Final Report

Anchorage Industrial Land Assessment

Prepared for:

Anchorage Economic Development Corporation
Municipality of Anchorage

Prepared by:

Economic & Planning Systems, Inc.
GDeS Architecture & Planning

March 31, 2009

EPS #18615

Final Report

Anchorage Industrial Land Assessment

Prepared for:

Anchorage Economic Development Corporation
Municipality of Anchorage

Prepared by:

Economic & Planning Systems, Inc.
GDeS Architecture & Planning

March 31, 2009

EPS #18615

The Economics of Land Use

Economic & Planning Systems, Inc.
2150 River Plaza Drive, Suite 400
Sacramento, CA 95833-3883
916 649 8010 tel
916 649 2070 fax

Berkeley
Sacramento
Denver

www.epsys.com

Table of Contents

List of Tables

List of Figures

1. EXECUTIVE SUMMARY

This report constitutes an effort by the Anchorage Economic Development Corporation (AEDC) and the Municipality of Anchorage (MOA) to measure the quantity and quality of the industrial land supply in the Anchorage Bowl, as compared to the projected demand for this land through 2030. This report includes an in-depth examination as to whether the amount of land designated for industrial use in Anchorage is adequate to accommodate estimated levels of industrial activity over the next 20 years, and also includes a set of recommendations which are intended to inform ongoing consideration of land use policy. This chapter provides a summary of the key findings and recommendations.

Summary of Findings

1. ***Anchorage will continue to have a resource- and logistics-driven economy for the foreseeable future. It is necessary to protect land to facilitate industrial development in the MOA supporting these key industries.***

   The provision of local industrial support to vital economic driver (basic) industries is essential to long-term growth of the MOA's local economy. A strong industrial sector is vital to local economic health by providing quality jobs, municipal revenue, and supporting other important local industries. Moving forward, the MOA should ensure that it is able to capture its share of economic activity that occurs in Alaska, and the provision of viable industrial land is a key component of that effort. Moreover, industrial development is critical in the support of non-basic industries such as retail which recycle money originated by basic economic activity through the local economy. Where adequate land exists for such uses with good position in the transportation network, there is strong rationale for preserving industrial land capacity.

2. ***Industrial development in Anchorage is demand inelastic compared to other regions of the United States.***

   Weather conditions, limited labor force, distance from end markets, and soil-related development constraints all combine to increase capital and operating costs associated with industrial activity in Anchorage. For these reasons, firms that would otherwise prefer to be located locally often elect to produce in the Lower 48 (e.g., Sea-Tac) and ship product to Anchorage. Moreover, industrial development is sought nearly exclusively by owner-operators developing purpose-built facilities, with very little speculative development, because of the inherent risks referenced above. These dynamics result in a local real estate market in Anchorage that does not respond to economic stimulus as fluidly as it would in other areas.

3. ***While retail uses will adapt and respond to growing population, industrial development is "fickle" and needs to be coaxed to develop locally.***

   As land values for retail exceed those of industrial, it is evident that retail uses are more capable of absorbing onerous soil preparation and other predevelopment costs than industrial uses. Over time, it is likely that the most easily-developed land will be consumed first,

leaving more difficult, marginally-feasible parcels. Failure to protect remaining industrial land from retail and other uses will shift certain industrial activities to the Mat-Su Borough, where soil conditions and parcel sizes are less constraining. To avoid this, proposed Title 21 Restrictions on the use of industrial land for retail development would reduce the speculative value of this land and reduce the overall development cost among industrial users, allowing beneficial industrial development to occur.

4. ***The region can garner a stronger multiplier effect from major resource projects and reduce the "bust" effect by taking extra steps to accommodate and protect labor intensive, high value industrial uses associated with metals fabrication, value-added operations (pipe coatings, threading, etc.).***

   In addition, engineering and other services occupying flex space and needing various industrial facilities are good high value candidates for prioritized future development.

5. ***Vacant land located in the Anchorage Bowl is insufficient to meet regional industrial demand through 2030, even assuming moderate growth in employment.***

   Historically, Anchorage has developed approximately 30 acres per year for industrial uses. Going forward, as the area grows and diversifies, the annual acreage required is likely to maintain this level and could be pushed higher in the advent of several major resource-based projects proposed in the region and the State. Even assuming a moderate 1.2-percent average annual growth in employment, the MOA is estimated to require 600 acres of developable industrial land by 2030 (see **Table 1**). Beyond this estimated required acreage, it would be advisable to target an overage of 20 percent to ensure long-term efficiency in the industrial land markets, translating to 720 acres under the base scenario.[1]

6. ***Demand for industrial land is closely tied to employment growth, which has historically been highly variable in Anchorage.***

   The completion of several large infrastructure projects will have significant impact on the Alaskan economy, which will have ripple effects in Anchorage and shape the type and magnitude of industrial development in the MOA. To allow for these types of projects, an "upside" development scenario has been used to test the effects of a 0.5-percent annual increase in employment growth. Specific projects and programs that could together contribute to this increase in employment growth may include these:

   - The Alaska North Slope (ANS) Natural Gas Line.
   - Knik Arm Bridge.
   - Pebble and Rock Creek Mines.

[1] A healthy industrial land market will require a reasonable vacancy rate to allow for efficient transitions as space is absorbed. This analysis incorporates a 20-percent buffer, which is deemed to be adequate for an industrial land market to operate effectively. Although this factor could be higher or lower, 20 percent is considered a reasonable overage for purposes of this analysis.

Table 1
Anchorage Bowl Industrial Land Assessment
Summary of Supply and Demand of Industrial Land: 2010 - 2030

Item	Formula	Base Scenario	High Growth Scenario [1]
Land Demand			
Estimated Demand [2]	a	600	900
Land Demand "Buffer" [3]	b = a * 20%	120	180
Total Land Demand	**c = a + b**	**720**	**1,080**
Undeveloped Land Supply			
Anchorage Bowl	d	598	598
Subtotal Surplus/ (Deficit) in Anchorage Bowl	**e = d - c**	**(115)**	**(475)**
Eklutna/ Other	f	203	203
Total Undeveloped Supply including Eklutna	**g = f + d**	**801**	**801**
Surplus/ (Deficit) including Eklutna	**h = g - c**	**81**	**(279)**
Less Acreage with Soil Limitations [4]	i	(370)	(370)
Subtotal Undeveloped Land Supply W/O Soil Limitations	**j = g - i**	**431**	**431**
Subtotal Surplus/ (Deficit)	**k = j - c**	**(289)**	**(649)**
Underutilized Acres (Potential Additional Supply) [5]	l	662	662
50% of Underutilized Acres	*m = l * 50%*	*331*	*331*
25% of Underutilized Acres	*n = l * 25%*	*166*	*166*
Subtotal Surplus/ (Deficit)	**o = k + l**	**373**	**13**
Assuming 50% of Underutilized Acres are Redeveloped	*p = k + m*	**42**	**(318)**
Assuming 25% of Underutilized Acres are Redeveloped	*q = k + n*	**(124)**	**(484)**

"supply_demand"

[1] High Growth Scenario is based on 1.7% average annual growth in employment. The Base Scenario is based on 1.2% average annual growth.
[2] Estimated land demand calculated in **Chapter 4** of this report.
[3] A 20% overage has been assigned to projected demand in order to simulate an efficient industrial market.
[4] Includes parcels with soil limitation ratings of 0.26 or higher, which are defined as by the U.S. Dept. of Agriculture's "Soil Survey of Anchorage, Alaska." The soil limitations associated with these parcels are considered "Severe" or "Very Severe." See **Appendix B** for more information.
[5] See **Chapter 5** and **Appendix B** for a detailed discussion of underutilized acreage.

- Air Cargo and Port Expansion.
- Military Expansion.
- Federal Infrastructure Stimulus applied to projects such as bridge crossings and goods movement facility expansions.

7. If a higher employment growth rate occurs as a result of fluctuations in oil prices, higher spending on infrastructure and mining projects in Alaska, or some other force, the demand for industrial land is likely to outstrip the supply of vacant industrial land, necessitating both the redevelopment of industrial parcels and the conversion of some publicly-owned lands to industrial uses.

If a 1.7-percent average employment growth rate is actually achieved in Anchorage over the long term, EPS predicts that 900 acres of additional developable industrial land would be required to accommodate growth. Assuming a 20 percent buffer over this amount, the high growth scenario anticipates the need for 1,080 acres through 2030.

8. Although the MOA appears "on paper" to have an abundance of industrially zoned land, much of this land is constrained and difficult to develop in an economically feasible manner.

Although there is an estimated 800 acres of vacant industrial land in the MOA, only 598 acres are in the Anchorage Bowl. This land largely is composed of pockets of industrial land scattered throughout the Central and Northeast (Ship Creek) industrial subareas.

An additional 203 acres of currently undeveloped industrial land exists in Chugiak/Eklutna, and Eagle River subareas, which will be necessary for meeting regional demand. However, there is a need to develop infrastructure and work through ground lease terms for many of these parcels, which can impede their ability to satisfy the industrial land demand.

9. The EPS Team has identified approximately 370 acres of vacant industrial supply which have known soil conditions, which could impede the ability for this land to be feasibly developed. Other vacant land may have other development constraints, such as a lack of adequate infrastructure, poor adjacencies, or small parcel sizes.

If this land is excluded from the vacant industrial land supply, a significant deficit (approximately 290 to 650 acres) is projected relative to demand over the next 20 years. As time progresses, industrial development will be forced further into areas plagued by peat soils, poor parcel configuration, and other marginal conditions. Industrial development, of all commercial land uses, is least able to absorb these costs although it provides important support to the local, regional, and state economies.

10. The EPS Team has identified approximately 660 acres of underutilized industrial land in Anchorage. Although this is not considered "vacant," these lands present considerable redevelopment opportunities that may partially accommodate future industrial growth.

Redevelopment of underutilized land plays a critical role in accommodating industrial future demand in the Anchorage Bowl. The redevelopment of this acreage, however, is likely to be a relatively slow and arduous process, requiring parcel assemblage to make a significant contribution to meeting demand. In all probability, it may be difficult to rely on the redevelopment of more than a third to a half of this acreage in response to industrial

demand. There may be a role for the public sector to facilitate this redevelopment through strategic investment in infrastructure, parcel assembly, entitlement streamlining, and land use policy adjustments.

11. In addition, there are several Public or Quasi-Public landowners, which are not included in either the vacant or "underutilized" industrial land supply. These sites may be viable candidates to accommodate specialized industrial growth.

Public agencies stand to play a significant role in the future development of industrial land in the bowl. These include the State of Alaska, the Railroad, Port, Airport, and MOA. A formal, coordinated effort between these agencies is required to maximize the efficiency of their respective efforts to plan for facilities and related land expansion.

Key Policy Recommendations

Based on the supply and demand conditions described in this report, an implementation program has been devised, which recommends strategies to enhance the efficiency of industrial land at strategic locations through redevelopment and other policy options. A viable industrial sector is vital to local economic wellbeing by providing jobs, municipal revenue, and supporting other important local industries. To encourage this dynamic, the EPS Team recommends a robust, comprehensive, and coordinated approach to improving the industrial land supply Anchorage. The MOA and other pertinent agencies and bodies should employ all available tools, and our Team's recommended strategies are explained in more detail below.

Title 21

Based on the results of this study, ample evidence suggests that proposed Title 21 modifications intended to protect industrial land from retail and other commercial encroachment is justified. Specific rationale for these recommendations is as follows:

1. Industrial development supports driving industries such as logistics and resource-based projects, in addition to providing valuable and necessary services to the general population for support to automotive industries, construction, and equipment sales/service.

2. Owner-operators involved in key local industries have elected to produce goods and ship from afar. A subset of these users has indicated interest in developing local facilities, but is turned away because of onerous costs of development.

3. Chief among the costs of development are parcel acquisition and assemblage. At the present time, speculative interest in industrial land has made it prohibitively expensive to acquire land. Protection from speculative interest for retail will bring down front-end costs and reduce risk.

4. Dwindling viable land supply drives costs up in two ways: (1) reduced supply in the face of sustained demand increases prices for land, all other things being equal; and (2) competition from other uses forces industrial projects to areas with marginal soils and other problems, increasing the cost of development.

5. Alaska is on the advent of a new era of major construction projects. Historical analysis shows major upswings in demand, as measured by development volume, during such projects. The Anchorage MOA stands to lose significant economic benefit if users "on the margin" choose to produce support components remotely, either in the Lower 48 or in the Mat-Su Borough.

Industrial Zoning

The distribution of I-1 and I-2 lands should be relatively balanced between the two categories. Historical analysis indicates that during periods of major construction projects, the emphasis on more intensive I-2 activities tends to increase. In intervening periods, I-1 seems to be more prevalent. Over the past 40 years, the I-1 uses have comprised approximately 55 percent of total share between the two categories. It is recommended that the MOA strike a balance between the two, and identify areas of I-1 that can be converted to I-2 as needed, based on market conditions, where appropriate buffers from sensitive receptors can be put in place.

Redevelopment Feasibility and Financing Strategy

Effective approaches to redevelopment hold the key to supporting and enhancing the MOA's industrial base beyond the policy, funding, and research initiatives discussed in this chapter. There is a need to find more economical means to deliver needed infrastructure as an effort to retrofit older industrial areas and reduce overall cost incidence to industrial development while improving operational efficiency. It is recommended that the MOA conduct a formal evaluation of potential development and funding strategies, including these:

- **Identification of target redevelopment areas.** Select areas in the Central Subarea and the Northeast Subarea which have significant underutilized parcels and provide near term redevelopment opportunities. Both of these areas are located in major established industrial clusters and directly adjacent to goods movement centers. An analysis of potential redevelopment areas should be conducted to further define these opportunities.

- **Evaluate potential for master-planned industrial retrofit area.** There may be suitable areas in the MOA which already have suitable infrastructure and amenities to accommodate a significant amount of industrial activity, but lack the scale, critical mass, or leadership to develop as a viable industrial area. A master-planned industrial development approach in such areas may be a suitable method to leverage existing assets and create vibrant industrial centers.

- **Public/private development and tax allocation bond financing.** For high profile, targeted users, evaluate the potential for Owner Participation Agreements with the MOA or other entities to infuse property tax allocation bonds secured by property tax increment. For promising projects, provide funding in exchange for upside participation in proceeds exceeding negotiated profit threshold. Case by case analysis should be conducted to maximize probability of timely payback to the MOA.

- **Land-secured tax-exempt bond financing.** Evaluate potential for special taxes and assessments secured by industrial land value to fund clean-up of contamination, soil replacement, as well as on- and off-site infrastructure.

- **State funding assistance.** Direct available stimulus funds or Permanent Fund to help secure critical Port and other funding necessary to improve cargo handling, goods movement, and logistics capacity. This may involve selecting subareas for systematic improvement of soils, parcel sized, and infrastructure on a case by case basis.

Local Economic Development Initiatives

Several local initiatives should be considered as an effort to garner additional information beyond that feasibly developed under this study. Efforts might include these:

- **Resource Industry Economic Impact and Supplier Development Strategy.** Today, Alaska is facing one of the world's largest construction projects if the ANS Natural Gas Pipeline is to be built in the near future. This massive project is just one of many proposed resource extraction projects on the horizon which could have significant positive impacts the Alaskan economy. In addition to new resource extraction projects, much of the existing support infrastructure in Alaska will need to be updated to endure long-term activity, including roads, bridges, ports, airports, rail extensions, pipelines and other support and transportation-related infrastructure.

  The MOA would be well-served in gaining an understanding of the economic impact and the corresponding land use planning ramifications of these major proposed infrastructure and natural resource extraction. To avoid the boom/bust cycle of the past, an Economic Impact and Supplier Development Strategy could identify "opportunity gaps" associated with planned major construction projects, and evaluate their critical labor force, land, and other capital needs. It would also identify strategies (land use, economic, and political) to minimize the acuteness of boom-bust cycles by evaluating uses that have a continuing life after the construction phase of major projects is complete.

- **Detailed Land Characterization Study.** As discussed in the body of this report, additional analysis of semi-vacant lands should be conducted, particularly where "anomalies" between database and visual observation are evident. This study made an effort to correct such anomalies for parcels sized over 0.5 acres.

Public Stakeholder Collaboration

The following stakeholders are critical to ensuring long-term support and opening land to key basic industries:

- **Airport**—discuss and pursue development of airparks dedicated to supporting the air logistics industry.

- **Port**—facilitate continued conveyance of land from Elmendorf to Port dedicated to Port operational support.

- **Railroad—**encourage consolidation of uses to open up additional acreage for users requiring multi-modal proximity.

- **University of Alaska**—open up discussions regarding incubator/tech transfer and research park development. Focus on renewable energy or other areas of direct benefit to local economy.

2. INTRODUCTION

Background

The MOA is in the process of creating a new, updated land use code, which is referred to as "Title 21." The Title 21 rewrite will include a revision to zoning classifications and other policies and regulations meant to guide growth and development in the MOA over the foreseeable future. The EPS Team was retained by the AEDC and MOA to prepare this Industrial Land Assessment (ILA), which will help inform the Title 21 rewrite process and the selection of land use policies affecting the core industrial areas of the MOA, and industrial development in general.

While issues related to the demand and supply of industrial land have been analyzed in previous studies, this ILA is unique in its focused look at industrial land, and its geographic coverage including the Anchorage Bowl and developed areas to the north including Eagle River, Chugiak, Birchwood, and Eklutna (Study Area, see next page).

These are some of the key questions and issues evaluated by the ILA:

- How much vacant or underutilized industrial acreage exists in the MOA Study Area?
- What types and amounts of industrial land are required through 2030?
- Does the existing land inventory provide meaningful opportunities for future industrial development?
- Should the MOA restrict the usage of industrial lands solely to industrial development?

Project Description

The EPS Team's ILA includes a qualitative and quantitative approach to analyzing development trends, employment projections, and industrial development capacity in the Anchorage Bowl and outlying areas to determine whether an over- or under-supply of industrial land exists, and considers implications for long-term land use planning in the region.

The ILA includes an estimate of the industrial land which would be demanded by 2030, based on employment and development trends and projections. This demand estimate was weighed against an evaluation of the size, location, and quality of Anchorage's industrial land supply. Based on supply and demand conditions, a detailed implementation program recommends strategies to enhance the efficiency of industrial land at strategic locations through redevelopment and other policy options.

Figure 1:
Observation Perimeter - Project Perimeter

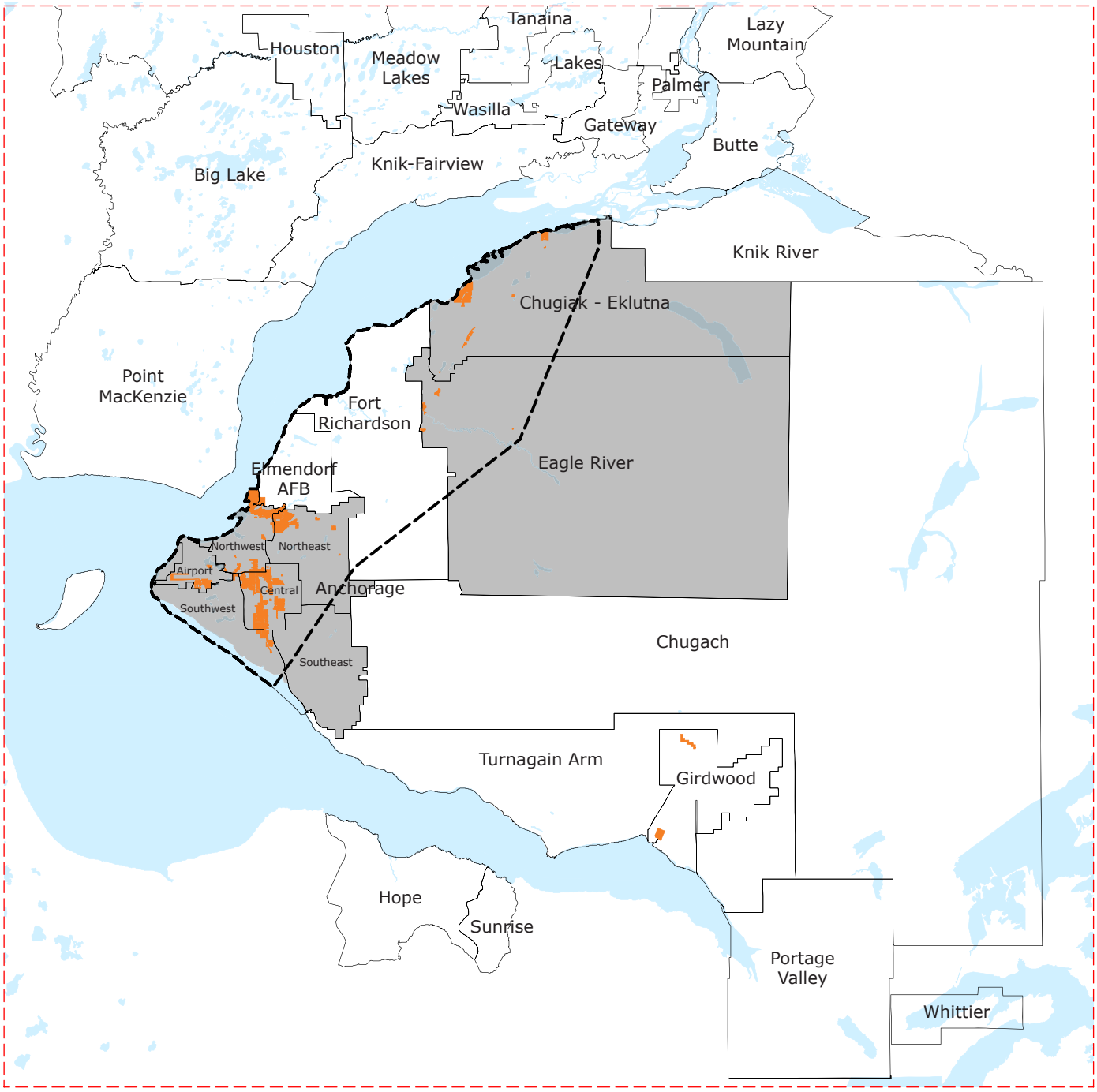
Economic & Planning Systems, Inc. GDeS Architecture & Planning

Observation Perimeter

Project Perimeter

Industrial Parcels in MOA

Figure 2:
Study Subareas in Regional Context



Economic & Planning Systems, Inc. GDeS Architecture & Planning

Observation Perimeter

Project Perimeter

Industrial Parcels in MOA

Study Subareas

Report Organization

This report is organized as follows:

- **Chapter 3:** A description of the current economic and real estate context for future industrial growth in the Study Area,
- **Chapter 4:** An assessment of the future demand for industrial space,
- **Chapter 5:** An assessment of the current industrial development supply in the Study Area,
- **Chapter 6:** A comparison of industrial land supply and demand,
- **Appendix A:** Detailed calculations associated with the analysis of industrial land demand.
- **Appendix B:** A detailed description of the methodology used to derive the GIS and Computer Assisted Mass Analysis (CAMA) used to analyze Industrial Supply.
- **Appendix C:** Description of methodology used to derive employment projections which are the basis of the Industrial Land Demand Analysis.

3. ECONOMIC CONTEXT

Anchorage's regional economy is distinctive relative to more traditional economies in the Lower 48 states. Because Alaska relies heavily on the use of its vast holdings of natural resources, it is vulnerable to market fluctuations related to changes in supply/demand conditions and related effects on pricing of its key products. Today, Alaska's key economic sectors are oil and gas, air cargo/logistics, government, seafood, tourism, and timber.

The oil and gas industry has had by far the most significant influence on economic development in Alaska over the last half-century. The meager and inconsistent extraction and processing of oil beginning in the Cook Inlet in 1958 began to accelerate through the 1960s. After discovering massive quantities of oil at Prudhoe Bay, Alaskan oil companies generated $1 billion in revenue for the state by 1970.[2] Construction of the Trans-Alaskan Pipeline, beginning in 1974, legitimized Alaska as a global player in the oil production industry and caused a 30-percent year-over-year increase in overall employment in the state in its first year of construction. This extreme expansion in economic activity persisted throughout the pipeline construction period through the late 1970s, finally tapering off at the end of the decade.

The first half of the 1980s saw a sizeable economic expansion of its own, this time related to high oil prices worldwide, and a healthy market for Alaska's oil. This period was associated with rapid rates of increase in population, employment, income, and many other indicators. However, when oil prices dropped drastically in the middle of the decade, a severe economic slump was observed, whereby population, employment, and overall economic activity in Alaska shrunk markedly almost until the end of the decade.

After the "boom-bust" cycles of the 1970s and 1980s, Alaska has enjoyed a prolonged period of sustained growth and economic expansion. Since 1988, Alaska has enjoyed uninterrupted annual positive growth in employment and Gross Domestic Product, although the rate of growth has slowed considerably during the current economic downturn and may see the first year of negative growth since the 20-year streak began.

Prospects for Growth

Mining

It is estimated that today, approximately 33 percent of Alaska's economy is directly tied to the oil and gas industry, another 33 percent is directly tied to spending by the federal government, and the remaining 33 percent is spread across various industry sectors.[3] Today, Alaska is primed for another increase in oil and gas-related activity because the market for oil has become

[2] Alaska Department of Labor and Workforce Development, "Alaska Economic Trends," December 1999.

[3] University of Alaska, Anchorage, Institute of Social and Economic Research.

constrained in recent years. Several development proposals, including most notably the construction of the new ANS natural gas line, present opportunities for a new era of resource extraction activity and economic expansion well into the future.

Tourism

In addition to the oil sector, several industries have potential to become emerging sectors contributing to increased economic growth. Tourism, for example, is an industry that has seen significant growth in recent years as outdoor enthusiasts and world travelers have been increasingly drawn to the natural beauty of Alaska. The cruise ship industry is expanding its Alaskan presence, with cruise ship passenger volume increasing from approximately 600,000 in 2000 to more than 1 million in 2007.[4]

Alternative Energy

Alternative natural energy has also been identified as an industry that could receive increased attention in coming years. With Alaska's windy coasts and tidal/wave resources, it is a viable candidate to be a leader in alternative energy production in future years. In fact, Alaska's first major wind farm at Fire Island is nearing the end of the planning process. It is expected that construction will begin on this project in the summer of 2009, and the first phase of the facility will be fully operational in late 2010. Other similar projects throughout Alaska are being studied, and it is expected that this industry could be a major asset for Alaska for many years to come.

Shipping/Logistics

Although already firmly entrenched in Alaska—and in Anchorage in particular—the shipping/ logistics industries could still see significant future expansion. Alaska's location positions it well relative to key world markets. It is closer to Asia than any other major North American city and is opportunely located between the Pacific Rim and Europe by way of the Northwest Passage. Global warming and the expected ice melt will further open a direct passage to Europe.

The Anchorage business community and public officials are working to capitalize on its transportation networks—including rail, airport, port, and highway systems—to best serve key markets. Anchorage is already home to the busiest air cargo airport in the U.S., with a major presence among firms such as FedEx and UPS.[5] In response to the need to accommodate Panamax tankers, increased military operations, barge shipments, and the projected opening of the Northwest Passage, the Port of Anchorage has several planned enhancements in progress.

---

[4] Alaska Department of Labor and Workforce Development, "Alaska Economic Trends," April 2008.

[5] Ted Stevens International Airport is ranked number one in the United States for having the most landed weight of cargo aircraft, according to the AEDC.

Prospects for Anchorage

Anchorage is the economic and government center of a region consisting of the Anchorage Bowl, northern communities of Chugiak-Eagle River and Eklutna, as well as Palmer, Wasilla, and the rest of the Mat-Su Borough. Anchorage is also the key finance and business center of the State and has by far the largest population and employment of any developed area statewide.

The Alaskan "Boom-Bust" dynamic described above has been observed several times, and Anchorage has not been shielded from these effects. These booms and busts have had significant impacts on the base of employment and makeup of industry throughout Alaska and has influenced the size, shape, and character of industrial land development throughout the State and in Anchorage in particular. Moving forward, the MOA needs to ensure that it is able to capture its share of economic activity that occurs in Alaska, and the provision of viable industrial land is a key component of that effort.

Workforce Issues

Like the entire state of Alaska, Anchorage has long been beset by a significant "brain drain," in which students and young educated workers leave the state for other areas.[6] This has historically been a major issue in Anchorage, and although some improvements have been made in recent years, a common sentiment among the business community remains the absence of available labor. The costs and uncertainty associated with a lack of labor has contributed to the area's relatively modest rates of industrial land development, as compared to those typically seen in metropolitan areas throughout the U.S. The lack of large, well developed industrial clusters, combined with the boom-bust dynamic, presents a risk to employees who would otherwise consider permanent relocation to the State. If steps can be taken to improve the feasibility of industrial development, a larger and more diverse local economy will continue to emerge over time, potentially mitigating some of these concerns.

Existing Industrial Market Conditions

The industrial real estate market has been shaped by many of the economic and demographic factors that are specific to Alaska—and Anchorage in particular—as described above. This section describes the nuances of the industrial real estate market in Anchorage.

For-Sale Industrial

Historically, the industrial land market has developed at a relatively slow rate in Anchorage, although it is intermittently punctuated by flurries of activity associated with major construction projects. In 2008, only 9 industrial land parcels were sold in Anchorage, at prices between $9.00 and $12.50 per land square foot.[7] Interviews of persons involved in local development suggest prices could be reduced by 15 to 20 percent if retail and other uses of this land are prohibited. Because cost is a major factor precluding feasible expansion of the industrial base, such

[6] See Chabin Concepts' "Vision Anchorage" study, 2002.

[7] See BOMA 2009 Industrial Forecast.

restrictions may improve the local industrial development climate. The 9 industrial parcels referenced above amounted to a total of only 15 acres, which implies an average lot size of approximately 1.5 acres per parcel, which is too small to accommodate many industrial uses.

As shown in **Table 2**, the asking sales price of industrial buildings currently for sale in the MOA range anywhere from $57 to $240 per square foot. The largest industrial building currently for sale in Anchorage is a 150,000-square-foot warehouse facility, which is offered at an asking price of $18.6 million. Although this building would be suitable for a large industrial user, smaller buildings characterize the majority of for-sale industrial product. As shown, the median size for-sale industrial building in Anchorage is 12,700 square feet.

In 2008, 19 existing industrial buildings were sold at an average price of $132.67 per building square foot. In contrast, development costs are similar if not higher than this amount, implying that developers cannot achieve significant return on investment in this context. The acreage, which comprises these 19 industrial buildings, totaled approximately 6 acres, implying an even smaller average parcel size than the vacant industrial land, at 0.25 acres per parcel.

For-Lease Industrial

Currently, average lease rates for industrial buildings in Anchorage range between $1.00 and $1.10 per square foot per month. These rates have slowly trended upwards in recent years, increasing from $0.91 to $0.96 per square foot in 2006. Again, capitalized lease rates (assuming an average capitalization rate of 7.8 percent) yields an imputed value of about $150/square foot, which may not be sufficient to cover predevelopment, vertical costs, and developer profit.

Another interesting factor that aptly characterizes the industrial real estate sector in Anchorage is the vacancy rate for industrial building space. Whereas the average rate for industrial buildings throughout the U.S. is approximately 12 percent, vacancy rates in Anchorage are extremely low for industrial land and buildings, at 2 to 3 percent.[8] The fact that speculative development is nearly non-existent in Anchorage despite low vacancies and relatively high lease rates reflects the significant risk inherent in developing these structures, primarily stemming from unknown or onerous front-end costs. Industrial development is carried out by owner operators responding to direct need for local services who construct facilities as part of a larger business operation strategy, not as a real estate venture. With progress in reducing risks and costs, it is likely additional operators, who currently manufacture in Sea-Tac or other lower-48 locations, may view operating a facility in Anchorage more favorably.

One of the major factors that cause the industrial real estate market in Anchorage to exist the way it does has to do with the high cost of land development in Anchorage. Site development costs are extremely expensive in Anchorage because many of the parcels require removal of peat soil and backfilling with soil that is more adequate for development. This can cost up to $0.45 per cubic foot.[9]

---

[8] CB Richard Ellis, 4th Quarter 2008.

[9] BOMA 2009 Industrial Forecast, Robert D. Martin, CCIM. January 9, 2009.

Table 2
Anchorage Bowl Industrial Land Assessment
Summary of Actively-Selling Industrial Zoned Land within City of Anchorage

Location	Property Type	Building Size (SF)	Price ($)	Price/SF
401 E. 100th Avenue	Industrial Warehouse	150,000	$18,600,000	$124.00
401 E. 100th Avenue	Industrial Warehouse	60,000	$7,440,000	$124.00
401 E. 100th Avenue	Industrial Warehouse	40,000	$4,960,000	$124.00
2216-2340 N. Post Road	Industrial Warehouse	85,770	$8,000,000	$93.27
3521 E. Tudor Road	Industrial Self/Mini-Storage Facility	79,483	$11,250,000	$141.54
814 W. Northern Lights Boulevard	Industrial Warehouse	49,792	$3,750,000	$75.31
2225 E. 5th Avenue	Industrial Office Showroom	18,730	$4,500,000	$240.26
125 W. International Airport Road	Industrial Warehouse	12,747	$1,475,000	$115.71
4041 Old International Airport Road	Industrial Warehouse	12,735	$1,250,000	$98.15
200 E. 26th Street	Industrial Warehouse	11,800	$750,000	$63.56
1000 W. 66th Avenue	Industrial Warehouse	9,867	$1,300,000	$131.75
6407 Greenwood Street	Industrial Office Showroom	8,000	$1,400,000	$175.00
5713 Arctic Boulevard	Industrial Flex Space	6,240	$650,000	$104.17
Alaska Place	Industrial Warehouse	NA	$11,000,000	NA
200 E 26th Street	Industrial, Office, Retail, Warehouse	8,154	$750,000	$91.98
5617 E Dowling	Industrial Warehouse	13,440	$1,700,000	$126.49
126 W International Airport Road	Industrial, Office, Retail, Warehouse	12,747	$1,578,000	$123.79
1155 E 70th	Industrial	4,145	$545,000	$131.48
6727 Greenwood Street	Industrial Warehouse	5,250	$650,000	$123.81
2225 E 5th Avenue	Industrial, Land, Retail, Office, Warehouse	18,730	$4,500,000	$240.26
5202 A Street	Industrial, Office, Retail, Warehouse	17,640	$999,500	$56.66
651 E 100th Building B	Industrial, Office, Retail, Warehouse	6,000	$898,000	$149.67
651 E 100th Building A	Industrial, Office, Warehouse	4,800	$950,000	$197.92
651 E 100th Building C	Industrial Warehouse	8,400	$1,000,000	$119.05
651 E 100th Building D	Industrial Warehouse	4,800	$900,000	$187.50
345 Boniface Parkway	Industrial Warehouse	13,276	$1,400,000	$105.45
9210 Vanguard	Industrial, Office, Retail, Warehouse	7,200	$1,149,000	$159.58
	Maximum	150,000	18,600,000	$240.26
	Average	25,759	3,457,204	$131.71
	Median	12,741	1,400,000	$124.00
	Minimum	4,145	545,000	$56.66

"indspace_list"

Source: AnchorageProspector.com, Cityfeet.com, Loopnet.com, and EPS

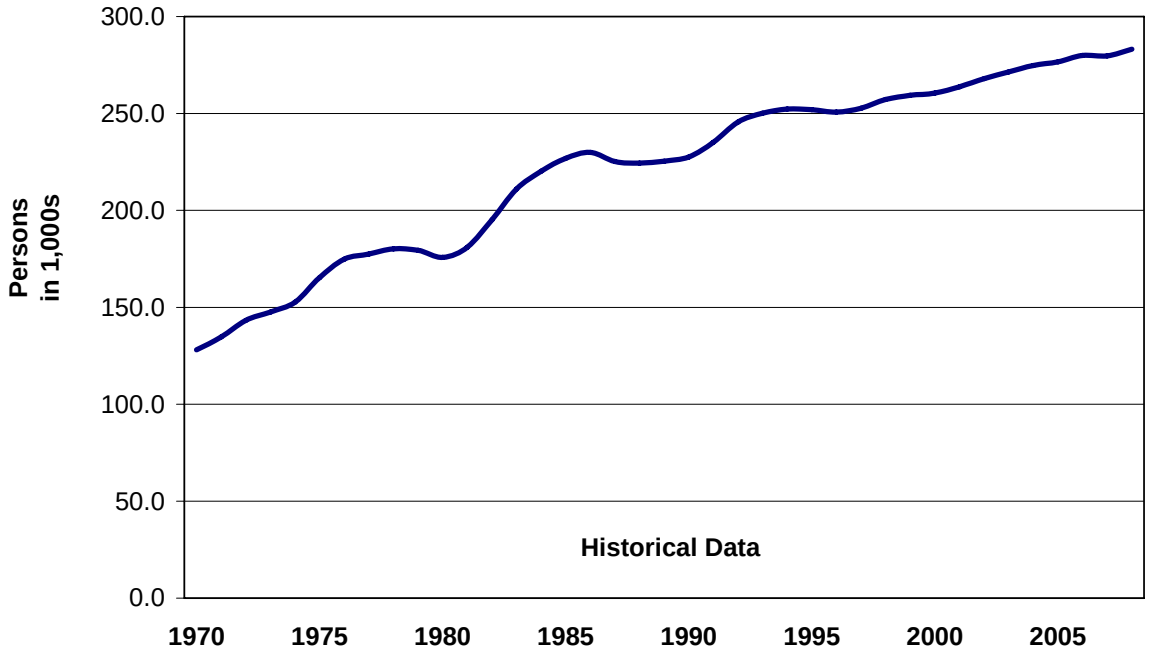
Demographics and Socio-Economics

EPS has evaluated several sources of demographic and socio-economic data to have a more robust understanding of historical growth fundamentals, and how these factors may relate to future expansion in the MOA.

Population

Figure 3 shows population growth in the MOA from 1970 through 2008. This figure aptly illustrates the cyclical nature of growth in Alaska, in which growth in population occurred much more quickly during the "boom" periods related to oil and gas markets in the mid-1970's and early-1980's. The 1980's oil boom was particularly acute, and was followed by a prolonged contraction of population in the MOA from 1986 through 1990. In the period from 1990 to the present, Anchorage has seen a healthy and steady rate of population growth, and has not been prone to the volatility of previous decades.

Figure 3 - Total Population (1970-2008)

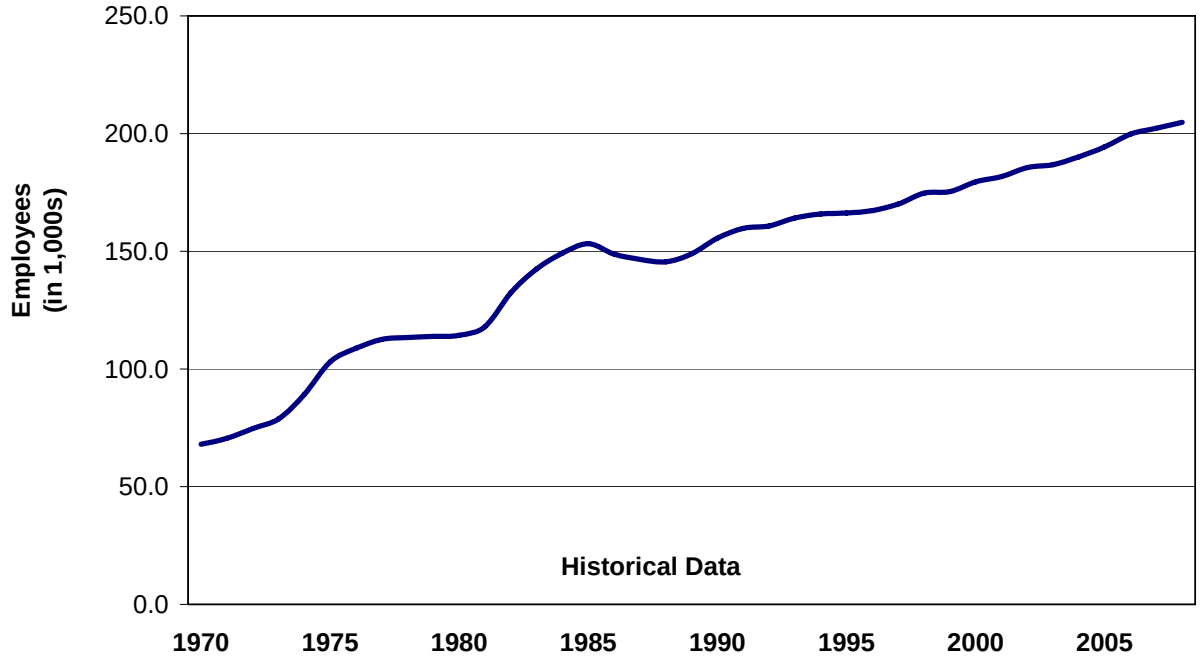


Source: Woods and Poole Economics, Inc. and EPS.

Employment

Figure 4 shows employment growth in the MOA from 1970 through 2008.[10] This figure shows a similar cyclical pattern of economic and related employment activity in Alaska, in which employment growth occurred rapidly in the mid-1970's and tapered off in the later portion of the decade, and an even more pronounced boom in the early 1980's, followed by a more severe "bust" in the late 1980's. After these two significant "boom-bust" cycles, Anchorage has seen positive, uninterrupted growth in employment.

Figure 4 - Total Employment (1970-2008)



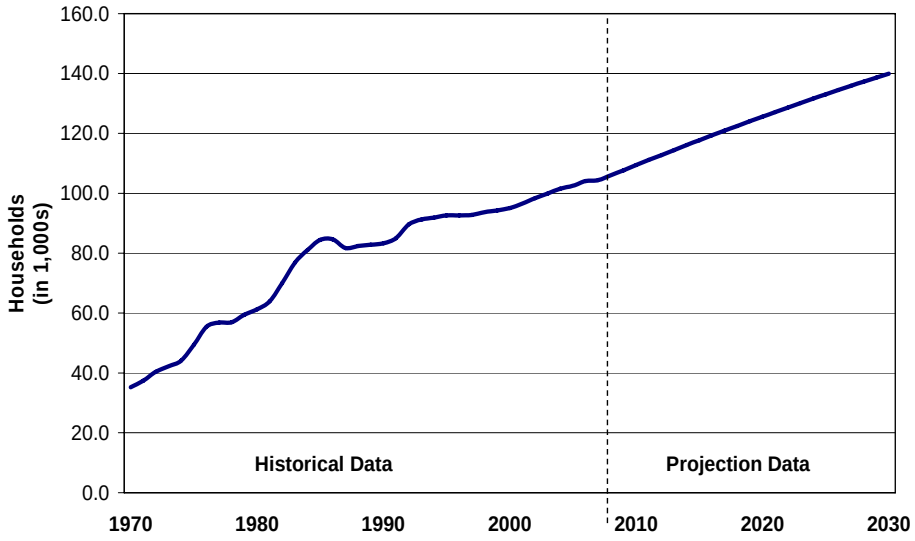
Source: Woods and Poole Economics, Inc. and EPS.

[10] Please note that the employment figures used in this analysis are for employment by place of *work* (as opposed to place of *residence*) and include all part-time and full-time jobs in the MOA. Furthermore, these figures may be higher than those seen elsewhere because they include proprietors, private household employment, and both full- and part-time workers. Because employment projections are a key component of the land demand analysis, these figures will be discussed in greater detail in the following chapter.

Other Economic/Demographic Information

Figures 5 through **7** show various other economic and demographic time series data from 1970 through 2008, and projected to 2030.[11] As shown, most economic indicators follow the same pattern described above, in which significant fluctuations as the results of the "boom" periods of economic expansion in the mid- and late- 1970's and early 1980's, which are generally immediately preceded by a tapering or decline during the "bust" periods. Since 1990, the Anchorage economy has been relatively stable, as compared to the turbulence of the 1970's and 1980's.

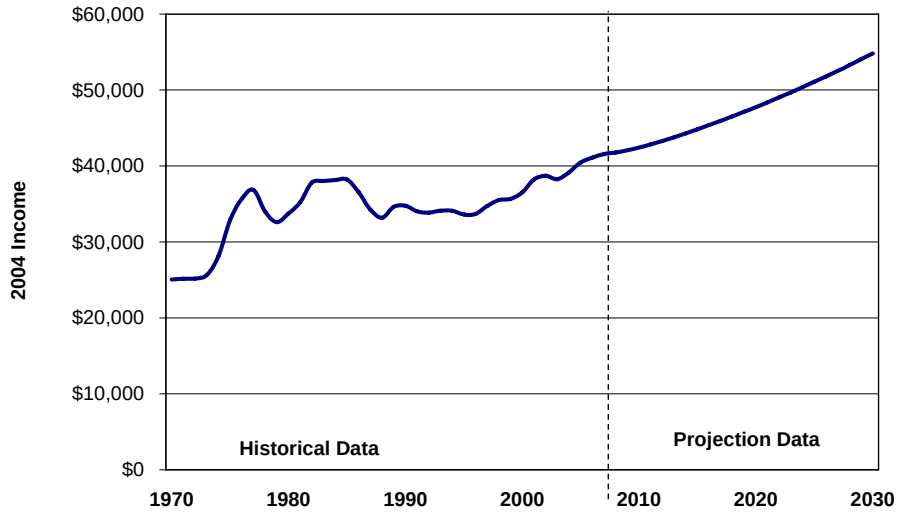
Figure 5 - Total Number of Households



Source: Woods and Poole Economics, Inc. and EPS.

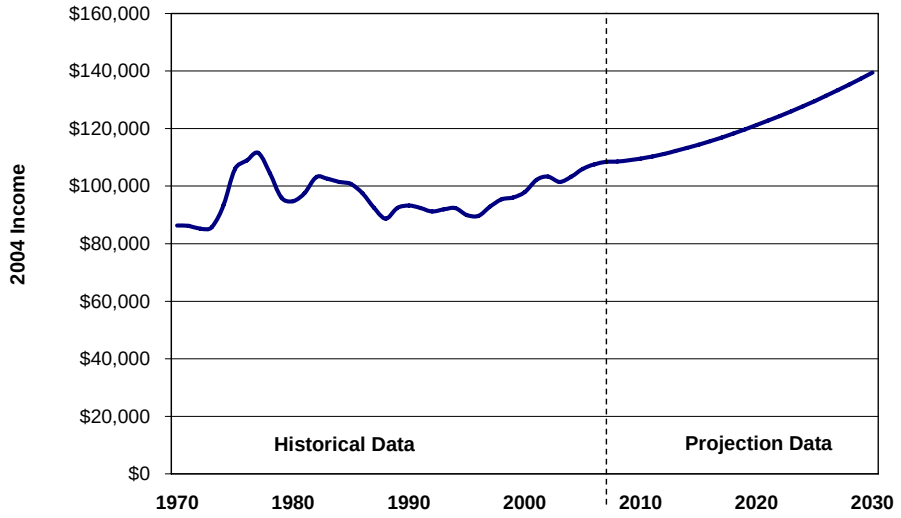
[11] These figures are based on data provided by Woods & Poole Economics, Inc., 2008. The Woods and Poole projections use a complex statistical algorithm, which is based on historical observations and projected growth in output for a range of industries. This methodology is based on long-term forecasts of total United States personal income, earnings by industry, employment by industry, population, inflation, and other variables, which are allocated to economic subregions based on the region's expected capture of each industry For more information on the methodology used to derive these projections, please see **Appendix C**. Also, please note that these projections were derived in mid-2008, based on 2007 data, and do not account for many of the severe economic events that occurred in these years. Although the short-term projections may be inexact, it is reasonable to believe that the long-term projections are valid.

Figure 6 - Total Personal Income Per Capita



Source: Woods and Poole Economics, Inc. and EPS.

Figure 7 - Mean Household Total Personal Income



Source: Woods and Poole Economics, Inc. and EPS.

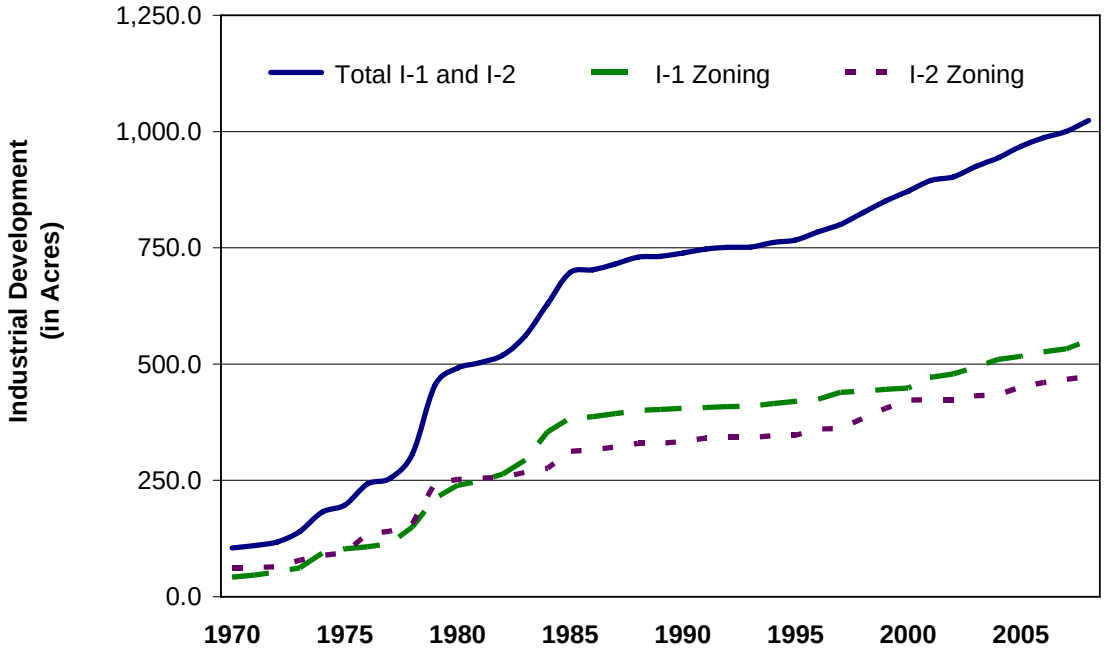
Industrial Land Development

Figure 8 shows the rate of industrial land development from 1970 through 2008. This figure similarly mirrors the cyclical nature of the Anchorage economy, and demonstrates that industrial development tends to occur during periods of economic expansion and employment growth, while tapering off during periods of slow or depressed economic activity.

It is of interest to note that during the period of intense employment growth associated with the pipeline construction period in the mid- to late 1970's, a noticeable increase in I-2 land can be

observed. During periods of more moderate growth, or the gas price boom of the 1980's, industrial land is characterized by more I-1 development than I-2.

Figure 8 - Cumulative I-1 and I-2 Industrial Development (1970-2008)



Source: Woods and Poole Economics, Inc. and EPS.

4. INDUSTRIAL LAND DEMAND

To estimate the projected demand for industrial land in the foreseeable future, the EPS Team analyzed the relationship between employment and industrial space in Anchorage, and used future employment projections to help predict the amount of industrial land which would be required from 2010 to 2030. This chapter estimates the amount of building and land demand likely occur among various industrial categories through 2030.

Employment

Employment projections are the basis for the industrial land demand analysis. Throughout the course of the ILA research period, the EPS Team has analyzed several private data vendors and public agencies which offer employment figures and weighed each according to a set of criteria which allowed us to select the data set(s) that would be most useful for this analysis. The employment projections are long-term in nature, while also accounting for, and building from, actual historical employment figures.

The data also include employment figures that are classified into individual sectors according to North American Industry Classification System (NAICS)-coding. This level of specificity facilitates analysis of each sector's relationship to industrial land separately, since different employment sectors use land in different ways, and similarly, various sectors are projected to grow at different rates as the regional and global economy mature and transform over time.

Moreover, the data offer projections by place of work, rather than place of residence. This is a key distinction since industrial development is more closely linked with employment growth than population growth.

Employment Projection Methodology

The employment projections use a complex statistical algorithm which is based on historical observations and projected growth in output for a range of industries. This methodology is based on long-term forecasts of total personal income, earnings by industry, employment by industry, population, inflation, and other variables.[12]

The employment figures were informed by input from local economists and economic development experts to accurately reflect local conditions.

[12] For a detailed description of the projection methodology used by Woods & Poole, see **Appendix C**.

Historical Employment

Table 3 shows employment growth in the MOA from 1980 to 2008 by employment sector. Since these figures include all part time and full time workers, the total employment figures shown may be higher than some other sources. Also, please note that the employment figures used in this analysis are for employment by place of *work* (as opposed to place of *residence*), and include all part-time and full-time jobs in the MOA. Furthermore, these figures may be higher than those seen in other analyses because they include proprietors, private household employment, and both full- and part-time workers.

As shown by **Table 3**, total employment in the MOA in 1980 was approximately 115,000 jobs. By 2008, employment had growth to approximately 205,000 jobs, which equates to an overall growth rate of approximately 2.0 percent annually. The largest current segment of non-government employment is in Health Care and Social Assistance, at 23,500 employees. The next largest category is Retail Trade, followed by Accommodation and Foods Services, and then Professional and Technical Services. It is noteworthy that although the Oil & Gas industry (which is classified into the Mining NAICS code) is a large part of the overall Anchorage economy, the number of jobs observed in Anchorage is quite low, since many of these jobs are likely to be classified into other occupational categories.

Projected Employment—Base Scenario

As shown in **Table 4**, employment in the MOA is predicted in this analysis to reach approximately 210,000 jobs in 2010, and then add approximately 57,500 more by 2030. **Figure 9** shows the projected future growth rate in employment, which—at 1.2 percent annually—tends to smooth out the fluctuations related to the "boom-bust cycle." Although lower, this growth rate is similar to the long-term growth rate observed from 1980 through 2008. In fact, the 1.2 percent average annual growth rate used in this analysis is only slightly less than the actual rate observed since 1985 (which is 1.3 percent).

These employment projections offer a reasonable estimate, which is used in our "Base Scenario" estimate of industrial land demand. Although it is not a foregone conclusion that 1.2 percent average annual will be achieved, we believe that it represents a healthy rate of growth for the MOA which is achievable in the long-term. A more aggressive growth scenario is described below.

Table 3
Anchorage Bowl Industrial Land Assessment
Historical Employment in MOA By Category

Item	Applied Category	1980	1990	2000	2008	Nominal Change	Average Annual Growth
Non-Government							
Forestry, Fishing-Related, and Other	n/a	671	1,074	1,285	1,332	661	2.5%
Mining	Mining	3,356	5,836	4,263	2,563	-793	-1.0%
Utilities	TPU	181	260	350	557	376	4.1%
Construction	Construction	7,199	8,472	10,006	13,575	6,376	2.3%
Manufacturing	Manufacturing	1,883	2,566	2,562	2,649	766	1.2%
Wholesale Trade	Wholesale Trade	3,341	4,671	5,270	5,562	2,221	1.8%
Retail Trade	Retail Trade	10,062	16,137	20,276	21,927	11,865	2.8%
Transportation and Warehousing	TPU	6,097	8,757	11,776	12,230	6,133	2.5%
Information	Services	2,478	4,037	5,252	4,988	2,510	2.5%
Financing and Insurance	FIRE	7,189	6,221	6,464	7,404	215	0.1%
Real Estate	FIRE	7,333	6,346	6,594	7,974	641	0.3%
Professional and Technical Services	Services	5,638	9,703	12,698	14,862	9,224	3.5%
Management	Services	719	1,238	1,620	1,127	408	1.6%
Administrative and Waste Services	Services	4,094	6,739	8,875	9,484	5,390	3.0%
Educational Services	Services	945	1,626	2,128	2,747	1,802	3.9%
Health Care and Social Assistance	Services	7,500	12,908	16,891	23,495	15,995	4.2%
Arts, Entertainment, and Recreation	Services	1,619	2,714	3,500	4,170	2,551	3.4%
Accommodation and Food Services	Services	6,052	10,146	13,086	15,111	9,059	3.3%
Other Services, Except Public Admin.	Services	3,663	6,281	8,184	10,018	6,355	3.7%
Total Non-Government		**80,020**	**115,732**	**141,080**	**161,775**	**81,755**	**2.5%**
Government							
Federal Civilian	Government	9,544	10,496	9,844	9,404	-140	-0.1%
Federal Military	Government	12,735	13,320	10,591	13,479	744	0.2%
State and Local	Government	12,041	15,990	18,061	20,197	8,156	1.9%
Total Government		**34,320**	**39,806**	**38,496**	**43,080**	**8,760**	**0.8%**
Total		**114,340**	**155,538**	**179,576**	**204,855**	**90,515**	**2.1%**

"hist_emp"

Source: Woods and Poole Economics, 2008.

Table 4
Anchorage Bowl Industrial Land Assessment
Projected Employment in MOA By Category

Base Scenario

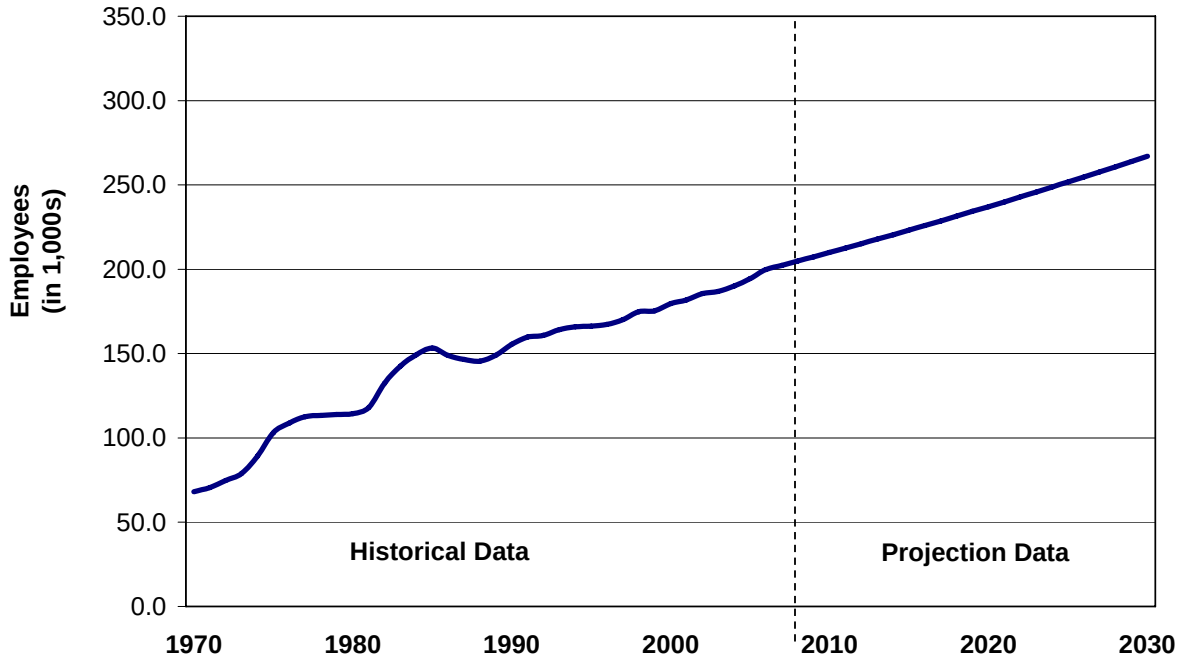
Item	Applied Category	2010	2020	2030	Nominal Change	Average Annual Growth
Non-Government						
Forestry, Fishing-Related, and Other	n/a	1,334	1,337	1,330	-4	0.0%
Mining [1]	Mining	2,506	2,506	2,506	0	0.0%
Utilities	TPU	581	715	865	284	2.0%
Construction	Construction	13,868	15,359	16,874	3,006	1.0%
Manufacturing	Manufacturing	2,707	2,998	3,295	588	1.0%
Wholesale Trade	Wholesale Trade	5,658	6,139	6,622	964	0.8%
Retail Trade	Retail Trade	22,388	24,714	27,053	4,665	1.0%
Transportation and Warehousing	TPU	12,506	13,889	15,250	2,744	1.0%
Information	Services	5,070	5,471	5,858	788	0.7%
Financing and Insurance	FIRE	7,540	8,208	8,844	1,304	0.8%
Real Estate	FIRE	8,128	8,909	9,695	1,567	0.9%
Professional and Technical Services	Services	15,394	18,227	21,333	5,939	1.6%
Management	Services	1,147	1,245	1,340	193	0.8%
Administrative and Waste Services	Services	9,679	10,656	11,618	1,939	0.9%
Educational Services	Services	2,895	3,731	4,752	1,857	2.5%
Health Care and Social Assistance	Services	24,864	32,821	42,929	18,065	2.8%
Arts, Entertainment, and Recreation	Services	4,321	5,134	6,040	1,719	1.7%
Accommodation and Food Services	Services	15,480	17,365	19,288	3,808	1.1%
Other Services, Except Public Admin.	Services	10,304	11,777	13,300	2,996	1.3%
Total Non-Government		**166,370**	**191,201**	**218,792**	**52,422**	**1.4%**
Government						
Federal Civilian	Government	9,439	9,578	9,654	215	0.1%
Federal Military	Government	13,511	13,642	13,725	214	0.1%
State and Local	Government	20,649	22,963	25,347	4,698	1.0%
Total Government		**43,599**	**46,183**	**48,726**	**5,127**	**0.6%**
Total		**209,969**	**237,384**	**267,518**	**57,549**	**1.2%**

"employment"

Source: Woods and Poole Economics, 2008.

[1] Assumes growth in Mining employment in Anchorage is flat from from 2010 to 2030. Note that most Oil & Gas employment is captured in the "Services" category. The "Mining" category is for actual mining jobs which are physically located within the Municipality of Anchorage.

Figure 9 - Total Employment
Base Scenario



Source: Woods and Poole Economics, Inc. and EPS.

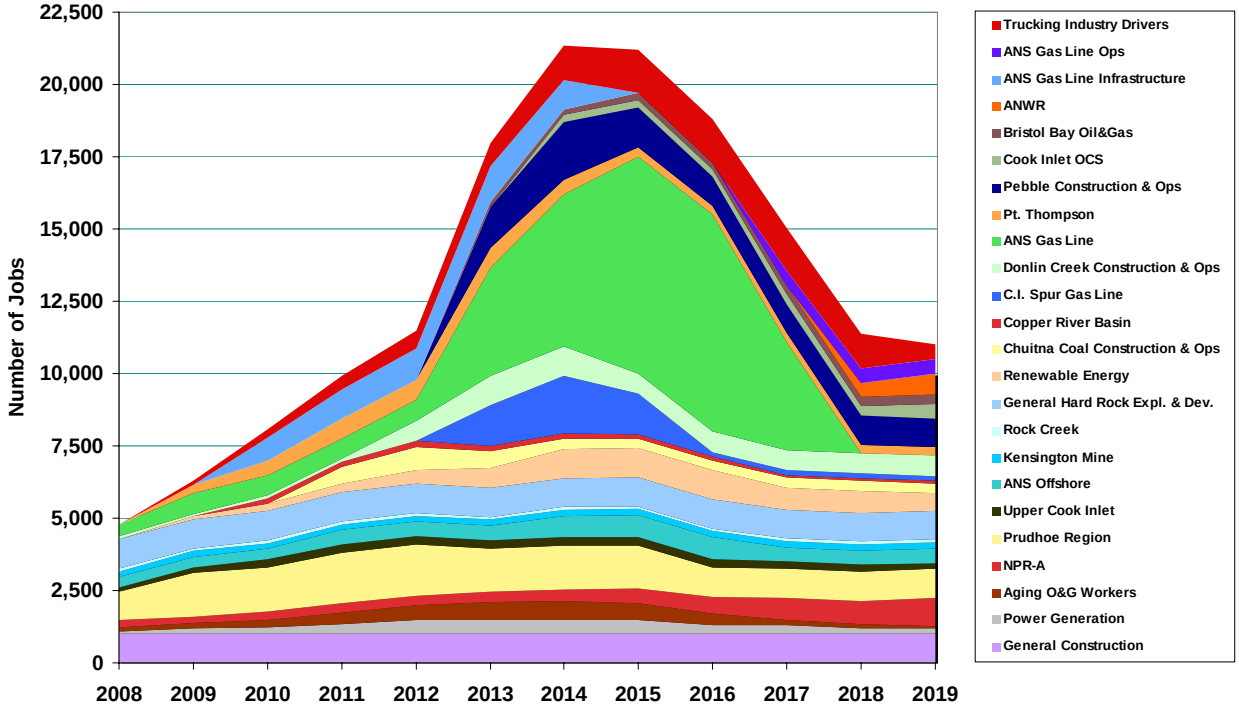
Projected Employment—High Growth Rate Scenario

The projected growth rates described above are the most accurate estimates that are available today, but are admittedly prone to deviation—especially in an economy such as that in Anchorage which is known to experience sizeable variations in economic activity. The employment projections used in this analysis do not account for the potential investment in several major construction projects which have been proposed for Alaska, including the ANS Natural Gas Pipeline, the Knik Arm Bridge, the Pebble Mine, Kensington Mine, etc. In addition to new resource extraction projects, most of the existing support infrastructure in Alaska will need to be updated to endure long-term activity, including: roads, bridges, ports, airports, rail extensions, pipelines and other support and transportation-related infrastructure. As an example, the State of Alaska recently projected that more than $2.0 billion of infrastructure improvements will be needed before the beginning of construction of the natural gas pipeline project.

Figure 10 below was furnished by the AEDC and shows the employment levels that would be associated with each major construction project which is envisioned for the future. Although the employment figures displayed in this figure do not use the same employment projection data, geography, or time horizon as those in the ILA, it properly illustrates that moving forward with any one of these projects could have a significant impact on employment in Anchorage, and therefore, on the results of this report.

Figure 10

Potential Annual Workforce Requirements Over the Next Decade



To capture a spectrum of plausible outcomes, a range has been devised to test industrial land demand based on varying levels of economic expansion in Anchorage. The University of Alaska's Institute of Social and Economic Research (ISER) has studied various employment growth scenarios for Anchorage and the State of Alaska in great detail. In a 2005 study, ISER had predicted that the base growth in employment in Anchorage would be approximately 0.5 percent, absent any changes in federal spending, expansions in mining or tourism, major infrastructure projects, oil price fluctuations, or other factors which are known to have significant impacts on the local and regional economy.[13] Any one of these factors could cause this growth rate to increase up to an additional 0.5 percent. Although the ISER researchers tend to use different data sources and methodologies and the base growth rate is lower than that used by the EPS Team in this analysis, we have assumed that the variation among high and low growth scenarios will be similar.

Accordingly, EPS has developed "High Growth Scenario" which assumes an employment growth rate that is 0.5 percent greater than the "Base Scenario" described above. The impact on projected future employment under this "High Growth Scenario" is shown in **Table 5**.

[13] See ISER's Economic Projections for Alaska and the Southern Railbelt 2005 – 2030 (September 30, 2005).

Table 5
Anchorage Bowl Industrial Land Assessment
Modified Employment in MOA By Category

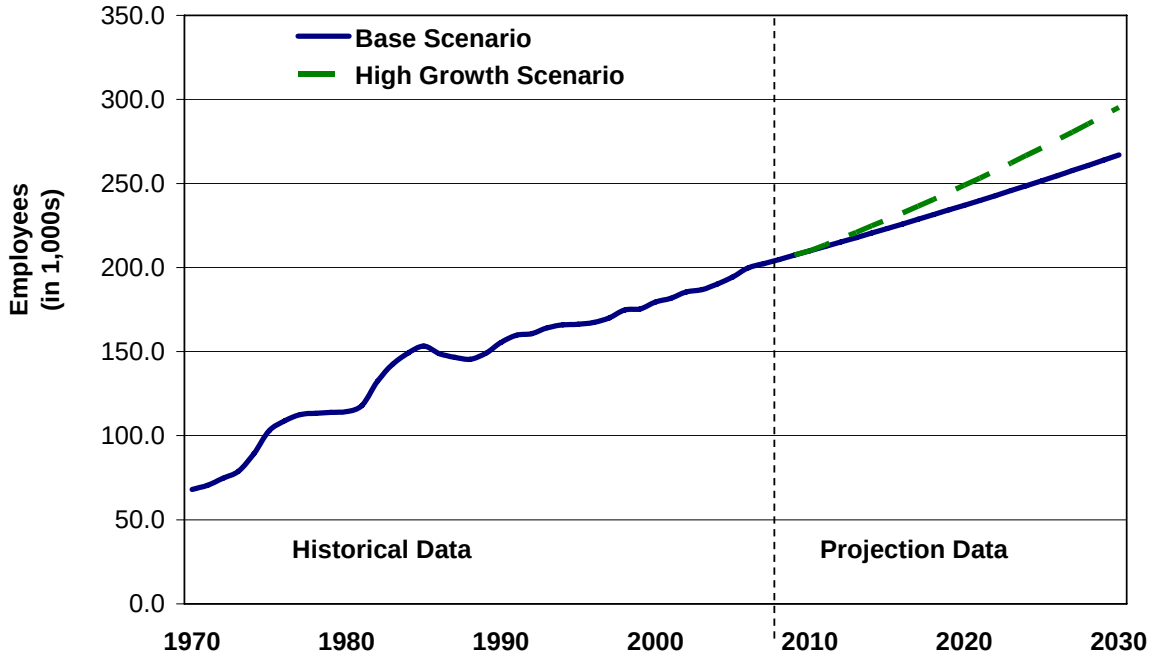
High Growth Scenario

Item	Applied Category	2010	Modified Annual Growth	Modified Employment 2030	Nominal Change
Non-Government					
Forestry, Fishing-Related, and Other	n/a	1,334	0.5%	1,470	136
Mining	Mining	2,506	0.5%	2,769	263
Utilities	TPU	581	2.5%	954	373
Construction	Construction	13,868	1.5%	18,626	4,758
Manufacturing	Manufacturing	2,707	1.5%	3,637	930
Wholesale Trade	Wholesale Trade	5,658	1.3%	7,311	1,653
Retail Trade	Retail Trade	22,388	1.5%	29,863	7,475
Transportation and Warehousing	TPU	12,506	1.5%	16,833	4,327
Information	Services	5,070	1.2%	6,468	1,398
Financing and Insurance	FIRE	7,540	1.3%	9,764	2,224
Real Estate	FIRE	8,128	1.4%	10,703	2,575
Professional and Technical Services	Services	15,394	2.1%	23,533	8,139
Management	Services	1,147	1.3%	1,479	332
Administrative and Waste Services	Services	9,679	1.4%	12,825	3,146
Educational Services	Services	2,895	3.0%	5,238	2,343
Health Care and Social Assistance	Services	24,864	3.3%	47,305	22,441
Arts, Entertainment, and Recreation	Services	4,321	2.2%	6,663	2,342
Accommodation and Food Services	Services	15,480	1.6%	21,288	5,808
Other Services, Except Public Admin.	Services	10,304	1.8%	14,677	4,373
Total Non-Government		**166,370**	**1.9%**	**241,404**	**75,034**
Government					
Federal Civilian	Government	9,439	0.6%	10,665	1,226
Federal Military	Government	13,511	0.6%	15,164	1,653
State and Local	Government	20,649	1.5%	27,977	7,328
Total Government		**43,599**	**1.1%**	**53,806**	**10,207**
Total		**209,969**	**1.7%**	**295,210**	**85,241**

"emp_mod"

Figure 11 shows projected employment by industry for both the Base and High Growth Scenarios.

Figure 11 - Total Employment



Source: Woods and Poole Economics, Inc. and EPS.

Industrial Building Space Projections

EPS used the employment growth projections described above as a basis for predicting industrial land demand in Anchorage. The next step in our analysis was to link employment with industrial development. The methodology used to model this linkage is described below.

Description of Methodology

This report uses empirical research which assigns employment growth among various sectors to specific types of industrial space (see **Table A-1** in **Appendix A** of this report).[14] EPS has reduced these ratios by 25 percent to reflect an employment pattern that is more closely attuned to the employment densities and development trends that are prevalent in Anchorage.

[14] See the "Employment Density Study Summary Report," prepared for the Southern California Association of Governments (SCAG) by the Natelson Company, 2001.

EPS analyzed four major types of industrial development in this analysis. These industrial categories are shown in **Table 6**, and are described in additional detail below.

- **Industrial Service/Assembly/Manufacturing:** This is the most common category of industrial development. This type of development typically includes "sales-service" style of light industrial, and may include businesses such as auto repair, storage, cabinet manufacturing, etc. This type can occur in either the I-1 or I-2 zones. For the purposes of this analysis, EPS has assumed that 50 percent of the Industrial Service/Assembly/ Manufacturing land occurs in I-1, and 50 percent in I-2.[15]

- **Miscellaneous Industrial:** This is generally considered to be the most "heavy" type of industrial development of the four analyzed in this report. This can include metal processing, petroleum refining and processing, mineral extraction, heavy manufacturing, and open storage. Although this type of development is most likely to occur in I-2 zoned land, the open storage category is allowed n I-1-zoned land. For this reason, the EPS Team has assumed that 50 percent of Miscellaneous Industrial will occur in I.2, and 50 percent in I-2.

- **Warehouse Distribution:** This category of industrial development is associated with large storage facilities which generally feature open floor plans, high ceilings, and roll-up doors for loading and unloading freight. Warehouse Distribution space is typically used for storage and is characterized by docks or grade doors, minimal tenant improvements, and adequate access to rail or roadway transportation networks. EPS has analyzed the incidence of Warehouse Distribution buildings in Anchorage and has found that approximately 65 percent of the land which accommodates this use is in I-1 land, and 35 percent in I-2. EPS has assumed that these ratios will continue in the future, and has allocated 65 percent of the projected growth in Warehouse Distribution to I-1 land, and the remaining 35 percent to I-2.

- **Industrial Flex:** Industrial Flex is the least intensive type of industrial development and often includes office space. This use type includes Research and Development (R & D) buildings and Mixed Commercial and Industrial. This type of development is most likely to occur in I-1 zoned land.

[15] An analysis of historical development patterns in Anchorage has indicated that the distribution among I-1 and I-2 land development has been approximately 55 percent–45 percent, respectively, from 1970 to 2008.

Table 6
Anchorage Bowl Industrial Land Assessment
General Assumptions and Definitions

Land Use	MOA Zoning Category	FAR	Sq. Ft./ Employee
Industrial Services, Assembly, Manufacturing	I-1 and I-2	0.25	1,000
Miscellaneous Industrial [1]	I-1 and I-2	0.15	1,800
Warehouse/Distribution	I-1 and I-2	0.30	2,800
Industrial Flex Space	I-1	0.30	500

"LU_def"

[1] Miscellaneous Industrial includes Open Storage, Processing, Heavy Manufacturing, Utilities, Trades, and Transportation.

Employment Density Assumptions

Demand for buildings and land was estimated by assigning employment densities by industrial use type and the use of Floor Area Ratios. The ratios used and a listing of the MOA's zoning classifications that are applicable to each industrial land use category are shown in **Table 6**. These ratios are based on EPS's professional judgment and experience, which is supplemented by actual land utilization rates observed in Anchorage.

The final major assumption used in the land demand analysis pertains to employment density. **Table 6** also shows the assumed square feet required—on average—for each employee under each industrial category. As shown, warehouse/distribution space is generally associated with the lowest employment density, at one employee per 2,800 square feet of building space. The highest employment density occurs in Industrial Flex development, at one employee per 500 square feet of space. While square footage per employee varies widely in the Industrial Service/ Assembly/Manufacturing and Miscellaneous Industrial categories, the estimated means are 1,000 and 1,800 square feet per employee, respectively.

The employment density assumptions used in this analysis are based on EPS experience and professional judgment, and have been supplemented by significant research of employment density trends specific to the MOA. Although the FAR and square-feet-per-employee factors will differ for individual parcels and properties analyzed, our team feels that these ratios express the most accurate overall depiction of employment density in Anchorage.

Also, it is crucial to note that the future land demand analysis presented in this report is based on the existing land use pattern which is prevalent in Anchorage. In other words, the estimated number of industrial acres required by 2030 assumes that the current industrial development paradigm continues into the future, in which low employment densities and Floor-Area-Ratios are prevalent.

Industrial Land Demand Analysis Results

The results of the industrial land demand analysis under the Base Scenario are shown in **Table 7**. As shown, the EPS Team estimates that by 2030, Anchorage will see approximately 5,700 new jobs which will require some form of industrial space. This will require approximately 6,500,000 square feet of new industrial space, which translates to a total of 600 acres of various types of industrial land by 2030. This implies an average annual absorption rate of approximately 30 acres per year.

Table 7
Anchorage Bowl Industrial Land Assessment
Estimated Supportable Industrial Space (2010-2030)

Base Scenario:
1.2% Avg Annual Growth

Item	Industrial Services/ Assembly/ Manuf.	Warehouse Distribution	Misc. Industrial	Industrial Flex	Total Industrial
New Jobs Using Space	4,780	370	260	310	**5,720**
Estimated Building Sq. Ft.	4,780,000	1,040,000	480,000	150,000	**6,450,000**
Estimated Net Developable Acres	440.0	80.0	70.0	10.0	**600.0**
Average Annual Absorption	*22.0*	*4.0*	*3.5*	*0.5*	*30.0*

"indspace_summary"

Table 8 shows the breakdown of predicted industrial land demand by 2030 as it pertains to I-1 and I-2 zoning categories. As shown, assuming that 50 percent of the Industrial Service/Assembly/Manufacturing land demand is developed in I-1 and the other 50 percent in I-2, EPS estimated that approximately 310 acres of I-1 land and 290 acres of I-2 land will be demanded by 2030.

Table 8
Anchorage Bowl Industrial Land Assessment
Estimated Acreage Requirements by Industrial Zoning Category

Base Scenario:
1.2% Avg Annual Growth

Land Use	Estimated Acreage Required: 2010 - 2030 Total	I-1 Zone	I-2 Zone
Industrial Services/ Assembly/ Manufacturing [1]	**440.0**	220.0	220.0
Warehouse/ Distribution [2]	**80.0**	52.0	28.0
Miscellaneous Industrial [3]	**70.0**	35.0	35.0
Industrial Flex	**10.0**	10.0	0.0
Total	**600.0**	**317.0**	**283.0**

"zoning_summ"

[1] Assumes 50% of Industrial Services/ Assembly/ Manufacturing occurs in I-1, and 50% occurs in I-2. On average historically, I-1 and I-2 land has been distributed approximately equally in the MOA.
[2] Assumes 65% of Warehouse/ Distribution occurs in I-1, and 35% in I-2, based on a review of historical development patterns in the MOA.
[3] Assumes 50% of Miscellaneous Industrial occurs in I-1, and 50% in I-2.

Tables 9 and **10** show a similar breakdown of predicted industrial land demand under the High Growth Scenario. As shown, the EPS Team predicts that by 2030, Anchorage could see as much as 8,500 new jobs which will require some form of industrial space under the High Growth Scenario. This would require approximately 9,600,000 square feet of new industrial space, translating to a total of approximately 900 acres of various types of industrial land by 2030. This implies an average annual absorption rate of approximately 45 acres per year.

Table 9
Anchorage Bowl Industrial Land Assessment
Estimated Supportable Industrial Space (2010-2030)

High Growth Scenario: 1.7% Avg Annual Growth

Item	Industrial Services/ Assembly/ Manuf.	Warehouse Distribution	Misc. Industrial	Industrial Flex	Total Industrial
New Jobs Using Space	7,100	570	410	450	**8,530**
Estimated Building Sq. Ft.	7,100,000	1,580,000	740,000	220,000	**9,640,000**
Estimated Net Developable Acres	650.0	120.0	110.0	20.0	**900.0**
Average Annual Absorption	*32.5*	*6.0*	*5.5*	*1.0*	*45.0*

"indspace_summary"

Table 10
Anchorage Bowl Industrial Land Assessment
Estimated Acreage Requirements by Industrial Zoning Category

High Growth Scenario: 1.7% Avg Annual Growth

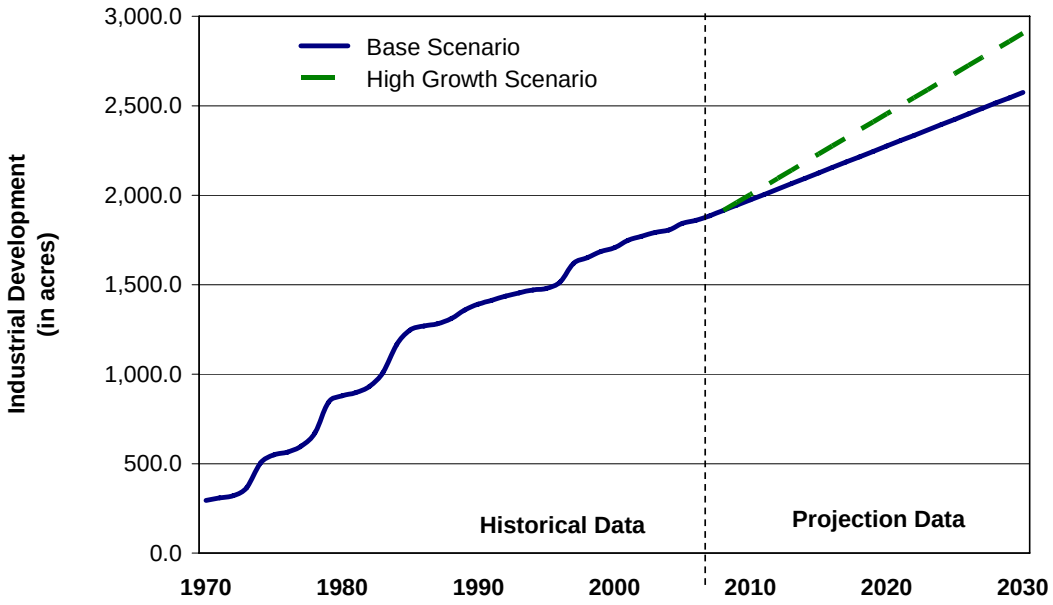
Land Use	Estimated Acreage Required: 2010 - 2030 Total	I-1 Zone	I-2 Zone
Industrial Services/ Assembly/ Manufacturing [1]	**650.0**	325.0	325.0
Warehouse/ Distribution [2]	**120.0**	78.0	42.0
Miscellaneous Industrial [3]	**110.0**	55.0	55.0
Industrial Flex	**20.0**	20.0	0.0
Total	**900.0**	**478.0**	**422.0**

"zoning_summ"

[1] Assumes 50% of Industrial Services/ Assembly/ Manufacturing occurs in I-1, and 50% occurs in I-2. On average historically, I-1 and I-2 land has been distributed approximately equally in the MOA.
[2] Assumes 65% of Warehouse/ Distribution occurs in I-1, and 35% in I-2, based on a review of historical development patterns in the MOA.
[3] Assumes 50% of Miscellaneous Industrial occurs in I-1, and 50% in I-2.

Figure 12 is a graphical depiction of the historical industrial land absorption and the predicted industrial land demand under the Base Scenario and the High Growth Scenario. The results for each industrial land use category evaluated under each scenario are described below. The backup calculations are shown in **Tables A-2** through **A-9** are included in **Appendix A** of this report.

Figure 12 - Cumulative Industrial Development



Source: Woods and Poole Economics, Inc. and EPS.

Industrial Service/Assembly/Manufacturing

As shown in **Table A-2**, approximately 4,800 of the new jobs added by 2030 are estimated to require Industrial Service/Assembly/Manufacturing space under the Base Scenario. By using assumptions of 1,000 square feet per employee and a 25-percent floor area ratio, EPS estimates that approximately 4,800,000 square feet of Industrial Service/Assembly/Manufacturing space on approximately 440 acres will be required by 2030.

Under the High Growth Scenario, the EPS Team predicts that approximately 7,100,000 square feet of Industrial Service/Assembly/Manufacturing space on 650 acres would be demanded by 2030, as shown in **Table A-3**.

Miscellaneous Industrial

As shown in **Table A-4**, approximately 260 of the new jobs added by 2030 under the Base Scenario are estimated to require Miscellaneous Industrial. Using assumptions of 1,800 square feet per employee and a 15-percent floor area ratio, EPS estimates that approximately 480,000 square feet of Miscellaneous Industrial space on approximately 70 acres will be required by year 2030.

Under the High Growth Scenario, the EPS Team predicts that approximately 740,000 square feet of Miscellaneous Industrial space on 110 acres would be demanded by 2030, as shown in **Table A-5**.

Warehouse Distribution

As shown in **Table A-6**, approximately 370 of the new jobs added by 2030 under the Base Scenario are estimated to require Warehouse/Distribution space. Using assumptions of 2,800 square feet per employee and a 30-percent floor area ratio, EPS estimates that approximately 1,000,000 square feet of Warehouse Distribution space on approximately 80 acres will be required by 2030.

Under the High Growth Scenario, the EPS Team predicts that approximately 1,500,000 million square feet of Warehouse/Distribution space on 120 acres will be demanded by 2030, as shown in **Table A-7**.

Industrial Flex

As shown in **Table A-8**, approximately 310 of the new jobs added by 2030 under the Base Scenario are estimated to require Industrial Flex space. Using assumptions of 500 square feet per employee and a 30-percent floor area ratio, EPS estimates that approximately 150,000 square feet of Industrial Flex space on approximately 10 acres will be required by 2030.

Under the High Growth Scenario, the EPS Team predicts that approximately 220,000 square feet of Industrial Flex space on 20 acres would be demanded by 2030, as shown in **Table A-9**.

Historical Industrial Development Analysis

To test the validity of our results and ensure that they are compatible with previous development patterns in Anchorage, the EPS Team evaluated industrial land and building absorption over the long term. **Figure 12** above shows the rate of development of industrial land from 1970 through 2008, and projected to 2030 under each scenario as described above.[16] As indicated, the MOA has absorbed an average of approximately 300,000 square feet of industrial building space per year, on approximately 33 acres on average over the long-term. The EPS Team's Base Scenario projection of 30 acres per year and up to 45 acres per year under the High Growth Scenario, are generally consistent with historical development patterns, and indicate a potential shift of employment and land use sectors that are more reliant on industrial development in the future (see **Table 12** in **Chapter 5**).

The analysis of historical building and land development also allowed the EPS Team to evaluate historical land utilization rates by calculating reality-based FAR. The overall industrial development has been developed utilizing an average FAR of 21 percent. I-1 industrial land and buildings have historically been constructed with a 28 percent FAR on average, and 13 percent

[16] Please note that these figures are based on the MOA's building permit database, and the industrial classifications presented therein may not match those presented elsewhere in this report.

on average for I-2 (see **Table 13** in **Chapter 5**). These ratios, when averaged, are consistent with those used to project industrial land demand in this analysis.

Historical and Projected Employment Density

Employment density is a key factor in the land demand analysis, and one that has been analyzed thoroughly by the EPS Team. Because of the abundance of laydown yard space and staging/ prepping areas in Alaska, industrial land is often underutilized, and overall employment densities can be extremely low in some instances. A 1996 Industrial Lands Assessment prepared by HDR used a different approach to calculate employment density than is used in this analysis. The HDR Study grouped employees across various employment categories into an "industrial" category, and then divided this by the number of developed industrial acres to arrive at an employment density ratio. This approach yielded an average of 6.4 industrial employees per industrial acre. By using a more nuanced methodology as described in this report, which evaluates industrial land demand based on employment growth by sector and corresponding development trends, the EPS Team has predicted a ratio of approximately 9.5 employees per industrial acre on average.

The employment densities used in this analysis have also been generally corroborated by several of the industrial land users that we have interviewed as part of this analysis. For example, one manufacturing company located in Anchorage has reported approximately 6 employees per acre, while another similar company has reported up to 18 per acre. These appear to be two extremes in the spectrum of industrial employment density in Anchorage, and represent the structural inefficiency that causes the irregular pattern of industrial development in the MOA. Other industrial businesses analyzed have reported employment densities that generally fall within this range.

National Review of Industrial Employment Density

To further vet the employment densities used in this analysis, EPS has conducted a review of industrial employment densities in several metropolitan areas throughout the U.S. The results of our evaluation are summarized in **Table 11**. As shown, the MOA is at or near the low end of the spectrum with respect to industrial land employment density, which is not unexpected given the difficulties posed by inclement weather, workforce issues, soil issues, etc.

Table 11
Anchorage Bowl Industrial Land Assessment
Industrial Land Employment Densities

Area	Industrial Use Type	Employment Density			Data Source
		Jobs/Acre	Sq. Ft./Job	FAR	
Pierce County, WA	Manufacturing/Warehousing	13.8			Pierce County Employment Density Survey, November 2006
City of Hillsboro, OR	Industrial	9.0			Hillsboro Comprehensive Plan
City of Silverton, OR	Industrial	8.9			Industrial Economic Opportunities Analysis, November 2006
Town of Caledon, Ontario, Canada	Manufacturing	17.0			Employment Land Needs Study, November 2007
	Warehouse/Distribution	9.0			
Peel Region, Ontario, Canada [1]		15.8			ReNew Canada newsletter, July/August 2007 (page 28)
Grand Traverse County, MI	Intensive Industry	30.0			Blair Township Master Plan
	Intermediate Intensive	14.0			
	Extensive	8.0			
Clark County, WA	Industrial - Comm.Plan std.	9.0			Current Industrial Land Inventory, November 2000
	Actual observed (1994-97)	4.4			
Portland-Vancouver MSA	Warehouse/Distribution	10.0	1,350	0.31	Regional Industrial Lands Study, October 2001
	General Industrial	24.5	533	0.30	
	Tech/Flex	24.3	467	0.26	
City of Wilsonville, OR	Efficient Land Need	16.3	750	0.28	Economic Opportunities Analysis Report, January 2008
	Medium Land Need	14.2	800	0.26	
	High Land Need	12.3	850	0.24	
City of Minneapolis, MN	Manufacturing	27.0			Industrial Land Use Study and Employment Policy Plan, June 2006
	Transportation & Warehousing	14.0			

"densities"

[1] Converted from "jobs per hectare" to "jobs per acre" at 2.47105381 acres/ha.

5. INDUSTRIAL LAND SUPPLY ANALYSIS

Methodology

The EPS team used a GIS/CAMA-Based Inventory of Industrial Land supply, combined with direct field observation, satellite imagery, and interviews to analyze I-1 and I-2, I-3, and MI zoned properties in Anchorage, Eagle River, and Chugiak-Eklutna. The Study Area boundary is shown in **Figure 1** in **Chapter 2**.

As described in the technical appendix, the EPS team worked with MOA staff to prepare map layers describing various parcel, land, and context characteristics. These were used in combination with MOA CAMA tables, documentation and data to prepare specific parcel information for the industrial zoned parcels.

Direct field observation took place through a windshield survey over the course of several days examining general industrial use and development characteristics as well as identifying anomalies between the GIS/CAMA-Based Inventory and actual site development. It also identified the extent of non-industrial development in industrial zoned properties.

During the inventory and supply analysis, the EPS team prepared and made use of extensive parcel overlays and other context factors available through Google Earth. Together, these layers allowed the team to evaluate anomalies in GIS/CAMA data in relation to actual physical use of sites, identify patterns of industrial development, and relate the analysis to specific Subareas.

Interviews were conducted with major industrial land development organizations including the Port of Anchorage, the Alaska Railroad Corporation, the International Airport, the University of Alaska-Anchorage, the Eklutna Corporation, CIRI, the Heritage Land Bank, the MOA, industrial land brokers, and numerous industrial companies, to further characterize the industrial land supply.

Sensitivity Analysis

The EPS Team then compared with direct field and satellite observation multiple anomalies appear in the undeveloped and vacant parcel quantities. The EPS team observed three particular anomalies:

- Land listed as vacant, but because of regulatory status, such as a wetland designation, is undevelopable.
- On observation, land designated as vacant does not necessarily mean empty. Many parcels designated vacant show some type of yard or storage activity.
- No recorded assessment does not mean without construction or use.

In particular, parcels without minimum vertical improvements or assessed value occur primarily in parcels used for yard, storage, or laydown space, or in parcels that were being used by adjacent developed parcels. In a few cases, new development had not yet been characterized,

or was temporary in nature. To establish a fully accurate understanding of undeveloped parcels, eliminating those which appear to be undeveloped but are in use, a comprehensive field survey of individual anomalous properties is necessary. To correct for inaccuracies caused by these anomalies, satellite observation on parcels of 0.5 acres or larger was used to adjust overall supply.

Overall Context

Historical Industrial Development Pattern

From its early beginnings as a camp and supply terminal port for construction of the Alaska Railroad, Anchorage's development pattern focused significant and strategic land assets on industrial development. During the rail construction period from 1915 to 1923, industrial expansion eastward along the Ship Creek basin was flanked by initial residential settlements on Government Hill and the early town of 600 lots on the elevated land to the south. This initial pattern of industrial development along the rail line extends to Merrill Field, the vital airfield commissioned in 1930 to replace the original airstrip constructed in 1924. It supported the primary air and rail movement of both goods and people throughout the state.

Evidence of historic population trends in Anchorage indicate that two significant events led to population increases of over 200 percent during the 1940s and the 1970s. The first, establishment of Elmendorf Air Force Base and Fort Richardson in 1940 responding to the increased Pacific threats in WWII, caused the census documented population to increase from fewer than 3,500 in 1940 to more than 11,250 in 1950.

The Port of Anchorage, established initially to support rail construction, experienced predictable, incremental growth for nearly 50 years. The Port at Seward was also a major contributor to the movement of goods and people during the early part of the century. However, relocation of the railroad headquarters to Anchorage, perhaps in response to Chickaloon coal extraction for the Navy, and the flooding of Seward in 1917 had already solidified the Port of Anchorage as the primary logistics center for Alaska. As WWI ended in 1918, many pilots made their way to Anchorage to continue flying. The bush pilots and their daily ferrying of goods and people throughout the Alaskan frontier from Merrill Field further enhanced the growth potential of the Port. Moreover, the completion of the rail line linking Anchorage to Fairbanks in 1923 opened a valuable heavy goods transportation link to the interior. Overall, Anchorage's industrial land and facility supply was able to support these expanded opportunities.

As demand for air cargo rapidly grew in the mid-20th century as a result of Anchorage's location advantage as a primary supply center, Merrill Field's ability to meet that demand, and modern aviation technology, reached capacity. At the same time, the Alaska Road Commission was completing the northern terminus of the Old Seward Highway, further strengthening Anchorage's role as the regional logistic center for Alaska.

The construction of the International Airport and adjoining airport road and the completion of the Old Seward Highway facilitated industrial land development adjacent to these two primary vehicle circulation arterials throughout the 1950s and early 1960s. Since zoning was not then a limiting factor in industrial development, higher, dry land near transportation routes were preferred development sites.

The Good Friday earthquake and tsunamis of 1964 devastated the Ports of Seward and Valdez. Historical accounts indicate Anchorage's building supply also suffered significant damage; however, the Port of Anchorage was able to resume operations within a short period of time. During the subsequent period of reconstruction, census data indicates that the population increased very little in the years following the earthquake, and few industrial parcels were developed until the construction of the Trans Alaska Pipeline began in 1975. Following the discovery in Prudhoe Bay in 1968, getting Alaskan oil to market became an American imperative. Getting goods and people to construction sites was enhanced through the completion of the Park Highway from Palmer to Fairbanks in 1971.

While industries such as mining, fishing, fur, and timber helped sustain incremental growth for industrial land in Anchorage's earliest decades, those industries were waning by the middle of the twentieth century. In the decades preceding construction of the Trans Alaska Pipeline, construction projects around Alaska sponsored by the federal government were the primary source of demand for industrial land in the Anchorage area.

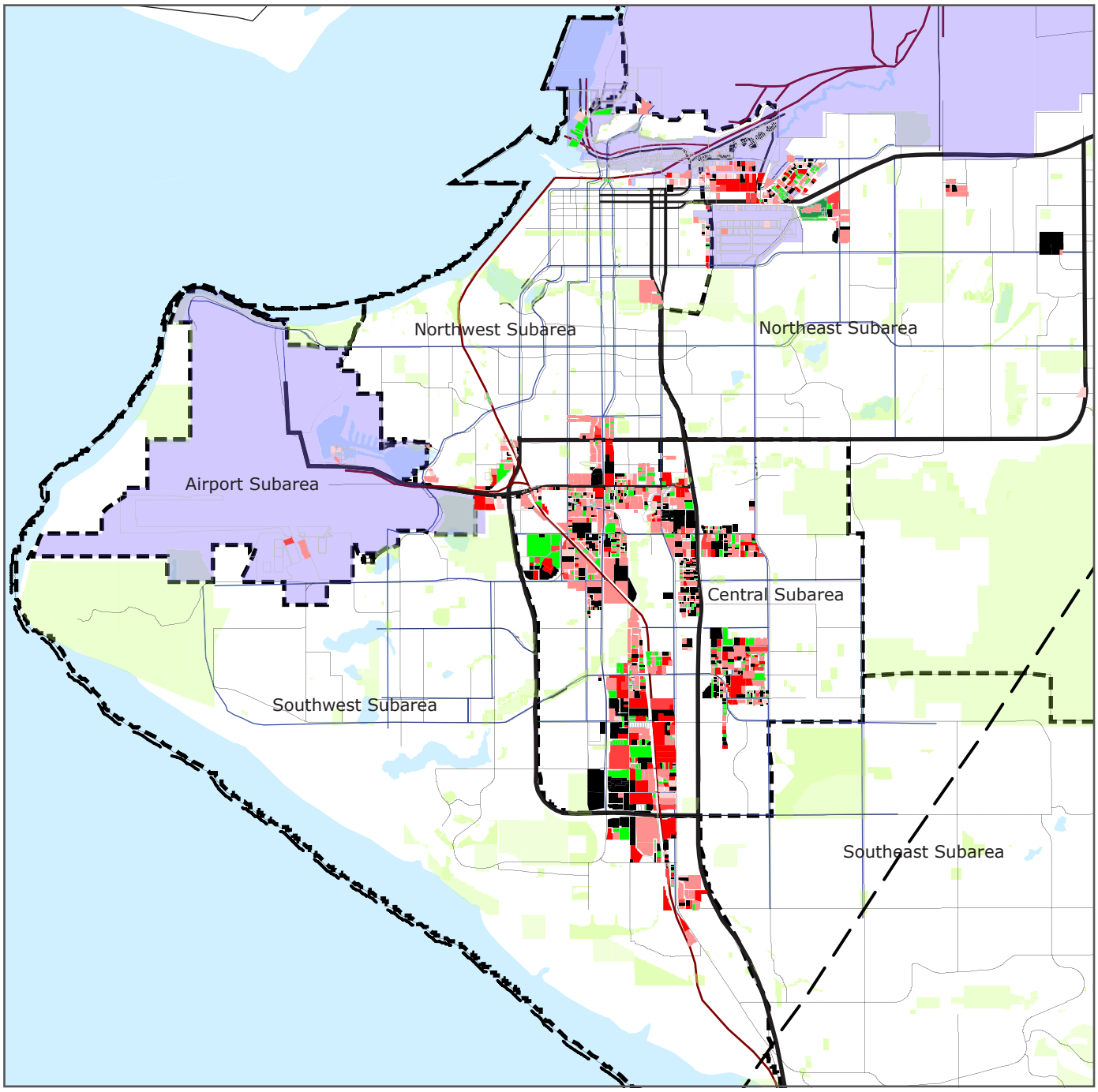
During the years from 1974 through 1977, a rapid influx of contractors, subcontractors, and materials led to extensive industrial development, particularly in the Northwest and Central Subareas. MOA data suggests that nearly 300 industrial parcels were built out during the period from 1975 to 1980, compared to 266 industrial parcels developed between 1942 and 1975. The data indicates that industrial development continued at a healthy pace over the next decade with approximately 536 industrial parcels developed between 1980 and 1989. This compares to 133 parcels in the 1990s and 256 parcels in the past decade.

Today, the Anchorage industrial land and facility supply supports nearly all sectors of the economy to some extent. Manufacturing and fabrication facilities are primarily limited to support of infrastructure, oil field and pipeline needs, while logistics, storage and construction laydown yard supply is extensive. This relationship of fewer manufacturing uses to more logistic uses lowers the industrial building floor area to site ratios for the overall bowl creating increased land area demands.

Moreover, observations of many recently developed industrial parcels in the I-1 and I-2 zones indicate a significant shift in use from industrial uses to commercial, retail, and other non-industrial uses. **Figures 13** and **14** illustrate the historical industrial development patterns in the MOA over four key time periods: (a) from 1942 through 1970, (b) 1971 through 1989, (c) 1990 through 1999, and (d) 2000 through 2008. While currently undeveloped parcels are shown in black, developed land is shown in gradations of red, with the lighter shades being developed earlier in the MOA's history, and the darker being the most recently developed. **Tables 12** and **13** show the corresponding industrial absorption from 1970 to the present in tabular form.[17]

[17] Please note that these figures are based on the MOA's building permit database, and the industrial classifications presented therein may not match those presented elsewhere in this report.

Figure 13:
Development of Industrially Zoned Parcels 1942-2008, Anchorage Bowl



Economic & Planning Systems, Inc.

GDeS Architecture & Planning

Subarea Perimeter

Railroad

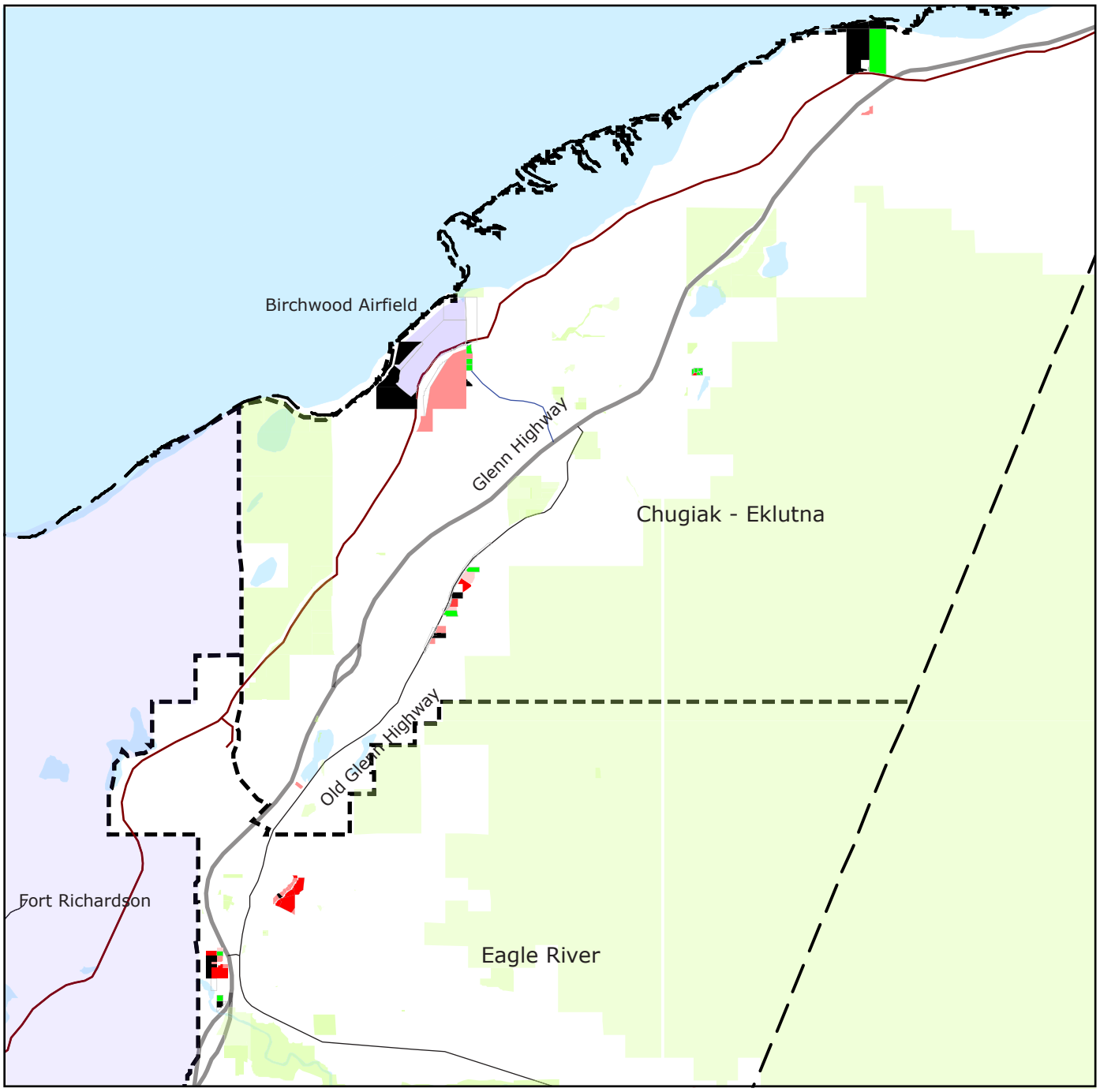
Primary Double Load Routes

Industrial Serving Arterials

Parcel Legend

- Vacant Parcels
- Developed 1942-1970
- Developed 1970-1989
- Developed 1990-1999
- Developed 2000-2008
- Developed-Undated
- Public or Unsuitable

Figure 14:
Development of Industrially Zoned Parcels 1942-2008, Eagle River - Chugiak/Eklutna



Economic & Planning Systems, Inc. GDeS Architecture & Planning

Subarea Perimeter

Railroad

Primary Double Load Routes

Industrial Serving Arterials

Parcel Legend

- Vacant Parcels
- Developed 1942-1970
- Developed 1970-1989
- Developed 1990-1999
- Developed 2000-2008
- Developed-Undated
- Public or Unsuitable

Table 12
Anchorage Bowl Industrial Land Assessment
Building Square Feet Constructed By Industrial Category

Category [1]	Before 1950	1950 - 1959	1960 - 1969	1970 - 1979	1980 - 1989	1990 - 1999	2000 - 2008	**Total**
Cold Storage	0	0	28,686	46,236	27,780	212,936	15,120	**330,758**
Warehouse/ Distribution	0	0	33,350	810,893	506,692	558,887	34,465	**1,944,287**
Lumber Storage	0	0	0	2,256	34,160	0	0	**36,416**
Manufacturing	134,152	6,926	329,073	506,741	586,684	338,175	233,714	**2,135,465**
Mini Warehouse	0	0	3,996	238,197	497,054	175,360	474,441	**1,389,048**
Prefab Warehouse	0	13,400	5,000	11,664	53,468	7,767	0	**91,299**
Warehouse	10,324	174,084	1,416,244	3,936,129	3,006,644	1,712,422	1,331,944	**11,587,791**
Total (Sq. Ft.)	**144,476**	**194,410**	**1,816,349**	**5,552,116**	**4,712,482**	**3,005,547**	**2,089,684**	**17,515,064**
Total (Acres) [2]	15.8	21.3	198.6	606.9	515.2	328.6	228.4	1,914.7
Average Annual (Sq. Ft.)	**n/a**	**19,441**	**181,635**	**555,212**	**471,248**	**300,555**	**208,968**	**301,984**
Average Annual (Acres) [2]		2.1	19.9	60.7	51.5	32.9	22.8	33.0

"sqft_hist"

Source: Municipality of Anchorage and EPS

[1] Does not include Office Warehouse.
[2] Assumes 21% Floor-Area-Ratio.

Table 13
Anchorage Bowl Industrial Land Assessment
Summary of I-1 and I-2 Land and Building Sq. Ft. Developed in MOA (1970 - 2008)

Item	1970 - 1979	1980 - 1989	1990 - 1999	2000 - 2008	Overall 1970 - 2008
Total Building Sq. Ft. Developed					
I-1	2,796,649	2,288,587	441,539	863,904	**6,390,679**
I-2	858,079	514,759	588,643	422,558	**2,384,039**
Combined	**3,654,728**	**2,803,346**	**1,030,182**	**1,286,462**	**8,774,718**
Combined Average Annual	*365,473*	*280,335*	*103,018*	*128,646*	*230,914*
Total Acres Developed					
I-1	184.7	191.3	43.6	105.2	**524.8**
I-2	184.0	85.3	75.3	67.7	**412.4**
Combined	**368.7**	**276.6**	**118.9**	**173.0**	**937.2**
Combined Average Annual	*36.9*	*27.7*	*11.9*	*17.3*	*24.7*
FAR					
I-1	0.35	0.27	0.23	0.19	**0.28**
I-2	0.11	0.14	0.18	0.14	**0.13**
Combined	0.23	0.23	0.20	0.17	**0.21**

"hist_acres"

Physical Characteristics

Industrial development throughout the Anchorage Bowl has followed general industrial trends in that development has occurred primarily on relatively flat sites adjacent to infrastructure, major road arterials and transportation modes. Two important physical constraints affect the ability to increase industrial supply over time and define structural development standards.

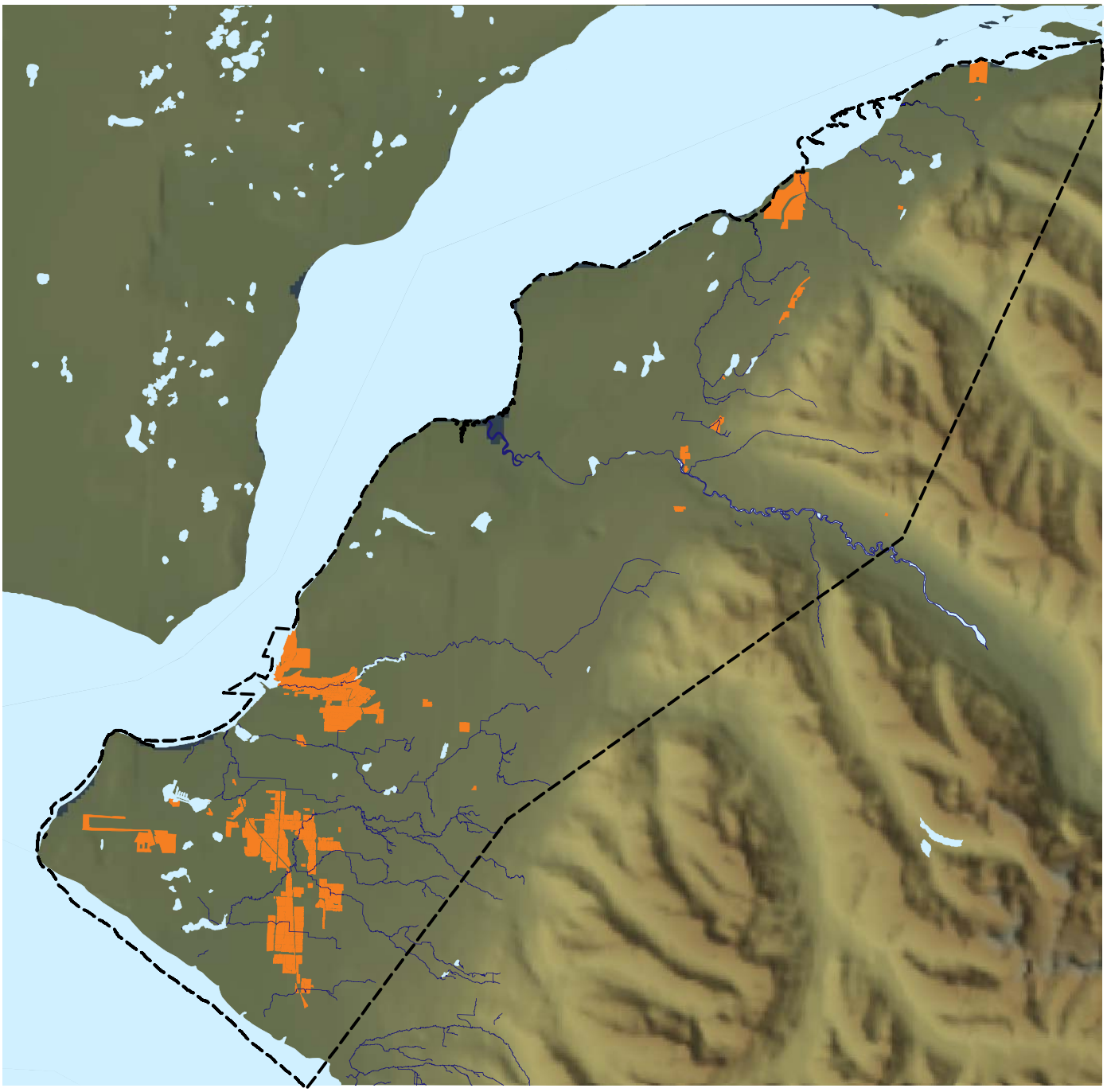
The first constraint is the character of the land itself. Bound between the mountains and the sea, development in the Anchorage Bowl has stretched to its physical boundaries. And while some large scale opportunities are present in Chugiak-Eklutna, the remaining opportunities are infill. Second, the bowl is home to numerous rivers, creeks, lagoons, lakes, and wetlands, which are integral to both environmental and community health. Industrial expansion into existing open space areas is neither practical nor desired by the community. In addition, existing industrial development has used most available sites, and those that remain typically have deep peat deposits that must be removed at great expense.

The extreme nature of seismic activity relative to the continuous subduction of the Pacific Plate under the North American Plate places industrial development sites in the bowl in moderate to high risk areas and is the second significant constraint. Structural system and foundation requirements contribute to increased development costs.

Moderate to severe winters also affect industrial development as large sites with yards, parking and dock areas must consider areas for snow removal and storage, as well as increased snow loading on structures.

Figures 15 through **19** show various characterizations of land in the MOA, and provide an overall sense of how industrial development relates to different land conditions. **Figure 15** displays the general topographic features of the Anchorage region, **Figure 16** shows streams, lakes, and wetlands, **Figure 17** shows open space, **Figure 18** displays the soil conditions of land, and **Figure 19** identifies the publicly-owned lands in Anchorage.

Figure 15:
Topography



Economic & Planning Systems, Inc.

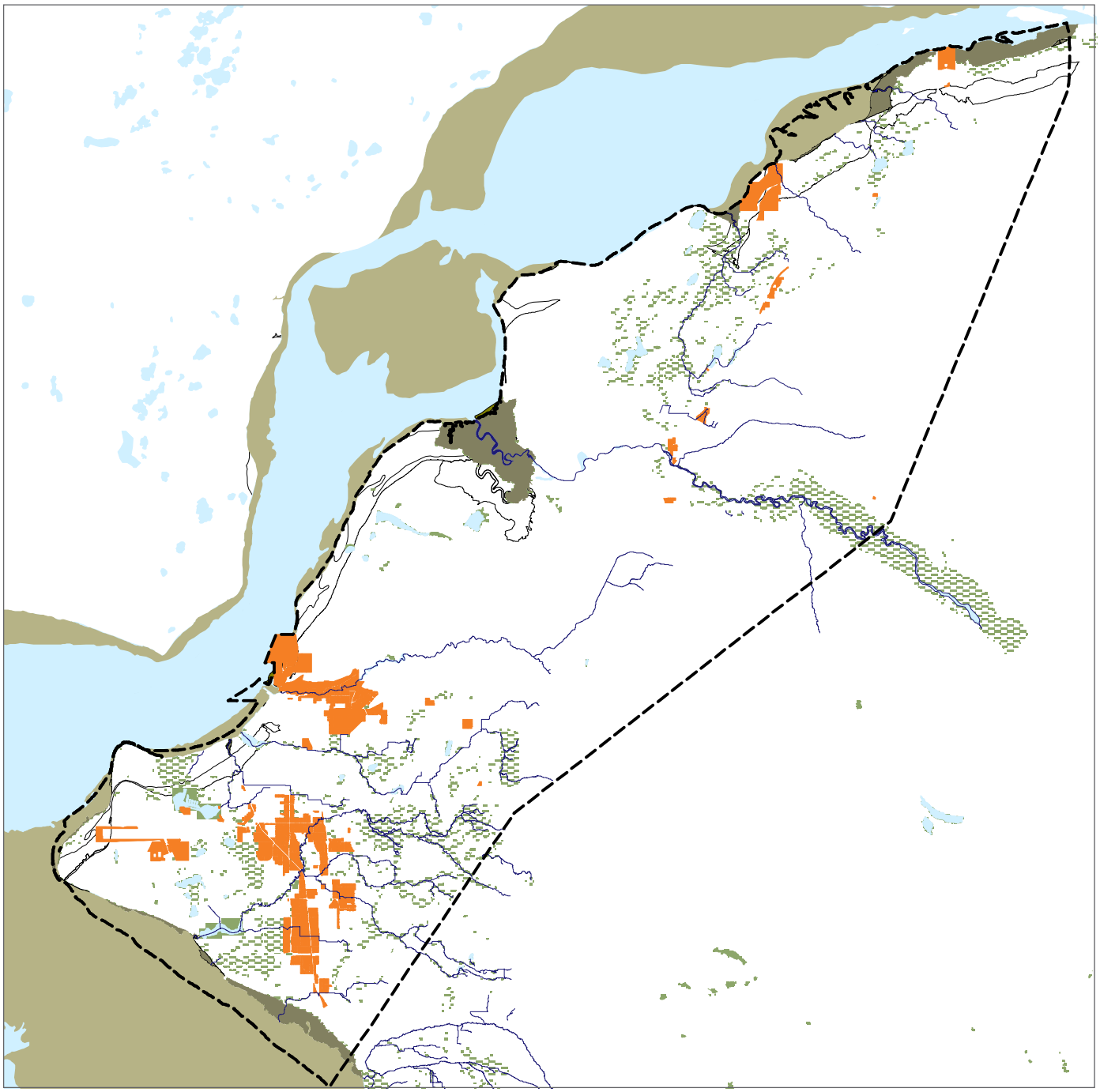
GDeS Architecture & Planning

Project Perimeter

Streams

Industrial Parcels in MOA

Figure 16:
Streams, Lakes and Wetlands



Economic & Planning Systems, Inc. GDeS Architecture & Planning

Project Perimeter

Industrial Parcels in MOA

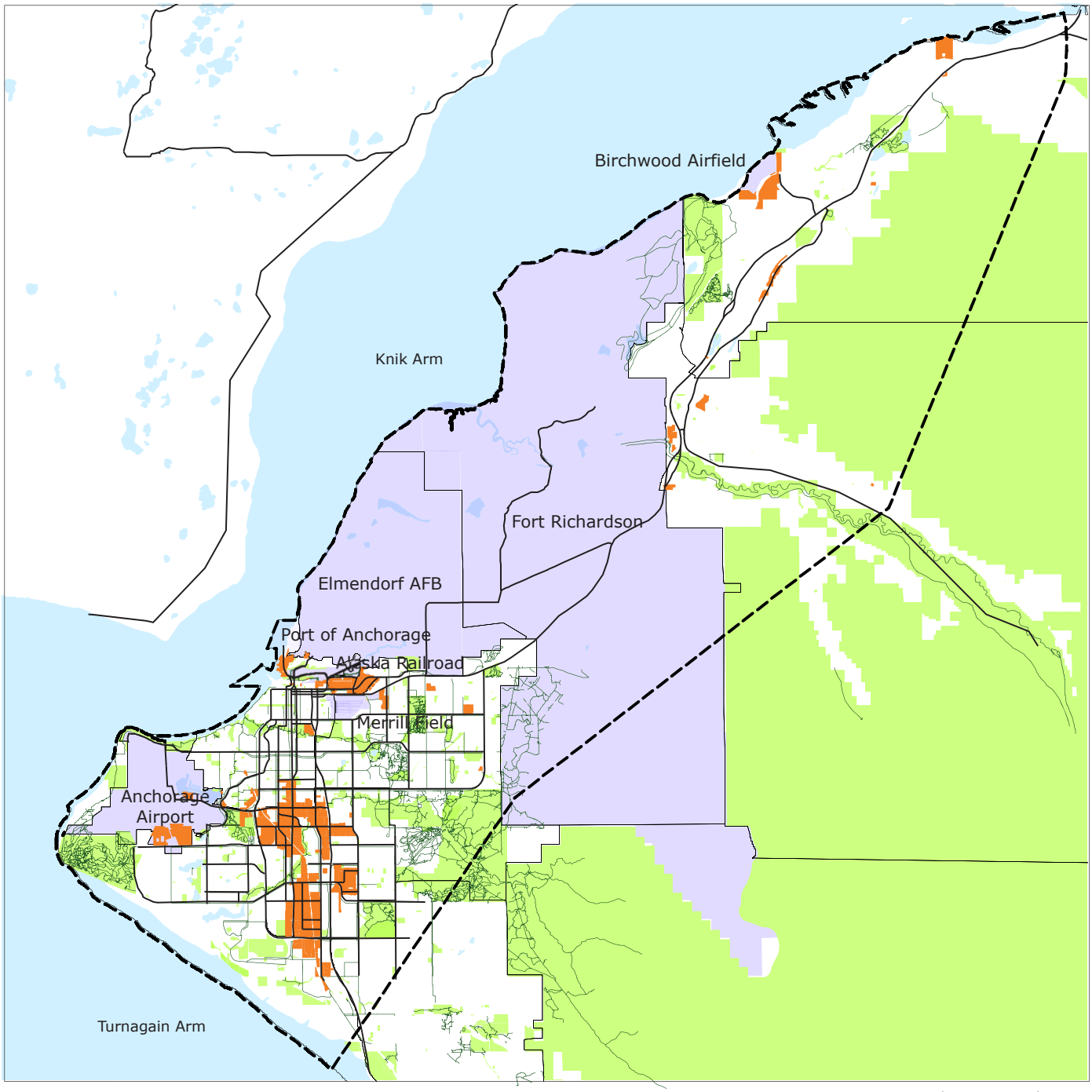
Coastal Wetlands

Tidal Flats

Wetlands

Streams

Figure 17:
Open Space



Economic & Planning Systems, Inc. GDeS Architecture & Planning

Project Perimeter

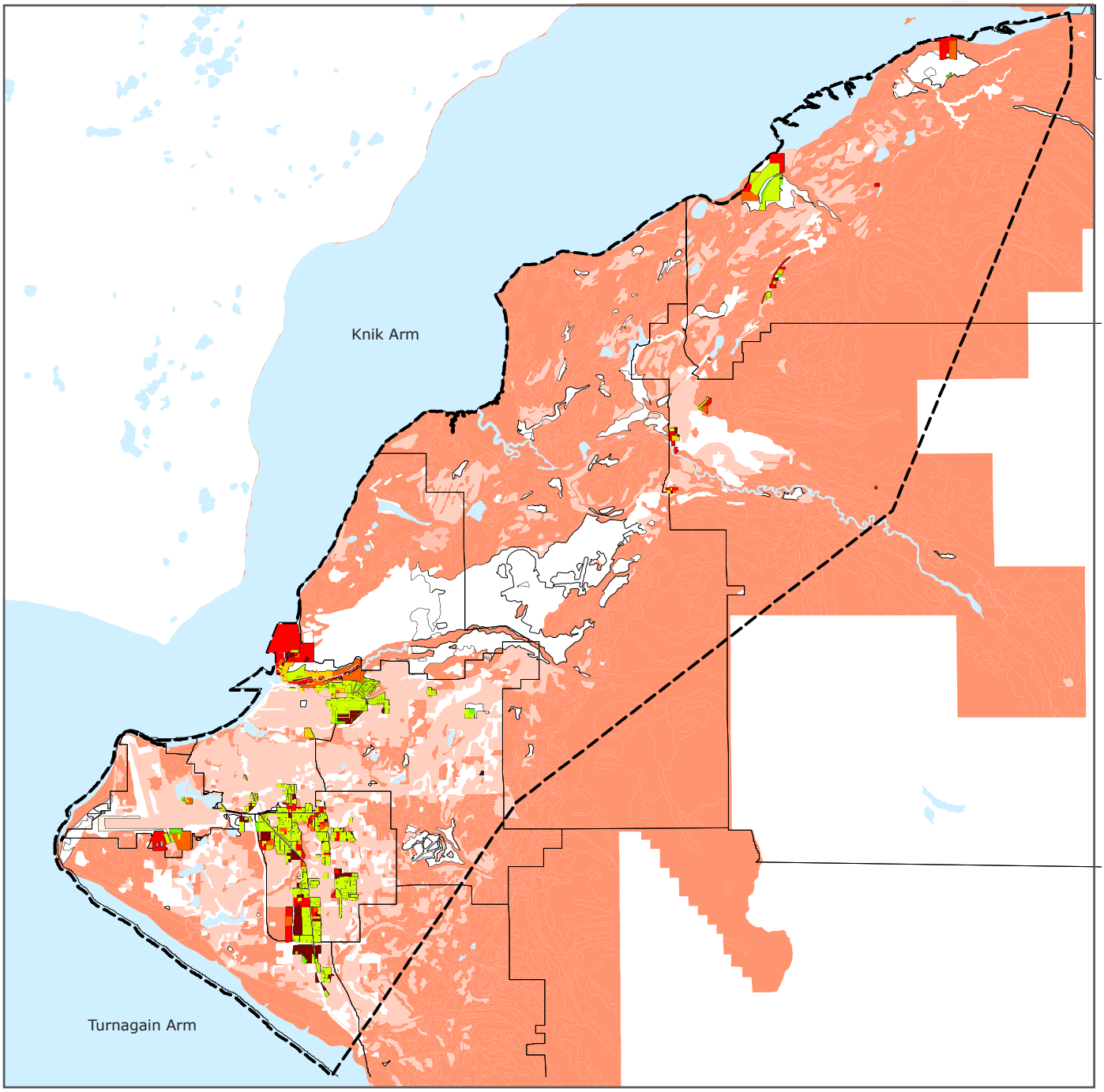
Roads

Open Space

Industrial Parcels in MOA

Public Owned Lands

Figure 18:
Soil Conditions



Economic & Planning Systems, Inc.

GDeS Architecture & Planning

Project Perimeter

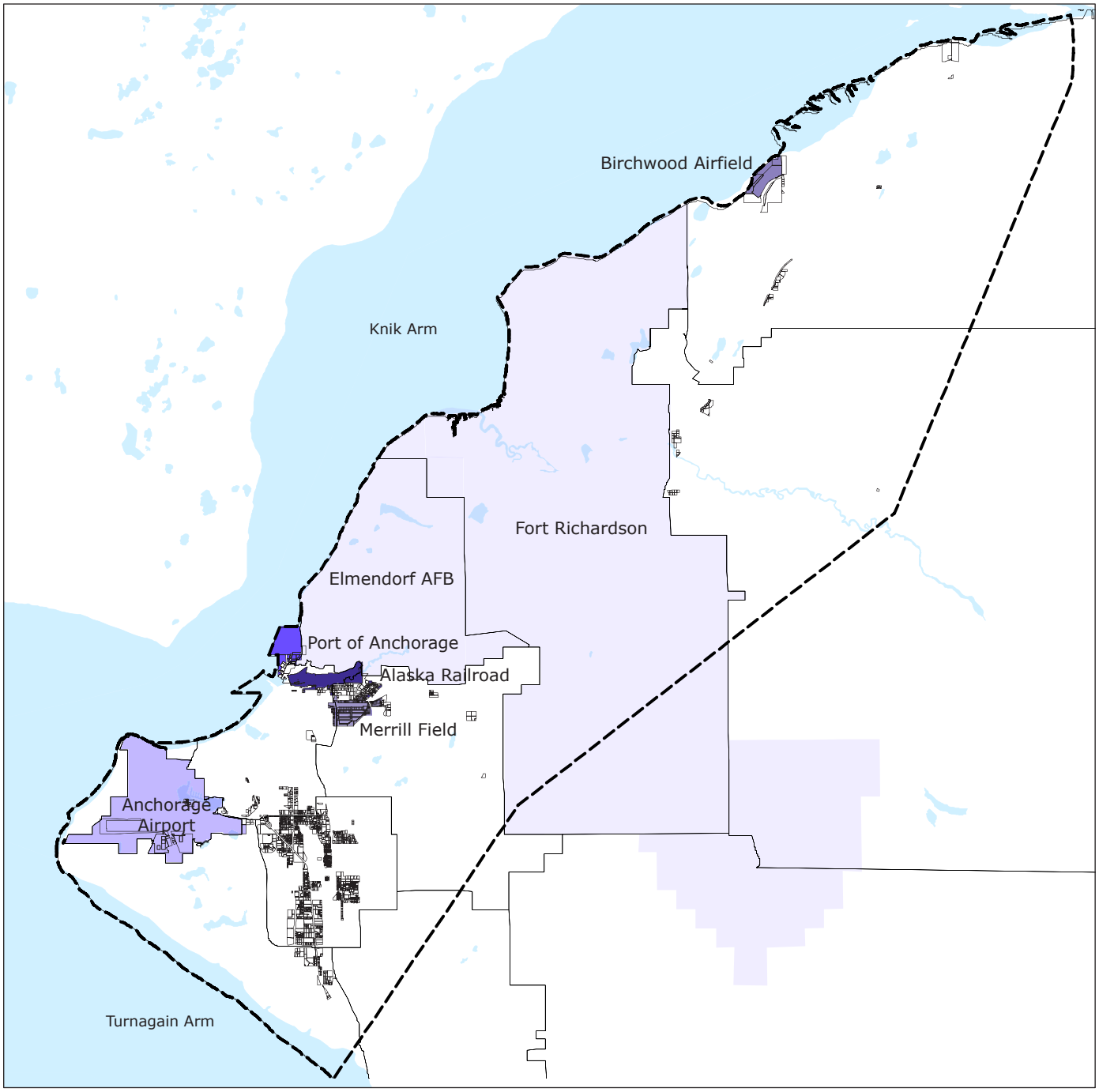
Industrial Parcel Limitations

- 0.51 to 1.00 - Very Severe
- -.26 to 0.50 - Severe
- 0.11 to 0.25 - Moderate
- 0.01 to 0.10 - Some
- 0 (Zero) - Not Limited
- Less Than 0 - Not Rated

Other Parcel Limitations

- More Severe
- Less Severe
- Not Rated

Figure 19:
Public Owned Lands



Economic & Planning Systems, Inc. GDeS Architecture & Planning

Project Perimeter

Port of Anchorage

Military

Anchorage Airport

Alaska Railroad

Airfields

Anchorage Bowl Comprehensive Plan (Anchorage 2020) Goals

As a result of the merger between the MOA and the Greater Anchorage Borough, the MOA was created as a unified local government. In the MOA, two comprehensive plans identify long tem community goals and govern the land use decisions; The Anchorage 2020 Comprehensive Plan, and the Chugiak-Eagle River Comprehensive Plan.

The Anchorage 2020 Comprehensive Plan identifies goals for industrial development and retention and calls for properties strategically located with rail, port, and international airport access to be preserved for industrial uses. It articulates the community desire to maintain a strong and diversified industrial economic base, enhance the overall quality and character of industrial development sites, and to find resolution to conflicts between adjacent industrial and residential land uses.

The goals indicate that residential land should not be converted to industrial uses, and that mixed light industrial/commercial developments will exhibit compatible users, create pedestrian oriented amenities, and address safety issues between customers and freight movement.

The Chugiak-Eagle River Comprehensive Plan calls for ensuring an adequate supply of land in suitable locations for commercial and industrial development that is compatible with the community needs and resources. The plan calls for industrial land in these locations to be protected against non-industrial uses. It acknowledges the need for industrial lands to have access to adequate utilities and services, access to major transportation systems, and buffering from adjoining incompatible uses, and requires industrial development take into account potential impacts on other uses with regard to access, parking, utilities, aesthetics and environmental quality.

Overall, the comprehensive plans envision a built environment that sustains long-term economic growth and viability by promoting residential, commercial and industrial development. It aims for a diverse economy, capitalizing on Anchorage's regional, state, and global position, and of Anchorage's leadership opportunity in Alaska's resource development.

Circulation

The industrial road network in Anchorage has developed in a similar fashion to many mid-century industrial centers throughout the United States. Older districts have roads that were built for lighter, shorter vehicles and less intensive uses. Newer districts developed wider roads with the ability to withstand heavier loads and appropriate turning radii. This relationship of new and old road infrastructure is evident in all of the observed Subareas. As a follow up to the Freight Mobility Study for the Anchorage Metropolitan Area published in 2001, Anchorage is undertaking incremental improvements to the Freight Distribution System.

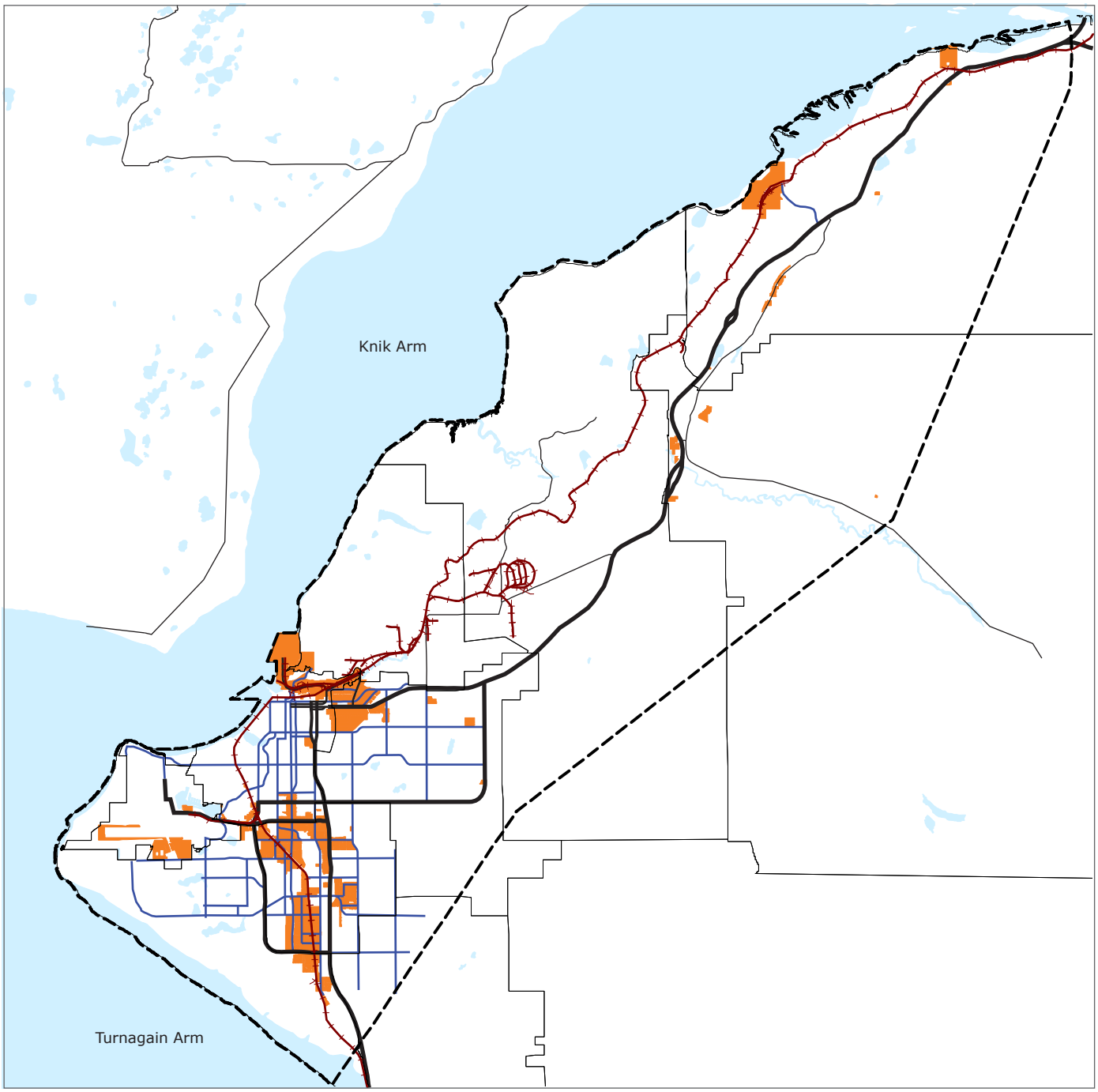
The regional circulation network in the bowl relies on two primary highway corridors, the Seward Highway, and the Old Glenn Highway. These primary double load routes serve the entire current industrial supply, including the port, the international airport, and the railroad industrial complex either directly, or through a series of industrial serving arterials. Three primary supporting double load routes, the International Airport Road connector, the Minnesota Drive/O'Malley Road loop, and the Tudor Road/Muldoon Road loop have been designated to increase the efficiency of goods movement and to minimize the conflicts of transitioning between the Seward Highway and the Old Glenn Highway in the downtown district.

Infrastructure

Infrastructure improvements in the Anchorage Bowl, based on available information, are available for industrial development both in terms of capacity and location. Areas needing infrastructure for development are typically charged for the improvements through a local improvement district. During interviews, development entities indicated reluctance on the part of some smaller landowners with low demand to enter into improvement districts and take on additional costs.

Two primary industrial development areas will need infrastructure improvements to support development. These include the large grouping of parcels at the southern end of the Central Subarea at C Street and King Street, as well as the Birchwood Airport industrial parcels in Chugiak-Eklutna. **Figure 20** below shows the circulation infrastructure system in Anchorage and the larger region.

Figure 20:
Anchorage Regional Circulation Infrastructure



Economic & Planning Systems, Inc.

GDeS Architecture & Planning

Alaska Railroad

Industrial Serving Arterials

Industrial Parcels in MOA

Primary Double Load Routes

Other Regional Roads

Project Perimeter

Industrial Typologies

In the four industrial classifications; Industrial Services/Assembly/Manufacturing, Warehouse Distribution, Miscellaneous Industrial, and Industrial Flex Space, several building construction types can be observed in Anchorage. These construction types are described below.

Warehouse/Supply

Throughout the bowl, and particularly in the Ship Creek area, there is evidence of both modern tilt-up concrete and high-bay metal building warehousing, some with dock-high loading bay. In addition, there appears to be a significant quantity of warehouse structures that are pre-1950s wood framed buildings and coated fabric industrial tents. These are typically stand alone buildings with ancillary office uses, although some also have fabrication facilities and exterior yard space.

Laydown and Storage Yard

Requiring little if any vertical improvements, laydown and storage yards throughout the bowl are characterized as both paved and unimproved yard space, typically fenced, with a variety other improvements ranging from old residential uses that have incorporated their remaining site for storage, small offices, and simple gate houses.

Storage

This typology is directed primarily at both single and multi-story self-storage buildings and yards which are classified as an industrial use, but primarily serve the commercial and residential population as personally accessed storage. The buildings are primarily metal, although some are hybrids with concrete masonry and metal. Many of these facilities also have yard space for vehicle storage.

Manufacturing and Fabrication

Although there is not an extensive supply of manufacturing and fabrication facilities in the bowl, those that do exist vary widely in size of the facility, the amount of building to yard space, and the construction type. Observations indicate that many of these facilities are in older buildings and that many have undergone incremental growth over the years as demand increased.

Mixed-Use

This typology is characterized by buildings that contain both industrial and commercial uses. This can either be retail sales out of a warehouse type configuration or in many cases, commercial offices such as engineering companies that also have equipment repair, small fabrication, or storage needs. In many observed cases, multi-tenant buildings housed both industrial and commercial tenants.

Characterization of Industrial Supply

Table 14 provides a breakdown, by Subarea, of currently undeveloped and underutilized industrial land based on GIS/CAMA data. In general, industrial land was identified as redevelopable or underutilized if (a) the parcel was industrially zoned but accommodated a very-low-density residential use, a residential use with a very-low assessed value, or a very-low FAR; or (b) the parcel is zoned commercial but has a commercial or industrial use associated with a very-low assessed value or FAR.[18]

As shown, the Central Subarea of the Anchorage Bowl has by far the largest share of land supply at nearly 60 percent of the Study Area. This land is roughly evenly divided between vacant and underutilized parcels. Other subareas with significant available land supply include Chugiak/Eklutna with 12.5 percent of the region's total, and the Northeast Subarea with just over 10 percent of the region's total vacant and underutilized land supply. Overall, more than 800 acres are defined as undeveloped throughout the MOA. In addition, more than 660 acres of I-1 and I-2 land have been identified as potentially underutilized and redevelopable. As identified in **Table 1**, some 370 acres of the undeveloped land have been identified to have severe or very severe soil limitations.[19] Conversely, parcels identified with redevelopment potential are subject to additional development constraints including contamination, small parcel sizes, encroachment of non-industrial uses, and inadequate infrastructure.

[18] Although a very general description of redevelopable and underutilized industrial is provided here, a very complex and specific methodology was used to classify these parcels. A more detailed technical description of categories of industrial land supply is found in **Appendix B**.

[19] United States Department of Agriculture: "Soil Survey of Anchorage Alaska."

Table 14
Anchorage Bowl Industrial Land Assessment
Summary of Industrial Land Supply in MOA [1]

District	Currently Undeveloped		Underutilized/ Redevelopable		Total	
	Acres	% of Total	Acres	% of Total	Acres	% of Total
Anchorage Bowl						
Northwest	31.0	3.9%	36.3	5.5%	67.3	4.6%
Northeast	70.8	8.8%	76.5	11.6%	147.3	10.1%
Central	458.1	57.2%	411.8	62.2%	869.9	59.5%
Southeast	0.0	0.0%	0.0	0.0%	0.0	0.0%
Southwest	38.3	4.8%	98.2	14.8%	136.5	9.3%
Subtotal Anchorage Bowl	**598.2**	**74.7%**	**622.8**	**94.0%**	**1,221.1**	**83.5%**
Other Areas						
Chugiak/ Eklutna	153.8	19.2%	29.0	4.4%	182.8	12.5%
Eagle River	48.7	6.1%	10.6	1.6%	59.3	4.1%
Subtotal Other Areas	**202.5**	**25.3%**	**39.6**	**6.0%**	**242.1**	**16.5%**
Total	**800.7**	**100.0%**	**662.4**	**100.0%**	**1,463.1**	**100.0%**

"supply_summ"

[1] Does not include publicly-owned land.

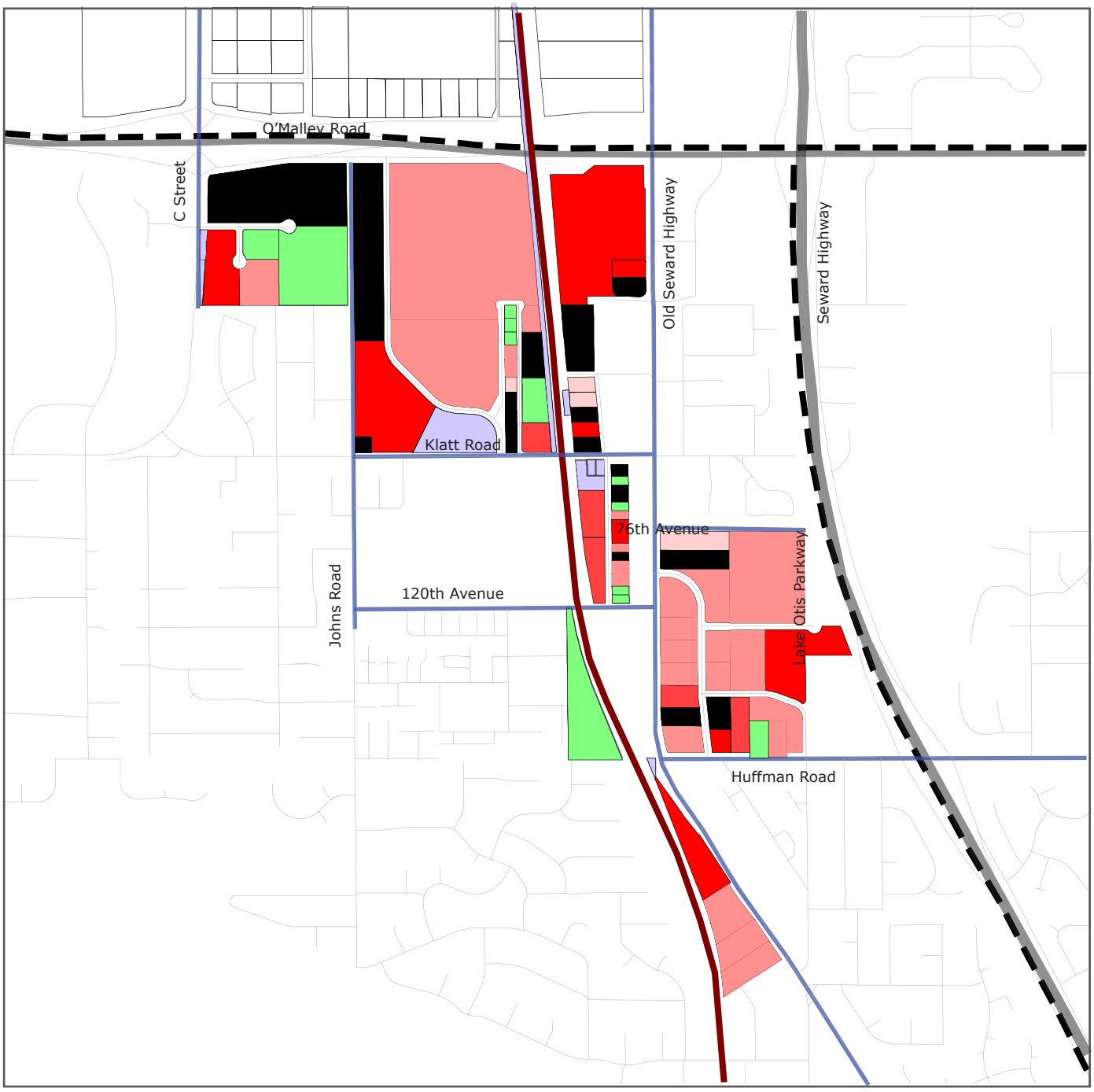
Specific Industrial Subareas

Southwest (38.3 acres vacant, 98.2 acres underutilized)

The primary industrial parcels in the Southwest Anchorage Subarea are in an I-2 cluster west of the rail line and an I-1 cluster stretching from O'Malley Road south along Old Seward Highway. The I-2 cluster is almost entirely occupied by the Alaska Aggregate Company warehouse and storage yard. The I-1 cluster is primarily retail uses adjacent to O'Malley Road—a combination of light industrial uses, with some retail mixed in just north of Huffman Road, and a strip of light industrial uses south of Huffman Road.

Unimproved supply is contained in a series of parcels along O'Malley Road and a series of small parcels accessed by South Gambell Street.

Figure 21: Southwest Subarea
Vacant and Developed Industrial Parcels 1942-2008



Economic & Planning Systems, Inc. GDeS Architecture & Planning

Subarea Perimeter

Railroad

Primary Double Load Routes

Industrial Serving Arterials

Parcel Legend

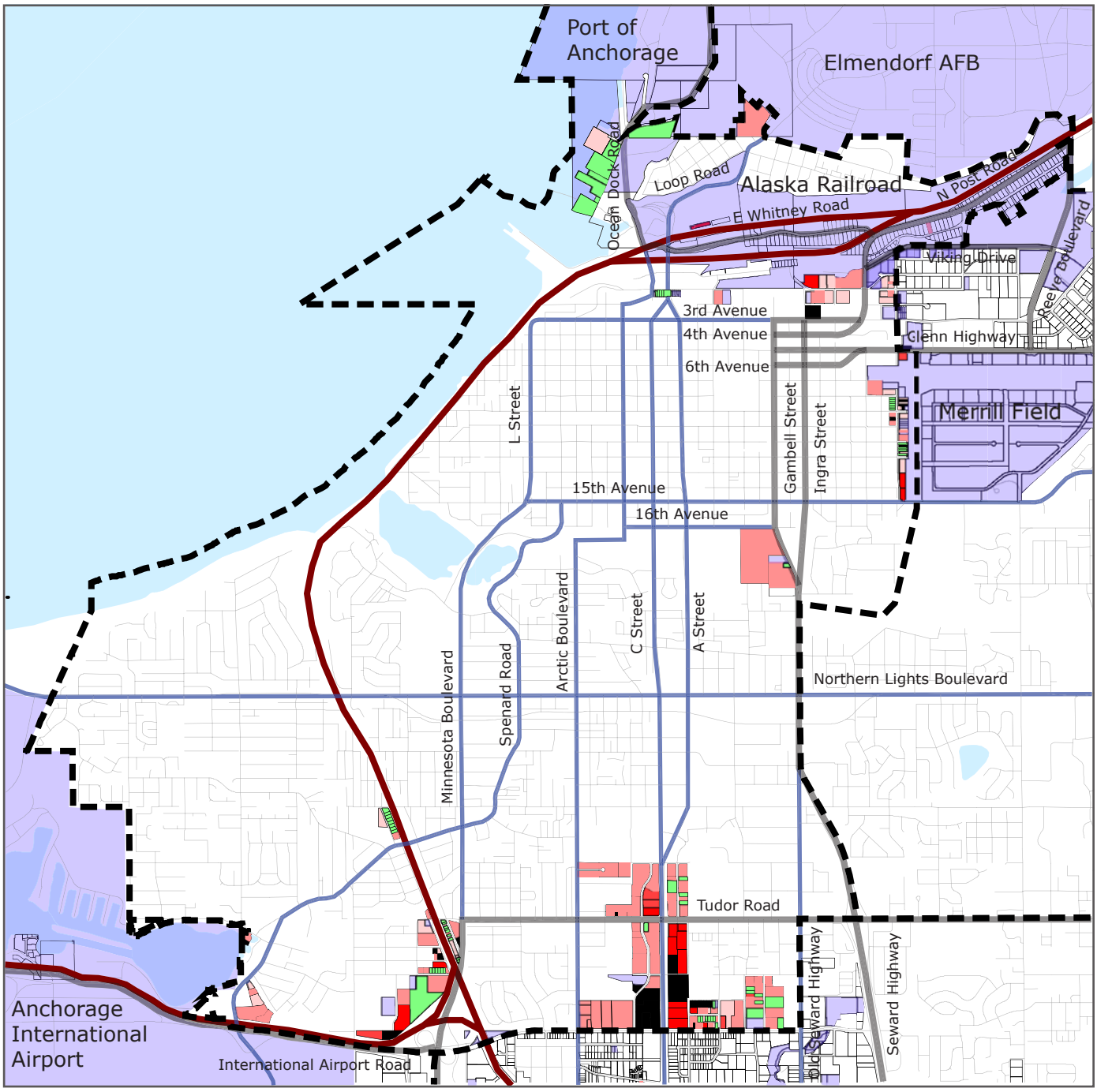
- Vacant Parcels
- Developed 1942-1970
- Developed 1970-1989
- Developed 1990-1999
- Developed 2000-2008
- Developed-Undated
- Public or Unsuitable

Northwest (31 acres vacant, 36.3 acres underutilized)

This area, exclusive of the International Airport, the Port of Anchorage, and the Rail Yard, has its highest concentration of industrial supply in the I-1 zone along the C Street corridor between West International Airport Road and West 40th Avenue, and stretching east along West International Airport Road to the Old Seward Highway. Most of the parcels are medium to small in size and many of the parcels south of Tudor Road have been developed for commercial uses. A second cluster of I-1 development occurs west of Minnesota Drive between West International Airport Road and West Tudor Road, yet it is surrounded on three sides by single-family residential uses. One additional cluster is at the far North of the Subarea, between East 3rd and 1st Avenues and Ingra Street and Nelchina Street. Other minor pockets are located adjacent to Spenard Lake, at 36th Avenue and Lois Drive, and at Gambell Street and East 16th Avenue. For the most part, these areas have been developed for industrial uses with the exception of a large parcel at Gambell Street which is commercial.

The only significant unimproved supply is composed of a series of parcels along C Street between International Airport Road and 40th Avenue.

Figure 22: Northwest Subarea
Vacant and Developed Industrial Parcels 1942-2008



Economic & Planning Systems, Inc. GDeS Architecture & Planning

Subarea Perimeter

Railroad

Primary Double Load Routes

Industrial Serving Arterials

Parcel Legend

- Vacant Parcels
- Developed 1942-1970
- Developed 1970-1989
- Developed 1989-1999
- Developed 2000-2008
- Developed-Undated
- Public or Unsuitable

Southeast

There are no I-1 or I-2 zones in the Southeast predominantly residentially developed Subarea, nor is there evidence of previous industrial development.

Central (458.1 acres vacant, 411.8 acres underutilized)

The Central Subarea has the highest concentration of industrially zoned land and development in the MOA. Stretching from Minnesota Drive east to Lake Otis Parkway, and from 40th Avenue south to O'Malley Road, the subarea consists of three primary clusters.

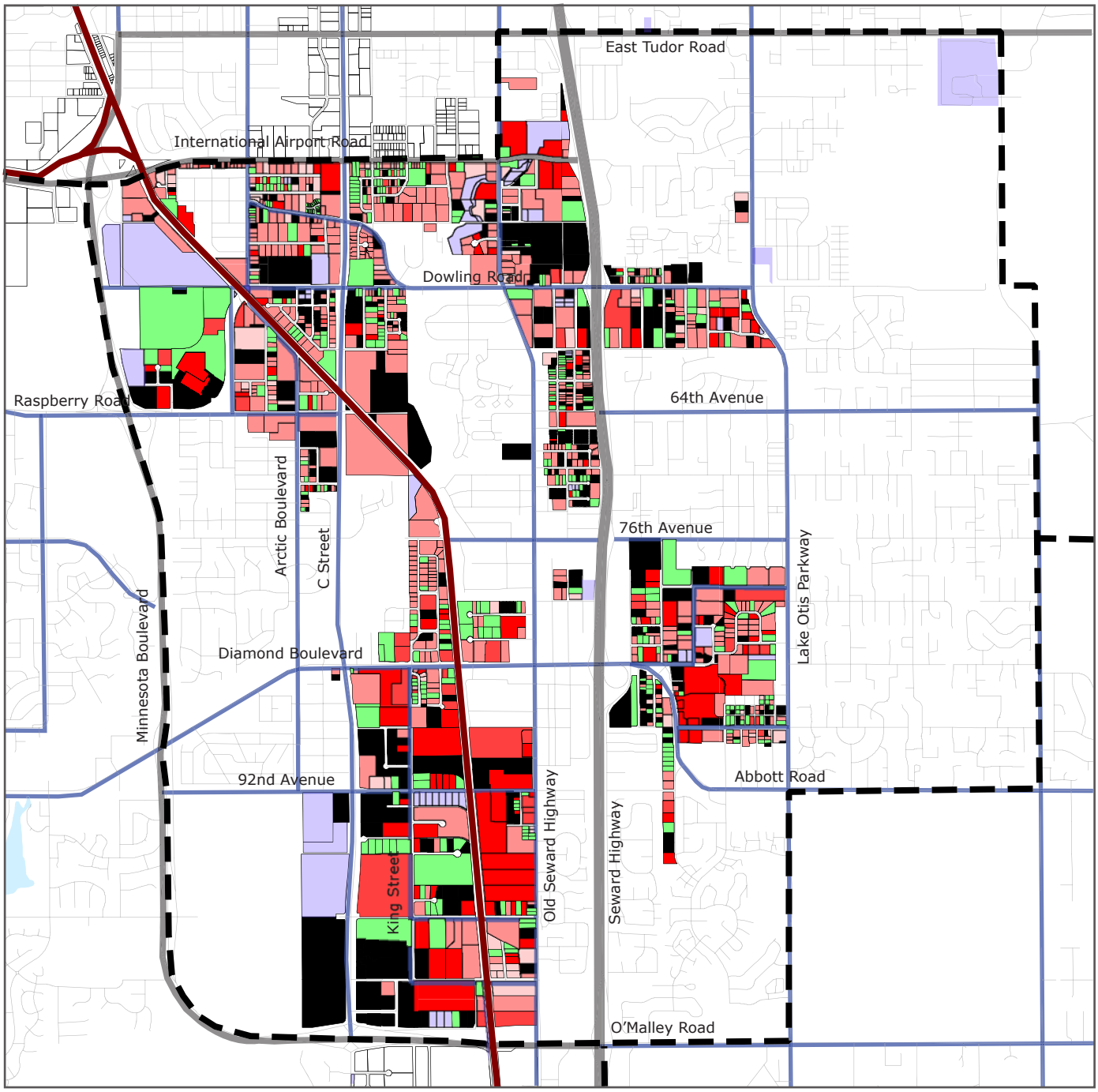
Winding between Northwood Drive to the west and Lake Otis Parkway to the east, and extending north to Tudor Road and south to West 71st Avenue more than 1,100 acres of I-1 land, with a small cluster of I-2 land, represents the largest industrial land zone in the Central Subarea. The pattern of industrial development takes advantage of the major arterials of International Airport Road, C Street, Dowling Road, and the Old Seward Highway, as well as the rail corridor. Exhibiting an wide variety of industrial and non industrial uses throughout the I-1 zone, the area includes warehouse, laydown yard, storage, fabrication, and other light industrial uses, mixed with uses including office, commercial, retail, religious and park. Parcel sizes also vary widely form 10s of acres to 7,500 square feet. And while there appear to be many multi parcel assemblies developed, there are also a significant number of single small parcel developments, many developed along with the major infrastructure projects; International Airport Road and completion of the Old Seward Highway before 1960. Undeveloped land in the cluster includes numerous small infill parcels and several larger parcel assemblies.

A second linear concentration of industrial land spans the rail corridor north to south from West 68th Avenue to O'Malley Road, and east to west from C Street to the Old Seward Highway. The more than 900 acres of I-1 and I-2 land contain much of Anchorages most recent, and largest parcel industrial development, as well as many of the remaining undeveloped large parcels. The I-2 area between West 92nd Avenue and O'Malley Road is approximately 430 acres. Numerous large industrial users have developed the area with both building and yard intensive operations including produce distribution and construction supplies. A large concentration of undeveloped parcels, particularly in the Southwest corner of the zone is inhibited by soils issues. Recent 30-acre and larger retail development and proposals have greatly reduced the amount of available, undeveloped land. Much of the more than 300 acres in the I-1 below West Dimond Boulevard have been developed as warehouse retail and vehicle sales, in particular the parcels fronting the Old Seward Highway, and West Dimond Boulevard. Data on the small quantity of remaining undeveloped parcels indicate significant soil constraints. Above West Dimond Boulevard is an assembly of smaller I-1 parcels exhibiting well-established light industrial uses along both King and Schoon Streets and extending north to West 76th Avenue. At the junction of West 68th Avenue and C Street is a concrete batch plant with direct rail access on nearly 40 acres of I-2 land. An additional 20-acre 1-2 parcel to the south is also developed.

The third is a 275 acre compact industrial cluster with approximate boundaries at East 76th Avenue to the North, East 88th Avenue to the south, Sandlewood Place to the west and Lake Otis Parkway to the East. The I-2 zoning for the cluster comprises nearly 90 acres; however, almost 30 acres are developed as a retail center. The remaining I-2 industrial development consists of a high utilization node at the Cinnebar Loop, and a combination of construction supply, auto salvage and warehouse uses along East 79th Avenue. In the I-1 zoning, development varies

widely from undeveloped storage yards to well established industrial suppliers and fabricators. This area reveals numerous small parcels both used in combination with larger adjacent parcels and individually developed. A significant number of parcels recognized as undeveloped are on examination being used as vehicle, container, or equipment storage yards.

Figure 23: Central Subarea
Vacant and Developed Industrial Parcels 1942-2008



Economic & Planning Systems, Inc. GDeS Architecture & Planning

Subarea Perimeter

Railroad

Primary Double Load Routes

Industrial Serving Arterials

Parcel Legend

- Vacant Parcels
- Developed 1942-1970
- Developed 1970-1989
- Developed 1990-1999
- Developed 2000-2008
- Developed-Undated
- Public or Unsuitable

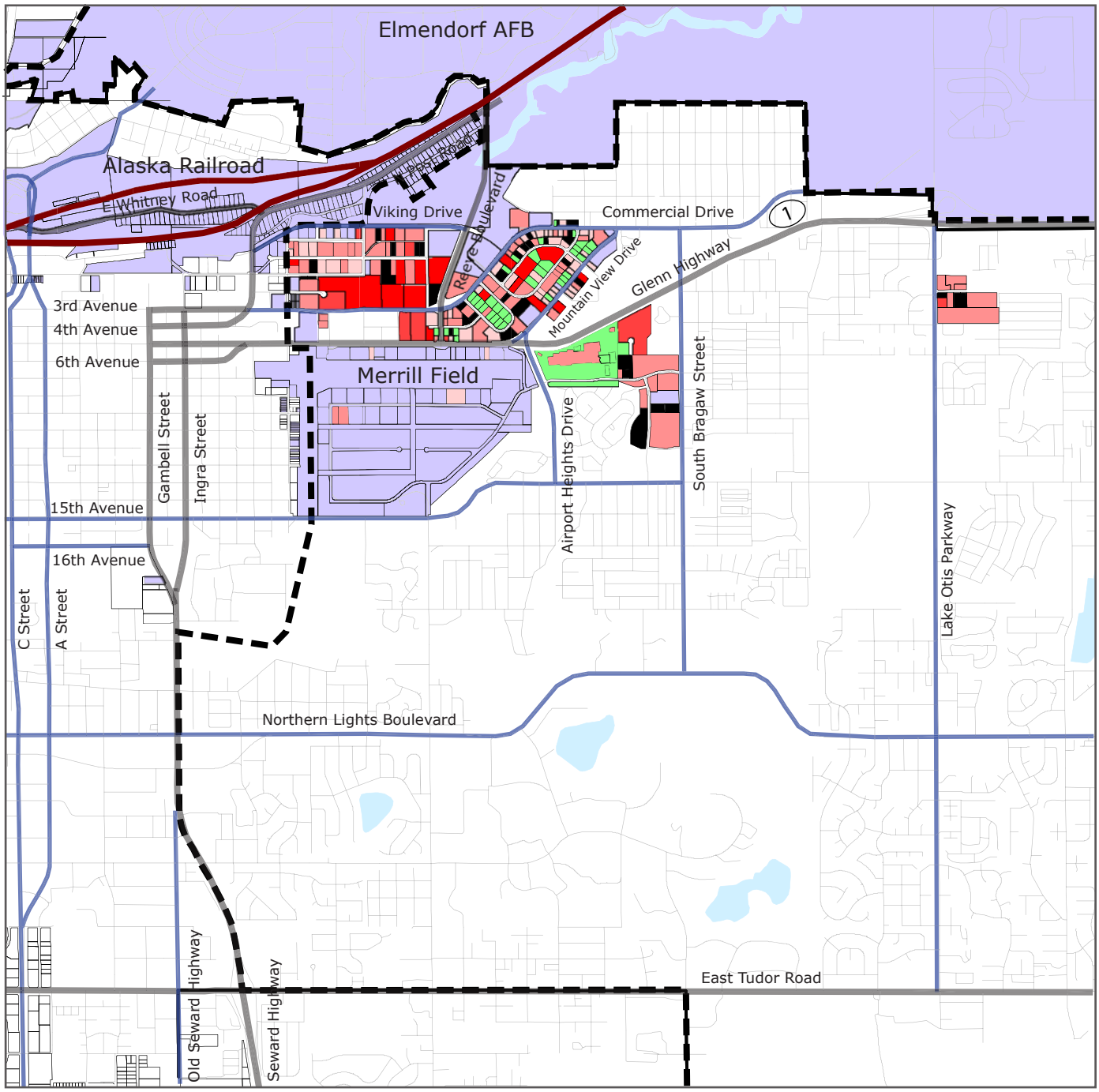
Northeast (70.8 acres vacant, 76.5 acres underutilized)

The Northeast Subarea contains some of the oldest industrial development with the highest site utilization in the area of Ship Creek. Adjacent to the rail yard, the I-2 area bounded on the South by East 3rd Avenue, the North by Viking Drive, the West by Orca Street, and the West by Reeve Boulevard, supports more than 120 acres of industrial development. Uses include storage and distributors, contractors and fabricators, auto salvage, and truck transport facilities. There are few undeveloped parcels; however, several are used solely for yard storage.

East of the I-2 zone is a nearly 200 acre I-1 cluster bounded by Reeve Boulevard on the West, Mountain View Drive on the East, Commercial Drive on the North, and the Glenn Highway on the South. This area also supports contractors, fabricators, and numerous logistics operators, as well as an alternative school. Along the Glenn Highway, vehicle sales and other retail uses are predominant.

Merrill Field is zoned I-1 and encompasses more than 320 acres of land area, though this acreage is not tabulated in the estimated supply because of its public ownership. To the immediate west of the field some small aviation related uses and older residences occupy I-1 land. A small I-1 cluster East of Merrill Field has been predominantly developed as commercial/retail with some warehouse uses, and another I-1 area at East 4th Avenue and Bonface Parkway is fully developed with low site utilization and it is entirely surrounded by residential uses.

Figure 24: Northeast Subarea
Vacant and Developed Industrial Parcels 1942-2008



Economic & Planning Systems, Inc. GDeS Architecture & Planning

Subarea Perimeter

Railroad

Primary Double Load Routes

Industrial Serving Arterials

Parcel Legend

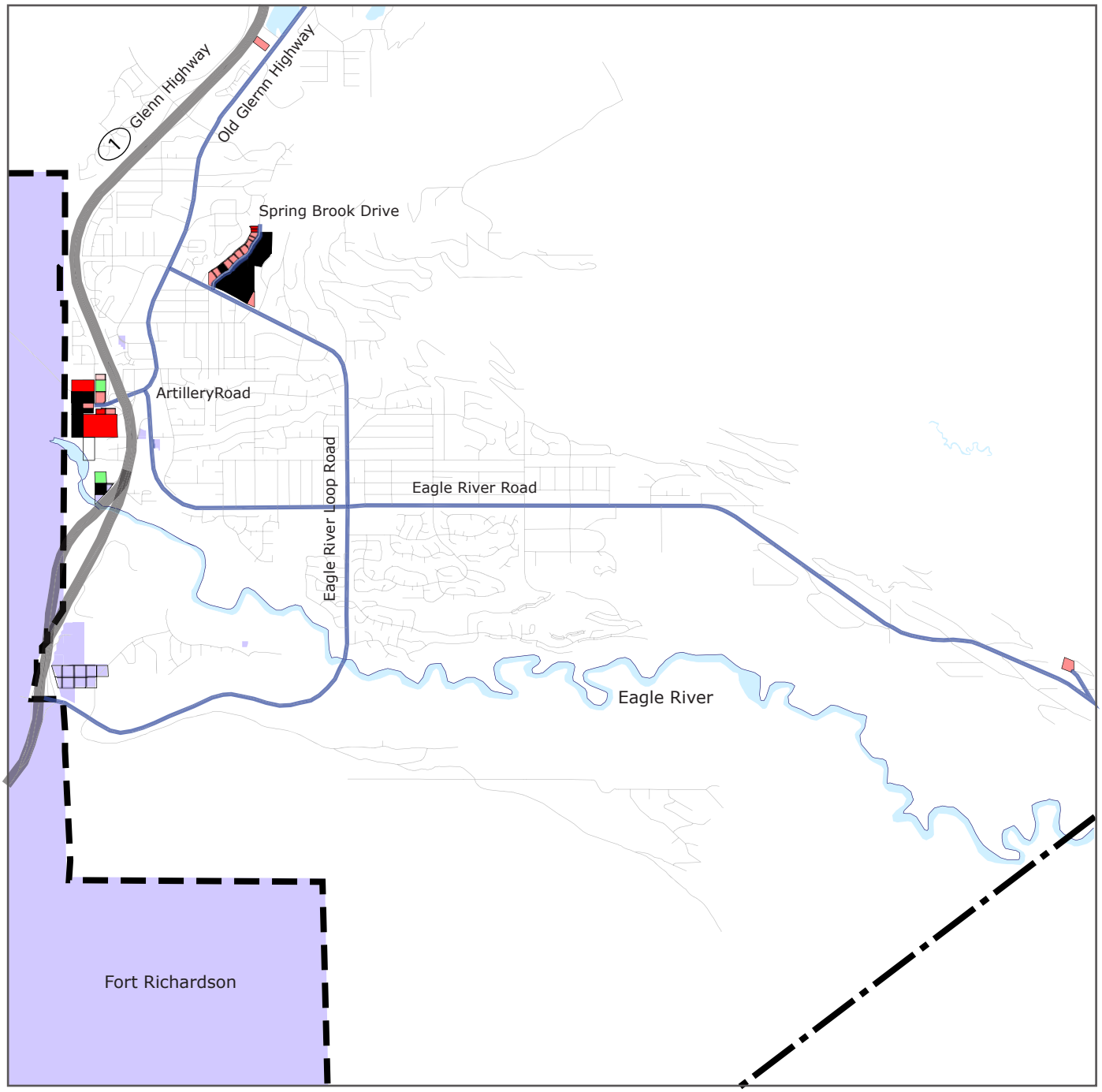
- Vacant Parcels
- Developed 1942-1970
- Developed 1970-1989
- Developed 1990-1999
- Developed 2000-2008
- Developed-Undated
- Public or Unsuitable

Eagle River (48.7 acres vacant, 10.6 acres underutilized)

There are few areas zoned for I-1 and I-2 in the predominantly residential and commercial community of Eagle River. Three primary industrial clusters provide locally-serving industrial facilities, and some parcels contain highway ramps. On the west side of the Glenn Highway at Artillery Road and just north of Eagle River, several I-1 parcels are located in two clusters. Some of these parcels demonstrate high utilization while others are either vacant or show very low utilization. Finally, a small cluster of I-1 developed industrial uses lines the relatively flat western side of Spring Brook Drive, while the I-1 and I-2 parcels on the steeper east side remain vacant, with the exception on one small parcel that has non-industrial development.

Vacant industrial land and historical industrial development patterns in the Eagle River Subarea are shown in **Figure 25**.

Figure 25: Eagle River Subarea
Vacant and Developed Industrial Parcels 1942-2008



Economic & Planning Systems, Inc. GDeS Architecture & Planning

Subarea Perimeter

Railroad

Primary Double Load Routes

Industrial Serving Arterials

Parcel Legend

- Vacant Parcels
- Developed 1942-1970
- Developed 1971-1989
- Developed 1990-1999
- Developed 2000-2008
- Developed-Undated
- Public or Unsuitable

Chugiak—Eklutna (153.8 acres vacant, 29 acres underutilized)

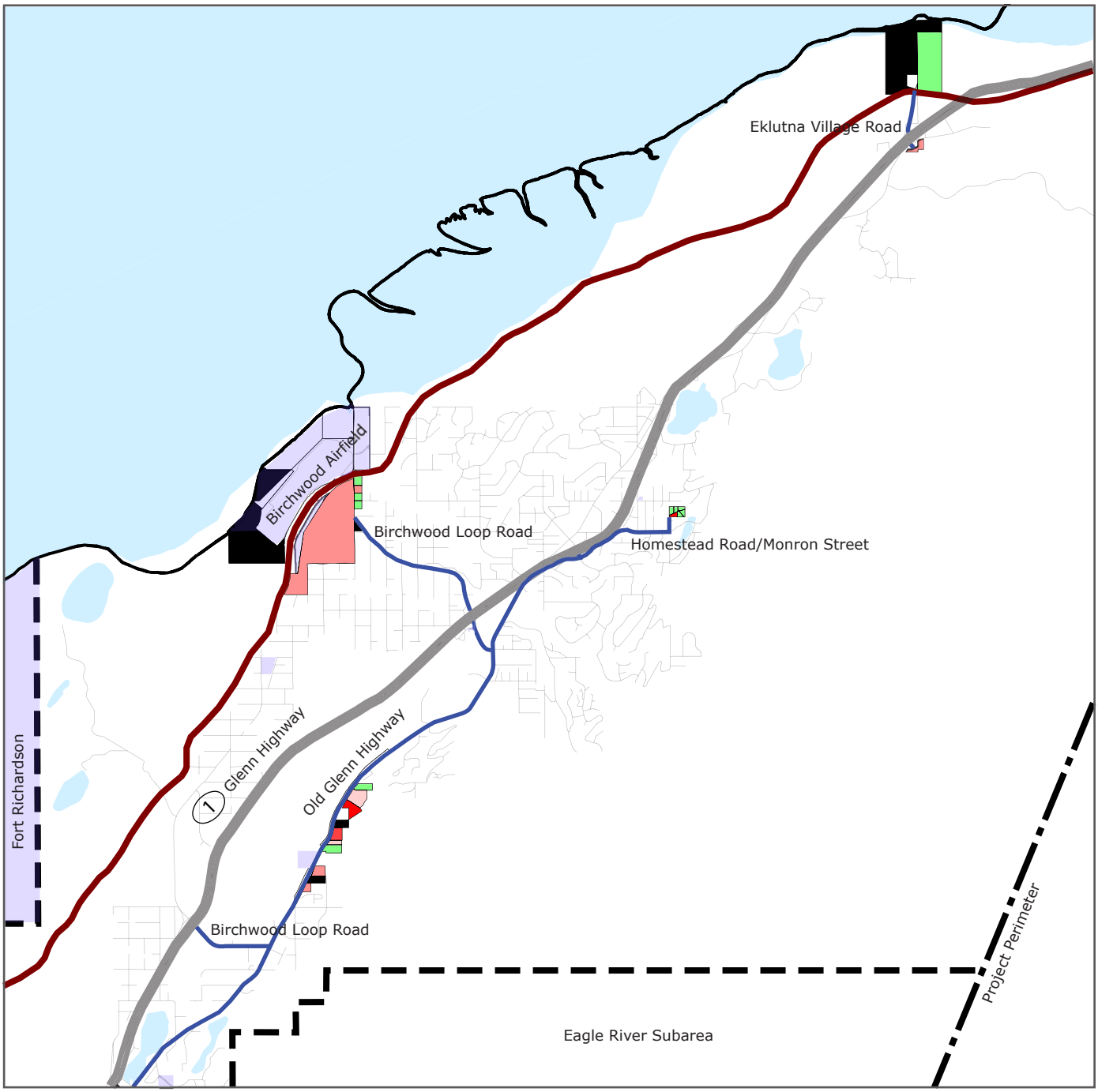
The Chugiak-Eklutna Subarea includes both established industrial development and numerous vacant I-1, I-2, and I-3 parcels. Along Old Glenn Highway, it is difficult to determine the extent of the industrial supply, and several parcels appear to have been developed before current zoning. From Birchwood Loop Road, North to Jewel Street, the Old Glenn Highway contains multiple I-1 and I-2 parcels developed as auto dismantlers, vehicle storage, and a major sand operation. Further north off Monron Street a cluster of I-1 parcels has been developed. At the intersection of Old Glenn Highway and Eklutna Lake Road, are two I-1 parcels. One has a low utilization development and the other incorporates the road and highway overpass and ramps. A large tract of undeveloped I-2 parcels with rail access is located at the North end of Eklutna Village Road. In addition, a single I-1 parcel is developed off Old Glenn Highway below Lower Fire Creek.

The most significant cluster of I-1 and I-2 parcels in the Subarea are located adjacent to Birchwood Airport. The I-2 land is undeveloped with the exception of an approximately 10 acre construction supply company. In the I-1 parcels, only one is developed. The area is being planned for extraction of 3.5 million cubic feet of gravel over the next 3 to 4 years, followed by industrial development.

A large tract of undeveloped I-2 parcels with rail access is located at the North end of Eklutna Village Road, however, these parcels are located on a geologic granite formation that is highly valued by the Eklutna tribe and may not be appropriate for development.

Vacant industrial land and historical industrial development patterns in the Chugiak—Eklutna Subarea are shown in **Figure 26**.

Figure 26: Chugiak-Eklutna Subarea
Vacant and Developed Industrial Parcels 1942-2008



Economic & Planning Systems, Inc. GDeS Architecture & Planning

Subarea Perimeter

Railroad

Primary Double Load Routes

Industrial Serving Arterials

Parcel Legend
Vacant Parcels
Developed 1942-1970
Developed 1971-1989
Developed 1989-1999
Developed 2000-2008
Developed-Undated
Public or Unsuitable

Airport (Public ownership)

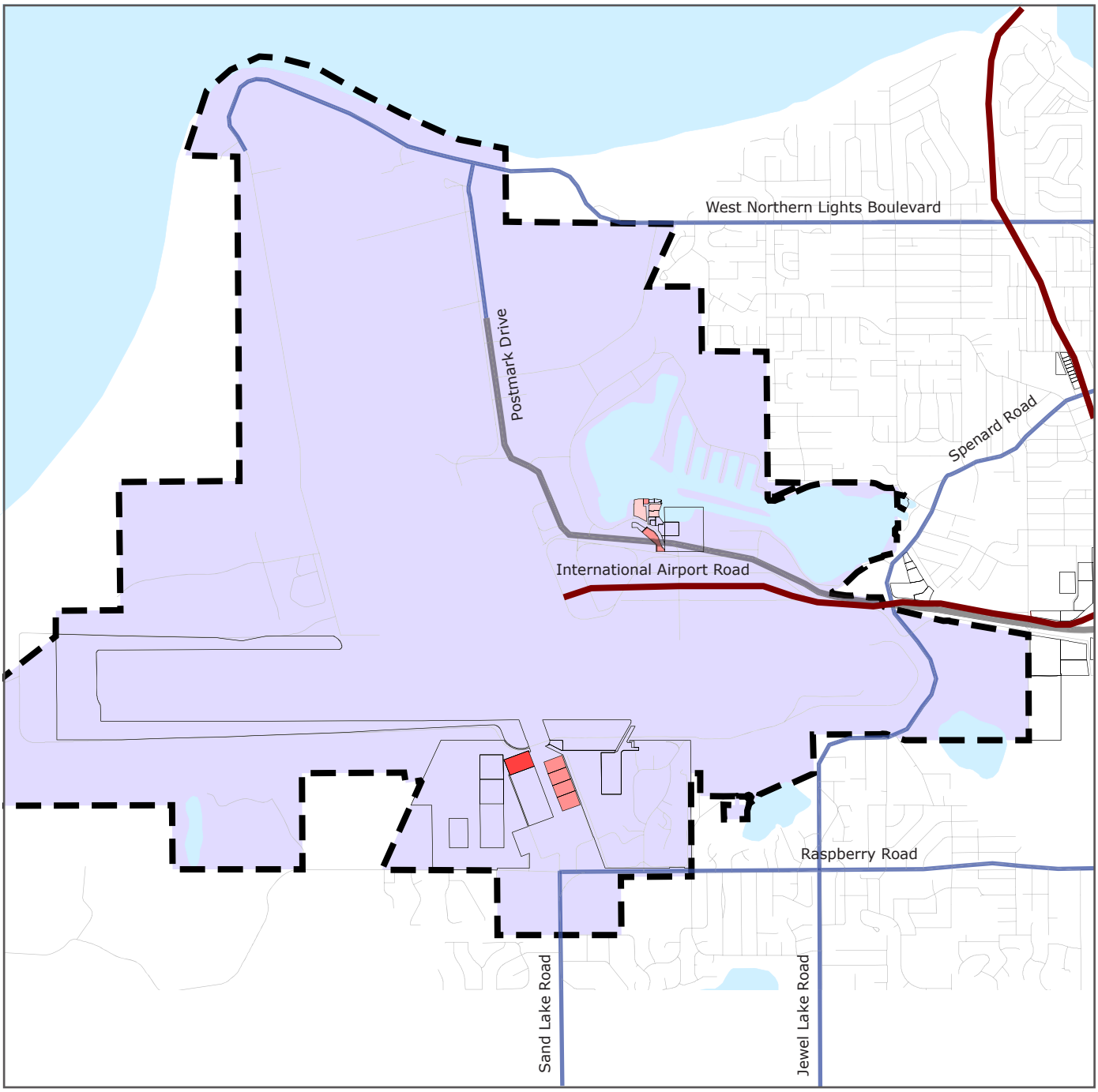
Industrial development at the Anchorage International Airport is primarily warehouse and cold storage with ancillary maintenance and office uses. Draft Chapter One of the Airport Master Plan Update indicates that in the North Airpark, 148 acres support just under 950,000 square feet of building area. The low .15 site utilization factor is in large part because of the 32 aircraft parking positions, apron area and load docks. In the East Airpark, approximately 47 acres support just over 250,000 square feet of building area with 11 aircraft parking positions as well as apron area and loading docks. The South Airpark is 8.7 acres and includes apron area, loading docks, and 35,000 square feet of building.[20]

Although no significant undeveloped supply is available at the Airport, the draft Master Plan is considering potential expansion of the North Airpark by 39 acres, the East Airpark by 40 acres, the South Airpark by up to 130 acres including the Kulis Air National Guard Base land, and the creation of a West Airpark of up to 200 acres. Issues associated with feasibility of this expansion are economic, soil quality, environmental, and neighborhood compatibility and the fact that any land use development in areas formally identified as airpark is restricted to aviation-related uses. In addition, future industrial development in the airport lands will be restricted to ground lease opportunities.

Vacant and developed industrial parcels in the Airport Subarea are shown in **Figure 27**.

[20] The acreage, building supply, and other data for this section are provided by an HNTB analysis for the Anchorage International Airport Master Plan, Chapter One: Inventory of Existing Conditions Draft.

Figure 27: Airport Subarea
Vacant and Developed Industrial Parcels 1942-2008



Economic & Planning Systems, Inc. GDeS Architecture & Planning

Subarea Perimeter

Railroad

Primary Double Load Routes

Industrial Serving Arterials

Parcel Legend

- Vacant Parcels
- Developed 1942-1970
- Developed 1971-1989
- Developed 1990-1999
- Developed 2000-2008
- Developed-Undated
- Public or Unsuitable

Port (Public ownership)

The Port of Anchorage currently holds approximately 129 acres of land for industrial uses adjacent to the pile supported dock, and has leased an additional 150 feet of land depth along its Eastern boundary from Elmendorf Air Force Base to move the terminal road and extend rail as part of the Ports ongoing expansion program. To support the movement of both military and civilian goods, fuel, industrial supplies, and raw materials, the expansion is planned to add approximately 135 acres of filled earth dock to replace the existing pile dock. The addition of 3 new 100-gauge cranes with 7 truck lanes will significantly increase the Ports capacity and ability to support Panamex ship draft. The existing Port intermodal yard will continue as a primary logistics depot for the State, and there appears to be little opportunity for leased industrial expansion on site. Along with enhancing its strategic military facilities, and expanding its capabilities to serve its vital goods movement mission to the entire State, the Port expansion is preparing to accommodate the demands of major infrastructure construction projects, and create important barge capacity.

Railroad (Public ownership)

The Alaska Railroad Corporation Terminal Reserve in Anchorage is about 600 acres, approximately half of which is used for rail activities, and half leased or rented to industrial users in I-1 and I-2 zoning. In addition, there are about 108 acres outside the reserve area of I-2 land that span both the Northwest and Northeast Subareas. As Anchorage's oldest industrial district, the Alaska Railroad Corporation industrial land has many structures that are either being rehabilitated or replaced. The largest percentages of users are logistics companies, moving companies, and auto companies. Pipe coating facilities are also located here. Because of the large number of small parcels, many users have operations that stretch across multiple parcels. Larger parcels are located between Viking Drive and East 3rd Avenue support additional logistics operators. Although this area offers strategic advantages near both rail and port operations, redevelopment opportunities may be limited because of the fact that the land can only be leased.

6. COMPARISON OF INDUSTRIAL SUPPLY AND DEMAND

The ILA described in this report is the culmination of a thorough evaluation of the demand for industrial land in Anchorage and a comparison of this demand to the industrial land supply, both in absolute, quantitative terms, as well as through a qualitative assessment of supply attributes.

Table 15 summarizes the comparison of industrial land demand and supply from 2010 to 2030. As shown, the EPS Team has predicted that approximately 600 acres of developable industrial land of various types will be required by 2030, assuming a reasonable rate of employment growth (Base Scenario). If an enhanced rate of employment growth occurs in Anchorage, this acreage requirement could be as high as 900 acres (High Growth Scenario). Because industrial land markets never truly reach equilibrium, a 20-percent overage has been applied to these figures in order to model an efficient market for industrial land. Although this factor could be higher or lower, 20-percent is considered a reasonable overage for purposes of this analysis. Therefore the true total of industrial land demand estimated in this report ranges from 720 to 1,080 acres.

Table 15 shows the undeveloped supply of industrial land in the Study Area. As shown, the EPS Team has estimated that approximately 800 acres of total undeveloped industrial land exists in the Study Area, of which approximately 600 acres are in the Anchorage Bowl, and the remaining 200 acres are in Chugiak-Eklutna and Eagle River. Therefore, if all undeveloped industrial land in the Anchorage Bowl were developed, an additional 115 to 475 acres of industrial land would still be required. If industrial development also occurred in Chugiak-Eklutna and Eagle River, the land demand is likely to be satisfied under the Base Growth scenario (with an excess of approximately 80 acres), but would fall short under the High Growth Scenario and require an additional 280 acres.

Although approximately 800 acres of vacant industrial land exists in the Study Area, much of this land has known soil conditions, which could impede the ability for this land to be feasibly developed. If this land is excluded from the vacant industrial land supply, a significant deficit (approximately 290 to 650 acres) is projected relative to demand over the next 20 years. In addition to parcels with known soil conditions, many vacant industrial parcels have other issues including size, parcel configuration, poor access to infrastructure, and adjacencies to incompatible uses. Parcels with these and other such issues further lessen the pool of land which could be used to satisfy demand for industrial.

The EPS Team has also evaluated the potential to redevelop some currently occupied industrial land in order to accommodate demand. As shown, the EPS Team has identified approximately 662 acres of underutilized industrial land throughout the MOA (see **Appendix B**). However, it is not realistic to assume that all of this land will be redeveloped, since this process is difficult, time-consuming, and expensive. **Table 15** shows the impact on the overall supply and demand balance under two development scenarios. As shown, if 50 percent of this land were to be redeveloped, there would be an overall surplus of 42 acres under the Base Growth Scenario, but a shortfall of 318 acres under the High Growth Scenario. If only 25 percent of this land were redeveloped, there would be a shortfall of 124 industrial acres under the Base Scenario, and a shortfall of 485 under the High Growth Scenario.

Table 15
Anchorage Bowl Industrial Land Assessment
Summary of Supply and Demand of Industrial Land: 2010 - 2030

Item	Formula	Base Scenario	High Growth Scenario [1]
Land Demand			
Estimated Demand [2]	a	600	900
Land Demand "Buffer" [3]	b = a * 20%	120	180
Total Land Demand	**c = a + b**	**720**	**1,080**
Undeveloped Land Supply			
Anchorage Bowl	d	598	598
Subtotal Surplus/ (Deficit) in Anchorage Bowl	**e = d - c**	**(115)**	**(475)**
Eklutna/ Other	f	203	203
Total Undeveloped Supply including Eklutna	**g = f + d**	**801**	**801**
Surplus/ (Deficit) including Eklutna	**h = g - c**	**81**	**(279)**
Less Acreage with Soil Limitations [4]	i	(370)	(370)
Subtotal Undeveloped Land Supply W/O Soil Limitations	**j = g - i**	**431**	**431**
Subtotal Surplus/ (Deficit)	**k = j - c**	**(289)**	**(649)**
Underutilized Acres (Potential Additional Supply) [5]	l	662	662
50% of Underutilized Acres	*m = l * 50%*	*331*	*331*
25% of Underutilized Acres	*n = l * 25%*	*166*	*166*
Subtotal Surplus/ (Deficit)	**o = k + l**	**373**	**13**
Assuming 50% of Underutilized Acres are Redeveloped	*p = k + m*	**42**	**(318)**
Assuming 25% of Underutilized Acres are Redeveloped	*q = k + n*	**(124)**	**(484)**

"supply_demand"

[1] High Growth Scenario is based on 1.7% average annual growth in employment. The Base Scenario is based on 1.2% average annual growth.
[2] Estimated land demand calculated in **Chapter 4** of this report.
[3] A 20% overage has been assigned to projected demand in order to simulate an efficient industrial market.
[4] Includes parcels with soil limitation ratings of 0.26 or higher, which are defined as by the U.S. Dept. of Agriculture's "Soil Survey of Anchorage, Alaska." The soil limitations associated with these parcels are considered "Severe" or "Very Severe." See **Appendix B** for more information.
[5] See **Chapter 5** and **Appendix B** for a detailed discussion of underutilized acreage.

Although not included in **Table 15**, this analysis also recognizes that a large portion of industrial land demand may be satisfied on various publicly owned lands throughout the MOA, such as those controlled by the Port, Airport, Railroad, and the University of Alaska. It is highly recommended that the MOA and AEDC maintain discussions with public landowners to ensure that these valuable land assets are utilized properly and efficiently with respect to industrial land use.

APPENDICES:

Appendix A: Industrial Land Demand Backup Calculations

Appendix B: Industrial Land Inventory and Supply Estimates—Technical Background

Appendix C: Woods and Poole Economics, Inc., Projection Methodology

APPENDIX A:

Industrial Land Demand Backup Calculations

Table A-1
Anchorage Bowl Industrial Land Assessment
Discounted Employment by Industry and Building Space Factors

Land Use Category	Mining	Construction	Manufacturing	Trans & Pub. Utlilties	Wholesale Trade	Retail Trade	FIRE	Services	Government
GENERALLY-APPLIED CATEGORIES									
Industrial Uses									
R&D/Flex Space	0.7%	1.4%	2.1%	0.6%	1.9%	0.5%	0.6%	0.7%	0.3%
Light Manufacturing	13.3%	26.7%	50.3%	22.2%	36.9%	6.8%	4.9%	9.4%	5.6%
Misc. Industrial	5.8%	1.8%	1.4%	2.4%	1.5%	0.4%	0.4%	0.4%	0.5%
Heavy Manufacturing	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Warehouse	0.9%	1.0%	4.8%	4.8%	5.0%	0.8%	0.2%	0.5%	0.3%
	20.7%	**30.9%**	**58.9%**	**30.0%**	**45.3%**	**8.5%**	**6.1%**	**11.0%**	**6.7%**
ANCHORAGE-ADJUSTED VALUES [1]									
R&D/Flex Space	0.5%	1.1%	1.6%	0.5%	1.4%	0.4%	0.5%	0.5%	0.2%
Light Manufacturing	10.0%	20.0%	37.7%	16.7%	27.7%	5.1%	3.7%	7.1%	4.2%
Misc. Industrial	4.4%	1.4%	1.1%	1.8%	1.1%	0.3%	0.3%	0.3%	0.4%
Heavy Manufacturing	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Warehouse	0.7%	0.8%	3.6%	3.6%	3.8%	0.6%	0.2%	0.4%	0.2%
	15.5%	**23.2%**	**44.2%**	**22.5%**	**34.0%**	**6.4%**	**4.5%**	**8.3%**	**5.0%**

"natelson_adjust"

Source: EPS, and SCAG Employment Density Study 2001 by the Natelson Company.

[1] In order to reflect employment patterns that more closely resemble those in Anchorage, the SCAG employment space requirement factors have been adjusted downward 25%.

Table A-2
Anchorage Bowl Industrial Land Assessment
Estimated Space Demand for Market Area 2010-2030: Industrial Services/ Assembly/ Manufacturing

Base Scenario:
1.2% Avg Annual Growth

Industry	Estimated Total Employment Growth (2010-2030)	Percentage of Employees Using Industrial Services/ Assembly/ Manuf. Space [1]	Number of Employees Using Industrial Services/ Assembly/ Manuf. Space	Estimated Gross Space Demand (2010-2030) Sq. ft.	Acres
Assumptions				*1,000 sq. ft./employee*	*0.25 FAR*
Mining [1]	0	10.0%	0	0	0.0
Construction	3,006	20.0%	602	601,951	55.3
Manufacturing	588	37.7%	222	221,823	20.4
TPU	3,028	16.7%	504	504,162	46.3
Wholesale Trade	964	27.7%	267	266,787	24.5
Retail Trade	4,665	5.1%	238	237,915	21.8
FIRE	2,871	3.7%	106	105,509	9.7
Services	37,304	7.1%	2,630	2,629,932	241.5
Government	5,127	4.2%	215	215,334	19.8
Total Adjusted Market Area (Rounded)	**57,600**		**4,780**	**4,780,000**	**440.0**

"lightmanuf_summ"

[1] Factors derived from the Southern California Association of Governments (SCAG) Employment Density Study 2001 by the Natelson Company. In order to reflect employment patterns that more closely resemble those in Anchorage, the SCAG employment space requirement factors were adjusted downward 25%.

[2] Note that most Oil & Gas employment is captured in the "Services" category. The "Mining" category is for actual mining jobs within the Municipality of Anchorage.

Source: SCAG, Woods & Poole Economics, and EPS.

Table A-3
Anchorage Bowl Industrial Land Assessment
Estimated Space Demand for Market Area 2010-2030: Industrial Services/ Assembly/ Manufacturing

High Growth Scenario:
1.7% Avg Annual Growth

Industry	Estimated Total Employment Growth (2010-2030)	Percentage of Employees Using Industrial Services/ Assembly/ Manuf. Space [1]	Number of Employees Using Industrial Services/ Assembly/ Manuf. Space	Estimated Gross Space Demand (2010-2030) Sq. ft.	Acres
Assumptions				*1,000 sq. ft./employee*	*0.25 FAR*
Mining [1]	263	10.0%	26	26,221	2.4
Construction	4,758	20.0%	953	952,771	87.5
Manufacturing	930	37.7%	351	350,876	32.2
TPU	4,700	16.7%	783	782,547	71.9
Wholesale Trade	1,653	27.7%	457	457,445	42.0
Retail Trade	7,475	5.1%	381	381,212	35.0
FIRE	4,799	3.7%	176	176,348	16.2
Services	50,321	7.1%	3,548	3,547,639	325.8
Government	10,207	4.2%	429	428,709	39.4
Total Adjusted Market Area (Rounded)	**85,100**		**7,100**	**7,100,000**	**650.0**

"lightmanuf_summ"

[1] Factors derived from the Southern California Association of Governments (SCAG) Employment Density Study 2001 by the Natelson Company. In order to reflect employment patterns that more closely resemble those in Anchorage, the SCAG employment space requirement factors were adjusted downward 25%.

[2] Note that most Oil & Gas employment is captured in the "Services" category. The "Mining" category is for actual mining jobs within the Municipality of Anchorage.

Source: SCAG, Woods & Poole Economics, and EPS.

Table A-4
Anchorage Bowl Industrial Land Assessment
Estimated Space Demand for Market Area 2010-2030: Misc. Industrial

Base Scenario:
1.2% Avg Annual Growth

Industry	Estimated Total Employment Growth (2010-2030)	Percentage of Employees Using Misc. Industrial Space [1]	Number of Employees Using Misc. Industrial Space	Estimated Gross Space Demand (2010-2030) Sq. ft.	Acres
Assumptions				*1,800 sq. ft./employee*	*0.15 FAR*
Mining	0	4.4%	0	0	0.0
Construction	3,006	1.4%	41	73,046	11.2
Manufacturing	588	1.1%	6	11,113	1.7
TPU	3,028	1.8%	55	98,107	15.0
Wholesale Trade	964	1.1%	11	19,521	3.0
Retail Trade	4,665	0.3%	14	25,191	3.9
FIRE	2,871	0.3%	8	13,953	2.1
Services	37,304	0.3%	112	201,442	30.8
Government	5,127	0.4%	19	34,607	5.3
Total Adjusted Market Area (Rounded)	**57,600**		**260**	**480,000**	**70.0**

"miscind_summ"

[1] Factors derived from the Southern California Association of Governments (SCAG) Employment Density Study 2001 by the Natelson Company. In order to reflect employment patterns that more closely resemble those in Anchorage, the SCAG employment space requirement factors were adjusted downward 25%.

Source: SCAG, Woods & Poole Economics, and EPS.

Table A-5
Anchorage Bowl Industrial Land Assessment
Estimated Space Demand for Market Area 2010-2030: Misc. Industrial

High Growth Scenario:
1.7% Avg Annual Growth

Industry	Estimated Total Employment Growth (2010-2030)	Percentage of Employees Using Misc. Industrial Space [1]	Number of Employees Using Misc. Industrial Space	Estimated Gross Space Demand (2010-2030) Sq. ft.	Acres
Assumptions				*1,800 sq. ft./employee*	*0.15 FAR*
Mining	263	4.4%	11	20,583	3.2
Construction	4,758	1.4%	64	115,617	17.7
Manufacturing	930	1.1%	10	17,579	2.7
TPU	4,700	1.8%	85	152,279	23.3
Wholesale Trade	1,653	1.1%	19	33,472	5.1
Retail Trade	7,475	0.3%	22	40,364	6.2
FIRE	4,799	0.3%	13	23,321	3.6
Services	50,321	0.3%	151	271,734	41.6
Government	10,207	0.4%	38	68,900	10.5
Total Adjusted Market Area (Rounded)	**85,100**		**410**	**740,000**	**110.0**

"miscind_summ"

[1] Factors derived from the Southern California Association of Governments (SCAG) Employment Density Study 2001 by the Natelson Company. In order to reflect employment patterns that more closely resemble those in Anchorage, the SCAG employment space requirement factors were adjusted downward 25%.

Source: SCAG, Woods & Poole Economics, and EPS.

Table A-6
Anchorage Bowl Industrial Land Assessment
Estimated Space Demand for Market Area 2010-2030: Warehouse/Distribution

Base Scenario:
1.2% Avg Annual Growth

Industry	Estimated Total Employment Growth (2010-2030)	Percentage of Employees Using Warehouse/Distribution Space [1]	Number of Employees Using Warehouse/Distribution Space	Estimated Gross Space Demand (2010-2030) Sq. ft.	Acres
Assumptions				*2,800 sq. ft./employee*	*0.30 FAR*
Mining	0	0.7%	0	0	0.0
Construction	3,006	0.8%	23	63,126	4.8
Manufacturing	588	3.6%	21	59,270	4.5
TPU	3,028	3.6%	109	305,222	23.4
Wholesale Trade	964	3.8%	36	101,220	7.7
Retail Trade	4,665	0.6%	28	78,372	6.0
FIRE	2,871	0.2%	4	12,058	0.9
Services	37,304	0.4%	140	391,692	30.0
Government	5,127	0.2%	12	32,300	2.5
Total Adjusted Market Area (Rounded)	**57,600**		**370**	**1,040,000**	**80.0**

"warehouse_summ"

Source: SCAG, Woods & Poole Economics, and EPS.

[1] Factors derived from the Southern California Association of Governments (SCAG) Employment Density Study 2001 by the Natelson Company. In order to reflect employment patterns that more closely resemble those in Anchorage, the SCAG employment space r equirement factors were adjusted downward 25%.

Table A-7
Anchorage Bowl Industrial Land Assessment
Estimated Space Demand for Market Area 2010-2030: Warehouse/Distribution

High Growth Scenario:
1.7% Avg Annual Growth

Industry	Estimated Total Employment Growth (2010-2030)	Percentage of Employees Using Warehouse/Distribution Space [1]	Number of Employees Using Warehouse/Distribution Space	Estimated Gross Space Demand (2010-2030) Sq. ft.	Acres
Assumptions				*2,800 sq. ft./employee*	*0.30 FAR*
Mining	263	0.7%	2	4,968	0.4
Construction	4,758	0.8%	36	99,916	7.6
Manufacturing	930	3.6%	33	93,753	7.2
TPU	4,700	3.6%	169	473,758	36.3
Wholesale Trade	1,653	3.8%	62	173,556	13.3
Retail Trade	7,475	0.6%	45	125,576	9.6
FIRE	4,799	0.2%	7	20,154	1.5
Services	50,321	0.4%	189	528,372	40.4
Government	10,207	0.2%	23	64,306	4.9
Total Adjusted Market Area (Rounded)	**85,100**		**570**	**1,580,000**	**120.0**

"warehouse_summ"

Source: SCAG, Woods & Poole Economics, and EPS.

[1] Factors derived from the Southern California Association of Governments (SCAG) Employment Density Study 2001 by the Natelson Company. In order to reflect employment patterns that more closely resemble those in Anchorage, the SCAG employment space r equirement factors were adjusted downward 25%.

Table A-8
Anchorage Bowl Industrial Land Assessment
Estimated Space Demand for Market Area 2010-2030: Industrial Flex

Base Scenario:
1.2% Avg Annual Growth

Industry	Estimated Total Employment Growth (2010-2030)	Percentage of Employees Using Industrial Flex Space [1]	Number of Employees Using Industrial Flex Space	Estimated Gross Space Demand (2010-2030) Sq. ft.	Acres
Assumptions				*500 sq. ft./employee*	*0.30 FAR*
Mining	0	0.5%	0	0	0.0
Construction	3,006	1.1%	32	15,781	1.2
Manufacturing	588	1.6%	9	4,630	0.4
TPU	3,028	0.5%	14	6,813	0.5
Wholesale Trade	964	1.4%	14	6,869	0.5
Retail Trade	4,665	0.4%	17	8,747	0.7
FIRE	2,871	0.5%	13	6,460	0.5
Services	37,304	0.5%	196	97,923	7.5
Government	5,127	0.2%	12	5,768	0.4
Total Adjusted Market Area (Rounded)	**57,600**		**310**	**150,000**	**10.0**

"rdflex_summ"

[1] Factors derived from the Southern California Association of Governments (SCAG) Employment Density Study 2001 by the Natelson Company. In order to reflect employment patterns that more closely resemble those in Anchorage, the SCAG employment space requirement factors were adjusted downward 25%.

Source: SCAG, Woods & Poole Economics, and EPS.

Table A-9
Anchorage Bowl Industrial Land Assessment
Estimated Space Demand for Market Area 2010-2030: Industrial Flex

High Growth Scenario:
1.7% Avg Annual Growth

Industry	Estimated Total Employment Growth (2010-2030)	Percentage of Employees Using Industrial Flex Space [1]	Number of Employees Using Industrial Flex Space	Estimated Gross Space Demand (2010-2030) Sq. ft.	Acres
Assumptions				*500 sq. ft./employee*	*0.30 FAR*
Mining	263	0.5%	1	690	0.1
Construction	4,758	1.1%	50	24,979	1.9
Manufacturing	930	1.6%	15	7,324	0.6
TPU	4,700	0.5%	21	10,575	0.8
Wholesale Trade	1,653	1.4%	24	11,777	0.9
Retail Trade	7,475	0.4%	28	14,015	1.1
FIRE	4,799	0.5%	22	10,797	0.8
Services	50,321	0.5%	264	132,093	10.1
Government	10,207	0.2%	23	11,483	0.9
Total Adjusted Market Area (Rounded)	**85,100**		**450**	**220,000**	**20.0**

"rdflex_summ"

[1] Factors derived from the Southern California Association of Governments (SCAG) Employment Density Study 2001 by the Natelson Company. In order to reflect employment patterns that more closely resemble those in Anchorage, the SCAG employment space requirement factors were adjusted downward 25%.

Source: SCAG, Woods & Poole Economics, and EPS.

APPENDIX B:

Industrial Land Inventory and Supply Estimates Technical Background

INDUSTRIAL LAND INVENTORY AND SUPPLY ESTIMATES— TECHNICAL BACKGROUND

Inventory Approach

In updating the Industrial Land Inventory and producing Industrial Land Supply Estimates for the Municipality of Anchorage (MOA), the EPS Team has followed an approach designed to assign all of the land located within the defined Study Area and in existing I-1, I-2, I-3 and MI Zoning Districts to mutually exclusive, but collectively comprehensive, categories. The industrial parcel classification criteria and selection rules defined for this process are parametric (i.e., they are based on discrete parcel attributes, development characteristics, and administrative/ownership status qualifiers) and recorded in the Industrial Land Inventory Database, which is described later in this section. This means the Industrial Land Supply Estimates may be directly related to the individual parcels making up each defined Supply Category, and that the Supply Estimates can be rapidly updated to reflect updates to parcel development status and/or adjustments to the defined selection criteria and categories.

Study Area, Subareas and Context

The Industrial Land Inventory and Industrial Supply Estimates pertain to the MOA's current Light Industrial (I-1), Heavy Industrial (I-2), Rural Industrial (I-3) and Marine Industrial (MI) Zoning Districts. The MOA boundary is shown in the context of nearby communities on the map **Figure B-1**. This map also shows a 65-square mile Observation Perimeter, which is discussed with the Industrial Demand projections of this report, and a Project Perimeter, which encloses the parcels located in the MOA's currently defined I-1, I-2, I-3 and MI Industrial Zoning Districts.

For the purposes of this Study, the MOA has been subdivided into 14 Subareas, as shown in map **Figure B-2**. The Study Subareas and boundaries are generally familiar from *Anchorage 2020* and other recent studies. At the request of MOA and AEDC staff, and as shown in map **Figure B-3**, the Ted Stevens International Airport has been 'broken out' of the previously defined Anchorage Southwest (ANC-Southwest) Study Subareas.

The Study Subareas shown with hachure shading in **Figures B-2** and **B-3** do not contain currently defined I-1, I-2, I-3 or MI Zoning Districts and land parcels within these Subareas are not included in the Inventory update or Supply estimates. In accordance with discussions with MOA and AEDC staff early in the Study, the Girdwood Industrial Zoning Districts and industrially-zoned parcels were excluded from the analysis. As shown by the Project Perimeter boundary, the Inventory and Supply estimates extend beyond the Anchorage Bowl to include industrially-zoned land in the Eagle River and Chugiac – Eklutna Subareas.

Identification of industrially-zoned MOA parcels was performed using digital map layers of existing (pre-Title 21) Zoning and parcel boundaries provided by MOA GIS Services. Following discussions with MOA Planning and GIS staff, EPS geocoded all of the 83,600 'physical' lots defined in the parcel layers provided to the EPS Team during December 2008 and January 2009,

Figure B-1
Observation and Project Perimeter

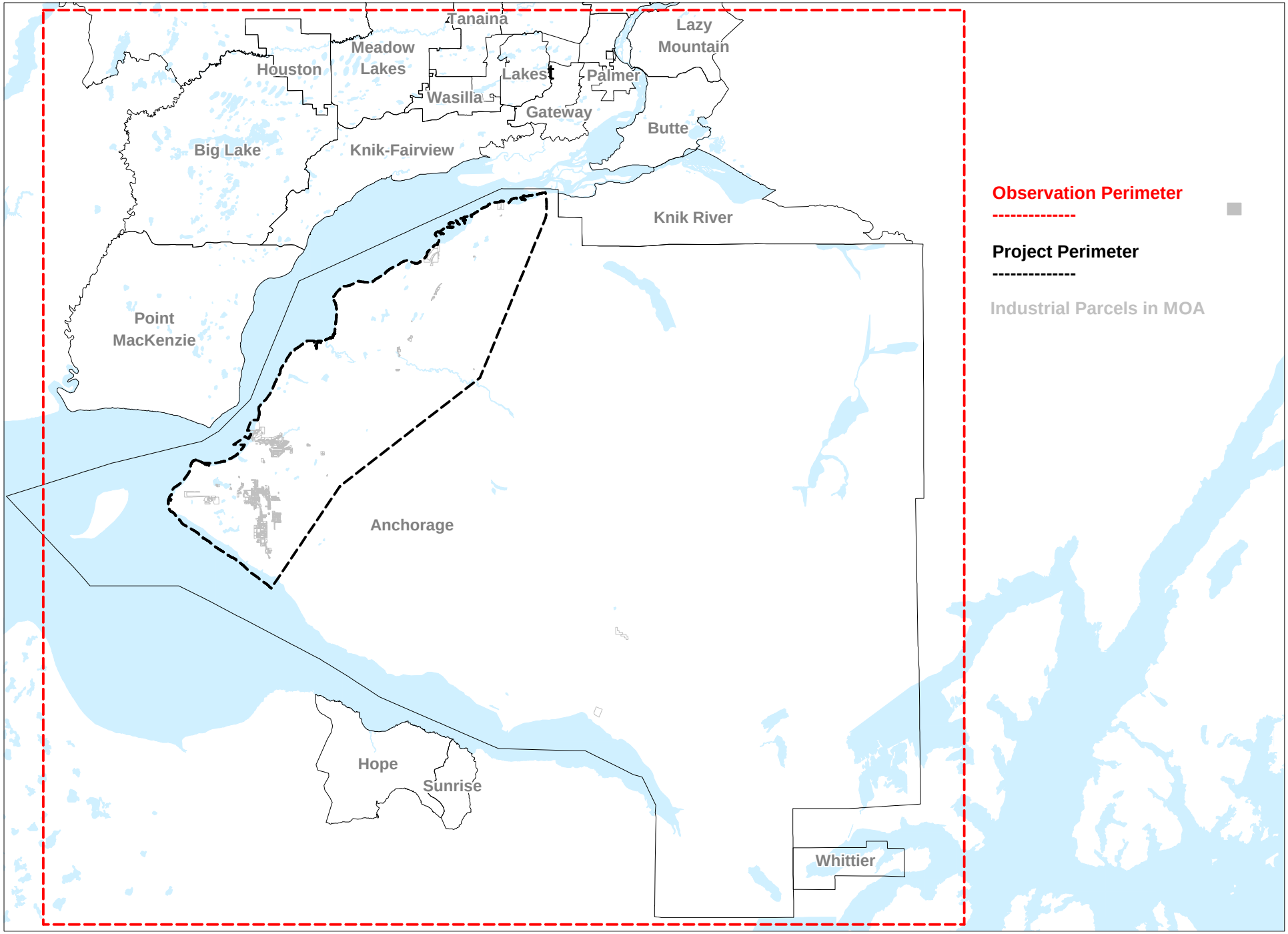


Figure B-2
Study Subareas in Regional Context

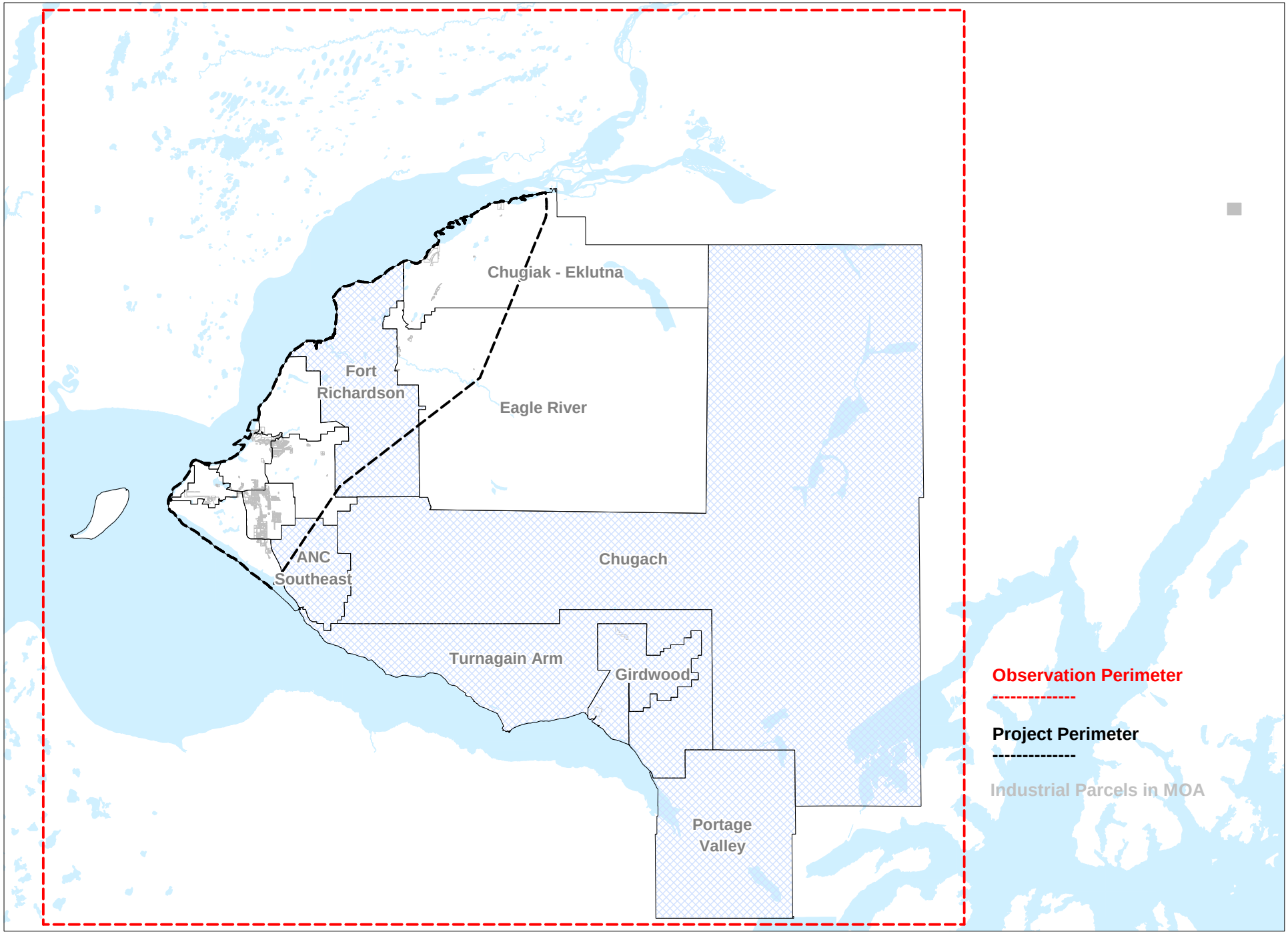
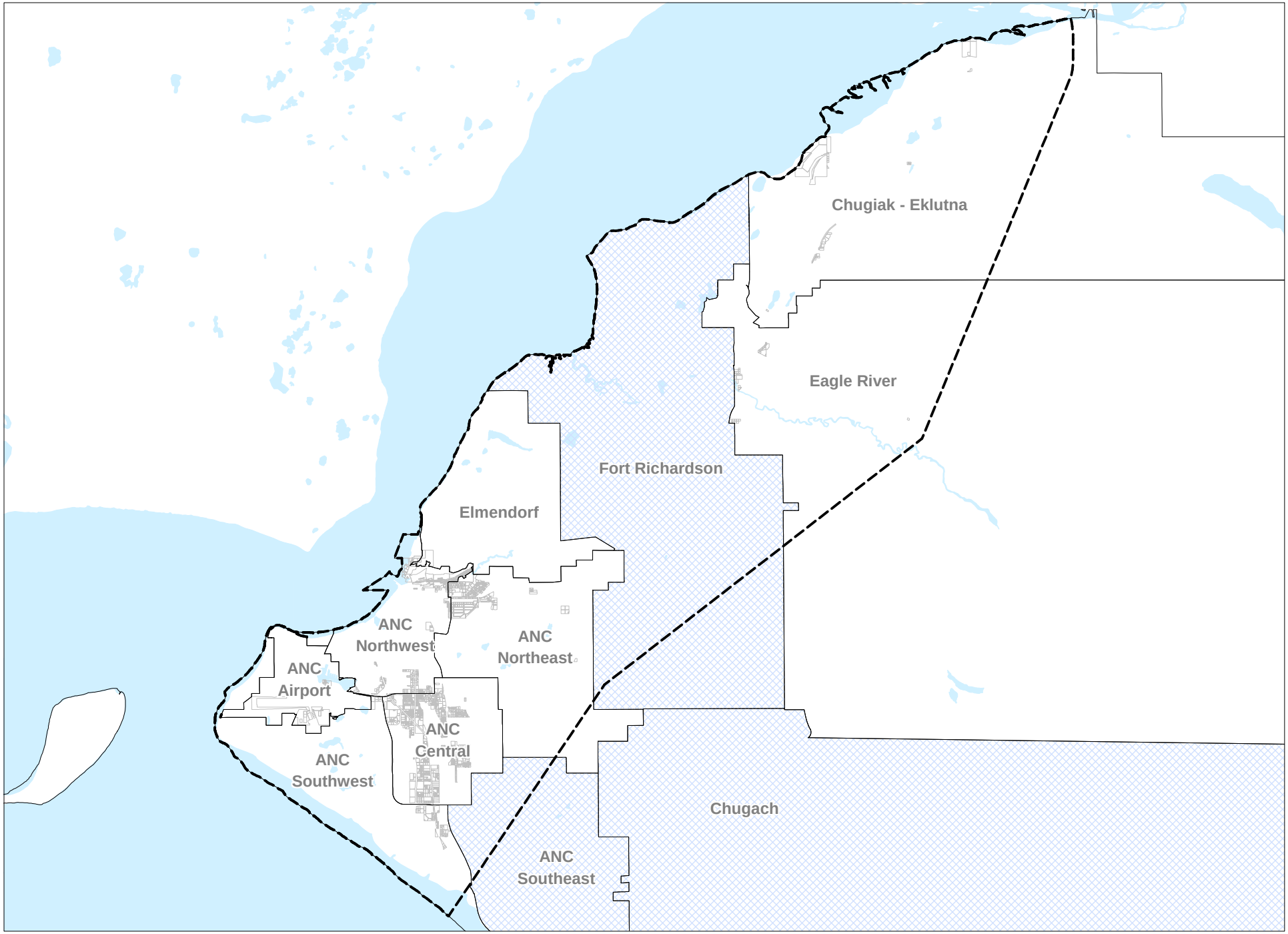


Figure B-3
Study Subarea Detail



according to their locations within Zoning Districts and by MOA GIS Land Use Category. During this process, EPS used the most recent Zoning and Land Use reference layers provided by MOA staff and/or available from the online MOA GIS data download website.

The locations and general zoning of the land identified as industrially zoned is shown in **Figure B-4.** EPS included lots having Special Limitation overlay status (e.g., I-1 SL and I-1 SL 2, I-2 SL, and I-3 SL 1 and I-3 SL 2) in the Inventory and Supply Estimates, and has grouped them with the more general I-1, I-2 and I-3 zoned land where appropriate. After discussions with MOA staff, the Zoning reference map layer provided by MOA GIS Services was assumed to have precedence in identifying current zoning designation over zoning designation fields found in CAMA and MUNIVIEW.

Where parcel boundaries were 'split' by the Zoning polygon boundaries in the reference maps, lots were assumed to be industrially zoned if the majority of the lot areas were located within the plotted Industrial Zone areas. EPS visually checked all 'split' lot zone geocoding to confirm this automated assignment, revising some assignments to compensate for lot geometric centroids located outside of lots' actual boundaries. In total, 2,675 lots were initially identified as being completely or partially within Industrial Zoning Districts; following visual checks and exclusion of the Girdwood Subarea, 2,654 lots were selected for subsequent characterization and analysis.

Supply Categories

Five distinct Industrial Land Supply categories have been defined for this study:

- Currently Undeveloped
- Redevelopable Residential
- Underutilized Non–Residential
- Currently Developed
- Unsuitable

These five supply categories are defined and discussed individually below, with references to the selection criteria also summarized in **Search and Classification Criteria**. Current estimates of parcel counts and aggregate acreage of Industrial Land in each category, by Study Subarea, are shown in **Table B-1.**

Unsuitable for Development

The Industrial Land estimates in the **Unsuitable** Supply Category are shown near the bottom of **Table B-1**. However, the **Unsuitable** category was the first to be defined for this study, as the parcels in this group all have attributes, which are assumed to effectively exclude them from default consideration as land developable before 2030. Unsuitability for default classification of industrially-zoned land as having residual development capacity broadly includes parcels owned by the Federal, State or Local Governments, parcels having legislated status as wetland

Figure B-4
Industrially Zoned Parcels

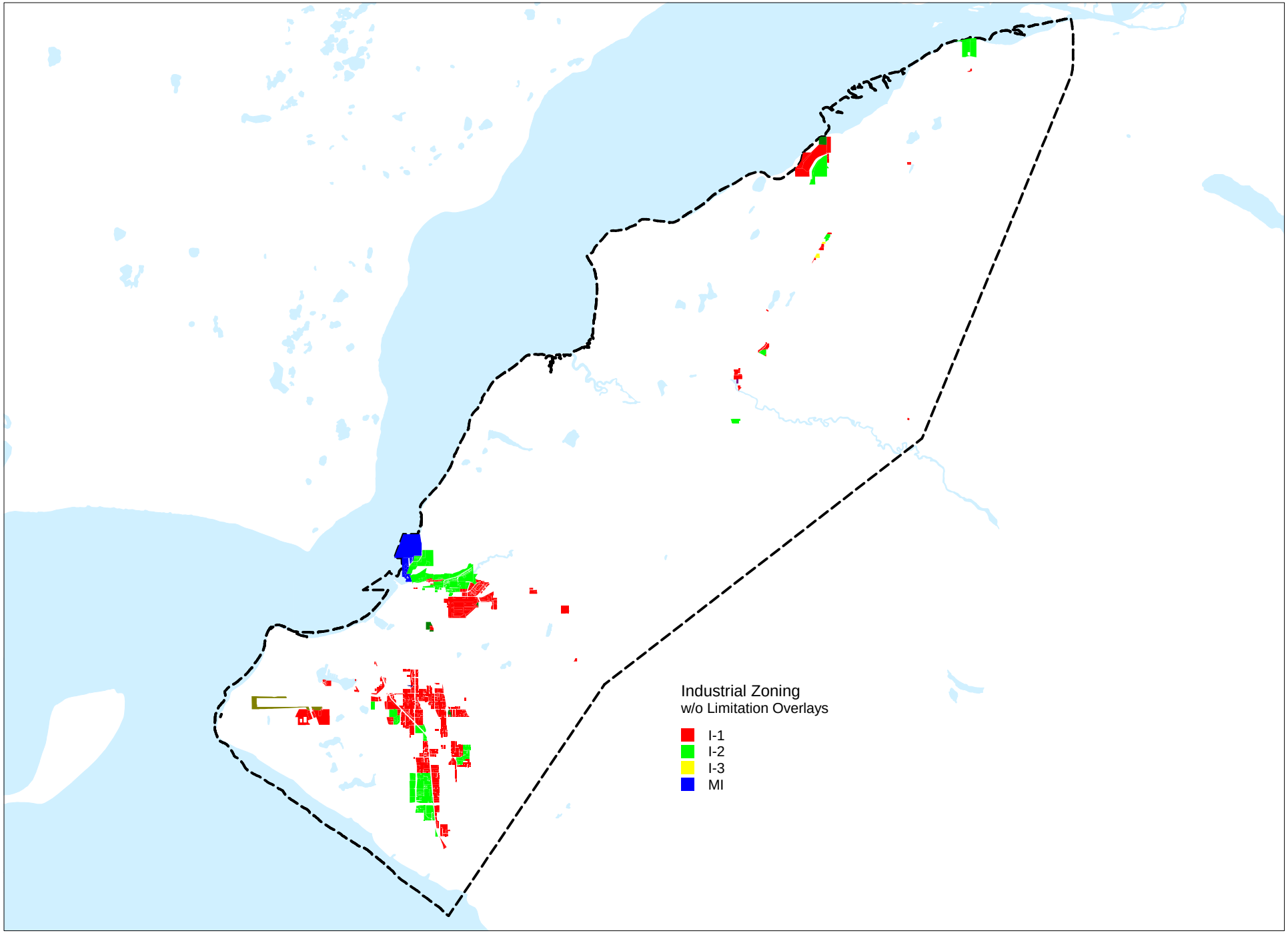


Table B-1
Anchorage Bowl Industrial Land Assessment
Preliminary Industrial Zoning Districts Land Supply Estimates [1]

Land Summary by Class

			Search and Classification Criteria							Subarea Geography																					
	Class	Ownership	MOA LU Types Included	Primary Land Use (Prior Status)	MOA LU Types Excluded	Ival : Lval ratio	DU : Land ratio	Floor Area Ratio	Suitability Classes	Airport Parcels	Airport Acres	Northwest Parcels	Northwest Acres	Northeast Parcels	Northeast Acres	Central Parcels	Central Acres	Southwest Parcels	Southwest Acres	Chugiak / Eklutna Parcels	Chugiak / Eklutna Acres	Eagle River Parcels	Eagle River Acres	Study Area Totals Parcels	Study Area Totals Acres
Increasing - Supply Potential - Decreasing	Currently Undeveloped (No Permanent Structures, E-Linkages or Assessed Building Value)	Private	8000s	'Vacant' Land	Utility-Related; Institutional; Parks and OS; Transportation-Related ROWs; Military; Intertidal, etc.	0.00	0.00	0.00	0, 1, 2			18	25.74	11	37.21	186	255.73	12	21.88	10	144.56	10	47.54	247	532.66
			2000s - 2400s	Commercial								7	1.15	8	6.00	67	58.80	2	2.31			1	1.18	85	69.45
			3000 - 3700s	Industrial								10	4.13	23	27.57	220	143.58	12	14.12	4	9.22			269	198.62
	Redevelopable Residential	Private	1000s - 1400s	Residential	[2] ***1240, 1900s***	***< 0.75*** [3]	< 1 : 5,000 sqft	***< 0.10*** [3]	0, 1, 2			1	0.27	1	0.15	71	25.68			10	19.17	2	4.78	85	50.04
			1500s - 1700s	Mixed Use												1	0.49							1	0.49
			1800	Unsound Dwelling Units			#N/A																		0	0.00
	Underutilized Non-Residential	Private	2000s - 2400s	Commercial								12	8.58	12	18.92	68	102.03	6	41.35			2	2.76	100	173.65
			3000 - 3700s	Industrial		***< 0.75*** [3]	#N/A	***< 0.10*** [3]	0, 1, 2			16	26.10	31	57.02	147	255.52	12	49.88	1	9.83	3	3.04	210	401.38
			8000s	Previously 'Vacant' Land								5	1.37	1	0.42	36	28.12	1	6.94					43	36.85
	Currently Developed	Private	1000s - 1400s	Residential	[2] 1800	***>= 0.75***	>= 1 : 5,000 sqft	***>= 0.10*** [3]	0 - 3			1	0.62	1	3.73	43	8.10			1	4.28			46	16.73
			1500s - 1700s	Mixed Use		[3]										3	0.81	2	0.58					5	1.40
			1240, 1900s	***Residential Associated***				#N/A								8	1.61							8	1.61
			2000 - 2400s	Commercial			#N/A					96	117.66	70	98.39	355	352.42	22	53.42	1	2.28	5	6.50	549	630.67
			3000 - 3700s	Industrial				***>= 0.10***				65	65.03	53	88.25	347	396.07	16	38.74	6	27.48	8	8.44	495	624.00
			8000s	Previously 'Vacant' Land								3	5.50			20	76.29			3	193.80	1	15.00	27	290.60
	Unsuitable	[4] Government, Utilities, Institutional	3800s - 7300s 8100, 8200	Utility-Related; Institutional; Parks and OS; Transportation-Related ROWs; Military; Intertidal, etc.	1000s - 3700s	#N/A	#N/A	#N/A	3	28	269.23	239	662.90	94	388.77	86	239.98	12	46.68	13	240.35	12	27.14	484	1,875
	Totals by Subarea		[5]							28	269.23	473	919.04	305	726.43	1,658	1,945.24	97	275.92	49	650.95	44	116.38	2,654	4,903.20

"ind_sup"

Sources: *Economic & Planning Systems, using MOA GIS Parcel, Zoning and Land Use boundary layers and 'roll-up' summaries of parcel development and valuation status developed by Dan Quinn and provided by MOA Information Technology Staff*

Notes: These preliminary estimates incorporate 2009 Assessed Valuation, but do not yet reflect revisions in 4-digit Land Use Codes which are being assigned to update current site usage of Industrially Zoned properties.

[1] The targeted Industrial Zoning Districts are I-1, I-2, I-3 and MI, as located in the Anchorage Bowl, Chugiak-Eklutna, and Eagle River subareas of the Municipality of Anchorage; the Anchorage Bowl Subarea has been further subdivided into six regions: Airport, Northwest, Northeast, Central, Southeast and Southwest.

[2] Mixed-Use can contain both Residential and Non-Residential Components.

[3] Threshold criteria for underutilized/redevelopable land have been set within the ranges indicated in ***Bold Red Italic.***

[4] Government, Utility, and Institutional contacts have been made independently to determine development plans and estimate potential development capacity on land generally excluded as 'Unsuitable' - these estimates will be added to the estimated supply from the Vacant, Redevelopable Residential and Underutilized Non-Residential classes.

[5] Parcel counts and acreages reflect reclassification of 1 SW parcel from 'Undeveloped' to 'Underutilized' in response to reviewers knowledge of site usage.

preserves, dedicated open space and parks, military reserves, etc. The specific selection criteria for this and the other Supply Categories are identified below and in the report sections for those categories.

Specific potentials for development on industrial land categorized as generally 'Unsuitable', where identified during the Team's interviews and research, constitute net additions to the 'default', 'raw' or baseline estimates of Currently Undeveloped, Redevelopable Residential and Underutilized Non-Residential development- and infill- capable land shown in **Table B-1.** As an example, all 269 acres of industrially zoned land in the Airport Study Subregion, having State or Federal ownership or being within the TSIA boundaries, is assigned a first-pass classification of Unsuitable. The EPS Team's estimates of potential future industrial development for the Airport Subarea therefore represent a net addition of estimated Industrial Development Capacity to year 2030.

The defined exclusionary criteria applied to assign **Unsuitable** status include:

Existing Land Use

The following MOA Planning/GIS Land Use classes and included sub classifications are assumed to be incompatible with default assumed potential for additional or alternative Industrial development:

3800s Utility-Related Facilities

4000s INSTITUTIONAL

5000s PARKS, OPEN SPACE, AND RECREATION AREAS

6000s TRANSPORTATION - RELATED

7000s R.O.W.s and Military Reservations

8100 Intertidal Areas

8200 Waterbodies

EPS observed, consistent with MOA documentation and discussions with MOA Planning and GIS staff, several Industrially Zoned parcels with only partial Intertidal or Water Body coverage were assigned primary Land Use codes other than 8100 or 8200. Examples of such parcels are shown in the Chapter 5 of this Report. EPS used MOA and Census Bureau digital maps of marine, shoreline and inland water bodies to 'net out' Industrially-zoned parcels' water acreage, in order to prevent overestimating the actual land acreage available to absorb new industrial uses.

Wetland Preserves

EPS visual review of all Industrially Zoned 'vacant' parcels of 0.5 gross acres or larger via Google Earth (which recently loaded 2006 orthophotographs provided by the MOA) showed some Industrially Zoned parcels located on or adjacent to obvious riparian or wetland habitats. This visual impression was confirmed against digital map wetland coverages available from the MOA GIS website. Those parcels having a wetland code of 'PRESERVATION' per the MUNIVIEW_BOTH table provided to the EPS Team have been assumed to have legislated wetland protection and have been assigned to the 'Unsuitable' category.

Institutional, Government and Utility Ownership

The following Property Tax Exemption Codes, as indicated in the MUNIVEW_PARCEL table provided to the EPS Team are assumed indicate Industrially Zoned parcel ownership incompatible with consideration for (additional/alternative) Industrial development:

'A' Utility

'F' Education - State

'2' State

'3' Federal

'4' Municipal

'9' Education - MOA

Anchorage 2020 Development Suitability Ratings

Industrially Zoned Parcels which had previously been assigned a Suitability Rating of '3' – that is, 'Unsuitable' for assumed development, infill or redevelopment, due to environmental sensitivity, problematic access, etc. during the *Anchorage 2020* buildout analysis, have also been assumed to be Unsuitable for consideration of development before 2030 in this Study. Parcels which had been assigned a Suitability Rating of '2' – 'Marginally Suitable' during *Anchorage 2020* buildout analysis, were 'passed through' for assignment to the other Supply Categories, unless they also matched other exclusionary criteria.

Currently Undeveloped

Industrially-Zoned Land with no or primarily non-residential surface use has been classified as **Currently Undeveloped** if it passes through the exclusionary criteria described above, has Zero (0) Residential Units, Zero Non-Residential Permanent Buildings **AND** Zero 2009 Building Assessed Value, per end of year 2008 and Tax Year 2009 CAMA extracts and MUNIVIEW tables provided to EPS by MOA staff. Land parcels meeting the Currently Undeveloped criteria are 'Vacant' in the sense they have no permanent, taxable structural improvements, but may not be 'Empty' lots; in fact, a large number of the 'Vacant' parcels viewed by EPS using 2006 and 2007 MOA and USGS aerials are seen to have some or even intensive use as lay-down and bulk storage yards.

To define a reasonable 'Undeveloped' standard for this Study, prior MOA GIS/Planning land use classifications other than 8000 – Vacant Land have been considered as potential candidates for Currently Undeveloped supply status. This consideration provided the industrially-zoned parcels met the Zero Buildings/Zero 2009 Building Assessed Value criteria **AND** were not Economically Linked to other, Currently Developed parcels, per the Economic Linkage and Lease maps and reference tables provided to EPS by MOA staff.

In all, EPS has classified 601 of the 2,654 parcels and 801 of the 4, 903 land acres in the Study Area as Currently Undeveloped (see **Table B-1**). The majority of the Currently Undeveloped category comprises parcels having an assigned MOA GIS/Planning Land Use Code of 8000 - Vacant Land in previous inventories, but 268 or one-third of the 801 acres are parcels which previously assigned Commercial or Industrial Land Use Codes – the non-vacant coding is

consistent with the outdoor storage/rental/repair of heavy equipment and outdoor bulk storage and 'wall-less warehousing' observed when EPS staff checked 2006 and/or 2007 aerials for all parcels assigned to the Currently Undeveloped category and having 0.5 or greater acres in gross area.

As shown in **Table B-1,** over half of the total acreage categorized as Currently Undeveloped is located in the Anchorage Central Subarea, and an additional nearly 20% of the total located in the Chugiac/Eklutna Subarea. Note the average parcel sizes for Currently Undeveloped Land in the Anchorage Central Subarea are much smaller than for the Chugiac/Eklutna Subarea.

This average size differential has possible implications for the ease of property assemblage for development, and can be examined in more detail in **Table B-2.** The breakouts by parcel size range show that in the Anchorage Central Subarea, 83% of the parcels and slightly less than one-third of the estimated 'land' acreage are in lots of less than 1 Acre; only 1% of the parcels and 20% of the 'land' acreage are in lots of 10 acres or larger. By comparison, in the Chugiak/Eklutna Subarea, over two-thirds of the parcels and 99% of the estimated 'land' acreage are in parcels of 1 acre or larger, with over 20% of the parcel count and over 80% of the estimated 'land' acreage in lots of 10 acres or larger.

The proportional distribution of Currently Undeveloped land within existing MOA Industrial Zoning Districts also varies by Subarea. As can be seen in **Table B-3,** approximately 66% of Anchorage Central currently undeveloped industrial land is located in **I-1** zones. For the Chugiak/Eklutna Subarea, 47% of the currently undeveloped industrial land is located in **I-1** zones.

The defined Currently Undeveloped selection criteria include:

Existing Land Use

The following MOA Planning/GIS Land Use classes and included sub classifications are assumed to be compatible with Currently Undeveloped status for additional or alternative Industrial development:

8000s Vacant Land

2000s – 2400s Commercial (Surface) Uses

3000s – 3700s Industrial (Surface) Uses

Anchorage 2020 Development Suitability Ratings

Industrially Zoned Parcels which previously were assigned a Suitability Rating of '0', '1' or '2' – that is, 'Not Rated' 'Suitable' or 'Marginally Suitable' for assumed development, infill or

Table B-2
Anchorage Bowl Industrial Land Assessment
Preliminary Industrial Zoning Districts - Vacant Land Supply Estimates [1] [2] [3]

Vacant Land by Parcel Sizes

Search and Classification Criteria									Subarea Geography															
Parcel Land Acres	**Ownership**	**MOA LU Types Included**	**Primar Land Use (Prior Status)**	**MOA LU Types Excluded**	**Residential Units**	**Number of Buildings**	**Assessed Building Value**	**Suitability Classes**	**Airport**		**Northwest**		**Northeast**		**Central**		**Southwest**		**Chugiak / Eklutna**		**Eagle River**		**Study Area Totals**	
									Parcels	**Acres**	**Parcels**	**Acres**	**Parcels**	**Acres**	**Parcels**	**Acres**	**Parcels**	**Acres**	**Parcels**	**Acres**	**Parcels**	**Acres**	**Parcels**	**Acres**
	Private	2000 - 3700s, 8000	Vacant / Unbuilt Land	1000-1900s, 3800s-7300s, 8100, 8200	0	0	0	0, 1, 2																
0 - 20,000 Sq. Ft.											25	4.93	12	4.15	291	70.09	9	2.81	2	0.47			339	82.45
20,000 Sq. Ft. - 1 Acre											1	0.79	18	11.81	100	74.62	7	4.90	3	1.75	1	0.93	130	94.82
1 - 3 Acres											6	11.62	7	12.61	56	98.27	6	10.29	2	3.14	6	12.88	83	148.81
3 - 7 Acres											3	13.67	1	5.15	15	77.45	3	13.00	3	12.22	2	8.96	27	130.46
7 - 10 Acres													4	37.06	6	51.99	1	7.32	1	9.94	1	9.86	13	116.18
10 Acres+															5	85.67			3	126.26	1	16.08	9	228.02
Total					**0**	**0.00**	**35**	**31.02**	**42**	**70.78**	**473**	**458.11**	**26**	**38.32**	**14**	**153.78**	**11**	**48.72**	**601**	**800.73**				

"vac_size"

Sources: *Economic & Planning Systems, using MOA GIS Parcel, Zoning and Land Use boundary layers and 'roll-up' summaries of parcel development and valuation status developed by Dan Quinn and provided by MOA Information Technology Staff*

Notes: These estimates incorporate 2009 Assessed Valuation and Development Status, but do not yet reflect revisions in 4-digit Land Use Codes which are being assigned to update current site usage of Industrially Zoned properties.

[1] Land Acreage adjusted by EPS to exclude areas with permanent/ standing water-coverage, tidal flats, low coastlands, etc.

[2] Government, Utility, and Institutional contacts have beeen made independently to determine development plans and estimate potential development capacity - these estimates will be added to the estimated supply from the Vacant/Unbuilt, Redevelopable Residential and Underutilized Non-Residential classes.

[3] Final parcel counts and acreages.

Table B-3
Anchorage Bowl Industrial Land Assessment
Preliminary Industrial Zoning Districts - Vacant Land Supply Estimates [1] [2] [3]

Vacant Land by Zone

Search and Classification Criteria									Subarea Geography													
Zoning Designation	Ownership	MOA LU Types Included	Primar Land Use (Prior Status)	MOA LU Types Excluded	Residential Units	Number of Buildings	Assessed Building Value	Suitability Classes	Northwest Parcels	Northwest Acres	Northeast Parcels	Northeast Acres	Central Parcels	Central Acres	Southwest Parcels	Southwest Acres	Chugiak / Eklutna Parcels	Chugiak / Eklutna Acres	Eagle River Parcels	Eagle River Acres	Study Area Totals Parcels	Study Area Totals Acres
	Private	2000 - 3700s, 8000	Vacant / Unbuilt Land	1000-1900s, 3800s-7300s, 8100, 8200	0	0	0	0, 1, 2														
I-1									34	28.56	31	56.15	409	292.18	15	11.89			8	28.41	497	417.19
I-1 SL											3	7.59	3	8.16			1	21.76	1	2.44	8	39.96
I-1 SL 2																	3	50.76			3	50.76
I-2									1	2.46	8	7.04	61	157.77	9	25.67			2	17.87	81	210.81
I-2 SL															2	0.76	5	71.76			7	72.52
I-3 SL 1																	3	5.12			3	5.12
I-3 SL 2																	2	4.38			2	4.38
	Totals by Subarea								**35**	**31.02**	**42**	**70.78**	**473**	**458.11**	**26**	**38.32**	**14**	**153.78**	**11**	**48.72**	**601**	**800.73**

"vac_zone"

Sources: *Economic & Planning Systems, using MOA GIS Parcel, Zoning and Land Use boundary layers and 'roll-up' summaries of parcel development and valuation status developed by Dan Quinn and provided by MOA Information Technology Staff*

Notes: These estimates incorporate 2009 Assessed Valuation and Development Status, but do not yet reflect revisions in 4-digit Land Use Codes which are being assigned to update current site usage of Industrially Zoned properties.

[1] The targeted Industrial Zoning Districts are I-1, I-2, I-3 and MI, as located in the Anchorage Bowl, Chugiak-Eklutna, and Eagle River subareas of the Municipality of Anchorage; the Anchorage Bowl Subarea has been further subdivided into six regions: Airport, Northwest, Northeast, Central, Southeast and Sou

[2] Government, Utility, and Institutional contacts have beeen made independently to determine development plans and estimate potential development capacity - these estimates will be added to the estimated supply from the Vacant/Unbuilt, Redevelopable Residential and Underutilized Non-Residential classes.

[3] Final parcel counts and acreages.

redevelopment during the *Anchorage 2020* buildout analysis, are assumed Suitable for consideration of development before 2030 in this Study.

Soil Limitation Ratings for Small Commercial Buildings

EPS calculated Approximate Soil Limitation Ratings for all Industrially-Zoned Parcels using GIS layers and documentation of the United States Department of Agriculture's *Soil Survey of Anchorage*, *Alaska*, provided by MOA staff and obtained from the USDA Natural Resources Conservation Service. Specific ratings by soil type were derived from the *Soil Survey's* Table 13 - Building Site Development: Structures; Limitations for Small Commercial Structures[1]. Parcel ratings were allocated by EPS, using weighted averages where parcel polygons intersected multiple soil types.

The allocated Soil Limitation Ratings are approximate, for broad-brush analysis and not a substitute for parcel-specific onsite evaluations, and therefore have not been used as filtering or selection criteria for assignments of land to the Supply Categories. However, the Soil Limitation Ratings provide an aggregate impression of the relative challenge and potential costs of developing land in the Currently Undeveloped Category, as shown in **Table B-4**.

The *Soil Survey* Small Commercial Structure limitation ratings range from Not Rated (often assigned to already graded and filled, 'urbanized' areas) through 0.00 (No Limitation) to 1.00 (The most severe limitations for potential commercial construction). EPS has assumed, following a reading of the *Soil Survey* notes and documentation for Table 13 - Building Site Development: Structures; Limitations for Small Commercial Structures, that parcels having weighted average Small Commercial Structure limitation ratings in the range of 0.51 to 1.00 may have Very Severe limitations for competitive industrial development requiring permanent structures onsite.

For the Anchorage Central Subarea, nearly one-third (32%) of the Currently Undeveloped gross parcel acreage appears to be in the Very Severe Limitation range, which can be correlated in many cases to the extents of the Doroshin and Iknuun Peats. For the Chugiak/Eklutna Subarea, approximately 47% of the of the Currently Undeveloped gross parcel acreage appears to be in the Very Severe Limitation range, which can be correlated in many cases to the extents of tidal flats into parcels along the Knik Arm, and to slope conditions for parcels located inland.

---

[1] From the *Soil Survey*: "Small commercial buildings are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments."

Table B-4
Anchorage Bowl Industrial Land Assessment
Preliminary Industrial Zoning Districts - Vacant Land Supply Estimates [1] [2] [3] [4]

Vacant Land by Soil Rating

Search and Classification Criteria									Subarea Geography											
Soil Limitation Rating	**Soil Limitation # Range**	**Ownership**	**MOA LU Types Included**	**Primar Land Use (Prior Status)**	**MOA LU Types Excluded**	**Residential Units**	**Number of Buildings**	**Assessed Building Value**	**Suitability Classes**	**Northwest Parcels**	**Northwest Acres**	**Northeast Parcels**	**Northeast Acres**	**Central Parcels**	**Central Acres**	**Southwest Parcels**	**Southwest Acres**	**Chugiak / Eklutna Parcels**	**Chugiak / Eklutna Acres**	**Eagle River Parcels**	**Eagle River Acres**	**Study Area Totals Parcels**	**Study Area Totals Acres**
		Private	2000 - 3700s, 8000	Vacant / Unbuilt Land	1000-1900s, 3800s-7300s, 8100, 8200	0	0	0	0, 1, 2														
Not Rated	#N/A									1	1.77	1	5.15	44	51.03	11	27.60	2	4.38			59	89.93
Not Limited	0.00 - 0.00											1	9.63	7	7.74			2	1.62	1	1.79	11	20.78
Some Limitation	0.01 - 0.10									20	8.72	40	56.00	333	192.85	15	10.72	4	26.88	1	1.18	413	296.35
Moderate Limitation	0.11 - 0.25									1	2.46			9	21.13							10	23.59
Severe Limitation	0.26 - 0.50									1	0.79			9	36.76			1	48.57	1	16.08	12	102.21
Very Severe Limitation	0.51 - 1.00									12	17.28			71	148.60			5	72.33	8	29.67	96	267.87
	Totals by Subarea									**35**	**31.02**	**42**	**70.78**	**473**	**458.11**	**26**	**38.32**	**14**	**153.78**	**11**	**48.72**	**601**	**800.73**

"vac_soil"

Sources: *Economic & Planning Systems, using MOA GIS Parcel, Zoning and Land Use boundary layers and 'roll-up' summaries of parcel development and valuation status developed by Dan Quinn and provided by MOA Information Technology Staff*

Notes: These estimates incorporate 2009 Assessed Valuation and Development Status, but do not yet reflect revisions in 4-digit Land Use Codes which are being assigned to update current site usage of Industrially Zoned properties.

[1] Soil Limitation Ratings derived from GIS layers and documentation of Soil Survey of Anchorage, Alaska provided by MOA staff and USDA Natural Resources Conservation Service. Specific ratings by soil type derived from Table 13 - Building Site Development: Structures; Limitations for Small Commercial Structures*. Parcel ratings allocated by EPS, using weighted averages where parcel polygons intersected multiple soil types. Ratings are approximate, for broad-brush analysis and not a substitute for parcel-specific onsite evaluations.

[2] *"Small commercial buildings* are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments."

[3] Government, Utility, and Institutional contacts have beeen made independently to determine development plans and estimate potential development capacity - these estimates will be added to the estimated supply from the Vacant/Unbuilt, Redevelopable Residential and Underutilized Non-Residential classes.

[4] Final parcel counts and acreages.

Redevelopable Residential

Industrially-Zoned Land with primarily residential surface use has been classified as **Redevelopable Residential** if it passes through the exclusionary criteria described above, and had a ratio of more than 5,000 square feet of land per residential unit **OR** a ratio of less than 0.75 of 2009 Building Assessed Value / Assessed Land Value, per end of year 2008 and Tax Year 2009 CAMA extracts and MUNIVIEW tables provided to EPS by MOA staff. Redevelopable Residential parcels located within industrial zones are therefore defined for this Study to include both relatively low densities of residential development for urbanized areas and relatively low-valuation of residential units compared to the value of the land they are occupying.

For Mixed-Use parcels having both residential and non-residential onsite uses, a more restrictive set of selection criteria have been applied, as such parcels can be generally well-developed even if the density and valuation of component individual uses to parcel totals may fall below the thresholds established for single-use development. Industrially-Zoned Land with mixed surface use has been classified as **Redevelopable Residential** if it had a ratio of more than 5,000 square feet of land per residential unit, **AND** a ratio of less than 0.75 of 2009 Building Assessed Value / Assessed Land Value, **AND** an overall Floor Area Ratio (FAR) of less than 0.10.

EPS also defined criteria to classify industrially-zoned parcels occupied by Unsound Residential Units (MOA GIS Land Use Code 1800) as **Redevelopable Residential.** In practice, no such parcels have been identified in the Study Area.

As was the pattern of distribution found for the Currently Undeveloped category, and as shown in **Table B-1,** the majority of the 86 parcels and about 50.5 acres of **Redevelopable Residential** land in the Study Area are located in the Anchorage Central and Chugiac/Eklutna Subareas. Similarly, the average size of parcels differs by Subarea, with the Anchorage Central Redevelopable Residential parcels averaging about 0.36 acres while the Chugiac/Eklutna Redevelopable Residential parcels average about 0.59 acres in size (see **Table B-2**).

The defined Redevelopable Residential selection criteria include:

Existing Land Use

The following MOA Planning/GIS Land Use classes and included sub classifications are assumed to be compatible with Redevelopable Residential status for additional or alternative Industrial development:

1000s – 1400s Single- and Multi-Family Residential, Mobile Homes and RV Parks, Group Quarters

1500s – 1700s Mixed Use Commercial/ Religious/ and Industrial/Residential

1800 Unsound Building Units

The following MOA Planning/GIS Land Use classes and included sub classifications are assumed to be incompatible with default assignment to Redevelopable Residential status for additional or alternative Industrial development:

1240 Parcels associated with mobile home park – no structure on lot

1900s Miscellaneous Residential-associated Uses

These exclusions are intended to prevent residential back yards, gardens, recreational yards and common space associated with existing residential buildings from being classified as vacant or underutilized. In practice, only 8 such parcels covering 1.61 land acres were found to be located on Industrially-Zoned land in the Anchorage Central Subarea – these were assigned to the Currently Developed category described below.

Development Thresholds

The following MOA current development densities and assessed valuation thresholds are assumed to be compatible with Redevelopable Residential status for additional or alternative Industrial development:

Land Sq. Ft. per Dwelling Unit > 5,000 Sq. Ft.

Building Value / Land Value < 0.75

Floor Area Ratio (FAR) < 0.10

Anchorage 2020 Development Suitability Ratings

Industrially Zoned Parcels which had previously been assigned a Suitability Rating of '0', '1' or '2' – that is, 'Not Rated' 'Suitable' or 'Marginally Suitable' for assumed development, infill or redevelopment during the *Anchorage 2020* buildout analysis, have been assumed to be Suitable for consideration of development before 2030 in this Study.

Underutilized Non-Residential

Industrially-Zoned Land with primarily non-residential surface use has been classified as **Underutilized Non-Residential** if it passes through the exclusionary criteria described above, and had a Floor Area Ratio (FAR) less than 0.10 **AND** a ratio of 2009 Building Assessed Value / 2009 Assessed Land Value less than 0.75. Underutilized Non-Residential parcels located within industrial zones are therefore defined for this Study as having both relatively low densities of commercial/industrial development for urbanized areas and relatively low-valuation of commercial/industrial structures compared to the value of the land they are occupying.

As shown in **Table B-5,** the majority of the 353 parcels and about 612 acres of **Underutilized Non-Residential** land in the Study Area are located in the Anchorage Central, Anchorage Southwest and Anchorage Northeast Subareas, Approximately 66% or two-thirds of the total land supply in this category was classified as Industrial usage under the existing (circa ~2006) MOA GIS/Planning Land Use Codes; about 28% was classified as Commercial usage and the remaining 6% was classified as Vacant Land, prior to this Study's update of industrially-zoned

Table B-5
Anchorage Bowl Industrial Land Assessment
Preliminary Industrial Zoning Districts - Underutilized Land Supply Estimates [1] [2] [3]

Underutilized Land by Parcel Sizes

Search and Classification Criteria									Subarea Geography															
Parcel Land Acres	Ownership	MOA LU Types Included	Primary Land Use (Prior Status)	MOA LU Types Excluded	Ival : Lval ratio	DU : Land ratio	Floor Area Ratio	Suitability Classes	Airport Parcels	Airport Acres	Northwest Parcels	Northwest Acres	Northeast Parcels	Northeast Acres	Central Parcels	Central Acres	Southwest Parcels	Southwest Acres	Chugiak / Eklutna Parcels	Chugiak / Eklutna Acres	Eagle River Parcels	Eagle River Acres	Study Area Totals Parcels	Study Area Totals Acres
	Private	2000 - 3700s, 8000	Underutilized/Unbuilt Non-Residential	1000-1900s, 3800s-7300s, 8100, 8200	> 0	< 0.75	< 0.10	0, 1, 2																
0 - 20,000 Sq. Ft.											20	5.38	11	4.47	103	28	6	1.56					140	39.41
20,000 Sq. Ft. - 1 Acre											3	2.36	18	12.09	76	55	1	0.71			1	0.72	99	70.62
1 - 3 Acres											8	15.04	8	12.65	44	73.90	5	9.47			4	5.08	69	116.14
3 - 7 Acres											1	3.60	5	21.86	22	100.83	3	17.60					31	143.88
7 - 10 Acres											1	9.67	1	9.58	2	16.32	1	9.30	1	9.83			6	54.68
10 Acres+													1	15.72	4	111.89	3	59.53					8	187.14
	Totals by Subarea								**0**	**0.00**	**33**	**36.04**	**44**	**76.36**	**251**	**385.67**	**19**	**98.17**	**1**	**9.83**	**5**	**5.80**	**353**	**611.87**

"under_size"

Sources: *Economic & Planning Systems, using MOA GIS Parcel, Zoning and Land Use boundary layers and 'roll-up' summaries of parcel development and valuation status developed by Dan Quinn and provided by MOA Information Technology Staff*

Notes: These estimates incorporate 2009 Assessed Valuation and Development Status, but do not yet reflect revisions in 4-digit Land Use Codes which are being assigned to update current site usage of Industrially Zoned properties.

[1] Land Acreage adjusted by EPS to exclude areas with permanent/ standing water-coverage, tidal flats, low coastlands, etc.

[2] Government, Utility, and Institutional contacts have beeen made independently to determine development plans and estimate potential development capacity - these estimates will be added to the estimated supply from the Vacant/Unbuilt, Redevelopable Residential and Underutilized Non-Residential classes.

[3] Final parcel counts and acreages.

parcels' development status and assessed building and land valuation[2]. The average size of parcels differs by Subarea, with Anchorage Central Underutilized Non-Residential parcels averaging about 1.54 acres, Anchorage-Northeast about 1.74 acres and Anchorage-Southwest Underutilized Non-Residential parcels 5.17 acres (see **Table B-5**).

Table B-6 indicates over 340 of the 612 acres, 56%, is zoned I-1 or I-1 SL, while the remaining 272 acres, 44%, is zoned I-2 or I-2 SL. **Table B-7** shows the Underutilized Non-Residential land in the Study Area sorted by soil limitation ratings.

The defined Underutilized Non-Residential selection criteria include:

Existing Land Use

The following MOA Planning/GIS Land Use classes and included sub classifications are assumed to be compatible with Underutilized Non-Residential status for additional or alternative Industrial development:

2000s – 2400s Commercial (Surface) Uses

3000s – 3700s Industrial (Surface) Uses

8000s (Previously) Vacant Land

Development Thresholds

The following MOA current development densities and assessed valuation thresholds are assumed to be compatible with Underutilized Non-Residential status for additional or alternative Industrial development:

Building Value / Land Value < 0.75

Floor Area Ratio (FAR) < 0.10

Anchorage 2020 Development Suitability Ratings

Industrially Zoned Parcels which had previously been assigned a Suitability Rating of '0', '1' or '2' – that is, 'Not Rated' 'Suitable' or 'Marginally Suitable' for assumed development, infill or redevelopment during the *Anchorage 2020* buildout analysis, have been assumed to be Suitable for consideration of development before 2030 in this Study.

[2] As indicated in the following section of this **Appendix,** EPS has also linked and recorded updated (EOY 2008, BOY 2009) CAMA and MUNIVIEW land and site use and structure type designations for all of the Industrially-Zoned parcels, and has prepared Correlation Tables relating these MOA Property use codes to MOA GIS/Planning four-digit code equivalents.

Table B-6
Anchorage Bowl Industrial Land Assessment
Preliminary Industrial Zoning Districts - Underutilized Land Supply Estimates [1] [2] [3]

Underutilized Land by Zone

Search and Classification Criteria									Subarea Geography															
Zoning Designation	Ownership	MOA LU Types Included	Primary Land Use (Prior Status)	MOA LU Types Excluded	Ival : Lval ratio	DU : Land ratio	Floor Area Ratio	Suitability Classes	Airport Parcels	Airport Acres	Northwest Parcels	Northwest Acres	Northeast Parcels	Northeast Acres	Central Parcels	Central Acres	Southwest Parcels	Southwest Acres	Chugiak / Eklutna Parcels	Chugiak / Eklutna Acres	Eagle River Parcels	Eagle River Acres	Study Area Totals Parcels	Study Area Totals Acres
	Private	2000 - 3700s, 8000	Underutilized/Unbuilt Non-Residential	1000-1900s, 3800s-7300s, 8100, 8200	> 0	< 0.75	< 0.10	0, 1, 2																
I-1											33	36.04	39	50.85	213	214.46	12	31.01			5	5.80	302	338.16
I-1 SL													1	1.42	1	0.71							2	2.13
I-1 SL 2																							0	0.00
I-2													4	24.08	37	170.51	7	67.16					48	261.75
I-2 SL																			1	9.83			1	9.83
I-3 SL 1																							0	0.00
I-3 SL 2																							0	0.00
	Totals by Subarea								**0**	**0.00**	**33**	**36.04**	**44**	**76.36**	**251**	**385.67**	**19**	**98.17**	**1**	**9.83**	**5**	**5.80**	**353**	**611.87**

"under_zone"

Sources: *Economic & Planning Systems, using MOA GIS Parcel, Zoning and Land Use boundary layers and 'roll-up' summaries of parcel development and valuation status developed by Dan Quinn and provided by MOA Information Technology Staff*

Notes: These estimates incorporate 2009 Assessed Valuation and Development Status, but do not yet reflect revisions in 4-digit Land Use Codes which are being assigned to update current site usage of Industrially Zoned properties.

[1] The targeted Industrial Zoning Districts are I-1, I-2, I-3 and MI, as located in the Anchorage Bowl, Chugiak-Eklutna, and Eagle River subareas of the Municipality of Anchorage; the Anchorage Bowl Subarea has been further subdivided into six regions: Airport, Northwest, Northeast, Central, Southeast and Southwest.

[2] Government, Utility, and Institutional contacts have beeen made independently to determine development plans and estimate potential development capacity - these estimates will be added to the estimated supply from the Vacant/Unbuilt, Redevelopable Residential and Underutilized Non-Residential classes.

[3] Final parcel counts and acreages.

Table B-7
Anchorage Bowl Industrial Land Assessment
Preliminary Industrial Zoning Districts - Underutilized Land Supply Estimates [1] [2] [3] [4]

Underutilized Land by Soil Rating

Search and Classification Criteria									Subarea Geography																	
Soil Limitation Rating	Soil Limitation # Range	Ownership	MOA LU Types Included	Primary Land Use (Prior Status)	MOA LU Types Excluded	Ival : Lval ratio	Floor Area Ratio	Suitability Classes	Airport Parcels	Airport Acres	Northwest Parcels	Northwest Acres	Northeast Parcels	Northeast Acres	Central Parcels	Central Acres	Southwest Parcels	Southwest Acres	Chugiak / Eklutna Parcels	Chugiak / Eklutna Acres	Eagle River Parcels	Eagle River Acres	Study Area Totals Parcels	Study Area Totals Acres
		Private	2000 - 3700s, 8000	Underutilized/ Unbuilt Non-Residential		> 0	< 0.75	< 0.10	0, 1, 2																	
Not Rated	#N/A										2	11.30			24	137.32	6	75.62					32	224.24
Not Limited	0.00 - 0.00														5	5.11	1	10.81			1	1.11	7	17.04
Some Limitation	0.01 - 0.10										30	24.49	43	60.64	207	217.79	12	11.74			2	2.35	294	317.02
Moderate Limitation	0.11 - 0.25												1	15.72	4	6.04			1	9.83			6	31.59
Severe Limitation	0.26 - 0.50														3	6.41							3	6.41
Very Severe Limitation	0.51 - 1.00										1	0.24			8	12.99					2	2.34	11	15.58
	Totals by Subarea								**0**	**0.00**	**33**	**36.04**	**44**	**76.36**	**251**	**385.67**	**19**	**98.17**	**1**	**9.83**	**5**	**5.80**	**353**	**611.87**

"under_soil"

Sources: *Economic & Planning Systems, using MOA GIS Parcel, Zoning and Land Use boundary layers and 'roll-up' summaries of parcel development and valuation status developed by Dan Quinn and provided by MOA Information Technology Staff*

Notes: These estimates incorporate 2009 Assessed Valuation and Development Status, but do not yet reflect revisions in 4-digit Land Use Codes which are being assigned to update current site usage of Industrially Zoned properties.

[1] Soil Limitation Ratings derived from GIS layers and documentation of Soil Survey of Anchorage, Alaska provided by MOA staff and USDA Natural Resources Conservation Service. Specific ratings by soil type derived from Table 13 - Building Site Development: Structures; Limitations for Small Commercial Structures. Parcel ratings allocated by EPS, using weighted averages where parcel polygons intersected multiple soil types. Ratings are approximate, for broad-brush analysis and not a substitute for parcel-specific onsite evaluations.

[2] *"Small commercial buildings* are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments."

[3] Government, Utility, and Institutional contacts have beeen made independently to determine development plans and estimate potential development capacity - these estimates will be added to the estimated supply from the Vacant/Unbuilt, Redevelopable Residential and Underutilized Non-Residential classes.

[4] Final parcel counts and acreages.

Currently Developed

Industrially-Zoned Land with primarily residential surface use has been classified as **Currently Developed** if it passes through the exclusionary criteria described above, and has a ratio of land per residential unit less than or equal to 5,000 square feet **AND** a ratio of 2009 Building Assessed Value / 2009 Assessed Land Value greater than or equal to 0.75, **OR** has been identified by the MOA as Economically Linked to other Currently Developed parcels.

Industrially-Zoned Land with primarily non-residential surface use has been classified as **Currently Developed** if it passes through the exclusionary criteria described above, has a Floor Area Ratio (FAR) greater than or equal to 0.10, **OR** has a ratio of 2009 Building Assessed Value / 2009 Assessed Land Value greater than or equal to 0.75, **OR** has been identified as Economically Linked to other currently developed parcels by MOA staff.

Currently Developed parcels located within industrial zones are therefore defined for this Study as having moderate to high densities of residential/commercial/industrial development for the Anchorage area and/or moderate to high valuation of residential/commercial/industrial units and structures to the land they are occupying. Development of these parcels with additional infill or alternative industrial development could therefore require displacement of well-established existing economic uses or extensive demolition or redevelopment of existing structures.

As indicated below, approximately 40% of the total acreage in this category has existing Industrial Land Use coding and thus may have (some) additional industrial infill capacity, but it is evident from both field work and inspection of historical and recent aerial views that many existing industrial establishments are intensive users of surface space for bulk outdoor storage, heavy equipment parking, assembly yards, etc., so that economically functional lot 'coverage' is often much greater than the associated permanent structures' 'footprints'.

As shown in **Table B-1,** the majority of the 1,130 parcels and about 1,565 acres of **Currently Developed** land in the Study Area are located in the Anchorage Central Subarea, containing about 53% of the acreage in this category, and the Chugiac/Eklutna Subarea, containing about 15% of the acreage in this category. The Anchorage-Northeast and Anchorage Northwest Subareas each contain about 190 acres or 12% of the category – together about 24% of the Currently Developed land.

The total land acreage in this category has been classified as 40% Commercial and 40% Industrial usage under the existing (circa ~2006) MOA GIS/Planning Land Use Codes; about 19% was previously classified as Vacant land and the remaining 1% was classified in Residential and Mixed Uses, prior to this Study's update of parcels' development status and assessed building and land valuation.

The defined Currently Developed selection criteria include:

Existing Land Use

The following MOA Planning/GIS Land Use classes and included sub classifications are assumed to be compatible with Currently Developed status:

1000s – 1400s Single- and Multi-Family Residential, Mobile Homes and RV Parks, Group Quarters

1240 Parcels associated with mobile home park – no structure on lot

1500s – 1700s Mixed Use Commercial/ Religious/ and Industrial/Residential

1900s Miscellaneous Residential-associated Uses

2000s – 2400s Commercial (Surface) Uses

3000s – 3700s Industrial (Surface) Uses

8000s (Previously) Vacant Land

The following MOA Planning/GIS Land Use classes and sub classifications were assigned to **Unsuitable** status, and have been excluded from the Currently Developed category to prevent double-counts of unique parcels and acreage:

3800s Utility-Related Facilities

4000s INSTITUTIONAL

5000s PARKS, OPEN SPACE, AND RECREATION AREAS

6000s TRANSPORTATION - RELATED

7000s R.O.W.s and Military Reservations

8100 Intertidal Areas

8200 Waterbodies

Development Thresholds

The following MOA current development densities and assessed valuation thresholds are assumed to be compatible with Currently Developed status:

Land Sq. Ft. per Dwelling Unit <= 5,000 Sq. Ft.

Building Value / Land Value >= 0.75

Floor Area Ratio (FAR) >= 0.10

Anchorage 2020 Development Suitability Ratings

Industrially Zoned Parcels which had previously been assigned a Suitability Rating of '0', '1' or '2' – that is, 'Not Rated' 'Suitable' or 'Marginally Suitable' for assumed development, infill or redevelopment during the *Anchorage 2020* buildout analysis, have been assumed to be Suitable for consideration of development before 2030 in this Study.

Additional Technical Discussion

In preparing the current Inventory of MOA Industrial Land, i.e., identifying MOA land parcels located in currently defined I-1, I-2, I-3 and MI Zoning Districts, and updating information about the physical characteristics, ownership, site use(s) and development status of those parcels, the EPS team assembled GIS map layers and data from several sources. These sources include:

- GIS map 'layers' in ESRI shapefile format, downloaded from the MOA GIS website: http://munimaps.muni.org/moagis/download.htm and provided by MOA staff. GIS Technician/Senior Cartographer Lisa Ameen, GIS Technician Terry Lamberson and GIS Tech II Brittni Kilborn have all been very generous with their expertise and very rapid in their response to EPS' requests for data and technical assistance, and have taken pains to convey the origins, complexity, special characteristics and limitations, and potential sources of misunderstanding in the supplied data.

  The shapefiles supplied by MOA GIS Services have as their defined projection and coordinate system State Plane Coordinate System 1983, Alaska 5004, Zone 4 (US Survey Feet). EPS has adhered to this standard in creating the Industrial Land Inventory shapefile, which comprises the parcel boundary digital map regions and the associated parcel attributes.

- GIS map 'layers' and data tables obtained from other government agencies, including 2000 and 2008 TIGER/Line shapefiles downloaded from ESRI and U.S. Census Bureau archives; Anchorage Soil Survey tables and documentation obtained from the Natural Resources Conservation Service; and USGS 1 degree Digital Elevation Map files downloaded from the WebGIS portal: http://www.webgis.com/terr_pages/AK/dem75/anchorageborough.html.

- Anchorage Computer Assisted Mass Appraisal (CAMA) and MUNIVIEW tables, documentation and custom data extracts provided by MOA Information Technology. Senior Systems Analyst Heidi Pollard provided invaluable guidance to EPS in dealing with the intricacies of the parcel appraisal and cadastral data, suggesting and coordinating assistance and special 'roll-up' parcel data extraction by MOA Contractor-Programmer Analyst Daniel W. Quinn.

  Mr. Quinn suggested and programmed data extraction and reporting code that assembles Year 2009 parcel development (in terms of aggregate residential units, building counts and gross building square footage) and the associated building and land valuations, summarizing and assigning the aggregate development and AV measures at the 'physical'/mappable parcel level. This greatly simplifies and accelerates access to data that would otherwise have required significant time and effort be expended by the Consultant Team, in tracing and correctly processing parcel development and valuation measures distributed across multiple CAMA data tables, 'cards' and property-lease relationships.

- The special parcel data extracts described immediately above, and correspondence tables of Anchorage CAMA land use codes and structure types to MOA GIS/Planning land use code equivalents constructed by EPS, in large part superseded the need to apply Alaska State Business License records obtained at the very beginning of the study from the Alaska State Department of Commerce, Community and Economic Development: http://www.commerce.state.ak.us/occ/buslic4.cfm. The State's business license records are coded by industry using the North American Industry Classification System (NAICS) and have been helpful in a limited number of instances in supplementing data available from the MOA online Parcel Viewer: http://munimaps.muni.org/website/anchorage/application/map.htm to identify or confirm the location of specific industrial businesses during the interview and field check phases of the current study.

  In follow-up and more extended land use studies within the MOA, EPS suggests the State Business License lists may have continuing utility, particularly if the full license database

contains more information about licensed establishments' actual physical locations (which appears to be a requirement for issuance of a license) as opposed to the license-holders mailing address, and if both the MOA's CAMA Parcel Site Address records and the State's Business License Physical Address records were standardized to US Postal Office formats, possibly using services such as those offered to government researchers without charge by the University of Southern California GIS Research Laboratory: https://webgis.usc.edu/.

Data Dictionary

The Industrial Land Inventory Data Dictionary is summarized as **Table B-8**, which shows the component data fields' names, descriptions and formats. **Table B-8** also indicates the data sources, indicating which data were assembled from CAMA, MUNIVIEW and GIS materials provided by the MOA, and which fields were assigned or calculated by EPS. Among the latter are: the development density ratios LSQFT_DU09 and FAR09, which are the calculated ratios of square feet of 'land' (excluding permanent water-body coverage) per dwelling unit for residentially-developed lots, and Floor Area Ratios; and IL_RATIO09, which is the calculated ratio of Aggregate Building Assessed Value to Aggregate Land Assessed Value, per calendar year 2009 tax valuations.

It should be noted the MOA's CAMA database does not always include development data for tax-exempt properties, such as those owned by the Federal and State governments, and so the Inventory records for lots and parcels with Exemption Codes "A", "F", "2", "3", "4" and "9" (and possibly others) should be used with caution – EPS tagged several such parcels with a "B" flag in the LBFLAG_06 field to indicate visual confirmation of permanent surface structures, per 2006 and 2007 aerial views available in Google Earth. To 'normalize' variations in the prior assignment of Exemption Codes between CAMA fields EX_CD_1 and EX_CD_2, EPS created the field EX_CD_ASSM to assure uniform selection/filtering capability for parcels with Exemption Codes "A", "F", "2", "3", "4" and "9" .

For the purposes of this study, EPS used GIS tools to independently assign gross lot and parcel areas in acres, and subsequently adjusted these gross area estimates to exclude water coverage, as recorded in the EPS_ACRES, LAND_ACRES, WET_ACRES and LND_SF_ADJ fields. The MOA provided area fields AREA and LAND_SQFT have been included to allow comparison and, if necessary, future checks and revisions. Similarly, EPS created fields such as EPSROWID, PFC_LINK, DQS_ULNK, DQS_PLNK, and ELNK121208 to aid referential integrity when relating data across several GIS layers and CAMA and MUNIVIEW tables and extracts. Some of these linking fields, and the MOAs older SEQNUM fields, may now be superseded by the UNIQEID field created jointly by GIS and Information Services staff in late December, 2008 – EPS has recorded the UNIQUEID field as UNIQ123008.

During the Inventory and Supply analyses, EPS has made extensive use of parcel overlays created for Google Earth using our Google Earth Pro license and ArcGIS and MapInfo GIS applications. To assist future users of the Industrial Land Inventory, EPS has included the coordinates for each of the included lots and parcels as WGS84 Latitude and Longitude coordinates, recorded in the LAT_WGS84 and LON_WGS84 fields. The Google Earth overlays will be included in the Work Products for this Study in KML or KMZ format, along with the Inventory database and associated map layer in ESRI shapefile format.

Table B-8
Anchorage Bowl Industrial Land Assessment
Industrial Land Inventory Data Dictionary Summary [1] [2] [3]

Field	FieldDesc	Type	Size	Decimals	Primary/Rollup	Source
PARCEL_NUM	11-digit Parcel ID, No "-" MASK	Text	11			MOA GIS 12/08/2008
PLOT_CNT	EPS-assigned count of GIS parcels sharing identical PARCEL_NUM attribute	Numeric	11	0		MOA GIS, EPS
SEQNUM	Superseded unique link attribute for CAMA/GIS 'parcels'	Text	10			MOA GIS 12/08/2008
AREA	GIS 'parcel' area in SqFT	Float				MOA GIS 12/08/2008
LEN	GIS 'parcel' perimeter in SqFT	Float				MOA GIS 12/08/2008
ZONING_DES	Zoning Designation, per 12/08/2008 Zoning shape file	Text	9			MOA GIS, EPS
ZONING_GRP	Zone (MOA Planning Dept. standard acronym)	Text	4			MOA GIS, EPS
GIS_LU_PRV	Planning/GIS 4-digit Land Use Code (per 12/08/2008 shape file)	Numeric	4	0	X	MOA GIS, EPS
GIS_LU_Y09	Planning/GIS 4-digit Land Use Code (per 2009 Update in progress)	Numeric	4	0	X	EPS
SUIT_VCNT	Suitability for development - (per Anchorage 2020 'vacant' parcel buildout analysis)	Numeric	1	0		MOA GIS, EPS
SUIT_UNDR	Suitability for infill - (per Anchorage 2020 'underutilized' parcel buildout analysis)	Numeric	1	0		MOA GIS, EPS
SUIT_REDV	Suitability for redevelopment - (per Anchorage 2020 'non-conforming' parcel buildout analysis)	Numeric	1	0		MOA GIS, EPS
EPSROWID	EPS-assigned unique ordinal # for 12/08/2008 GIS parcel records	Numeric	11	0		EPS
SUBREGION	MOA Regional Planning Subareas - per AEDC suggestions and GIS 'Community' shape files.	Text	4			EPS
UNIQ123008	Current unique link attribute for CAMA/GIS 'parcels'	Numeric	11	0		MOA GIS, IT
IND_FLAG	EPS-assigned T/F flag for GIS parcels completely or mostly located in Industrial Zoning Districts	Logical	1			EPS
IND_SPLIT	EPS-assigned T/F flag for GIS parcels 'split' by Industrial Zoning District boundaries	Logical	1			EPS
EPS_ACRES	GIS 'parcel' area in Acres (polygon area - may include water-coverage)	Float				EPS
LAND_ACRES	GIS 'parcel' land area in Acres (land area - excludes water-coverage, tidal flats, low coastlands)	Float				MOA GIS, EPS
WET_ACRES	GIS 'parcel' wetland area in Acres (wetland area - per MOA GIS wetlands layer)	Float				MOA GIS, EPS
WET_TYPE	GIS 'parcel' wetland type - per MOA GIS wetlands layer	Text	10			MOA GIS, EPS
MAP_COMMNT	Platting comment(s)	Text	***60***			MUNIVIEW_PARCEL 12/08/2008
PFC_LINK	EPS-assigned T/F flag checking match on PARCEL_NUM to 1/08/09 MUNIVIEW_PARCEL file	Logical	1			EPS
DQS_ULNK	EPS-assigned T/F flag checking ***unique*** match on PARCEL_NUM to 1/12/09 Quinn Summary File	Logical	1			EPS
DQS_PLNK	EPS-assigned T/F flag checking match on PARCEL_NUM to 1/12/09 Quinn Summary File	Logical	1			EPS
ELNK121208	Economic Link - Unique Ordinal # assigned to Economic Linkage Polygons in MOA-provided coverage.	Numeric	11	0		MOA GIS, EPS
Y09_LND_AV	Aggregate Current tax year land value	Numeric	11	0	X	QUINN SUMMARY 'ROLL-UP' 01/12/2009
Y09_BLD_AV	Aggregate Current tax year building value	Numeric	11	0	X	QUINN SUMMARY 'ROLL-UP' 01/12/2010
Y09_TOT_AV	Aggregate Current tax year value of property	Numeric	11	0	X	QUINN SUMMARY 'ROLL-UP' 01/12/2011
LAT_WGS84	Parcel Centroid 'Y' Coordinate (WGS84 Latitude)	Numeric	11	6		EPS
LON_WGS84	Parcel Centroid 'X' Coordinate (WGS84 Longitude)	Numeric	11	6		EPS
CLASS_CD	Class of parcel [Residential, Commercial]	Text	17			MUNIVIEW_BOTH 12/08/2008
APPLUCD	Appraisal/Property 3-digit Land Use Code (per 12/08/2008 MUNIVIEW_BOTH file)	Numeric	3		X	MUNIVIEW_BOTH 12/08/2008
LD_USE_CD	Land Use Description	Text	24		X	MUNIVIEW_BOTH 12/08/2008
STRCT_TYPE	Structure type description [Apartment, Hotel, Nursing home, etc.]	Text	25		X	MUNIVIEW_COMMERCL 12/08/2008
VDO	V=vacant, D=Dwelling, O=Other (Superseded; used as crosscheck for other fields)	Text	1			MUNIVIEW_BOTH 12/08/2008
RENUMBR_ID	Previous Parcel ID. Parcel may be renumbered and/or replatted	Text	13		X	MUNIVIEW_PARCEL 1/08/2009
OWN_NAME_1	Owner Name, Part 1/3	Text	30			MUNIVIEW_PARCEL 1/08/2009
OWN_NAME_2	Owner Name, Part 2/3	Text	30			MUNIVIEW_PARCEL 1/08/2009
OWNER_ADDR	Owner Mailing Address (Unparsed 'Street' Address)	Text	30			MUNIVIEW_PARCEL 1/08/2009
CITY	Owner Mailing Address City	Text	16			MUNIVIEW_PARCEL 1/08/2009
STATE	Owner Mailing Address State	Text	2			MUNIVIEW_PARCEL 1/08/2009
ZIP_CODE	Owner Mailing Address 5-digit ZIP Area	Text	5			MUNIVIEW_PARCEL 1/08/2009
ZIP_BLOCK	Owner Mailing Address 4-digit ZIP Suffix	Text	4			MUNIVIEW_PARCEL 1/08/2009
SITE_ADDR	Site Address (Unparsed 'Street' Address)	Text	40			MUNIVIEW_PARCEL 1/08/2009
ST_EXMP_CD	State exemption code	Text	1		X	MUNIVIEW_PARCEL 1/08/2009
STATE_EXCD	State exemption code description	Text	15		X	MUNIVIEW_PARCEL 1/08/2009
EX_CD_ASSM	Exemption code assumed for Industrial Land Inventory Study (EPS checks of leases and ownership)	Text	1			EPS
EX_CD_1	Exemption code one	Text	1		X	MUNIVIEW_PARCEL 1/08/2009
EX_CD_1_LB	Exemption code description one	Text	21		X	MUNIVIEW_PARCEL 1/08/2009
EX_CD_2	Exemption code two	Text	1		X	MUNIVIEW_PARCEL 1/08/2009
EX_CD_2_LB	Exemption code description two	Text	21		X	MUNIVIEW_PARCEL 1/08/2009
MAP_KEY	8 character parcel ID for tie to mapping	Text	8			QUINN SUMMARY 'ROLL-UP' 01/12/2009
MKEYLOTS	EPS-assigned count of GIS parcels sharing identical MAP_KEY attribute	Numeric	11	0		EPS, QUINN LEASE 'ROLL-UP' 01/12/09
RES_UNITS	Total number of living units on 'physical' parcel	Numeric	11	0	X	QUINN SUMMARY 'ROLL-UP' 01/12/2009
LAND_SQFT	Land Area in SqFt	Numeric	11	0		QUINN SUMMARY 'ROLL-UP' 01/12/2009
YEAR_BUILT	Original date of construction	Numeric	5	0		MUNIVIEW_COMMERCL 12/08/2008
EFF_YEAR_B	Effective year built	Numeric	5	0		MUNIVIEW_COMMERCL 12/08/2008
LND_SF_ADJ	Adjusted Land Area in SqFt - excludes water-coverage, tidal flats, low coastlands	Numeric	11	0		EPS
NBR_BLDGS	Total number of buildings on 'physical' parcel	Numeric	11	0	X	QUINN SUMMARY 'ROLL-UP' 01/12/2009
BLDG_AREA	Total GBA in SqFt on 'physical' parcel	Numeric	11	0	X	QUINN SUMMARY 'ROLL-UP' 01/12/2009
BLDG_COVER	Total built coverage (ground floor SqFt) on 'physical' parcel	Numeric	11	0	X	QUINN SUMMARY 'ROLL-UP' 01/12/2009
BLDG_STORY	Maximum floor levels on 'physical' parcel	Numeric	11	0	X	QUINN SUMMARY 'ROLL-UP' 01/12/2009
CLASS	'Binary' Class of parcel [Residential, Commercial]	Text	1		X	QUINN SUMMARY 'ROLL-UP' 01/12/2009
CONDO_CNT	Total number of condominium units on 'physical' parcel	Numeric	10	0	X	QUINN SUMMARY 'ROLL-UP' 01/12/2009
APTMT_CNT	Total number of apartment units on 'physical' parcel	Numeric	10	0	X	QUINN SUMMARY 'ROLL-UP' 01/12/2009
LEASE	Active Lease Flag ('Y' or ' ')	Text	1			QUINN SUMMARY 'ROLL-UP' 01/12/2009
LEASE_CNT	Active Lease Count	Numeric	11	0	X	QUINN SUMMARY 'ROLL-UP' 01/12/2009
IL_RATIO09	Aggregate building value (2009) / Aggregate land value (2009)	Numeric	9	2		EPS
LSQFT_DU09	Adjusted Land Area in SqFt / Total # of living units on 'physical' parcel	Numeric	9	2		EPS
FAR09	Floor Area Ratio : Total GBA in SqFt / Adjusted Land Area in SqFt	Numeric	9	2		EPS
BSDS_SCM	Soil Suitability/Limitation Rating for Small Commercial Structures	Numeric	5	2	X	EPS, USDA Anchorage Soil Survey
WET_LAND	Wetland legislated condition	Text	13		X	MUNIVIEW_BOTH 12/08/2008
LBFLAG_06	'Snapshot' impression of parcel surface development status, per Google Earth and 2006 MOA imagery	Text	1			EPS, for selected parcels
SUPPLY_CAT	Industrial Land Supply Category and Land Use Group Code	Text	7			EPS
SUPPLY_GRP	Industrial Land Supply Group Code	Text	3			EPS
GEOTIF_06	Aerial 'tile' location, per USGS index, for use with 2007 MrSID Aerials of Anchorage Bowl	Text	15			USGS

"diction_summ"

Sources: MOA GIS datasets and metadata; Economic & Planning Systems.

Notes: [1] The field list, data types and sizes indicated above are draft and subject to change during collaboration with MOA staff.
[2] The Inventory Work Product will include an ArcView shapefile, using Alaska State Plane Coordinate System, Zone 4, (1983 U.S. Survey Feet) as the default projection.
[3] Fields with Yellow Backgrounds are 'scaffolding' aids that may be dropped from final Industrial Land Inventory Deliverable.

APPENDIX C:

Woods and Poole Economics, Inc.
Projection Methodology

Anchorage Borough, Alaska
2008 Data Pamphlet
Technical Description of the Woods & Poole Economices, Inc.
2008 Regional Projections and Database

Overview of the Projection Methods

The strength of Woods & Poole's economic and demographic projections stems from the comprehensive historical county database and the integrated nature of the projection model. The projection for each county in the United States is done simultaneously so that changes in one county will affect growth or decline in other counties. For example, growth in employment and population in Houston will affect growth in other metropolitan areas, such as Cleveland. This reflects the flow of economic activity around the country as new industries emerge or relocate in growing areas and as people migrate, in part because of job opportunities. The county projections are developed within the framework of the United States projection made by Woods & Poole. The U.S. projection is the control total for the 2008 regional projections and is described in the "Overview of the 2008 Projections" chapter included in Woods & Poole publications.

The regional projection technique used by Woods & Poole - linking the counties together to capture regional flows and constraining the results to a previously determined United States total - avoids a common pitfall in regional projections. Regional projections are sometimes made for a city or county without regard for potential growth in surrounding areas or other areas in the country. Such projections may be simple extrapolations of recent historical trends and, as a result, may be too optimistic or pessimistic. If these county projections were added together, the total might differ considerably from any conceivable national forecast scenario; this is the result of each regional projection being generated independently without interactive procedures and without being integrated into a consistent national projection.

The methods used by Woods & Poole to generate the county projections proceed in four stages. First, forecasts to 2040 of total United States personal income, earnings by industry, employment by industry, population, inflation, and other variables are made. Second, the country is divided into 179 Economic Areas (EAs) as defined by the U.S. Department of Commerce, Bureau of Economic Analysis (BEA). The EAs are aggregates of contiguous counties that attempt to measure cohesive economic regions in the United States (a list of all EAs and their component counties can be found in Appendix 6 following this chapter); in the 2008 Woods & Poole model, EA definitions released by the BEA in

May 2007 are used. For each EA, a projection is made for employment, using an "export-base" approach; in some cases, the employment projections are adjusted to reflect the results of individual EA models or exogenous information about the EA economy. The employment projection for each EA is then used to estimate earnings in each EA. The employment and earnings projections then become the principal explanatory variables used to estimate population and number of households in each EA.

The third stage is to project population by age, sex, and race for each EA on the basis of net migration rates projected from employment opportunities. For stages two and three, the U.S. projection is the control total for the EA projections. The fourth stage replicates stages two and three except that it is performed at the county level, using the EAs as the control total for the county projections.

The "Export-Base" Approach

The specific economic projection technique used by Woods & Poole to generate the employment, earnings, and income estimates for each county in the United States generally follow a standard economic "export-base" approach. This relatively simple approach to regional employment projections is one that has been used by a number of researchers (see [5] and [9]). Although this approach has been criticized by several empirical studies (e.g., [8]), given the availability of regional data it remains one of the most feasible methodologies.

Certain industrial sectors at the regional level are considered "basic." This means that these sectors produce output that is not consumed locally but is "exported" out of the region for national or international consumption. This assumption allows these sectors to be linked closely to the national economy, and hence follow national trends in productivity and output growth. Normally, the "basic" sectors are mining, agriculture, manufacturing, and the Federal government. In contrast, "non-basic" sectors are those such as retail trade, utilities, real estate, and construction, the output of which is usually consumed locally. The growth of the "non-basic" sectors depends largely on the growth of the "basic" sectors that form the basis of the region's economy.

Intuitively, this approach has great appeal and there are numerous examples that seem to support the "export-base" theory. Automobile production in Detroit, for instance, is obviously much more sensitive to national and international price and demand for transportation equipment than to local demand. In Texas, oil and natural gas exploration and production are tied closely to the worldwide demand and

supply of petroleum resources and not tied primarily to energy consumption in Texas.

Although the theory is appealing, some shortcomings do exist in the "export-base" approach. For example, some "basic" commodities produced locally are consumed locally. Producers of durable equipment used in other manufacturing processes are often affected not by the national demand for their product but by the regional demand. Machine tool makers that supply the local automobile industry in Detroit will prosper to the extent Detroit's automobile producers prosper. In Houston, the strength of the local oil industry will affect the demand and production of equipment for oil and natural gas production and exploration. In both of these instances, some durable manufacturing industries exist to serve local, not national, markets.

However, despite the shortcomings, the availability of relatively clean data for sub-national geographic areas makes the "export-base" approach very useful. The analytical framework for projections using the "export-base" approach entails estimating either demand equations or calculating historical growth rate differentials for output by sector. The principal explanatory variable, or the comparative data series for growth rate differentials, is the national demand for the output of that sector. Employment-by-sector data are often used as a surrogate variable since county output-by-sector data are not available; employment-by-sector data is used by Woods & Poole. Earnings projections are then obtained by using earnings-per-employee data either estimated as part of the model or imposed exogenously on the system. The complementary relationship could also be estimated, i.e., using an earnings forecast to derive employment based on earnings-per-employee data; this procedure has been used previously in some Woods & Poole regional models.

A modification of the "export-base" approach is used by Woods & Poole to account for regional variants to normal "basic"/"non-basic" industry definitions. Some "non-basic" sectors can be more appropriately modeled as "basic" sectors in certain regional economies. The finance and insurance sector or wholesale trade sector in New York City, for example, and the accommodation and food services sector in Las Vegas, are cases in which traditionally "non-basic" sectors are really "basic." New York is a worldwide financial and trade center and thus "exports" these services outside of the region; Las Vegas, as a vacation and entertainment center, similarly "exports" the output of its accommodation and food services sector to other parts of the country. Activity in these sectors, in these specific geographic areas, is therefore linked more closely to the performance of these same sectors in the surrounding regions and the nation as a whole than

to the other "basic" industries in the region.

A list of Economic Areas that have traditionally "non-basic" sectors modeled as "basic" sectors is presented in Table 1. Areas with "non-basic" sectors modeled as "basic" are those areas with a proportion of "non-basic" sector employment relative to total employment greater than 1.5 standard deviations above the national mean for a specific sector. With the exception of two sectors that are always considered "non-basic," construction and state and local government, all "non-basic" sectors are evaluated for each EA using this method (see [5]).

Table 1. Economic Area "Non-Basic" Sectors Considered as "Basic" in the 2008 Woods & Poole Regional Model

UTILITIES
- Birmingham-Hoover-Cullman, AL
- Bismarck, ND
- Clarksburg, WV + Morgantown, WV
- Duluth, MN-WI
- Farmington, NM
- Gulfport-Biloxi-Pascagoula, MS
- Helena, MT
- Wichita Falls, TX

WHOLESALE TRADE
- Atlanta-Sandy Springs-Gainesville, GA-AL
- Charlotte-Gastonia-Salisbury, NC-SC
- Chicago-Naperville-Michigan City, IL-IN-WI
- Dallas-Fort Worth, TX
- Fargo-Wahpeton, ND-MN
- Houston-Baytown-Huntsville, TX
- Idaho Falls-Blackfoot, ID
- Memphis, TN-MS-AR
- New York-Newark-Bridgeport, NY-NJ-CT-PA

RETAIL TRADE
- Alpena, MI
- Bangor, ME
- Cape Girardeau-Jackson, MO-IL
- Duluth, MN-WI
- Eugene-Springfield, OR
- Kearney, NE
- Marinette, WI-MI
- McAllen-Edinburg-Pharr, TX

Sarasota-Bradenton-Venice, FL
Tampa-St. Petersburg-Clearwater, FL
Traverse City, MI

TRANSPORTATION and WAREHOUSING
Anchorage, AK
Fayetteville-Springdale-Rogers, AR-MO
Jacksonville, FL
Joplin, MO
Kearney, NE
Memphis, TN-MS-AR
New Orleans-Metairie-Bogalusa, LA
Pendleton-Hermiston, OR
Redding, CA
Scotts Bluff, NE
State College, PA

INFORMATION
Atlanta-Sandy Springs-Gainesville, GA-AL
Boston-Worcester-Manchester, MA-NH
Cedar Rapids, IA
Colorado Springs, CO
Columbus-Auburn-Opelika, GA-AL
Dallas-Fort Worth, TX
Denver-Aurora-Boulder, CO
Kansas City-Overland Park-Kansas City, MO-KS
Los Angeles-Long Beach-Riverside, CA
New York-Newark-Bridgeport, NY-NJ-CT-PA
San Angelo, TX
San Jose-San Francisco-Oakland, CA
Seattle-Tacoma-Olympia, WA
Washington-Baltimore-Northern Virginia, DC-MD-VA-WV

FINANCE and INSURANCE
Chicago-Naperville-Michigan City, IL-IN-WI
Dallas-Fort Worth, TX
Des Moines-Newton-Pella, IA
Hartford-West Hartford-Willimantic, CT
Jacksonville, FL
Kansas City-Overland Park-Kansas City, MO-KS
New York-Newark-Bridgeport, NY-NJ-CT-PA
Omaha-Council Bluffs-Fremont, NE-IA
Philadelphia-Camden-Vineland, PA-NJ-DE-MD
Phoenix-Mesa-Scottsdale, AZ
Sioux Falls, SD
Tampa-St. Petersburg-Clearwater, FL

REAL ESTATE and RENTAL and LEASING
- Alpena, MI
- Austin-Round Rock, TX
- Bend-Prineville, OR
- Denver-Aurora-Boulder, CO
- Honolulu, HI
- Los Angeles-Long Beach-Riverside, CA
- Miami-Fort Lauderdale-Miami Beach, FL
- Orlando-The Villages, FL
- Pensacola-Ferry Pass-Brent, FL
- Phoenix-Mesa-Scottsdale, AZ
- San Diego-Carlsbad-San Marcos, CA
- San Jose-San Francisco-Oakland, CA
- Sarasota-Bradenton-Venice, FL
- Seattle-Tacoma-Olympia, WA
- Tucson, AZ

PROFESSIONAL and TECHNICAL SERVICES
- Albuquerque, NM
- Austin-Round Rock, TX
- Boston-Worcester-Manchester, MA-NH
- Chicago-Naperville-Michigan City, IL-IN-WI
- Colorado Springs, CO
- Denver-Aurora-Boulder, CO
- Detroit-Warren-Flint, MI
- Houston-Baytown-Huntsville, TX
- Idaho Falls-Blackfoot, ID
- Los Angeles-Long Beach-Riverside, CA
- Miami-Fort Lauderdale-Miami Beach, FL
- New York-Newark-Bridgeport, NY-NJ-CT-PA
- Philadelphia-Camden-Vineland, PA-NJ-DE-MD
- San Diego-Carlsbad-San Marcos, CA
- San Jose-San Francisco-Oakland, CA
- Washington-Baltimore-Northern Virginia, DC-MD-VA-WV

MANAGEMENT of COMPANIES and ENTERPRISES
- Boise City-Nampa, ID
- Charlotte-Gastonia-Salisbury, NC-SC
- Cincinnati-Middletown-Wilmington, OH-KY-IN
- Fayetteville-Springdale-Rogers, AR-MO
- Minneapolis-St. Paul-St. Cloud, MN-WI
- Richmond, VA
- Roanoke, VA
- San Jose-San Francisco-Oakland, CA
- St. Louis-St. Charles-Farmington, MO-IL

ADMINISTRATIVE and WASTE SERVICES
- Albuquerque, NM
- Augusta-Richmond County, GA-SC
- Jacksonville, FL
- Las Vegas-Paradise-Pahrump, NV
- Miami-Fort Lauderdale-Miami Beach, FL
- Orlando-The Villages, FL
- Phoenix-Mesa-Scottsdale, AZ
- Sarasota-Bradenton-Venice, FL
- Tampa-St. Petersburg-Clearwater, FL

EDUCATIONAL SERVICES
- Albany-Schenectady-Amsterdam, NY
- Boston-Worcester-Manchester, MA-NH
- Burlington-South Burlington, VT
- Hartford-West Hartford-Willimantic, CT
- New Orleans-Metairie-Bogalusa, LA
- New York-Newark-Bridgeport, NY-NJ-CT-PA
- Philadelphia-Camden-Vineland, PA-NJ-DE-MD
- Pittsburgh-New Castle, PA
- Rochester-Batavia-Seneca Falls, NY
- Scranton--Wilkes-Barre, PA
- South Bend-Mishawaka, IN-MI
- St. Louis-St. Charles-Farmington, MO-IL
- Syracuse-Auburn, NY
- Washington-Baltimore-Northern Virginia, DC-MD-VA-WV

HEALTH CARE and SOCIAL ASSISTANCE
- Albany-Schenectady-Amsterdam, NY
- Bangor, ME
- Bismarck, ND
- Cape Girardeau-Jackson, MO-IL
- Duluth, MN-WI
- McAllen-Edinburg-Pharr, TX
- Pittsburgh-New Castle, PA
- Portland-Lewiston-South Portland, ME
- Pueblo, CO
- Scranton--Wilkes-Barre, PA
- Springfield, IL

ARTS, ENTERTAINMENT, and RECREATION
- Flagstaff, AZ
- Gulfport-Biloxi-Pascagoula, MS
- Helena, MT
- Lake Charles-Jennings, LA

Las Vegas-Paradise-Pahrump, NV
Los Angeles-Long Beach-Riverside, CA
Missoula, MT
Orlando-The Villages, FL
Reno-Sparks, NV
Santa Fe-Espanola, NM
Sarasota-Bradenton-Venice, FL
Shreveport-Bossier City-Minden, LA

ACCOMMODATION and FOOD SERVICES
Alpena, MI
Flagstaff, AZ
Gulfport-Biloxi-Pascagoula, MS
Honolulu, HI
Las Vegas-Paradise-Pahrump, NV
Reno-Sparks, NV

OTHER SERVICES, EXCEPT PUBLIC ADMIN.
Abilene, TX
Alpena, MI
Amarillo, TX
Beaumont-Port Arthur, TX
Corpus Christi-Kingsville, TX
Lafayette-Acadiana, LA
Lewiston, ID-WA
Lubbock-Levelland, TX
McAllen-Edinburg-Pharr, TX
Miami-Fort Lauderdale-Miami Beach, FL
Midland-Odessa, TX
Mobile-Daphne-Fairhope, AL
Monroe-Bastrop, LA
San Angelo, TX
Springfield, IL
Wichita Falls, TX

FEDERAL CIVILIAN GOVERNMENT
Anchorage, AK
Charleston-North Charleston, SC
El Paso, TX
Flagstaff, AZ
Gulfport-Biloxi-Pascagoula, MS
Honolulu, HI
Huntsville-Decatur, AL
Macon-Warner Robins-Fort Valley, GA
Pensacola-Ferry Pass-Brent, FL
San Antonio, TX

Texarkana, TX-Texarkana, AR
Virginia Beach-Norfolk-Newport News, VA-NC
Washington-Baltimore-Northern Virginia, DC-MD-VA-WV

In addition to following an "export-base" approach, Woods & Poole uses exogenous information about EA economies as well as some individual EA models to make projections. Although almost all EAs are not modeled individually, since most are assumed to fit a normative structure, certain EAs that have interesting features can be modeled separately. Areas that have had rapid growth (such as Houston) or severe economic recessions as in some heavy-industry EAs (such as Cleveland) lend themselves to individual models. These regional economies, at least in part, can be modeled separately. This is a simple "bottom-up" approach that can take into account the idiosyncrasies of individual areas (see [2], [3], [7]).

An example of the "bottom-up" approach is shown with the equations for Cleveland, Houston, Sioux City IA, and Seattle, presented in Table 2. The Cleveland-Akron-Elyria OH-PA Economic Area is defined as Ashland, Ashtabula, Carroll, Columbiana, Crawford, Cuyahoga, Erie, Geauga, Harrison, Holmes, Huron, Lake, Lorain, Mahoning, Medina, Portage, Richland, Stark, Summit, Trumbull, Tuscarawas, and Wayne counties in Ohio; and Mercer county in Pennsylvania. The Houston-Baytown-Huntsville TX Economic Area is defined as Angelina, Austin, Brazoria, Brazos, Burleson, Calhoun, Chambers, Colorado, DeWitt, Fayette, Fort Bend, Galveston, Goliad, Grimes, Harris, Houston, Jackson, Lavaca, Leon, Liberty, Madison, Matagorda, Montgomery, Nacogdoches, Polk, Robertson, Sabine, San Augustine, San Jacinto, Shelby, Trinity, Victoria, Walker, Waller, Washington, and Wharton counties. The Sioux City-Vermillion IA-NE-SD Economic Area is defined as Monona, O'Brien, Osceloa, Plymouth, Sioux, and Woodbury counties in Iowa; Antelope, Boyd, Cedar, Dakota, Dixon, Holt, Knox, Madison, Pierce, Stanton, Thurston, Wayne, and Wheeler counties in Nebraska; and Bon Homme, Clay, Union and Yankton counties in South Dakota. The Seattle-Tacoma-Olympia WA Economic Area is defined as Clallam, Grays Harbor, Island, Jefferson, King, Kitsap, Kittitas, Lewis, Mason, Pacific, Pierce, San Juan, Skagit, Snohomish, Thurston, and Whatcom counties.

The following discussion of these equations illustrates some of the logic and assumptions that go into the Woods & Poole model. The historical data used in the model equations is defined and explained in a later section of this chapter. Figure 1 illustrates graphically the degree of fit for several of the equations.

In equation (1) Cleveland manufacturing employment is a function of total U.S. manufacturing employment, the wages of Cleveland manufacturing workers relative to manufacturing workers for the U.S. as a whole, and a lagged dependent variable. All the coefficients are significant at a 95% confidence level, and together clearly explain historical manufacturing in Cleveland. It is interesting to note that the coefficient for relative wages is significant and negative. The ratio of earnings per manufacturing worker in Cleveland to U.S. earnings per manufacturing worker (this is the definition of relative wages) historically has always been greater than one, with a mean of 1.13 for the period 1970 to 2006. Relatively high wages explain, in part, the decline in manufacturing employment in areas such as Cleveland. Faced with relatively high wages, manufacturers have an incentive to increase the productivity of existing plants and save labor, move plants to other areas where wages are lower, or close plants permanently because of competition from other facilities able to produce the same goods more efficiently.

Equation (2) explains Houston manufacturing employment as a function of total U.S. mining earnings times a dummy variable for the years 1971 to 1985, U.S. manufacturing earnings, and a lagged dependent variable. U.S. mining earnings measures the expansion of domestic mining activity as oil and natural gas prices increased during the 1970s. Historically the largest manufacturing sectors in the Houston Economic Area were the production of equipment used in the exploration and extraction of petroleum resources and the production of refined fuels and chemicals from oil; both of these manufacturing sectors were dependent on the output of the mining sector for the U.S. as a whole. As the price of oil increased during the 1970s, demand for new extraction and exploration increased. Similarly, as prices fell in the 1980s, demand for new exploration waned. Both of these phenomena have affected Houston's manufacturing employment base.

Equation (3) measures Houston mining employment as a function of U.S. mining earnings and the dependent variable lagged one year. Mining employment in Houston, another "basic" sector, depends on total demand for domestic mining output. As the price of oil rises, marginal U.S. reserves, which are relatively more expensive to produce or refine, become competitive, and Houston (and U.S.) production increases. In addition, increased mining revenues allow more capital to be used in the production of oil when prices are high. When prices are low, Houston (and U.S.) production declines and imports generally rise.

In equation (4) Sioux City IA farm employment is a function of U.S. farm employment, the dependent variable lagged one year, and an intercept term. Farming, the largest "basic" sector in Sioux City, has

experienced significant employment declines in recent years. Sioux City farm employment is related to U.S. farm employment in this equation because the reasons for job losses in Sioux City are related to nationwide changes in agriculture. In every decade this century, farm employment in the U.S. has declined as farm productivity has increased. The experience of Sioux City is like that of most other farming areas: employment has declined as output has remained steady or increased. The national projections of agricultural productivity growth are important to expected farm employment in Sioux City.

Equation (5) explains Sioux "non-basic" employment as a function of Sioux City "basic" employment, the dependent variable lagged one year, and an intercept term. This equation illustrates the relationship between "basic" employment losses and subsequent "non-basic" employment losses. As the population declined in Sioux City, so did "non-basic" employment.

In equation (6) Seattle manufacturing employment is a function of an intercept term, the U.S. unemployment rate, a dummy variable for 1970 to 1972, and a lagged dependent variable. The largest manufacturing sectors in Seattle - aircraft, lumber, and wood products - are sensitive to U.S. business cycles. U.S. business cycles are measured by the civilian unemployment rate, which has a negative coefficient in equation (6). The negative coefficient of the dummy variable for 1970 to 1972 adjusts the specification of the equation for the severe regional recession during that time.

Equation (7) explains Seattle "non-basic" employment as a function of an intercept term, Seattle population, a dummy variable for the 1970-72 regional recession, and the U.S. unemployment rate. The unemployment rate measures the sensitivity of Seattle employment to U.S. business cycles. "Non-basic" employment is also a function of the population of the region; as the population of Seattle has grown, the demand for "non-basic" sector employment has also increased. It is interesting that population is contemporaneous with the dependent variable, "non-basic" employment, in equation (7) but lagged in equation (5). In rapidly growing areas, such as Seattle, population increases have an immediate effect on employment growth in "non-basic" industries. In some very rapidly growing areas of Texas in the late 1970s, population growth actually preceded "non-basic" employment growth. This is analogous to "boom towns" of the Old West as the economy catches up to the demand created by the new population growth and new businesses locate in the fast-growing area. However, in areas losing population, "non-basic" employment does not decline in step with population losses. Many "non-basic" businesses in a declining area will hang on as long as possible in anticipation of an upturn in the region's

economy. This reflects the local nature of most "non-basic" businesses and the desire of firms to protect their capital investment in a specific site.

The Demographic Model

The demographic portion of the regional model follows a traditional cohort-component analysis based on calculated fertility and mortality in each county or EA. The "demand" for total population is estimated from the economic model: if the demand for labor is forecast to rise for a particular county or EA, then either the labor force participation rate will rise or population in-migration will be positive. The inverse is true for counties and EAs with projected declines in employment. Therefore, future EA and county migration patterns for population by age, sex, and race are based on employment opportunities. Individuals and families are assumed to migrate, at least in part, in response to employment opportunities (see [1], [4], and [6]) with two exceptions: for population aged 65 and over and for college or military-aged population, migration patterns over the forecast period are based on historical net migration and not economic conditions. The integration of economic and demographic regional analysis is a significant strength of the Woods & Poole approach.

The age, sex, and race distribution of the population is projected by aging the population by single year of age by sex and by race for each year through 2040 based on county or EA specific mortality, fertility, and migration rates estimated from historical data. In the Woods & Poole model, projected net mortality and migration are estimated based on the historical net change in population by age, race, and sex for a particular county or EA. Similarly, projected net births and migration of age zero population by race are estimated based on the historical change in age zero population by race per female population age 15 to 44 by race for a particular county or EA.

The United States population by age, sex, and race projections, 2007-2040, are based on Bureau of the Census population estimates for 2000 through 2006. Woods & Poole forecasts these U.S. estimates with a cohort-component model based on the year to year change in U.S. population by single year of age, race, and sex. Forecast fertility, mortality, and international migration are estimated from the Census population estimates and are applied exogenously to the Woods & Poole U.S. projections. Woods & Poole produces only a "middle" U.S. population forecast - this forecast is similar to the Census "middle" forecast scenario for the U.S. population. The U.S. population by age, sex, and race forecast is the control total for the EA projections. Each EA projection serves as the control totals for the county

projections.

The Accuracy of the Projections

Unlike other sciences, economics and demographics cannot rely on experimentation to test theories and verify hypotheses. Rather, historical data are analyzed and theories are developed that explain the historical data. The resulting models are then used to make a projection. Woods & Poole projections, like all economic and demographic projections, utilizes this approach: analyzing historical data to make estimates of future data. There are, of course, inherent limitations to projections, and the Woods & Poole projections should never be interpreted as an infallible prediction of the future; future data may differ significantly from Woods & Poole projections and Woods & Poole does not guarantee the accuracy of the projections. In all Woods & Poole publications, the word "forecast" is used as a synonym for "projection" and refers to Woods & Poole estimated data for any year from 2007 to 2040 (2008 to 2040 for population); in Woods & Poole publications "projections", or "forecasts", both mean estimates of future data (2007 to 2040, or 2008 to 2040 for population).

One key limitation to all projections, and Woods & Poole projections in particular, is that the future is never known with any certainty. The model on which the projections are based may not accurately reflect future events. In addition, there is always the possibility of an unanticipated shock to the economy, or of some other event that was not foreseen based on an analysis of historical data. For instance, a local government may enact a new industrial policy that has an unexpected, beneficial effect on employment growth. Or an abrupt economic change, although anticipated, may occur with much greater intensity or in a shorter time period than expected. For example, the projection may assume an increase in the price of a commodity, such as oil, over a five-year period, but an embargo may raise the price to that level in only one year. In addition, the projections may not be accurate because historical data is revised; or because the projection model does not accurately reflect demographic or economic phenomena; or because the projections contain errors; or because the smooth growth path of the long-term projections inaccurately reflects important variance in economic or demographic growth for particular regions; or because assumptions about national or regional growth, upon which the projections are based, turn out to be incorrect. In addition, there are many other types of economic and demographic events that could create outcomes far different from Woods & Poole's projections.

Another limitation results from doing forecasts for small geographic

areas for small data series. Statistically, models are more reliable the larger the area and/or the series being studied. Small area forecasts, such as county population for White men age 84, are subject to more error because of the small sample size. This error can be reduced, although never eliminated, by constraining the small area forecasts to the forecast totals for a larger area or series; this is the method used by Woods & Poole.

One way to evaluate the effectiveness of a projection method is to compare previous projections to current data; although such a comparison does not indicate the potential accuracy of current or future projections, it can be useful to measure the magnitude of error of previous projections. Table 3 illustrates how well Woods & Poole regional models projected employment, population, and personal income over a 1-year to 10-year forecast horizon for various geographies.

One statistic used to evaluate the projections is the Average Absolute Percent Error (AAPE), which is the average of the absolute values of the percent difference from the projected data to the actual data. The lower the AAPE, the more accurate the projection (e.g., Woods & Poole's 3-year population projections have been accurate within ñ1.8% for states and ñ3.2% for counties). All Woods & Poole projections are evaluated for each projection horizon; thus, the AAPE for 1-year projections is calculated based on all Woods & Poole one-year projections (there have been twenty 1-year projections and eleven 10-year projections). Changes to historical data are not adjusted when calculating the AAPEs. Thus, if a projection was made using historical data that were subsequently revised, the AAPE is calculated based on the revised data, probably inflating the AAPE, particularly for short-term projections. For example, projections of 1993 employment done in 1984 were made using a different definition of employment; in the 1984 forecast, U.S. total employment in 1980 was estimated to be 106.4 million jobs. However, since then, the definition of employment has been revised several times by the Department of Commerce and now U.S. total employment in 1980 is estimated to be 114.2 million jobs; therefore, the AAPEs are calculated based on revised data so they incorporate not only forecast error but definitional changes as well, probably inflating the AAPEs.

The longer the forecast horizon, the larger the AAPE. Thus for all Metropolitan Statistical Areas (MSAs), 1-year population projections have been accurate within ñ1.3% compared to ñ5.7% for the 10-year projection. In addition, population projections, the most stable series and the data least subject to historical revision, have the lowest AAPEs.

Personal income has the highest AAPE for all geographies because, in addition to projecting the level of personal income, there is an implicit price inflation forecast built into the income projections. In the early 1980s after a period of rapid inflation, the Woods & Poole personal income projections had relatively high AAPEs (the 10-year personal income forecast had an AAPE of ñ16.2% for counties). As inflation mitigated in the 1980s, the AAPEs for personal income dropped sharply; the 5-year AAPE dropped to ñ9.7% for counties.

Generally, the smaller the geography, the larger the AAPEs for all variables. For all counties, the AAPE for 8-year population projections was ñ7.1%. However, for counties with population under 50,000 in 2000, the 8-year projection AAPE was ñ7.5%. Similarly, for larger geographies, the AAPEs are usually lower. The AAPE for counties with 2000 population between 50,000 and 100,000 was ñ6.0%; for counties with population over 100,000 the AAPE was ñ5.8%. AAPEs for smaller variables tend to be higher than AAPEs for larger variables. Thus, the AAPE for retail trade employment would probably be higher than the AAPE for total employment, holding geographic area size and forecast horizon constant.

The accuracy of Woods & Poole's projections has been comparable to the accuracy of other regional forecasting programs. Figure 2 compares Woods & Poole's projections to Department of Commerce Bureau of Economic Analysis (BEA) and Census Bureau projections over comparable forecast horizons. The Woods & Poole 8-year forecast AAPEs for states for the year 1990 for employment and personal income were slightly below the BEA AAPEs, and slightly above the BEA for population. Similarly, the Woods & Poole 1-year to 5-year population projections AAPE for states were slightly below the Census AAPEs.

Other statistics are sometimes used to evaluate forecasts. The AAPE is most commonly used as a measure of accuracy for projections when the units being compared are of different sizes (e.g., county population, the base of which can range from 100 for Loving, TX to 8 million for Los Angeles, CA). It has the advantage of being able to compare units of different sizes equally. In some models, the Root Mean Squared Error (RMSE) is used to measure accuracy. The RMSE has the disadvantage of giving modest errors for large units a greater weight than modest errors for small units (i.e., an error of 10,000 on a base of 2 million is given greater weight than an error of 1,000 on a base of 20,000, just the opposite of the AAPE).

Another useful statistic in evaluating forecasts is the simple average of all the percent errors: the Average Percent Error (APE). This measures the bias of the forecast. In Woods & Poole projections,

employment for counties have always had a downward bias (the APE has been negative). The APE for all 5-year Woods & Poole county employment projections is -1.7% with a standard deviation of 11.9% (see Table 3). In contrast, the county population projections have always had an upward bias (the APE has been positive). The APE for all 5-year Woods & Poole county population projections is +0.51% with a standard deviation of 7.4%.

Historical Data

Much of the historical economic data in the Woods & Poole regional databases are obtained from the Bureau of Economic Analysis (BEA) of the Department of Commerce. The historical data from the BEA include county-level data for each year 1969 through 2006 for employment and earnings by one-digit Standard Industrial Classification (SIC) code (1969 to 2000) and by one-digit North American Industry Classification System (NAICS) code (2001 to 2006), and personal income by source of income. Other sources of data include the 1970, 1980, 1990, and 2000 Censuses and post-Censal reports for population and household data, and the quinquennial Census of Retail Trade for retail sales data. Woods & Poole generally accepts the government data as given unless indicated otherwise in this chapter. The discussion which follows, of the historical data used by Woods & Poole, is not intended to be a complete explanation of the historical data; the user should consult the government sources of the historical data for a complete explanation. Some of the sources of government data used by Woods & Poole have technical explanations of how the historical data is collected, how the data can be used, and limitations to the data; the documentation may contain important information on the applicability of the data for particular applications and should be reviewed by users of the historical data; the documentation can be obtained from the U.S. Dept. of Commerce, the Government Printing Office or many public libraries. All data for the years 2007-2040 (2008-2040 for population) are projected by Woods & Poole.

Historical data are subject to revision from time to time. Historical employment and income data from the Bureau of Economic Analysis are revised on a regular basis. For example, historical data released by the Bureau of Economic Analysis in 1984 showed total employment for the United States in 1980 to be 106.4 million jobs; the current estimate of 1980 U.S. total employment is 114.2 million jobs. When using the historical data, it is important to use the current revision and not combine this data with previous versions since there may be definitional changes in the data.

Gross Domestic Product by State

Gross Domestic Product by State, formerly Gross State Product (GSP), is called Gross Regional Product (GRP) in the Woods & Poole database. GRP is historical for the United States total, regions, and states for the years 1969-2007 from the Bureau of Economic Analysis Gross Domestic Product by State series. All county, and metropolitan area, historical GRP data, 1969-2007, is estimated by Woods & Poole by allocating state GRP in a particular year to counties within the state based on the proportion of total state earnings of employees originating in a particular county. County GRP estimates are constrained to state totals for the years 1969-2007. All GRP data is establishment based.

Employment

The employment data in the Woods & Poole database are a complete measure of the number of full- and part-time jobs by place of work. Historical data, 1969-2006, are from the U.S. Department of Commerce, Bureau of Economic Analysis. The employment data include wage and salary workers, proprietors, private household employees, and miscellaneous workers. Wage and salary employment data are based on an establishment survey in which employers are asked the number of full- and part-time workers at a given establishment. Because part-time workers are included, a person holding two part-time jobs would be counted twice. Also, since the wage and salary employment data are based on an establishment survey, jobs are counted by place of work and not place of residence of the worker; thus, a job in the New York Metropolitan Area is counted in the New York Metropolitan Area regardless of where the worker lives.

Data on proprietors include farm and non-farm proprietors by sector. Proprietors include not only those people who devote the majority of their time to their proprietorship, but people who devote any time at all to a proprietorship. Thus, a person who has a full-time wage and salary job and on nights and weekends runs a small business legally defined as a proprietorship would be counted twice. The employment data therefore include full- and part-time proprietors.

Private household employment data include persons employed by a household on the premises, such as full-time baby-sitters, housekeepers, gardeners, and butlers. Miscellaneous employment data include judges and all elected officials, persons working only on commission in sectors such as real estate and insurance, students employed by the colleges or universities in which they are enrolled, and unincorporated subcontractors in sectors such as construction.

The employment data used by Woods & Poole comprise the most complete

definition of the number of jobs by county. Woods & Poole data may be higher than that from other sources because they measure more kinds of employment.

There are three other commonly used government sources for employment data: the Bureau of Labor Statistics (BLS), the Bureau of the Census, and the National Income and Product Accounts (NIPA). These sources of employment data differ from the data used by Woods & Poole. The BLS establishment data are generally much lower than the Woods & Poole data because agricultural workers, the military, proprietors, households, and miscellaneous employment are not included; the exclusion of proprietors from the BLS data is the most significant difference. Data from the Census (and some survey data from the BLS) are based on employment by place of residence and differ fundamentally in concept from the Woods & Poole employment data by place of work; Census employment data are generally lower than Woods & Poole data, but not always. Since Census data are based on a household survey, persons holding two jobs would be counted only once, and, therefore, the data would be lower than Woods & Poole. However, Census survey data for counties that have a large number of commuters and relatively few jobs within the county could yield employment data higher than Woods & Poole. Employment data in the National Income and Product Accounts are close to Woods & Poole data, except that part-time proprietors and certain miscellaneous employees are excluded; therefore, these data are usually lower.

Employment by Sector

The employment data is by two-digit North American Industry Classification System (NAICS) industry. The two-digit industries are defined in the 1997 North American Industry Classification System Manual. The employment data in the Woods & Poole 2008 database is no longer based on the Standard Industrial Classification (SIC) system definitions. For the years 1969-2000 BEA provided employment industry data by SIC rather than by NAICS; Woods & Poole has estimated the NAICS industry data for 1969-2000 from the BEA SIC 1969-2000 employment industry data and the NAICS employment industry data for the years 2001-2006.

As a rule, employment is classified in a given industry depending on the primary activity of the establishment. For example, employees of a large oil company are classified in many different sectors depending on the specific establishment in which they worked, even though the company as a whole would be considered a mining company: employees at a refinery are in manufacturing; employees at the company headquarters are in management; pipeline operators are in transportation; and oil

field workers are in mining. If a given establishment is engaged in activities in different sectors, all employees are classified according to the primary activity of the establishment regardless of their actual occupations; thus, a secretary for a trucking company is a transportation worker and an accountant at a small plumbing company is a construction worker. The main exception to this rule is the classification of government workers in the Woods & Poole database: all government employees are classified in Federal civilian, Federal military, or state and local government employment, regardless of the usual classification of the establishment in which they work. Definitions for each sector, based on NAICS industries, in the Woods & Poole database are as follows:

Farming includes establishments such as farms, orchards, greenhouses, and nurseries primarily engaged in the production of crops, plants, vines, trees (excluding forestry operations), and specialties such as Christmas trees, sod, bulbs, and flower seed. It also includes establishments such as ranches, dairies, feedlots, egg production facilities, and poultry hatcheries primarily engaged in the keeping, grazing, or feeding of cattle, hogs, sheep, goats, poultry of all kinds, and special animals such as horses, bees, pets, fish farming, and animals raised for fur.

Forestry, fishing, related activities, and other includes establishments primarily engaged in harvesting timber, and harvesting fish and other animals from their natural habitats. The sector also includes agricultural support establishments that perform one or more activities associated with farm operation, such as soil preparation, planting, harvesting, and management, on a contract or fee basis. Excluded are establishments primarily engaged in agricultural research and establishments primarily engaged in administering programs for regulating and conserving land, mineral, wildlife, and forest use. Other consists of jobs held by U.S. residents who are employed by international organizations and by foreign embassies and consulates in the United States.

Mining includes establishments that extract naturally occurring mineral solids (e.g. coal and ores), liquid minerals (e.g. crude petroleum), and gases (e.g. natural gas.) Mining includes quarrying, well operations, beneficiating (e.g., crushing, screening, washing, and flotation), and other preparation customarily performed at the mine site, or as a part of mining activity.

Utilities includes establishments engaged in the provision of electric power, natural gas, steam supply, water supply, and sewage removal. Utilities include electric power generation, electric power

transmission, electric power distribution, natural gas distribution, steam supply provision, steam supply distribution, water treatment, water distribution, sewage collection, sewage treatment, and disposal of waste through sewer systems and sewage treatment facilities. Excluded from this sector are establishments primarily engaged in waste management services that collect, treat, and dispose of waste materials but do not use sewer systems or sewage treatment facilities. Also excluded from this sector are federal or state or local government operated establishments.

Construction includes establishments primarily engaged in building new structures and roads, alterations, additions, reconstruction, installations, and repairs. It includes general contractors engaged in building residential and nonresidential structures; contractors engaged in heavy construction, such as bridges, roads, tunnels, and pipelines; and special trade contracting, such as plumbing, electrical work, masonry, and carpentry. Construction includes establishments primarily engaged in the preparation of sites for new construction, including demolition, and establishments primarily engaged in subdividing land for sale as building sites. Construction work done may include new work, additions, alterations, or maintenance and repairs.

Manufacturing includes establishments engaged in the mechanical, physical, or chemical transformation of materials, substances, or components into new products. The assembling of component parts of manufactured products is considered manufacturing, except in cases where the component parts are associated with structures. Manufacturing establishments can be plants, factories, or mills as well as bakeries, candy stores, and custom tailors. Manufacturing establishments may either process materials or may contract with other establishments to process their materials for them. Broadly defined, manufacturing industries include the following: food processing, such as canning, baking, meat processing, and beverages; tobacco products; textile mill products, such as fabric, carpets and rugs; apparel; wood products, including logging, sawmills, prefabricated homes, and mobile homes; furniture; paper; printing; chemicals, such as plastics, paints, and drugs; petroleum refining; rubber and plastics; leather products; stone, clay, and glass; primary metals, such as steel, copper, aluminum, and including finished products such as wire, beams, and pipe; fabricated metals, such as cans, sheet metal, cutlery, and ordnance; industrial machinery, including computers, office equipment, and engines; electronics and electrical equipment; transportation equipment, such as cars, trucks, ships, and airplanes; instruments; and miscellaneous industries, such as jewelry, musical instruments, and toys. Excluded from manufacturing is

publishing of printed materials.

Wholesale trade includes establishments engaged in wholesaling merchandise, generally without transformation, and rendering services incidental to the sale of merchandise. The merchandise described in this sector includes the outputs of agriculture, mining, manufacturing, and certain information industries, such as publishing. Wholesale establishments are primarily engaged in selling merchandise to retailers; or to industrial, commercial, institutional, farm, construction contractors; or to professional business users; or to other wholesalers or brokers. The merchandise sold by wholesalers includes all goods used by institutions, such as schools and hospitals, as well as virtually all goods sold at the retail level. Wholesalers can be merchant wholesalers who purchase goods from manufacturers or other wholesalers and sell them; sales branches of manufacturing, mining, or farm companies engaged in marketing the products of the company to retail establishments; or agents, merchandise or commodity brokers, and commission merchants.

Retail trade includes establishments engaged in retailing merchandise, generally without transformation, and rendering services incidental to the sale of merchandise. Retail trade includes store retailers such as motor vehicle and parts dealers including automobile, motorcycle and boat dealers as well as tire and automobile parts stores; furniture and home furnishing stores; electronics and appliance stores; food and beverage stores, including supermarkets, convenience stores, butchers, and bakeries; health and personal care stores such as pharmacies and optical goods stores; gasoline stations; clothing and clothing accessory stores; sporting goods, hobby, book and music stores; department stores; and miscellaneous establishments, including office supply stores, mobile home dealers, thrift shops, florists, tobacco stores, and pet shops. Retail trade also includes nonstore retailers such as Internet and catalog sellers, as well as home delivery establishments such as heating oil dealers. Retail trade excludes eating and drinking places, including restaurants, bars, and take-out stands.

Transportation and warehousing includes industries providing transportation of passengers and cargo and warehousing and storage for goods. Establishments in these industries use transportation equipment or transportation related facilities as a productive asset. Transportation includes railroads, highway passenger transportation, trucking, shipping, air transportation, pipelines, and transportation services. Transportation also includes private postal services, and courier services but excludes the U.S. Postal Service. Warehousing includes refrigerated storage and grain elevators.

Information includes establishments engaged in producing and distributing information and cultural products; providing the means to transmit or distribute these products as well as data or communications; and processing data. The main components of this sector are the publishing industries, including software publishing, and both traditional publishing and publishing exclusively on the Internet; the motion picture and sound recording industries; movie theaters; the broadcasting industries, including traditional broadcasting and those broadcasting exclusively over the Internet; the telecommunications industries; the industries known as Internet service providers and Web search portals; data processing industries; and the information services industries.

Finance and insurance includes establishments primarily either engaged in or facilitating financial transactions (e.g. transactions involving the creation, liquidation, or change in ownership of financial assets.) Establishments include depository institutions, such as commercial banks, credit unions savings and loans, and foreign banks; credit institutions; credit card processing; investment companies; brokers and dealers in securities and commodity contracts; security and commodity exchanges; carriers of all types of insurance; insurance agents and insurance brokers. Also included are central banks and monetary authorities charged with monetary control.

Real estate and rental and leasing includes establishments primarily engaged in renting, leasing, or otherwise allowing the use of tangible or intangible assets, and establishments providing related services. Real estate includes real estate leasing establishments, real estate agencies and brokerages, property management establishments, appraisals establishments, and escrow agencies. Rental and leasing includes car and truck rental, consumer goods rentals such as video stores and and formal wear rental stores, and commercial equipment renting and leasing construction, transportation, office and farm equipment. Also included are establishments that lease nonfinancial and noncopyrighted intangible assets such are patents and trademarks.

Professional and technical services includes establishments that specialize in performing professional, scientific, and technical activities for others. These activities include legal advice and representation; accounting, bookkeeping, and payroll services; architectural, engineering, and specialized design services; computer services; consulting services; research services; advertising services; photographic services; translation and interpretation services; veterinary services; and other professional, scientific, and technical services. Excluded are establishments primarily engaged

in providing office administrative services, such as financial planning, billing and recordkeeping, personnel, and physical distribution and logistics.

Management of companies and enterprises includes bank holding establishments, other holding establishments, corporate management establishments as well as regional and subsidiary management establishments. Company or enterprise headquarters are included.

Administrative and waste management includes establishments engaged in office administration, hiring and placing of personnel, document preparation and similar clerical services, solicitation, collection, security and surveillance services, cleaning, and waste disposal services. Among many other establishments administrative includes call centers, tele-marketers, janitorial services, armored cars, temporary employment agencies, locksmiths, landscaping, and travel agencies. Waste management includes, among other establishments, solid waste collections and disposal, landfill operations and septic tank maintenance. Excluded from administrative and waste management are establishments involved in administering, overseeing, and managing other establishments of the company or enterprise. Also excluded are government establishments engaged in administering, overseeing, and managing governmental programs.

Educational services includes private elementary schools, junior colleges, colleges, universities, and professional schools. Also included are trade and vocational schools, business and secretarial schools, computer training services, language schools, fine arts training, sports training establishments, driving schools, flight schools and establishments that provide test preparation and tutoring. Educational services may be provided imparted in educational institutions, the workplace, or the home through correspondence, television, or other means. Public schools, including colleges and universities, are excluded from educational services.

Health care and social assistance includes establishments providing health care and social assistance for individuals. Health care establishments include ambulatory care services (e.g. physician offices, dentists, specialists, HMOs, dialysis centers, blood banks, ambulance services), hospitals, and nursing and residential care facilities. Social assistance establishments include individual and family services (e.g. adoption agencies and youth centers) and community services such as food banks and homeless shelters. Excluded from this sector are aerobic classes and nonmedical diet and weight reducing centers. Also excluded are public hospitals and clinics.

Arts, entertainment, and recreation includes establishments that are involved in producing, promoting, or participating in live performances, events, or exhibits intended for public viewing; establishments that preserve and exhibit objects and sites of historical, cultural, or educational interest; and establishments that operate facilities or provide services that enable patrons to participate in recreational activities or pursue amusement, hobby, and leisure time interests. The sector includes establishments engaged in the performing arts, sporting events, museums, zoos, amusement and theme parks, golf courses, marinas, casinos, and gambling establishments. Excluded are movie theaters.

Accommodation and food services includes hotels, motels, casino hotels, bed and breakfasts, campgrounds and recreational vehicle parks and other lodging places as well as eating and drinking places, including restaurants, bars, and take-out stands. Also included are caterers and food service contractors.

Other services, except public administration includes churches and establishments engaged in equipment and machinery repairing, promoting or administering religious activities, grantmaking, advocacy, and establishments providing drycleaning and laundry services, personal care services, death care services, pet care services, photofinishing services, temporary parking services, and dating services. Private households that engage in employing workers on or about the premises in activities primarily concerned with the operation of the household are included in this sector.

Federal civilian includes all Federal government workers regardless of their establishment classification. Federal civilian employment includes executive offices and legislative bodies; courts; public order and safety; correctional institutions; taxation; administration and delivery of human resource programs, such as health, education, and public assistance services; housing and urban development programs; environmental programs; regulators, including air traffic controllers and public service commissions; the U.S. Postal Service; and other Federal government agencies.

Federal military includes Air Force, Army, Coast Guard, Marine Corps, Merchant Marine, National Guard, and Navy. Personnel deployed abroad are counted in their home base or port. Reserves who receive regular training are included. Civilians working on a military base are classified in the sector appropriate to their occupation.

State and local government is defined the same as Federal civilian except that the activities are run by state and local governments. At

the local level, this includes all public schools as well as police and fire departments; at the state level, it includes all public junior colleges, colleges, and universities.

Earnings

Earnings of employees is the sum of wages and salaries, other labor income, and proprietors' income. Earnings also includes personal contributions for social insurance, but does not include residence adjustment; each of these components is defined in the discussion of total personal income that follows. As with employment, the historical earnings data (1969-2006) are from the U.S. Department of Commerce, Bureau of Economic Analysis. Also, like employment, earnings data are by place of work, so that earnings of an employee who works in one county but resides in another are counted in the county where the job is.

The two-digit NAICS sectors for earnings are defined the same as for employment in the preceding section. The two-digit industries are defined in the 1997 North American Industry Classification System Manual. As with employment, earnings data in the Woods & Poole 2008 database is no longer based on the Standard Industrial Classification (SIC) system definitions. For the years 1969-2000 BEA provided earnings industry data by SIC rather than by NAICS; Woods & Poole has estimated the NAICS industry data for 1969-2000 from the BEA SIC 1969-2000 earnings industry data and the NAICS earnings industry data for the years 2001-2006.

Earnings relates to workers' compensation and is not a measure of company earnings or profits. Earnings-by-sector data are sometimes used as a surrogate variable for output by sector at the regional level where output data are not generally available.

Personal Income

The historical data (1969-2006) for total personal income are from the U.S. Department of Commerce, Bureau of Economic Analysis. Total personal income is the income received by persons from all sources, that is, from participation in production, from both government and business transfer payments, and from government interest, which is treated like a transfer payment. Persons consist of individuals, nonprofit institutions serving individuals, private uninsured welfare funds, and private trust funds. Personal income is the sum of wages and salaries, other labor income, proprietors' income, rental income of persons, dividend income, personal interest income, and transfer payments less personal contributions for social insurance. Definitions

for the sources of personal income follow:

Wages and salaries consists of monetary remuneration of employees, including compensation of corporate officers; commissions, tips, and bonuses; and receipts-in-kind that represent income to the recipients.

Other labor income consists of employer payments to private and government employee retirement plans, private group health and life insurance plans, privately administered workers' compensation plans, and supplemental unemployment benefit plans.

Proprietors' income includes inventory valuation and capital consumption adjustments and is defined as the income, including income-in-kind, of proprietorships and partnerships, and of tax-exempt cooperatives. Inventory valuation adjustment is the difference between the cost of inventory withdrawals as valued in determining profits before tax, and the cost of withdrawals valued at current replacement costs. Capital consumption adjustment is depreciation and damage to a proprietor's fixed capital less the value of the current services of the fixed capital assets owned by and used by the proprietor.

Dividend income consists of the payments in cash or other assets, excluding the corporation's own stock, made by corporations located in the United States or abroad to persons who are U.S. residents; it excludes that portion of dividends paid by regulated investment companies (mutual funds) related to capital gains distributions. Interest is the interest income (monetary and imputed) of persons from all sources. Rental income is the net income of persons from the rental of real property except for the income of persons primarily engaged in the real estate business; the imputed net rental income of the owner-occupants of nonfarm dwellings; and the royalties received from patents, copyrights, and the right to natural resources.

Transfer payments to persons are payments to persons for which no current services are performed. They consist of payments to individuals by Federal, state, and local governments and by businesses. Government payments to individuals include retirement and disability insurance benefits, medical payments (mainly Medicare and Medicaid), income maintenance benefits, unemployment insurance benefits, veterans benefits, and Federal grants and loans to students. Business payments to persons consists primarily of liability payments for personal injury.

Personal social insurance contributions are subtracted in the calculation of personal income and consist of the contributions, or payments, by employees, by the self-employed, and by other individuals

who participate in the following government programs: Old-age, survivors, and disability insurance (social security); hospital insurance; supplementary medical insurance; unemployment insurance; railroad retirement; veterans life insurance; and temporary disability insurance. These contributions are excluded from personal income by definition, but the components of personal income upon which these contributions are based-mainly wage and salary disbursements and proprietors' income-are presented gross of these contributions.

Residence adjustment is the net amount of personal income of persons residing in a specific geographic area but receiving the income outside that geographic area. For example, a person who earns income in one county but lives in a different county would have that income counted under residence adjustment; the county in which the person lives would have a positive residence adjustment and the county in which the person works would have a negative adjustment. Residence adjustment adjusts the earned component of personal income, which is establishment-based by place of work, to population, which is by place of residence. When total personal income is adjusted this way, personal income per capita can be calculated. Residence adjustment is a net number for a given county; if it is negative, it means that there is net commuting into the county; if it is positive, it means that there is net commuting out of the county.

As with employment, the definition of total personal income used by Woods & Poole is the most comprehensive one available. Another commonly used measure of income is money income of persons. Money income is the concept used by the Bureau of the Census and is widely used in other sources. When Woods & Poole's income data are higher than data from another source, once inflation adjustments are taken into account, it is probably because the other source uses money income base data. Total personal income includes all of money income plus the exclusions to money income. Money income excludes payments-in-kind such as food stamps, agricultural payments-in-kind, and the value of in-kind medical payments; the imputed rental value of owner-occupied housing; the imputed value of certain interest payments such as the value to consumers of free non-interest bearing checking accounts; all other labor income; capital consumption adjustments for proprietors; inventory valuation adjustments, although sometimes this is negative; and lump-sum payments such as liability judgments and consumer defaults on debts to businesses. For the U.S. as a whole, money income is about 25% less than total personal income; at the regional level, the difference varies depending on the specific composition of total personal income.

Another commonly used measure of income is disposable income, which is

defined as total personal income less personal tax and non-tax payments. Disposable income is the income available to persons for spending or saving. Tax payments are payments, net of refunds, made by persons to the government; it includes taxes such as income, estate and gift, and personal property taxes, but it excludes personal contributions to social insurance. Non-tax payments include tuition and fees paid to schools and hospitals operated mainly by the government, donations to such institutions, passport fees, and fines and penalties.

Retail Sales

Data for retail sales by kind of business are from the 1972, 1977, 1982, 1987, 1992, 1997, 2002 Census of Retail Trade (U.S. Department of Commerce, Bureau of the Census). Retail sales data for 1972, 1977, 1982, 1987, 1992, and 1997 has been changed by Woods & Poole from SIC classifications to estimated NAICS kind of business classifications to be consistent with 2002 Census of Retail Trade data. The intervening historical data for the years 1969-71, 1973-76, 1978-81, 1983-86, 1988-91, 1993-96, and 1998-2001 are also estimated by Woods & Poole. These estimates are made by interpolating retail sales by kind of business per capita for the intervening years (e.g., 1973-76). These proportions are then multiplied by population for the intervening years to estimate retail sales by kind of business. The estimates are then constrained to U.S. retail sales by kind of business for the intervening years. U.S. retail sales data for 1969-2002 are from the Bureau of Economic Analysis but are revised by Woods & Poole to be consistent with the sum of the county retail sales data for the Census years. Therefore, retail sales data for the U.S. are the sum of county retail sales as published in the Census of Retail Trade and differ from the U.S. data published monthly by the Department of Commerce.

Some county data from the Census of Retail Trade are withheld because of Federal information disclosure policies. All withheld data have been estimated by Woods & Poole; the techniques used to make these estimates are described below in the section titled "Estimation of Missing Historical Data."

Retail sales are counted, as are employment and earnings, on an establishment basis. Mail-order sales are counted at the point from which the merchandise is sent and not at the point at which it is received. Retail sales are classified by kind of business according to the principal lines of commodities sold (e.g., groceries or hardware) or the usual trade designation (e.g., drug store or cigar store). In some cases, an establishment sells goods in several different business groups, such as a convenience store with gasoline pumps. In these

cases, all the establishment's sales are classified in the business group that is the primary activity of the establishment; therefore, the retail sales data by kind of business does not reflect retail sales by merchandise line. The specific kinds of business, on an NAICS basis, are described as follows:

Motor vehicle and parts dealers include establishments selling new and used cars and trucks, boats, recreational vehicles, utility trailers, aircraft, snowmobiles, motorcycles, snowmobiles, and mopeds. It also includes dealers selling new automobile parts and accessories, such as tires, as well as automobile repair shops maintained by establishments engaged in the sale of new automobiles. Establishments selling medium and heavy-duty trucks are generally excluded.

Furniture and home furnishings stores include establishments primarily selling new furniture, floor coverings, draperies and window treatments, glassware and china. Bath, linen, matress and lamp stores are included. Used furniture, appliance, and electronics stores are excluded.

Electronics and appliance stores include establishments selling new consumer electronics, televisions, radios, home appliances, computers, cameras and photography supplies.

Building material and garden equipment and supplies dealers include retail establishments primarily engaged in selling lumber and other building materials; paint, glass, and wallpaper; hardware; nursery stock; lawn and garden supplies; and outdoor power equipment. It includes lumber and other building materials dealers, and paint, glass, and wallpaper stores selling to the general public, even if sales to contractors account for a larger proportion of total sales. Dealers selling mobile homes are excluded.

Food and beverage stores include establishments primarily engaged in selling for home preparation and consumption. Food stores include grocery stores, such as supermarkets and convenience stores; meat and fish markets; fruit and vegetable markets; candy, nut, and confectionery stores; dairy product stores; retail bakers; and miscellaneous stores such as beer, wine and liquor stores, health food stores, and coffee and tea stores.

Health and personal care stores include pharmacies and drug stores; cosmetic, beauty supplies and perfume stores; optical goods stores; health supplement stores; and convalescent supply stores.

Gasoline stations include establishments primarily selling gasoline and

automotive lubricants. These establishments frequently sell other merchandise, such as tires, batteries, accessories, and other automobile parts, or perform minor repair work. Establishments called garages but deriving more than half of their receipts from the sale of gasoline and automotive lubricants are included. Gasoline stations combined with other activities such as convenience stores or car washes are classified by their primary activity as determined by sales.

Clothing and clothing accessories include retail stores primarily engaged in selling clothing of all kinds and related articles for personal wear and adornment. These establishments include men's, boys', women's, infants' and girls' clothing stores; shoe stores; and specialty stores, such as swimwear, wigs, lingerie, luggage and handbags. Establishments that meet the diversity criterion for department stores are not included. Excluded are custom tailors and athletic uniform stores

Sporting goods, hobby, book, and music stores include sporting good stores (including bicycle stores, golf pro shops, exercise equipment stores and gun shops); hobby, toy and game stores; sewing and needlework stores; musical instrument and supply stores; book stores, newsstands, and music stores. Excluded are used book stores.

General merchandise stores include department stores, general discount stores, variety stores, warehouse clubs, and miscellaneous general merchandise stores. These stores all sell a number of lines of merchandise, such as dry goods, apparel and accessories, furniture and home furnishings, small wares, hardware, and food in one establishment.

Miscellaneous retail stores include florists; office supply, stationery and gift stores; used merchandise stores such as thrift stores, used book stores, and antique shops; pet shops; art dealers; mobile home dealers; swimming pool stores; and tobacco stores.

Nonstore retailers include Internet sellers; mail order and catalog sellers; television and infomercial sellers; door-to-door sellers; vending machine operators; and direct selling establishments such as heating oil dealers, bottled gas dealers, newspaper delivery, and bottled water providers.

Constant and Current Dollars

All earnings, personal income, and retail sales data in the Woods & Poole database are presented in 2004 dollars. These are called "constant" dollars and are used to measure the "real" change in earnings and income when inflation is taken into account. For example,

it would be incorrect to assume that Americans were more than twice as wealthy in 1980 as in 1970 even though income per capita increased from $4,081 to $10,114; during those ten years the general price level increased more than 97%, and $10,114 in 1980 could not buy as much as $10,114 could in 1970. When adjusted for the rate of inflation by making income per capita "constant" in 2004 dollars, the increase from 1970 to 1980 was only 26% ($16,725 to $21,052).

In the Woods & Poole database, the personal consumption expenditure deflator is used to convert current dollars into constant dollars; the chain-type deflator, revised by the BEA in 2000, is used by Woods & Poole. The personal consumption expenditure deflator for each year from 1969 to 2040 is listed in Table 4. To convert current dollar data to 2004 dollars, divide the current dollars by the deflator for the appropriate year in Table 4 divided by 100. To convert constant 2004 dollar data into current dollars, multiply the constant dollars by the deflator for the appropriate year in Table 4 divided by 100. The same deflator is used for the U.S. and all counties in the Woods & Poole database; hence, the rate of inflation (the percent difference year to year in the deflator) is assumed to be constant for all parts of the country.

Table 4. Personal Consumption Expenditure Deflator
(2004 = 100)

1969	23.30
1970	24.40
1971	25.44
1972	26.32
1973	27.75
1974	30.62
1975	33.17
1976	35.01
1977	37.28
1978	39.90
1979	43.42
1980	48.05
1981	52.33
1982	55.22
1983	57.60
1984	59.78
1985	61.75

1986	63.26
1987	65.45
1988	68.04
1989	71.01
1990	74.27
1991	76.96
1992	79.18
1993	81.01
1994	82.71
1995	84.49
1996	86.30
1997	87.76
1998	88.55
1999	90.02
2000	92.26
2001	94.19
2002	95.53
2003	97.42
2004	100.00
2005	102.95
2006	105.80
2007	108.49
2008	111.69
2009	115.02
2010	118.48
2011	122.10
2012	125.90
2013	129.88
2014	134.05
2015	138.42
2016	143.00
2017	147.80
2018	152.84
2019	158.13
2020	163.68
2021	169.51
2022	175.63
2023	182.06
2024	188.81

2025	195.91
2026	203.30
2027	210.98
2028	218.98
2029	227.30
2030	235.96
2031	244.97
2032	254.36
2033	264.12
2034	274.29
2035	284.88
2036	295.88
2037	307.30
2038	319.16
2039	331.48
2040	344.27

Note: Chain-type deflator; historical data, 1969-2007, from U.S. Dept. of Commerce; projected data, 2008-2040, from Woods & Poole Economics, Inc.

Population

The historical population data for the years 1969 to 2007 is from the U.S. Department of Commerce, Bureau of the Census. The historical population data in the 2008 Woods & Poole database includes 2000 Census results. The historical county total population and population by single year of age by race and sex for the years 1991-1999 and 2001-2007 was estimated by Woods & Poole using 1990 and 2000 Census results and Bureau of the Census intercensal and postcensal estimates. The historical county population by single year of age by race and sex for the years 1971-1979 and 1981-1989 is estimated by using single year of age data from the 1970, 1980, and 1990 Census of Population for counties, and U.S. annual population by single year of age by race and sex.

Population is defined as July 1 residential population and includes: civilian population; military population except personnel stationed overseas; college residents; institutional populations, such as prison inmates and residents of mental institutions, nursing homes, and hospitals; and estimates of undocumented aliens. Excluded are persons residing in Puerto Rico, U.S. territories and possessions, and U.S. citizens living abroad.

For the years 1990 to 2040 the population data is broken down by five race/ethnic groups: White not including Hispanic or Latino (i.e. Non-Hispanic), Black Non-Hispanic, Native American or American Indian Non-Hispanic, Asian American and Pacific Islanders Non-Hispanic, and Hispanic or Latino. Population by race as defined by the Census Bureau reflects self-identification by respondents and does not denote any clear-cut scientific definition of biological stock. White population includes people who identify themselves as White and people who do not identify themselves by any race but identify themselves by nationality, such as Canadian, German, Italian, Arab, Lebanese, Near Eastern, or Polish. Black population includes people who identify themselves as Black and people who do not identify themselves by any race but identify themselves by nationality, such as African American, Afro-American, Black Puerto Rican, Jamaican, Nigerian, West Indian, or Haitian. Native American population includes people who identify themselves as Alaska Native or American Indian by Indian tribe or classify themselves as Canadian Indian, French American Indian, Spanish-American Indian, Eskimos, Aleuts, and Alaska Indians. Asian American and Pacific Islander population are people who identify themselves as having origins in any of the original peoples of the Far East, Southeast Asia,or the Indian subcontinent including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, Vietnam, Hawaii, Guam, Samoa, or other Pacific Islands.

Hispanic or Latino population are people whose origins are from Spain, the Spanish-speaking countries of Central or South America, the Dominican Republic, and who identify themselves generally as Spanish, Spanish-American, Hispanic, Hispano, Latino, and so on. Hispanic population is not a race group but rather a description of ethnic origin. Although Hispanics are part of the other four race groups they split out separately in the Woods & Poole database so that the four race groups plus Hispanic equals total population.

Hispanic data are historical for 1970, 1980, and 1990-2006 from the decennial censuses, adjusted to July 1, and from Census Bureau intercensal and postcensal population estimates. For counties with Hispanic population greater than 40,000, actual historical data for 1981-1985 from a special Census Bureau report are included. Census Bureau data are also included for the U.S. for 1969-1990, and for states for 1981-1985 and 1990. Hispanic data for all other years are estimated. The Woods & Poole Hispanic population data for 1980 differ significantly from the final 1980 Census for some states, e.g., Alabama and Mississippi; this is because of post-1980 Census Bureau revisions to the 1980 Census that are incorporated in the Woods & Poole data.

For the years 1970 to 1989 the population in the Woods & Poole database is available in three race groups which sum to total population: White, Black, and Other. All three of these race groups include Hispanic population. The Hispanic data for 1970 to 1989 is provided separately. Although the total Hispanic population and the population by age and gender for the years 1970 to 1989 are consistent with the data 1990 to 2040, the population by race data is not.

The Woods & Poole database includes 2000 Census population data, adjusted to July 1, for total population by single year of age, race and sex. However, the 2000 Census race classifications were adjusted to create a consistent time-series for the years 1990 to 2000. The 2000 Census classification Some Other Race was distributed as follows: of the 15.36 million people classifying themselves as Some Other Race, 14.89 million were Hispanic and were therefore added to Hispanic population; the remaining 468,000 were distributed to the other four race groups proportionally by age and gender. The 2000 Census classifications for Two or More Races were distributed as follows: of the 6.8 million people classifying themselves as Two or More Races, 2.22 million were Hispanic and were added to the Hispanic population; the remaining 4.60 million were distributed to the other four race groups proportionally by age and gender.

The population data in the Woods & Poole database are generally consistent with data from other sources, including the Census Bureau. The most significant difference between the Census Bureau data used by Woods & Poole and the actual 1970, 1980, 1990, and 2000 Census results is that Woods & Poole data are July 1-based and the decennial census data are April 1-based. Decennial census data were adjusted forward from April 1 to July 1 to make them consistent with population data for other years as well as with the employment and income data, which are also July 1-based.

Households

The data for households are from Census Bureau counts in 1970, 1980, 1990, and 2000 and Census Bureau estimates for 1985. As with population, the household data from the decennial censuses were adjusted from April 1 to July 1. The 1985 Census Bureau estimate was already July 1-based. All other years of county household data (i.e., 1969, 1971-1979, 1981-1984, 1986-1989, and 1991-1999) are estimates. Household data for the U.S. and states, 1969-2000, are based on Census Bureau data.

Household data for total number of households, group quarters

population, and average size of households from the 1990 and 2000 Census, adjusted to a July-1 base, are included in the Woods & Poole database.

Households are defined as occupied housing units. A housing unit is a house, an apartment, a group of rooms, or a single room occupied as separate living quarters. The occupants of a housing unit may be a single family, one person living alone, two or more families living together, or any group of related or unrelated persons who share living quarters. All people are part of a household except those who reside in group quarters. Group quarters include living arrangements such as prisons, homes for the aged, rooming houses, college dormitories, and military barracks. The average size of households is defined as total population less group quarters population divided by the number of households. Mean household income is defined as total personal income less estimated income of group quarters population divided by the number of households.

Households by Income Bracket

The number of households by income bracket is historical only for 1990 and 2000 and is based on Census data for household income in the years 1989 and 1999, respectively. The income brackets are in 2000 dollars and since the brackets themselves are not adjusted over the projection horizon all brackets from 2001 to 2040 are also in 2000 dollars. The 2000 Census income brackets are retained for the projection years; as a result, in the Woods & Poole projections, there is a heaping of households into the higher income brackets because of projected real increases in total personal income. The projection of the number of households by income bracket is made simply by changing the median income for the years 2001 to 2040 in relation to projected mean household income, and retaining the income distribution around the 2000 median. The lack of historical time series data for county households by income bracket means that the projections are based on a single observation point; projections based on extrapolations from a single data point are less reliable that projections based on time-series data.

Woods & Poole Wealth Index

The Woods & Poole Wealth Index is a measure of relative total personal income per capita weighted by the source of income. The Wealth Index is the weighted average of regional income per capita divided by U.S. income per capita (80% of the index); plus the regional proportion of income from dividends/interest/rent divided by the U.S. proportion (10% of the index); plus the U.S. proportion of income from transfers

divided by the regional proportion (10% of the index). Thus, relative income per capita is weighted positively for a relatively high proportion of income from dividends, interest, and rent, and negatively for a relatively high proportion of income from transfer payments. Because the imputed rent of owner-occupied homes is added to rental income of persons in calculating total personal income, some of the appreciated value of owner-occupied homes is included in rental income. Since dividends, interest, and rent income are a good indicator of assets, the Woods & Poole Wealth Index attempts to measure relative wealth.

Comparative Data

Some Woods & Poole statistical tables and data files contain summary data on unemployment, number of business establishments, and educational attainment. These data are provided for comparison purposes and are not part of the Woods & Poole forecasting model.

Labor force and unemployment data are from the Bureau of Labor Statistics. Data are provided for the civilian labor force, employment, unemployment, and the unemployment rate for 1998 to 2007. Employment is defined by the Bureau of Labor Statistics and excludes military employment and proprietors. Civilian labor force is defined as people who are either employed or who are unemployed and looking for work; civilian labor force is the sum of the employed and unemployed. The unemployment rate is the number of people unemployed divided by the civilian labor force. The monthly data are not seasonally adjusted. The labor force, employment, and unemployment data are all by place of residence and not by place of work.

Business establishments by size and industry is from the Bureau of the Census. Data are provided for the total number of business establishments and the number with fewer than fifty employees and the number with fifty or more employees by one-digit NAICS industries. The data are for March 2005 and March 2006 and are not an annual average. The number of business establishments excludes proprietors and government. The industry groups are based on 1997 North American Industry Classification System (NAICS) definitions. The data on the number of business establishments includes establishments by industry that are statewide and not part of any particular county. In the Woods & Poole database, statewide establishments are distributed proportionally to counties within the state based on the number of establishments by industry within a particular county; therefore, Woods & Poole county data may differ from other published data.

Educational attainment data for the years 1970, 1980, 1990, and 2000

are from the Bureau of the Census. The percent of the population age 25 or more not completing high school, completing high school, and completing four or more years of college is reported. The educational attainment data are based on self-reporting by decennial Census respondents and are not matched to actual school enrollment or graduation data.

Land area is from the 2000 Census and is in square miles. The data are for all U.S. counties; the land area for geographic units larger than county (including the U.S. as a whole) is calculated by summing county land area.

Estimation of Missing Historical Data

Some historical earnings and employment data by sector was withheld by the Department of Commerce because of Federal information disclosure policies. Data are usually withheld in small sectors in a specific county; the reporting of this data would divulge confidential employment and earnings information about specific companies in that area. In order to make the database consistent, and facilitate the forecasting model, all missing data points were estimated by Woods & Poole. In sum, approximately 4% of all data in the historical database were withheld and had to be estimated.

The algorithms used to estimate the missing data were applied in two stages. First, a "best guess" of the missing data was obtained. For example, in the case of mining employment, missing data for a county were estimated by observing the relationship between that county's mining employment in reported years and statewide mining employment for the same years. This method took into account, when possible, fluctuations in a series because of business cycles during the historical period. When sufficient years in a series were reported to provide statistical reliability (this occurred in approximately 33% of the cases where data were withheld), business cycles were all estimated separately, thus enabling reliable estimates to be made of the missing data points. In other cases, where too many years in a series were withheld, business cycles were not taken into account, but the same method of observing the relationship between county series, in reported years, to the state series in the same years was used (this occurred in approximately 61% of the cases). In approximately 6% of the cases, the data for a county series, such as mining employment, were withheld for every year, and the relational method would not work. In these cases, the relationship between total economic activity in the county to the state, in a non-cyclical manner, was used to derive "best guess" results.

Once the "best guess" results were estimated, an iterative procedure was used to simultaneously constrain the "best guess" to the county control total, (i.e., total employment in the above example) and the state total for the series (i.e., state mining employment in the above example). This iterative procedure, beginning with the "best guess" solution, produced, for all missing data points, a convergence point that is used as historical data. However, since the data are truly withheld by the government, there is no mathematically tractable solution to the problem of missing data. Estimated withheld data are indicated for employment and earnings of employees in the Woods & Poole database printed tables with an "e" following the estimated data; estimated withheld data for retail sales by kind of business and other data series is not indicated in the Woods & Poole database.

Average Annual Rate of Growth

In some statistical tables in Woods & Poole publications, data are presented for the average annual rate of growth for a particular variable over a specified time period. The average annual rate of growth is the compounded growth of a variable over time. Thus, a 3.0% average annual rate of growth between 1970 and 1980 for population would mean that, on average, the population increased 3.0% each year between 1970 and 1980.

An average annual rate of growth can be calculated by dividing the data year t+n by data year t and calculating the nth root of the quotient (where n is the number of years between t and t+n). Subtract one and multiply by 100 to convert the growth into percent. A negative average annual rate of growth would mean a decline in the variable over time.

Rounding of Data

Data for the U.S., states, Metropolitan Statistical Areas (MSAs), Designated Market Areas (DMAs), and other regions are the sum of counties. Due to rounding, the subtotals in Woods & Poole data tables may not exactly equal the components. Special calculations in some data tables (e.g., population growth rates) also may not exactly equal the data because of rounding. Since the U.S. and state data are based on county estimates, they may differ from U.S. and state data available from other sources.

County Definitions

The county definitions and county-equivalent definitions used in the Woods & Poole database are defined by the BEA. In New England, counties were created by summing townships and creating

county-equivalent areas. Parishes in Louisiana, Boroughs in Alaska, and Independent Cities in Maryland, Missouri, and Nevada are called counties in the Woods & Poole database. In some states, notably Virginia, counties exist with independent cities. In cases where boundaries between counties and independent cities (or counties and other counties) have changed since 1969, new county groups are created to maintain the consistency of the historical data. Table 5 lists all the special county groupings in the Woods & Poole database.

Broomfield County Colorado (FIPS 08014) is a new county created after the 2000 Census from portions of Boulder, Adams, Jefferson and Weld counties; it is not included separately in the 2008 Woods & Poole database.

Federal Information Processing Standards (FIPS) codes are defined by the National Institute of Standards and Technology to give numeric "names" to geographic areas such as states and counties. Each state has a two-digit FIPS code (Alabama is 01 and Wyoming is 56) and counties have five-digit codes with the first two digits being the state code: Autauga AL is 01001 and Weston WY is 56045.

Table 5. Woods & Poole Special County Definitions
(FIPS codes in Parentheses)

Northwest Arctic Borough, AK (02188)
- Kobuk, AK (02140)

Remainder of Alaska, AK (02999)
- Aleutian Islands, AK (02010)
- Aleutian Islands East Borough, AK (02013)
- Aleutian Islands West Census Area, AK (02016)
- Bethel Census Area, AK (02050)
- Denali Borough, AK (02068)
- Dillingham Census Area, AK (02070)
- Haines Borough, AK (02100)
- Kenai Peninsula Borough, AK (02122)
- Lake and Peninsula Borough, AK (02164)
- North Slope Borough, AK (02185)
- Prince of Wales-Outer Ketchikan, AK (02201)
- Sitka Borough, AK (02220)
- Skagway-Yukatat-Angoon, AK (02231)
- Skagway-Hoonah-Angoon Census Area, AK (02232)
- Southeast Fairbanks Census Area, AK (02240)
- Valdez-Cordova Census Area, AK (02261)
- Wrangell-Petersburg Census Area, AK (02280)
- Yakutat Borough, AK (02282)

Yukon-Koyukuk, AK (02290)

Yuma + La Paz, AZ (04027)
La Paz, AZ (04012)
Yuma, AZ (04027)

Miami-Dade, FL (12086)
Dade, FL (12025)

Maui + Kalawao, HI (15901)
Kalawao, HI (15005)
Maui, HI (15009)

Fremont, ID (16043)
Fremont, ID (16043)
Yellowstone Park, ID

Park, MT (30067)
Park, MT (30067)
Yellowstone Park, MT (30113)

Valencia + Cibola, NM (35061)
Cibola, NM (35006)
Valencia, NM (35061)

Halifax, VA (51083)
Halifax, VA (51083)
South Boston City, VA (51780)

Albemarle + Charlottesville, VA (51901)
Albemarle, VA (51003)
Charlottesville City, VA (51540)

Alleghany + Clifton Forge + Covington, VA (51903)
Alleghany, VA (51005)
Clifton Forge City, VA (51560)
Covington City, VA (51580)

Augusta + Staunton + Waynesboro, VA (51907)
Augusta, VA (51015)
Staunton City, VA (51790)
Waynesboro City, VA (51820)

Bedford + Bedford City, VA (51909)
Bedford, VA (51019)
Bedford City, VA (51515)

Campbell + Lynchburg, VA (51911)
Campbell, VA (51031)
Lynchburg City, VA (51680)

Carroll + Galax, VA (51913)
Carroll, VA (51035)
Galax City, VA (51640)

Dinwiddie + Colonial Heights + Petersburg, VA (51918)
Dinwiddie, VA (51053)
Colonial Heights City, VA (51570)
Petersburg City, VA (51730)

Fairfax + Fairfax City + Falls Church City, VA (51919)
Fairfax, VA (51059)
Fairfax City, VA (51600)
Falls Church City, VA (51610)

Frederick + Winchester, VA (51921)
Frederick, VA (51069)
Winchester City, VA (51840)

Greensville + Emporia, VA (51923)
Greensville, VA (51081)
Emporia City, VA (51595)

Henry + Martinsville, VA (51929)
Henry, VA (51089)
Martinsville City, VA (51690)

James City + Williamsburg, VA (51931)
James City County, VA (51095)
Williamsburg City, VA (51830)

Montgomery + Radford, VA (51933)
Montgomery, VA (51121)
Radford City, VA (51750)

Pittsylvania + Danville, VA (51939)
Pittsylvania, VA (51143)
Danville City, VA (51590)

Prince George + Hopewell, VA (51941)
Prince George, VA (51149)
Hopewell City, VA (51670)

Prince William + Manassas + Manassas Park, VA (51942)
Prince William, VA (51153)
Manassas City, VA (51683)
Manassas Park City, VA (51685)

Roanoke + Salem, VA (51944)
Roanoke, VA (51161)
Salem City, VA (51775)

Rockbridge + Buena Vista + Lexington, VA (51945)
Rockbridge, VA (51163)
Buena Vista City, VA (51530)
Lexington City, VA (51678)

Rockingham + Harrisonburg, VA (51947)
Rockingham, VA (51165)
Harrisonburg City, VA (51660)

Southampton + Franklin, VA (51949)
Southampton, VA (51175)
Franklin City, VA (51620)

Spotsylvania + Fredericksburg, VA (51951)
Spotsylvania, VA (51177)
Fredericksburg City, VA (51630)

Washington + Bristol, VA (51953)
Washington, VA (51191)
Bristol City, VA (51520)

Wise + Norton, VA (51955)
Wise, VA (51195)
Norton City, VA (51720)

York + Poquoson, VA (51958)
York, VA (51199)
Poquoson City, VA (51735)

Shawano (includes Menominee), WI (55901)
Menominee, WI (55078)
Shawano, WI (55115)

Metropolitan Area Definitions

Metropolitan Statistical Areas (MSAs), Combined Metropolitan

Statistical Areas (CSAs), Micropolitan Statistical Areas (MICROs), and Metropolitan Divisions (MDIVs) in the Woods & Poole database are as defined in the December 2005, Office of Management and Budget (OMB) "Revised Definitions of Metropolitan Statistical Areas, New Definitions of Micropolitan Statistical Areas and Combined Statistical Areas, and Guidance on Uses of the Statistical Definitions of These Areas" (OMB BULLETIN NO. 06-01).

All Woods & Poole historical data back to 1969 is revised to reflect the new 2005 OMB Metropolitan Area (MSA, CSA, MICRO, and MDIV) definitions. There are 361 MSAs, 120 CSAs, 577 MICROs, and 29 MDIVs in the 2008 Woods & Poole database. A list of all CSAs, MSAs, MICROs, and MDIVs and their component counties can be found in Appendices 2, 3, 4 and 5, respectively. These Appendices follow this chapter and begin on page 40. Although CSAs can be defined in terms of MSAs and MICROs, in the Woods & Poole database, and in Appendix 2, they are defined in terms of counties.

New England City and Town Areas (NECTAs) and Combined New England City and Town Areas (CNECTAs) are not in the Woods & Poole database because they are defined with geographic units smaller than counties. The 19 MSAs, CSAs, and MICROs in Puerto Rico are also not included in the Woods & Poole database.

MSAs, as defined by the OMB, have at least one urbanized area of 50,000 or more population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties. Micropolitan Statistical Areas - a new set of statistical areas - have at least one urban cluster of at least 10,000 but less than 50,000 population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties. The central cities that form the basis on MSAs and MICROs are generally included in their titles, as well as the name of each state into which the MSA or MICRO extends. MSAs and MICROs are defined in terms of whole counties (or equivalent entities), including in the six New England States. If the specified criteria are met, a MSA containing a single core with a population of 2.5 million or more may be subdivided to form smaller groupings of counties referred to as Metropolitan Divisions. MDIVs are not comparable to either MSAs or MICROs and should not be ranked together.

According to the OMB if specified criteria are met, adjacent MSAs and MICROs, in various combinations, may become the components of a new set of areas called Combined Statistical Areas. For instance, a CSA may comprise two or more MSAs, a MSA and a MICRO, two or more MICROs, or multiple MSAs and MICROs. In the Woods & Poole database CSAs are

defined in terms of counties. According to the OMB combinations for adjacent areas with an employment interchange of 25 or more are automatic. Combinations for adjacent areas with an employment interchange of at least 15 but less than 25 are based on local opinion as expressed through the Congressional delegations.

DMAs and Regions

Television Designated Market Areas (DMAs) are defined in the September 2006 U.S. Television Household Estimates published by Nielsen Media Research, Inc. DMAs are geographic definitions of television markets based on measured viewing patterns. DMAs are aggregates of counties, and generally each county is in only one DMA. A list of all DMAs and their component counties can be found in Appendix 7 following this chapter. In the few cases where a county is split into more than one DMA, an estimated proportion of the population, employment, households, and income in the county have been assigned to each DMA. The specific proportions used for split counties are listed parenthetically in Appendix 7.

The eight regions in the Woods & Poole database are aggregates of states and are defined by the Bureau of Economic Analysis. A list of all BEA regions and their component states can be found in Appendix 1 following this chapter. The BEA regions used by Woods & Poole differ from the nine regions defined by the Census Bureau and used in their publications.

References

1. Carlino, Gerald A., and Edwin S. Mills, "The Determinants of County Growth," Journal of Regional Science, Regional Science Research Institute, Philadelphia, Vol. 27, No. 1, 1987.
2. Crow, R.T., "A Nationally Linked Regional Model," Journal of Regional Science, Vol. 13, 1973.
3. Hall, O.P., and J. A. Licari, "Building Small Region Econometric Models: Extension of Glickman's Structure to Los Angeles," Journal of Regional Science, Vol. 14, 1977.
4. Holdrich, Martin, "Future Regional Employment and Its Impact on Population, Income, and Consumer Spending," unpublished paper presented to the Southern Regional Demographics Group, October 1985.
5. Johnson, K.P., and H.L. Friedenberg, "Regional and State Projections of Income, Employment, and Population to the Year 2000," Survey of Current Business, U.S. Government Printing Office, Washington, D.C., Vol. 65, No. 5, May 1985.
6. Kahley, William J., "Population Migration in the United States: A Survey of Research," Economic Review, Federal Reserve Bank of

Atlanta, Vol. 76, No. 1, 1991.
7. Klein, L.R., and N.J. Glickman, "Econometric Model Building at the Regional Level," Regional Science and Urban Economics, Vol. 7, 1977.
8. Plaut, T.R., "A Supply-Side Model of Texas Manufacturing Growth," Journal of Regional Science, Vol. 24, No. 3, August 1984.
9. U.S. Department of Commerce, Bureau of Economic Analysis, 1985 OBERS BEA Regional Projections, U.S. Government Printing Office, Washington, D.C., Vol. 1, 1985.