CHAPTER 6
LABORATORY AND RESEARCH METHODS

LABORATORY METHODS

The laboratory methods for the SF-80 Bayshore Viaduct Seismic Retrofit Projects (SF-80 Bayshore Project) were developed for use on late-19th- to early-20th-century stratified urban deposits, in which the most common features to be excavated are privies, pits, and wells containing large quantities of artifacts. These hollow features are usually filled over a relatively brief period of time, often representing a single event. The sections below describe the methods used to process and catalog the collections. The Anthropological Studies Center (ASC) has been using these methods for over a decade on dozens of sites, resulting in a suite of archaeological databases that are truly comparative.

All artifacts and other recovered cultural materials remain the property of Caltrans; the collection will be permanently curated at the Archaeological Collections Facility at Sonoma State University, Rohnert Park, California. In addition to the artifacts and the faunal and floral remains, the facility will also archive copies of the field notes and drawings and the final report.

PROCESSING PROCEDURES

For each context (numbered field stratum) from an CRHR-eligible feature, all recovered materials were taken to the laboratory facilities of the ASC at Sonoma State University, where they were cleaned, sorted by material type, permanently labeled with a number, and cataloged. A provenience-based numbering system that includes two elements was used: the main catalog number represents the context, or layer, from which the artifact was recovered, while the subcatalog number is an assigned sequential number, beginning with 1 for each artifact or lot (group of like artifacts), within a context.

Once labeled, the artifacts were grouped by feature and cataloged. As each material class (ceramic, glass, metal, and other) was laid out, artifacts were first crossmended within contexts and then throughout the feature. Information on crossmends between contexts and features was subsequently used, in conjunction with stratigraphic data, to interpret the history of the deposit. Ceramics were grouped by fabric and then sorted by form, function, and decoration. Makers' marks and identifiable patterns were researched to ascertain origin and date range.

Glass artifacts were initially sorted by color and then by form: tableware/serving/drinking use, bottles, or windowpane. Tableware/serving/drinking items were cataloged by color, form, function, and decoration. Bottles were cataloged by color and function, where bottle shape, finish type, or embossment was used to determine original bottle contents. Temporally diagnostic manufacturing techniques were noted where applicable. Embossed and marked items were researched to identify manufacturer, contents, origin, and date range. Window glass was counted, weighed, and discarded.

Metal artifacts were identified by material and function. Complete nails were counted and measured while fragments were sorted, nail heads counted, and the lot weighed before being discarded. Marked items were researched, identified, and dated where possible. Nondiagnostic items were counted, weighed, and discarded. Other artifacts—such as buttons, slate pencils, tobacco pipes, and game pieces—were identified by material and function. Marked items were researched to identify manufacturer, origin, and date.

Once the collection was processed, photography began. Artifacts from the seven privy features were laid out and photographed as a group, and close-up vignettes were taken of selected artifact groupings. Both were photographed in black-and-white prints and color slides.

FUNCTIONAL CATEGORIES

The artifacts are presented in the artifact catalogs and summary tables according to a general functional classification based on Stanley South's (1977) categories, which have been modified and expanded for use with mid-19th- to early-20th-century sites in the western United States. The materials are separated into broad Group divisions and then further split into Class and Subclass. For the purposes analytical research and intrasite comparison, the Class division is the most versatile level, allowing a comprehensive range of functions while maintaining a manageable aggregate of categories.

Most group and class names have been used by the ASC for nearly two decades, while some have been slightly altered over time. A new label, Social Drugs, was recently chosen to replace Indulgences—an outmoded and somewhat ambiguous term. Table 6.1 provides a list of the classifications used to define functional types for this project.

MINIMUM NUMBER OF ITEMS (MNI)

When artifacts are quantified in a standard analytical manner, they can be used for intrasite and intersite comparison and analysis. MNIs are the minimum number of individual items (not the number of fragments) represented in an artifact collection (e.g., a bottle broken into 10 fragments is still only 1 item). The kind of artifact-dense deposits encountered on the SF-80 Bayshore Project investigations lend themselves particularly well to determining item counts, as so many objects were discarded intact.

After crossmending was completed, the artifacts were cataloged and the MNI was determined. Each intact object (e.g., complete unbroken bottle) received an MNI of 1. Items that crossmended and were reconstructable, with no missing pieces, were also given an MNI of 1. The remaining artifacts were carefully studied to ascertain whether non-crossmending items could be from the same item. For example, saucer rim sherds that did not physically mend but were of the same material, curvature, thickness, glaze, and decoration were considered associated and given an MNI of 1 for the lot. Similarly, fragments representing unique decorative patterns or forms would each be given an MNI of 1. When it was determined that items conceivably could be from the same object, an MNI of 1 was assigned to the group. All items with markers' marks that could

Table 6.1. Artifact Catalog Categories, SF-80 Bayshore Project

Group	Class	Subclass Examples
Activities	Advertising	pins, signs
	Animal Husbandry	horseshoes
	Collecting	stalactites, coral
	Commerce	coins, banks, scale pans
	Entertainment	music (e.g., harmonicas), games (e.g., checker pieces, dominos)
	Firearms	guns, ammunition
	Painting	paint brushes, paint cans
	Pets	bird feeders, dog collars
	Tools	axes, files, folding rulers
	Transportation	carriage parts, harness parts
	Writing	pens, pencils, ink bottles
Domestic	Clothing/Footwear Maintenance	needles, bluing balls, shoe polish bottles
	Food Prep/ Consumption	kitchen (e.g., baking pans, skillets), serving (e.g., platters, teapots), tableware (e.g., plates, forks), drinking vessels (e.g., tumblers, stemware, cups)
	Food/Food Storage	canning jars, crocks, retail food containers (e.g., pickle bottles, Worcestershire sauce bottles)
	Furnishings	furniture, flower pots, vases, pictures
	Heating/Lighting	lamps and chimneys, light bulbs, candle holders
Indefinite Use	-	identified items with more than one potential original use
	Misc. Beads	beads with more than one potential original use
	Misc. Closures	closures associated with contents of indefinite use
	Misc. Containers	bottles, jars, and cans with unidentified contents
	Misc. Metal Items	hardware metal artifacts (e.g., wire, sheet metal) items with more than one potential original use (e.g., bells)
Industrial	Machinery	spark plugs, gears
Personal	Accoutrements	purses, eyeglasses, jewelry
	Clothing	garments, buttons, clothing buckles
	Footwear	shoes, shoe eyelets
	Grooming/Health	toiletry items (e.g., perfume bottles, brushes, chamber pots), medicine bottles (e.g., patent/ proprietary, pharmacy, bitters, vials), syringes
	Social Drugs	retail alcoholic-beverage containers and closures (e.g., wine, beer, champagne, distilled beverages), spittoons, pipes, opium lamps
	Toys	dolls, tea sets, marbles
Structural	Fixtures	sinks, toilets
	Hardware	hinges, brackets, nails
	Materials	window glass, brick
Undefined Use	-	unidentified items (e.g., melted glass, amorphous metal), slag, coal

not be associated with other items in the feature received an MNI count. Unmarked/ Nondiagnostic fragments that conceivably could be associated with marked/ diagnostic items did not receive an MNI. Artifact fragments that exhibited form, color, material, or function unique to a feature were assigned an MNI of 1 (e.g., a single cobalt-blue glass bottle body fragment where there was no other cobalt-blue glass in the feature).

Artifacts that always would have been used together also received on MNI of 1 (e.g., teapot and lid, lid with drainer and dish of a soap-dish drainer). Using this criterion, objects of different materials could be combined and given an MNI of 1 (e.g., a glass nursing bottle with its associated ceramic cap, a glass beer bottle and its associated ferrous crown cap). Items that are often considered a set but not always used or even purchased together, such as a cup and saucer or a washbasin and pitcher, were each given a separated MNI. Shoes were given MNIs based on pairs (e.g., 3 shoes of the same size, 2 left and 1 right, were given and MNI of 2); shoe-related paraphernalia, such as eyelets, were not given an MNI when located in contexts with shoes. Since eyelets were used with items other than shoes, they were each given an MNI when not found in a context with shoes. Similarly, individual buttons were given MNIs, as it was not feasible to assign button counts to separate items of clothing. Another artifact type for which it is difficult to determine MNI counts is beads: for example, a single lamp whimsy could container hundreds of beads of various styles and colors. When a function could not be determined, each bead received an MNI of 1.

Building material was sampled in the field and, unless marked or of architectural interest, was not brought back for cataloging. Nails were also sampled in the field. Without knowing the original window size, it is difficult to establish an MNI for window glass; therefore, fragments were counted but not assigned an MNI. Finally, amorphous items (e.g., melted glass, rusted metal lumps) were not assigned MNIs. The proportion of Undefined items varies due to differential preservation within features; since they cannot be identified, they were not given MNI counts.

DATING METHODS

All artifacts were studied to determine if they were temporally diagnostic. When present, ceramic makers' marks were noted and researched to ascertain manufacturer's dates of operation; named decorative patterns were also investigated and dated where possible. Where relevant, decorative techniques with known dates of production were noted (e.g., decalcomania became popular in the 1890s). As a result of the McKinley Tariff Act in 1891, all foreign-made items, including ceramics, were required to bear the name of the country of origin. Marks without country of origin must date before this act and were assigned an end date of 1891 or earlier. Ceramic Registry marks—assigned to ceramic patterns and shapes that were registered with the Patent Office in London—functioned as a form of patent protection and were good for a period of three years from date of issue. For dating purposes, when a Registry mark was present on a ceramic artifact, the date range assigned was three years from the date of Registry mark issue. Thus a Registry mark of August 22, 1856, would have a date range of 22 August 1856-1859. When makers' mark end dates were later than the date that the lot address was open for deposition, the date of lot closure was used as the end date. For example, if an

item with a ceramic mark utilized between 1885 and 1946 was found in a feature on a lot that was paved over in 1938, the date range would be 1885-1938.

Glass artifacts with embossments and/or makers' marks were noted and researched to determine place of origin, contents, and production date ranges. Date ranges were based on when the company was formed, when it changed ownership or moved to a new address as listed in the embossment, and when the product was patented. By using both the bottle manufacturer and the bottle contents manufacturer, date ranges were refined. Temporally diagnostic manufacturing techniques were also used for dating. For instance, the crown cap was introduced in 1892; if a bottle company was in business from 1880 through 1920 and the bottle had a crown finish, a beginning date of 1892 would be assigned. Pressed-glass patterns were studied and identified where possible. Occasionally patterns could be dated or assigned a probable manufacturer. Finally, some glass items retain patent dates (e.g., glass illuminators), which were recorded.

ARTIFACT TABLES

The artifacts from each analytical unit (either a single context or a group of related contexts) are described in several types of tables that focus on different descriptive attributes, such as function, decoration, and dating information, while specific functional types are presented in their own tables where appropriate. Some artifact types—such as building material, window glass, buttons, beads, and amorphous items—are not included in the artifact group summary tables, although they are mentioned in the MNI section. These types of items may help understand the circumstances of deposition, but are often otherwise meaningless and tend to skew comparisons between deposits. Likewise, each food-refuse subclass (seeds, shell, and bones) is summarized in its own individual table. Inclusion of counts from even relatively small assemblages of these remains can potentially multiply total counts manifold, reducing all other artifact types to a small percentage of the total. Further, the presence or absence of small ecofacts, such as fish bone or seeds, can be a function of differing preservation or varied sampling strategies among features, greatly reducing the comparative research value of this information.

FOOD-REFUSE ANALYSIS: FAUNAL REMAINS

The methods used for processing and analyzing faunal material from the SF-80 Bayshore Project developed from those used on the Cypress Archaeological Project. Both were based on the BABAS system (Bone and Butchering Analysis System) developed by Sherri Gust (2001). The technology has been improved in the form of new and more useful software standards, while the specific recording methods also evolved, with changes in the measuring, quantifying, and application of meat data. The development of the system resulted in a change in both the appearance and content of the faunal tables and worksheets from those used originally on the Cypress Project. Detailed below are the methods of identification and analysis.

Two of the primary goals of the analyses were the calculation of meat weight and the determination of the price range of the meat cuts represented. Arriving at these

determinations, which became the basis for the meat-weight analysis system, required a great deal of research. The source material needed to quantify meat type and retail cut was assembled by Sherri Gust from United Sates Department of Agriculture diagrams (e.g., Anonymous 1929b; Dowell and Bjorka 1941; Edinger 1933; Hall 1912; U.S. Agriculture Adjustment Administration [USAAA] 1940), supplemented by information from analysis of butchering patterns. Weights of wholesale and retail cuts of major meat animals were obtained from a variety of sources (Anonymous 1929b; Ashbrook 1955; Dowell and Bjorka 1941; Edinger 1933; Hall 1912; USAAA 1940).

Other information had to be acquired on a project-specific basis, including regional and temporal factors that must be taken into account when ranking meat weights by price. In this case, prices were obtained from 19th-century Oakland and San Francisco butchers. Sherri Gust garnered the information from numerous Oakland repositories and local newspapers for the late 19th century. Based on this information, various retail cuts from each major meat animal were ranked High, Moderate, and Low.

For animals that were usually purchased whole, such as small mammals and birds, meat weights were calculated as the mean number of individuals (MNI) multiplied by the net quantity of usable meat for the particular species. These values were obtained from a variety of sources (Eschmeyer and Herald 1983; White 1953). Meat weights for these animals and for the major meat animals are estimates only, based on market-weight averages for the meat type, and retail cut.

The faunal specimens were received by the faunal lab in clean condition, labeled and sorted by context. Items that could not be labeled because of small size or poor condition were contained in bags labeled with the appropriate provenience information. All faunal materials were processed by block number and by the features within that block designation. As a statistical standard, 100 was chosen as the minimum number of identifiable specimens required for analysis. In the first step of the process, all the labeled faunal material was removed from its packaging and spread out on a table. The initial sort involved grouping by general animal categories (avian elements, small and very small mammal, medium and large mammal, fish, shellfish). The medium to large dietary animals (cow, sheep, pig, and occasionally cervid) were further divided by element during the first sort. All fish remains were separated from the collection at this time and rough-sorted.

Information on provenience (archaeological block, feature, and level), taxon (cow, sheep, etc.), element (humerus, femur, rib, etc.), portion (part of an element), side, epiphyseal-fusion status (degree of bone-suture closure, to determine age at death), butchering cuts, tool marks (saw, knife, ax, etc.), taphonomic factors (burning, weathering, and gnawing), and cultural modification (shaping, polishing, etc.) were recorded for each specimen within the computerized BABAS data-entry form. In addition, specifics on meat type (beef, mutton, pork, etc.), retail cut (porterhouse, sirloin, brisket, etc.), and chunk (cuts appropriate for roasts, steaks, soups and stews, or indeterminate) and steak equivalents were recorded. The MNI was determined during the hands-on identification and data-entry process. The MNI is based on the number of a particular element or portion of an element, by side, while taking the age and size of the specimen into consideration. The comparative collections of the ASC and the California Academy

of the Sciences, Department of Ornithology and Mammology in Golden Gate Park, San Francisco, were used for identification. Whenever possible, identifications were made to at least class or family level. None of the specimens was weighed.

Once all the bone from a given feature had been identified and all pertinent data had been entered, the number of identified specimens (NISP) was calculated, and taphonomic data, butchering information, actual meat weights, and price distribution were recorded. Access database software was used to provide the data-entry form and the database environment. This program is merely a means to an end: to generate the numbers needed to plug into a meat-weight worksheet.

In order to accurately assess the portions of meat being consumed and their associated price-ranking, it was necessary to discontinue the use of the standard Minimum Butchering Unit method and change the way meat was calculated. The most useful information from urban sites is how many pounds of meat the specific bones of various animals represent. The usefulness of the system also depends on a measure of consistency that crosses all three major meat animals. Sherri Gust developed the Steak Equivalents method to improve accuracy and to address research questions more pertinent to mid- to late-19th-century urban sites. In developing and using this method, the historical data gathered on meat weights, retail cuts, and butchering patterns mentioned above was used to determine the usual number of steaks in each portion of a major-meat animal's carcass. The resulting number of steaks for each cut was then divided into the meat weight for that particular cut to get real meat weights in pounds for each steak. While specimens were being processed, each bone was measured perpendicular to the normal plane of butchering and given a number of steak equivalents. The standard used for beef is about 1 inch for a steak, and a measurement of 1/2 inch is used for the medium meat animals (sheep and pig).

To address the consistency of retail cuts across all major meat animals, the terminology for each retail cut was changed to match those for beef. In most cases the translation is quite logical, and the boundaries for the transition from one retail-cut to another is the same. In this way, specific status issues and statistical analysis across meat type are more straightforward. The analyst is comparing apples and apples instead of apples and oranges. In features with a high percentage of steaks, this change in method also made the data easier to understand and use in the interpretation. It is also important to recognize cuts of meat specific to a certain animal; for example, if the faunal data reflect the consumption of a large number of hams or legs of mutton, this needs to be noted and discussed. The extrapolation of chunk percentages becomes a greater part of the analytic discussion as well. Many cuts of meat around the vertebrae and ribs are not clearly identifiable in terms of the type of cut they may have come from, or the method in which they may have been prepared. In most cases, the cut bone from these elements may be attributed to noncommercial traditional preparation and use. Even in assemblages with a large number of unknowns, however, the numbers of identifiable chunks often reflect trends in preferences for steaks, roasts, and soup bones.

Since determining household economic status and actual proportional meat weights is the end game in this process, much attention needs to be paid to where those factors shift on the skeletal element itself. In some cases, the location of an element/subelement

within a series must also be identified. The definition of the chunk steak equivalents, and appropriate retail cuts are crucial to defining the research questions. In the case of ribs, the transition from chuck rib to rib is very important and suggests a tendency more towards moderate- or high-cost meat. Likewise, the thoracic vertebra must be identified within series for the same reason. The sacral region must also be pinned down to sirloin or rump whenever possible to maintain data that will clarify the discussion. In cases where a whole or nearly whole element was present—usually one that was appropriate for a roast, such as a femur or humerus—the entire element and its steak equivalents were attributed to the predominant retail cut. For instance, if a whole femur is represented, the meat that surrounded that bone would have included rump on the proximal end, round in the center, and hindshank on the distal end, all with differing meat-cost implications. It is more likely that a roast of this sort was purchased and sold as a round, and the meat weight should be correctly placed in that category.

Another area where the analyst must make efforts to maintain the accuracy of the data is in the mending of the faunal material in those portions where two elements occupy a cut of meat. In the case of ribs for both medium meat animals and cow, a rib is roughly equivalent to a steak. This makes it vitally important for the analyst to spend the time making mends to determine the true number of individual rib portions represented. Due to the very nature of rib bone, the specimens are often recovered in a fragmentary state, resulting from the time spent in the ground or the vagaries of excavation. For this reason, if more time and care were not taken on the ribs for each animal, an over-count and a resulting overestimation of meat weight and associated cost would skew the results.

The previously described scenario is not the only area in which overestimation can occur. A number of cuts of meat are comprised of a couple of different bones. The sirloin can present the ilium from the pelvis, and portions of the sacrum. The rump can have the ischium or pubis in combination with a proximal femur. A neck cut can include portions of the humerus, scapula, and cervical vertebra. In addition, the hindshank for all animals includes the patella, and in the case of pigs a fibula, in combination with the tibia. The foreshank also is in this category, bearing both the radius and ulna. If during identification these elements are not looked at with possible association in mind, the number of steak equivalents attributed to those bones could be twice what they should be.

Visual inspection and the information recorded for element, subelement, piece code, and segment were used to apply a retail cut to each specimen. That information, combined with any information pertaining to cut marks, and the note fields for each database record were used to detail the chunk type and appropriate quantity of steak equivalents. The steak equivalents by retail cut and major meat animal were tabulated and the results were entered into a computerized worksheet. From here, built-in formulas calculated the weight totals by retail cut and cost.

RESEARCH METHODS

Historical research for the SF-80 Bayshore archaeological investigations has moved through several phases, from a preliminary survey of historical documents for each block of the study area through ongoing, lot- and feature-specific research. The research for this phase of the project builds on that compiled for earlier phases.

The historical research repositories visited for the Bayshore Project, and the resources used, are substantially similar to those detailed in *Guide to Historical Research in San Francisco, for Project SF-480 Terminal Separation Rebuild* (Olmsted 1991). The research for the current phase of the project builds upon research that was done for the Research Design and Treatment Plan (Mc Ilroy and Praetzellis 1997). The additional research conducted for this phase, and the challenges encountered, are discussed below.

Doing research on San Francisco properties presents a special challenge, because many of the pre-1906 records were destroyed by fire. For example, the earliest available Sanborn map for San Francisco is 1887. A Sanborn map created in 1877 once existed; although numerous archives on both the East and West coasts have been checked, including the Library of Congress, no one has yet found a copy of the map. A City of San Francisco Land-Use map from 1874 shows that some of the city blocks had alleys that no longer existed in 1887, and that the residential pattern of some blocks had a different configuration.

The earliest Tax Assessor's Block Book available for San Francisco is 1894. Most of the archaeological features excavated and evaluated had associations at least a decade earlier. Pre-1906 deeds are also not available, limiting the ability to find early landowners.

On the other hand, San Francisco has an excellent collection of San Francisco city directories from the 1850s onward, water-tap records dating back to the 1860s, early Great Register of Voters, and numerous photographic collections. These records have their quirks, however. The tap records were re-organized sometime after 1890. Although the rewritten records contain the information from the hookups as far back as the 1860s, the addresses used are not necessarily the addresses at the time of the hookup. Instead, the street number at the time the records were recompiled was used. The Great Register of Voters also had to be used with care. It was determined that the information contained therein was accurate to the date that the individual originally registered to vote, rather than to the date of the register. The date of actual registration and the date of the yearly register could differ by as much as 10 years.

Determining associations for features dating from the 1860s through the 1880s, although a challenge, can be achieved by using multiple lines of evidence. The 1870 U.S. Census does not have street addresses, and the 1880 U.S. Census addresses do not always correspond to those addresses and structures indicated on the 1887 Sanborn. However, using city directories, tap records, block books, the 1874 Land-Use map, and the 1887 Sanborn map in conjunction with censuses, it was possible to reconstruct the census enumerator's path and locate the individuals residing on the property at the time of the archaeological features' deposition.

Other sources utilized to research these individuals included the *San Francisco Morning Call* for birth, death, and marriage records; county histories, and various documents at the Bancroft Library and the California Historical Society. One unique source, *The South of Market Journal,* provides a window into the life of the South of Market neighborhood at the turn of the 20th century. The journal was first published in 1925 by The South of Market Boys Association, a group of men who had grown up in the neighborhood during the 19th and early 20th centuries. The journal published numerous accounts through the 1940s based on the memories of these men—what the neighborhoods looked like, stories about their neighbors, and accounts of ordinary activities, as well as special events, as far back as the 1870s. Some of the people associated with the archaeological features were mentioned in this journal.

The following archives were used during this phase of the SF-80 Project historical research:

- California Historical Society (Municipal Records; *South of Market Journal*)
- San Francisco Public Library (tap records, block books, city directories, San Francisco newspapers, maps, photographs, Great Register of Voters)
- Bancroft Library (manuscript collection; photographs)
- Schulz Information Center at Sonoma State University (city directories)
- Sonoma County Public Library (censuses, city directories, Great Register of Voters)
- On-line Databases (censuses, city directories, Sanborn maps, Panoramic maps; *San Francisco Call* index).