The Development Pattern of the South Bay

South Bay Transportation Performance Study

Technical Report 1

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Introduction

This is the first of three Technical Reports that support the Policy Report, *Sustainable South Bay: An Integrated Land Use and Transportation Strategy* As explained in that document, there is a statewide initiative in California (SB 375) to re-shape regional development patterns so they generate fewer vehicle miles traveled in fossil fueled vehicles. The preferred pattern will consist of dense, walk-able nodes (where housing is closer to work and shops) coordinated with better public transit networks.

But what is the *existing* development pattern in the South Bay sub-region of Los Angeles County?   What are the opportunities and barriers to changing it?

Usage of the term *development pattern* is a little imprecise in practice. It can refer to the spatial pattern of building height and density, the spatial distribution of functionality or, more generally, the spatial arrangement of origins and destinations. It shapes travel demand.

Development patterns can vary widely between sub-regions. For example, commercial functions can be concentrated in a single downtown center, distributed along arterial corridors, or focused on stops along a rail line. The residential function can be isolated in large low density tracts, built in high density super blocks, or mixed in with commercial functions. And so forth. The particular development pattern affects whether transportation strategies can be simple and low cost or whether they must be complex and expensive.

This first attempt at documenting the existing South Bay development pattern should be revised when current data become available from the 2010 Census and as SCAG assembles data as part of its effort to produce a Sustainable Communities Strategy pursuant to SB 375.

This report presents the available data for three basic elements of the South Bay

- Cities – Size and Density
- Grid – Arterials and Intersections
- Centers – Single Function and Mixed Use

In addition, average distances traveled for a few trip types are estimated. Before looking at the data, an outline of the development dynamics that established the existing land use patterns is presented.

South Bay Development Dynamics

Reducing vehicle miles traveled by stopping, or at least slowing, the process of developing green fields on the metropolitan periphery into low density suburbs is one of the objectives of SB 375. Yet, based on history, yesterday's green fields and today's low density suburbs will become tomorrow's dense, mature suburbs.

That development process has played out in the South Bay over the last 160 years. Cattle ranching dominated the South Bay until 1848 when the Treaty of Guadalupe Hidalgo transferred the area to the United States. Cattle ranches were replaced by farms with crops such as lima beans, strawberries, and celery. Dairies and chicken farms were also common until WWII.

Transportation technology has always played a big role shaping land use. In 1905 virtually everyone walked, rode in a traditional horse cart, or caught a streetcar. The mobility options of that era certainly constrained the land development options.

By 1920 the Pacific Electric Railway had opened up the South Bay to limited commercial and suburban residential development as street car networks spread in fingers throughout the county and provided access to the dominant central business district in downtown Los Angeles. These original transit oriented developments began the process of converting agricultural land on the urban periphery at the time. In fact, development of 3 of the 8 neighborhoods studied in this project was affected by the Pacific Electric network – Riviera Village, Old Torrance and downtown Inglewood.

The automobile age led to development of those in-between areas not served by the streetcars. Automobile use increased accordingly thereby encouraging more farm land development in a self-reinforcing cycle. Pacific Electric use declined with service ending in the mid-1960s and even earlier in the South Bay.

The post-war housing boom absorbed virtually all of the remaining green fields and displaced the remaining farm land. Dairies were outlawed by municipal ordinances in the mid-sixties. Agriculture was essentially gone by 1984.

By then, rebuilding the regional rail infrastructure was being discussed by the transportation planners. As a regional backbone rail network has evolved over the years, competition among sub-regions for investment funds has increased. Despite the Blue, Red, and Green lines and their planned extensions, no commitment has been made to tie the South Bay into that regional backbone rail network for the foreseeable future. The South Bay remains auto dependent for short and long haul journeys.

Land tends to be expensive in built-out cities and this is certainly the case throughout the South Bay, almost all of which is within 7 miles of the Pacific Ocean and is in high demand because of that coastal proximity. As a consequence, developers seek out the opportunities that involve the least valuable structures since the existing buildings will be demolished and replaced with new construction. Typically they are the smallest and/or oldest, often dating from the 40's, 50s or 60's.

Those economic realities have over the years led to *density creep* as virtually every new building displaced one that was smaller. Street and parking congestion have increased with the density. To many old time residents, the South Bay now feels crowded with traffic problems constraining their freedom of movement.

As a consequence of this 160 year long process, the South Bay has become a built-out, relatively dense sub-region. This suggests that accelerating density increases without substantial investments in transit will not achieve the desired transportation benefits,

More needs to be known about how the transportation-land use relationship works in mature suburbs, especially in the areas with the highest densities. There are many mature suburban regions in California that could benefit. Finding new strategies for reducing automobile dependence will depend on that knowledge.

South Bay Cities: Size and Density

Seventeen jurisdictions make land use decisions in the South Bay -- 15 incorporated cities plus parts of the City of Los Angeles and sections of unincorporated Los Angeles County. Each has a unique history, size, geography and political orientation. With 17 jurisdictions, coordinated action can be challenging,

The total size of the South Bay sub-region is 90,002 acres or 140.3 square miles. This is slightly larger than Portland, Oregon. Population in 2000 was just over 1 million (1,031,600), living in about 372,000 housing units, and driving about 550,000 cars. Almost half a million worked in the South Bay in 2000 (498,500).   Gross residential density is approximately 4.1 DU/acre, a little over *twice* the density of Portland.

Three jurisdictions dominate geographically – Torrance, Carson and parts of Los Angeles make up almost half of the total South Bay area (47.1%). Including the next three, Rancho Palos Verdes, Inglewood and unincorporated county, means that a little less than one third of the cities account for a little more than two-thirds (68.5%) of the area. Because of the extent of their physical dominance, decisions in those jurisdictions have disproportionately influenced the transportation performance of the South Bay sub-region.

The largest cities will also have the most street miles and the most parking spots. Donald Shoup at UCLA has raised the importance of parking policies to transportation performance. It may be that street management policies will also have a significant role in improving performance. The largest jurisdictions will have a disproportionate impact on transportation performance through parking and street management policies.

The jurisdictions in terms of their land area from the largest to the smallest are as follows:

Table 1. Size in Acres		
Jurisdiction	**Acres**	**Percent of Total**
City of LA	17,716	19.7
Torrance	12,312	13.7
Carson	12,310	13.7
Rancho Palos Verdes	8,745	9.7
Inglewood	5,839	6.5
Unincorporated County	4,675	5.2
Redondo Beach	4,111	4.6
Hawthorne	3,801	4.2
El Segundo*	3,550	3.9
Gardena	3,381	3.8
Palos Verdes Estates	3,075	3.4
Rolling Hills Estates	2,624	2.9
Manhattan Beach	2,518	2.8
Rolling Hills	1,954	2.2
Lawndale	1,264	1.4
Lomita	1,212	1.3
Hermosa Beach	915	1.0

Source: ICF Consulting, U.S, Census Bureau, Individual Cities
*Median size in Acres

The South Bay had a 2000 population of just over a million people – 1,031,637.   Population leads to a different "size" ranking from acreage because of differences in residential density, household size, land devoted to commercial and civic uses, obstacles such as the I-405 freeway and other factors.

Nevertheless, population is almost as concentrated as land area. The top three cities account for only 43% of the population but the six largest cities account for 70.5 %. The included parts of the City and County of LA house 29.3% of the total South Bay population (VS 24.9% of the acreage).

Hawthorne replaces RPV otherwise the cities with the largest population are the same as the cities with the most acreage. It is likely that the six cities with the largest population with over 70% of the total are having a significant impact on sub-regional transportation performance since VMT are generated by people, not acres.

The following table shows the South Bay cities in terms of year 2000 population, ranked from largest to smallest:

Table 2. Size in Population		
Jurisdiction	**2000 Pop**	**Percent of Total**
City of LA	193,052	18.7
Torrance	137,946	13.4
Inglewood	112,580	10.9
Unincorporated County	108,970	10.6
Carson	89,730	8.7
Hawthorne	84,112	8.2
Redondo Beach	63,261	6.1
Gardena	57,746	5.6
Rancho Palos Verdes*	41,145	4.0
Manhattan Beach	33,852	3.3
Lawndale	31,711	3.1
Lomita	20,046	1.9
Hermosa Beach	18,566	1.8
El Segundo	16,033	1.6
Palos Verdes Estates	13,340	1.3
Rolling Hills Estates	7,676	0.7
Rolling Hills	1,871	0.2

Source: ICF Consulting, Siembab Planning Associates
*Median Population

There were also almost one-half million people employed by South Bay businesses in 2000. The largest employment centers were Torrance, Los Angeles, and Carson. Those three jurisdictions accounted for 48.3% of total employment. The top 6 cities accounted for 77.9%, almost 4 out of 5 employees in the South Bay. In other words, employment is even more concentrated than either acres or population.

Although street management policies were not examined, it stands to reason that cities with large employment centers will adopt policies that facilitate the flow of commuter automobile traffic. The relevant policies include speed limits, on-street parking restrictions, left turn pockets, and striping that reduces vehicular capacity such as for bicycle lanes.

Torrance, Inglewood, Los Angeles and Carson are significant employment centers as well as the largest in acreage and population. (Data were not available for the unincorporated County.) El Segundo and Gardena join the top six and Hawthorne slips to 7. Since employment centers are destinations, residential origins and commercial destinations are clustered in the same 6 or 7 cities core cities.

Table 3. Employees per City		
Jurisdiction	**Employees**	**Percent of Total**
Torrance	109,276	22.9
Los Angeles	63,066	13.2
Carson	58,063	12.2
El Segundo	57,535	12.1
Inglewood	49,492	10.4
Gardena	33,810	7.1
Hawthorne	33,128	7.0
Redondo Beach	24,233	5.1
Manhattan Beach	13,691	2.9
Hermosa Beach	8,705	1.8
Lomita	7,845	1.6
Lawndale	7,304	1.5
Rolling Hills Estates	4,619	1.0
Rancho Palos Verdes	4,252	0.9
Palos Verdes Estates	1,263	0.3
Rolling Hills	276	0.0
Total	476,558	100.0

Source: ICF Consulting, Siembab Planning Associates

Density is a different dimension from size, and the key variable in defining the development pattern. Density is one of the most politically sensitive characteristics of the built environment and a direct result of public land use policy. In other words, dense cities have chosen that option, at least at some time in the past.

Five jurisdictions have relatively high gross population densities (19.3/A to 25.1/A) and five others have low population densities (2.9/A to 4.7/A) -- four of them on the Palos Verdes Peninsula. The densest city, Lawndale, is also the third smallest in area.

Combining employee density per acre with population density shows that high density population cities tend to also have above the median employee density and vice versa; low population density tends toward low employment density. The most significant exception is El Segundo with relatively low population density but very high employment density, reflecting the fact that most of its land area is used for commercial and industrial purposes. Only Torrance, City of LA and Carson have more total employees.

The gross density table is generally led by the smallest jurisdictions. Among the large jurisdictions, only Hawthorne, Inglewood and Gardena are more dense than the median. Torrance, Carson, Rancho Palos Verdes and Los Angeles have below median residential densities.

Table 4. Population and Employee Gross Densities				
Jurisdiction	People per Acre	Employees per Acre	Combined	People per Acre/ Employees per Acre
Lawndale	25.1	5.8*	30.9	4.33
Unincorporated County	23.3	4.7	28	4.96
Hawthorne	22.1	8.7	30.8	2.54
Hermosa Beach	20.3	9.5	29.8	2.14
Inglewood	19.3	8.5	27.8	2.27
Gardena	17.1	10	27.1	1.71
Lomita	16.5	6.5	23	2.54
Redondo Beach	15.4	5.9	21.3	2.61
Manhattan Beach	13.4*	5.4	18.9	2.48
Torrance	11.2	8.9	20.1	1.26
City of LA	10.9	3.6	14.5	3.03
Carson	7.3	4.7	12	1.55
Rancho Palos Verdes	4.7	0.5	5.2	9.40
El Segundo	4.5	16.2	20.7*	0.28
Palos Verdes Estates	4.3	0.4	4.7	10.75
Rolling Hills	3.8	0.1	3.9	38.00
Rolling Hills Estates	2.9	2	4.9	1.45

Source: ICF Consulting, Siembab Planning Associates
*Median Numbers

Housing density is most often measured in terms of dwelling units per acre. These are gross residential densities, meaning that the denominator is the *total* acres rather than just the residential acres, i.e., those with housing on them. Net densities will always be higher than gross densities for the same general area. Net densities are calculated for the study areas discussed in subsequent Technical Reports. Different rankings between housing and population density are caused by differences in family size and vacancy rate.

Gross housing density follows the same pattern as gross population density. Relatively dense jurisdictions tend to be relatively small in size. Although Hermosa Beach replaces Lawndale as the densest and Redondo Beach moves up slightly, the basic ranking remains about the same as population density.

Table 5. Gross Housing Density: DU/Acre	
Hermosa Beach	10.8
Lawndale	7.8
Hawthorne	7.8
Redondo Beach	7.2
Lomita	6.8
Inglewood	6.6
Unincorporated County	6.4**
Gardena	6.2
Manhattan Beach	6.0*
Torrance	4.5
City of LA	3.7
Carson	2.1
El Segundo	2
Rancho Palos Verdes	1.8
Palos Verdes Estates	1.7
Rolling Hills Estates	1.1
Rolling Hills	0.3

Source: ICF Consulting, Siembab Planning Associates
*Median
**Estimate

A jobs-housing balance is considered desirable by planners because it suggests there is a statistical probability that residents work relatively close to where they live. While this may be true in general, the probabilities in some cases can be quite low. A balanced ratio between jobs and housing is widely acknowledged to be an extremely crude metric for characterizing the aggregate distance to work for any region or sub-region. .

At the city scale, the ratio between jobs and houses simply provides a measure of the extent to which a city is rich in either work destinations or residential origins. A balanced city does not mean that its residents also work in the city although some may.

In the South Bay (excluding city and county of Los Angeles due to lack of data), 3 cities are housing rich, 5 are job rich, and 7 are relatively balanced.

This suggests that employment is scattered throughout the sub-region but not on the Palos Verdes Peninsula where what little employment exists is concentrated in and around its only commercial concentration, The Peninsula Center. El Segundo is a major regional employment center while Carson and Torrance are sub-regional centers.

There is a strong tendency for the larger cities to be not only less dense but also to be job rich. Even relatively balanced Inglewood and Hawthorne are slightly job rich. Since these are gross densities, low residential is consistent with job concentrations as indicated in the Population and Employment Table.

Table 6. Jobs-Housing Ratio	
Relatively Job-rich cities	
El Segundo	7.90
Carson	2.30
Torrance	2.00
Gardena	1.60
Rolling Hills Estates	1.60
Cities with relative J-H balance	
Inglewood	1.30
Hawthorne	1.10
Lomita	0.95
Manhattan Beach	0.91
Hermosa Beach	0.88
Redondo Beach	0.82
Lawndale	0.74
Housing-rich cities	
Rolling Hills	0.40
Rancho Palos Verdes	0.27
Palos Verdes Estates	0.24

The Suburban Grid: Arterials and Intersections

Overview

The street pattern establishes the spatial framework that organizes development.
The South Bay, like many other suburban sub-regions, was built on a square grid. A system of parallel major arterials north-south and east-west are exactly one-mile apart. Minor arterials can be found half-way between the majors so that a traveler starting at a major will encounter a minor in ½ mile, another major ½ mile after that, another minor ½ mile after that, and so forth.

However, the current urban form no longer strictly conforms to the grid to the extent that it once did. In addition to the natural features such as the ocean and the hills that have been there from the beginning, the grid is now interrupted by infrastructure added incrementally over time such as flood control channels, freeways, and railroad tracks. Large single function centers such as retail malls have been developed which also disrupt the grid.

The I-405, the only freeway through the heart of the South Bay, is a large structure that runs north and south through the approximate center of the sub-region across 6 cities and parts of Los Angeles City and County. The I-105 runs near the northern boundary of the South Bay cutting through 3 cities plus parts of Los Angeles City and County.

The sub-region's only light rail infrastructure runs in the middle of the I-105 until it turns south at the freeway's western terminus in El Segundo. From there it continues south touching the edge of Manhattan Beach and terminating at a stop where Hawthorne, Redondo Beach and Lawndale meet.

The major and minor arterials form a system of corridors, with mostly but not exclusively commercial edges. In most cases, the area behind the commercial edges and within the square mile grid was developed as residential sub-divisions and remains today as primarily single family residential neighborhoods. The minor arterials run through the center of these mile square neighborhoods and often are developed as commercial corridors although mixed use and residential edges are not uncommon. Public facilities such as schools or parks are usually found within the residential neighborhoods rather than on the commercial edges, but there are exceptions, of course.

The result is a series of single family residential enclaves bordered by a commercial mix of retail and office. In some cases there is a row of multi-family dwellings that run between the commercial edge and the single family center. In this way, the South Bay's traditional suburbs tend to be horizontal mixed-use with a variety of housing types.

This could be a design feature with significant impact on neighborhood transportation performance. The edges of major arterials in some suburban areas are brick walls not commercial corridors. The wall functions as a noise barrier, gives the residential neighborhood a hard edge, and increases the automobile traffic flow along the arterial. Such neighborhoods may have similar residential densities as those with commercial edges but will lack direct access to the commercial mix.

Single function centers have historically grown within this basic mixed-use grid. They include industrial centers such as the Standard and Mobil oil refineries and the Hawthorne and Torrance municipal airports and adjacent related commercial/industrial districts. There are also retail malls, civic centers, hospital campuses and college campuses such as California State University at Dominguez Hills (CSUDH) and El Camino Community College. There are even a few "walk-able" mixed-use centers consistent with the regional "Blueprint" pattern promoted by SB 375 – Riviera Village, downtown El Segundo, Old Torrance, and downtown Inglewood are four that were included in the South Bay Transportation Performance Study.

This first attempt at describing the South Bay development pattern consists of the inventory of those various elements.

Arterials

The South Bay is approximately a rectangle with north-south as its longest dimension. Although hard distinctions are impossible to make, we estimate that there are ten major north-south arterials. The major north-south arterials run collectively for a total of 111 miles within the South Bay. In each case, the arterial is part of a regional circulation system that connects adjacent sub-regions at grade. Those ten arterials run for a total of 273 miles within Los Angeles County meaning that only 41% of their collective length is in the South Bay (although most of this distance outside of the South Bay is accounted for by Pacific Coast Highway (PCH) which is the main arterial that connects northern and southern California and therefore runs completely through the county). Excluding PCH, 55% of the total length of the 9 remaining arterials is in the South Bay.

Similarly, there are 15 major east-west arterials that run collectively for a total of 92 miles in the South Bay. Their length in Los Angeles County totals 202 miles meaning that 45% of their collective length is in the South Bay.

Those 202 linear miles consist of mostly commercial edges (with sections in various mixes). If these edges average 1/8 mile deep, there are approximately 25 square miles of major corridor edges (16,000 acres). In other words, about 18% of the land in the South Bay runs along the edges of its major arterials.

These long, straight, wide major arterials were presumably intended to be the infrastructure to provide access by cars and buses to an array of commercial destinations and employment centers. For instance, a bus rider could live in Rancho Palos Verdes and travel directly up the nearly 40 mile length of Hawthorne Blvd (La Brea) into the heart of Hollywood. The question is how many do?

The answer is relevant because those major suburban arterials may not function for most people as long corridors for 40 mile trips but as connectors for smaller groups of people over relatively short distances – like 5 miles or even 3 miles. To the extent that is true today or could be made true tomorrow means that these wide arterials could be re-purposed by sectioning into a mix of two roadways, one in the middle for through traffic and the other along the edges for local

traffic. Local traffic could then easily and safely carry smaller, slower personal vehicles and DASH-type transit services.

There are also 9 minor arterials that run north-south for a total of 67 miles within the South Bay out of 86 miles within LA County. This means 78% of the total length of the minor arterials is in the South Bay. Eight minor arterials run east-west for 37 miles out of a total of 52 miles in LA County – 72% in the South Bay. This means that in addition to carrying less traffic, the minor arterials are not as long and have a much more local orientation in the South Bay than the major arterials.

Intersections

The major and minor arterials also create a system of intersections at regular intervals. Intersections are of special interest in the analysis of urban form. Crossroads have traditionally been market centers because they are the places that enjoy the best ground access from all directions. Intersections are also physically the geographic center of the surrounding neighborhood – typically residential in suburban areas.

In a world built for automobiles, suburban arterials usually function as commercial corridors. Their strip businesses are intervening opportunities for drivers headed to other destinations. Their intersections are great places for developing auto oriented businesses such as drive-throughs and gas stations because they are positioned to capture the auto traffic that passes by in 4 directions. In such places, many more people typically drive-by than live nearby.

But outside of the auto-perspective, arterials can also be understood as a series of intersections, each the center of a unique neighborhood that extends .5 mile in each direction along the intersecting major arterials. It may be that a successful transition away from auto-dominance will require seeing arterials as a sequence of neighborhood centers or proto-centers.

There are 3 types of intersections:

- Major-Major – where two major arterials cross
- Major-Minor – where a major and a minor cross
- Minor-Minor – where two minor arterials cross

It is therefore possible to characterize the suburban grid formed by major and minor arterials as a natural three-level hierarchy of centers.

Inventory

The South Bay has approximately the following number of intersections:

Major-Major   100
Major-Minor   54
Minor-Minor   48

Most of those 202 are candidates to be developed or otherwise transformed into some level of center serving the adjacent residents. Some are of course located in industrial districts which have no nearby residential tracts. The potential for intersection development as a strategy for reducing VMT will be discussed further in the Policy Report.

Sample of Current Uses

How are these intersections now being used? In other words, what land uses, buildings and functions are currently located there?

While funding was not available for a comprehensive answer to that question, a small sample was examined in 2004. At that time 11mile-long corridors were identified by Solimar Research Group as candidate study areas. A windshield survey of the land uses at a sample of the intersections at the ends of each corridor found the following:

Table 7. Land Uses at Intersections		
Retail	**29**	
	Mall/mini malls	17
	Stores at lot line	8
	Rx/Grocery	2
	Big box	2
Auto Services	**13**	
	Gas stations	8
	Closed gas	2
	Other (muffler)	3
Food Service	**10**	
	Drive thru	9
	Restaurant	1
Vacant	**8**	
Civic-educ-religious	**6**	
Housing	**4**	
Office/Bank	**3**	
Hotel	**1**	

This distribution suggests that the intersections that anchor suburban corridors are auto-oriented, typically containing something like a mini-mall, big box or market with large parking lot, gas station and drive-through fast food on its four corners. Although auto-oriented, such intersections are nevertheless potential central markets for their adjacent neighborhoods.

Centers: Single Function and Mixed Use

Single Function

Single function centers are one of the most prominent characteristics of the spatial organization of suburbs. They are significant from a transportation standpoint because there are seldom any houses within ½ mile walking distance of the facilities, they often are surrounded by surface parking lots and/or large parking structures, they have market areas up to 20 miles, and a very high percentage of employees and visitors drive automobiles to get there. In short, single function centers typically generate a great deal of vehicle miles traveled (VMT).

They include most notably the large, usually enclosed retail malls that were popular from the 1950s at least through the 1980s. According to ERA, the South Bay malls have the consistently largest floor plates in Los Angeles County.

Other single function centers, including secondary and post-secondary school campuses, office parks, municipal airports, civic centers, oil refineries and medical centers can also be found in the South Bay. And, of course, two single function centers of international significance provide bookends to the South Bay: Los Angeles World Airpor (LAX) on the north and Port of Los Angeles (POLA) on the south.

Education Centers

There are at least 17 education centers in the South Bay that occupy 10 acres or more. Five are post-secondary institutions – 1 state university, 3 community colleges and a private college.

The largest, California State University at Dominguez Hills (CSUDH), is located on 364 acres plus parking for 4,000 automobiles. Enrollment is 13,600 students and there are also 1,350 employees. CSUDH had, at one time, an aggressive distance education program but we did not collect data on the current status of the program.

El Camino Community College is the next largest campus on 126 acres plus 23 more acres dedicated to parking. El Camino has about 2,300 employees and 24,500 students.

Los Angeles Southwest College (LASC) and Los Angeles Harbor College (LAHC) each occupy about 90 acres. LASC has an additional 8 acres of parking; parking at LAHC was not available. LAHC employs 415 with 8,500 students. LASC has about 6,000 students and no estimate of employees was available.

Marymount College is the remaining post-secondary institution in the South Bay and it occupies a relatively small campus with 10 acres plus 3 for parking. It has 91 employees and 725 students.

Together they occupy 680 acres plus over 34 acres of parking. Collectively they have 53,325 students and four of the five (excluding LASC) employ 4,160. All are essentially commuter schools with little or no on campus housing.

The remaining educational centers consist of the campuses of 12 independent school districts plus parochial schools. The summary table includes a sample of 12 elementary, middle, and high schools and one parochial school. The smallest in the sample is Tulita Elementary in Redondo Beach which occupies 7 acres with an additional 2.5 acres for parking. The largest is Morningside High School in Inglewood on 69 acres plus 4 for parking. The median size in our sample is between 39 and 40 acres.

Sports/Entertainment Centers

There are 2 stadiums and a unique regional center – Hollywood Park Racetrack and Casino.

The largest stadium is the Home Depot Center in Carson with 27,000 seating capacity on 125 acres plus parking onsite for 4,500 cars and an additional 4,500 shared with CSUDH.

The Forum is currently owned by a church but still available for the occasional large scale entertainment event. The Forum was formerly the home of the Los Angeles Lakers and was frequently used as a venue for concerts. It occupies 28 acres plus 22 for parking and has a seating capacity of 22,000.

Hollywood Park is a unique attraction with both the historically significant racetrack plus a more recently added gambling casino. It has a market area that arguably includes most of LA County and has seating for 80,000.   The Hollywood Park campus occupies 330 acres with 164 more for parking.   Both Hollywood Park and the Forum are in Inglewood and are more or less adjacent on the same arterial.

 El Camino Community College (ELCC) has the 12,600 seat Murdock Stadium but its footprint was not separately available and so it has been included in the ELCC description under Educational Centers.

Medical Centers

There are approximately 9 medical centers in the South Bay, but one has been shuttered for several years. Medical centers are usually surrounded by office buildings occupied by doctors, laboratories, pharmacies, and medical equipment retailers. For the most part, the estimates reflect only the hospital campus so the actual area of the total medical functionality in and around the center may be larger than stated.

Two of the medical centers are relatively large. Torrance has a 108 acre medical campus that includes Torrance Memorial Hospital and Del Amo Hospital. Los Angeles County Harbor-UCLA Medical Center is next at 72 acres with 12.5 more acres for parking with a 553 bed capacity.

Smaller centers include the Little Company of Mary Hospital adjacent to the West Torrance Care Center which together occupy 34 acres; Harbor City Medical Center which includes a Kaiser Permanente facility occupies 27 acres; the UCLA Daniel Freeman Regional Center on 21 acres

with 5 more for parking; the Centinela Hospital Medical Center on 11 acres plus a little over 3 for parking; and the Gardena Memorial Hospital on 6 acres with 700 employees and 180 beds.

No data were available for the LA Metropolitan Medical Center in Hawthorne. The 274-bed facility of the RFK Medical Center in Hawthorne remains, but it has been closed for business for a few years.

Retail Malls

The South Bay is served by 10 retail malls, half of them in Torrance. The largest, by far, is Del Amo Fashion Center on 178 acres surrounded by 12,000 parking spaces with 2.5 million square feet of retail and around 300 stores. The smallest is Torrance Promenade on 6 acres, adjacent however to Del Amo Fashion Center.

Table 8. Retail Mall Size			
Mall	**Acres**	**Parking**	**City**
Del Amo Fashion Center	178	12000 spaces	Torrance
Galleria at the South Bay	93	2200 spaces	Redondo Beach
South Bay Pavilion	78	35 acres	Carson
Plaza El Segundo	45	14 acres	El Segundo
Manhattan Village	44	2,500 spaces	Manhattan Beach
Torrance Crossroads	43	2,531 spaces	Torrance
Peninsula Center	28	15+ acres	Rolling Hills Estates
Rolling Hills Plaza	22	8 acres	Torrance
Torrance Town Center	20	15 acres	Torrance
Torrance Promenade	6	1,700 spaces	Torrance

Civic Centers

Only a few cities have significantly large civic centers. The largest are Carson and Torrance, and both serve as central meeting places for a variety of South Bay events due to the presence of a variety of public facilities beyond city hall that make them true *civic* centers.

Table 9. Civic Center Size		
	Acres	**Parking**
Torrance Civic Center	40	650 spaces
Carson Civic Center	35	650 spaces
Inglewood Civic Center	Not Available	

Municipal Airports

There are two municipal airports in the South Bay, one large and one relatively small. As with hospitals and medical centers, an airport attracts complementary businesses with the result that they are often the center of a more spatially significant (extensive) industrial district. The areas provided refer only to the airports themselves and not to the industrial districts.

Table 10. Airport Size		
	Acres	**Parking**
Torrance Municipal Airport	500	550 spaces
Hawthorne Municipal Airport	80	500 spaces

Oil Refineries

The two largest single function facilities in the South Bay are its oil refineries. Chevron in El Segundo sits on 1,000 acres and Exxon Mobil in Torrance takes up 750 acres. Between them, they employ about 1,800 people.

Other Employment Centers

There are several relatively large employment centers sprinkled throughout the South Bay -- in El Segundo, Torrance, Hawthorne, Redondo Beach, and the Harbor Gateway district of Los Angeles. There are industrial parks and warehouses in Carson, which have a concentration of the logistics industry due to their location near the Port of Los Angeles. At least 30,000 people are employed in the office district east of PCH in El Segundo.

Recreational Areas
There are also several golf courses and large parks.

Jurisdiction	Acres	Malls	Post Secondary Ed.	Stadia	Medical	Civic Center	Airport	Oil Refinery	Other Emp.
City of LA	17,716		1						
Torrance	12,312	5	1		4	1	1	1	1
Carson	12,310	1	1	1		1			
Rancho Palos Verdes	8,745								
Inglewood	5,839			2	2	1			
Unincorporated County	4,675		1						
Redondo Beach	4,111	1							1
Hawthorne	3,801				1		1		1
El Segundo	3,550							1	1
Gardena	3,381				1				1
Palos Verdes Estates	3,075								
Rolling Hills Estates	2,624	1							
Manhattan Beach	2,518	1							
Rolling Hills	1,954		1						
Lawndale	1,264								
Lomita	1,212								
Hermosa Beach	915								

Table 11. Single Function Centers by City Size

The table shows that almost all of the single function centers are located in the largest cities.

Mixed-Use Centers

Dense, mixed-use centers are thought to be the strongest feature of suburban form for minimizing auto travel. According to theory, mixed-use centers allow many people to live in or adjacent to many commercial activities facilitating walking as the principal transportation mode. In addition, the density of residents and commercial functions will exceed the threshold needed to support public transit service. The need for autos will be minimized.

Seven mixed-use centers were identified in the South Bay.

- Manhattan Beach Pier/Downtown
- Hermosa Beach Pier/Downtown
- El Segundo Downtown*
- Inglewood Downtown*
- Old Torrance*
- Riviera Village*
- Redondo Beach Pier Area

* Centers included in the South Bay Transportation Performance Study

The mixed-use centers are relatively small, on the order of small school campuses. The range was from 8.4 acres in Manhattan Beach to 32.2 acres in El Segundo (which included parts of the Chevron Refinery and the adjacent industrial area.

In practice, the mix of uses was as much a mix of commercial uses with small amounts of housing within the centers. In all cases studied, the residential component of the mix was more horizontal, with most housing adjacent to the centers.

But then virtually all commercial land uses in the South Bay are part of a horizontal mixed use area. In almost every case, strip commercial along the arterials is backed by a residential neighborhood.

From this perspective, the "mixed use centers" identified are compact, centralized versions of linear commercial corridors. .

Distances

The development pattern creates the distances between residential origins and a myriad of locations. Estimates for the journey to work and distance to retail malls are provided below:

<u>Journey to work</u>

The Census collects data on time to work, but not distance. The following are the times for the journey to work in 2000, organized by general location within the South Bay. The average for the entire US was 25.5 minutes. The average speed was estimated to be 27 MPH for converting time to distance.

Table 12. Journey to Work		
Cities	**Wait in Minutes 2000 Census**	**Estimated Miles Assuming 27 MPH**
Coastal Cities		
Redondo Beach	28.0	12.6
El Segundo	21.9	9.9
Manhattan Beach	28.9	13.0
Hermosa Beach	32.8	14.8
Inland Cities		
Torrance	26.1	11.7
Carson	22.7	8.6
Inglewood	29.7	13.4
Los Angeles County*	29.4	13.2
Los Angeles City*	29.6	13.3
Hawthorne	26.9	12.1
Gardena	25.5	11.5
Lawndale	25.3	11.4
Lomita	25.6	11.5
Peninsula Cities		
Rancho Palos Verdes	33.1	14.9
Palos Verdes Estates	32.8	14.8
Rolling Hills Estates	31.9	14.4
Rolling Hills	32.0	14.4

*Entire County and City

It is clear that the Peninsula cities have the longest commutes, consistent with being geographically isolated from job centers. The following table shows the relationship between

commute times and three job measurements – total jobs, employment density, and jobs-housing ratio -- for the cities with the shortest average commute times.

The cities with the shortest commute times also tend to be relatively large with relatively lower residential densities. Ironically, Lawndale has the third lowest average commute times but is the smallest and most dense city in the South Bay. Perhaps this can be explained by being adjacent to Hawthorne and Torrance

Table 13. Commute Times and Job Measurements				
	Above Median Total Jobs	**Above Median Job Density**	**Job Rich**	**Jobs Housing Balance**
Carson	X		X	
El Segundo	X		X	
Lawndale	X	X	X	
Gardena		Median		X
Lomita	X	X	X	
Torrance	X	X	X	
Hawthorne	X	X		X
Redondo Beach (median)	Median	X		X
Inglewood	X	X		X

This table shows that if a city has a large number of jobs compared to other cities in the sub-region, has a relatively high level of job density, and is jobs-rich (has a jobs-housing ratio greater than one), then its residents will have on average some of the shortest commute times in the sub-region. In some cases, having two of the three job characteristics is enough to achieve low commute times.

Three exceptions are noted. On one side, Lawndale and Lomita have relatively short commute times but only one of the three desirable employment metrics (job density -- Lawndale is right at the median value).   Neither city had a neighborhood that was studied in depth so why those two would have such good journey to work times will remain a mystery. One possible explanation is that both are adjacent to some complex of job centers in neighboring cities but that would require verification.

The other exception is Inglewood which has two of the three desirable employment metrics but does not have a relatively short average commute. The explanation is probably the relatively high level of transit ridership by Inglewood residents since transit typically takes longer than driving.

Table 14. Proximity to Retail Malls: Distance from study area to closest retail mall

All residents in the study areas live reasonably close to a retail mall. The drive-distances range from 1.1 miles on Artesia (from Rindge, the middle intersection) to 3.3 miles on both Gardena (from Normandie) and Inglewood downtown. The average distance was 2.5 miles.

El Segundo   **2.52 miles**
Closest Mall/Retail Center: Manhattan Village
Path: Rosecrans and Sepulveda to El Segundo Blvd. west to Main Street and then north to Grand and Main

Old Torrance   **2.27 miles**
Closest Mall/Retail Center: Del Amo Fashion Center
Path: From Sarton/ El Prado- southeast on Sartori, right onto Cabrillo, right onto West Carson

Riviera Village   **2.51 miles**
Closest Mall/Retail Center: Del Amo Fashion Center
Path: From PCH/Palos Verdes: northeast on Palos Verdes to Sepulveda, right on Sepulveda, left onto Hawthorne

Inglewood   **3.30 miles**
Closest Mall/Retail Center: Westfield Fox Hills Malls
Path: West on E. Manchester, right on I-405, right on Sepulveda, right at Fox Hills Malls

Hawthorne   **2.50 miles**
Closest Mall/Retail Center: Southbay Galleria
Path: Hawthorne Blvd south until Artesia

Artesia   **1.10 miles**
Closest Mall/Retail Center: Southbay Galleria
Path: East on
Artesia

Gardena   **3.30 miles**
Closest Mall/Retail Center: Southbay Galleria
Path: West on Gardena, right on Crenshaw, left on Redondo Beach Blvd., left on
Hawthorne

These distance relationships show that retail centers are within short distances of most neighborhoods, even without considering the presence of strip retail on virtually every arterial. Journey to retail looks like it can be accomplished within a few miles of every neighborhood.

Observations on the Existing South Bay Development Pattern

The preceding sections of this report are a first cut at describing the development pattern in the South Bay sub-region. One goal was to make comparisons with other sub-regions possible as well as to establish a baseline for comparisons with itself as development continues to occur over the coming decades.

A second goal was to obtain insights into how smart growth might fit in the South Bay.

Can the same general strategy for changing the sub-regional development pattern be applied in every sub-region? Possibly, if the existing development patterns are comparable; probably not if they aren't. While the South Bay appears to have developed in a common suburban pattern we cannot know for sure without a similar description of the characteristics of other sub-regions. Clearly, the South Bay has several unique characteristics.

For example, the South Bay is anchored on the north by the Los Angeles International Airport and on the south by the Port of Los Angeles, two of the largest examples of transportation infrastructure of their type. The Pacific Ocean forms the western border and 6 of the 17 jurisdictions have a coastline. The area is built-out -- no green fields exist although Carson has a number of brown fields. Just these physical characteristics would seem to set the South Bay apart from any other sub-region, all the while that there will be strong similarities with mature suburbs that experienced substantial growth immediately following World War II.

The following 8 observations on the existing development pattern add different perspectives on the suitability of a smart growth strategy in the South Bay.
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1. Growth in the outer ring suburbs is part of a long running process which may improve regional transportation performance more by making the outer ring suburbs more mixed use than by making the inner ring denser – especially without large public transit investments. .

The South Bay became a mature suburb through the typical suburban development arc, from green field to relatively dense grey field. It would seem reasonable to expect that if green field development on the metropolitan periphery continued, today's newest suburbs would follow the experience of the South Bay and gradually become denser through infill projects.

Closing the periphery to new green field development should not attenuate that process. Instead growth could be directed to accelerate the densification of these recent, still low density suburbs. In other words, one strategy would be to direct growth toward the adolescent suburbs near the periphery instead of to the more central suburbs until there is a uniform density across sub-regions. The mature suburbs could produce lessons on how the adolescents should go about absorbing higher residential densities. More commercial development making more neighborhoods mixed use is a likely outcome.

2. The development pattern of every sub-region is determined by the political organization of space and the cumulative land use decisions each produces.

The South Bay sub-region has the same area as Portland, Oregon, the 30th largest city in the nation. But instead of one jurisdiction, the South Bay is politically fragmented into 15 municipal corporations plus parts of the City and County of Los Angeles. Seventeen jurisdictions independently setting policies on land use, density, open space, industry, and so forth guarantees a varied development pattern. It seems unlikely that its development pattern would be as coherent as Portland's, nor exactly like any other sub-regions, because each area has its own political organization and politics.

It also seems unlikely that 17 jurisdictions will adopt a single development strategy or complementary strategies that would produce some model development pattern. This challenge is complex but helped by both the City and County of Los Angeles which have recently begun to participate with the South Bay cities in the discussion about transportation and the sub-regional development pattern. Their participation is a significant issue because it appears that a sub-regional Sustainable Communities Strategy pursuant to SB 375 will be required to include at least the portions of the South Bay that are unincorporated.

3. The policies of the largest six or seven jurisdictions have had a disproportionate influence on sub-regional transportation performance and could similarly affect future performance through their parking and street policies. Those jurisdictions planning the most physical development will exert influence in the long run future through their land use policies.

Land, population and employment tend to be concentrated – the top 6 jurisdictions in each category have 2/3 or more of each total. There is a 14 to 1 ratio between the largest and the smallest city. This suggests that the land use, parking, street management and related policies in those 6 or 7 jurisdictions will significantly influence the transportation performance of the entire South Bay sub-region. Of course, the City of Los Angeles is the largest jurisdiction but it is also located along the eastern edge of the South Bay where its policies are less likely to affect the sub-region as a whole.

Most of the single-function districts are located in the largest jurisdictions while the smallest cities tend to have the most residential and employment density. So, for example, while the surface parking lots of the various isolated single function centers might be the most likely places to add dense infill development, the past political decisions on density suggest the likelihood of resistance to such development projects in the future.

The need to share land use and transportation innovations between cities suggests the value of the SBCCOG's working groups for livable communities, infrastructure, and GIS as well as its Green Cities Task Force. In each case the professional staff from many of the cities interact, share information, and discuss policies.

5. Development patterns appear to be highly contextual which makes it unrealistic to uncritically import a model because it works elsewhere.

The City of Portland and the South Bay are approximately the same size in acres. Portland of course has a reputation as a "green city," based in part on it being widely perceived as the home of the best practice of smart growth, with extensive rail transit, a compact downtown, and an urban boundary that contains development. In contrast, the South Bay is polycentric with *twice* the housing density of Portland while lacking rail transit or quality transit service of any sort.

Portland is the dominant jurisdiction in a modest sized metropolitan area with a strong regional government. The South Bay is a relatively small, polycentric sub-region in a region dominated in size and political power by the City and County of Los Angeles. One implication of being a tail rather than the whole dog is that transit funding simply does not flow to the South Bay, despite its density. Without the foundation of strong public transit, there should be serious doubt about the extent to which the smart growth strategy could work in the South Bay anything like it does in Portland.

5. From a transportation perspective, single function districts, in part because of their size, are the most significant feature of the current development pattern and may be the hardest to remediate.

The most pronounced feature of the development pattern is the single function districts such as shopping malls, sports stadiums, oil refineries and school campuses that developed over time and significantly altered the original street grid. Although research was not directed at the transportation performance of these centers, it is easy to observe that they generate a great number of trips. They are virtually concrete islands usually surrounded by surface parking lots that attract both employees and customers. For example, CSUDH has a 13,600 student body and employs another 1,350. El Camino Community College has 24,500 students and 2,300 employees.

There are 45 single function districts from at least 10 up to 1,000 acres in size plus several large employment districts that were not estimated. A strategy for reducing sub-regional VMT will need to address the VMT generated by these districts. Some of them such as the two oil refineries will be impossible to change until at some point in the future they reach the end of their economic life. The following are options that might work for other categories of single-function districts:

- Distribute the functionality of these districts out into neighborhood and village centers so that not all consumers and employees need to visit the physical campus – through satellite centers at major intersections or via network services such as distance education.
- Connect them with their market areas with good public transit service, possibly with dedicated van pools.
- Add functionality (e.g., education, medicine, retail, etc.) to the single function districts thereby facilitating trip chaining.
- Develop housing on the extensive surface parking lots and ensure that the adjacent residential neighborhoods have access by walking, cycling and local use vehicles.
- Introduce neighborhood electric vehicles for use on the grounds of each district, where appropriate.

7. Outside of the single function centers, the grid of arterials provides the best structure for changing the existing development pattern

- Over 200 miles of major arterials criss-cross the South Bay. The lots along the edges of those streets if 1/8 mile deep yield about 16,000 acres, or around 18% of the land in the entire sub-region. Just over 200 intersections in a three level hierarchy (100 are intersections of two major arterials) currently cater mostly to the automobile. In order to improve the existing development pattern, those auto oriented major intersections will need to be high priority targets for redevelopment.

- Those major suburban arterials may not function for most people as long corridors for 40 mile trips but as connectors for smaller groups of people over relatively short distances – like 5 miles or even 3 miles. To the extent that is true today or could be made true tomorrow means that these wide arterials could be re-purposed by sectioning into a mix of two roadways, one in the middle for through traffic and the other along the edges for local traffic. Local traffic could then easily and safely carry smaller, slower personal vehicles and DASH-type transit services.

- Arterials might work as corridors in an auto-oriented world but in an area transitioning to less auto dependence they should be re-imagined as a series of *centers* at the intersection between major and minor arterials. As mentioned, intersections of major arterials that are currently auto oriented (e.g., with gasoline stations or drive-through fast food) might be the priority targets for making a transition to a new development pattern. The major intersections probably provide the best opportunities for re-developing into compact centers although an argument could be also be made for the major-minor intersections.

- Major and minor arterials could play different roles in moving toward a new development pattern.   Since major arterials tend to provide the regional connections with only about half of their total length being contained in the South Bay, they could be partitioned into lanes for through and local traffic. Their major intersections would be candidates for commercial development and their minor intersections could be used for medium residential density.

  Minor arterials are primarily contained within the South Bay and at least some of them would be candidates for a 25 MPH speed limit in order to accommodate slower vehicles. Most new residential development could be directed to the minor arterials with small retail clusters at minor-minor intersections.

8. Key distance relationships in the current development pattern imply that the most productive residential-based mixed used projects may be office commercial or light industrial rather than retail.

The distance relationship between residential origins and the array of destinations needed by each home is the most important characteristic of the development pattern. Shortening the average trip distance is one of the main objectives for changing the existing pattern.

Retail shopping is of course an important trip purpose. We found that there was a retail mall close to every neighborhood studied. The drive-distances ranged from 1.1 miles on Artesia to 3.3 miles on both Gardena and Inglewood downtown. The average distance was 2.5 miles.

Retail is also found in strips along major and minor arterials. Taken together with mall proximity, the journey to retail does not appear to be the most significant distance problem within the existing pattern. All trips to retail destinations appear to be within the range of low speed vehicles.

The journey to work is a much greater challenge with one-way distances running as high as almost 15 miles for residents of the Peninsula, with no average shorter than an estimated 8.6 miles in Carson.

The analysis implied that relatively large numbers of total jobs and high job gross density in a job-rich city (or at least balanced between jobs and housing) will shorten the commute distance. This suggests that as housing is added at strategic locations, some form of compact employment opportunity should also be added nearby.