Light Rail Potential in Rochester, New York

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The development of public transit in the United States is again at a crossroads. The administration in Washington has made policy statements and begun to implement programmatic changes that significantly differ or diametrically oppose trends that dominated the recent past. What the future holds, or what adjustments will be required to existing transit services and to plans for system expansion, is uncertain. It is clear, however, that a turning point has been reached. Light rail is regarded differently than heavy rail or buses. Heavy rail is in considerable disfavor because of high capital costs; buses are in favor because they are simple and responsive; light rail is left somewhere in the middle. A recently "discovered" mode, light rail does not have the documented use in North America to allow nondebatable forecasts and estimates of its merits. Therefore, any information exchange is particularly significant; e.g., the Rochester case—a potential transit service in an available corridor that once accommodated streetcar operations but lost them. If a commitment is not made soon to reactivate such service, the opportunity (the physical channel) may be lost. Not long ago, the overall decision about a light rail service in Rochester might have been favorable, and it would probably have been backed with generous assistance from Washington. Today, in a different policy climate, the same facts and findings might have a different interpretation. This paper will examine the corridor, the participants, and the possibilities and discuss speculations about the future.

The Erie Canal was dug through New York State and the City of Rochester in 1822. It served well for many years and changed the economic life of the country. Technological changes and traffic volumes eventually demanded an expanded channel; in 1914, the larger New York State Barge Canal was built south of the city. There was a long debate locally over what to do with the abandoned bed, including the masonry viaduct crossing the Genesee River in the center of Rochester. In 1922, it was decided to place various rail services within the bed and, in the process, restructure the metropolitan transportation network. Part of the canal was decked over, creating a tunnel and expanding the surface street network. The principal concern at that time was to accommodate interurban trolleys and to bring them into downtown Rochester on an exclusive right-of-way. These lines reached other cities of New York State; however, this service soon faded and disappeared from the scene across the entire nation.

Rail freight service also used the channel (a small special operation still exists today), but the major user of the "ditch" was a streetcar line, locally known as the Subway because of the central covered portion. It started revenue service in 1927 and was operated by the New York State Railways Company, also responsible for a number of other surface trolleys in Rochester.

This 9-mile line is well known among streetcar buffs, and its characteristics are thoroughly recorded. Its principal feature was the grade-separated channel between the two terminals of Rowlands in the southeast and Driving Park Avenue in the northwest. Left-hand running was employed, which allowed the use of standard single-end cars with a center platform serving both directions at all stations.

One of the problems was that the Subway led its own life and was never fully integrated with the other transit services, even when the Rochester Transit Corporation took over the system and despite many proposals to extend branch lines and coordinate services. All of Rochester's surface lines were converted to buses by 1940, but the Subway remained. It was never a profitable venture, and farebox revenues exceeded operating expenses in only one year (1943). Patronage peaked at 5 million in 1949, but slid to about a million in the mid-1950s. By then the line was becoming dilapidated because of deferred maintenance; after disputes between the city and the corporation as to financial responsibility, service was discontinued in 1956 (the year of the Interstate Highway Act).

For several decades thereafter, the "ditch" in Rochester stayed in the memories of transit specialists and planners: "Shouldn't the service be reactivated?" "What are they going to do with it?" A partial, although negative, answer was provided in the context of the highway building boom that swept the nation in the 1960s. Rochester is one of the few cities in the United States that actually built a tight loop with several radials around the CBD. It was opportune to place one of these roadways along the southeastern leg of the old canal/Subway, because historically and currently it traverses a high travel-demand corridor.

This left the tunnel through the downtown, the viaduct crossing the Genesee River, and the 2 miles of open cut northward. General railroad freight and passenger service eroded in Rochester as it did elsewhere, and rail rights-of-way could be considered for other uses. Thus, it was not difficult to identify possible channel extensions all the way north to the lake and southward through and beyond the entire urbanized area.

Various suggestions and scattered evaluations took place before a major study was organized and completed in the early 1970s.[1] Its findings were overoptimistic: the line would be rebuilt along 19 miles; it would have more heavy rail rather than light rail characteristics; it would carry 53 000 passengers per day by 1990. In addition, substantial induced development along the channel and around the stations was envisioned.

Forecasts and plans were met locally with widespread disbelief, if not outright hostility. More public involvement during the study process might have built confidence and support, but the principal difficulty appears to have been a dramatic, fundamental change in community perceptions and expectations. The consultants used state-of-the-art techniques; they did what was expected of them; and they were no different than most who were practicing the art of transit planning at that time.

The 1970s study started in an era when metropolitan growth was an article of faith throughout the country and Rochester was in a boom mood—the new towns of Gananda and Riverton are two examples of the great expectations. But it was soon apparent that urban regions in the older parts of the country were approaching stability. Miraculous rebirth of downtown areas does not often occur, and economic development is not based on wishful thinking. Questions of local share of capital costs and continuing operation and maintenance costs also surfaced. The study was shelved, but the concept was not forgotten by those who believed that a viable urban transportation system must have a strong transit component.

In the meantime, energy issues became more critical, light rail's reputation improved in North America, and UMTA restructured its study, planning, engineering, and implementation procedures. In the late 1970s, under the leadership of the Rochester-Genesee River Transportation Authority (R-GRTA), it was decided to start again, but to proceed carefully within a conservative framework. UMTA provided the usual share of study funds and decided to designate this effort a "pre-alternatives analysis," without answering the question of exactly what specificity was expected. The principal differences in scope were that the study would concentrate on the two main modal choices (busway and light rail), that alternate alignments off the

channel would not be examined in depth, and that a full alternatives analysis would be undertaken if the findings were positive.

The most important objective in the pre-alternatives analysis phase was to determine if the corridor (the Subway bed and various surface rail rights-of-way) held any promise at all for transit operations. If so, further evaluations would be undertaken of all possibilities and implications; if not, the land would be used for other development purposes that presumably would permanently preclude a transit service in the channel.

A new group of consultants was selected, and work on the study started in the fall of 1980.[2] The following observations and findings are from this just-completed study.

The normal monitoring mechanisms were applied and the following agencies were active in the review process: the Board of the R-GRTA and a special committee, City Hall and the Planning Department, the Genesee Transportation Council (as the regional planning agency), the New York State Department of Transportation, and UMTA. Each has special concerns; most of them will be highlighted in the following discussion.

The principal supervisory responsibility, however, rests with an ad hoc Corridor Advisory Committee; it has met frequently and taken its assignment seriously. Its organization and performance, as well as its antecedents and likely follow-up, are of interest and can help in the understanding of the process.

The first task the consultants undertook was a community leaders' survey that sought to include those with a role in transportation decisions, those who represented potentially affected groups or districts, and those who simply were in visible positions. In addition to being asked about their concerns and attitudes, each person was asked both to serve on an advisory board and to identify other leaders. Because of the previous planning experience, the prevailing community attitude toward transit in the channel was negative and one of "show me."

The early survey provided many attitudinal insights. It was never intended to be a referendum, but it did identify concerns and issues that the study should address. Those who expressed support mentioned all the benefits that generally can be expected from an improved public transit system, which need not be specifically elaborated. Of greater interest are the negative observations that were made before any technical work on this study project was begun.

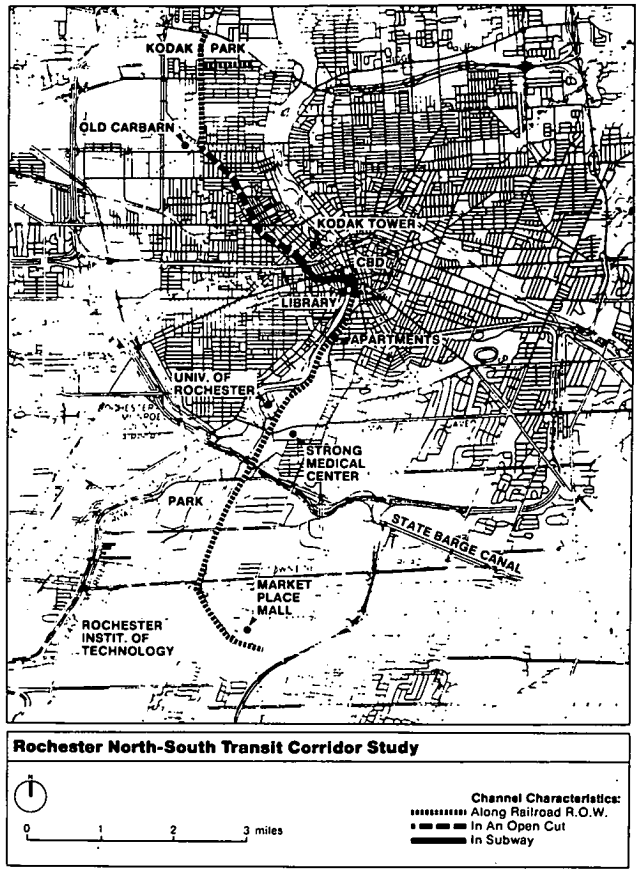
Most original opponents expressed skepticism that sufficient patronage would be generated. The corridor itself with its north-south orientation was not regarded as the most promising location in an area with high transportation needs. Some people indicated that the existing bus and park-and-ride services were adequate and that there were no real transportation problems. A number of respondents believed that Rochesterites were not likely to give up their automobiles for a classless public service. Many opponents raised questions about funding and possible local subsidy requirements. Some individual but interesting responses included the following observations: that winters in Rochester were too cold for residents to use transit; that a line connecting to suburban retail centers would likely siphon shoppers away from the CBD; and that use of the land for industrial development would be more beneficial to the community.

All these and the many other viewpoints that emerged during the interviews were given consideration in the subsequent planning work. The interviews were far-ranging, and other specific suggestions or indications of problems provided the consultants with a rich inventory of qualitative information for guidance during the study.

DESCRIPTION OF THE CORRIDOR

The alignment under consideration proceeds north to south for 11 miles; downtown Rochester is at the approximate midpoint (Figure 1).

Figure 1. Proposed corridor.



The northern terminal of the light rail line and that of the busway are to be in the vicinity of West Ridge Road, a major east-west artery of the city. West Ridge Road also parallels and serves the massive Kodak Park complex; with its thousands of workers, the complex constitutes a significant traffic generator. But there are some concerns: the workers are spread over a large area; most of the space is preempted by industrial development and proprietary parking lots; and the Kodak Park management does not feel compelled to vigorously support a new public transit service because it has always provided all the parking spaces demanded.

The urbanized districts north and west of the proposed terminal area must also be considered. Many people live between Kodak Park and the lake, but at low densities. An extension of the light rail line northward would most likely not be cost-effective under these conditions; but, if a busway is the modal choice, these districts will be tapped directly by bus lines that converge in and out of the terminal node and require no passenger transfers. This affects the comparative patronage estimates between the two principal modes.

The first section southward from Kodak Park for almost 2 miles would share a wide rail right-of-way that has excess width and capacity at present. It runs past primarily residential areas at modest densities and income levels. A significant node exists where the rail right-of-way crosses the old canal bed at Lexington Avenue. There are physical problems with different elevations and a knot of various alignments and bridges, but it is possible to bring the line from the rail embankment into the "ditch." This location is also interesting because the old Subway terminated here (the carbarn still exists), and there is extensive industrial development nearby.

Proceeding southward, the empty 80-ft-wide canal bed

is still intact, with heavy retaining walls along both sides. The problem is that, when the 6 bridges crossing it were in danger of collapse, the city replaced them with earth embankments. The channel would therefore have to be "unplugged" for both a light rail and a busway alternative. Light rail would need access stairs for passengers; buses would need vehicular ramps at the major cross streets. Unfortunately, the channel has also been used as a depository for debris, both by private citizens and by the City of Rochester, but no irreversible damage has been done so far.

The neighborhoods along this section of the alignment are old, working-class districts. They exhibit mixed use and some deterioration, but, by and large, the area is very much alive and can be expected to contribute a good share of patronage.

However, the tightness of development that is a feature of such areas creates design problems. Local shopping centers are clustered on the cross streets near the channel; most streets are narrow; and intersections are constraining. Although patronage forecasts indicate considerable access demand for both principal modes by feeder bus and park-and-ride patrons, adequate parking space and efficient access channels for services and vehicles will be hard to provide at the designated and logical station or stop locations. Near the end of this section, just before the alignment enters the downtown tunnel, there is a district with considerable vacant land that the city earmarked some time ago as a potential organized industrial district. The problem was that the channel curves through the area and creates awkwardly shaped lots on both sides. Decking over is not even remotely feasible from an economic standpoint, so a compromise proposed a realignment of the line (straightening) that would both preserve the physical integrity of the designated industrial district and not diminish hope for the plan's implementation.

Another notable factor is Kodak Tower (national headquarters). Although it is located several blocks away from the channel, it is an obvious but isolated traffic generator; the decision had to be made not to curve out the proposed line to serve it directly. This is a complex situation with an interplay of several forces. The CBD to the southeast would be connected to Kodak Park at the northern end of the line, but there is not much business linkage between those two centers. Kodak Tower, on the other hand, would remain separate and, presumably, would continue to interact with Kodak Park, largely through the use of cars and existing surface bus lines. The constraints to putting all these nodes on the same chain are, simply, the canal bed's immobility and the noncommittal attitude of the largest employer in the city.

The next section of the line is the core segment that curves through the western half of the CBD and crosses the river. This section is a completely enclosed tunnel that is well suited to the pollution-free operation of a light rail service; a busway would require extensive ventilation arrangements. The tunnel is in good structural shape and well protected from intrusion and most other uses. Its only function at present is the entry by way of a railroad siding to deliver newsprint rolls to the local newspaper plant and the recent conversion of a section of the tunnel into a storage location for these rolls. This obviously is a conflict in use, but two transit tracks can be routed past the warehouse operations. The logical alternative to transit service is the subdivision of the underground space for similar support activities. This part of the CBD has been largely an adjunct to the principal core across the river, but it shows recent signs of growth in its own right. It contains the War Memorial Auditorium, some new buildings that have been constructed, and several renovation projects that are under way or have been completed.

The heavy masonry viaduct with its arches opening up to the Genesee River has landmark status and brings the line almost to the very center of the CBD on the east side. Here is located one of the major issues associated with the transit concept: Is a 2-block distance between the 100 percent corner on Main Street and the nearest station excessive? Popular wisdom maintains that one reason for the demise of the early streetcar service was the Rochesterites' reluctance to walk this distance. Considerable effort was spent in previous studies to structure schemes that would bring service directly into the very center of the CBD. Such loops are physically possible, but penetration to street surface, portal placement, and use of scarce circulation space are obvious difficulties. In this analysis, it was decided that such attempts would not be cost-effective under the scarce resource conditions that exist today. Another important new element is the convention center to be built between Main Street and the transit alignment on the river front. This structure will effectively draw the activity core toward the line and will extend and incorporate the developing skyway system of Rochester and lessen the possibility of any linkage problems.

After the viaduct and past the "knuckle" in the line at the library, the alignment turns south and progresses from urban to suburban districts. The special nodes on the northern leg were industrial complexes, and the southern leg is blessed with significant institutional clusters. The alignment now diverts from the old canal bed, which extended eastward, and uses existing rail rights-of-way. The selected path is the east side of the river, although an alternative on the west bank was considered. The west bank path, however, has a structural problem—leaving the channel at the viaduct, it interferes with the War Memorial site, does not touch major traffic generators, and misses the core by an even greater distance. Because the winters are quite severe in Rochester, (another argument in favor of a rail-based, as compared to a road-based, system), potential transit users probably will not patronize a line that is further from the core.

The first section of the line beyond the Inner Loop Highway crosses an open zone that is designated and equipped as an industrial district. There are no problems here—and no patronage—because nothing has yet been done. But recently, directly south of the zone, the New York State Urban Development Corporation built a housing project for low-income families directly along the river. This development has not fulfilled all expectations, but it is occupied and has a riverbank promenade on top of the old rail right-of-way. The original design allowed for transit passage and recognized that such a possibility could emerge in the future, but the situation must be evaluated today on its own merits. Frequent bus service along this stretch is not compatible with the linear park concept, but streetcars at 10-minute intervals also may not be tolerated along the promenade. Depressing the line right next to the river would be expensive and probably subject to flooding; placing the line behind the buildings on the land side would interfere with the parking lot, a major artery, or other built-up blocks. This is a major question that has to await further detailed study. Various solutions are conceivable, but none of them will please everyone.

Moving southward, the line follows an abandoned rail channel with no apparent difficulty and, after about a mile, reaches the University of Rochester. This is a significant traffic generator, although the campus is self-sufficient, with its internal dormitory groups.

The problems here are different, but they can be solved. The first is a single-track bridge that carries the rail right-of-way across a major boulevard. Short headways for transit vehicles undoubtedly require a parallel structure—an almost mandatory condition with the busway scenario unless reversible one-way operations are instituted during morning and afternoon peak periods. With light rail service that incorporates proper signals and controls and operates at the 10-minute intervals that appear to accommodate the expected loads quite well, the short, single-track bridge should be able to allow alternating passages with no safety or capacity problems.

Another issue that will require local adjustment is the established use of the old alignment as university parking

lots. This is not a physical obstacle, but negotiations will be required.

Just south of the university campus is one of the major east-west regional arteries (Elwood Avenue); it is crossed by existing bridges. Several large institutions are in the adjoining district, notably a medical center. This district is an obvious strong node where feeder services and other access possibilities should converge. Proper interchange arrangements will have to be made within space that is constrained and valuable.

The next section of the alignment, about 2 miles, traverses a lightly developed part of the region. The right-of-way is well segregated, and the few crossings of minor streets at grade should present no problems. Some other issues, however, must be addressed.

One is the presence within the right-of-way of a track used occasionally to service the university power plant from the south. The questions involve the joint use or crossing of light rail and freight tracks. A solution is possible but may take various forms, depending on what final agreements are reached.

At one point along this segment, the line crosses the State Barge Canal and a parallel, limited-access highway (the Outer Loop). This, too, could be a node but, unfortunately, the new highway provides only a single-track overpass. Either alternating operations or a parallel bridge is needed.

Another question concerns a major park toward the river. It is relatively lightly used at present and generates little traffic, but with upgraded service it might become a major attractor.

The last major node of this study alignment is Jefferson Road, the most important east-west artery of the southern half of the region. It is a typical suburban corridor, lined with commercial activities with an automobile-oriented configuration, and more development is on the way. Several large institutions and clusters, notably the Rochester Institute of Technology, are in the vicinity, but beyond walking distance. It is not possible to route the transit service past all the important centers, particularly if existing rail rights-of-way are to be used. Thus, a system of feeder services becomes essential.

One alternative is to stop the line just short of Jefferson Road to avoid crossing problems and expense. However, the demand from the south is sufficiently heavy to justify a major, grade-separated overpass to reach behind several large shopping centers on the south side. A terminal can be placed adjacent to one of the largest centers and joint use of the parking lot can be arranged.

The right-of-way continues further south, but estimates indicate drastically reduced patronage volumes—development here is still sparse. Physical linkage to several expressways, including the New York State Thruway, indicates little potential added traffic. The logical point of termination appears to be this fringe district of the urbanized area.

SUMMARY

The current study extended over the entire year of 1981 and was a pre-alternatives analysis. Its principal aim was to determine whether the channel had a reasonable potential for transit use or whether Rochester should finally abandon the idea. The tasks involved in this effort covered the usual ground and require no special elaboration. The effort used a highly conservative framework to ensure that every finding is completely defensible and that the concept is not based on questionable assumptions. For example, it was decided not to consider any induced development and the consequent patronage in the corridor generated by the presence of a new transit service. The plan had to stand on its own direct merits so the residents and officials of Rochester could arrive at unbiased conclusions. These were, perhaps, harsh and unusual constraints, but the history of the channel allowed no other approach.

A critical task was to estimate potential patronage. The methods employed were innovative and based on a sketch-planning model with interactive graphics capability and extensive follow-up elaboration of assumptions about feeder services, elasticities, and service levels.[3] Although this effort was interesting, the technical details go beyond the scope of the current discussion; they should be presented in a separate paper outlining modeling procedures useful for preliminary alternatives evaluation. A summary of the tentative findings will have to suffice here.

A pre-alternatives analysis was not expected to arrive at precise estimates, nor was this possible; too many operational scenarios regarding feeder and access services are still open. The aim was to define reasonable ranges regarding the operations of the system and its major elements. Socioeconomic data were obtained from state and regional sources that focused on present and future urban level travel behavior. The study area defined consisted of a wide band that ran through the region and centered on the line and its immediate corridor. The basic study units consisted of 82 zones; trip interchanges, mode choices, access opportunities, and many other relevant factors were determined for each zone. For follow-up analyses, these zones were grouped into 13 districts, each with a specific relationship to the line service. Strictly differentiated calculations for busway and light rail operations were not made, but the basic variable was the ease or difficulty with which patrons could enter or leave the line by various access modes. This took into account real or logical interchange possibilities, as well as penalties for transfer among modes. Certain access and transfer conditions are peculiar to each of the two principal alternatives; therefore, discussion of the associated implications throughout the entire range of estimates is possible.

The first calculation produced an approximate figure of 35 000 riders per day on the line. Although far below the estimate made in the 1974 study, it caused questions to be asked locally and in Albany and Washington about the assumptions and factors used. The results actually were overgenerous toward access conditions, and a subsequent exploration focused on the other end of the scale. By virtually eliminating such factors as feeder buses, two transfers, and park-and-ride use, the new estimated use was slightly more than 26 000 riders per day. This is still a respectable figure, but so conservative that the viability of mass transit in the community is suspect. After several more modeling runs and further adjusting estimates, light rail ridership of about 30 000 per day is predicted, pending more detailed analyses of the data and more elaborate modeling procedures.

The second major area of inquiry was the cost of constructing and operating a new transit service. The Rochester community is deeply concerned about this matter, as are most cities.

Methodology does not require discussion; the approach was straightforward and relied on preliminary engineering estimates and recent experiences of cities now building light rail or busway facilities.

The tentative figure for building and equipping the 11-mile light rail line is close to $100 million; this is relatively low on a mileage basis because the channel is there and ready for use. But $100 million is not easy for any community to raise for a specific project. Funding sources are uncertain under current conditions, as is the federal attitude toward such endeavors, no matter how promising. Private financing is conceivable but highly doubtful, even without more detailed evaluations of potential returns. Local government is hard pressed to maintain even current services, much less consider major expansions; even a 20 percent share will generate much debate.

The construction costs for the busway alternative were estimated at about $75 million, but this figure is flexible and depends on what associated elements of the total surface system are included in the calculation.

The final component of the evaluation is estimated operations and maintenance costs and how they compare

with expected revenues. This might be the critical element, given today's concern with financial performance.

CONCLUSIONS

More work must be done, but certain conclusions have already emerged. One is that there is little doubt that a light rail line can provide more economical service than an all-bus operation. A fleet of only 8 vehicles could carry the estimated passenger loads. In Rochester and most other places examined recently the rail concept has a clear advantage. It is not as certain that light rail can be self-sufficient, but the indications are favorable. It depends primarily on fare levels and revenue allocation.

No decision has been reached in Rochester. To some, the situation is encouraging, and light rail service is most attractive. Others see dangers and uncertainties. But the greatest concern is the amount of capital resources needed to implement it and where the resources will come from. Basically the issue is how society perceives the role and benefits of efficient mass transit. The evaluation will never be purely quantitative and explicit. Even using the worst set of assumptions, a light rail service in Rochester would draw 5000 riders away from automobiles and place them on public transit. This result will be interpreted differently by different people—as an additional burden on hard-pressed, subsidized public operations or as a welcome strengthening of an appropriate and efficient urban service.

REFERENCES

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2. Parsons Brinckerhoff of New York City, together with Bergmann Associates of Rochester.
3. This work was the responsibility of Jerome Lutin of Parsons Brinckerhoff.

Cologne's Contribution to the Light Rail Concept

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West Germany has been one of the most active countries in the development and application of light rail transit. Cologne (Köln) is the largest West German city to rely upon LRT (Stadtbahn) instead of full rapid transit (U-Bahn) as the primary rail transit mode. The LRT system, operated by the Kölner-Verkehrs-Betriebe (KVB), has developed in a well-planned, gradual manner from a basic streetcar system to a high-performance LRT network. The system was built by adapting the right-of-way to the physical and operating environment. Therefore, most of the 30 km of fully separated right-of-way are located in the heavily congested city center. Most lines reenter the surface after leaving downtown, but retain some form of priority right-of-way.

To operate on the improved rights-of-way, the KVB developed and purchased the B-car, one of the highest performance cars in West Germany, but a car that is still flexible enough to operate on all surface sections, including conventional streetrunning. Other areas of investment, such as electrification, signals, and track, have kept pace with the overall system improvement. The result of these developments has been steadily improving performance and a ridership level that totaled 175.8 million passengers (LRT and bus) in 1980.

Many of the technical and operating elements can be seen in the new intercity light rail line that runs from Cologne to Bonn. The route was converted from a declining commuter railroad operation to LRT in 1977 after several technical and institutional problems had been overcome. Improved service and integration of the former rail system into the LRT networks in Cologne and Bonn led to dramatic ridership gains.

The city of Cologne (Köln), with a population of 1 million is the fourth largest city in the Federal Republic of Germany (West Germany). It is located along the Rhine River in the heart of the industrial and commercial center of West Germany.

Three larger German cities, West Berlin, Hamburg, and Munich, have transit systems that emphasize rapid transit; thus Cologne is the largest German city to rely upon transit LRT as the major rail mode for local travel. The combination of an extensive network and implementation of important technical and operating concepts makes Cologne a major contributor to the international development of light rail.

Public transportation in Cologne is carried out primarily by the Kölner-Verkehrs-Betriebe (KVB), a transit company owned by the city of Cologne. The backbone of the KVB network is the Stadtbahn, or light rail system.

The light rail system has experienced constant growth in terms of ridership, line length, and performance. This trend is the result of a well-planned effort to upgrade the rail transit system from a conventional streetcar to a high-quality light rail mode. The success of this effort in Cologne provides an excellent example of how a basic LRT system can undergo gradual, evolutionary changes to become a high-performance transit operation.

HISTORY

The streetcar system in Cologne was almost totally destroyed during World War II. The first priority after the war was to rebuild quickly a basic and inexpensive system. By 1954, the KVB was a stable system consisting of 144 km of streetcar lines and 148 km of bus lines.

Over the following decade, certain inadequacies became apparent. There was no north-south route through downtown and only one indirect route to the large commercial area around the train station. As the city became more motorized, automobiles were not only taking riders away from the transit system, but were also hindering the flow of streetcars in the city. There was a need for a transit service that offered higher speeds, more attractive service, and better downtown distribution. In 1962 the city began planning for the construction of downtown subway sections.

LIGHT RAIL CONCEPT

Although sections with complete right-of-way (R/W) separation (U-Bahn) were to be built, the system was not intended to be a full rapid-transit mode. The operating concept chosen from the General Transportation Plan of