

Post-Earthquake Housing Recovery

San Antonio/Fruitvale Neighborhoods

DESIGN CHARRETTE RECOMMENDATIONS

Sponsors

The California OES Earthquake Program,
the AIA East Bay Chapter, and
the Association of Bay Area Governments

February, 1997

This report is part of a larger, two-year project of the Earthquake Program, Coastal Region, California Office of Emergency Services. That project began in 1996 and will develop a ***Planning Guide for the Provision of Post-Disaster Housing in Urban Areas*** in late 1998. The charrette process described herein was complemented by a similar exercise in San Francisco. The recommendations that emerged from both charrettes have been summarized for review by experts, and will be considered by a number of focus groups; the most feasible and beneficial ones will be included in the ***Planning Guide***. For additional copies of one or both charrette reports, or for more information on the project, contact Sarah Nathe, Earthquake Program, OES Coastal Region, 1300 Clay Street, Suite 400, Oakland, CA 94612, (510) 286-0858.

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Summary & Recommendations

The Post-Earthquake Housing Charrette addressed an imposing challenge for East Bay communities--providing housing and neighborhood recovery strategies after a Hayward fault earthquake. Using a prototypical neighborhood in the San Antonio/ Fruitvale districts of Oakland, the group explored the many issues that will arise. The problem of providing housing after an earthquake in the future is being exacerbated every day by the high demand for affordable housing in the Bay Area: more and more people are being housed in older, poorly maintained rental units, and low vacancy rates make their voluntary retrofit unlikely. Repair of these damaged buildings after an earthquake will be difficult to fund either publicly or privately. Without policy changes and government intervention, there will be unnecessarily large numbers of poor and working class families homeless following the next earthquake.

The charrette working group has proposed various solutions to the post-earthquake housing problem, but implementation of many recommendations will require financial resources and coordination among federal, state, regional and local policies. Careful consideration of the neighborhood exigencies, and the most workable options, led the charrette participants to favor the following strategies:

- ◆ Get people back into damaged, but repairable buildings quickly
- ◆ Develop two stages of interim housing (2-6 mos., 2 mos-3 years)
- ◆ Design some of the interim housing to become permanent
- ◆ Support seismic retrofit now to prevent thousands of displaced people later
- ◆ Begin today to plan for or implement the first four strategies

The charrette participants emphasized a neighborhood recovery approach for the districts in question. Interim housing was conceived in the context of commercial sustainability and the complex weave of community resources and services.

The San Antonio/Fruitvale Districts

Oakland's San Antonio/Fruitvale districts were chosen as a focus for exploring post-earthquake housing solutions because they typify the East Bay's older, urban neighborhoods, which run from Richmond and San Pablo in the north, down to Hayward and include parts of San Jose in the south. The districts are ethnically diverse, densely populated, and home to a number of nonprofit and community-based organizations (CBOs). As is the case with many East Bay areas, the prototypical neighborhood has a large inventory of woodframe, and some URM, structures built before 1945. Of the structures built after 1945, a large proportion is made up of vulnerable multi-story woodframe apartment buildings of the type that failed famously in the Northridge earthquake.

About 75% of the households in the districts are made up of renters. Just over 70% of the people live in multi-family units. The average household size is 3.6 people, significantly larger than the overall Oakland average. Nearly 50% of Oakland's population growth in the 1980s was

Strategy #2: Develop Two Stages of Interim Housing

The charrette participants reviewed the feasibility of various approaches to interim housing provision. In recent U.S. disasters, trailers or manufactured portable units have been used to create single-family, detached housing. These units are completely prefabricated like mobile homes. This solution has been very costly and inefficient in the past; in the instance of the Hayward fault quake, it is even more undesirable: it is too expensive, there will be a huge demand that supplies can't meet; it is hard and slow to transport (especially after the freeway system is damaged); and it requires space that will not be available in most high-density neighborhoods in the Bay Area.

Assuming that Strategy #1--accelerated housing repair--is in place, temporary housing needs can be met with a two-stage, phased program providing structures for use from either 2-6 months, or from 3-4 years. Charrette participants referred to this as short-term and long-term interim housing (see Figure 1, attached).

Short-term interim housing will be for people from repairable buildings that will be returning to them in a few months. This type will be sited on lots where housing was burned, or damaged to such an extent that rapid demolition was called for. These lots will most likely have delayed reconstruction due to funding demands and permit procedures. Short-term interim housing may also need to be sited in the streets if demand is high enough. The length of its use is estimated to be 2-6 months. It will consist of structures as various as tents or other portable shelters, or modular housing already manufactured in various places in California. By modular, we mean units that are assemble on site using prefabricated core modules with either built on site walls or walls shipped with the core modules.

Long-term interim housing will be for people from extensively damaged housing that will be rebuilt, or from buildings that must be replaced with new housing. It will be sited in parking lots, playing fields, and backyards. This type will be already manufactured modular housing, some of it stackable, or specially designed modular "core units" for backyards. Core units will be engineered so that they can become permanent, with some small improvements. Its use will be necessary until lost units are rebuilt or replaced--3-4 years is a reasonable estimate (see Figure 1).

The strategy requires that long-interim structures **do not** occupy sites for future permanent housing, thereby becoming an obstacle to recovery. It further assumes that cities will use sweeping emergency powers to make sites available, prioritize restoration of utilities, and actively manage recovery efforts. The strategy will necessitate the following:

- Restricting access to secondary streets, allowing a portion of the street to be used for housing sites.
- Privately owned vacant sites be made available for interim housing and neighborhood services.
- Structures that can be easily deployed in large numbers, and sited in available space.
- Neighborhood infrastructure and utilities be restored to support both interim and permanent uses.
- Provisions for other types of interim nonresidential services including health care, social services, and information centers.

Strategy #3: Design Some of the Interim Units to become Permanent

Portions of the San Antonio/Fruitvale districts have been down-zoned recently, as have numerous other urban areas in the East Bay. Effectively, this will reduce the number of conforming units that can be rebuilt after an earthquake (unless the city intervenes to alter the zoning). In recognition of this loss of housing, the charrette working group found it necessary to create units in the neighborhood in some other way, since the displaced people may be effectively prohibited from going to other neighborhoods by the same down-zoning trend.

To increase density, the concept of modular backyard units, housing 3-6 people, was advanced; these units could be used by interim residents until other structures are rebuilt, and then become legal permanent backyard dwellings for the homeowner to use or rent in perpetuity. Given the space in the prototypical 12-square block area, charrette participants estimated 40-50 such backyard units added.

This strategy will necessitate some changes in zoning and enforcement policy, and in provision of temporary/permanent housing:

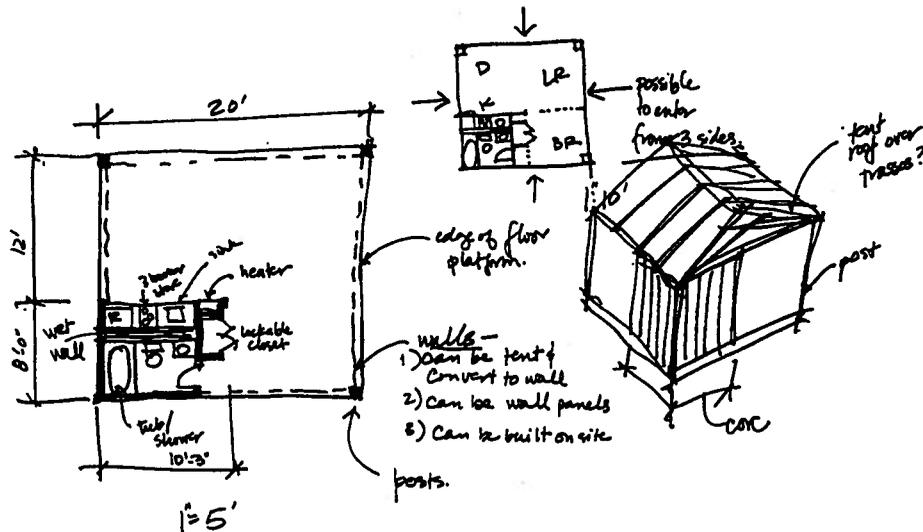


Figure 3. Proposed Backyard Unit

- Draft a policy that the first five lot owners per block that agree to take a modular backyard unit will get a structure they can keep forever, after making improvements.
- Support fast construction of those five units/block, and adopt a policy that those who provide space for the units will never have them counted as nonconforming units in the future
- Don't require parking spaces for those five units/block
- To offset the post-earthquake loss of units resulting from down-zoning, draft an ordinance that allows owners to keep their pre-earthquake unit # if their buildings are repaired and reoccupied within one year.

Strategy #4: Support Seismic Retrofit

In spite of some city ordinances and programs supporting the seismic strengthening of buildings, few property owners in this neighborhood have complied. Market rate solutions are hard to justify to owners on the basis of current rents. Yet, in spite of the market economics, pre-earthquake seismic retrofit (strengthening vulnerable buildings) is *far* cheaper (by orders of magnitude)--both for private property owners and public agencies--than funding the post-earthquake repair of buildings and providing temporary housing solutions. For example, the average cost of bolting an older structure to its foundation is about \$3,000. That same structure, jolted off its foundation and seriously damaged, can cost at least \$100,000 to repair and hundreds of thousands of dollars to replace.

It became very clear to those who participated in the charrette that seismic retrofit should be a top priority for all governments involved in the eventual provision of post-earthquake housing for two reasons: 1) it is the only *cost-effective* option; and 2) without it, the housing loss will be so extensive that the other strategies will not be sufficient to house all the displaced people. We recommend the following to governments from local to federal:

- Use a "carrot and stick" program of structural strengthening. Offer loan programs and matching grant funds, and/or tax incentives for retrofitting projects. At the same time, initiate a strict code compliance program for buildings susceptible to failure in an earthquake.
- Follow the lead of some forward-thinking cities, and develop programs that offer--in addition to financial help--technical assistance, directions, and even construction tools--to private building owners for retrofitting their homes.

Strategy #5: Lay the Groundwork for all other Strategies NOW

Post-earthquake recovery always goes more smoothly if a jurisdiction has engaged in pre-earthquake planning. It is least costly and most efficient to address the challenge of post-earthquake housing provision by undertaking some activities NOW:

- Develop a plan for temporary housing solutions. Specify what streets and other private and public land can be used as temporary housing sites. Coordinate this plan with the resources and plans of other agencies and community-based organizations.
- Invest in equipment, materials, and training to be able to implement the plan.
- Establish a set of policies that empower city departments to enact emergency standards and procedures for building inspections, plan check, and building code interpretation. These criteria should apply both to fixing yellow-tagged buildings and putting up temporary housing structures.
- Offer formal training in building inspection.

- Educate neighborhood and community groups in the issues, and involve them in planning and problem-solving.
- Include architects, engineers, planners, and construction industry professionals in retrofit and other forms of hazard mitigation.
- Establish a loan program that streamlines funding for repairing damaged buildings. Work with lending institutions, insurance companies, and other government agencies BEFORE the next major earthquake to design a coordinated, accelerated funding process.

The Charrette Process

The design charrette was a three-day activity. It began on Friday evening, when the participants convened for a briefing about the likely earthquake impacts on the neighborhood in question and the East Bay in general. Over the next two days, three sessions addressed 1) planning and design issues; 2) housing delivery and neighborhood recovery strategies; and 3) housing recovery concepts.

Participants worked in two teams to discuss the challenges inherent in the above topics, and to propose and then draw some of the solutions to anticipated problems. On the final afternoon, each group presented their plans, made suggestions, and distilled their approaches into one overall set of recommendations. The following pages summarize the findings from the three days of concentration.

Charrette participants talked extensively with each other about proposed solutions and designs



Session 1 Planning and Design Issues

Each team was given three questions about the neighborhood recovery process following an earthquake. The answers they came up with touch upon all of the most important issues.

1. What are the top three challenges regarding neighborhood services, such as non-residential uses and infrastructure?

Participants identified three important concerns about preserving and restoring neighborhood services: maintaining services, providing interim solutions while damaged services are repaired, and planning for recovery prior to the earthquake.

a. Maintaining services

Service providers already in the neighborhood are at the same risk of structural damage to their buildings as the residents, and will be under considerable pressure to provide additional help, or assistance to people previously not in need. Communication is essential among residents, agencies, and organizations involved in the assessment, repair and recovery of the area. Residents will also need communications with the outside world. Intelligence gathering is important for the jurisdiction as it makes relief and recovery decisions. A multi-service center (perhaps a church) would allow for information to flow both to and from the residents. This central meeting spot should be organized by a pre-existing community-based organization (CBO) already active in the neighborhood. In addition, a government-run Disaster Assistance Center (DAC) may at some point be made available to the residents of this neighborhood (if not actually in the neighborhood). These centers traditionally involve agencies that provide post-disaster programs to residents.

It is especially important that goods and services can be brought into and through the area. Traffic from I-80 may be rerouted to E. 14th & E. 12th, which will add to the congestion. Transportation is also essential for job retention of the residents. Without incomes, the homeowners will have limited resources and access to funds from financial institutions to rebuild, and renters will not have income to afford rebuilt housing.

b. Providing interim infrastructure

The restoration of utilities is important to the livability of the area. Utilities such as water and sewer are necessary for the basic health and welfare of the community. Water and sewage are considered essential to providing housing services. Under non-disaster circumstances, a housing unit without water or sewer services can not be legally occupied. In stages, other services such as power, garbage removal, local communications, traffic control, street lighting, and recycling services will also have to be restored or provided. Policing of distressed areas will be in demand as one of the interrupted services people want back immediately.

Eventually all of these services will have to be fully reconstructed or repaired. The phasing of service restoration is dependent on the amount of damage to the systems and the distribution of damages regionally, but the group recommended a one-month to six-month period

for basic services, while six months to four years may be required for permanent service restoration

c. Pre-event planning

Planning for responding to the interruption of services and the restoration of services should happen at several levels. Neighborhoods may not receive assistance immediately and should therefore prepare for a certain level of self-sufficiency. Local, state, and federal governments should provide incentives for neighborhood preparedness. Local governments need to be working with utilities and public work departments to retrofit their systems, and to plan for restoration of services and reconstruction where necessary. This process will require some regulation as well as incentives. A knowledge of the distribution of probable damages and service interruption is essential to carrying out the task of pre-event planning. In addition, foreknowledge of service provision issues will help in locating sites (or determining the process for doing so) for interim housing.

2. What are the most challenging aspects of providing interim housing?

a. Coordination among agencies:

Under normal circumstances development in any area is a complex issue taking into account many stakeholders. In a post-disaster situation, the need for quick resolutions to interim housing issues will be difficult and many private players (including existing homeowners, apartment owners, financial institutions, and developers) and public agencies (codes enforcement agencies, public funding agencies at all levels of government, and planning/housing departments) will be involved. At issue will be who is in charge and who pays. Where does the funding come from and who coordinates it. In the first week of the disaster a needs assessment should be done in order to clarify the types of affected families and households, and their interim housing needs. This needs assessment will be updated in the one-month to six-months period. The needs assessment will make it possible to coordinate with existing or new area plans.

b. Finding land for interim housing:

As with many of the low-income neighborhoods, San Antonio/Fruitvale has very little open space as it is. Charrette participants thought that most open space will be needed for service provision and housing following a Hayward event. More space will be needed for interim housing than existing open space. Where will the additional space for interim housing be placed? Parking areas, what few vacant lots there are, and lots made vacant by post-earthquake demolitions will have to be utilized. Because of the existing density in the area, only a few sites will be available for interim housing provision: the fields, parking lots, burned areas, backyards, and streets. NOTE: interim sites should not occupy sites for future permanent housing

If interim housing must be placed on streets, the need for additional on street parking will become acute. Some streets can be reduced to one-lane, one-way, and parking can be made 90° to the sidewalk. Among the best sites for interim housing are existing parking lots. However, these are privately owned and the use of them will require additional off-street parking.

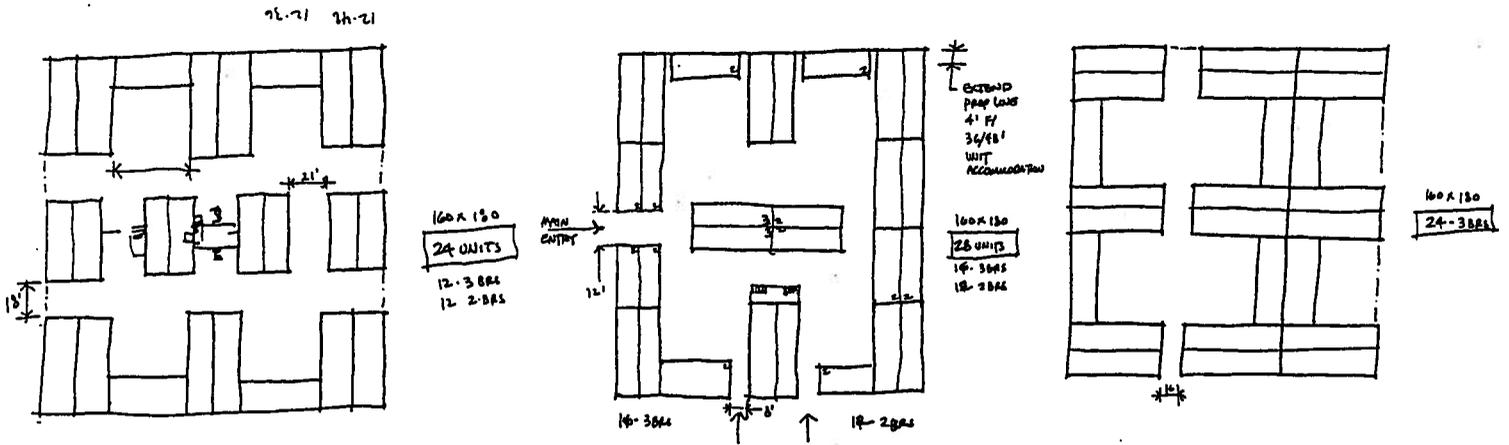


Figure 4. Three Interim Housing Solutions on Rectangular Lots

c. Property ownership vs. community values:

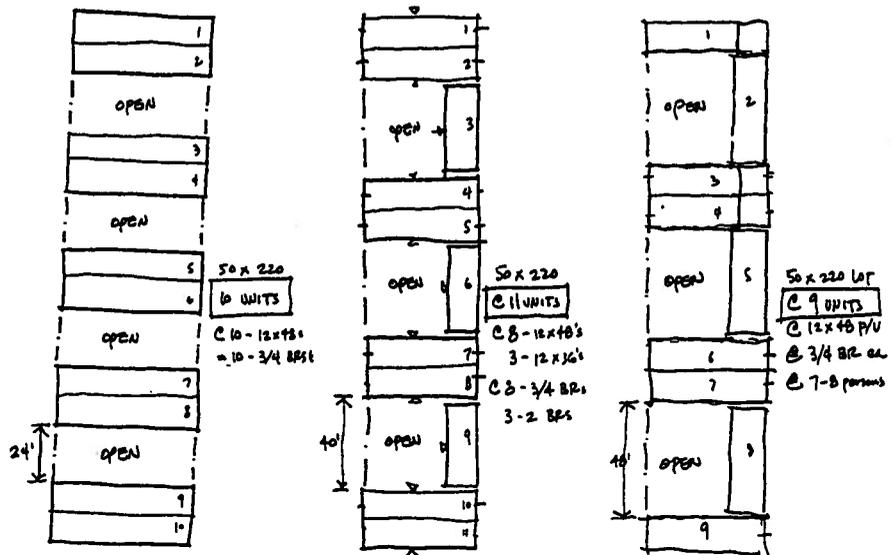
Different groups of people within neighborhood have different visions for the recovery process and how it affects them personally. Owners of undamaged buildings, for instance, may not want interim housing in their street. People who rent apartments may not want to be relocated several blocks away while their units are being repaired or rebuilt. On a larger scale, can the city use eminent domain to acquire land from individual land owners for the good of the whole community? Following a disaster where rental units are left vacant due to damage, some properties will be under foreclosure. What are the opportunities for these properties?

d. Housing special populations

Because there is not enough room for housing units that meet existing building, zoning and state and federal codes, the city will need to waive some codes. In addition to the problem of space, the cost of providing interim housing that meets all current codes and standards is prohibitive. Some provision will need to be made for persons with disabilities. Obviously units will have to be structurally sound with enough lighting and ventilation for basic housing services. What other requirements will have to be met? Is that dependent on the length of time the units will be occupied?

Given that service provision will be difficult, should groups with specific needs (elderly, disabled, families with small children) be aggregated in clustered housing units with services, or should people be dispersed according to their location prior to the disaster? In both cases, there should be a frank estimate of the duration of time they would spend in interim housing.

Figure 5. Three Interim Housing Solutions on Narrow, Demolished Lots



3. What are the challenges facing the replacement of housing?

a. Relationship between interim and replacement housing

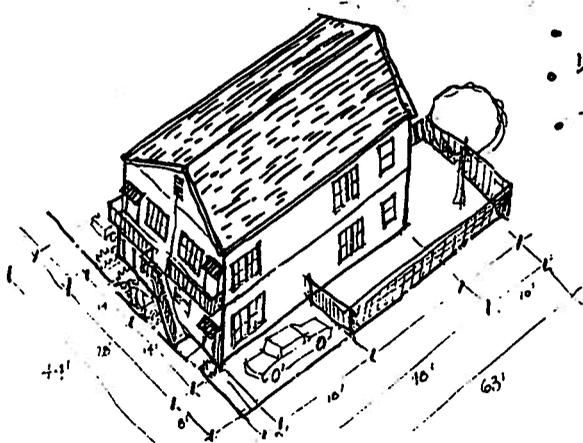
The relationship between interim and replacement housing will have to be thought out initially and will undoubtedly change as the development process proceeds. The phasing of people from interim housing into permanent housing will be dependent on the speed at which replacement housing is developed. Replacement housing is dependent on many factors such as public and private funding sources, the speed at which the permit process proceeds, and landowners' willingness to develop.

b. Down-zoning.

Because the area has been down-zoned, it would be impossible to rebuild the same number of units on existing lots. This is a problem city wide and moving people to other areas will not alleviate the pressures for housing in the area. Post-earthquake finance shortages in combination with current zoning will create disincentives for private owners of multifamily housing and single family housing to rebuild. Low income renters in the area (the majority of renters) already pay more than 30% of their income on housing (the test for affordability). With the aforementioned employment problems, the amount that people can spend on housing will be reduced. Down-zoning will make it difficult to build at a density that with the prevailing rents will support a mortgage large enough for development. Even without down-zoning, it is not clear that existing rents could support a loan for development. Therefore, either density must be increased and/or rents will need to increase. And any raise in rents will increase the rent burden on low-income households and exacerbate the already problematic overcrowding.

It is possible to provide housing under these circumstances by offering density bonuses to developers of low-income housing. Relocate high-density housing to underutilized, marginal industrial or commercial areas where residents have less resistance to larger-scale housing developments. Try to cluster high-density housing in proximity to services, jobs, and transportation.

TYPICAL 4-FLEX: • "LOT" SIZE 44' X 63' \approx 2800 sf
OR 700 sf/unit.



- UNIT SIZE : 14' X 48' = 670 sf.
- 1/2 PARKING SPACE/UNIT + ON-STREET parking
- TRUCKED ON TO SITE AS 14 X 48' ASSEMBLED.
OR
PANELIZED & ASSEMBLED ON-SITE.

Figure 6. Higher Density Housing on a Previously Single-Family Lot

c. Availability of money

A great deal of money will be needed in the short-term for interim housing and for design development. Funding for reconstruction is likely to be inadequate. Long-term "bricks and mortar" funds will be needed for construction. There will be competition for funds from other neighborhoods and other jurisdictions. Public funds will be available, but will not suffice to reconstruct all the lost housing. Private funds may be forthcoming from insurance companies, but many of the people in the neighborhood may not have insurance. Similarly, multifamily property owners without adequate insurance will need capital, but may not be able to charge more rent to cover the additional debt needed to rebuild. Will the city be able to recoup some of its expenditures with tax assessments? If so, will this raise the cost of housing for the inhabitants?

Small Business Administration (SBA) loans have a dollar limit that prohibits large apartment owners from borrowing necessary funds. Therefore, we can expect some owners of larger buildings will walk away, leaving vacant lots or damaged buildings. The problems of unemployment and underemployment also affect homeowners who may be unable to afford repairs, not be able to get private financing and may not qualify for Small Business Administration (SBA) loans. As was seen in the Northridge earthquake, owners of rental housing with few units and stable, moderate rents can more easily rebuild using SBA loans.

Because rents in the area will not support rebuilding, subsidies and incentives will be needed to replace the lost housing. There are existing federal and state programs to fund low-income housing, but the demand for funds from all over the Bay Area will deplete the existing funds quickly. Can we expect private and non-profit institutions to provide additional funds? How will the existing programs expand to meet the need? At what level of government will the subsidies be coordinated?

Existing community development corporations may be in best position to get available money from public and private sources and concessions from the city. Such organizations have experience and expertise in providing housing and services. Can they expand to meet the need and how will they be supported by the local government?

d. Opportunities:

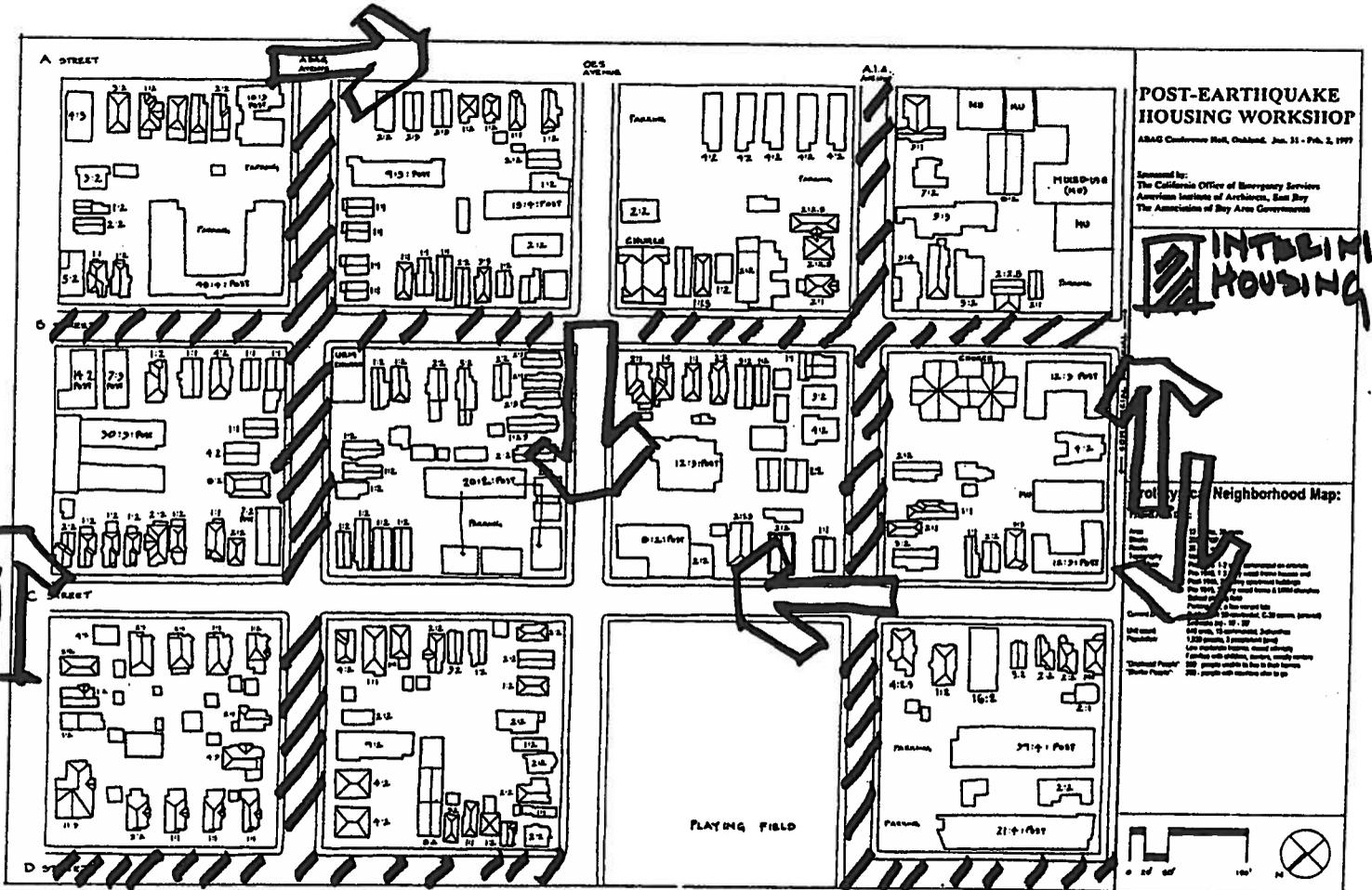
Widespread housing destruction can lead to big changes. The city has an opportunity to make rules that may lead to changes in the character and composition of the neighborhood. Changes to zoning could lead to higher or lower densities; the area has already been downzoned such that any new multifamily housing would need to have fewer units than those already developed in the neighborhood. Home ownership in this neighborhood is low--only about 25% of the residents own. The city may decide to develop housing and programs that promote ownership. The existing neighborhood organizations, or one that organizes following the quake, may have plans for the future of the area. In addition, individuals may petition for, or against, certain provisions of the reconstruction plan. A process will have to be developed for conflict resolution for the many problems that will be associated with the reconstruction process in the area.

If possible, the city should look carefully at the destroyed housing units and look for opportunities to increase open space in the area. The lots could be used as interim housing or services and then be designated as open space when people are moved into permanent housing or the service providers are moved or no longer needed.

4. Related Policy Issues

- A rent freeze and eviction control (through emergency ordinance) will be needed to stop landlords and tenants from trying to unfairly take advantage of the situation.
- Decide on the strategy for replacing permanent housing BEFORE siting interim housing to avoid putting (long term) interim housing where replacement housing can be located.
- May need to get a zoning change to allow compact construction (*aka* density increase).
- Mitigate decrease in density by making it easier to add units to lots.
- Make it easier for city to acquire property from absent and delinquent owners.
- Make decisions about what the city should do with available land: For instance: facilitate sale to other owners; take property somehow--temporary eminent domain (what is the cost?); create a land trust; or use the Redevelopment Agency somehow.
- Use opportunity to increase open space in neighborhoods with a deficit of it.
- Give non-profits access to the land--cheaply, or as a gift.
- Try to increase allocation of federal Low-Income Housing Tax Credits for California and have them earmarked for replacement housing. While the efficiency of this program can be debated, it has expanded low income housing options in the state. Affordable housing developers are familiar with the process and are able to syndicate the credits to corporations.

Figure 7. System of One-Way Streets With 45° Parking and Interim Housing on Closed Streets



1. How should housing development be staged or sequenced?

a. Staging

1) The criteria for street closures should be the following: Maintain easy access to one-stop service location; Maintain access to staging areas and demolitions; Maintain access through local roads to arterials; Close roads near to demolished and damaged structures; Timing: fix utility mains first on main streets (close side streets and site housing there, with above-ground utilities in Phase 1); Maintain auto access to units located on closed streets; coordinate residential parking patterns with utility work shifts--park in evenings on streets being fixed during the day

2) In owner-occupied single family units, build interim units in backyards and front yards that can be stick-built on site construction or pre-fabricated panels or core construction. Utilities need to be hooked up to them. The units could be used as second units or garages later. Perhaps backyards could be linked to develop larger temporary interim housing.

3) The use of parking lots brings up the issue of ownership, access, adjacent uses and safety. In addition, the parking lots used for housing or service provision will need to have access for construction staging. Utilities to them must be provided. Vehicles displaced by the change of use of parking lots will need to find another place.

4) The use of the playing field (park or open space) will need to be phased to include 1. debris removal (expedite), 2. staging building materials, and 3. interim housing and services. Construction will include the need for security--lighting, fencing, hire locals as security guards. Infrastructure will need to be installed. If the neighborhood does have open space, larger areas give more flexibility to arrangement and size of interim housing. However, open space must be maintained as open space in the long run

5) Enact temporary eminent domain to use demolished lots for sites of temporary housing until the (new) owner is ready to build replacement housing (ground lease? insurance?)

6) Where feasible, purchase or acquire undamaged vacant properties by temporary eminent domain or lease, convert to interim housing or essential services

On next pages:

Figure 8. Overall Scheme for Location of Interim Units in 12-Block Area

Figure 9. Close-up of Units on Streets, Parking Lots, and Playing Fields

POST-EARTHQUAKE HOUSING WORKSHOP

ABAG Conference Hall, Oakland, Jan. 31 - Feb. 2, 1977

Sponsored by:
The California Office of Emergency Services
The American Institute of Architects, East Bay
The Association of Bay Area Governments



2 STORY PLOT UNITS

2 STORY P-FAB UNITS

DAMAGED UNITS

PERM. 3/4 YARD UNITS

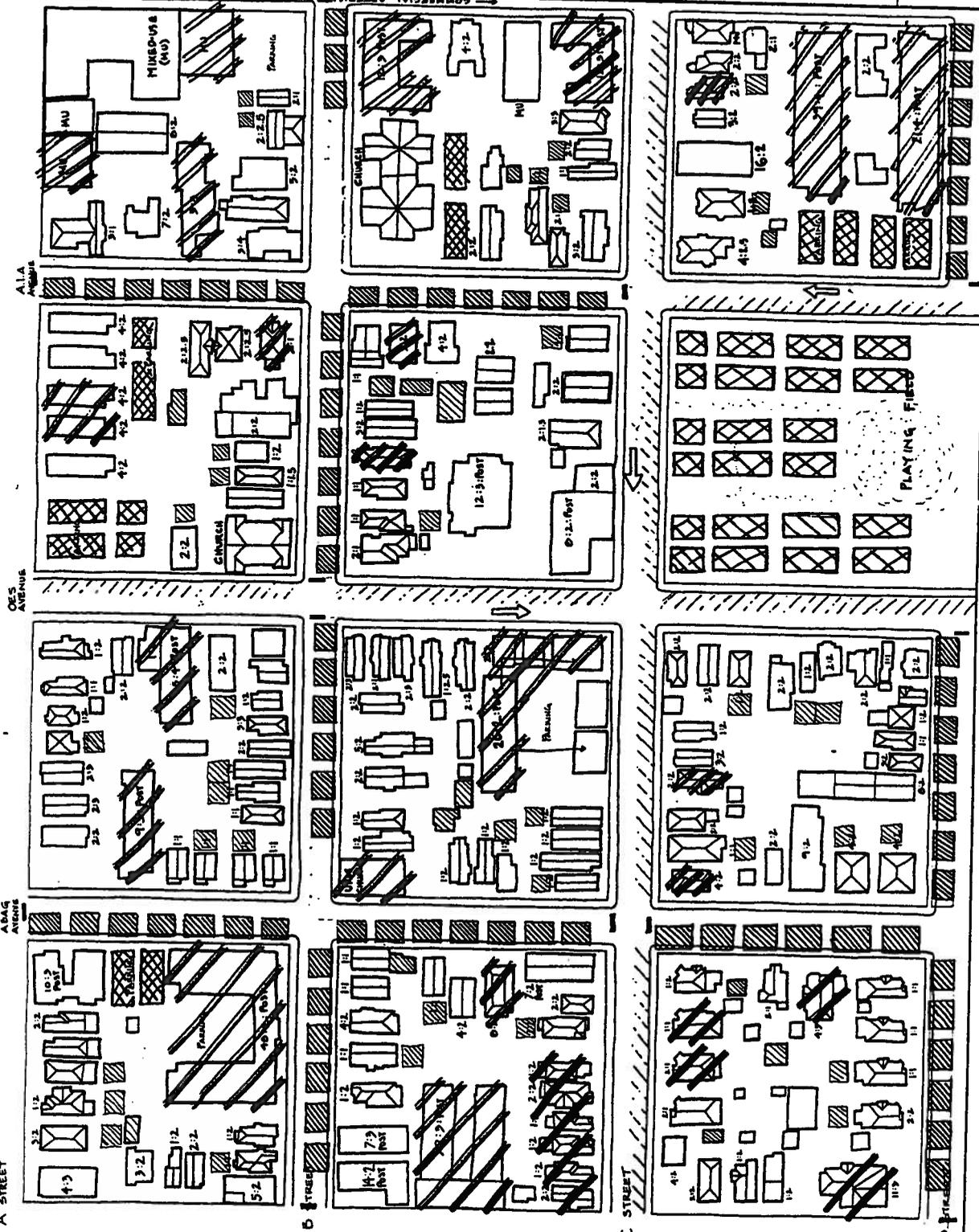
INT. STREET UNITS

Prototypical Neighborhood Map:

Enclaved Area Data:

Area: 12 blocks, 30 acres
 200 ADU's
 2000 sq ft
 1000 sq ft
 1000 sq ft

Current zoning: C-30
 Unit count: 480 units, 15 commercial, 2 churches
 Population: 1200 people, 2 preschool (ages 3-5)
 Employment: 1000 people, 1000 people
 "Displaced People": 500 - people unable to live in their homes
 "Shelter People": 200 - people with nowhere else to go



b. Sequencing

The sequencing of recovery activities depends on two things, the state of the building and the state of financing for rebuilding. Therefore, first do a damage and finance assessment quickly and determine whether each structure is habitable, repairable, or should be rebuilt. The assessment should be followed by these steps:

1. If a structure is repairable, evaluate the damages, the potential for money to be available to the owner, and in what period of time.
2. If the potential for repair is low, make demolition decision (if damage is substantial), or purchase decision (if finance is available).
3. If the potential for repair is high, develop a timeline for repair and reconstruction.

Simultaneously, a study of the demographics of households that have been displaced and their propensity to stay in the neighborhood should be undertaken. Because financing is dependent on vacancy rates and rents, information about potential renters family size and income (ability to pay what rents) is needed. In addition, the repairs to owned units is dependent on the financial situation of the homeowner.

The information obtained by the preceding assessments will determine the relationship of interim housing to replacement housing. It will provide information on the number of people in need of interim housing and for how long, and it will provide information on the number and size of units needed for permanent housing. To some extent, the information should be used to develop a model that will determine what incentives and subsidies will be needed to provide replacement housing.

The sequencing of housing for displaced households differs by the type:

A) Owners in damaged, repairable houses can build interim sites in backyards, if there's room. Those who can't do this (because they're seniors, the lots are small, or there are insurance problems), move to category B or C.

B) Damaged rental houses that do not require demolition should receive priority for repair before destroyed houses are rebuilt. Locate displaced families to demolished lots, then move them back into repaired units just as owners are ready to build on demolished lots. Give original renters first right of refusal to move into repaired units. Use public power to expedite repair when it is not economically feasible for owner.

C) Locate renters from destroyed apartments in housing on open space and parking lots (most flexible locations). Give original tenants first right of refusal to reoccupy rebuilt units. If rebuilt sites are downzoned, the excess tenants must be located elsewhere.

D) Households depending on project-based Section 8 certificates in buildings damaged or destroyed should be issued vouchers for any unit.

See Figure 10 on the next page for a schematic, and Figures 14-17 for drawings of the phases.

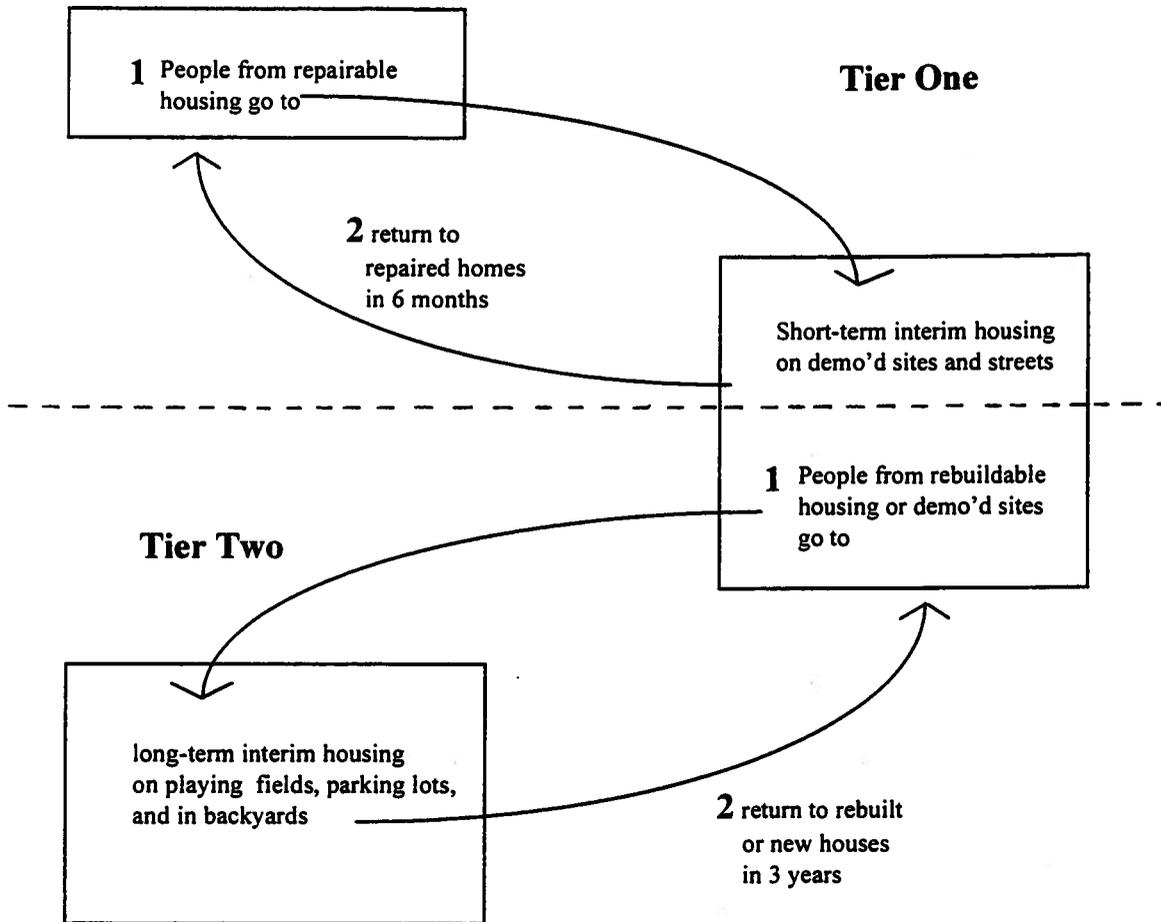


Figure 10. Two-Tiered, Two-phased Scheme.

Tier One, (step 1): people from repairable housing should go to short-term interim sites (step 2); and from there back to their homes in 3-6 months. Tier Two (step 1): people whose houses can't be repaired (and must be demolished or rebuilt) should go to long-term interim sites (step 2); and either stay there [in backyard units] or return to rebuilt or new houses in 2-3 years. The first steps in each tier happen simultaneously.

c. Interim Housing Space Needs

The two teams assumed a different number of units displaced long enough to need interim housing. The two tables below each represent reasonable estimates of household sizes and configurations.

Table 1: Medium Interim Housing Space Needs (for 12-block area)

	No. of units	Unit size	Population	Total space needed
studio	172	300 sf	1 person	51,600 sf
1 Bedroom	60	450 sf	2 people	27,000 sf
2 Bedrooms				
3-4 people	46	550 sf	3, 4 people	25,300 sf
5 people	9	650 sf	5 people	5,850 sf
3 Bedrooms	8	750 sf	6, 7 people	6,000 sf
Total Demand	295 units	400 sf Avg.		Built area 116,000 sf Land area 210,000 sf w/ n 55% FAR

Table 2: Maximum Interim Housing Space Needs (for 12-block area)

	No. of units	Unit Size	Population	Total Space
studio	20/30	350 sf	1-2 people	3,750 sf
1 Bedroom	30/35	450-500 sf	2-3 people	15,750 sf
2 Bedrooms	100/110+	600-650 sf	3-4 people	66,000 sf
3 Bedrooms	40/45	800-850 sf	4-5 people	36,000 sf
4 Bedrooms	10/15	1000-1100 sf	5-6 people	15,000 sf
Total Demand	200/230 units	665 Avg		Build area 136,500 sf Land area 173,000 sf w/ 79% FAR

The first team assumed a larger number of households needing interim housing, but smaller units with fewer bedrooms. Based on an estimated cost of \$50 per square foot authorities would need to raise at least \$5.8 million for interim housing for the first scheme and second scheme would require \$6.8 million. This does not include the cost of land if it must be leased or purchased (through eminent domain or outright). Less land will be needed by scheme two because of denser development (79% FAR).

d. Buildable Area:

The teams estimated the number and size of lots that could be used for interim housing. The following table describes the findings for the 12 block area studied.

Table 3: Space available for building interim housing (in 12-block area)

Streets	26,400 sf (not including sidewalk), comprised of 3 streets w/40' deep parking bays at each end
Playing field	102,000 sf
Backyards	40 units assumed (50 max.)
	priorities: of damaged houses
	largest rear and side yards
Area of demolished buildings	58,000 sf
Parking lots	42,000 sf
TOTAL BUILDABLE	228,400 sf + 50 units

2. Generally, what are the ways interim housing can be delivered?

a. Funding Program Criteria

Who provides funding and how much are two of the most complicated questions in this exercise. The flow of capital will determine whether, and how well, the rest of the proposed solutions can be put in place. A conservative estimate of the cost of constructing interim housing is around \$50/sf.

b. Management of Process

Who determines the type, amount, location, and schedule of housing? How do you match supply to demand--who gets to live where, when? (first R of R) Who determines code and permit regulations? When do people move from emergency housing into interim housing?

c. Physical Issues

What form does the interim housing take? Is it pre-built whole units or pre-built components--panels, core units with extensions, converted shipping containers and/or manufactured houses. How and who coordinates with the manufacturers of the above products before the earthquake regarding special criteria for interim housing? That criteria includes that the units must be easy to deliver to site due to access problems, must be easily moved and assembled (folding panels?), must be designed such that the units can be attached--side-by-side or above/below, must be convertible to above-ground utility arrangements.

Before the earthquake, investigate the construction or conversion of a production facility in an urban area to produce interim housing units. In addition to manufactured housing, alternative structures & systems may be used, including construction staging, steel space frame structures, recycling debris into masonry blocks, and/or oil company prefabs. Dormitory type units can be used for singles previously in housed in Single Room Occupancy Hotels.

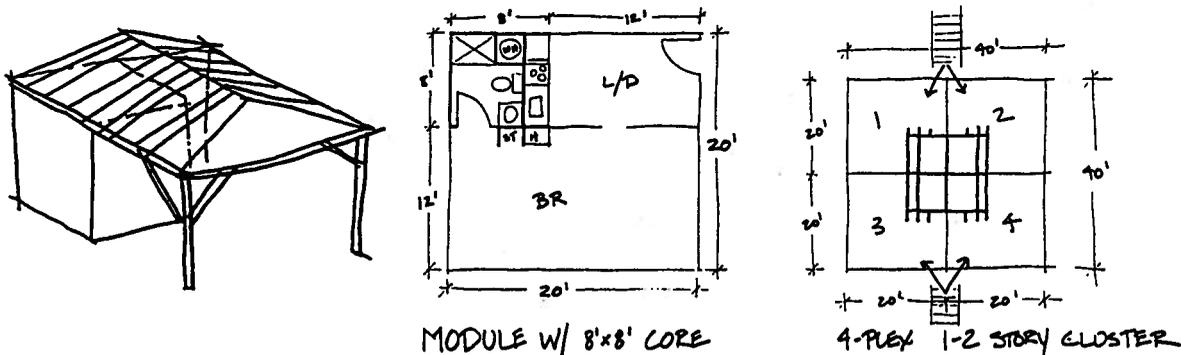


Figure 11. Stick Construction with Core Unit. In backyards, vacant lots, parking lots

d. Site Planning Issues

There are two proposals for urban design, one is to keep the blocks as they are and the other is to introduce mid-block alleys. The alley scheme would allow access to second unit, increase emergency access, make waste disposal less public. However, it would require that lot lines be redrawn and easements or right-of-ways be created. It also brings up security concerns such as defensible space that could be mitigated using speed bumps or gates. In addition, the introduction of alleys will decrease the room available for second units as well as make some properties' setbacks non-conforming. Other possible strategies for replacement of housing include: add alleys in order to increase units and access to backyard units; create super blocks that reduce auto use and make some street area available for housing; create pedestrian routes for access to backyard units.

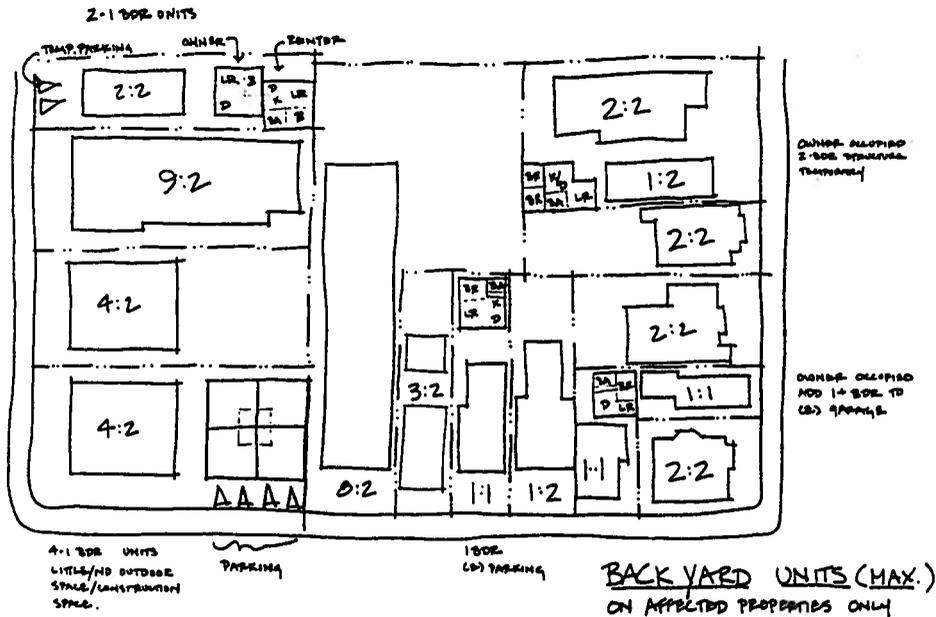


Figure 12. Five backyard units and one cluster in parking lot

e. Services

If the given existing block structure remains, access to second units and their residents in emergencies is reduced. Parking for second units will be far from them. Lighting will not be uniform, access for people with disabilities into the backyard units is difficult. Private yards will have to have access through them. Setbacks from other backyard units may be minimal or nonexistent. This leads to the idea of attached units or clustering. Security for the units may be decreased because of their relative isolation.

f. Module Design

If modular units are used, the question of how will they reach the sites must be answered. The problem is complicated by the circumstances of the transportation system in the area. It is assumed that the area does not have sufficient building supplies to meet demand following an earthquake. How will the materials get into the Bay Area? By ship--is the port operating? By truck--what is the damage to the highways? Is there sufficient knowledgeable labor in the area to construct, assemble or place the interim housing units?

Plentiful in the area are shipping containers. In order to use such a structure, some design and code discussions must take place--preferably prior to the disaster. These units are made to stack. How will the resident enter the upper units? What heating and ventilation will be provided? What sort of foundation is needed.?

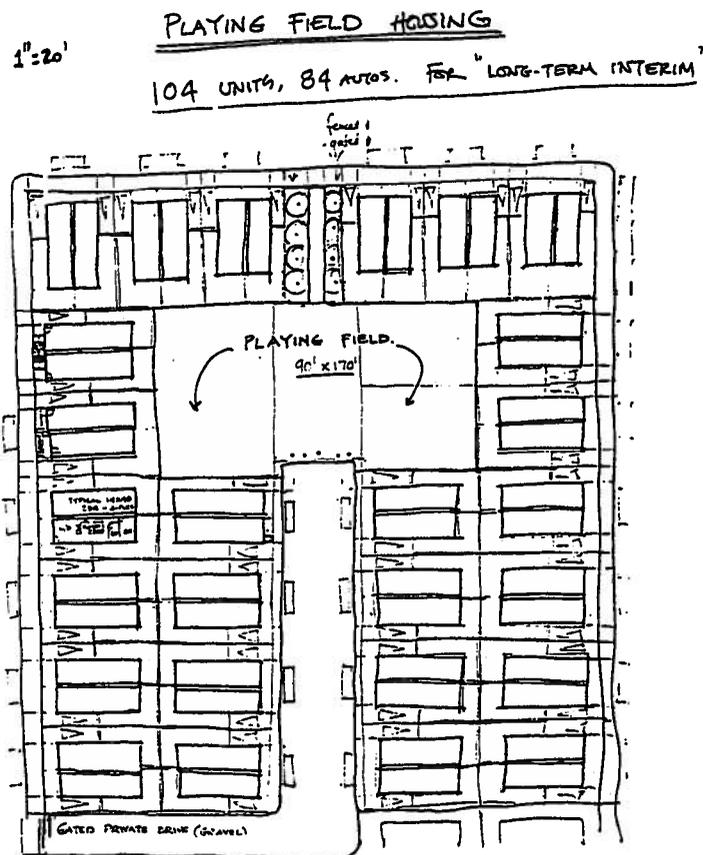
3. How can neighborhood infrastructure be brought on line to support interim and replacement housing?

Above-ground plastic pipe will support sewer and water for interim housing. Coordinate infrastructure repair among utilities in order to avoid continuous digging. Step in permanent infrastructure repair and replacement with the traffic plan and use of streets for interim housing modules

4. Related Policy Issues

- Encourage and **SUBSIDIZE** quick repairs because that is the most cost-effective action.
- It will save millions of dollars after a quake to bolt and strengthen houses **NOW**:
 - RRR money
 - state and federal governments benefit from subsidizing retrofit
 - adopt a California plan similar to that of Florida's to support retrofit
- Make part of the city's emergency plan policy to recycle building materials after a quake (sort them off-site)
- Make a policy that the first five lots per block that agree to take a modular will get a unit they can keep forever; with a few improvements, they can have the nonconforming unit.
- Allow fast construction of those five units/block and resolve not to count the multifamily units in the future
- Do not require parking spaces for those five units/block
- To save all units from effects of down-zoning, have an ordinance that allows owners to keep all their units if they are repaired and reoccupied within one year (units unoccupied for one year will be considered a use change, and thus the number of units must conform and because of down-zoning will be fewer)

Figure 13. Long-Term Interim Housing



POST-EARTHQUAKE HOUSING WORKSHOP

ABAG Conference Hall, Oakland, Jan. 31 - Feb. 2, 1997

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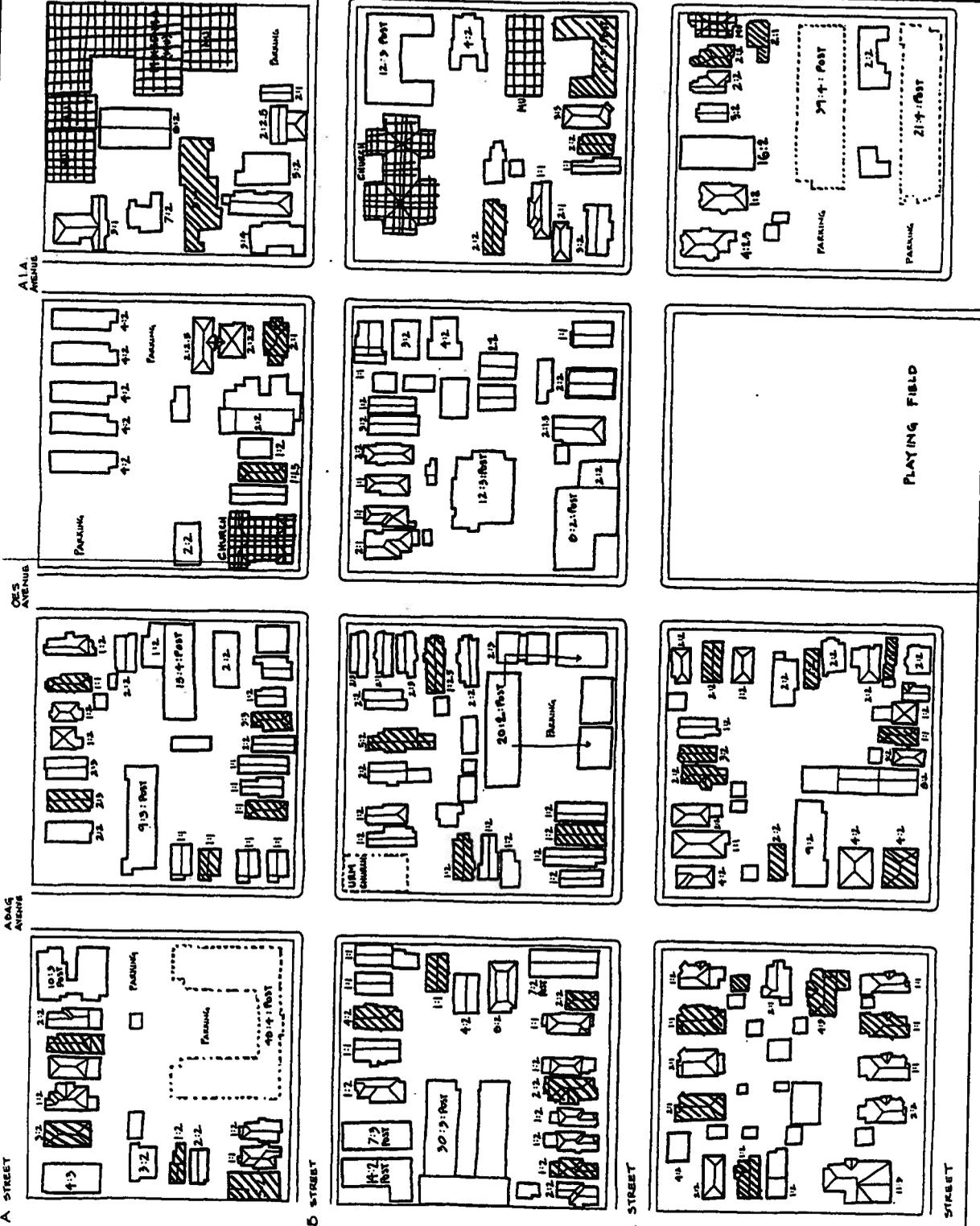
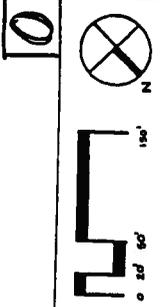
SITE PLAN - INITIAL ASSESSMENT

DESTROYED BUILDINGS [---]
DAMAGED BUILDINGS [ZZZZ]
(Hazardous) [ZZZZ]
NON-RESIDENTIAL USE [=====]

Prototypical Neighborhood Map:

Project Area Data:
Area: 11 blocks, 30 acres
Block: 207 ft x 300 ft
Lot: 40 ft x 100 ft
Pop. 1980: 1,3 story commercial on outside
Pop. 1980: 1,3 story wood-frame houses on inside
Pop. 1980: 1,4 story post-frame building
Pop. 1980: 1,4 story post-frame building
School (elementary)
Parking lots: 3 for recent lots
4-6 and 15-16 residential, C-20 (open, 10-15%)
4-6 and 15-16 residential, C-20 (open, 10-15%)
4-6 and 15-16 residential, C-20 (open, 10-15%)
1,500 people, 1 prototypical lot
Low-income housing, mixed ethnicity
100-150 people with mobility issues
150-200 people with mobility issues to go

Current Zoning:
Use Count:
Population:
"Outdated People":
"Outdated People":
"Outdated People":





POST-EARTHQUAKE HOUSING WORKSHOP

ABAG Conference Hall, Oakland, Jan. 31 - Feb. 2, 1977

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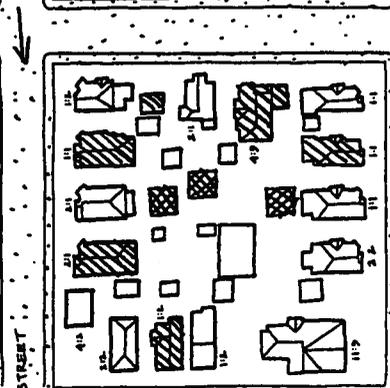
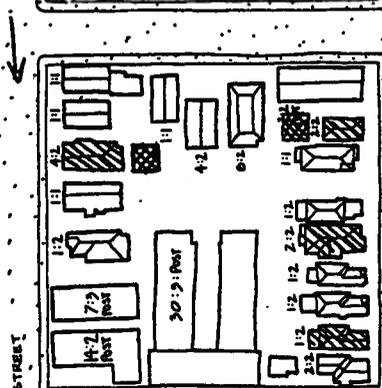
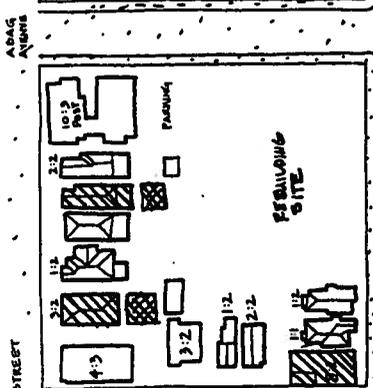
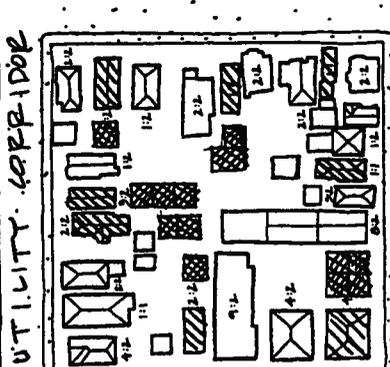
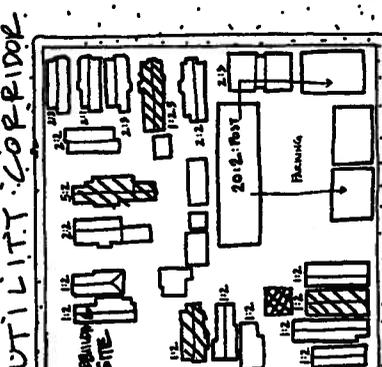
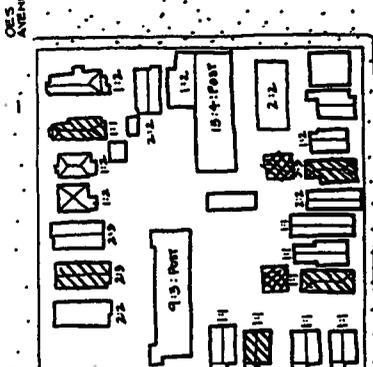
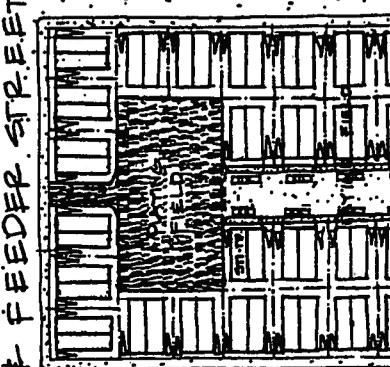
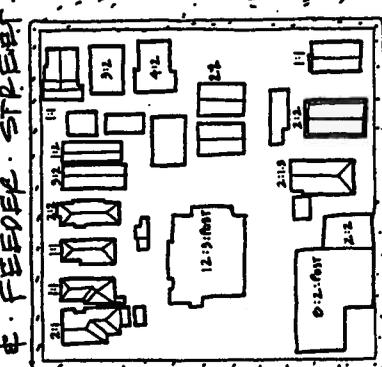
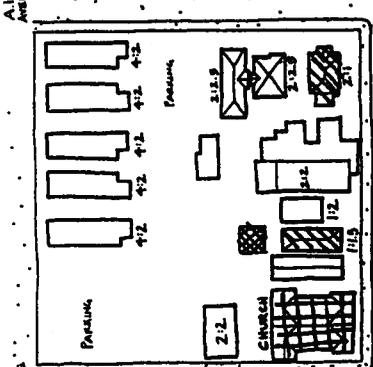
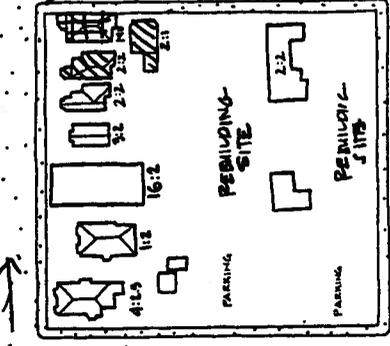
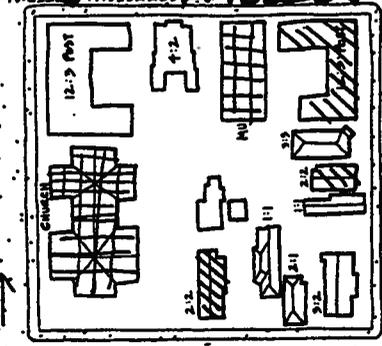
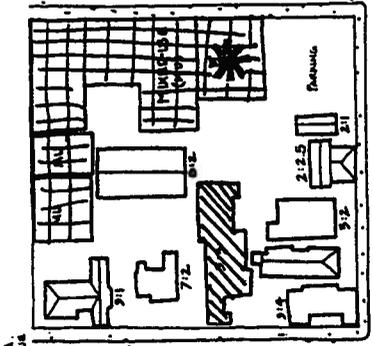
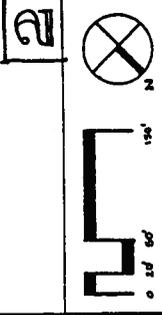
SITE PLAN #18 NOS.

LAND USE
 1. Single-Family Detached
 2. Single-Family Attached
 3. Multi-Family
 4. Office/Commercial
 5. Community Center
 6. Church
 7. School
 8. Recreation
 9. Open Space
 10. Parking
 11. Utility Corridor
 12. Feeder Street

STREETS/CIRCULATION:
PARKING:
OPEN SPACE:
FEEDER STREET:
UTILITY CORRIDOR:
REPLACEMENT HOUSING:
REPAIR HOUSING:

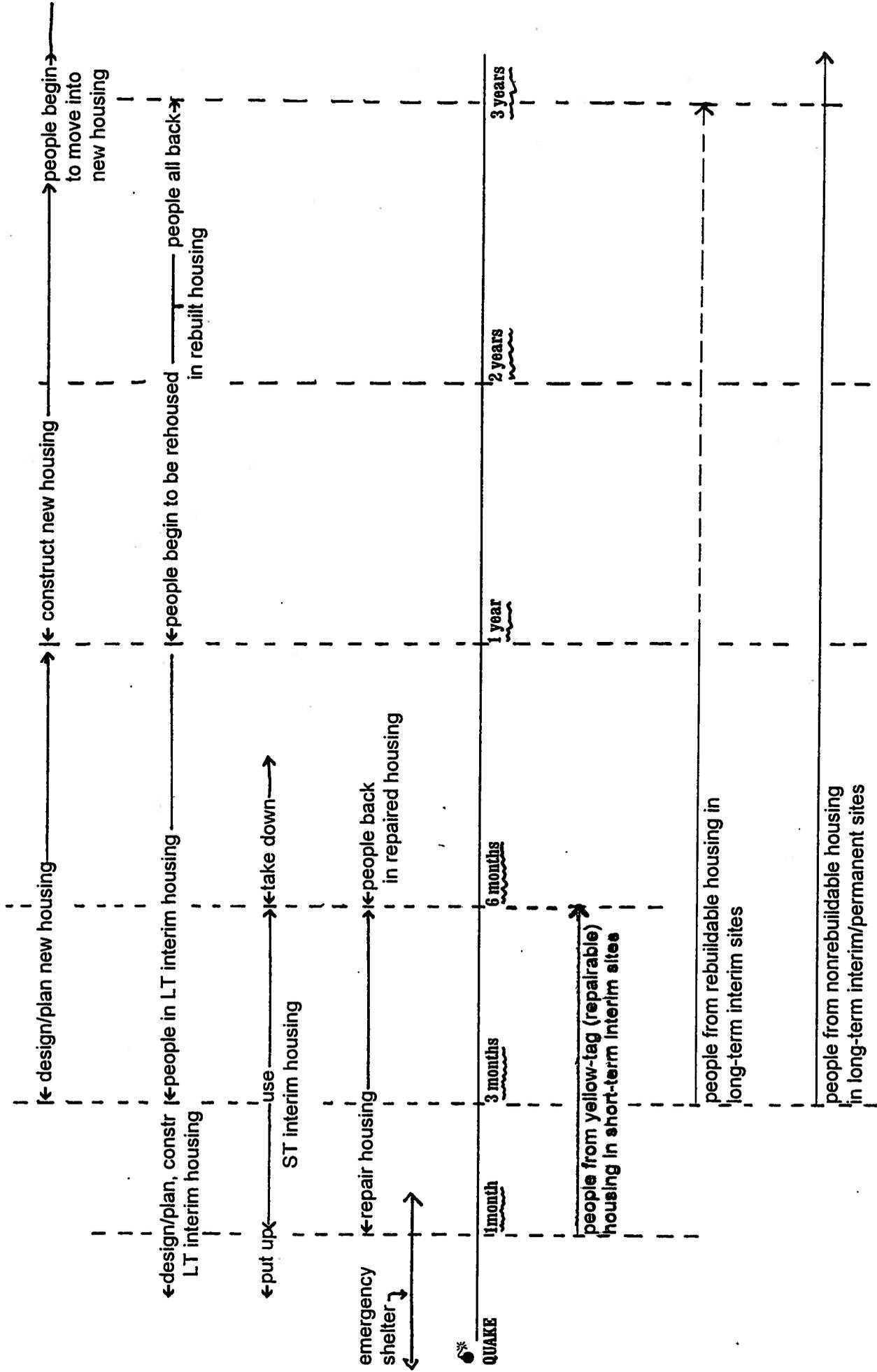
Prototypical Neighborhood Map:

13 blocks, 30 acres
 200-300 units
 25-40% low income
 10-15% elderly
 1-2 story wood frame houses and
 1-2 story wood frame townhomes
 1-2 story apartment buildings
 1-2 story wood frame 8-1000 duration
 1-2 story wood frame 1000-1500 duration
 1-2 story wood frame 1500-2000 duration
 1-2 story wood frame 2000-2500 duration
 1-2 story wood frame 2500-3000 duration
 1-2 story wood frame 3000-3500 duration
 1-2 story wood frame 3500-4000 duration
 1-2 story wood frame 4000-4500 duration
 1-2 story wood frame 4500-5000 duration
 1-2 story wood frame 5000-5500 duration
 1-2 story wood frame 5500-6000 duration
 1-2 story wood frame 6000-6500 duration
 1-2 story wood frame 6500-7000 duration
 1-2 story wood frame 7000-7500 duration
 1-2 story wood frame 7500-8000 duration
 1-2 story wood frame 8000-8500 duration
 1-2 story wood frame 8500-9000 duration
 1-2 story wood frame 9000-9500 duration
 1-2 story wood frame 9500-10000 duration



A STREET B STREET C STREET D STREET

Figure 18 Phasing of repairs, interim housing use, rebuilding and reconstruction



1. Construction/Provision of Interim Housing Units

Because state and local building codes affect the way manufactured housing is designed, and because coordination in a post-disaster atmosphere is difficult, pre-approval of interim housing designs and construction should be attempted before the quake. Bring all parties to the table, including local government housing and building officials, California Department of Housing and Community Development (HCD), the International Conference of Building Officials, the Division of the State Architect, community development corporations and manufacturers of modular housing. This committee can pre-approve several types of designs appropriate to different levels of damage to housing and transportation facilities. Plans should be updated every two years to take into account changes in recognized risk, technology, and transportation. A limit should be set on the eligibility for use. Plans should be approved and adopted at state and local levels.

When designing modular interim and permanent housing units, transportation factors play a roll in the proportions of the units. Standard tractor trailers carry a 8'6" x 102" load without special transport. Wide load trips can be made up to 12' wide and with special trucks the width can go up to 14' wide. The height restriction on all loads is 13'6" (from ground to top). Cargo containers are 8' wide.

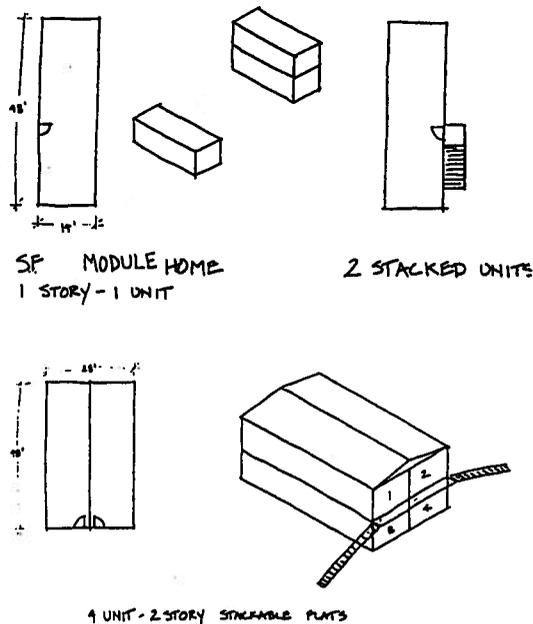


Figure 19. Modular Home Schemes

Panelized construction may make more sense because individual trucks can carry more units per trip and the sizes of units can be more flexible, However, these types of units will require more work on site, inspections will be required, and the finished product may take longer.

A new funding mechanism for repairs for multifamily housing is needed because SBA has a funding cap that is too low for apartments with more than 10 or so units. Federal Community Development Block Grants (CDBG) to cities are limited as well. Either an entirely new program will need to be developed, (perhaps working with private financial institutions) or the SBA and CDBG programs need to develop ways of accommodating large, (multi-owner) apartment structures.

Because of the density in the neighborhood, some interim housing units will be placed on streets: The space available is 55' from property line to property line (including two 10' sidewalks). The proposal is to create a 10' driving lane with 30' housing space. This will require using 5' of one sidewalk. The typical module size will be 30' x 24' (720 sf) and each block can accommodate 13 units. The total gains are 5,472 sf of housing. With this scheme, some driveways will be blocked and all will have difficult access. The street use pattern will need to be changed to accommodate the housing and additional street parking needs. The group found that two-story units were not possible in the streets because there is no room to stack them and the second story would conflict with existing poles and wires.

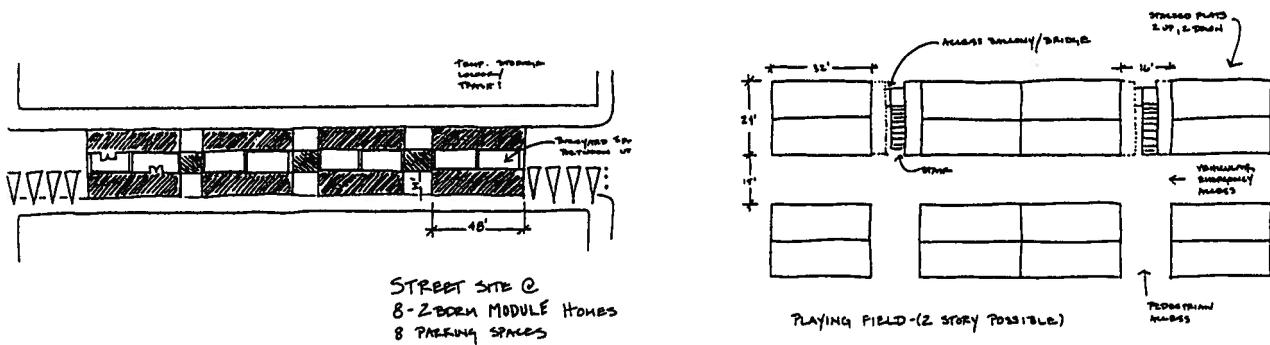


Figure 20. Modular Home Configurations

Interim housing units built on the playing field can be two-story, (stackable possible) with two flats up and two flats down.

Table 4. Priorities for Making Housing Available:

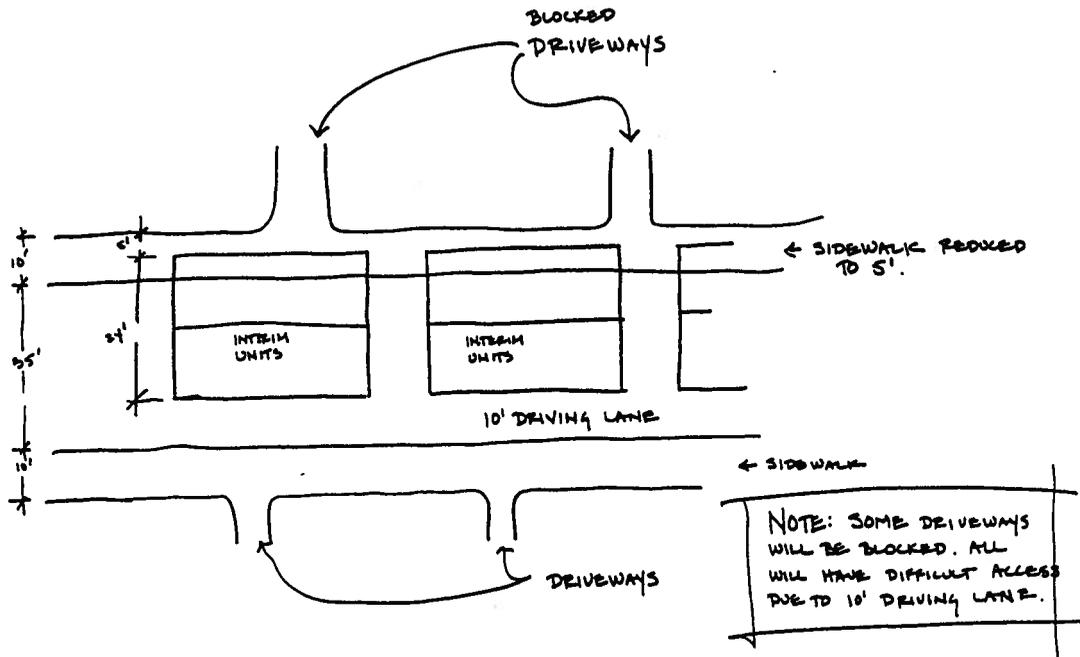
Permanent Solutions	a. Repair damaged structures b. Use backyards for permanent modular units
Temporary Solutions	c. use parking lots d. use demolished building sites e. use playing fields f. use streets

2. Overarching Issues

Because of the high cost of providing interim housing, priority should be given to fast repairs of damaged housing in order to reduce the number of people who require interim housing.

To reduce the number of people requiring any kinds of special housing, retrofit the vulnerable structures NOW. It is far cheaper to retrofit now than to shelter, house temporarily, or replace housing later.

Figure 21. Interim Housing Solutions Using Modular Units on Street Sites



OPTIONS FOR TEMP. UNITS ON STREETS:

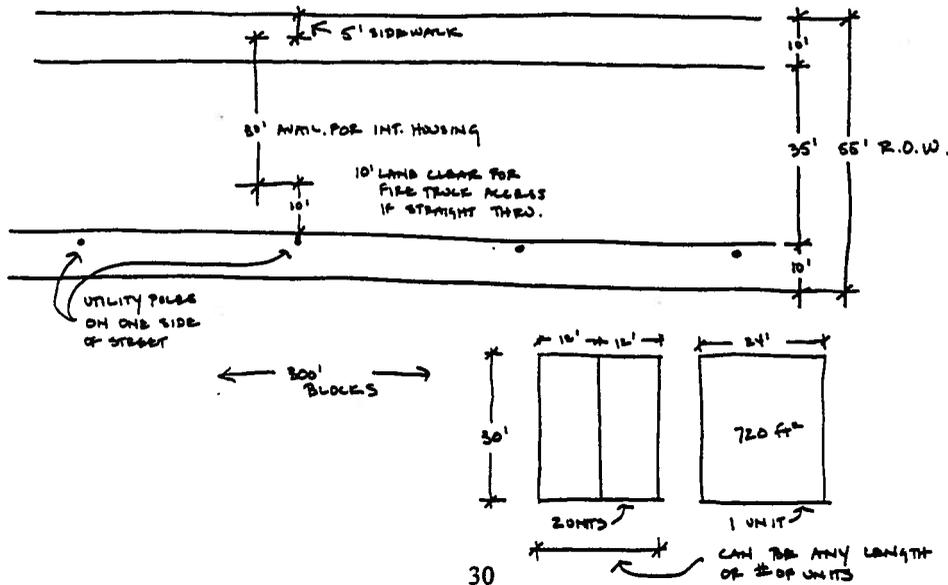
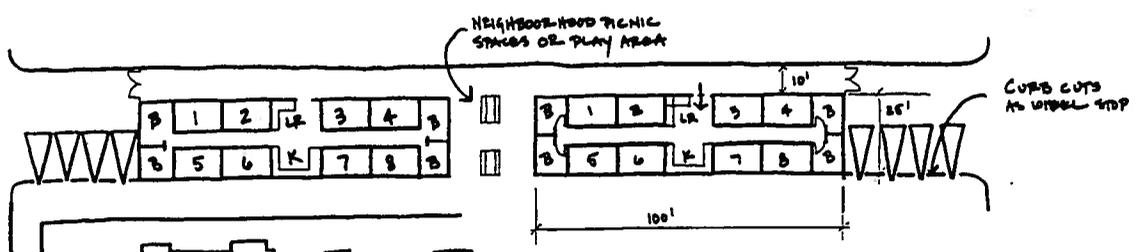
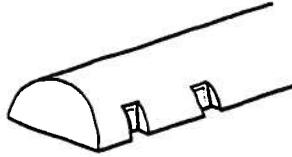
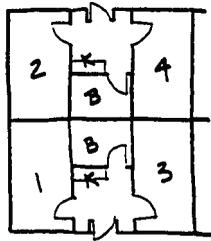
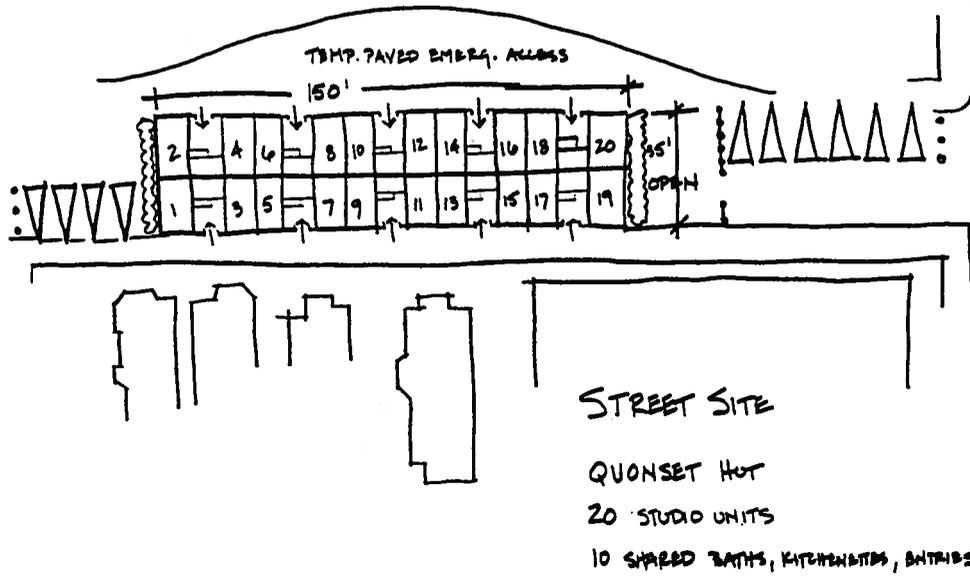


Figure 22. Quonset hut solutions to housing on street



STREET SITE

QUONSET HUT SRO'S

16 UNITS w/ 2 COMMON KITCHENS

8 SHARED BATHROOMS

8 PARKING SPACES

Acknowledgments

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