PRELIMINARY ENGINEERING REPORT

USR 23 REPORT

USR 23 IN FRANKLIN AND DELAWARE COUNTIES

SR 161 IN CITY OF WORTHINGTON AND SHARON TOWNSHIP, FRANKLIN COUNTY





PREPARED FOR THE

STATE OF OHIO DEPARTMENT OF HIGHWAYS

APRIL 1962

BURGESS AND NIPLE CONSULTING ENGINEERS

COLUMBUS, OHIO

THE REPORT

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HUDSON 8-9748

April 26, 1963

Mr. Pearl E. Masheter
Director
Ohio Department of Highways
Ohio Departments Building
Columbus, Ohio

Dear Mr. Masheter:

In compliance with the Engineering Agreement 809 dated April 4, 1961 we submit herewith the completed Preliminary Engineering Report for USR 23 north of Columbus.

The report is a study of USR 23 in Franklin and Delaware Counties from the area north of the City of Worthington, northerly to the terminus of the four lane highway 4.5 miles north of the City of Delaware. The feasibility of upgrading the existing USR 23 to fully controlled access as compared to the merits of a relocation are herein presented. The study also includes consideration of the relocation of SR 161 in the City of Worthington and Sharon Township, Franklin County to provide for a connection between USR 23 and IR 70 (SR 1).

The draft of the Preliminary Report was submitted on June 22, 1961. Revisions and changes suggested following the review by the various agencies have been incorporated in the final Report.

Based on the information obtained from the surveys, maps, studies and analyses, it is our conclusion that the routes selected are feasible from an engineering point of view within the economic limitations noted.

We appreciate and have enjoyed the opportunity to prepare this Report and wish to extend our appreciation and thanks to the Department of Highways for the generous cooperation extended us on the accomplishment of this assignment. We trust this Report will assist you in any actions necessary to bring about the realization of the recommendations of the Report.

Respectfully submitted,

BURGESS & NIPLE

Ben K. Bare

Ben K. Bare

REPORT CONTENTS

THE REPORT

SECTION I – PURPOSE AND SCOPE OF REPORT

Agreement . . . . . Sheet 1
Scope . . . . . Sheet 1
Route Studies . . . . . Sheet 1
Recommended Route Locations:
ReIocated SR 161 Worthington By-Pass . . . . . Sheet 3
ReIocated USR 23 Worthington to DeIaware . . . . . Sheet 4
Relocated USR 23 North of Delaware . . . . . Sheet 6

SECTION II – FACTORS AFFECTING DESIGN

Land Use – Present and Future . . . . . Sheet 7
Topography and GeneraI Geography of the Area . . . . . Sheet 7
SoiIs and GeoIogy . . . . . Sheet 8
Right-of-Way . . . . . Sheet 9
Contingent Highway Studies and the Existing Road System . . . . . Sheet 10
Traffic . . . . . Sheet 11
Design Criteria . . . . . Sheet 12
Stage Construction . . . . . Sheet 14
Economic Studies . . . . . Sheet 15
Estimated Project Cost . . . . . Sheet 17

SECTION III – RECOMMENDED LOCATION STUDIES

ReIocated SR 161 Phase 161 – I, II and III . . . . . Sheet 18
ReIocated USR 23 Phase 23 – 1 and II . . . . . Sheet 21
ReIocated USR 23 Phase 23 – III . . . . . Sheet 24

SECTION IV – ALTERNATE LOCATION STUDIES

USR 23 Freeway on Existing Location Phase 23-IV and 23-V . . . . . Sheet 27
USR 23 Freeway on Existing Location Phase 23-VI . . . . . Sheet 29

SECTION V – SUMMARY OF COSTS AND ECONOMIC BENEFIT ANALYSIS

Summary of Costs . . . . . Table 1-7
Economic Benefit Analysis . . . . . Table 8-10

REFERENCE PLATES
PLAN AND PROFILE SHEETS
LAND OWNERSHIP MAPS

REFERENCE PLATES

General Location Map . . . . . PIate 1
Location Studies . . . . . PIate 2
SoiI and Geology Map . . . . . PIate 3
Typical Sections . . . . . PIate 4-7
Structures - Highway and Railroad . . . . . PIate 8-9
ReIocation and Improvement Maps . . . . . PIate 10-13
Traffic . . . . . Plate 14-18

PLAN AND PROFILE

ReIocated SR 161 . . . . . Sheet 1-3
Relocated USR 23 . . . . . Sheet 4-7
Delaware Expressway . . . . . Sheet 8
ReIocated USR 23 North of DeIaware . . . . . Sheet 9-10
USR 23 Freeway on Existing Location . . . . . Sheet 11-15
USR 23 Freeway on Existing Location North of Delaware . . . . . Sheet 16-17

LAND OWNERSHIP MAPS

ReIocated SR 161 . . . . . Sheet 1-3
ReIocated USR 23 . . . . . Sheet 4-8
ReIocated USR 23 North of Delaware . . . . . Sheet 9-10
USR 23 Freeway on Existing Location . . . . . Sheet 11-16
USR 23 Freeway on Existing Location North of DeIaware . . . . . Sheet 17-18

USR 23 REPORT

SECTION I SCOPE AND PURPOSE OF REPORT

AGREEMENT

This preliminary engineering report, the USR 23 Report, has been prepared in accordance with an Engineering Agreement dated April 4, 1961, between the State of Ohio Department of Highways and Burgess & Niple, Consulting Engineers, Columbus, Ohio. The "Specifications for Consulting Engineer Services" as published by the Department of Highways, dated May 1, 1960 is incorporated and made part of the Engineering Agreement. These specifications detail the general purpose, requirements and objectives of the Preliminary Engineering Report.

SCOPE

The broad purpose of the Preliminary Engineering Report is to provide an analysis and determination of the most feasible route location within the limits identified in the Engineering Agreement.

This Report is the result of the study to determine the feasibility of developing USR 23 on existing location into a limited access freeway as compared to the construction of a freeway on relocation.

The general purpose, requirements and objectives of the Preliminary Engineering Report are described in the Engineering Agreement as follows: "The Consultant agrees to prepare a preliminary Engineering Report, as authorized by the State, on USR 23 in Franklin and Delaware Counties, from the area of Worthington, northerly to the terminus of the four lane section approximately 4.5 miles north of the City of Delaware. This report shall study the feasibility of upgrading the existing USR 23 to fully controlled access as opposed to the relative merits of a new location. Consideration shall be given to a connection between USR 23 and SR 1 North of SR 161 in the study area, and to the approved relocation of USR 23 as a limited access facility as outlined in the Delaware Arterial Report."

The 1960 census attributed to Franklin County a 35.7% gain in population to 682,962 from the year 1950 to 1960 as compared to the state increase of 22.%. The one million population mark is predicted shortly before 1980. The rapid growth and urbanization means additional facilities, additional transportation routes and a large change in land use patterns. The potential of land use activity is largely determined by its location in relation to the transportation system.

ROUTE STUDIES

The route studies included in the report are divided into three study areas:

1. Worthington bypass which provides for the relocation of SR 161 north of Worthington from its connection west of the city at existing SR 161 to IR 71.
2. USR 23 improvement between Worthington and Delaware which is a study of the feasibility of upgrading the existing USR 23 to fully controlled access as opposed to the relative merits of a relocation of USR 23.
3. USR 23 improvement north of Delaware from the end of the Delaware Expressway to the end of the present four lane highway 4.5 miles north of Delaware. The relative merits of relocation as opposed to upgrading on existing location are analyzed.

The Relocation and Improvement Maps, Plates10 to 13 show the various location studies within the area of study. Many of the factors affecting design of the improvement and the construction features of the improvement are shown on these plates. The recommendations for the route locations within the above noted study areas were made following the comparison and analysis of the several routes. These recommended route locations are included within this section in the report and are shown in detail on the Reference Plates and the Plan and Profile sheets. The route recommended is shown as a solid line and the alternate route, on existing location, as a dashed line. The limits of the stage of construction and limits of the report are as noted on the plans.

Section II, Factors affecting Design include a discussion of the general features of the area through which the route studies pass and the design criteria consistent with the type highway to be built. Traffic data, right-of-way limitations, stage construction and economic factors are discussed as to the overall effect on the location studies.

Section III, Recommended Location Studies include the details of recommended route as to the features of importance and consideration in locating the improvement along the line shown on the plans. Generally only freeway standards are considered.

Section IV, Alternate Location Studies include the details on the alternate route – in this study the improvement on existing location. The features of importance and description of items of right-of-way are further expanded as to their effect on the design presented for the improvement. On existing location both freeway and expressway are analyzed in the type improvement considered.

Section V, Summary of Costs and Economic Benefit Analysis includes tabulation of tentative cost estimate of the various phases of the improvement, listing items of construction, right-of-way, engineering, incidentals and total project costs. The economic benefit analysis includes the tabulation of highway costs and road user costs needed for the analysis and recommendations for the study.

Land Ownership Maps include the right-of-way requirements and parcels affected by the improvements both on the relocation, Sheets 1-10 and on existing location (alternate), Sheets 11-18.

SECTION I PURPOSE AND SCOPE OF REPORT

ROUTE STUDIES

Route Studies (continued)

One of the purposes of the report is to provide a workable program that will derive the most benefits to the user and be in balance with the highway cost. The stage or phase of construction for the improvement should also be part of the ultimate plan for the completed highway system. The three recommended relocations and the two alternate improvements on existing location are interconnected and dependent to some degree on the adjacent improvement or existing conditions. The priority of construction included in the recommendations and shown on the plans will allow the eventual development of the improvement to the ultimate plan.

The results of the location studies give preference to the completion of the following improvements and in the order noted:

1. Relocated SR 161 Worthington By-Pass.

   Phase 161-I, the interstate freeway IR 270 between IR 71 and existing USR 23 including the two major interchanges.

   Phase 161-II, the interstate freeway IR 270 between the interchange on existing USR 23 and Relocated USR 23 (north) at existing SR 315 including the interchange for this connection.

   Phase 161-III, the freeway south of the interchange at IR 270 and Relocated USR 23 (north) to existing SR 161 as part of the relocation of SR 161 and extension of the Olentangy Expressway including the interchange at existing SR 161.

2. Relocated USR 23 Worthington to Delaware

   Phase 23-I and 23-II, the freeway north of interchange at IR 270 and Relocated SR 161 west of the Olentangy River, to the Delaware Expressway including the interchange at SR 750, Hyattsville Road, and existing USR 23. Both sections would be built concurrently to provide a continuous highway.

3. Relocated USR 23 North of Delaware

   Phase 23-III, the expressway (ultimate freeway) extending north from the Delaware Expressway to the end of the four lane improvement 4.5 miles north of Delaware with a partial interchange at the north limits of Delaware.

The alternate location studies on existing location were also assigned stage of construction limits:

USR 23 Freeway on Existing Location Worthington to Delaware

Phase 23-IV and 23-V, the freeway north of the interchange at IR 270 and existing USR 23 to the Delaware Expressway including the interchanges as shown on the plan.

USR 23 Freeway on Existing Location North of Delaware

Phase 23-VI, the freeway extending north from the Delaware Expressway to the end of the four lane improvement north of Delaware with interchanges at Hills-Miller Rd. and Delaware County Rd. 213.

The alignment of Relocated SR 161 east of the interchange with IR 71 has been changed to fall along the alignment approved for the Outerbelt IR 270. The preliminary draft of this Report was based on the original Outerbelt Report recommendations that the outerbelt location would be south of Worthington. The alignment of the Relocated SR 161 was designed on the basis of a bypass for SR 161 and the eventual eastward extension to the south of Westerville and to its connection with USR 62 near New Albany. The alignment to the west for SR 161 relocation is on a line subsequently adopted for for the Outerbelt location.

On this east-west alignment known as IR 270 and Relocated SR 161 the interchanges are basically the same for all studies. All ramp connections, weaving and lane capacities are well within the limits of design for safe, unrestricted operation.

Frontage roads are two-directional and are employed to control access to the limited access highway. They provide access to the adjacent property owner and in many cases provide a means of connecting the cross roads and maintaining circulation within the area. Particularly on the existing alignment these frontage roads are connected to the improvement by ramps.

Topographic maps, aerial photographs, and tax maps supplemented by field inspections developed the routes locations as shown in the report.

The United States Geological Survey Maps (1 inch = 2000 feet) were used for the Relocation and Improvement Map, Plates10-13 on which the major features of the entire area are shown. The comparative advantages of one study over the other and the project effects on the area are most easily shown on these plates.

The project section herein known as the Relocated SR 161 is the connection of existing SR 161 at SR 315 west of Worthington to IR 71 northeast of Worthington. The extension of the proposed relocated Olentangy River Road to the north, referred to in the report as relocated SR 161 (Phase 161-III), allows traffic to leave the existing SR 161 and turn north at the interchange on the freeway. This connection is also the Olentangy Expressway extension northward or Relocated USR 23 extension southward.

The east-west connection for Relocated SR 161 and IR 270 from SR 315 north of Worthington eastward to Cleveland Avenue (Phase 161-I and 161-II) is along the line as proposed by the Columbus Outerbelt Report and the recommendations of the Ohio Department of Highways as to the centerline location. This section is on the Interstate System. The typical sections, structures and interchanges have higher design criteria than that incorporated in the USR 23 study.

Aerial mosaics furnished by the Ohio Department of Highways were used to develop particular items of design on the several location studies. The plan and profile sheets, sheets 1-17, incorporate the aerial mosaics in the area through which the improvements are made.

The draft of this Preliminary Engineering Report was submitted to the Department of Highways in June, 1961. The comments received have been reviewed and more detailed designs and estimates were made for the final report.

SECTION I PURPOSE AND SCOPE OF REPORT

RECOMMENDED ROUTE LOCATIONS

RELOCATED SR 161 WORTHINGTON BY-PASS

Relocated SR 161, Phase 161-I, 161-II and 161-III as shown on the Relocation and Improvement Map, Plate 10 and in detail on the Plan and Profile Sheets 1-3 is the route recommended in this area of the report and includes the connection between USR 23 and IR 71 (SR 1) north of existing SR 161. Within the scope of the report the improvement has been separated into three stages of construction.

The connection from the Interstate Route IR 71 to existing USR 23 (High Street) has been assigned the first priority of construction. Phase 161-I of Relocated SR 161 would include the interchanges at IR 71 and existing USR 23 complete with grade separations and pavement necessary to provide a limited access freeway connection between these two major highways. This connection would provide immediate relief to the area south of the improvement and lessen the congestion due to through north-south traffic in the Worthington area. It would not ease the east-west congestion and traffic needs on existing SR 161 that passes through the center of Worthington. The interchange geometrics and recommended stage of completion of the connections within the interchange area contemplate the early completion of the remaining sections of the improvement and the IR 270 extension to the east and west.

Phase 161-II of Relocated SR 161, which has been assigned the second priority of construction, would include the freeway extension to the west of existing USR 23, across the Olentangy River, with the interchange at SR 315. This will provide for the ultimate extension of the Olentangy Expressway to the Relocated SR 161, Phase 161-III from the south. The Phase 161-II connection would provide some relief to the east-west traffic on existing SR 161 by allowing traffic from the west and existing Olentangy River Road to divert to the north along SR 315 to the interchange and thence to USR 23 and IR 71. The capacity of SR 315 will limit the flow of traffic over this stage of construction.

Phase 161-III of Relocated SR 161 is the extension of the Olentangy Expressway which would replace Olentangy River Road and SR 315 as a major traffic artery. It should follow very closely the other two phases of Relocated SR 161. The need for this connection could be accelerated with the construction of either the Olentangy Expressway or IR 270 to the west. The eventual construction of the Olentangy Expressway to existing SR 161 is of major importance to the traffic requirements of metropolitan Columbus. The extension north to the outerbelt would complete this connection and provide for the uninterrupted flow of traffic to the IR 71 and USR 23.

The location of the outerbelt along the alignment shown as IR 270 instead of along the earlier recommended line south of SR 161 as in the Columbus Outerbelt Report has changed the status of the construction of the entire section herein referred to as Relocated SR 161.

Traffic volumes indicate the area of need for the improvement to be along the entire route of Relocated SR 161 as shown in the report. The improvement of USR 23 north of the Relocated SR 161 would develop the capacity of the freeway and the interchanges to desirable operating conditions nearer the practical capacity of the ramps. The flexibility of Relocated USR 23 and the existing USR 23 highway to adjust to the traffic requirements in the period beyond 1980 has been considered. Both study lines to the north could be developed eventually. The interchanges should adapt to the normal expansion with little difficulty. Traffic data is shown on Plates 14 and 15 for the two location studies. Relocated SR 161 has an adequate reserve capacity on all the ramps and through lanes of the interchanges to adequately serve two north-south highways. No capacity deficiencies or expensive highway expansion is contemplated on this section within a reasonable period beyond 1980.

The completion of all three phases of Relocated SR 161 is recommended prior to any additional improvement on the other location studies. The acquisition of right-of-way at an early date particularly in the interchange area is very important. The proximity of the heavily developed incorporated land of the City of Worthington will influence the right-of-way costs considerably if the project is delayed.

Section II Factors Affecting Design includes the many items of consideration and importance in determining the best route for the by-pass in the area north of the Worthington-Columbus area.

The right-of-way requirements and the parcels affected by the study are shown on the Land Ownership Maps Plates 1 to 3.

Section III Recommended Location Studies, includes the description and design details associated with the final recommended study on relocation. Section V includes the Summary of Costs for all three phases of Relocated SR 161.

SECTION I PURPOSE AND SCOPE OF REPORT

RECOMMENDED ROUTE LOCATIONS

RELOCATED USR 23 WORTHINGTON TO DELAWARE

Relocated USR 23, Phase 23-I and 23-II, as shown on the Relocation and Improvement Map, Plate 11 and 12 and in detail on the Plan and Profile, Sheets 4-7 is the route recommended in the report in this area.

The purpose of the study in this area was to compare the cost of a new freeway on new location to the cost of upgrading USR 23 on existing location to an ultimate limited access freeway. Section III Recommended Location Studies include the description and design details associated with the final recommendations.

The Relocated USR 23 route west of the Olentangy River is recommended because the largest road user benefits are derived from this improvement. Design standards are high, a greater overall capacity in the future for transportation and development to the north is encouraged, less disruption in the area through which it passes. A new, high-type freeway would be built for only $136,900 or 1.5% more than upgrading the existing highway to freeway standards, the result a freeway and a major highway instead of one freeway.

The many advantages of the relocation completely dominate the route study in this area. The route recommended is located on open farm lands away from the developed areas and buildings that are associated with the existing road system. The area of greatest potential lies to the west of SR 315 above the flood plain of the river valley. Subdivisions are being developed within this area for future residential sites. The depth of the development depends upon the topography and the existing road system. The upper plateau which generally lies west of the relocation will retain its use for agricultural purposes until such time as the more desirable sites are developed to the east within the river valley area. Land use is progressing through a transition from farming to residential development within all the subdivisions along the route study. Generally only the early stage of development has been realized; some of the subdivision roads have been built, a very few residences have been completed, and the promotion of the area for future home sites is being advertised.

SR 315, a scenic highway, is quite limited to its potential as a main highway capable of serving such a large area. The tremendous influence of the proposed Olentangy Expressway from the south will initiate a rapid growth throughout this area. Traffic volumes in 1980 from Columbus on the Olentangy Expressway along its extension along the relocated SR 161 (Phase 161-III) will be equal to that on the North Freeway (IR 71). This volume of traffic from the south and the location of the outerbelt across this area will accelerate the need for the relocation both for the needs in the area through which it passes and the needs of interstate traffic. The existing road system will be retained throughout for local traffic requirements.

The advantage of extending the Olentangy Expressway north along the west side of the river over the recommended relocation is apparent. The predominant traffic volume to the north will be removed from the interstate system (IR 270) and from the two turning movements at the interchanges at existing USR 23 and at Relocated USR 23. Since the relocation occupies open farm land there is less adjustments and disturbance within the area. It can be built with very little interference to the traveling public and at a time convenient to the needs; however, right-of-way must be acquired as soon as possible and the relocation incorporated within the future plans of the area.

Time is an important element in the Report. Acceptance by the many agencies, planning and zoning groups, local officials and the private citizen is the key to the entire improvement.

Both Phase 23-I and 23-II would be built concurrently to provide a completed highway. Relocated USR 23 is of lower priority than Relocated SR 161 and would follow that improvement in the near future. These plans should be developed in order to facilitate land acquisition and allow the area to develop with the relocation in this overall plan.

On Relocated USR 23, construction costs of $5,751,800 were 66.4% of the total project cost of $8,680,800; right-of-way cost of $1,663,400 comprised 19.2% of this total. The total project cost was $136,900 more or 101.5% of the cost of the USR 23 Freeway on existing location. In comparison the USR 23 Freeway on existing location construction costs of $5,176,700 were 60.6% of the total project cost of $8,543,900; right-of-way cost of $2,228,100 comprised 26.2% of this total.

Section V, Summary of Cost and Economic Benefit Analysis includes the breakdown in the costs and the economic benefits derived by the location studies. Both studies have 14 access ramps and the Relocation has seven (7) grade separations compared to nine (9) on the USR 23 Freeway on existing location. The interchanges on the two studies are located on the same cross roads and ramps afford access to the other local road systems.

Section V, Summary of Costs and the Economic Benefit Analysis include the annual highway costs, the tabulation of annual user costs, and the benefit ratio for the location studies. The Relocated USR 23 has a benefit ratio of 1.97 compared to 1.26 for the USR 23 Freeway and 1.35 for the USR 23 Expressway on existing location. On Relocated USR 23 the annual highway costs of $538,600 is $44,000 or 9% more than the $494,600 on the USR 23 Freeway on existing location. Road user costs of $6,752,600 is $382,200 or 5.3% less than $7,134,800 respectively on the same studies.

Traffic data and volumes, shown on Plates 16 and 17 as derived from the various traffic studies made by the Ohio Department of Highways, indicate nearly equal volumes of traffic served by the two studies. With the completion of the Relocated USR 23 there would remain a reserve capacity on the existing highway to allow a 50% increase without affecting operation on the unimproved existing route. The number of accidents is estimated to be one third less on relocation than on the improvement on the existing route.

Assigned volumes on the USR 23 Freeway on existing location in 1980 are three times those present on the highway today. The existing highway should continue to operate efficiently for several more years within the capacity of a four lane divided highway. The cross road exposures to turning and collision movements, increasing amount of side friction that comes with the development adjacent to the highway, deficiencies in profile and roadway section, and the limitations of the narrow median would eventually restrict the existing highway to an arterial street. Accident prone areas should be improved, traffic control devices would be necessary to provide access at several of the cross roads, and speed reduction controls along the route would be required to to reduce the number and severity of the accidents associated with the narrow median.

SECTION I PURPOSE AND SCOPE OF REPORT

RECOMMENDED ROUTE LOCATIONS

Relocated USR 23 Worthington to Delaware (continued)

A major factor against the improvement on the existing location is the displacement of the items of right-of-way as compared to short term modifications made on the highway to upgrade that point of conflict to a condition that can be tolerated by the user. As the side friction increases speed change lanes are added, a flashing light is the next step, followed by the traffic signal, and finally the last step, channelization with a multi-phase traffic signal. At this time the area is completely dominated by motorist and private services; the pavement fully occupies the right-of-way, and the building of grade separations is beyond economical consideration.

The present highway has a feature of access that is not possible with frontage roads and grade separations. Egress to the property adjacent to the highway after the improvement nearly always will be by an indirect route. The status-quo will be greatly affected by this restriction of movement across the median. The road, since its original conception, has provided the advantage of transportation and the inherent value of locating residential and farm buildings near these roads. The residences and buildings have grown quite old and the highway has a need to expand. A policy of acquiring the right-of-way over a period of several years prior to the need for the improvement of the highway is desirable to bring about the eventual use of frontage roads and grade separations. Set back controls and the tentative status of the access restrictions would allow the area to adjust to the ultimate improvement and still enjoy the existing benefits. The improvement could then be built with some savings, less disruption within the area, and derive much higher user benefits.

The existing four lane divided highway is adequate to the requirements of traffic north of Lazelle Road for the next five years. The improvement on existing location south of Lazelle Road at the county line should be of early consideration regardless of other courses of action. Protection of traffic should be provided by partial control of access, by rebuilding the roadway section to provide an adequate median, and by providing a grade separation at Flint or Lazelle Road.

On either location study the area south of the Scioto-Powell Road is critical in regard to right-of-way requirements. On relocation the right-of-way requirements and the parcels affected by the study are shown on the Land Ownership Maps, Plates 4-8.

The validity of the report on the Worthington to Delaware location study will depend upon the action taken on the recommendations. The Relocated USR 23 is particularly vulnerable to much higher right-of-way costs as the land use changes from farming to residential subdivisions. With the outerbelt moving the city influence into this area, the subdivisions are expected to develop very rapidly, consequently the severance damages would be very high.

In comparison on the USR 23 Freeway on existing location, the developments concerned with motorist services and subdivisions with access to the highway will also rapidly increase the improvement costs.

FREEWAYS have a limited access requirement over and above all other plans. Full control of access warrants interchanges where turning movements dictate and grade separations for the local roads. With no crossings at grade tolerated, the minor intersecting roads are rerouted, terminated or provided grade separations or connections at the interchanges. Ramps connect the local road to the major highway. On relocation the highway of the traffic potential herein studied would be of a Freeway type unless the road user benefits would be such as to limit the number of intersections at grade at the minor cross roads. The ultimate Freeway would be considered an Expressway at this stage.

EXPRESSWAYS have the full control of access same as on Freeways and is considered to be of a higher design. Grade separations and interchanges are provided at the major public roads. Some intersections at grade are tolerated on the minor roads. Turning lanes and improvements are made in line with the provision for upgrading the intersection to Freeway standards. Right-of-way has been included on all studies for the ultimate Freeway design. Intersections at grade for the expressway improvement are shown on the Relocation and Improvement Map, Plates10-13 and on the traffic plates. Total costs for the various stages are included in the Summary of Costs and Economic Benefit Analysis tables at the end of the report.

Section II, Factors Affecting Design include the many items of consideration and importance in determining the best route for the improvement between Worthington and Delaware.

Section III, Recommended Location Studies include the description and design details associated with the final recommended study on relocation. Section IV Alternate Location Studies include the details associated with the study on existing location.

SECTION I PURPOSE AND SCOPE OF REPORT

RECOMMENDED ROUTE LOCATION

RELOCATED USR 23 NORTH OF DELAWARE

Relocated USR 23,. Phase 23-III, as shown on the Relocation and Improvement Map, Plate 13 and in detail on the Plan and Profile Sheet 9 and 10, is the route recommended by the report in this area. The relocation as shown on the plans is for the ultimate construction of the highway as a freeway, therefore with no intersections at grade. In the event of the placing USR 23 on the state freeway system this plan would meet the requirements of that system. Within existing conditions the recommendation for the improvement in this area is along expressway standards.

The primary purpose of the location study in this area is to determine the feasibility of upgrading the existing highway to fully controlled access as compared to a freeway on relocation. The Delaware Expressway which is designed to freeway standards and the USR 23 improvement north of the limits of the report which is designed to expressway standards impose considerable influence on the route location and degree of access.

The need for the improvement is not critical at this time and would necessarily follow the other improvements in design and construction. The route can best be served by noting the intent of the relocation whereby land use and future developments can continue with this freeway in the ultimate overall plan. Advance acquisition of right-of-way and coordination with road improvements and subdivision developments would reflect a large savings in the project costs. The advantages for the planning and development of the area are apparent.

The expressway is recommended on the relocation because design standards are high, it preserves the status quo of the area with less disturbance to the area through which it passes, it is the least expensive of all the studies, and a greater overall capacity for development with two highways; one as an expressway and eventual freeway, the other as an arterial street. Traffic volumes and design features on adjacent sections give a preference to expressway rather than freeway standards within the period of study.

Traffic volumes and data shown on Plate 18 are derived from the traffic studies and present traffic requirements expanded to 1980. The traffic volumes do not indicate an immediate need for the improvement. The alignment north of Delaware adjacent to the Olentangy River with the additional traffic and development along the existing highway will be the factors affecting safety that will point out the need for the relocation.

Increased land values will develop much more rapidly along the existing highway reflecting much larger differences in the cost in the location studies as the need for the improvement becomes more evident. With the eventual construction of the relocation, the through traffic would be removed from the present highway. Existing USR 23 would then be delegated the role of providing a high type arterial road to serve the area north of Delaware and afford a north-south distributor between the freeway and the existing road system. The preservation of the existing road system and retention of existing land use are very important factors in favor of the relocation.

The improvement of USR 23 north to Findlay from a narrow two lane substandard road of obsolete alignment to a four lane divided expressway will generate a considerable increase in traffic. The roadway section, alignment, and access conditions contribute to the adverse safety record being generated on the existing highway by the increase in traffic and the continuing growth of the development adjacent to the highway. Upon the completion of the plans and the construction of adjacent sections, the need of the improvement will become apparent. It is conceivable that this relocation could be programmed prior to the relocation south of Delaware should safety requirements in this limited area become critical.

Road user costs and highway costs do not favor either location to a significant degree. The total project cost for the expressway on relocation is the least expensive, $4,042,900 compared to the freeway on relocation cost of $4,358,300. The improvement on existing location as an expressway and as a freeway costs $4,103,400 and $4,286,000 respectively, however the grade separation at Coover Road is not included in this study. The expressway on the relocation has a construction cost of $2,993,200 or 72.5% of the total project cost and right-of-way cost of $391,000 or 9.7% of the total project cost. Road user costs on relocation is 3.3% lower, $1,843,800 compared to $1,900,000 on existing location and annual highway costs are 8.4% higher, $247,800 compared to $228,600 on existing location.

The Relocated USR 23 with freeway standards provides for an additional grade separation as compared to the USR 23 freeway on existing location. Both require grade separations and ramps in the immediate area north of Delaware. Section V, the Summary of Cost includes the tabulation of tentative cost estimate for the various highway improvement for both location studies. The Economic Benefit Analysis includes the annual highway costs and tabulation of annual users cost for the location studies. The benefit ratio indicates that user benefits are not adequate to provide an immediate improvement in this area.

Section II, Factors Affecting Design include the many items of consideration and of importance in determining the best route through the area north of Delaware.

Section III, Recommended Location Studies include the description and design details associated with the final recommended study on relocation.

Section IV, Alternate Location Studies include the design and details associated with improvement on existing location.

The right-of-way requirements and the parcels affected by the location study are shown on the Land Ownership Maps Plates 9-10 and 17-18.

SECTION II FACTORS AFFECTING DESIGN

LAND USE – PRESENT AND FUTURE

The effect of the improvement on the present and future land use was considered on all the route studies. The Relocation and Improvement Maps, Plates 10-13 show the areas of high land use and development. The proposed highway improvements both on relocation and on the existing location illustrate the degree of access and limits of the facility as to the over-all effect on the route study on land use and the existing road system. The advantages of one over the other in matters other than economics can be also compared on these plates.

The entire study area is dominated by the land use predicated by the existing highway system and the Olentangy River. Highly developed agricultural properties form the basic background for the growth of the area. These relatively large farms are being divided into residential holdings of varying degree of development. It is generally agreed that this area will develop into a prime residential area by the turn of the century.

Railroads which are usually consistent with commercial and manufacturing developments run in a northerly direction parallel to the major drainage courses and on the plateau between the rivers. The only area of concern with manufacturing or industrial development lies south of the Relocated SR 161 in the northeast area of Worthington and adjacent to the New York Central and Pennsylvania Railroads.

The Relocated SR 161 which includes part of the Outerbelt beginning at the IR 71 Freeway, passes over open farm land until it reaches the developed area on existing USR 23. Several motels and residences will be displaced in this area for the interchange and access requirements. Continuing to the west and across the river the alignment will be along the back line of the large residential properties fronting on Wilson Bridge Road. The river valley and flood plain is used in completing the SR 161 relocation to the south and to existing SR 161 along the extension of the Olentangy Expressway.

The Relocated USR 23 alignment studies are more dependent on future land use than on present land use. In the area north of Worthington the presence of S R 315, which is now designated a scenic highway, and the Olentangy River valley has fostered the earliest developments to residential use in the area adjacent to these desirable features. Several subdivisions are present in the area and developing westward from the river. Other land areas are in the process of being platted and developed even as these plans are developed. The Mt. Air community adjacent to the river was a key control point on all location studies. The extent of development and degree of access to the effected properties were of major considerations in the general alignment of the relocation.

The USR 23 Freeway on the existing location presented a different approach where both present and future land use are more in balance in their importance. Commercial development along the existing highway is very light except in the area immediately north of Relocated S R 161 and north of the City of Delaware. USR 23 is one of the major highways into Columbus and is developing additional conveniences to serve the motoring public along its boundaries. The need for grade separations and interchanges are more frequent on the existing location because of these services and local traffic requirements to the private developments. The location of the ramps that provide access to the freeway are positioned to give the motorist convenient routes to the nearby cross road and nearby development. The need of frontage roads to provide access to the various properties and serve as distributor roads for local traffic is also considered.

The area adjacent to the existing highway is also attractive to private developments for recreation and includes two 18-hole golf courses, a summer theater, two drive-in theaters, two scout camps, and several private lodges. Josephinum College and the Methodist Theological School occupy large tracts of land within this study area. Several churches and cemeteries are located near the various routes studied. Strip development is generally concentrated at the cross roads, decreasing in development as the distance to the cities increase.

The study area north of Delaware is also effected by the influence of the existing USR 23 four-lane highway and the Olentangy River. The existing highway is flanked on the east by the river and on the west by a strip development of commercial and residential holdings. The present alignment provides below minimum safety requirements for access to these developments. North of the Hills-Miller Road the area is limited by the development of several small subdivisions and the farm residences and building adjacent to the existing highway. Large farms occupy the remaining area. The new Buckeye Valley School on Coover Road will extend its influence over the area in the near future. North of the Pennsylvania Railroad, the Delaware Reservoir and its recreational facilities will attract the week-end motorist. Except for two small developments at the cross roads the area is occupied by well developed farms with the buildings located adjacent to the existing highway.

One of the major factors in the analysis of the improvement is the land and community benefits derived from the improvement. Severance damages, loss of frontage, displacement or removal of buildings, effect of partial take on the remainder of the parcel, before and after value of the parcel are considered in the design of the improvement. The goal of the proposed highway improvement is to fit into the mold of the land it crosses and best serve the needs of all the people.

TOPOGRAPHY AND GENERAL GEOGRAPHY

The area lying north of the City of Columbus and the City of Worthington is composed of flat to gently rolling land typical of prairies. The most striking feature is the north-south alignment of the streams as they flow through Franklin County to the Ohio River. The Scioto River on the west, the Olentangy River in the report area and Alum Creek on the east are the focal lines for the relief of the terrain. The river valleys are of comparatively early age and have not extended their influence to any great extent away from their flood plains. The upland plateaus are nearly level except for the very few secondary branches that spring out from the Olentangy River. The topography can best be seen on the Relocation and Improvement Maps, Plates 10-13.

The rivers are not navigable but are of major importance in the flood control protection and as a water supply source for the area south of the report area. The Olentangy River is the only river of consideration in the report area but influences the location studies more than any other single feature. North of the City of Delaware the Olentangy River is contained behind the flood control dam maintained by the U.S. Engineers. Completed in 1948, this reservoir has been successful in dampening the flood levels within

Topography and General Geography (continued)

the area covered by the route studies. The respect the river has gained should be noted in the lack of encroachment upon the channel and flood plain and the number of bridges still remaining over the channel that were built after the 1913 flood.

The slopes of the river valley are bisected by the tributaries from the plateau. Many of these water sources have easily eroded the glacial till and have broken up the smooth valley outline. It is only in these finger type tributaries and transitions between the river valley and the plateau that farming is not a factor in the development. These slopes are the location for new subdivisions, private lodges and individual small acreage estates.

Railroads lie on these plateaus between the rivers also in a north-south direction eventually meeting within Columbus. Existing USR 23 alignment once contained the Electric Railroad between Worthington and Delaware via Village of Stratford. The Village of Mount Air and Stratford are directly affected by the relocation. The Village of Powell and several of the smaller junctions at the crossroads and at the railroads are considered in the overall design of the improvement.

The General Location Map, Plate 1, illustrates the importance of this connection to the north particularly to Sandusky and Toledo on Lake Erie as part of the ultimate State Freeway System.

In developing the Report the United States Geological Survey Maps and work sheets (1" – 2,000' and 1" – 800') were used extensively to determine alignments of various possible relocations. Aerial photographs supplied by the Ohio Department of Highways, zoning and tax maps from the Franklin and Delaware Counties were incorporated into the plan development. Field investigations were made along the lines of study to coordinate and resolve the elements of design for the alignments shown.

SOILS AND GEOLOGY

The area of study is dominated by the Olentangy River. The rolling topography and the river valley slopes to the south following the course cut by the river through the glacial till. The present land features depend on the rock structures under the surface and their relative position to the rock of the river valley. The effect of the several glaciers, the exposure to erosion and the physical properties of subsurface structures have shaped the features we now see.

Publications by the Geological Survey of Ohio, "Geology of the Columbus Quadrangle, Bulletin 14," and "Geology of Delaware County, Bulletin 30," and "Floods in Ohio, 1959, Bulletin 32" Department of Natural Resources contain considerable information in regard to the soil and geology of the entire area.

The Olentangy River follows very nearly the preglacial valley being influenced by its relationship to bed-rock. The entire area of study has been subjected to preglacial weathering from the Paleozoic era down to the Glacial Period. With the coming of the glaciers, in particular the Wisconsin glacier, the residual soil and subsoil has been redistributed over the gentle rolling rock surface. The area is contained completely within the Central Lowland Till Plain.

The major water courses that have continued to exist after the glacier receded have eroded the till and have shaped the valley to lie along the shale and rock layers that outcrop along its bank. The river while eroding to its present course and system of tributaries, have developed laterally to form a flood plain. The tributaries have cut back into the level terrains for a short distance leaving the remainder of the plateau relatively flat. Only the major tributaries reach out east-west with any effect on the relief.

The Soil and Geology Map, Plate 3 illustrates the general subsurface conditions that exist within the area of the study. The eastward dip of the subsurface rock and shales is 25 feet per mile with considerable outcroping of the Ohio Shale and Olentangy shale along the east banks of the Olentangy River. The river lies on the boundary between the older limestones of the west half of the state and the shales and sandstones of the east half. The section at the county line illustrates the general cross section of the area.

From the area north of Delaware the river follows the preglacial valley at an average drop of 8 feet per mile. It follows along the face and on top of the Olentangy shale to a point south of Delaware where it has cut down and eastward along the dip surface of the Delaware limestone formation. The river continues to the Franklin County line on limestone with the river valley contained within a much narrower valley. The river has cut into the rock only to a small degree, 5-10 feet, throughout its course. South of the county line in the northern part of Franklin County the river begins a flatter slope and has developed the flood plain and terraces adjacent to the river. The river flows over the Olentangy shale favoring the east bank and then onto the Ohio shale and till plain as it continues to the south and the limits of the report.

In general the surface materials except for those in the valley bottoms, is covered with a compact, yellow boulder clay or till of varying thickness. These light colored soils are usually medium acid and medium in material fertility that has been developed from moderately fine (clay loam) of the Wisconsin glacial till. The surface soils are shallow with heavier subsoils which are less permeable and more difficult to cultivate if eroded. The clay which composes 95% of the till is a fine grained, compact material nearly impermeable to water. Boulders of all sizes are embedded in this clay. The rock profile under the surface is consistent with the general topography of that seen on the surface. The effect of the dip of the shales and rocks in relation to the river would indicate no difficulty with the profile and alignment shown on any of the relocations. The shales are closest to the surface at the transition from the flood plain to the plateau above the river.

The shales will be encountered in very limited amounts in a few of the cuts required in leaving the Olentangy River valley. Descriptions of the Ohio and Olentangy shale formations and the Delaware and Columbus limestone formations is not included herein as the geology reports and State of Ohio bulletins carry extensive data as to their characteristics.

SECTION II FACTORS AFFECTING DESIGN

Soils and Geology (continued)

The Bureau of Natural Resources, State of Ohio was contacted on the well hole logs that are adjacent to the various alignments. These records verified the information available from the various bulletins. Soil profile information from the State of Ohio Department of Highway, supplied additional information at these connections to the existing roadway systems.

The lR 71plans show that 7 to 9 feet of clay and silty clay with boulders encountered on 4 feet of shale over 32 feet of sand silt with black Ohio shale being encountered 44 feet below the surface. The depth of the shale decreases to the west to the area of existing USR 23 on the Relocated SR 161 where shale can be expected to be 3-10 feet below the surface.

On the Relocated USR 23 alignment and north from Linworth Road to the Mt. Air area, bedrock will be 4 to 16 feet below the surface. North of Mt. Air where the relocation is nearing the plateau the clay overburden varies from 15 to 45 feet thick. In the area of the Olentangy Caverns on the Industrial School Road the logs show 14 feet of clay over limestone.

The improvement of USR 23 on the existing location does not present any major soil problems in that the area has adequate overburden and cuts of normal range are affected in the widening.

North of Delaware the till is composed of A6a clay and silty soils. Outcrops of shale along the river are the base for the mantel of earth to the west of the present alignment. Excavation should not encounter any rock formations and only a limited amount of shale along the existing location where the extension of drainage facilities will require some shale removal. On the relocated alignment a limited exposure to shale will be encountered in leaving the river valley and passing into the upland plateau.

The till or ground moraine deposited by the glaciers forms a veneer over the more irregular bed rock surface. This level plain has only begun to create drainage relief. The valleys of the river has deposits of the upland till and gravel in the major flood plain. Organic deposits of a limited nature could be expected in the lower areas of the river bed. The Powell and Broadway moraines are shown on Plate 3. These moraine belts rise above the level till plain to a height of up to 40 feet. These belts were created along the marginal edge of the glacier when it paused or moved back over the area before withdrawing to the north. Gravel deposits are to be found in these areas. Oil and gas deposits are not present in the area and not considered as a possible source.

Except where the river crossings and relocation along the river valley is planned, very little difficulty should be expected in regard to the soil conditions.

RIGHT-OF-WAY

The right-of-way width will vary depending upon the construction requirements and the economical analysis of the frontage adjacent to the Freeway. The requirements of the right-of-way limits shall be in accordance with Geometric Design Standards of the Interstate and Defense Highways. The typical sections are the criteria element by which the land to be acquired is determined. Additional width may be required for construction.

Property affected by the relocation and improvement is shown in the Land Ownership Maps.

On the Relocated USR 23 alignment a minimum right-of-way width of 240 feet is desirable to provide for moderate cuts and fills with additional widening required at deep fills crossing major drainage courses and in areas of the grade separations and interchanges. Where a 2-3% existing ground cross slope is present the benched median will provide saving both in right-of-way width and earthwork quantities. Much of the relocation is along boundary lines of farms away from their buildings and access roads.

The right-of-way minimum width on the interstate section of relocated SR 161 is 270 feet with additional widening dependent upon construction and economic requirements.

On the improvement on existing location the right-of-way requirements will be very irregular. In most instances the land required for the construction of the limited access facility will require additional strips of land on both sides of the highway. The widening of the median and the economic justification of the frontage road account for these acquisitions. These strips will generally be 50 to 70 feet wide except at ramp connections and at crossroads. With the presence of residential and commercial development adjacent to the existing highway, the providing of access roads will nearly always cause the displacement or relocation of the building or proximity damages to those not removed. Except where widening is in one direction only as in adding a pair of lanes, the additional land required is for the construction of the frontage roads and interchange or grade separations at the crossroads. Associated with these acquisitions would be the many slope and work easements to provide for egress to the property owner's buildings and fields.

The properties were evaluated as to type of zoning and land use; residential, commercial (including motels and service stations), farm lands, potential subdivisions, platted and partially developed subdivisions, church and school properties and parks – both State and Federal. Individual buildings were valued according to relocation and proximity damages. Severance and loss of egress factors were thoroughly studied in the use of frontage roads to provide access to those many properties otherwise land locked. These values of frontage roads vs. right-of-way costs are considerable and extremely difficult to evaluate. This is compounded by the other function of the frontage road to provide a connection to the crossroads and ramps for local circulation adjacent to the Freeway.

Property values are rising rapidly throughout the area. On the relocation study, subdivisions covering 50-150 acres are quickly taking the remainder of the prime residential locations near the Olentangy River. Strip development along existing USR 23 is increasing the side friction and rapidly increasing the cost of providing a limited access freeway in the future.

Right-of-Way (continued)

Mineral rights involving the natural resources were not compensable since there is no industry of this type effected by the alignments; however, with the type of surface deposits containing gravel available, the construction costs should reflect some savings.

All costs of land, buildings, damages, building demolition and cost of acquisition are included in the estimate contained in this Report. Type of right-of-way acquisition and access control shall be in acrordance with the Ohio Department of Highways Right-of-way manual.

The studies have a particular regard for land use. On the relocation study, the effect of severance of land parcels on future use is a factor of major importance. In upgrading the existing highway to a limited access Freeway the immediate use or present value has a dominant role in the over-all plan. Services to the motoring public shall be somewhat restricted by controlled egress but the safety to the local and motoring public by removing potential collision points would offset these deficiencies.

The limitation of access provides the highway with a protection against deterioration due to traffic interferance from roadside development. The safety and capacity of the highway is dependent upon this access control and the degree of control influenced by the public crossroads at the point of access.

The report offers a limited access highway with interchanges and grade separations with no intersections at grade; also presented is the highway with grade separations including interchanges and some intersections at grade of public roads. In all locations right-of-way is acquired for ultimate grade separation and elimination of all intersections at grade.

All costs to the Utilities in adjusting their facilities in the portion outside the area of the previous state highway right-of-way are included in the right-of-way costs contained in the Report.

The other utility relocations and adjustments required for the improvements do not reflect in the cost of the project directly. On the relocation study, the utilities absorb very little additional cost. With the Freeway on existing location and the change in right-of-way type and access requirements the utilities within the limits would require relocation. Pole lines would not be seriously affected but the underground gas and telephone lines would constitute a nominal cost to their owners.

The major utilities involved on this Report are noted below. The location of the major distribution and transmission lines including the size and ownership are shown on the Land Owner Maps. The crossroads and secondary township and county roads have the normal utility services adjacent to the right-of-way line and are not included on the ownership maps.

Utilities effected by the Improvements:

Ohio Bell Telephone Company
Columbus & Southern Ohio Electric Company
Ohio Power Company
Ohio Edison Power Company
Sinclair Oil Company
Ohio Oil Company
Delaware City Water Department
Delaware Gas Company
Ohio Fuel Gas Company
Northern Ohio Telephone Company

CONTINGENT HIGHWAY STUDIES AND EXISTING ROAD SYSTEM

The relocation and improvement studies on all sections of the report were dependent to a large extent on the existing Federal and State highway network, the County and Township road system, the city street system and other preliminary studies and projects now underway with other agencies. A continuity of design is necessary to provide a facility that is both economical and in balance with the needs of the traveling public and the community through which it passes.

Several preliminary design reports and highway improvements are being developed at this time that have considerable influence on the design requirements used throughout the Report.

The Preliminary Design Report on Olentangy River Road by Alden E. Stilson and Associates, Columbus, will be completed in the very near future. The proposed relocation of the Olentangy River Road is compatible with the design features required on extending this alignment north within the section referred to in the report as Relocated SR161 (Phase III). This same connection is the extension of Relocated USR 23 south as part of the Olentangy River Road improvement or Olentangy Expressway

The remainder of the Relocated SR161 alignment in the east-west direction is on the alignment of the I270 Outerbelt alignment. The construction plans are in the early stage of plan preparation by DeLeuw, Cather, and Brill, Columbus. The report has been up dated to the higher design requirements for the I270 interstate highway with the design sections retaining the designations as per the original draft of the Report. I270 will provide the SR161 By-pass from the area west of Dublin to a point south of Westerville while the Phase Ill of Relocated SR161 will provide the connection to Olentangy Expressway relocation and Relocated USR23.

The Delaware Expressway plans are in the final stage of construction plans on the USR23 section and are partially developed on the Relocated USR42 section. The expressway has no intersections at grade except at its north terminal with existing USR23. Burgess and Niple are preparing these plans.

SECTION II FACTORS AFFECTING DESIGN

Contingent Highway Studies and Existing Road System (continued)

Following the preliminary report by Barrett and Associates, Ltd., Columbus, construction plans are being prepared for the improvement of USR23 north of Delaware. Beginning at the end of the existing four lane pavement and the north limit of this report the present roadway is being upgraded to a limited access type highway which would eventually consist of a divided four lane Freeway with frontage roads on both sides.

Traffic volumes and assignments to the various alignments and existing roads are discussed elsewhere in the report.

The alignment proposed for I270 and Relocated SR161 would obviously require three major interchanges with free flowing movements to all quadrants. The degree of development of the interchange patterns depends upon the characteristics and demands of traffic as to volumes, design speeds and the capacity. The classification of the intersecting freeway with 1270 will influence the design as to major movements, type of ramp connections and weaving-merging arrangements in the interchange areas. With the interchanges being located quite close to each other a uniformity of pattern of the ramp arrangements shall be attained to eliminate confusion to the motorist.

Diamond type interchanges are used extensively on the remainder of the interchanges north on the USR23 study. With the need of frontage roads parallel to the Freeway on the existing location the ramps are connected to the frontage road and thence to the crossroad.

SR161 is the only highway of any consequence providing a continuous route across the many rivers and railroad facilities in northern Franklin County. The roadway occupies the narrow right-of-way along a line that is reasonably straight and free of profile deficiencies. With age it has developed a nearly continuous strip of development along its boundaries with Worthington and Linworth losing their identity. The highway being the only east-west artery in the northern part of the City and County carries the bulk of the truck traffic in this direction and interconnects USR33 in the west with Olentangy River Road, USR23, I71, and USR62 in the east. SR315 and Wilson Road afford only a limited amount of relief to the overflow from Olentangy River Road to USR23. Much of the traffic has its destination to existing USR23 and the I71 freeway while other needs are of a local nature. The present roadway with pavement widening within the interchange shall be able to handle the local traffic in the ultimate plan of the improvement and relocation of SR161.

SR315 recently designated a scenic highway is displaced in a limited area near the interchange with 1270. Northward the alignment which is adjacent to the river and through very scenic surroundings is not disturbed. The relocation of SR315 to Linworth Road rather than to Wilson Bridge and SR315 south is both economically feasible and best serves the local traffic requirements and over all road network.

With the construction of Relocated Olentangy River Road the function of existing River Road shall be of service limited to local traffic. Linworth Road at its junction with River Road a mile and a half south of SR161 provides the connection to SR315 over the existing alignment provided on Linworth Road. This realignment of travel habits would influence a much larger area for the potential use across the Freeways and Outerbelt.

The County road system has been carefully analyzed as to present usage and as to the effect of interchanges on both studies. The pattern established by river crossings, railroad grade crossings and school districts was of major consideration on locating the grade separations and interchanges. Local traffic had its greatest effect on the ramp locations associated with the interchanges.

The County road system is composed generally of hard surfaced, all weather roads of 50 mph design speed. Only the recently developed subdivision roads and those with 1980 traffic counts of 80 VPD or less are of gravel surface. All existing river crossings are narrow two lane structures of pre-war origin.

The factors concerned with the various details of the highway design are included in that phase of the plans found elsewhere in the Report.

TRAFFIC

All economic, design and traffic studies are based on the design hourly volume for the year 1980. The assignments to the various sections of study were based on several adjacent traffic studies.

The State of Ohio Department of Highways has assigned traffic to the Outerbelt relative to both the relocation of USR 23 west of the river and on existing location. The outerbelt assignments are included on the Columbus Metropolitan Area Map 3 showing "1980 Peak Hour Traffic Assignment to Arterial System and Scheme 2 of the Proposed Expressway System, Dec. 1961". This scheme contains the alignment study with USR 23 on relocation west of the Olentangy River. Scheme I, November, 1962 contains the study of USR 23 on existing location. The outerbelt alignment is south of Wilson Road on that study and new assignments have been made on a limited section on the proposed line parallel and north of Wilson Road.

"Sketch Showing the Estimated 1980 Average Daily Vehicular Movements on Proposed State Route U.S. 23 from Franklin County Line to Interstate Route 75 at Findlay, July, 1961" shows the 1980 average daily vehicular movements on the two lines of study on USR 23 - North of Delaware the study is along existing location only.

"Sketch Showing Vehicular Movements for an Average Day in April, 1961 at Existing Intersections on State Route U.S. 23 from Worthington North Corporation to State Route 229 North of Delaware, April, 1961" gives additional information as to turning movements on several of the secondary roads not shown on other studies. The relationship of existing traffic to design traffic and the composition of the vehicle volumes are used in the geometric and economic analysis of the highway improvement.

Additional information was received from the Bureau of Planning Survey, Department of Highways on vehicle counts on SR 315. Traffic counts were made on other intersections required in the analysis of the overall plan of a limited access highway. Private and semi-public facilities were included in the survey of traffic requirements.

The above information is compiled in the Report on the five traffic plates. The Relocated SR 161 which includes the Outerbelt segment, is assigned traffic for both USR

Traffic (continued)

23 studies; Relocated USR 23, Plate 14 and USR 23 Freeway on Existing Location, Plate 15. Traffic assignments for both independent study alignments between Worthington and Delaware are shown on Plate 16 and 17. The Relocated USR 23 traffic is that assignment made if it were the only road improvement. USR 23 Freeway on the existing location assignments are those if only that route existed at the degree of improvement shown. North of Delaware the Relocated USR 23 and USR 23 Freeway traffic volumes are shown on Plate 18. Values have been assigned to the relocation in regard to cross road traffic. 1980 ADT traffic at all the cross roads are shown because of the importance of interchange, grade separations, and frontage roads in the completed system. Directional design hourly volumes are needed for the reassignment of cross road traffic and ramp design at the access points to the freeway.

The information compiled on these plates were resolved from the various traffic studies and adjusted to give a complete picture of the overall traffic needs. The effect of the Freeway on the local road system and land use along the proposed locations and in reference to the traffic assignments prior to study were reassigned to the Freeway at the point of application.

The study of the highway improvement is made on the feasibility of up-grading the route between Worthington and Delaware and north of Delaware to the proposed highway improvement north of the Reservoir. The control of access is of major consideration throughout the study both in regard to stage construction and the ultimate design. The existing USR 23 facility has controlled access along some of its length namely north of Stratford to Delaware in that it allows one access point to each property owner. Cross roads and intersections at-grade with high type approaches at the cross roads are used on the present four-lane highway. Sight distance and alignment is adequate for 70 mph. design speeds. Narrow medians or lack of median, numerous access points, lack of turning or storage lanes and mixture of local thru traffic shall limit its operation and safety to an operating speed of 44 mph (60 mph design speed). The ultimate design would be of the freeway type while an expressway with some intersections at grade might be desirable as an intermediate and more economical improvement for the benefits gained.

The composition of the present and 1980 ADT is generally in the range of 10% commercial truck traffic and is included in the total in all cases. The volumes are adjusted only in regard to operating costs of trucks vs. passenger vehicles on the economic and and benefit ratio studies. A distribution factor for the directional flow during peak hours is 60% and the peak hour value of 15% of the average daily traffic (ADT). Directional design hourly volumes (DDHV) is based on those factors throughout the report in noting 1980 traffic requirements.

DESIGN CRITERIA

The design criteria for the Report is based on the engineering criteria as set forth in the State of Ohio, Department of Highways, Manual of Location and Design, American Association of State Highway Officials publications "A Policy on Arterial Highways in Urban Areas, 1957", "A Policy on Geometric Design on Rural Highways, 1954" and "Geometric Design Standards for Highways Other Than Freeways, 1962." Certain modifications were made to conform with the "Geometric Design Standards for the National System of Interstate and Defense Highways" as adopted by the Committee on Planning and Design Policies, American Association of State Highway Officials, July 12, 1956. The criteria presents the basic design and details followed in this Report and contained within the above noted publications. The design criteria shall not be limited to the minimum standards but shall employ as high a standard possible whenever the use of such standards will not substantially increase the cost of the Project.

The design criteria is of two specific alignments with some definite qualifications. The I270 section including Relocated SR161 is of the higher design because this section is on the Interstate System of Defense Highways. The degree to which the design is increased is as shown on the typical sections and included in the criteria so listed.

In that the report is a study the feasibility of upgrading the existing USR-23 to fully controlled access as opposed to the relative merits on a new location a distinction of degree of control of access is expanded.

FREEWAY – Full control of access warrants grade separations and interchanges. Without crossings at grade the minor intersecting roads are rerouted, terminated, provided grade separation or connections at the interchanges. Ramps are used to provide access from the local highway to the major highway.

EXPRESSWAY – Full control of access is provided with grade separations and some interchanges provided at the major roads. Some intersections at grade are tolerated at minor roads. Provisions for upgrading the at grade intersection to freeway status is incorporated in the right-of-way requirements. The means of developing the intersection to freeway standards were considered in the stage construction where expressway standards apply.

The horizontal and vertical alignment is controlled by the topography, geography, land use, right-of-way, existing road system, traffic and construction design controls that mold the highway into an efficient artery of transportation. The ultimate goal of the facility is to provide a road that together with its economical and esthetical qualities will make a profitable return in proportion to the money spent upon it. This road shall be of a design consistent with both present and future needs. The ultimate design is for the total elimination of the remaining intersections at grade that exist on the expressway stage of construction. The expressway is considered in that it can be the stage that would best serve the needs in 1980.

Roadway

TYPICAL SECTIONS are shown on plates 4 through 7 and provide for two 12-foot lanes in each direction. Three 12-foot lanes are used in a limited quantity on extending ramp terminals in order to decrease lane density on the main roadway. Each directional roadway is protected by a 10-foot paved berm on the right and 4-foot paved berm on the left. North of Delaware aggregate berms are used adjacent to the pavement. Paved berms are used on the inside shoulders with the 20-foot median.

Design Criteria (continued)

The width of the median will be dependent upon the section of highway under design. That section of highway included on I270 will retain the 84-foot raised median. On all relocated alignments and on the USR23 on existing location where economic considerations qualify its use, a 50-foot depressed median shall be used. The USR23 Freeway in existing location will employ a minimum 20-foot median between edge of the traveled lane with a 5-foot paved shoulder sloping to the 10-foot curbed median. Final construction plans shall consider using a 16-foot median with guard rail over sections where the existing median is less than 10 feet. The irregularity of the profile of the adjacent lanes creates a problem of final cross section requirement for the USR23 Freeway on existing location. Storage for left-turning vehicles at the intersections at grade will require the larger median.

A benched median that provides a 2-foot difference in the profile on the adjacent lanes is recommended as shown on the typical sections of the Relocated USR23 alignment, Plate 4. The drainage courses and existing ground slope is conducive to this arrangement of profiles. In addition to the savings in embankment and excavation items, the safety benefits, and the drainage advantages, the Freeway profile can be more easily adapted to the cross road profiles. Lane capacity for future traffic and the existing highway system would not require additional lanes within the median on this alignment.

Independent profiles have been recommended on the USR23 Freeway on existing location as a means of decreasing the climbing grade of the south bound lanes and is shown on the plans. The existing river crossing and right-of-way requirements allowed this feature to be incorporated in the plans. An independent profile on I270 can improve the overall profile at the interchanges at I71 and also near the Olentangy River with the Relocated USR23 connection in its final construction plans.

Side slopes shall be as flat as possible in that they provide access of emergency use. Type of soil and costs of providing flat slopes shall be considered in balancing earthwork quantities and reducing other roadway costs.

DESIGN SPEED for the Freeway shall be seventy (70) miles per hour. This speed determines the configuration and physical features of the highway that influence vehicle's operation.

ALIGNMENT shall be of as high a standard as possible. Flat curves of 0° 28' to 1° – 28' are used extensively throughout the report with major change in alignment restricted to curves of 2° 30' with spiral transitions.

GRADES shall range from 3% maximum to 0.2% minimum.

SIGHT DISTANCES at horizontal and vertical curves shall be at least 600 feet. Sight distances are based on a height of eye at 4 feet and object of 0 height. Minimum length of vertical curve is 400 feet.

SUPERELEVATION shall be attained by rotating about the inside edge of pavement and as shown on the typical section. The maximum rate is 0.08 foot per foot.

Traffic Control and Safety of the Interstate and Primary System is within the framework of policies of the Ohio Department of Highways and approved by the Bureau of Public Roads.

Signs shall be provided at the interchanges and elsewhere to prevent confusion, provide maximum safety and obtain desired traffic movements. Traffic control devices shall be installed where required by final design factors. Delineators shall be installed on all interchanges and on the entire length of the Interstate Highway and pavement marking on all the sections of study in accordance with the ASSHO "Policy for Signing and Pavement Marking for the Interstate Highway System". All interchanges shall be lighted in accordance with the policy of the State of Ohio Department of Highways at time of development of final plans.

Interchange and Ramp Design

INTERCHANGES on this report fall into two categories:

1. Diamond type where the crossroads require only light turning movements, and

2. Cloverleaf type at Freeway and major roads with modifications for the type of connection and traffic volumes. The location of the interchanges are shown on the Plan and Profile Sheetsand the Relocation and Improvement Plates

The diamond interchanges have incorporated the frontage roads as the connection for the ramps to the crossroad. The requirements of the traffic and access to other crossroads and private developments are well adapted to this arrangement. The crossroad terminal shall be designed for the design speed of the crossroad.

The cloverleaf interchange is used as the basic traffic configuration on the three adjacent interchange designs on the Worthington By-Pass and the Relocated SR161 alignment. The uniformity of the interchange pattern, type of intersecting highway, and traffic volumes were of major importance in the overall plan. In rural areas interchanges between Freeways are associated with direct or semi-direct movements. Traffic movements to all quadrants are required and expected in a manner that shall provide an adequate, natural path for the vehicle. The major movements are provided by direct connections to the right and semi-direct for the left movement. Loops are used only where the distributor roads remove the heavy weaving from the heavily traveled freeway and when the freeway and ramp weaving traffic is very light. The exit ramp from the freeway is consistently from the slower moving, outside lane and to the right throughout all the interchanges. Major movements require modifications of the general configuration to more favorably give priority to the movement.

On the USR23 Freeway the partial cloverleafs minimize construction and right-of-way costs. The loop replaces the one set of ramps which allows the crossroad to be relocated in a more desirable location.

RAMP DESIGN is dependent upon the volume of traffic and terminal conditions at the main roadway. The design speed for the ramps shall not exceed 45 mph or be less than 25 mph except where stop conditions exist at the crossroad. Ramp grades shall be limited to 5 percent down grade and 4 percent up grade unless otherwise restricted by right-of-way. Ramp radius on loops shall fall within the limits of 300 feet maximum to 150 foot minimum. Lengths and transitions for curve shall be of a proportion to allow the vehicle to maintain a safe, reasonable speed throughout. The radius of the loop

Design Criteria (continued)

shall be dependent upon the adjacent features of the roadway. Distributor roads, weaving sections with the acceleration – deceleration lane adjacent to the main pavement, and standard exit and entrance conditions will limit the radius required at each particular ramp. On semi-direct connections the ramp shall be designed to handle large volumes of traffic by use of flat curves at the terminal with proper transitions to curves of not less than 700 feet radius for a design speed of 50 mph. The ramps associated with diamond interchanges shall be designed to allow smooth operation. A 250 foot radius is desirable in all cases except where the ramp has been provided adequate sight and alignment qualities to permit a 200 foot radius preceding the stop condition of the crossroad. Sight distance shall be as long as practical and in balance with other design features of alignment and profile but shall not be less than 315 feet. All design features shall be above minimum herein indicated to provide a directional roadway that will carry the volume required on the overall plan. Speed change lanes shall be of design that will permit speed changes off the main pavement. The lengths of the transition or taper shall be consistent with the design features of all other ramps on the system. Weaving lanes will be tolerated only where extremely light movements are present on both the main roadway and ramps. Other weaving sections are placed on the distributor road. Weaving sections shall be not less than 600' in length. Major forks are used where the turning movement is predominant to the through traffic and in separating ramp movements. The entrance opening shall be two-lane when traffic exceeds 1200 vph. Single lane openings are used on all entrances to the Freeway with adequate weaving lanes preceding the merger of two ramps at the freeway . On the more heavily traveled sections the entrance ramps are continued adjacent to the freeway to the next interchange.

The ramps including all merging and weaving sections shall be so designed that the traffic over the design period and in the future will not cause traffic interference on the main Freeway.

Drainage

The drainage criteria for the study shall be established by the Manual of Location and Design, State of Ohio Department of Highways. The I270 section which includes the Relocated SR161 alignment will contain the higher standards as to disposal of water from the highway area. The importance of removing and channelizing water off of the pavement is of primary importance on all sections with the means of disposal and their effects on clearances to the pavement of secondary importance. The 50-year design frequency will be used to provide the basic protection to the highway and the drainage area affected.

The structures over the Olentangy River shall be designed to pass a 50-year design frequency flood. The relocated channel and bridge openings shall provide for the future improvement and flood control measures as are necessary for the protection of the highway and the adjacent property owners.

The reports included below by agencies concerned with the Olentangy River supply additional information on flood conditions that shall be considered in the design features of the embankment heights, channel relocations, width and slope protections adjacent to the highway and the structures over the river.

1. "Floods of January and February, 1959 in Ohio, "U.S.G.S. Circular Number 418
2. "Map HA-52"–Department of Interior.
3. "Plans for Dam, Delaware Reservoir Project Feb. 1946" U.S. Engineers.
4. "Floods in Ohio Bulletin 32, 1959"–State of Ohio, Department of Natural Resources.

Structures

GENERAL : Structures on the study include all river and stream crossings over 20-foot span and grade separations between the Freeway and other highways and railroads.

DESIGN SPECIFICATIONS: Structures shall conform to the requirements of the "Design Specifications for Highway Structures of the State of Ohio Department of Highways, October 1957" together with the revisions thereof. Design of structures carrying tracks over Freeway will also be subject to the requirements of the Railroad concerned.

Width of structures for the Freeway and crossroads shall be determined in accordance with the State of Ohio, Department of Highways, Division of Construction, Bureau of Bridges, "Design Regulations, January 1962." Relocated SR161 (Phase 161-I and 161-II) is on the Interstate System and the remainder of the study is on the Federal Primary System. The effect of length and capacity on bridge cross-sections and clearances are included in the "Design Regulations" and shown on Plates 8 and 9–Structures.

STAGE CONSTRUCTION

The completion of the highway to standards below the ultimate design at an early date and completion to final design as funds become available is one of the facts to be gained by the study. The ultimate goal of all studies to gain a limited access highway with elimination of all grade separation in the future but not necessarily by 1980. The ability of these studies to this end is the basis of the Report.

The existing highway is presently fulfilling the earlier stage requirements in that it is handling the present traffic adequately but with every increasing points of friction. It has the advantage 1) of being utilized for both the local and national needs, 2) zoning has been established along it boundaries, 3) the services to the motorist are present, and 4) some degree of ultimate design has been incorporated into the facility.

The limiting of access to private entrances and some public roads will require frontage roads to serve these adjacent properties and the service centers. These roads will require additional right of way and displacement of buildings near the freeway. Along certain sections of this existing highway the median is inadequate and will require additional widening of the pavement to gain this objective. Grade separations at the crossroads disturb the frontage and traffic distribution at that point where the improvement accomplishes only a degree of its purpose. With the degree of design now present, stage construction on a major part of the existing highway would be delegated to the early improvement of right of way and the construction of frontage roads. Providing an adequate median and limited number of grade separations would be the next step. By

Stage Construction (continued)

1980 traffic volumes would indicate the number of intersections at grade tolerated in the highway improvement.

On the relocation of the highway the new route provides a generally higher type and consistent design which provides a new route to augment and relieve the existing route. The local traffic continues to use the existing route extending its useful life to a more safe role. The adjacent landowner is not displaced as the relocation generally falls along back property lines and lines of least resistance as to the economic considerations of the relocation. Stage construction is not recommended between Worthington and Delaware on relocation because of the anticipated traffic volumes and the nature of the relocation. North of Delaware it would seem feasible as traffic is much lighter and conditions north of the report area would lend themselves to this assignment.

The limits of the stage construction is to both control the length of project as to total cost and usable sections for traffic needs. The recommended and alternate improvements are discussed elsewhere as to the stage of development to the ultimate plan.

Relocated SR161 is recommended in progressive stages according to the needs of traffic. The connection of I71 to existing USR23 is of high priority at the present time and one of the requirements of this report. The connection to SR315 and the bypass of Worthington is of the next priority of importance. The emergence of the outerbelt in the northern route instead of the inner route as recommended in the Outerbelt Report would place the SR161 Bypass along the alignment proposed by the I270 alignment. This interchange alignment and configuration is compatible to either arrangement of USR23 to the North and not actually dependent upon their early completion. The third phase(161-III) would relieve the traffic through Worthington considerably in that the Olentangy River Road traffic would have access to both the north and east limits of the I71 and USR23 improvements. The needs of traffic along the Relocation SR161 alignment between I70 and Relocated USR23 completely dominate the I270 requirements west and east of the study area.

All of the sections of study can be further divided as to stage construction as need for the grade separations develop. The long range benefits of complete separation of grades would not necessarily be completed by 1980 but are included in the overall plan and discussed elsewhere in the Report.

ECONOMIC STUDIES

Method of Analysis – Benefit Ratio

The broad purpose of this report is to determine the most feasible route that will provide the maximum traffic service at a minimum cost. The road user benefits are analyized and developed as recommended by the instructions furnished by the State of Ohio, Department of Highways and in accordance with the practice recommended by the American Association of State Highway Officials, 1960 published in, "Informational Report by Committee on Planning and Design Policies on Road User Benefit Analyses for Highway Improvements."

The results of the analysis is included in Section V, Economic Benefit Analysis and discussed further in the Recommended Route Locations, Section I.

The road user benefit analysis for the relocation and improvement of the highway is a comparison of alternate locations. The existing road is considered the basic condition in analyzing the benefit ratio. The tables included in the Economic Benefit Analysis in the Report following this discussion lists the comparisions of the relocation and improvements of USR23 as to the degree of limited access. The various studies are compared to the basic condition. In this manner the ratios can be compared directly to their relative values.

For each study the annual road user costs and the annual cost of improving, maintaining and operating that portion of the highway are determined for a selected period, in this case 17 years through the year 1980. Road user costs include all traffic directly involved or effected by the improvement.

The highway improvement is divided into as many sections as there are significant variations in the major design factors. Traffic volumes and physical changes in the character of the Freeway as to number of lanes, profile and alignment are considered in determining the degree of accuracy obtained in the report.

The road user benefits are developed in three steps: (1) Computation of benefits derived through the improvement and use of the highway; (2) determination of the cost of that highway both as to initial project cost and to the continuing costs; and (3) the determination of the relocation between road user costs and road costs. The principle benefits are the differences in road user benefits and road costs in comparing alternate alignments under various operating conditions.

Basic Assumptions for Evaluating Highway Costs

The major factors considered in the calculation of highway costs is the sum of all capital costs on an annual basis and the annual cost of maintenance.

The estimate presented by the preliminary design report supplies the capital costs which are further separated into the costs for (1) pavement and appurtenances, (2) roadway including grading, drainage and minor structures, (3) structures over 20 feet span and (4) right-of-way. The capital recovery factor "K" for a 3% interest and amortization rate of the total cost of each of the above items is applied to these costs to compute that part of the annual cost.

Economic Studies (continued)

The estimated useful lifetime assumed for the various items of construction are as follows:

1. Pavement, including guardrail, fencing, lighting, traffic control devices, costs of detours and incidentals and other items not included below	20 years
2. Roadway, including all costs relative to excavation and embankment construction, roadside improvements, drainage and minor drainage structures	40 years
3. Structures over 20 foot span	40 years
4. Right-of-Way	60 years

Basic Assumptions for Evaluating Road User Costs

The major factors considered for the calculation of road user costs are selected to provide working controls that are practical and at the same time give reasonable accuracy. The road user costs is expressed in cents per vehicle mile covering all items involved in vehicle ownership and operation. The Value of time is included as one of the items of cost.

Road user costs for the report are established in terms of the following major analysis elements:

1. Type of vehicle - passenger including 10% commercial trucking.
2. Type of area - rural.
3. Type of highway - divided, 4 lane.
4. Type of operation - free or normal.
5. Running Speeds - 49 mph (70 mph Design Speed) - Divided Highway.
   44 mph (60 mph Design Speed) - Non-Divided Highway.
6. Gradient Class - 0 to 3 percent or 3 to 5 percent.
7. Type of surface - paved, good condition.
8. Alignment - tangent and flat curves.

All other factors are considered insignificant to the analysis of the relocation and and improvement of USR23 to freeway or expressway standards.

For the various sections of the relocation and improvement, the road user cost is calculated by the formula: Section Road User Cost = 365 x 'A' x 'L' x 'U'.

Where:
'A' = annual average daily traffic for the period (17 years)
'L' = length of section under study in miles
'U' = the combined unit operating and time cost per vehicle mile for the type highway and operating conditions thereon.

The highway improvement benefits the road user in several ways. The expense of operation of the vehicle, safety of operation, savings in time and increased comfort are items of consideration in the road users cost.

Consideration shall be given to the following seven factors in the economic analysis of the improvement:

1. Solvency of the state system in regard to overall road user to benefits derived.
2. Benefits to the community and land adjacent to the improvement and those served by the highway.
3. Costs of construction of the relocation or improvement.
4. Costs of maintenance and operation of the highway.
5. Direct benefits to the road user in the form of vehicle operating costs and savings in time.
6. Indirect benefit to the road user in the form of increased comfort and convenience, and
7. Benefits to the road user in the form of over-all accident reduction.

Factors 1), 2), and 7) are included in the discussion but not assigned specific economical values in the analysis. The values and weight of their importance to the broad analysis is important and the omission of such values would effect the overall results. The cost of accidents alone in comparing the four lane highway with at grade intersections to the limited access highway would reflect a considerable cost favorable to the improvement.

This analysis is limited to the comparison of road user benefits to capital costs and is to be used in comparing alternates of this improvement of USR23. It is desirable to build the highway that will return the greater benefits to the amount expended upon it. In general, a benefit ratio of 1.00 is the point at which maximum overall benefits are derived.

In the determing of costs and the benefit cost ratio, the existing highway (USR23) has certain factors that are considered in the analysis. A median of 20 feet or more exists on 55% of its length. The existing four lane highway is of a high type with alignment and grades that tolerate design speeds of 60-70 mph. On sections where the median is less than 10' a 60 mph design speed is assigned in the analysis. Maintenance costs are normal for the existing divided highway and with the addition of a leveling and resurfacing course to the existing pavement and the resurfacting of the shoulders would carry the traffic over the existing alignment through the analysis period. The highway would have an extremely high accident rate, constant side friction, restrictive type operation with many intersections at grade. The costs of stops are not included or anticipated on the through lanes but would become necessary as local conditions develop.

Economic Studies (continued)

The cost attributed to the crossroad traffic having to stop on the basic study is considered and included in that item of road user costs. A lane capacity of 800 vph at a running speed of 44 mph is used to establish the required basic condition for the benefit ratio. All other factors are equal. The basic condition is conservative as to benefit ratio in that there will be local restrictive areas at the major crossroads at Flint Road, Scioto-Powell Road and SR315 at Stratford. The cost for widening and providing left turning lanes is also excluded as it is unreasonable to expect a highway with as varied a section and traffic characteristics to operate over the study period except as a basic condition for the economic studies.

The results of the economic study is shown on the Tabulation of Annual Users Cost and Benefit Ratio in Section V and Discussed in Section I on the Recommended Route Locations.

ESTIMATED PROJECT COST

The Estimated Project Costs for the recommended and alternate location of the highway facilities in this report are set forth in the Tabulation of Tentative Construction Cost Estimate. All project sections are tabulated as to construction stage and in regard to requirements of the degree limited access. The economic analysis is included elsewhere in this Report.

The costs presented therein have been divided into the items that comprise a project of the type in accordance with the State of Ohio, Department of Highways, "Tabulation of Predetermined Prices, September 1, 1961." Some deviation from this method was necessary in determining the cost of upgrading the existing USR23 facility where a more detailed study was made. Reference to construction plans for a more itemized construction cost were made instead of using cost per mile figures as for relocation. Estimates of quantities and costs include all those items that can be anticipated at this time that are the result of the design criteria and necessary to construct the highway facility as shown in the report.

Roadway

Includes the total cost of all items relative to clearing and grubbing in clearing the right-of-way for grading (excluding the demolition of buildings and other structures), cost relative to excavation and embankment construction, costs relative to drainage facilities including minor drainage, inlets and storm sewers, pipe culverts, concrete box culverts, and channel changes, all costs relative to guard rail, fencing, traffic control devices lighting and roadside improvements and those relative to all other items not included above. The estimate does not include lighting for the through pavement or crossroads between interchanges on either the relocation or the alternate improvement on existing alignment. Rest areas and weigh stations, are excluded as they are dependent upon adjacent highway facilities and need on the overall State of Ohio network of highways.

Pavement

Includes the total cost for the base, surfacing, shoulders of all the freeway through lanes, the ramps, relocation or grade separations at the crossroads and interchanges including the frontage road connections to the crossroads.

Structures over 20 Feet

Includes the total cost for all bridge structures of spans over 20 feet crossing streams, other freeways, crossroads and railroads.

Right-of-Way

Includes the cost of all land, rights-of-way, building, severance, damages, mineral rights, acquistion including demolition of all buildings and other structures. Also includes the estimated utility adjustment cost for those utilities outside the existing state highway right-of-way.

Preliminary Engineering

Includes the engineering costs incurred prior to the acquisition of the right-of-way and subsequent highway construction and represents a cost of approximately five (5) percent of all items of construction excluding right-of-way.

Construction Engineering

Includes the construction engineering and contingencies representing a cost approximating seven (7) percent of subsequent items of construction exclusive of Right-of-Way and Preliminary Engineering.

Detours and Incidentals

Includes the cost of detours and maintenance of traffic and funds for the unforeseen conditions or emergencies that may arise in the course of the project and represents a cost of ten (10) percent of the subsequent items of construction exclusive of right-of-way and preliminary engineering.

Total Project Cost

Includes the major construction costs for the completed project as compiled from the unit construction cost estimate required, as supporting evidence for this preliminary design report as per "Appendix D, Specifications for Consulting Engineer Services."

RELOCATED SR 161

Description and Location

The recommended alignment of Relocated SR 161 (5.12 miles in length) also called in this Report the Worthington By-Pass is shown on the Relocation and Improvement Map, Plate 10 and in detail on the plan and Profile Sheets 1-3. The outerbelt (IR 270) is included within the stage of construction herein noted as Phase 161-I and 161-II. The northern extension of the Olentangy Expressway to the outerbelt from existing SR 161 to the interchange at the outerbelt is noted as Phase 161-III. This section also can be considered the southern extension of Relocated USR 23. All items required for the completed highway to serve as a by-pass are dependent upon the requirement that Phase 161-I be the first section built, followed by Phase 161-II, and then Phase 161-III. This order of construction is recommended as the need of the facility is realized. The interchanges are designed complete with the interior loops and to the ultimate bridge widths. Only the through lane extensions and the direct movement ramps for the next phase are omitted. The interchanges constructed on the earlier phase would not be disturbed when the adjacent stage or phase is constructed and the additional movements added.

Relocated SR 161, Phase 161-I (2.42 miles in length) is a four lane limited access highway of Interstate standards, connecting IR 71 and existing USR 23 (High Street). Plate 4 notes the details of the 84 foot raised median and typical section. The interchanges are designed to the requirements of 1980 traffic and so arranged as to not disrupt traffic on IR 71 while being built. The proposed centerline follows the line established by the Department of Highways as per the public hearing held in Columbus, Ohio, on June 11, 1962. 0.40 miles of the relocation lies within the City of Worthington, the remainder of which lies in Sharon Township, Franklin County. The extension of the bypass and IR 270 to the east from IR 71 follows the approved route of the outerbelt. The requirements of this extension were altered with the outerbelt included within this relocation study. The interchanges and alignment of the outerbelt in the Westerville area is outside the scope of this report. The relocation of SR 161 will be completed by the outerbelt with the interchange at existing SR 161 north of Westerville.

The alignment of the route of Relocated SR 161 to the west of IR 71 follows the line recommended in the draft of this report and the line approved by the Ohio Department of Highways for the outerbelt location. The relocation to the west is parallel and 0.16 miles north of Wilson Bridge Road. All the structures and roadway items have been designed for an ultimate six lane highway with four lane construction proposed at this time. Grade separations are located at the Worthington-Galena Road and over the New York Central and Pennsylvania Railroad tracks. An additional lane on each side of the existing IR 71 pavement south to existing SR 161 would be required with the extension of the outerbelt to the east. The interchange at existing USR 23 is included in Phase 161-I including the improvements to the north and south to the frontage road connections. The priority of this phase is of particular importance and of immediate consideration in that the large volumes of traffic from the north and northwest would have a reasonable route to the south and to the IR 71 instead of being routed over city streets. Considerable traffic will be removed from existing USR 23 south into Worthington with this phase completed. This phase would have first priority of construction.

Relocated SR 161, Phase 161-II (1.04 miles in length) is a six lane divided highway of Interstate standards extending to the west along the line of the outerbelt and parallel to Wilson Bridge Road, north of the City of Worthington, all lying within Sharon Township, Franklin County. Plate 4 notes the 84 foot raised median and typical section. The alignment is extended across the Olentangy River and SR 315. The interchange at SR 315 is designed to include existing traffic requirements and the ultimate extension of the Olentangy Expressway to the north and along the alignment shown in the report. This phase would have second priority of construction. Either the by-pass to the west or Phase 161-III could be completed as the next step in the stage of construction. The configuration of the interchange is adaptable to either extension. The recommended extension would be to the south where traffic needs and road user benefits are the greatest. A limited amount of traffic will be able to use this facility until these extensions are completed.

Relocated SR 161, Phase 161-III is a four lane highway of freeway standards (1.66 miles in length) that extends from the south limits of the outerbelt interchange, beginning at Wilson Bridge Road, and in a southerly direction parallel to SR 315, the entire improvement lying within the limits of the City of Worthington. Plate 4 notes the detail of the 50 foot depressed median and typical section. The improvement lies within the Olentangy River flood plain and requires considerable channel relocation and widening south of Wilson Bridge Road. The Relocated SR 161 curves slightly to the east to align with the proposed Olentangy Expressway crossing existing SR 161, 0.13 miles east of its intersection with SR 315. The grade separation and 1,000 feet of roadway are included to the limits of this report. The widening of the pavement to 52 feet on existing SR 161 and the construction of ramps to the north are also included with this phase. Existing SR 315 remains intact north from existing SR 161 to the relocation across the freeway and the connection to Wilson Bridge Road. This phase would have a high priority for construction in that it will provide the badly needed connection to existing SR 161 and Olentangy River Road. The construction of the Olentangy Expressway will accelerate this need.

Alternate Study – SR 315 Relocation

An alternate study was made extending SR 315 north from its proposed junction with Wilson Bridge Road and passing under the end spans of the river bridges carrying the outerbelt. The recommended relocation of SR 315 from the area north of the outerbelt is a relocation over the outerbelt west of the interchange to the connection with Linworth Road. This route will serve a much larger area. The relocation to Linworth Road is more economical and of a higher type alignment to the credit of the overall road system. The cost of the improvement is included with Relocated USR 23 but shall be considered with the construction associated with the west extension of the outerbelt or Phase 161-III of the Relocated SR 161.

SECTION III RECOMMENDED LOCATION STUDIES

Relocated SR 161 Worthington By-Pass (continued)

Traffic

The traffic assignments for the relocated SR 161 are shown on Plate 14 and 15. The assignments to the interchanges for both studies are within the practical capacity of the geometrics of the interchanges. Plate 14 includes the assignments derived from the outerbelt distribution and traffic assignments applied to the relocated USR 23 west of the river. Assignments to existing USR 23 require the same interchange configurations on both schemes. Plate 15 includes the assignments derived from the outerbelt distribution and the traffic assignments applied to the USR 23 on existing location as generated from the improvement of USR 23 south from Findlay.

The studies influence the ramp and connecting roadway lanes more heavily on the relocated USR 23 and USR 23 freeway interchanges with relocated SR 161. The more desirable traffic volumes are on the relocated USR 23 study with a greater reserve capacity adjacent to the existing USR 23 improvement. This is desirable for traffic increases beyond the 1980 design period. The ramp terminals are planned to remove any backup on the through lanes and eliminate congestion that can not be eliminated by the normal outlay for additional pavement.

The generation of traffic into the IR 71 area is nearly the same for both studies for the USR 23 improvement. It should be noted that the movements to the south on the IR 71 interchange are nearly equal to the through movements in the east-west direction and twice those on IR 71.

Present and Future Land Use

The outerbelt section of the relocated SR 161 east of existing USR 23 lies in open farm land adjacent to residential and light manufacturing developments. The corporation limits of Worthington extend north of the relocation along the east side of the railroad. The grade separation and connection to Campbell Road allows access to this area east of the railroad. The construction of the IR 71 freeway in 1958 caused some minor realignment in farm ownership in the area. The existing road system is adaptable to the new access requirements and realignment of farm holdings. The freeway in the area of IR 71 should not affect land use because of the restrictions of access to the freeway and the importance of other features such as railroads, light manufacturing zoning, and local road system in the surrounding area.

The interchange at existing USR 23 will displace several residences and motels that occupy the front area of these deep parcels. The frontage roads will provide safe access at a distance from the ramp terminals to further protect the road user against confusion and uncontrolled access.

West from existing USR 23 on Phase 161-II the relocation lies along the back line of the deep properties fronting on Wilson Bridge Road. One large expensive residence is displaced on this alignment. The York Country Club is not disturbed on the north. The deep ravine is used to guide the relocation to the Olentangy River crossing.

South of the outerbelt on Phase 161-III the river valley is used as the relocation turns south via the interchange and continues south parallel to SR 315 to existing SR 161. Properties to the west continue to be served from SR 315 except for the connection being limited to Wilson Bridge Road. The channel relocation will follow an existing secondary channel and parallel the roadway embankment. The entire channel south of the outerbelt to existing SR 161 will be improved by widening and clearing to protect the adjacent property and the highway.

Heavy development can be expected on all quadrants on both of the USR 23 study lines. The protection of the investment made in the improvement is important and some method of extending the improvement on the alternate study to lesser standards should be considered in final construction plans.

Alternate Location Studies

Several other location studies were made north of Worthington and were discarded because of the costs or undesirable design features. The only opening north of the present line would cross USR 23 at Flint Road and pass north of Josephinum College. This route would be considerably longer and gain very little in access requirements. Any route south of the proposed line would be over the incorporated lands of Worthington and sever their light industrial and manufacturing area and seriously disrupting their residential development to the north. The existing road system, especially in the proximity of the relocated SR 161 interchange with IR 71, would create some difficulties to any line south of Wilson Bridge Road.

Right-of-way Requirements

The utilities and parcels of ownership affected by the relocation of SR 161 are shown on the Land Ownership Maps, Sheet 1-3 for all three phases. Wilson Bridge Road and the extension of Olentangy River Road via SR 315 to this connection provides a convenient means of maintaining the access to these properties adjacent to the freeway. The relocation of the channel will be important as the highway will displace part of the flood plain and require adequate channel improvements to protect the remainder of the flood plain particularly to the east.

Twenty-one residences and four commercial buildings are displaced by the relocation. Eighty properties are affected by the relocation. All the county roads and city streets remain open with Wilson Bridge Road relocated south of the interchange to provide protection to the traffic movements and the development along existing USR 23. The only frontage roads required are north of the interchange at existing USR 23 to provide access to a small subdivision and residences adjacent to the relocation. Land locked parcels east of the railroad are flexible as to farming requirements and the need of access to those parcels was considered in the right-of-way costs.

The utilities along existing USR 23 will be displaced by the interchange.

The interchange at existing USR 23 will displace several underground utilities and require relocation of the surface utilities around the area occupied by the improvement. The utilities associated with SR 315 and the other county roads will require the normal adjustments associated with a limited access highway improvement.

Effect of the Area on Design

On the outerbelt alignment a considerable difference in grade exists between the Olentangy River, existing USR 23 and the New York Central-Pennsylvania Railroads. The amount of glacial till that overlays Olentangy and Ohio shale will generally be adequate to provide normal cuts. Some shale will be encountered in leaving the river valley. The major drainage course entering the river along this line has some effect on the final line and grade. The exact elevation of the shale, depth of cut to the shale, the drainage course location adjacent to the centerline will allow an adjustment to flatter grades than 3% on leaving the valley upon development of final plans.

The interchanges with SR 315 and the Relocated SR 161 is moved slightly west and uphill from the present road location. This limits the amount of shale exposure and provides some cut in a basically embankment area. The ramp alignment and profile requirements to the east will require high standards because of the traffic volumes and outerbelt criteria. It is desirable to avoid long flairs on the river bridges and a sharp curve to align the ramp on the end of the bridge.

Distributor roads are used on the existing USR 23 interchange because the loops carry a moderate volume of traffic and the volume associated with the weaving section could not be tolerated adjacent to high speed through traffic. A high percentage of the traffic on the distributor road will be using the right lanes of the freeway and the ramps at the adjacent interchange allowing the through lanes to operate with much less friction. A large proportion of the traffic on this distributor will be generated within a two mile radius of the interchange.

The relocation is carried over the railroad because of drainage difficulties to the east. By continuing the relocation over IR 71 the IR 71 pavement is not disturbed and all the structures and ramps are designed to not interfere with the present traffic requirements of the freeway. The existing continuous steel beam bridge carrying Schrock Road over the freeway will be modified to allow the two lanes to fall behind the piers and eventually provide for the extension of a 12 foot lane adjacent to the main line pavement to the ramps at SR 161.

All three sections can be built as the need for that section becomes evident and as discussed in the recommendations. Maintenance of traffic are minor items and there will be little interference to the community through which it passes.

Estimated Project Cost

The estimated total cost of the project is $12,182,800. The tabulation of tentative cost estimate is included in the Summary of Cost for 161-I, 161-II, and 161-III in Section V of the Report.

SECTION III RECOMMENDED LOCATION STUDIES

RELOCATED USR 23

Description and Location

The recommended alignment of Relocated USR 23 (11.37 miles in length) between Worthington and Delaware is shown on the Relocation and Improvement Map, Plates12 and 13 and in detail on the Plan and Profile, Sheets 4 – 7. Both phase 23-I and 23-II should be built concurrently to provide a completed highway improvement as recommended with freeway standards. The typical section for this phase is shown on Plate 4 and 5.

Beginning at the extension of the divided four lane highways north of the interchange of IR 270 and the relocated SR 161 and approximately 0.03 miles west of the intersection of Hard Road and SR 315 all located in Sharon Township, Franklin County the freeway extends north crossing SR 315, 0.23 miles north of Hard Road into the Olentangy valley and thence curves to the left crossing SR 315 at Colony Way. Leaving the Olentangy River valley and passing through the southwest part of Mt. Air the proposed relocation continues northwest entering Perry Township at Plum Tree Drive, continuing on a tangent, crossing into Liberty Township, Delaware County, 0.41 miles west of the county line intersection at SR 315, continuing on a slight curve to the right crossing Jewett Road (Township Road 127) 0.55 miles west of the intersection at SR 315 and continuing on a tangent in a northwesterly direction crossing SR 750 east of the Village of Powell and 0.61 miles west of the intersection of SR 750 and SR 315, continuing on a tangent crossing the Girls Industrial School Road (Del. Co. 124) 0.74 miles west of SR 315.

The construction stage herein known as 23-II continues on the tangent to the northwest and crosses the Hyattsville Road (Del. Co. 123) 0.68 mile east of its intersection with Liberty Road (Del. Co. 9). On a tangent to the north and parallel to Liberty Road the relocation crosses Township Road 140 and Township Road 141, 0.65 miles east of Liberty Road, crossing into Delaware Township on a curve to the right and on a tangent to the northeast crossing existing USR 23, 0.42 miles north of its intersection with SR 315 at the Village of Stratford. The alignment curves to the left along the existing USR 23 centerline following that alignment along a curve to the right to the end of the relocation study and the beginning of the Delaware Expressway.

The Relocated USR 23 alignment between Worthington and Delaware west of the Olentangy River is the recommended route as compared to the upgrading of the existing USR 23. Both studies begin at points equal distant from the Outerbelt, have the same limits to the south of the Delaware Expressway, and are of nearly equal length.

The relocation will extend north within the Olentangy River valley north of the extension of Olentangy Expressway and Relocated SR 161, Phase 161-IV through the IR 270 interchange. A grade separation and ramp connection is provided at Hard Road to provide access to SR 315 and serve the area north of the Outerbelt.

The river establishes a minimum height of the embankment and the alignment of the relocation in the flood plain south of Mt. Air. The river location and right-of-way limitations force the freeway away from the river on an angle to the northwest to follow along the drainage course and the slopes to the plateau above the valley. Several other alternate studies were made at this particular point and will be discussed further under affects of area on design. The benched median with separate profiles as shown in the typical section is used to advantage along the alignment as the freeway is positioned at the edge of the plateau favoring the eastward slope. The slope of the ground to the east at 3-4% across the proposed profile will create a highway overlooking the entire Olentangy River valley. The cuts at the crossroad are balanced against the large embankments required across the major drainage courses.

Grade separations with some limited road relocation are provided at Jewett Road (Township Road 127) and at the Girls Industrial School Road (Del. Co. 124). Township Road 140, a 14 foot gravel road, is cul-de-saced and a grade separation is included on Township Road 141. Full diamond interchanges are recommended at SR 750, east of the Village of Powell and on the Hyattsville Road (Del. Co. 123). Several narrow gravel streets in Mt. Air are terminated along the east side of the proposed relocation. Garriage Road, a 16 foot gravel road to the back area of a subdivision is cul-de-saced at the connection to another subdivision fronting to the west. The relocated alignment is connected to the existing USR 23 alignment just north of the Village of Stratford by braiding the two lane ramps to the existing USR 23 pavement. The traffic requirements to existing USR 23 to the south are obtained by an exit ramp to that sector off the relocation and an entrance ramp to the south on Township Road 141. This ramp will also provide access to the entire south section of Delaware via Liberty Road.

A full diamond type interchange has been recommended at Hyattsville Road. This county road has access to the various schools in the county system and is one of the more important cross roads in the county. Consideration was given to placing the south set of ramps on the next road south at the Girls Industrial School Road. The southern traffic movements are more predominant at this point. Without a frontage road between the two roads this arrangement was abandoned.

The need of frontage roads is reduced because of the few residential and high type developments adjacent to the relocation. A frontage road is recommended on the west side of existing USR 23 to connect the several east-west subdivision streets to the south and the freeway. The State Highway Patrol will have access to the freeway.

The Relocated USR 23 is proposed as a four lane highway of freeway standards with no stage construction assigned for expressway standards. The construction of only the northbound lanes and their structures with purchase of all right-of-way was not considered as an alternate construction phase.

Alternate Study – SR 315 Relocation

The relocation of SR 315 to realign with Linworth Road and pass over the outerbelt is recommended for several reasons. This connection should best fulfill the needs of more traffic in that the area to be served is much broader and not restricted by the river and relocated freeway. The needs of local traffic west of the river are to the north and south following along this route. The freeway system will provide connections at Hard Road and SR 161. The relocation of SR 315 as recommended should be included with either Relocated SR 161, Phase 161-III or with Relocated USR 23 as included in the plans whichever is built first. The cost of the relocation is included with the Relocated USR 23 study.

SECTION III RECOMMENDED LOCATION STUDIES

RELOCATED USR 23 WORTHINGTON TO DELAWARE

Relocated USR 23 Worthington to Delaware (continued)

Existing SR 315 north of existing SR 161 is carried on relocation across the Relocated SR 161 to connect with Wilson Bridge Road and across the Olentangy to High Street. This provides local traffic access to the area west and east of the river and south of the outerbelt. Both present and future land developments would require this connection. The cost of this connection is included with relocated SR 161, phase 161-III.

Traffic

The traffic assignments for the relocated USR 23 are shown on Plates16 and 17 and are those traffic values distributed by the Outerbelt to both independent relocation and the existing highway studies.

Except for the traffic assigned to the Village of Powell, all the cross road movements are considerably smaller than those on the same cross roads on existing USR 23. The Traffic Plate shows an extremely large proportion of 1980 traffic using the entire relocation. SR 315, Smokey Row Road, and Liberty Road are parallel to the relocation and distribute local traffic to the cross roads and interchanges for access to the freeway. This entire area is relatively undeveloped with only a few homes on the many subdivided sections through which the freeway passes. The platting of subdivisions, options on the many properties in the area for residential development, zoning controls, and extension of utilities are all pointing to this area for rapid development and increased land use. The existing USR 23 could continue to function as a major highway possibly incorporating some of the features recommended in that study. The two highways together should meet the needs of the area north of Columbus for many years.

Present and Future Land Use

The relocation is dominated by the Olentangy River valley and the development of the land west of SR 315. In the area north of the outerbelt to SR 750 several large subdivisions and the community of Mt. Air also extend considerable influence on the relocation. Olentangy Estates which has access from SR 315 at Colony Way has incorporated an 18 hole golf course within its boundaries. A sewage and water treatment plant have been planned to serve this subdivision from an area set aside near the Olentangy River. The Mt. Air community is concentrated along SR 315. Several of the narrow gravel streets lead up the slopes to the west. The relocation was positioned between these two subdivisions and to the west of Mt. Air. In this area several large tracts of land were severed by relocation as the freeway passed up the slopes and through the subdivision on Highland Road. The limited use of frontage roads provides access in a manner as to minimize right-of-way damages. Since the most highly developed and most desirable land lies nearest the river and SR 315 and on the slopes of the valley it was desirable that the highway move to the location with the least amount of damage to existing holdings.

North of SR 750 the relocation occupies open farm land of variable quality and cultivation. The drainage courses leading to the river and the natural ground slope restrict it to grazing land and limited farming. The tourist attraction at Olentangy Caverns is preserved by passing west of the site across the west part of that property. The larger farms of this area front either on the cross road or on the roads parallel to the relocation. Old section lines, property lines, and old cemetery plots make up this irregular property line along which the relocation was established. The relocation should not hinder the continued growth of the platted subdivisions or the development of open farm lands for residential development should the improvement be initiated within a reasonable period.

The entire relocation was made to best fit into the existing features of the area and to provide the maximum benefits to those using the facility and those living in the area through which it passes. The cross roads do not present any unusual difficulties or access problems. In that the relocation falls along back property lines and away from the residences and buildings, adjustments in farming and land development should be reasonably easy.

North of Stratford where the relocated and USR 23 freeway studies are on the same alignment on existing USR 23, the properties that now have access to the present highway will either be rerouted over a frontage road to a cross road or denied access to the freeway and paid damages for such loss. The St. Paul's Church will be severely affected by this access limitation but will still have access to the east. The subdivision growth has generally been to the west in this area; also with most of the subdivision streets extending westward to Liberty Road. A frontage road has been provided on the west side of the existing highway to connect these streets to the south.

Right-of-Way Requirements

The effect of the recommended relocation of USR 23 on the individual property owners and utilities are shown on the Land Ownership Map, Sheets 4 – 8.

The area between Hard Road and Jewett Road, which includes Mt. Air, Olentangy Estates, Denison Engineering Company, Highland View Subdivision, and C. T. Hadden farm, does not lend itself to an inexpensive route to the north. By holding to the back property lines and away from the developed lands, access to the rim of the valley and acceptable relocation through this area was gained. Eight (8) residences are displaced on the 23-I phase. SR 315 retains its function for local traffic.

At the Girls Industrial School Road at the Olentangy Caverns and the beginning of Phase 23-II the cross road is relocated along the edge of the ravine and under the highway. The existing road serves the residences to the west. Only one residence is affected on this section.

Relocated USR 23 lies along the back property lines on the many properties fronting on SR 315 and Liberty Road; however, several small parcels are land-locked. A few subdivisions of a size extending between the roads noted above are severed. The damage incurred by this severance is tempered by the degree of development, the present access to the cross roads and the adjacent land ownership. With the relocation depressed at most of the cross roads, the construction and right-of-way requirements are not extensive.

The acquisition of right-of-way along existing USR 23 north of the Village of Stratford would be in common with the requirements used on the study for USR 23 Freeway on existing location where access to the highway would be accomplished by means of

SECTION III RECOMMENDED LOCATION STUDIES

RELOCATED USR 23 WORTHINGTON TO DELAWARE

frontage roads to the cross roads or interchanges; otherwise damages due to loss of access will be required. Direct access for the Highway Patrol will be provided at their existing building with the frontage road providing access to the south and the relocation for local service. A total of nine residences are displaced and ninety-four parcels are affected by the relocation.

Several high voltage transmission lines cross the relocation but require no adjustment or relocation. The utilities associated with the cross roads will require the normal adjustments.

Affect of Area on Design

The shortest route would be north along the river valley. SR 315 and the meandering of the river within the relatively wide flood plain cause some complications to this scheme. SR 315 alignment involves difficulties at the river crossings and on matters of egress to properties along its limits. The river valley is quite narrow north of the county line discouraging use of the valley on either side of the river. Alignment east of the river was discarded after some study because of the geology and of the expensive river crossings required.

An alternate plan was considered within the river valley. Instead of leaving the valley south of Mt. Air the alternate plan shown on the Relocation and Improvement Map, Plate 11 extended the alignment north, nearly parallel and east of SR 315. Passing to the east of Mt. Air and displacing the channel to the east the alternate relocation would extend to the north. On a long curve to the left it would leave the valley on the area of SR 315 and Jewitt Road (Township Road 127) and align with the recommended relocation north of the interchange at SR 750. The overall increased cost and deficiencies of this route eliminates it from further consideration.

The wide flood plain is used to position the outerbelt interchange and the relocation to the north skirting the new subdivision developments west of SR 315. At Mt. Air the relocation leaves the valley and incorporates a typical section that provides separate profiles to take advantage of the cross slope. The relocation does not rise to the top of the plateau west of the river but instead lies approximately 40 to 50 feet below the plateau. This location falls along the break line between the farming and grazing lands and provides for favorable crossings of the secondary drainage courses. The till depth over the subsurface limestone formations is adequate to allow cut adjacent to the rather high fills across the drainage courses. Cross roads would generally retain their present profile thereby causing less disturbance to the adjacent properties. The grid pattern of the local road system would allow the roads to continue their present duties in addition to providing access to the new route.

At Stratford it was desirable to use the existing alignment as the existing roadway section was adequate and right-of-way acquisition was not expensive. High volume, high speed ramps are braided to the existing USR 23 highway to provide a high type connection for present and future traffic demands.

The termination of the relocation study at the south limits of the Delaware Expressway would provide a fully controlled, limited access freeway from the outerbelt to the area north of Delaware.

Estimated Project Costs

The estimated total cost of the project is $8,680,800 or 101.5% more than the improvement of USR 23 on existing location. The tabulation of tentative cost estimate is included in the Summary of Cost for Relocated USR 23 Phase 23-I and 23-II in Section V of the Report. The economic benefit analysis is also included in Section V.

RELOCATED USR 23

Description and Location

The recommended line of Relocated USR 23 (4.87 miles in length) north of Delaware is as shown on the Relocation and Improvement Map, Plate 13 and on Plan and Profile Sheets 9 and 10. The entire stage of construction is included with Phase 23-III for both freeway and expressway standards. 4.72 miles of the improvement lies in Delaware and Troy townships, Delaware County. The typical section for this phase is shown on Plate 4.

Beginning within the corporation limits of the City of Delaware on the alignment of the Delaware Expressway at the extension of Pennsylvania Avenue, the divided four lane freeway is extended by a slight curve to the left to the northwest, crossing existing USR 23, leaving the Olentangy River valley and following the abandoned Pennsylvania Railroad roadbed alignment; generally, the alignment is such as to position the recommended centerline 120 feet easterly of the old roadbed centerline. The median is increased to 50 feet and the benched median with separate profiles as shown on the typical sections, is used as the relocation curves northerly, parallel to existing USR 23. Continuing on the tangent alignment, the relocation crosses the Hills-Miller Road (Township Road 192) 0.27 miles west of its intersection with existing USR 23; leaving the old railroad alignment and on a curve to the right crosses Coover Road (Township Road 194) 0.36 miles west of its intersection with existing USR 23; continuing on a tangent in a northeasterly direction and with a normal median as shown on the typical sections, the relocation passes under the Pennsylvania Railroad embankment 0.28 miles northwest of the existing railroad structure; thence on a tangent crossing Willey Road (Township Road 196) 0.08 miles west of its intersection with existing USR 23; thence on a curve to the left and north parallel to the existing alignment of existing USR 23, aligning with the proposed alignment at the limits of the report.

The Relocated USR 23 herein described and shown in detail in the plans as a freeway would be recommended in the event the USR 23 improvement was on the state freeway system. The location study has recommended an alignment similar to the line B in the draft of the report; however, the relocation to the existing pavement at the north limit of the report is revised to meet the requirement of the improvement to the north.

Freeway with Interchanges and Grade Separations

The Delaware Expressway extended along the recommended alignment of Relocated USR 23 crosses the existing four lane pavement within the City of Delaware. Existing USR 23 on Sandusky Street is carried over the relocated USR 23 to allow local traffic access to the many businesses and residences north of Delaware. Access to the freeway is provided only for the northerly movements, with the entrance-ramp providing access both from Delaware and the immediate area north of Delaware; the exit-ramp aligns with Franklin Street, providing access to the northern section of Delaware. The ramp and the access road to the Children's Home will provide a buffer to the residential street pattern. The traffic would be distributed to the existing city street system from Franklin Street via Pennsylvania and Lincoln Avenues.

Grade separations are provided at the Hills-Miller Road (Township Road 192) and Coover Road (Township Road 194) to allow the existing local roads access from the west to existing USR 23 and thence to the relocation. The proximity of the Buckeye Valley School to the relocation would require a grade separation on both the freeway and expressway improvements. Separation of the existing county road system and the relocation is very important to the safety of the overall plan. Existing USR 23 will provide the connection for the school to the relocation.

The relocation passes under the Pennsylvania Railroad on an alignment which carries it behind the several small businesses and buildings to the interchange on the relocated Troy-Chapel Road (Township Road 196). All four movements are provided at this interchange for access to Delaware Dam and to the local road system and existing USR 23 south to Delaware. Access along the east side of the proposed highway to the north and to the park entrance is provided by a frontage road. This access is not available on the improvement on USR 23 freeway on existing location, the alternate plan. On the west side of the improvement both Township Roads 211 and 219 are terminated at the connection with the existing highway. The existing pavement and the proposed south bound lanes would serve as a frontage road and would be connected to the county road network to the south at the interchange at Township Road 196. Access to the north would be provided by the existing road and ultimately proposed frontage road to the next access point at the Township Road 198 which is north of the limits of this report. The degree of limited access as to the location of grade separations vs. intersections at grade is dependent upon the status of the USR 23 north of the limits of the report and the status of USR 23 as a part of the state freeway system. The Delaware Reservoir has considerable influence on traffic requirements from the south and from the Columbus area. It would appear that access controls would tolerate some intersections at grade north of this area. The transition should be such as to alert the motorist to the change in access and exposure to intersections at grade.

Expressway with Interchanges, Grade Separations and some Intersections at Grade

The recommended improvement is as an expressway with the overall design and right-of-way requirements based on the improvement being to ultimate freeway standards.

Intersections at grade with Township Road 192 and 196 would be allowed under expressway limitations for stage construction with ultimate grade separations at these points. The relocation of Township Road 196 at the future location of the interchange and the ramps on the east side would be included for a high type connection to existing USR 23.

Traffic

The traffic assignments for the Relocated USR 23 are shown on Plate 18. Traffic volumes are moderate with very light turning movements at the various ramp connections.

The existing USR 23, a four lane highway, has been assigned the traffic with origins north of Delaware and south of the Delaware Reservoir. This artery provides access to the five local public roads, retains the status-quo as to services provided the adjacent land owner and traveling public and it removes the local traffic from the freeway.

SECTION III RECOMMENDED LOCATION STUDIES

RELOCATED USR 23 NORTH OF DELAWARE

Relocated USR 23 North of Delaware (continued)

The Delaware Expressway within the city limits of Delaware is limited access with no intersections at grade which would tend to extend that type control both north and south of Delaware. On a new alignment it would be reasonable to expect the separation of grades at crossroads and elimination of private access to continue under freeway standards to the section on the improvement where traffic volumes, requirements of the adjacent land and alignment of the improvement are such as to tolerate intersections at grade and expressway standards. It is important that the plan be flexible to fit both present and the future requirements.

The addition of the new Buckeye Valley School on Coover Road (Township Road 194) will increase the 1980 traffic volumes much higher than normal extensions of present traffic volumes on this road. These values have been included in the report.

North of the Pennsylvania Railroad the interchange and relocation of Troy-Chapel Road (Township Road 196) will afford the east-west connections to the county road system south of the Delaware Dam Reservoir. It will also allow local traffic to use existing USR 23 as an access to Delaware Dam and to the area south of the dam. The frontage road and existing USR 23 should absorb the heavy weekend traffic to the reservoir and remove it from the heavy freeway through traffic at these access points.

The improvement of USR 23 north of the report area to a limited access highway is underway at the present time. It includes improvement on existing alignment and on relocation to a connection with IR 75 at Findlay, Ohio. IR 75 completes the system north to Toledo. As shown on Plate 1, USR 23 is not parallel to any interstate system route. It would fill a gap in the state highway system not covered by the interstate system particularly to the northwest section of the state between Columbus and Toledo via Findlay.

Present and Future Land Use

The relocation beginning at the north end of the Delaware Expressway, a divided four lane highway of urban freeway design standards, is within the residential confines of the City of Delaware. The freeway passes near the main building of the Delaware County Children's Home where it leaves the existing alignment. The freeway on the relocation crosses farm land and intersects the crossroads in areas where residential type development is light. The old railroad right-of-way is the boundary of many tracts of land fronting on the north-south county road system. The frontage roads and crossroads provide access to these properties. The frontage roads on the west side of the freeway could eventually be continued into the City of Delaware as the development of the city moves northward. With the relocation along the back or tract line, damages to residences and business properties are reduced and will require only minor adjustment in farming practice where the relocation may separate the adjacent parcels.

The location of the new Buckeye Valley School on Coover Road (Township Road 194) will increase the importance of the existing county road system. The preservation of the advantages of the local road system and the removing of the through traffic from the local system is a design feature not included in the cost analysis.

At the north terminal of existing USR 23 and Relocated USR 23 the heavy weekend traffic to the facilities around the Reservoir will be carried by the ramps and existing roads. The tourist and recreational traffic will be removed from the freeway reducing exposure to the heavy weekend through traffic volumes.

The general land use north of this interchange is agricultural with the residence and farm buildings fronting on existing USR 23. It is planned to allow the existing pavement to be the west frontage road and provide for the ultimate alignment of the four lanes and a proposed frontage road east of the existing pavement.

Right of Way Requirements

The effect of the recommended relocation of USR 23 on the individual property owners and utilities is shown on the Land Ownership Map Sheets 9 and 10.

The recommended alignment anticipates heavy damages at the Delaware County Children's Home due to the proximity of the Highway to the main building. The building is old and its potential quite limited. For this reason the importance of the building is a minor factor in the future plans of the improvement. The south bound ramp and the frontage road extension to Franklin Street separate the main building of the Home from the larger tract west of the building. Only one building is taken in this area as the freeway has its alignment along the back line of the parcels fronting on existing USR 23. The old railroad right of way is utilized as the right of way for the frontage road and is the west limit of the required 240 foot minimum right of way. Damage to the frontage on the crossroads and residences is minimized by partially depressing the freeway at the two crossroads north of Delaware. Only one residence and a small machine shop are acquired on this line. Thirty-six properties are affected by the relocation. At the interchange north of the Pennsylvania Railroad the alignment falls west of the buildings and residences fronting on existing USR 23. Upon realigning with existing USR 23 it would be desirable to move to the east side of the present alignment with the new pavement and somewhat closer to the embankment in the U.S. Government lands and continuing northward parallel to the existing alignment to the SR 229. The relocated alignment does not disturb the commercial, business and residential access of the properties north of the City of Delaware. The required agricultural adjustments are items of right of way damages. Commercial interests can still be maintained as existing USR 23 will continue to serve local traffic and a considerable amount of through traffic with destination at the Reservoir.

Very few utilities are affected on relocation. The 16-inch water main to the City of Delaware lies in the westerly part of the abandoned Pennsylvania Railroad right of way. With the adjustment of grades and roadway sections on the development final plans the only relocations required would be at the point where the line passes under the freeway to the west side of the proposed relocation. Two small oil transmission lines will require relocation under the freeway. Except at the crossroads where local service is encountered very little cost is incurred for these items. These utilities are shown on the Land Ownership Maps in the Report.

Relocated USR 23 North of Delaware (continued)

Effect of Area On Design

The Olentangy River and the present alignment of existing USR 23 immediately north of the City of Delaware creates a very narrow corridor for the present four lane divided highway. The river has been relocated and the pavement width increased to an overall width of 50 feet through this area in recent years. This is one of the major reasons for the relocation.

The topography lying west of the existing alignment is composed of till and gravel terraces 20 to 30 foot thick. Drainage courses are well defined in the gently rolling farm land. The more radical relief is in the area adjacent to the existing highway. The river rests on Olentangy Shale throughout this area with lateral irregularities caused by the eastward dip of the rock formations. No difficulties due to soil conditions are anticipated in the area north of Delaware.

The relocated route profile provides minimum interference to existing drainage facilities and crossroads. It would pass under the elevated Pennsylvania Railroad tracks and rise to the north to eventually pass over the upper reaches of the embankment of the Delaware Reservoir.

The area around the Delaware Reservoir has many public recreational facilities such as boating, hunting and fishing and attracts substantial weekend traffic. Several parks and the dam itself require access roads for these public conveniences. The reservoir creates a barrier to the east on the county road system.

The north-south course of the Olentangy River has created an irregular county road system to the east and west reaches of the county. Within the study area all the local roads terminate at existing USR 23. Roads to the east are very limited because of the river crossing with one bridge on Township Road 215 and the other Delaware County Road 213. The next river crossing to the north is at SR 229 east from Norton.

Area characteristics are more stable adjacent to the relocated USR 23 alignment with the potential for development greatest along existing USR 23 and the river. The proximity of the railroad, local roads, and city utilities will increase the potential of the entire area both for residential and commercial development. A most desirable feature is that the existing local road system is not disturbed.

No particular problems are anticipated with the structures or drainage structures on this alignment. Maintenance of traffic and contingencies would be light on the relocation study. On relocation the criteria differs from the improvement in existing location in the median width and the overall benefits derived by the road system.

Estimated Project Costs

The estimated total cost of the project as an expressway is $4,042,900 compared to $4,358,300 as a freeway; however, two grade separations are excluded in the expressway plan. The cost of improvement on existing location falls between these values. Section V includes the tabulation of tentative cost estimate and the economic benefit analysis for the Relocated USR 23, Phase 23-III.

SECTION IV ALTERNATE LOCATION STUDIES

USR 23 FREEWAY ON EXISTING LOCATION – WORTHINGTON TO DELAWARE

USR 23 FREEWAY ON EXISTING LOCATION

Description and Location

USR 23 on existing location (11.62 miles in length) between Worthington and Delaware is shown on the Relocation and Improvement Map, Plate 12 and 13 and in detail on the Plan and Profile, Sheets 11-15. Phase 23-IV and 23-V can be built separately as the need arises either as freeway or expressway. 1.38 miles of the improvement lies in Sharon Township, Franklin County and the remainder in Orange, Berlin, Liberty and Delaware Townships, Delaware County.

Beginning at the extension of the new 6 lane divided highway north of the interchange of IR 270 and Relocated SR 161 with existing USR 23 and 0.47 miles north of Wilson Bridge Road, the upgrading and widening of the present roadway is as shown on the plans and on the typical sections Plates 5 and 6. The improvement consists of widening the pavement section to a four lane divided highway with a minimum median width of 20 feet. The present alignment will be retained throughout with some profile improvement south of Stratford.

The feasibility of upgrading of the present highway to standards consistent with a state freeway system is one of the purposes of this study. The alignment and sight distance requirements are within the 70 mph design criteria. Correction of profile deficiencies, roadway section improvement, the full control of access, and elimination of intersections at grade are the major design features of the improvement. The improvement on existing location would offer a Freeway with the absolute minimum standards particularly in regard to the median and roadway section.

Freeway with Interchanges and Grade Separations

Grade separations are provided at the Flint Road relocation and at Lazelle Road. The York Temple Country Club and Pontifical College generate a considerable amount of traffic in this area. Flint and Lazelle Road are heavily traveled county roads serving a large area to the east. A six lane highway is proposed between the ramps to meet the traffic requirements. The extensive use of frontage roads was necessary to provide access to the property owner and provide circulation of local traffic to the crossroads and interchanges with access to the Freeway.

At Scioto-Powell Road, which is the eastward extension of SR 750, an interchange is provided. Two out-door theaters and WRFD radio facilities are located near this intersection. Frontage roads provide access to these properties and the ramps to the freeway.

A grade separation is provided at Gooding Road (Township Road 114) and connected to the north and south by frontage roads.

The Girls Industrial School Road (Del. Co. 124) and Lewis Center Road (Del. Co. 106) are realigned to form an interchange and grade separation with ramps to the south. Ramps to the north are provided at the next road north at the interchange and grade separation at Hyattsville Road (Township Road 123). This arrangement is particularly well adapted to the county school system and the local traffic requirements.

On the Phase 23-V beginning 0.38 miles south of Olentangy Road the proposed south bound lanes and grade change is recommended to provide for the slight realignment for the grade separation and to improve the uphill grade of the existing highway adjacent to the river north of Stratford. The existing north bound pavement becomes the frontage road lessening right-of-way costs on the east side of the improvement and the existing south bound pavement becomes the proposed north bound pavement. The new south bound lanes will meet the existing alignment north of Stratford.

Gregory Road (Del. Co. 72) is extended west to Township Road 118 which runs adjacent to the Olentangy River. An exit ramp is included at this grade separation for the area east of the highway and north to Stratford.

A new river bridge is required for the south bound lanes at Stratford. A relocation of SR 315 is recommended to allow the existing pavement and the existing river bridge to be utilized without major modifications and provide a connection to the improvement for local traffic. The Methodist Theological School, the Village of Stratford, Delaware Country Club and the entire area east of the river is serviced from this interchange. SR 315 terminates at this connection to USR 23 by means of ramps.

The State Highway Patrol would have direct access to the improvement from their existing buildings south of Delaware. The remainder of the project would be provided with frontage roads to the crossroads and ramp access points. Relocated USR 42 and the Delaware Expressway will continue the limited access controls over that section not included in this report. The Relocated USR 42 ramps connect to the Delaware Expressway at the interchange and a grade separation is provided at Olentangy Street in the City of Delaware.

Expressway with Interchanges, Grade Separations and Some Intersections at Grade

Intersections at grade would be made at Gooding Road (Township Road 114), Olentangy Road (Del. Co. Road 98) and Gregory Road (Del. County Road 72). Traffic movements at these intersections are light and the county road system is rather limited to their use as an east-west crossroad.

Traffic

The traffic assignments for the USR 23 Freeway on existing location are shown on Plate 16 and 17 and are those values distributed by the outerbelt to both independent location studies. Traffic volumes are particularly heavy north of the outerbelt in the area of Flint and Lazelle Road. The ADT volumes at the crossroads give the desired turning movements developed by the county road system. The network of the local road system and the development of the area within this network established the overall location of the access points to the improvement. Road user benefits and right-of-way cost were considered in positioning the access points to the Freeway and to the crossroads.

The existing highway provides continuous access to the adjacent property along its entire length except for a section north of Stratford, which has partial control of access, allowing a private intersection at grade for each property owner. The farm residences and buildings are located near the present right-of-way. An earlier improvement increas-

USR 23 Freeway on Existing Location Worthington to Delaware (continued)

ing the old two lane to a four lane highway has encroached on these properties and their buildings and is evident in the modification of the roadway section. With the commercial and residential strip development along the highway, a frontage road will be required over a large part of the improvement. This frontage road will displace many of the buildings on these properties somewhat complicating right-of-way acquisition.

The traffic analysis on this section for the years of 1961 through 1962 show a total of ninety-three (93) accidents and one (1) fatality for rate of 2.1 and 1.35 accidents per million vehicle miles in Franklin County and Delaware County respectively. Accidents accountable to at grade intersections include: Flint Road – 4, Scioto-Powell Road – 6, and SR 315 – 5. The remainder of the accidents were evenly distributed over the entire route with 28 non-collision (off-road), 19 accidents associated with driveways, and 19 rear end collisions.

Present and Future Land Use

The area adjacent to the existing highway is principally open farm land of varying degree of development. The development is greatest near the cities and at the several crossroads. Flint and Lazelle Road have local traffic demands for the York Temple Country Club and the "Josephinum" Pontifical College. The area east of USR 23 toward Westerville is also served from this section of the highway. At the Scioto-Powell Road, the studio and broadcasting facilities of WRFD Radio, the WRFD Park, Green Meadows Motel, an outside theater – "Play House on the Green" and an outdoor movie theater have developed considerable traffic. Several large tracts of land are known to be programmed for a large residential development west of the highway.

North of the Scioto-Powell Road for approximately 6.25 miles to Gregory Road the development adjacent to the improvement is farming with some residential buildup at the crossroads. Friends Church on Gooding Road and two cemeteries on the east side of the Freeway are effected and damaged slightly by the right-of-way requirements. Camp Lazarus, a Boy Scout camp, is not provided access from the improvement but allowed damages to cover a new access road from the crossroad.

The existing north bound pavement provides the frontage road for that property lying to the east of the improvement from Olentangy Road to the Village of Stratford. The Delaware Country Club, the Methodist Theological School and the area on both sides of the river and east of the improvement are adequately served with this arrangement. The interchange provides the connection to the improvement for this area and SR 315. In Stratford an old stone church, a motel, and two residences are displaced by the new pavement for the south bound lanes. SR 315 is aligned with Delaware County Road 4, the old USR 23 alignment, to provide access to the adjacent properties. The Delaware County Road 4 continues north and eventually connects to a frontage road provided by the Delaware Expressway. The St. Paul's Church shall have access to the east and to Delaware County Road 4. A frontage road is recommended only on the west side of the existing highway south of the Relocated USR 42 and Delaware Expressway to connect the several subdivision streets to the south and to Township Road 141.

The future land use is important to the cost of the project. Commercial properties, service stations in particular, that are built close to the existing highway are very costly to the improvement. The residences and farm buildings located near the highway are generally heavily depreciated and not a major item of the improvement. The inconvenience of relocation and the effect of the change on the before and after values are more important. The newer buildings are generally located at a distance from the highway.

It would be desirable to require a building set back restriction and partial control of access adjacent to the existing highway to eventually provide an area for the frontage road. The useful life and overall safety of the existing highway could be prolonged and lead to the eventual construction to expressway and ultimate freeway standards in the future.

Right-of-Way Requirements

The effect of upgrading USR 23 on existing location on individual property owners and the utility ownership is shown on the Land Ownerships Maps, Sheets 11-16.

The crossroad improvements associated with grade separations and interchanges displace nearly all the residential and commercial buildings in those areas. The frontage road studies included the cost of removal of buildings, loss of access, before and after values, right-of-way and construction costs prior to their inclusion in the plans. Frontage roads, continuous along both sides of the improvement, would be expected as the land use values increase. Damages due to loss of access will be required where frontage roads are not constructed.

Services to the motoring public would be somewhat restricted in their present location; however, most of these services would be removed by right-of-way requirements at the crossroads. Three motels and two service stations would be displaced by the improvement. Only three motels would remain in the area between Worthington and Delaware and all service stations would have been removed. The displacement of fifty-two residences adjacent to the highway will cause some complications in the acquisition of the additional right-of-way. (Other building will be very near the frontage road requiring proximity damage settlements). One hundred forty-four properties will be effected by this improvement. During the development of construction plans a thorough study would be necessary to determine the need and economics of the various frontage road as related to the factors that exist at that time. With the loss of direct access to the highway other damages due to loss of business and resale value would enter into the final cost settlement.

Several electrical transmission lines cross the existing highway but do not require adjustment or relocation. Underground telephone conduit and gas service that is being developed in the area north of Worthington would be relocated. Pole lines carrying electric and telephone services along the right-of-way limits would be adjusted in a few cases to the new limits of the controlled access highway. At the crossroads the services associated with the local system would be adjusted to the new improvement.

Estimated Project Cost

The estimated total cost of the project is $8,543,900. The tabulation of tentative cost estimate is included in the Summary of Cost for the USR 23 Freeway Phase 23 IV and 23 V in Section V of the report. The economic benefit analysis is also included in Section V.

SECTION IV ALTERNATE LOCATION STUDIES

USR 23 FREEWAY NORTH OF DELAWARE

Description and Location

The improvement of USR 23 on existing location (4.70 miles in length) north of Delaware following the existing alignment is shown on the Relocation and Improvement Map, Plate 13 and on the Plan and Profile Sheets 16 and 17. 4.55 miles of the improvement lies within Delaware and Troy Townships, Delaware, Ohio. The feasibility of upgrading the present highway is one of the primary purposes of this report in this study area, and although the improvement is not recommended, the results of the study are presented. The entire stage of construction is included with Phase 23-VI for both freeway and expressway standards. The typical sections for this phase are shown on Plate 6.

Beginning on the extended alignment of the Delaware Expressway at the extension of Pennsylvania Avenue 0.15 miles within the north corporation line of the City of Delaware, the improvement curves slightly to the right to the existing USR 23 alignment and parallel to the Olentangy River. The alignment and widening can be obtained by paralleling the north bound lanes and widening to the west using a 20 foot median for a distance of 2500 feet and continuing along this tangent alignment on a very slight relocation west of the existing right-of-way. The relocation continues for 5500 feet crossing the Hills-Miller Road (Twp. Road 192) where the alignment curves to the north parallel to the existing centerline with the widening again to the west of the 52 foot pavement to include a 20 foot median. North of the Pennsylvania Railroad grade separation the proposed four lane pavement meets the existing four lane divided highway which is parallel to the west side of the Delaware Reservoir levee. At the end of the existing four lane divided highway the alignment shifts slightly to the east and parallel to the existing two lane road and the proposed ultimate alignment north of the limits of the report.

Freeway with Interchanges and Grade Separations;

At the north corporation line within the City of Delaware a grade separation is proposed for the northbound traffic from the City of Delaware. Pennsylvania Avenue is extended from its intersection with Sandusky Street over the Delaware Expressway as a ramp connection from Delaware to the north. A ramp connection from the north is provided aligning with Sandusky Street along the same connection being provided by the Delaware Expressway. The access to the frontage on the west side of the improvement from the city limits to the Hills-Miller Road is provided by a frontage road lying west and behind the strip development that fronts on the existing highway. This type of access is required because of the topography and right-of-way requirements to the land areas; however, damages to commercial interests will be extremely high in that the service to the motoring public will be very inconvenient for continued use. The frontage road connection from Hills-Miller Road to Franklin Street should serve the local traffic requirements and access to this area.

At the Hills-Miller Road (Township Road 192) a complete diamond type interchange is proposed. The interchange is placed at this point for several reasons. On this study it best serves the local road system by simplifying the east-west cross road pattern across the Olentangy River and connects the limited access highway and the parallel frontage roads into a workable road network. A new river structure would be included on the same alignment with the interchange. The old bridge at County Road 215 at Panhandle Road would be abandoned not only because of its age but because it is inadequate and has several undesirable features that should not be included in a connection to a major highway. This interchange is the collector-distributor for the entire areas north of the City of Delaware and south of the Pennsylvania Railroad. Frontage roads starting at the Pennsylvania Railroad on both sides of the existing and proposed improvement terminate at this interchange. Coover Road (Township Road 194) connects to the frontage road thence to the south and the interchange. The inconvenience of the connection is recognized as a major disadvantage to the needs of the school transportation system. The many advantages of the Hills-Miller connection recommends the improvement as shown.

The north bound lanes and the deceleration lane for the exit-ramp occupy the existing Pennsylvania Railroad underpass with the southbound lanes passing under the railroad within a new structure immediately west of the existing underpass. The 20 foot median will require the modification of the existing structure to utilize a pier in the median. Several items of construction will cause difficulties at this structure.

A modified cloverleaf type interchange is provided for the area north of the railroad and west and south of the Delaware Reservoir. The crossroad is extended parallel to the railroad tracks with the ramp connection to the north and minimizing right-of-way requirements at the access points to the dam. The county road system is preserved and local access is provided in all directions north of the railroad. A frontage road on the west side of the improvement provides intersections at grade for Troy-Chapel Road (Township Road 196) and Willey Road (Township Road 211) and the existing pavement can be utilized for the connection to Township Road 209 and frontage on the west side of the improvement and north of the limits of the report.

An exit-ramp from the south will provide access to the State Park area at Delaware Dam and the frontage road on the east side of the improvement. The frontage road will have access to the improvement only to the north of the report area at SR 229 at Norton.

Expressway with Interchanges, Grade Separations, and Some Intersections at Grade

Intersections at grade at Hills-Miller Road (Township Road 192) and Coover Road (Township Road 194) in this study would be allowed. The ramps and the grade separation at Hills-Miller would be eliminated and the frontage road in the southeast quadrant would be eliminated. Except for this frontage road, all the right-of-way for the ultimate improvement is included in this phase with all the frontage roads including the Olentangy River crossing being a necessary part of the improvement. The Coover Road grade separation is directly dependent upon the Hills-Miller Interchange status. It is desirable to have a grade separation for the access to the Buckeye Valley School on Coover Road. Benefits derived by a grade separation would not justify the additional cost. The interchange at Hills-Miller Road would serve the same function in addition to the advantages gained at that location.

USR 23 Freeway on Existing Location North of Delaware (continued)

Traffic

The traffic assignments for the improvement of USR 23 on existing location is shown on Plate 18.

The traffic plate shows the volumes included on the several cross roads terminating on existing USR 23. The interchange at Hills-Miller Road provides the only east-west connection over the Olentangy River and across the improvement. It provides the connection for the frontage roads and ramps to the freeway and the local road system. The Hills-Miller interchange is the key to local traffic movement in the area south of the Pennsylvania Railroad and north of the City of Delaware.

The improvement on existing location is particularly detrimental to the adjacent commercial and residential holdings. These owners would no longer have a convenient access to their properties and for the most part must alter their access to the proposed frontage road system.

North of the Pennsylvania Railroad the interchange tends to align the cross road access requirements to the needs of the area. Access is not provided along the east side of the highway between the dam to the park entrance.

The traffic analysis on this section for the years of 1961 through 1962 show a total of twelve (12) accidents and one (1) fatality for a rate of 1.36 accidents per million vehicle miles. Rear end collisions and accidents associated with driveways account for ten (10) of these accidents. The accidents are fairly well distributed along the entire route favoring the section nearest Delaware. Crossroads are relatively free from accidents.

Present and Future Land Use

The existing USR 23 alignment was improved to its present four lane width in 1955 and follows an alignment in general the same as the original roadway. Traffic dividers are incorporated in the 50 to 52 foot wide pavement for the median and separation of traffic between Delaware and the Pennsylvania Railroad. A small dam, an old concrete arch bridge across the river, a recent relocation of the river eastward and the deep cut of the existing highway into the adjacent, developed hillside parallel to the highway are important controls on the location studies in this area.

The corridor through which the highway passes in leaving the City of Delaware is bounded on the east by the Olentangy River and on the west by a strip of commercial and residential properties. These properties are located both at the highway level with extremely tight access and on the terrace overlooking the valley with access up the slopes. This pattern of development exists to the Hills-Miller Road. To afford access to these properties on the west, the frontage road adjacent to the improvement would displace nearly all the businesses being served. An alternate plan of not disturbing the frontage to the west and building the highway to the east of the existing alignment would require considerable channel relocation in addition to the pavement and roadway costs.

The potential of this area adjacent to the existing USR 23 is very high because of the influence of the topography, road system, and utilities located within the area and its location relative to the City of Delaware. New commercial and residential construction adjacent to the existing highway should be expected and the development should rapidly increase the cost of the improvement on the existing location.

North of the Hills-Miller Road the development adjacent to the existing highway consists of residences and farm buildings associated with the agricultural requirements of the area. Residential development is also present along the east side of the highway being concentrated in the area immediately north of Hills-Miller Road and north of the Pennsylvania Railroad. Providing access to these properties would generally displace the buildings being served thereby giving thought to the use of frontage roads to the back of the property. In the area north of the railroad the several residences are taken for the interchange requirements for access to the dam and the county road system.

The Delaware Water Plant and the new Buckeye Valley School should have considerable influence in the manner and degree of development in this entire area south of the railroad. The potential of this area is very high.

Maintenance of traffic and providing of an adequate, safe route for the public during construction would be difficult because of the various features of the topography and the improvement. Costs associated with the railroad structure would be expensive. The acquisition of right-of-way will be particularly difficult in that many items of damage and access loss will enter into the acquisition.

The construction of the new Buckeye Valley School on Coover Road by the county school system would indicate a changing land use in the very near future.

In the area of the reservoir where farming predominates, it is expected that the recreation facilities at the dam will dominate the area with some scattered services to the traveler at the points of access.

Affect of Area On Design

The location study of the improvement along the existing alignment inherits all the deficiencies acquired in the up-grading of the existing highway to the design criteria of freeway standards. The present alignment and access is adequate for an arterial highway with partial control of access with some speed controls near the city limits of Delaware. With the increase in development and traffic flow the access to the existing four lane highway has grown more critical and will increase even more rapidly with the new school on Coover Road. The existing 2 to 4 foot wide median is not adequate for separation of traffic and left turn storage thereby creating a dangerous condition. Widening alone would improve the safety of the highway considerably. The recently developed park lands at the reservoir and the long needed highway improvement north and northwest to Findlay, which is either under construction or in plan stage, will also generate a great deal of through traffic through this section. The limitations of right-of-way and the construction elements associated with the roadway section will require constant modifications of design standards to fit the existing topography.

The maintenance of traffic during construction, rebuilding, and extension of the railroad bridge and contingencies associated with this improvement will cause considerable description of services and will cost more than a relocation.

USR 23 Freeway on Existing Location North of Delaware (continued)

Right-of-Way Requirements

The results of the study for the improvement of the existing highway north of Delaware are shown on the Land Ownership Maps, Sheet 17 and 18.

Extremely heavy right-of-way costs are anticipated along this route with frontage roads required not only for access to the individual properties but for lateral movement between the cross roads. Including the interchange at Hills-Miller there will be nine (9) buildings directly affected by the improvement with access to the frontage on existing USR 23. A motel-trailer area, commercial produce building, a drive-in restaurant and three service stations will be affected by direct loss of frontage to existing USR 23. Damages will be exceedingly heavy in these particular areas because the frontage road is not adjacent to the frontage where the services are provided. Acquisition of land not associated directly with the frontage will further complicate right-of-way costs. In this particular area right-of-way costs are increasing steadily and becoming more complex as time passes. Sixty-four properties will be affected by the improvement.

North of the interchange the area is basically agricultural with the residences located the normal distance from the old alignment. With the addition of frontage roads and widening of the highway to the west the work limits of the new work would necessarily require the relocation of several of the homes in the area and proximity damages to many others. Working agreements and slope easements would further complicate acquisition and construction plans for the development of a minimum standard improvement. Several of the frontage roads have completely independent alignment in order to minimize overall cost and provide a workable, accessible road system. It is anticipated that five (5) residences will be displaced by the frontage roads in this area.

North of the Pennsylvania Railroad a total of three (3) residences and one small business building will be displaced by the improvement. The area immediately north of the railroad is used to keep the interchange loops and cross road connection in the restricted area below the dam proper and allow connections in all directions to the recreational areas. Except for a few very small commercial establishments, a church and small cemetery and township hall at the intersection of the Troy-Chapel Road, all the residences along both sides of USR 23 are associated with the farms thereon situated. Access is provided by the frontage roads parallel to the freeway to SR 229. The reservoir in the area of the USA lands would become limited access with the only access to the dam service area from the ramps at the interchange and the exit-ramp to the park and frontage road at the end of the report.

The entire right-of-way is complicated by the topography and terrain as well as the proximity of the items of Right-of-Way to the proposed improvement. The expected increase in land use and in development adjacent to the existing highway will increase the cost of right-of-way considerably as the need for the improvement becomes more evident.

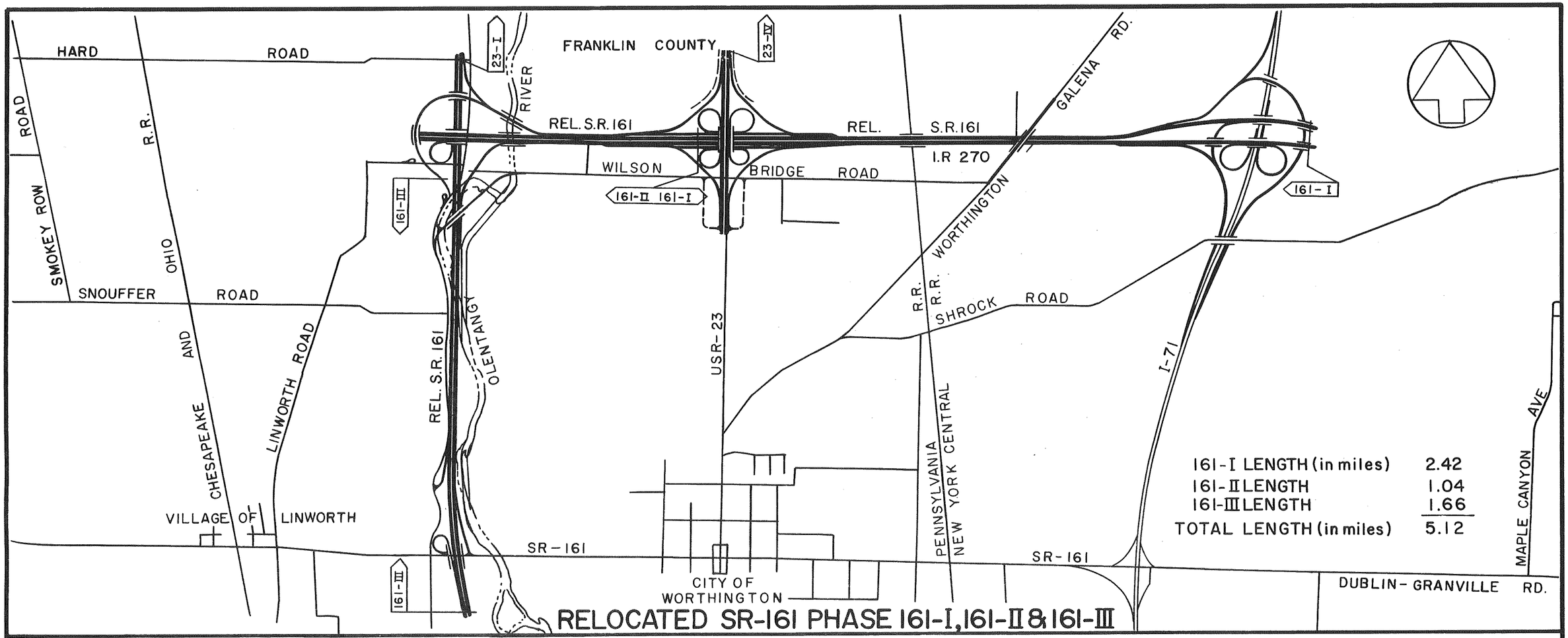
Estimated Project Costs

The estimated total cost on this study as an expressway is $4,103,400 compared to $4,286,000 as a freeway. The cost of the improvement on existing location falls within the costs of the Relocated USR 23 with freeway and expressway standards. Section V includes the economic benefit analysis and the tabulation of tentative cost estimate for USR 23, Phase VI.

SECTION V

SUMMARY OF COSTS

ECONOMIC BENEFIT ANALYSIS

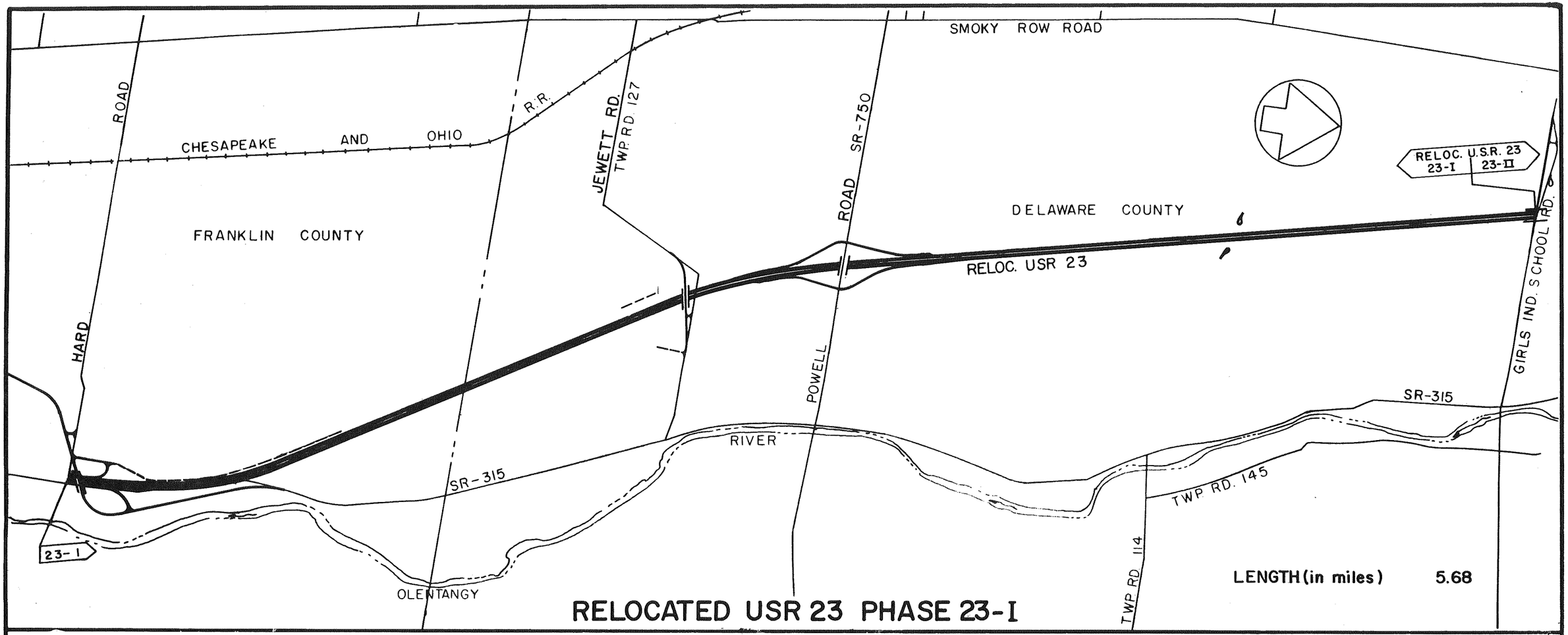


161-I LENGTH (in miles)	2.42
161-II LENGTH	1.04
161-III LENGTH	1.66
TOTAL LENGTH (in miles)	5.12

RELOCATED SR-161 PHASE 161-I, 161-II & 161-III

TABULATION OF TENTATIVE COST ESTIMATE

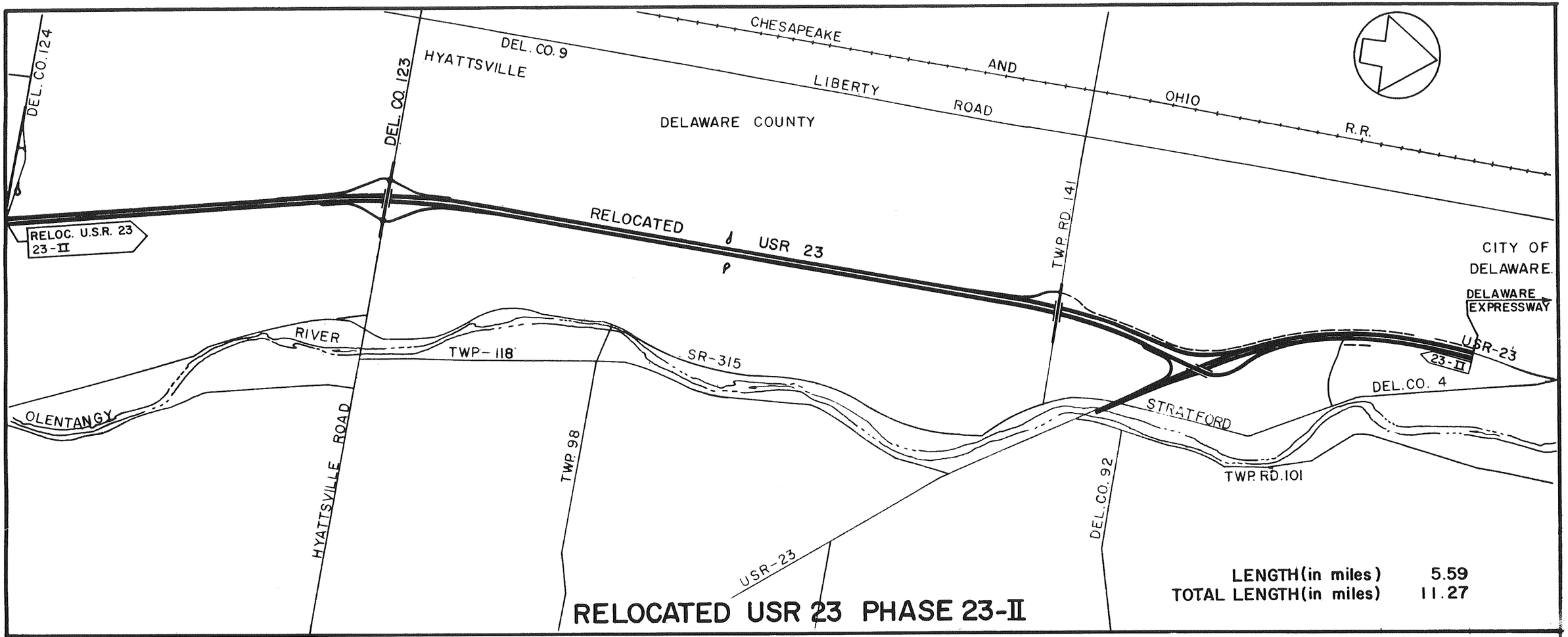
		Freeway Standards		
	Total 161-I	Total 161-II	Total 161-III	Total 161-I, 161-II, & 161-III
Roadway	$1,248,200	$ 791,800	$1,090,500	$ 3,130,500
Pavement	1,035,900	512,800	439,100	1,987,800
Structures over 20 feet	1,852,200	1,310,100	426,600	3,588,900
Total Construction	$4,136,300	$2,614,700	$1,956,200	$ 8,707,200
Right-of-Way	695,000	616,300	248,100	1,559,400
Preliminary Engineering	206,900	130,800	97,900	435,600
Construction Engineering	289,600	183,100	137,000	609,700
Detours and Incidentals	413,700	261,500	195,700	870,900
Total Project Costs	$5,741,500	$3,806,400	$2,634,900	$12,182,800



RELOCATED USR 23 PHASE 23-I

TABULATION OF TENTATIVE COST ESTIMATE

	Freeway Standards Total 23-I
Roadway	$1,376,000
Pavement	1,345,400
Structures over 20 feet	361,400
Total Construction	$3,082,800
Right-of-Way	1,246,000
Preliminary Engineering	154,200
Construction Engineering	215,800
Detours and Incidentals	308,300
Total Project Costs	$5,007,100

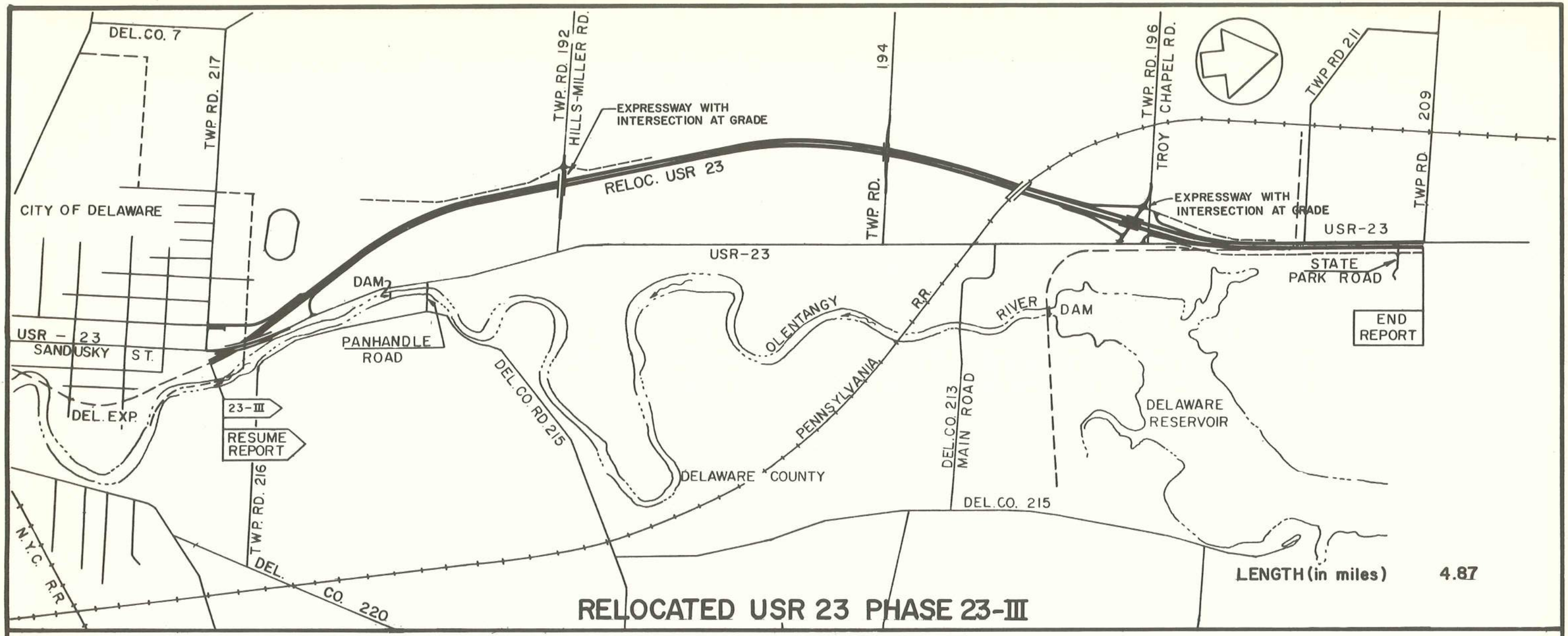


RELOCATED USR 23 PHASE 23-II

LENGTH(in miles)	5.59
TOTAL LENGTH(in miles)	11.27

TABULATION OF TENTATIVE COST ESTIMATE

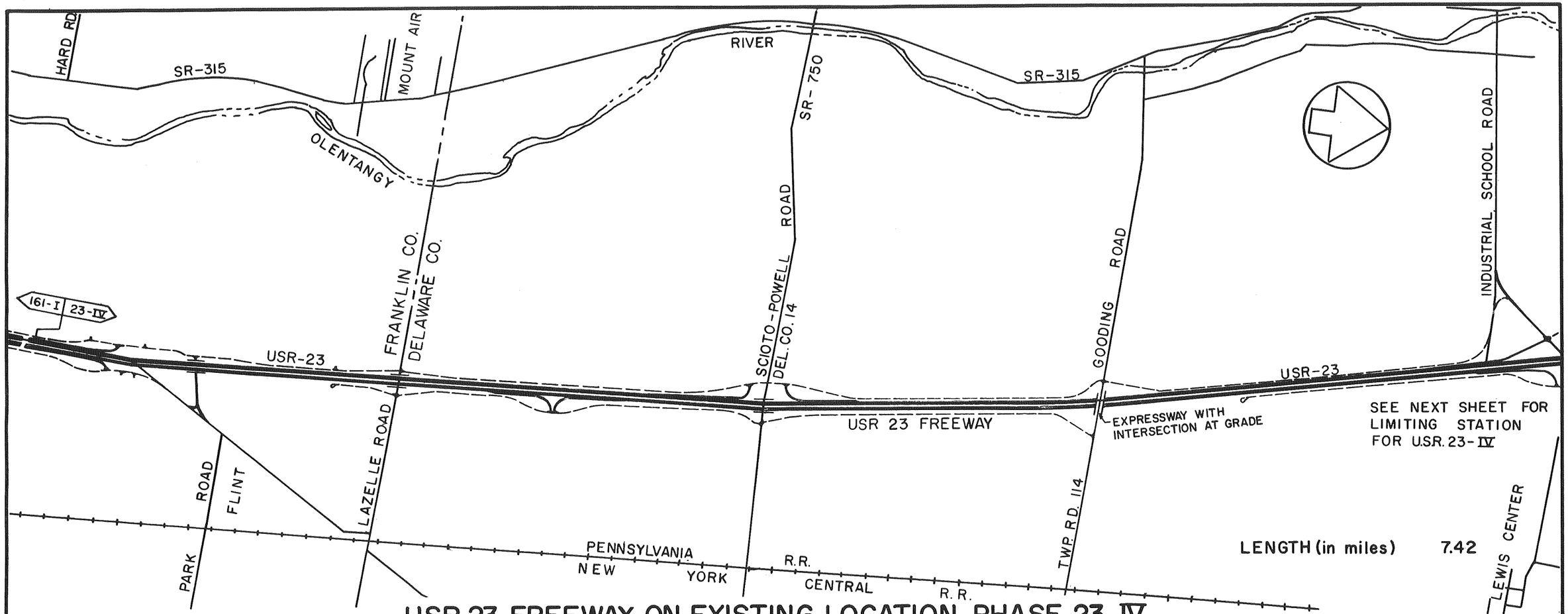
	Freeway Standards	
	Total 23-II	Total 23-I & 23-II
Roadway	$ 968,700	$2,344,700
Pavement	1,257,000	2,602,400
Structures over 20 feet	443,300	804,700
Total Construction	$2,669,000	$5,751,800
Right-of-Way	417,400	1,663,400
Preliminary Engineering	133,500	287,700
Construction Engineering	186,900	402,700
Detours and Incidentals	266,900	575,200
Total Project Costs	$3,673,700	$8,680,800



RELOCATED USR 23 PHASE 23-III

TABULATION OF TENTATIVE COST ESTIMATE

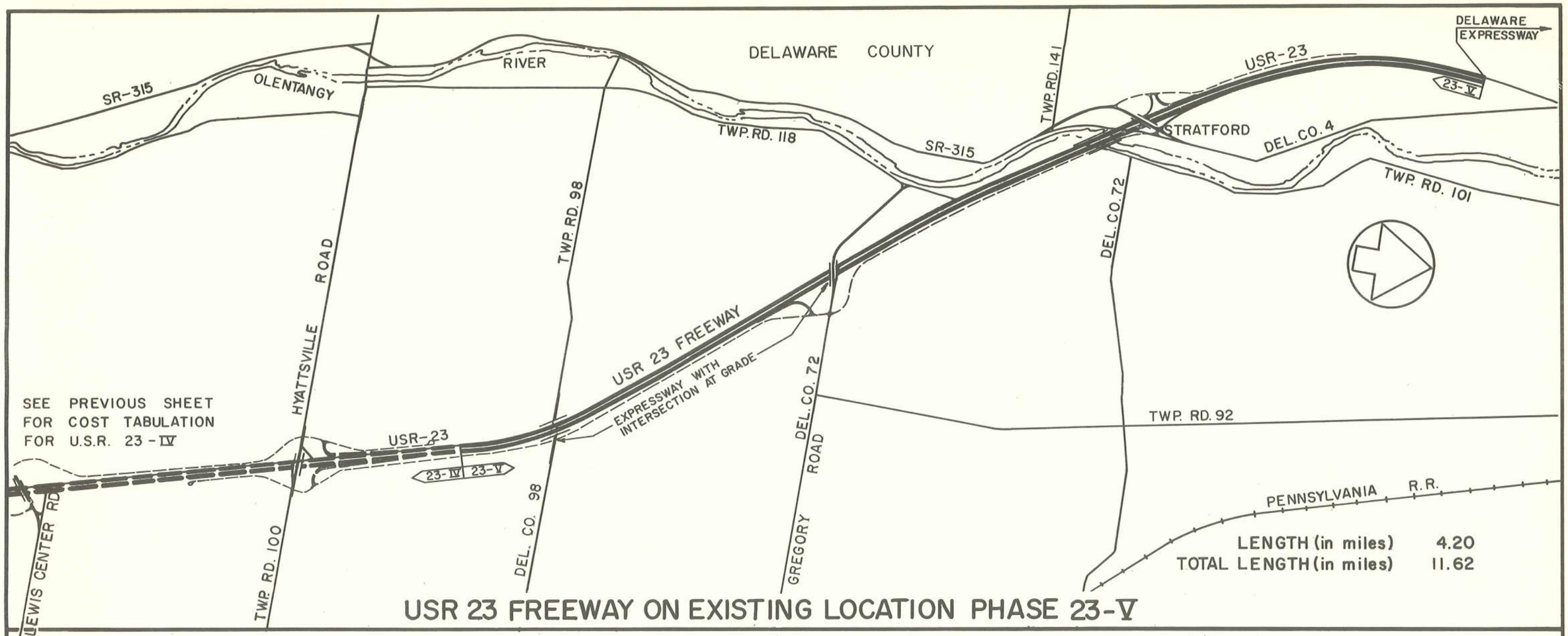
	Freeway Standards Total 23-III	Expressway Standards Total 23-III
Roadway	$ 991,100	$ 963,300
Pavement	1,237,100	1,201,500
Structures over 20 feet	1,023,600	828,400
Total Construction	$3,251,800	$2,993,200
Right-of-Way	391,000	391,000
Preliminary Engineering	162,600	149,700
Construction Engineering	227,700	209,600
Detours and Incidentals	325,200	299,400
Total Project Costs	$4,358,300	$4,042,900



USR 23 FREEWAY ON EXISTING LOCATION PHASE 23-IV

TABULATION OF TENTATIVECOST ESTIMATE

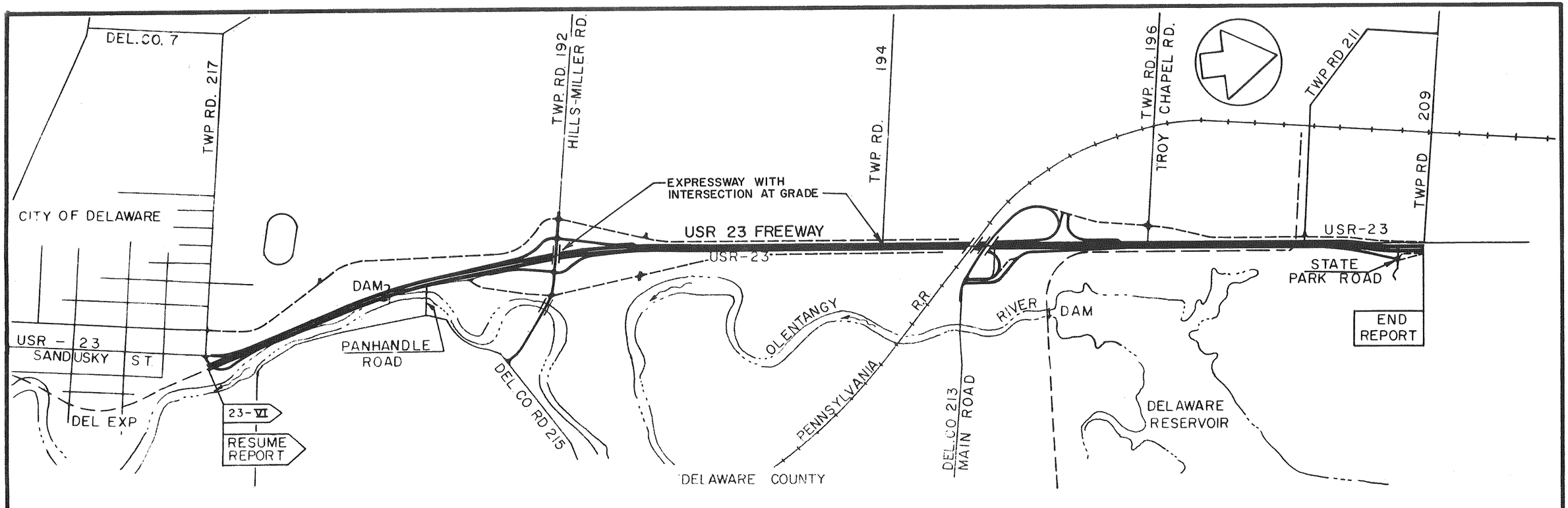
	Freeway Standards Total 23-IV	Expressway Standards Total 23-IV
Roadway	$1,020,100	$ 991,700
Pavement	1,498,000	1,486,300
Structures over 20 feet	589,900	404,000
Total Construction	$3,108,000	$2,882,000
Right-of-Way	1,876,600	1,876,600
Preliminary Engineering	155,400	144,100
Construction Engineering	217,600	201,800
Detours and Incidentals	310,800	288,200
Total Project Costs	$5,668,400	$5,392,700



USR 23 FREEWAY ON EXISTING LOCATION PHASE 23-V

TABULATION OF TENTATIVE COST ESTIMATE

	Freeway Standards		Expressway Standards	
	Total 23-V	Total 23-IV & 23-V	Total 23- V	Total 23-IV & 23-V
Roadway	$ 680,700	$1,700,800	$ 563,700	$1,555,400
Pavement	758,000	2,256,000	756,100	2,242,400
Structures over 20 feet	630,000	1,219,900	391,600	795,600
Total Construction	$2,068,700	$5,176,700	$1,711,400	$4,593,400
Right-of-Way	351,500	2,228,100	351,500	2,228,100
Preliminary Engineering	103,500	258,900	85,600	229,700
Construction Engineering	144,900	362,500	119,800	321,600
Detours and Incidentals	206,900	517,700	171,200	459,400
Total Project Costs	$2,875,500	$8,543,900	$2,439,500	$7,832,200



LENGTH (in miles) 4.70

USR 23 FREEWAY ON EXISTING LOCATION PHASE 23-VI

TABULATION OF TENTATIVE COST ESTIMATE

	Freeway Standards Total 23-VI	Expressway Standards Total 23-VI
Roadway	$ 876,600	$ 861,700
Pavement	1,117,200	1,073,500
Structures over 20 feet	633,300	551,200
Total Construction	$2,627,100	$2,486,400
Right-of-Way	1,080,800	1,069,800
Preliminary Engineering	131,400	124,400
Construction Engineering	183,900	174,100
Detours and Incidentals	262,800	248,700
Total Project Costs	$4,286,000	$4,103,400

ECONOMIC BENEFIT ANALYSIS

UNIT COST OF OPERATION
USER COSTS(U) – CENTS PER VEHICLE MILE
TANGENT – DIVIDED HIGHWAY

Item of Cost	Cost Factor	Freeway & Expressway @ 49 mph Running Speed				Basic Condition @ 44 mph Running Speed			
		* Free Operation		* Normal Operation		** Free Operation		** Normal Operation	
		0–3%	3–5%	0–3%	3–5%	0–3%	3–5%	0–3%	3–5%
Gasoline	32¢ per gallon	2.24	2.39	2.33	2.49	2.09	2.22	2.11	2.23
Tires	$100 initial cost per set	0.43	0.49	0.47	0.54	0.34	0.39	0.38	0.44
Oil	45¢ per quart	0.25	0.25	0.25	0.25	0.21	0.21	0.21	0.21
Car Repairs	1.2¢ per vehicle mile	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1. 20
Car Depreciation	1.5¢ per vehicle mile	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Time	1.55 per hour	3.17	3.17	3.17	3.17	3.52	3.52	3.52	3.52
Comfort and Convenience	0.0¢ per vehicle mile – Free operation 0.5¢ " " " – Normal operation 1.0¢ " " " – Restricted operation	0	0	0.50	0.50			0.50	0.50
Total Unit Cost per Vehicle Mile		8.79	9.00	9.42	9.65	8.86	9.04	9.42	9.60

*The user costs are tabulated for a four lane divided highway with a paved surface in good condition on a open high type alignment at the gradient shown for the two operating conditions, normal and free. Running speed of 49 mph (design speed of 70 mph) and lane capacity of 1200 vph are used to determine the type of operation on the Freeway system at the gradient range of 0-3% and 3 to 5%.

**Basic cost for the study as tabulated for a four lane highway in good condition on a moderate to high type alignment at the gradient range shown. Running speed of 44 mph and lane capacity of 800 vph used for the uninterrupted flow of traffic with no limit of access or grade separations.

ANNUAL ESTIMATED ACCIDENTS ON USR 23 STUDY

Road Description	Vehicle Miles Per Year	Accidents Per Vehicle Miles	Accidents Per Year	Fatalities Per Year
Rel. USR 23	76,820,000	1.5	115.2	0.47
Ex. USR 23	12,000,000	2.3	27.6	0.11
		Total for Rel. USR 23	142.8	0.58
USR 23 Freeway	82,100,000	2.6	214	0.87

TABLE 8

ECONOMIC BENEFIT ANALYSIS

ANNUAL HIGHWAY COSTS
FOR
RELOCATED USR 23 AND USR 23 FREEWAY ON EXISTING LOCATION

RELOCATED USR 23 — **EX. USR 23 BASIC STUDY**

Items	Estimate Life (years)	Recovery Factor "K"*	Relocated USR 23 with Complete Grade Separation and Expressway (Alternate) 23-I Cost	23-I Annual Cost	23-II Cost	23-II Annual Cost	23-III Cost	23-III Annual Cost	23-III(Expressway) Cost	23-III(Expressway) Annual Cost	USR 23 Basic Study ** 23-IV Annual Cost	23-V Annual Cost	23-VI Annual Cost
CONSTRUCTION COSTS:													
Pavement and other items	20	.0672	$1,772,100	$119,085	$1,640,200	$110,220	$1,663,400	$111,780	$1,602,000	$107,655	$ 18,770	$ 11,130	$ 11,940
Roadway	40	.0433	1,257,600	54,455	852,400	36,910	890,000	38,540	862,200	37,335			
Structures over 20' Spans	40	.0433	361,400	15,650	443,300	19,195	1,023,600	44,320	828,400	35,870			
Right-of-Way	60	.0361	1,246,000	44,980	417,400	15,070	391,000	14,115	391,000	14,115			
Subtotal of Annual Costs				$234,170		$181,395		$208,755		$194,975	$ 18,770	$ 11,130	$ 11,940
ANNUAL MAINTENANCE COSTS				70,310		52,645		52,805		52,805	33,390	15,660	21,150
Total Annual Highway Costs				$304,480		$234,040		$261,560		$247,780	$ 52,160	$ 26,790	$ 33,090

USR 23 FREEWAY ON EXISTING LOCATION

Items	Estimate Life (years)	Recovery Factor "K" *	USR 23 Freeway with Complete Grade Separation and Expressway (Alternate) 23-IV Cost	23-IV Annual Cost	23-V Cost	23-V Annual Cost	23-VI Cost	23-VI Annual Cost	23-IV(Expressway) Cost	23-IV(Expressway) Annual Cost	23-V(Expressway) Cost	23-V(Expressway) Annual Cost	23-VI (Expressway) Cost	23-VI (Expressway) Annual Cost
CONSTRUCTION COSTS:														
Pavement and other items	20	.0672	$1,962,500	$131,880	$1,072,600	$ 72,080	$1,479,900	$ 99,450	$1,928,200	$129,575	$1,035,000	$ 69,550	$1,422,100	$ 95,565
Roadway	40	.0433	866,400	37,515	573,000	24,810	776,700	33,630	838,000	36,285	456,000	19,750	761,800	32,985
Structures over 20' Span	40	.0433	589,900	25,540	630,000	27,280	633,300	27,420	404,000	17,495	391,600	16,960	551,200	23,870
Right-of-Way	60	.0361	1,876,600	67,745	351,500	12,690	1,080,800	39,020	1,876,600	67,745	351,500	12,690	1,069,800	38,620
Subtotal of Annual Costs				$262,680		$136,860		$199,520		$251,100		$118,950		$191,040
ANNUAL MAINTENANCE COSTS				62,970		32,080		37,510		62,970		32,080		37,520
Total Annual Highway Costs				$325,650		$168,940		$237,030		$314,070		$151,030		$228,560

* Capital Recovery factor "K" is for 3% interest rate and the period of amortization noted above.

** Basic study is required for the Economic Benefit Analysis and includes the resurfacing of existing USR 23 within the study period.

The estimated annual maintenance cost for either the relocation and improvement on USR23 is $6,500 per mile/year. To maintain the frontage roads parallel to the Freeway is $1,100 per mile/year.

*Recommended Route

TABLE 9

ECONOMIC BENEFIT ANALYSIS

TABULATION OF ANNUAL USER COSTS AND BENEFIT RATIO
FOR
RELOCATION USR 23 AND USR 23 ON EXISTING LOCATION

Section of USR 23	Construction Phase	Length (miles) 'L'	Grade Class %	ADT	*1980 Operation Ratio	*1980 Operation Type Oper.	**Period of Analysis AADT 'A'	**Period of Analysis Ratio	**Period of Analysis Type Oper.	Cost (in cents) Vehicle/Mile 'U'	Vehicle Mi./year	Annual Road User Costs (Dollars)	Total Annual Highway Cost (Dollars) (See Previous Table)	Benefit Ratio
• Rel. USR 23	23-I	3.04	0-3	23,800	.89	N	19,700	0.74	F	8.79	$21,859,100	$1,921,400	$304,480	
	23-I	2.64	0-3	22,300	.84	N	18,500	0.70	F	8.79	17,826,700	1,567,000		
	23-II	5.59	0-3	22,000	.83	N	18,200	0.68	F	8.79	37,134,400	3,264,200	234,040	
Total	23-I&II	11.27										$6,752,600	$538,520	1.97
Rel. USR 23	23-III	4.87	0-3	14,300	.54	F	11,800	0.44	F	8.79	20,975,100	$1,843,800	$261,560	0.31
• Rel. USR 23 Exp.	23-III	4.87	0-3	14,300	.54	F	11,800	0.44	F	8.79	20,975,100	$1,843,800	$247,780	0.33
USR 23 Freeway	23-IV	5.57	0-3	22,900	.86	N	19,000	0.71	F	8.79	38,628,000	3,395,500	325,650	
	23-IV	1.85	3-5	23,400	.88	N	19,400	0.73	F	9.00	13,099,900	1,179,000		
	23-V	4.20	0-3	22,900	.86	N	19,000	0.71	F	8.79	29,127,000	2,560,300	168,940	
Total	23-IV&23-V	11.62										$7,134,800	$494,590	1.26
USR 23 Expressway	23-IV	5.57	0-3	22,900	.86	N	19,000	0.71	F	8.79	38,628,000	3,395,500	314,070	
	23-IV	1.85	3-5	23,400	.88	N	19,400	0.73	F	9.00	13,099,900	1,179,000		
	23-V	4.20	0-3	22,900	.86	N	19,000	0.71	F	8.79	29,127,000	2,560,300	151,030	
Total	23-IV&23-V	11.62										$7,134,800	$465,100	1.35
USR 23 Freeway	23-VI	4.70	0-3	14,620	.82	N	12,600	0.71	F	8.79	21,615,300	$1,900,000	$237,030	0.07
USR 23 Expressway	23-VI	4.70	0-3	14,620	.82	N	12,600	0.71	F	8.79	21,615,300	$1,900,000	$228,560	0.08
Ex. USR 23	23-IV Basic	5.57	0-3	22,900	1.25	R	19,000	1.08	N	9.42	38,628,000	3,638,800		
	23-IV Basic	1.85	3-5	23,400	1.03	N	19,400	1.09	N	9.60	13,099,900	1,257,600	52,160	
Ex. USR 23	23-V Basic	2.78	0-3	22,900	1.29	R	19,000	1.07	N	9.42	19,279,300	1,816,100		
	23-V Basic	1.42	3-5	22,900	1.29	R	19,000	1.07	N	9.60	9,847,700	945,400	26,780	
Total	23-IV&23-V Basic											$7,657,900	$ 78,940	
Ex. USR 23	23-VI Basic	4.70	0-3	14,620	.82	N	12,600	.71	F	8.86	21,615,300	$1,915,200	$ 33,090	

*1980 Traffic from Traffic Sheet. All operations of Freeway based on 1200 vph/lane on 4 lane tangent high type highway. DDHV=0.15 x 0.60 x ADT

**Average Annual Daily Traffic Volume (AADT) adjusted for 10% commercial volumes and for a 17 year period of analysis. AADT = 0.83(1980 ADT); ADDHV = 0.15 x 0.60 x AADT

Type of operation: Ratio = AADT/Capacity

F – Free Ratio less than 0.75
N – Normal Ratio 0.75 to 1.25
R – Restricted Ratio greater than 1.25

• Recommended Route

$$\text{Benefit Ratio} = \frac{\text{Difference in Road User Costs}}{\text{Difference in Highway Costs}} = \frac{R - R_1}{H_1 - H}$$

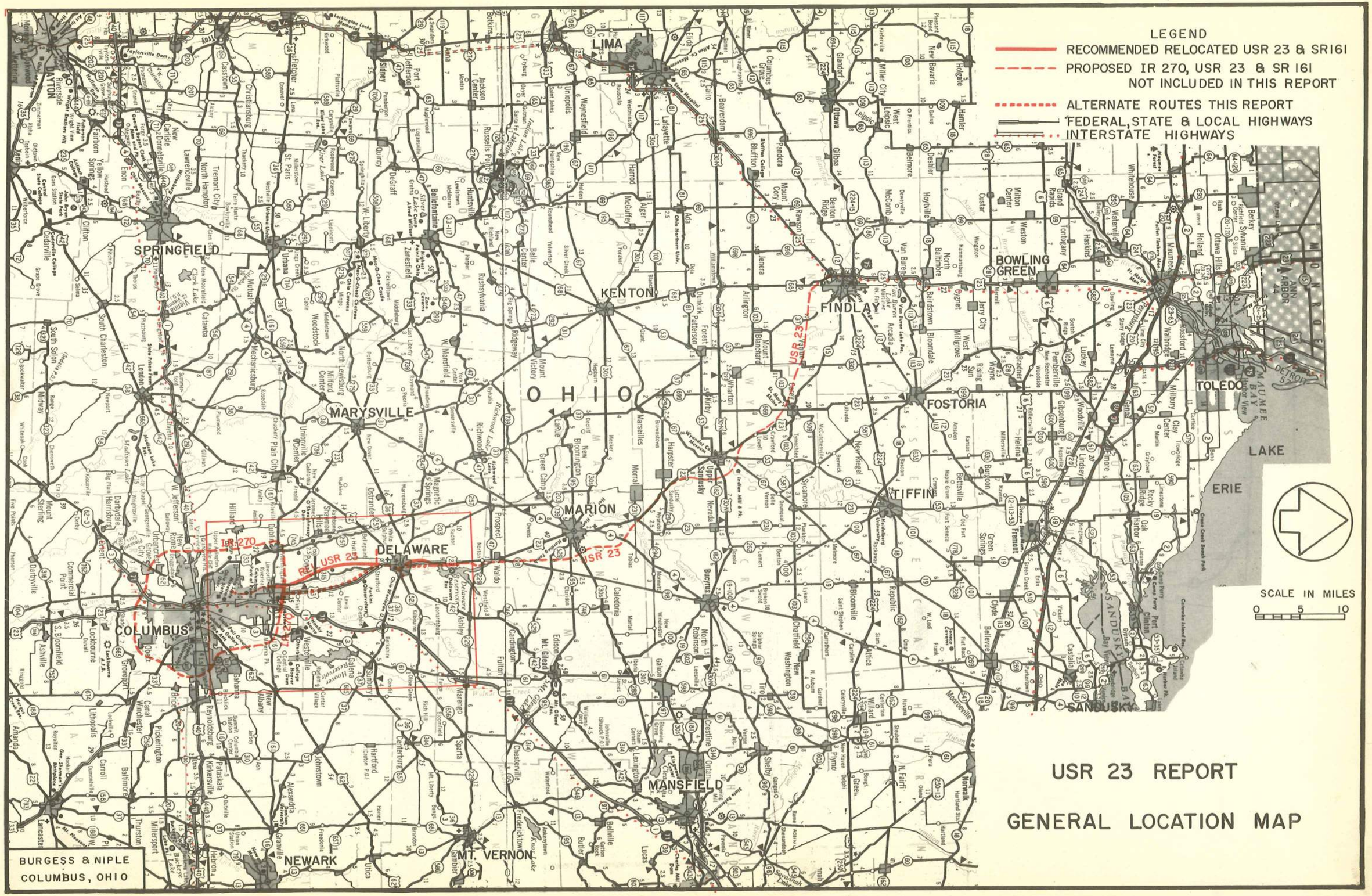
Where R – Total annual road user cost for basic condition.
R_1 – Total annual road user cost for improvement or relocation.
H – Total annual highway cost for basic condition.
H_1 – Total annual highway cost for the improvement or relocation.

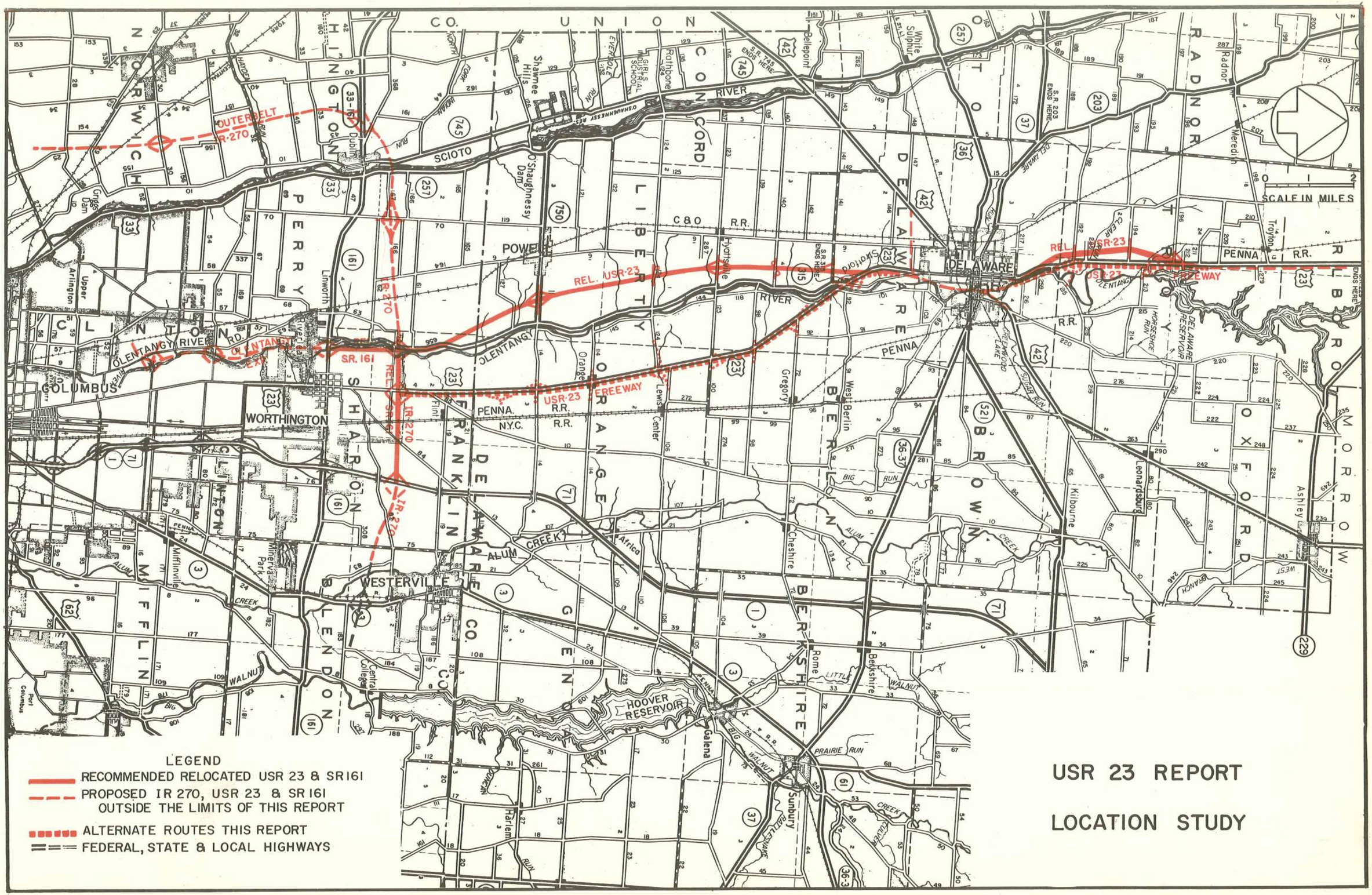
TABLE 10

REFERENCE PLATES

PLAN AND PROFILE SHEETS

LAND OWNERSHIP MAPS


LEGEND
RECOMMENDED RELOCATED USR 23 & SR161
PROPOSED IR 270, USR 23 & SR 161 NOT INCLUDED IN THIS REPORT
ALTERNATE ROUTES THIS REPORT
FEDERAL, STATE & LOCAL HIGHWAYS
INTERSTATE HIGHWAYS
SCALE IN MILES
0 5 10
DAYTON
SPRINGFIELD
LIMA
KENTON
FINDLAY
BOWLING GREEN
TOLEDO
FOSTORIA
TIFFIN
SANDUSKY
MARYSVILLE
MARION
DELAWARE
COLUMBUS
MANSFIELD
NEWARK
MT. VERNON
OHIO
LAKE ERIE
MAUMEE BAY
SANDUSKY BAY
USR 23
IR-270
SR 161
USR 23 REPORT
GENERAL LOCATION MAP
BURGESS & NIPLE
COLUMBUS, OHIO


CO. UNION
DELAWARE
CO.
FRANKLIN
CO.
MORROW
CO.
PERRY
CO.
HIGHLAND
CO.
CLINTON
CO.
MADISON
CO.
FAYETTE
CO.
PICKAWAY
CO.
FAIRFIELD
CO.
LICKING
CO.
KNOX
CO.
MIFFLIN
TWP.
BERKSHIRE
TWP.
BERLIN
TWP.
BERKLEY
TWP.
BROWN
TWP.
DARBY
TWP.
DELAWARE
TWP.
GENOA
TWP.
HARRISON
TWP.
JEFFERSON
TWP.
LIBERTY
TWP.
OXFORD
TWP.
ORANGE
TWP.
PERRY
TWP.
RADNOR
TWP.
SHARON
TWP.
TROY
TWP.
WESTERVILLE
TWP.
CONCORD
TWP.
COLUMBUS
WORTHINGTON
DELAWARE
POWELL
WESTERVILLE
OUTERBELT
I-270
REL. USR-23
USR-23 FREEWAY
SR. 161
REL. SR. 161
SCIOTO RIVER
OLENTANGY RIVER
ALUM CREEK
BIG WALNUT
LITTLE WALNUT
BIG RUN
PRAIRIE RUN
SUGAR RUN
HOOVER RESERVOIR
DELAWARE RESERVOIR
HORSESHOE RUN
FREEWOOD LANE
C&O R.R.
PENNA. R.R.
N.Y.C. R.R.
SCALE IN MILES
Dublin
Shawnee Hills
Bellepoint
Rathbone
White Sulphur
Radnor
Meredith
Troyton
O'Shaughnessy Dam
Gregg Dam
Upper Arlington
Linworth
Hyattsville
Shortford
Orange
Gregory
Lewis Center
Flint
West Berlin
Harlem
Africa
Cheshire
Rome
Berkshire
Galena
Sunbury
Kilbourne
Leonardsburg
Ashley
Minerva Park
Central College
Port Columbus
Mifflinville
Girls Industrial School
Eversole
S.R. 145 ENDS HERE
S.R. 203 ENDS HERE
S.R. 315 ENDS HERE
S.R. 23 ENDS HERE
LEGEND
RECOMMENDED RELOCATED USR 23 & SR161
PROPOSED IR 270, USR 23 & SR 161 OUTSIDE THE LIMITS OF THIS REPORT
ALTERNATE ROUTES THIS REPORT
FEDERAL, STATE & LOCAL HIGHWAYS
USR 23 REPORT
LOCATION STUDY

Hilliard
Dublin
Galena
Sunbury
Delaware
Radnor
RIVER
Olentangy
Scioto
C.C.C. & St.L. R.R.
C.S.O.
C.A.O. R.R.
Penna. R.R.
DELAWARE
WORTHINGTON
COLUMBUS
I.R. 270
REL. USR 23
REL. USR 23 FREEWAY
REL. SR. 161
EXT.
USR 23 FREEWAY
Penna. R.R. (C.C.C. & St.L.) R.R.
N.Y.C.
DELAWARE RESERVOIR
COUNTY LINE
FRANKLIN DELAWARE
ALUM CREEK
SCALE IN MILES
0 1 2
33
161
257
745
315
23
42
38
37
262
71
3637
521
36

GEOLOGY LEGEND

OHIO SHALE
bituminous black shale with large concretions

OLENTANGY SHALE
soft blue calcareous and argillaceous shale

DELAWARE LIMESTONE
blue cherty limestone and brown calcareous shale

COLUMBUS LIMESTONE
massive gray limestone, brown and magnesian towards base, with a basal limestone conglomerate

MORAINES

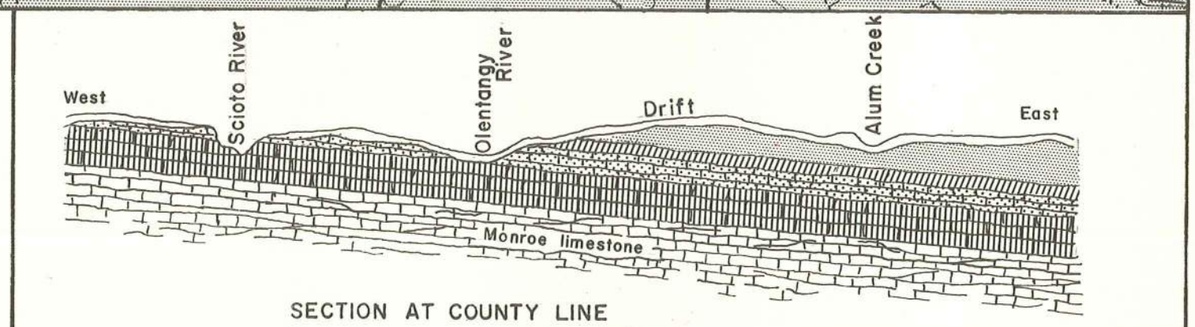
LEGEND

RECOMMENDED RELOCATED USR 23 & SR 161

PROPOSED IR 270, USR 23 & SR 161 OUTSIDE THE LIMITS OF THIS REPORT

ALTERNATE ROUTES THIS REPORT

FEDERAL, STATE & LOCAL HIGHWAYS



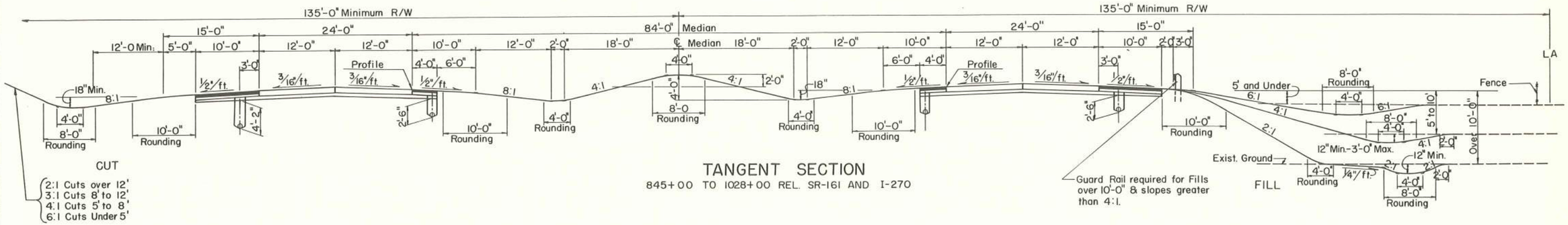
SECTION AT COUNTY LINE

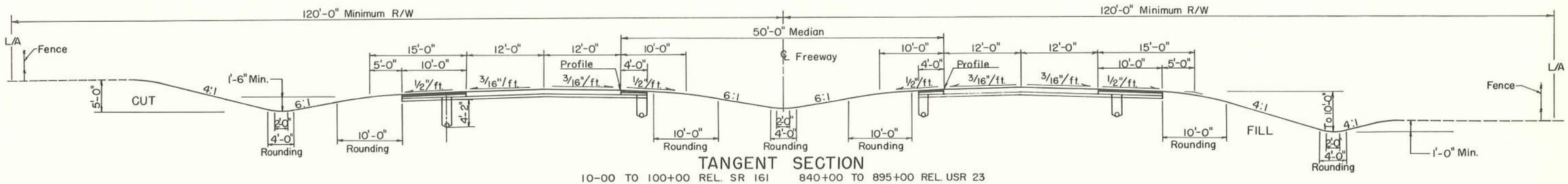
USR 23 REPORT

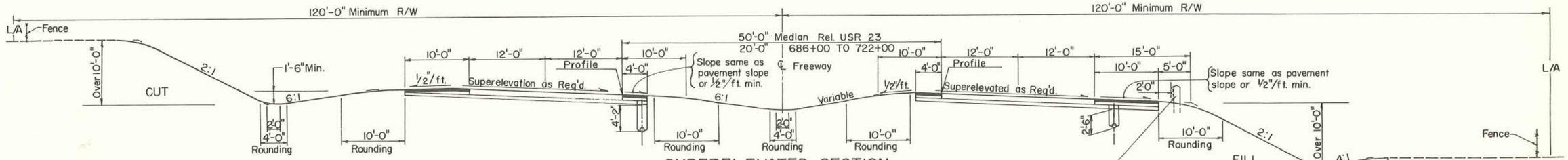
SOIL DATA

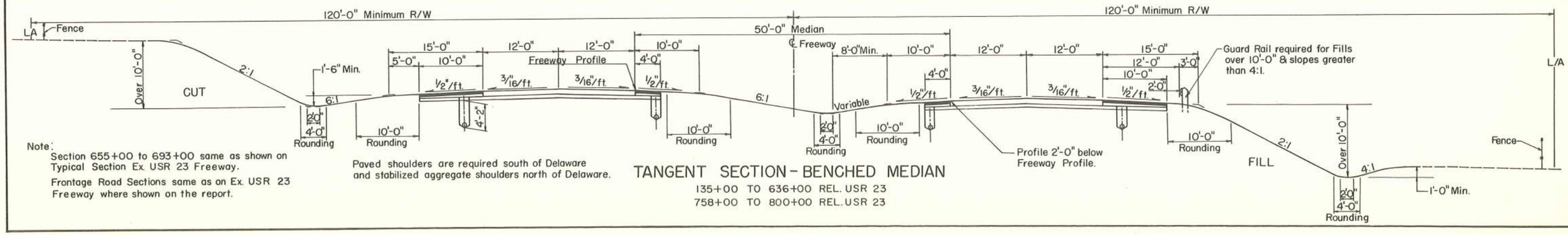
TYPICAL SECTIONS

RELOCATED SR 161 AND USR 23







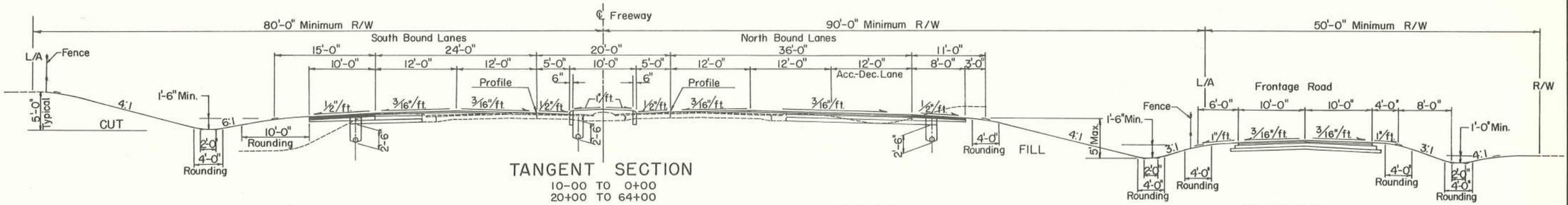


Note:
Section 655+00 to 693+00 same as shown on Typical Section Ex. USR 23 Freeway.
Frontage Road Sections same as on Ex. USR 23 Freeway where shown on the report.

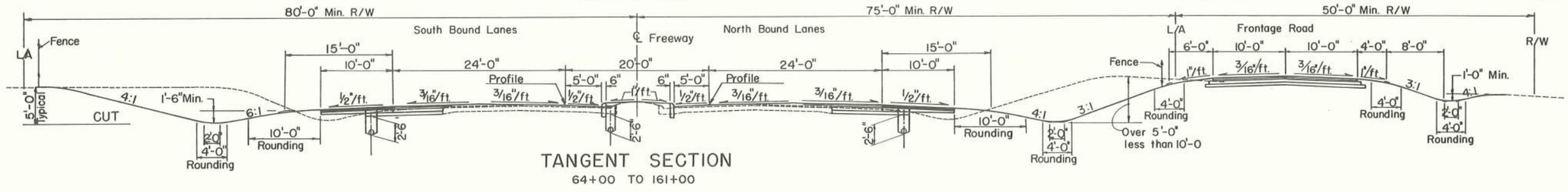
Paved shoulders are required south of Delaware and stabilized aggregate shoulders north of Delaware.

TYPICAL SECTIONS

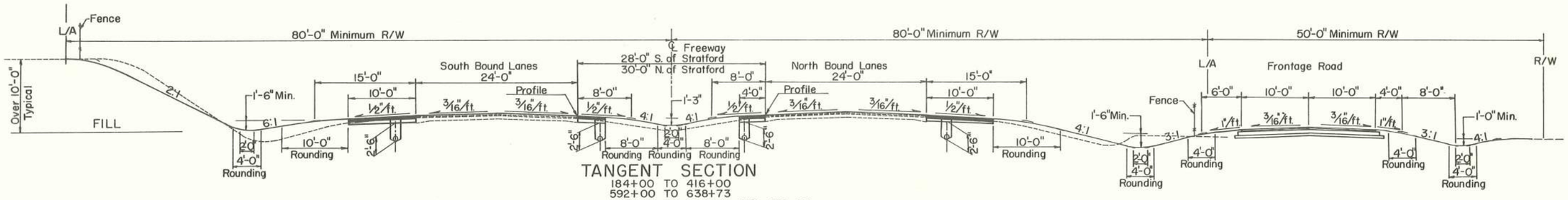
EXISTING USR 23 - FREEWAY



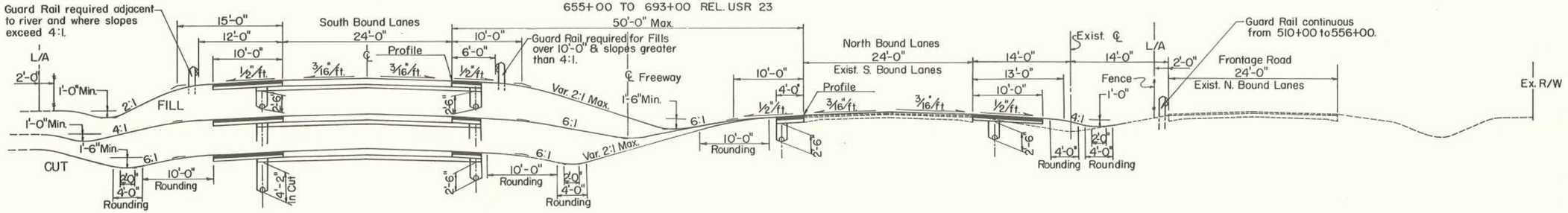
TANGENT SECTION
10-00 TO 0+00
20+00 TO 64+00



TANGENT SECTION
64+00 TO 161+00



TANGENT SECTION
184+00 TO 416+00
592+00 TO 638+73
655+00 TO 693+00 REL. USR 23

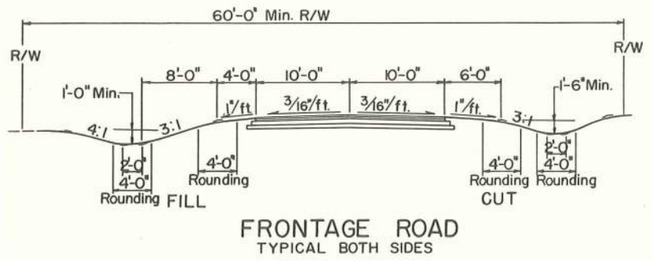


TANGENT SECTION
448+00 TO 592+00

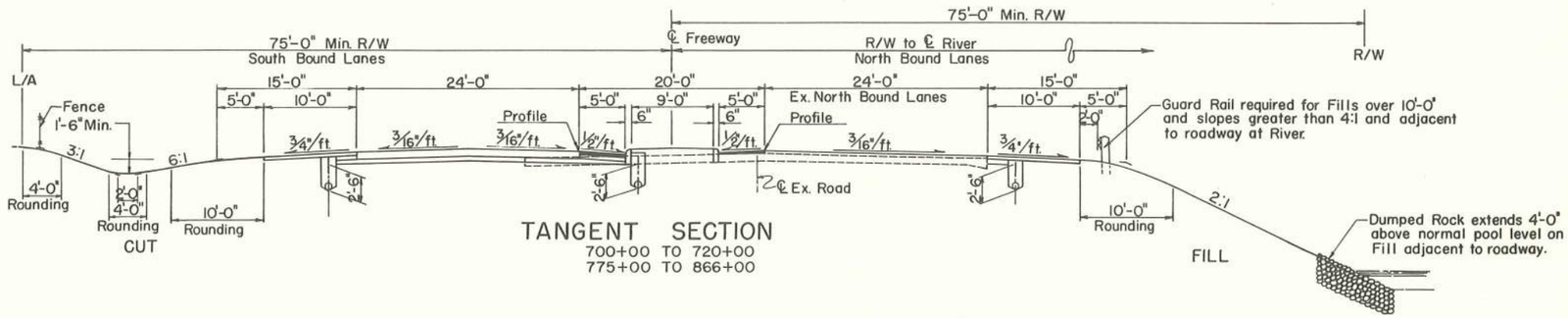
Note: See Plate 7 for USR 23 Inventory of Existing Roadway.
See next sheet for sections:
0+00 to 20+00
161+00 to 184+00
416+00 to 445+00

TYPICAL SECTIONS

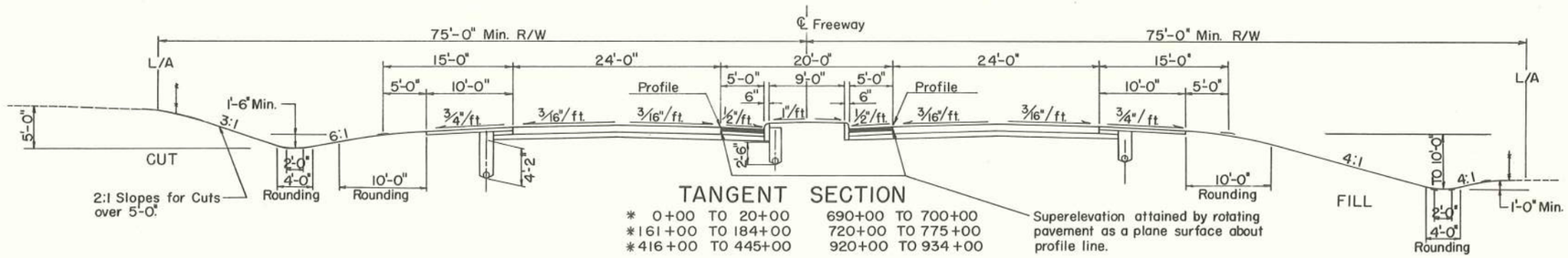
EXISTING USR 23 - FREEWAY



FRONTAGE ROAD
TYPICAL BOTH SIDES



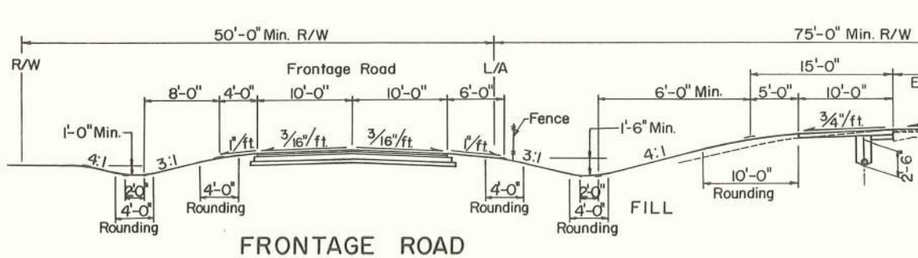
TANGENT SECTION
700+00 TO 720+00
775+00 TO 866+00



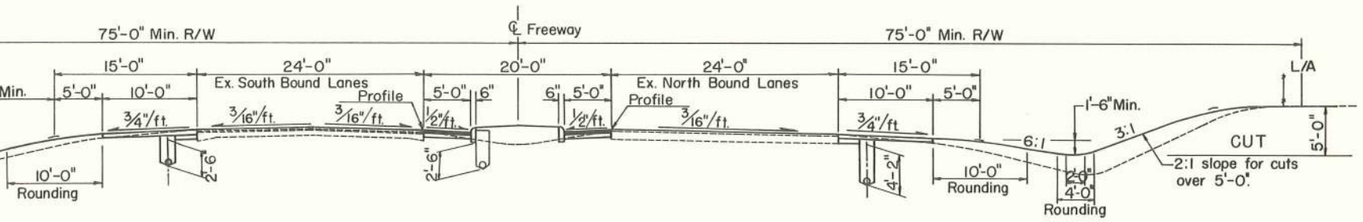
TANGENT SECTION

* 0+00 TO 20+00	690+00 TO 700+00
*161+00 TO 184+00	720+00 TO 775+00
*416+00 TO 445+00	920+00 TO 934+00

Superelevation attained by rotating pavement as a plane surface about profile line.



FRONTAGE ROAD
TYPICAL BOTH SIDES



TANGENT SECTION
865+00 TO 920+00

* Typical Sections South of Stratford

USR 23 INVENTORY OF EXISTING ROADWAY

MILES: 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7

VISIBLE FIXED POINTS: BEGIN REPORT; BRIDGE RD; WORTHINGTON CORP. 0.03; 0.67; 0.82 FLINT ROAD; 1.21; 1.86 FRANKLIN CO.; DELAWARE CO.; 3.16; 3.26 POWELL RD 3.41; 5.32; 5.65; 5.98 GIRLS SCHOOL RD. 6.31 IND.; LEWIS CENTER ROAD

SECTION IDENTIFICATION	WILSON	0.00	0.67	1.21	1.86	3.16	3.41	5.32		
SECTION LENGTH		0.67	0.54	0.65	1.30	0.25	1.91	0.33		
PAVEMENT WIDTH		50'	22' & 22'	22' & 22'	20' & 22'	22' & 22'	20' & 22'	22' & 22'		
MEDIAN WIDTH		1'	6'	10'	10'	10'	10'	10'		
RIGHT-OF-WAY WIDTH		110'	115'	115'	115'	115'	115'	115'		

MILES: 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15

VISIBLE FIXED POINTS: 7.25 HYATTVILLE RD; 8.24 DELAWARE CO. 98; 10.35; 10.65 SR 315; 10.72; 12.09; 12.47 DELAWARE CORP; SEE DELAWARE ARTERIAL REPORT; TWO 24' PAVEMENTS MEDIAN VARIES FROM 16' TO 60'; 14.80 DELAWARE CORP

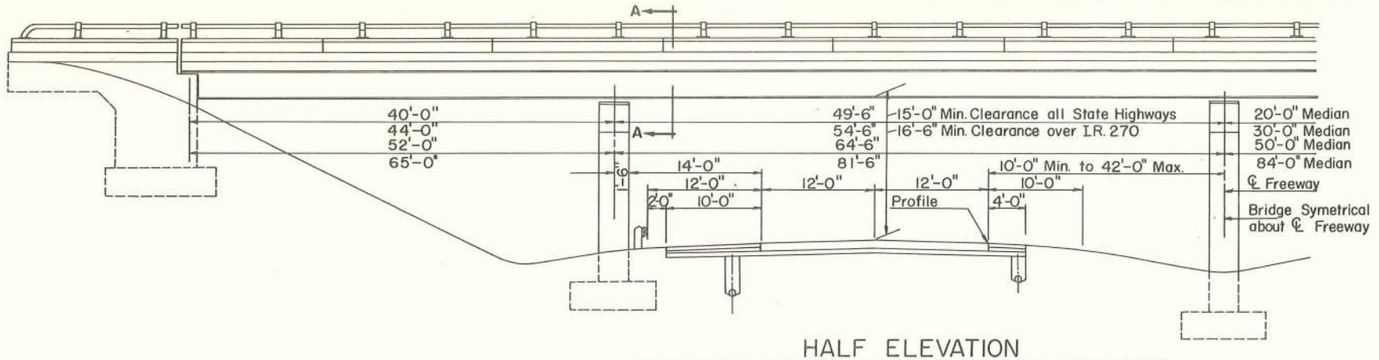
SECTION IDENTIFICATION	5.65	10.35	10.72	
SECTION LENGTH	4.70	0.37	1.37	
PAVEMENT WIDTH	24' & 24'	24' & 24'	24' & 24'	
MEDIAN WIDTH	28'	4'	30'	
RIGHT-OF-WAY WIDTH	150'	100'	195'	

MILES: 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23

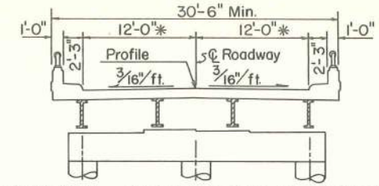
VISIBLE FIXED POINTS: 15.21; 17.80 PENN. RR.; 17.99; 19.50 TROY 209; 19.55 END REPORT

SECTION IDENTIFICATION	15.21	17.99		
SECTION LENGTH	2.78	1.56		
PAVEMENT WIDTH	24' & 24'	24' & 24'	22'	
MEDIAN WIDTH	2' TO 4'	20'	NONE	
RIGHT-OF-WAY WIDTH	120'	100'		

STRUCTURES – HIGHWAY

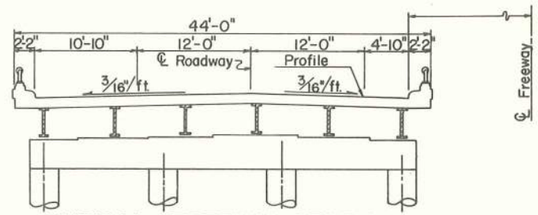


HALF ELEVATION
FREEWAY UNDER CROSSROAD OR FREEWAY

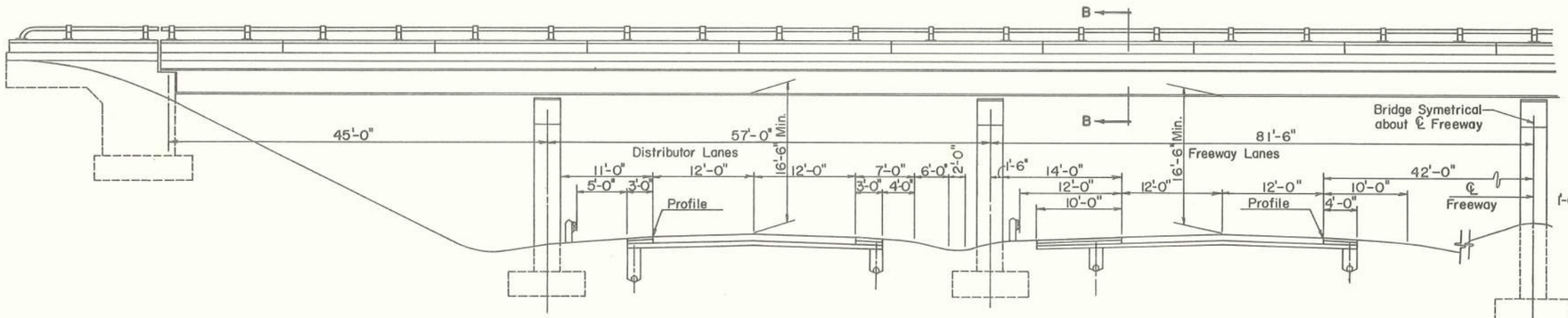


TYPICAL CROSSROAD SECTION
SECTION "A-A"

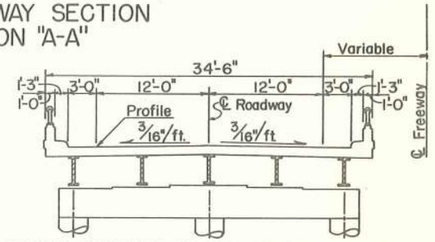
* 14'-0" on all Franklin County roads.



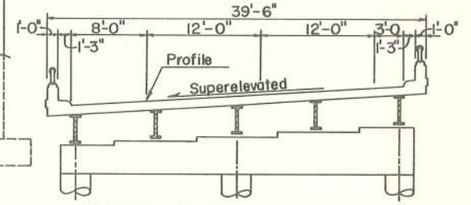
TYPICAL FREEWAY SECTION
SECTION "A-A"



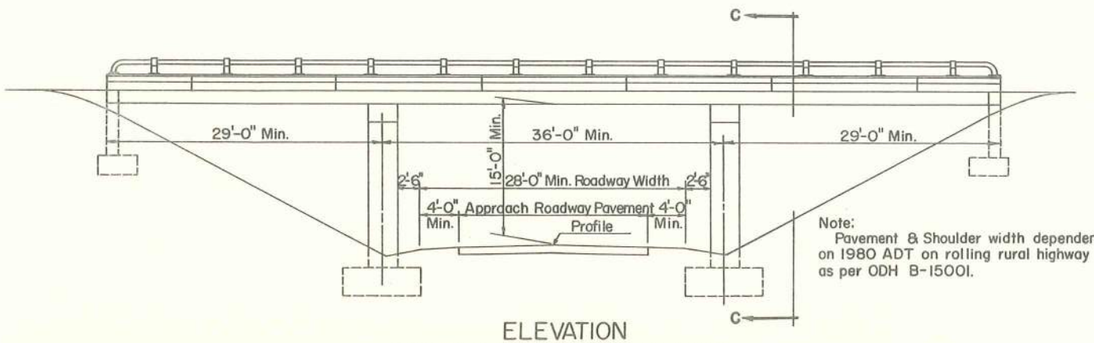
HALF ELEVATION
FREEWAY WITH DISTRIBUTOR ROADS UNDER FREEWAY



RAMP SECTION ON TANGENT ALIGNMENT

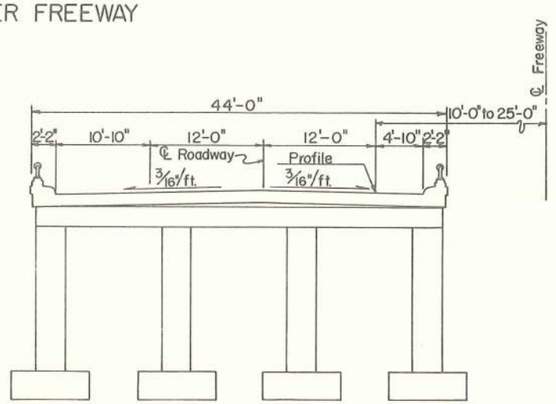


RAMP SECTION ON CURVE

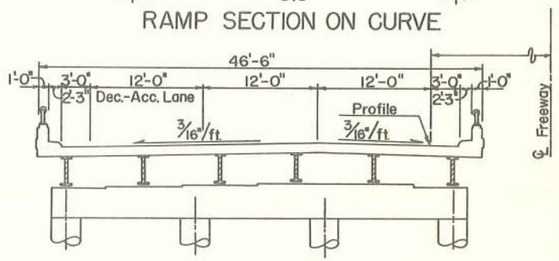


Note:
Pavement & Shoulder width dependent on 1980 ADT on rolling rural highway as per ODH B-1500I.

ELEVATION
FREEWAY OVER CROSSROAD



SECTION "C-C"

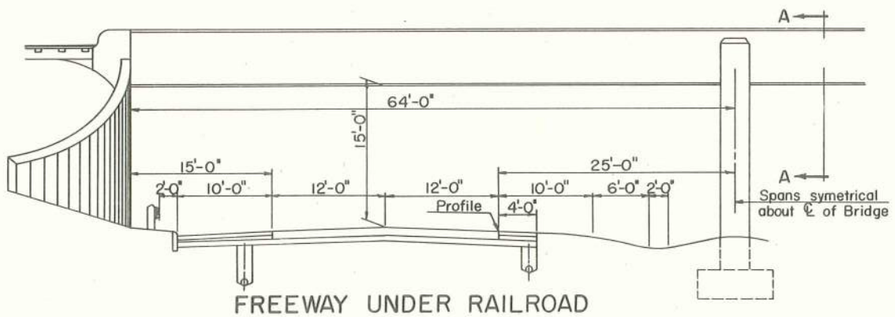


FREEWAY WITH MERGING LANES
SECTION "B-B"

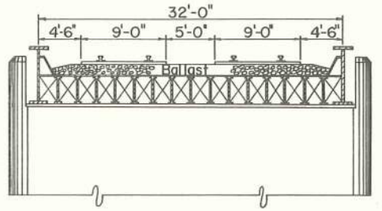
Note:
Width of Structures for cross roads and Freeways as determined by State of Ohio, Department of Highways, Div. of Construction, Bureau of Bridges, Design Regulations, January 1962.
Structure criteria shall be subject to revision, during design to agree with current Bureau of Public Roads and State of Ohio design requirements and other pertinent data.

Scale: 1/16" = 1'-0"

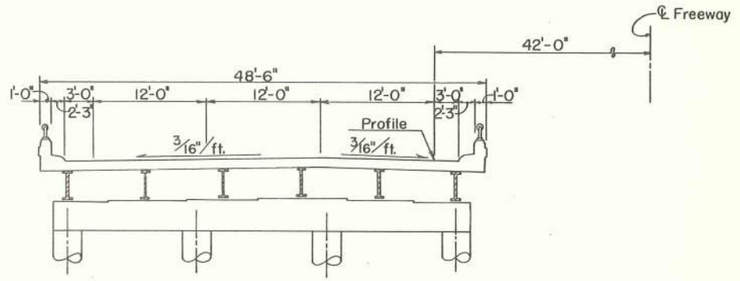
STRUCTURES - RAILROAD AND RIVER



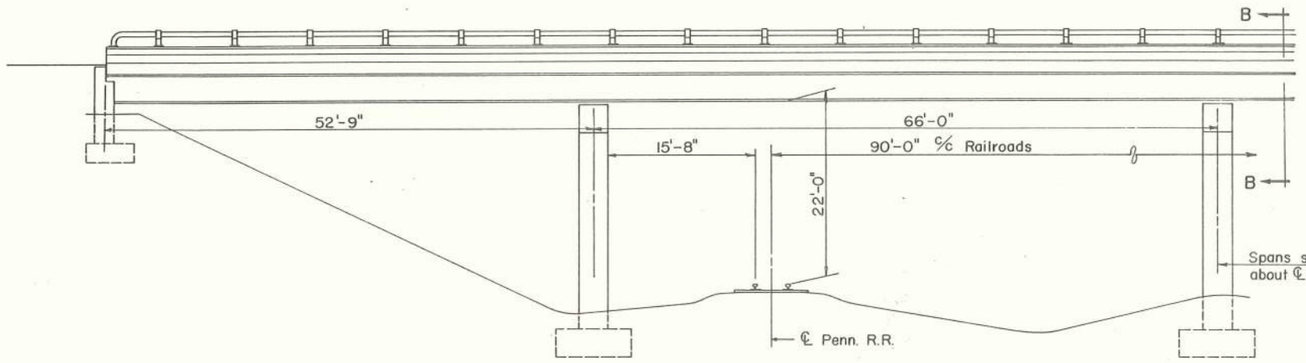
FREEWAY UNDER RAILROAD



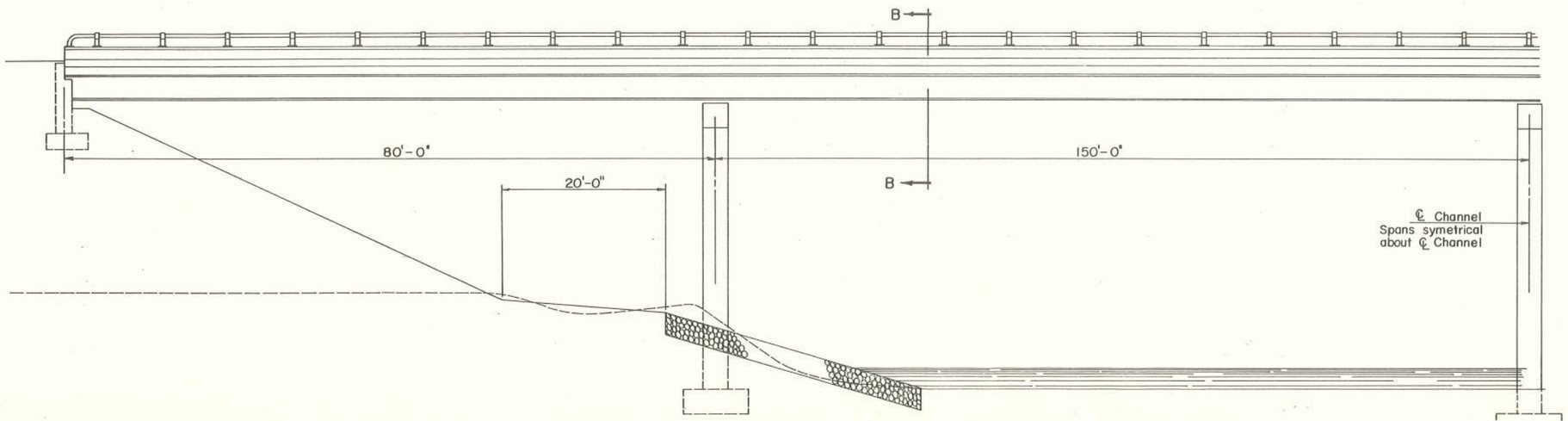
SECTION A-A



SECTION B-B

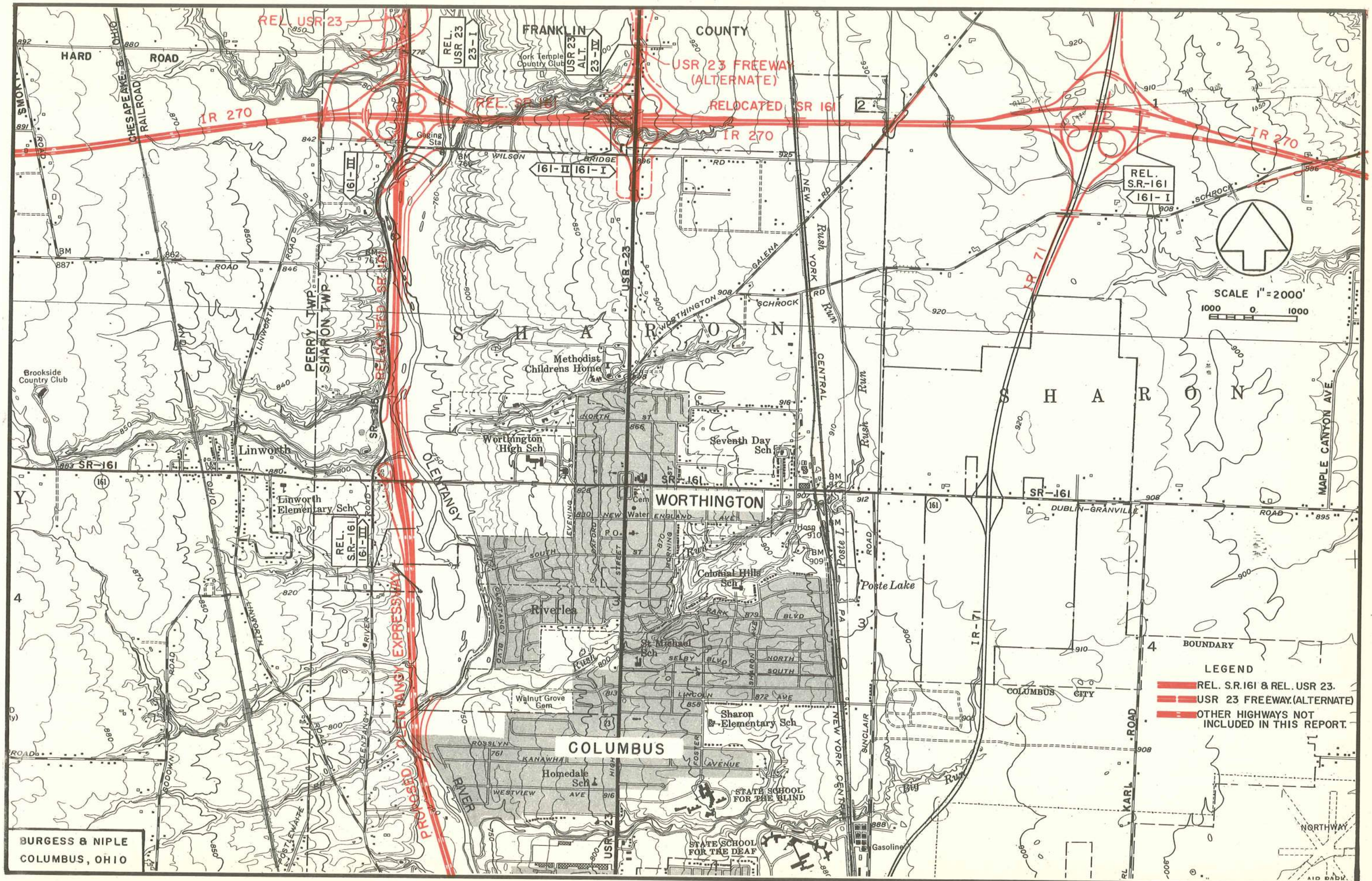


FREEWAY OVER RAILROAD



FREEWAY OVER OLENTANGY RIVER

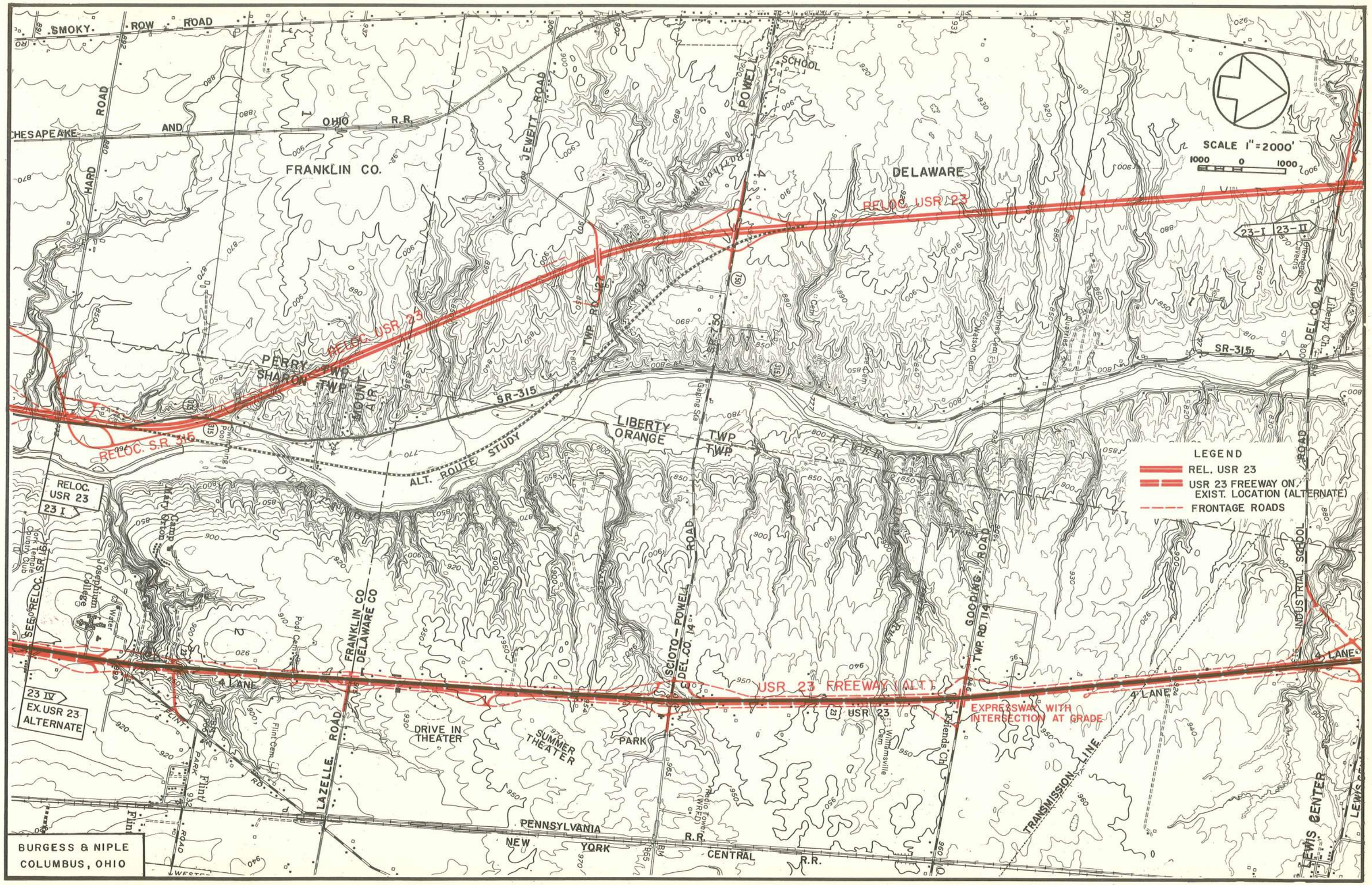
Note:
The cross section and clearances of the bridge involving railroad facilities and the Freeway shall be agreed upon by the State and Railroad involved.
The channel relocation and channel crossings as to span and water way opening shall be agreed upon by the State and agencies involved at time of construction.



USR 23 REPORT

RELOCATION AND IMPROVEMENT MAP RELOCATED SR 161 AND RELOCATED USR 23

PLATE 10



USR 23 REPORT

RELOCATION AND IMPROVEMENT MAP RELOCATED USR 23 vs USR 23 FREEWAY

PLATE II

SCALE: 1"=2000
1000 0 1000

LEGEND
REL. USR 23
USR 23 FREEWAY (ALTERNATE)
FRONTAGE ROADS

SEE INSERT BELOW EX. USR 23

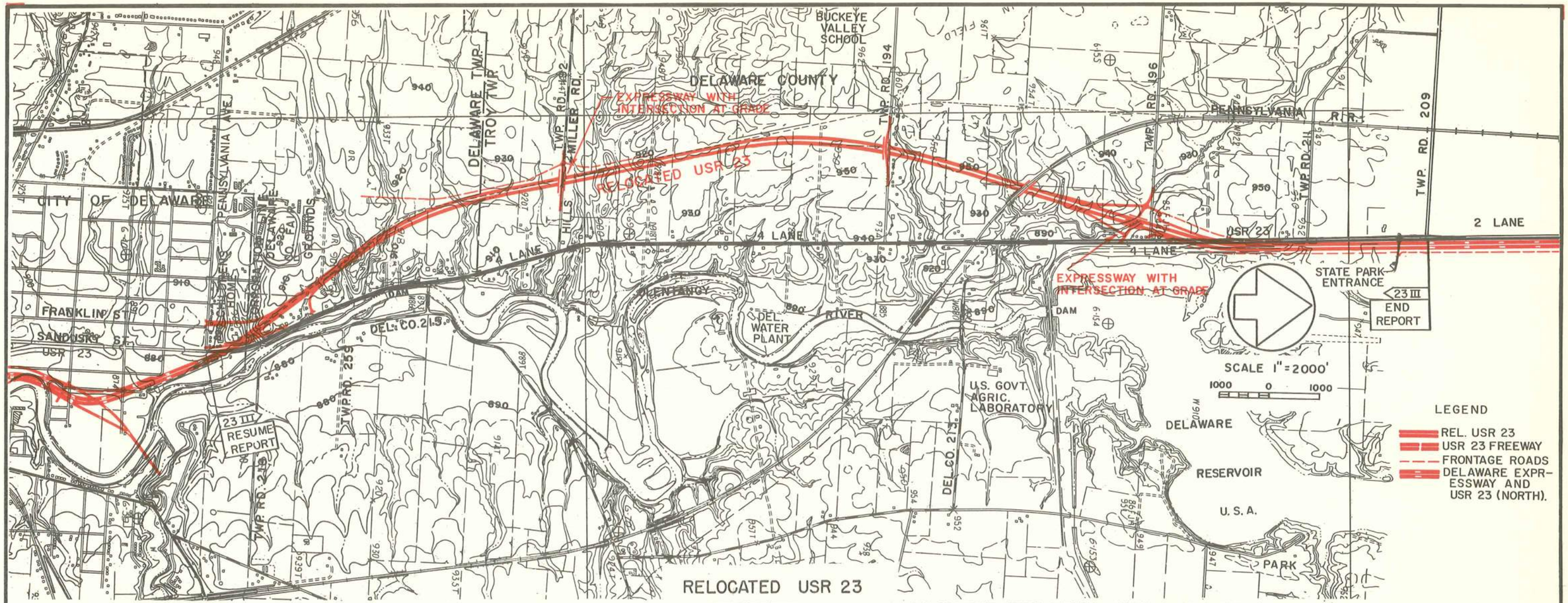
INSERT USR 23 FREEWAY

BURGESS & NIPLE
COLUMBUS, OHIO

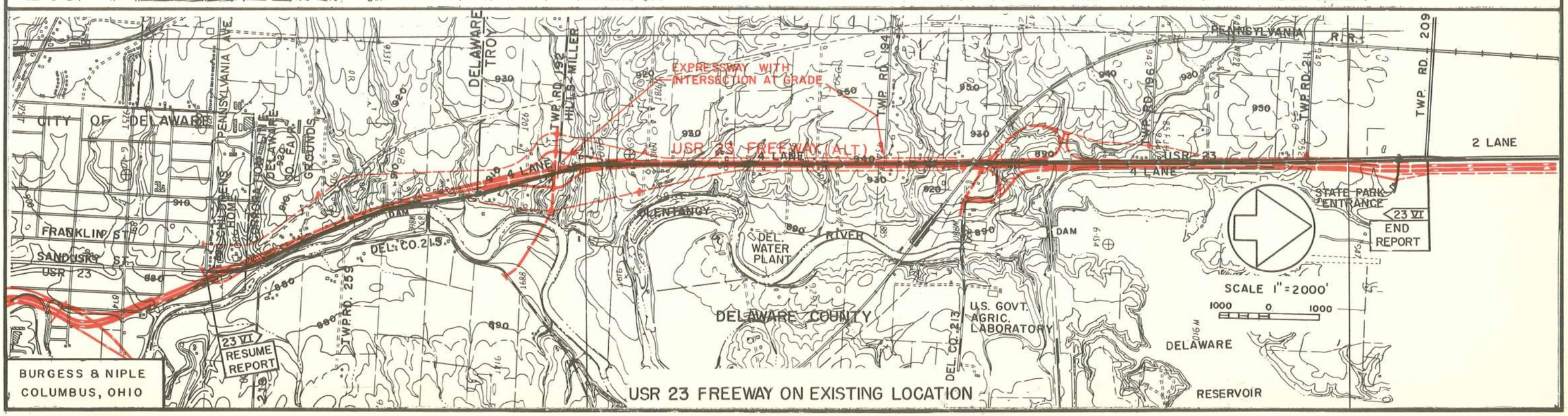
USR 23 REPORT

RELOCATION AND IMPROVEMENT MAP RELOCATED USR 23 vs USR 23 FREEWAY

PLATE 12



RELOCATED USR 23



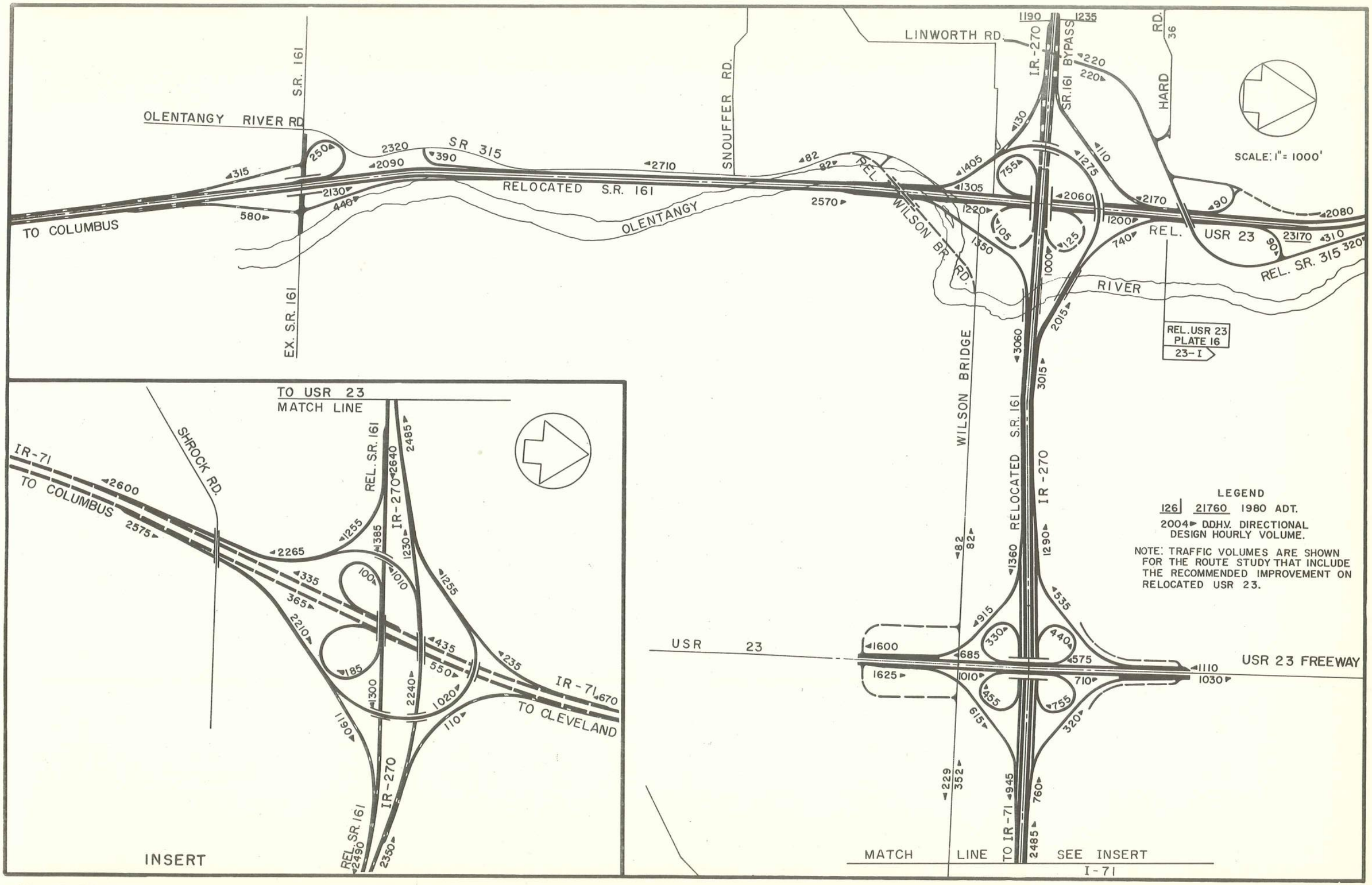
BURGESS & NIPLE
COLUMBUS, OHIO

USR 23 FREEWAY ON EXISTING LOCATION

USR 23 REPORT

RELOCATION AND IMPROVEMENT MAP-RELOCATED USR 23 AND USR 23 FREEWAY NORTH OF DELAWARE

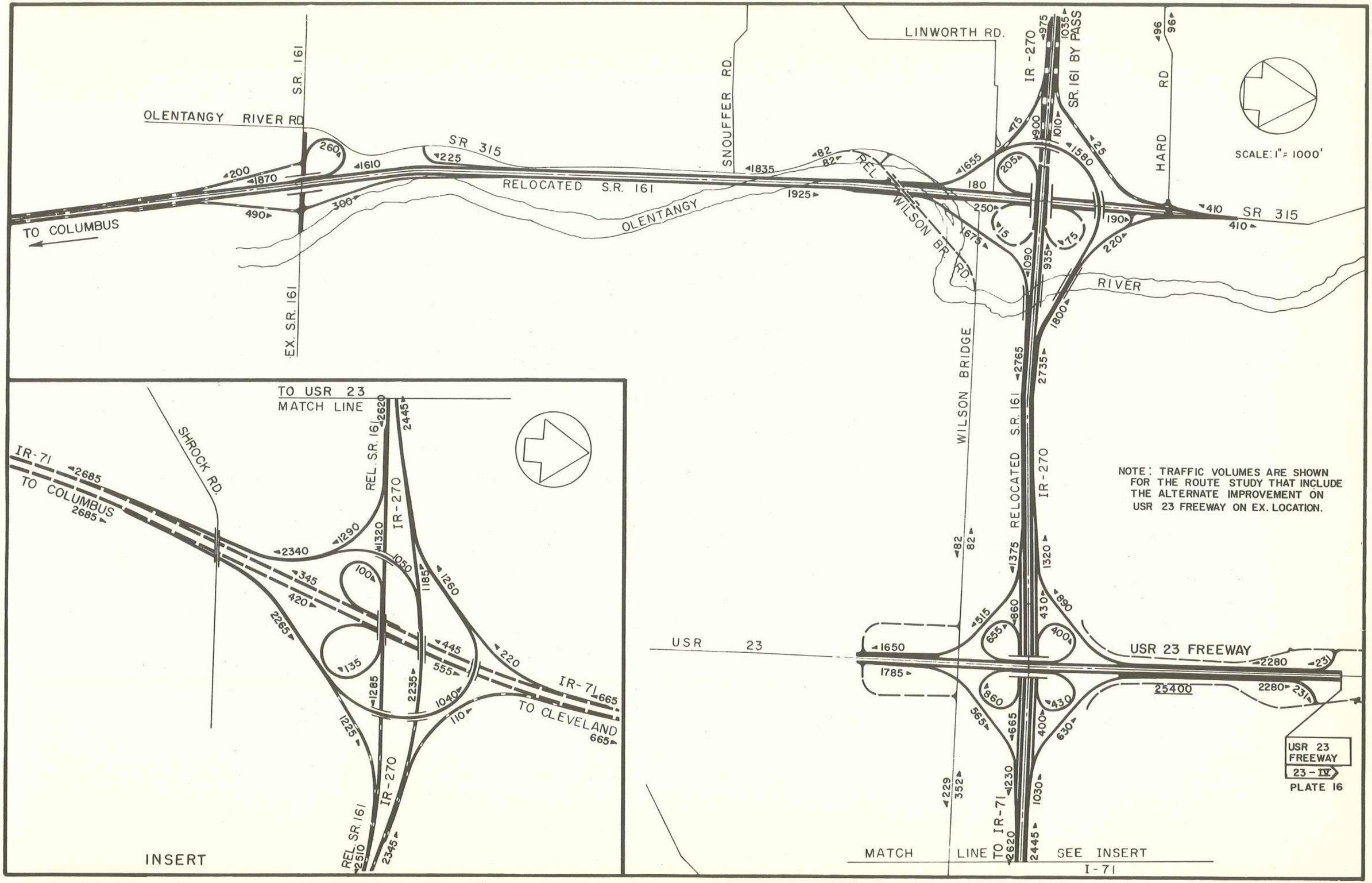
PLATE 13

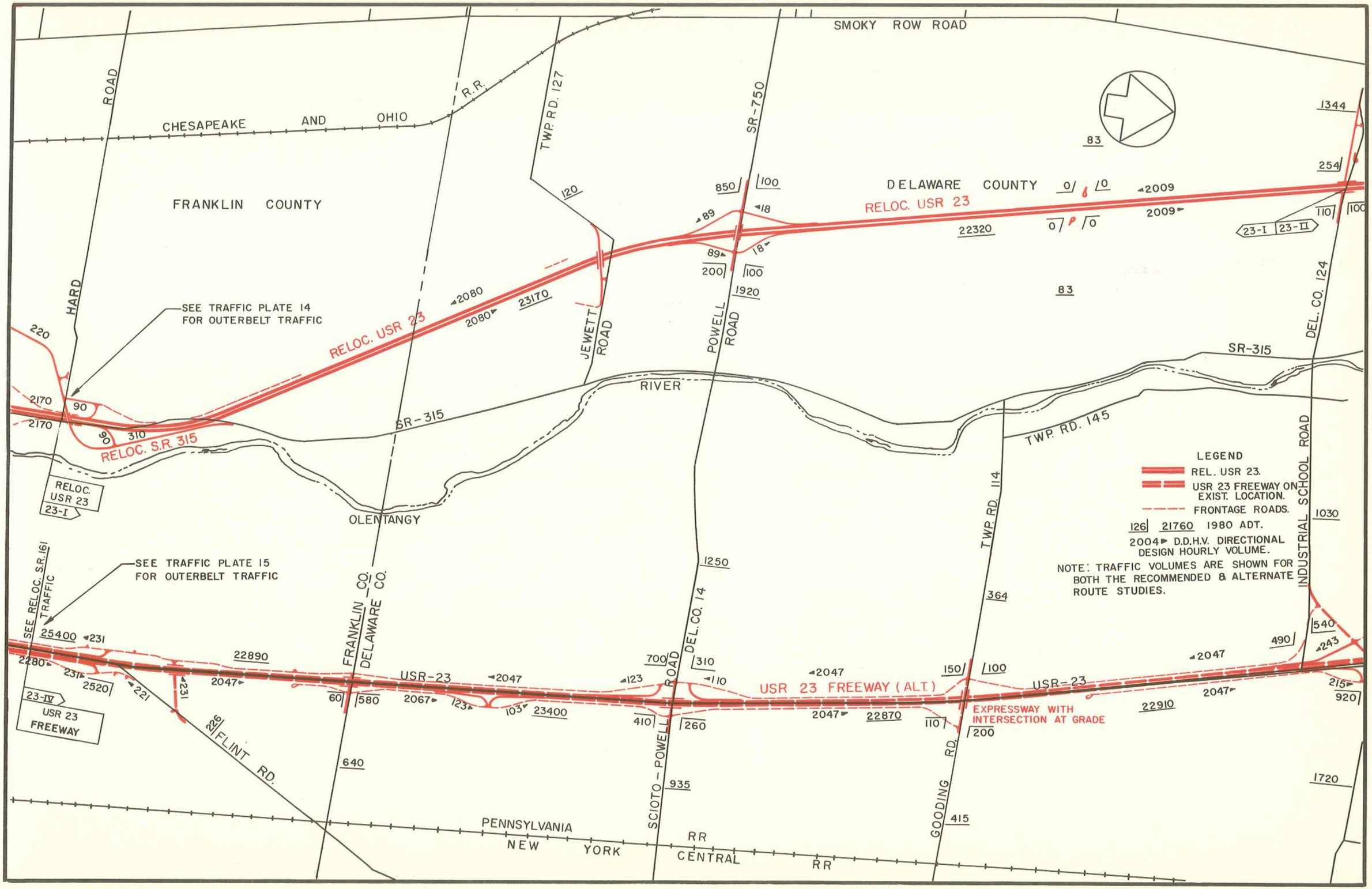


USR 23 REPORT

TRAFFIC — RELOCATED SR 161 WITH RELOCATED USR 23

PLATE 14


OLENTANGY RIVER RD
S.R. 161
EX. S.R. 161
SR 315
RELOCATED S.R. 161
OLENTANGY
SNOUFFER RD.
LINWORTH RD.
WILSON BR. RD.
IR - 270
SR. 161 BY PASS
HARD RD
SR 315
RIVER
TO COLUMBUS
SCALE: 1" = 1000'
TO USR 23
MATCH LINE
SHROCK RD.
REL. SR. 161
IR-71
TO COLUMBUS
IR-270
IR-71
TO CLEVELAND
REL. SR. 161
INSERT
WILSON BRIDGE
REL. S.R. 161
IR-270
USR 23
USR 23 FREEWAY
NOTE: TRAFFIC VOLUMES ARE SHOWN FOR THE ROUTE STUDY THAT INCLUDE THE ALTERNATE IMPROVEMENT ON USR 23 FREEWAY ON EX. LOCATION.
USR 23 FREEWAY
23 - IV
PLATE 16
MATCH LINE TO IR-71
SEE INSERT
I-71



USR 23 REPORT

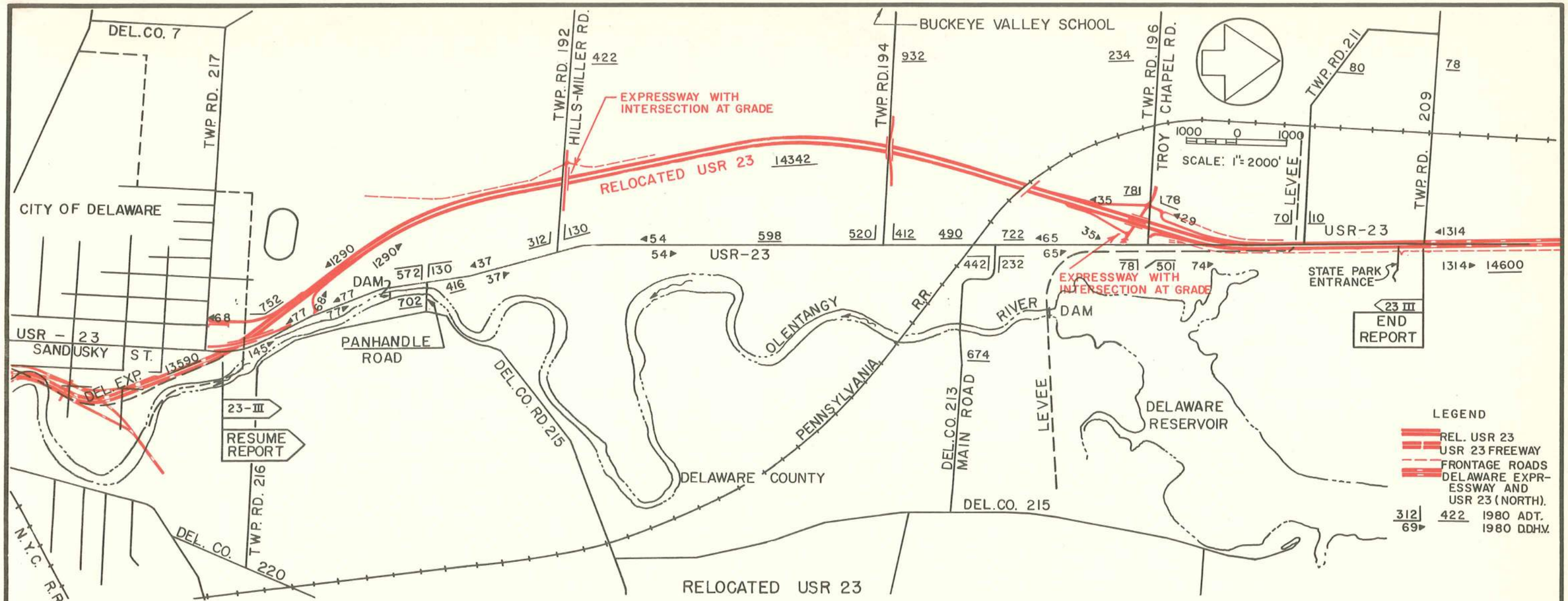
TRAFFIC – RELOCATED USR 23 vs USR 23 FREEWAY

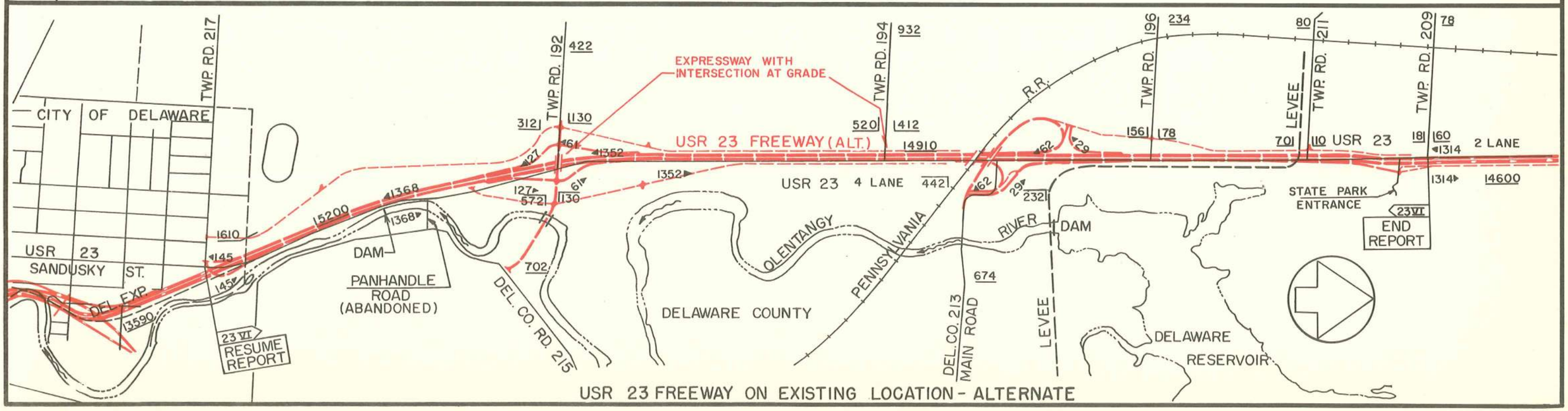
PLATE 16

DEL. CO. 124
DEL. CO. 123
DEL. CO. 9
HYATTSVILLE
CHESAPEAKE AND OHIO R.R.
LIBERTY ROAD
DELAWARE COUNTY
TWP. RD. 140
TWP. RD. 141
REL. USR 42
CITY OF DELAWARE
RELOCATED USR 23
USR 23
RIVER
TWP-118
SR-315
OLENTANGY
HYATTSVILLE ROAD
TWP. 98
DEL. CO. 4
STRATFORD
TWP. RD. 101
DELAWARE EXPRESSWAY
SUSPEND REPORT 23 II
SEE INSERT BELOW USR. 23 FREEWAY
DEL. CO. 92
USR 23 FREEWAY (ALT.)
EXPRESSWAY WITH INTERSECTION AT GRADE
DEL. CO. 98
OLENTANGY RD.
DEL. CO. 72
TWP. RD. 92
GREGORY RD.
PENNSYLVANIA RR.
LEWIS CENTER RD.
TWP. RD 100

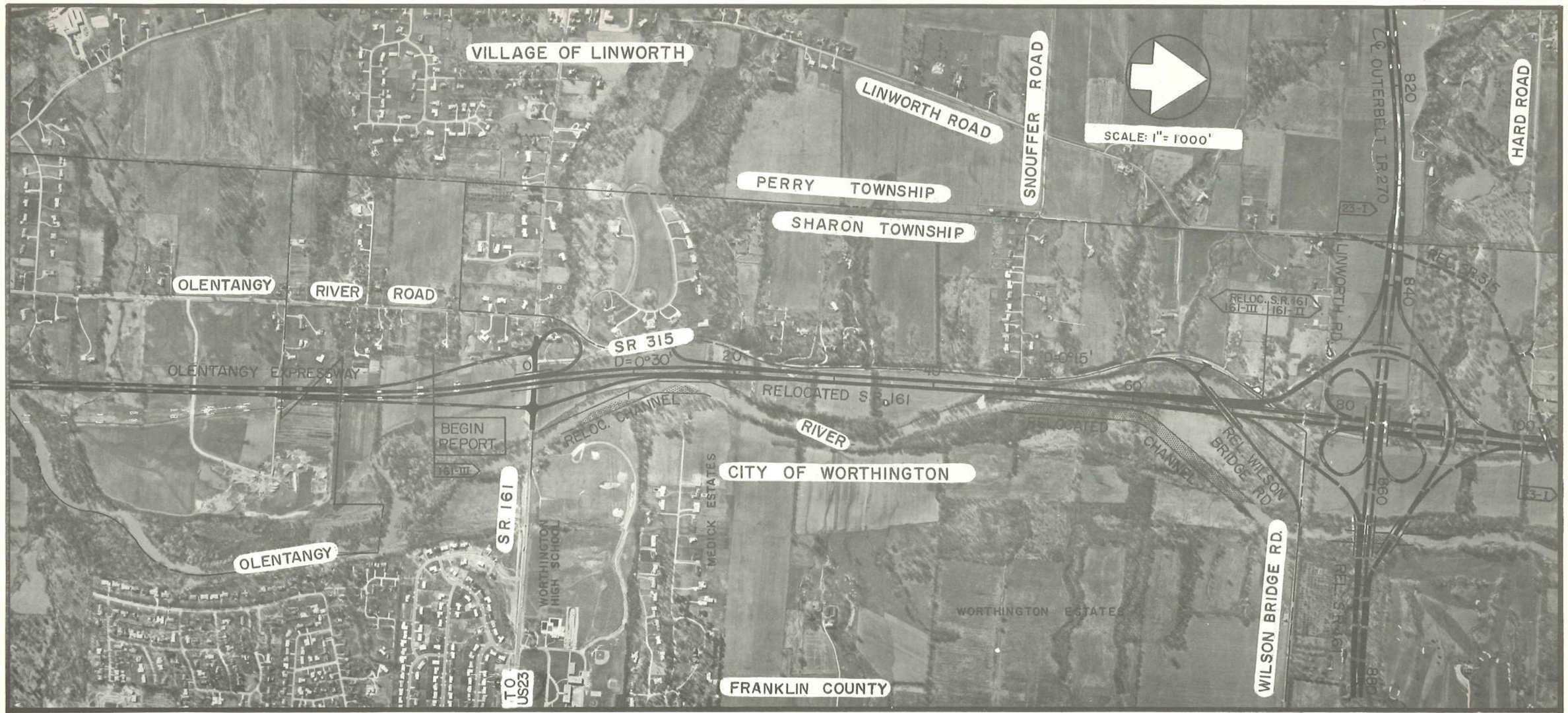
LEGEND
REL. USR 23.
USR 23 FREEWAY. (ALTERNATE)
FRONTAGE ROADS.
126 | 21760 1980 ADT.
2004► D.D.H.V. DIRECTIONAL DESIGN HOURLY VOLUME.
NOTE: TRAFFIC VOLUMES ARE SHOWN FOR BOTH THE RECOMMENDED & ALTERNATE ROUTE STUDIES.

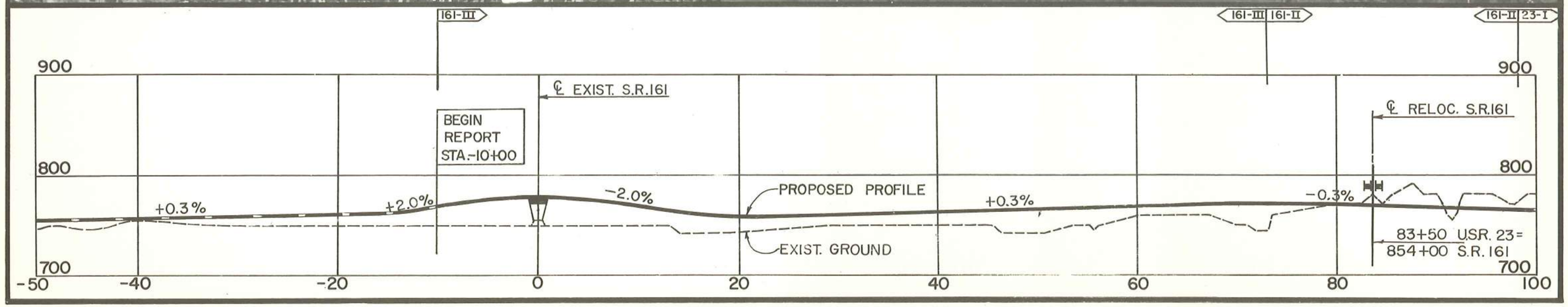
INSERT USR 23 FREEWAY
SUSPEND REPORT 23 V

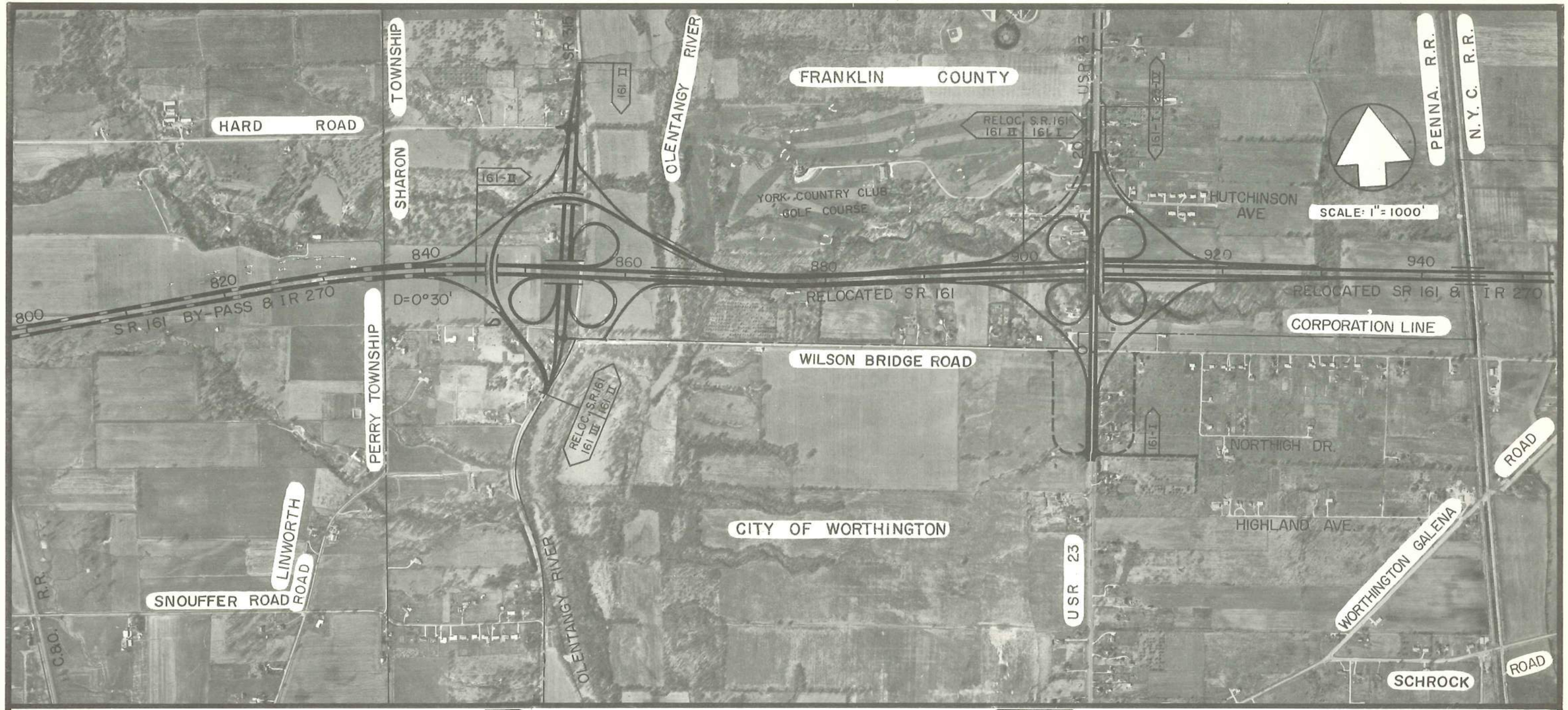

DEL. CO. 7
TWP. RD. 217
CITY OF DELAWARE
TWP. RD. 192
HILLS-MILLER RD.
422
EXPRESSWAY WITH INTERSECTION AT GRADE
RELOCATED USR 23
14342
TWP. RD. 194
932
BUCKEYE VALLEY SCHOOL
234
TWP. RD. 196
CHAPEL RD.
TWP. RD. 211
80
78
TWP. RD. 209
TROY
1000 0 1000
SCALE: 1"= 2000'
LEVEE
USR-23
1314
1314 14600
STATE PARK ENTRANCE
23 III
END REPORT
EXPRESSWAY WITH INTERSECTION AT GRADE
DAM
RIVER
OLENTANGY
PENNSYLVANIA
RR
DAMHANDLE ROAD
DEL. CO. RD. 215
DELAWARE COUNTY
DEL. CO. 213 MAIN ROAD
DEL. CO. 215
DELAWARE RESERVOIR
USR - 23 SANDUSKY ST.
DEL. EXP.
13590
23-III
RESUME REPORT
TWP. RD. 216
DEL. CO. 220
N.Y.C. R.R.
LEGEND
REL. USR 23
USR 23 FREEWAY
FRONTAGE ROADS DELAWARE EXPRESSWAY AND USR 23 (NORTH).
312 69 422 1980 ADT. 1980 D.D.H.V.
RELOCATED USR 23

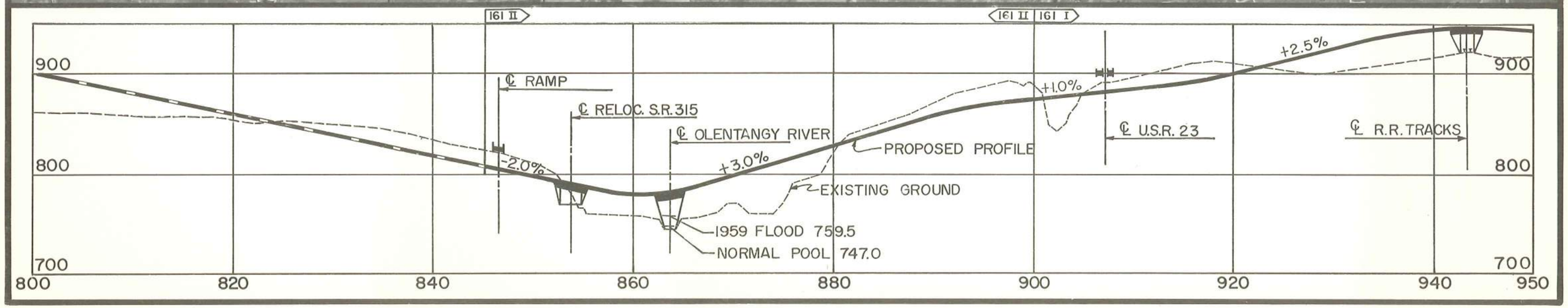

CITY OF DELAWARE
TWP. RD. 217
TWP. RD. 192
422
EXPRESSWAY WITH INTERSECTION AT GRADE
TWP. RD. 194
932
R.R.
TWP. RD. 196
234
80
TWP. RD. 211
TWP. RD. 209
78
LEVEE
USR 23 FREEWAY (ALT.)
14910
USR 23 4 LANE
442
USR 23
2 LANE
14600
STATE PARK ENTRANCE
23 VI
END REPORT
DAM
RIVER
OLENTANGY
PENNSYLVANIA
PANHANDLE ROAD (ABANDONED)
DEL. CO. RD. 215
DELAWARE COUNTY
DEL. CO. 213 MAIN ROAD
674
LEVEE
DELAWARE RESERVOIR
USR 23 SANDUSKY ST.
DEL. EXP.
13590
23 VI
RESUME REPORT
USR 23 FREEWAY ON EXISTING LOCATION - ALTERNATE

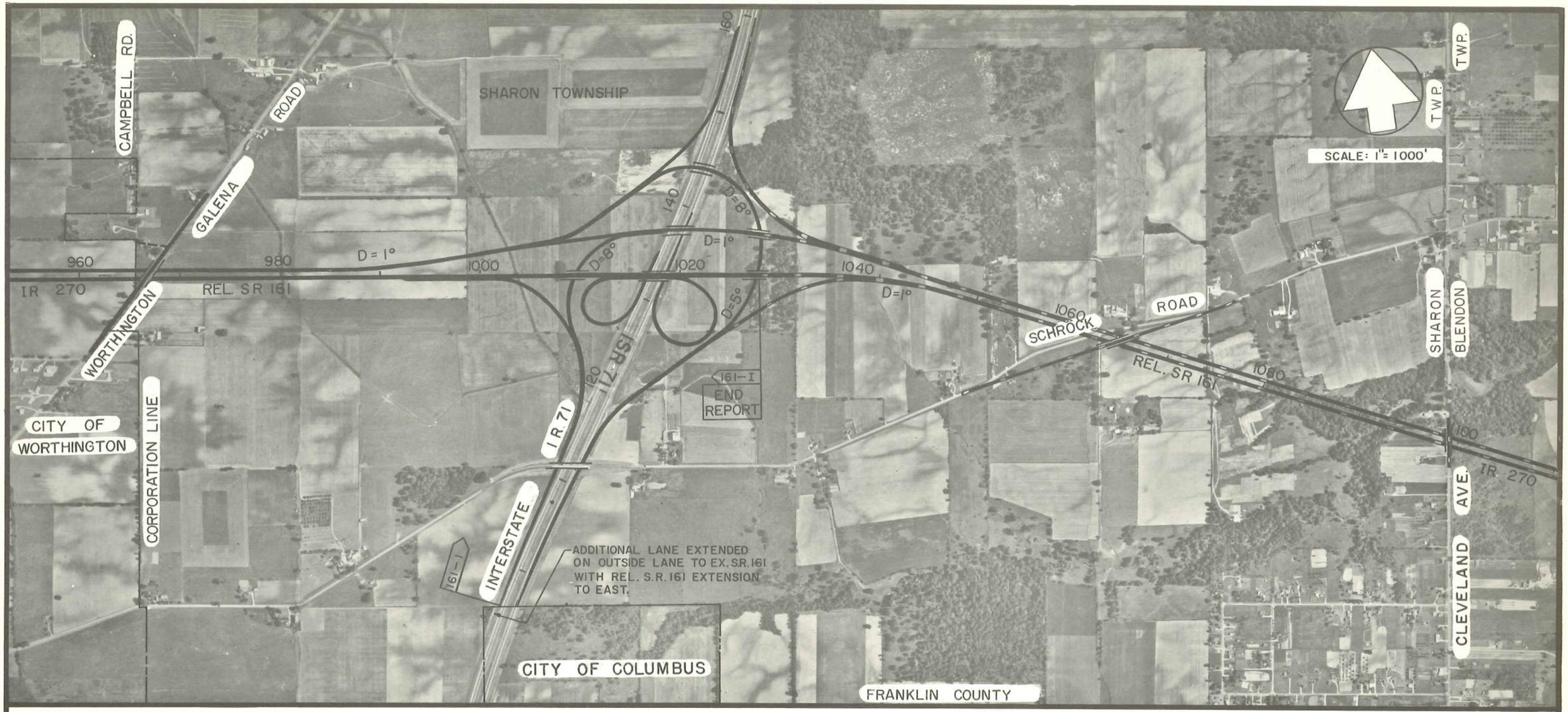
PLAN AND PROFILE SHEETS

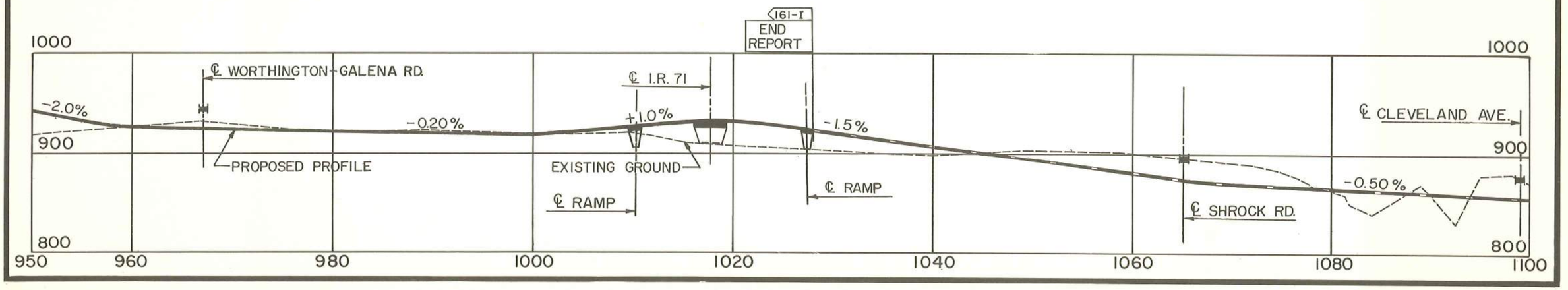

VILLAGE OF LINWORTH
LINWORTH ROAD
SNOUFFER ROAD
SCALE: 1"= 1000'
HARD ROAD
PERRY TOWNSHIP
SHARON TOWNSHIP
OLENTANGY RIVER ROAD
SR 315
D=0°30'
D=0°15'
OLENTANGY EXPRESSWAY
RELOCATED S.R. 161
RELOC. CHANNEL
RIVER
BEGIN REPORT
161-III
CITY OF WORTHINGTON
SR 161
WORTHINGTON HIGH SCHOOL
MEDICK ESTATES
OLENTANGY
TO US23
FRANKLIN COUNTY
WORTHINGTON ESTATES
WILSON BRIDGE RD.
RELOC. S.R. 161
RELOC. S.R. 315
LINWORTH RD.
161-III 161-II
23-I
820
840
860
880
0
20
40
60
80
100

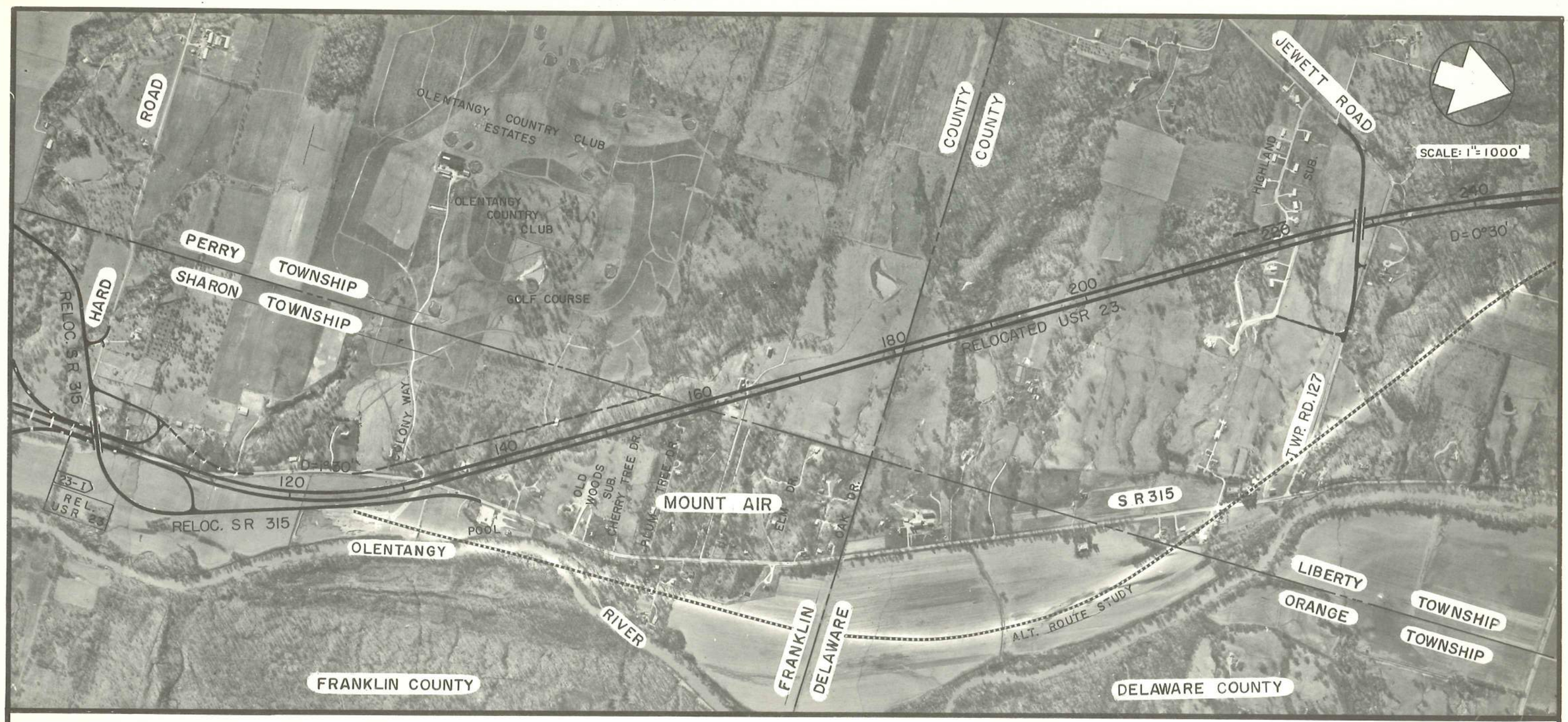

161-III
161-III 161-II
161-II 23-I
900
800
700
℄ EXIST. S.R.161
BEGIN REPORT STA.-10+00
+0.3%
+2.0%
-2.0%
PROPOSED PROFILE
+0.3%
-0.3%
EXIST. GROUND
℄ RELOC. S.R.161
83+50 USR. 23 = 854+00 S.R. 161
-50
-40
-20
0
20
40
60
80
100

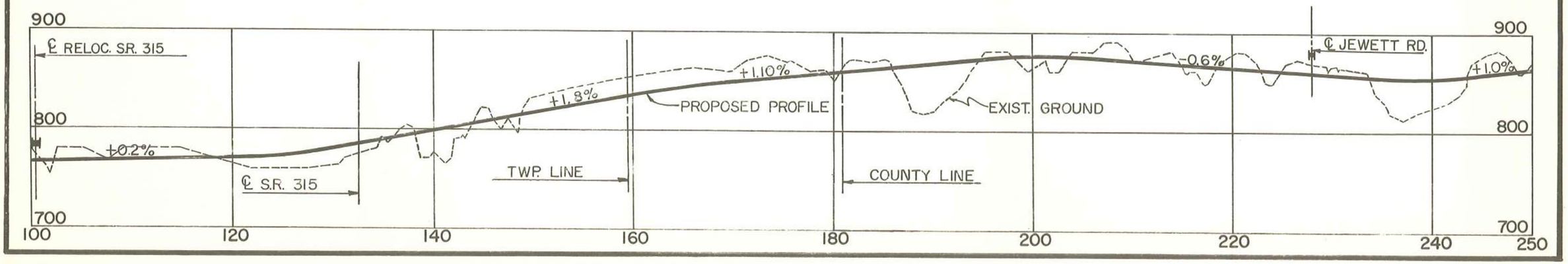

HARD ROAD
SHARON TOWNSHIP
SR 315
161 II
OLENTANGY RIVER
FRANKLIN COUNTY
USR 23
RELOC. S.R. 161
161 II 161 I
161-I 161-II
YORK COUNTRY CLUB GOLF COURSE
HUTCHINSON AVE
SCALE: 1" = 1000'
PENNA. R.R.
N.Y.C. R.R.
161-II
840
860
880
900
920
940
820
800
D=0°30'
RELOCATED SR 161
RELOCATED SR 161 & IR 270
SR 161 BY-PASS & IR 270
CORPORATION LINE
PERRY TOWNSHIP
WILSON BRIDGE ROAD
RELOC. S.R. 161
161 III 161 II
161-I
NORTHIGH DR.
ROAD
LINWORTH ROAD
SNOUFFER ROAD
R.R.
C.B.O.
CITY OF WORTHINGTON
OLENTANGY RIVER
USR 23
HIGHLAND AVE.
WORTHINGTON GALENA
SCHROCK ROAD

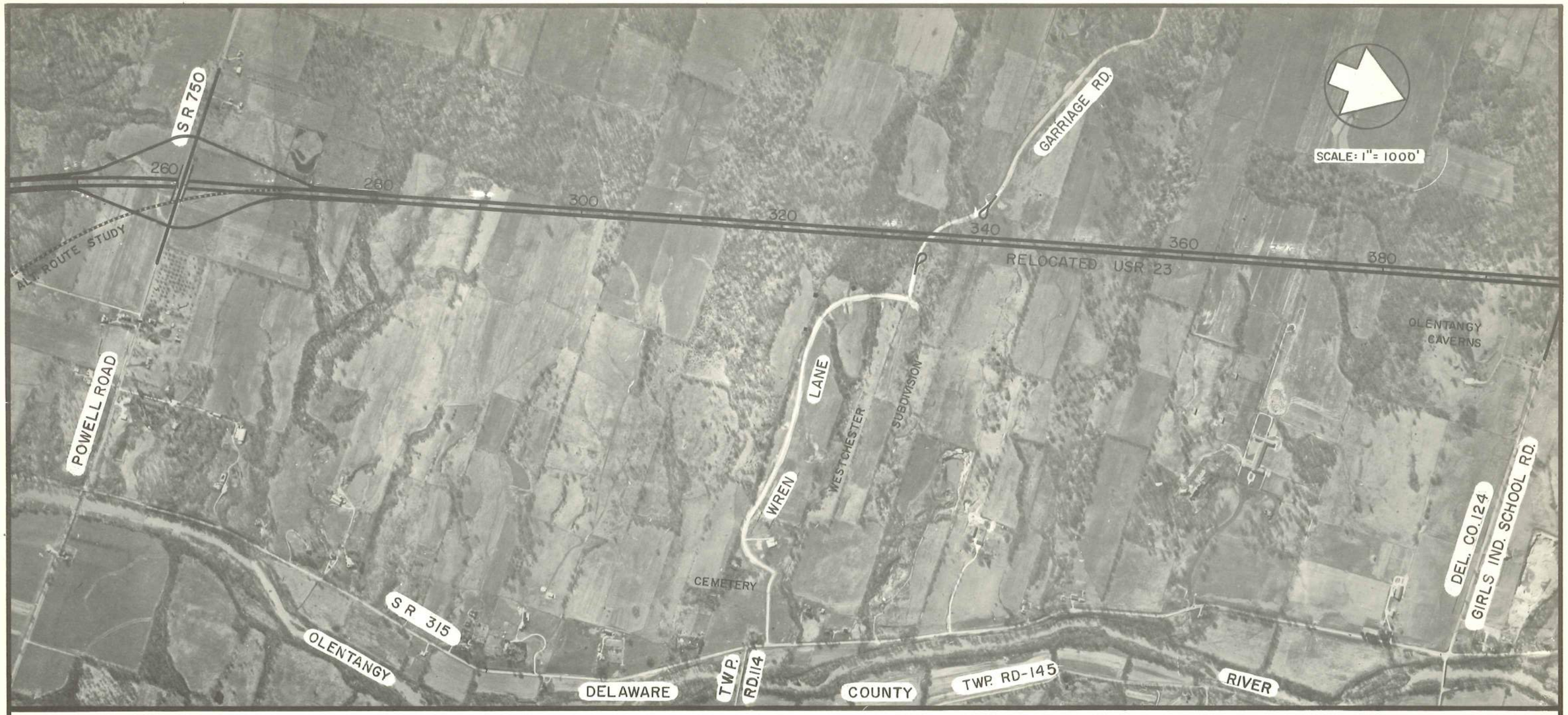

161 II
161 II 161 I
900
800
700
℄ RAMP
℄ RELOC. S.R. 315
℄ OLENTANGY RIVER
℄ U.S.R. 23
℄ R.R. TRACKS
-2.0%
+3.0%
+1.0%
+2.5%
PROPOSED PROFILE
EXISTING GROUND
1959 FLOOD 759.5
NORMAL POOL 747.0
800
820
840
860
880
900
920
940
950

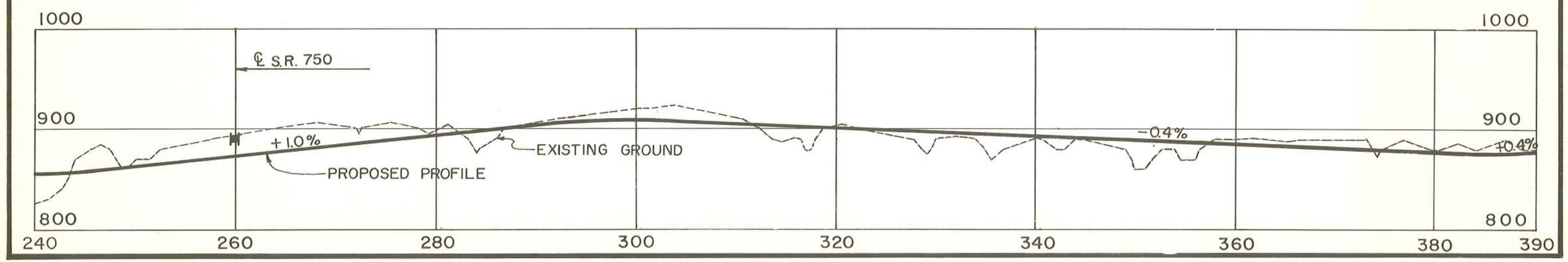

CAMPBELL RD.
GALENA ROAD
SHARON TOWNSHIP
SCALE: 1"= 1000'
T.W.P.
T.W.P.
960
980
D = 1°
1000
1020
1040
D=1°
D=8°
D=8°
D=1°
D=5°
IR 270
REL. SR 161
WORTHINGTON
SCHROCK
ROAD
1060
REL. SR 161
1060
SHARON
BLENDON
100
IR 270
CLEVELAND AVE.
161-I
END
REPORT
IR 71
ISR-71
120
140
160
CITY OF
WORTHINGTON
CORPORATION LINE
INTERSTATE
161-I
ADDITIONAL LANE EXTENDED
ON OUTSIDE LANE TO EX. SR. 161
WITH REL. S.R. 161 EXTENSION
TO EAST.
CITY OF COLUMBUS
FRANKLIN COUNTY


161-I
END
REPORT
1000
900
800
℄ WORTHINGTON-GALENA RD.
℄ I.R. 71
℄ CLEVELAND AVE.
-2.0%
-0.20%
+1.0%
-1.5%
-0.50%
PROPOSED PROFILE
EXISTING GROUND
℄ RAMP
℄ RAMP
℄ SHROCK RD.
950
960
980
1000
1020
1040
1060
1080
1100

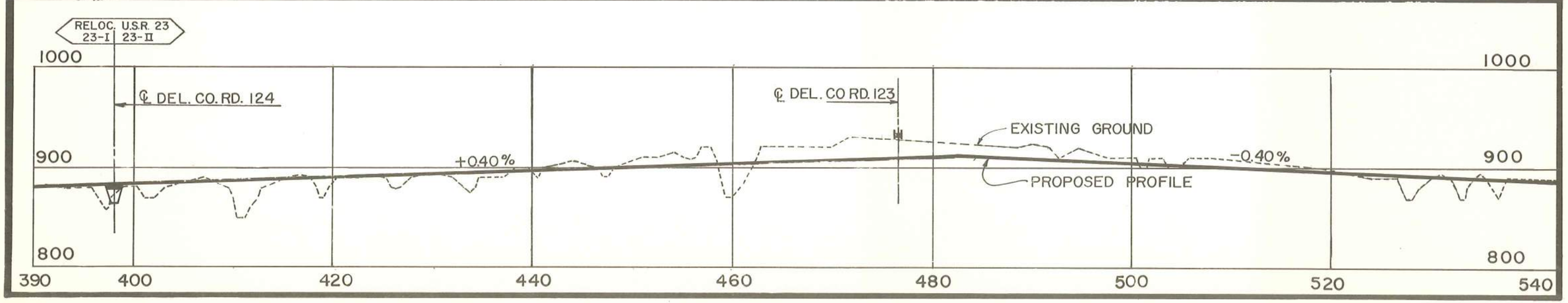

ROAD
OLENTANGY COUNTRY ESTATES
OLENTANGY COUNTRY CLUB
GOLF COURSE
COUNTY
COUNTY
JEWETT ROAD
HIGH LAND SUB.
SCALE: 1"=1000'
240
220
D=0°30'
PERRY TOWNSHIP
SHARON TOWNSHIP
HARD
RELOC. SR 315
200
180
RELOCATED USR 23
160
140
120
D=1°30'
COLONY WAY
23-1
REL. USR 23
RELOC. SR 315
POOL
OLENTANGY
OLD WOODS SUB.
CHERRY TREE DR.
PLUM TREE DR.
MOUNT AIR
ELM DR.
OAK DR.
S R 315
TWP. RD. 127
RIVER
FRANKLIN
DELAWARE
ALT. ROUTE STUDY
LIBERTY
ORANGE
TOWNSHIP
TOWNSHIP
FRANKLIN COUNTY
DELAWARE COUNTY


900
℄ RELOC. SR. 315
800
700
+0.2%
℄ S.R. 315
TWP. LINE
+1.8%
+1.10%
PROPOSED PROFILE
EXIST. GROUND
COUNTY LINE
-0.6%
℄ JEWETT RD.
+1.0%
900
800
700
100
120
140
160
180
200
220
240
250


SCALE: 1" = 1000'
S R 750
260
280
300
320
340
360
380
ALT. ROUTE STUDY
RELOCATED USR 23
GARRIAGE RD.
POWELL ROAD
LANE
WESTCHESTER
SUBDIVISION
WREN
OLENTANGY CAVERNS
DEL. CO. 124
GIRLS IND. SCHOOL RD.
CEMETERY
S R 315
OLENTANGY
DELAWARE
TWP.
RD. 114
COUNTY
TWP. RD-145
RIVER


1000
900
800
℄ S.R. 750
+1.0%
-0.4%
+0.4%
EXISTING GROUND
PROPOSED PROFILE
240
260
280
300
320
340
360
380
390


DEL. CO. 124
TRANSMISSION LINE
DEL. CO. 123
SCHOOL
HEIGHTS SUB.
DEL. CO. 9
LIBERTY ROAD
SCALE: 1"= 1000'
400
420
440
460
480
D=0°30'
500
CEMETERY
520
540
RELOCATED USR 23
RELOC. USR. 23
23-I | 23-II
OLENTANGY CAVERNS
GIRLS IND. SCHOOL RD.
HYATTSVILLE RD.
RIVERVIEW
OLENTANGY
RIVER
SR315
SR315
TWP. RD. 140
DELAWARE COUNTY


RELOC. U.S.R. 23
23-I | 23-II
1000
900
800
℄ DEL. CO. RD. 124
℄ DEL. CO RD. 123
+0.40%
-0.40%
EXISTING GROUND
PROPOSED PROFILE
390
400
420
440
460
480
500
520
540

DEL. CO.9

LIBERTY TOWNSHIP

TWP. RD.141

DELAWARE TOWNSHIP

LIBERTY ROAD

SCALE 1"=1000'

BARRINGTON ESTATES

STATE HIGHWAY PATROL

CITY OF DELAWARE

RIVER FOREST SUB.

RELOC. USR. 42

560 580 600

RELOCATED USR 23

FRONTAGE ROAD

D=1° 30'

660

640

CHURCH

SUSPEND REPORT

23-II

DEL.CO. 4

DEL EXPR.

TWP. RD.140

OLENTANGY VIEW SUB.

TWP. R.101

OLENTANGY

RIVER

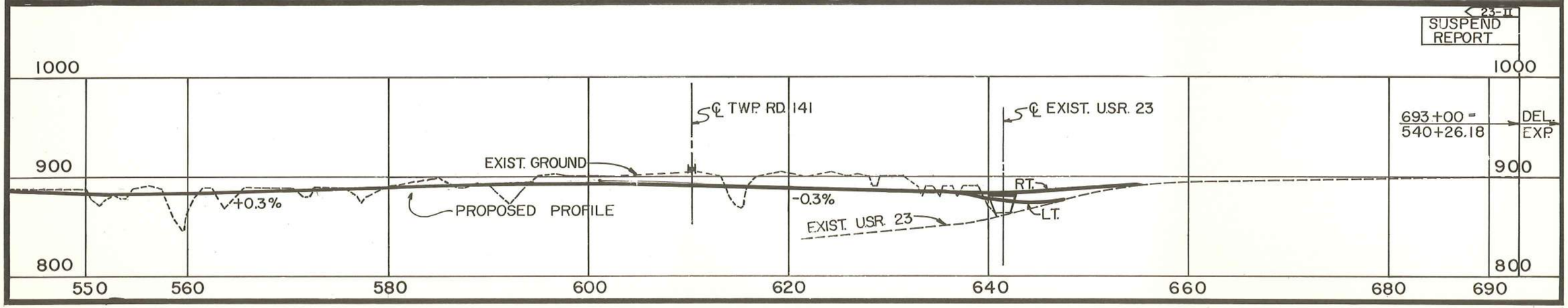
SR 315

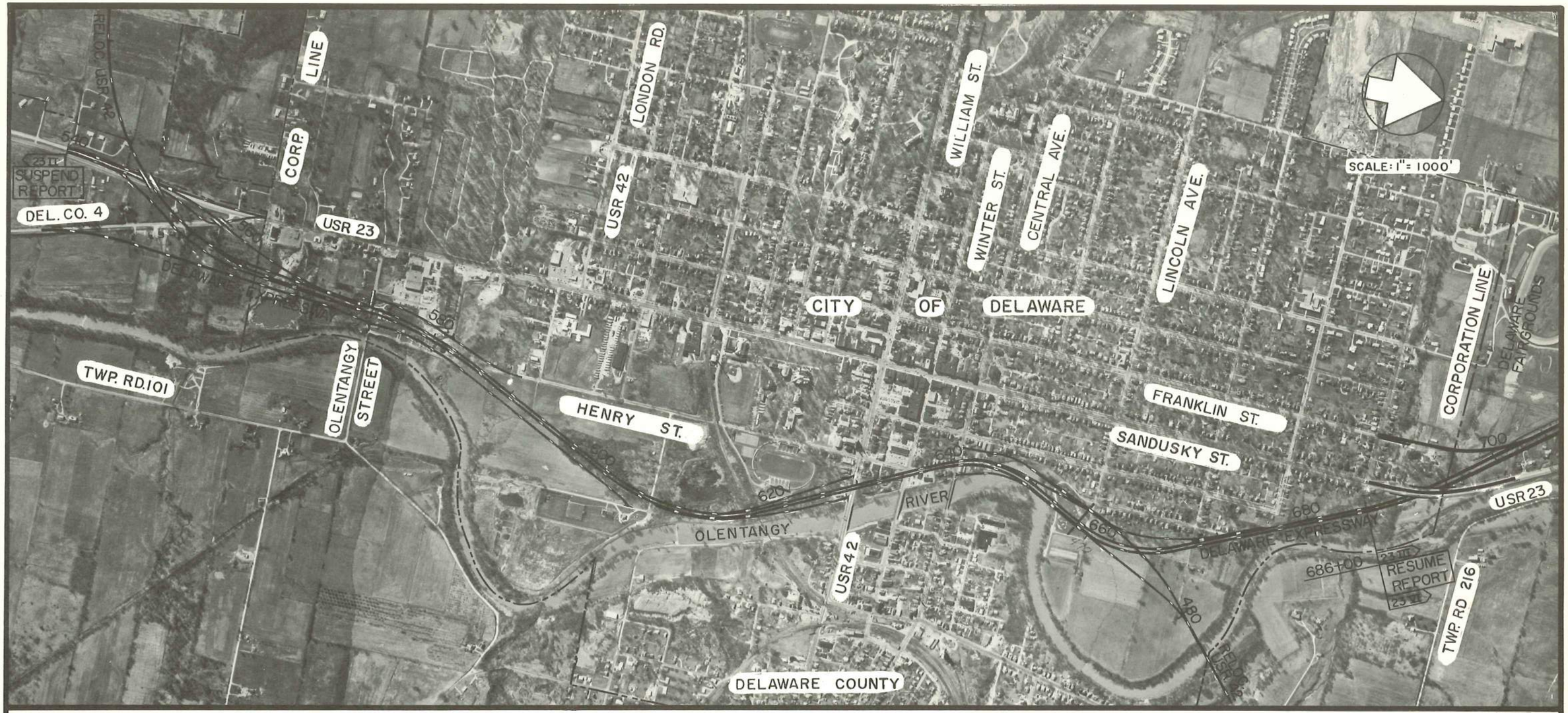
USR 23

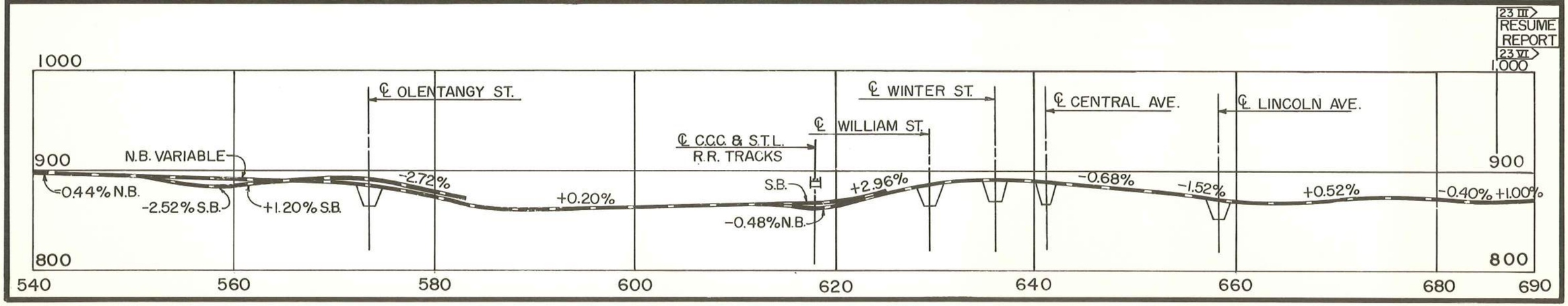
METHODIST THEOLOGICAL SCHOOL

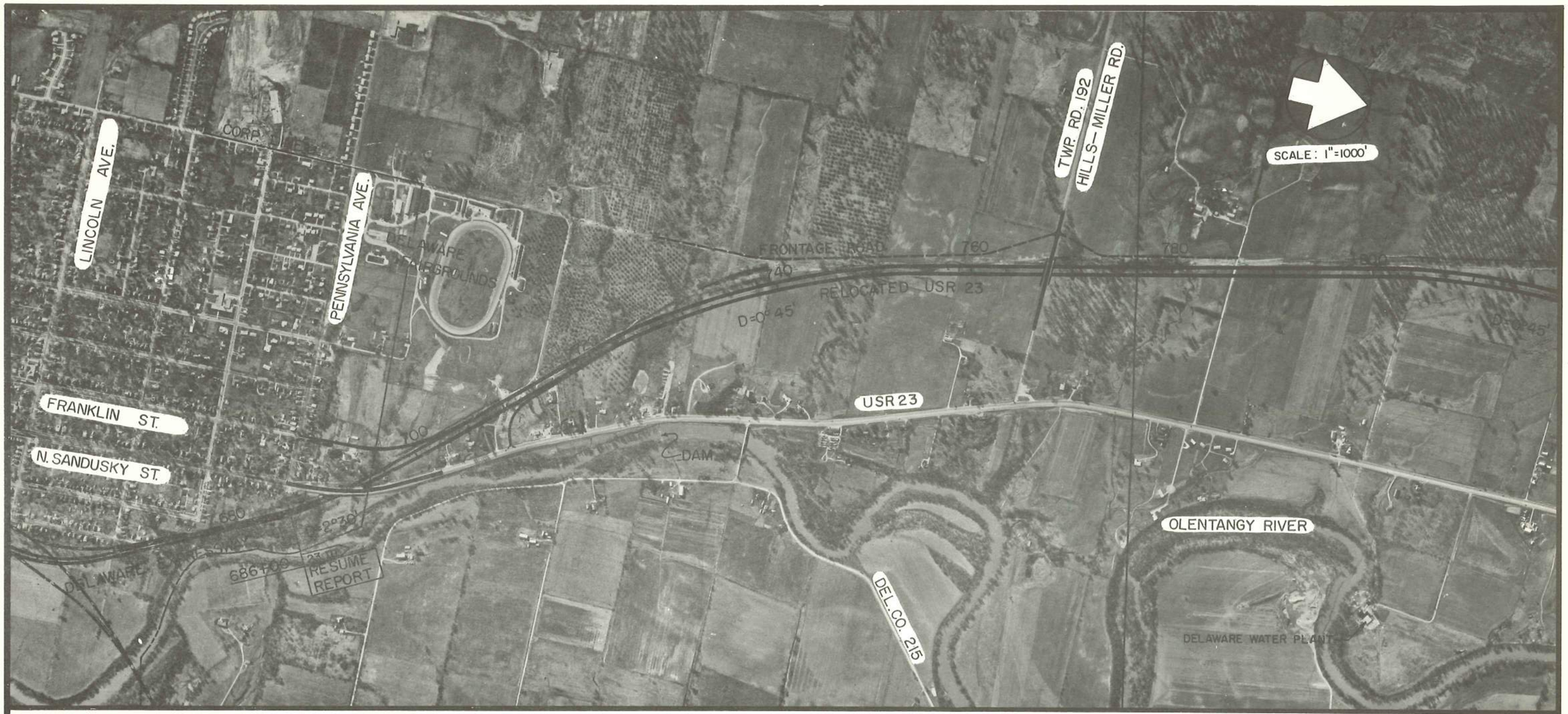
DEL. CO.92

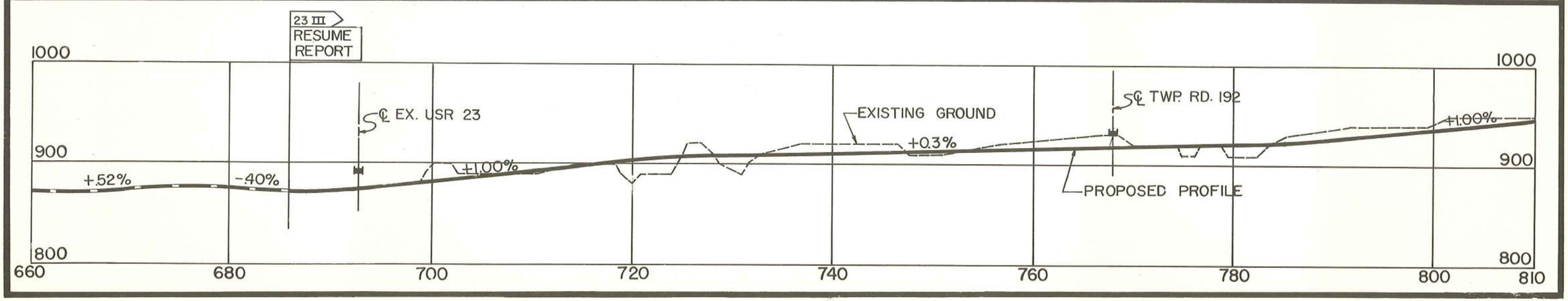
DELAWARE COUNTY

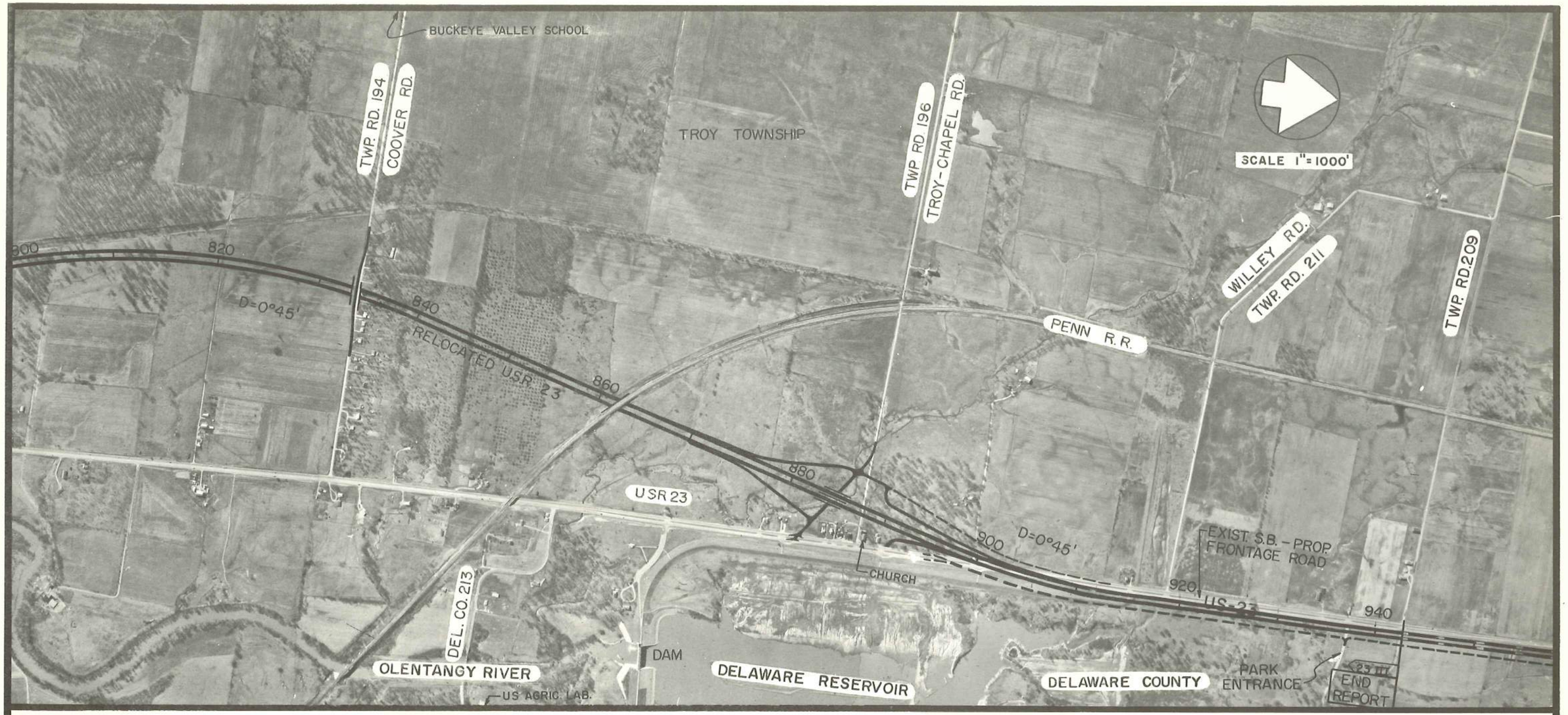


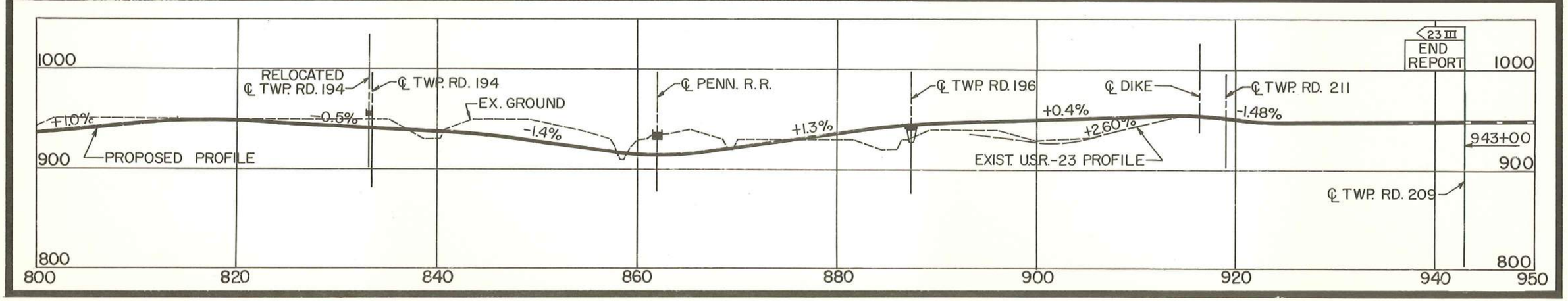

RELOC. USR 42
CORP. LINE
LONDON RD.
USR 42
WILLIAM ST.
WINTER ST.
CENTRAL AVE.
LINCOLN AVE.
SCALE: 1" = 1000'
23 II
SUSPEND REPORT
DEL. CO. 4
USR 23
CITY OF DELAWARE
CORPORATION LINE
DELAWARE FAIRGROUNDS
TWP. RD. 101
OLENTANGY STREET
HENRY ST.
FRANKLIN ST.
SANDUSKY ST.
OLENTANGY
RIVER
USR 42
USR 23
DELAWARE EXPRESSWAY
686+00
23 III
RESUME REPORT
23 VI
TWP. RD 216
DELAWARE COUNTY

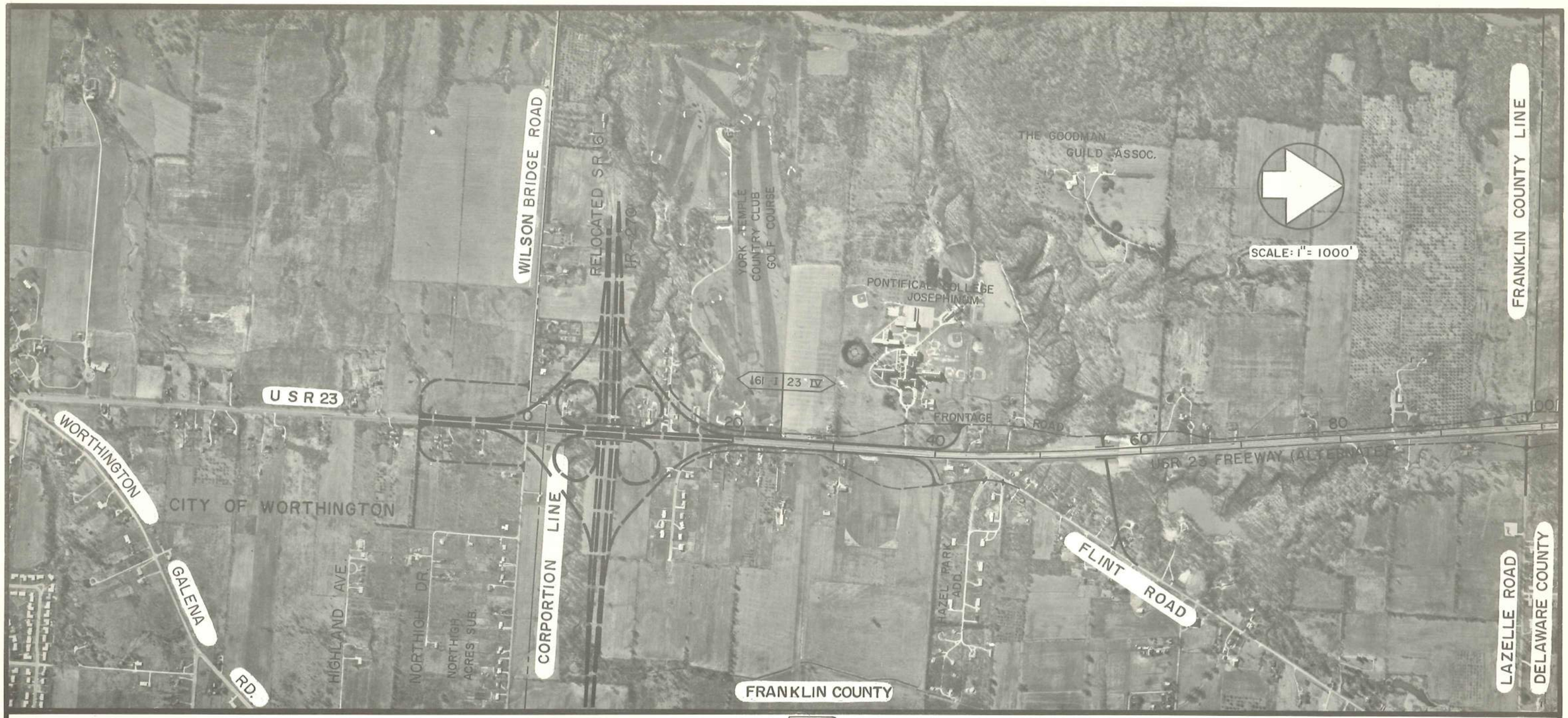

23 III
RESUME REPORT
23 VI
1000
900
800
℄ OLENTANGY ST.
℄ WINTER ST.
℄ WILLIAM ST.
℄ C.C.C. & S.T.L. R.R. TRACKS
℄ CENTRAL AVE.
℄ LINCOLN AVE.
N.B. VARIABLE
-0.44% N.B.
-2.52% S.B.
+1.20% S.B.
-2.72%
+0.20%
S.B.
-0.48% N.B.
+2.96%
-0.68%
-1.52%
+0.52%
-0.40%
+1.00%
1,000
900
800
540
560
580
600
620
640
660
680
690

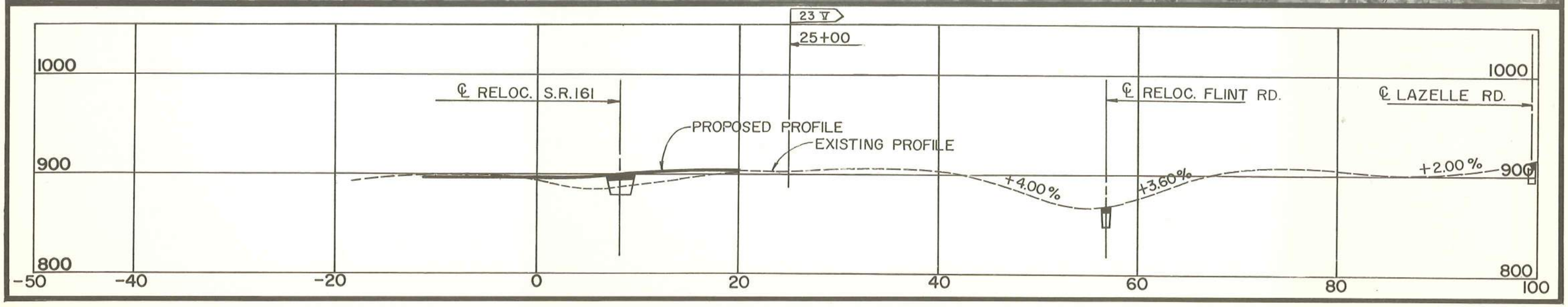

LINCOLN AVE.
PENNSYLVANIA AVE.
CORP.
DELAWARE FAIRGROUNDS
FRONTAGE ROAD
RELOCATED USR 23
D=0° 45'
TWP. RD. 192
HILLS-MILLER RD.
SCALE: 1"=1000'
FRANKLIN ST.
N. SANDUSKY ST.
USR 23
DAM
OLENTANGY RIVER
DEL. CO. 215
DELAWARE WATER PLANT
686+00
23 III
RESUME
REPORT
740
760
780
800
100
660
2°30'

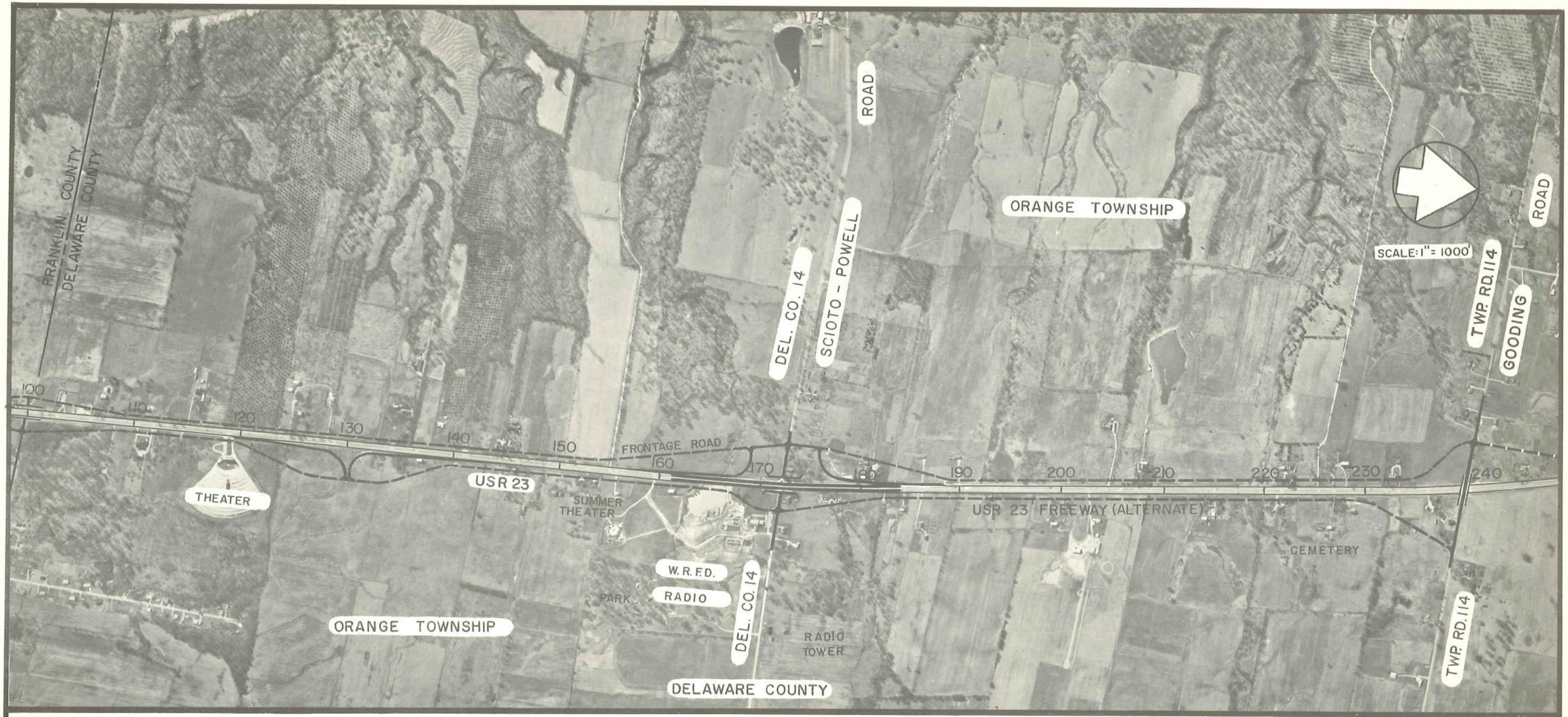

23 III
RESUME
REPORT
1000
900
800
℄ EX. USR 23
EXISTING GROUND
℄ TWP. RD. 192
+1.00%
+0.3%
+1.00%
+.52%
-.40%
PROPOSED PROFILE
660
680
700
720
740
760
780
800
810

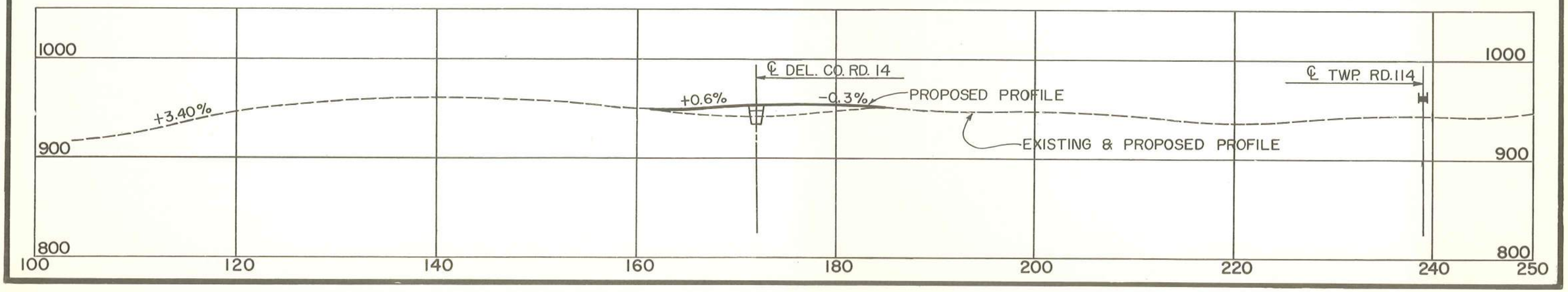

BUCKEYE VALLEY SCHOOL
TWP. RD. 194
COOVER RD.
TROY TOWNSHIP
TWP RD 196
TROY-CHAPEL RD.
SCALE 1"=1000'
WILLEY RD.
TWP. RD. 211
TWP. RD.209
820
D=0°45'
840
RELOCATED USR 23
860
PENN R.R.
880
USR 23
900
D=0°45'
EXIST. S.B. - PROP. FRONTAGE ROAD
CHURCH
920
US 23
940
DEL. CO. 213
DAM
OLENTANGY RIVER
DELAWARE RESERVOIR
US AGRIC. LAB.
DELAWARE COUNTY
PARK ENTRANCE
23 III
END REPORT

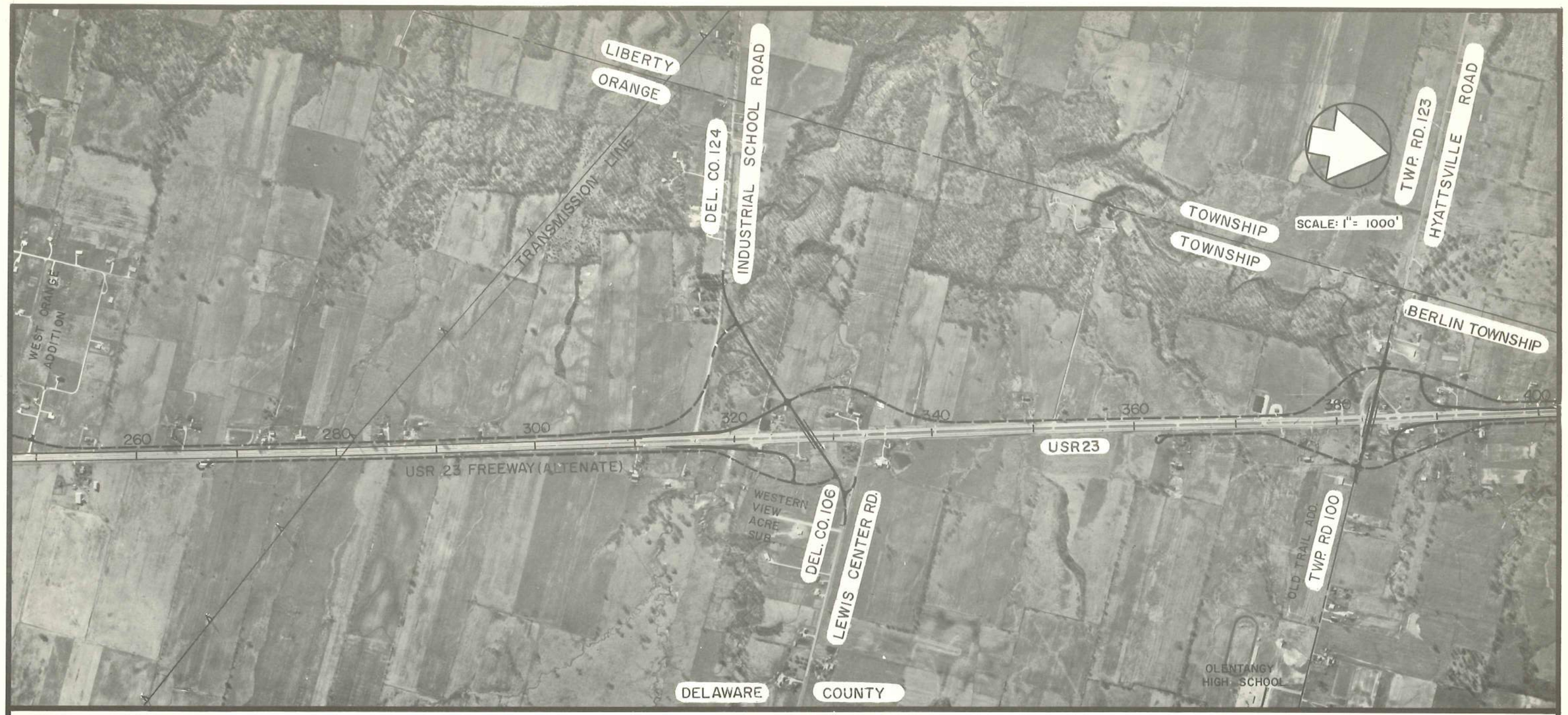

1000
900
800
RELOCATED
℄ TWP. RD. 194
℄ TWP. RD. 194
EX. GROUND
℄ PENN. R.R.
℄ TWP. RD. 196
℄ DIKE
℄ TWP. RD. 211
23 III
END REPORT
+1.0%
-0.5%
-1.4%
+1.3%
+0.4%
+2.60%
-1.48%
PROPOSED PROFILE
EXIST. USR-23 PROFILE
943+00
℄ TWP. RD. 209
800
820
840
860
880
900
920
940
950

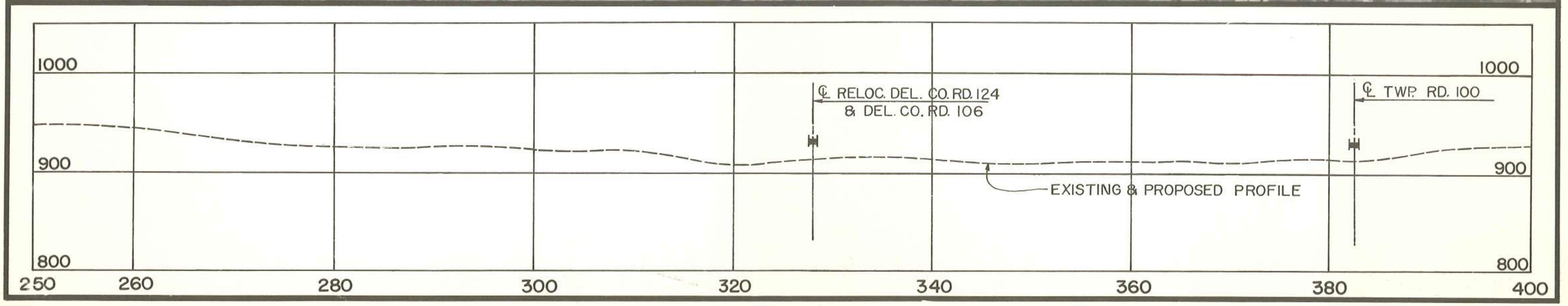

WILSON BRIDGE ROAD
RELOCATED S.R. 161
U.S. 270
YORK TEMPLE COUNTRY CLUB GOLF COURSE
THE GOODMAN GUILD ASSOC.
PONTIFICAL COLLEGE JOSEPHINUM
FRANKLIN COUNTY LINE
SCALE: 1" = 1000'
161 I 23 IV
U S R 23
FRONTAGE ROAD
20
40
60
80
100
U.S.R. 23 FREEWAY (ALTERNATE)
WORTHINGTON
CITY OF WORTHINGTON
GALENA
RD.
HIGHLAND AVE
NORTHIGH DR.
NORTHIGH ACRES SUB.
CORPORTION LINE
FRANKLIN COUNTY
HAZEL PARK ADD.
FLINT ROAD
LAZELLE ROAD
DELAWARE COUNTY

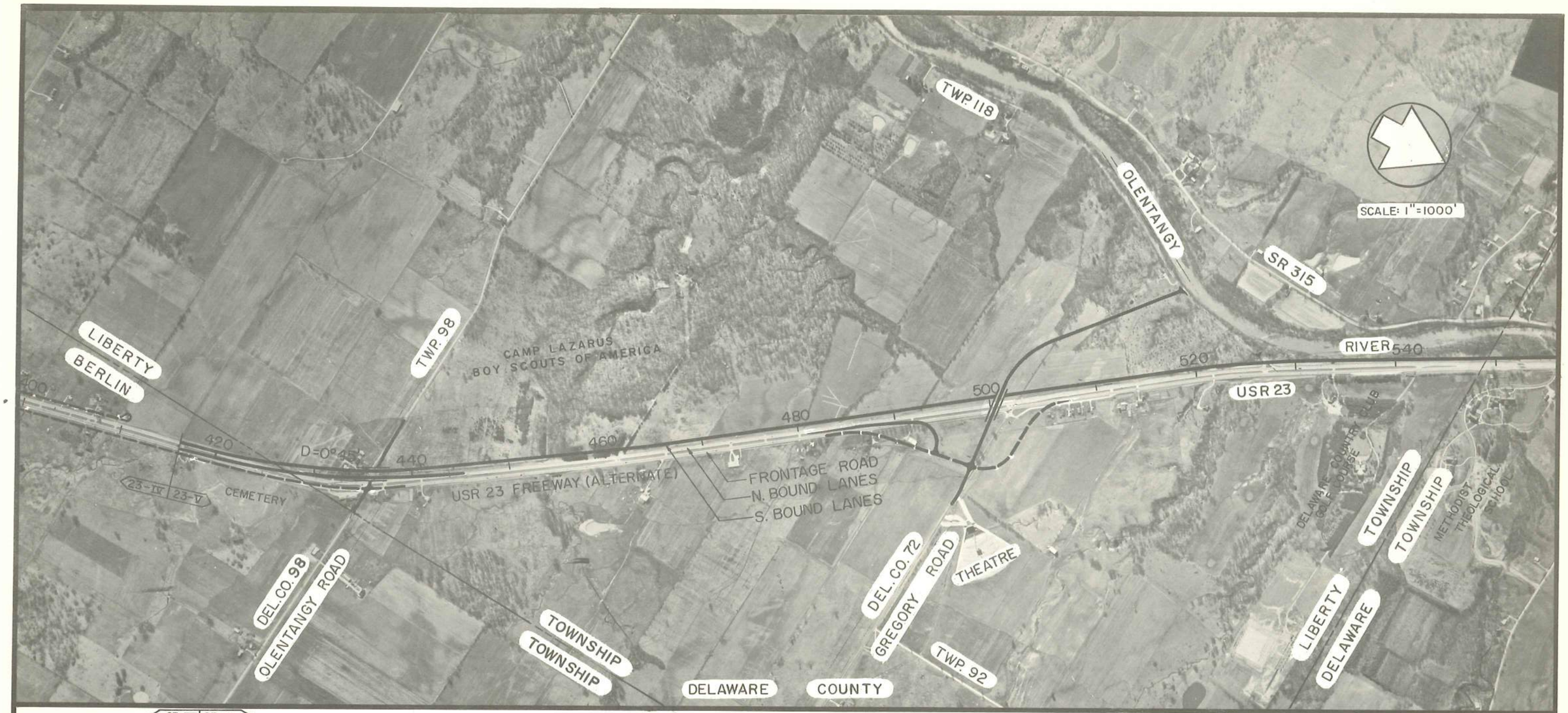

23 V
25+00
1000
900
800
℄ RELOC. S.R.161
PROPOSED PROFILE
EXISTING PROFILE
℄ RELOC. FLINT RD.
℄ LAZELLE RD.
+4.00%
+3.60%
+2.00%
-50
-40
-20
0
20
40
60
80
100

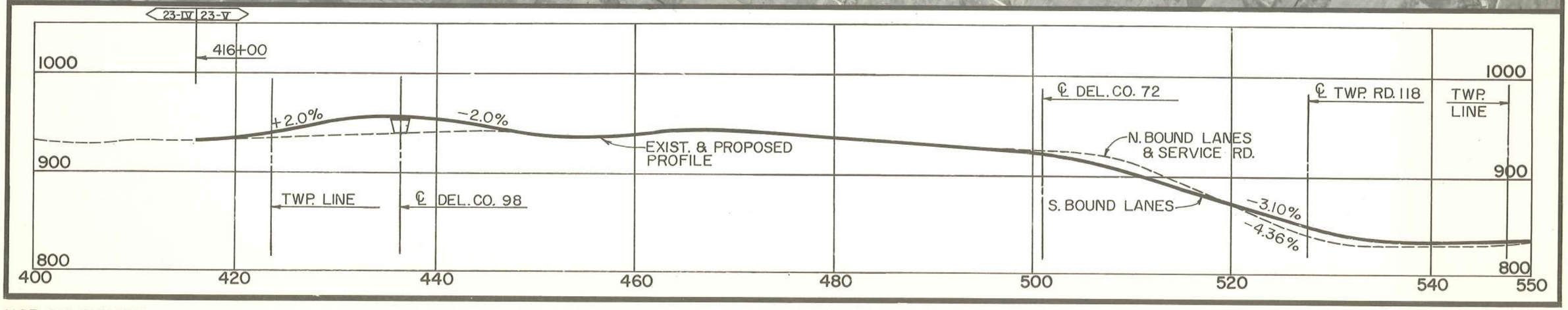

FRANKLIN COUNTY
DELAWARE COUNTY
DEL. CO. 14
SCIOTO - POWELL
ROAD
ORANGE TOWNSHIP
SCALE: 1" = 1000'
TWP. RD. 114
GOODING
ROAD
100
110
120
130
140
150
FRONTAGE ROAD
160
170
180
190
200
210
220
230
240
THEATER
USR 23
SUMMER THEATER
USR 23 FREEWAY (ALTERNATE)
CEMETERY
W.R.F.D.
PARK
RADIO
DEL. CO. 14
RADIO TOWER
ORANGE TOWNSHIP
DELAWARE COUNTY
TWP. RD. 114

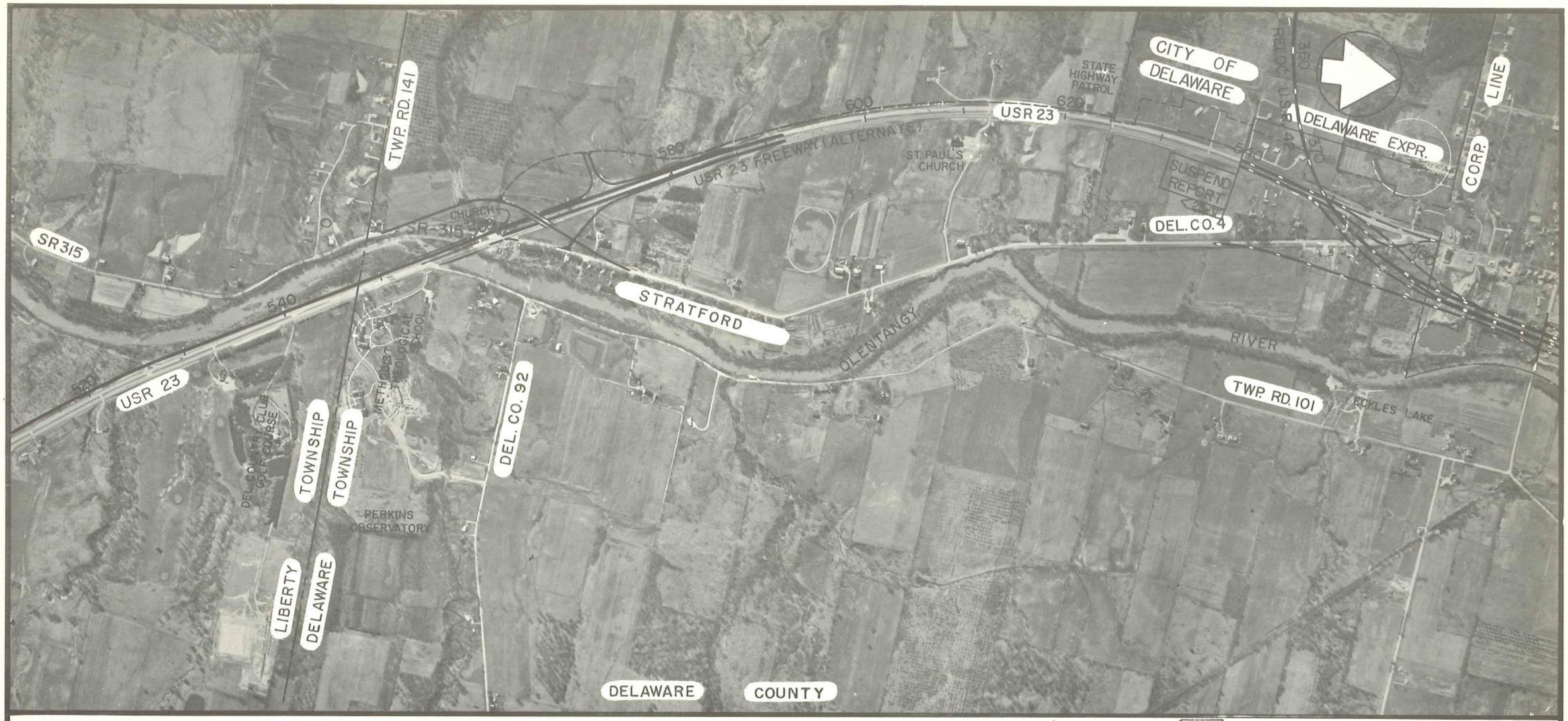

1000
900
800
100
120
140
160
180
200
220
240
250
℄ DEL. CO. RD. 14
℄ TWP. RD. 114
+3.40%
+0.6%
-0.3%
PROPOSED PROFILE
EXISTING & PROPOSED PROFILE

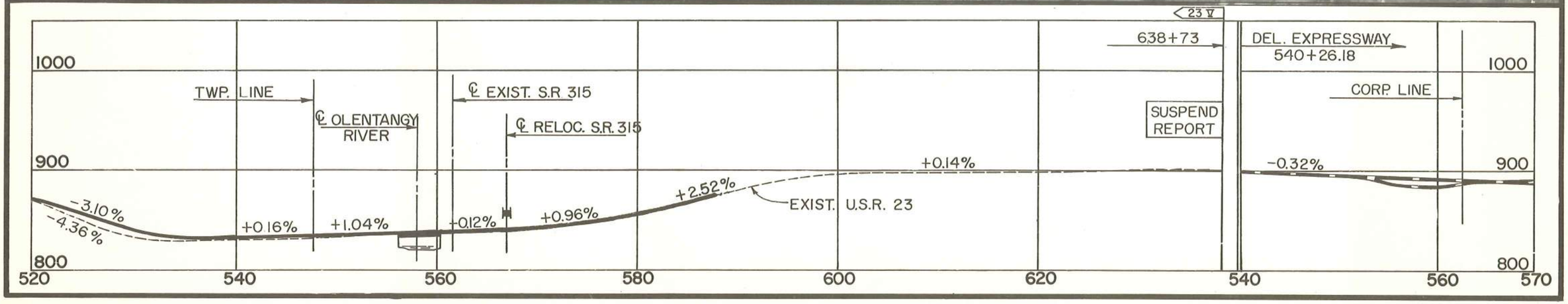

LIBERTY
ORANGE
TRANSMISSION LINE
DEL. CO. 124
INDUSTRIAL SCHOOL ROAD
TOWNSHIP
TOWNSHIP
SCALE: 1" = 1000'
TWP. RD. 123
HYATTSVILLE ROAD
BERLIN TOWNSHIP
WEST ORANGE ADDITION
260
280
300
320
340
360
380
400
USR 23 FREEWAY (ALTENATE)
USR 23
WESTERN VIEW ACRE SUB.
DEL. CO. 106
LEWIS CENTER RD.
OLD TRAIL ADD.
TWP. RD 100
OLENTANGY HIGH SCHOOL
DELAWARE
COUNTY

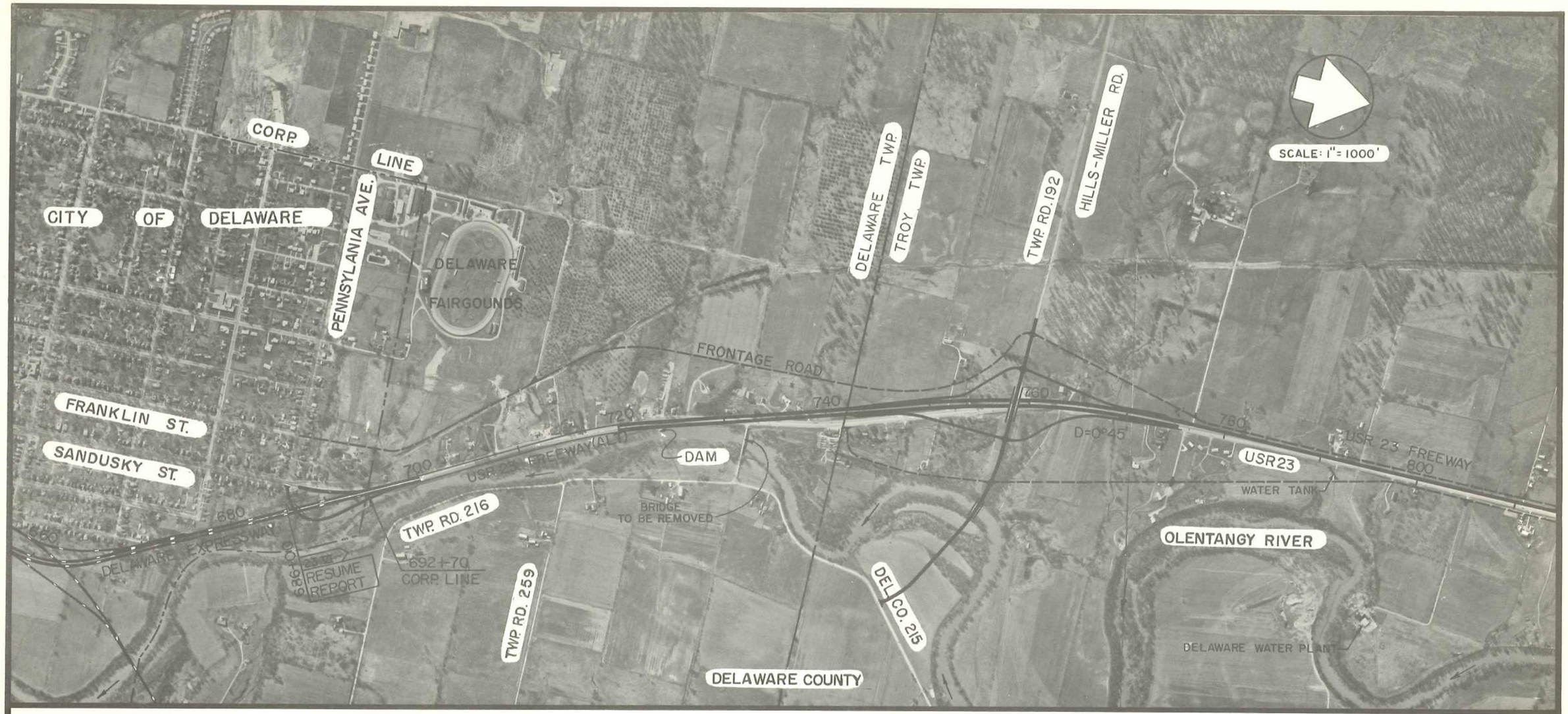

1000
900
800
℄ RELOC. DEL. CO. RD. 124
& DEL. CO. RD. 106
℄ TWP. RD. 100
EXISTING & PROPOSED PROFILE
250
260
280
300
320
340
360
380
400

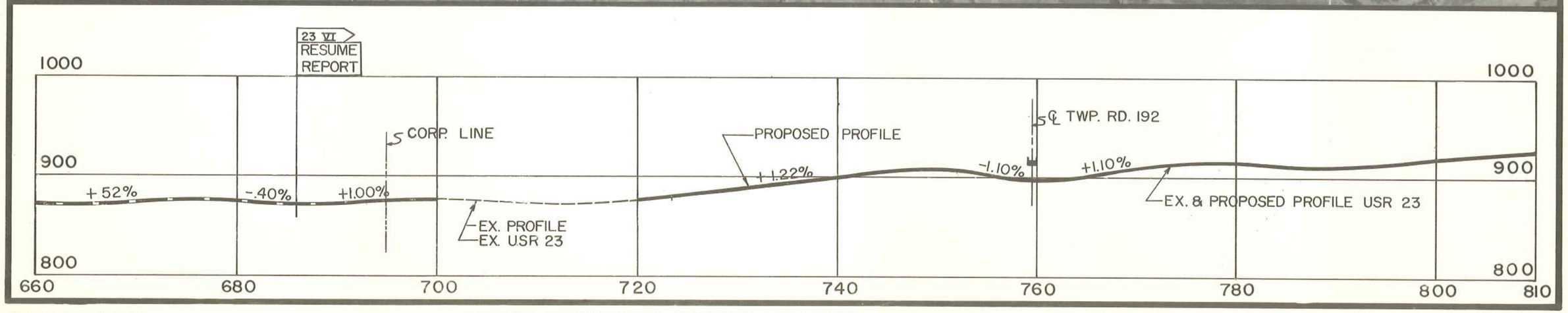

TWP. 118
OLENTANGY
SR 315
SCALE: 1"=1000'
LIBERTY
BERLIN
TWP. 98
CAMP LAZARUS
BOY SCOUTS OF AMERICA
RIVER
USR 23
D=0°45'
USR 23 FREEWAY (ALTERNATE)
FRONTAGE ROAD
N. BOUND LANES
S. BOUND LANES
23-IV
23-V
CEMETERY
DEL. CO. 98
OLENTANGY ROAD
TOWNSHIP
TOWNSHIP
DEL. CO. 72
GREGORY ROAD
THEATRE
TWP. 92
DELAWARE
COUNTY
DELAWARE COUNTY GOLF COURSE CLUB
METHODIST THEOLOGICAL SCHOOL
TOWNSHIP
TOWNSHIP
LIBERTY
DELAWARE


23-IV
23-V
416+00
1000
900
800
+2.0%
-2.0%
EXIST. & PROPOSED PROFILE
TWP. LINE
℄ DEL. CO. 98
℄ DEL. CO. 72
℄ TWP. RD. 118
TWP. LINE
N. BOUND LANES & SERVICE RD.
S. BOUND LANES
-3.10%
-4.36%
400
420
440
460
480
500
520
540
550

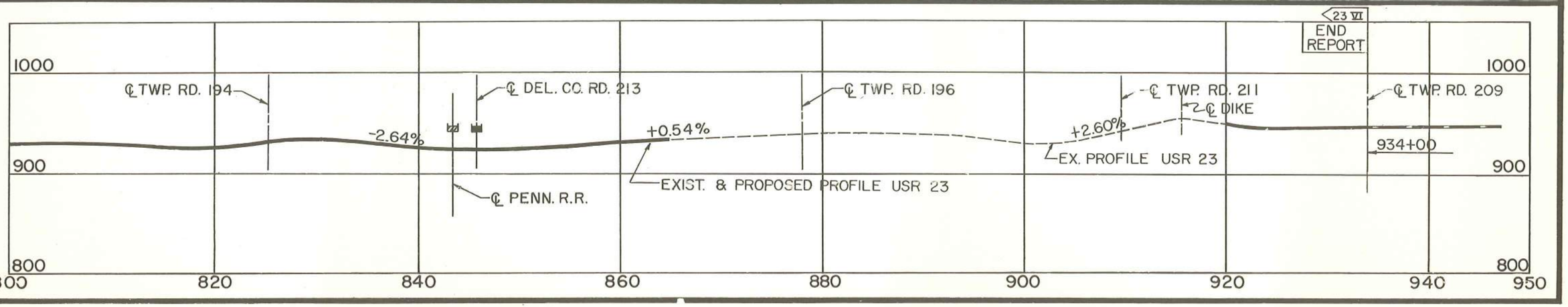

SR315
USR 23
520
540
560
580
600
620
TWP. RD. 141
USR 23 FREEWAY (ALTERNATE)
CHURCH
ST. PAUL'S CHURCH
STATE HIGHWAY PATROL
CITY OF DELAWARE
DELAWARE EXPR.
RELOC. U.S.R. 23
CORP. LINE
SUSPEND REPORT
DEL. CO. 4
STRATFORD
OLENTANGY RIVER
METHODIST THEOLOGICAL SCHOOL
DEL. COUNTRY CLUB GOLF COURSE
TOWNSHIP
TOWNSHIP
DEL. CO. 92
PERKINS OBSERVATORY
LIBERTY
DELAWARE
TWP. RD. 101
ECKLES LAKE
DELAWARE
COUNTY


1000
900
800
520
540
560
580
600
620
540
560
570
TWP. LINE
℄ OLENTANGY RIVER
℄ EXIST. S.R 315
℄ RELOC. S.R. 315
638+73
DEL. EXPRESSWAY
540+26.18
CORP. LINE
SUSPEND REPORT
-3.10%
-4.36%
+0.16%
+1.04%
+0.12%
+0.96%
+2.52%
+0.14%
-0.32%
EXIST. U.S.R. 23

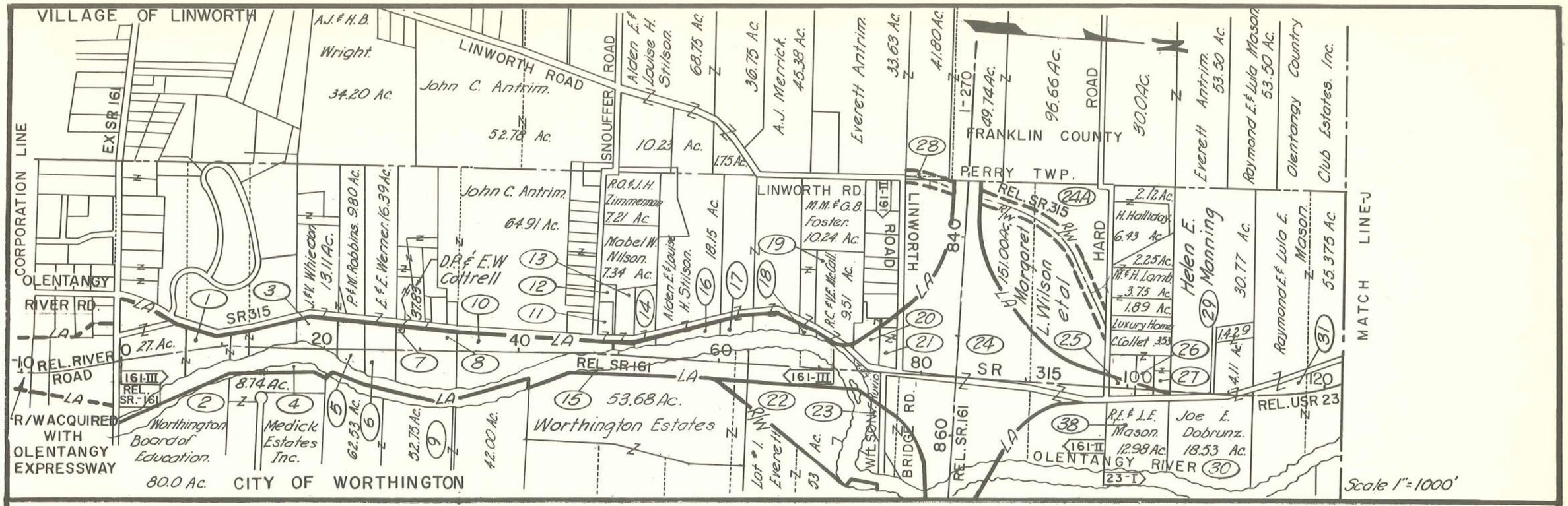

CORP. LINE
CITY OF DELAWARE
PENNSYLANIA AVE.
DELAWARE FAIRGROUNDS
DELAWARE TWP.
TROY TWP.
TWP. RD. 192
HILLS-MILLER RD.
SCALE: 1"=1000'
FRONTAGE ROAD
FRANKLIN ST.
SANDUSKY ST.
USR 23 FREEWAY (ALT.)
DAM
BRIDGE TO BE REMOVED
D=0°45'
USR 23 FREEWAY
USR23
WATER TANK
TWP. RD. 216
692+70
CORP. LINE
23 VI RESUME REPORT
DELAWARE EXPRESSWAY
TWP. RD. 259
DEL CO. 215
OLENTANGY RIVER
DELAWARE WATER PLANT
DELAWARE COUNTY


23 VI RESUME REPORT
1000
900
800
CORP. LINE
PROPOSED PROFILE
℄ TWP. RD. 192
+52%
-.40%
+1.00%
+1.22%
-1.10%
+1.10%
EX. PROFILE EX. USR 23
EX. & PROPOSED PROFILE USR 23
660
680
700
720
740
760
780
800
810

BUCKEYE VALLEY SCHOOL
COOVER RD.
TROY TOWNSHIP
TWP. RD. 196
TROY-CHAPEL RD.
SCALE: 1"=1000'
WILLEY RD.
TWP. RD. 209
TWP. RD. 194
PENNSYLVANIA
R.R.
800
820
840
USR 23 FREEWAY
860
880
LEVY
TWP. RD. 211
900
920
940
CHURCH
USR 23
DEL. CO. 213
DEL. WATER PLANT
BRIDGE
DAM
OLENTANGY RIVER
US AGRIC. LAB.
DELAWARE RESERVOIR
PARK ENTRANCE
23 VI
END REPORT
DELAWARE COUNTY



LAND OWNERSHIP MAPS



RELOCATED SR 161 PHASE 161 III
PARCELS AFFECTED

1. Huntington National Bank
2. Worthington Board of Educ'n.
3. J. & V. Whiedon
4. Medick Estates Inc.
5. J. Wirick Trs.
6. E.A. & E.L. Werner
7. D.P. & E.W. Cottrell
8. Ruth Parkinson
9. Methodist Childrens Home
10. John C. Antrim
11. W.E. Richards
12. F.V. Smith
13. M.W. Vandergrift
14. M.M. Wright
15. Worthington Estates
16. Alden & Louise Stilson
17. Laura J. Merrick
18. W.H. & D.M Zimmerman
19. R.C & V.E. McCall
22. Everett Antrim
23. F. Jr. & J.L. Ruvio

RELOCATED SR 161 PHASE 161 II
PARCELS AFFECTED

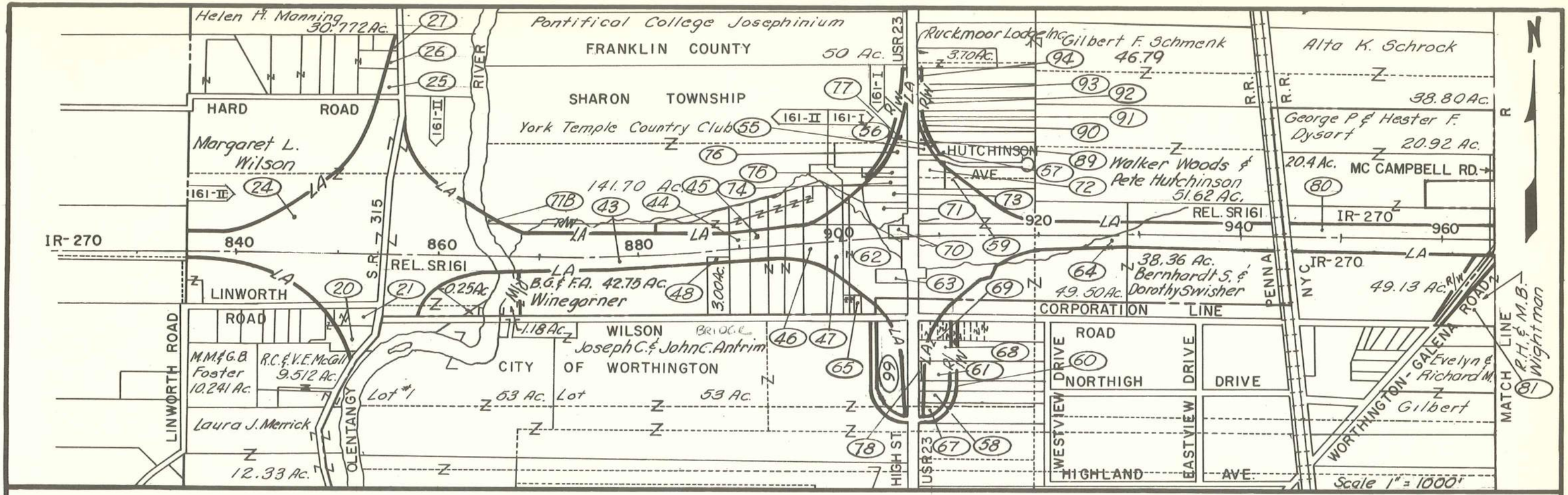
20. W.E. & K.B. Smith
21. H. Person
24. Margaret Wilson
25. T.J. & E.M. Thatcher
26. C.J. & E.A. Collet
27. Elizabeth Collet

See next Sheet for Phase 161 II

RELOCATED USR 23 PHASE 23 I
PARCELS AFFECTED

28. Everett Antrim
29. Helen H. Manning
30. Joe E. & Julia M. Dobrunz
31. Raymond E. & Lula E. Mason
38. R.E. & L.E. Mason
24A. Margaret Wilson

See L.O.M. Sheet #4 for Phase 23 I

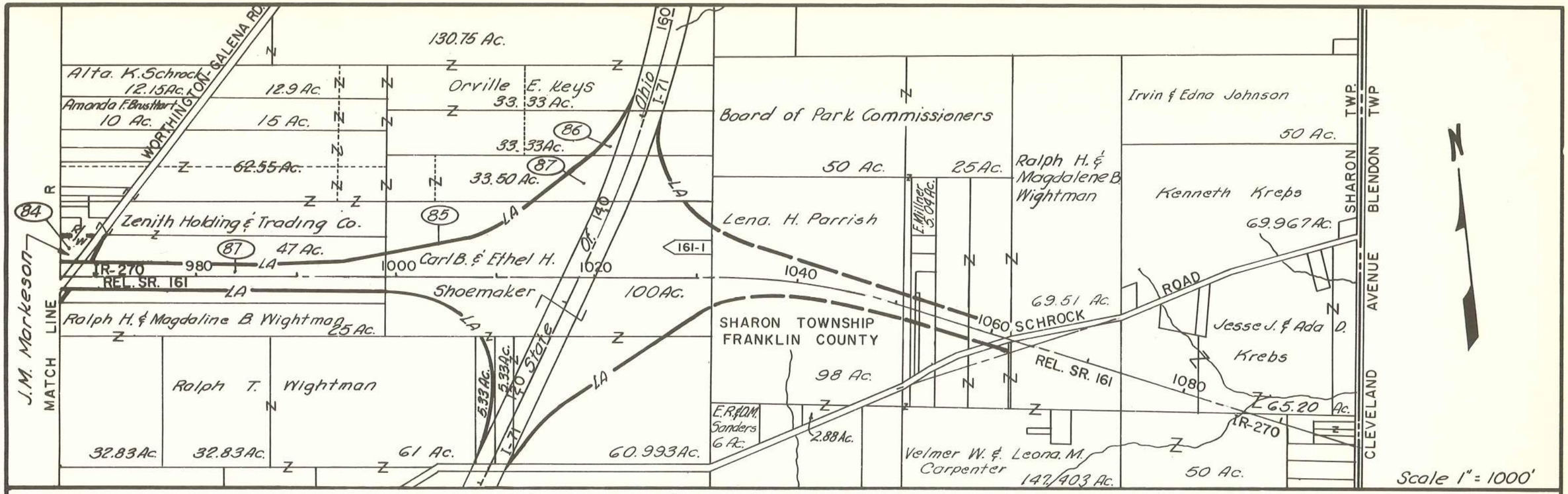


RELOCATED SR 161 PHASE 161 II
PARCELS AFFECTED

(20) W.C. & K.B. Smith
(21) H. Pearson
(24) Margaret Wilson
(25) T.J. & Z.M. Thatcher
(26) C.J. & E.A. Collet
(27) Elizabeth Collet
(43) B.G. & F.A. Winegarner
(44) E.V. & S.B. Case
(45) George V. & Justine H. Thomas
(46) Harry R. O'Brien
(47) Robert E. & Marion E. Olmstead
(48) W.A. Beaver
(77B) York Temple Country Club
(49) Anexey D. & Violet H. Coats
(50) Roy & Octa F. Haddox
(51) Howard S. & Mary L. German
(52) William O. & Delilah M. Kahler
(53) John A. & Betty J. Dodd
(54) William E. & M.O. Loeffler
(55) Standard Oil Co.
(56) Worthington Heights Inc.
(57) Evelyn Rolfe
(58) Loy A. Updegraff
(59) Bert H. & Geneva E. Moore
(60) Rodney V. & Elizabeth Kirk
(61) Florence B. Huff
(62) F.G. & F.M. Johnston
(63) F. Dereno et al

RELOCATED SR 161 PHASE 161 I
PARCELS AFFECTED

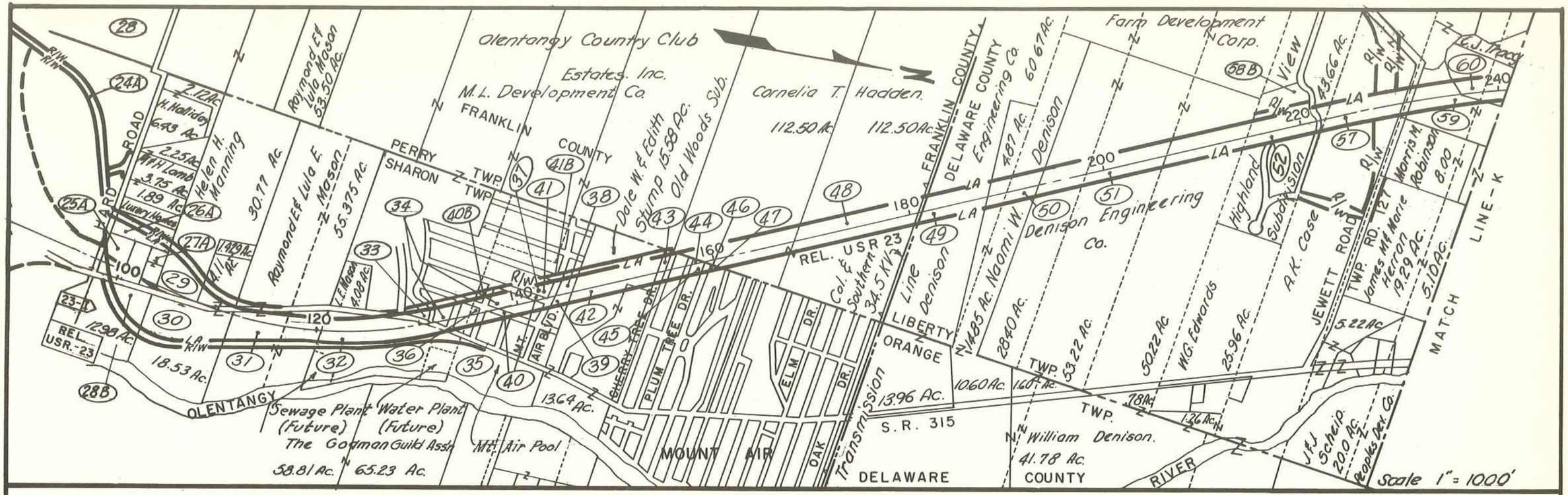
(64) Bernhardt S. & Dorothy Swisher
(65) A.M. Knost
(66) Joseph C. & John C. Antrim
(67) Howard E. & Dorothy Wellman
(68) Santo & Mary Del Matto
(69) Donald P. & Vivian Bean
(70) J. Jr. & M.E. Myles
(71) J.M. & E.S. Williams
(72) Walker Woods & Pete Hutchinson
(73) R.E. & M.L. Wagner
(74) Fred J. & Minnie Loeffler
(75) James H. Stokes
(76) D.W. & L.E. Miller
(77) York Temple Country Club
(78) G.L. & M.J. Meyers
(80) George P. & Hester F. Dysart
(81) R.H. & M.B. Wightman
(82) ———
(83) ———
(84) J.M. Markeson
(85) Carl B. & Ethel H. Shoemaker
(86) Orville E. Keys
(87) Zenith Holding & Trading Co.
(88) J.M. & S.M. Lobmiller
(89) Nellie M. Gray
(90) W.E. & A.L. Barnes
(91) W.R. & K. Sanders
(92) James & Mary Eversman
(93) C.R. & C.G. Reynolds
(94) L.E. & S.H. Yost



RELOCATED SR 161 PHASE 161 I

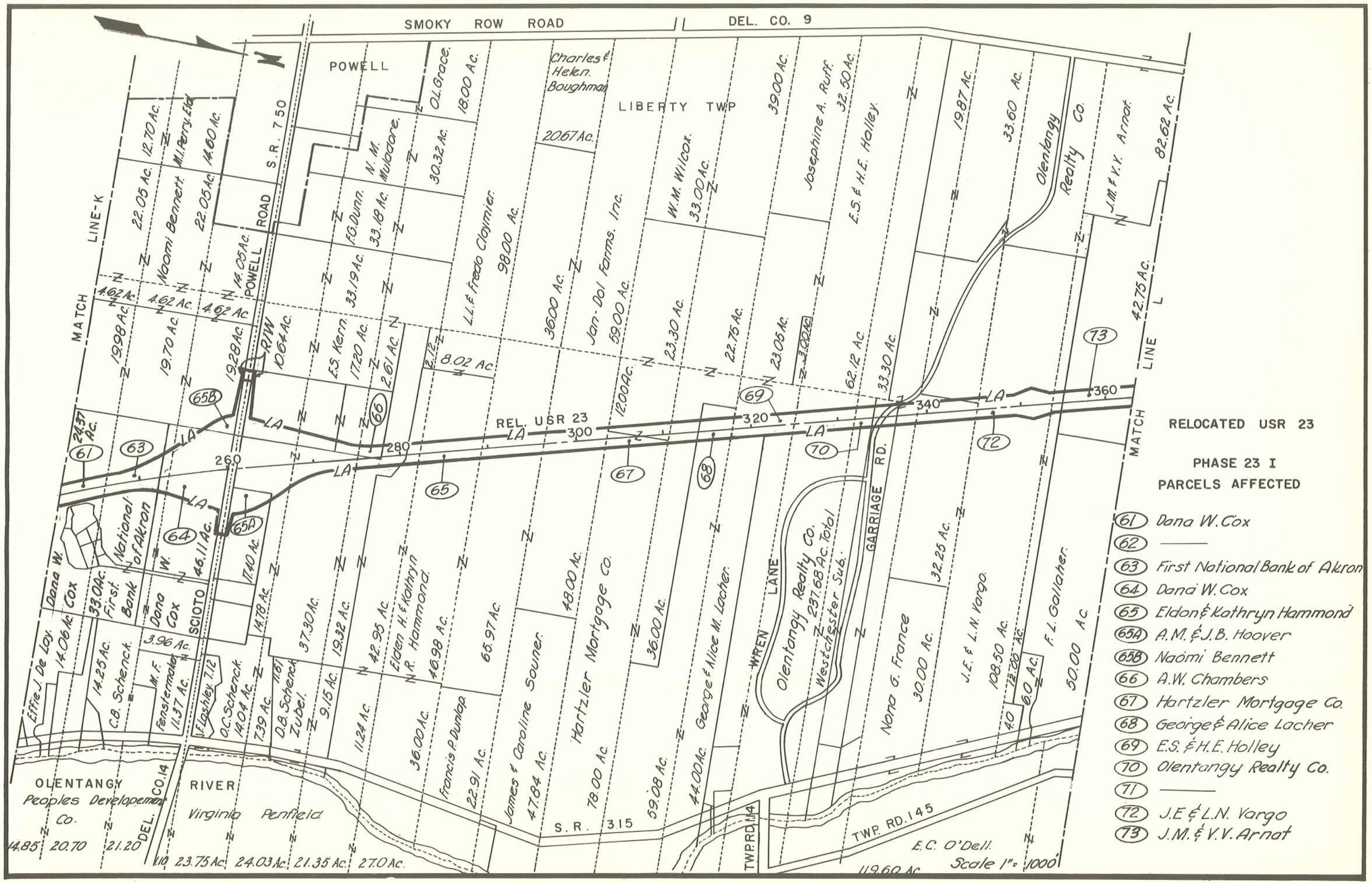
PARCELS AFFECTED

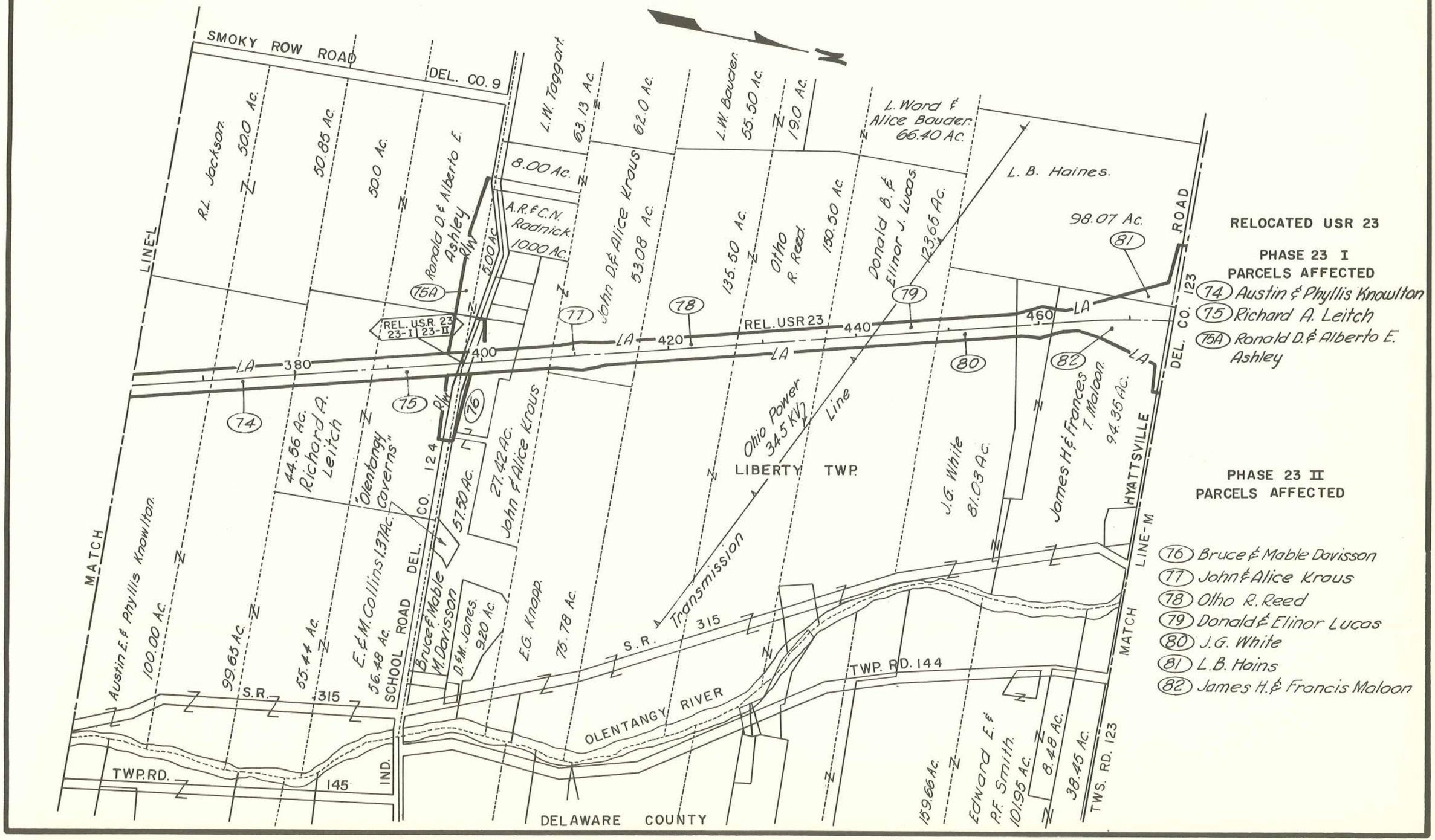
(84) J.M. Markeson
(85) Carl B. & Ethel H. Shoemaker
(86) Orville E. Keys
(87) Zenith Holding & Trading Co.



RELOCATED USR 23 PHASE 23 I
PARCELS AFFECTED

(24A) Margaret Wilson
(25A) T.J. & E.M. Thatcher
(26A) C.J. & E.A Collet
(27A) Elizabeth Collet
(28B) Raymond E. & Lula E. Mason
(28) Everett Antrim
(29) Helen H. Manning
(30) Joe E. & Julia M. Dobrunz
(31) Raymond E. & Lula E. Mason
(32) M.L. Development Company
(33) M.L. Development Company
(34) Lester C. Bush
(35) Dennis C. Beougher
(36) Martha R. Shroyer
(37) Florida Southern College
(38) James & Florence Pruden
(39) Thomas & Lillian Snowden
(40) Raymond E. & Lula E. Mason
(41) Jessie Gutches
(42) Dale & Edith Stump
(40B) John C. Zimpfer
(41B) Nell E. Bush
(43) Dale & Edith Stump
(44) Columbus Industries, Inc.
(45) U.W. & R.F. Burk
(46) John F. Riffle
(47) Tina P. Riffle
(48) Cornelia T. Hadden
(49) Denison Engineering Co.
(50) Naomi W Denison
(51) Denison Engineering Co.
(52) Highland View Subdivision
(53) Mary Ann Grigsby
(54) Highland View Subdivision Res. "A"
(55) Robert & V.L. Palumbo
(56) Edwin & J. Lawrence
(57) A.K. Case
(58) Frank & J. Koenig
(59) Louis Follmer
(60) Yellowstone Club
(58B) Wm. H. Zimmernan


SMOKY ROW ROAD
DEL. CO. 9
POWELL
LIBERTY TWP
S.R. 750
ROAD
LINE-K
MATCH
LINE L
REL. USR 23
RIW
S.R. 315
TWP. RD. 145
TWP. RD. 14
GARRIAGE RD.
WREN LANE
OLENTANGY RIVER
DEL. CO. 14
SCIOTO
Charles & Helen Boughman
O.L. Grace
Naomi Bennett
M.I. Perry Etal
N.M. Muldoore
F.G. Dunn
E.S. Kern
L.L.F. Fredo Claymier
Jan-Dol Farms, Inc.
W.M. Wilcox
Josephine A. Ruff
E.S. & H.E. Halley
Olentangy Realty Co.
J.M. & V.V. Arnat
Olentangy Realty Co. 237.68 Ac. Total Westchester Sub.
Nona G. France
J.E. & L.N. Vargo
F.L. Gallaher
Dana W. Cox
First National Bank of Akron
Effie J. De Loy
C.B. Schenck
M.F. Fenstermaker
F. Lashley
O.C. Schenck
D.B. Schenck Zubel
James & Caroline Souner
Hartzler Mortgage Co.
George & Alice M. Lacher
Francis P. Dunlap
Virginia Penfield
Peoples Development Co.
E.C. O'Dell
Scale 1" = 1000'
RELOCATED USR 23
PHASE 23 I
PARCELS AFFECTED
61 Dana W. Cox
62 ———
63 First National Bank of Akron
64 Dana W. Cox
65 Eldon & Kathryn Hammond
65A A.M. & J.B. Hoover
65B Naomi Bennett
66 A.W. Chambers
67 Hartzler Mortgage Co.
68 George & Alice Lacher
69 E.S. & H.E. Holley
70 Olentangy Realty Co.
71 ———
72 J.E. & L.N. Vargo
73 J.M. & V.V. Arnat



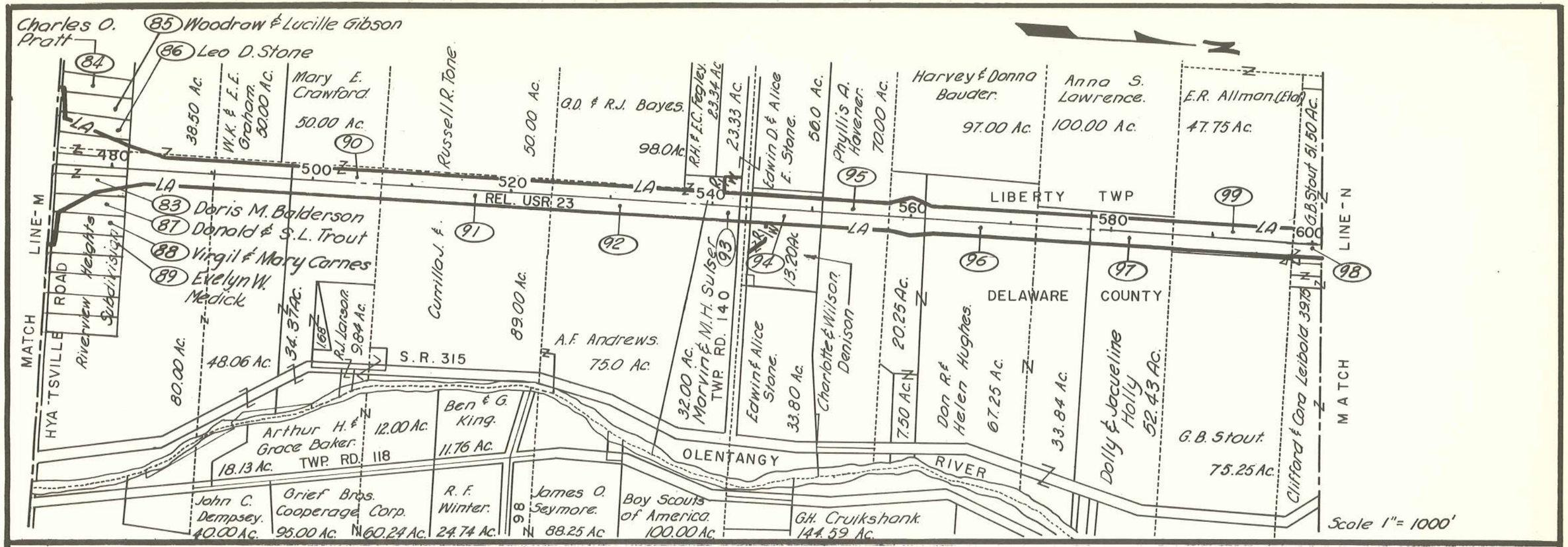
RELOCATED USR 23

PHASE 23 I
PARCELS AFFECTED

(74) Austin & Phyllis Knowlton
(75) Richard A. Leitch
(75A) Ronald D.& Alberto E. Ashley

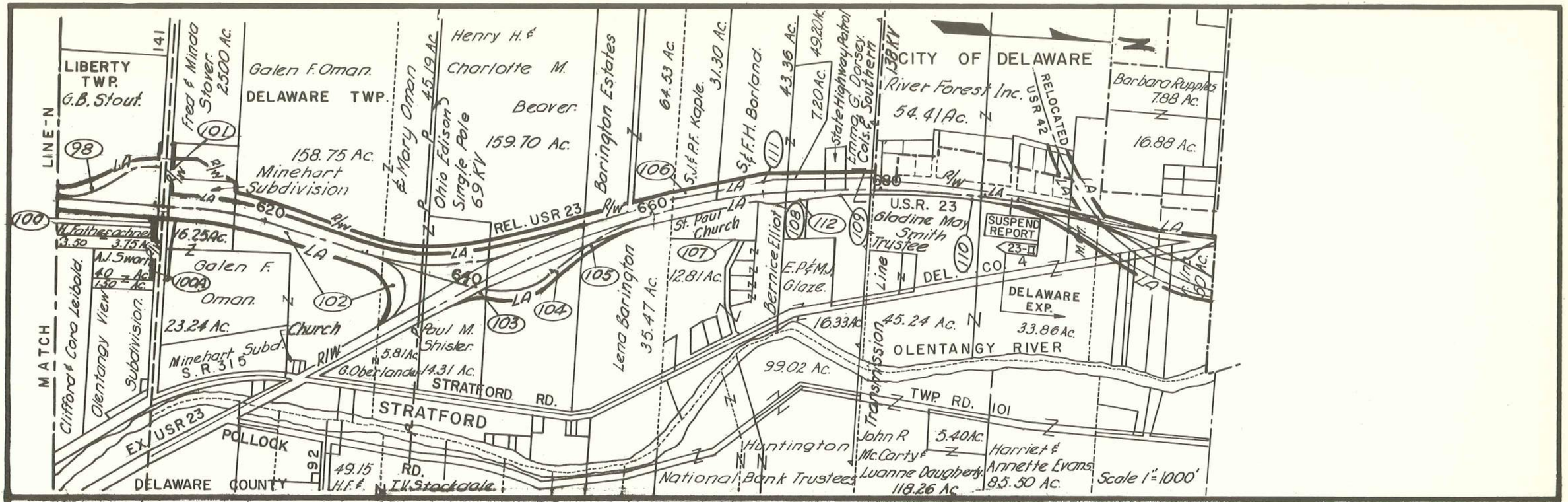
PHASE 23 II
PARCELS AFFECTED

(76) Bruce & Mable Davisson
(77) John & Alice Kraus
(78) Otho R. Reed
(79) Donald & Elinor Lucas
(80) J.G. White
(81) L.B. Hains
(82) James H.& Francis Maloon



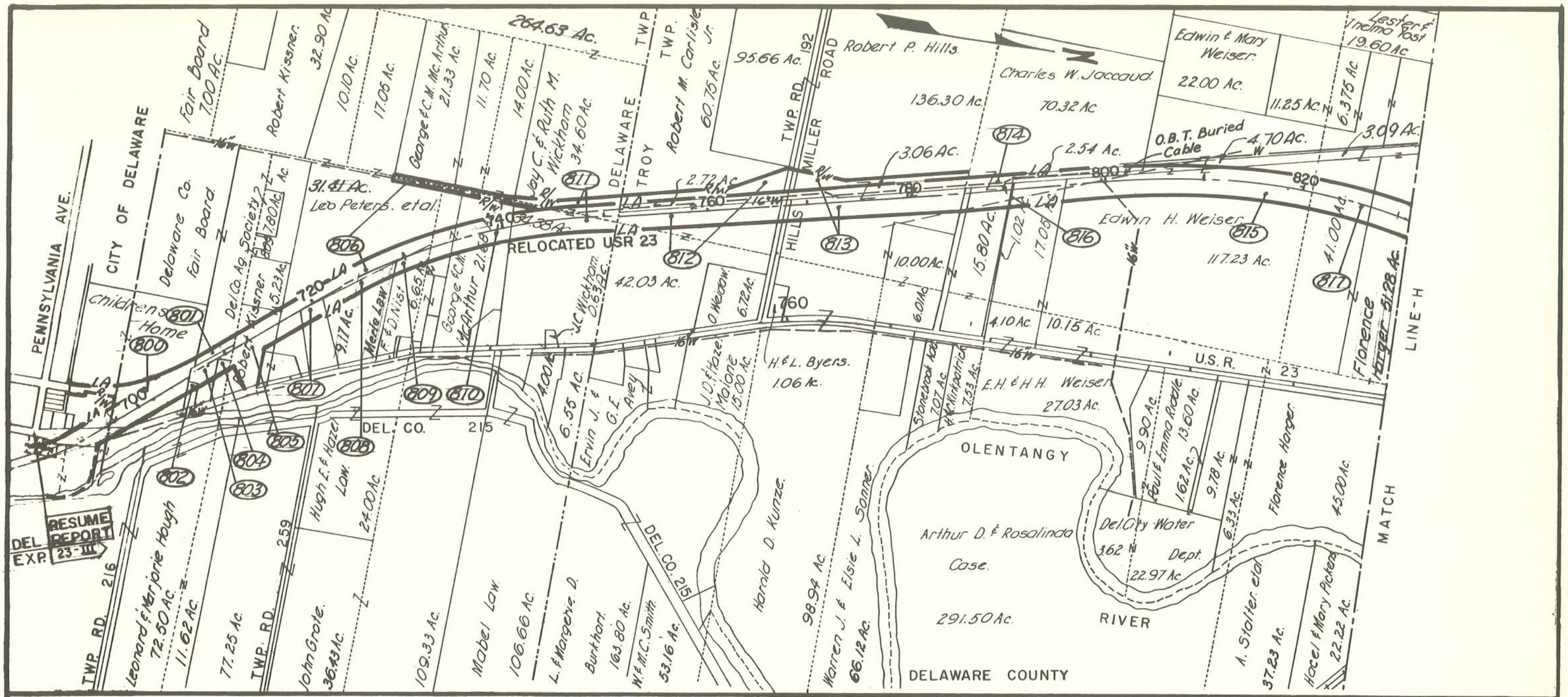
RELOCATED USR 23 PHASE 23 II
PARCELS AFFECTED

(83) Doris M. Balderson
(84) Charles O. Pratt
(85) Woodrow & Lucille Gibson
(86) Leo D. Stone
(87) Donald & S.L. Trout
(88) Virgil & Mary Carnes
(89) Evelyn W. Medick
(90) Mary E. Crawford
(91) Currilla & Russell Tone
(92) A.F. Andrews
(93) Marvin & M.H. Sulser
(94) Charlotte & Wilson Denison
(95) Phyllis A. Havener
(96) Don R. & Helen Hughes
(97) Dolly & Jacueline Holly
(98) G.B. Stout
(99) E.R. Allman (et al)



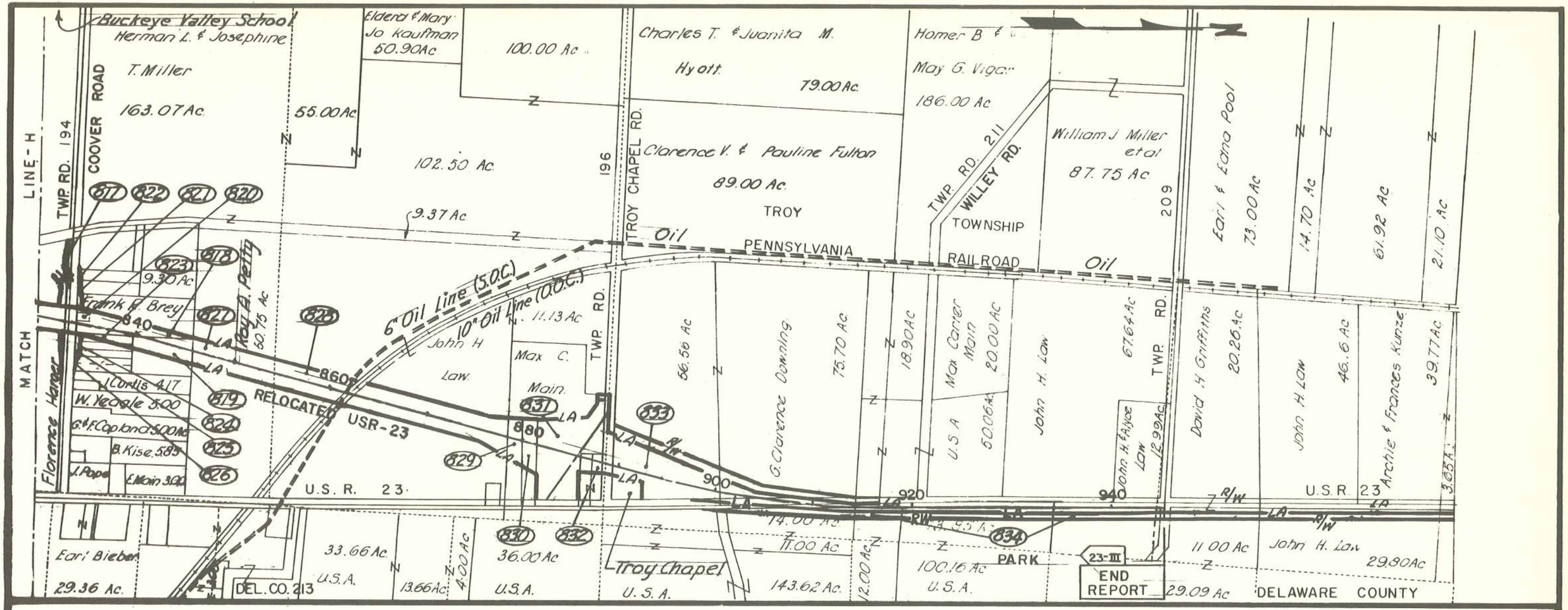
RELOCATED USR 23 PHASE 23 II
PARCELS AFFECTED

(98) G. B. Stout
(100) H. Fatherochner
(100A) A. J. Swartz
(101) Anna Ross
(102) Galen & Mary Oman
(103) Paul M. Shisler
(104) Henry H. & Charlotte M. Beaver
(105) Lena Babington
(106) S. J. & P. F. Kaple
(107) St. Paul Church
(108) Bernice Elliot
(109) Emma G. Dorsey
(110) Gladine May Smith Trustee
(111) S & F. H. Borland
(112) K. & S. Doty



RELOCATED USR 23 PHASE 23 III
PARCELS AFFECTED

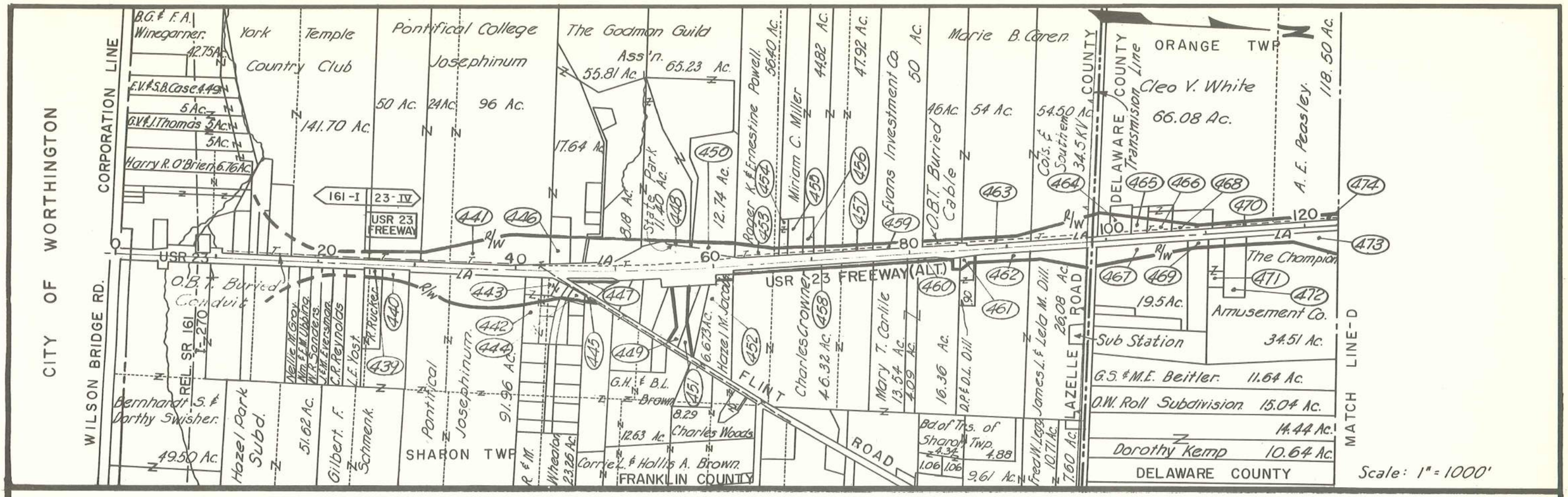
(800) Childrens Home	(809) F. & D. Nist
(801) Delaware Co. Agriculture Society	(810) George & C.M. McArthur
(802) B. & R. Wooten	(811) Joy C. & Ruth M. Wicham
(803) P. & R. Gerwig	(812) Robert M. Carlisle Jr.
(804) A.M. Smith	(813) Robert P. Hills
(805) Robert Kissner	(814) Charles W. Jaccoud
(806) Leo Peters et. al.	(815) Edwin H. Weiser
(807) T. & M. Williams	(816) Lillian H. Weiser
(808) Merle Law	(817) Florence Harger



RELOCATED USR 23 PHASE 23 III

PARCELS AFFECTED

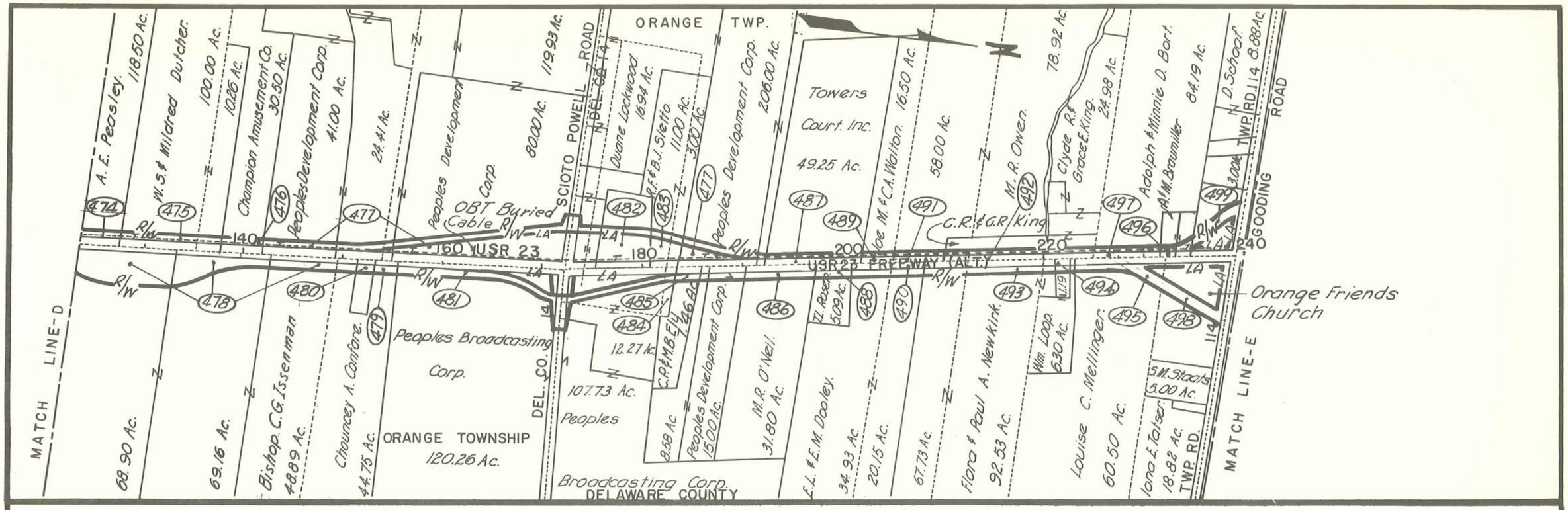
817	Florence Harger		826	T. & C.V. Smart	Lots - 52 & 53
818	Frank R. Brey		827	Roy A. Petty	
819	C.E. & E.W. Adams		828	John H. Law	
820	Machine Shop		829	F.M. & V.B. Stiles	
821	John P. Shiplett		830	R. Stair	
822	J.A. Mechling		831	Max C. Main	
823	L.B. & D.C. Hardin	Lot - 49	832	M. Russel	
824	J.M. Wright	Lot - 50	833	G. Clarence Downing	
825	J.M. & E.L. Stewert	Lot - 51	834	U.S.A.	



USR 23 FREEWAY PHASE 23 IV

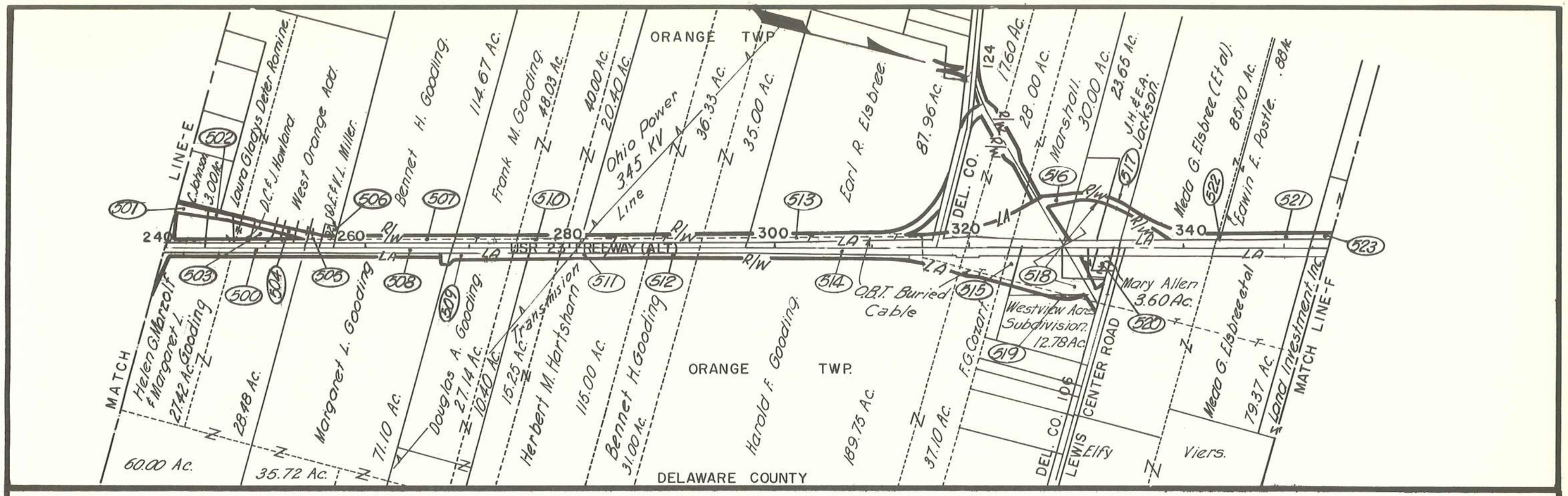
PARCELS AFFECTED

(439) R.C. & B. Rucker
(440) Gilbert F. Schmenk
(441) Pontifical College Josephinum
(442) Mariam R. Fraseh
(443) E. & A. Salvatore
(444) J. Douglos & Ernestine Taylor
(445) Robert Duchene
(446) Dorothy M. Shearer
(447) J.B. Crawford
(448) The Godman Guild Ass'n.
(449) M.K. Bell
(450) Oda F. Ingmire
(451) C.E. Schaer
(452) Hazel M. Jacobs
(453) Roger & Ernestine Powell
(454) J.B. & H.L. Evans
(455) W.E. Brady
(456) H.L. Jr. & B. Smith
(457) Miriam C. Miller
(458) Charles Crowner
(459) Evans Investment Co.
(460) Mary T. Carlile
(461) D.P. & D.L. Dill
(462) James & Lela Dill
(463) Marie B. Caren
(464) S.D. Cohagan
(465) Carl G. Blume
(466) T.J. & Annia Fracassa
(467) H.E. & A.E. Rice
(468) J.G. Rotonda, Tr.
(469) Robert G. Denmead
(470) Cleo V. White
(471) W. Harris
(472) Property Investment Co.
(473) The Champion Amusement Co.
(474) A.E. Peasley



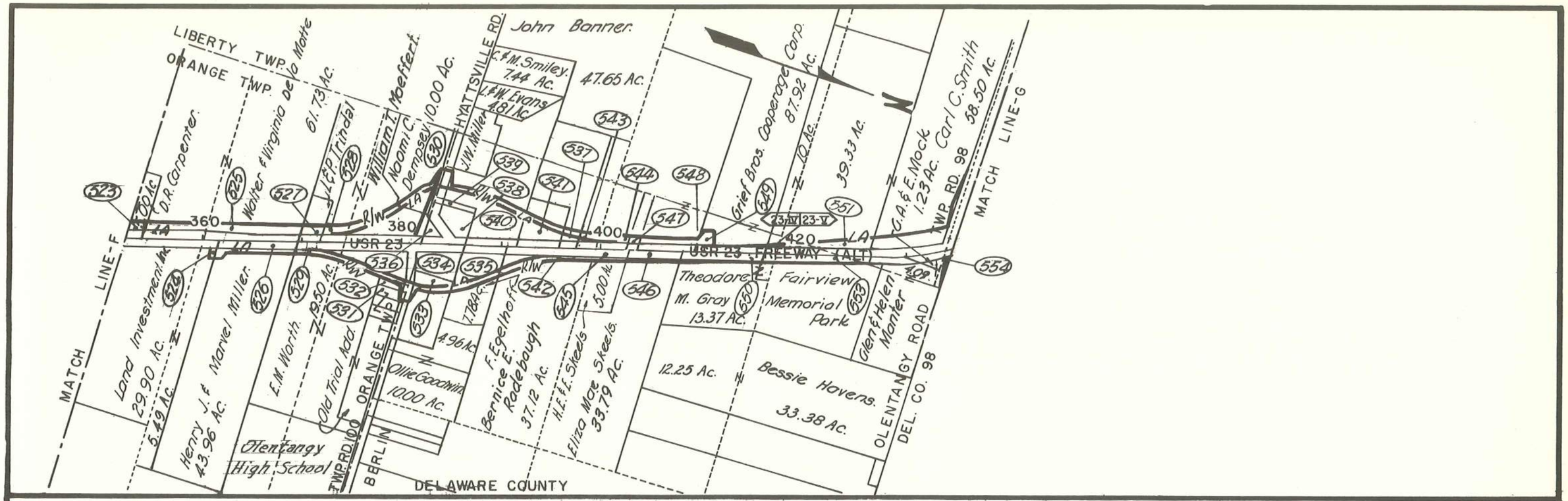
USR 23 FREEWAY PHASE 23 IV
PARCELS AFFECTED

(474) A.E. Peasley
(475) William & Mildred Dutcher
(476) The Champion Amusement Co.
(477) Peoples Development Corp.
(478) Bishop Clarence G. Issenmann
(479) Chauncey A. Confare
(480) Isaac A. Greshel
(481) Peoples Broadcasting Corp.
(482) Lucille M. Bender
(483) R.F. & B.J. Sletto
(484) J.H. & D.A. Ely
(485) C.P. & M.B. Ely
(486) M.R. O'Neill
(487) Towers Court Inc.
(488) Theresa L. Rosan
(489) Joe M. & Carrie Walton
(490) Earcel L. & Edna Dooley
(491) M. Ross Owen
(492) Clyde R. & Grace King
(493) Flora & Paul A. Newkirk
(494) William M. Loop
(495) Louis C. Mellinger
(496) Arthur & Maxine Broumiller
(497) Adolph & Minnie Bort
(498) Mildred M. & Allen A. English
(499) Callie R. & C.W. Marland



USR 23 FREEWAY PHASE 23 IV
PARCELS AFFECTED

(500) Helen Morzolf & Margaret Gooding
(501) Laura G. Deter Romine
(502) David C. & Jean Howland
(503) Harold & Ruth Earich
(504) Merle E. & Ruth Strang
(505) Forest G. Smith
(506) David E. & Volma Miller
(507) Bennet H. Gooding
(508) Margaret L. Gooding
(509) Douglas A. Gooding
(510) Frank M. Gooding
(511) Herbert M. Hartshorn
(512) Bennet H. Gooding
(513) Earl R. Elsbree
(514) Harold F. Gooding
(515) Frona G. Cozart et al
(516) Leslie H. Marshall
(517) J. H & E.A. Jackson
(518) Bessie M. Kline
(519) Westview Acres Subdivision
(520) Mary Allen
(521) Meda G. Elsbree et al
(522) Edwin E. & Frances Postle
(523) Doris R. Carpenter



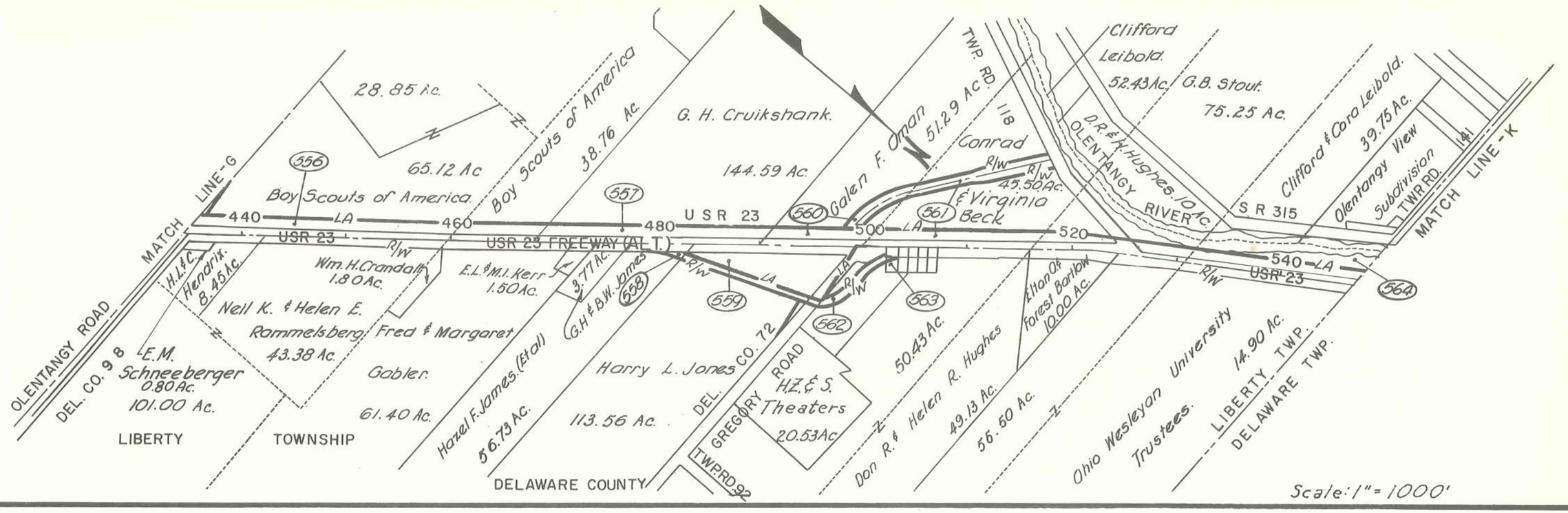
USR 23 FREEWAY PHASE 23 IV
PARCELS AFFECTED

(523) Doris R. Carpenter
(524) Land Investment Inc.
(525) Walter & Virginia De la Motte
(526) Henry J. & Marvel Miller
(527) L. & P. Trindal
(528) Wm. T. & Mary Ann Moeffert
(529) E.M. Worth
(530) Naomi C. Dempsey
(531) Charles & S.H. Hayden L-151
(532) Clyde & Verna Wilson L-150, L-152
(533) Thelma L. Milton
(534) L.R. & J.L. Hines
(535) Fred O. Egelhoff
(536) Hazel I. Chesser

(537) Leslie H. Marshall
(538) T.A. & B.Z. Olivere
(539) Helen White
(540) Watt L. & Jo Ann Hutchison
(541) Don R. & Bonnie Atkins
(542) Bernice E. Radebaugh
(543) Harold A. Seymour
(544) Ruth Thornbury
(545) Harold & Earline Skeels
(546) Eliza Mae Skeels
(547) Carl C. & Mary Skeels
(548) S. Corwin & Loy G. Skeels
(549) Grief Bros. Cooperage Corp.
(550) Theodore M. Gray

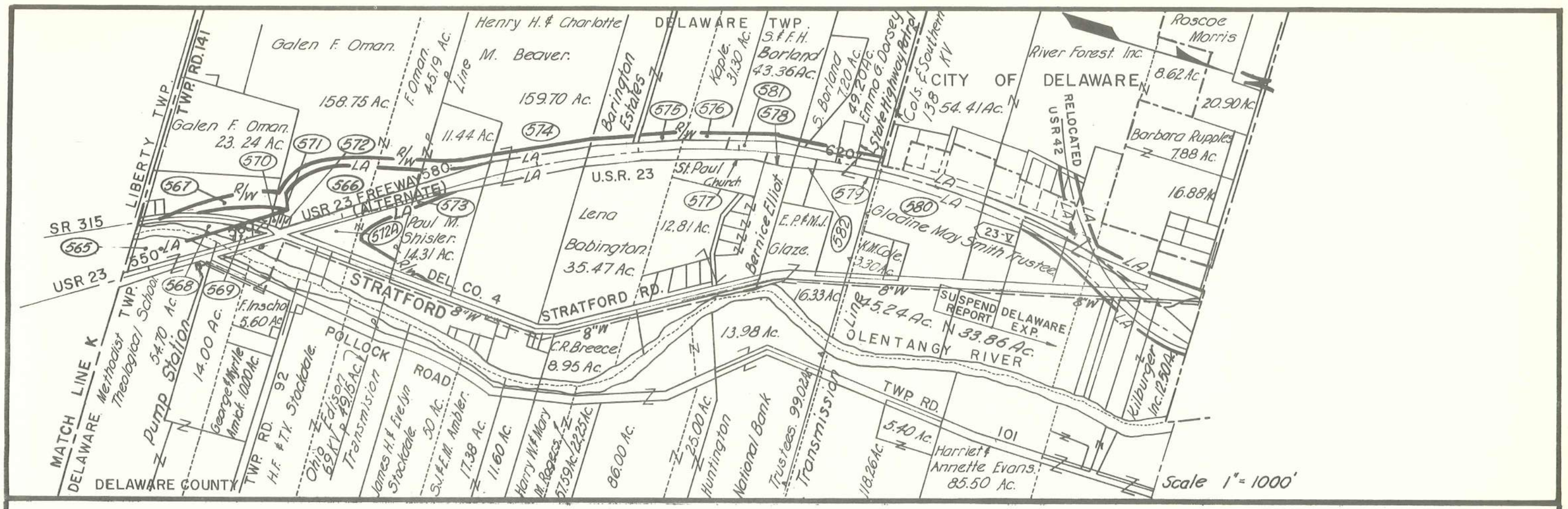
USR 23 FREEWAY PHASE 23 IV
PARCELS AFFECTED

(551) Carl C. Smith
(552)
(553) Fairview Memorial Park-Cemetery
(554) George & Elizabeth Mock



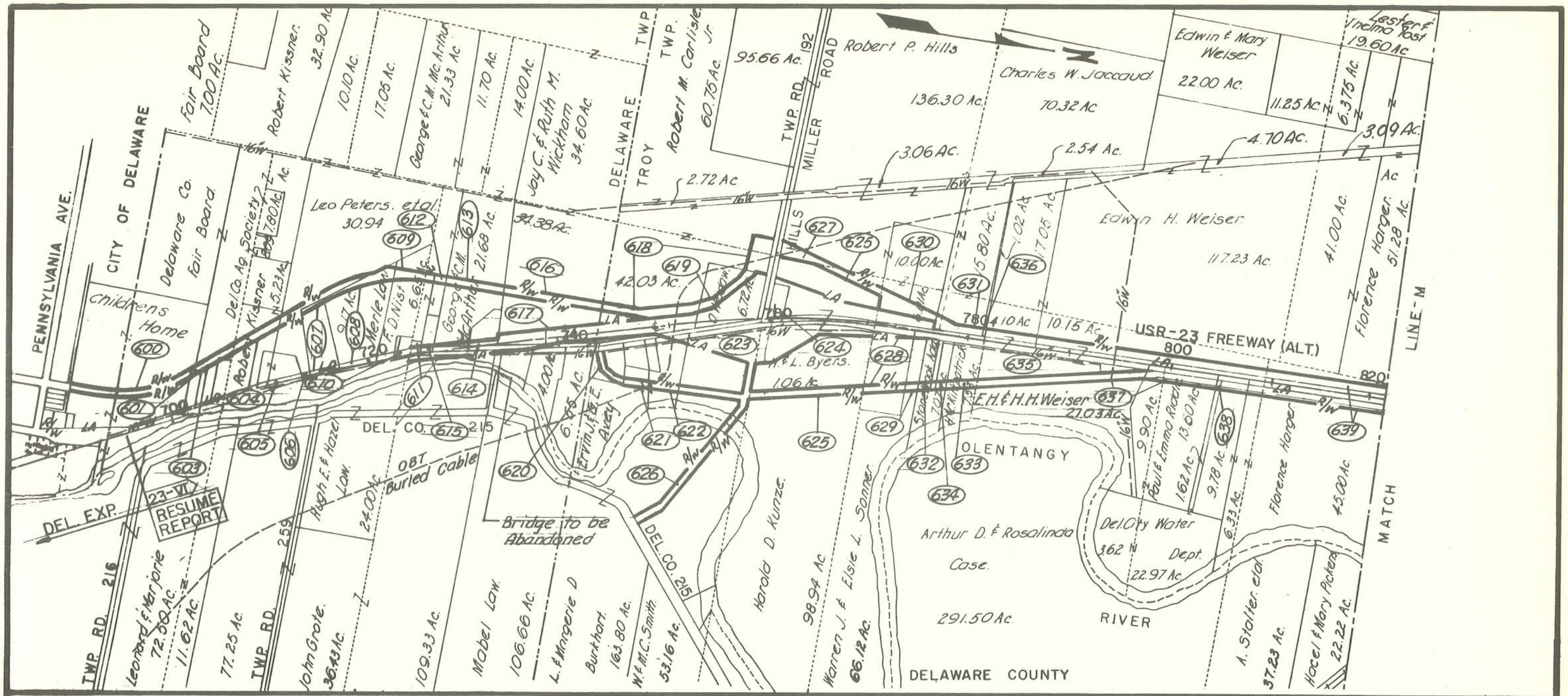
USR 23 FREEWAY PHASE 23 V
PARCELS AFFECTED

556 Boy Scouts of America
557 George H. Cruikshank
558 Hazel F. James etal
559 Harry L. Jones
560 Golen F. Oman
561 Conrad & Virginia Beck
562 J.D. Newfield etal
563 Wayne & Pouline Keiser
564 Ohio Public Service



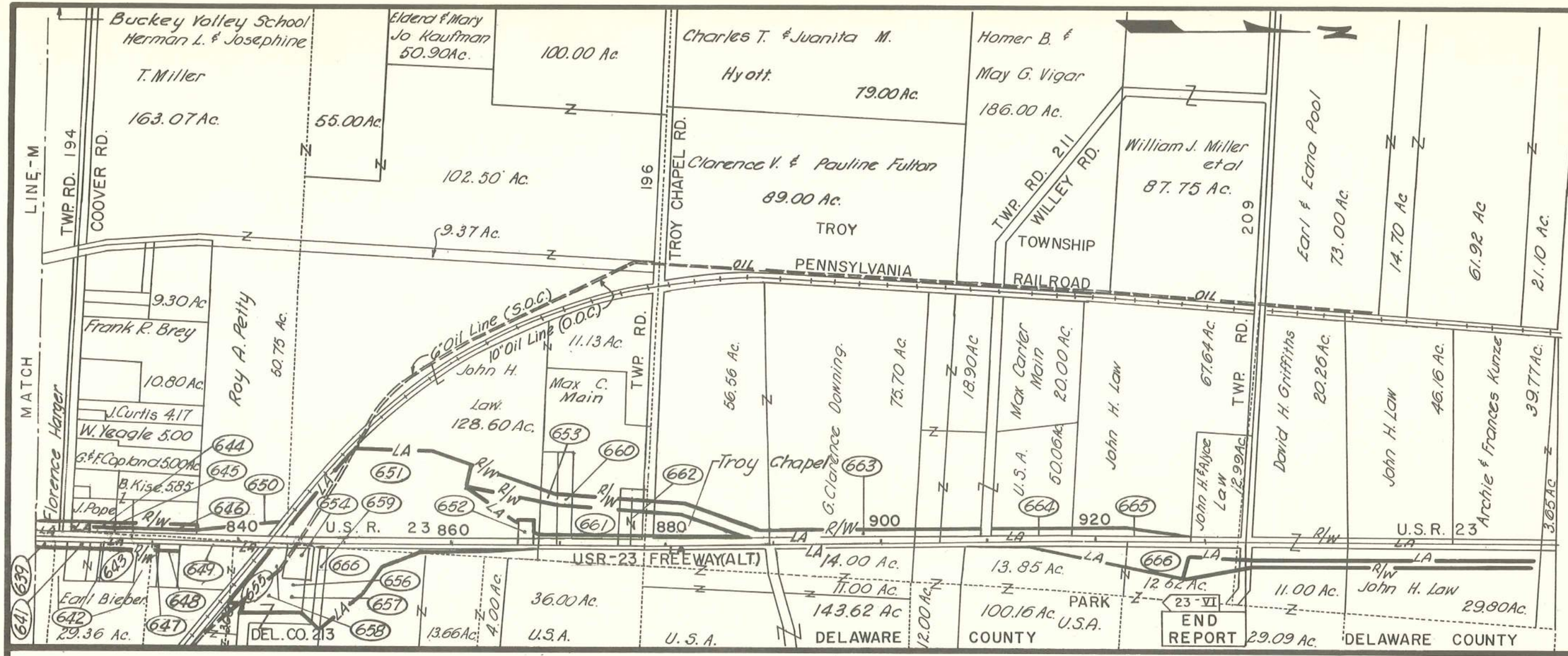
USR 23 FREEWAY PHASE 23 V
PARCELS AFFECTED

(565) Methodist Theological School
(566) Galen & Mary Oman
(567) Minehart Subdivision
(568) M. Hess
(569) H. & G. Worline
(570) Church
(571) C. Liebold
(572) R. Covey
(572A) G. Oberlander
(573) Paul M. Shisler
(574) Henry & Charlotte Beaver
(575) Babington Estates
(576) S. J. & P. F. Kaple
(577) St. Pauls Church
(578) Bernice Elliot
(579) Emma G. Dorsey
(580) Gladine May Smith
(581) S. & F. H. Borland
(582) K. & S. Doty



USR 23 FREEWAY PHASE 23 VI PARCELS AFFECTED

(600) Children's Home
(601) B. & R. Wooten
(602)
(603) P. & R. Gerwig
(604) Robert Kissner
(605) T. Ludwig & R. Kibbey
(606) Leo Peters
(607) T. & M. Williams
(608) Merle Law
(609) F. & D. Nist
(610) H. W. Thomas
(611) Wm. & M. Wells
(612) H. & R. Case
(613) George & C.M. McArthur
(614) Aden Albertson
(615) Wm. Willey
(616) Jay C. & Ruth M. Wickham
(617) J.C. Wickham
(618) Robert M. Carlisle Jr.
(619) Ola Mae Weidow
(620) L. & B.Z. Zimmerman
(621) Ervin J. & G.E. Avey
(622) L.M. & E. Avey
(623) J.D. & Hazel Malone
(624) H. & L. Byers
(625) Harold D. Kunze
(626) L. & M.D. Burkhart
(627) Robert P. Hills
(628) M. Minorchek
(629) Warren J. & Elsie L. Sonner
(630) Robert P. Hills
(631) Charles W. Jaccaud
(632) H.S. Kirkpatrick
(633) H. & C. Kirkpatrick
(634) Thomas & Virginia Tisdel
(635) E.H. & H.H. Weiser
(636) Lillian H. Weiser
(637) Paul & Emma Riddle
(638) Delaware City Water Dept.
(639) Florence Hager



USR 23 FREEWAY PHASE 23 VI
PARCELS AFFECTED

(639) Florence Harger
(640)
(641) R.H. Howard
(642) Earl Bieber
(643) Lowrence & Elizabeth Cox
(644) John & Dorthy Pope
(645) B. & M. Kise
(646) Lewis & B. Petty
(647) Paul Riley
(648) Menzae Davis
(649) E. Broyles

(650) Roy A. Petty
(651) John H. Law
(652) F.M. & V.B. Stiles
(653) F.M. & V.B. Stiles
(654) P.L. Burdette
(655) William & Janet Maxwell
(656) Clinton & Kathryn Beardsley
(657) Arthur A. Johnson
(658) Overlook Acres
(659) Berdette & Helen Ross
(660) R. & D. Stair

(661) Max C. Main
(662) M. Russell
(663) G. Clarence Downing
(664) U.S.A
(665) John H. Law
(666) U.S.A.