

Gateway Park East Station Area Plan

A Framework for Transit-Oriented Development

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in consultation with

Regional Transportation District
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Contents

1 Introduction	
The Purpose of the Gateway Park East Station Area Plan	4
East Corridor Environmental Impact Statement	4
Why Plan for a Transit-Oriented Development?	4
Project Partners and the Planning Process	4
Organization of the Plan	9
How to Use this Plan	9
2 Overview and Existing Conditions	
Location and Context	12
Surrounding Land Uses	12
The Study Area	12
Existing Land Uses in the Study Area	14
Existing Zoning	14
Existing Transportation	14
3 The Vision	
Development of the Vision	18
Preferred Concept – an emphasis on connections	19
Plazas and Public Spaces	23
The Grade-Separated Commuter Rail Station	25
4 Implementation	
Land Use and Policy Changes	28
Infrastructure Improvements	28
5 Guidance for Transit-Oriented Development (TOD) Zoning	
Purpose of this Section	30
Sub-Districts	30
Proposed Transit-Oriented Development (TOD) Zoning	31
Appendices	33
A Development of the Vision	
B Gateway Park East Transportation Study	

1 Introduction

1 Introduction

Purpose of the Gateway Park East Station Area Plan

This is an exciting time for Aurora – a time of change and opportunity. The Gateway Park East Station Area Plan is a product of the City of Aurora’s commitment to create urban activity centers along the city’s future commuter and light rail transit corridors.

FasTracks is the Regional Transportation District’s (RTD) plan to complete a regional rapid transit system by 2017. Commuters throughout the metro region endorsed the \$4.7 billion investment in November, 2004 in order to have the transportation infrastructure in place to provide for the projected growth and transportation needs in the metro region. This comprehensive system will consist of commuter rail, light rail, bus rapid transit, circulator bus service, and park-n-Ride facilities. The FasTracks program includes 119 miles of new light rail and commuter rail, 18 miles of bus rapid transit service, 21,000 new parking spaces at rail and bus stations throughout the system, and expanded bus service.

The East Corridor will be a 23.6 mile commuter rail line connecting the intermodal transit hub at Denver Union Station and Denver International Airport (DIA). The transit line will connect employment areas, neighborhoods, and new development areas with these two destinations as well as with the I-225 light rail corridor and destinations in Aurora such as the Anschutz Fitzsimons medical campus, the Colorado Science and Technology Park, Aurora City Center, and Gateway Park.

There will be five FasTracks stations on the East Corridor, two of which are located in Aurora. The Peoria-Smith station will be the transfer station from the I-225 light rail line to the East Corridor commuter rail. The station at 40th Avenue and Airport Boulevard will be located in the center of the Gateway Park development as shown in Figure 1.

Gateway Park is a mixed-use development comprised of 1,300 acres at I-70 and Peña Boulevard, and is within the borders of Aurora and the City and County of Denver. Gateway Park lies on the east and west sides of Peña Boulevard, and this station area plan focuses on the eastern side, known as Gateway Park East, and the mostly undeveloped land surrounding the future 40th Avenue and Airport Boulevard station.

East Corridor Environmental Impact Statement

The East Corridor Environmental Impact Statement (EIS) process assessed several transit technologies and decided upon electrical multiple unit (EMU) commuter rail.



Electric Motorized Unit (EMU)

These EMU cars are longer and heavier than the light-rail trains and will require a 1,000 foot long raised platform. Electric power will be supplied through overhead wires. The proposed frequency of service will be at 15 minute intervals and the expected daily ridership in 2030 is projected to be 37,500 passengers per day. It is planned that the trip from Denver Union Station to DIA will take approximately 30 minutes.

The draft EIS is expected to be ready for public review and comment by early 2009 and completed by August of 2009. Construction of the East Corridor is scheduled to begin in 2011 with the opening of the line planned for 2015.

Why Plan for Transit-Oriented Development

Transit-oriented development (or TOD) refers to the clustering of offices, homes, shops, lodging, and

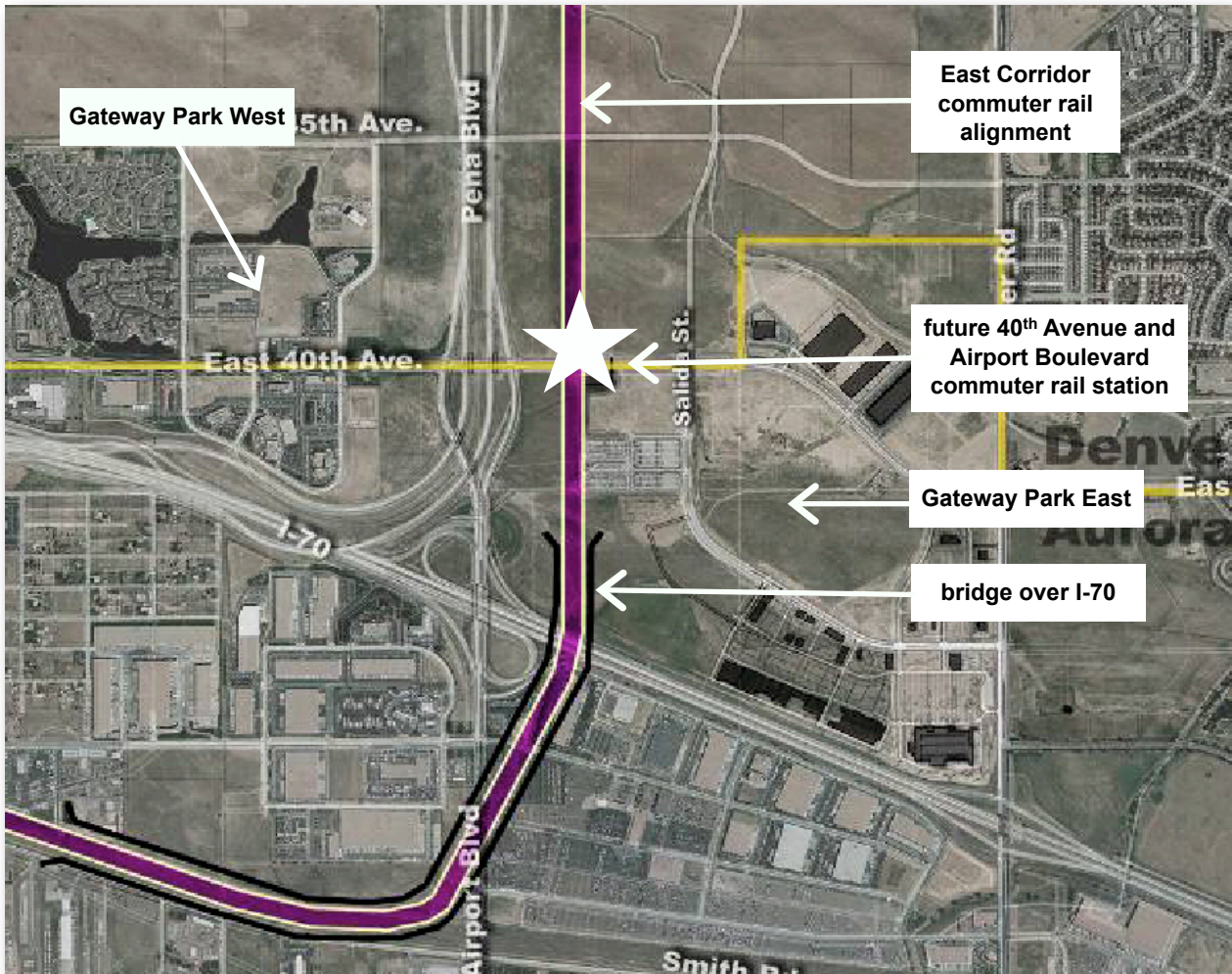


Figure 1. Proposed Alignment of East Corridor Commuter Rail at Gateway Park

services in close proximity to a rail station. This pattern typically involves compact development and a mixing of different land uses, along with amenities such as pedestrian-friendly streets, parks and plazas.

To be successful, TODs must serve a significant portion of trips by public transit, walking and biking, rather than by private automobile. While this does

not mean that residents in a TOD will give up owning a car, they are likely to own fewer cars and to drive less than residents living farther from transit. The result is that while not car free, they have more options to conduct the trips necessary in their daily lives.

The entire Gateway Park area benefits from good visibility from its location at the regional crossroads of I-70 and Peña Boulevard. Gateway Park has been evolving for 11 years with development occurring initially along both sides of E. 40th Avenue in Gateway Park IV West, and more recently in Gateway Park IV East adjacent to Tower Road. With its extraordinary highway and future rail transit infrastructure, Gateway Park East is a highly strategic development site. Gateway Business Park and the Pauls Corporation have responded to the opportunity for TOD through a two-step approach by developing commercial uses responding to the market now, and by planning for a future denser,

compact urban form occurring adjacent to the future station.

The goal of this station area plan is to articulate the vision developed through the planning process that recognizes Gateway Park's strategic location and maximizes the use and benefits of the commuter transit. The station at 40th Avenue and Airport Boulevard station has the potential to create a mixed-use hub for Gateway Park, the City of Aurora, and the City and County of Denver. Figure 1 shows the location of Gateway Park East, the proposed alignment of the commuter rail along Smith Road and Peña Boulevard, the elevated track over I-70, and the lowered 40th Avenue.

Purpose

While TOD offers housing, travel, retail and commercial opportunities, it also presents its own set of challenges. For the Gateway area, it is how to best integrate the commuter station into a compact urban form and allow all the competing uses such as commuter parking and new development in a sequential and beneficial manner.

The Gateway Park East Station Area Plan is the outcome of a planning process undertaken by the City of Aurora in partnership with Gateway Business Park to:

- 1. Inform the East Corridor EIS of the desired location for the 40th and Airport station and recommend infrastructure improvements;**
- 2. Establish common goals for Gateway Business park, the City and County of Denver and the City of Aurora;**
- 3. Establish a sequential and comprehensive framework for the development of the land adjacent to the 40th and Airport station;**
- 4. Determine the scope of proposed transportation and other infrastructure improvements associated with transit-oriented development and identify implementation strategies; and**
- 5. Guide the character of development within the TOD area through timely rezoning.**

Objectives

This plan presents the long term vision for the station area, showing concepts on the intensity of development that can occur adjacent to and on both sides of E. 40th Avenue. This guiding document defines planning principles, planning concepts, land use recommendations, general design guidelines, and implementation strategies for the defined TOD study area.

All Aurora's station area plans further articulate the policies of the 2003 Aurora Comprehensive Plan. They outline guiding planning principles together with the neighborhood character and identity. Development principles, concepts and guidelines together with TOD zoning provisions are the result.

The objectives of the Station Area Plan are to:

1. Transit-Oriented Development

- Identify the extent of an area that should be planned for transit-oriented development;
- Establish a clear identity for Gateway Park at the future transit station;
- Allow for high density and flexibility in development options for the land within the station area plan;
- Provide open space amenities that serve the new land uses and establish a comfortable, attractive and lively public realm;
- Concentrate office and lodging uses within walking distance of the station; and
- Provide a safe pedestrian and bicycle access as part of the grade-separated station over E. 40th Avenue.

2. Transportation

- Present concepts that incorporate development and locate the 40th Avenue and Airport boulevard station so that they benefit transit riders, RTD operations, and development opportunities;
- Minimize the impact of the commuter rail operations on E. 40th Avenue pedestrian and vehicular traffic; and
- Investigate alternate locations for commuter parking from that now available on the existing RTD park-n-Ride lot.

3. Urban Design

- Develop a station identity that represents Aurora and Gateway Park since it is the first FasTracks station encountered when leaving DIA (funding for two other intervening stations are not part of the FasTracks program); and
 - Create a compact, mixed-use development with flexible block sizes and pedestrian-oriented activities adjacent to public spaces.
-

Project Partners and the Planning Process

The property around the station is under one ownership and the property owner worked closely with the city and the station area plan consultants. In January of 2006, the City of Aurora and Gateway Business Park retained a consultant team lead by David Owen Tryba Architects to develop a station area plan for the proposed FasTracks station at 40th Avenue and Airport Boulevard.

One of the first questions that arose was where the most appropriate location of the station should be to create a compact, transit-oriented development area. Since the site around the proposed station is undeveloped and within Gateway Business Park, the planning process involved two stakeholder workshops and a series of regular planning meetings. The planning team consisted of the staff from the City of Aurora, representatives from the Gateway Business Park and the Pauls Corporation, RTD, DIA, and the City and County of Denver.

The first stakeholder workshop was held on February 23, 2006 with representatives from the Pauls Corporation, Gateway Business Park, Denver International Airport, RTD East Corridor team, City and County of Denver, and City of Aurora. The key ideas that surfaced in this workshop have provided the basis for the concepts developed in this study. These ideas are:

- There is a desire to plan for increased densities over time so a multi-step approach to increasing the density should occur;
- The station should be moved to the north closer to E. 40th Avenue. It was proposed and agreed that the trackway should be elevated over E. 40th Avenue and that the station should also be centered and span over 40th Avenue;

- High density, transit-oriented development is desirable on both the north and south sides of E. 40th Avenue;
- Structured parking should be part of new developments as densities and economics allow;
- The existing detention pond is in an area best suited for future development. There is a strong preference to relocate the existing pond into the Peña Boulevard right-of-way; and
- The existing RTD park-n-Ride lot should be relocated within the Peña right-of-way when the level of development dictates.

The second stakeholder workshop was held on May 4, 2006 to discuss the concepts, alternatives, the location and character of public plazas, the approach to zoning, and the options for the location of the RTD commuter park-n-Ride lot.

The major idea that the project team recommended to the East Corridor EIS team was to provide a grade separated commuter rail crossing at E. 40th Avenue with an elevated station spanning E. 40th Avenue. Since the commuter rail required a major structure to cross I-70 and Airport Boulevard, the team advocated the benefits of continuing this structure across E. 40th Avenue and requested that RTD prepare a cost estimate to identify the incremental cost of the structure. RTD provided an estimate of approximately \$40 million for the structure and questioned the necessity of the grade separation.

To prepare a more detailed transportation assessment, the Pauls Corporation retained Fehr & Peers to prepare trip generation estimates using ITE's Trip Generation methodology and land use density assumptions from the station area plan. The results of this Gateway Park East Transportation Study identified traffic volumes higher than the DRCOG

regional travel demand model estimates for E. 40th Avenue. This study is included in Appendix B.

Fehr & Peers was subsequently retained by the Pauls Corporation to analyze the level of service (LOS) operations and the queuing spill-back at the 40th Avenue/Peña Boulevard interchange using the micro-simulation program VISSIM. The VISSIM model included the two signalized intersections at 40th Avenue and Peña Boulevard. The model indicated that both intersections would require roadway improvements to meet the forecast traffic demand.

In September, 2007 the Pauls Corporation proposed to the City of Aurora that E. 40th Avenue be lowered beneath the commuter rail alignment instead of the elevated structure approach. The City supported the proposal and the Pauls Corporation presented it to RTD for their review. In early 2008, RTD approved the concept with the understanding that the additional costs for grade separation would be paid by others. RTD is currently considering including the E. 40th Avenue grade separation in the preparation of the East Corridor EIS documents.

Organization of the Plan

This plan is organized into five sections:

Section 2 - contains a brief study area inventory and analysis. It identifies existing conditions in the area and looks at the regional context. It examines pedestrian, vehicular and transit movements.

Section 3 - presents the vision for the Gateway Park East station area.

Section 4 - identifies implementation strategies for the infrastructure improvements and private property development scenarios.

Section 5 - contains zoning guidance for transit-oriented development.

The appendices contain the details of concept development and the Transportation Study by Fehr & Peers.

How to Use this Plan

This plan is a guiding document meant to provide a flexible framework for creating a compact, mixed-use employment area adjacent to the transit station, according to key planning principles identified by the stakeholders. This plan also presents proposed design standards and TOD Zoning guidance. Applicants are to use this document as a guide in the development of site plans within the study area.

The Gateway Park East Station Area Plan will be adopted by ordinance and incorporated by reference into both the Aurora Comprehensive Plan and the City of Aurora's Building and Zoning Code. Where there are differences between the Code and this Station Area Plan, the guidelines contained in this plan shall apply.

The implementation of this plan is proposed as follows:

- the East Corridor Draft Environmental Impact Statement is completed and includes the grade separation of the commuter rail tracks and E. 40th Avenue by the lowering of 40th Avenue;
- Intergovernmental Agreement (IGA) between the various parties is completed;
- the East Corridor is designed and construction commences; and
- land within the study area is rezoned.

2 Overview and Existing Conditions

2 Overview and Existing Conditions

Location and Context

Gateway Park is a 1,300 acre mixed-use area with office, hotel, retail, residential, warehouse distribution, and manufacturing uses approximately five miles from the Aurora City Center and 10 miles from DIA. It is primarily an employment center with approximately 8,000 jobs (as of 2008) and hotels, residential and retail uses can be considered supporting elements to this primary use.

The section of Gateway Park west of Peña Boulevard is largely built out with multi-story office buildings, several hotels, restaurants, and one light manufacturing facility. Prominent companies, such as Prologis, Lockheed and Boeing have national headquarters and offices in this development. Nearly 1,000 residential units, both rental and ownership, are located around a twenty-three acre lake north of 40th Avenue and connected to adjacent uses by a pedestrian and bicycle trail.

On the east side of Gateway Park, uses adjacent to Tower Road and I-70 have recently been constructed, including large format retail buildings with a “green” Wal-Mart and a Home Depot. A variety of other commercial uses such as retail, office, and restaurant are being developed along the Tower Road frontage.

The East Corridor commuter line is planned to be adjacent to the western boundary of Gateway Park IV East, within the Peña Boulevard right-of-way. The proposed alignment includes a major elevated structure over Airport Boulevard and I-70.

Surrounding Land Uses

The area south of I-70 is a well-established industrial area characterized by offices, large warehouse, distribution and manufacturing buildings. This is a major employment corridor that extends along the interstate between I-25 and the Aurora city limits.

The Airport Boulevard and I-70 intersection is an important and busy access point to this industrial area and points east and west.

The nearest existing residential neighborhoods are in Denver: Green Valley Ranch east of Tower Road, and Montbello, west of Chambers Road. Both of these are primarily single family neighborhoods and are over one mile away from the future station. A new residential neighborhood is under construction south of East 48th Avenue and wraps around a school campus. The City and County of Denver has recently been updating their “Gateway Plan” and has identified transit-oriented development as the proposed land use for the approximately 60 acre area north of E. 40th Avenue owned by the Gateway Business Park.

The Study Area

The vacant land surrounding the station is considerable, totaling about 400 acres of undeveloped or “greenfield” land east of Peña Boulevard. Portions of this area can be developed to take advantage of proximity to the station since most of it is within the ½ mile radius of the station. The width of the Peña right-of-way forms an effective barrier to the concept of a 360 degree TOD. Due to this, one objective of this plan has been to create a north-south pedestrian connection as part of the elevated transit station spanning E. 40th Avenue. This Station Area Plan concentrates on the “core” of this 400 acres, an area of approximately 140 acres north and south of E. 40th Avenue within a ¼ mile radius of the proposed station. This study area is comprised of approximately:

- 50 acres of Pauls Corporation owned land north of E. 40th Avenue;
- 35 acres of Pauls Corporation owned land south of E. 40th Avenue;



Figure 2. Study Area “Core” and Station “Area of Influence”

- 16 acres of RTD land (existing park-n-Ride and bus transfer facility);
- 20 acres in the Peña right-of-way north of E. 40th Avenue; and
- 18 acres in the Peña right-of-way south of E. 40th Avenue.

Within the Aurora city limits, the study area consists of approximately 69 acres south of E. 40th Avenue.

Existing Land Uses in the Study Area

The existing land uses within the one-half mile radius surrounding the future station location consist of several hotels, office, and retail and restaurant buildings on the west side of the commuter rail alignment. On the east side, are Roth Distribution, a kitchen appliance showroom located north of E. 40th Avenue, the RTD commuter parking lot, and a sub-regional detention pond (Figure 3).

The RTD park-n-Ride lot is accessed from North Salida Street and has 1,079 parking spaces and twelve bus bays. This serves as the bus transfer location for bus routes 43, 44, 153, 48X, AB (Boulder/DIA), AF (Cold Spring/Downtown/DIA) and AT (Arapahoe County/DIA). Since there is no charge for parking, this park-n-Ride lot is continuously full. This has been problematic as the commuter parking is pre-empted by long-term parking, and the Gateway Business Park has identified that during holidays, there is overflow parking onto the adjacent streets, and cars are towed. This approximately 15 acre site is owned by RTD.

The detention pond south of E. 40th Avenue, called "Irondale Drainage Basin Pond C", has an area of approximately four acres. The pond's location interferes with lowering E. 40th Avenue and it should be relocated into the Peña Transportation Corridor.

Existing Zoning

Existing Aurora zoning in the study area is Medium Industrial District (M-2 District) which allows for a broad range of manufacturing, warehouse, office and office showroom uses. The study area is within the Building Height Overlay District and there is no height limitation. The existing built large-format retail and the office and service uses to the east of the study area and adjacent to Tower Road are zoned Highway Service District (B-3 District) as is the hotel and office

area west of Peña Boulevard. Residential uses are not permitted in the existing Aurora zoning. Residential uses are allowed on the lands within the City and County of Denver.

Existing Transportation

The major east-west connector is 40th Avenue with a traffic volume of approximately 15,000 vehicle trips per day west of Peña Boulevard, and approximately 8,000 vehicles per day east of Peña Boulevard. Tower Road is a major north-south arterial with approximately 26,000 vehicles per day.

Peña Boulevard Transportation Corridor

The purpose of Peña Boulevard is to provide convenient access to DIA. The ten mile long freeway begins at I-70 and ends at the airline terminal and is owned and maintained by the City and County of Denver. The vehicular traffic on Peña Boulevard is forecast to grow 60 to 90 percent in the next 25 years due in part to the traffic generated from the development of surrounding lands. As a result, the Denver International Airport has prepared a "Concept Plan" for the Peña Boulevard Transportation Corridor. The plan includes widening Peña Boulevard in the future by adding one additional lane to both the northbound and southbound traffic, with the widening taking place towards the existing center median. A collector and distributor roadway system is proposed to be located about 250 feet on either side and outside of the existing travel lanes. This collector/distributor roadway parallel to Peña Boulevard will carry the local traffic from the development of the lands in the Denver-Aurora Gateway area. It is important to note that the financing grants for Peña Boulevard stipulated that the roadway is to primarily serve airport-only traffic.

In the vicinity of the 40th Avenue and Airport station, the Peña Boulevard right-of-way is approximately



Figure 3. Proposed Alignment of East Corridor Commuter Rail at Gateway Park

2,000 ft. wide. Peña Boulevard has been designated an official bicycle route and this makes it possible for cyclists to ride to and from DIA.

Pedestrian and Bicycle Connections

A portion of a 10 foot wide pedestrian and bicycle pathway has already been built along Airport Way on the west side of the Peña Boulevard right-of-way and is proposed to extend to DIA.

Landscape Character and Views

A drainage way and potential pedestrian connection runs diagonally east-west through the Gateway Park East between Tower Road and Salida Street, south of and approximately parallel to E. 40th Avenue. This drainage way is a potential pedestrian way and greenbelt. A future detention pond is planned as part of this drainage way on the east side of Salida.

The topography is relatively flat and there are scenic views from the site to the mountains in the west.

3 The Vision

3 The Vision

Development of the Vision

Building on the foundation of stakeholder interests and site conditions analysis, the station area planning process developed a vision for the “core” area on the north and south sides of 40th Avenue, on lands owned by Gateway Business Park in the cities of Aurora and Denver. A vision statement was developed with input from a larger stakeholder group in two workshops.

“Create notable, active, maintainable places that can evolve, grow and change over time into a vibrant mix of moderate to high density pedestrian-oriented uses with strong connections to multi-modal transit and an integrated station, and where people would want to work, live, shop and gather in a beautiful, safe and convenient environment.”

The vision is to create a pedestrian-oriented mixed-use area that may be more of an employment area south of 40th Avenue, and a mixed-use area north of E. 40th Avenue. The challenge is to link these two areas together to create a vital, dense and recognizable urban area. There were several alternative locations studied for the location of the station. The pros and cons of an elevated versus an at-grade station were analyzed in the context of transportation and congestion impacts, ease of access, development potential and feasibility. The result is a recommendation for a framework strategy that has:

- A grade separated commuter rail line at E. 40th Avenue with 40th Avenue lowered beneath the track;
- An elevated station that spans E. 40th Avenue and provides access to the station from both the mixed-use areas south and north of E. 40th Avenue;

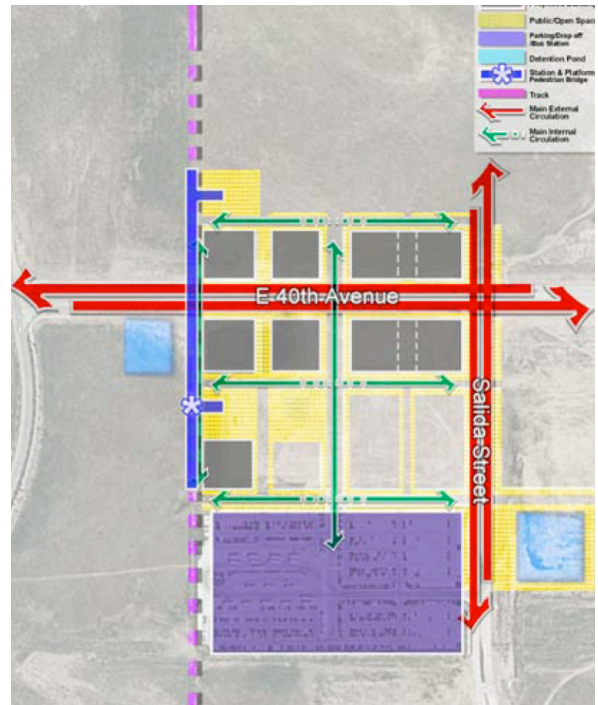


Figure 4. Grade separation and the elevated station. The concept illustrates a possible level of development in 2020, five years after the opening of the station.

The colors represent the following:

- Gray – buildings
- Yellow – public plazas
- Purple – surface and structured parking

- A street system that is oriented to the pedestrian, with a street grid that allows for block lengths that are a recommended length of 300 to 600 feet, on-street parking, and wide sidewalks with street trees and furniture;
- A central plaza that is an important civic place;

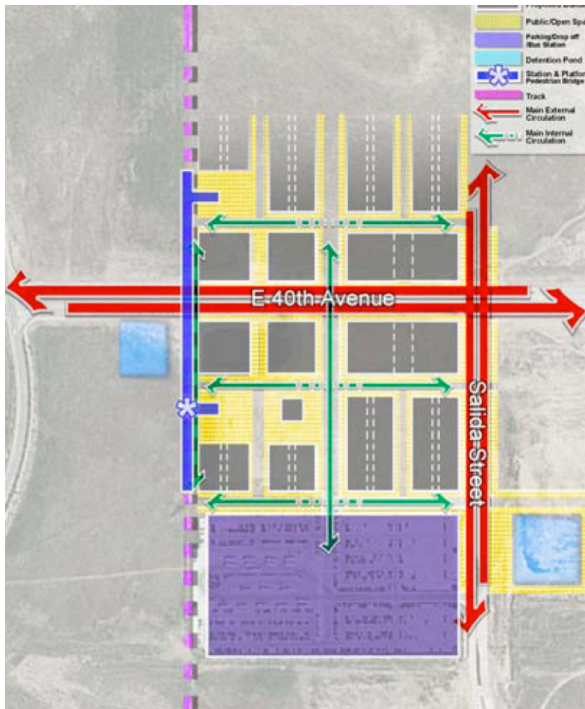


Figure 5. Possible development scenario in 2030.

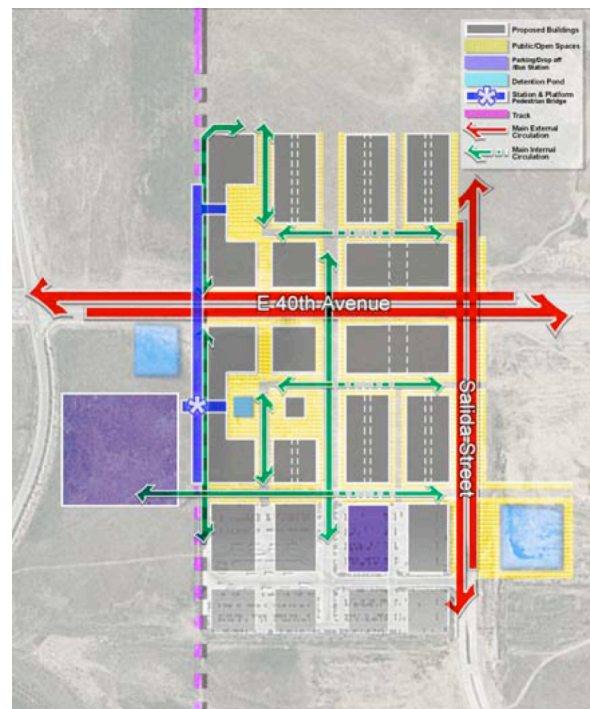


Figure 6. Possible phasing scenario at build-out (2035 or later)

- The existing commuter parking and bus transfer facility relocated to the Peña Boulevard right-of-way;
- Buildings that are of moderate to high density (in the range of 4 to 9 stories) and with no height limit specified in the zoning;
- The existing detention area relocated to the Peña right-of-way; and
- The I-70 bridge structure is recommended to be a structure that does not limit views to the commercial land lying north of I-70 and be a visually attractive landmark.

Grade Separation, the Preferred Concept – an emphasis on connections

The proposed grade separation at E. 40th Avenue accomplishes three objectives. First, it removes any potential vehicular-train conflicts that could result in increased traffic congestion or accidents. Secondly, it provides a safer environment for pedestrians accessing the station from the hotel and office uses to the west. Third, with the addition of the station as part of the elevated structure, the station spans E. 40th Avenue and provides direct access to the station from future transit-oriented developments on both sides of E. 40th Avenue in both Aurora and Denver.

Figures 4, 5 and 6 illustrate the phasing of development that could occur when key infrastructure improvements occur.

The key features of the concept are:

A. Grade separation of E. 40th Avenue and an elevated station

The elevated station provides for a pedestrian crossing of E. 40th Avenue without the need for additional pedestrian bridges. Traffic volumes on E. 40th Avenue will continue to increase. The Gateway Park East Transportation Study projected a daily vehicular volume in 2030 of close to 50,000 at Airport Boulevard and 40th Avenue. One way to integrate development on both sides of 40th Avenue and create more TOD opportunities is with the station connection. The elevated station eliminates the need for pedestrian bridges and allows direct pedestrian access to the station from transit-oriented developments both north and south of 40th Avenue. The concepts below illustrate how the station access points from the north and south could be adjacent to a public plaza. These plazas would be attractive focal areas for the surrounding developments.

The elevated station also provides a unique “landmark” opportunity for Gateway, the City of Aurora, and the City and County of Denver where the architecture and construction materials could present a distinct identity for the station and TOD.

B. Detention pond and RTD parking relocation to the Peña Transportation Corridor

Given the barrier that Peña Boulevard presents to 360 degree TOD development, this would be in part offset by locating surface parking and the existing detention pond west of the commuter line. Relocating the RTD commuter parking into the Peña right-of-way provides the opportunity for the existing lot to be developed for buildings. Relocating the detention pond into the right-of-way maximizes the TOD development potential and provides an opportunity to have a water feature or pond at the entry to the TOD area. The relocation is a pre-requisite to lowering E. 40th Avenue.

C. Land Uses

Commercial land uses are preferred south of 40th Avenue and residential and mixed-use are the desired uses north of 40th Avenue. The buildings could be in the range of 5 to 9 stories and no height limits would be enforced. An urban street grid is proposed with a recommended maximum block length of 600 feet.

D. Public Spaces

The urban plazas adjacent to the station access points serve as the central organizing feature for new development. These spaces are important elements to provide “green” spaces and an active focus for surrounding ground floor uses. The size is to be determined based on intensity and density of uses in future development. Considerations to be determined include



Figure 7. Bird's-eye view looking east with the commuter rail station spanning 40th Avenue. This illustrates the “2020” concept. (Building heights are conceptual.)

maintenance and construction obligations. The public spaces are to meet the city of Aurora’s Small Urban Parks criteria.

E. Development Phasing

The concepts in Figures 8, 9 and 10 depict the possible progression of development in five and 10 year increments. The initial actions required are the lowering of 40th Avenue and the relocation of the detention pond.

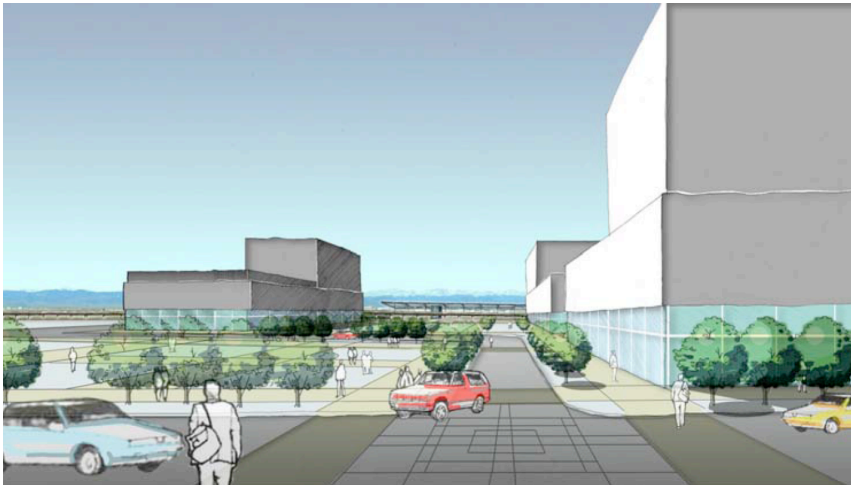


Figure 8.
View looking west from the plaza area. This view corresponds with the “2020” concept in Figure 4.

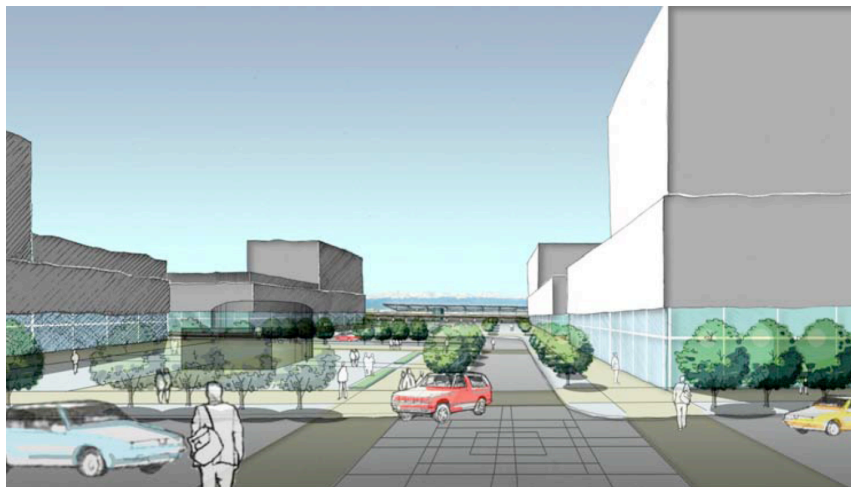


Figure 9.
View of plaza with additional development, corresponding to the concept in Figure 5.



Figure 10.
View of plaza area at build-out, corresponding with the concept in Figure 6.

Plazas and Public Spaces

Plazas at both entrances to the station are recommended as gathering places and to provide visual amenities for the adjacent uses. Water was considered as a possible thematic element for the plazas, due to existing detention area and the need for a second one in the future.

The scale of the plaza is important in the context of the surrounding development. It is envisioned that this TOD would be mixed-use, with the employment, restaurants, hotel and retail uses concentrated south of 40th Avenue. This would be hub of the TOD, and as such should have an appropriately sized plaza to accommodate casual use as well as planned events.

The examples of well-known public spaces illustrated on the following page show the following:

- Pioneer Courthouse Square in Portland is the size of one downtown block, and is 240 feet by 240 feet.
- Englewood CityCenter’s plaza links the light rail station with a mainstreet. The plaza is 500 feet long and 300 feet wide.
- The semicircular plaza at Stapleton town center is at one end of the central park and measures 200 by 230 feet.

Recommendations

- While the plazas should be generally paved, they should also include focal elements that include public art and potentially water. Trees, shrubs and flowers should all be incorporated into the plaza design.
- The minimum size of the plaza (south of 40th Avenue) should be meet the requirements of the city of Aurora’s Small Urban Parks criteria, and provide activity space for office workers and residents.

- Buildings on the south side of the plaza should not overshadow the plaza.
- A roadway can circle the plaza but the roadway should be narrow so that this is defined as a pedestrian area.
- Should parking structures be developed, their pedestrian entrances should be located so that pedestrians would walk from the parking structure to the transit station and through the plaza.



Figure 11. Plaza with pond
(Ross Landing Park, Chattanooga, TN)

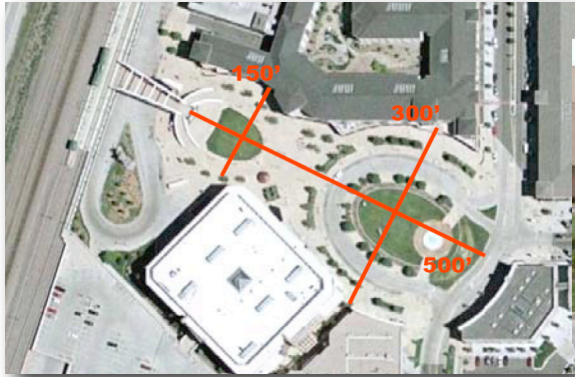


Figure 12 and 13. Englewood CityCenter

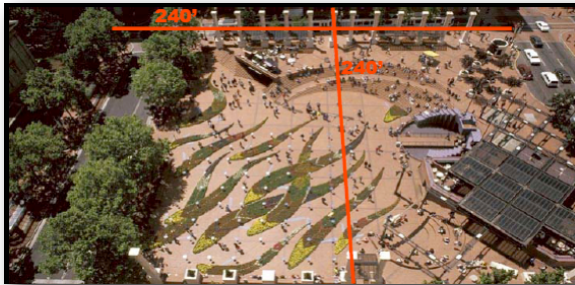


Figure 14 and 15.
Pioneer Courthouse Square, Portland, OR



Figure 16.
Stapleton Town Center, Denver, CO

The Grade-Separated Commuter Rail Station

The concept for the elevated commuter rail station arose from the workshops held early in the study. Since the initial concept for the elevated commuter rail line was considered too costly, the proposed lowering of E. 40th Avenue would still accomplish the goal of having a commuter rail station that is easily accessible from both sides of E. 40th Avenue. The figure below illustrates a concept of how this station may appear from E. 40th Avenue. A canopy structure would provide weather protection for the commuters, and the design of the station and bridge structure could be the “landmark” element that the workshop participants advocated.

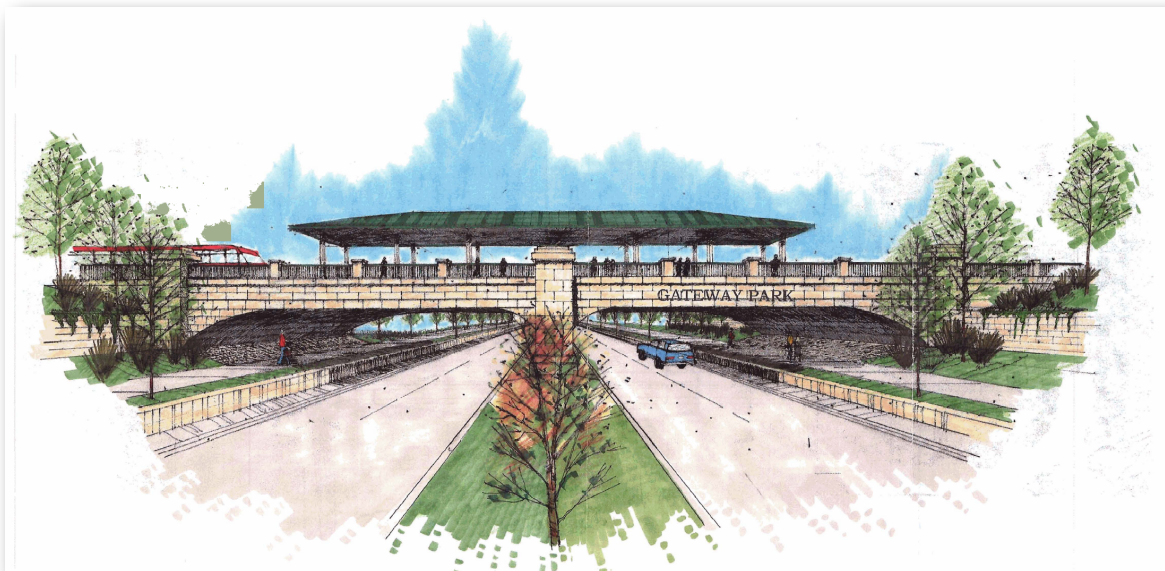


Figure 17. Concept for the proposed grade-separated commuter rail station

4 Implementation

4 Implementation

The Gateway Park East Station Area Plan presents a long-term vision for redevelopment around the future 40th Avenue and Airport Boulevard station and this section outlines the initiatives and priorities for short-term and long-term infrastructure development.

The most important infrastructure improvement is the lowering of E. 40th Avenue beneath the commuter rail line and the associated need to relocate the existing detention pond to the Peña Boulevard right-of-way. The lowering of E. 40th Avenue cannot be accomplished without the relocation of the pond due to engineering and drainage requirements.

Land Use Policy Changes

The recommendation of this plan is to encourage the development of a compact, dense commercial area adjacent to the transit station. The automobile-oriented character of the existing industrial zoned lands in the core of the study area (i.e., the 16 acres south of E. 40th Avenue and west of Salida Street) is to be changed to a pedestrian-oriented, dense and mixed-use area.

Specific actions are:

1. **Adopt the Gateway Park East Station Area Plan;**
2. **Implement an IGA among the participants to specify funding and maintenance obligations;**
3. **Rezone to the Transit-Oriented Development Zoning District with the modifications made through Chapter 5 of this plan dependent on the timing of East Corridor commuter rail construction and market demand.**

Infrastructure Improvements

Specific actions are:

1. Affirm that the E. 40th Avenue grade separation is included in the East Corridor Environmental Impact Statement as the preferred alternative;
2. Initiate the relocation of the detention pond to the Peña Boulevard right-of-way;
3. Identify the design and configuration of the commuter rail station;
4. Confirm that the commuter parking supply is adequate to meet the commuter rail line opening day projected demand at the station, taking into consideration the recommendations of the Aurora Corridor-Wide Strategic Parking Study;
5. Execute the intergovernmental agreement (IGA) which addresses the funding approach, maintenance, etc.; and
6. Initiate and prepare for the relocation of the RTD park-n-Ride to the Peña Boulevard right-of-way, as considered desirable and feasible through the continued consultation of the study's partners.

Timing of any re-zoning may be undertaken by the property owner when deemed practicable during or after the design and construction of the East Corridor commuter rail line.

5 Guidance for Transit-Oriented Development Zoning

5 Guidance for Transit-Oriented Development Zoning

Purpose of this Section

This chapter identifies the primary goals to be implemented through zoning in the Gateway Park East station area. The purpose of this chapter is to provide zoning guidance that identifies modification to the City of Aurora's Transit-Oriented Development (TOD) Zoning District to ensure that the development meets the goals of this Gateway Park East Station Area Plan. The user should reference both this chapter and Section 146-725 Transit-Oriented Development Zoning District in the City of Aurora Building and Zoning Code.

The Development Standards and Guidelines in this chapter are specifically intended to address new development and redevelopment proposals. The standards establish a consistent design framework to ensure quality in future developments. If there is a conflict between the standards provided for in the

City of Aurora Building and Zoning Code, the standards of this section shall apply.

Sub-Districts

This section presents revisions to Sec. 145-727 (B), and the following map shows the extent of the Core sub-district. The area defined as the study area in this station area plan shall be considered as a Core-sub-district.

1. Core Sub-District

- a. *Location.* This sub-district includes the land south of E. 40th Avenue, west of Salida Street, and includes the RTD property.
- b. *Uses.* This zone includes medium to high intensity commercial, residential, hotel, civic, and entertainment uses. Ground-floor commercial uses are encouraged to occur along the street frontages and surrounding any public parks or plazas.

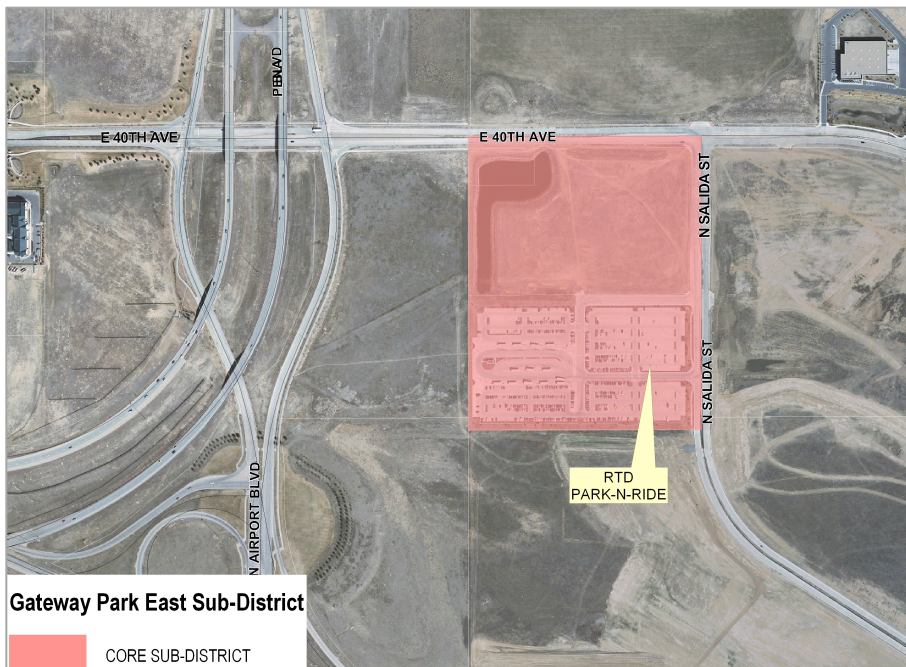


Figure 18. Gateway Park East Station Area Core Sub-District

Proposed Transit-Oriented Development (TOD) Zoning

Transit-Oriented Development Zoning and the regulations described in this section shall apply for the properties as depicted on the zoning map as amended and shown below.

The TOD zoning district will be available for the properties south of E. 40th Avenue, west of Salida Street, and north of the RTD property that are currently zoned Medium Industrial District (M-2 District).

Rezoning

As with properties elsewhere in the city, the landowners may initiate a rezoning.

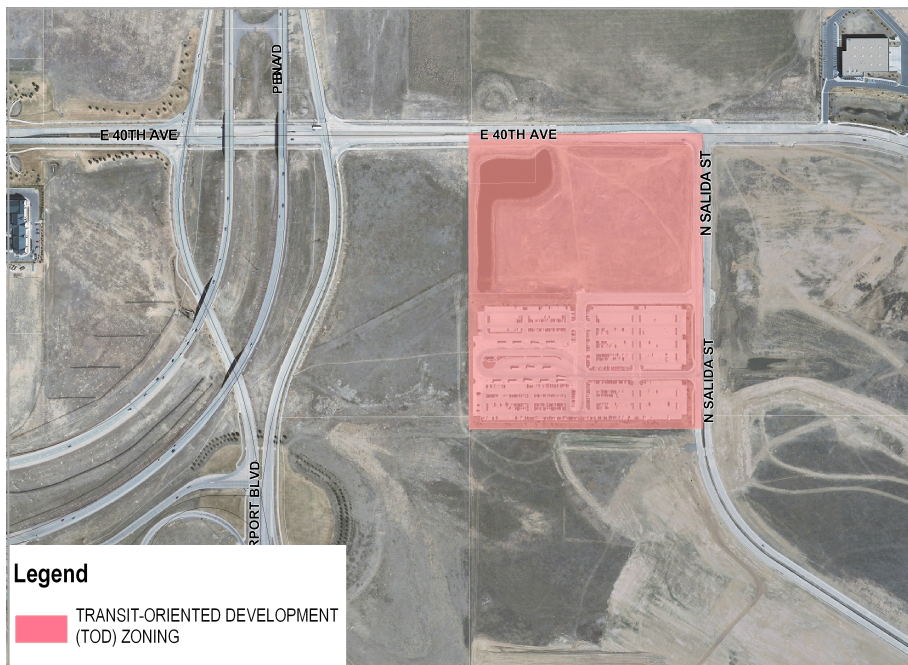


Figure 19.
Proposed Transit-Oriented Development (TOD) Zoning

Development Standards

This section provides modifications to Sec. 146-728. Development Standards.

(A) *Block Size and Street Grid.*

2. *Desired Sizes.* Blocks shall typically be no longer than 600 feet in length and no more than 1,800 feet around the perimeter.

(C) *Residential Density.*

2. *Desired Densities.* Residential densities for the Core sub-district are desired to be a minimum of 40 units per acre.

(D) *Building Heights.*

2. *Desired Heights.* Building heights for the Core sub-district are:

Minimum height of two stories. No maximum height.

(E) *Urban Form.*

2. *Desired Building Setbacks.* The setbacks for the Core sub-district in the TOD Zoning District shall apply. In addition, the following development standards shall apply.

- a. Front. Setback not more than ten (10) feet in the Core sub-district. The ten (10) foot setback is permitted in the Core sub-district for outdoor cafes and overhanging balconies, but shall not exceed forty (40) percent of the building frontage. Steps, stoops, balconies, awnings, chimneys, bay windows, etc. may encroach into the setback.

3. *Desired Building Forms.* The following additional development standards and guidelines shall apply.

- a. Continuous building frontages are recommended on all streets.
- b. Commercial uses at grade on main streets and surrounding any public spaces are encouraged to provide activity.
- c. Clear windows at grade are required.
- d. Quality materials on the ground floor façade are required on all buildings on major streets.
- e. Eight-five (85) percent of the building façade facing a public park or plaza must be a quality material such as masonry.
- f. Entries should be generously proportioned and defined with architectural features. Awning and structural canopies for weather protection at building entrances are desirable.
- g. Mid-block access at-grade through buildings is permitted.
- h. Visible drive-through windows of any kind shall not be permitted in the Core sub-district.
- i. Blank walls are not permitted on any façade. All façades are to have architectural details that add visual interest.
- j. Loading docks and entrances shall not be located on the major pedestrian streets leading to the transit station.
- k. Alternative uses for building roofs such as terraces, roof gardens and green roofs are encouraged.

APPENDIX A

Development of the Vision

Appendix A

Transit Station Location and the TOD Core

The station area plan study commenced by investigating the development opportunities provided by locating the station at various points either closer to I-70 or E. 40th Avenue. Walking distances to the station were a key element in the analysis as well as the proposal for commuter parking in the Peña right-of-way.

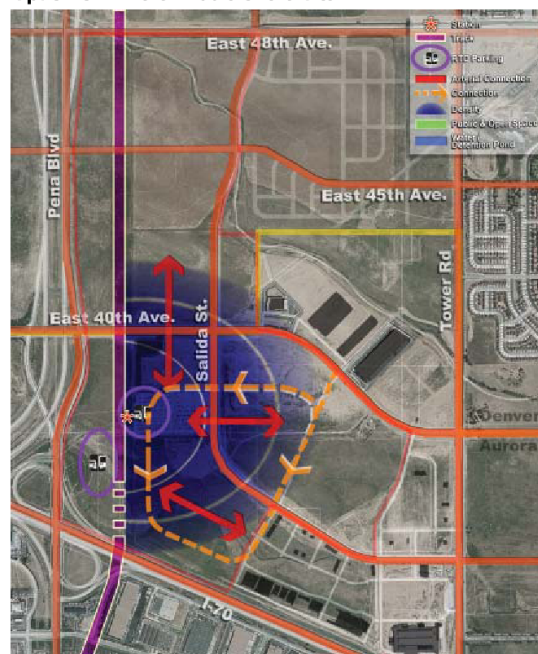
Option 1: Close to E. 40th Avenue. By locating the station close to E. 40th Avenue, a larger portion of the 140 acre “core” area is available for residential and mixed-use development by having access to the station within a convenient walking distance.

Option 2: Adjacent to the RTD park-n-Ride. While this option places the station contiguous to the existing RTD park-n-Ride, it is further away from the potential residential and mixed-use area north of E. 40th Avenue.

Option 01: Close to E. 40th Ave.



Option 02: In the Middle of the Site



A major goal that arose from the workshops was to separate the E. 40th Avenue vehicular traffic from the commuter line. Traffic operations, congestion, motorist safety and safe and convenient pedestrian access were all considerations in this goal.

The schematics shown opposite were developed early in the study to show:

1. an elevated track extending from I-70 to north of 40th Avenue, with an elevated station; and
2. an elevated track over I-70 transitioning to an at-grade track and station.

Option 3: Close to I-70. This option was investigated to take advantage of the elevated rail structure and have an elevated station visible from I-70. With the elevated structure, a roadway could be located under the rail structure and access the proposed parking in the Peña right-of-way without crossing the commuter line. This option was considered too far removed from the core area.

Option 03: Close to I-70



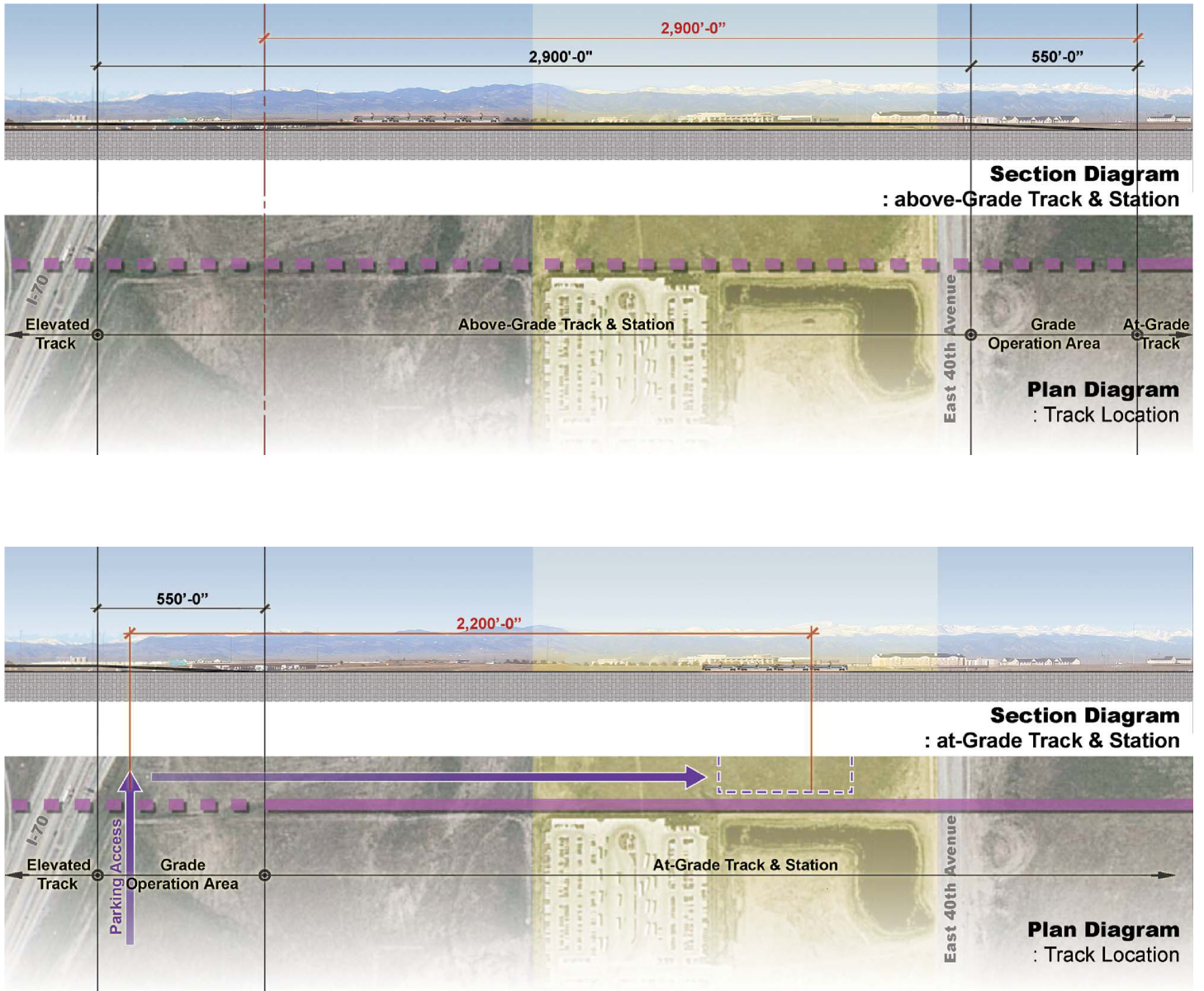
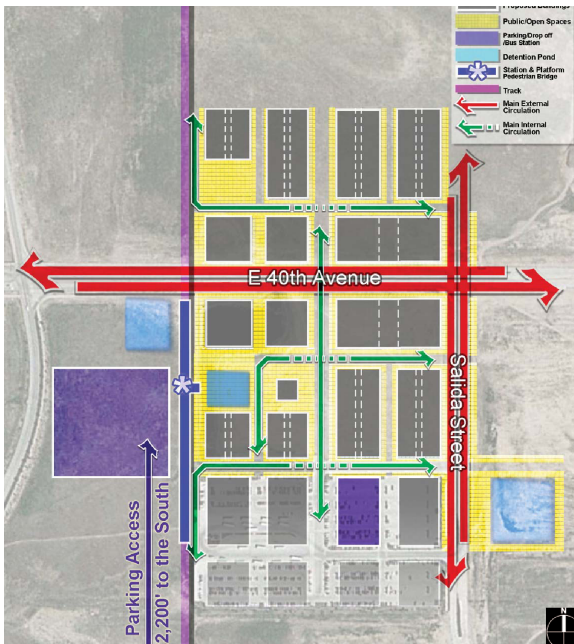


Figure A-1. Elevated Commuter Rail Profile and Plan

Alternate Concept A – an at-grade station south of E. 40th Avenue

As the concepts were being developed, RTD stated that the additional cost for the elevated structure would not be included in the FasTracks program and budget. Therefore, two alternate concepts were developed that still preserved the elevated track over E. 40th Avenue but have the station at-grade.

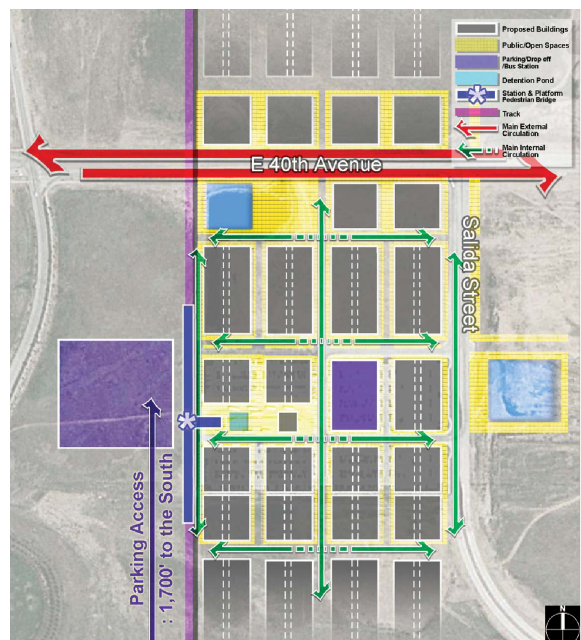
Alternate Concept A promotes the grade separation of E. 40th Avenue and the location of the station just south of E. 40th Avenue. The reason for this is convenient access to the station for the residents and people employed north of E 40th Avenue, and people accessing the station from the hotels to the west. One major assumption for this concept is that the location of the RTD park-n-Ride may move, and that locating the station for the purpose of convenience to the existing parking area may not be the best concept in the long run.



Alternate Concept B – an at-grade station adjacent to the RTD park-n-Ride

This concept was developed to address the situation if the detention pond is not able to be relocated. The detention pond could be utilized as a feature for a plaza on E. 40th Avenue. With this scenario, the transit station would be located adjacent to the existing park-n-Ride lot. Development would most likely occur first adjacent to E. 40th Avenue, and over time the RTD land would be more valuable for development than parking.

The concept of the public plaza adjacent to the station is still retained but in a smaller form. Figure A-2 shows the view looking west in the public plaza towards the transit station. The bird's eye view in Figure A-3 shows the relationship between the station, surface parking in the Peña right-of-way, and the form of development adjacent to the station platform



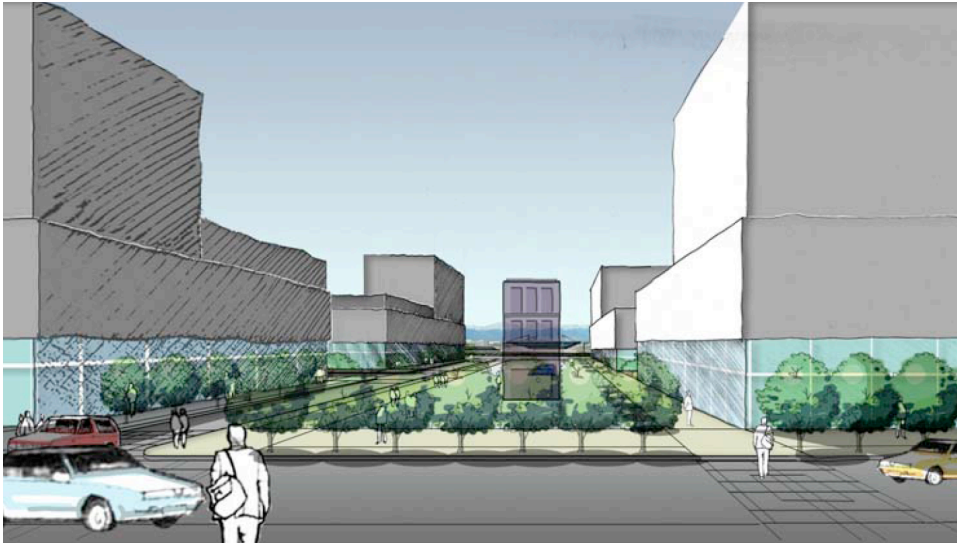


Figure A-2. View looking west, to the public plaza and the station in the distance



Figure A-3. Bird's eye view, looking east, to the station south of E. 40th Avenue

APPENDIX B

Gateway Park East Transportation Study

Fehr & Peers

DRAFT

**Gateway Park East
Transportation Study**



Prepared for: City of Aurora

February 8, 2007



FEHR & PEERS
TRANSPORTATION CONSULTANTS

TABLE OF CONTENTS

1.0	INTRODUCTION.....	2
2.0	PROJECT TRAFFIC.....	4
3.0	BACKGROUND TRAFFIC.....	5
4.0	TOTAL TRAFFIC ON 40 TH AVENUE	5
5.0	BEST PRACTICES FOR COMMUTER RAIL CROSSINGS.....	9
	General Findings	9
	RTD Policy for Commuter Rail Grade Crossing	10
	Case Studies	11
	Southern California Regional Rail Authority (Metrolink)	11
	Dallas Area Rapid Transit (DART)/Fort Worth Transit Authority (The T)	12
	Southeastern Wisconsin Regional Planning Commission – Transportation Division... ..	13
6.0	PEDESTRIAN INTERACTIONS AT 40 TH AVENUE	13
7.0	TRAFFIC OPERATIONS AND QUEUING ANALYSIS.....	15
	Existing Conditions Model Calibration.....	15
	2030 Peak Hour Model.....	16
	2030 Model Results	16
8.0	GRADE CROSSING EVALUATION METHODOLOGY	17
9.0	RECOMMENDATION.....	18

1.0 INTRODUCTION

This report documents the transportation analysis for the Gateway Park East development, with specific attention to the long range impacts at the commuter rail crossing of 40th Avenue. The study focuses on the potential need for grade separation of the East Corridor commuter rail line at 40th Avenue and includes a review of grade crossing policies in peer agencies, estimates of the future (2030) traffic volume on 40th Avenue, application of the Regional Transportation District's (RTD) current grade crossing methodology to the site, and traffic operations and queuing analysis for 40th Avenue/Pena Boulevard interchange intersections.



The Gateway Park East development includes the proposed transit oriented development (TOD) site to be located on the East Corridor Commuter Rail Line at or near 40th Avenue. As part of RTD's FasTracks program, the East Corridor Line will connect Denver Union Station and Denver International Airport (DIA). The new line will be constructed on acquired right-of-way along Pena Boulevard, linking the existing rail along Smith Road to DIA. A stop on the East Corridor will be placed in proximity to the current RTD 40th Ave/Airport Blvd Park-n-Ride location south of 40th Avenue on Salida Street.



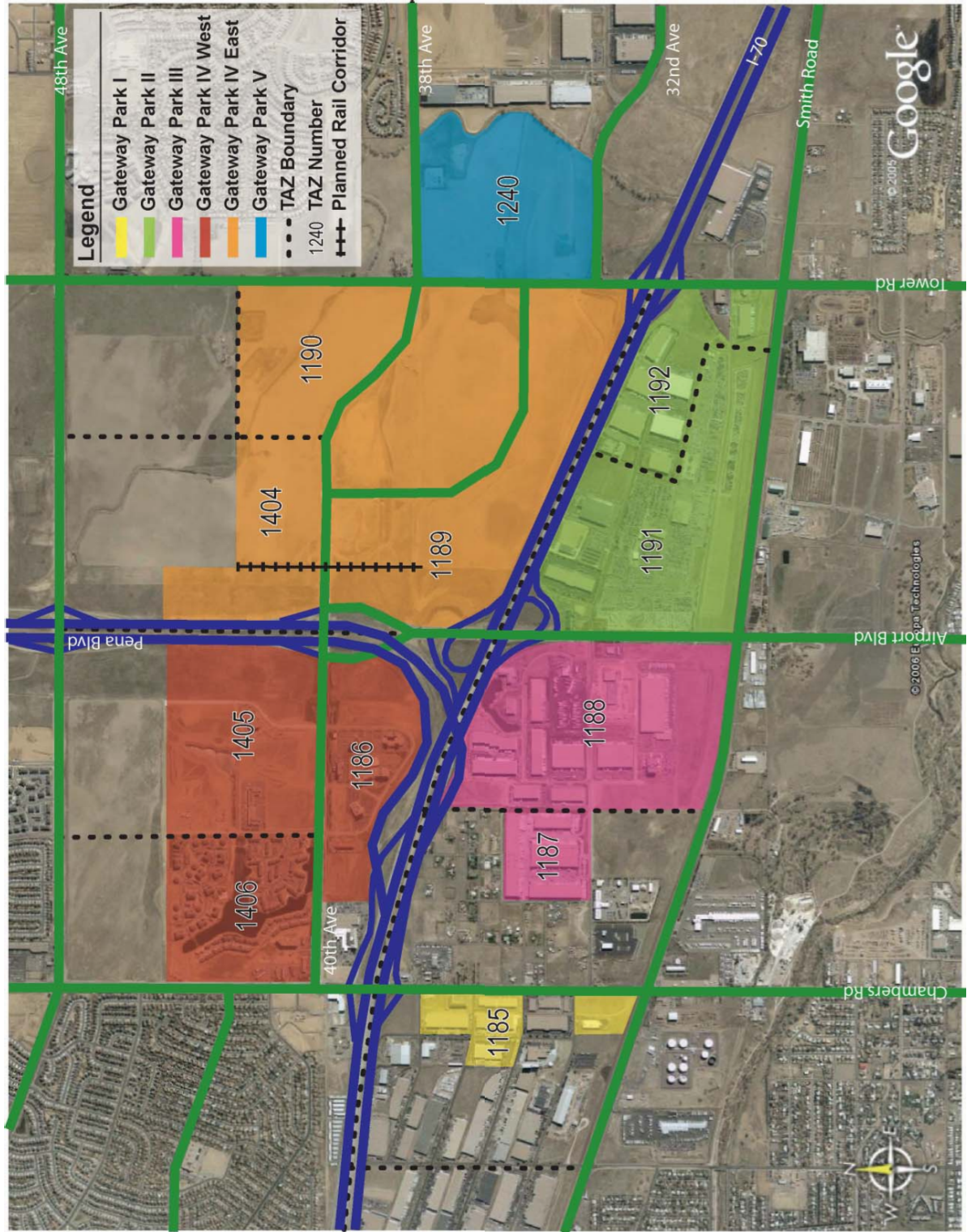
A study of current practices by transit agencies in the United States with current or proposed commuter rail pertaining to grade crossing policies was performed as part of this study. Transit agency policies were obtained through interviews of personnel at selected agencies familiar with grade crossing policy and from reading transit agency reports and guidelines. This report summarizes the best practices from comparable transit agencies and compares their policies to current RTD policy.

Estimates of 2030 traffic volumes on 40th Avenue between Airport Boulevard and Salida Street and RTD's current grade crossing policy were used to help evaluate whether current RTD policy for commuter rail grade crossings supports the need to grade separate the proposed crossing at 40th Avenue.

Traffic operations at the 40th Avenue/Pena Boulevard interchange were analyzed using the micro-simulation software VISSIM. The traffic operations and queuing analysis was performed to determine whether queuing from the downstream signalized intersections would back up onto the proposed 40th Avenue rail crossing. VISSIM was used to determine the overall intersection level of service (LOS) and the subsequent queuing on the westbound approach where the rail crossing is planned. Analysis included 2030 traffic volumes during the AM and PM peak hours of operation.

Figure 1 shows the Gateway Park study area, six sub areas and the traffic analysis zones (TAZs) that represent the development within the DRCOG regional travel demand model.

FIGURE 1. GATEWAY PARK STUDY AREA



2.0 PROJECT TRAFFIC

Project traffic for Gateway Park was developed using the current land plan for the area and the ongoing station area plan, jointly produced by RTD, City of Aurora and the Pauls Corporation. The trip generation estimate was compared to the DRCOG regional travel demand model. ITE's *Trip Generation 7th Edition* was used to determine trip generation rates for each land use within the land plan. Trips were generated and summarized based on each subarea within Gateway Park for 2030 conditions. Each subarea corresponds to one or multiple TAZs within the regional travel demand forecasting model maintained by DRCOG. Table 1 shows the trip generation for each subarea within Gateway Park.

These volumes represent the total number of vehicle trips the entire development is expected to generate by 2030. Some reduction in trips could be expected at the transit oriented development portion of Gateway Park would be designed to convert typical vehicle trips into walking and transit trips. The magnitude of any reduction for the TOD is a factor of the location and mix of uses around the transit station and the site plan for the TOD, which is not sufficiently detailed to calculate a reduction at this point in time. As such, this trip generation estimate provides for a reasonable, though somewhat conservative estimate of vehicular traffic at the rail crossing location.

Estimated total trip generation for Gateway Park is 229,000 trips per day. Using the same land use inputs, this same area generates 234,000 trips per day in the DRCOG Cycle 14 2030 regional travel demand model. This shows a reasonable comparison between the ITE approach and the regional demand model. It would be expected that the travel demand model would generate more trips since only three household and three employment inputs are available. The ITE method is more specifically related to the particular land uses at the site.

TABLE 1. GATEWAY PARK ITE TRIP GENERATION IN 2030

Subarea	TAZ	Daily			AM Peak Hour			PM Peak Hour		
		Total	In	Out	Total	In	Out	Total	In	Out
Gateway Park I	1185	4,006	2,003	2,003	285	180	105	332	144	188
Gateway Park II	1191	18,692	9,346	9,346	1,736	1,412	324	1,871	506	1,365
	1192	5,366	2,683	2,683	556	458	98	552	123	429
<i>Subtotal</i>		<i>24,058</i>	<i>12,029</i>	<i>12,029</i>	<i>2,292</i>	<i>1,870</i>	<i>422</i>	<i>2,423</i>	<i>629</i>	<i>1,794</i>
Gateway Park III	1187	5,794	2,897	2,897	525	431	94	549	137	412
	1188	17,800	8,900	8,900	1,528	1,123	405	1,563	519	1,044
<i>Subtotal</i>		<i>23,594</i>	<i>11,797</i>	<i>11,797</i>	<i>2,053</i>	<i>1,554</i>	<i>499</i>	<i>2,112</i>	<i>656</i>	<i>1,456</i>
Gateway Park IV West	1186	16,664	8,332	8,332	1,343	991	352	1,478	572	906
	1405	13,436	6,718	6,718	1,266	937	329	1,421	486	935
	1406	13,204	6,602	6,602	1,107	419	688	1,416	802	614
<i>Subtotal</i>		<i>43,304</i>	<i>21,652</i>	<i>21,652</i>	<i>3,716</i>	<i>2,347</i>	<i>1,369</i>	<i>4,315</i>	<i>1,860</i>	<i>2,455</i>
Gateway Park IV East	1189	101,018	50,509	50,509	7,721	5,414	2,307	10,813	4,138	6,675
	1190	11,454	5,727	5,757	1,388	1,198	190	1,371	367	1,104
	1404	11,448	5,724	5,724	848	375	473	1,026	551	475
<i>Subtotal</i>		<i>123,920</i>	<i>61,960</i>	<i>61,960</i>	<i>9,957</i>	<i>6,987</i>	<i>2,970</i>	<i>13,210</i>	<i>5,056</i>	<i>8,254</i>
Gateway Park V	1240	10,152	5,076	5,076	465	347	118	911	365	546
Total		229,034	114,517	114,517	20,821	13,285	7,536	23,303	8,710	14,593

3.0 BACKGROUND TRAFFIC

An estimate of background traffic (traffic unrelated to the Gateway Park development) was developed using the DRCOG Cycle 14 2030 TransCAD travel demand forecasting model. It should be noted that in our review of the model in the project area, we noted inconsistencies between the model network and the current roadway network. Fehr & Peers corrected these inconsistencies in an effort to accurately reflect the forecast traffic volumes expected on 40th Avenue in 2030.

The TransCAD modeling software allows a user to remove traffic from specific TAZs without changing the overall assignment within the model. This provides the opportunity to report background traffic based on the full demand calculated by the model. For Gateway Park, the traffic from the 12 TAZs representing the development area was removed, resulting in a background traffic estimate for all area roadways. This process resulted in a daily background volume of 4,772 vehicles at the rail crossing location on 40th Avenue in 2030.

4.0 TOTAL TRAFFIC ON 40TH AVENUE

To develop an estimate of total traffic on 40th Avenue at the rail crossing location, the estimated trip generation with the ITE methodology was added to the background traffic at this location. The trip generation for each subarea of Gateway Park was assigned based on the distributions shown in Figure 2. The figure shows the amount of traffic from each subarea that is expected to use 40th Avenue at the rail crossing location. The distributions were based on the assignment of

trips for each subarea in the travel demand model during the PM peak period. Tables 2, 3 and 4 show the total traffic estimates for Daily, AM peak hour and PM peak hour conditions and the trips associated with each TAZ.

TABLE 2. 40TH AVENUE DAILY VOLUME CALCULATION					
Subarea	Volume Source	Distribution	Eastbound	Westbound	Total
	Background	-	1,526	3,246	4,772
Gateway Park I	1185	-	-	-	-
Gateway Park II	1191	5%	468	468	936
	1192	5%	135	135	270
Gateway Park III	1187	5%	145	145	290
	1188	5%	445	445	890
Gateway Park IV West	1186	10%	834	834	1,668
	1405	10%	672	672	1,344
	1406	10%	661	661	1,322
Gateway Park IV East	1189	30%	15,153	15,153	30,306
	1190	30%	1,718	1,718	3,436
	1404	30%	1,717	1,717	3,434
Gateway Park V	1204	10%	508	508	1,016
	TOTAL		23,982	25,702	49,684

FIGURE 2. TRIP DISTRIBUTION

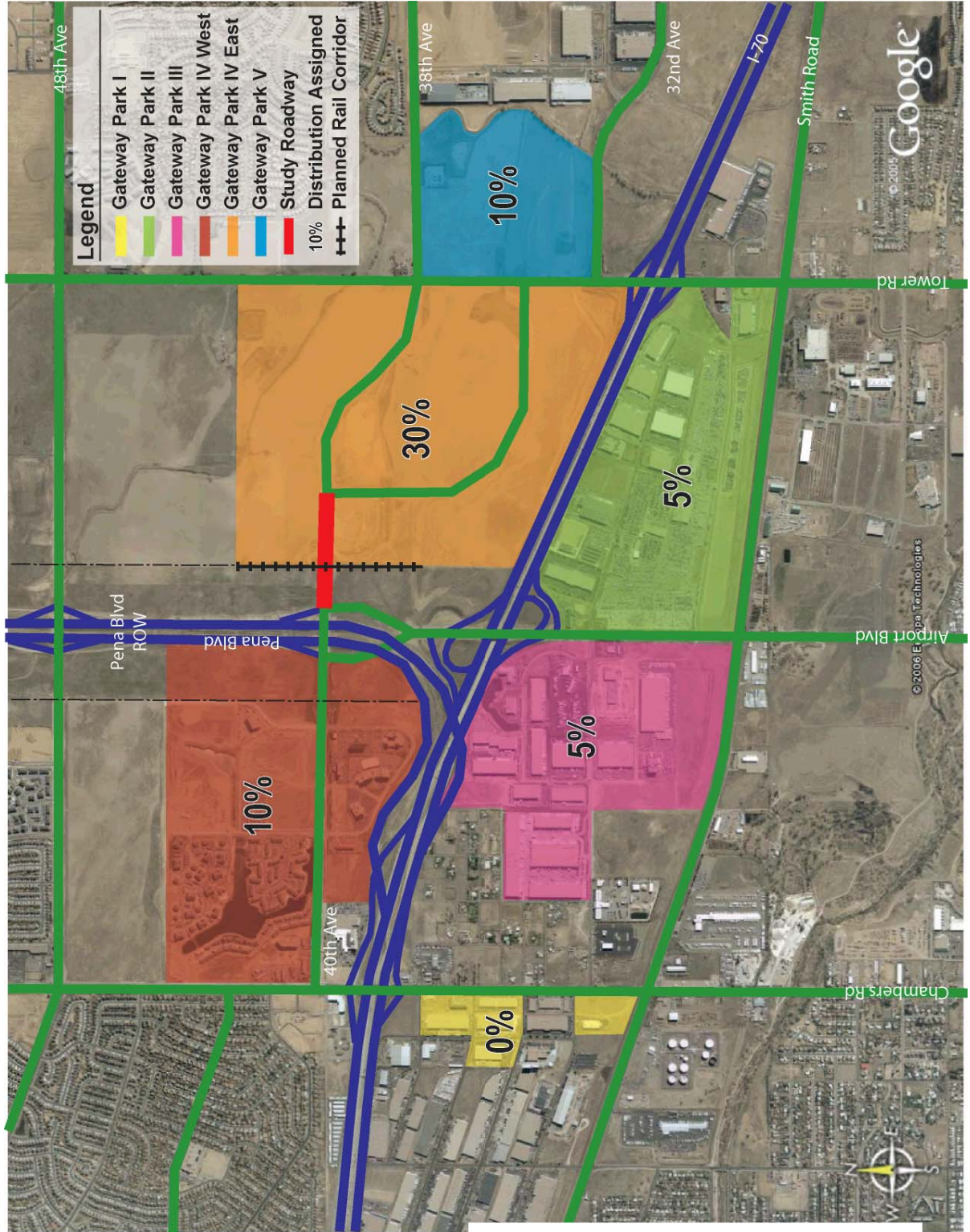


TABLE 3. 40 TH AVENUE AM PEAK HOUR VOLUME CALCULATION					
Subarea	Volume Source	Distribution	Eastbound	Westbound	Total
	Background	-	64	988	1,052
Gateway Park I	1185	-	-	-	-
Gateway Park II	1191	5%	16	71	87
	1192	5%	5	23	28
Gateway Park III	1187	5%	5	22	27
	1188	5%	20	56	76
Gateway Park IV West	1186	10%	35	99	134
	1405	10%	33	94	1217
	1406	10%	69	42	111
Gateway Park IV East	1189	30%	1,624	692	2,316
	1190	30%	360	57	417
	1404	30%	113	142	255
Gateway Park V	1204	10%	35	12	47
	TOTAL		2,379	2,298	4,677

TABLE 4. 40 TH AVENUE PM PEAK HOUR VOLUME CALCULATION					
Subarea	Volume Source	Distribution	Eastbound	Westbound	Total
	Background	-	185	189	374
Gateway Park I	1185	-	-	-	-
Gateway Park II	1191	5%	69	25	94
	1192	5%	22	7	29
Gateway Park III	1187	5%	21	7	28
	1188	5%	53	26	79
Gateway Park IV West	1186	10%	91	58	149
	1405	10%	94	49	143
	1406	10%	62	81	143
Gateway Park IV East	1189	30%	1,242	2,003	3,245
	1190	30%	110	331	441
	1404	30%	165	143	308
Gateway Park V	1204	10%	37	55	92
	TOTAL		2,151	2,974	5,125

5.0 BEST PRACTICES FOR COMMUTER RAIL CROSSINGS

Commuter rail grade crossing policies for transit agencies in the United States with commuter rail were reviewed to provide a context for RTD's draft *Grade Crossing Evaluation Methodology Report (DRAFT), July 2004*. Table 5 displays the location and transit agencies of existing commuter rail systems in the United States. There are 27 communities in the United States with existing or proposed commuter rail systems, including Denver. Federal transportation agencies and rail agency policies were reviewed also.

Policies for specific transit agencies were acquired through a literature search and individual telephone interviews with agency staff members familiar with grade crossing policies. This section reports the general findings for commuter rail grade crossings throughout the nation and the findings from the case study interviews conducted by Fehr & Peers.

Location	Transit Agency
Anchorage, AK	Alaska Railroad Corporation (ARC)
Baltimore, MD	Maryland Transit Administration (MTA)
Boston, MA	Massachusetts Bay Transportation Authority (MBTA)
Chicago, IL	Northern Indiana Commuter Transportation District
Chicago, IL	Northeast Illinois Regional Commuter Railroad Corp.
Dallas, TX	Dallas Area Rapid Transit (DART)
Fort Worth, TX	Fort Worth Transportation Authority (The T)
Hartford, CT	Connecticut Department of Transportation
Los Angeles, CA	Southern California Regional Rail Authority
Miami, FL	South Florida Regional Transportation Authority
New York, NY	Metro-North Commuter Railroad Company
New York, NY	MTA Long Island Rail Road (MTA-LIRR)
New York, NY	New Jersey Transit Corporation (NJ TRANSIT)
Philadelphia, PA	Southeastern Pennsylvania Transportation Authority
Philadelphia, PA	Pennsylvania Department of Transportation
San Diego, CA	North San Diego County Transit District (NCTD)
San Francisco, CA	Peninsula Corridor Joint Powers Board (PCJPB)
Seattle, WA	Central Puget Sound Regional Transit Authority
Stockton, CA	Altamont Commuter Express (ACE)
Syracuse, NY	ON TRACK
Washington DC	Virginia Railway Express (VRE)

¹ Source: Federal Transit Administration National Transit Database

General Findings

The research conducted identified that there is no universal grade crossing policy for grade separation among transit agencies across the nation. Very few transit agencies have any written grade crossing policies for commuter rail. No agencies were found to have any grade separation threshold policy for commuter rail based on vehicular traffic volumes of the street crossing.

Grade crossing policy is sometimes deferred to the state department of transportation (DOT) or the state public utilities commission (PUC).

The majority of commuter rail lines are placed on existing railroad right-of-way and share the right-of-way with freight rail traffic. Because grade crossings for commuter rail occur on existing freight rail lines, the existing grade crossing treatment (at-grade or grade separated) is utilized. No policies were found during the research process that dealt exclusively with new rail being constructed for commuter rail lines, like that will occur for the East Corridor Line at 40th Avenue.

The Federal Highway Administration (FHWA) does not have any Federal level criteria to determine whether grade separation should occur. FHWA does recommend that grade separation occur for highways crossing high speed passenger rail routes. The Federal Railroad Administration (FRA) recommends that every effort should be made to provide grade separation for high-density crossings or those with a history of accidents. FRA has developed GradeDec.Net, a highway-rail grade crossing investment analysis modeling tool which is available online. GradeDec.Net is intended to help transportation planners identify the efficient grade crossing investments.

While there are few universal grade crossing policies by transit agencies, individual at-grade crossings have feasibility studies conducted to determine a course of action that should be taken. The results of a feasibility study can recommend 1) closing the grade crossing, 2) grade separating the crossing, or 3) improve the crossing warning devices. This recommendation takes into account economic feasibility, safety, and community support.

Public streets with at-grade commuter rail crossings are signalized with automatic grade crossing signals. Most of these crossings have drop-down gates and flashing lights. If at-grade crossings do not have drop-down gates and flashing lights, they are usually upgraded to have these as a minimum due to the increased frequency of trains using the crossing when commuter rail is introduced. Additional pedestrian enhancements can be made to the grade crossing signal if pedestrian activity occurs at the crossing.

RTD Policy for Commuter Rail Grade Crossing

The *Grade-Crossing Evaluation Methodology Report (DRAFT)* prepared for RTD and CDOT was reviewed by the project team to become familiar with the methodology. Grade crossing methodology is separated into safety, traffic operations, and feasibility elements.

Safety standards and treatments at grade crossings for commuter rail are different than that of LRT vehicles. Since commuter rail is considered a heavy rail technology, the FRA imposes safety standards to commuter rail comparable to freight rail. For the US-36 Corridor commuter rail analysis, the FRA's GradeDec 2000 model was used to predict crossing safety for each of the grade crossings along the corridor. The grade separation threshold based on safety was set at 1 accident per 25 years.

When safety concerns were not met for grade separation, traffic operations of the grade crossing were examined to determine how the grade crossing would affect vehicular traffic. There is no universally accepted procedure to calculate delay at a grade crossing. RTD and CDOT have accepted to use the Signalized Intersection Analysis in the *2000 Highway Capacity Manual*. If intersection level of service (LOS) was LOS D or worse (greater than 35 seconds of delay per vehicle), mitigation measures would need to be implemented. Mitigation measures include grade separation, warning device upgrades, signal coordination with traffic signals near grade crossing and crossing closure.

If safety and traffic operation thresholds are not met, the feasibility of grade separation can be evaluated. Feasibility of grade separated crossings examines physical impacts, environmental and social impacts, public acceptance, cost and funding. Feasibility studies should be performed to assess the impacts of grade separation.

Case Studies

Fehr & Peers contacted four transit related agencies about grade crossing policy. Three transit agencies with existing commuter rail systems were contacted, with two agencies responding to the interview. One agency with a proposed commuter rail system was contacted and responded to the interview.

Southern California Regional Rail Authority (Metrolink)

Metrolink operates seven commuter rail lines in the greater Los Angeles region. The Metrolink system contains 788 highway-rail crossings. Of these crossings 443 are at-grade crossings and 345 are grade separated crossings. Metrolink has jurisdiction over 518 of the 788 grade crossings in the system.

Naresh Patel, a public project engineer at Southern California Regional Rail Authority (SCRRA), was contacted and interviewed about SCRRA policy for commuter rail grade separation policy. SCRRA has produced a document, *Grade Crossing Design Guidelines*, which provides consistent guidelines for the uniform design of grade crossings. The guidelines state that it is SCRRA policy to (1) promote the elimination of highway-rail grade crossings to the extent



feasible, (2) oppose the creation of new highway-rail grade crossings and (3) promote the improvement of remaining highway-rail grade crossings.

Although SCRRA has design guidelines for commuter rail grade crossings, SCRAA has no formal threshold policies to determine prioritization of grade separation. Mr. Patel stated that an individual feasibility study is conducted for each new grade crossing or when grade separation is considered at an existing location. The feasibility study estimates cost,

considers whether there is political support for the crossing, and considers whether there is funding available.

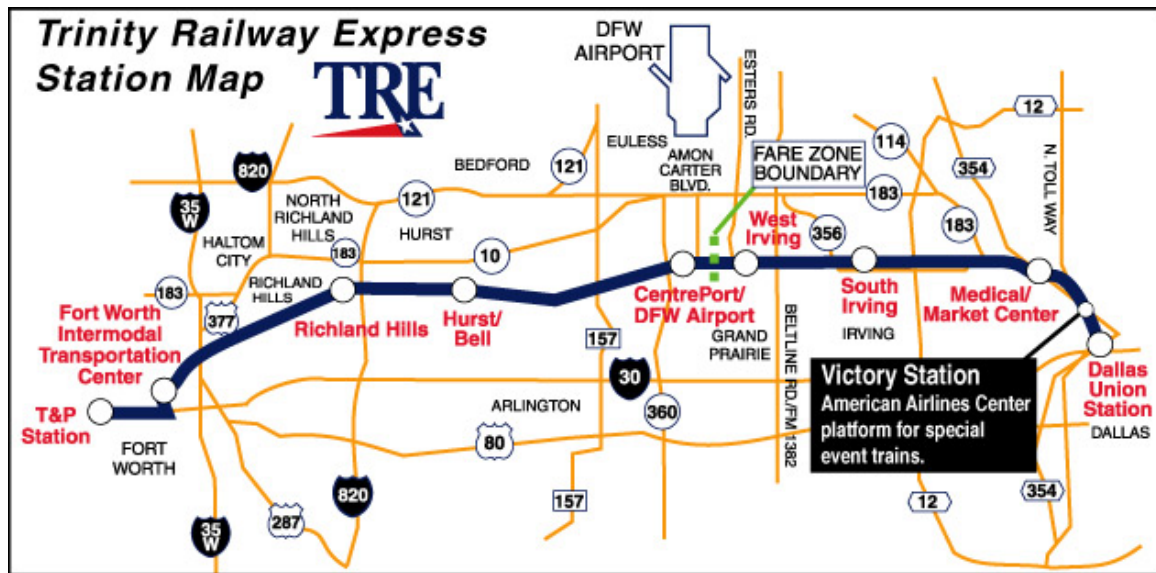
SCRRA coordinates their grade crossing procedures with the Public Utilities Commission of the State of California (CPUC). Warning signal devices at grade crossings are regulated by CPUC. In addition, SCRRA tries to follow freight train guidelines set forth by the American Railway Engineering and Maintenance-of-Way Association (AREMA) in the grade crossing design since commuter rails share the rail with freight trains.

Although commuter rail does not have volume threshold levels for vehicular traffic to grade separate, the Metropolitan Transportation Agency (MTA) in Los Angeles has a *MTA Grade Crossing Policy for Light Rail Transit*. The threshold for grade separation is based on peak hour vehicular volumes per lane and peak hour LRT frequency at the crossing. Mr. Patel stated that

LRT has a policy for grade separation because MTA is building new rail for the LRT vehicles, while the Metrolink commuter rail runs on existing rail lines.

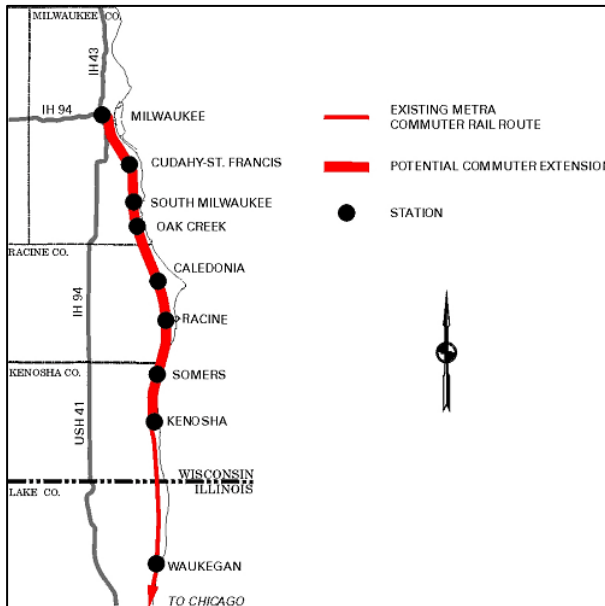
Dallas Area Rapid Transit (DART)/Fort Worth Transit Authority (The T)

The Trinity Railway Express (TRE) is a commuter rail line connecting downtown Ft. Worth, downtown Dallas and DFW Airport. The TRE is a cooperative service provided by DART (Dallas) and The T (Ft. Worth). TRE began running in 1996 from Dallas Union Station. Full service from Dallas to Ft. Worth began in 2001. Freight trains operate on the same rail line as TRE. Over 2 million passengers ride TRE annually.



Numa Bulot at DART was contacted by Fehr & Peers in regards to the grade crossing policy for TRE. Neither DART nor The T has written grade crossing policies or threshold levels for grade separation. All grade crossings for the TRE line were existing freight train crossings before the commuter rail line was initiated. Grade crossings along the TRE line are either grade separated or have at grade warning signal devices, usually with gated signals. Mr. Bulot stated that for a new highway-rail grade crossing, nothing less than a gated warning signal would be required.

Southeastern Wisconsin Regional Planning Commission – Transportation Division



The Southeastern Wisconsin Regional Planning Commission is proposing an extension of the existing METRA commuter rail line from Chicago. The 33-mile extension will start in Kenosha, WI and end in Milwaukee. The commuter rail line will be placed on an existing freight rail line. Improvements to the rail will be done to comply with commuter rail safety standards. This proposed commuter rail line has just started the Environmental Impact Statement process at the beginning of 2006.

The Milwaukee area metropolitan planning organization (MPO), the Southeastern Wisconsin Regional Planning Commission (SWRPC) is taking the lead on the proposed commuter rail line. Otto Dobnick at SWRPC (Transportation Division) was contacted regarding the grade crossing

policy for the proposed Kenosha-Milwaukee commuter rail extension. Currently, SWRPC has no policy on grade separation at commuter rail grade crossings. They have not addressed detailed grade crossing policies yet because they are in the beginning processes of the EIS. Grade crossing policies and grade separation will be addressed in the EIS process. Mr. Dobnick stated it is probable that the Wisconsin Department of Transportation will take the lead on recommending grade crossing policies since the highways would be the facility moved in grade separation.

6.0 PEDESTRIAN INTERACTIONS AT 40TH AVENUE

Existing pedestrian facilities are intermittent in the area surrounding the 40th Ave/ Airport Blvd Park and Ride Station. No pedestrian connections exist along Salida Street or 40th Avenue between the station and area developments. Along 40th Avenue to the west, sidewalks begin at the edge of the Airport Blvd/ Pena Blvd right-of-way and extend west into Gateway Park West. To the east



sidewalks have been constructed along lots that have been developed. There are no sidewalks along undeveloped lots. The same is true along Salida Street. Sidewalks are present where development has occurred. There are no sidewalks in the remaining segments.

The City of Aurora policy requires sidewalks on all streets. It is planned that sidewalks will be constructed as development occurs. The designated transit oriented development (TOD) site

adjacent to the proposed commuter rail station will place an emphasis on walkable streets with wide sidewalks.

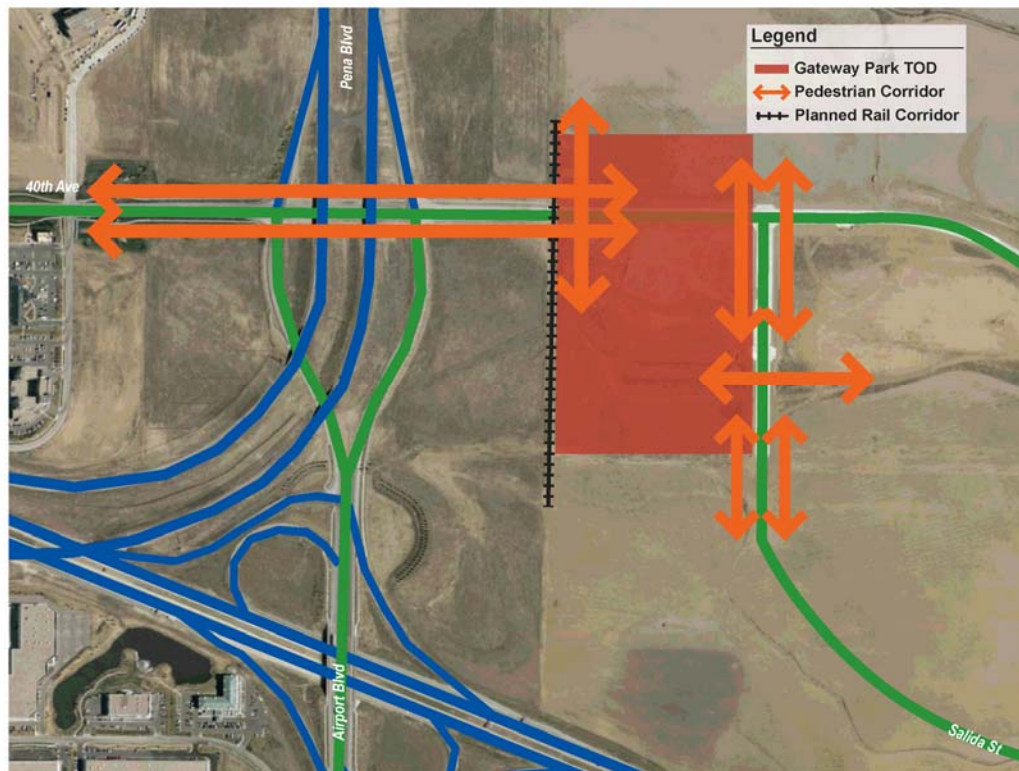
Future pedestrian connections will be needed to connect the transit station area and TOD to the surrounding developments. Important connections will be along 40th Avenue to the west across Pena Boulevard, to the north along Salida Street across 40th Avenue, to the east across Salida Street, and to the south along Salida Street. These connections will require enhanced pedestrian facilities to provide a friendlier pedestrian environment.



Pedestrian safety will be a major issue if an at-grade rail crossing is introduced along 40th Avenue. Additional enhanced pedestrian features will be required to assure the crossing pedestrian friendly and safe.

Figure 3 depicts the future pedestrian connections to the transit station and TOD in the 40th Avenue and Salida Street corridors.

FIGURE 3. PEDESTRIAN CONNECTIONS



7.0 TRAFFIC OPERATIONS AND QUEUING ANALYSIS

Fehr & Peers analyzed the LOS operations and the queuing spillback at the 40th Avenue/Pena Blvd interchange using the micro-simulation program VISSIM. The VISSIM model included the two signalized intersections at 40th Avenue Pena Boulevard interchange. The model was calibrated to existing traffic conditions. Queuing and LOS analysis were performed for the AM and PM peak hours for the 2030 build-out conditions.

Existing Conditions Model Calibration

An existing conditions model was created for the study area. The following pieces of data were collected and included in the model to replicate existing traffic conditions at the two study intersections. The data collected included:

- 1) Existing intersection geometries were collected and used for the two study intersections.
- 2) Turning movement traffic counts for the AM and PM peak hour were conducted on October 4, 2006 to determine the peak hour vehicular traffic volume.
- 3) Existing signal timing plans were obtained from the city of Aurora.
- 4) Queue lengths for the westbound approach at 40th Ave/NB Pena Blvd were collected during the AM peak hour on October 4, 2006.

The model was then calibrated to match existing peak hour vehicular traffic turn volumes and the existing queues occurring today. Once the model was calibrated the future year scenario models were created.

2030 Peak Hour Model

The future year peak hour traffic volumes were calculated using a two step process. First, existing traffic volumes were grown by a one percent annual growth rate to account for growth in background traffic in the area between 2006 and 2030. Second, project traffic generated by the Gateway Park development was added to the background traffic. Trip generation volumes for the development were calculated in the *Aurora Gateway East TOD Transportation Study*. Since some of the development exists today, only the only traffic added to the background volumes were the trips generated by proposed development between 2006 and 2030.

New signal timing plans were developed for the 2030 AM and PM peak hours trying to best accommodate traffic. Signal timing was developed using *Synchro 6*. Cycle lengths were increase to 100 seconds in the AM peak and 150 seconds in the PM peak.

No geometric changes were made to the study intersections.

2030 Model Results

The LOS and queuing results were calculated from VISSIM and results were averaged over 10 model runs for the AM and PM peak hours. The LOS results are calculated in an HCM compliant format using a Fehr & Peers post-processor.

Table 6 reports the queuing results for the westbound approach and northbound approach at the 40th Ave/Pena NB Ramps intersection from VISSIM. VISSIM reports average queue length as the average queue over the entire hour as opposed to the average queue length for each cycle length.

TABLE 6. 2030 QUEUING ANALYSIS FROM VISSIM AT 40 TH AVE/PENA NB RAMP (FEET)				
Approach	AM Peak Hour		PM Peak Hour	
	Average Queue	Maximum Queue	Average Queue	Maximum Queue
Westbound	1459	1677*	1334	1678*
Northbound	457	832	557	938*

* Represents the end of the modeled link. Queue is theoretically infinite.

The East Line Commuter Rail line crosses 40th Avenue approximately 700 feet east of the 40th Ave/Pena NB Ramp intersections. **In both the AM and PM peak hour, the average queue extends across the rail crossing, suggesting that the queue from this intersection would interfere with an at-grade rail crossing throughout most of the peak hour.**

The maximum queues for the westbound direction extended past the end of the modeled link. As a result, not all the demand volume was serviced during the peak hour. Table 7 displays the demand volume and the volume served for each intersection during the peak hour. This excess demand volume will have to be served in the adjacent hours before or after the peak hour.

TABLE 7. PERCENT DEMAND SERVED DURING PEAK HOUR (VPH)						
Intersection	AM Peak Hour			PM Peak Hour		
	Demand	Volume	%	Demand	Volume	%

	Volume	Served	Served	Volume	Served	Served
40 th Ave/Pena SB Ramps	4910	4313	88%	6112	4364	71%
40 th Ave/Pena NB Ramps	5346	4880	91%	7037	4948	70%

Turning traffic patterns are forecast to change in the future year when compared to existing conditions. In particular, the westbound left (WBL) from 40th Avenue to Airport Blvd are forecast to increase to 639 vph in the AM peak hour and 1218 vph in the PM peak hour.

Table 8 displays the LOS results from VISSIM for the two study intersections. Analysis indicates that both intersections will be at capacity and will not serve the forecast demand in their current geometric configuration. Operations reported by VISSIM reflect the effective operating capacity of the intersection. VISSIM does not calculate delay for vehicles that do not enter the network. Table 9 displays the corresponding *Synchro HCM* calculations for LOS, which accounts for the full demand volume in the LOS report.

TABLE 8. 2030 VISSIM PEAK HOUR INTERSECTION DELAY (SECONDS PER VEHICLE)		
Location	AM Peak Hour	PM Peak Hour
40 th Ave/Pena SB Ramps	50.3 (D)	60.7 (E)
40 th Ave/Pena NB Ramps	64.6 (E)	63.0 (E)

TABLE 9. 2030 SYNCHRO PEAK HOUR INTERSECTION DELAY (SECONDS PER VEHICLE)		
Location	AM Peak Hour	PM Peak Hour
40 th Ave/Pena SB Ramps	68.9 (E)	158.2 (F)
40 th Ave/Pena NB Ramps	23.0 (C)*	123.3 (F)

* Synchro does not account well for queue spillback from downstream intersections.

8.0 GRADE CROSSING EVALUATION METHODOLOGY

Based on the review of the process other transit associated agencies use to evaluate grade crossings, Fehr & Peers believes the methodology adopted by RTD and CDOT is an appropriate tool for use in planning the RTD commuter rail system. In many aspects, the methodology exceeds the processes used by other agencies around the country.

Accordingly, Fehr & Peers applied the *Grade-Crossing Evaluation Methodology Report (DRAFT)* to evaluate the operations at the proposed crossing of the East Corridor rail line with 40th Avenue. The analysis is based on a projected daily vehicular volume of close to 50,000 vehicles on 40th Avenue at the crossing location. Using this estimate of daily traffic calculated in section 3.0, and assuming a four-lane cross section for 40th Avenue, the average total delay at the crossing is estimated to be approximately 133.6 seconds. This equates to Level of Service (LOS) F. The calculations are available in the appendix.

9.0 RECOMMENDATION

An at-grade crossing at 40th Avenue is projected to operate at poor level of service with the potential for frequent conflicts with queuing vehicles in the year 2030. **With this in mind, it is recommended that a feasibility study be conducted for the grade separation of the East Corridor rail line at 40th Avenue.** A feasibility study will allow for the assessment of impacts related to the grade separation, including station area impacts and development impacts.

APPENDIX

Grade Crossing Calculation Summary

RTD Grade-Crossing Evaluation Methodology Report (DRAFT)

RTD Grade Crossing Evaluation Methodology - Average Approach Delay Estimation

LOS F Grade Separation Analysis?¹ Y

Vehicle Flow Rate (v)

AADT	50,000 veh		
K	0.1		
DD	0.52	v=	1368 vph
PHF	0.95		
N	2 lanes		

Effective Green Time (g)

C	180 sec		
T _{BL}	55 sec	g=	121 vph
T _{QC}	4 sec	g/C=	0.672

Heavy Vehicle Factor (F_{HV})

%HV	5 %		
E _T	2	F _{HV} =	0.952

Saturation Flow Rate (s)

S ₀	1900 pcplph		
F _{LU}	0.952	s=	1723 pcplph

Volume to Capacity Ratio (v/c)

v/c= 1.18

Lane Group Capacity (c)

c= 2316 vph

Uniform Delay (d₁)

d₁= 47.0 sec

Incremental Delay (d₂)

T	0.25	d ₂ =	86.5 sec
k	0.5		
l	1		

Total Delay (d)

d= 133.6 sec

NOTES:

¹ "Delays in excess of 35 seconds indicate that a more detailed [grade separation] analysis is warranted."

Assumptions made by Fehr & Peers

Variable value taken from RTD Grade Crossing Evaluation Methodology Report

Variable value taken from HCM 2000

Project specific variables

