ABSTRACT: A Personal Rapid Transit (PRT) "shuttle" system is proposed for the I494 Corridor, complementing and significantly increasing the attractiveness of rail, carpool, vanpool, bicycle, and bus commutes for this suburban major employment center. PRT provides non-stop, no-wait, 30 mph service over the commute's last two miles, and services mid-day trips. In addition to PRT, a very comprehensive "door to door mobility" service is proposed, supplying both high tech (web/cellular) and "high touch" (personal) solutions to meet employees' complex transportation needs.

BACKGROUND: PRT TECHNOLOGY

Personal Rapid Transit (PRT) is an elevated monorail system with many three-person, driverless, electric vehicles. It is ideally suited short "feeder/distributor", shuttle, and "circulation" operations at train stations, airports, office parks, and shopping centers. PRT provides non-stop, no-wait, 30 mph service.

Vehicles travel above ground on 16' elevated "guideway." Stations are located near building entrances. Many stations are situated along the route to minimize walking once the trip ends. Vehicles travel non-stop to their destination along the main guideway at 30 mph, speeding at twice the average speed of autos on congested streets below. Stations are NOT located on the main guideway; instead, stations are located on separate station guideway that branches from the main guideway. Thus, stations are described as "off-line," meaning "not on the main line."

PRT combines concepts from monorail (Disneyland), automated people movers (San Francisco Airport), roller coasters, and automated highway systems (California Governor Schwarzenegger's GM OnStar van drives itself in the science fiction movie The Sixth Day).

Passengers travel alone or with people of their choosing. Vehicle weight minimization greatly reduces the size of the elevated guideway and supporting columns, dramatically reducing construction cost and right of way acquisition. Vehicles flow along the guideway almost like data packets on the Internet, anticipating demand so that wait time is eliminated. In addition to improving commute alternatives, the PRT system eliminates mid-day stranding caused by traditional carpooling/transit, by providing efficient transit to adjoining shops and restaurants.

PRT system capacity is roughly 4,000 person trips per hour per PRT "loop." Systems may have many loops, providing more capacity.

PRT combines the advantages and efficiency of rail and bus transit with the high level of service provided by automobiles. As a result, PRT can attract a significant number of drivers into a system that is energy efficient, safe, and socially responsible.
Recent national studies by the Texas Transportation Institute and the Brookings Institution conclude that there is no ‘silver bullet’ to reduce traffic congestion. A more accurate conclusion is that our current national tool kit for reducing traffic congestion is ineffective, thus new tools should be developed.

Electric trolleys first became operational in 1888, and provided much faster service than the horse carts that they replaced. Cities granted franchise agreements to real-estate speculators who built and operated trolley systems as a means to build new homes. Within a few years, trolleys were the dominant mode of transit. This real-estate driven franchising model is also quite promising for PRT. Franchisees take on the investment risk instead of taxpayers. The current public policy context often focuses only on transportation benefits, but transit works better economically when also used as a means to a real-estate ends. By reducing traffic congestion, PRT enables new real-estate development within suburban areas where traffic congestion currently limits or prohibits growth (such as in Minnesota Edge Cities).

With the current set of transit tools, transit agencies are often forced into capital-intensive investments using 100-year-old technology, frequently with capital costs in the billions, and with no hope of ever covering annual operating costs. One of the major drawbacks of older transit technology is that riders only come from within a small 20-acre / 500-person area surrounding transit stations. PRT offers a better solution than expensive transit line extension investments. By serving as a feeder to existing transit stations, PRT can bring 20,000 people within a short PRT ride of those transit stations. Thus, PRT can profitably create huge increases in conventional transit ridership. The current insufficient transit toolkit forces an emphasis on adding new subsidized transit, rather than on improving the operating economics of existing transit investments.

The transportation political system is broken into many separate and competing agencies. Within this policy context it is difficult to provide a seamless, customer-centered, multimodal transportation system. But this is what is really needed to get travelers to and from destinations. U.C. Researcher Susan Shaheen defines "comprehensive new mobility" as "pairing clusters of smart technologies with existing transportation options to create a coordinated, intermodal transportation system that could substitute for the traditional auto."

A study of a 20,000-person Palo Alto office park explored the impact of a hypothetical PRT feeder system coupled with comprehensive new mobility. This hypothetical service significantly increased the attractiveness of commuter rail, carpool, vanpool, bicycle, and bus commutes. This new service increased transit market share from 0% to 19.75%, increased carpooling from 9.6% to 32.1%, and shrank solo driving share from 89% down to 45.6%.
Suburban commute alternatives are diagramed below. The PRT Shuttle solves the “last mile” problem, efficiently connecting different commute alternatives to workplaces. A stylized version of a PRT shuttle system is shown below as an oval with many stations blanketing the job center with efficient feeder/distributor service:

Suburban Commute Alternatives

Delivery services, Personal activities, Business services

Train

Walk

Bike, scooter

Electronic hitchhiking

Short carpool pick up

• Web/wireless coordination
• Car share service
• Guaranteed ride home service

PRT shuttle system LAST MILE mid-day trips

Jobs Center

Comprehensive new mobility improves door to door suburban commutes

Of particular note, driving alone requires very little conscious thought. People drive alone following their route out of habit, focusing very little of their mental capacity on the driving. To compete with driving alone, commute alternatives must become simpler.

Train and bus commuters face the “first mile” problem as well: how to get to the train station or bus stop in their home city. If we provide a solution for the last mile (and mid-day stranding) that often provides sufficient motivation for commuters to solve the first mile problem.

Without PRT, carpoolers typically worked in the same building, meaning that finding a carpool partner who lived nearby was a significant challenge. By providing efficient distribution, PRT breaks this restriction. Carpoolers travel to the edge of the employment center, park at the most convenient employer lot, and then ride PRT to reach their workplaces. With 20,000 workers serving as potential carpool matches, the spatial matchmaking probability improves dramatically.

By rapidly connecting within an entire major employment center, PRT provides sufficient scale for centralized commute services such as “guaranteed ride home”, car sharing, and car rental.

I-494 CORRIDOR

The seven-county metropolitan Minneapolis commute mode split is: 77.6% drive alone, 7.5% bike/walk, 4.4% rideshare, 4.8% transit. The average one-way commute distance is 11.4 miles, taking 24 minutes. (from Met Council web)

Joel Garreau's book, Edge Cities, defines a major suburban employment center along I494, covering portions of Bloomington, Edina, and Richfield. The area of maximum employment may be defined in the following image:
The green oval has the highest employment, with some additional heavy employment in the blue oval. The Mall of America and Minneapolis / St. Paul Airport are in the middle of the blue oval. In this "thermal" map, dark red areas show maximum employment locations for Bloomington residents. Map source: http://lehd.excensusonline.com/.

The I-494 corridor is important to the region:
- 19% of metro area population lives along corridor
- 21% of metro area jobs are located on corridor. The 494 area has the second largest number of jobs after downtown Minneapolis.
- Largest number of metro area hospitality and hotel sites
- I-494 experiences very heavy traffic congestion

Commutes to 494 coming from South and West are served by 35W HOV lanes and new I-494 frontage road bus service (Metro Transit Route 540). Commutes from Minneapolis are served arterial bus service. Commutes to the nearby airport and Mall of America are served by the new and very successful Hiawatha LRT line, but there is no direct LRT service to the green oval. The region faces the common challenge where "radial" transit service is designed to funnel people to Minneapolis and St. Paul central business districts (CBDs). But, the region really has three major job centers: Minneapolis CBD (22.2M square feet office space), I-494 (15.7M s.f.), and St. Paul (8.4M s.f.). (Data from CB Richard Ellis.) Throughout the nation, recently risen edge cities (such as I-494 corridor) are poorly served by radial transit networks developed well before edge cities existed.

The Met Council Sector 5 study covers the I-494 Corridor and states, "The area between Eden Prairie and the airport has the region's highest concentration of employment outside of the downtowns. However, the existing transit network largely ignores this development. Some routes have been added to partially meet specific demands, but this I-494 service has not been well integrated. Transit faces the challenges of free parking and a corridor designed for the auto." (The study then provided details of new service for the area.)
I-494 office development hugs the highways and major arterials. Thus, the area isn't a solid oval shape of offices. Typical suburban office parks encompass one or two square miles in a solid oval shape to accommodate the same number of employees. In contrast, our I-494 Edina/Bloomington/Richfield area of interest is a series of "office strips" with large areas of interleaved low density development.

Major employment within the corridor includes:

- Best Buy (5,000 Employees)
- Fairview Southdale Hospital (3,200 employees + many patients and visitors)
- Express Scripts (1,400 Employees),
- Centennial Lakes Office Park (3,000),
- Normandale Lake Office Park (5,000),
- France Place (1,500),
- Northland Executive Center (3,000),
- Southdale Mall (4K jobs, 41K visitors/day).

The CB Richard Ellis "greater 494 area" has 15.7M s.f. of office space. 494 is the "hottest" office market in the area, with the highest rental rates and lowest vacancy. The Minneapolis metropolitan area has lower unemployment than the nation as a whole. Within the "green oval," there is 8.2M s.f. of office with 4.4M s.f. designated Class A.

On December 17, 2004, a "494 Corridor Charrette" was held. The charrette discussed current conditions in the 494 Corridor and explored the possibility of PRT as a means to provide: a) improved mobility, b) reduced congestion, c) improved land use, d) improved safety, e) improved air quality, f) reduced natural resource consumption, g) reduced cost of living. The following people attended the charrette:

- Dave Van Hattum, 494 Commuter Services
- Melissa Madison, 494 Commuter Services
- Adam Harrington, Metro Transit, Lead Planner for Sector 5 study
- Joe Pignato, MN DOT
- Dave Christianson, Met Council / Metro Commuter Services
- James Barton, Senior Transportation Planner, Met Council
- Amy Fink, Citizens for PRT
- Fred Dock, Meyer, Mohaddes Associates, Transportation Consultant to Southdale Study
- Mark Koegler, Hoisington Koegler Group, Land Use Consultant to Southdale Study
- Steve Lillehaug, Traffic Engineer, City of Edina
- Chad Smith, Planner, City of Bloomington
- Katie Walker, Principal Planning Analyst, Hennepin County (Southdale Study, etc)
- Steve Raney, Cities21

The main charrette outcome was to shift focus from the larger 494 Corridor to a smaller area, Edina's Greater Southdale Area.

EDINA ESAS

The City of Edina and Hennepin County are undertaking a study, the Edina Southdale Area Study (ESAS). The area of study includes Fairview Hospital, Southdale Mall, The Galleria, Centennial Lakes Park, Centennial Lakes offices, the Edinborough complex, and other areas, encompassing an area bounded by Route 100, I-494, France, and Xerxes/York. The area encompasses about 36,000 workers, 5,000 residents, and 1.8M square feet of retail space. The area is dense with people, has a great mix of uses, but is completely auto-centric. Acres of free parking invite cars; buildings are set far back from the roads; many arterial streets crisscross the area; pedestrians are hard pressed to walk from property to property within the area; the arterials are wide. Traffic congestion is awful and high throughout day because of retail shopping trips.
Some of the land is redevelopable and there may be more financially valuable uses than current uses.

There are about 12 high-rise housing buildings on Xerxes (the right hand edge) that cater to seniors. The ESAS area includes many empty nesters near retirement age. There are many retired "snow birds," who go to Florida for 3 months in the winter. They prefer low-maintenance town home and condo living with no snow-shovelling and no yard upkeep.

The ESAS received broad press coverage, including Feb. 10, 2005 page 1 coverage in the Minneapolis Star Tribune. An ESAS Community Meeting was held on Feb. 10 at Edina's Braemer Golf Course Clubhouse. The current ESAS schedule calls for the submission of a draft report to City Council by mid-June, 2005.

The ESAS emphasis is on real-estate development within the area, with some planning for a circulator/shuttle transit system. Three real-estate development options are being considered. All options will "densify," bringing more people to this heavily congested area. All options will improve pedestrian movement. The "work scope" of the ESAS does not allow for specific recommendation of circulator transit technology (be it small buses or PRT) - this will only come from a follow-on to the ESAS. Given the work scope limitation, some Community Meeting audience members were taken aback by the preliminary transit circulator route sketches, which were limited to streets (a PRT alignment can pass through parking lots and place stations at the front door of buildings).

Some Community Meeting audience members felt that "something isn't adding up here." That large growth within this highly congested area could only be accommodated by a very effective new transportation solution.

There isn't a comparable bus circulation system serving an area similar to ESA. ESA is somewhat unique. The Emeryville, CA bus circulation system, the Emergy-Go-Round, serves significant retail, office, and residential, but connects to the BART rapid transit system, so connects to a large source of potential riders. The ESA does not have this large line haul connection. Thus, we would expect an exceptionally well implemented ESA bus circulator to have ridership substantially less than EGR's 2,500 passenger trips/day. The current abysmal ESA traffic congestion and the large growth envisioned (that will generate many more new trips) lead to a conclusion that a PRT is the only viable transportation solution to mitigate current congestion and accommodate large new growth.

One citizen attendee pointed out that, for the entire Minneapolis Metro Region, adding high-rise housing in the Southdale Area prevents construction of homes 40 miles away from Minneapolis. This produces many environmental and traffic congestion benefits: reduces overall "vehicle miles traveled" and associated greenhouse gas production and traffic congestion. Reduces pristine land consumption, leaving more land for wildlife habitat and farming. All that being given, local Southdale Area citizens may not all want to sacrifice their community character to reduce the region's problems.

A rough preliminary Edina PRT route is shown below. As PRT transit moves forward within Edina, the route should evolve to more accurately reflect upcoming decisions on the three ESAS real-estate options. More PRT stations will be needed to support new real-estate development.

**NETWORK TRANSIT SOLUTION**

Proposed Edina Southdale Area PRT System:
### STATION DESCRIPTIONS

1. **Fairview Southdale Hospital (3200 jobs + many visitors).**

2. **Valley View & W 66th, West (apts)**
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<td>3.</td>
<td>Southdale mall &amp; transit center. (4K jobs, 41K visitors) (needs 2 stations)</td>
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<tr>
<td>4.</td>
<td>Xerxes &amp; W 66th – 17 story apartment</td>
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</table>
| 5. | Galleria Shopping Center  
   See Southdale picture above |
| 6. | Valley View & France office center |
| 7. | Tech worker apartments. |
| 8. | York & Hazleton (apts) + Yorktown Mall |
| 9. | Adams Hill (apts + close to major library + close to YMCA) |
| 10. | York & Parklawn (jobs + near apts.) |
| 11. | Centennial Lakes Office Park. (3K jobs.)  
   7650 Edinborough Way (2 stations) |
| 13. | France/494 NW - France Place (1500 jobs),  
   3601 Minnesota Drive, Edina. Note: the South side of Minnesota Drive is in Bloomington. All PRT stations should be in Edina. |
ESAS COMMUTERS

The narrow ESA has many jobs, many apartments, lots of retail, and the hospital. ESA represents a very interesting, self-contained mixed-use area. Alas, it is very auto-centric, as buildings are "set back" from the street to allow for ample parking. As an example, almost all people drive across the arterial street between the Southdale and Galleria shopping malls. This streetscape is very hostile to pedestrians, and acres of parking make the walk quite long.

Nearby highways experience significant peak hour backups. Minneapolis highway congestion is some of the nation’s worst.

Metro Transit’s budget was cut 4% in 2004, not an encouraging trend.

12% come from Minneapolis, 6% come from Bloomington, 4% from Edina, 3% from St. Paul, and 3% from Richfield. This leaves 53% wrestling with sprawling commutes that are poorly served by transit and HOV.

Because of all the retail and hospital workers, ESAS worker income is as follows:

- 47% earn under $15K per year
- 32% earn between $15K and $39K
- 20% earn $40K or more

18% work in administrative jobs, 18% in health care, 16% in retail, and 14% in food service. There is a small percent of professional, scientific, finance, and real-estate personnel.
ESAS RESIDENTS

There are 3,564 ESA employed residents. Many of these commute to jobs right along the East/West portion of the immediate I-494 corridor or to downtown, so are good candidates for commute alternatives.

Commute Shed: Workers living in the ESAS area, and employed along the local I-494 Corridor.
Source: Local Employment Dynamics (LED), US Census Bureau, MN DEED, Excensus LLC – Q2 2002 data

These ESAS residents are of the "professional class." 40% earn $40K/year or more. 11% work in professional, scientific, and technical services. 10% in finance and insurance.

ESAS NETWORK TRANSIT RIDERSHIP SOURCES

1. Internal trip making.

ESA PRT trip time will be competitive with solo driving, so should capture a significant share of internal trips. The ESAS plans new housing, that will further increase ridership. PRT stations can be built right into the second floor of these new buildings.

Most errands should be well-served by PRT. For large volume purchases, such as weekly grocery shopping runs, the use of special shopping carts will be required. A section is dedicated to this below.

In addition to errand-running, ESA has its own "suburban oasis," the Centennial Lakes park, offering immediate access to walking, skateboarding, concerts, and open space:

Centennial Lakes

2. Commuter carpooling, vanpooling, and subscription bus service will increase because of PRT’s solution to the last mile problem. The Excensus Labor Shed graphic shown previously can provide an opportunity for targeted marketing to ESA commuters. The I-35W HOV lane for commutes coming from South of Bloomington provides a nice opportunity for those commuters.
3. Increased bus ridership from Minneapolis. Metro Transit route 6, 152, and 578 will see increased ridership from the connection to ESA PRT. Route 6 offers five-minute peak hour frequency. These routes can be modified to have fewer stops (and less serpentine routing within ESA) within ESA as PRT will provide a much better solution. The Excensus labor shed shows a high percentage of Minneapolis CBD residents who work in ESA.

4. Increased bus ridership for Metro Transit East/West route 540 (and future 594) service along I-494 frontage roads. The Labor Shed (workers commuting from I-494 corridor to ESA) does not look like it will generate significant ridership, but the Commute Shed shown previously does look quite promising for ESA residents who commute to jobs along I-494. In addition, Metro Transit provides significant North/South arterial bus service that can then connect with the Route 540 East/West service. The labor shed shows good potential for these commutes. Unfortunately, these commutes require four segments:
   - Fist Mile
   - North/South arterial service
   - Route 540 East/West service
   - PRT last mile.

The new (and popular) Hiawatha LRT service can also connect to Route 540.

5. Regarding commutes from South of Bloomington, across the river. This suburban area has seen the most housing growth. It is the region's most desirable area to live in. There are still some available parcels. This is a new area with more modern housing options. Bloomington, etc are older suburbs with older houses. There are massive bottlenecks in crossing the river South of Bloomington (because there are few bridges), so there is a significant time savings provided by using the I-35W HOV lanes. The Burnsville Transit Center (South of the River) is an important connection point.

6. Shared parking. PRT could provide shoppers with remote Xmas parking. Likewise, most of the year, the malls have unused shopping spaces. Parking could be managed on an area-wide scale, reducing the overall need for parking. An area-wide parking system could be implemented with electronic access and electronic gates. This would enable the implementation of small parking charges, which further serve as a deterrent to SOV use.

PRT GROCERY SHOPPING

A recent national dialog on CUTR's transp-tdm list serve led to some interesting ideas on this topic. Ongoing work-in-progress research notes can be found on: http://www.cities21.org/granny.htm

How will ESAS people transport goods? With their favorite duffle bag? With sturdy, reusable shopping bags? With a large, special-purpose backpack?

For more than few days grocery shopping, a foldable Versacart shopping cart that folds like a baby stroller or a Hook and Go may be in order.

The Versacart Rolling Cart is a $50 collapsible grocery cart. It folds like a modern baby stroller. Measures 37” H x 18”D x 17”W. Tall folks will need an extension (such as can be found at http://www.luv-handles.com/ for $20). This picture at right shows the Versacart with Luv-handles added. Versacart has 3.72 cubic foot capacity and carts up to 100 pounds. It comes with a top to protect groceries. Available at numerous web luggage shops, including Stacks and Stacks, 1800luggage.com, and ThatsIt!. A number of people voiced reservations about the Versacart's style.

The Hook & Go (http://www.hookandgo.com/index.htm) allows shoppers to hook up to 12 plastic shopping bags full of groceries onto the 8 hooks. Maximum load is 70 lbs. Weighs 7.6 lbs, and folds nicely. 18”L x 21.5”W x 42”H. The Hook & Go works well, even for tall people (6’4).
In addition, a set of centrally managed community grocery carts could be provided, similar to airport luggage smart carte systems. Once you're done with your cart, you deadhead it to the storage facility. The carts could be tracked with GPS and the PRT provided could manage cart inventory.

FUTURE PRT EXPANSION FOR METROPOLITAN MINNEAPOLIS

494 office development hugs the highways and major arterials. Thus, the area isn't a solid oval shape of offices. Typical suburban office parks encompass one or two square miles in a solid oval shape to accommodate the same number of employees. In contrast, the 494 green oval is a series of "office strips" with large areas of low density development within the green oval. Our green oval stretches 6 miles along 494 from West to East, longer than is ideal for developing "small" PRT circulator systems. However, all that being said, the "box" formed by 62 on the top, 100 and 35 on the side, and 494 on the bottom is a very interesting area to concentrate on within the green oval. The PRT alignment can stay below 62 on top. This box is roughly 3 miles wide by 2 miles high.

Metro Transit Route 540 East/West bus serves Eden Prairie to Mall of America / the Airport. PRT could eventually serve all of this.

Maple Grove is a soon to be Edge City located Northwest of Minneapolis. It will also be an excellent candidate for PRT.

APPENDIX: PRT DEVELOPMENT STATUS

PRT is an emerging technology under development in Minnesota (SkyWeb Express), the United Kingdom (ULTRA), and Korea. The original PRT concept was invented in the U.S. 40 years ago, and has been independently derived on numerous occasions since. SkyWeb has one vehicle and a 60' test track segment. Former Microsoft employees have provided the majority of their funding. A $4M SkyWeb earmark stalled in the Minnesota state 2004 legislative session. ULTRA has a 1km "figure 8" test track with two vehicles. ULTRA is partnering with TRW on advanced sensor technology research. In 2001, ULTRA lined up $68M in public sector funding, but that commitment was later withdrawn. The European Union provides ongoing ULTRA-based PRT research funding and views PRT as an important part of the Kyoto Protocol effort. The Korean Government has recently announced a $30M PRT R&D program. First commercial deployment for any of these systems could be as early as 2007.

Two important procurements are currently underway for transit systems at Heathrow Airport in London and at Dubai International Financial Center (a free-trade skyscraper center) in the Persian Gulf. Either procurement could fund the world's first PRT system.

APPENDIX: PRT IMPLEMENTATION CHALLENGES

PRT technology will be difficult to implement, and especially difficult to implement in a cost-effective manner. Multiple efforts may be required – it is not at all clear that the first fully funded effort will succeed. PRT represents the first truly new transportation mode since the airplane. It is useful to reflect on the difficulty in bringing about the airplane. Before the Wright Brothers succeeded, there were many failed attempts (collectively known as the "Wrong Brothers"). Many very intelligent people believed that man would never fly.

It is possible to produce PRT at a low delivered cost of $10M per mile, as well as a high $40M per mile. A model whereby engineers have financial incentives to keep costs down will be more advantageous than that of a traditional "cost plus" manufacturer that passes on cost overruns to taxpayers. Likewise, IBM required a "skunkworks" culture to bring about the PC, and a similar structure may be necessary for PRT. Traditional component vendors may be forsaken for cost-conscious roller coaster and gondola makers, or even Daimler-Chrysler's semi-autonomous GEM subsidiary. The winner of the DARPA grand robotic
vehicle challenge spent $1M to claim the $1M prize. The second place finisher, the Golem Group, spent only $35K. Golem provides another excellent example of desired PRT vendor characteristics.

PRT systems share more in common with today's complex hardware/software systems than with the traditional civil/transportation engineering discipline. The largest technical challenge is in developing the "control system" that safely choreographs vehicles maneuvering only 10 feet apart. In order to obtain liability insurance, the control system safety must be proven via a painstaking, time-consuming process.

Most of PRT control system technology has already been prototyped in research projects such as: University of California's PATH Lab automated car tailgating project, Frog Navigation's Park Shuttle, Daimler-Chrysler's Chauffer II truck tailgating, and Toyota's IMTS bus.

The European Commission's Research Director for Urban Sustainability claims the major PRT implementation obstacles have been non-technical in nature. One such problem is that no American city wants to take on the downside risk of hosting the first PRT system (many cities want to be the second host city). Our mature democracy favors incremental change while resisting large-scale innovative change.

APPENDIX: PRT VISUAL IMPACT

The visual impact of the svelte PRT elevated guideway should be considered carefully. Dense suburban areas with modern architecture are the natural candidates to host the first futuristic PRT systems. To reduce visual impact, stations may be located inside building lobbies, or immediately adjacent to the second floor.

REFERENCES / FURTHER READING

- U. WA. Bellevue PRT Study: [http://faculty.washington.edu/jbs/itrans/belvue.htm](http://faculty.washington.edu/jbs/itrans/belvue.htm)
- Innovative Transportation Technologies web [http://faculty.washington.edu/jbs/itrans](http://faculty.washington.edu/jbs/itrans)
- CB Richard Ellis real-estate market research. Click this link, then select the Minneapolis office and retail local market reports: [http://www.cbre.com/Research/Market+Reports/Local+Reports+Worldwide/globalresearch.htm](http://www.cbre.com/Research/Market+Reports/Local+Reports+Worldwide/globalresearch.htm)
- City of Edina ESAS pages: [http://www.ci.edina.mn.us/Pages/L4-39_SouthdaleStudy.htm](http://www.ci.edina.mn.us/Pages/L4-39_SouthdaleStudy.htm).