– A Proposal For –

A VERY LARGE ARRAY RADIO TELESCOPE

Volume IV - A

APRIL 1972

National Radio Astronomy Observatory*

Green Bank, West Virginia

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Contents

VOLUME IV-A. THE SITE

THE ARRAY SITE

The Very Large Array (VLA) is a major new instrument which will make important advances in radio astronomy possible. It is on a scale which far exceeds anything which has been built previously for radio astronomy, although it uses concepts and methods which are well tested. It will be used to gather information primarily in the centimeter wavelength range.

The site, which is described in the present volume, was chosen with a great deal of care in order to maximize the utility of the instrument. The site study was described in detail in Volume IV of the VLA Proposal. The present volume is an edited version of those parts of Volume IV which apply specifically to the site which was finally selected.

The instrument will consist of 27 paraboloidal antennas placed at intervals along three arms. The arms are over 13 miles long and lie at intervals of 120° in azimuth. A large number of observing points will be built on each arm so that the antenna placement can be altered to suit different astronomical investigations. Each antenna will be 25 meters in diameter, and placed on an alt-azimuth mounting. The antennas will be transported along the arms on a double-line railroad track.

A service area, and the buildings for the facility, will be placed near the junction of the three arms. The building complex is shown schematically on one of the attached figures.

1. General Site Features

The site, designated Y15 in NRAO internal reports, lies in Socorro and Catron Counties, New Mexico, in the eastern end of the Plains of San Augustin. The center of the array layout is approximately 22 statute miles west of Magdalena, N. M. The geographical coordinates of the center are 34°04'44" N, 107°37'03" W. The three branches of the array are each 21 km (13.05 statute miles) in length, and extend outward from the center on true azimuths of 115°00', 235°00', and 355°00'.

The general site area is shown on the appended map. The base map was the Socorro sheet (NI 13-4) of the 1:250,000 series published by the USGS[1]. The site is shown in much greater detail on the following maps of the 7-1/2 minute series:

Dog Springs
Lion Mountain
Lion Mountain NW
Augustine Well
Arrowhead Well
Tres Montosas
Mt. Withington

The 1:24,000 map covering the outermost 4 miles of the southwest arm is not yet available.

In addition to the map, profiles for each of the three arms of the array are attached.

The terrain is gently rolling, in a broad southwesterly trending valley. The elevation of the valley floor averages about 7000 feet. Many of the mountain peaks surrounding the basin attain elevations over 9500 feet. These mountains are all in national forests (Cibola, Gila, and Apache).

There are no railroads in the site area, but the northern branch of the Wye would cross U.S. Highway 60 approximately 2 miles from the apex. The older and now abandoned route of U.S. Highway 60 would be crossed by both the southeastern and southwestern branches of the Wye.

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[1] United States Geological Survey

Electrical transmission lines cross all three branches of the Wye, at a total of six locations. The line voltages for these transmission lines vary from 14.4 kV to 24.9 kV.

The old alignment of U.S. Highway 60 is just south of the apex and can be used for an access road, as can State Highway 78 which runs generally north-south about 2 miles east of the apex. U.S. Highway 60 is a two-lane road that runs generally east-west across the Plains of San Augustin from Datil, on the western edge of the Plains, to Magdalena and thence to Socorro in the Rio Grande Valley.

Datil, roughly 12 miles west of the site center, has a population of less than 100 and, as might be expected, has minimum facilities.

Magdalena, 22 miles to the east, has a population of 1500. There is an Indian school there, and a district office of the U.S. Forest Service. There are two reasonably modern motels and restaurants in Magdalena. A public school system serves Magdalena and the surrounding area. There are no resident physicians or medical facilities.

Socorro, the nearest town of any size, is located about 50 miles east of the site at the junction of U.S. Highway 60 and Interstate Highway 25. It has a population of 6000 and an economic background of cattle raising and mining.

The Atchison, Topeka and Santa Fe Railway provides freight service to Socorro on the line connecting Albuquerque and El Paso. Socorro is also the switchpoint for a branch line which runs to Magdalena, thus providing rail service 22 miles from the center of the site.

Socorro is on the Chicago-El Paso route of the Continental Trailways Bus Line. There is a municipal airport with lights for night operation. The nearest commercial airline service is 75 miles to the north of Albuquerque, which is served by TWA, Continental, Frontier, and Texas International Airlines.

Socorro is also the home of the New Mexico Institute of Mining and Technology, which offers bachelors' degrees in all of the basic sciences as well as masters' and Ph.D. programs in several fields. The Institute is basically a research center for metallurgy, geology, atmospheric physics, ground water hydrology, and for many other phases of the broad field of earth sciences.

Socorro has three public grade schools, one parochial grade school, one junior high school and one high school. There are over 2000 students enrolled in the public school system. The high school is accredited by the North Central Association.

Since Socorro is a junction point of major highways, there is a good selection of motels and restaurants for a town of its size. It has a mayor-council type of government, with the mayor elected every two years and the councilmen serving staggered four-year terms.

There are four medical doctors, three osteopaths, one dentist, and one optometrist as well as a modern county hospital with 46 beds. The county office of the State Health Department is located in Socorro. The town has a normal complement of churches, service clubs, banking facilities, and businesses. Recreation in the area is generally of the outdoor type and includes golfing, hunting, and fishing.

A surplus of unskilled labor exists in the Socorro area, but probably a large part of the skilled labor required for construction and operation of the array would be drawn from other communities up and down the Rio Grande Valley. As a wage scale indication, base wage rates for skilled construction workers in the Socorro area were $6.35 per hour in 1969.

2. Climatology

The average daily maximum temperature is 72° F and the average daily minimum temperature is 31° F. The highest recorded temperature is 104° F, and the lowest is -22° F. The annual mean temperature is 52.5° F.

The average annual precipitation is 12 inches; the daily and monthly maxima recorded in a four-year period are 2.25 inches and 4.66 inches, respectively. The relative humidity averages 53 percent. The sun shines approximately 70 percent of the time possible. One tornado has been recorded since 1860; this occurred in 1929 somewhat south of the site. Dust storms are infrequent and not severe, and no hail has been recorded in the last 16 years. The prevailing wind is from the west, with an average velocity of 9.6 miles per hour. Maximum 50-year wind expectancy is 77 mph.

There is a fairly high incidence of thunderstorms in the area, with an average of 45 in the summer and 35 in the winter. Because of the high rate of activity, the Langmuir Laboratory for Atmospheric Physics has been located in the mountains east of the Y15 site for thunderstorm and lightning research.

3. Geology and Foundation Investigation

Geologically, the region is a southwesterly trending valley probably formed by erosion cutting deeply into volcanic rocks of the Datil formation. The valley floor lies at an average elevation of about 7000 feet. Bordering the valley on the northwest and northeast are the Datil and Gallinas Mountains, which reach as high as 10,000 feet. The southeastern branch of the Wye extends out of the San Augustin Plains and into an area of moderately dissected terrace deposits within the Mulligan Gulch drainage system.

No significant faulting is known to occur in the San Augustin Plain, but the thick alluvial cover may mask some faulting. Two small intrusive rock units occur about six miles west of Augustin. The scarcity of such intrusive bodies, in view of their abundance in other sections of southern and central New Mexico, suggest that the area is a reasonably stable one.

Nearly all of the strong earthquakes in New Mexico and a majority of the weaker ones have occurred along the Rio Grande Valley between Albuquerque and Socorro (Northrup 1961). The most active area lies just west of Socorro where two or three micro-earthquakes are recorded each day (Sanford 1963). The Magdalena area is more stable.

Four damaging earthquakes with an intensity of seven or greater (on an increasing scale from 1 to 12) have occurred in Socorro, although the last was in 1906. Since instrumentation of the central New Mexico area was completed in 1962, the strongest tremor in the area was a 2.9 on the Richter intensity scale (recorded in 1963). It is believed that the maximum ground acceleration experienced in the Magdalena area has been only about 3 cm/s^2 or 0.003 g (Sanford, written communication).

Unconsolidated Quaternary terrance and alluvial material underlie the entire site. The surrounding mountains are made up of crudely stratified beds of rhyolite and latite tuffs, flows and breccia, which are overlain in scattered localities by Quaternary basalt and basaltic andesite flows. The Tertiary volcanic units appear to have been the source of most of the Quaternary and Recent sand and gravel deposits.

Because of lack of exterior drainage, a lake developed in Quaternary time, filling most of the present plains area. The lower sand and gravel benches probably formed while the lake surface was high and were later partly dissected as the lake level dropped to the stage where it covered only the lower portions of the valley. The floor of the lower lake, which includes the site center, is underlain by high plasticity, impervious clays.

As the region became more arid and the lake shrank, the sands on the shoreline around the lake were formed into dunes. These sands have been widely distributed and now cover most of the lower elevations of the basin to a depth ranging from a few inches to over 10 feet.

The surface sand deposits at the site generally occur in the form of dunes composed of very fine to silty sand that is poorly graded. This type of sand would not be satisfactory for use in concrete mixtures.

A highway borrow pit about one-half mile north of U.S. Highway 60 and just west of the Catron-Socorro County line contains a large stockpile of well graded sand of up to medium grain size. This material was screened from the surficial deposits in an old stream channel, suggesting that sand could be obtained also in other areas where the sands have been concentrated and washed by the action of ancient streams.

Fine grained, silty gravel deposits cover most of the San Augustin Plains. This gravel would be satisfactory for embankment material, but it ranges from fairly satisfactory to unsatisfactory for use as base course or aggregate. Generally this material contains up to 15 percent silty fines and a maximum of 20 percent fine gravel. The gravel size usually is less than 1 inch.

Two borrow pits have been developed in the area adjacent to the Catron-Socorro County line and north of U.S. Highway 60. Deposits in these areas contain less than 10 percent fines and up to 50 percent gravel; however, the average gravel size is less than 2 inches and the pebbles are fairly well rounded. As mentioned above, these deposits probably have been more actively washed and sorted by ancient stream action than the average surficial material.

Surface evidence indicates fairly good concentrations of gravel similar to those mentioned above at selected locations in the low hills just west of the midpoint of the southwestern branch of Y15.

The best gravel sources would be from outcrops of the Gila Conglomerate. These occur along U.S. Highway 60, a short distance east of the site, and also at a shallow depth beneath the surficial deposits near the end of the southeastern branch. In most of the exposures, the gravel fraction is over 60 percent. The gravel is well graded up to about 3 inches and the maximum size is about 14 inches. These pebbles and cobbles are subrounded to sub-angular and should be satisfactory to crush for use as aggregate. The matrix is composed of fairly clean, angular sand which is rather tightly cemented with calcium carbonate.

The nearest commercial source of aggregate is at Socorro, a distance of approximately 50 miles. Local sources of rock will have to be chosen with care, as flow banded rhyolite or tuff composes a large percentage of the hard rock outcrops in the region. Both of these rock types probably would be unsuitable for crushing to obtain aggregate.

Rock suitable for crushing is available at three locations. The best and most centrally located deposit is a dark gray, andesitic volcanic rock which is dense and very hard. It occurs just north of U.S. Highway 60 at the eastern edge of the plains. The rock is rather massively bedded, but it is quite well fractured so that material suitable for crushing should be readily available, even though blasting will be required. The over-burden is negligible, and the surface outcrops suggest that the deposit could be expected to yield more than 200,000 cubic yards of rock.

A source of high-plasticity clay was found about 1.5 miles southwest of the apex. The obvious extent of the deposit is an area about 150 feet by 400 feet and 2 feet or more in thickness. It is believed that similar deposits probably underlie much of the low ground near the apex.

In summary, all of the needed mineral construction materials can be obtained within a 15-mile radius of the Y15 apex. Test drilling and laboratory testing will be necessary in order to ascertain the extent of the usable deposits and the quality of the material for various applications.

Ten test borings were performed along the three branches of the Wye at places where it was felt that a representative sampling could be obtained. A visual inspection was also made of each branch.

Along the northern branch the soil is composed of silty sand and sandy silt with intercalated high plasticity clayey lenses. Near the apex, the surface material consists of clay covered by windblown silt and sand. Hummocky sand dune terrain prevails from just south of U.S. Highway 60 for about three miles to the north. In places, these sands are moderately loose and may be as much as 10 feet in thickness. Except near the apex, the sediments underlying the northern branch contain from 5 to 20 percent fine gravel. The sieve analyses from the test borings indicate a maximum gravel content of 9 percent in the samples tested; however, those results do not appear to be typical of the majority of the surface material. Using a 100 pound hammer with a 30 inch drop, the penetration resistance tests showed a blow count per foot of from 4 to 39 at a depth of 2 feet, 6 to 41 at 5 feet, and 17 to 62 at 10 feet with refusal in one hole. The rather wide variation was a result of the varied types of material and changes in density. In all four holes a blow count of 20 or more was attained consistently below 12 feet.

Soils along the first 9 miles of the southeastern branch are composed of sandy silt and silty sand with varying amounts of gravel up to 25 percent. The remainder of the branch crosses an area where detritus has been washed down from the adjacent mountain slopes, causing the soil to contain more clay as well as an abundance of small, angular rock fragments. The penetration resistance tests showed a blow count per foot of from 20 to 39 at a depth of 2 feet, from 7 to 14 at 5 feet, and from 35 to 50 at 10 feet. A consistent blow count of 20 or more was attained in the three holes at depths ranging from 7 to 10 feet.

Along the southwestern branch, fine-grained sand and silty sand are the most prevalent soil constituents, but locally the branch crosses low ridges that are underlain by gravel. Windblown sand masks the soil along much of the distance; however, the sand has not been formed into well developed dunes and probably the deposits are not thick. The penetration resistance tests showed a blow count per foot of from 9 to 14 at a depth of 2 feet, 1 to 33 at 5 feet, and 70 at 10 feet, with refusal in two holes.

No difficulty should be encountered in the excavation of the alluvium, and this material should be satisfactory for embankments when properly compacted. The high degree of compressibility of some of the samples tested indicates the need for special attention to compaction, particularly in low areas subject to ponding.

The bearing capacity determinations indicate that the placement of footings could be a problem at shallow depths because of the critical deflection requirement. This problem can be circumvented if the footings are placed deeper. A careful soil test drilling program must be undertaken in order to avoid locating footings in zones of low bearing capacity, for the penetration resistance tests indicate a wide range of values, including some that are quite low. The compressibility factor of the soils under saturated conditions should also be given careful consideration.

4. Topography and Drainage

The vegetation on the site consists primarily of sparse stands of low grama grass. The density of the grass is somewhat greater in the bottom lands where the water is retained more effectively. In most places the grass cover is sufficiently dense to prevent the sand and dust from blowing except during the strongest winds. In the area of windblown sand, there are scattered growths of small sagebrush intermixed with very sparse grass.

The northern branch has almost a flat grade, rising only 50 feet in the first 62,000 feet. North Lake begins at station 620+00 and runs to station 680+00. Here the branch will be on a 15 foot fill to accommodate any ponding which may occur in the normally dry lake bed. The area from station 680+00 to 686+40 is the only place requiring protection from runoff (from the Gallinas Mountains, the flow running southward along the western side of the branch). The drainage requirements on this branch are: thirty-three 24-inch diameter and two 48-inch diameter pipe culverts.

The southeastern branch is crossed by the drainage flow from Mount Withington on the south. The gradient from the apex of the Wye to station 530+00 is consistent and relatively flat with no major drainage structures needed. From station 530+00 to station 552+00, the branch rises 40 feet crossing a saddle between two hills; it then drops 90 feet to station 686+40. This section has numerous washes and gullies which enter from the mountains on both sides of the branch. The drainage flow from station 600+00 to station 686+40 is in the same general direction as the branch, eventually emptying into Mulligan Gulch.

The drainage requirements on this branch are: twenty 24-inch diameter, thirteen 30-inch diameter, elven 36-inch diameter, nine 42-inch diameter, eight 48-inch diameter, two 54-inch diameter, four 60-inch diameter, and two 78-inch diameter pipe culverts.

The southwestern branch crosses the normal drainage lines from Mount Withington and has a low gradient for practically its entire length. The drainage demands are light except where sheet flooding enters from the hills on the northern side, in the stretch from station 650+00 to 686+40. No major drainage structures are necessary. The drainage requirements on the branch are: twenty-four 24-inch diameter, six 30-inch diameter, three 36-inch diameter, nine 42-inch diameter, and eight 48-inch diameter pipe culverts.

Riprap will be used at a wash area on the southeastern branch where erosion protection will be required.

5. Railway

The railway section permits the mobile antennas to be transported to different locations on the Wye. The tracks will also carry personnel and maintenance equipment to the observing stations; this makes access roads along the branches unnecessary.

The observing stations are on spurs with the centers of the stations approximately 100 feet from the center line of the main tracks. All spurs are at right angles to the main tracks. By placing the antenna stations on spurs, the main tracks are left clear for other vehicular movement. Antennas can be transferred from one branch to another at the Wye apex, where the tracks meet to form a railway junction.

The major railway-highway crossings will be accomplished with a bituminous base course over railway ballast and covered with 2-1/2 inches of asphaltic concrete surface. Minor railway-road crossings will be made by normal timber crossing methods. Railway crossings will follow AREA[1] practice and methods.

Railroad-type cattle guards will be used where existing fences cross the Wye branches.

The design of the railway was based on the following requirements:

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[1] American Railway Engineering Association

(1) Use of standard gauge railroad track, consisting of 90 pound re-layer rails on untreated hardwood, random cut, industry grade ties. Ties will be at 28-inch spacing, supported by 6 inches of gravel ballast. Tie plates and joint bars will be used material, with other accessories being new.

(2) Distance between center lines of double tracks to be 18 feet.

(3) Observation stations to be placed on spur tracks perpendicular to the main tracks.

(4) Trackage to support antennas weighing 225 tons.

(5) Maximum allowable track grade of 2 percent.

(6) Provision for switching of antennas from one branch to another at the point of intersection.

(7) Antenna movement to be permissible in winds up to 35 mph.

The tracks and ballast sections will be constructed by approved methods and procedures to meet AREA specifications. The subgrade shall have a rating CBR-10 or better. Borrow material is expected to be available within the right-of-way and within free haul distance in most cases. Gravel will be obtained from the closest sources in order to reduce haul distance.

The observing stations on the spurs have three foundations--one for each leg of the radio telescope. One is centered between the tracks, and the other two are outside of the tracks and straddling them. The foundations are meant to prevent overturning of the antennas as well as to support them in a fixed position.

Each station will be enclosed with a 4-foot high open mesh stock fence. Two 15-foot long gates across the railway tracks will lock together at the center line when closed.

The foundations for the observing stations will consist of pilings except in areas of high bearing capacity, where poured-in-place mats will be used. The decision for each location will be based on soil tests.

Three additional foundations will be constructed at each spur intersection for use during antenna transfer from the main track.

The staging area provides a location for the field erection of the antennas, on rails extending from a spur track near the apex, thus permitting access to the Wye. After the array becomes operational, the staging area will be used for maintenance. The design includes trackage, a hard stand for crane operation, and assembly and storage areas.

The staging area will cover 24,000 $feet^2$. It will be paved as follows: hardstand area to have 2-1/2 inches of asphaltic concrete over 6 inches of gravel base on prepared subgrade; remaining area to have bituminous double surface treatment over 4 inches of gravel base on prepared subgrade. Material and construction are to meet Asphalt Institute specifications. The access to the staging area will be by gravel road. Drainage will be minimal, and existing channels will generally be crossed by constructing dips.

The top 6 inches will have to be stripped from the ground surface in order to remove existing vegetation prior to emplacing the embankment material.

6. Access Road

The roads serving the VLA site are the entrance road, the access road to airstrip, and the access road to the Wye apex. The design is based on the following requirements:

(1) All weather surface.

(2) Forty-five mph speed.

(3) Adequate drainage.

(4) Three hundred feet sight distance.

(5) Seven percent maximum grade.

The entrance road from the main highway to the building complex will have a wearing course of asphaltic concrete on a 6-inch gravel base. The roadway will be 24 feet wide with shoulders 2 feet wide. It is designed for the traffic classification designated "light", on the basis of the expected average daily number of equivalent 18,000-pound single axle load applications. Mix design criteria, specifications, and construction methods are MS-2 and SS-1 from the Asphalt Institute. The other access roads differ from the entrance road only in width.

The total length of all access roads is 3700 feet. The entrance road from the highway is 500 feet long. The access road from the building complex to the staging area will be 500 feet long.

7. Airstrip

The airstrip is to be classified as a Basic Utility Airport, meeting the FAA design criteria, Stage 11B. This is suitable for about 95 percent of the general aviation fleet.

Each end of the airstrip has a 1000-foot clear zone to provide for a 20:1 glide approach. A 30-foot wide paved taxiway and a 150-foot by 200-foot paved apron are to be located at one end of the airstrip. The runway, taxiway, and apron will be surfaced with bituminous triple surface treatment on a granular base. The paved areas can accommodate a 15,000 pound wheel loading, equivalent to a DC-3 class aircraft. The airstrip will be equipped with a wind cone. It will be reached by a paved access road.

The airstrip will run approximately east and west to face the prevailing wind. It will be 150 feet wide with a paved runway 75 feet wide and 5200 feet long. The length of the runway is determined by the altitude (6900 feet above sea level) and the mean maximum temperature (85°F). Drainage is provided by six 36-inch diameter and three 48-inch diameter pipe culverts.

The location shown for the airstrip on the map may be changed.

8. Water Supply

The water supply will be a "High Pressure Storage" system composed of a well, elevated storage tank, chlorinator, and softener. Water supply requirements for the VLA site are based on 5000 gallons per day potable water and 50,000 gallons reserve for fire.

The source of the water supply is an underground aquifer which will be tapped by a 10-inch diameter well, cased to 8 inches. Delivery of the water will be by an electric, submersible, centrifugal pump in the well. The pumped water is conveyed by pipe to an elevated 65,000-gallon storage tank. This tank will contain a three-day domestic supply, and 50,000 gallons of water for fire delivered at 400 gallons per minute for a two-hour duration. Distribution from the storage tank is by gravity through a chlorinator and zeolite filter prior to consumption at the building complex.

The aquifer underlying the San Augustin Plains is not too well defined, but it appears that water will be encountered at depths of 50 to 100 feet. Wells from 75 feet to 250 feet deep should provide an adequate supply of water to meet the site demand. The well water should be potable with hardness ($CaCO_3$) in the neighborhood of 90 ppm.

9. Utilities

Electric power in the general vicinity of the site is supplied by the Socorro Electric Cooperative, Inc.

The Cooperative has a 69 kV circuit with overhead static protection from Socorro into Magdalena, New Mexico. This line has a very high grade of continuity. From the transformer station in Magdalena, a 25 kV circuit runs westerly and passes adjacent to the proposed building complex. This circuit serves about 600 miles of distribution lines from its source in Magdalena all the way to the Arizona state line. The main circuit has static protection but the feeders are connected through oil circuit reclosers. This provides a reliable service that has proven quite satisfactory for the existing users but may lack the absolute continuity required for the VLA. Socorro Electric Cooperative will also have a 69 kV line running past the site by 1974.

The existing 25 kV circuit is capable of supplying the normal operating requirements of 800 kW and possible surge to 1600 kW without excessive voltage drop. This study was based on a normal load of 800 kW with a 90 percent load factor utilization. Demand load is considered as 1600 kW. The buildings will be heated electrically. This will eliminate the need for a natural or bottled gas supply source.

A completely automatic 500 kW diesel or turbine driven emergency generator set is to be installed as stand-by equipment. This unit will be complete with the necessary cleaners, filters, indicators, instrument panel, fuel tanks, lines and pumps, coolant system, shut-off safety devices, governor, 32-V automatic starting system and batteries, control panel for the generator and 800 A automatic transfer switch.

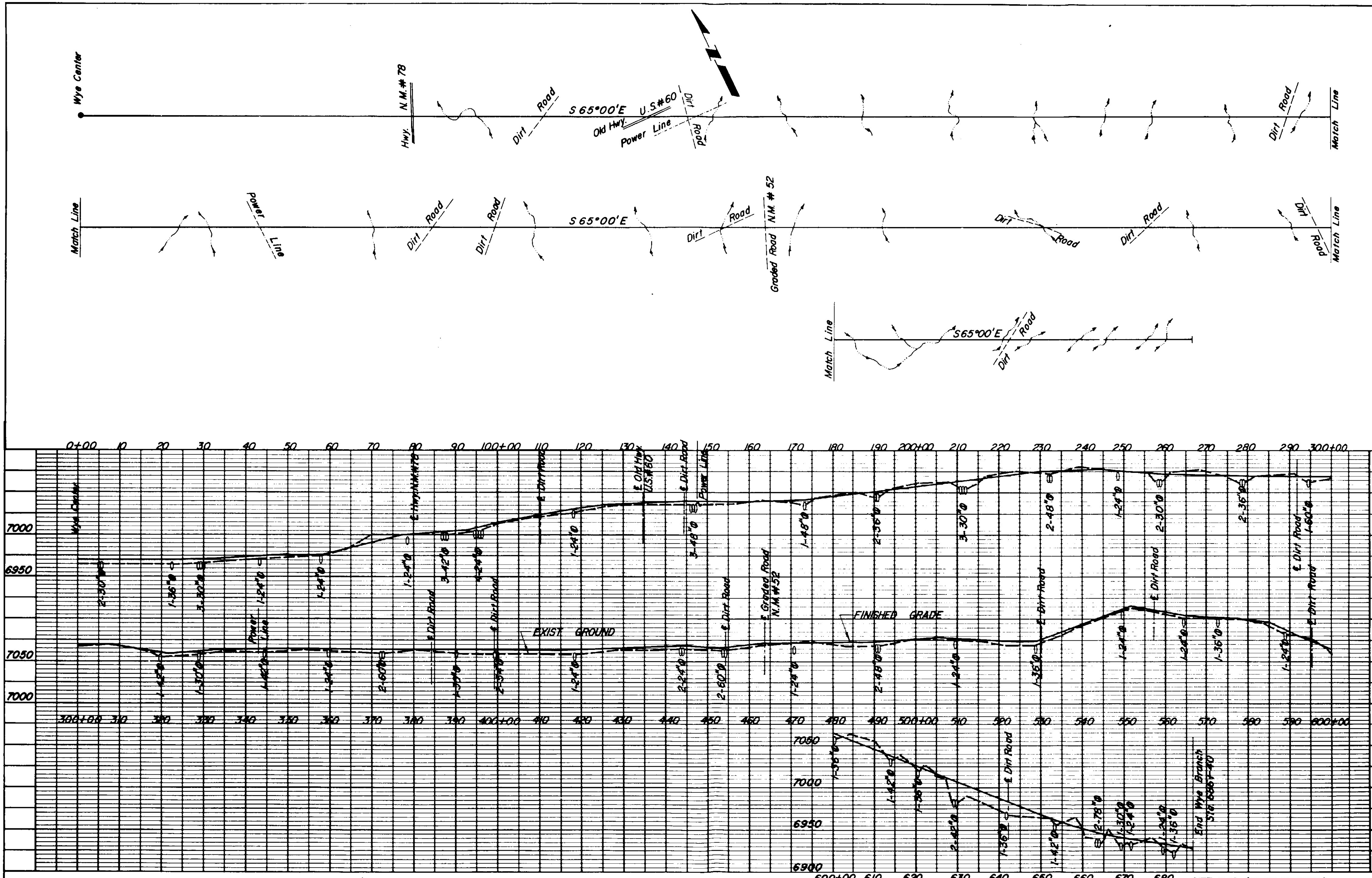
Electrical service to the observing stations will be supplied by overhead lines from an outdoor transformer supplied by the utility company. The outdoor transformer will have the following secondary characteristics: 2300 V, 3-phase, 3-wire, 60 Hz. The secondary side of the transformer will serve the 2300 V switch gear which in turn will distribute power to the overhead lines. At each observing station, there will be a 3-phase primary fused switch transformer and panel board which will drop the voltage to 277/480 V.

VLA SITE DEVELOPMENT STUDY
FOR
THE ASSOCIATED UNIVERSITIES, INC.
SITE Y-15, NEW MEXICO

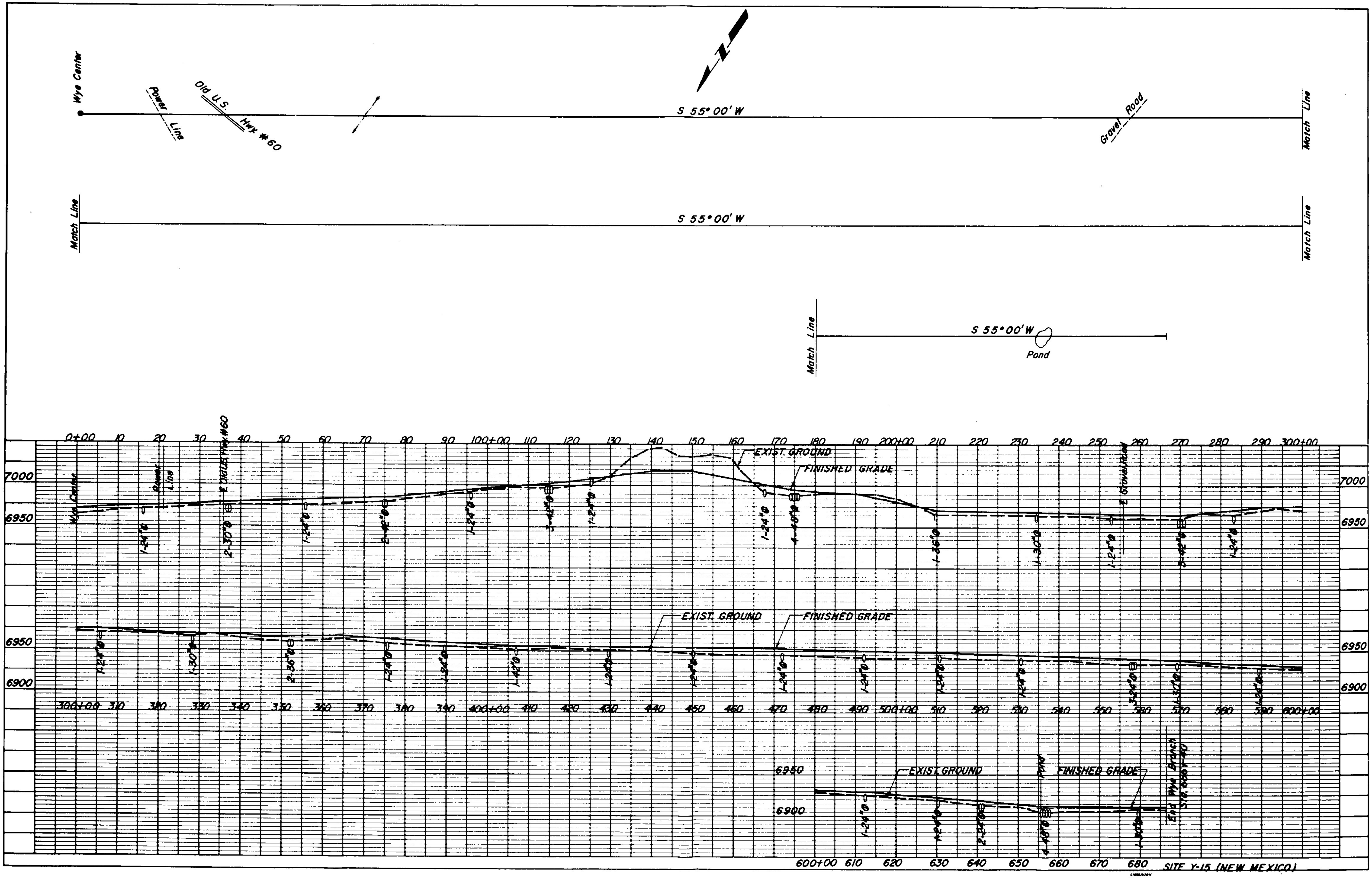
GENERAL PLAN, OWNERSHIP, HYDROLOGY & DRAINAGE

LIMBAUGH ENGINEERS, INC.
CONSULTING ENGINEERS and PHOTOGRAMMETRISTS

DRAWN BY R.M.
CHECKED BY B.H.
FILE NO. 2941
DATE DEC. 1969



SITE Y-15 (NEW MEXICO)



Wye Center
Power Line
Old U.S. Hwy #60
S 55° 00' W
Gravel Road
Match Line
Match Line
S 55° 00' W
Match Line
Match Line
S 55° 00' W
Pond
EXIST. GROUND
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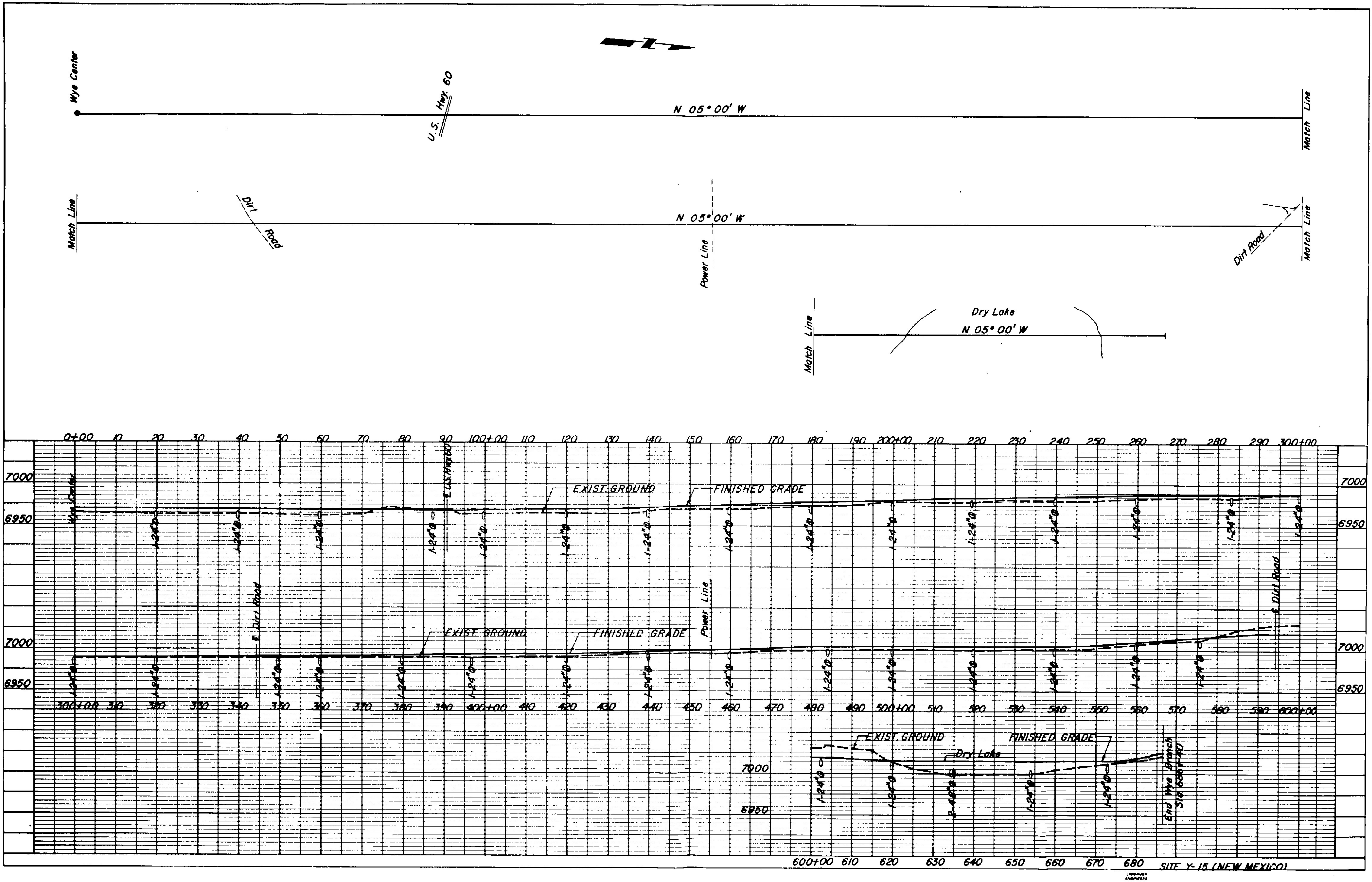
End Wye Branch
SITE Y-15 (NEW MEXICO)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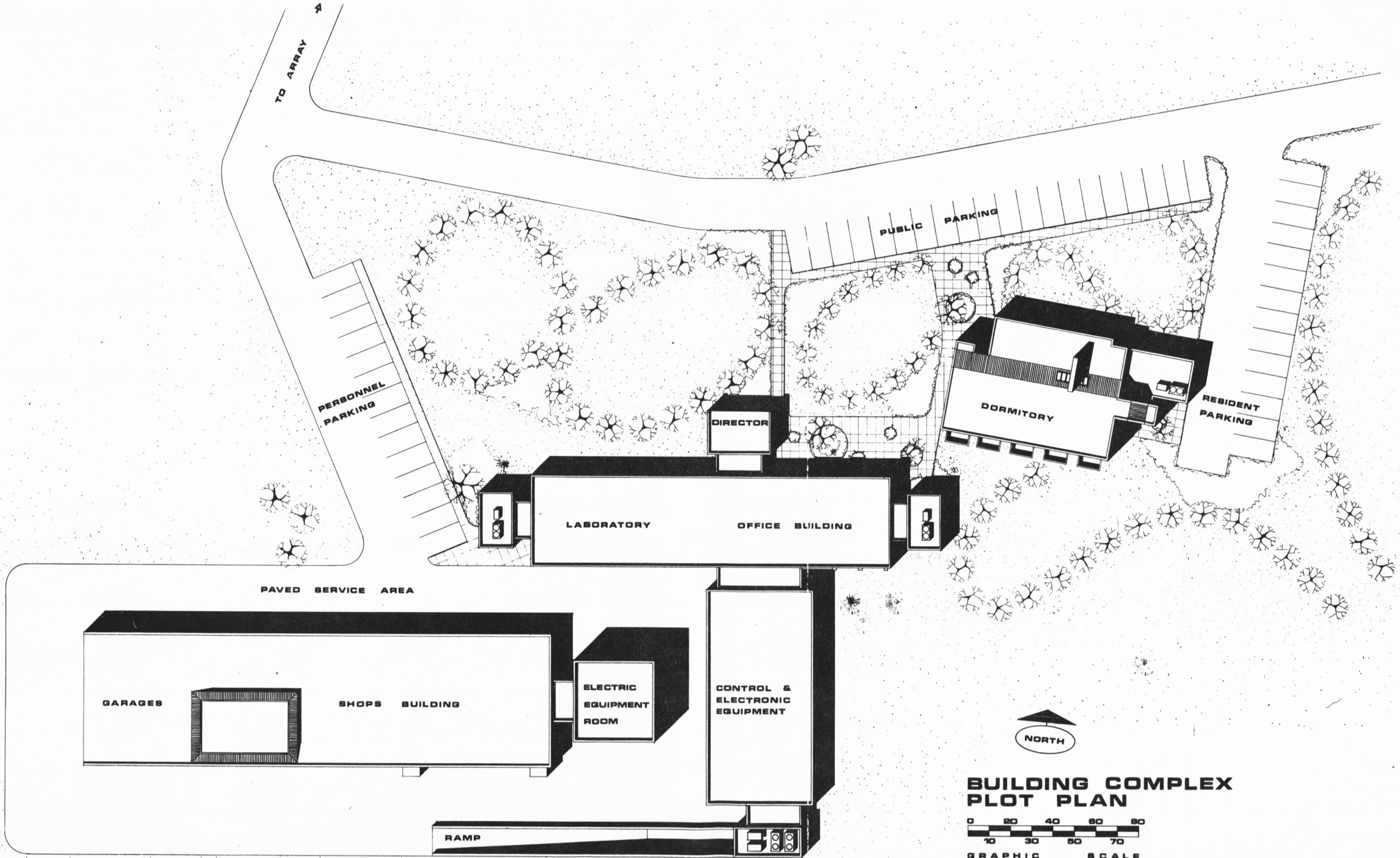
Match Line
Dirt Road
Power Line
Dry Lake
0+00 10 20 30 40 50 60 70 80 90 100+00 110 120 130 140 150 160 170 180 190 200+00 210 220 230 240 250 260 270 280 290 300+00
7000
6950
Wye Center
℄ U.S. Hwy. 60
EXIST. GROUND
FINISHED GRADE
1-24"⌀
℄ Dirt Road
Power Line
300+00 310 320 330 340 350 360 370 380 390 400+00 410 420 430 440 450 460 470 480 490 500+00 510 520 530 540 550 560 570 580 590 600+00
Dry Lake
2-48"⌀
End Wye Branch
Sta 686+40
600+00 610 620 630 640 650 660 670 680
SITE Y-15 (NEW MEXICO)



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V L A SITE DEVELOPMENT STUDY

FOR

THE ASSOCIATED UNIVERSITIES, INC.

BUILDING COMPLEX
PLOT PLAN