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MEMORANDUM

To: Euclid & Market Land Use & Mobility Plan (EMLUMP) Project Team

From: Colin Burgett, Gordon Hansen and Magnus Barber

Date: June 13, 2012

Subject: Road Diet Options for Market Street

This memorandum provides an overview of "road diet" examples and typical traffic volume thresholds, intended to inform the discussion of potential lane configuration options for Market Street, east of 47th Street, within the EMLUMP area.

Road diet concept drawings for the Market Street corridor (between 47th and Euclid) are shown on Pages 12 through 18, including both short-term (restriping only) and long-term improvement options that could be considered.

Introduction

A "road diet" is a cost-effective, relatively simple means of increasing safety, accessibility, and mobility along significant corridors, especially where roadway capacity exceeds both current and forecast traffic volumes. It is considered a form of traffic calming. In general, these projects entail:

- Reducing the amount of vehicular travel lanes, often in conjunction with installing a center turn-lane where none was provided previously
    - "4 to 3" road diet is most common, typically involving an existing four-lane street (with two motor vehicle travel lanes in each direction) with no center turn-lane that is restriped with one lane in each direction plus a center turn-lane
    - "6 to 5" road diets have been completed on some six-lane arterials (reduction to four motor vehicle travel lanes plus a center turn lane and bicycle lanes)
    - In addition, road diets have been implemented on multi-lane one-way streets.
- Other elements often include narrowing the remaining lanes, adding bike lanes, and in some cases a landscaped median and/or modifications to on-street parking
- With greater street right-of-way following lane contraction, sidewalks may also be expanded and ADA-compliant ramps installed to provide greater accessibility along a major corridor.

Figure 1 provides photographs showing a typical "before" and "after" scenario with implementation of a "4 to 3" road diet. Figure 2 provides a similar conceptual example of such a scenario applied to Market Street.

Figure 1 Typical Road Diet (4 to 3 Conversion)

Before

After

Figure 2 Market Street Road Diet Concept

Before

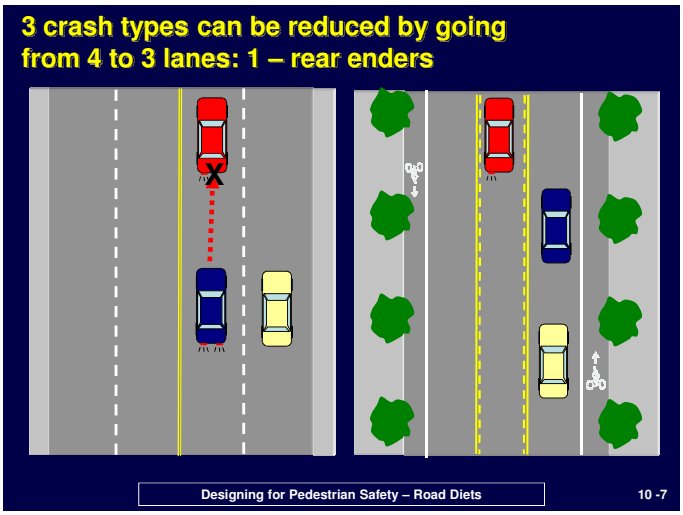
After

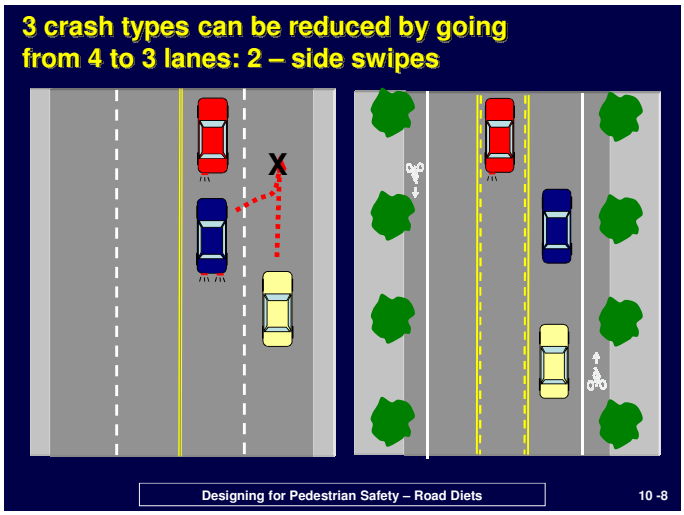
Safety Benefits of Road Diets

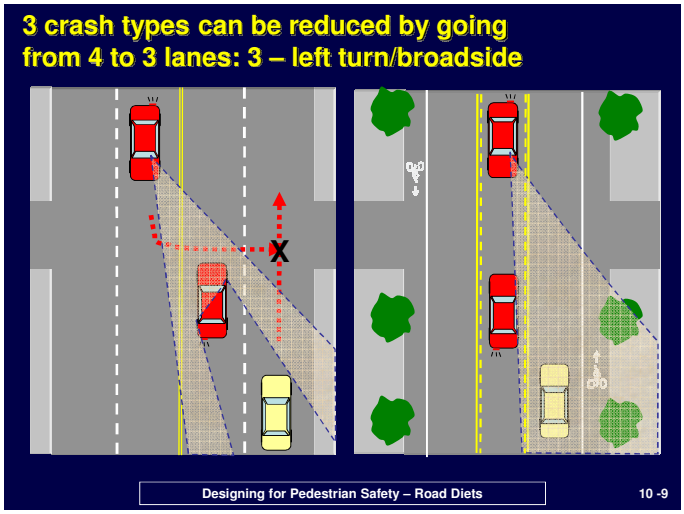
Road diets are particularly effective tools to improve the safety of both drivers and bystanders (including pedestrians and bicyclists). In the typical roadway conversion scenario – four lanes to three lanes with a center turn lane – a road diet curbs three types of accidents, which are illustrated in Figure 3:

- Rear-enders: vehicles turning left against oncoming traffic that could be rear-ended from drivers not paying attention may use the center turn lane instead.
- Side swipes: With two lanes in each direction, drivers switching lanes might side swipe another car because of the car's blind spot; with a road diet, however, drivers would not be able to switch lanes.
- Left turn/broadside: Whereas drivers turning left across incoming traffic may not be able to see a car in the far lane if another car in the near lane is waiting for the turn, vehicles turning from a center turn lane have only one lane of traffic to cross in order to complete the turn.
- In addition to driver safety, a road diet often also intrinsically increases bicycle and pedestrian safety by creating dedicated spaces for these modes. Striped bike lanes reinforce that the street is used by multiple modes of transportation, and pedestrians enjoy a combination of buffered walking spaces, wider sidewalks, or refuges (median islands) at crosswalk locations.

Figure 3: Crash Types Avoided by Road Diets







Slides courtesy Michael Moule, Nelson\Nygaard Consulting Associates

Typical Implementation of Road Diets

Road diets have typically been implemented on four-lane arterials or local streets where local circulation and/or neighborhood quality-of-life is constrained due to any one, or all, of the following:

- Narrow sidewalks
- Higher than desired vehicle speed (particularly where vehicular capacity far exceeds average traffic volumes)
- Lack of dedicated bicycle facilities
- Safety concerns due to rear-end collisions

Traffic Volume Thresholds for 4 to 3 Road Diets

Road diets have been successfully installed on streets with varying traffic volumes:

- The most common type of "4 to 3" road diets have primarily been implemented along corridors with average daily traffic (ADT) counts of up to 20,000 to 22,000 ADT.
    - For example, Valencia Street in San Francisco carried 22,000 ADT before implementation of a "4 to 3" road diet, and continues to carry 20,000 ADT today, following a very popular multi-stage implementation effort. Bicycle volumes, in particular, have increased dramatically on Valencia Street following implementation of the road diet.
- In addition, there have been several successful instances of road diets implemented along streets featuring higher average volumes.
    - For example: along Tacoma Street in Portland, Oregon (ADT 30,000), four lanes were reduced to three and additional improvements such as curb extensions, refuge islands, and on-street parking were added; as a result, overall traffic and instances of speeding decreased while few drivers diverted to alternate routes.

Road Diet Examples

Figure 4 shows a "before" and "after" example of a road diet project on a segment of La Jolla Boulevard in San Diego. Figure 5 provides a comparison of traffic volumes on several corridors in which road diets were implemented in various cities.

Figure 4 Road Diet Example: La Jolla Boulevard

Before

After

Figure 5 Road Diet Examples

Location	Average Daily Traffic (ADT)	Change in Design	Effect	Illustrations	Source
▪ Valencia Street San Francisco, CA	▪ **~22,000 (before)** ▪ **~20,000 (after)**	▪ 1st iteration: 4 lanes to 2 with center turn lane and bike lanes ▪ 2nd iteration: 2 lanes with bike lanes and expanded sidewalks	▪ 10% reduction in ADT (to 19,979) ▪ 2-8% increase in ADT on 4 parallel streets. ▪ Crashes decreased from 73.2 to 62/year ▪ Injury crashes decreased from 58.8 to 50/year ▪ Bicycle use in PM peak hour increased from 88 to 215 ▪ Bicycle crashes increased from 10.1 to 12/year	 1960s  2000s  2010s	(1)
▪ Tacoma Street Portland, OR	▪ **30,000 (before)**	▪ 4 lanes to 2 lanes with a center turn lane and some on-street parking	▪ Speeding decreased ▪ Overall traffic decreased ▪ Minimal traffic diversion ▪ Increased on-street parking ▪ Improved pedestrian environment	 	(2)

High Street Oakland CA	**22,000 – 24,000**	4 lanes to 2 with center turn lane	Crashes decreased from 81 to 68 per year	 Before  After	(3)
Lake Washington Boulevard Kirkland, WA	**20,000**	4 lanes to 2 with center turn lane	▪ Reduction in speeding ▪ Reduced noise levels ▪ Easier access to street from driveways	 After	(4)

Table adapted from Huang, Stewart, Zegeer, and Tan Esse, 2003

(1) 1960s image, Eric Fischer; Sallaberry, M. *Valencia Street Bicycle Lanes: A One Year Evaluation*. San Francisco Department of Parking and Traffic. December 2000.

(2) Jennifer Rosales, Parsons Brinckerhoff

(3) Knapp, K., T. Welch, and J. Witmer. Converting Four-Lane Undivided Roadways to a Three-Lane Cross Section: Factors to Consider. Presented at the 1999 Annual Meeting of the Institute of Transportation Engineers, Las Vegas, NV, August 1-4, 1999.

(4) Burden, D. and P. Lagerwey. *Road Diets: Fixing the Big Road*

Road Diet Costs

Most benefits associated with road diets can be delivered simply by restriping the street. Costs for road diets vary, but can be extremely cost effective relative to other types of transportation projects:

- The cost of road diets are often "bundled" with scheduled projects such as street repaving/resurfacing, thus allowing for installation of "restriping only" road diets at a very low "marginal" cost.
- In addition, a "multi-stage" implementation plan often includes an initial "trial" (restriping only), which may be followed by additional physical improvements to the roadway during a later year, subject to funding and approval of the results of the "trial". In addition, long-term construction and maintenance costs may be reduced, compared to the cost of maintaining a four-lane configuration.

Potential EMLUMP Road Diet Candidate: Market Street

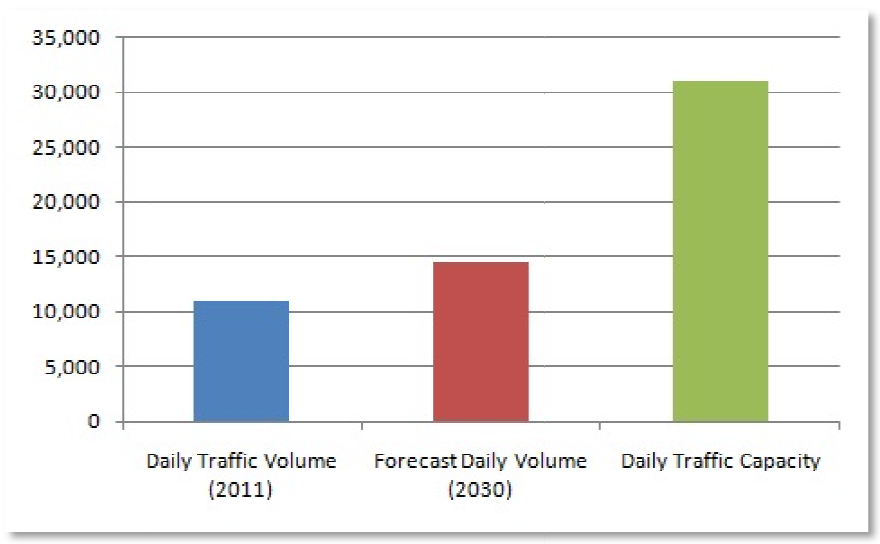
As has been discussed previously during the EMLUMP existing conditions review and various team meetings:

- The relatively low existing and forecasted future-year traffic volumes on Market Street (east of Market Street) make it an excellent candidate for a "4 to 3" road diet, potentially supporting the multi-modal circulation goals identified in the EMLUMP at a relatively low cost for implementation.
- In comparison, full build-out of Market Street to its currently planned configuration (described further below) would require additional right-of-way (ultimately reducing the net supply of developable land within the EMLUMP area) and additional costs for construction.

Market Street Characteristics within EMLUMP Area

- Existing and Future traffic volumes is available from several sources:
    - Year 2005 traffic counts conducted for the *Central Imperial Redevelopment Plan Transportation Impact Study* (2009)
    - Year 2011 traffic counts conducted for the EMLUMP
    - Year 2030 traffic forecasts prepared for the *Central Imperial Redevelopment Plan Transportation Impact Study* (2009)
        - Year 2030 forecast predicts a relatively benign level of traffic growth on Market Street
- Existing and Year 2030 volumes are below the typical threshold of 20,000 to 22,000 ADT for successful "4 to 3" road diets on all segments (and well below that threshold on segments east of 47th Street):
    - East of Euclid: **less than 13,000 daily vehicles**
        - 11,988 daily vehicles (2005)
        - 11,136 daily vehicles (2011)
        - 12,810 (Year 2030 forecast)
    - East of 47th / west of Euclid: **less than 14,000 daily vehicles**
        - 11,706 daily vehicles (2005)
        - 10,022 daily vehicles (2011)
        - 13,106 (2030 forecast)
    - West of 47th / east of I-805: **less than 20,000 daily vehicles**
        - 18,483 daily vehicles (2005)
        - 14,860 daily vehicles (2011)
        - 19,910 (2030 forecast)
- Market Street features four travel lanes (west of Euclid), providing a capacity of over 30,000 daily vehicles; and two lanes (east of Euclid).
    - Center-turn lanes are provided at signalized intersections (but not at mid-block segments)
    - On-street parking is allowed on most segments (except at signalized intersections).
    - Sidewalks are provided on segments west of 51st Street, directly bordering the curb lane. An unpaved pedestrian path currently accommodates pedestrian circulation east of 51st Street. Signal-controlled pedestrian crossings are provided at four intersections within the Plan Area, with an average distance of 1,300 feet (one-fourth of a mile) between signalized crossings. No bicycle lanes are provided.

Figure 6 Traffic Volume & Capacity on Market Street (Four-lane Configuration)



- Planned Road Characteristics:
    - Figure 7 shows the current Street Classifications within the EMLUMP study area
    - The planned roadway configuration on Market Street, based on its designation as a "Four -Lane Urban Major Street" is as follows (see Figure 8 for additional details):
        - Four travel lanes would be provided on all segments (requiring a widening of the segment east of Euclid Avenue, providing a capacity to accommodate over 30,000 daily vehicles, despite forecasted volumes of less than 14,000 daily vehicles on segments east of 47th Street (as summarized on Figure 6).
        - Right-of-way would be widened to accommodate a raised center median and bicycle lanes
        - **Four Lane Urban Major Streets (including Market Street) are ultimately intended to accommodate a motor vehicle travel speed of 45 miles per hour** (see Figure 8 for description of design speed).
            - Such a travel speed may not be consistent with the "transit-oriented development" and land use/community development goals described in the EMLUMP.
        - In order to allow for a "4 to 3" road diet, reclassification of Market Street would be necessary.
            - Potentially, the segment east of 47th Street could be reclassified as a 2-lane collector.
            - Currently, there are no collector streets within the EMLUMP area. Rather, the current roadway network is limited to "arterial" and "local" streets (while most "local" streets within the EMLUMP area are discontinuous).
                - As a result, many existing land uses rely on direct access to arterial streets, given the lack of "collector" streets and continuous "local" streets.

Figure 7 Street Classification Map

Four Lane Urban Major Streets are shown in brown: Euclid, Market, Imperial, and 47th Street are all designated as Major Streets, requiring 4 lanes plus raised medians at full buildout.

There are no Two Lane Collector Streets (shown in gold) within the boundaries of the EMLUMP study area (highlighted in gray).

Local Streets within the study area are discontinuous, requiring most trips within the study area to occur on Major Streets.

Figure 8 Street Classification Requirement for Four Lane Urban Major Streets (including Market Street)

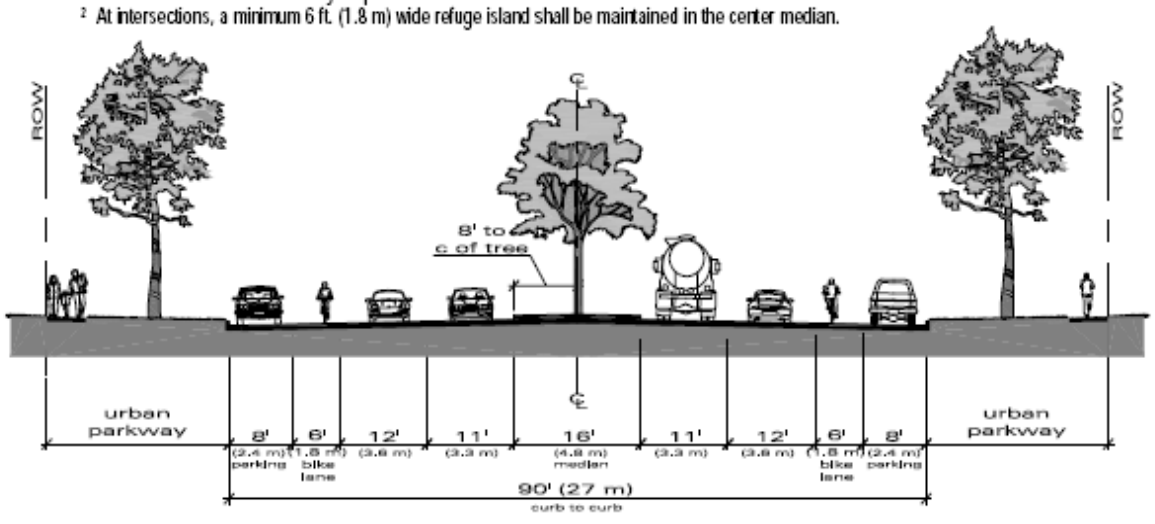
Four Lane Urban Major Mj

Width, Right-of-Way		118 ft. (35.6 m) - 130 ft. (39.0 m)
Design ADT	LOS C LOS D	30,000 35,000
Design Speed		45 mph (70 km/h)
Width (includes bike lanes and 16 ft. (4.8 m) raised center median), **Curb-to-Curb**[1,2]		90 ft. (27.0 m)
Maximum Grade		7%
Minimum Curve Radius		1,090 ft. (325 m) with no superelevation 830 ft. (245 m) with 2% (min.) superelevation 660 ft. (195 m) with 6% (max.) superelevation
Land Use		Single Dwelling Residential-no front or side yards; Multiple Dwelling Residential-no front or side yards; Neighborhood Commercial; Community Commercial; Regional Commercial; Commercial Office; Visitor Commercial; School (high school and above); Church; Public Building; Urban Village Commercial Retail; Industrial
Parkway Options		U-4 (a); U-5 (a,b); U-6 (a,b)

NOTE: Four-Lane Urban Major street classification is applicable to streets of limited length, where intersections are closely spaced, where there is extensive driveway access, or in other situations where the speed is expected to be less 45 mph (70 km/h) or less.

[1] Widen additional 10 ft. (3.0 m) at approaches to intersecting four- or six-lane streets to provide a minimum of 250 ft. (75 m) of two-lane left-turn storage, exclusive of transitions. Receiving lanes for dual lefts shall be 12 ft. (3.6 m) wide. In instances where supporting information exists, such as an approved traffic impact study, showing clearly that dual left-turn lanes would not be warranted, the standard curb-to-curb width may be permitted.

[2] At intersections, a minimum 6 ft. (1.8 m) wide refuge island shall be maintained in the center median.



Road Diet Concept Drawings for Market Street

Conceptual drawings of potential road diet concepts for Market Street are provided on the following pages.

Figure 9A Market Street Road Diet Concept: Short-term Option (Restriping Only) – Corridor View

Image source: © 2012 Google and © 2012 INEGI

San Diego Euclid and Market Village Master Plan

Conceptual 4-to-3 Lane Conversion, Market between Euclid and 47th

San Diego, CA

February 2012

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Figure 9B Market Street Road Diet Concept: Short-term Option (Restriping Only) – Close-in View

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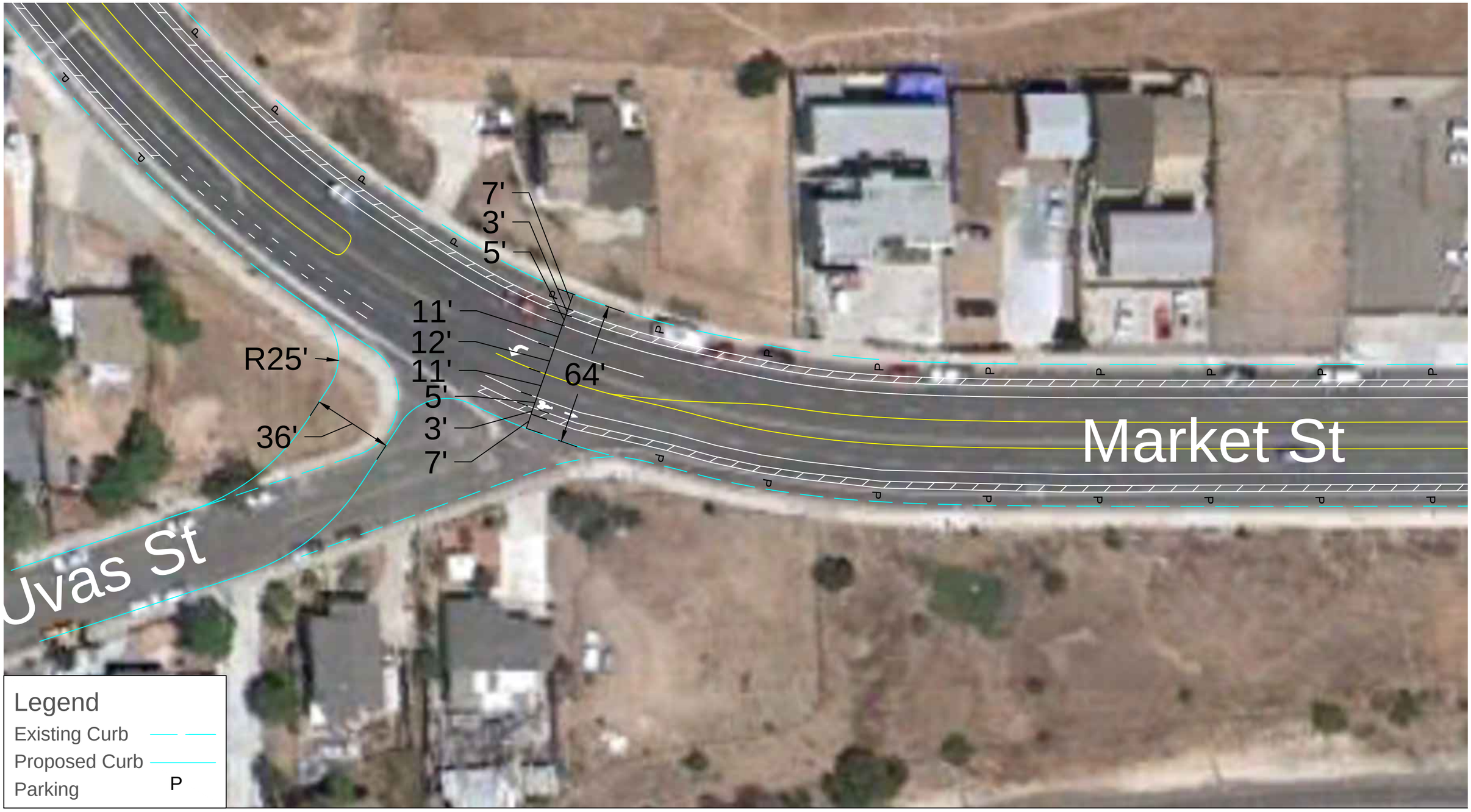

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Figure 10A Market Street Road Diet Concept: Potential Long-term Option (with Median Enhancements) – Corridor View

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Figure 10B Market Street Road Diet Concept: Potential Long-term Option (with Median Enhancements) – Close-in View

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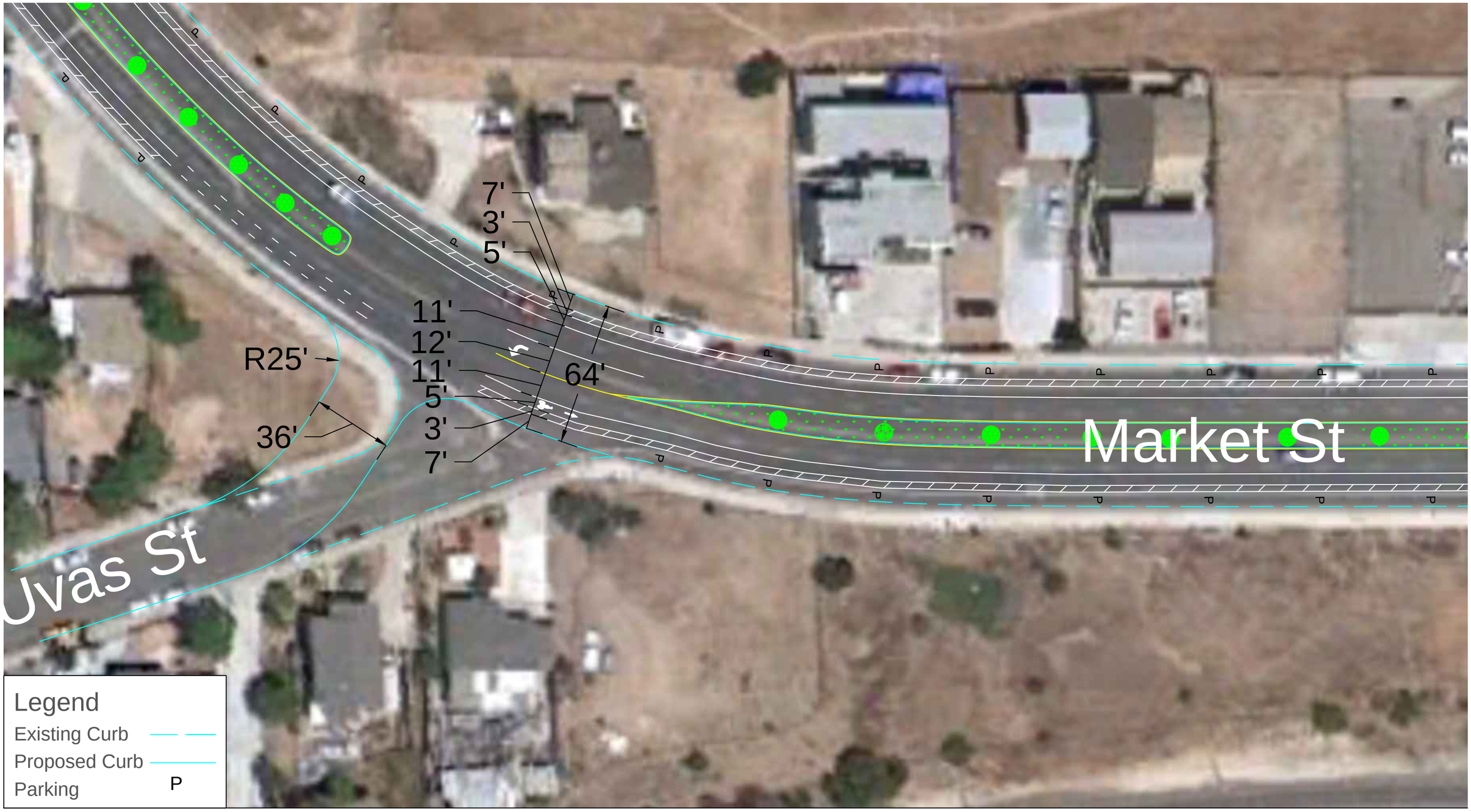

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