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Director of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
Attn: B. K. Grimes, Director
Emergency Preparedness Task Group
Washington, D.C. 20555

Reference: Beaver Valley Power Station Unit Nos. 1 and 2
Docket Nos. 50-334 and 50-412
Requests for Information Regarding Evacuation Times
Dated November 29, 1979, and December 26, 1979

Gentlemen:

In response to your requests for information regarding evacuation times for the general public from an area around Beaver Valley Power Station, the attached Technical Memorandum is provided. The report provides evacuation time estimates for various areas in the 10 mile radius circle for normal weather conditions, flood conditions, and severe winter storm conditions.

The estimated time required to evacuate the ambulatory patients from affected hospitals has been included with non-car-owning population addressed in the report. The time required to evacuate patients requiring ambulance transportation has not yet been determined. This information will be developed at a later date and included in the Traffic and Notification Study.

The time required for confirmation of evacuation has not yet been estimated. In order to estimate this confirmation time, a practical method of confirmation must be developed and implemented. This time estimate will then be provided in the Traffic and Notification Study.

The evacuation time estimates in the report are in agreement with those of principal local officials. Estimates by local officials were on the order of 5 to 7 hours for evacuation of the 10 mile radius area.

If you have any questions concerning this response, please contact my office.

Very truly yours,

BOZ
SE
1/1
HOD:

1867 091

C. N. Dunn
Vice President, Operations

8002040 557

STATE
PROGRAMS
B GRIMES

Technical Memorandum

PRELIMINARY ESTIMATES OF
EPZ EVACUATION TIMES

1867 092

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INTRODUCTION

This technical memorandum describes the preliminary findings of an assessment of the time required to evacuate a nominal 10-mile radius area surrounding the Beaver Valley nuclear power facility.

It is intended to reexamine certain elements of the evacuation process and develop specific recommendations regarding the concept of evacuation and required operational practices. Summarized below are some of the assumptions on which the accompanying analysis is based and some of the issues which will be examined in more detail.

1. An examination is currently underway to determine the method(s) of notifying the area population of an emergency condition. Preliminary indications from this analysis have led to the assumption that the area residents will be notified within about a fifteen minute time period in the event of a general emergency.
2. For purposes of the evacuation time analysis the 1970 U.S. Census data were used. It is recognized that changes in the total number of area residents and their geographical distribution within the area will have occurred

during the last decade. It is intended to update the 1970 population data, but it should be noted that the anticipated changes will not have a significant impact on the evacuation time estimates developed in this technical memorandum.

3. It is intended to make contingency provisions in the emergency response plan for the urban population east of the Ohio River opposite the Borough of Aliquippa. These contingency provisions were not included in the analysis described in this memorandum.
4. The EPZ subarea definitions used in the analysis are considered appropriate and consistent with the needed simplicity required to transmit information and guidance to the impacted population. It is intended, however, to reexamine these subareas to evaluate if additional subdivisions may prove to be feasible for incorporation in the final plan.
5. In Hopewell Township, in the western sector of the EPZ near the 10-mile limit, traffic operational problems in the event of a general evacuation have been identified. Realistic options in terms of traffic operations provisions are currently being evaluated to mitigate the projected problems in this area. Evacuation time estimates have been developed with and without such special provision to expedite traffic flow.

EMERGENCY PLANNING ZONE

The 10-mile radius emergency planning zone around the Beaver Valley Power Station encompasses land areas in three states (Pennsylvania, Ohio and West Virginia). A total of 37 municipal jurisdictions are situated wholly or partially within the 10-mile radius area. These municipalities are listed in Table 1.

In defining the designated evacuations area (nominally representing a 10-mile radius area) the following criteria were used:

1. The designated area must encompass the recommended 10-mile radius area as specified in NRC guidelines.
2. The designated area must be readily identifiable and comprehensible to allow for effective public broadcasting of information and guidance during an emergency event requiring area evacuation.
3. The perimeter of the designated evacuation area should not have major irregularities to maintain a credible area boundary.

A review of the topographic conditions and jurisdictional boundaries in the area surrounding the power station has led to the preliminary definition of the emergency planning zone

as outlined in Figure 1. In addition to the area outlined in this figure it is considered desirable to extend this area eastward across the Ohio River to provide in the emergency plan a contingency action component that would allow for the evacuation of this area in the event the need were to arise. This contingency element of the emergency plan has not been included in this analysis aimed at providing evacuation time estimates for the EPZ, since the additional area is situated outside the 10-mile radius.

A meteorological assessment conducted as part of the environmental report¹ indicates a high frequency wind condition from the northwest quadrant during the winter period and from the southerly direction during summer and autumn. Because of these meteorological conditions the following area sectors have been delineated for potential evacuation.

Ten-mile Area: The total designated evacuation area representing the nominal ten-mile radius area.

Five-mile Area: The designated evacuation area representing the nominal five-mile radius area.

Subarea 1: The area within the EPZ situated in Beaver County north of the Ohio River.

¹Beaver Valley Power Station No. 2, Environmental Report, Construction Permit Stage, Volume 1, June 1972, Appendix A.

Subarea 2: The area within the EPZ situated in Beaver
County south of the Ohio River.

The evacuation of Subarea 1 exclusive of the remainder of the EPZ would provide a public safety response in the event the emergency condition arose during a period of prevailing winds from the southerly direction. The evacuation of Subarea 2 exclusive of the remainder of the EPZ would respond to an emergency condition with winds from the west or northwest. The sectors of the EPZ comprising Subareas 1 and 2 are illustrated in Figure 1.

AREA POPULATION

Within the emergency planning zone, representing a nominal 10-mile radius area around the power facility, there is a resident population (1970) of approximately 155,000. About 50 percent of the area population is concentrated in the eastern segment of the emergency planning zone more than five miles from the plant site. The 1970 area population by municipal jurisdiction is listed in Table 2, and the area population by EPZ subareas is listed in Table 3.

The availability of private cars in the area varies between counties and between urban and rural populations and is likely to impact the overall area evacuation time. The proportions

of households with cars and without cars are summarized in Tables 4, 5, and 6.

AUTOS AVAILABLE IN THE EPZ

The auto availability in the designated evacuation area has been estimated from 1970 U.S. Census data. The total available car fleet is estimated to be about 63,000 vehicles. The vehicle utilization during an emergency evacuation can be expected to be less than 100 percent because: (1) on average about 8 to 12 percent of the vehicle fleet is estimated to be inoperable or being repaired; (2) on average nearly half of the vehicle fleet is owned by households that have more than one vehicle and not necessarily all vehicles would be used for evacuation purposes. The analysis described in this technical memorandum, however, was conducted with a conservative posture and assumed that the entire auto fleet would be used during an evacuation.

NON-CAR-OWNING POPULATION

As illustrated in Tables 4, 5, and 6 a number of households within the designated evacuation area will not have autos available. From survey data in other rural and urban areas it has been determined that the number of persons in non-car-owning households is consistently lower than in car-owning households. This characteristic was allowed for in developing the estimated total non-car-owning population of 13,400 in the area.

Approximately 70 percent of this population group resides in urban centers. A large proportion of the normal tripmaking by persons from non-car-owning households is made on foot or with available public transportation. In addition, there exist social service agencies that provide transportation to select population subgroups in both urban and rural areas. In many instances, however, the non-car-owning population is provided with transportation by friends and relatives. In areas with a high native population (people born in the area in which they reside today) most of the non-car-owning population may be supplied with transportation by relatives or friends in the event of an evacuation. For purposes of making evacuation time estimates, however, it has been assumed that public transportation will need to be provided to evacuate the non-car-owning population.

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EVACUATION TIME ESTIMATES

The time required to evacuate the area population can be separated into two major components: (1) preparation time prior to evacuation, and (2) actual evacuation travel time.

The actual evacuation travel time will be dependent upon the rate at which people will be leaving their home to evacuate the area (i.e. the individual household preparation time required prior to evacuation). Under the assumed condition that there would be a simultaneous exodus from the area the existing road system capacity would be the controlling factor determining the evacuation time. Key locations in the road system would constitute "metering" points allowing traffic to move at a rate consistent with the physical capacity of the system at those locations. It is estimated that under such conditions the actual travel time would range from a low of about 1.5 hours in Hancock County to 2.0 hours in Columbiana County and up to 4.0 hours south of Aliquippa in Beaver County.

It is unlikely, however, that all evacuees will leave the area simultaneously and thus the traffic load on the road system

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will develop over a time span determined by preparation time required prior to evacuation. To estimate the departure rate of evacuees the following action steps and time estimates have been assumed.

CAR-OWNING POPULATION

Assembly of the Family Unit

For analysis purposes it has been assumed that an emergency event would occur during the day on a weekday. In such an event the area labor force will receive notification to evacuate at their place of work. Based upon a 15-minute notification time and immediate broadcasting of public information over radio and television it has been assumed that the entire area population will be apprised of the need to evacuate within about 45 minutes from initiation of notification. The assumed rate at which broadcast information is assimilated by the area population is listed in Table 7 and illustrated in Curve #1 in Figure 2,

The rate at which area workers will leave their place of work to return home and prepare for evacuation will be quite variable, and will depend upon the particular job condition and responsibility level of the worker. A time distribution of employees leaving their place of work has been assumed and is shown in Table 8.

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The travel time of the employees from their place of work to home has been estimated on the basis of generalized work trip time distributions. An average travel speed of 20 mph has been used in estimating the travel time home for the area workers. The estimated worker arrival time at home after initial emergency notification is illustrated by Curve 2 in Figure 2.

Preparation for Evacuation

People can be expected to react differently to any emergency situation, and the conditions imposing an evacuation need on the area population are likely to generate great differences in the amount of time people will spend in preparing to leave their home. In order to estimate the overall evacuation time it has been necessary to attempt a prediction of time that will be needed prior to actual evacuation. Some of the more dominant factors that will influence the time required include:

- Selecting basic necessities for those persons evacuating to public shelter areas as opposed to persons evacuating to homes of friends and relatives.
- Size of the family and number of children.
- Number of cars available.
- Individual sense of urgency.

The predicted preparation times prior to evacuation, shown in Table 8, were derived from the following population categorizations:

- a. A small percentage of the area households are single-person households, and this segment of the population could be expected to be highly mobile and ready to leave in 15 minutes or less.
- b. A larger proportion of the area residents may feel a high sense of urgency and be prepared to leave home within 30 minutes of the arrival time of the worker(s).
- c. The largest proportion of the area residents will require some time to pack some essentials, especially in households with children, and as a result may require 45 minutes to one hour following assembly of the family members.
- d. A proportion of the area population especially those with a business at their home is likely to require the greatest amount of time, not only to prepare for individual family member needs but to secure equipment, etc., and as a consequence, their time needs may be well in excess of one hour.

Evacuation of the Car-Owning Population

The rate of departure from home by the area evacuees is illustrated by Curve #3 in Figure 2. The actual travel time of the evacuees will be dependent upon the areas in which they reside and the available road facilities by which they can leave the area. The four most critical areas within the designated evacuation are are noted below:

- Chester in Hancock County
- East Liverpool in Columbiana County
- Beaver/Monaca in Beaver County
- Aliquippa in Beaver County.

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In each of these four areas the road facilities available for evacuation are limited and traffic delays within these urban centers can be expected.

The rate of traffic accumulation on the road system leaving Chester in Hancock County is expected to induce travel delays in the order of 15 to 30 minutes when about half of the area residents have departed from home. At the time when the last 20 percent of the Chester area residents are preparing to leave home (as illustrated by Curve 3 in Figure 2) the traffic congestion will have largely abated and travel out of the area can be expected to be quite expeditious. It is estimated, therefore, that the car-owning population of Hancock County (about 95 percent of the EPZ population in Hancock County) will have evacuated and be outside the 10-mile radius area in 3-1/2 hours following initiation of the emergency notification.

The traffic accumulations in East Liverpool in Columbiana County, Ohio, will be substantially greater than in Chester, W. Virginia. In excess of 8000 cars will exit the area via a limited number of travel facilities. Traffic congestion and traffic delays in the urban area of East Liverpool will occur and is estimated to involve delays of 30 to 45 minutes. The point of maximum congestion is expected when about 60 percent of the East Liverpool residents have departed from home. Although the number of exit routes from East Liverpool is limited, the available travel

facilities both west and northwest provide adequate capacity to allow evacuation of Columbiana County portion of the EPZ in about 3-1/2 hours following notification of the emergency.

In Beaver County, the more sparsely populated areas directly north and south of the site have adequate secondary road facilities to accommodate the expected traffic loads and evacuation of the car-owning population from these areas is estimated to be complete within about 3 hours following notification. An exception to this time estimate may exist dependent upon the "close-down" time required by a small group of workers in the Crucible Steel Plant in Midland.

The area of Beaver/Monaca at the junction of the Ohio River and Beaver River is estimated to experience congestion and delays similar to the conditions in East Liverpool. Total evacuation time of the car-owning population in this area is thus expected to be complete in 3-1/2 hours following the initiation of emergency notification.

The city of Aliquippa and Hopewell Township represent the greatest concentration of population within the EPZ. The three major travel facilities available to evacuate this area are Route 60, Route 51 and Constitution Blvd. along the west bank of the Ohio River. Route 60 is a major, limited access facility

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and is expected to carry a substantial proportion of the traffic load generated in the Aliquippa and Hopewell area. The access restriction to Route 60, however, will induce major traffic concentrations on Route 51 and on Constitution Blvd. As a consequence it is estimated that Route 51 will become severely congested and traffic delays of up to 1-1/2 hours may occur. Under existing traffic operation conditions it is estimated that the evacuation of the car-owning population from the city of Aliquippa and Hopewell Township would require 5 hours following initial notification of the emergency. The magnitude of the traffic delays is such that other alternative conditions for evacuation are currently being examined. A feasible option that is being evaluated consists of selecting one of the travel facilities in the area (possibly Route 51) and establishing a one-way southbound traffic operation during the area evacuation. Such action would reduce the overall area traffic delay to about 1/2 hour and thus allow the car-owning population of this sector of the EPZ to complete evacuation within 4 hours after notification of the emergency.

A summary of the evacuation times under a normal weather day time emergency event is provided in Table 10.

NON-CAR-OWNING POPULATION

As noted earlier the population from non-car-owning households in the designated 10-mile radius evacuation area is estimated at 13,400. In excess of 70 percent of this population group resides in urban areas. Although a large proportion of these non-car-owning area residents are likely to leave the area with friends and relatives it is essential that the emergency response plan provide for the provision of public transportation to evacuate this population group.

In the urban areas, specific locations such as fire stations can be designated as collection points for the public transport dependents to permit a time efficient evacuation by bus. Generally, within these urban centers walk distances to fire stations would be 1/2 mile or less.

In the rural areas, the establishment of similar collection points at fire stations or municipal centers is feasible, however, the transport dependents cannot be expected to walk to these designated points. Local municipal staff and firemen could be used to collect the non-car-owning residents and bring them to the designated points for subsequent transport out of the area by bus. The magnitude of the rural non-car-owning population is sufficiently low to make such a procedure effective and time

efficient. A sample of rural non-car-owning populations are tabulated in Table 11.

Evacuation by Bus

Experiences in mobilizing school buses in response to emergency conditions, such as severe snow and ice storms, indicates a time lapse of about 1-1/2 hours between notification of the school bus contractor or coordinator and the arrival of buses at schools. Only a small proportion of this mobilization time represents actual travel time. It can realistically be expected, therefore, that mobilization of buses from both private contractors and nearby public transit agencies will involve a time period of about 1-1/2 hours. In addition to the mobilization time the buses can be expected to be subjected to travel delays similar to that encountered by the evacuees travelling by car. It is estimated that the time required to evacuate the public transport dependents will be 4 hours. A similar estimate of time is required to evacuate the school children in the area in the event an emergency condition arises when schools are in session.

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ADVERSE WEATHER CONDITIONS

Severe inclement weather conditions may impact the time required to evacuate the area residents. The following weather related conditions would impact the efficiency of the area evacuation:

- Flooding of the Ohio River and consequent impassibility of Route 68 in the Borough of Industry.
- A winter storm producing hazardous driving conditions on most area roads.

The expected evacuation time impacts of these conditions have been estimated and are summarized in the following paragraphs.

Flood Condition

During a major flood of the Ohio River, Route 68 in the Borough of Industry may become impassible. Because of the proximity of the flood prone area to the facility site Route 68 would not be subject to major traffic volumes generated by area evacuees. Only the western segment of the population within the Borough of Industry would need to be rerouted northerly along secondary roads to leave the area in case of an emergency event at the power facility during a flood condition. It is estimated that

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during such a major flood the evacuation time for the population of Industry would be about 1/2 hour longer than under normal conditions.

Winter Storm Hazardous Driving Condition

A winter snowstorm in the area can produce generally hazardous driving conditions, notwithstanding efficient winter road maintenance activities. Such hazardous conditions would reduce the overall travel speed throughout the area and, depending upon the severity of the storm, could reduce speeds to an average of about 10 mph. With increased headways between vehicles during hazardous conditions, the efficient utilization of available roadway capacity would be significantly impaired.

The time necessary for evacuation of the car-owning population from the time they commence leaving home under normal weather conditions until all are evacuated has been estimated at 2 hours and 45 minutes as reflected in Figure 2. Under extremely hazardous travel conditions, this time estimate is expected to increase by about 40 percent as a consequence of reductions in travel speed and more significantly as a consequence of increases in vehicle headways.

The total evacuation time of the car-owning population during inclement weather conditions thus could be 4 hours and 45 minutes instead of 3-1/2 hours under normal conditions.

A similar 40 percent impact on the evacuation time of the transport dependents can be expected and would result in a total area evacuation time of about 5 hours and 20 minutes.

The area evacuation times for various travel conditions and for the subareas of the EPZ are summarized in Table 12.

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TABLE 1
MUNICIPALITIES WITHIN OR PARTIALLY WITHIN
THE 10-MILE EPZ

| <u>Municipality</u> | <u>Ten-Mile Radius</u> |
|--------------------------------|------------------------|
| A. Beaver County, Pennsylvania | |
| <u>Cities and Boroughs</u> | |
| Aliquippa | X |
| Beaver | 0 |
| Bridgewater | 0 |
| East Rochester | X |
| Fallston | 0 |
| Georgetown | 0 |
| Glasgow | 0 |
| Hookstown | 0 |
| Industry | 0 |
| Midland | 0 |
| Monaca | 0 |
| New Brighton | X |
| Ohioville | 0 |
| Patterson Heights | X |
| Rochester | 0 |
| Shippingsport | 0 |
| <u>Townships</u> | |
| Brighton | 0 |
| Center | 0 |
| Chippewa | X |
| Greene | 0 |
| Hanover | X |
| Hopewell | X |
| Independence | X |
| Patterson | X |
| Potter | 0 |
| Pulaski | X |
| Raccoon | 0 |
| Rochester | X |
| South Beaver | X |
| Vanport | 0 |

TABLE 1 (continued)

B. Columbiana County, Ohio
Cities and Villages

East Liverpool

0

Townships

Liverpool

X

Middleton

X

St. Clair

X

C. Hancock County, West Virginia
Cities

Chester

0

Districts

Grant

X

Clay

X

Total Number of Municipalities = 37

0 Totally within the 10-mile EPZ

X = Partially within the 10-mile EPZ

TABLE 2
1970 POPULATION WITHIN THE EMERGENCY
PLANNING ZONE

Beaver County, Pennsylvania

Cities and Boroughs

| | |
|-------------------|--------|
| Aliquippa | 22,277 |
| Beaver | 6,100 |
| Bridgewater | 966 |
| East Rochester | 920 |
| Fallston | 571 |
| Georgetown | 234 |
| Glasgow | 112 |
| Hookstown | 246 |
| Industry | 2,442 |
| Midland | 5,271 |
| Monaca | 7,486 |
| New Brighton | 7,637 |
| Ohioville | 3,918 |
| Patterson Heights | 777 |
| Rochester | 4,819 |
| Shippingsport | 238 |

Townships

| | |
|--------------|--------|
| Brighton | 7,532 |
| Center | 10,598 |
| Chippewa | 3,306 |
| Greene | 1,489 |
| Hanover | 2,154 |
| Hopewell | 14,133 |
| Independence | 1,761 |
| Patterson | 3,442 |
| Potter | 484 |
| Pulaski | 700 |
| Raccoon | 2,615 |
| Rochester | 1,363 |
| South Beaver | 1,169 |
| Vanport | |

Beaver County Subtotal = 114,850

TABLE 2 (continued)

Columbiana County, Ohio

Cities and Villages

| | |
|----------------|--------|
| East Liverpool | 20,020 |
|----------------|--------|

Townships

| | |
|-----------|-------|
| Liverpool | 3,678 |
| Middleton | 789 |
| St. Clair | 7,428 |

Columbiana County Subtotal = 31,915

Hancock County, West Virginia

Cities

| | |
|---------|-------|
| Chester | 3,614 |
|---------|-------|

Districts

| | |
|-------|-------|
| Grant | 5,215 |
|-------|-------|

Hancock County Subtotal = 8,829

TOTAL = 155,594

TABLE 3
AREA POPULATION BY EPZ SUBAREAS

| <u>Area</u> | <u>Population</u> |
|-----------------------------------|-------------------|
| Ten-mile Radius Area | 155,594 |
| Five-mile Radius Area | 17,304 |
| Subarea 1 | |
| Beaver County North of Ohio River | 50,125 |
| Subarea 2 | |
| Beaver County South of Ohio River | 64,725 |

TABLE 4
BEAVER COUNTY CAR OWNERSHIP

| <u>Percentage of households with</u> | <u>County Total</u> | <u>Rural Areas</u> | <u>Urban Areas</u> |
|--|-------------------------|------------------------|------------------------|
| 1 car | 53.2 | 48.7 | 54.4 |
| 2 cars | 28.0 | 38.5 | 25.2 |
| 3 or more cars | 4.7 | 8.0 | 3.8 |
| none | 14.1 | 4.8 | 16.6 |
| Total | 100.0 | 100.0 | 100.0 |

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TABLE 5
COLUMBIANA COUNTY CAR OWNERSHIP

| <u>Percentage of households with</u> | <u>County Total</u> | <u>Rural Areas</u> | <u>Urban Areas</u> |
|--|-------------------------|------------------------|------------------------|
| 1 car | 51.8 | 51.9 | 51.7 |
| 2 cars | 29.2 | 33.6 | 26.3 |
| 3 or more cars | 5.1 | 6.4 | 4.2 |
| none | 13.9 | 8.1 | 17.8 |
| Total | 100.0 | 100.0 | 100.0 |

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TABLE 6
HANCOCK COUNTY CAR OWNERSHIP

| <u>Percentage of Households with</u> | <u>County Total</u> | <u>Rural Areas</u> | <u>Urban Areas</u> |
|--|-------------------------|------------------------|------------------------|
| 1 car | 55.0 | 56.0 | 54.4 |
| 2 cars | 27.7 | 30.2 | 26.4 |
| 3 or more cars | 4.0 | 4.1 | 4.0 |
| none | 13.3 | 9.7 | 15.1 |
| Total | 100.0 | 100.0 | 100.0 |

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TABLE 7
PERCENTAGE OF POPULATION RECEIVING
BROADCAST INFORMATION

| <u>Percentage of Population</u> | <u>Time after Initiation of Emergency Notification</u> |
|-------------------------------------|--|
| 10 | 15 minutes |
| 10 | 20 minutes |
| 30 | 25 minutes |
| 30 | 30 minutes |
| 10 | 35 minutes |
| 5 | 40 minutes |
| 5 | 45 minutes |

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TABLE 8
PERCENTAGE OF WORKERS LEAVING THEIR PLACE OF
WORK UPON RECEIPT OF INFORMATION

| <u>Percentage of Workers</u> | <u>Time after Receipt of Broadcast Information</u> |
|----------------------------------|--|
| 50 | 10 minutes |
| 30 | 15 minutes |
| 10 | 20 minutes |
| 5 | 30 minutes |
| 5 | 45 minutes |

The time required in some industrial plants in the area to close down the operation will exceed the times illustrated in Table 7, but is estimated to impact only a small proportion of the total work force.

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TABLE 9
 PERCENTAGE OF POPULATION PREPARED TO EVACUATE
 FOLLOWING ARRIVAL OF HOUSEHOLD WORKERS

| <u>Percentage of Population</u> | <u>Preparation Time Following Arrival of Worker</u> |
|-------------------------------------|---|
| 10 | 15 minutes |
| 20 | 30 minutes |
| 30 | 45 minutes |
| 15 | 1 hour |
| 15 | 1 hour, 15 minutes |
| 10 | 1 hour, 30 minutes |

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TABLE 10
SUMMARY OF EPZ EVACUATION TIMES FOR
CAR-OWNING POPULATION

| <u>Area</u> | <u>Total Evacuation Time</u> |
|--|----------------------------------|
| Five-mile Radius Area | 3 hours |
| Subarea 1 (Beaver County North of Ohio River) | 3-1/2 hours |
| Subarea 2 (Beaver County South of Ohio River) | 5 hours* |
| Ten-mile Radius Area | |
| • Hancock County | 3-1/2 hours |
| • Columbiana County | 3-1/2 hours |
| • Beaver County -- Rural Area North and South of Ohio River | 3 hours |
| • Beaver County -- Total EPZ Area | 5 hours* |

* Without contemplated special traffic operation provisions.
With such provisions evacuation time is estimated to be
4 hours.

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TABLE 11
SELECTED SAMPLE OF RURAL
NON-CAR-OWNING POPULATIONS

| <u>Municipality</u> | <u>Estimated Non-Car-Ownng Population</u> |
|-----------------------|---|
| Greene Township | 48 |
| Raccoon Township | 70 |
| Hanover Township | 68 |
| Independence Township | 48 |
| Industry Borough | 68 |
| Ohioville Borough | 38 |

TABLE 12

EVACUATION TIME SUMMARY

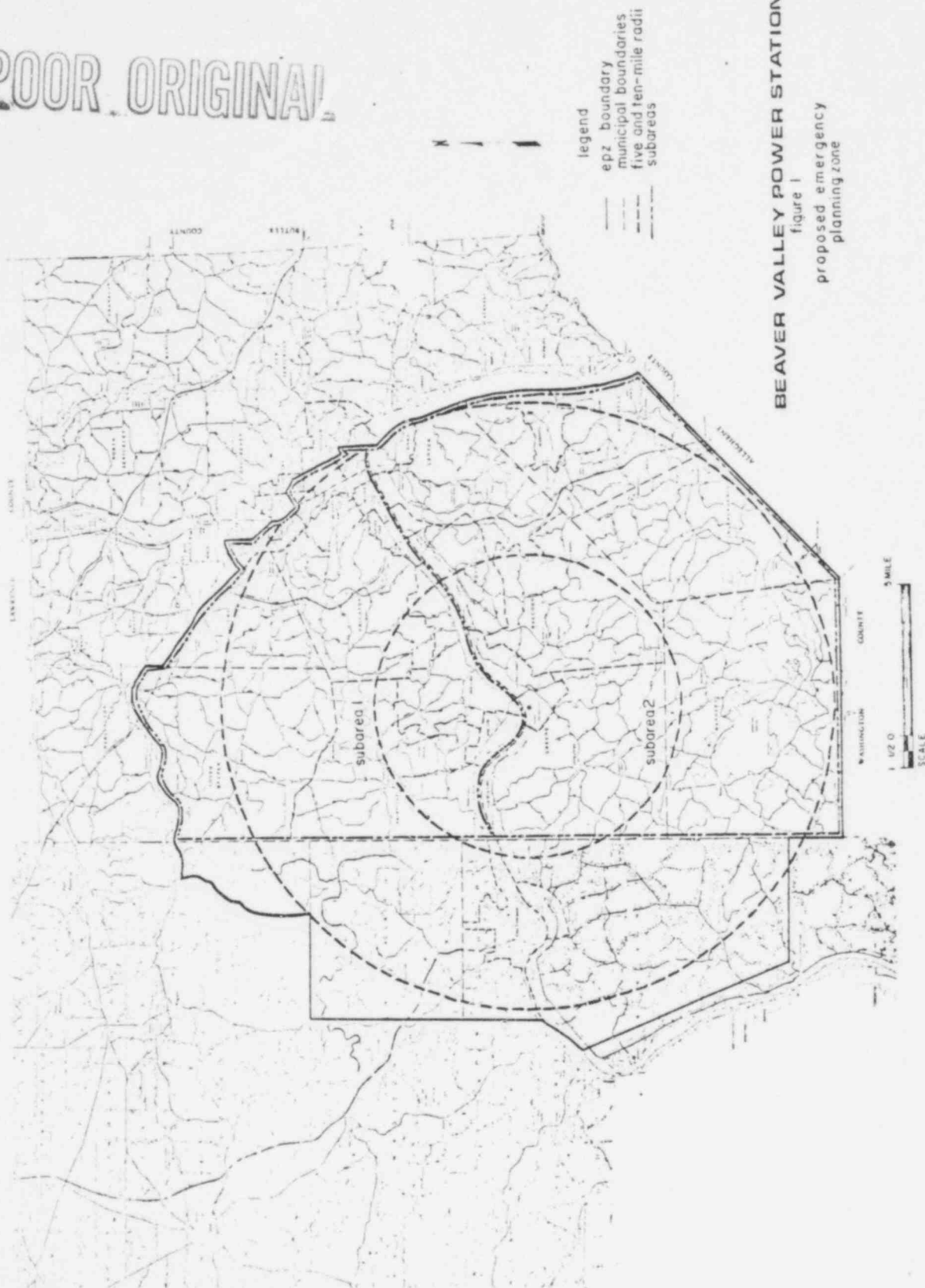
| <u>Areas</u> | <u>Normal Weather Day-Time Emergency</u> | <u>Emergency During Flood Condition</u> | <u>Emergency During Severe Winter Storm</u> |
|---|---|---|---|
| 1. Subarea 1 (Beaver County North of Ohio River) | 4 hours, 15 minutes | 4 hours, 45 minutes | 6 hours, 5 minutes |
| 2. Subarea 2 (Beaver County South of Ohio River) | 5 hours, 45 minutes* (4 hours, 45 minutes)** | 5 hours, 45 minutes* (4 hours, 45 minutes)** | 7 hours, 15 minutes* (6 hours, 5 minutes)** |
| 3. Total Five-mile Radius Area | 3 hours, 45 minutes | 4 hours, 15 minutes | 4 hours, 30 minutes |
| 4. Total Ten-mile Radius Area | | | |
| o Hancock County | 4 hours, 15 minutes | 4 hours, 15 minutes | 5 hours, 45 minutes |
| o Columbiana County | 4 hours, 15 minutes | 4 hours, 15 minutes | 5 hours, 45 minutes |
| o Beaver County | 5 hours, 45 minutes* (4 hours, 45 minutes)** | 5 hours, 45 minutes* (4 hours, 45 minutes)** | 7 hours, 15 minutes* (6 hours, 5 minutes)** |

* Without contemplated special traffic operation provisions in Hopewell Township.

** With contemplated special traffic provisions.

1867 128

POOR ORIGINAL



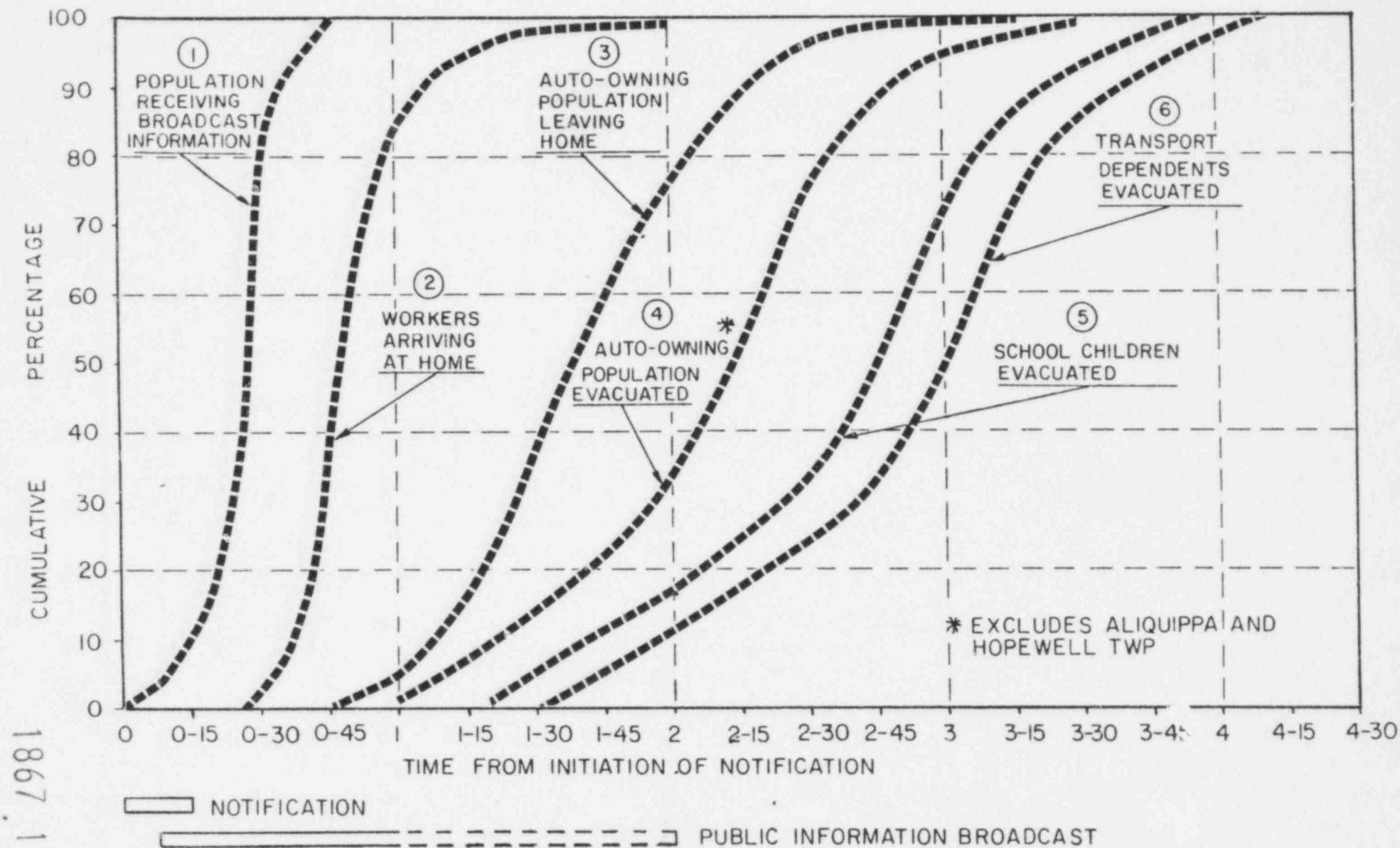


FIGURE 2 TIME ESTIMATES OF POPULATION EVACUATION