Public Transportation's Role **in the Knowledge Economy**

APTA
AMERICAN
PUBLIC
TRANSPORTATION
ASSOCIATION

Acknowledgements

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Executive Summary

Communities are adopting fresh perspectives in order to succeed in the new economy. Increasingly, creating clusters of knowledge-focused businesses and institutions is the path for success in the 21st Century. These communities—which have the knowledge-sharing infrastructure of business incubators, accelerators, anchor institutions, and startups—are known as "innovation districts." This study, which focused on the Silicon Beach Innovation District in Los Angeles County, CA; the Historic Technology District in northwest Austin, TX; and Research Triangle Park, one of the oldest research parks in the United States, located between Durham, Chapel Hill, and Raleigh, NC, finds that public transportation could be the determining factor in the success of innovation districts in the United States.

In the three innovation districts studied, local economic development officials and planners expect public transit, by 2045, to become *the determining factor* in:

- over $177.83 billion of cumulative business sales through 2040;
- $78.8 billion in wage income; and
- $106.3 billion in gross domestic product (GDP) in the U.S. economy.

Three main effects drive these economic gains. First, high-tech, high-value industries are attracted from other U.S. or international locations to clusters where public transit provides access to the needed workforce. Second, better access to workers enhances efficiency, and thereby generates net new economic activity. Third, certain transportation efficiency gains, quantified in an earlier APTA report (*The Role of Transit*

in Support of High Growth Industry Clusters in the U.S).[1] , lead to additional economic activity.

Public transportation is critical in connecting workers with employment opportunities in innovation districts. This analysis finds that if the public transportation services envisioned in the innovation districts' long-range plans are realized, businesses would move to such districts and that their productivity would increase. The improvements envisioned in these long-range plans would provide access for more than 2.4 million workers (estimated by regional models) whom automobile congestion would otherwise exclude from a 45-minute commute to the clusters by 2045.

While Silicon Beach will see significant benefits from investing in public transportation, innovation districts in Raleigh-Durham and Austin that have more development potential - and may require public transportation for reasons other than those in Silicon Beach (i.e., scarcity of land for roadway right-of-way) - will also benefit. These additional cases illustrate the importance of public transportation in less urban, smaller innovation districts.

The study also demonstrates the importance of workforce preferences, retention and livability in sustaining innovation districts. In all three of the new innovation districts studied:

- Workforce preferences alone were found to have the ability to drive the need for public transportation, whether roadway access is limited by land constraints (as in Silicon Beach) or land is plentiful (as in Research Triangle Park and Austin's northwest district).

- Public transportation solutions can largely, if not primarily, maintain the competitiveness of districts by accommodating the housing, lifestyle, and cultural preferences of younger "knowledge workers."

- The presence of public transportation in an innovation district contributes to the competitiveness of an entire region, even when transit is not required for access to a district.

- A large subset of the young, knowledge-focused workforce is attracted to areas with high-quality public transportation services.

1 *Economic Development Research Group. (2013). The Role of Transit in Support of High Growth Innovation Districts in the U.S. Retrieved from* http://www.apta.com/resources/reportsandpublications/Documents/TransitHighGrowthClustersUS-Final2013-1124.pdf

This growing demand for public transportation, and the responsiveness of the workforce to public transportation options (as demonstrated in a prior study[2]), shows that deficiency or technical infeasibility of roadway options is not the only factor that can or should justify investment in public transportation to serve an innovation district.

While the previous study[3] looked at the national picture, the current study includes an assessment of the potential savings to businesses and households at the regional level if communities fully implement the aggressive public transportation improvement strategies described in the cases. By reducing the out-of-pocket travel costs, travel time, and reliability challenges associated with auto dependence in congested networks, public transportation investments have the potential to provide significant savings to households and businesses. Those potential savings improve the chances that each of these regions will enjoy an increase in jobs, income, gross domestic product and business sales that may not have otherwise occurred.

Transportation savings from more efficient modes is only one aspect of regional competitiveness for any given city or region. The analysis shown here indicates that public transportation investments serving the districts and connecting them to larger, enhanced public transportation networks are likely to have benefits for any given city ranging from the hundreds of millions to the billions of dollars in the long term. Specific long-term productivity gains for cities in this case study include:

- Los Angeles: $141.8 billion in additional business sales and $62 billion in additional wages due to implementation of the long-range transportation plan.
- Austin, TX: $19.9 billion in additional business sales and $8.7 billion in additional wages due to implementation of the regional long-range plan.
- Research Triangle Park, NC: Through enhanced access to the Research Triangle, an anticipated $12.4 billion in additional business sales and $5.4 billion in additional wages.

2 *Economic Development Research Group. (2013). The Role of Transit in Support of High Growth Innovation Districts in the U.S. Retrieved from* http://www.apta.com/resources/reportsandpublications/Documents/TransitHighGrowthClustersUS-Final2013-1124.pdf

3 *Economic Development Research Group. (2013). The Role of Transit in Support of High Growth Innovation Districts in the U.S. Retrieved from* http://www.apta.com/resources/reportsandpublications/Documents/TransitHighGrowthClustersUS-Final2013-1124.pdf

Communities of all sizes and in all regions can attract innovation districts if they have the right mix of elements. This research shows that public transportation investment is a crucial element in creating and sustaining such districts – and to growing local and regional economies.

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APTA AMERICAN PUBLIC TRANSPORTATION ASSOCIATION

1 Introduction

1.1 Objective

In December 2013, the American Public Transportation Association (APTA) published a report titled *The Role of Transit in Support of High Growth Business Clusters in the U.S.*[1] The report explored both the role of business clusters (also known as "innovation districts") in the U.S. economy and the congestion-related mobility challenges facing eight specific high-growth knowledge–oriented innovation districts. These eight clusters are located in six metropolitan areas: Boston, Atlanta, Denver, Chicago, Seattle and San Francisco. Given constraints on continued road development in these areas, the study concluded that there is a solid case for expanding public transportation to support growth in these centers.

As a follow-on study to the 2013 report, this report completes study of the "set" of technology-oriented clusters in the United States by looking at high-growth areas in Southern California, North Carolina, and Texas. It also expands the impact discussion to address the role of labor accessibility at business clusters in determining where, and how rapidly, the U.S. economy expands in high-value and high-technology sectors.

The clusters explored in the current study are the Silicon Beach Innovation District in Los Angeles County, CA; the Historic Technology District in northwest Austin, TX; and Research Triangle Park, one of the oldest research parks in the United States, located between Durham, Chapel Hill, and Raleigh, NC. These cases include geographic regions and development contexts, as well as types of cluster dynamics, not covered in the original study. They provide insight into the various factors that contribute to firm location choice, including the locality preferences of workers, the preference of startups for high degrees of firm-to-firm interaction and the need of

1 *Economic Development Research Group. (2013). The Role of Transit in Support of High Growth Business Clusters in the U.S. Retrieved from* http://www.apta.com/resources/reportsandpublications/Documents/TransitHighGrowthClustersUS-Final2013-1124.pdf

older, more established firms for significant space to grow, both in terms of employees and capacity.

In all three cases, public transportation is considered a necessary element for the continued growth of the district. The need for public transportation is based on a combination of (a) existing and anticipated roadway congestion with limited expansion options and (b) the desire to support the type of urban environment that is attractive to the newer wave of technology firms and workers.

In addition to assessing the three districts described above, this report also includes a brief examination of high-speed rail and the role that it could play in supporting technology districts. The analysis uses the San Francisco Bay area (originally covered by cases in the previous report) as a case study because of ongoing high-speed rail planning in California.

1.2 Methodology

This report bases its three primary case studies on a two-pronged approach that includes both qualitative and quantitative methods. For the qualitative portion, the authors interviewed representatives from local metropolitan planning organizations (MPOs), economic development organizations, planning agencies, and area businesses. These interviews were supplemented by a review of open-source literature to define:

- the boundaries of each district;
- the role of the district in the local economy;
- the importance of geographic co-location of businesses in the district, as well as factors affecting the district's marketability for retaining and attracting future business;
- immediate and long-term transportation and accessibility needs in the district; and
- the role public transportation and land-use solutions are expected to play in the district's development.

Exhibit 1-2 presents a list of interviewees for each case study.

Exhibit 1-2
Case Study Interviewees and Modeling Contacts

Case Study	Interviewees
Silicon Beach/Santa Monica Innovation District	**Southern California Association of Governments:** Hsi-Hwa Hu, Yongping Zhang (Transportation Modeling), & Naresh Amatya (Transportation Planning). **City of Santa Monica:** Jason Harris (Economic Development Division Manager).
Austin Northwest Technology Innovation District	**Capital Area Metropolitan Planning Organization:** Cathy Stephens (Environmental & Planning Program Manager), Greg Goldman (Planner), Alex Kone (Planner), & Michael Dutton (Transportation Planner). **Austin Department of Economic Development:** Greg Kiloh (Project Manager, Redevelopment Division) **Austin Chamber of Commerce:** Jeremy Martin Sr. (VP, Government Relations and Regional Infrastructure). **Austin Planning and Development Review Department:** Donna Galati (Senior Planner) & Tanya Swartzendruber (Principal Planner).
Research Triangle Park	**Research Triangle Park:** Abby Gingrich (Program Projects Coordinator), Liz Rooks (Executive Vice PresidenVP & COO), & Corey Liles (Senior Planner). **Triangle Transit:** Greg Northcutt (Director of Capital Development). **North Carolina State University:** Joe Huegy (Director, Travel Behavior Modeling Group)
San Francisco Bay Area High-Speed Rail	**Metropolitan Transportation Commission:** David Ory (Principal, Planning) **Bay Area Council:** Michael Cunningham (V.P. Public Policy) **Silicon Valley Leadership Group:** Zoe Mullendore (Associate of Housing and Transportation)

Supplementing the knowledge gained from interviews with on-the-ground practitioners and business people is an analysis of the current and anticipated accessibility challenges of each district. We show data from each area's transportation model, used to develop an assessment of the current and future accessible commuting areas surrounding the district, comparing free flow and congested conditions.

Each analysis concludes with an economic impact breakdown showing the degree to which enhanced public transportation investment would stimulate regional earnings, business output (sales), employment, and gross domestic product. The report bases its economic impact analysis on information from regional travel–demand model scenarios applied in the IMPLAN-Based Transportation Regional Economic Development Information System (TREDIS, *http://www.tredis.com.*)

1.3 Report Organization

This report is organized as follows: Chapter 2 provides background material on the business clustering phenomenon and the particular location requirements of high-tech industries. Chapters 3 through 5 present case details for the three primary districts studied. Chapter 6 presents the additional material on planned high-speed rail in San Francisco. Chapter 7 summarizes findings.

2 Innovation Districts, Location Choice, and Access

2.1 How Districts Are Formed

Business clustering occurs across a broad spectrum of industries because firms benefit from market scale and density. In 1890, Alfred Marshall's foundational work defined the mechanisms by which agglomeration (or clustering) benefits arise, in terms of three drivers: (1) "matching (of specialized worker skills, products, and needs); (2) sharing (to spread costs more widely); and (3) knowledge spillovers (from greater interaction of businesses and people)."[1] Since then, researchers have done a wide range of studies to further elucidate these ideas. Delgado, Porter, and Stern (2010), for example, define the drivers as "input-output linkages, labor market pooling and knowledge spillovers."[2] Explained more generally, they state that clustering "arises from interdependencies across complementary economic activities that give rise to increasing returns." These "complementary economic activities" can occur within a single industry or across industries that have related activities. The agglomerative forces act at different scales and differentially affect industries. Together with a number of other factors, these forces play a large role in firms' location choices and in cluster development patterns.

Agglomerative forces are also intrinsically linked to access. The ability to benefit from market-scale effects or knowledge-spillovers is predicated on the accessibility provided by transportation or communication technology. As urban economist Edward L. Glaeser stated: "[A]ll benefits of cities come ultimately from reduced transport costs for goods, people and ideas."[3]

1 *EDR Group, et al. (2013). NCHRP Project 2-24, Economic Productivity and Transportation Investment: Task 1—Literature Review, Stakeholder Perspectives and Framework Outline. National Cooperative High Research Program, Transportation Research Board. Retrieved from* http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP02-24_Task1LitReview.pdf

2 *Delgado, Porter, and Stern. Clusters, Convergence, and Economic Performance. (2010). Center for Economic Studies Working Paper 10-34. Retrieved from* ftp://ftp2.census.gov/ces/wp/2010/CES-WP-10-34.pdf

3 *Glaeser, E.L. (1998). Are cities dying? The Journal of Economic Perspectives, 12(2). Retrieved from* http://www.csus.edu/indiv/c/chalmersk/ECON180FA08/GlaeserDyingCities.pdf

In terms of market-scale effects, firms benefit in terms of productivity when they have greater access to labor, supplier or customer markets in surrounding areas. Large markets offer more (and differentiated) inputs and thus improve the likelihood of matching demand to desired skills, services or products—and reduce search costs. Better matching increases efficiency. Pooling of demand for inputs also creates stability, both for companies and for workers.

The forces of agglomeration and access can act at a variety of scales. A commuting threshold of 30 to 40 minutes has the strongest positive effect on the labor market and therefore affects clustering within metropolitan areas, but not necessarily within small localized districts. However, if one considers supplier and customer relationships, expectations about mobility depend on the type of product being traded. For example, freight delivery markets—for materials or consumer goods to points of final consumption—can be approximated with three-hour/one-day delivery thresholds. Complex buyer-supplier relationships between firms providing services to other knowledge-intensive businesses are determined more by the scale at which interpersonal relationships are strongest—i.e., the highly localized scale of a single urban district. Other business-to-business connections are sufficiently organized such that they can be adequately facilitated by one-day-return business travel, such as short "commuter" flights and high-speed or high-quality conventional rail services.

Knowledge spillovers, learning and innovation effects also contribute to a highly localized form of clustering. Knowledge, particularly informal, non-codified knowledge, tends to be shared when people work in close proximity, trust their colleagues and have the opportunity for frequent contact or exchanges. Proximity encourages networks of innovative activity. A study by Carlino et al. at the Federal Reserve Bank of Philadelphia uses patent citations as "tangible evidence of knowledge spillovers." The study finds clustering of related patent citations within geographic urban districts, thus supporting the argument that knowledge spillovers are a factor in co-location.[4]

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4 *Carlino, Carr, Hunt, and Smith. (2012). The Agglomeration of R&D Labs. Federal Reserve Bank of Philadelphia Working Paper No. 12-22. Retrieved from:* http://www.philadelphiafed.org/research-and-data/publications/working-papers/2012/wp12-22.pdf

2.2 Economic Challenge: Clustering Without Crowding

The above-described agglomerative forces tend to encourage densification or "centripetal" (inward) movement. Counteracting this are competing "centrifugal" (outward) forces, which also tend to arise with density and act to push economic activities toward the periphery of an area. These centrifugal forces are usually associated with resource limitations and include congestion on transportation networks, increases in land prices per square foot (associated with supply constraints) and certain externalities such as air or noise pollution. The first two directly affect business location choices, while the third affects quality of life in an area. Congestion erodes the ability of a business to access an adequately diverse and skilled labor market. Land prices make the cost of doing business more expensive in central locations in comparison to less dense locations.

Each firm, therefore, faces a tradeoff between centripetal (needing to co-locate with other firms) and centrifugal (need to avoid crowding) forces. The results of that tradeoff determine a firm's location preference. Because not all industries have the same requirements, some (such as heavy manufacturing or logistics) will choose to locate in less urban environments with ample low-cost land and good road accessibility, while others (such as high-tech, finance or media) will choose to pay for space and labor in more congested urban areas in order to benefit from knowledge exchanges facilitated by small-scale co-location. Nevertheless, those firms choosing to cluster can bear only a certain amount of congestion before it takes too much of a toll on labor access, another important component of business success.

Public transportation, a highly efficient mode for serving dense development, can help mediate the congestion issues that these denser districts face.

2.3 Knowledge-Based, Technology-Oriented Clusters

The previous two sections of this chapter have dealt generally with the concept of an innovation district as a business cluster and the economic forces that tend to lead to clustering at a variety of scales. This section turns to the idea of a high-tech, knowledge-based district—the type that is increasingly shaping the urban environment and the U.S. economy.[5]

The Brookings Institution released a report in May 2014 titled *The Rise of Innovation Districts: New Geography of Innovation in America.*[6] The report argues that a new urban model of innovation is emerging in the United States, giving rise to what it calls "innovation districts." These districts, a particular type of increasingly important business cluster, are a manifestation of trends altering both firm and worker location preferences. Entrepreneurial firms are placing a strong emphasis on collaboration and, thus, on co-location in areas with diverse sets of knowledge and skills, as well as other shared assets. At the same time, a growing number of "knowledge workers" show a preference for "places that are walkable, bike-able and connected by transit and technology."[7] Firms respond to the preferences of labor. Moreover, the process of innovation has evolved away from large companies with major in-house R&D branches to a "multi-channel" model that involves firms both large and small, major institutions such as universities and venture capital firms.[8] This model is more at home in a dense urban environment that facilitates considerable interaction and provides support networks for smaller firms (such as specialized services, shared equipment and flexible or shared workspaces).

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5 *For a discussion of growth trends in knowledge-based, technology-oriented industries, refer to Section 2.2 of the previous APTA cluster report: Economic Development Research Group, 2013.*

6 *Katz, B. & Wagner, J. (2014). The Rise of Innovation Districts: A New Geography of Innovation in America. Metropolitan Policy Program at Brookings. Retrieved from* http://www.brookings.edu/~/media/Programs/metro/Images/Innovation/InnovationDistricts1.pdf

7 *Ibid.*

8 *Pacthod, D., & Park, M. (2012). How Can the US Advanced-Industries Sector Maintain Its Competitiveness? Cited in ibid.*

Based on these trends, the logic behind this report's inquiry into the transportation and access needs of high-growth innovation districts is as follows:

1. Certain agglomerative forces (e.g., knowledge spillovers and shared resources of particular types) disproportionately affect knowledge-based industries, thus causing them to cluster in relatively small geographic areas.
2. Knowledge-based industries located in these small geographic districts require highly skilled, specialized labor and, therefore, must draw from large market areas to find employees with the skills needed to support their businesses—or must locate in environments attractive to their workforce for living.
3. The concentration of traffic onto a relatively small area of dense development results in congestion. Moreover, the dense development patterns of districts make it hard to address congestion through roadway-capacity expansion alone.
4. Congestion is a centrifugal force—it puts negative pressure on the forces that encourage clustering. (Congestion induces firms to locate in non-clustering patterns to avoid crowding.)
5. The decision by high-tech businesses to locate in dense districts despite higher land and labor costs demonstrates the value of clustering to those businesses in terms of increased productivity. To maintain this benefit, government and business need to address transportation congestion in a way that allows districts to maintain their preferred physical design.
6. Public transportation is a likely solution to the problem of congestion in and around innovation districts: it is uniquely positioned to provide greater access to labor for these districts, while remaining compatible with a dense urban form. At the same time, it relieves pressure on the road system, saves commuters the expense and cost of driving and car ownership and improves conditions for the movement of goods.

The following chapters test the above logic against the reality of three different high-tech innovation districts in the United States. The results demonstrate that both the public and business view public transportation as a necessary ingredient in the continued growth and success of the districts—both as a means of addressing roadway congestion and labor-market access and as a way of responding to changing preferences of companies and workers for more urban environments.

3 Silicon Beach Innovation District

This case study examines the clustering dynamic of the rapidly growing Silicon Beach area, located near the beaches of Los Angeles' Westside, and the challenges it faces with congestion and accessibility. High-tech companies are attracted to the area for a number of reasons. Companies, particularly startups, want to be in the area because the quality of life attracts a young, educated labor force. Additionally, firms at the interface of media, technology and entertainment benefit from proximity to the older established entertainment industry in the region. The scale of clustered activity, in turn, creates a positive feedback loop. Co-location of many similar companies generates a market for specialized services and shared resources. Clustering is of particular benefit for entrepreneurial activity. The ready availability of skills and services lowers the barrier to entry and the cost of doing business for small firms. Moreover, the density of activity in the Silicon Beach area supports both formal and informal networking, thus facilitating the type of knowledge exchange that is key to the technology industry.

With dynamic growth comes development challenges. The city of Santa Monica, located within the district, has placed limitations on growth, causing spillover of larger firms into surrounding jurisdictions where they can obtain the necessary floor space. Additionally, the entire Silicon Beach area is subject to significant roadway congestion and parking constraints that are expected to worsen as the area continues to grow. This will limit firms' access to the labor market and put pressure on their productivity and competitiveness. Expansion of rail service to the area is intended to address these challenges.

3.1 Overview of the District

California's Silicon Beach is a hotbed of high-tech startup activity. The area's climate, social scene, access to capital and proximity to the entertainment industry in Los Angeles (LA) have all contributed to its rapid growth over the past decade.[1] The core of the district is centered in Santa Monica, a city of just 8.4 square miles, but also includes Venice to the south and Culver City to the east and Playa Vista and Marina del Rey to the southeast. Key industries in the district include social media (SnapChat, WhisperText); business marketing and advertising (CallFire, Zefr, GumGum, NearWoo); video, entertainment and media (The Young Turks, Crackle, Fullscreen, M-Go, NXTM, Jukin Media); gaming; and mobile apps.

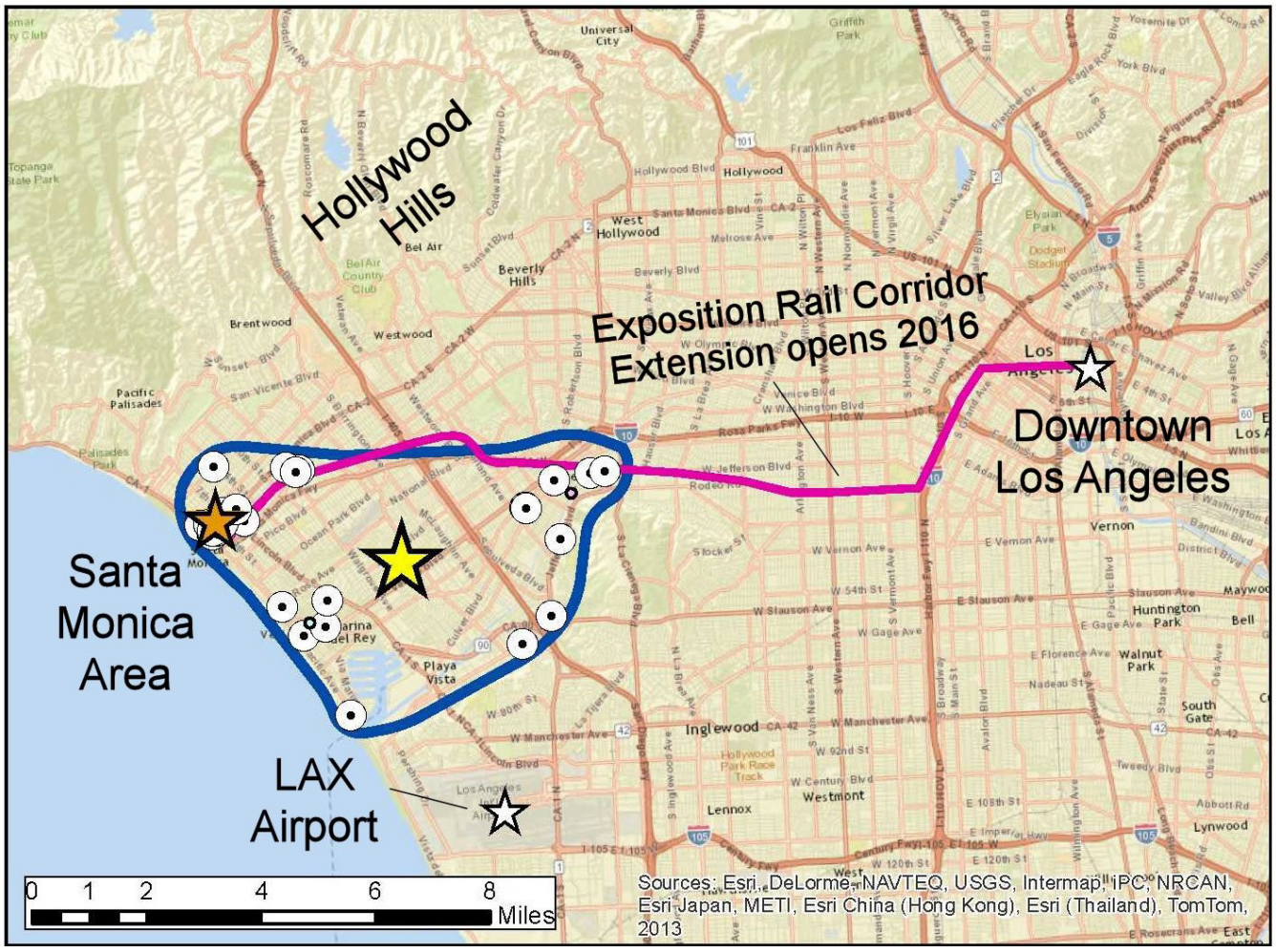

Figure 1. Location of the Silicon Beach Innovation District
Source: EDRG Analysis, using ESRI base map.

1 *McCullen, T. (2014, February 14). US property: Silicon Beach tech hub sparks boom in LA's Westside. Financial Times. Retrieved from* http://www.ft.com/intl/cms/s/2/cb79bb38-8e8a-11e3-98c6-00144feab7de.html#axzz3BayInCxs

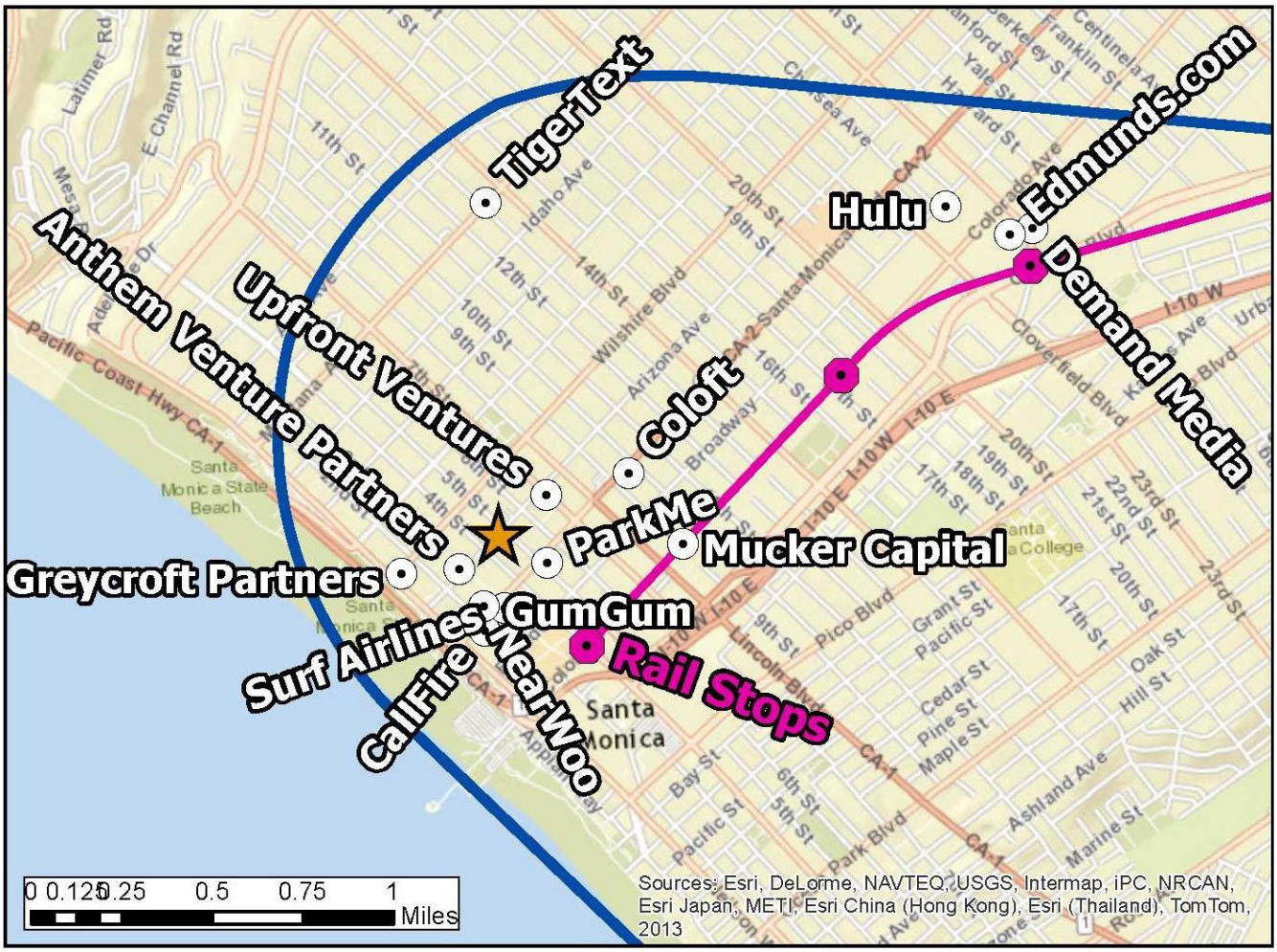

Figure 2. Tech businesses near Silicon Beach's Exposition Line
Source: EDRG Analysis, using ESRI base map.

The Third Street Promenade and surrounding streets in downtown Santa Monica form the heart of the startup scene in the Silicon Beach area. This location offers support services that are particularly important early in the life cycle of a business, including shared work space for nascent businesses (Cross Campus), access to venture capitalists and professional services such as law firms that specialize in helping startups (Stubbs, Alderton & Markiles, LLP), incubator space (Brighthouse) and accelerator space (Mucker Lab). By clustering, these firms are able to share resources and benefit from overlapping demand for specialized startup-oriented services.

In addition to benefiting from shared resources, startups have particularly strong needs for interaction among firms as they move through rapid-paced development and learning cycles, share ideas and search for specific talent or services to support their growth. These interactions are purposely facilitated by a variety of events in the Silicon Beach area. For example, the first annual Silicon Beach Tech Crawl in July 2012 featured a bar crawl that included tours of local startups and venture capital firms; e.g., Goodreads, CallFire, ParkMe, Launchpad LA. (The following month, the adjacent city of Venice replicated the event.[2]) Similarly, the Silicon Beach Fest "celebrates LA's

2 *Tech Crawl Redux: Silicon Beach Tour Hits Venice. (2012, August 8). Socaltech.com Retrieved from* http://www.socaltech.com/tech_crawl_redux_silicon_beach_tour_hits_venice/s-0044344.html

unique startup entertainment tech community with panels, pitches and parties."[3] The first Silicon Beach Fest, in 2012, included discussion panels on how startups, technology and Hollywood are working together to create companies using digital and social media tools. Activities also included a demo day, an Angel Pitch day, a student pitch competition, a hackathon, workshops and networking events.[4] Such activities support the sharing of ideas and skills critically important to an innovation economy and demonstrate the unique convergence of tech and entertainment upon which Silicon Beach's success is built. Both the Silicon Beach Tech Crawl and the Silicon Beach Fest now occur annually.

The laid-back character of these networking events is indicative of another reason for the area's rising popularity with tech companies large and small—namely, the relaxed lifestyle that attracts young tech workers. Mark Suster, a LA two-time entrepreneur turned venture capitalist, theorizes that the emergence of Santa Monica and the adjacent community of Venice (part of West LA) as a center of high-tech start-ups

> *[i]s driven by a broader trend of the tech industry overall – cloud computing. In driving down the costs of building businesses, it's driving down the age of startup founders and thus they're starting companies where young people want to live."*[5]

In the LA region, employee housing preferences have been moving from the more suburban Pasadena and San Fernando Valley to the hipper, more urban Santa Monica and Venice Beach. In response to tech location trends, venture capital firms (Greycroft, Rustic Canyon, Anthem) and incubators (Amplify, Launchpad, Mucker, Science) are relocating as well. Suster's own firm, Upfront Ventures, followed suit in 2014.[6]

While startups contribute significantly to the vibrant character of Silicon Beach, the area also includes more mature companies. These older companies tend to have greater space needs. Moreover, while they still benefit from firm-to-firm interactions, a supply of new ideas and an educated

3 *Digital LA/Silicon Beach Fest. (2014). Silicon Beach Fest 2014. Retrieved from* http://siliconbeachfest.com

4 *Stubbs Alderton & Markiles, LLP. (2012). Join Us at the Silicon Beach Fest! June 21–23rd, 2012. Retrieved from* http://stubbsalderton.com/2012/06/join-us-at-the-silicon-beach-fest-june-21-23rd-2012/

5 *Suster, M. (2012, July 10). Why Technology is Driving More Urban Renewal. Both Sides of the Table. Retrieved from* http://www.bothsidesofthetable.com/2012/07/10/why-technology-is-driving-more-urban-renewal/

6 *Ibid.*

workforce, firms at later stages of development are not as reliant on shared resources and services.

Santa Monica presents a particular challenge for larger firms. The city maintains a "no growth" policy and has not approved construction of an office building in more than 10 years. It invests very little in business-attraction activities and offers no incentives to businesses to locate in the city. Startups and companies with lower space requirements adapt by renovating and filling existing space, converting old downtown offices, retail stores and even houses to suit their needs.

The Water Garden, touted on its website as a "Class 'A' trophy suburban office complex,"[7] is located in the eastern part of Santa Monica near the airport and is the one location in the city where tenants can lease larger offices. The complex offers 1.27 million square feet in eight buildings of five or six stories each. Hulu has its headquarters here, as do Demand Media (a content and social media company with clients such as Livestrong and eHow) and Edmunds.com (an online resource for consumer automotive information). Some smaller firms, such as ZipfWorks (which incubates next-generation mobile shopping apps), also rent space at the Water Garden. The influence of the entertainment industry is evident here as well. Universal Music Group, the largest music company in the world, and Lionsgate Entertainment are headquartered near the Water Garden.

Because of its rapid growth, the Silicon Beach area faces growth pressures, both in terms of available real estate and congestion. Because of Santa Monica's commercial no-growth policy, some larger firms and firms that outgrew their space have moved to nearby locations in Venice and Culver City, thus expanding the scope of the tech district. Google, which occupied 65,000 square feet spread over six buildings in Santa Monica, moved just across the border to the Binoculars Building in Venice, where it has consolidated operations in over 100,000 square feet of contiguous space. Venice is repurposing distribution warehouses to accommodate the spillover of larger firms from Santa Monica.

Daily commuting is also an issue. The concentration of tech companies causes Santa Monica's population to triple during the day, from about 90,000 to approximately 270,000.[8] Residents' two major complaints

7 *Water Garden Company, LLC. (2014). Project Profile. Retrieved from* http://www.wg-la.com/profile/index.shtml

8 *Jason Harris, Economic Development Division manager, City of Santa Monica.*

are (1) traffic and parking and (2) the steep cost of housing. To alleviate the housing crunch and help address congestion, the city has been allowing new residential development in the city. Most of the new units are rental housing for the creative workforce such as lofts, studios and one-bedroom apartments.

3.2 Transportation Challenges and Outlook

As described above, one of the major challenges facing the Silicon Beach Innovation District is congestion on the road system. As the area grows, congestion is projected to worsen, thus placing further pressure on the area. In a knowledge-based industry, businesses rely heavily on their ability to access an adequate labor force with appropriate skills. Limitations on the accessible labor market—because of long commutes for workers, increased search costs for skilled labor or reduced quality of the match between firm needs and worker skills — can translate into reduced productivity.

Using output from the Southern California Association of Governments' (SCAG) transportation model, shows the anticipated reduction in the portion of the population that will be within the 30-minute commute for the district, from 2010 to 2035. Notably, downtown Los Angeles is just outside a 30-minute commute in the base year but will be well outside this threshold by 2035. Access to/from LA is important not only for commuters, but also for businesses in the Silicon Beach area to have adequate access to business services (lawyers, venture capital, etc.) and for the entertainment industry. Exhibit 3-2 summarizes the anticipated decrease in accessibility, expressed in terms of population reachable within 30 minutes of free flow, present-day peak hours and future-year peak hour travel times. It also provides a picture of the additional accessibility that planned public transportation service could provide.

Exhibit 3-2
Current and Future Population Accessible from the Silicon Beach Innovation District

	Free Flow 30 minute	Peak Hour, 2010 30 minute	Peak Hour, 2035 30 minute	Transit, 2035 45 minute
2035 Population with Access to the Silicon Beach Innovation District	7,000,000	2,300,000	1,300,000	3,100,000
Percent of Free Flow		33%	19%	44%

Source: EDRG Analysis, using data from the Southern California Association of Governments (SCAG).

Given that the city of Santa Monica has already identified roadway congestion (and parking) as a serious challenge, and that space for roadway expansion is limited, new road construction is unlikely to fully accommodate the district's growth. Therefore, public transportation is a necessary component of the envisioned future of the district.

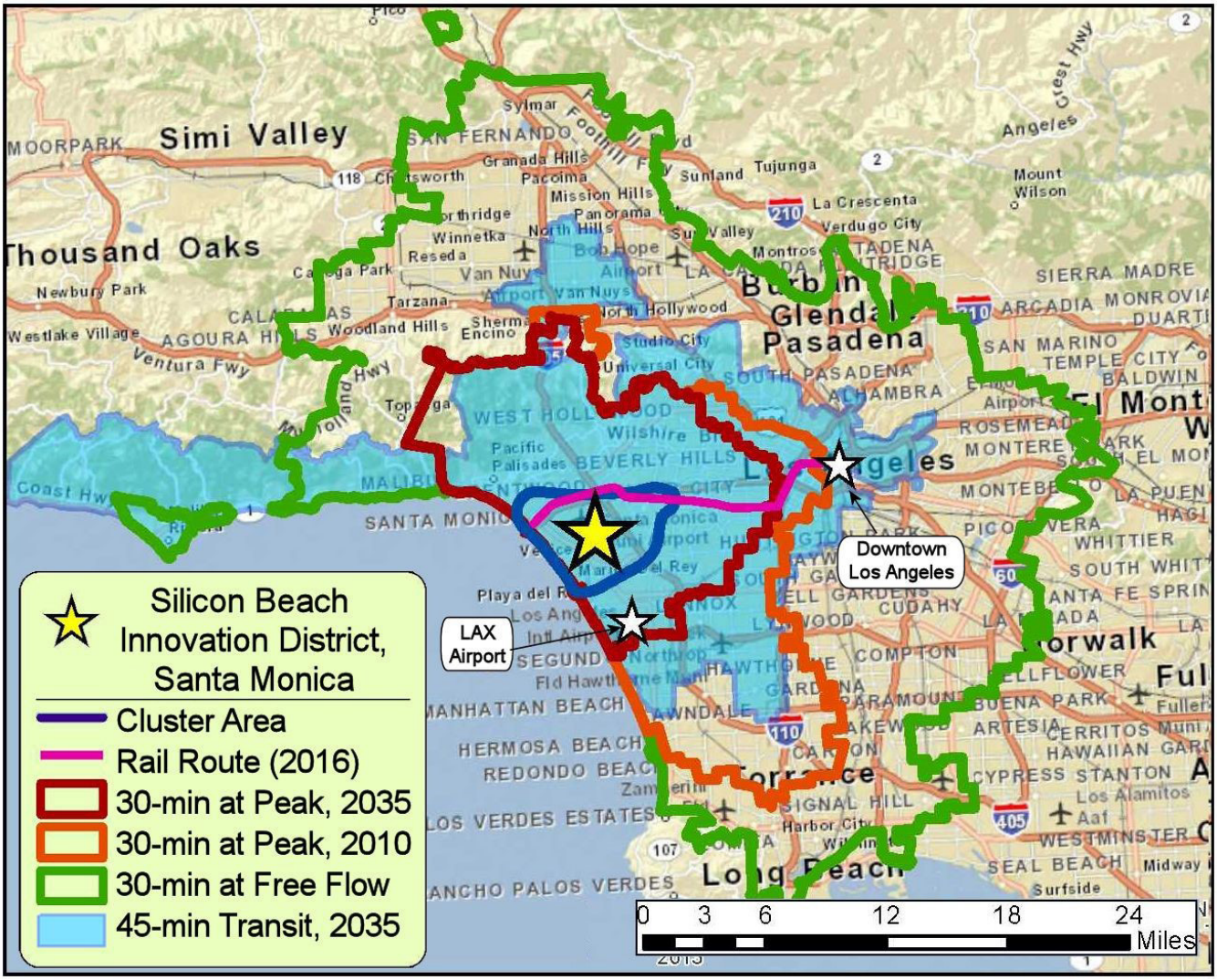

Figure 3. Diminishing Highway Accessibility and Future Public Transportation Accessibility for the Silicon Beach Innovation District

Source: EDRG Analysis, using data from the Southern California Association of Governments (SCAG), and an ESRI base map.

3.3 Role of Public Transportation in Sustaining the DIstrict

Current public transportation service in Santa Monica consists of the city-run Santa Monica Municipal Bus Lines, known locally as the Big Blue Bus, and some Los Angeles Metro bus service from Santa Monica to downtown LA. Big Blue Bus runs 19 routes over 51 square miles, with more than 19 million riders per year.[9] Five of the routes are rapid bus service and one route provides express freeway service to downtown Los Angeles; 12 of the routes provide service to downtown Santa Monica. New rail service to downtown Los Angeles is expeceted to open this year.

9 *Big Blue Bus. (2014). About BBB. Retrieved from* http://bigbluebus.com/About-BBB/About-BBB.aspx

Economic development officials in the area view improved public transportation service to downtown Santa Monica as critical to the district's continued growth. They see public transportation—along with efforts to create more local housing—as important in addressing the traffic and parking issues that arise as more and more startups move into Santa Monica and the surrounding communities. The Exposition (Expo) Light Rail Line is expected to alleviate traffic congestion on I-10, facilitate access between downtown Los Angeles and downtown Santa Monica and support continued growth in the region. Phase I construction (from downtown LA to Culver City) began in 2006; service opened in 2012. Phase II will complete the 15.2 mile, $2.5 billion project,[10] with full service expected this year.

The Expo Line will have three Santa Monica stations: 26th Street/ Bergmot, 17th Street/Santa Monica College and Downtown Santa Monica at 4th and Colorado. "The light rail stations were incorporated in the city's Land Use and Circulation Element (LUCE) and are part of an integrated citywide strategy to reduce greenhouse gases and achieve no net new evening peak trips."[11] Big Blue Bus is now studying ways to interface with the Light Rail Transit (LRT) in Santa Monica.

10 *BuildExpo. (2013). About Expo Overview. Retrieved from* www.buildexpo.org/about-expo/

11 *Nazarchuk, A. (2014). Expo Light Rail Project Information. City of Santa Monica. Retrieved from* www.smgov.net/bebp/project.aspx?id=25923

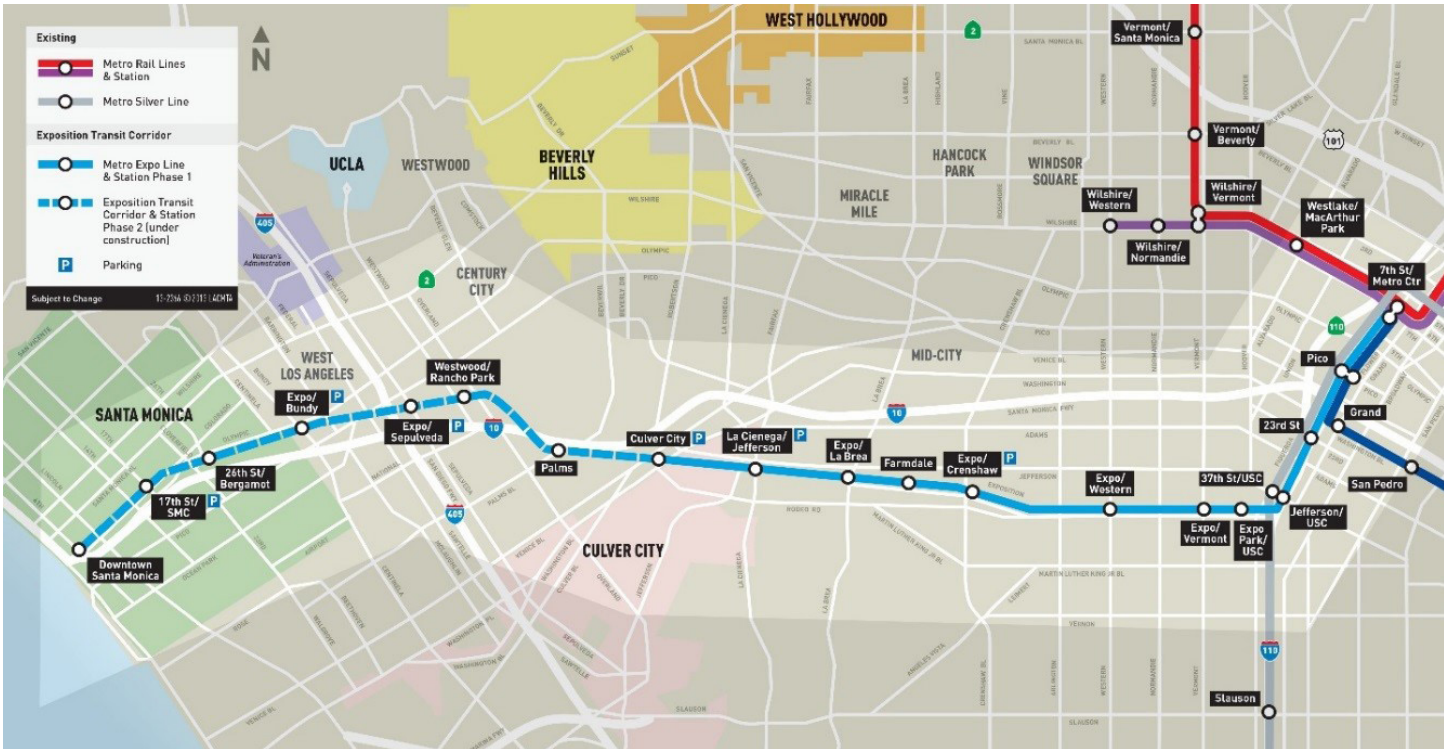

Figure 4. Exposition Light Rail Line Phase I and II Alignment
Source: BuildExpo. (2013). Alignment Map. Retrieved from http://www.buildexpo.org/about-expo/alignment-map/

A longer-range public transportation project is the proposed extension of the Purple Line subway service into West LA, with a final phase reaching Santa Monica as well. In 2012, the Federal Transit Administration approved the initial nine-mile extension from the current last stop at Wilshire Boulevard and Western Avenue to Westwood, with the new terminus near the Veteran's Affairs Hospital. Construction on the first 3.9 miles began in 2014. Completion of the full route is targeted for 2035.[12] Extension of the line to Santa Monica is likely 20 years away, but is under discussion as a way to relieve congestion on Wilshire Boulevard between downtown LA and downtown Santa Monica. Wilshire Boulevard is one of the densest employment corridors on the West Coast.

The ramifications of transit service to the Silicon Beach Innovation District extend beyond the modal efficiencies given above. By enlarging the size and diversity of the workforce available to Silicon Beach area businesses within a 35-minute peak commute, the proposed transit project (when combined with complementary multimodal investments) can provide businesses with access to a larger pool of skilled and knowledge-based workers, thereby allowing a better match between jobs and potential employees. This study strongly indicates that the enhanced labor market supported by public transit will make Silicon Beach's businesses more competitive and more productive in the long term.

If the larger region's unfunded public transportation initiatives—envisioned by SCAG's current 2035 long-range plan—are fully implemented by 2035, public transportation could save the region's businesses and residents more than $6.4 billion from 2015 to 2035 in reduced transportation costs. These savings, combined with the productivity effects of enhanced access to the Silicon Beach Innovation District, offer potential regional economic gains of as many as 78,950 permanent jobs by 2035. The

12 *Metro. (2014). Purple Line Extension. Retrieved from* http://www.metro.net/projects/westside/

same transportation savings and productivity benefits would also generate, by 2035, a cumulative $144.9 billion in additional business sales, $86.6 billion in cumulative additional Gross Regional Product (GRP) and nearly $64.2 billion in cumulative wages earned in the regional economy. These time-, cost-, reliability- and accessibility-related effects are over and above the costs to construct and operate the transit services.

4 Austin Northwest Innovation District

The following case study focuses on the historic center of the technology industry in Austin, TX, located approximately eight miles northwest of Austin's downtown. The district initially developed around a University of Texas (UT)-Austin research facility that started in the 1950s in the style of a traditional suburban office park. It has found success with larger, more mature companies attracted to the large parcels of land and to the quality of life, which has had appeal for executives and other more established workers. In recent years, a parallel but distinct growth trajectory for the technology industry has taken hold in downtown Austin—focused on startups, high levels of firm-to-firm interaction and the urban vibrancy that attracts young professionals. Faced with the emerging congestion that comes with changes in business and residential location preferences, the Northwest District is gradually transitioning toward a more transit-friendly urban form. While highway options are still available, the district's growth will also require a mix of land use and public transportation solutions as this historic center diversifies its development patterns and mobility options.

4.1 Overview of the District

The Austin technology sector is a tale of two worlds: an established suburban district entering a stage of transition and a fast-growing downtown district. Austin's history as a technology center began with the Balcomes Research Center on 393 acres northwest of the city center. The land previously housed a World War II magnesium plant, which is now the J.J. Pickle Research Campus of the University of Texas (UT). UT researchers and students who worked at the latter facility went on to form the foundation of Austin's private-sector technology district.

The first major tech firms to locate in Austin include Austin-based Tracor in the 1950s,[1] IBM in 1967 and Texas Instruments in 1969.[2] Subsequently, firms such as Hewlett-Packard and Dell joined the district. These large firms, along with more recent tech giants such as Apple, Google and Microsoft, have created business campuses in northwest Austin near the J.J. Pickle facility.

More recently, downtown Austin, which for years was dominated by government activity and support services, has emerged as a tech mecca for startups, particularly for firms engaged in social media, e-commerce and biotech. Some of the downtown startups are actually spinoffs from the larger firms in the northwest area. Downtown is an attractive location for a number of reasons. As in the case of the Silicon Beach District (Chapter 3), startups wish to locate where young tech workers want to live—in this case, the central city. Additionally, the area has assets associated with its role as a traditional Central Business District (CBD). Many venture capital firms are located in the innovation district, UT's main campus is close by and public transportation is easily accessible. The district is home to several incubators and accelerators, which further support the growth of high-technology and knowledge-driven businesses.

While downtown Austin is undoubtedly important to the region's technology industry, this case study focuses on the historic center of the tech industry in Austin, located about eight miles northwest of the central business district. The Northwest area was selected for study because (a) the area demonstrates clustering dynamics apart from the context of a traditional downtown and (b) it is entering a potentially transformative phase – and therefore highlights both the need for densification and increased public transportation service and the difficulties inherent in evolving from traditional suburban to more urban forms of development.

The Northwest Innovation District is centered on the J.J. Pickle Research Campus. It is bordered on the north by Route 45, on the east by Interstate 35 and to the south and west by Route 183.[3] Semiconductor, silicon chip and software companies originally comprised this district and still dominate the area, particularly in terms of employment. Major employers

1 *Kleiner, D.J. (2010, June 15). Tracor. Handbook of Texas Online. Retrieved from* http://www.tshaonline.org/handbook/online/articles/dnt03

2 *Austin History Center. When and how did Austin get its start as a high-tech mecca? Austin Public Library. Retrieved from* http://www.austinlibrary.com/ahc/faq13.htm

3 *The boundaries on the north, south and west extend about one-third mile outside the triangle formed by Routes 183, 45 and I-35 to include development on both sides of these highways.*

include IBM, Google, Microsoft, Hewlett-Packard, Applied Materials, Apple and National Instruments. More recently, the area has attracted "big data" firms including Pervasive Software and Momentum, SL.

The district is characterized by large, campus-style business parks dependent on automobile access. The area attracts businesses because it is located close to higher-end residential neighborhoods in the lakes and hills and communities with strong school districts. Executives at these major corporations like the lifestyle in this region of Austin. Many come from established firms such as Dell and have settled in the area. In other words, labor preferences are driving firm-location choice, as in the Silicon Beach case. However, presently there is a difference in whose preferences are being prioritized. Because industry giants such as Apple, IBM, Google and Microsoft can better compete for young workers, regardless of their location, and because of their history in the area, these large firms thus far have opted to remain in the innovation district (instead of downtown locations).

The district also has substantial land available for expansion and the development of large campuses for single users. The large tracts of available land play a role in attracting new growth to the area. For example, in 2013 Visa announced the relocation of its global information center (software development for cybersecurity and e-commerce) from California to the Austin Northwest Innovation District. The new facility will add more than 800 jobs over the next five years. To lure Visa to the area, the state of Texas and the city of Austin put together an attractive package of incentives, including $1.6 million from the city and $7.9 million from the Texas Enterprise Fund.[4]

4 *Copelan, L. & Ladendorf, K. (2013, February 13). Austin seeing interest from California companies 'double or triple,' chamber says. Austin America-Statesman. Retrieved from* http://www.mystatesman.com/news/business/austin-seeing-interest-from-california-companies-d/nWNqQ/

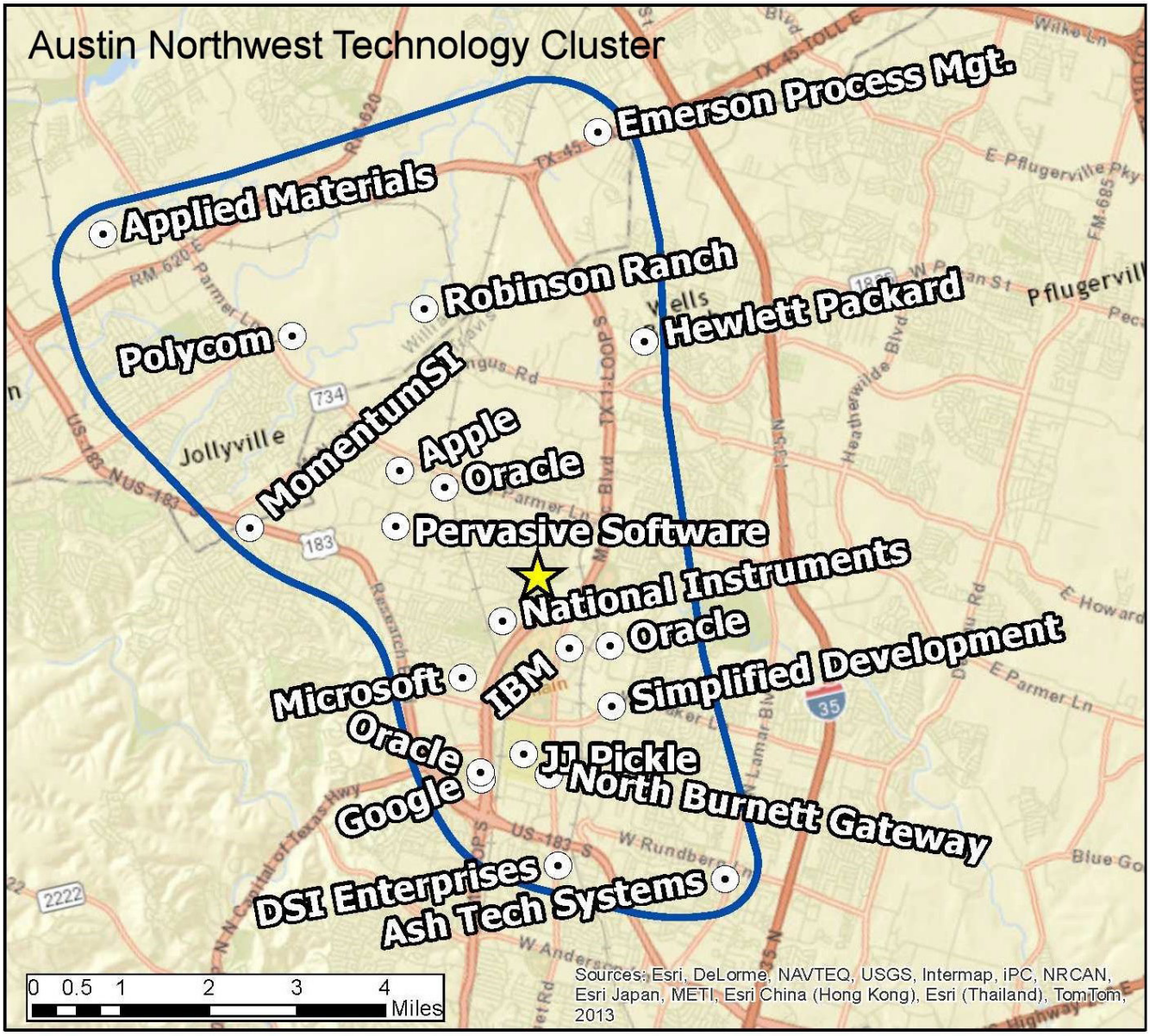

Figure 5. Businesses in the Austin Northwest Technology Distict
Source: EDRG Analysis, using ESRI base map.

Downtown Austin, on the other hand, does not have large spaces available and is quickly filling up with smaller firms. The largest technology firm in downtown is Facebook, which has to rent space in two different buildings to meet its needs. Nevertheless, some advantages of the downtown environment are causing planners in Austin to rethink the growth trajectory of the Northwest area. While the Northwest Innovation District has been successful historically in attracting and supporting large businesses, it has been less successful to date in diversifying to include firms at earlier stages of development. Smaller firms in the northwest face competition for labor from downtown businesses, which successfully draw younger workers seeking urban amenities, social media

and networking opportunities and close proximity to bars, nightclubs and music venues.[5] Startups also tend to place a premium on the ability to connect with other companies as they search for skills, collaborators and funding. As trends in the tech industry make small firms and flexible use of space (facilitated by renting rather than large-campus development) increasingly important [6],[7] the Northwest area will face pressures to adapt. These adaptations affect long-term planning for the area's transportation and land use needs.

Current and anticipated changes in business and residential location preferences, along with localized roadway congestion (see Section 4.2), have prompted the city of Austin to begin working toward a new vision for the Northwest area—one characterized by a denser, mixed-use development pattern that provides work-life opportunities and increases options for public transportation use. For example, city planners worked with the developers of the Domain, a 303-acre mixed-use development now in its third phase, to create a mixed-use project that will eventually include 6,000 residences and 12,500 jobs at retail, office, hotel and entertainment businesses. The development, located on land that was once part of the IBM campus, is bounded by the Union Pacific Railroad to the west, Loop 1 to the west and north, Braker Lane to the south and Burnet Road to the east.

In 2007, the city completed a master plan for the 2,300-acre North Burnett/Gateway area directly south of the Domain,[8] a location characterized by auto-repair companies, warehouse facilities and manufacturing firms. The new master plan calls for higher density mixed-use development, with transit-oriented development focused around the area of the Kramer MetroRail Station. The area is served by bus and MetroRapid bus service and could eventually include a station along the Lone Star Regional Rail planned between Austin and San Antonio. In 2009, the city adopted land-use regulations for this area to encourage higher densities, including condo and townhouse development.

5 *Calnan, C. (2014, March 21). Digital Downtown: Tech companies trade suburbs for city blocks. Austin Business Journal. Retrieved from* http://www.bizjournals.com/austin/print-edition/2014/03/21/digital-downtown-tech-companies-trade-suburbs-for.html?page=all

6 *DePillis, L. (2012, October 12). Dinosaur Makeover: Can Research Triangle Park Pull Itself Out of the 1950s? New Republic. Retrieved from* http://www.newrepublic.com/blog/plank/108527/dinosaur-makeover-can-research-triangle-park-pull-itself-out-the-1950s

7 *Florida, R. (2012, August 31). The Joys of Urban Tech. The Wall Street Journal. Retrieved from* http://online.wsj.com/news/articles/SB10000872396390444914904577619441778073340

8 *City of Austin. (2007). North Burnet/Gateway Neighborhood Plan. Retrieved from* http://www.austintexas.gov/page/north-burnetgateway

The Northwest Innovation District also includes Robinson Ranch, one of the largest tracts (8,000 acres) of undeveloped land in single ownership in the city. Austin annexed the parcel in 2004 and zoned it as a Planned Unit Development (PUD), which gives a developer significant flexibility and eliminates the need for a project to go through the city's zoning process.[9] This cattle ranch and quarry is immediately adjacent to the new 40-acre Apple campus, part of the 400-acre Riata master-planned community.[10] Apple has 3,000 jobs at the site, with plans to increase that number to 7,000 by 2022. To date, the owners of Robinson Ranch have not indicated a willingness to sell the property for development, but the city and the real estate community are keeping an eye on the area. They hope to create additional mixed-use projects to help attract new tech firms, densify the area and allow transit-friendly development.

It is clear from these developments that the Northwest Innovation District's ongoing success will require a vision for livability and accessibility different from its historical geographic form. The growing concentration of business activity in the area, combined with the increasing workforce demand for a different living and working environment, is creating a new set of transportation ideas and priorities for the future. Furthermore, worsening roadway congestion throughout the region is likely to stimulate demand for new types of land use and transportation alternatives for the district.

4.2 Transportation Challenges and Outlook

Modeling results from Austin's Metropolitan Planning Organization, the Capital Area Metropolitan Planning Organization (CAMPO), show the anticipated reduction, between 2010 and 2035, in the portion of the population that will be within the 30-minute commute for the Northwest Innovation District. While there is a noticeable decline in accessibility (see Exhibit 4-2), the limitations in terms of roadway congestion for the Northwest area of Austin are not as severe as those faced by the Silicon Beach District described in the previous chapter (Section 3.2). As discussed more fully in

9 *Behunek, Sara. (2012, September 27). Robinson Ranch future development in limbo. Community Impact Newspaper. Retrieved from* http://impactnews.com/austin-metro/northwest-austin/robinson-ranch-future-development-in-limbo/

10 *Buchholz, Jan. (2012, July 27). Apple's new Austin neighbors: Cattle and quarries — and they ain't mooovin' anytime soon, experts say. Austin Business Journal. Retrieved from* http://www.bizjournals.com/austin/print-edition/2012/07/27/land-everywhere---but-little-to-develop.html?page=all

the next section, planners in Austin at present view public transportation as both a means of addressing emerging congestion and as a way of achieving a future development vision to keep up with trends in the tech industry and in residential preferences. The push toward public transportation is not the result of a single trend (e.g., reduced accessibility from road congestion) but rather the product of a number of converging trends in land use, the business environment and desired mobility options.

Exhibit 4-2
Population Accessible from the Austin Northwest Innovation District

	Free Flow 30 minute	Peak Hour, 2010 30 minute	Peak Hour, 2035 30 minute
2035 Population with Access to the Austin Northwest Innovation District	2,800,000	2,000,000	1,700,000
Percent of Free Flow		71%	61%

Source: EDRG Analysis, using data from the Capital Area Metropolitan Planning Organization (CAMPO).

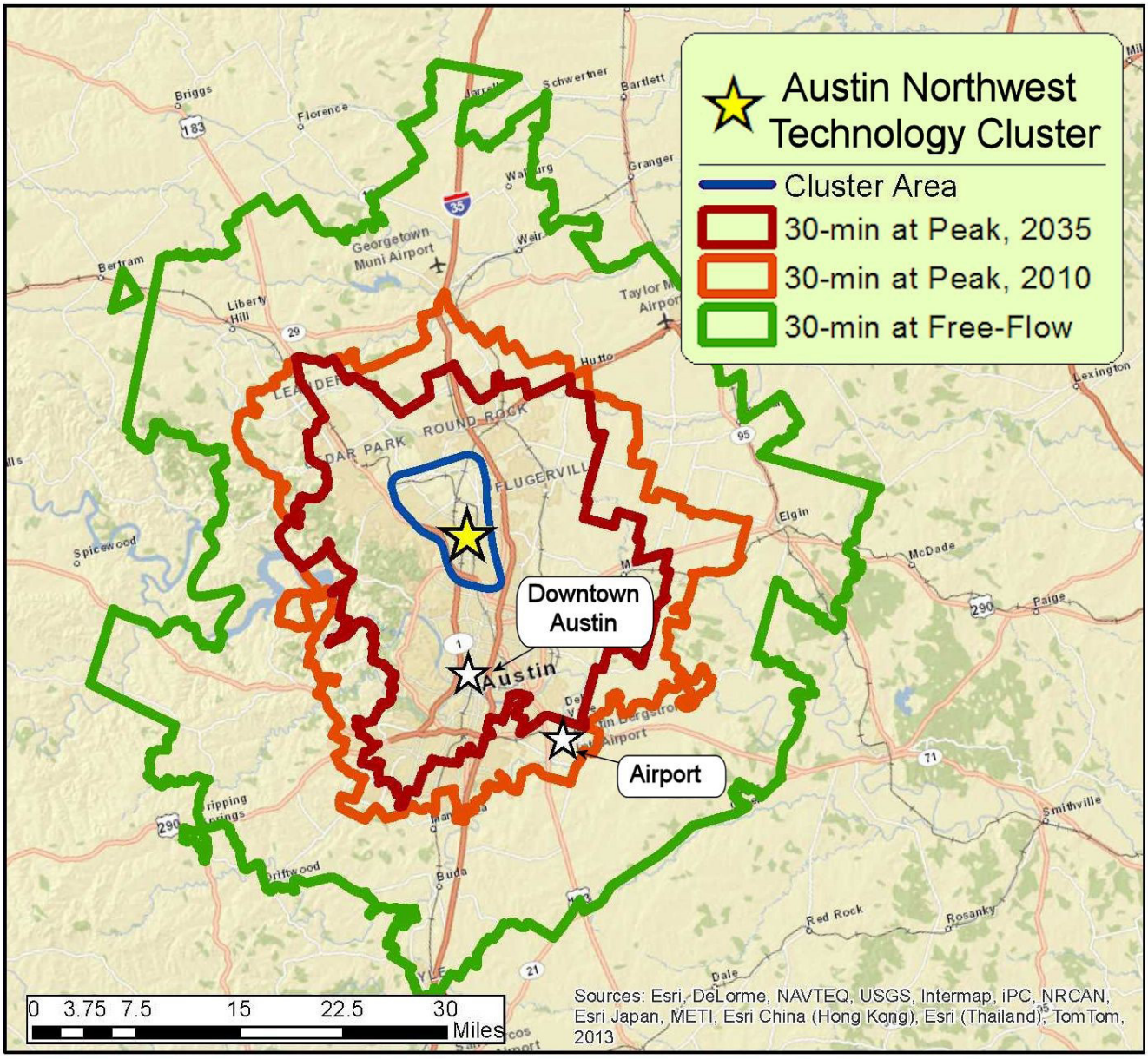

Figure 6. Diminishing Highway Accessibility for the Austin Northwest Innovation Distric
Source: EDRG Analysis, using data from the Capital Area Metropolitan Planning Organization (CAMPO), and an ESRI base map.

4.3 Role of Public Tranportation in Sustaining the DIstrict

According to Jeremy Martin, senior vice president of the Austin Chamber of Commerce, businesses attracted to Austin do not consider public transportation to be a primary factor in their location decisions—although it is a consideration. However, Martin believes that within two years, as congestion continues to worsen and more firms are attracted to the region, public transportation options will become more important to firms seeking space in Austin. While no firms are running private shuttles (as in Boston and San Francisco), some, such as Apple, have an internal

Transportation Management Association set up to help with ride matching (carpooling) for employees. Other employers have approached Capital Metro to partner to create better access to rail.

The city recognizes that continued growth in the region will be limited without transportation solutions to mitigate growing congestion on area highways. Solutions in Austin, unlike in some denser urban areas, will require a mixture of highway and public transportation options.

On the roadway side, transportation planners are exploring options to increase capacity on US-183 in the study area. These options include creating managed or express lanes that would allow buses to travel for free while charging passenger vehicles and trucks variable rates. A toll road already exists just north of the study area: US-183A, which runs parallel to US-183.[11] Similarly, construction is underway to add variable-toll express lanes to the section of the MoPac expressway south of W. Parmer Lane in the study area.[12] These efforts indicate that, while highway capacity improvements will be part of the solution, limits exist to what they can achieve beyond existing and planned tolling. Planners agree that public transportation will also have to play a role in maintaining accessibility in the Northwest Innovation District.

Commuter rail was introduced to the district in 2011, when the Capital MetroRail Red Line opened on freight lines formally owned by the Southern Pacific Railway Company. The 32-mile line has nine stations; Kramer Station is on Kramer Lane, close to the J.J. Pickle Research Campus. Also in the district area, but in the less-dense northern section, is Howard Station, at the intersection of W. Howard Lane and the MoPac Expressway. The system currently operates with trains arriving only every half hour in peak periods.[13] However, the city recently approved funds to add vehicles and decrease headways to operate at frequencies more similar to that of a light rail system. This will serve to increase both the attractiveness and the capacity of the line, which faces crowding during peak hours.[14]

Planning for significant expansion of the public transportation system is also underway. After years of preparation, in 2014 the city council approved the Austin Strategic Mobility Plan. The plan included the $1.38 billion Urban

11 *Central Texas Regional Mobility Authority. (2014). 183A. Retrieved from* http://www.mobilityauthority.com/183A.pdf

12 *Mopac Improvement Project. (2013). About the MoPac Improvement Project. Retrieved from* http://www.mopacexpress.com/about/project-overview.php

13 *Capital Metropolitan Transportation Authority. (2013). MetroRail. Retrieved from* http://www.capmetro.org/metrorail/

14 *Watson, K. (2014, June 25). MetroRail to Receive $50 Million State Grant. Kirk Watson Texas Senator. Retrieved from* http://www.kirkwatson.com/featured-posts/metrorail-receive-50-million-state-grant/

Rail (with $700 million to be funded locally), a 9.5-mile rail corridor that would have connected downtown to the Highland Mall, just south of the study area.[15] Urban Rail was defeated as part of the city's 2014 bond election. The Strategic Mobility Plan also includes improvements to the I-35 corridor and to the I-35/US-183 interchange at the southeastern tip of the study area. In August 2014, bus rapid transit on the 803 Route started operations along Burnet Road, with three stations in the study area (The Domain, UT Research Center and Crossroads just south of US-183).[16] Planners envision future intercity rail, called Lone Star Rail, to run down the middle of the MoPac Expressway, providing service from northern Austin to San Antonio. Two stations are under consideration in the study area, at McNeil Lane and Braker Lane.[17] The introduction of intercity rail service could further support the business district by facilitating business travel between cities in Texas. The additional access provided by Lone Star Rail would likely give added incentive for denser development in the area around the stations.

The Northwest Innovation District in the future is likely to be characterized by a combination of older, suburban-style corporate campuses, newer mixed-use development to create a "second downtown," increased public transportation solutions and some highway improvements. Its development process is unlikely to reproduce the same dynamics as exist in downtown Austin. The area can serve as a complement to the startup activity in downtown, providing opportunities for firms to "graduate" from small spaces in the downtown to larger spaces in the northwest. Thus, both centers of activity exist within an ecosystem that meets a spectrum of needs for firms of different scales and at various points along the lifecycle of innovation. Public transportation is one important part of the continued viability of the Austin Northwest Innovation District.

By enlarging the size and diversity of the workforce available to both the Northwest Innovation District and downtown businesses within a 35-minute peak commute, the proposed transit build program can enable the Austin region's businesses to select better workers and to realize a better

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15 *Austin Transportation Department. (2014). 2014 Austin Strategic Mobility Plan. Retrieved from* http://www.austintexas.gov/sites/default/files/files/AMP_Report_DrupalUpload.pdf

16 http://www.capmetro.org/route803/

17 *Carter & Burgess, Inc., and Capital Market Research, Inc. (2006). Executive Summary Economic Impact Analysis: Passenger Rail Station Areas. Retrieved from* http://lonestarrail.com/images/uploads/ASA_Economic_Impact_Study.pdf

fit between workers and jobs. This report finds convincing evidence that the enhanced labor market supported by public transit will make Austin's businesses more competitive and more productive in the long term.

If the larger region's unfunded public transportation initiatives envisioned by CAMPO's past 2035 long-range plan (including the unfunded Urban Rail line) were fully implemented by 2035, public transportation could save the region's businesses and residents more than $744 million in reduced transportation costs. These savings—combined with the productivity impacts resulting from enhanced labor market access—offer potential productivity gains to businesses of more than 11,170 permanent jobs by 2035, supporting a cumulative $20.3 billion in additional business sales, $12 billion in cumulative additional Gross Regional Product (GRP) and nearly $10 billion in cumulative wages earned in the Austin economy by 2035. These accessibility-related effects are over and above the costs of outlays made to construct and operate the transit services.

5 Research Triangle Park

Research Triangle Park (RTP)—located between Durham, Chapel Hill and Raleigh, NC—is the archetype of a planned knowledge-industry district in the United States. It was designed explicitly to take advantage of the knowledge-transfer potential from nearby universities and to translate that knowledge into commercial products and services. Reflecting the planning principles of its time, RTP is a suburban-style office park with large, independent corporate campuses connected by significant roadway infrastructure. However, the district now faces a changing profile of demands from newer and smaller technology companies that desire more urban environments and increased firm-to-firm interactions facilitated by density.

Like the Northwest Innovation District in Austin, Research Triangle Park is dealing with a gradual—and, as of yet, uncertain—process of land-use changes, densification, diversification of its business base and increased orientation toward public transportation. RTP representatives feel that the district is still competitive in terms of congestion and access (relative to other locations like Silicon Valley) and that highway improvements are still possible. Nevertheless, evidence from current peak-traffic levels and regional modeling indicates that access to labor will be noticeably constrained in the future.

RTP knows it must cater both to startups and to established firms, offering flexible space to both. It also must create an environment attractive to the workers whom tech firms wish to attract—which means supporting denser, walkable, accessible environments with increased local amenities and a greater supply of housing. Public transportation is one piece of this overall strategy—one that reinforces and is reinforced by the other components. With a process of gradual redevelopment, public transportation will further strengthen the types of development RTP wishes to sustain.

5.1 Overview of the District

Research Triangle Park is situated on 6,900 acres adjacent to I-40, I-540 and State Route 147, southeast of Durham, east of Chapel Hill and northwest of Raleigh. One of the oldest research parks in the United States, it houses some of the largest tech and research firms in the world, including IBM, Cisco, BioGen, BASF and Bayer CropScience. The park boasts close to 200 firms[1] with over 42,000 full-time employees and 10,000 contract employees[2] in more than 22.5 million square feet of space.[3]

The history of RTP dates back to the 1950s. The idea for the park emerged from a collaboration between three institutions of higher education (University of North Carolina at Chapel Hill, Duke University in Durham and North Carolina State University in Raleigh), business leaders and the governor. The idea of building the park was to attract research firms to expand on research conducted at the universities and help keep young, educated people in a region historically dominated by apparel, tobacco and furniture manufacturing.

Unlike the gradual, ad-hoc growth of other technology districts such as Silicon Valley in California and the Route 128 corridor in Massachusetts, RTP's development was carefully planned—from its particular land uses to marketing brochures highlighting research at partner universities. The state legislature passed enabling legislation for the development and management of the park and included zoning that established setbacks, height restrictions and allowable uses. Initially, in July 1957, a private entity, Pinelands Inc., assembled 800 acres for the park; it added another 3,430 acres in subsequent months. After a group of businesses and government organizations raised sufficient funds, the newly created Research Triangle Foundation—a nonprofit charged with overseeing development of the park—acquired the land. RTP was planned as a research campus, designed to have individual corporate campuses separated from each other by open space and wooded areas.

1 *Telephone conversation with Liz Rooks (Executive Vice President & COO) and Corey Liles (Senior Planner) of the Research Triangle Park, August 25, 2014.*

2 *Durham Convention & Visitors Bureau. (2014). The Research Triangle Park. Retrieved from* www.durham-nc.com/about/about-features/research-triangle-park.html

3 *DePillis, L. (2012, October 12). Dinosaur Makeover: Can Research Triangle Park Pull Itself Out of the 1950s? New Republic. Retrieved from* http://www.newrepublic.com/blog/plank/108527/dinosaur-makeover-can-research-triangle-park-pull-itself-out-the-1950s

The first two businesses opened in the park in 1957. Development then lagged until the mid-1960s, when the U.S. Department of Health, Education and Welfare announced that it would locate the National Environmental Health Sciences Center at RTP; IBM also broadcast that it would build a 600,000–square-foot research facility there. Over the next several decades, many additional research facilities and private companies have opened at RTP, making it one of the premier locations for technology and pharmaceutical development in the world.[4]

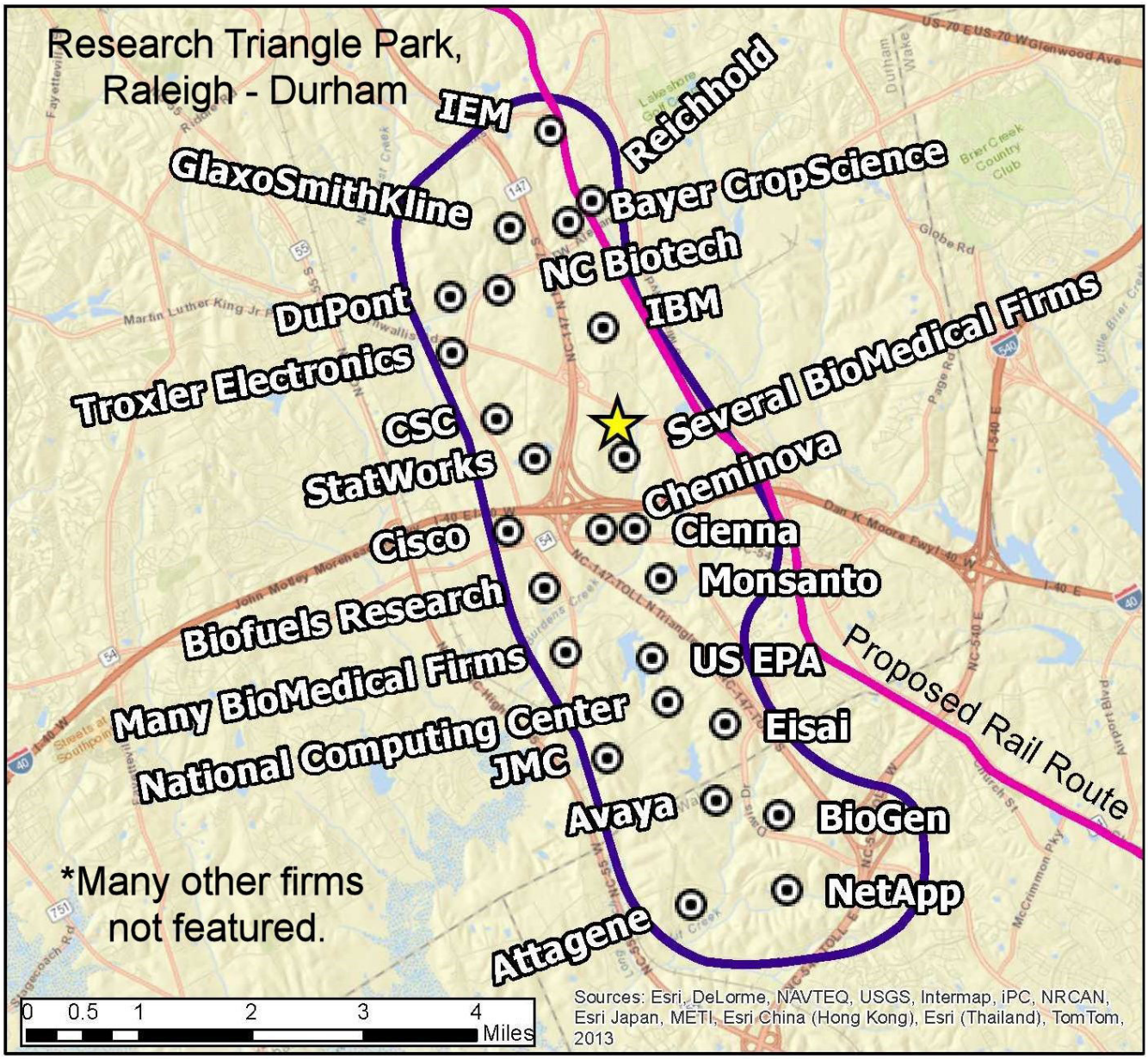

Figure 7. Businesses in Research Triangle Park
Source: EDRG Analysis, using ESRI base map.

4 *Link, A.N. & Scott, J.T. (2000). The Growth of Research Triangle Park. Retrieved from* http://www.dartmouth.edu/~jtscott/Papers/00-22.pdf

RTP today is an expansive, auto-dependent facility. The development model of large, campus-style corporate parks for individual businesses, as well as a near-prohibition on retail and residential uses, means that employees who work at RTP must commute from surrounding areas. Current public transportation service is limited to bus and express bus service provided by Triangle Transit.[5] For years, this model worked well, attracting major firms that wished to distinguish themselves by their corporate campuses surrounded by green space. Firms purchased large tracts of land and used landscaping to create autonomous parcels. When the park was first developed, the modern-day emphasis on urban amenities, density and collaboration had not yet taken hold. And while neither firms nor workers enjoyed the congested roadway conditions leading to RTP (especially on I-40), the park continued to attract them because of the low cost of living in the wider region, the availability of land and the climate.

Over the past decade, however, corporate and employee preferences have affected the park's ability to grow and prosper. Due to the fast pace of change in the tech industry, many firms now want to lease space rather than purchase land and buildings. Additionally, the new generation of tech workers wants a variety of mobility options. For example, one demand is for housing and workplace locations where residents can get to work and entertainment, and other activities, without relying on automobiles and parking. [6]

In response to these trends, RTP embarked on a master planning effort in 2010[7] and unveiled the new plan in 2012.[8] This plan calls for $2 billion in investment that will support up to 100,000 more jobs in the park. The aim is to diversify the employment base in the park by attracting more small- and mid-size firms, along with spinoffs from the larger firms already

5 *Triangle Transit. (2014). Routes and Schedule Systems Map. Retrieved from* http://www.triangletransit.org/sites/default/files/maps-and-schedules/RoutesAndSchedules-system_map.pdf

6 *DePillis, L. (2012, October 12). Dinosaur Makeover: Can Research Triangle Park Pull Itself Out of the 1950s? New Republic. Retrieved from* http://www.newrepublic.com/blog/plank/108527/dinosaur-makeover-can-research-triangle-park-pull-itself-out-the-1950s

7 *Hoyle, A.J. (2010, August 30). Board wants new master plan for Research Triangle Park. Triangle Business Journal. Retrieved from* http://www.bizjournals.com/triangle/stories/2010/08/30/story5.html?page=all

8 *Research Triangle Foundation of North Carolina. (2012). The Research Triangle Park Master Plan. Retrieved from* http://aws-master.s3.amazonaws.com/wp-content/uploads/2014/08/CONCISE-MASTER-PLAN.pdf

in the park.[9] The plan targets over 1,000 acres for development and lays out three activity nodes—Park Center, Triangle Commons and Kit Creek Center—that include residential, retail uses and research facilities, as well as increased densities.[10] These changes will require an amendment to RTP's enabling legislation.

In the founding master plan for RTP, Park Center was designated as the original (and only) service center for the park.[11] In recent years, the center has faced challenges related to aging building stock and high rates of vacancies as the built form no longer meets demand in the market. To address these changing needs, RTP recently purchased the 100-acre parcel comprising Park Center and will redevelop the area to be a higher-density, mixed-use office/commercial hub.[12] RTP expects to complete infrastructure for Park Center this year.[13] The 2012 master plan also includes two new activity nodes. The Triangle Commons node is intended as a mixed-use development that will include incubator space and a conference center hosting symposia and other events to encourage interaction among firms. This emphasis on interaction responds to shifts in the business model of technology companies. Rapid change and the importance of startups make collaboration and sharing of ideas increasingly important. Additionally, the Kit Creek Center will provide research space for both small and large firms.[14]

5.2 Transportation Challenges & Outlook

The RTP master plan points to traffic congestion at peak times on major arterial and interstates serving the park and concludes that additional transportation alternatives will be required in the long term. At present, less than 2 percent of trips to and from the park are by Triangle Transit buses.

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9 *Kroll, D. (2014, February 2). 7 Reasons It's Finally Time To Live In Research Triangle Park. Forbes. Retrieved from* http://www.forbes.com/sites/davidkroll/2014/02/04/7-reasons-its-finally-time-to-live-in-research-triangle-park/

10 *Bracken, D. (2012, November 9). New RTP Master Plan Promises More Density, Amenities. Triangle News & Observer. Retrieved from* http://www.apartmentrep.com/MultifamilyBlog/tabid/79/EntryId/89/New-RTP-Master-Plan-Promises-More-Density-Amenities.aspx

11 *Research Triangle Foundation of North Carolina. (2014). The Research Triangle Park Master Plan.*

12 *Ohnesorge, L.K. (2014, May 7). The Research Triangle Park 'refresh:' CEO says we'll know what it will look like in September. Triangle Business Journal. Retrieved from* http://www.bizjournals.com/triangle/blog/2014/05/the-research-triangle-park-refresh-ceo-says-well.html?page=all

13 *Liz Rooks (Executive Vice President & COO), Research Triangle Park.*

14 *Research Triangle Foundation of North Carolina. (2014). The Research Triangle Park Master Plan.*

Interstate 40, the primary eastern route providing highway access to the park, "slows to a crawl at most morning and evening rush hours."[15] Results from the Triangle Regional Model confirm this prediction of increased roadway congestion.[16] It shows the expected shrinking of the 30-minute commute shed for the district, from 2010 to 2040. As shown in Exhibit 5-2, this analysis projects that, in that time period, the population accessible from Research Triangle Park within 30 minutes will be reduced by 340,000. Limitations on labor accessibility can result in reduced business productivity due to long commutes, increased search costs for skilled labor or reduced quality of labor-to-firm matching.

Exhibit 5-2
Current and Future Population Accessible from Research Triangle Park

	Free Flow 30 minute	Peak Hour, 2010 30 minute	Peak Hour, 2040 30 minute
2040 Population with Access to Research Triangle Park	1,600,000	1,100,000	760,000
Percent of Free Flow		67%	46%

Source: EDRG Analysis, using data from the Triangle Regional Model.

15 *Ibid.*

16 *Maintained by the Institute for Transportation Research and Education at North Carolina State University through a collaboration between Capital Area MPO, Durham-Chapel Hill-Carroboro MPO, NC Department of Transportation, and Triangle Transit. See:* http://www.itre.ncsu.edu/HWY/documents/TRMFactSheet.pdf *Accessed 4 September 2014.*

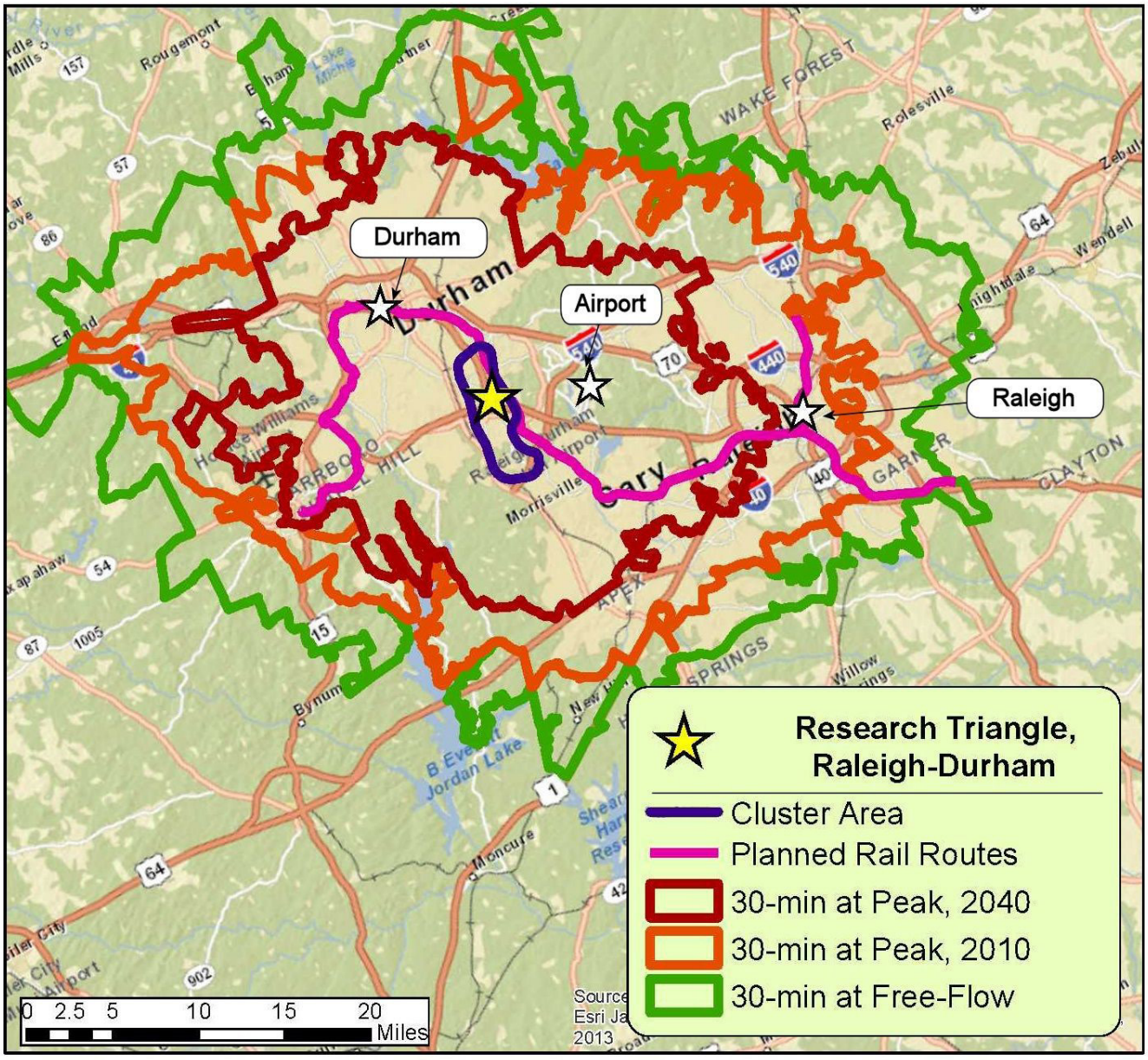

Figure 8. Diminishing Highway Accessibility for Research Triangle Park
Source: EDRG Analysis, using data from the Triangle Regional Model, and an ESRI base map.

5.3 Role of Public Transportation in Sustaining the District

Reduced automobile accessibility and changing preferences of technology firms for more urban settings pose a problem for the continued success of Research Triangle Park. While RTP understands public transportation is necessary to support sustainable growth in the district, altering the transportation mix will not be easy. Because of its large single-tenant campuses with considerable distance between each, the park is a classic example of the "last mile problem" for public transportation users. Moreover, Triangle Transit was forced to move its Regional

Transit Center outside the park in 2008 when its landlord declined to renew its lease.[17] This has resulted in a decrease in bus ridership by park employees.[18] Public transportation will require significant land-use changes, likely to occur only over a considerable period of time. Most of the large corporate campuses are owned by the firms they house. Densification within the park will require agreement between adjacent corporate landowners about future land uses and building designs. Such collaboration will vary from project to project and take time to evolve toward a more transit-friendly land-use pattern.[19] In addition, highway improvement options still exist to help relieve congestion and congestion levels have not yet reached the point where RTP cannot attract or accommodate new businesses. Competitors like Silicon Valley face even worse congestion. Finally, flexible work schedules and the growth of telecommuting have also served to relieve some pressure on the roadways serving the park.

Nevertheless, RTP planners recognize that, for its continued success—which includes the need to diversify its business base and attract smaller firms in new tech industries—the park must include more transportation options. For business models that require considerable interaction on a day-to-day basis, telecommuting is not an acceptable alternative to being present. However, to attract young talent, the environment surrounding this new generation of technology firms must be more urban and more active. RTP and Triangle Transit plans have called for improved bus service, commuter rail service and (in the long term) potential light-rail services that would enable those working in RTP jobs to live in downtown Raleigh, Durham and Chapel Hill and easily access jobs in RTP.

In 2011, analysts completed an alternatives study for the Triangle Transit Authority, exploring commuter rail service from Durham to south of Raleigh. There have been plans that called for two commuter rail stations within RTP.[20]

The RTP North station would have been located proximate to the planned Triangle Commons—a 300–400-acre site to include seven million

17 *(2008, December 1). Triangle Transit opens new transfer station. Triangle Business Journal. Retrieved from* http://www.bizjournals.com/triangle/stories/2008/12/01/daily6.html

18 *Liz Rooks (Executive Vice President & COO), Research Triangle Park.*

19 *Research Triangle Foundation of North Carolina. (2014). The Research Triangle Park Master Plan.*

20 *Triangle Transit. (2011). Durham-Wake Corridor Alternatives Analysis Report. Our Transit Future. Retrieve from* http://ourtransitfuture.com/durham-wake-alternatives-analysis-report/

square feet of development including office, hotel and conference space and a science and technology high school. This station would include six feeder bus bays.

The Triangle Metro Center Station would have been located west of Miami Boulevard and just south of Nelson Chapel Hill Highway. This station was planned to include 10 feeder bus bays. Funding for the commuter rail service requires that Orange, Durham, and Wake counties all impose a half-cent sales tax to pay for the service. Orange and Durham counties have passed the tax but the county commissioners stalled a vote on the tax in Wake County, pending an additional study of public transportation options for that county.[21]

Long-range plans in the area have also called for light-rail service along the western edge of RTP. This service is at least 20 years in the future and planners remain uncertain about its potential to become a reality. While LRT is moving forward between Chapel Hill and Durham, plans to extend the service to Raleigh have, up to this point, not found support in Wake County.[22] The RTP master plan suggests that LRT could eventually serve both the Park Center development and the planned Kit Creek research center in the southern portion of the park.[23]

Overall, RTP staff believes improved public transportation must be a part of the park's future. Tech workers of the current generation seek jobs in areas with transportation options; smaller companies and startups are looking for opportunities to collaborate and exchange ideas. Mixed-use development served by public transportation will help the park attract these workers and firms, diversify its base and position itself to retain its position as a premier location for the knowledge industries.

The impacts of transit service to the RTP extend beyond the modal efficiencies given above. By enlarging the size and diversity of the workforce available to within a 35-minute peak commute to the RTP, the proposed transit build program (when combined with complementary multimodal investments) can enable RTP's businesses to select more qualified workers and achieve a better fit between workers and jobs. The enhanced labor

21 *Greg Northcutt (director of Capital Planning), Triangle Transit, 2014 (phone conversation); Liz Rooks, 2014 (phone conversation).*

22 *Capitol Broadcasting Company, Inc. (2014, February 26). Wake commissioners lukewarm on light rail. WRAL. Retrieved from* http://www.wral.com/wake-commissioners-lukewarm-on-light-rail/13432425/

23 *Research Triangle Foundation of North Carolina. (2014).*

market supported by transit will make RTP businesses more competitive and more productive in the long term.

If the unfunded public transportation initiatives of the larger region—envisioned in the Research Triangle area's current 2035 long-range plan—are fully implemented by 2035, public transportation could save the region's businesses and residents more than $555 million in reduced transportation costs. These savings, combined with the productivity gains from enhanced access to the RTP, will provide by 2035 more than 6,983 permanent jobs, supporting a cumulative $12.7 billion in additional business sales, $7.9 billion in cumulative additional Gross Regional Product (GRP) and nearly $5.6 billion in cumulative wages earned in the North Carolina economy. These accessibility-related effects are in addition to the impact of dollars spent constructing and operating the transit services.

6 San Francisco Bay Area: High-Speed Rail and Evolving Labor Market Access Needs

The state of California is planning for high-speed rail (HSR) that will connect the Bay Area in the north to downtown Los Angeles in the south.[1] The proposed route would have a terminal at the new Transbay Transit Center, just south of Mission Street in downtown San Francisco,[2] and would use the existing Caltrain tracks down the peninsula, through San José and south through Gilroy, thus serving both the South of Mission/Mid-Market tech hub and the Silicon Valley tech hub.[3] While the HSR would not begin operations for at least a decade (the full San Francisco to Los Angeles route is currently targeted for 2028),[4] a project is underway to electrify the Caltrain tracks on the peninsula to accommodate faster service.[5] This electrification is necessary to support future HSR on these tracks and is one of the "Connectivity & Bookend" projects included in the HSR system plan.

The role of high-speed rail in supporting business-to-business connections, as well as access to a wider labor market, has been a key component of the economic justification for high-speed rail, both in California[6] and elsewhere in the United States. For example, a 2011 study published by the Midwest High-Speed Rail Association found that high-speed rail between Chicago and other large and mid-size metropolitan areas in the Midwest

1 *California High Speed Rail Authority. (2014). Connecting California: 2014 Business Plan. Retrieved from* http://www.hsr.ca.gov/docs/about/business_plans/BPlan_2014_Business_Plan_Final.pdf

2 *Transbay Transit Center. The Program. Retrieved from* http://transbaycenter.org/project/program-overview

3 *For more discussion of these clusters, refer to Chapters 6 and 7 of the previous study: The Role of Transit in Support of High Growth Business Clusters in the U.S. Retrieved from* http://www.apta.com/resources/reportsandpublications/Documents/TransitHighGrowthClustersUS-Final2013-1124.pdf

4 *California High Speed Rail Authority. (2014). Connecting California: 2014 Business Plan.*

5 *Caltrain. (2014). Caltrain Modernization Program. Retrieved from* http://www.caltrain.com/projectsplans/CaltrainModernization.html

6 *California High Speed Rail Authority. (2008). The Economic Impact of the High Speed Rail in the San Francisco Bay Area (Fact Sheet). Retrieved from* http://www.hsr.ca.gov/docs/about/business_plans/BPlan_2008_SRC_EcoStudiesSF.pdf

can broaden regional labor markets and support the growth of technology districts.[7]

Despite such evidence of business impacts—in particular, impacts in technology districts—interviews with Metropolitan Transportation Commission (MTC) staff, as well as with representatives of the Silicon Valley Leadership Group and the Bay Area Council, revealed that to date the high-tech/knowledge industries in the Bay Area do not consider HSR to be immediately relevant to their future growth.[8] Interviewees attribute this disconnect to the nature of tech industries and their rapidly changing business models. Given the environment focused on rapid change, public projects several years into the future do not register on the private-sector planning horizon. It has, in fact, been difficult to engage high-tech businesses in the planning process for HSR.[9]

However, these same industries, particularly those sited on the peninsula, are very supportive of the Caltrain electrification project. Businesses believe the project will expand access to their workforce. The level of interest in Caltrain electrification demonstrates that workforce access is an issue of concern to businesses in the San Francisco Bay Area. As the area continues to grow, access will face further pressures from congestion and workers will find it harder to find affordably priced housing in the Bay Area. Thus, in the long term, knowledge-based firms in San Francisco may ultimately turn to HSR as another means of reaching the necessary skilled labor. This is consistent with international research that points to the role of HSR in supporting new patterns of commuting within a 0.75–1.5-hour travel time range.[10]

In terms of business-to-business connections over longer distances (e.g., between the Bay Area tech industry and its counterparts in the Southern California entertainment industry), the anticipated role of HSR is supportive but not necessarily transformative. The LA region has five airports and the Bay Area has three; these services provide fast, convenient transportation between the two metro areas. However, the potential exists of relieving

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7 *Midwest High Speed Rail Association. (2011). The Economic Impacts of High Speed Rail: Transforming the Midwest. Retrieved from* http://www.edrgroup.com/pdf/MWHSR-ExecSummary-Final.pdf

8 *MTC: David Ory; Bay Area Council: Michael Cunningham, VP Public Policy; Silicon Valley Leadership Group: Zoe Mullendore, Associate of Housing and Transportation. Phone Interviews (2014, summer).*

9 *Michael Cunningham, Bay Area Council.*

10 *de Ureña, J.M. (2012). High-Speed Rail and its Evolution in Spain. In José Maria de Ureña (Ed.), Territorial Implications of High Speed Rail (5-7). Burlington, VT: Ashgate.*

congestion at airports and shifting some trips toward the more energy-efficient mode of high-speed rail. As with the labor market effect, Bay Area and LA tech industries have not yet focused on the congestion mitigation benefit of HSR because of how long it generally takes to develop HSR service. As planning progresses and service comes closer to reality, businesses in high-tech districts will most likely weigh the long timeline of HSR against their need for access to skilled labor, collaborators and clients across the state. The same forces that drive tech companies to consider the benefits of public transportation are likely to awake their potential interest in high-speed rail development.

Regardless of the high-speed rail issue, districts of the type analyzed in the prior report, combined with overall public transportation potential in the area, are of high regional economic significance. If the larger region's unfunded public transportation initiatives envisioned by the Metropolitan Transportation Commission (MTC)'s long-range plan are fully implemented by 2035, public transportation could save the region's businesses and residents over $6.6 billion in reduced transportation costs, $2.2 billion in cumulative personal income (from 2015 to 2035), $3.2 billion in cumulative additional sales from regional businesses and $2.5 billion in cumulative additional Gross Domestic Product (GDP) during that 20-year period. These gains include only those attributable to the savings from enhanced transportation performance and do not include the spending effects of capital or of operating outlays themselves, nor do they include potential productivity gains from enhanced labor and commodity markets.

7 Conclusions

Overall, this exploration of innovation districts in Los Angeles, Raleigh-Durham and Austin significantly complements the previous cluster study[1] by assessing the role of public transportation in districts that still have considerable development potential and may require public transportation for reasons other than scarcity of land for roadway right-of-way. While the previous study established the importance of public transportation for sustaining large and well-developed districts in the future, these additional cases illustrate the following key aspects of the transportation needs of innovation districts.

7.1 Market Forces Demand Regulatory Change

The Austin and Research Triangle Park cases both demonstrate how market forces are beginning to reshape innovation districts historically developed on the "office park" model of large campuses surrounded by trees and parking lots. Both cases provide examples of situations where real estate developments geared to the tastes, business and workforce requirements of the late 20th century are being redesigned and re-engineered with mixed-use and higher density business environments, which include an expanded role for high-density transportation. This is very different from the more mature districts in the prior study, where districts like Kendall Square in Cambridge, MA, and Midtown South of Market in San Francisco benefitted from initial designs and contexts already oriented toward public transportation.

1 *Economic Development Research Group. (2013). The Role of Transit in Support of High Growth Innovation Districts in the U.S. Retrieved from* http://www.apta.com/resources/reportsandpublications/Documents/TransitHighGrowthClustersUS-Final2013-1124.pdf

The Northwest District in Austin and Research Triangle Park also differ from the suburban districts of the Route 28 Technology Corridor in Burlington, MA, or the Deerfield district near Chicago in that the former two districts are still developing and redeveloping a large share of their land, with visions of a far more transit-oriented and mixed-use environment than they currently have. Overall, these two newly analyzed innovation districts show how market forces are driving both a more diverse set of transportation options and a new vision for suburban districts, even in districts that have historically flourished with auto-oriented forms. Communities that enable land-use regulations that are flexible and complementary with market demand will see ongoing benefits.

The Silicon Beach case offers an example of some of the centrifugal forces resulting from rigid land-use regulations. Santa Monica's commercial no-growth policy has led to commercial growth in surrounding areas where fewer public transportation options exist and where expansion plans are less robust than in the heart of the Silicon Beach district. The likely result—increased traffic congestion—is the opposite of the intended outcome from Santa Monica's commercial no-growth strategy.

For communities to fully leverage the benefits from innovation districts, regulatory structures must allow for built environments to respond to demands for housing and commercial development near public transportation.

7.2 Knowledge Workers Want Public Transportation

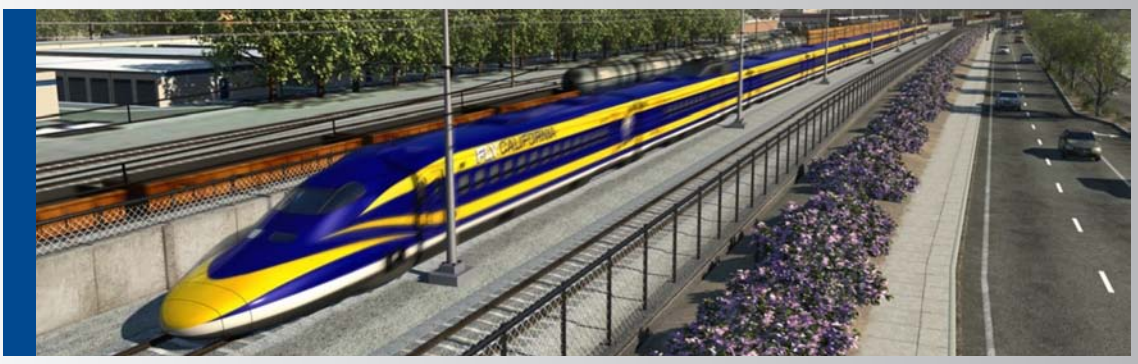
All three of the additional innovation districts studied demonstrate that whether roadway access is limited by land constraints (Silicon Beach) or land is plentiful (Research Triangle Park and Austin's Northwest District), workforce preferences alone can drive a need for public transportation access. In all three districts, public transportation solutions are considered largely, if not primarily, to maintain districts' competitiveness in accommodating the housing, lifestyle and cultural preferences of younger knowledge-workers. This growing demand for public transportation, and the workforce's responsiveness to these options (as demonstrated in the prior study), shows that deficiency or technical infeasibility of roadway

options is not the only factor that can or should justify investment in public transportation.

Specifically, for Research Triangle Park to remain competitive without urban neighborhoods (within the park itself), the presence of direct access to the downtown neighborhoods of Raleigh, Durham and Chapel Hill will become increasingly important. Local observers see this as a potentially important driver of demand for future public transportation service. In a similar way, regardless of whether Austin's Northwest District has land available to expand roadways into the district, planners and employers see the existence of non-driving access to downtown and other neighborhoods as crucial to attract and retain the desired workforce. Even in Santa Monica, where public transportation has had a limited role, economic development officials today see its critical role in ensuring that startups continue to be attracted to the area in the face of looming housing, traffic and parking issues.

7.3 Investment Enhances Competitiveness

While the previous study has a national focus, the current one includes an assessment *at the regional level* of potential savings to businesses and households if government and business fully implement the public transportation improvement strategies described in the cases. By reducing out-of-pocket travel costs, travel time and reliability challenges inherent in auto dependence on congested networks, public transportation investments have the potential to save significant money for households and businesses. In that way, they can improve the chances that these three regions will enjoy jobs, wage income, gross domestic product and business sales that they otherwise may not have realized. While transportation savings from more efficient modes is only one aspect of regional competitiveness for any given city or region, our analysis indicates that investments in public transportation serving these districts and connecting them to larger enhanced public transportation networks are likely to have benefits for any given city—ranging, in the long term, from hundreds of millions to billions of dollars.



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