

the moanalua corridor: environmental problems along the proposed route of hawaii interstate h-3

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Even in the "Paradise of the Pacific," Honolulu and the island of Oahu have not escaped traffic congestion. Eighty percent of the population of Hawaii, or 650,000 people, live in the 600-square-mile area of Oahu and create a traffic problem of major magnitude. Following the precedent set by mainland cities, we have attempted to cope by planning and building freeways. Three have been scheduled so far; H-1 is operational, and H-2 is under construction. The peripheral parts of H-3 are already under construction, and construction of the major part will probably begin within the year (Fig. 1).

Although H-1 and H-2 were favorably accepted, H-3, planned to link the windward and leeward sides of Oahu by crossing the Koolau Range through the relatively undeveloped Moanalua corridor, has generated considerable opposition. The sources of this opposition and the less than enthusiastic response to the upcoming freeway construction illustrate not only some interesting, although somewhat confusing, contrasts but also some serious deficiencies in the traditional transportation planning process. Planning for H-1 began in 1959. Similar planning techniques were used for H-2 and H-3. It appears now that the time lag between the planning of H-1 and the construction of H-3 coupled with the aroused concern that has developed for the environment is the reason for the opposition to H-3. In any event, looking back on the events as they occurred is an educational experience.

IN THE BEGINNING

The first automobile come to Oahu in 1898 and, as elsewhere, was immediately popular. Even though there were few reliable roads, automobile ownership continued to increase, and the demand for road construction had generated enough pressures that Hawaii finally won approval to receive funds legislated in the Federal-Aid Highway Act of 1916. This participation established a significant precedent for later highway funding.

By 1959, as shown below, vehicle ownership had grown to the point that the transit system, which had been operating profitably since 1921, began to feel the effects. In fact the number of annual transit revenue-passengers dropped by a third between 1945 and 1950 (and is still dropping even today). Urban expansion, which got off to a faltering start prior to World War II, picked up momentum during the 1950's, and traffic problems increased proportionately.

<u>Year</u>	<u>Vehicles</u>
1920	6,000
1925	17,000
1950	82,000
1958	135,000

Because of the precedent established earlier, the Territory of Hawaii was eligible for inclusion in the Federal-Aid Highway Act of 1956. This new money available for construction coupled with the mounting traffic problems made the need for transportation planning quite obvious. So, planning for an Interstate Highway System on Oahu was begun.

OAHU TRANSPORTATION STUDY

The Oahu Transportation Study (OTS), an island-wide transportation study, was authorized in 1962, and work was actually initiated on March 1, 1963, as a joint project of the state and the City and County of Honolulu (the majority of the people on Oahu live in the district of Honolulu, and the entire island is under one city-county government). The study's findings, based on traditional transportation planning procedures of the Federal Highway Administration, were published in 1967.

Unfortunately, because of mounting pressures to ease the traffic congestion problem, freeway planning began prior to island-wide transportation planning, and the corridors for all 3 freeways were selected before OTS was completed. In fact by the time OTS was completed, H-1 was under construction, the final design for H-2 was accepted, and the preliminary design for H-3 had been completed.

The island-wide transportation plan prepared by OTS was essentially a highway-oriented plan. Rapid transit was proposed only along a corridor passing through the central portion of Honolulu, approximately paralleling H-1. The lack of emphasis on transit was based on modal-split characteristics observed during the early 1960's and on forecast vehicle ownership characteristics. Minimal transit usage was forecast along the H-2 and H-3 corridors.

H-3 CORRIDOR STUDY

To a certain extent, the need for the 3 transportation corridors, which have become freeway corridors, really could have been located without the aid of sophisticated models because the need to serve the 3 distinct sectors of the island was obvious. Most of H-1 is now open and actual use has proved its utility. The structures on H-2 are complete and paving will begin in the fall of 1972, so worrying about the suitability of its location is an exercise in futility. But construction of H-3 has not reached the point of no return. Because of this, a review of the H-3 corridor location process is appropriate.

Major determinants of route selection for highways linking the windward and leeward sides of Oahu are the deep valleys curved into the leeward slope of the Koolau Range. Studies were made of 5 potential corridors that take advantage of the valleys of Moanalua, North Halawa, Kalihi, Nuuanu, and Manoa (Fig. 2). At a public hearing in January 1965, the state discussed these potential corridors and explained that the North Halawa corridor was not receiving further consideration because it failed to provide the required traffic service. The Nuuanu corridor and the Manoa corridor presented multiple difficulties: displacement of families, additional congestion of existing connecting highways, and great disruption of existing facilities during

Figure 1. Proposed freeways for Oahu.

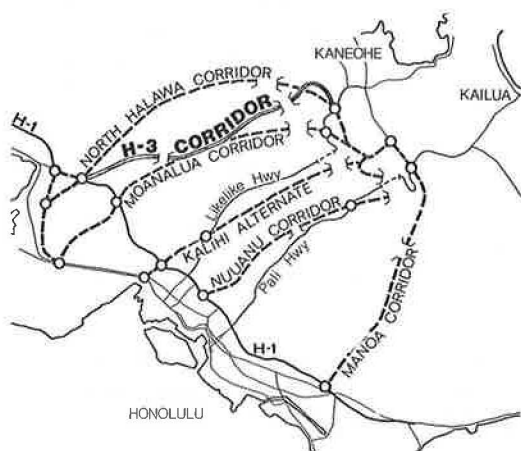
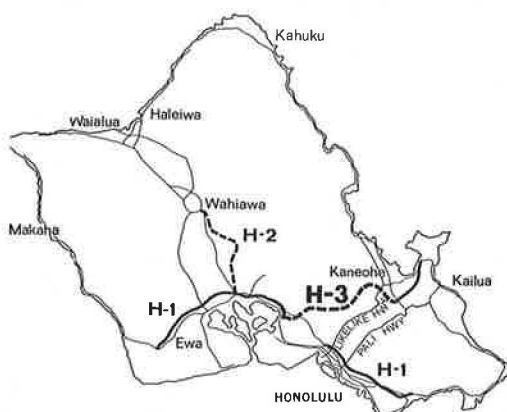


Figure 2. Corridors considered for H-3 route.



construction; hence, both of these corridors were also dropped from consideration. During the public hearing, the state indicated that it favored the Kalihi corridor. However, at the public hearing the community opposed the Kalihi corridor for reasons similar to those the state posed for Manoa and Nuuanu and strongly supported the Moanalua corridor. For example, the Chamber of Commerce of Honolulu stated (1), "The Moanalua corridor would open a completely new scenic area which would be a tremendous asset to the state." The Oahu Development Conference stated (1), "The ODC believes that the state has a rare opportunity to design and construct through Moanalua Valley a scenic freeway that could be one of the most dramatic in the nation."

In response to the opposition generated by the Kalihi corridor proposal, the state changed its plans and came back to community meetings in May 1965 with the Moanalua corridor design. This corridor concept received substantial support at the May meeting and little or no opposition. The state continued further development of the Moanalua corridor; and, when the OTS plan was adopted in 1967, the state felt it had satisfied most interested parties, and the Moanalua corridor design was adopted. During October and November 1969, the state published notification of the opportunity for public hearings to discuss the design. No requests for public hearing were received. Following this, the state requested the Federal Highway Administration's approval of the design, and in August 1970 the approval was received.

The approved proposal involves a 9.4-mile, divided 6-lane freeway designed to Interstate standards. The construction cost is estimated to be \$260 million. The cost is high primarily because the design entails 2 tunnels, the 0.4-mile Red Hill Tunnel and the 0.9-mile Trans-Koolau Tunnel. Except for a 1-mile portion of the facility that drops down the Pali cliff on a viaduct, the freeway will be at-grade. There will be only 2 interchanges plus the connector to H-1.

H-3 ENVIRONMENTAL IMPACT STATEMENT

It is questionable that the requirements of the National Environmental Policy Act for the preparation of an environmental impact statement applied to a project for which planning and design had proceeded as far as they had for H-3. However, in similar cases, the courts have tended to hold that the projects are not exempt from the act (2). Perhaps for this reason, and certainly because the Hawaii Department of Transportation wanted to have H-3 built quickly and openly with as few interruptions as possible, it arranged for the preparation of an environmental impact statement.

The first draft of the environmental impact statement was issued in June 1971, 9 months after FHWA had approved the design. The statement, prepared by a consulting firm, which was to have a contract to finalize certain aspects of the H-3 design after

the project passed the environmental review, was, on the surface, an extensive document. It contained a justification of the need for H-3, the alternatives, a project description, and a discussion of the environmental impact of the route including visual impact and aesthetics, noise, air quality, water supply, stream flow, erosion and siltation, displacement of families, business and employment, agriculture, schools and religious institutions, public recreation facilities, vegetation, wild life, historical and natural features, and public transportation.

The draft was mailed to the appropriate city and state agencies, to the Environmental Center of the University of Hawaii, and to a number of environmental community organizations. The response to the draft provided local planners with a fresh insight into the changeable nature of planning goals as perceived by the more vocal community groups. Community groups that had come out in favor of the H-3 design 5 years before were now violently opposed. Whereas no one was concerned enough in 1969 to attend a public hearing to learn about the design, by July 1971 officials of the transportation department were asked to attend as many as 3 public meetings on the same night. Groups were formed to "Stop H-3," and other groups were formed to "Save H-3"—usually the groups opposed were more vociferous than those in favor.

RESPONSE TO THE DRAFT STATEMENT

Responses to the draft statement were collated by the Hawaii Department of Planning and Economic Development. Most of the responses from city or state agencies approved the impact statement or at least did not disapprove. Most of the responses from community groups that engaged in critical review disapproved of the draft and questioned the state's assessment of the environmental impact that would result. Analyzing a summary of the response prepared by the University of Hawaii Environmental Center provides a more or less moderate view of criticism of the draft. The university's critique stated (3), "If the H-3 route could be justified, the justification would require much more understanding and evaluation of the environmental impact of the project than was displayed in the impact statement under review which was in some respects inaccurate or misleading and which is in important aspects incomplete." The major points subject to argument can be divided into 7 categories detailed below.

Relation of Freeway Width to Valley Width

The project description did not disclose the exact alignment or configuration of the road. From the discussion, it was not clear whether the highway was at-grade or elevated or whether the centerline followed or was displaced from the axis of Moanalua Valley. A route map showed the highway crossing the Moanalua Stream at least 20 times. The estimated effects of the highway on water, soil, and aesthetics obviously depended critically on whether construction within the valley was to be primarily cut-and-fill with extensive stream relocation effectively reducing the number of stream crossings or primarily a viaduct with limited cuts and fills.

The Moanalua Valley ranges from 2,500 to 6,000 ft in width, yet no note of the width of the highway in relation to the width of the valley was made. Thus, the freeway could have occupied from 10 percent to 50 percent of the valley floor depending on the design, but exactly how much of the valley would be covered and what the effects would be were never discussed.

Effects on Vegetation and Wildlife

The portion of the impact statement dealing with vegetation and wildlife hardly hinted at major questions such as the degree of disruption of the various ecosystems traversed by the route and the value of preserving those ecosystems. The ecosystem problem is complex because there is often an enormous range in ecological conditions in Moanalua Valley related especially to variation in rainfall. Moderately dry-land vegetation predominates in the lower part of the valley and rain forest vegetation in the crest area. Evidence could be found that many botanists do not put a high value on preserving the existing vegetation in the valley, but the question was not discussed specifically in the draft.

There was no discussion of the effects on fauna except the claim that the highway will have negligible effect on land animals and birds. Ignorance was very likely the major reason for the slight degree of concern with faunal effects.

The statement indicated little concern with the effects on agriculture. It recognized that attempts would be made to relocate banana farms displaced by the highway but did not recognize the great difficulty of finding other lands with the necessary combination of soil, climate, terrain, access, and ownership.

Effects on Water

In its proposed route through Moanalua Valley and through the Koolau ridge, the proposed H-3 freeway would or could have many effects on water—influencing ground-water recharge, groundwater storage, floods, dry-weather stream flows, and surface-water quality. The draft impact statement mentioned only 2 effects: those having to do with groundwater recharge and low-water stream flow. The effects on flood flows and water quality, certainly the most significant expectable, were not even mentioned.

Construction of the highway will prevent infiltration of precipitation through the pavement, perhaps restrict infiltration of precipitation on the shoulders and the steep slopes of cuts and fills, and prevent seepage from those parts of the stream confined to lined channels. The naturally occurring infiltration and seepage recharge dike compartments in and windward of the Koolau ridge and, to leeward, the basal groundwater transitional between the Honolulu and Pearl Harbor areas. The dike water infiltration from the vicinity of the proposed highway may supply part of the discharge of a Board of Water Supply tunnel as well as provide low flows of windward streams and recharge to the leeward basal groundwater body. The leeward basal groundwater body is the main source of water for the Honolulu-Pearl Harbor area. The effects of the reduction in infiltration on water supply did not seem likely to be important, but their appraisal seemed essential in the impact statement.

The effects on flood flows in the Moanalua Stream are likely to be very great, especially if the 1967 plans are followed. These plans call for the construction of a flood control reservoir, which was only hinted at in the statement in its reference to a request made by the Damon Estate trustees "that the state reexamine its plans to construct a reservoir at the South Branch of Moanalua Stream" (3), a request to which the state agreed, subject to determination of feasibility. It appeared that this reservoir, not elsewhere discussed in the statement, has been designed to reduce the flood-carrying capacity necessary in bridges, culverts, and channels downstream, including already existing structures below that part of the valley to be occupied by the highway. Obviously the effects of this reservoir needed discussion in a comprehensive environmental impact statement. So, too, should have been included the possible effects of grading and paving on flood flows.

Very likely the most profound effects of the proposed highway construction on water will be on the quality of the water delivered by Moanalua Stream through its channelized lower course to Keehi Lagoon. During floods, Moanalua already carries enough sediments to run red. The source of the red soil it carries is uncertain because the soils of the upper valley are brown and gray. With the extensive cut-and-fill work proposed by the 1967 plans for the proposed highway, the additional burden of soil that will be carried by the stream will be very great. The resulting increase in water pollution, which warranted thorough examination in the light of the state's water quality standards, was not mentioned in the impact statement.

The flood control reservoir in the 1967 plans would reduce sediment yield from the southern branch of the valley but at the expense of loss of useful life. Quite probably this reduction would be offset by the increase in erosion resulting from increased flood flows from the paved and graded areas and the greater rates of flood discharge produced by straightening and shortening the stream channel. In particular, the cuts and fills will be extremely susceptible to erosion during construction. Stilling basins shown in the 1967 plans are obviously designed only for dissipation of hydraulic energy and not for sediment trapping. Limitations to the effectiveness of revegetation of cuts and fills are discussed in connection with effects on flora; and, even with extraordinary controls on sediment production and transport, not indicated in the statement, acceleration of erosion and the transport downstream of sediments and turbidity should be expected.

Effects on Air

The possible deleterious effects of automobile emissions produced along the proposed H-3 corridor were passed over lightly in the environmental impact statement in discussions of the Red Hill Tunnel, the Trans-Koolau Tunnel, and in a brief section on air quality.

Automobile emissions generated within the Red Hill and Trans-Koolau tunnels are to be exhausted through ventilation structures from which, according to the draft, the trade winds were expected to dissipate air pollutants rapidly. How rapidly was not stated. Qualitative observations concerning the air quality of the existing Likelike Tunnel seemed pertinent. That tunnel, located at approximately the same elevation and near the proposed Trans-Koolau Tunnel, utilizes, as far as could be determined, the same mechanism for ventilation. The air quality of the present tunnel is often poor at least in terms of objectionable odor. The possibility of adverse health effects due to carbon monoxide buildup if automobile traffic were stalled within the tunnel is also of concern.

According to the draft, the northeast trade winds are expected to dissipate quickly and effectively the pollutants emitted by automobiles within Moanalua Valley. Again there was no quantitative estimation of the rate of dispersion. It should be recognized, however, that moderate to strong trade winds blow only about 70 percent of the time. During the other 30 percent of the time there are either kona (south to southwest winds) or relatively calm conditions—what would happen then?

There was in the draft no mention of the damaging effects to vegetation of ozone, PAN, and oxides of nitrogen or of the concentration of lead in vegetation and soil that might be expected near the highway. Besides these effects on the natural vegetation, there should have been discussion of the effects on the banana farms through which the highway will pass on the windward side of the Koolau Range and on the plantings in the planned botanical gardens in Moanalua Valley.

Effects on Archaeological Sites

The draft impact statement indicated a commendable concern with possible effects on archaeological sites in Moanalua Valley and referred to a report on such sites resulting from a Bishop Museum study supported in part by Department of Transportation funds (4). The statement concluded that the effects would be slight. It was, however, difficult to reconcile details in the statement with the museum report. According to the report, 20 sites are included within the highway right-of-way. All but 4 of the sites will remain unaffected by the highway, and these 4 will be relocated. But, the 4 sites are not identified.

Noise Effects

The draft statement indicated (1), "The Department of Transportation anticipates a substantial reduction in noise from motor vehicles. A special acoustics consultant is being engaged, and it is expected that the state's program of noise minimization will be effective." This statement was questioned for a number of reasons.

Experiments have shown that sound can be attenuated if the path of propagation passes through extended areas of dense planting. The required thickness of planting varies with the density of plant material and the frequency of the sound. A given thickness is more effective at the high end of the audio frequency spectrum than at the low end. Generally speaking, a thickness of dense planting of the order of several hundred feet is required to have an appreciable effect.

The planting is effective only when the sound passes through it, for the attenuation results primarily from a combination of reflection, refraction, and absorption of the sound energy by the plant material. Where a highway is elevated, or surrounding land areas are elevated, the sound energy often can follow a direct path from the source to an observer. In addition, in steep-walled valleys, sound may be reflected from rock faces.

With respect to Moanalua Valley, it seemed doubtful that planting alone will allow retention of the valley's present noise-free quality. Large diesel trucks create

significant amounts of acoustic energy at the very low frequencies on which planting has the least effect. The high walls of the valley, on the other hand, are likely to be efficient reflectors of this same energy. It is probable that truck exhaust noise will be audible throughout most of the valley region, and it is likely to be distinctly intrusive within approximately 1,000 ft of the highway. Almost the entire bottom area of Moanalua Valley lies within approximately 500 ft of the proposed H-3 route, and the slopes, which are to be included in the proposed park, cannot be shielded effectively from noise by any plantings.

Another potential problem area is the windward-viaduct section of the proposed route. The buildings of the Kaneohe State Hospital, a mental hospital, are located between 500 and 2,500 ft of the windward viaduct. Unless precautions are taken in the design of this viaduct, the patients at the hospital can be exposed to a psychological stress caused by traffic noise. Because of the nature of the patients at this hospital, the additional stress could have an important effect on their treatment.

Visual Effects

The draft indicated that the transportation department was concerned with both views of the surroundings from the highway and views of the highway from its surroundings. To quote from the Environmental Center review (3): "Without question, the highway, even designed to defense highway specifications rather than to truly scenic highway specifications, will afford a scenic ride to the motorist in both Moanalua and windward portions." Doubtless, too, detriments to the scenic characteristics would be minimized by skillful architectural treatment and landscaping as suggested by the statement. However, the scale relation between the highway and Moanalua discussed earlier, and probably the similar relation between the windward viaduct and the pali along which it is built, are such that it is extremely doubtful that the obtrusiveness of the highway in its surroundings can be obscured to viewers either on or at a distance from the highway. To visitors in the proposed park in Moanalua Valley, especially, even with the maximum care in design and planting, the field of view will be that of a major highway in a pleasing setting and not that of a beautiful valley incidentally containing a roadway. In particular, it is difficult to imagine how, in either the narrow valley or on the windward pali, the opposing roadways can be obscured from each other as suggested.

Recreational Effects

The draft statement recognized very little impact of the highway on recreational opportunities in the area it will traverse. It overlooked a unique aspect of Moanalua Valley that should have been considered in connection with the plan to develop a park in the valley. The valley had a significant pre-Cook traditional background, as well as some historical importance during the period extending through the periods of the Kingdom and the Republic and into the early period of the Territory. These give special significance to the historic zoning proposal for the park in the valley, which is intended to be not merely recreational but educational. The traditional and historical significance of the valley and the historical zoning concepts embodied in the park plan were nowhere discussed in the environmental impact statement.

The statement declared that the park development and the proposed highway will be compatible and, indeed, that the highway will be advantageous in providing access to the park. Because the highway will occupy so large a part of the valley (most of the valley bottom), because of the traffic noise it will produce, and because of its overwhelming visual impact, it cannot appropriately be considered compatible with the park.

COMMUNITY REACTION

The deficiencies in the draft environmental impact statement as well as a number of points of questionable validity were mentioned by many of the groups that reviewed the statement. Accusations were made, with some justification, that the statement read more like a rationalization for the H-3 project than a critical analysis of environmental effects. However, the major focus of the reviews of community groups was on

alternatives to the construction of a new freeway rather than on its environmental impact. There were questions whether the capacity of the 2 existing highways across the Koolau Range could be increased through the application of traffic engineering concepts such as the use of 1-way routes, reversible lanes, and the widening of the existing roadways so as to eliminate the need for the H-3. There were also questions as to the extent to which the transport needs might be met by public transit. It was pointed out that the modal split between individual automobile transportation and transit that was used to justify the highway was based on characteristics of the early 1960's that might not still be valid, more travelers being willing to consider using transit now than in the past.

Nearly all of the opponents to H-3 came out in favor of transit as an alternative approach to highway construction. However, it was clear that they were thinking in terms not of bus transit but of rapid transit such as subway or monorail. Yet, with a population of 40,000 now on the windward side and of no more than 100,000 within 20 years and most employment opportunities in Honolulu, nearly everyone in this bedroom community would have to take a daily trip on the rapid transit line in order to make it a feasible operation. Bus transit on an exclusive freeway lane is a viable alternative that was not seriously considered in the original draft and gained moderate acceptance during the fall as the controversy continued.

THE PREFINAL DRAFT

Probably had the Department of Transportation foreseen the extent of adverse criticism that was generated by the first draft of its H-3 environmental impact statement, it would have made a strong case for bypassing preparation of the impact statement. Having begun the impact statement process, however, there could be no backing out, and the department had its consultants prepare a new draft. This "prefinal draft" was issued in December 1971.

As contrasted with the 22-page first draft, the new version ran to 5 volumes. The first 96-page volume comprised the statement itself; the second, about 400 pages, contained criticisms to the first draft and responses from the department; and the remaining 3 volumes contained 9 appended reports on special studies. This new draft clearly represented not just more bulk but a much more thorough attempt to identify and where possible to quantify the environmental effects of the proposed highway.

Effects on Erosion and Sedimentation

The new draft recognized that special pains would have to be taken to control erosion from cuts and fills on the highway and to control the resulting turbidity and sedimentation in the waters downstream; it cited controls being used at the Halawa interchange, which was already under construction at the leeward end of the H-3 route, as evidence of successful methodology. With the onset of the kona season rains, however, limitations on the success of the controls at Halawa were becoming apparent. At the opposite end of the highway, on the windward side, special stringency of control is justified because of the special conservation classification of waters of Kaneohe Bay into which the area drains. Effective control cannot be expected from conventional methods in that area or in the upper part of Moanalua Valley because of the high rainfall in those areas. Completely effective control cannot be expected with any practicable measures, and a significant impact of the highway on erosion and sedimentation should be regarded as inescapable.

Effect on Air Quality

Concern over air quality in the tunnels was reduced by a clarification in the prefinal draft of the impact statement that one of the tunnels would be served by a semitransverse ventilation system and the other by a full-transverse system distributing air in-flow over each traffic lane.

The new draft concluded that the effects of the highway and tunnels on open air quality would be insignificant. This conclusion was based on a special consultant study of air

pollution, based on a quantitative diffusion model. The model has, however, been severely criticized. A full discussion of the problem is unwarranted here, but some brief notes may be of interest. The model utilizes a coordinate system moving with the vehicles, but its application to the problem involving a fixed terrain, fixed tunnel portals, and 2-way traffic flow has not yet been satisfactorily explained, although there has now been extensive discussion and correspondence between the air quality consultants and their critics.

Effects on Noise

The prefinal draft also concluded that the highway will have a great noise impact to a distance of only about 200 ft from the centerline, some impact to a distance of about 300 ft in areas with dense vegetation and about 700 ft in areas without such vegetation, and no impact in residential areas. These estimates were based on another special consultant study.

These conclusions have, like the conclusions with respect to air quality, been the subject of considerable discussion and correspondence between the consultants and their critics. The remaining disagreement is in part a function of limitations in the state of the art of noise estimation and in part the result of inclusion of noise levels that clearly have effects on activities such as sleep and recreational enjoyment within the range defined as no impact.

Traffic Alternatives

The 2 existing highways, the Pali and the Likelike, are both 4-lane divided highways. Each highway has grades as steep as 7 percent, and each passes through tunnels beneath the crest of the Koolau Range. There are a number of at-grade intersections along each route. During peak hours the split is about 85-15, and the traffic flow approaches complete congestion, occasionally going into a stop-and-go situation. The combined average daily volume on the 2 routes is about 60,000. The city-owned bus line does not extend to the windward side. A private bus line runs from the windward side to Honolulu on a 45-min headway, and usage is negligible in terms of total daily travel.

Establishing a 1-way pair on the Pali and the Likelike is impractical for a number of reasons. The primary one is traffic safety. The intersections and driveways along the routes would be hard to control. Also, for many streets that converge on these highways, there are no alternative arteries. Hence, a large number of users would be forced to go far out of their way if a 1-way pattern were in effect. Because of the observed low transit usage and the relatively high levels of congestion on the existing routes, the department concluded that no travel alternative existed and nearly all future traffic would have to be carried on a new freeway.

Indirect Effects

In its review of the prefinal draft, the Environmental Center called attention to the fact that the proposed highway, like any other major new transportation facility, would have profound effects on population dispersal and land use and those effects would lead to a host of indirect and ramifying environmental effects not discussed in the statement. The center went on to indicate that capabilities to analyze and predict those indirect effects were severely limited and that only their general recognition could be expected in the framework of an environmental impact statement.

The land use implications of H-3 became matters of general public concern; commentary on H-3 began to appear regularly in the local news media, and by the end of February 1972 the controversy reached proportions sufficient to receive the attention of the state legislature. A joint hearing on the H-3 was held by the senate and the house; no conclusions were reached, however.

In March a further critical review was received from the Environmental Protection Agency (EPA). After claiming that the estimates of damage to vegetation and wildlife in Moanalua Valley were incomplete, that the effects of stream channelization in Moanalua were not considered and the proposed erosion control measures were unsatisfactory,

that the air quality model was of questionable validity, and that the effects on air quality of increased vehicle use were not considered, the EPA severely criticized the lack of analysis and long-range implications and secondary environmental effects. It concluded (5): "The Environmental Protection Agency recommends that Interstate H-3 not be constructed until the existing course of the island's development can be thoroughly examined, focusing on that course's impact on the human environment. This should include administrative and legislative mechanisms established and implemented to ensure that the direct effects of the highway construction and the secondary effects of inducing development are regulated to reduce adverse environmental effects."

While the EPA report was being prepared and distributed, a representative of a local conservation group found that H-3 had never been completely adopted on the Oahu general plan. The city council reacted by directing the city planning department to add all portions of H-3 to the general plan. The planning department responded by saying it would have to study the matter before it could form an opinion. Their study is continuing, and no action has been taken.

CONCLUSIONS

The preparation of environmental impact statements is required by the National Environmental Policy Act in the case of actions supported by federal funds and by executive order of the governor of Hawaii in the case of actions supported by state funds or affecting state lands. These joint requirements have been hailed as a great advance in planning; they have indeed forced planning agencies to take more serious cognizance of the environmental effects of their actions. The extent to which the environmental effects have been identified and analyzed by the responsible agencies or their consultants has varied a good deal from project to project. All too often when an impact appraisal is made by the agency that wants to construct the project or by a consultant hired by the agency, the statement has been a defense rather than an evaluation. This problem is compounded by the effect noted by Winfrey that many transportation planners have lost sight of the fact that transportation facilities are not and never have been ends in themselves (6).

For the H-3 freeway, the extent of the environmental identification and analysis displayed in the preparation of the prefinal draft was greatly increased over that displayed in the first draft, but even so the outcome has been severely criticized by citizen groups, other local reviewing institutions, and even by the EPA. The validity of the criticisms is open to question. Although environmental enthusiasts tend to hold out for complete descriptions of environmental effects and go to the extreme to insist that no project should be undertaken that will have negative effects on the environment, the demands of an increasing population make many public construction projects unavoidable.

If the EPA's review and criticism of the Moanalua impact statement truly reflects the all-encompassing goals of the agency, then future environmental impact statements must consider not only the typical traditional environmental consequences of new construction but also the social implications and urban design trade-offs of public facility construction. Is this all-encompassing review really the purpose of an environmental impact statement?

Public facility construction must continue. The valid points raised by those concerned with the environment must be treated adequately in future design and construction. This will cause design and construction costs to increase—a justifiable increase when one considers the costs that the community has had to bear in the past for narrowly conceived projects that only partially considered the total environmental impact problem. But how much environmental control and design improvement can be accomplished if tools to estimate environmental impacts are unavailable or yield conflicting results? One typical problem illustrated over and over again in the Moanalua example was the tendency for environmental "experts" to totally disagree on basic environmental elements such as noise control or level of air quality. The community has high environmental expectations, but available evaluation techniques and design procedures do not live up to the expectations. An intensive effort must be made to bring about improvements in the techniques of analysis and design of projects subject to environmental impact.

Is the Moanalua case just another instance of environmentalists out of control, or can a community's goals really change completely within the short span of 2 years? The development of the plans for H-3 has taken many years. Concern for environmental quality did not arrive until the end of this period. The further development of alternative plans and the analysis of the environmental effects of these alternatives would take additional time. It is seriously questionable whether the provision of additional needed transportation capacity can be deferred so long, especially if the overall advantages of the alternatives, including the environmental advantages, are uncertain.

Community goals do not change overnight, instead the process is evolutionary and should be reasonably predictable. The obstacle confronting the transportation planner so far has been that he has been so wrapped up coping with the changeable nature of land use and population distribution he has either missed or refused to accept the fact that modal-acceptance characteristics are also changing. This acceptance of transit did not show up in the travel inventories of the early 1960's, but, perhaps for reasons involving environmental impact, the trend is apparent now and growing in intensity.

One of the basic assumptions of many transportation planners is that travel patterns and characteristics inventoried in an urbanized area will remain constant for a 15- to 20-year time span. Evidence on Oahu indicates that this concept is not (or at least is no longer) valid. It appears that travel patterns and modal-acceptance characteristics do change with time.

The Moanalua situation is an example of a transportation plan caught in the midst of change. People on Oahu are not rushing to get on transit today; they have not in the past. But, their goals are changing, and all indications are that people on Oahu will accept transit more readily in the future than they do now. As the acceptance rate goes up, need for new freeways should go down. This phenomenon of changing goals and acceptance characteristics is normal and must be built into the planning process.

REFERENCES

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