Since 1966, system changes have continued to have an impact on available financial resources. By 1975, expenses paid from the general construction fund (which was initially funded by the general obligation bonds) had increased $66 million over the 1966 reestimate. This increase reflects unanticipated expenses for construction (largely inflationary, except for elevator installation), increased Joint Venture fees ($23 million in additional expenses not programmed in 1966), the costs of agency agreements -- many of which were not anticipated -- inflated land values, and, most significantly, pre-full revenue operating expenses, security, maintenance, and startup costs (an increase of $65 million).

d. Costs of Design Changes

No single decision was responsible for adding unusual engineering costs to system expense, although the policy of permitting exploration of engineering alternatives and accommodating community demands abetted the tendency. Responsiveness to community demands is treated subsequently; here, however, we can itemize some of the engineering expenses, in addition to design improvements, which results in premature drawdown of funds.

Route location engineering was underfunded from the start. Not only was additional work required in making special alternative location studies in the communities of Richmond, Berkeley, Oakland, San Francisco, Hayward, Albany, and Lafayette, but extensive route location surveys also were required in support of unanticipated proposals for joint use of freeway corridors in Southern Alameda County and Central Contra Costa County. As with all massive public works projects developed during the 1960's, there was considerable demand for public participation. Thus considerable expense was related to participation in public hearings on BARTD planning and implementation issues held at the request of local authorities.

Conceptual work and predesign studies not originally contemplated as a Joint Venture function also expanded the scope of effort beyond that contained in the Composite Report. This included the conceptual developmental engineering for fare collection equipment, which was originally presumed to be part of the equipment manufacturer's effort. Additionally, the Joint Venture retained consulting architects to provide detailed conceptual work regarding the development of aesthetic details for the system as a whole. While the latter provided a landmark and the valuable Manual of Architectural Standards for BART, it was a $370,000 expense not provided for in the Composite Report.

The development of alternative construction methods and the obtaining of rights-of-way entry permits to accomplish soil investigations were further examples of additional scope.

Finally, certain predesign efforts which the Joint Venture accomplished were not part of the original estimates yet, in BART's mind, were a part of a turn-key transit system. These included, for instance, system computer programming, train operation simulation programming, and the design for the District's central control shortwave radio system.

The scope of architectural design was increased substantially over the Composite Report's estimate because of the unique treatment and special consideration for aesthetics which was given to each station as well as other components of the system. The Composite Report set out station design configurations based on competitive utilization of standard features throughout the system. Instead, BARTD made extensive use of separate architectural firms, which resulted in an estimated $3.5 million over earlier projections. The expense of individual design elements included conducting engineering studies, both architectural and structural, which were applicable only to single locations. The evaluation of incorporating train screens, ventilation equipment, and additional escalators were among these studies.

Additional unanticipated costs relate to such areas as surveying, transit vehicle development, engineering (including models), coordination with the Division of Highways, systems operation support and, notably, staff support to the District. This latter category included negotiating and servicing BARTD labor stabilization agreements, assisting District right-of-way activities, providing assistance in public hearings, and assistance in establishing accounting, purchasing, and other system procedures.

e. The Costs of Community Acceptance

A key decision in terms of system design and system expense was the policy of the Board to work closely with local communities in order to accommodate their demands concerning route and

station location and alignment of BART facilities within their communities. In preparing the engineering plan contained in the Composite Report, it was the policy of the Board of Directors to have the District and Joint Venture staffs work closely with the engineering and planning departments of the counties within the District so that each jurisdiction's individual views could be taken into account in developing the plan for a regional rapid transit system. Following the bond election on November 6, 1962, it was the policy of the Board to authorize the expenditure of engineering funds for special studies in response to the requests of individual communities.

Although the District was capable of making unilateral design decisions, local communities retained leverage in their dealings with BARTD since formal agreements were required from each community before BARTD could begin construction. This process of reaching agreement often involved painstaking negotiations over the number of amenities BARTD would finance within the community. Many of the amenities which BARTD did finally provide were not considered in the early cost estimates for the system.

Eventually, 15 miles of the 71-mile system were to be rerouted from their original plan, and sixteen of thirty-four stations would be relocated at community insistence. To date, BARTD has executed 166 agreements, 96 with cities, 10 with counties, 15 with special districts, 34 with railroads, and 11 with the State Division of Highways. The costs of this process was substantial in two terms: time and direct cost. The cost of time was particularly substantial, given the rates of inflation which accrued during schedule delays. Considerable refinement and preliminary work became necessary to gain public acceptance of the system, locally, even after final location and acquisition of right-of-way occurred. This was counter to the basic assumption that work could commence immediately, and hence resulted in substantial delays compared to the original schedules. Agency agreements funded out of the general construction fund alone totaled $82 million. An additional $80 million worth of projects based upon community or agency demands were funded largely by federal assistance.[1] These direct costs were augmented by the inflationary expense which the delays caused by evaluating, approving, or rejecting potential improvements.

---

[1] SFBARTD Comparative Data Report, January 31, 1975.

The nature of delay caused by public or community action can be illustrated in just a few examples. The taxpayers' suit against the District bond election filed in November, 1962 provided a highly visible challenge which caused a 6-month delay. The suit was filed November 29, 1962 and settled, in BARTD's favor, June 10, 1963. During the time of the legal action, an injunction prevented BARTD from disbursing funds to the Joint Venture or committing to construction. The cost of that delay was computed by BARTD at nearly $185,000 of staff expense plus $12 million inflation cost. Intangible costs associated with that delay were the costs of reassembling the engineering team which was getting ready to begin work in November. Although the latter expense has been mentioned repeatedly, it was reduced in magnitude by the decision of the joint venture to continue work during the lawsuit based on its confidence that the lawsuit would be settled in BARTD's favor. The Joint Venture incurred approximatley $250,000 of expenses which were later honored as reimbursable by the District.[1]

In downtown San Francisco, fourteen citizens advisory groups raised questions concerning BARTD facilities planned in the City. Over the course of 16 to 20 months, BARTD sought an agreement on station mezzanine extensions, station locations, depth of BART structure below the ground, separate utility chases, the width of sidewalks, the development of plazas, the lengths of Muni platforms, and location of station entrances, all seeking to satisfy the citizens advisory groups that land use or traffic ciruclation patterns in downtown San Francisco would not be adversely affected.[2] The inflation costs associated with the delay these negotiations incurred have been estimated at $6.5 million, with the cost of staff work estimated at $1.1 million. Additionally, of course, one must take account of the costs of the betterments which were accepted subsequent to agreements. In downtown Oakland, similar discussions caused a delay of 8 months and an associated inflation cost of nearly $1 million.

One of the more highly publicized controversies between BARTD and the local community occurred in Berkeley. In "Regional Rapid Transit," the entire route alignment through Berkeley was aerial. Subsequent to that report and prior to the Composite Report, Berkeley planners proposed a modification to the section of BART which would be within the Berkeley city limits, moving the alignment and placing a portion of it underground. In the joint venture's final planning between 1959 and 1962, the engineering consultants agreed to place the central portion of the line (about 1 mile) underground. In local hearings, this plan was accepted by Berkeley, although considerable disillusionment with the aerial structure was expressed.

---

[1] McDonald & Smart, Inc. interview with Jack Everson, PBTB.

[2] BART Response to Senator Nejedly's Questions Concerning the San Francisco Bay Area Rapid District District, Oakland, California, BARTD Office of Research, February 3, 1972.

In 1963, a new mayor was elected in Berkeley, Wallace Johnson, who felt strongly that BART should be placed underground through Berkeley, primarily because the aerial structure was viewed as having a blighting influence, creating a psychological barrier between blacks and whites (since the street down which the alignment runs is more or less the border between the black and white neighborhoods of the city), having a detrimental impact on businesses along its route, and being aesthetically unattractive. A committee of the City Council, headed by Mayor Johnson, was appointed; and, in the spring of 1964, it came up with a proposal calling for the sale of "tax allocation bonds," $6.2 million of which would be earmarked for construction of additional subway alignment. The scheme would call for the city to purchase the right-of-way under urban renewal programs; bonds would be paid off from income from the sale of these properties, the value of which presumably would be greatly increased by the BART construction.

The City Council committee concluded that only a border-to-border subway would raise the property values along the right-of-way sufficiently to permit tax increment funds to pay for the subway. Based on this determination, the city requested BARTD to provide an estimate of the additional costs of total subway construction.

This was the beginning of a continuing exchange over the estimated cost of Berkeley's request. BARTD's engineers' preliminary estimate of the incremental cost of placing the route underground was $21 million. Berkeley's engineers, on the other hand, adamantly defended an estimate of $10 million for realigning the route underground. Berkeley estimated it could raise $6.2 million from the tax allocation bonds and had received a HUD capital grant of $4.7 million to assist in covering the remainder. During the course of over twenty meetings of the BARTD Board of Directors and monthly staff discussions, the Joint Venture engineers and the Berkeley City Council argued their respective estimates, which were important to the implementation of the undergrounding. While Berkeley was willing to pay the incremental cost, BARTD required that financing to cover the entire amount of their estimate be earmarked prior to construction.

On September 11, 1964, the BARTD Board announced its decision. It rejected Berkeley's request for an all-subway system, although the rejection was couched in terms which permitted negotiations to be pursued. Quiet negotiations carried on between Mayor Johnson and Adrian Falk, Chairman of the BARTD Board, resulted in an agreement on October 22, setting up a procedure authorizing BARTD to call for bids on the aerial

section in four parts of the city and on subways in two shorter extensions on either side of the central station (which the city could finance from available resources). This did not foreclose the option of extending the subway the whole length of the city, although that consideration was held in abeyance until adequate financing was arranged. Furthermore, the two short subway extensions would at least provide reliable cost estimates for the entire length.

Following the opening of bids, which came to an estimated $7.1 million for the two shorter extensions, the joint venture estimated that the total subway cost would be $25 million. The Berkeley City Council then decided to offer the voters of Berkeley a choice between the shorter or longer subway extensions. The city asked BARTD to hold an election containing three propositions: first, to establish a special district within the BART District in which a bond election could be held; second, to approve a bond issue in that special district for $2.4 million, the difference between the subway bids and the HUD grant; or, third, to approve a bond issue of $20.5 million to cover (with the HUD grant) BARTD's estimate of the construction cost of placing the entire route underground through Berkeley.

A citizens committee was established in support of the proposition for the longer Berkeley subway. Members of the City Council strongly backed -- and even led -- the citizens committee in a campaign to approve the larger bond issue. It was a strong campaign which rode the crest of much anti-BART sentiment, encouraged by the San Francisco Chronicle's vitriolic campaign against the District. Endorsement of the committee's position on the larger bond issue was received from the full spectrum of citizen and political organizations, from the conservative Berkeley Citizens United to the radical Committee for New Politics. Even groups who opposed rapid transit supported the referendum, perhaps as a means of placing BARTD in the adversary role.

The election was held on October 5, 1966, two years after the agreement between Mayor Johnson and Adrian Falk. The approval of the larger bond issue was overwhelming -- 82% favorable. Thus, in the most dramatic confrontation between BARTD and the community, BARTD's planning was reversed, although at community expense rather than at BARTD expense.

While BARTD did not agree with the psychological and aesthetic reasons for rejecting the aerial alignment, its basic defense of its earlier plan was based on the additional cost of placing

the route underground. Berkeley's bond issue satisfied the financial concern of additional cost for improvements, but it did not cover the inflationary increment to BARTD's share. The subway dispute had caused a significant delay in the timing of BART's construction.[1]

This was not the only delay in the Berkeley segment of the Richmond line. The Mayor and City Council had agreed on station designs in which both the northern and southern Berkeley stations would be partially above ground. The design of the Ashby station, the southernmost, included a 700-foot long, 5-foot high surface skylight, which permitted natural light into the underground subway station but created a surface barrier along its length. In the area surrounding the station, however, the route more or less divides the black and white neighborhoods. Thus, the issue of BART dividing the neighborhoods, an issue raised against the aerial structure, resurfaced.

In mid-December, 1967, Ronald Dellums, then a Berkeley City Councilman, decided to take the design of the station to court, arguing that the understanding of the voters at the time of the referendum had been that the entire line through Berkeley, including the stations, was to be underground. The case was decided in May, 1968 (months after bids were to have been opened for the earlier design) in favor of placing the entire station underground. The entire process of design and construction needed to start again. In this case, BARTD argued, justifiably, that both the Mayor and the City Council of Berkeley had previously approved the established design, and that this should provide BARTD with the local authority to proceed with engineering and construction. BARTD considered it unreasonable to be required to make a change which they estimated would add up to $2.5 million to the station. The court's decision, however, was binding.

While few of the responses to community action were as dramatic as that of Berkeley, nonetheless they had an impact both on schedule and cost. In Richmond, agreement on station location, yard size, vehicle underpasses, pedestrian overpasses, and station site development caused a 13-month delay in schedule. In Concord, agreement over the structure and Chabot

---

[1]The bids for the Berkeley subway were opened at the end of May, 1968, and, of note, the bid of the successful contractor was $12.5 million, much closer to the Berkeley estimate than to the Joint Venture's.

Canyon delayed the schedule 4 months, and agreement over traffic circulation at the station and utility relocation delayed the station facility construction 5 months. In San Leandro, agremeent was reached 6 months behind schedule; in Alameda County, 8 months behind schedule; and in Hayward, 13 months behind schedule.

The process of coming to an agreement with the local communities and gaining interaction with citizens groups and local government are necessary components of the planning for a rapid transit system. At the time of BART's planning, however, the length of time necessary to reach agreement was totally unforeseen. With the acceptance of the Composite Report, it was believed that agreements with local communities could be handled expeditiously, and that most route location and design issues already had been resolved at the local level. After the bond issue, however, many of the local communities realized the significance of BART and its immediacy. Their serious attention was suddenly brought to bear on the question of BART's contribution, responsibility, and potential for the local community.

These costs cannot be ignored when imposing a rapid transit system on an area. However, community interaction must be considered explicitly in scheduling a rapid transit system; consideration of the costs must be in terms of the phasing of construction to respond to community demands as well as the expense of improvements. The failure of the Joint Venture to consider these costs might be underplayed, since there was little precedent. Nonetheless any future system must consider this interaction an integral part of plan implementation and cost.

f. The Watershed: The Oakland Subway Bid

A fiscal year-end audit in mid-1965 punctuated the concern that costs were running beyond the initial Composite Report estimates, and that drawdown of funds was occurring more rapidly, relative to construction benchmarks, than had been envisioned initially. This concern reached crisis proportion in December, 1965 with the receipt of bids for the Oakland subway between 24th Street and Madison, and the transbay tube.

Throughout 1964 and 1965, construction contracts had come in generally below either the Composite Report preliminary cost estimates or the final engineering estimates prepared subsequent to the bond issue. On the other hand, unscheduled drawdown on funds had been occurring for non-construction activity,

including right-of-way acquisition, engineering, and design expenses. Excluding the Oakland subway and transbay tube bids, the thirteen previous construction contracts had been an average of 14% below the final engineering estimates and 16% below the Composite Report estimates. Thus, concern over construction costs was minimized.

In the case of the Oakland subway, however, the Composite Report had budgeted $26 million. In the final engineering, the cost estimate had increased dramatically to $49 million. While this increase sought to accommodate the inflationary pressures, the full impact of Vietnam-related reduced competition among contractors was further emphasized when only two bids were received on the subway contract on December 3, 1965. The low bid was $61.5 million, a 135% increase over the Composite Report estimate and a 25% increase over the final engineering estimate.

Six days later, the transbay tube bids were opened. The same two construction firms bid on the transbay tube, although Perini Corporation, which came in with a low bid for the Oakland subway, came in high on the transbay tube. The low bid for the tube was nearly $90 million, or 51% above the Composite Report's $59.5 million estimate and some $8 million in excess of the final engineering estimate. The transbay tube bid was alarming, although less immediately critical since the Division of Bay Toll Crossings had agreed to fund the tube from toll revenues on the Bay Bridge. While negotiations were necessary to expand the funding from toll bridge revenues, at least the tube was not funded from the finite bond issue sum available for system construction.

The need for a total reestimate of the original costs for constructing the basic system and the transbay tube was manifest. By July, 1966, the engineers had revised all cost estimates for construction on the basic system and the transbay tube. It was determined that the basic system would experience a cost overrun of $151 million, bringing the total cost of the system to nearly $942 million (later in 1966, this was revised to $992 million). The reestimate indicated a cost overrun on the transbay tube and approaches of $47 million. Thus, by the end of 1966, the BART system was reassessed as a $1.2 billion transit system. Table IV-4 illustrates the relative increase in each category of expense as a result of the July, 1966 reestimate. Sixty percent of the 1966 forecast was credited to inflationary increases, while the remainder was assigned to the increase in scope over initial plans.

Among the policies which the Board adopted subsequent to this reestimate was a strong cost control policy. In the case of the Oakland subway bid, the District permitted both bids for Contract K0011 (the Oakland subway) and repackaged the contract into six smaller contracts. Although construction was delayed 8 months by going out to bid a second time, design modification reduced the cost $3.9 million. More substantial in nature, however, was the impact which the increased competition for the smaller contracts caused in the ultimate bid price. Firms which did not have the size to undertake the entire subway contract were able to bid on the smaller segments of the contract. As a result, the total bid price for the six contracts which comprised a scope of work similar to contract K0011 was $47 million, quite close to the engineers' estimate prior to going to bid.

The new subway bid notwithstanding, there was an immediate need for $150 million in additional financing. The 1966 reestimate had considerable impact on both the subsequent schedule for construction and the costs of remaining elements of the system. The transbay tube contract and the repackaged Oakland subway contracts were signed and construction commenced. From 1967 through 1969, a period of acute financial austerity, contract awards were stretched out as funding became available. This policy of putting out to bid only those contracts which could be fully covered by available resources had particular implications for the rolling stock. The bids for transit vehicles were received in 1967, but since the funds were not available, they remained unopened until 1969. By delaying the order for transit cars from 1967 until 1969, not only were deliveries delayed, but the cost of each car increased from $153,000, estimated in the Composite Report, to $236,000. Undoubtedly, a portion of this escalation must also be attributed to more detailed design specifications. Nonetheless, the inflationary toll was taken on delays.

This provides merely a single example of the cost directly associated with the District's financial constraint. Another example is the contract for electrical substation equipment. As a cost reduction measure, the initial contract was sufficient to build only 60% of full design capacity, or just enough to power an abbreviated fleet of 250 cars.

g. Board Policy on Long-Range Financing

In recognition of the needs for alternate sources of financing, on September 8, 1966 the Board of Directors of BARTD committed itself to building a complete, operable regional rapid transit system fully consistent with the standards that were set in the Composite Report. This commitment was clear; the system which was proposed to the voters in 1962 was the system which would be constructed. This policy position, however, was not adopted without considerable debate.

In order to accomplish this goal, every effort was being made to control and reduce costs, without compromising standards. The District also increased its efforts to gain federal support. Finally, the decision was reached to consider truncating the basic system through phasing construction in those elements of the system which would result in lower patronage requirements. Thus, some 55 miles of the 71-mile system would be completed.

Throughout this period, the assumption was maintained that operating revenues would exceed operating costs, hence funding need only be sought for system completion, not operation. The Board, however, was not alerted to the danger that rolling stock would also have to be externally financed. The General Manager was particularly reluctant to make this concession.

The position the Board stated was that it would make every effort to seek additional funds to complete the system, and only failing that would it consider a deferred program of construction which would complete a smaller system first. With this policy position, quoted below, the District proceeded for two years to pursue state approval of additional tax support and federal funding.

> "In summary, it is possible that additional funds and cost reductions may reasonably be expected to provide the funds necessary to complete a regional system. The federal capital grant funds and additional revenue derived from interest-bearing time deposits may total as much as $100 million according to present estimates. Cost reductions and deferrals could well amount to as much as $50 million.
>
> "Should, however, the District find it impossible to complete the basic System within the limits of available funds, and after taking into account practical deferrals in the program of construction, it contemplates seeking voter approval of a second general obligation bond issue in whatever amount may be necessary. Under existing law, the District may issue general obligation bonds, up to a limit of 15 percent of the assessed valuation of taxable property within the District. Because of the constant growth annually in the value of such taxable property on its assessment rolls, it will be possible by 1969 to issue an additional estimated $68,000,000 in bonds, providing their issuance

is approved by the electorate. If necessary, the District also contemplates requesting the Legislature to amend its enabling act to increase the bonding limit to 20 percent and possibly to modify the voting requirement. Public confidence in the program as expressed when the voters approved the original $792,000,000 bond issue is expected to assure their approval of whatever additional financing is required."[1]

C. Operating System Engineering

The characteristics of BART which facilitated public acceptance of regional transit -- the high technology, advanced state-of-the-art engineering concepts -- also were responsible for considerable concern as the equipment and facilities were placed in operation. Expectations were high for a sophisticated rapid transit system based on new, highly automated technology. From the inception of the Commission in 1953, the public information efforts associated with rapid transit in the Bay Area touted the advanced engineering and associated effectiveness which any proposed system would represent.

The augmented expectations of the public, then, were frustrated as costs soared, delivery schedules were delayed, and performance failed to meet anticipations. The difficulties of a new system would have in meeting performance specifications were recognized early in the history of BART planning. Thus, an approach to evaluate system needs, as well as the solutions to those needs, was devised.

One must realize that the advocates of regional transit in the Bay Area, from the earliest days, possessed a conviction not only of the need but also the form of the solution. Operating characteristics for BART were determined long before technical systems to fulfill them were adapted to BART's use. (Many of the systems were premised upon systems that were operational in different applications, such as aerospace.)

This section reviews the evolution, rather than distinct decision points, of some of these characteristics, and the decision process related to the technical choice of potential operating systems which offered alternatives.

---

[1] Policy Statement on Long Range Financing, adopted by the Board of Directors on September 8, 1966.