interest.) The resulting “buffer” overlays illustrate the generalized extent of all types of quarry-related ground disturbances that I saw in each air-photo. (See Figures B-3, C-3, D-3, and E-3.) By stacking the “buffer” overlays (with different colors representing the different years of the photos from which they were derived), the final figures for 1948, 1955, and 1960 present time “progression” maps that illustrate the areal expansion of the quarry operation prior to the date of those photos. (See Figures C-4, D-4, and E-4.)

1939 Air-photo

At the time the 1939 air-photo was taken (on 8-1-1939), much of the ground surface within the area of interest was in a natural state (hillsides and stream channels covered by trees, brush, or grass that have a distinctive mottled grey tone). (Figure B-1 presents the 1939 air-photo with the numbered lots overlaid on it.) However, some areas had apparently been disturbed by human activities including exploration trenches and drilling pads, road grading, mineral extraction, excavation, placement of "mining waste" (non-limestone "overburden" materials) as fills, and grading to prepare pads for construction of cement plant buildings and conveyors. (The attached Figure B-2 presents color-coded translucent overlays that indicate the extent of the various types of ground disturbances that I see in the 1939 air-photo.) The extent of several roads, exploration trenches, and drilling pads correlate with sample locations indicated on Tolman's 1939 Sample Location Map. In addition, there are roads and extraction areas located beyond the limits of Tolman's map. A lot-by-lot summary of my interpretations of the 1939 air-photo is presented in the attached Table B.

In the 1939 air-photo, I do not see ground disturbances of the four types on Lots 1, 2, 5, 10, 11, 12, 14, 17, 18, or 19. There were “light use” roads on Lots 3, 6, 13, and 15. I see “heavy-use roads” on Lots 7, 9, and 16. “Exploration”-related ground disturbances are visible on Lots 6, 7, and 9. “Mineral Extraction” disturbances were evident on Lots 6 and 7. “Cuts and Fills” relating to mining are on 6, 7, and 9, while “cuts and fills” for construction of building or conveyor systems are visible on Lot 16.

The 1939 “buffer” map (Figure B-3) shows the 50-foot buffers around all of the ground disturbance areas in the 1939 air-photo.

1948 Air-photo

At the time the 1948 air-photo was taken (on 9-26-1948), the extent of ground disturbance areas was greater than it had been in 1939. (Figure C-1 presents the 1948 air-photo with the numbered lots overlaid on it.) Roads had been added, additional exploration routes had been established, and the extent of mineral extraction had increased into areas that had not been disturbed in 1939. (The attached Figure C-2 presents color-coded translucent overlays indicating my interpretation of the extent of the various types of ground disturbances that are visible in the 1948 air-photo.)

The attached Table C presents a lot-by-lot summary of my interpretations of the 1948 air-photo. Table C also indicates (by shading) where ground disturbances had increased from those visible in the 1939 air-photo.

In the 1948 air-photo, I do not see ground disturbances of the four types on Lots 1, 10, 12, 14, 18, or 19. There were light-use roads on Lots 2, 4, 13, 15, and 16. Heavy-use roads were on Lots 3, 5, 6, 7, and 9. Exploration-related ground disturbances were visible on Lots 3, 6, 7, 9, and 11. Mineral Extraction disturbances were evident on Lots 3, 6 and 7. Cuts and fills relating to mining were visible on Lots 3, 6, 7, 8, and 9, while cuts and fills relating to building or conveyors were visible on Lots 16 and 17. Permanente Road was blocked on Lot 9 by a large fill associated with a conveyor system.

The 1948 “buffer” map (Figure C-3) shows the 50-foot buffers around all of the ground disturbance areas in the 1948 air-photo. Figure C-4 shows both the 1939 and 1948 “buffers” to illustrate the time progression.

1955 Air-photo

At the time the 1955 air-photo taken (on 6-8-1955), the extent of ground disturbance areas was greater than it had been in 1948. (Figure D-1 presents the 1955 air-photo with the numbered lots overlaid on it.) Roads had been added, additional exploration routes had been established, and the extent of mineral extraction had increased into areas that were not disturbed in 1948. (The attached Figure D-2 presents a color-coded translucent overlay indicating my interpretation of the 1955 extent of the various types of ground disturbances that had been added after those I observed on the 1948 air-photo.)

The attached Table D presents a lot-by lot summary of my interpretations of the 1955 air-photo. The table also indicates (by shading) where ground disturbances increased from those in the 1948 air-photo.

In the 1955 air-photo, I do not see ground disturbances of the four types on Lots 1, 10, 12, 14, 18, and 19. There were light use roads on Lots 2, 4, 13, 15, 16, and 17. Heavy use roads were on Lots 3, 5, 6, 7, and 9. Exploration-related ground disturbances were visible on Lots 3, 6, 7, and 11. Mineral Extraction disturbances were evident on Lots 3, 6 and 7. Cuts and fills relating to mining were visible on Lots 3, 6, 7, 8, and 9, while cuts and fills relating to building or conveyors were visible on Lots 16 and 17. Permanente Road remained blocked by a large fill on Lot 9.

The 1955 “buffer” map (Figure D-3) shows the 50-foot buffers around all of the ground disturbance areas in the 1955 air-photo. Figure D-4 shows the 1939, 1948, and 1955 “buffers” to illustrate the time progression.

1960 Air-photo

At the time the 1960 air-photo taken (on 8-22-1960), the extent of ground disturbance areas was greater than it had been in 1955. (Figure E-1 presents the 1960 air-photo with the numbered lots overlaid on it.) Roads had been added, additional exploration routes had been established, and the extent of mineral extraction had increased into areas that were not disturbed in 1948. (The attached Figure E-2 presents a color-coded translucent overlay indicating my interpretation of the 1960 extent of the various types of ground disturbances that had been added after those I observed on the 1955 air-photo.)

The attached Table E presents a lot-by lot summary of my interpretations of the 1960 air-photo. The table also indicates (by shading) where ground disturbances increased from those in the 1955 air-photo.

In the 1960 air-photo, I do not see ground disturbances of the four types on Lots 1, 10, 12, 14, 18, or 19. There were light use roads on Lots 2, 4, 13, 15, 16, and 17. Heavy use roads were on Lots 3, 5, 6, 7, and 9. Exploration-related ground disturbances were visible on Lots 3, 6, 7, and 11. Mineral Extraction disturbances were evident on Lots 3, 6 and 7. Cuts and fills relating to mining were visible on Lots 3, 6, 7, 8, and 9, while cuts and fills relating to building or conveyors were visible on Lots 16 and 17. Permanente Road remained blocked by a large fill on Lot 9.

The 1960 “buffer” map (Figure E-3) shows the 50-foot buffers around all of the ground disturbance areas in the 1960 air-photo. Figure E-4 shows the 1939, 1948, 1955, and 1960 “buffers” to illustrate the time progression.

LIST OF PHOTOS USED

1939 air-photo (taken on 8-1-1939): Santa Clara County Archives (CIV-286-71)

1948 air-photo (taken on 9-26-1948): Google Earth Historic Images

1955 air-photo (taken on 6-8-1955): Pacific Aerial Surveys (AV 170-23-20 and AV 170-24-18)

1960 air-photo (taken on 8-22-1960): Pacific Aerial Surveys (AV 385-07-14)

LIST OF HISTORIC REPORTS USED

Tolman, C.F.; 6-18-1939; Report on Tonnage and Composition of Limestone Available in Proposed Quarries A and B, Permanente Corporation, and Superficial Residual Clay on the Property of the Permanente Corporation, Santa Clara County, California; Stanford University.

Pantin, J.H.; 11-1946; (report) Insoluble Residues of the Calera Limestone in Santa Clara County, California; Stanford University.

Matheison, E.; 5-28-1982; (report) Geology of the Permanente Property, Kaiser Cement Corporation, Permanente, California; xx pages text and three plates.

Table A - Lot Ownership and Year when acquired by Permanente

Lot #	Common Reference	Date Acquired
1	Santa Clara Holding Company	1939
2	Roman Catholic Archbishop of SF	1942
3	Santa Clara Holding Company	1939
4	Mid-Peninsula Open Space Dist.	2009
5	Roman Catholic Archbishop of SF	1942
6	Santa Clara Holding Company	1939
7	Santa Clara Holding Company	1939
8	Roman Catholic Archbishop of SF	1941
9	Santa Clara Holding Company	1939
10	Hart & Scully	1965
11	Crocker	1943
12	Campbell	1968
13	Barnard	1979
14	Morris	1942
15	Morris	1942
16	Santa Clara Holding Company	1939
17	Roman Catholic Archbishop of SF	1942*
18	Haines	1956
19	Valley Title	1967

* acquired by Permanente Metals

SCHC = Santa Clara Holding Company

Table B - Lot Ownership Changes and Ground Disturbances in 1939 Air-photo

Lot #	Common Reference	Year Acquired	Roads	Exploration	Mineral Extraction	Cuts and Fills
1	SCHC	1939	-	-	-	-
2	Archbishop	1942	-	-	-	-
3	SCHC	1939	R-l	-	-	-
4	Mid-Pen	2009	-	-	-	-
5	Archbishop	1942	-	-	-	-
6	SCHC	1939	R-l	E	M	F-m
7	SCHC	1939	R-h	E	M	F-m
8	Archbishop	1941	R**	-	-	-
9	SCHC	1939	R-h	E	-	F-m
10	Hart & Scully	1965	-	-	-	-
11	Crocker	1943	-	-	-	-
12	Campbell	1968	-	-	-	-
13	Barnard	1979	R-l	-	-	-
14	Morris	1942	-	-	-	-
15	Morris	1942	R-l	-	-	-
16	SCHC	1939	R-h	-	-	F-c
17	Archbishop	1942*	-	-	-	-
18	Haines	1956	-	-	-	-
19	Valley Title	1967	-	-	-	-

* acquired by Permanente Metals

SCHC = Santa Clara Holding Company

R-l = light use roads

R-h = heavy use roads

R** = County road only

F-m = mining-related fills (including conveyors)

F-c = fill for construction

Disturbances noted above may include all or a portion of each lot.

Table C - Lot Ownership Changes and Ground Disturbances in 1948 Air-photo

Lot #	Common Reference	Year Acquired	Roads	Exploration	Mineral Extraction	Cuts and Fills
1	SCHC	1939	-	-	-	-
2	Archbishop	1942	R-l	-	-	-
3	SCHC	1939	R-h	E	M	F-m
4	Mid-Pen	2009	R-l	-	-	-
5	Archbishop	1942	R-h	-	-	-
6	SCHC	1939	R-h	E	M	F-m
7	SCHC	1939	R-h	E	M	F-m
8	Archbishop	1941	R**	-	-	F-m
9	SCHC	1939	R-h	E	-	F-m
10	Hart & Scully	1965	-	-	-	-
11	Crocker	1943	-	E	-	-
12	Campbell	1968	-	-	-	-
13	Barnard	1979	R-l	-	-	-
14	Morris	1942	-	-	-	-
15	Morris	1942	R-l	-	-	-
16	SCHC	1939	R-l	-	-	F-c
17	Archbishop	1942*	-	-	-	F-c
18	Haines	1956	-	-	-	-
19	Valley Title	1967	-	-	-	-

* acquired by Permanente Metals

SCHC = Santa Clara Holding Company

added or increased since 1939

R-l = light use roads

R-h = heavy use roads

R** = County road only

F-m = mining-related fills (including conveyors)

F-c = fill for construction

Disturbances noted above may include all or a portion of each lot.

Table D - Lot Ownership Changes and Ground Disturbances in 1955 Air-photo

Lot #	Common Reference	Year Acquired	Roads	Exploration	Mineral Extraction	Cuts and Fills
1	SCHC	1939	-	-	-	-
2	Archbishop	1942	R-l	-	-	-
3	SCHC	1939	R-h	E	M	F-m
4	Mid-Pen	2009	R-l	-	-	-
5	Archbishop	1942	R-h	-	-	-
6	SCHC	1939	R-h	E	M	F-m
7	SCHC	1939	R-h	E	M	F-m
8	Archbishop	1941		-	-	F-m
9	SCHC	1939	R-h	-	-	F-m
10	Hart & Scully	1965	-	-	-	-
11	Crocker	1943	-	E	-	-
12	Campbell	1968	-	-	-	-
13	Barnard	1979	R-l	-	-	-
14	Morris	1942	-	-	-	-
15	Morris	1942	R-l	-	-	-
16	SCHC	1939	R-l	-	-	F-c
17	Archbishop	1942*	R-l	-	-	F-c
18	Haines	1956	-	-	-	-
19	Valley Title	1967	-	-	-	-

* acquired by Permanente Metals

SCHC = Santa Clara Holding Company

added or increased since 1948

R-l = light use roads

R-h = heavy use roads

R** = County road only

F-m = mining-related fills (including conveyors)

F-c = fill for construction

Disturbances noted above may include all or a portion of each lot.

Table E - Lot Ownership Changes and Ground Disturbances in 1960 Air-photo

Lot #	Common Reference	Year Acquired	Roads	Exploration	Mineral Extraction	Cuts and Fills
1	SCHC	1939	-	-	-	-
2	Archbishop	1942	R-l	-	-	-
3	SCHC	1939	R-h	E	M	F-m
4	Mid-Pen	2009	R-l	-	-	-
5	Archbishop	1942	R2	-	-	-
6	SCHC	1939	R-h	E	M	F-m
7	SCHC	1939	R-h	E	M	F-m
8	Archbishop	1941	R**	-	-	F-m
9	SCHC	1939	R-h	-	-	F-m
10	Hart & Scully	1965	-	-	-	-
11	Crocker	1943	-	E	-	-
12	Campbell	1968	-	-	-	-
13	Barnard	1979	R-l	-	-	-
14	Morris	1942	-	-	-	-
15	Morris	1942	R-l	-	-	-
16	SCHC	1939	R-l	-	-	F-c
17	Archbishop	1942*	R-l	-	-	F-c
18	Haines	1956	-	-	-	-
19	Valley Title	1967	-	-	-	-

* acquired by Permanente Metals

SCHC = Santa Clara Holding Company

added or increased since 1955

R-l = light use roads

R-h = heavy use roads

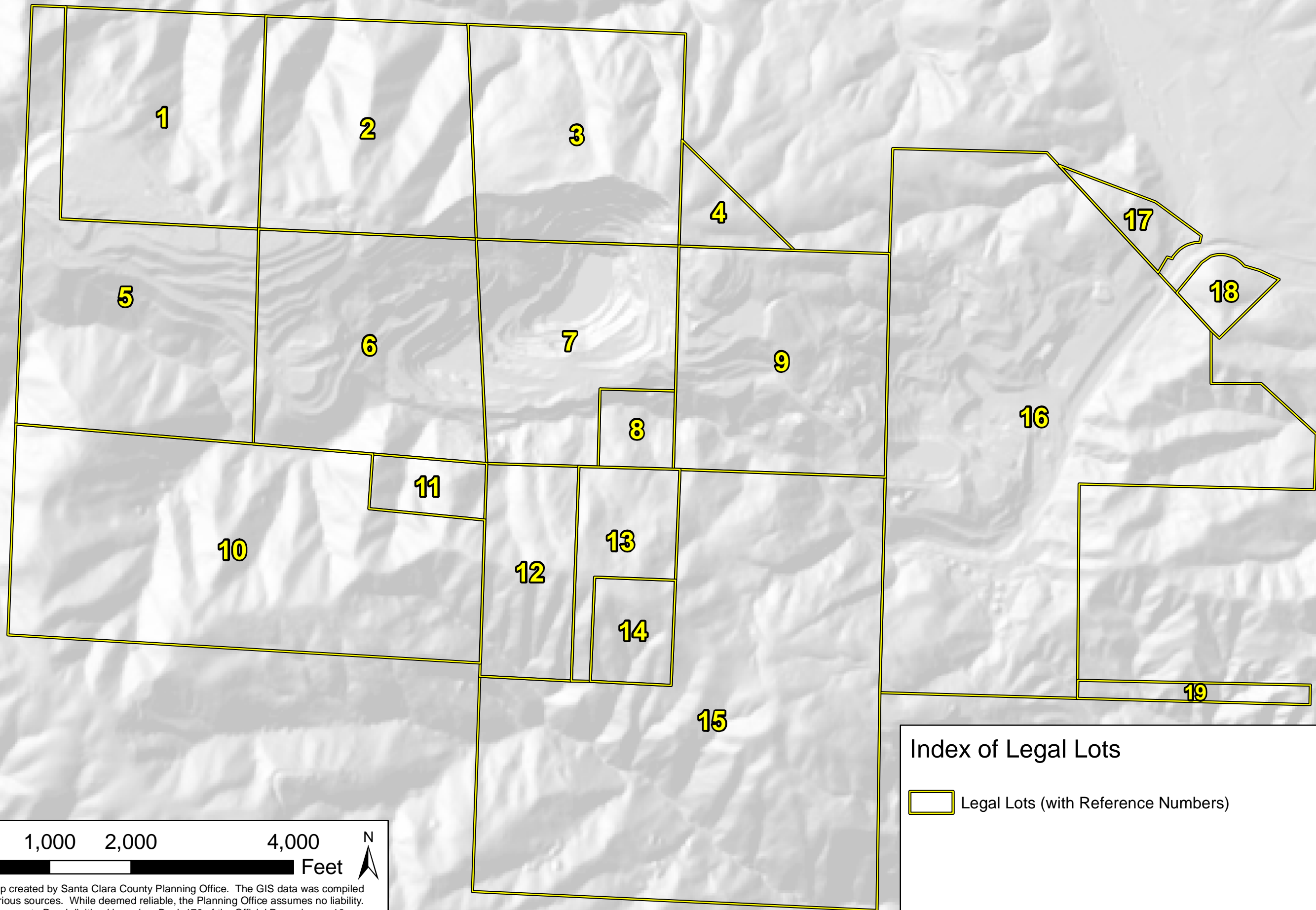
R** = County road only

F-m = mining-related fills (including conveyors)

F-c = fill for construction

Disturbances noted above may include all or a portion of each lot.

Figure A-1



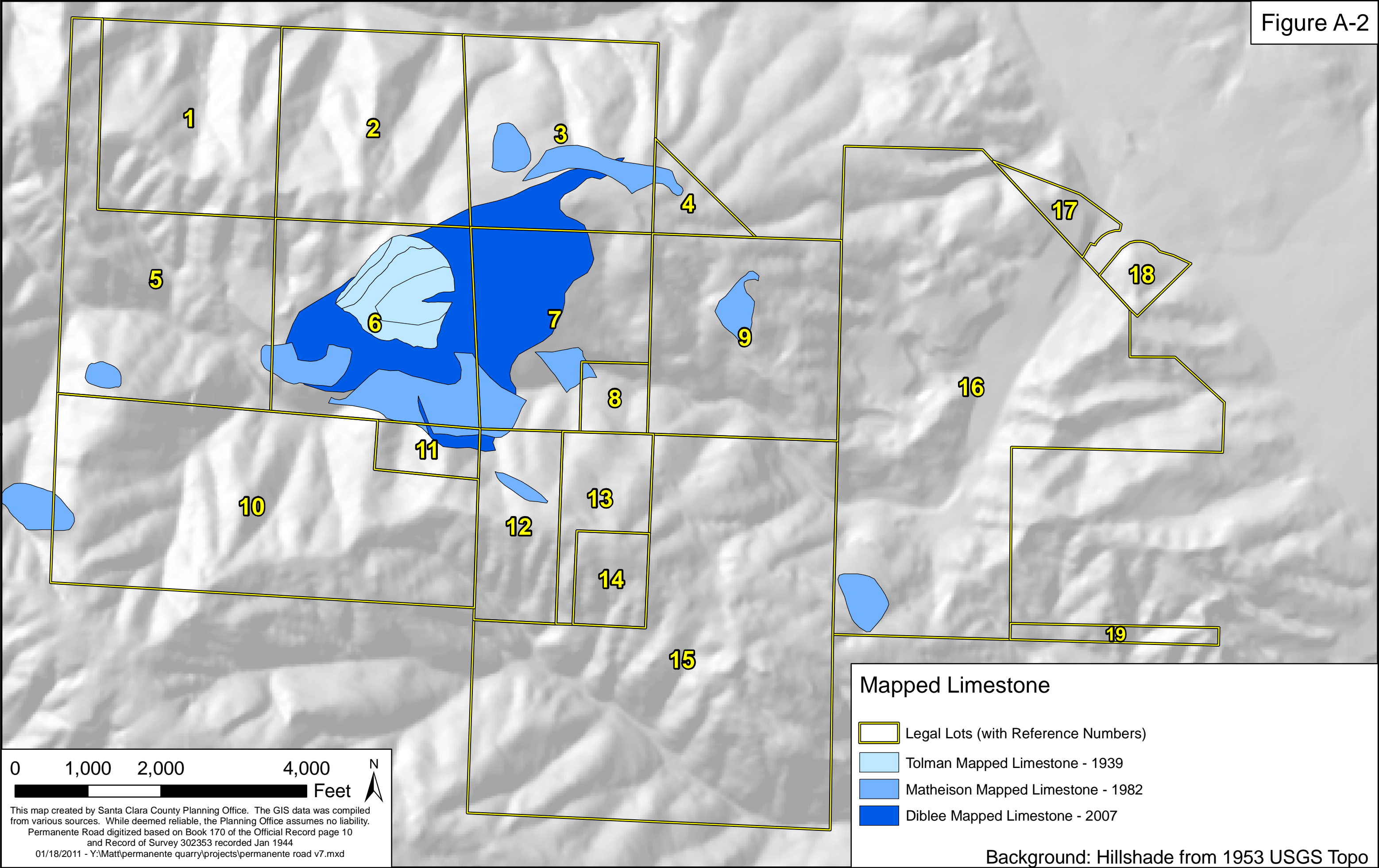
This map created by Santa Clara County Planning Office. The GIS data was compiled from various sources. While deemed reliable, the Planning Office assumes no liability. Permanente Road digitized based on Book 170 of the Official Record page 10 and Record of Survey 302353 recorded Jan 1944
01/18/2011 - Y:\Matt\permanente quarry\projects\permanente road v7.mxd

Index of Legal Lots

 Legal Lots (with Reference Numbers)

Background: Hillshade from 2006 LiDAR

Figure A-2



0 1,000 2,000 4,000 Feet

This map created by Santa Clara County Planning Office. The GIS data was compiled from various sources. While deemed reliable, the Planning Office assumes no liability. Permanente Road digitized based on Book 170 of the Official Record page 10 and Record of Survey 302353 recorded Jan 1944

01/18/2011 - Y:\Matt\permanente quarry\projects\permanente road v7.mxd

Figure B-1

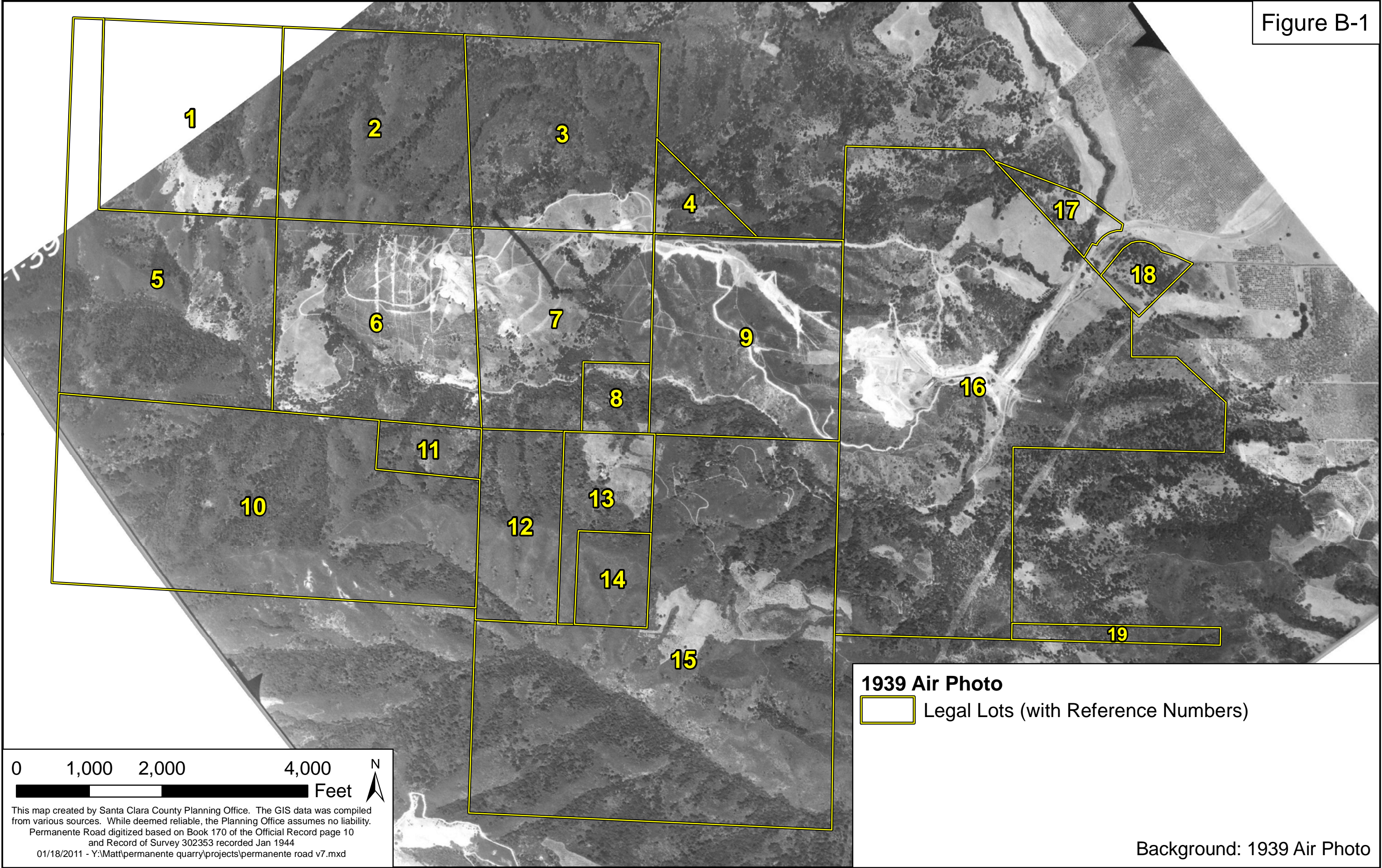


Figure B-2

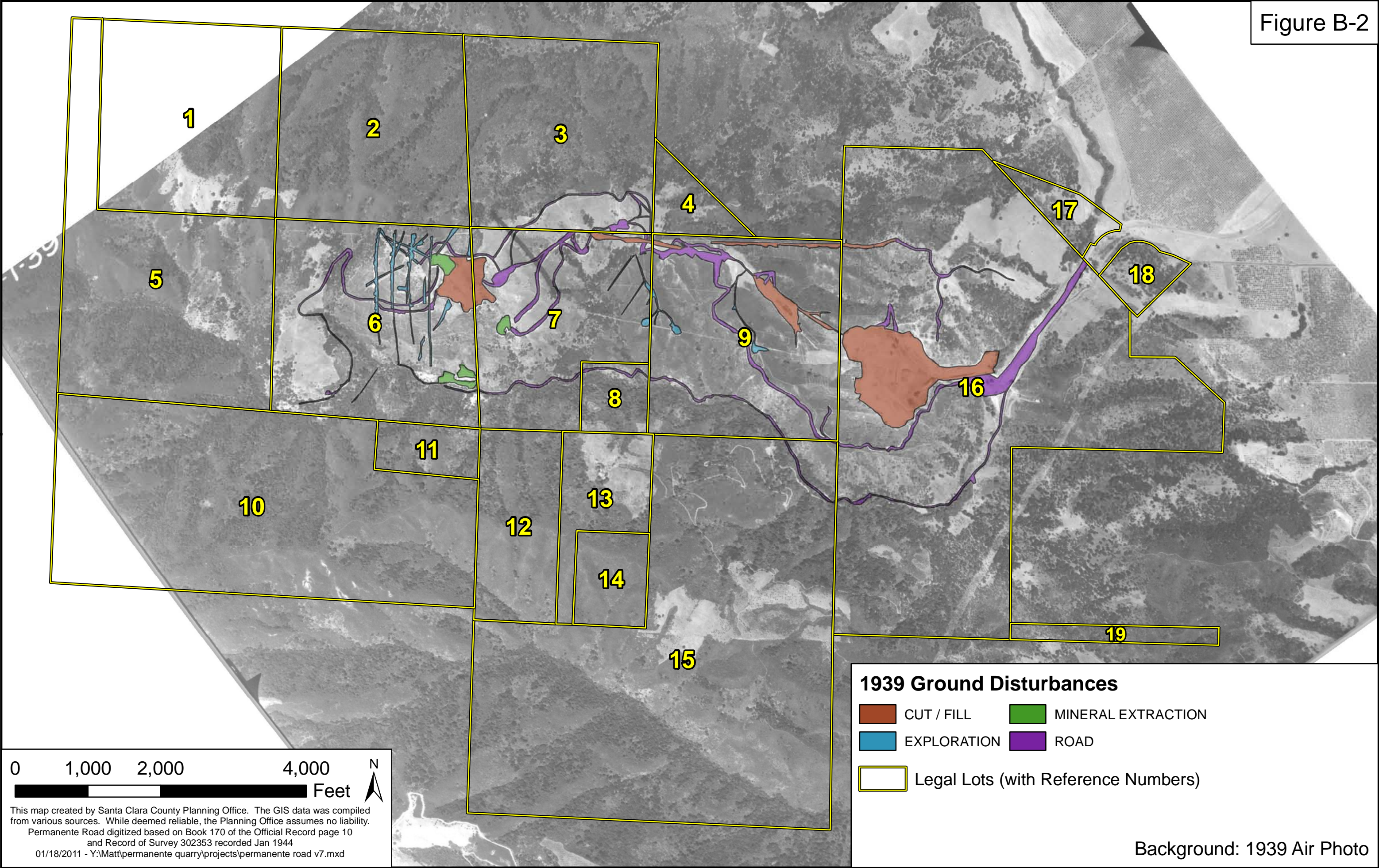


Figure B-3

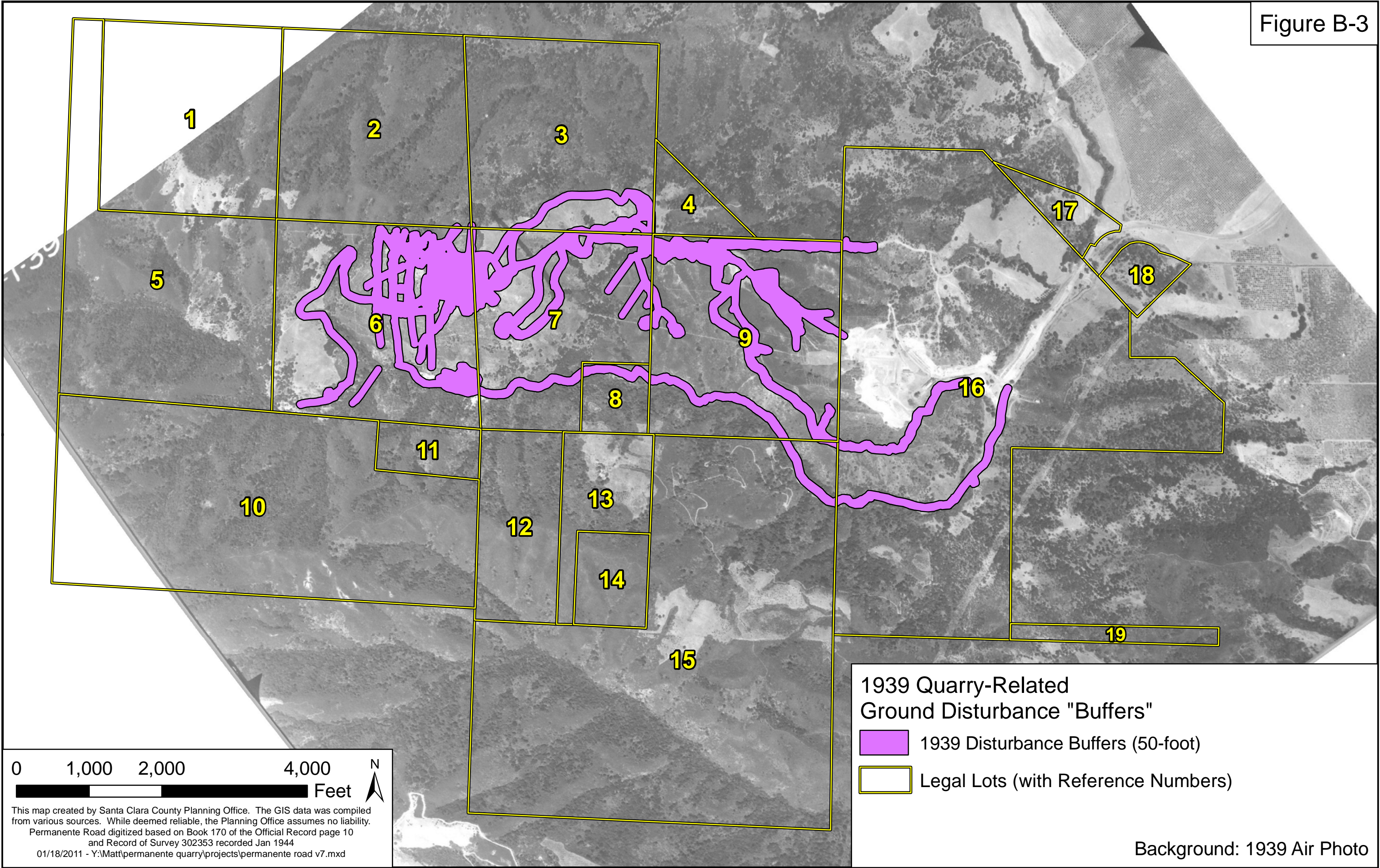
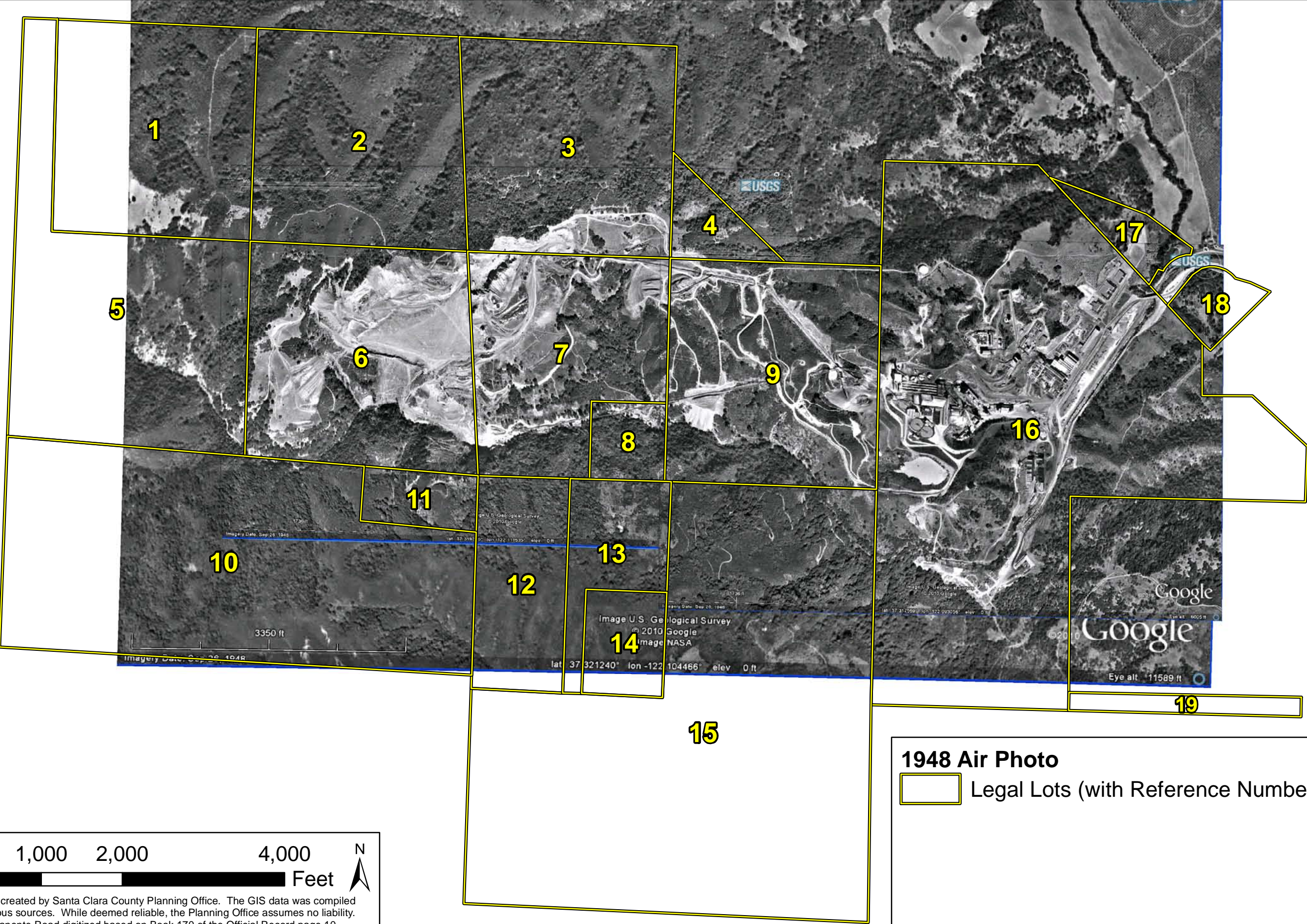


Figure C-1



1948 Air Photo

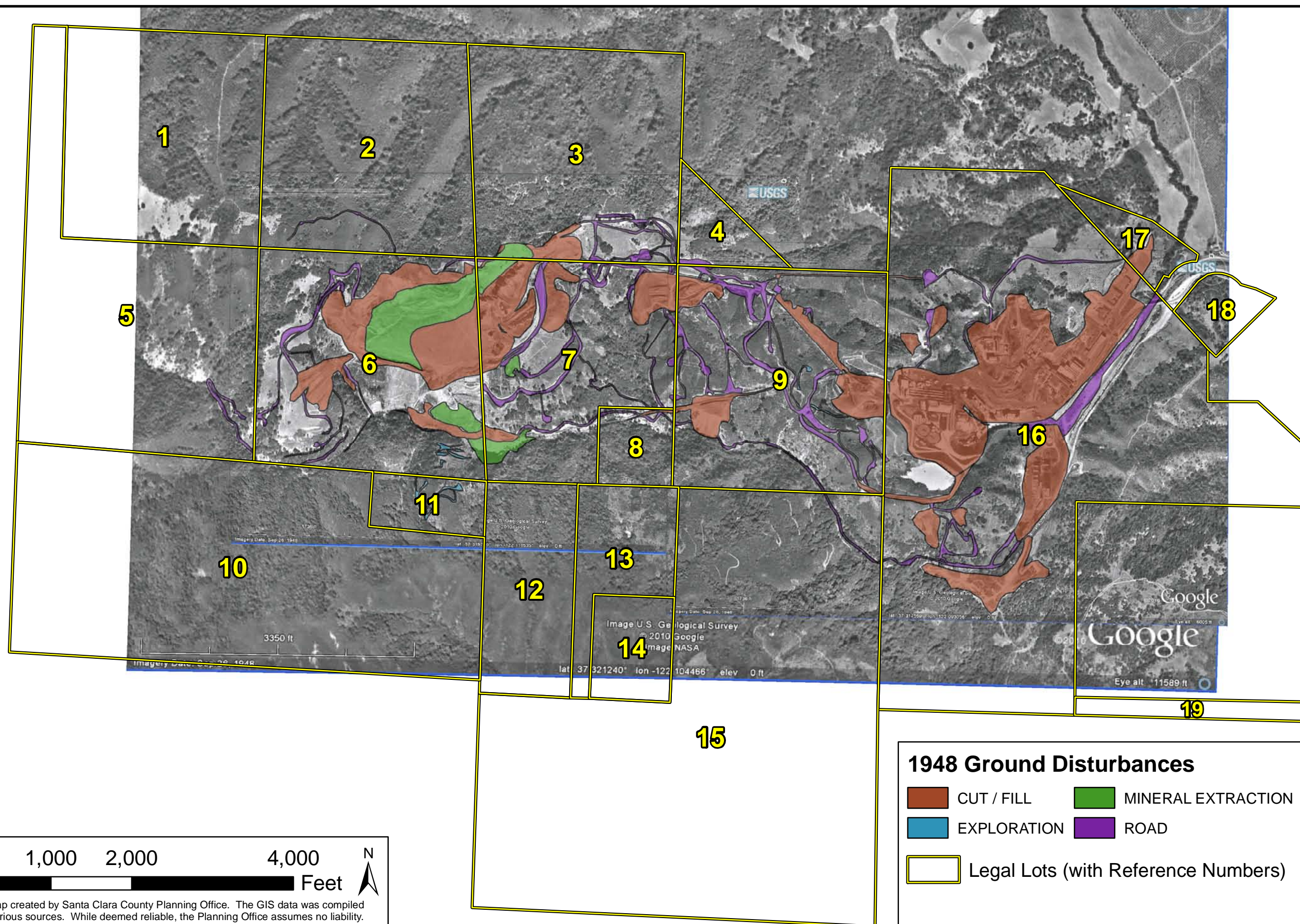
 Legal Lots (with Reference Numbers)



This map created by Santa Clara County Planning Office. The GIS data was compiled from various sources. While deemed reliable, the Planning Office assumes no liability. Permanente Road digitized based on Book 170 of the Official Record page 10 and Record of Survey 302353 recorded Jan 1944
01/18/2011 - Y:\Matt\permanente quarry\projects\permanente road v7.mxd

Background: 1948 Air Photo

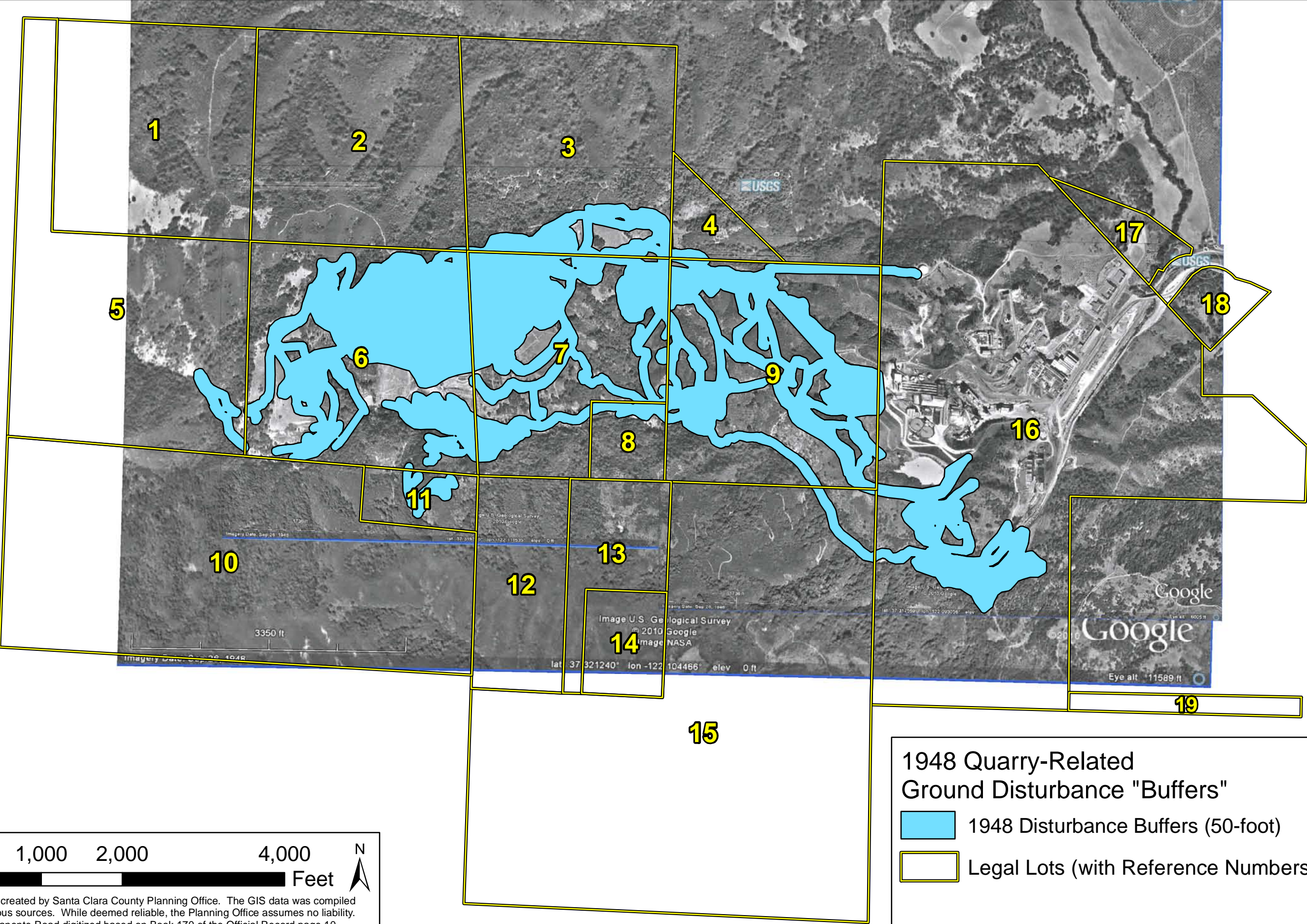
Figure C-2



This map created by Santa Clara County Planning Office. The GIS data was compiled from various sources. While deemed reliable, the Planning Office assumes no liability. Permanent Road digitized based on Book 170 of the Official Record page 10 and Record of Survey 302353 recorded Jan 1944
01/18/2011 - Y:\Matt\permanent quarry\projects\permanent road v7.mxd

Background: 1948 Air Photo

Figure C-3



1948 Quarry-Related
Ground Disturbance "Buffers"

- 1948 Disturbance Buffers (50-foot)
- Legal Lots (with Reference Numbers)

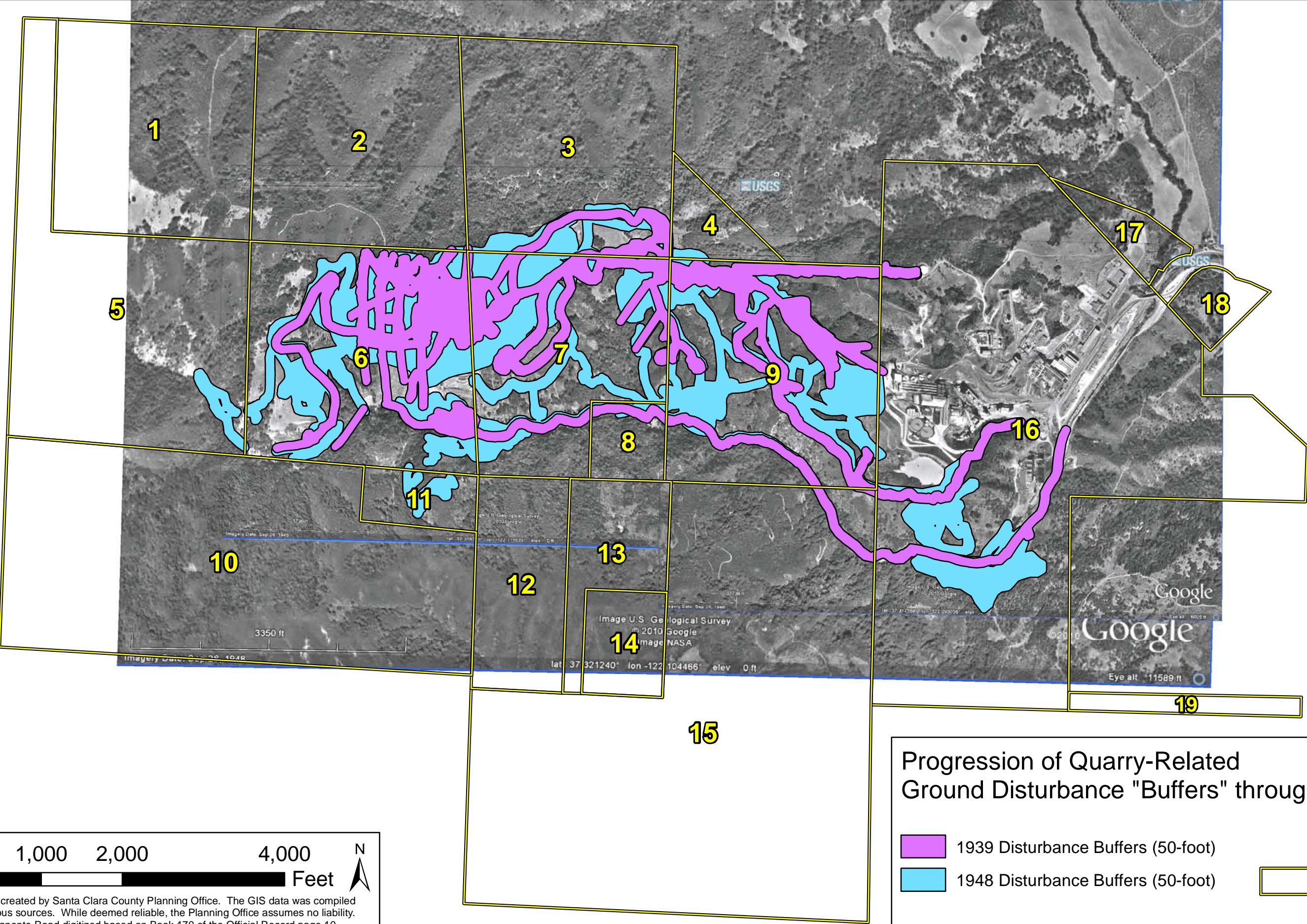
Background: 1948 Air Photo

0 1,000 2,000 4,000 Feet

This map created by Santa Clara County Planning Office. The GIS data was compiled from various sources. While deemed reliable, the Planning Office assumes no liability. Permanente Road digitized based on Book 170 of the Official Record page 10 and Record of Survey 302353 recorded Jan 1944




01/18/2011 - Y:\Matt\permanente quarry\projects\permanente road v7.mxd

Figure C-4



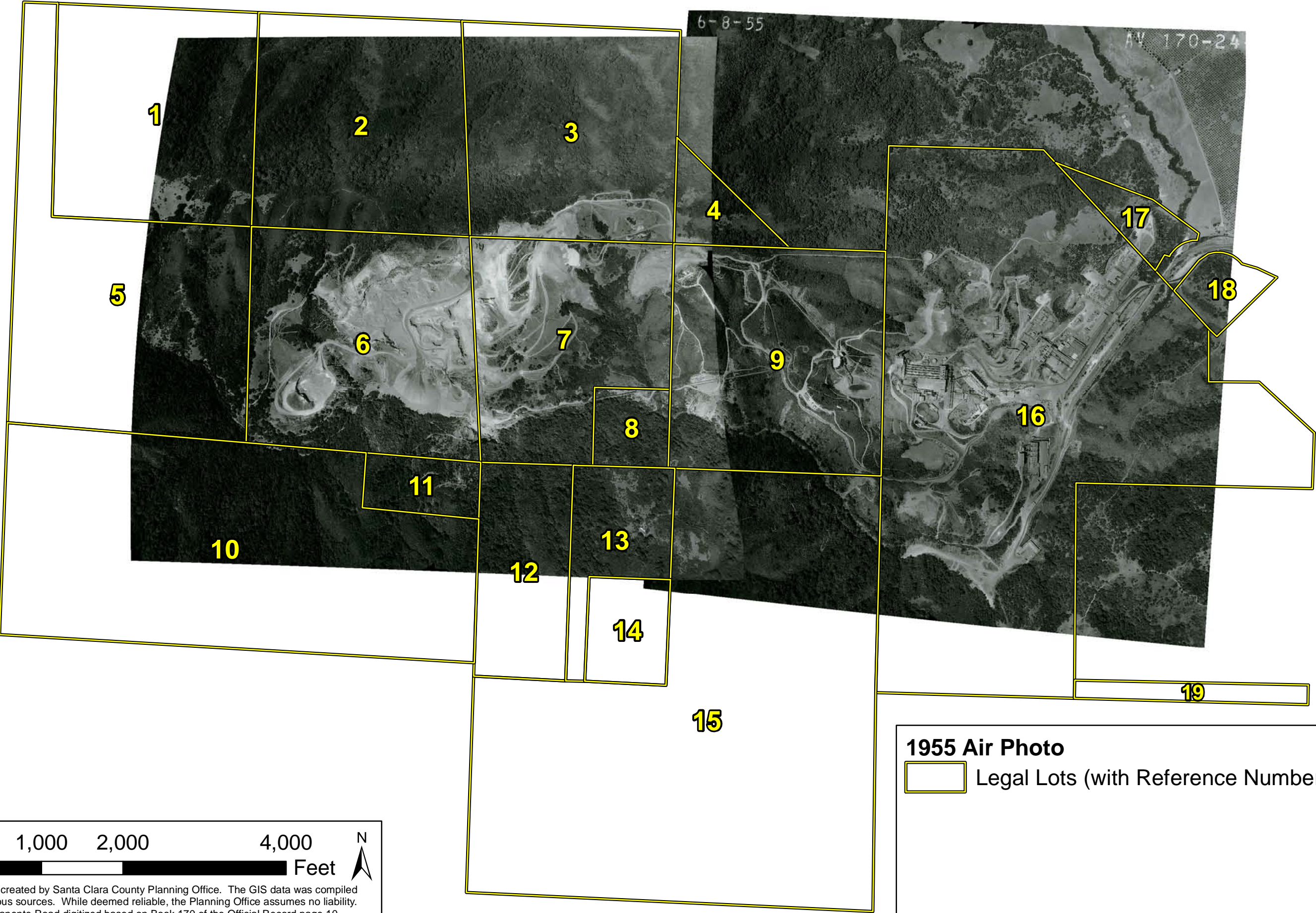
This map created by Santa Clara County Planning Office. The GIS data was compiled from various sources. While deemed reliable, the Planning Office assumes no liability. Permanente Road digitized based on Book 170 of the Official Record page 10 and Record of Survey 302353 recorded Jan 1944
01/18/2011 - Y:\Matt\permanente quarry\projects\permanente road v7.mxd

Progression of Quarry-Related Ground Disturbance "Buffers" through 1948

 1939 Disturbance Buffers (50-foot)	 Legal Lots (With Reference Numbers)
 1948 Disturbance Buffers (50-foot)	

Background: 1948 Air Photo

Figure D-1



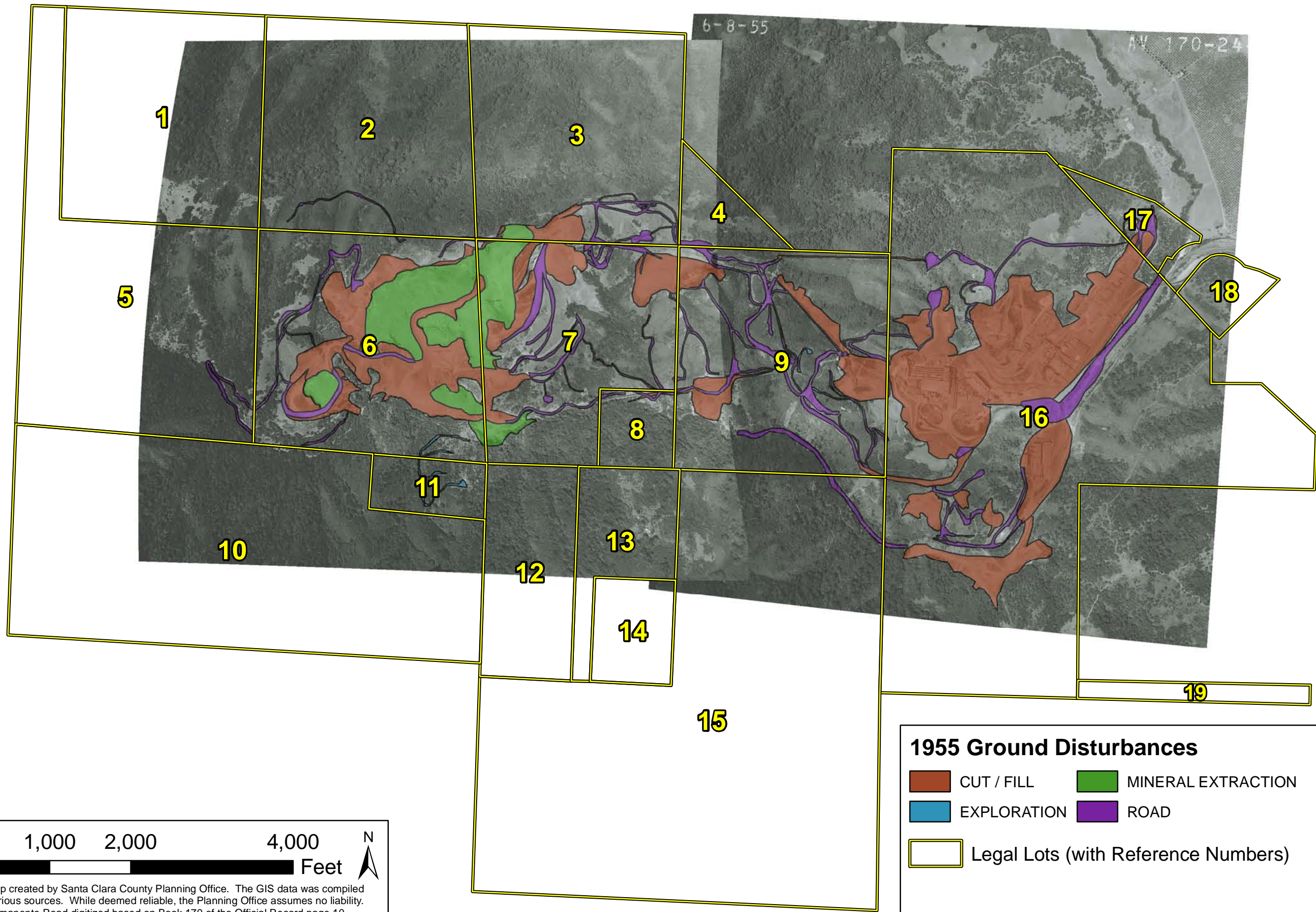
This map created by Santa Clara County Planning Office. The GIS data was compiled from various sources. While deemed reliable, the Planning Office assumes no liability. Permanente Road digitized based on Book 170 of the Official Record page 10 and Record of Survey 302353 recorded Jan 1944
01/18/2011 - Y:\Matt\permanente quarry\projects\permanente road v7.mxd

1955 Air Photo

 Legal Lots (with Reference Numbers)

Background: 1955 Air Photo

Figure D-2



1955 Ground Disturbances

- | | |
|---|--|
|  CUT / FILL |  MINERAL EXTRACTION |
|  EXPLORATION |  ROAD |
|  Legal Lots (with Reference Numbers) | |

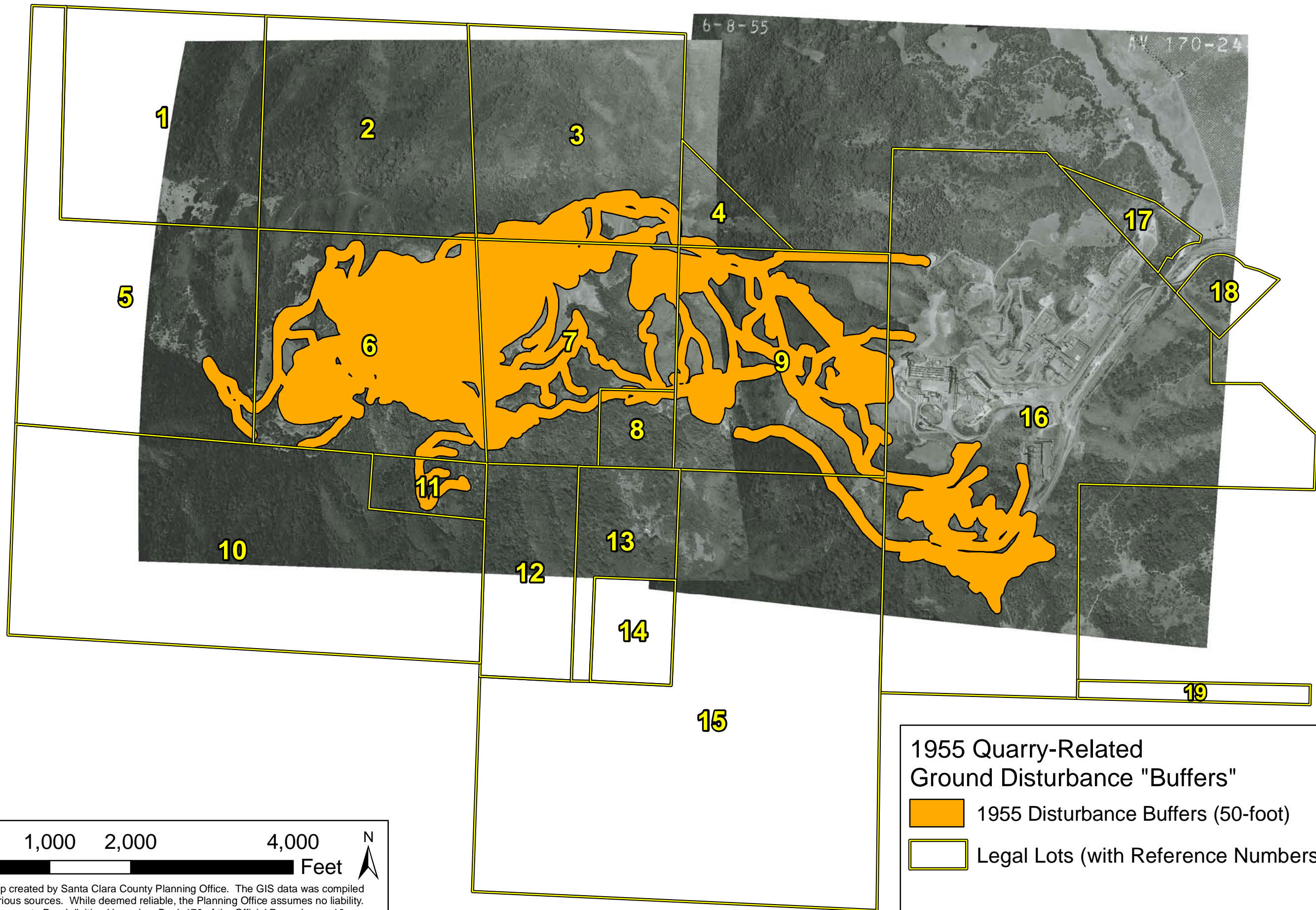
0 1,000 2,000 4,000 Feet

This map created by Santa Clara County Planning Office. The GIS data was compiled from various sources. While deemed reliable, the Planning Office assumes no liability. Permanente Road digitized based on Book 170 of the Official Record page 10 and Record of Survey 302353 recorded Jan 1944



01/18/2011 - Y:\Matt\permanente quarry\projects\permanente road v7.mxd

Background: 1955 Air Photo

Figure D-3



1955 Quarry-Related
Ground Disturbance "Buffers"

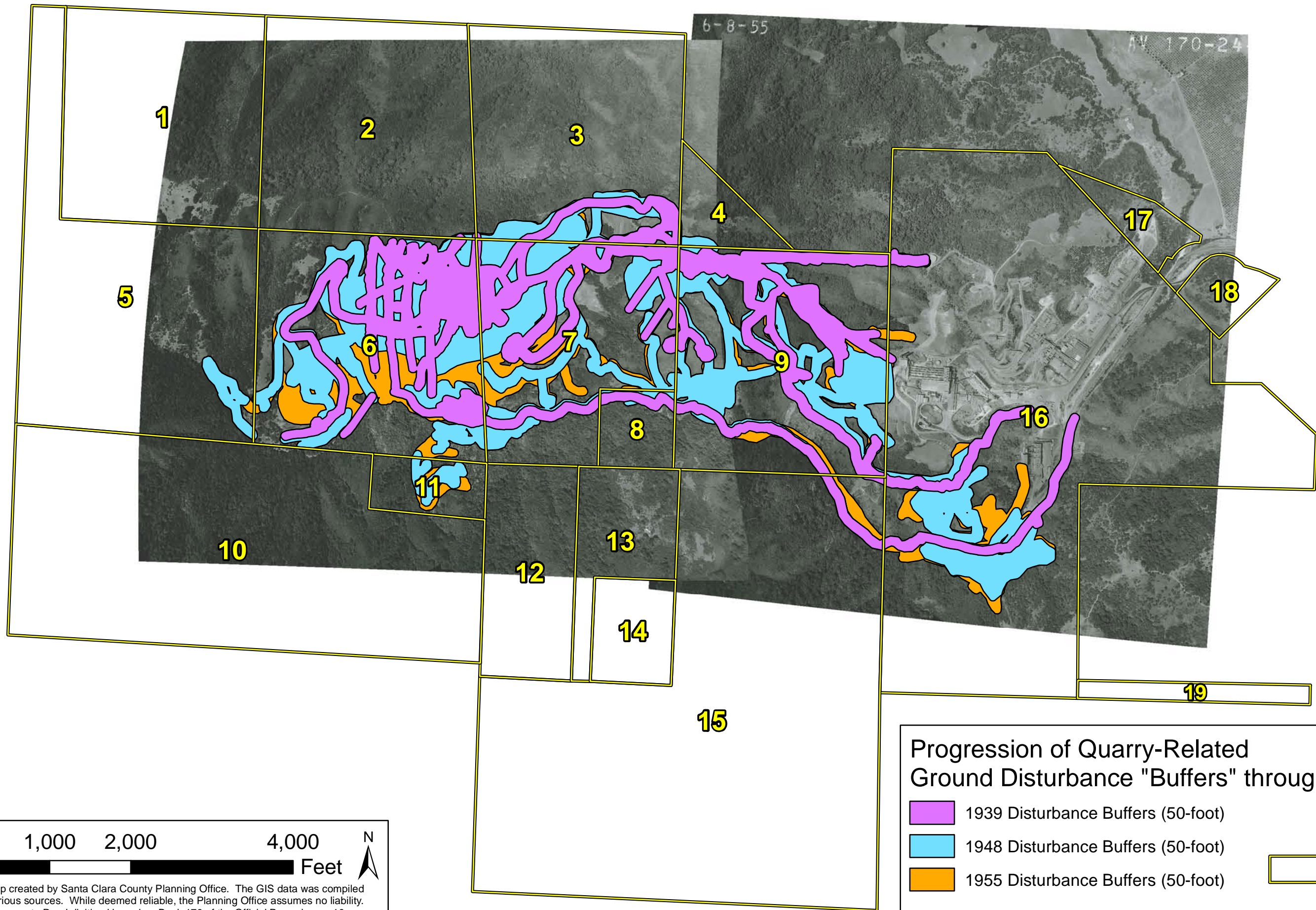
-  1955 Disturbance Buffers (50-foot)
-  Legal Lots (with Reference Numbers)

0 1,000 2,000 4,000 Feet

This map created by Santa Clara County Planning Office. The GIS data was compiled from various sources. While deemed reliable, the Planning Office assumes no liability. Permanente Road digitized based on Book 170 of the Official Record page 10 and Record of Survey 302353 recorded Jan 1944
01/18/2011 - Y:\Matt\permanente quarry\projects\permanente road v7.mxd

Background: 1955 Air Photo

Figure D-4



0 1,000 2,000 4,000 Feet

This map created by Santa Clara County Planning Office. The GIS data was compiled from various sources. While deemed reliable, the Planning Office assumes no liability. Permanente Road digitized based on Book 170 of the Official Record page 10 and Record of Survey 302353 recorded Jan 1944
01/18/2011 - Y:\Matt\permanente quarry\projects\permanente road v7.mxd

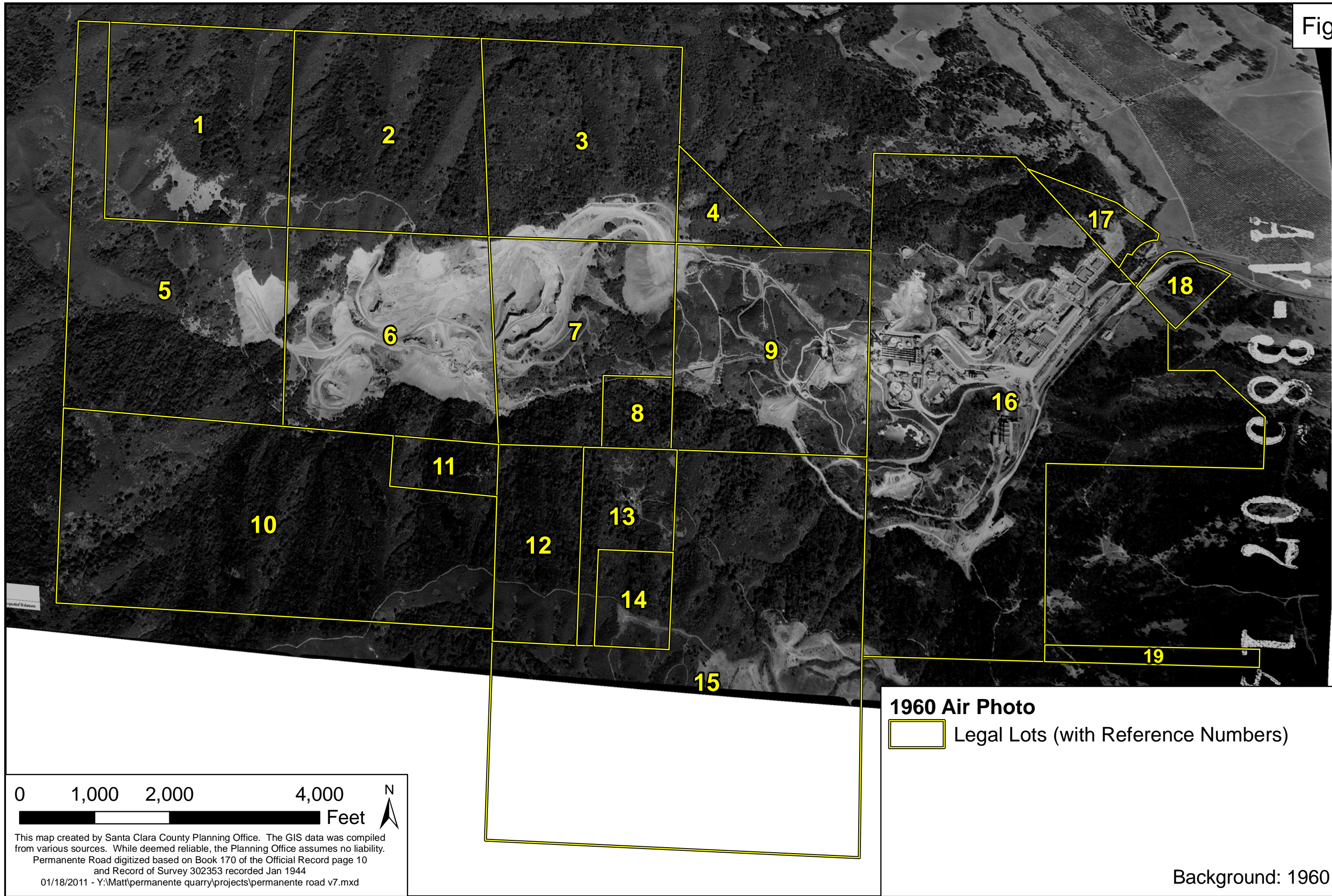
Progression of Quarry-Related Ground Disturbance "Buffers" through 1955

- 1939 Disturbance Buffers (50-foot)
- 1948 Disturbance Buffers (50-foot)
- 1955 Disturbance Buffers (50-foot)

Legal Lots (With Reference Numbers)

Background: 1955 Air Photo

Figure E-1



0 1,000 2,000 4,000 Feet

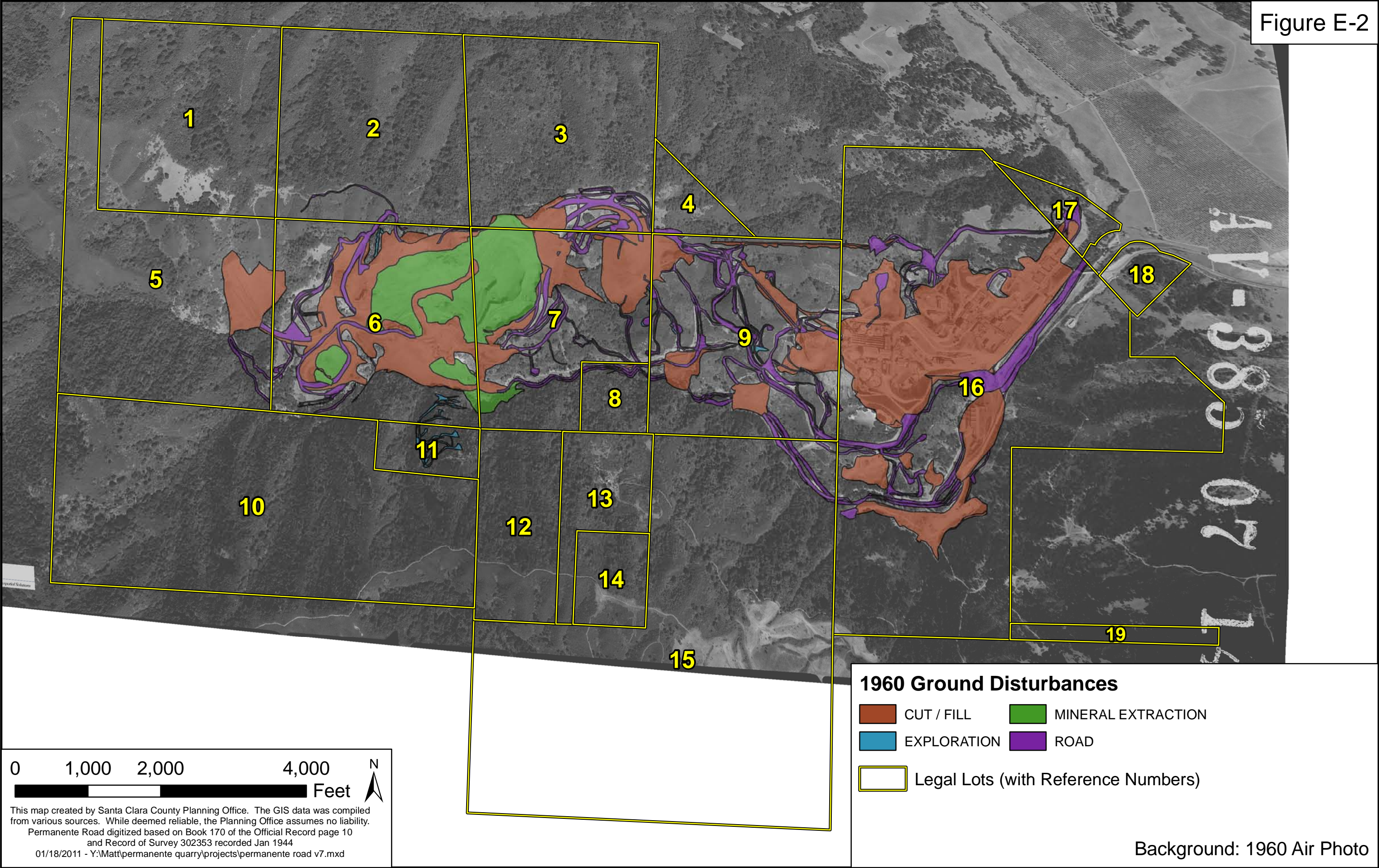
This map created by Santa Clara County Planning Office. The GIS data was compiled from various sources. While deemed reliable, the Planning Office assumes no liability. Permanente Road digitized based on Book 170 of the Official Record page 10 and Record of Survey 302353 recorded Jan 1944
01/18/2011 - Y:\Matt\permanente quarry\projects\permanente road v7.mxd

1960 Air Photo

Legal Lots (with Reference Numbers)

Background: 1960 Air Photo

Figure E-2



0 1,000 2,000 4,000 Feet

This map created by Santa Clara County Planning Office. The GIS data was compiled from various sources. While deemed reliable, the Planning Office assumes no liability. Permanente Road digitized based on Book 170 of the Official Record page 10 and Record of Survey 302353 recorded Jan 1944

01/18/2011 - Y:\Matt\permanente quarry\projects\permanente road v7.mxd

Figure E-3

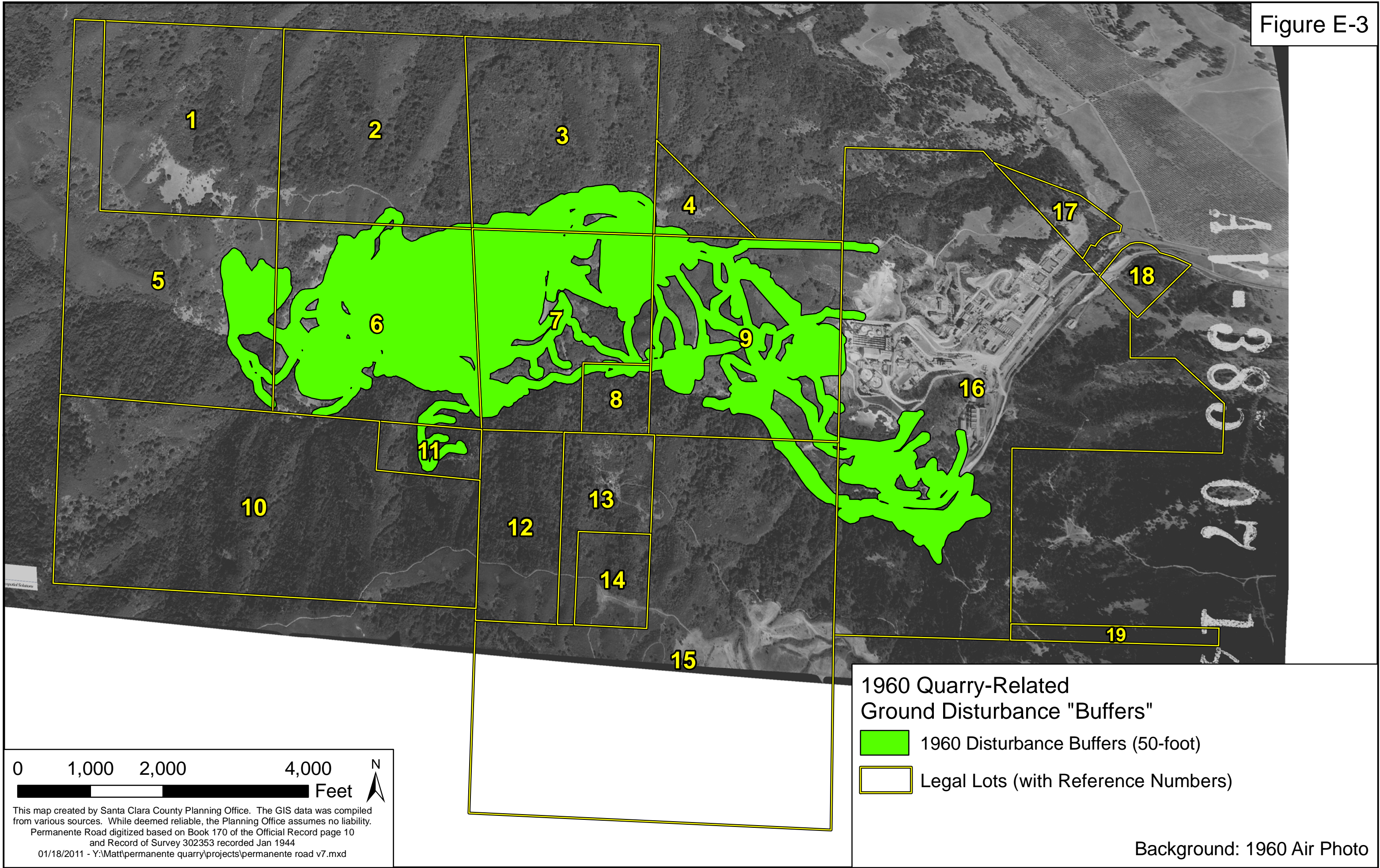
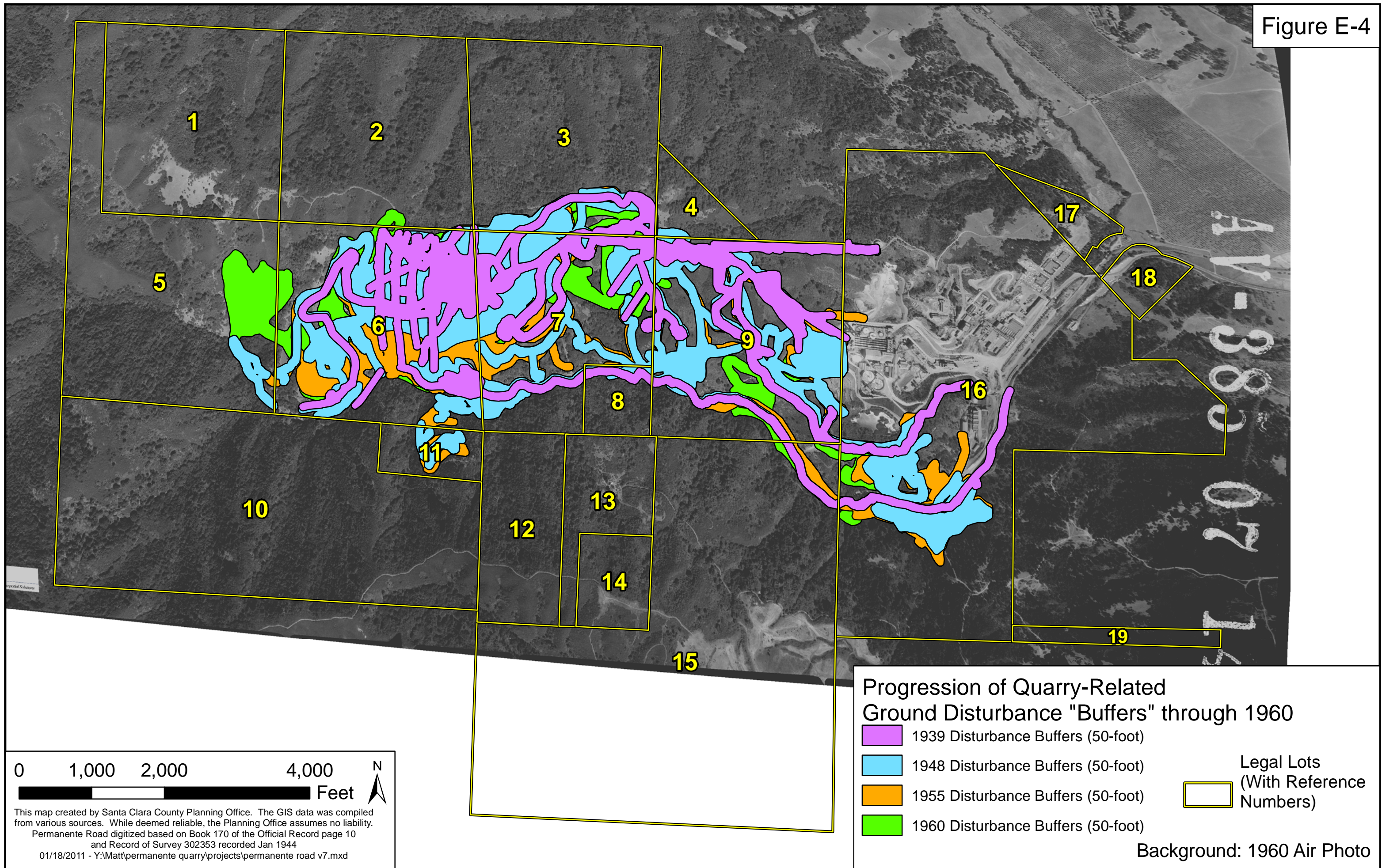


Figure E-4



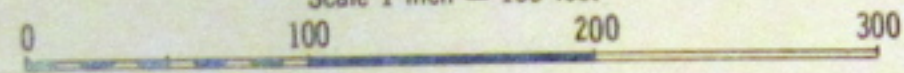
GEOLOGIC MAP OF PROPOSED QUARRIES A AND B PERMANENTE CORPORATION SANTA CLARA COUNTY, CALIFORNIA

Showing area trenched and sampled in detail
by Jackhammer holes, Diamond Drill holes,
Churn Drill holes, and outcrop samples.

Quarry A from 1700 contour to 1930 contour
Quarry B from 1500 contour to 1700 contour

LEGEND

Scale 1 inch = 100 feet



Contour Interval 10 feet

Datum Mean Sea Level

- Roads —
- Jackhammer Holes
Drilled by Permanente Corporation
- Diamond Drill Holes
Drilled by Permanente Corporation
Drilled by Santa Clara Holding Co.
- Churn Drill Holes
Drilled by California Portland Cement Co.
- Outcrop Samples
Taken by Permanente Corporation

- Franciscan formation
 - Upper light limestone; contains chert
 - Dark limestone; high calcium carbonate,
low chert, colored by hydrocarbon residues
 - Sandstone and shale
 - Andesite
- Faults
- Breccia Zones
- Rock contacts. Exposed
- Rock contacts. Not Exposed

June 14, 1939

Geologist



