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June 22, 1962

Mr. Gene Anderson
2549 East Broadway
Tucson, Arizona

Re: Sunizona Acres Project
Water Exploration
Cochise County, Arizona

Dear Gene,

We are somewhat reluctant to comment on water potential in those areas where no survey was conducted and little other information is available. However, it is obvious that the survey was only reconnaissance in nature and that we were merely speculating on the water potential in those areas which are a considerable distance from the location of our geophysical surveys.

Your lay summation titled "Addendum to Report on Underground Water Supplies - geophysical Survey Sunizona Acres" we concur with in general with one exception---the word "lower" should be deleted to say "higher" in the last sentence of paragraph 5 on page one. Bedrock usually gives a higher reading.

Item No. 2 should read as follows: "By comparison with known strata, bedrock or existing wells, other areas similar to known strata may be located, and relatively higher or lower readings may indicate even better production areas than the known areas.

We are enclosing a retyped page 4 of our report dated May 4, 1962 which should replace the one now included. Zone "z" had been mistakenly ommitted and this is hereby corrected. Page 7a is added and copies are enclosed along with copy of our plan map of the Sunizona Acres Project showing in color the water zone quantity potential based on the electrical and magnetic reconnaissance surveys conducted during the later part of April 1962.

Our statement is enclosed.

Yours very truly,

E. Grover Heinrichs

EGH:jh
Enclosures
cc: K. W. Richardson

JUN 1962
GEOEX

SUNIZONA ACRES SUBDIVISION

Addendum to Report on Underground Water Supplies.

Geophysical Survey Sunizona Acres.

In April 1962, the Heinrichs Geoexploration Company performed a reconnaissance type geophysical survey on the Sunizona Acres Subdivision property for the purpose of adding to known information about ground water supplies. Using methods of induced polarization-electrical resistivity and total intensity magnetic readings an attempt was made to correlate and project known characteristics in the area of the existing wells into areas where very little, if any, data was available. This is believed successful within the limits imposed on the geophysical survey.

In general answers to the following questions were sought; what production could be expected in the northeast and northwest areas of the Sunizona property, and what could be expected as wells are drilled closed to the areas of known bedrock in Section 11 east of the sales office.

Accordingly, induced polarization-electrical resistivity surveys were made, starting in the center of the area of wells 5, 6, and 7 tying in the areas of known bedrock, and then projecting the survey into the unknown areas to the northwest and northeast. In connection with the resistivity survey, a continuous total intensity magnetic profile was made, from which, an estimate can be made as to the approximate depth of bedrock along the survey line.

Geophysical surveys such as the ones made at Sunizona, show these things to the experienced interpreter;

1. The induced polarization-electrical resistivity surveys, simply stated and without discussion of the many possible errors, show the vertical depth to bedrock, and where enough data is available, the general types of formation to be encountered. The lower readings indicate deeper bedrock, and the more permeable formations. A possible error here is that is the tighter, clay type or cemented formations will also give higher readings, similar to bedrock. Bedrock usually gives a higher reading. Local [illegible] higher or lower

obtained in vicinity of deep

2. By comparison with known strata, bedrock or existing wells, other areas similar to the known strata may be located, ~~or lower~~ readings may indicate even better production areas than the known areas.

3. The mobile magnetometer, total intensity magnetic survey records a continuous profile, as it travels along, of the magnetic intensity. The magnetic profile is roughly the same as the bedrock profile, that is the higher magnetic readings show shallower bedrock.

One of several possible errors here is that different types of rock formations will give different readings, although lying at the same elevation.

The reconnaissance type survey, by definition will overlook and miss many details, however the data assembled by the survey and properly interpreted adequately described in a general way the unknown areas. The map attached shows the expected areas of good water production, and conversely the poor water production areas.

Subservice geological features discovered by the geophysical surveys were;

1. The location of a buried volcanic hill in the general area of well # 7. Well # 7 was previously believed to have been drilled very close to bedrock while # 6 even though 70' deeper did not approach bedrock. The geophysical readings, therefore support the original conclusions. For the purposes of irrigation wells this higher elevation bedrock is still so deep that it will be no problem.

2. Section 35 and 2 in the northwest corner of the property show very deep valley fill and consequently should be good water production areas. The very south line of Section 2, appears to be underlain by shallow bedrock extending up from the south.

3. No production areas in Section 10 were discovered and the outline of shallow bedrock in Section 11 was approximately located. The possibility of a good well location in the very northwest corner of Section 11 was discovered, otherwise well drilling should be confined to the easternmost areas of Section 11. Additional geophysical surveys in Section 11 would be helpful in determining how far to the west wells could be drilled successfully. As may be seen on the map, the poorer production area skirts along the south line of the Sunizona property and the porduction from wells # 1, 2 and 3 bear this out.

4. The area around wells # 4 and 5 was judged to be a poorer production area in comparison to areas to the north and northeast. The entire northeast area of the property within limitations of the survey made is believed to be a good water production area. In the northeast corner of Section 32 was the deepest valley fill recorded on the property, and it is believed there is no bedrock in the area higher than 1000 feet deep and it may be as deep as 3500 feet in some places. Along the resistivity survey spreads, especially spread 9, line 5 some very low readings were made. The magnetic highs in this area still show bedrock so deep as to be of little concern.

The geophysical surveys made reaffirmed the previous beliefs about the good ground water production areas in Sunizona Acres Subdivision and further delineated the possible trouble spots. This data is valuable as an aid to planning the further development of the property. Further substantion was found for the statement that all of the area away from the exposed hills is capable of good water production, the amount depending upon the type of drilling done and the formations encountered.

WILLEN CORPORATION 2030 PIONEER COURT SAN MATEO, CALIFORNIA FIRESIDE 1-7401

December 15, 1961

Dr. Paul R. Kitzinger
New Mexico Institute of Mining and Technology
Sorroco, New Mexico

Dear Sir:

I have read with much interest the article in Science Digest regarding your pioneering work with Induced Electrical Polarization techniques for underground water exploration.

We own about 10,000 acres in the Sulphur Springs Valley in Arizona which we are gradually sub-dividing and offering for sale. As we desire to provide information regarding sub-surface water to anyone considering purchase of our land, we have drilled, cased and tested ten wells within the 11 sections of land thus far offered for sale.

Our water exploration program is of intense interest to all property owners in the area and we are coordinating and exchanging information with the local office of the U. S. Geological Survey. Enclosed is a preliminary copy of a report prepared by our engineer, Mr. Gene E. Anderson.

Would you or your associates be interested in undertaking a project for Induced Electric Polarization testing of our entire 10,000 acre property, and preparation of a report on underground water conditions? Our detailed logs and test records for the test wells drilled to date should be helpful in checking and coordinating your testing techniques to local conditions.

I hope there is some way that we can work together in such an exploration project, however, if this is not feasable perhaps you could refer us to a licensee who is skilled in the use of your technique.

I will await your comments with much interest.

Yours truly,

WILLEN CORPORATION

L. G. Erickson

L. G. Erickson

LGE:lm

SUNIZONA ACRES SUBDIVISION

REPORT ON UNDERGROUND WATER SUPPLIES

Prepared By
Gene E. Anderson P.E.
Civil Engineer
Tucson, Arizona
November 20, 1961

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I. GENERAL

LOCATION

Sunizona Acres Subdivision comprizes portions of an area approximately eight miles wide by five miles deep lying adjacent to and north of highway 181 and easterly from highway 666, Cochise County, Arizona. (townships 17-18 south and ranges 26-27 east.) The nearest towns are Pearce, Arizona, seven miles west, Willcox, 32 miles north and Douglas approximately 38 miles to the south.

TOPOGRAPHY

The terrain within the subdivision is predominately flat with a few minor washes and rises and is covered with range grass and varying amounts of mesquite and other brush. The land slopes from east to west at the rate of 30-35 feet per mile. The soil type varys from a very sandy loam to a clayey loam, with all the soil being adaptable for agricultural purposes. The subsoil may be either clay or a very clean open gravel depending upon the particular location. As of November 1961, no caliche or alkali deposits have been encountered.

CLIMATE

The average rainfall in Willcox, the nearest U.S. Weather Bureau station has been 11.70 inches annually as determined from records for the period of 1880 to 1945. Over half of this rainfall falls during intense thundershowers in the month of July, August and September. The driest months are April, May and June. The average temperature during the period of record was 59.6°F with January being coldest with 41.6°F and July, high at 79.4°F. The average evaporation is 85 inches per year. In Arizona the required irrigation well capacity is usually figured to be 6 to 10 gallons per minute per acre of land to be irrigated, the exact capacity required to be determined by the climate and type of crops to be grown.

GEOLOGY

Sunizona Acres Subdivision lies near and slightly astraddle the surface-water divide that separates the Douglas and Willcox basins. Accordingly this report will deal with both basins, but only to the extent they affect the subdivision area. Both basins are characterized by valleys trending north and south lying between maturely dissected fault-block mountain ranges rising to 9 and 10 thousand feet on the east and 6 to 7 thousand feet on the west. The basins are separated by the series of low, partially buried hills lying just south and west of the subdivision area. The valley areas are locally known as Sulphur Springs Valley and comprize some 70% of the area of the basin.

These valley areas are filled with debris and sediment eroded from the mountains and are known to be 3000 and more feet thick in some places. This sediment is the principal aquifer in the basin, containing and furnishing all the water of any consequence. For the purposes of irrigation supply only the upper five to six hundred feet of this sediment can be considered as water-bearing due to the prohibitive pumping lifts below this depth and the decreasing permeability of the lower, older and more tightly cemented formations.

This upper valley fill or alluvium has been deposited since early Quaternary time (approximately 50 million years ago). Recent alluvial fill is believed to have occured in the subdivision area, and even within historical time perennial streams and gullying have occurred in Turkey Creek and Ash Creek.

A further discussion of the valley fill is warranted to describe as fully as possible the conditions affecting wells drilled into the fill areas. The valley fill consists of a large variety of sediments derived from erosion of rocks in the mountain areas, consisting of clay, silt, sand, gravel and boulders, all carried into the valley and deposited by streams and other run-off. The larger particles were, logically, deposited near the mountains and constitute the principal areas of recharge to the valley fill. Near the center of the valley clay predominates to a very large extent and has been laid down to great thicknesses in some areas by ancient lakes. In all the valley fill areas a great variety of formations will be encountered in close proximity to each other. This is especially true of the Sunizona Acres Subdivision area, lying as it does in the Turkey Creek and Ash Creek alluvial belts.

The origins of the varying formations may be better understood if a stream channel can be imagined depositing a lens (or bar) of clay after one storm, but during a time of severe flooding depositing large areas of gravel, perhaps then to change course entirely leaving the old stream bed to fill with sand. The end result is a deposition of lens shaped and fingers of strata varying abruptly in gradation, consolidation, and texture both horizontally and vertically. Generally the gradation varys from large to smaller particles as the streams move away from the mountains and deposits out the larger particles as the velocity of flow slows. The widely varying formations show up in the drillers well logs, and correlation of individual formations from well to well is not generally possible. The beds are interconnected however, as shown in the uniform water table throughout the area. A typical cross-section is shown at the end of this report. The alluvial fill has been filled with water over a period of thousands of years, and now is being mined as is coal or copper ore, all over the State of Arizona with a resulting drop in the water level or water in storage.

II. GROUND WATER RESOURCES

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WILLCOX BASIN

The Willcox basin extends northwesterly from the drainage divide in the Sunizona Acres area to another divide at the headwaters of Aravaipa Creek some 56 miles distant. The basin is

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unique in that it has no natural outlet. All the water drains into a large flat southwest of the town of Willcox known as the Willcox Playa. Some ground water may drain from this basin through the valleys of alluvial fill near Pearce and Sunizona Acres, however whether this is true or what quantities are involved has never been proven.

Water is recharged to the Willcox Basin ground-water reservoir in the valley fill principally by runoff from the mountains into the coarse material adjacent to the mountains, but also by precipitation and the return of irrigation water to the underground storage. Some twentyfive percent of the irrigation water applied to the land returns to the water table. (Ref. #1) A very small amount of the rainfall on the valley area escapes evaporation or mesquite and other vegetation to reach the underground supply. The total amount of recharge to the basin is not known.

Discharge from the basin occurs by evaporation, estimated from 11,000 to 32,000 acre feet per year, by vegetation, principally mesquite, calculated to be 85,000 acre feet per year, and by underflow from the basin, quantity unknown, and by artificial discharge by well, pumped and artesian. In 1946, the estimated annual discharge from pumps was 200,000 acre feet. Since that time however, agricultural development has increased enormously and the water level has dropped as much as 60 feet in some wells in the center of activity in the Kansas Settlement area. While it was believed the annual safe yield of the basin had not been exceeded in the late 1940's, it undoubtedly has been at the present time. The amount of water in storage however, is ample to fulfill the demand in the foreseeable future.

DOUGLAS BASIN

The Douglas Basin extends southerly from the drainage divide of the Willcox basin thirty eight miles to the International Boundary Line and thence on into Mexico. It is centered about White water Draw which originates in Rucker Canyon in the Chiricahua Mountains and eventually crosses into Mexico where it is a tributary to the Yaqui River and thence to the Gulf of California.

Recharge to the basin occurs primarily where the runoff infiltrates into the coarse sand and gravel near the mountain fronts. Some movement of ground water into the basin may occur in the vicinity of Turkey Creek, as mentioned in this report. The amount of recharge from precipitation and irrigation of crops is believed to be very small in the Douglas Basin. The total amount of recharge is estimated at 22,000 acre feet per year, of which 20,000 acre feet is from run-off from the mountains.

Discharge of the ground water occurs from evaporation, believed to be negligible, transpiration by plants, principally mesquite, of some 8,000 to 13,000 acre feet annually, flow out of the basin at the International boundry and pumping. The flow out of the basin is esitimated at 7,000 acre feet per year. The amount pumped from wells was calculated in 1951 to be 41,000 acre feet. In summation the total amount of discharge in recent years must be approximately 70,000 acre feet annually and the recharge approximately 20,000 acre feet annually, the difference being withdrawn from storage. The maximum drop of water table in the basin has been observed to be about 40 feet in some wells in the last 50 years

although the maximum general decline has been only 10 feet since 1947, occuring around the center of agricultural activity near Elfrida. (Ref. #2)

III. QUALITY OF WATER

Waters in the Douglas Basin are classified as excellent to good for irrigation purposes and waters in the northern part of the basin are low is dissolved solids, generally less than one third of the suggested maximum of 1000 p.p.m. of the U.S. Public Health for muncipal water supply. (Ref. #2)

In the Willcox Basin the water away from the Playa is equal in quality to the water in the Douglas Basin, generally having 150 to 300 parts per million of dissolved solids and classified excellent to good as irrigation water. (Ref. #1)

Flouride is a problem in both basins and especially in the Willcox basin, in finding an acceptable domestic water supply. The maximum florine content should not exceed 1.5 parts per million for growing children without mottling of the tooth enamel. On the other hand a 1.0 p.p.m. flourine content is desirable to form teeth more resistent to decay. Sunizona Acres Subdivision is fortunate in having a flourine content in a desirable range of 0.8 p.p.m. and 1.5 p.p.m. Flourine is not expected to become a problem in the ground water available for domestic use in the Sunizona Acres Subdivision area.

A copy of a water quality test of water from one well in the Sunizona Acres Subdivision land is attached at the end of this report. It shows an excellent quality of underground water; approximately twice the quality as City of Tucson water in respect to total hardness and dissolved solids.

The Willcox basin, having no natural outlet, will gradually accumulate salts and other minerals as the water from the basin evaporates leaving behind these mineral elements in the remaining water and as irrigation and other water percolates through the subsoil to the water table, leaching out salts in the soil on the way down. Water from areas near the Playa are presently so highly mineralized as to be unfit for use either for irrigation purposes or drinking water. As the distance from the playa increases however the quality of ground water increases, and it is a safe assumption that ground water is the Sunizona Acres Subdivision area will not, in the foreseeable future, become too mineralised for domestic use.

IV. SUNIZONA ACRES WELLS

Geology

As mentioned above Sunizona Acres subdivsion lies between Ash Creek and Fivemile Creek and astraddle the Turkey Creek alluvium. These alluvial deposits are apparent from the drillers logs and the more permeable deposits (sand and gravel) furnish the water to the wells in Sunizona Acres. The surface water

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drainage divide is between Ash Creek and Turkey Creek, Ash Creek running into the Douglas Basin during periods of flow and Turkey Creek going to the Willcox Basin.

South of the subdivision area are Squaretop Hills and Ash Creek ridge and to the west are Turkey Creek Ridge and Sulphur Hills. These isolated buttes and ridges are probably a northwesternly extension of the Swisshelm Mountains, having similar structures and formations. They are formed of sedimentary and volcanic rocks interconnected below the surface with only the tops showing above the alluvial fill. A few outcrops of bedrock occur above the fill around these buttes and ridges and the thickness of fill between the various outcropping is probably directly proportional to the distance between them. This thickness of fill is important in predicting if any ground water moves from the Willcox basin into the Douglas Basin.

It is believed (Ref. #1) that the greatest thickness of fill occurs between Turkey Creek Ridge and Ash Creek Ridge, because of the following factors.

1. The distance between these ridges, approximately two miles.
2. Change from sedimentary rocks in Ash Creek Ridge to volcanic rock in Turkey Creek ridge perhaps due to faulting.

The results of the well drilled at the new sales office, which are discussed below, indicate that there is no flow between the Willcox and Douglas basins through this area. Whether or not this underground flow exists still only speculative and is, for the purposes of water supply, only an academic question.

The U.S. Geological Survey has recently completed a preliminary gravity anomaly survey in the Sunizona Acres area and is intending to make a more detailed survey and study in the near future (December 1961). The gravity measurments taken to date indicate, with certain factors known or assumed, the relative depth to bedrock, or conversely the thickness of alluvial fill. This preliminary survey shows the greatest thickness of fill to pass through the center of the subdivision and out to the north with a rapid decrease to the west and south and a more gradual decrease to the Pat Hills to the northeast. (see attached map) The amount of water available is more or less dependent upon this thickness of alluvial fill. Therefore it can be expected that wells will be better to the north with more depth of alluvial fill available and will be of decreasing capacity to the south and west. This depth of fill is of importance only when high volume irrigation type wells are desired. More detailed and accurate predictions of the thickness and type of alluvial fill will soon be available after the U.S. Geological Survey has completed its planned gravity survey and studies.

Well #5 at a four hundred foot depth and Well #7 at a four hundred and thirty-two foot depth were drilled very nearly to bedrock. While it is not believed these wells actually penetrated the bedrock, the high percentage of fractured volcanic rocks found in the bottom samples indicate the bottom of the water bearing alluvial fill was very near. Well #6 half way between these wells and at a depth of five hundred and three feet did not encounter these rocks, nor did any of the other wells. This is to emphasize that the top of the bedrock is not uniform but is as rough and irregular as the top of any surface range of hills. Indeed, an unfortunate

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driller may strike the top of some sub-surface peak much shallower and in a location not anticipated.

STATIC WATER LEVELS

From the existing well logs the static water level has been plotted and a copy of this profile is attached at the end of this report. From this profile the static water level can be determined within about five feet for any location adjacent the existing wells. Also readily apparent is the existing gradient of the water table, seen as approximately 10-11 feet per mile from east to west, the water moving very slowly (several hundred feet per year) (Ref. #3) from the mountains to the center of the basin. ~~chod yellow sheet~~. The static water level has declined very little in recent years. The level in a well (since abandoned) in the northeast quarter of section 6, approximately one-half mile from well #6 was measured in 1910 (Ref. #4) to be 100 feet below the surface. By projecting the present static water level it can be seen that the static water level has fallen only some 10 to 15 feet in the last fifty years. This decline will be accelerated with increased pumping in the area however.

PRODUCTION OF EXISTING WELLS

The majority of the wells that have been drilled in the subdivision area were better than expected, generally being of irrigation capacity. Pumping lifts were not excessive although the amount of drawdown was high in most cases. The best well, number seven, produces 1200 gallons per minute when tested to the capacity of the test pump, and will very likely would produce 1500 gallons per minute or more if equipped and pumped to the maximum. Well numbers five through ten were twelve inches in diameter and from 350 to 500 feet deep, and all have a capacity of six hundred g.p.m. or more which is considered ample for irrigation of the eighty acre parcels on which they are situated.

Copies of logs and the pumping test results are attached at t the end of this report. While the results were not perfectly consistent enough wells have been drilled and data accumulated that the production of any future well drilled within the area surrounding these wells can be closely predicted.

For a domestic supply only, say 5 to 10 gallons per minute a well would generally have to penetrate below the static water level some thirty to forty feet, or to a depth of some 150 feet in most areas. Well casing eight inches in diameter would be sufficient for a domestic well.

The old windmill well near the intersection of Fort Bowie Road and Chiracahua Drive is a good example of a domestic size well. This well is capable of almost ten gallons per minute when pumped down to its maximum depth of 141 feet. The static level in this well is 119 feet below the surface, thus having available some 20 feet of water-bearing strata. The casing is of relatively thin galvanized steel and is six inches in diameter. The method of perforating is unknown but was probably done by drilling circular holes with a brace and bit.

To obtain water in large amounts, sufficient for irrigation purposes a well should be at least 12 inches in diameter and drilled to a depth of four or five hundred feet depending upon the location. Slight artesian pressures exist in the lower formations and even though the formations are generally less permeable with depth, frequently a great deal of water has been found available at depths of 350 to 450 feet. This is especially true when the coarse, fractured formation (basal gravel) lying directly on top of bedrock is encountered. Obviously the better wells are to be found where the formations are an open and porous clean gravel and the poorer ones are drilled in higher percentage of impervious formation such as clay. Due to the valley fill conditions no correlation of the formations from one well to the other can be accurately made, neither can the formations to be encountered be accurately predicted.

The following conclusions, based on observation of and experience with the ten wells drilled to the present time, can be drawn and will hold true for the majority of cases.

1. With well depths of 350 to 500 feet ample water for irrigation purposes is available at a pumping lift of 250 to 300 feet.
2. Increased capacity can generally be obtained with an increase in depth until bedrock is hit, and the bottom formations generally are very productive.
3. Wells located most distant from the hills and ridges surrounding the subdivisiona area tend to be more productive.

Comparison of the capacities of wells #8 at 353 feet (660 g.p.m.) and #9 at 392 feet (940 g.p.m.) and the results of deepening well #6 bear out the conclusion of increased production with increased depth. Well #6 was initially drilled to 403 feet and had a capacity of 525 gpm when first tested. It was them deepened 100 feet the bottom sixty feet being in a hard cemented gravel formation, called "rock" by the driller, and an 78% increase in capacity to 925 gpm was gained. A comparison of the pumping test results (attached) for this well shows increased production at all the pumping levels tested, indicating artesian pressures in the lower formations encountered.

An adjacent well of interest is the well on the ranch land about one mile north of well number six. The pumping test conducted on it in July, 1958 showed the capacity to be in excess of 2500 gpm from a pumping level of 260 feet. The exact depth of this well is unknown but it is believed to be approximately five hundred feet. It has been reported that deepening of the well resulted in greatly increased production.

Well Number 11 was drilled in July, 1961 just across the surface drainage divide in the Douglas Basin. This well is located at the new sales office at the northeast corner of the intersection of highways 181 and 666 and is currently supplying water to the sales office. The static water level is 104 feet below the surface or at an elevation of 4192 feet. The sudden drop in the water table from the windmill well, (elevation 4238) a little over one mile east, to this well suggests that there is very littly, if any, interflow between the two wells, and the Douglas and Willcox basins, through the alluvial fill between Turkey Creek Ridge and Ash Creek Ridge.

A distinct difference in formation exists between Well # 11 and the other ten wells. fro a depth of 135 feet to bedrock at 222 feet the formation in well number eleven was a hard dirty black clay and shale which was non-water bearing. This well is currently producing about 10 gallons per minute from the more pervious formations at depths of 104 to 135 feet.

This black clay-shale formation was deposited by an ancient lake and very likely lies under a large area, probably all of the Sunizona Acres property lying within the Douglas Basin. Therefore no future wells for other than domestic supply, should be drilled in this area, which however, comprises only a very small percentage of the total Sunizona Acres Subdivision area.

VI CONCLUSION

Water in varying amounts is available underneath all of Sunizona Acres Subdivision. Domestic wells can be developed anywhere in the subdivision area and should cost between $1000 and $1500 when complete and equipped. Wells of irrigation capacity may be developed in most locations within the subdivision area with economic pumping lifts to be expected. The cost of drilling, casing, and testing of irrigation size wells can be estimated by the following formula:
Total cost = $0.90 x diameter of casing in inches x depth in feet.

Any report on water supply is necessarily limited and its accuracy controlled by the amount of information available. Accordingly when their proposed work is completed by the U.S. Geological Survey and as additional wells are drilled in the area this report will be revised to include this future information. Within the area results may be predicted with good accuracy. As wells are drilled further away from the existing wells less accuracy can be predicted and some suprizes may be in store. Also, by the nature of the science of geology and of subsurface formations, no exact statements and predictions can be made but it is hoped that this report gives clearly and accurately, within the above limitations, the ground water situation for Sunizona Acres subdivision.

ACKNOWLEDGEMENTS

Sincere appreciation is extended to members of the Tucson office of the United States Geological Survey, Ground Water Division for their assistance in assembling information, analyzing of samples and guidance during the writing of this report. Also appreciated was the excellent cooperation of the well drillers and in particular Myron Ingle, of Pearce, Arizona, whose knowledge and experience of local conditions was invaluable. Others assisting were Farmer's Pump Company Willcox, Frank Lange, Elfrida, and of course the staff of this Engineer. Also without the excellent and unusual cooperation of the Developer, The Willen Corporation of San Mateo, California whose desire was to test fully the available water supply none of this would have been possible.

REFERENCES

#1. Geology and ground-water resources of the Willcox Basin, Cochise and Graham Counties, Arizona. By R.S. Jones, R.L. Cushman, and J.D. Hem. May 1, 1947.

#2. Geology and ground-water resources of the Douglas basin, Arizona. By D.R. Coates and R.L. Cushman. U.S. Geol. Survey Water-Supply Paper 1354, 1955.

#3. Field Measurements of the rate of movement of underground water Slichter, G.S., U.S. Geological Survey Water-Supply Paper 140, 1905.

#4. Geology and water resources of Sulphur Spring Valley, Arizona. By O.E. Meinzer and F.C. Kelton, with a section on agriculture, by R.H. Forbes. U.S. Geol. Survey Water-Supply Paper 320. 1912.

Listed below are additional publication of interest to individuals seeking futher information on Southern Arizona Ground water.

1. Annual Report on Ground Water in Arizona, Arizona State Land Dept., Prepared annually by the U.S. Geological Survey, Phoenix, Arizona., Water Sources Report, published September each year.

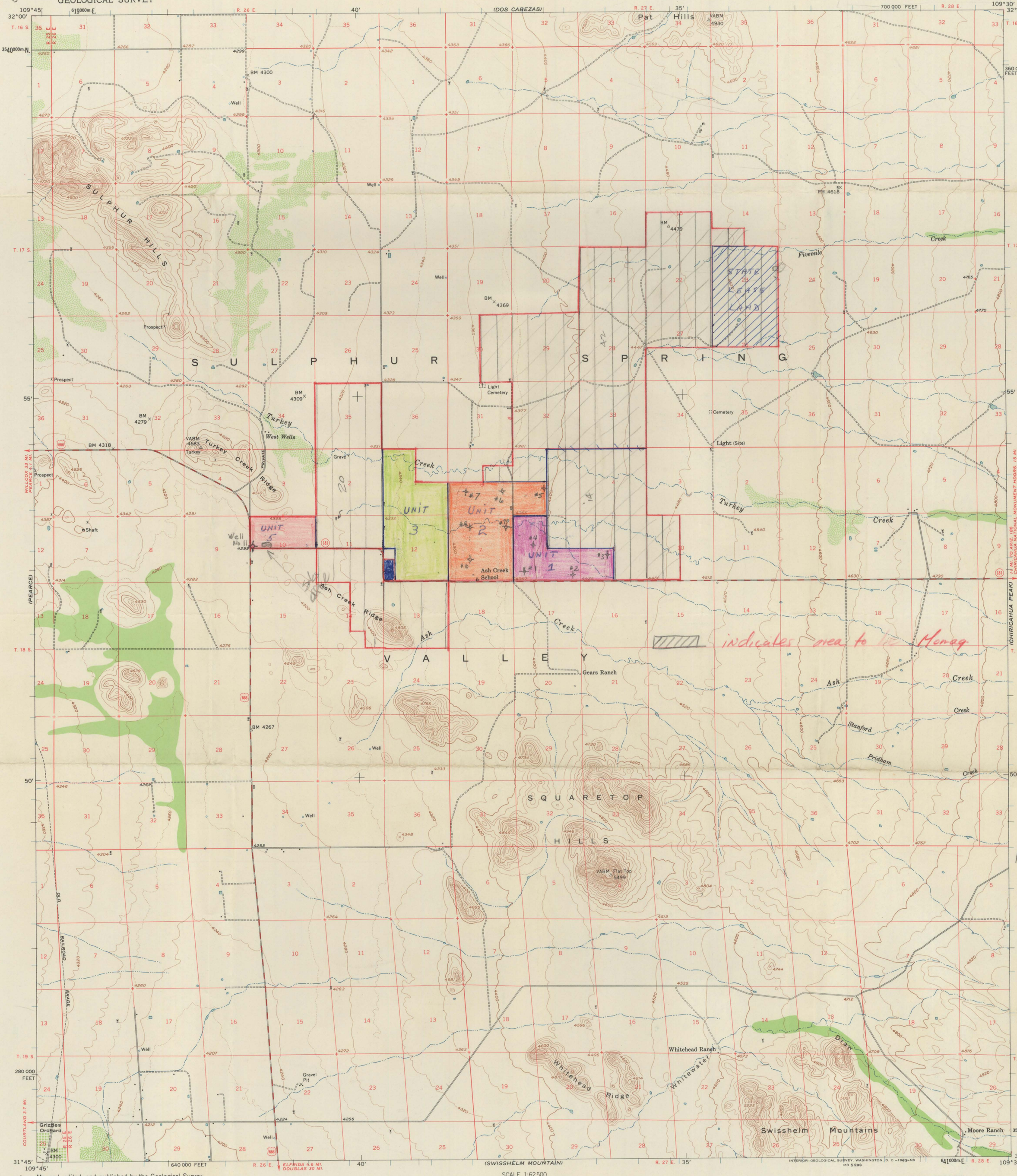
2. Ground Water in the Gila River Basin and adjacent Areas, Arizona a summary. U.S. Geological Survey Open File Report, 1952.

3. Ground water in San Simmon Valley, Arizona. By A.T. Schwennesen with a chapter on agriculture, by R.H. Forbes. U.S. Geol. Survey Water-Supply Paper 425-A. 1918.

PRELIMINARY

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SQUARETOP HILLS QUADRANGLE
ARIZONA—COCHISE CO.
15 MINUTE SERIES (TOPOGRAPHIC)



Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography from aerial photographs by ER-55 plotter
Aerial photographs taken 1956. Field check 1958

Polyconic projection. 1927 North American datum
10,000-foot grid based on Arizona coordinate system, east zone
1000-meter Universal Transverse Mercator grid ticks,
zone 12, shown in blue

Unchecked elevations are shown in brown

13°
TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 1958

SCALE 1:62 500

CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 20-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER 25, COLORADO OR WASHINGTON 25, D. C.
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

ARIZONA
QUADRANGLE LOCATION

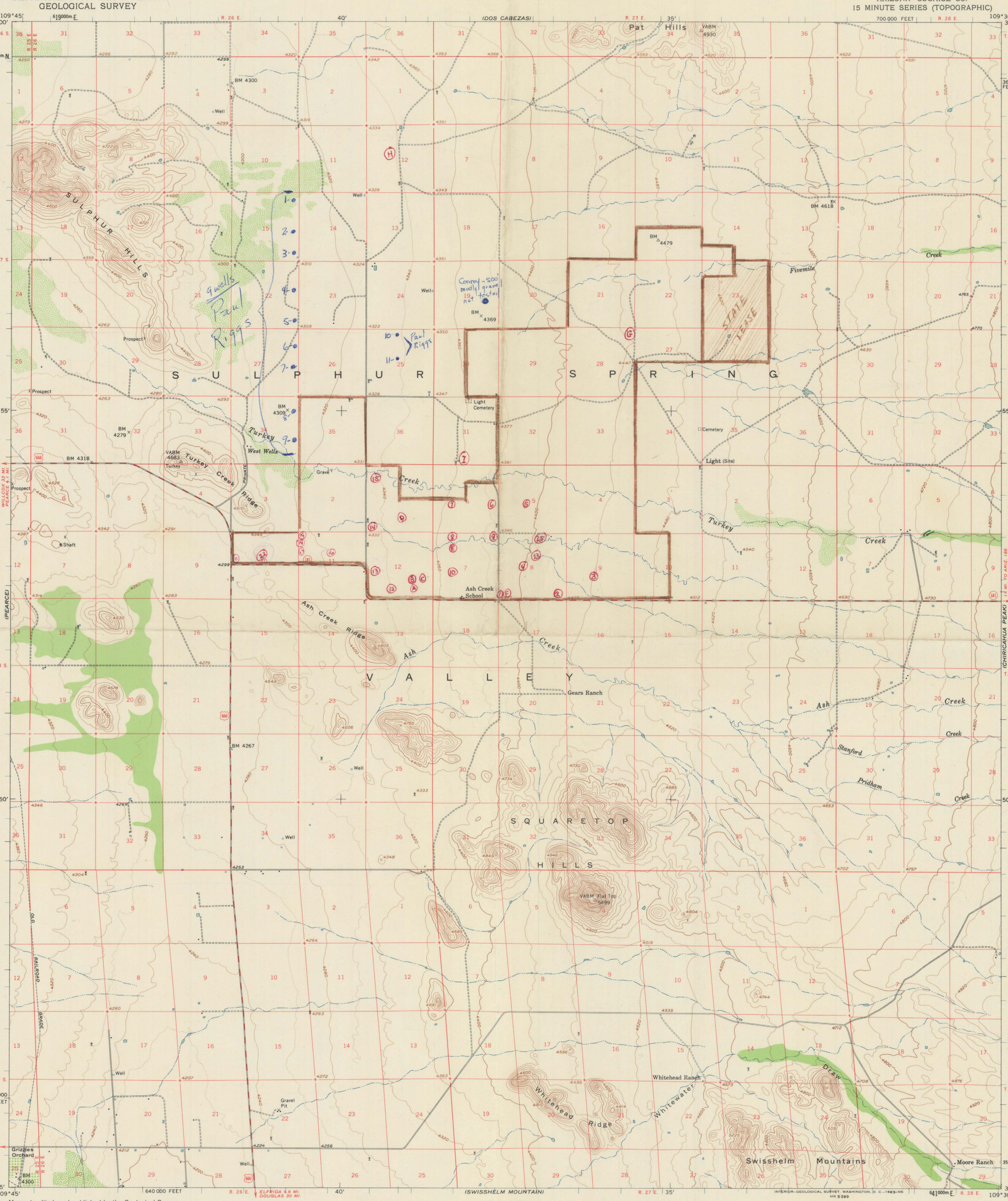
ROAD CLASSIFICATION
Medium-duty — Light-duty
Unimproved dirt
U. S. Route — State Route

SQUARETOP HILLS, ARIZ.
N3145—W10930/15
1958

SUNIZONA

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SQUARETOP HILLS QUADRANGLE
ARIZONA—COCHISE CO.
15 MINUTE SERIES (TOPOGRAPHIC)



Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography from aerial photographs by ER-55 plotter
Aerial photographs taken 1956. Field check 1958

Polyconic projection. 1927 North American datum
10,000-foot grid based on Arizona coordinate system, east zone
1000-meter Universal Transverse Mercator grid ticks,
zone 12, shown in blue

Unchecked elevations are shown in brown

TRUE NORTH
MAGNETIC NORTH
13°
APPROXIMATE MEAN DECLINATION, 1958

SCALE 1:62500

1 ½ 0 1 2 3 4 MILES

3000 0 3000 6000 9000 12000 15000 18000 21000 FEET

1 .5 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 20-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
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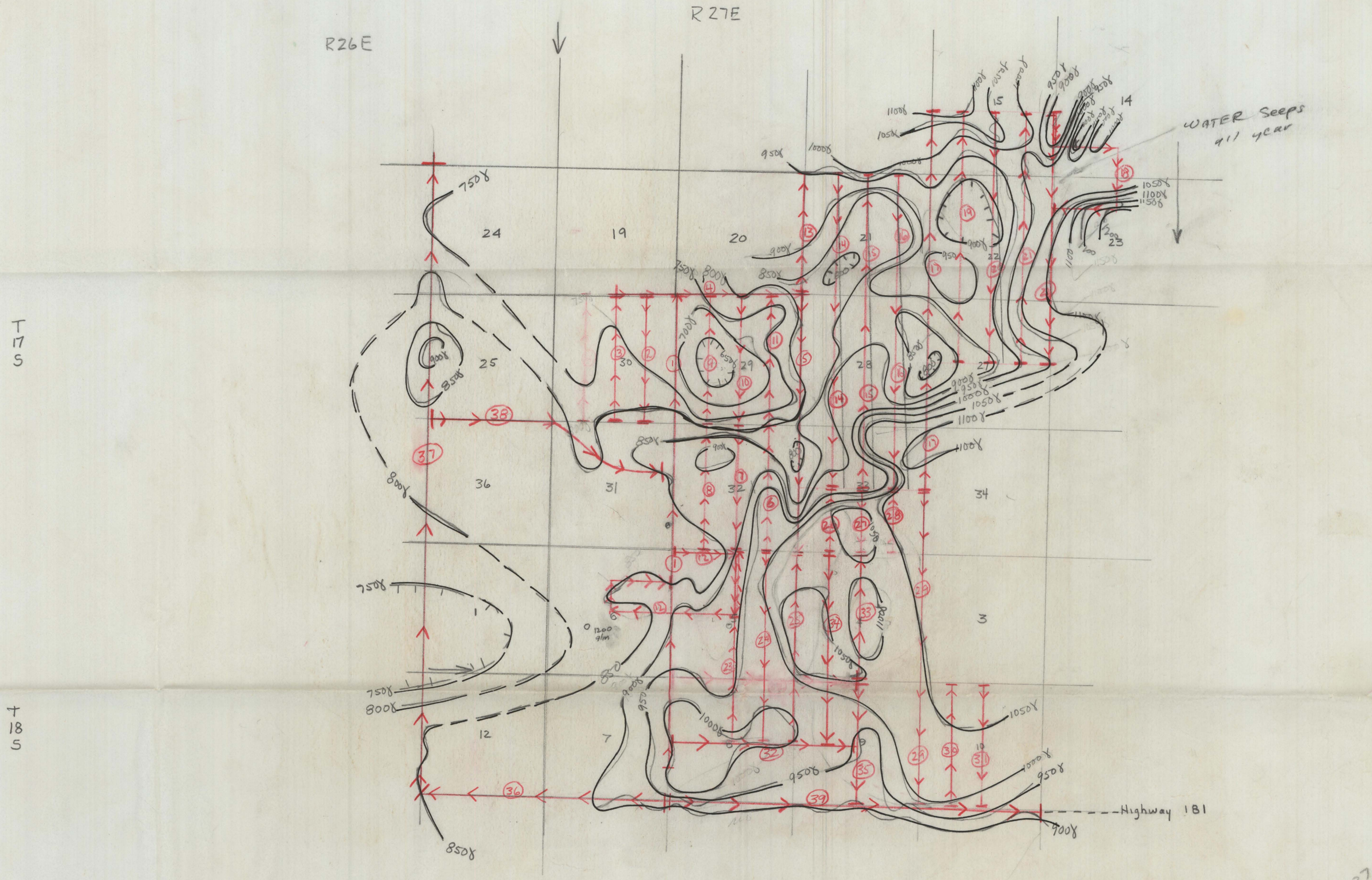
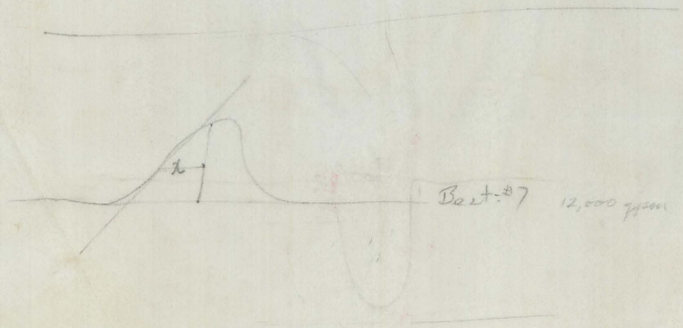
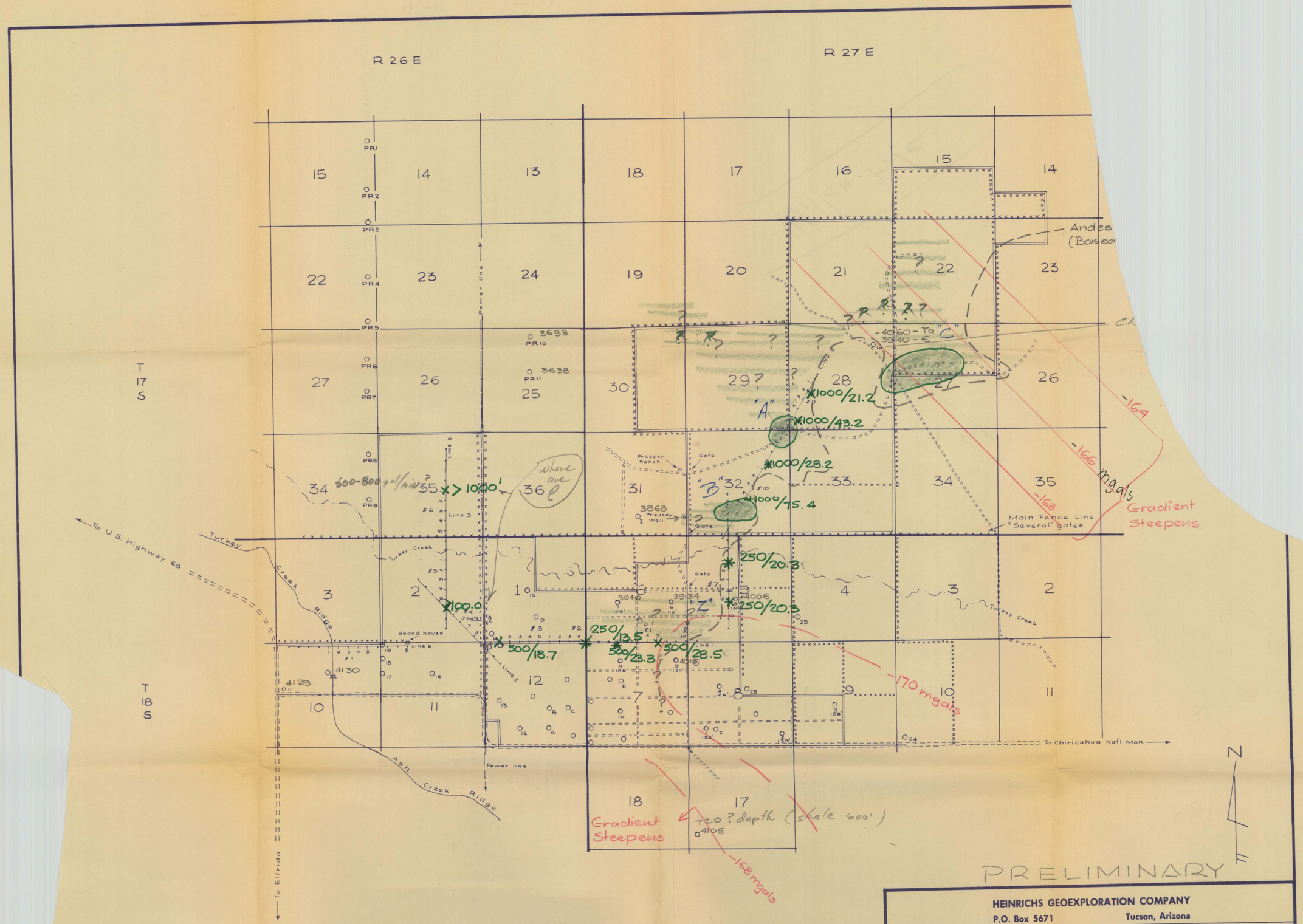

R26E
R27E
T 17 S
T 18 S
WATER Seeps all year
Highway 181
Momag traverse
Preliminary
Total coverage - 59 miles
Pressey Well
SE 1/4 Sec 31, T17S, R27E
Preliminary
7/1/65


Base #7 12,000 gamma



LEGEND

.—.—.	Power Line
x x x x x	Fence Line
	Windmill
	Well (PR = Paul Riggs)
=======	Road

Elevation Above Sea Level of Basement

* analytical depth to resistivity 2d layer showing depth/apparent resistivity ($\rho/2\pi$)

A Possibly good water

—— -170 mgals

Approximate location of gravity contour ~~shown in red~~ from U.S.G.S. data.

Horizontal control by brunton compass & chain on geophysical work

WILLEN CORP. SUNIZONA Acres Boundary

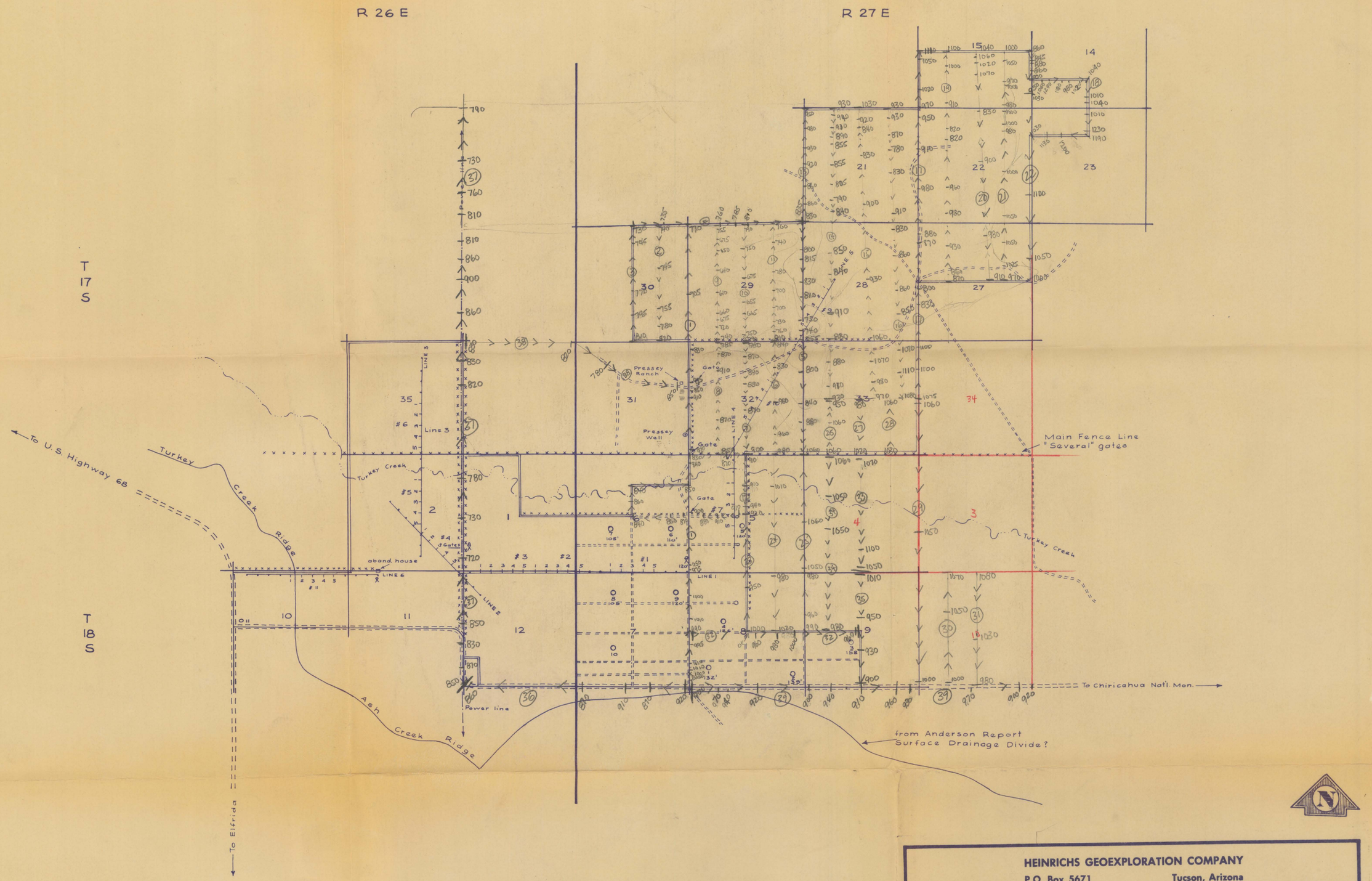
HEINRICHS GEOEXPLORATION COMPANY
P.O. Box 5671 Tucson, Arizona

RECONNAISANCE
INDUCED POLARIZATION
ELECTRICAL RESISTIVITY SURVEY
FOR
WILLEN CORPORATION

SUNIZONA ACRES PROJECT
Cochise County, Arizona

SCALE: 1" = 3000'	CONTOUR INTERVAL:	REVISIONS
	DATA BY: E. G. H.	7-10-65
DATE: APRIL 1962	SHEET OF	
DRAWN BY: I. B.	DRAWING NO.:	FILE:

~~Specific Capacity~~



LEGEND

·—·—·	Power Line
x x x x x	Fence Line
	Windmill
105'	Well
=======	Road

Horizontal control by brunton compass & chain on geophysical work

HEINRICHS GEOEXPLORATION COMPANY
P.O. Box 5671 Tucson, Arizona

RECONNAISANCE
INDUCED POLARIZATION
ELECTRICAL RESISTIVITY SURVEY
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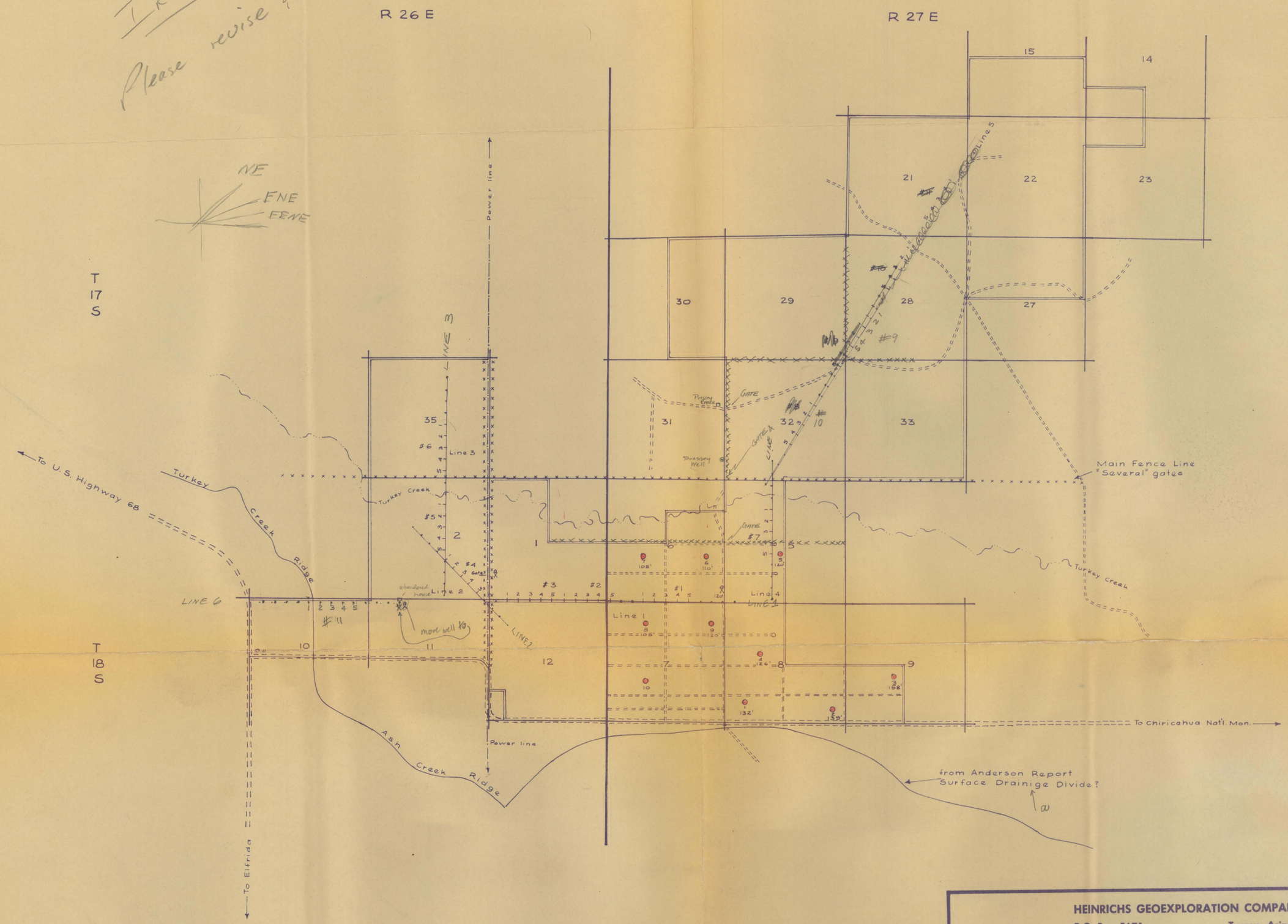
	DATA BY: E. G. H.	
DATE: APRIL 1962	SHEET OF	
DRAWN BY: I. B.	DRAWING NO.:	FILE:

IRENE

Please revise & add



LEGEND

·—·—·	Power Line
x x x x x	Fence Line
	Windmill
105'	Well
=======	Road

Note Horizontal control by brunton compass & chain on geophysical work

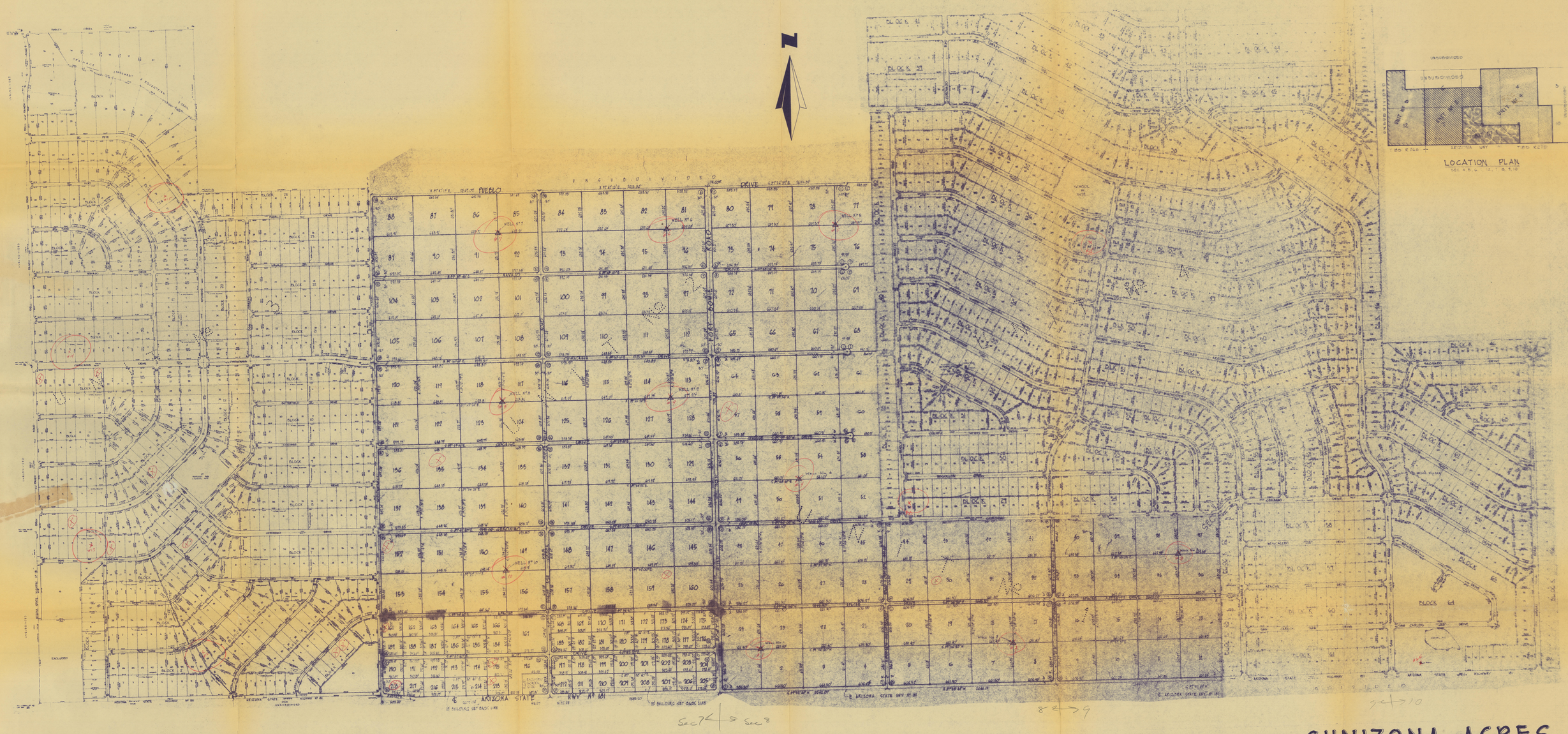
HEINRICHS GEOEXPLORATION COMPANY
P.O. Box 5671 Tucson, Arizona

RECONNAISANCE
INDUCED POLARIZATION
ELECTRICAL RESISTIVITY SURVEY
FOR
WILLEN CORPORATION

SUNIZONA ACRES PROJECT
Cochise, Arizona

SCALE: 1" = 3000'	CONTOUR INTERVAL:	REVISIONS
	DATA BY: E. G. H.	
DATE: APRIL 1962	SHEET OF	
DRAWN BY: I. B.	DRAWING NO.:	FILE:

R 26 E
R 27 E
T 17 S
15
14
Andesite Line? (Based on wells and Magnetics)
Proposed resistivity lines
PR1
PR2
PR3
PR4
PR5
PR6
PR7
PR8
PR9
PR10 3693
PR11 3638
30
29
31
4060 = Ta
3940 = E
1000/21.2
1000/43.2
1000/28.2
1000/75.4
Site for well if one is needed in this area
164
166
168
Gradient Steepens
170 mgals
Turkey
Creek
Ridge
Gilbert
Cusick
Myatt
Cook
Kohl
Washington
Baker
Burrell
Chrobak
Morris
Lewis
Davison
Fox
Power line
Not Basin Divide
gradient steepens
4105
Idozona
Ta-265
176 mgals
To Chiricahua Nat. Mon.
U.S.G.S. Grdwat. Divide
Don't Copy
from Anderson Report
Sulphur Drainage Divide?
Ed Davidson (USGS) believes this large low grav. nose is due to a large tuffaceous material in basement. This nose broadens and apparently extends to Chiricahuas. Control is very poor except in T18S, R27E
#1 Electrical Log T.D. ~ 540-550
Run resistivity from SE cor sec 33 to cor sec 29 to obtain resistivity at 2 sec. etc.
Data Summary
Elevation Above Sea level of Basement (?)
~~(where reached by drills)~~
X analytic depths to ~~2d layer (resistive)~~ resistive 2d layer showing depth/resistivity
~~P.R.L. Paul Riggs Wells~~
Possibly good water
Approximate location ~~of U.S.G.S.~~ of gravity contours shown in red (from USGS data)
LEGEND
Power Line
Fence Line
Windmill
Well
Road
Horizontal control by brunton compass & chain on geophysical work
HEINRICHS GEOEXPLORATION COMPANY
P.O. Box 5671 Tucson, Arizona
RECONNAISANCE
INDUCED POLARIZATION
ELECTRICAL RESISTIVITY SURVEY
FOR
WILLEN CORPORATION
SUNIZONA ACRES PROJECT
Cochise County, Arizona
SCALE: 1" = 3000'
CONTOUR INTERVAL:
REVISIONS
DATA BY: E. G. H.
DATE: APRIL 1962
SHEET OF
DRAWN BY: I B
DRAWING NO.:
FILE:



SUNIZONA ACRES

UNITS 1, 2, 3 & 4

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

HP

Project: Sunizona Line: 6 Spr. 11 E1/2 Int.Cal _____ Date: 4/26/62

Send												
Rec.	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
Time	10:05	10:09	1038	10:40	10.43	10:55	10:59	11 02	11:05	11:53	11:55	11:58
DC-1	21.8 21.8	1.80 1.80	11.2 11.2	4.0 4.0	.65 .67	7.0 7.0	2.70 2.70	1.23 1.23	.33 .33	1.52 1.52	.99 .99	.58 .58
DC-2	21.9 21.9	1.82 1.82	11.5 11.5	4.1 4.1	.63 .61	7.0 7.0	2.58 2.58	1.28 1.28	.29 .29	1.54 1.54	1.01 1.01	.52 .52
Σ	43.7 43.7	3.62 3.62	22.7 22.7	8.1 8.1	1.28 1.28	14.0 14.0	5.28 5.28	2.53 2.51	.62 .62	3.06 3.06	2.0 2.0	1.10 1.10
DC-3	21.7 21.8	1.78 1.80	11.2 11.4	4.0 4.0	.65 .68	7.0 7.0	2.70 2.70	1.22 1.21	.34 .36	1.52 1.51	.98 .98	.59 .59
Dc-4	22.0 21.9	1.84 1.82	11.5 11.6	4.1 4.1	.62 .60	7.0 7.0	2.58 2.58	1.29 1.30	.28 .26	1.54 1.56	1.02 1.02	.51 .51
Σ	43.7 43.7	3.62 3.62	22.7 22.7	8.1 8.1	1.27 1.28	14.0 14.0	5.28 5.28	2.51 2.51	.62 .62	3.06 3.07	2.0 2.0	1.10 1.10
DC-AV	43.7	3.62	22.7	8.10	1.28	14.0	5.28	2.51	.62	3.06	2.00	1.10
AC-1	20.7	1.80	10.9	3.9	.65	6.6	2.58	1.21	.31	1.48	.98	.53
AC-2	20.7	1.80	10.9	3.9	.65	6.6	2.58	1.22	.31	1.48	.98	.54
Σ	41.4	3.60	2.18	7.80	1.30	13.2	5.16	2.43	.62	2.96	1.96	1.07
S. P.		-1.1			+.3				+15.2			
AC-N		.03			.02				.04			
					Large bursts AC-N							

INDUCED POLARIZATION - RECEIVER NOTES PAGE

HP Project: Sunrozna Line: 4 Spr. 11 E/2 Int.Cal 50.5 / 50.5 Date: 4/26/62

Send	1-2	4-5	3-4	2-3	1-2		CAL	4-5				
Rec.												
Time	1201	1211	1214	1216	1220		9:53	954	9:57	1247	1251	1253
DC-1	.21 .21	.68 .70	.48 .42	.32 .32	.20 .20		27.0	34.2	72.5	27.0	34.0	71.5
DC-2	.18 .18	.59 .54	.55 .60	.31 .31	.12 .12		27.0	34.2	72.5	27.0	34.0	71.5
Σ	.39 .39	1.27 1.26	1.03 1.02	.63 .63	.32 .32							
DC-3	.21 .22	.70 .72	.46 .42	.36 .34	.20 .20		27.0	34.2	72.5	27.0	34.0	71.5
Dc-4	.18 .17	.57 .55	.62 .59	.33 .29	.12 .11		27.0	34.2	72.5	27.0	34.0	71.5
Σ	.39 .39	1.27 1.27	1.02 1.01	.63 .63	.32 .31							
DC-AV	.39	1.27	1.02	.63	.32		54.0	68.4	145.0	54.0	68.0	143.0
AC-1	.18	.62	.50	.31	.15		26.5	34.0	71.0	26.5	33.8	70.5
AC-2	.18	.62	.50	.31	.15		26.5	34.0	71.0	26.5	33.8	70.5
Σ	.36	1.24	1.00	.62	.30		53.0	68.0	142.0	53.0	67.6	141.0
S. P.	+16.0											
AC-N	.02											

water well + house Located
310 East

INDUCED POLARIZATION SENDER NOTES

Project: Sunizona Line: 5 SPR 11 E½ Date: 4-26-62

Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
Receive												
Time	10:05	10:09	10:38	10:40	10:43	10:55	10:59	11:02	11:05	11:53	11:55	11:58
Range	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
V	200	170	160	140	170	160	160	160	170	160	160	160
Current AC	1470	1470	1470	1440	1430	1450	1440	1430	1425	1420	1410	1400
Current DC	1470	1470	1470	1450	1440	1460	1450	1430	1430	1420	1420	1410
Send	1-2	4-5	3-4	2-3	1-2		Cal	4-5				
Receive												
Time	12:01	12:11	12:14	12:16	12:20		9:53	9:54	9:57	12:47	12:51	12:53
Range	1.5	1.5	1.5	1.5	1.5		.50	.75	1.5	.50	.75	1.5
V	160	160	170	160	180		100	140	180	120	120	160
Current AC	1395	1410	1400	1400	1395		540	690	1470	520	670	1390
Current DC	1395	1420	1410	1410	1395		560	690	1470	530	670	1380

Ω 1-2 110, 2-3 95, 3-4 85, 4-5 90

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

BB

Project: Sunizona Line: 6 Spr. 11 E½ Int.Cal _____ Date: 4/26/62

Soar

Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
Rec.	.5-1.0 E →		1.0-1.5 E		→	1.5-2.0 E			→	2.0-2.5 E		→
Time	1013	1015	1028	1030	1033	1118	1120	1123	1127	1137	1143	1147
DC-1	20.2 20.2	1.59 1.59	10.1 10.2	3.7 3.7	.57 .56	6.50 6.50	2.42 2.42	1.10 1.10	.24 .24	1.37 1.33	.85 .85	.51 .53
DC-2	20.2 20.2	1.62 1.62	10.1 10.0	3.7 3.7	.53 .54	6.40 6.40	2.42 2.42	1.12 1.11	.26 .24	1.39 1.48	.85 .85	.46 .44
Σ	40.4 40.4	3.21 3.21	20.2 20.2	7.4 7.4	1.1 1.1	12.9 12.9	4.84 4.84	2.22 2.21	.50 .50	2.76 2.76	1.70 1.70	.97 .97
DC-3	20.2 20.2	1.60 1.60	10.2 10.2	3.7 3.7	58 58	6.5 6.45	2.43 2.42	1.10 1.10	.25 .25	1.30 1.32	83 83	.54 .54
Dc-4	20.2 20.2	1.61 1.62	10.0 10.0	3.7 3.7	52 52	6.4 6.45	2.41 2.42	1.10 1.10	.26 .26	1.46 1.43	87 87	.43 .45
Σ	40.4 40.4	3.21 3.22	20.2 20.2	7.4 7.4	1.1 1.1	12.9 12.9	4.84 4.84	2.20 2.20	.51 .51	2.76 2.75	1.70 1.70	.97 .99
DC-AV	40.4	3.21	20.2	7.40	1.10	12.9	4.84	2.21	.505	2.76	1.70	.97
AC-1	19.2	1.52	9.5	3.45	.52	6.0	2.30	1.02	.23	1.27	.80	.45
AC-2	19.2	1.52	9.5	3.45	.52	6.0	2.30	1.03	.22	1.27	.79	.46
Σ	38.4	3.04	19.0	6.90	1.04	12.0	4.60	2.05	.45	2.54	1.59	.91
S. P.		-1.4			+.7				+16.0			
AC-N		.05			.06				.05			
					Full scale Burst							

BB

BB

INDUCED POLARIZATION - RECEIVER NOTES

PAGE _____

Project: Sunizona Line: 6 Spr. 11 E½ Int.Cal 46.5 / 46.0 Date: 4/26/62

Send	1-2	4-5	3-4	2-3	1-2		CAL	4-5				
Rec.	→	2.5	-3.0 E	→								
Time	1150	1223	1227	1230	1233		9:39	9:41	943	12:43	1244	1246
DC-1	.16 .17	.53 .53	.44 .45	.28 .30	.16 .14		24.0	31.2	70.2	23.5	31	68.0
DC-2	.14 .13	.52 .52	.42 .41	.26 .25	.10 .12		24.0	31.2	70.0	23.5	31	68.0
Σ	.30 .30	1.05 1.05	.86 .86	.54 .55	.26 .26		48.0	62.4	140.2	47.0	62.0	136.0
DC-3	.18 .18	.53 .53	.46 .44	.30 .30	.14 .14		24.0	31.0	70.2	23.5	31	68.0
Dc-4	.18 .13	.52 .52	.40 .42	.24 .24	.12 .12		24.0	31.0	70.2	23.5	31	68.0
Σ	.31 .31	1.05 1.05	.86 .86	.54 .54	.24 .26		48.0	62.0	140.4	47.0	62.0	136.0
DC-AV	.305	1.05	.86	.542	.26		48.0	62.2	140.3	47.0	62.0	136.0
AC-1	.13	.52	.41	.24	.11		22.5	29.2	67.5	22.0	29.0	65.0
AC-2	.14	.51	.42	.25	.11		22.5	29.2	67.5	22.0	29.0	65.0
Σ	.27	1.03	.83	.49	.22		45.0	58.4	135.0	44.0	58.0	130.0
S. P.	+16.7				+8.8							
AC-N	.05 Burst				.05							

BB Set

INDUCED POLARIZATION SENDER NOTES

Project: Sunizona Line: 5 SPR 11 E ½ Date: 4-26-62

Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
Receive												
Time	10:13	10:15	10:28	10:30	10:33	11:18	11:20	11:23	11:27	11:37	11:43	11:47
Range	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
V	160	170	160	160	180	160	160	160	180	180	160	180
Current AC	1475	1470	1470	1460	1450	1430	1430	1425	1420	1430	1420	1420
DC	1480	1470	1480	1470	1450	1440	1430	1425	1420	1430	1420	1420

Send	1-2	4-5	3-4	2-3	1-2		CAL	4-5				
Receive												
Time	11:50	12:23	12:27	12:30	12:33		9:39	9:41	9:43	12:43	12:44	12:46
Range	1.5	1.5	1.5	1.5	1.5		.50	.75	1.5	.50	.75	1.5
V	180	160	160	160	180		90	110	200	120	140	190
Current AC	1410	1400	1400	1395	1390		540	690	1470	520	670	1395
DC	1410	1400	1400	1395	1390		540	690	1470	530	670	1395

Ω 1-2 110, 2-3 95, 3-4 85, 4-5 90

10 N 1/2

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project Sunrizona Line 5 Spr. 10 N 1/2 Field date 4/24/62 Data page_____ Comp. date 4/30/62. Comp by E.G.H.

(A) Send	CAL.	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3
(B) Receive	1-2	.5-1.0N →		1.0-	1.5 No.	→	1.5-	2.0	N →		2.0-	2.5
(C) n separation		1	2	1	2	3	1	2	3	4	2	3
(D) I		1830	1830	1800	1810	1810	1810	1795	1780	1800	1770	1770
(E) Vdc (avg)		12.6	3.3	13.5	3.43	1.46	12.45	3.35	1.37	.79	3.255	1.41
(F) DCcal used	1.071											→
(G) Kn x 10^{-3}		1.5	6.0	1.5	6.0	15.0	1.5	6.0	15.0	30.0	6.0	15.0
(H) ρ dc=ExFxGx10^3/D		11.1	11.6	12.0	12.2	13.0	11.1	12.0	12.4	14.1	11.8	12.8
(I) Vac Σ		11.6	3.0	12.5	3.14	1.35	11.4	3.04	1.25	.70	2.94	1.29
(J) AC noise x 2		.12	→					→				→
(K) Vac(corr) $=\sqrt{(I)^2 - J^2}$		11.6	3.0	12.5	3.14	1.35	11.4	3.04	1.25	.69	2.94	1.29
(L) AC-DC cal. used	.949											→
(M) ρ dc/ρac=ExL/K		1.031	1.044	1.025	1.037	1.026	1.036	1.046	1.040	1.088	1.050	1.038
(N) PFE=(M-1)(10^2)		3	4	3	4	3	4	5	4	9	5	4
(O) MCF=(M-1)(10^5)/H		279	379	208	303	200	324	383	322	625	424	297

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	3-4	4-5	1-2	2-3	3-4	4-5	CAL	1-2				
(B) Receive	→		2.5-	3.0	→							
(C) n separation	4	5	3	4	5	6						
(D) I	1750	1770	1740	1730	1740	1750	680	1450	1830	660	1370	1720
(E) Vdc (avg)	.78	.47	1.45	.84	.49	.34	62.0	141.0	168.0	60.0	134.0	158.0
(F) DCcal 1.071 used						→	1.097	1.028	1.089	1.100	1.022	1.089
(G) Kn x 10^{-3}	30.0	52.5	15.0	30.0	52.5	84.0						
(H) ρ dc=ExFxGx10^3/D	14.3	14.9	13.4	15.6	15.8	17.5						
(I) Vac Σ	.69	.44	1.33	.75	.45	.30	59.0	134	158	57	128	150.0
(J) AC noise x 2	.12					→						
(K) Vac (corr) $=\sqrt{I^2 - J^2}$	.68	.425	1.33	.74	.434	.276						
(L) AC-DC cal. used .949						→	.952	.950	.940	.950	.955	.949
(M) ρdc/ρac =ExL/K	1.089	1.049	1.034	1.078	1.071	1.169						
(N) PFE=(M-1)(10^2)	9	5	3	8	7	17						
(O) MCF=(M-1)(10^5)/H	622	329	254	500	450	966						

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1114 57

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: Sunizona Line: 5 Spr. 10 N½ Int.Cal _____ Date: 4/24/62

Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
Rec.	.5-1.0	N →	1.0 -	1.5 N	→	1.5 -	2.0 N	→	→	2.0	- 2.5	N →
Time	11:26	11:35	11:47	11:56	11:53	12:50	12:54	12:58	13:02	13:11	13:14	13:18
DC-1	6.3 6.3	1.64 1.65	6.8 6.8	1.73 1.73	.72 .73	6.25 6.25	1.65 1.62	.72 .77	.37 .38	1.62 1.62	.78 .80	.40 .36
DC-2	6.3 6.3	1.66 1.67	6.7 6.7	1.70 1.70	.73 .73	6.20 6.20	1.70 1.73	.65 .60	.42 .41	1.63 1.63	.62 .60	.39 .42
Σ	12.6 12.6	3.30 3.32	1.36 1.35	3.43 3.43	1.45 1.46	12.45 12.45	3.35 3.33	1.37 1.37	.79 .79	3.25 3.25	1.40 1.40	.79 .78
DC-3	6.35 6.3	1.60 1.60	6.8 6.8	1.74 1.76	.73 .73	6.25 6.8	1.60 1.59	.79 .85	.39 .39	1.68 1.67	.73 .78	.36 .34
Dc-4	6.25 6.3	1.72 1.72	6.7 6.7	1.69 1.68	.73 .73	6.20 6.15	1.75 1.76	.56 .52	.39 .38	1.59 1.59	.68 .63	.42 .44
Σ	12.66 12.55	3.32 3.32	1.35 1.35	3.43 3.44	1.46 1.46	12.45 12.45	3.35 3.35	1.35 1.37	.78 .77	3.27 3.26	1.41 1.41	.78 .78
DC-AV	12.60	3.3	13.5	3.43	1.46	12.45	3.35	1.37	.79	3.255	1.41	.78
AC-1	5.8	1.50	6.25	1.57	.68	5.7	1.52	.62	.35	1.47	.65	.34
AC-2	5.8	1.50	6.25	1.57	.67	5.7	1.52	.63	.35	1.47	.64	.35
Σ	11.6	3.0	12.5	3.14	1.35	11.4	3.04	1.25	.70	2.94	1.29	.69
S. P.		-6.5							-4.2			
AC-N		.06							.06			
		.2										

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: Sunizona Line: 5 Spr. 10N½ Int.Cal 46.8 AM 45.8 PM Date: 4/24/62

Send	4-5	1-2	2-3	3-4	4-5		CAL.	1-2				
Rec.	→	2.5	-3.0	N	→							
Time	1320	1331	1333	1336	1339		11.07	11.09	1112	1350	1352	14:06
DC-1	.20 .20	.75 .75	.42 .42	.20 .25	.16 .15		31.0	70.5	84.0	30.0	67.0	79.0
DC-2	.26 .27	.70 .70	.42 .42	.24 .24	.18 .19		31.0	70.5	84.0	30.0	67.0	79.0
Σ	.46 .47	1.45 1.45	.84 .84	.49 .49	.34 .34							
DC-3	.22 .24	.75 .75	.41 .42	.22 .22	.14 .13		31.0	70.5	84.0	30.0	67.0	79.0
Dc-4	.25 .24	.70 .69	.42 .42	.26 .26	.20 .21		31.0	70.5	84.0	30.0	67.0	79.0
Σ	.47 .48	1.45 1.45	.83 .83	.48 .48	.34 .34							
DC-AV	.47	1.45	.84	.49	.34		62.0	141.0	168.0	60.0	134.0	158.0
AC-1	.22	.66	.37	.22	.15		29.5	67.0	79.0	28.5	64.0	75.0
AC-2	.22	.67	.38	.23	.15		29.5	67.0	79.0	28.5	64.0	75.0
Σ	.44	1.33	.75	.45	.30		59.0	134	158.0	57.0	128.0	150.0
S. P.	-4.8				+15.4							
AC-N	.06				.06							

INDUCED POLARIZATION SENDER NOTES

Project: Sunizona Line: 5 SPR 10 N½ Date: 4-24-62

Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
Receive	5→1.0 N		1.0→1.5	N		1.5	→	2.0	N	2.0→		
Time	11:26	11:35	11:47	11:50	11:53	12:50	12:54	12:58	13:02	13:11	13:14	13:18
Range	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	220	180	220	220	180	200	200	200	200	210	220	190
Current AC	1830	1830	1800	1810	1810	1810	1795	1780	1800	1770	1770	1750
Current DC	1825	1840	1790	1810	1820	1800	1800	1800	1820	1770	1770	1760
Send	4-5	1-2	2-3	3-4	4-5		Cal	1-2				
Receive	2.5 N	2.5	→	3.0	N							
Time	13:20	13:31	13:33	13:36	13:39		11:07	11:09	11:12	13:50	13:52	14:01
Range	2.0	2.0	2.0	2.0	2.0		.75	1.5	2.0	.75	1.5	2.0
	180	200	260	220	200		160	220	240	190	220	240
Current AC	1770	1740	1730	1740	1740		680	1440	1830	650	1360	1720
Current DC	1770	1740	1740	1740	1750		680	1450	1830	660	1370	1720

Ω 1-2 120, 2-3 175, 3-4 130, 4-5 80

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HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project Sunizona Line 5 Spr.10 5 1/2 Field date 4/24/62 Data page_____ Comp. date 4/30/62. Comp by E.G.H.

(A) Send	CAL.	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4
(B) Receive		.5 -	1.05 →	1.0 -	1.55	→	1.5	5 - 2.0	→	→	2.0 -	2.5
(C) n separation		1	2	1	2	3	1	2	3	4	2	3
(D) I		1750	1745	1730	1740	1730	1750	1725	1725	1725	1750	1740
(E) Vdc (avg)		13.8	3.14	12.6	3.4	1.33	14.4	3.46	1.535	.835	3.51	1.44
(F) DCcal 1.081 used	1.081	→	→	→	→	→	→	→	→	→	→	→
(G) Kn x 10^{-3}		1.5	6.0	1.5	6.0	15.0	1.5	6.0	15.0	30.0	6.0	15.0
(H) ρ dc=ExFxGx10^3/D		12.8	11.7	11.8	12.7	12.5	13.3	13.0	14.4	15.7	13.0	13.4
(I) Vac Σ		13.0	2.90	11.8	3.14	1.24	13.5	3.20	1.44	.75	3.26	1.37
(J) AC noise x 2		.08	→	→	→	→	.12	→	→	.12	.10	→
(K) Vac(corr) = $\sqrt{I^2 - J^2}$		13.0	2.90	11.8	3.14	1.24	13.5	3.20	1.44	.74	3.26	1.37
(L) AC-DC cal. Used	.957											
(M) ρ dc/ρac=ExL/K		1.016	1.038	1.021	1.035	1.027	1.020	1.035	1.020	1.081	1.030	1.006
(N) PFE=(M-1)(10^2)		2	4	2	4	3	2	4	2	8	3	1
(O) MCF=(M-1)(10^5)/H		125	325	178	276	216	150	269	139	515	231	45

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	2-3	1-2	4-5	3-4	2-3	1-2	CAL.	1-2	N 1/2 &	5 1/2		
(B) Receive	→	→	2.5 -	3.0	5	→						
(C) n separation	4	5	3	4	5	6	Note averaged 1.071 of N 1/2 with					
(D) I	1740	1730	1760	1730	1730	1725	below and			650	1350	1700
(E) Vdc (avg)	.89	.52	1.565	.885	.58	.395	used 1.081			58.0	129.0	154
(F) DCcal 1.081 used	→	→	→	→	→	→				1.121	1.047	1.104
(G) Kn x 10^{-3}	30.0	52.5	15.0	30	52.5	84.0						
(H) ρ dc=ExFxGx10^3/D	16.6	17.1	14.4	16.6	19.0	20.8						
(I) Vac Σ	.82	.46	1.43	.79	.51	.33				56.0	126.0	146.0
(J) AC noise x 2	.10	→	.12	→	→	→						
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	.814	.448	1.43	.781	.496	.309						
(L) AC-DC cal. used .957	→	→	→	→	→	→				.966	.977	.948
(M) ρdc/ρac =ExL/K	1.048	1.111	1.047	1.072	1.118	1.224						
(N) PFE=(M-1)(10^2)	5	11	5	7	12	22						
(O) MCF=(M-1)(10^5)/H	289	650	326	434	621	1077						

1 198

1.146

15 703

.963

1.038
1.053
2.91

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: Sumizona Line: 5 Spr. 10 S½ Int.Cal _____ Date: 4/24/62

Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
Rec.	1.5-1.0 S →		1.0-1.5 S →			1.5 S	2.0 S →			2.0-2.5 S →		
Time	1429	1433	1443	1447	1450	1507	1512	1516	1520	1553	1555	1559
DC-1	6.9 6.9	1.55 1.62	6.35 6.40	1.70 1.68	.68 .70	.71 .71	1.70 1.73	.70 .68	.38 .35	1.76 1.76	.73 .74	.44 .44
DC-2	6.9 6.9	1.59 1.62	6.25 6.20	1.70 1.73	.65 .63	.73 .73	1.76 1.72	.84 .86	.46 .50	1.75 1.75	.71 .70	.43 .43
Σ	13.8 13.8	3.14 3.14	12.60 12.60	3.40 3.40	1.33 1.33	1.44 1.44	3.44 3.45	1.54 1.54	.84 .85	3.51 3.51	1.44 1.44	.89 .89
DC-3	6.9 6.9	1.48 1.46	6.45 6.50	1.68 1.72	.73 .76	.71 .71	1.70 1.68	.75 .70	.43 .41	1.75 1.78	.72 .72	.46 .46
Dc-4	6.9 6.9	1.66 1.69	6.15 6.10	1.80 1.68	.60 .58	.73 .73	1.77 1.78	.79 .82	.40 .42	1.76 1.74	.72 .72	.43 .42
Σ	13.8 13.8	3.14 3.15	12.40 12.40	3.40 3.40	1.33 1.34	1.44 1.44	3.47 3.46	1.54 1.52	.83 .83	3.51 3.52	1.44 1.44	.89 .88
DC-AV	13.8	3.14	12.6	3.4	1.33	14.4	3.46	1.535	.835	3.51	1.44	.89
AC-1	6.5	1.45	5.9	1.57	.62	6.75	1.60	.72	.37	1.63	.68	.41
AC-2	6.5	1.45	5.9	1.57	.62	6.75	1.60	.72	.38	1.63	.69	.41
Σ	13.0	2.90	11.8	3.14	1.24	13.50	2.20	1.44	.75	3.26	1.37	.82
S. P.		+0.5			+11.4				+17.0			
AC-N		.04			.04				.06			

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: Sunizona Line: 5 Spr. 10 5½ Int.Cal 45.0 Date: 4/24/62

Send	1-2	4-5	3-4	2-3	1-2		CAL	1-2	Sec	N½	Spr.	10
Rec.	→	2.5	3.0	So	→							
Time	1602	1620	1626	1628	1633		16:45	16:47	1649			
DC-1	.26 .25	.75 .72	.42 .42	.30 .31	.14 .18		29.0	64.5	77.0			
DC-2	.27 .27	.82 .84	.47 .47	.28 .27	.21 .23		29.0	64.5	77.0			
Σ	.53 .52	1.57 1.56	.89 .89	.58 .58	.40 .41							
DC-3	.26 .26	.70 .72	.39 .39	.32 .33	.22 .23		29.0	64.5	77.0			
Dc-4	.26 .26	.86 .85	.49 .49	.26 .26	.17 .16		29.0	64.5	77.0			
Σ	.52 .52	1.54 1.57	.88 .88	.58 .59	.39 .39		58.0	129.0	154.0			
DC-AV	.52	1.565	.885	.58	.395							
AC-1	.23	.72	.39	.25	.16		28.0	63.0	73.0			
AC-2	.23	.71	.40	.24	.17		28.0	63.0	73.0			
Σ	.46	1.43	.79	.51	.33		56.0	126.0	146.0			
S. P.	+5.2				+5.7							
AC-N	.05				.06							

INDUCED POLARIZATION SENDER NOTES

Project: Sumizona Line: 5 SPR 10 55 Date: 4-24-62

Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
Receive												
Time	14:29	14:33	14:43	14:47	14:50	15:07	15:12	15:16	15:20	15:53	15:55	15:59
Range	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
V	220	240	220	220	220	180	200	220	240	200	220	240
Current AC	1750	1740	1730	1740	1730	1750	1725	1720	1720	1750	1740	
Current DC	1750	1750	1730	1740	1730	1750	1730	1730	1730	1755	1740	1740

Send	1-2	4-5	3-4	2-3	1-2		Cal	1-2				
Receive												
Time	16:02	16:20	16:26	16:28	16:33		16:45	16:47	16:49			
Range	2.0	2.0	2.0	2.0	2.0		.75	1.5	2.0			
V	200	220	200	220	220		140	220	240			
Current AC	1730	1760	1730	1730	1720		450	1350	1700			
Current DC	1730	1760	1735	1730	1730		450	1350	1700			

BB

11 W½

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project Sunizona Line 6 Spw11 W½ Field date 4/25/62 500a Data page_____ Comp. date 4/30/62 Comp by E.G.H.

(A) Send	CAL.	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3
(B) Receive		.5-1.0	W →	1.0-	1.5 W	→	1.5W	-2.0	→	→	2.0-	2.5
(C) n separation		1	2	1	2	3	1	2	3	4	2	3
(D) I		1450	1445	1445	1425	1420	1440	1415	1410	1400	1410	1390
(E) Vdc (avg)		34.9	3.185	26.4	2.475	0.66	10.5	3.32	1.41	0.58	4.6	2.595
(F) DCcal used	1.096	→	→	→	→	→	→	→	→	→	→	→
(G) Kn x 10^{-3}		1.5	6.0	1.5	6.0	15.0	1.5	6.0	15.0	30.0	6.0	15.0
(H) ρ dc=ExFxGx10^3/D		39.6	14.5	36.0	11.4	7.64	12.0	15.4	16.4	13.6	21.5	30.7
(I) Vac Σ		32.0	2.99	24.6	2.34	.65	10.0	3.16	1.35	.52	4.40	2.40
(J) AC noise x 2		.16	→	→	→	→	.14	→	→	→	.16	→
(K) Vac(corr) = $\sqrt{I^2 - J^2}$		32.0	2.99	24.6	2.34	0.63	10.0	3.16	1.34	0.50	4.40	2.40
(L) AC-DC cal. used	.952	→	→	→	→	→	→	→	→	→	→	→
(M) ρ dc/ρac=ExL/K		1.039	1.015	1.021	1.007	0.996	1.000	1.000	1.001	1.103	0.995	1.030
(N) PFE=(M-1)(10^2)		4	2	2	1	0	0	0	0	10	0	3
(O) MCF=(M-1)(10^5)/H		98	104	70	61	-53	0	0	6	758	-23	98

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	3-4	4-5	1-2	2-3	3-4	4-5	CAL.	1-2				
(B) Receive	→	→	2.5-	3.0	W →	→						
(C) n separation	4	5	3	4	5	6						
(D) I	1380	1380	1395	1390	1380	1370	680	1425	530	520	670	1380
(E) Vdc (avg)	1.305	0.55	2.35	1.50	0.92	0.415	61.0	136.4	47.0	46.0	60.0	132.4
(F) DCcal 1.096	→	→	→	→	→	→	1.115	1.045	1.128	1.130	1.117	1.042
(G) Kn x 10^{-3}	30	52.5	15.0	30.0	52.5	84.0						
(H) ρ dc=ExFxGx10^3/D	31.1	22.9	27.7	35.5	38.4	27.9						
(I) Vac Σ	1.20	.50	2.24	1.40	.87	.35	58.0	130.0	44.0	44.0	57.0	128.0
(J) AC noise x 2	.16	→	→	→	→	→						
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	1.19	0.474	2.24	1.39	.855	0.31						
(L) AC-DC cal.	.952	→	→	→	→	→	.951	.953	.936	.957	.950	.967
(M) ρdc/ρac =ExL/K	1.044	1.104	0.999	1.028	1.025	1.274						
(N) PFE=(M-1)(10^2)	4	10	0	3	3	27						
(O) MCF=(M-1)(10^5)/H	141	454	-4	79	65	984						

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: Sunrizona Line: 6 Spr. 11W Int.Cal 46.5 / 45.8 Date: 4/25/62

Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
Rec.	.5-1.0W		1.0-	1.5W	→	1.5-	2.0W	→		2.0	-2.5W	→
Time	1305	1314	1429	1457	1500	1515	1523	1527	15:36	1553	1557	1602
DC-1	17.6 17.6	1.62 1.55	13.2 13.2	1.28 1.27	.32 .36	5.3 5.3	1.70 1.70	.68 .73	.32 .38	2.4 2.3	1.30 1.25	.72 .78
DC-2	17.3 17.3	1.55 1.62	13.2 13.2	1.20 1.20	.34 .30	5.2 5.2	1.62 1.62	.75 .69	.25 .26	2.2 2.3	1.30 1.35	.58 .52
Σ	34.9 34.9	3.17 3.17	26.4 26.4	2.48 2.47	.66 .66	10.5 10.5	3.32 3.32	1.43 1.42	.57 .58	4.6 4.6	2.60 2.60	1.30 1.30
DC-3	17.6 17.6	1.55 1.55	13.2 13.2	1.20 1.20	.38 .36	5.3 5.4	1.70 1.72	.65 .65	.28 .30	2.5 2.5	1.20 1.20	.68 .63
Dc-4	17.3 17.3	1.63 1.63	13.2 13.2	1.27 1.28	.28 .30	5.2 5.1	1.62 1.59	.75 .75	.31 .27	2.1 2.1	1.40 1.38	.63 .68
Σ	34.9 34.9	3.18 3.18	26.4 26.4	2.47 2.48	.66 .66	10.5 10.5	3.32 3.31	1.40 1.40	.57 .59	4.6 4.6	2.60 2.58	1.31 1.31
DC-AV	34.9	3.185	26.4	2.475	.66	10.5	3.32	1.41	.58	4.6	2.595	1.305
AC-1	16.0	1.49	12.3	1.17	.33	5.0	1.58	.68	.26	2.2	1.20	.60
AC-2	16.0	1.50	12.3	1.17	.32	5.0	1.58	.67	.26	2.2	1.20	.60
Σ	32.0	2.99	24.6	2.34	.65	10.0	3.16	1.35	.52	4.40	2.40	1.20
S. P.		+5.6			-10.3				+4.8			
AC-N		2.08			.08				.07			
	Extremely Windy CONDITIONS					drifting S.P.						

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: Sunizona Line: 6 Spr. 11 W/2 Int.Cal _____ Date: 4/25/62

Send	4-5	1-2	2-3	3-4	4-5		CAL	1-2				
Rec.	→	2.5	3.0	W	→		.75	1.5	.50	.50	.75	
Time	1612	1630	1635	1640	1643		1130	1132	1142	16:58	17:00	17:03
DC-1	.30 .35	1.20 1.20	.78 .78	.38 .55	.30 .32		30.5	68.2	23.5	23.0	30.0	66.2
DC-2	.20 .20	1.15 1.16	.72 .72	.54 .35	.10 .10		30.5	68.2	23.5	23.0	30.0	66.2
Σ	.55 .55	2.35 2.34	1.50 .50	.92 .90	.40 .42							
DC-3	.35 .30	1.20 1.15	.80 .78	.38 .36	.16 .18		30.5	68.2	23.5	23.0	30.0	66.2
Dc-4	.20 .25	1.15 1.18	.69 .73	.54 .56	.24 .23		30.5	68.2	23.5	23.0	30.0	66.2
Σ	.55 .55	2.35 2.33	1.49 .51	.92 .92	.40 .41							
DC-AV	.55	2.35	1.50	.92	.415		61.0	136.4	47.0	46.0	60.0	132.4
AC-1	.25	1.12	.70	.44	.18		29.0	65.0	22.0	22.0	28.5	64.0
AC-2	.25	1.12	.70	.43	.17		29.0	65.0	22.0	22.0	28.5	64.0
Σ	.50	2.24	1.40	.87	.35		58.0	130.0	44.0	44.0	57.0	128.0
S. P.	-13.0				-18.0							
AC-N	.08				.08							

INDUCED POLARIZATION SENDER NOTES

Project: Gunizona Line: 6 SPR 11 W½ Date: 4-25-62

Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
Receive	.5-	1.0 →	1.0 -	1.5	→	1.5 -	2.0	→		2.0	- 2.5	→
Time	13:05	13:14	14:49	14:57	15:00	15:15	13:23	15:27	15:36	15:53	15:52	16:02
Range	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
V	210	200	170	200	200	210	180	200	200	200	200	200
Current AC	1440	1440	1440	1420	1420	1430	1400	1410	1390	1410	1390	1380
Current DC	1460	1450	1450	1430	1420	1450	1430	1410	1410	1410	1390	1380

Send	4-5	1-2	2-3	3-4	4-5		Cal	1-2				
Receive	→	2.5	-3.0	→								
Time	16:12	16:30	16:35	16:40	16:43		11:30	11:32	11:42	16:58	17:00	17:03
Range	1.5	1.5	1.5	1.5	1.5		.75	1.5	.50	.50	.75	1.5
V	200	220	200	200	200		180	240	140	140	160	240
Current AC	1380	1390	1390	1380	1370		675	1420	530	520	670	1380
Current DC	1380	1400	1390	1380	1370		680	1425	530	520	670	1380

2 12-150, 2-3 130, 3-4, 130, 4-5 130

Hewlitt - Packard Meter

11 E ½ HP

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project Sunizona Line 6 - Spr 11 E ½ Field date 4/26/62 Data page_____ Comp. date 4/30/62 Comp by C.S.L.

(A) Send	4-5	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4
(B) Receive	CAL	.5-1.0E	→	1.0-1.5E	→	→	1.5-2.0E	→	→	→	2.0-2.5E	→
(C) n separation		1	2	1	2	3	1	2	3	4	2	3
(D) I		1470	1470	1470	1445	1435	1455	1445	1430	1430	1420	1415
(E) Vdc (avg)		43.7	3.62	22.7	8.10	1.28	14.0	5.28	2.51	.62	3.06	2.00
(F) DCcal USED	1.000											
(G) Kn x 10^{-3} a=500		1.5	6.0	1.5	6.0	15.0	1.5	6.0	15.0	30.0	6.0	15.0
(H) ρ dc=ExFxGx10^3/D		44.5	14.8	23.2	33.6	13.4	14.4	21.9	26.3	13.0	12.9	21.2
(I) Vac Σ		41.4	3.60	21.8	7.80	1.30	13.2	5.16	2.49	.62	2.96	1.96
(J) AC noise x 2		.06	.06	.04	.04	.04	.08	.08	.08	.08	.04	.04
(K) Vac(corr) = $\sqrt{I^2 - J^2}$										.615		
(L) AC-DC cal. USED	.985											
(M) ρ dc/ρac=ExL/K		1.040	0.991	1.026	1.024	0.970	0.959	1.006	1.019	0.992	1.019	1.006
(N) PFE=(M-1)(10^2)		4	-1	3	2	-3	-4	1	2	-1	2	1
(O) MCF=(M-1)(10^5)/H		90	-61	112	72	-224	-285	27	72	-61	147	28

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	2-3	1-2	4-5	3-4	2-3	1-2	CAL	→	→	→	→	→
(B) Receive	→	→	2.5-3.0E	→	→	→	4-5	→	→	→	→	→
(C) n separation	4	5	3	4	5	6						
(D) I	1405	1395	1415	1405	1405	1395	550	690	1470	525	670	1385
(E) Vdc (avg)	1.10	.39	1.27	1.02	.63	.32	54.0	68.4	145.0	54.0	68.0	143.0
(F) DCcal							1.019	1.010	1.013	0.973	0.985	0.969
(G) Kn x 10^{-3}	30.0	52.5	15.0	30.0	52.5	84.0			~1.000			
(H) ρ dc=ExFxGx10^3/D	23.5	14.7	13.5	21.8	23.6	19.3						
(I) Vac Σ	1.07	.36	1.24	1.00	.62	.30	53.0	68.0	142.0	53.0	67.6	141.0
(J) AC noise x 2	.04	.04	.04	.04	.04	.04						
(K) Vac (corr) = $\sqrt{I^2 - J^2}$		.358				.298						
(L) AC-DC cal.							0.982	0.995	0.979	0.981	0.995	0.986
(M) ρdc/ρac =ExL/K	1.012	1.073	1.009	1.006	1.000	1.058						
(N) PFE=(M-1)(10^2)	1	7	1	1	0	6			~0.985			
(O) MCF=(M-1)(10^5)/H	51	496	67	28	0	300						

Burr - Brown Meter

11 E 1/2 BB

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project Sunizona Line 6 - Spr - 11 E ½ Field date 4/26/62 Data page_____ Comp. date 4/30/62 Comp by C.S.L.

(A) Send	4-5	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4
(B) Receive	CAL	.5-1.0E	→	1.0-1.5E	→	→	1.5-2.0E	→	→	→	2.0-2.5E	—
(C) n separation		1	2	1	2	3	1	2	3	4	2	3
(D) I		1480	1470	1475	1465	1450	1435	1430	1425	1420	1430	1420
(E) Vdc (avg)		40.4	3.21	20.2	7.40	1.10	12.9	4.84	2.21	.505	2.76	1.70
(F) DCcal USED	1.090											
(G) Kn x 10^{-3} a = 500'		1.5	6.0	1.5	6.0	15.0	1.5	6.0	15.0	30.0	6.0	15.0
(H) ρ dc=ExFxGx10^3/D		44.7	14.3	22.4	33.0	12.4	14.7	22.1	25.4	11.6	12.6	19.6
(I) Vac Σ		38.4	3.04	19.0	6.90	1.04	12.0	4.60	2.05	.450	2.54	1.59
(J) AC noise x 2		.10	.10	.12	.12	.12	.10	.10	.10	.10	.10	.10
(K) Vac(corr) = $\sqrt{I^2 - J^2}$		38.4	3.04	19.0	6.90	1.034	12.0	4.60	2.05	.439	2.54	1.59
(L) AC-DC cal. USED	.945											
(M) ρ dc/ρac=ExL/K		.995	.998	1.005	1.012	1.006	1.016	.995	1.020	1.088	1.027	1.010
(N) PFE=(M-1)(10^2)		0	0	0	1	1	2	0	2	9	3	1
(O) MCF=(M-1)(10^5)/H		-11	-14	22	36	48	109	-23	79	758	214	51

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	2-3	1-2	4-5	3-4	2-3	1-2	CAL	→	→	→	→	→
(B) Receive	→	→	2.5-3.0E	→	→	→	4-5	→	→	→	→	→
(C) n separation	4	5	3	4	5	6						
(D) I	1420	1410	1400	1400	1395	1390	550	690	1470	525	670	1395
(E) Vdc (avg)	.97	.305	1.05	.86	.542	.26	48.0	62.2	140.3	47.0	62.0	136.0
(F) DCcal						→	1.145	1.109	1.048	1.118	1.080	1.027
(G) Kn x 10^{-3}	30.0	52.5	15.0	30.0	52.5	84.0		~	1.088	≅ 1.090		
(H) ρ dc=ExFxGx10^3/D	22.3	12.4	12.3	20.0	22.2	17.1						
(I) Vac Σ	.91	.27	1.03	.83	.49	.22	45.0	58.4	135.0	44.0	58.0	130.0
(J) AC noise x 2	.10	.10	.10	.10	.10	.10						
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	.904	.251	1.03	.824	.48	.196						
(L) AC-DC cal.						→	.938	.939	.961	.936	.935	.956
(M) ρdc/ρac =ExL/K	1.014	1.149	.965	.988	1.068	1.253			~ .945			
(N) PFE=(M-1)(10^2)	1	15	-3	-1	7	25						
(O) MCF=(M-1)(10^5)/H	63	1200	-285	-60	306	1480						

BB

9 N½

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project Sunizona Line 5 Spr. 9N½ Field date 4/20/62 Data page_____ Comp. date 4/21/62. Comp by C.S.L.

(A) Send	1-2	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3
(B) Receive	CAL	.5-1.0N	→	1.0-1.5N	→	→	1.5-2.0N	→	→	→	2.0-2.5N	→
(C) n separation		1	2	1	2	3	1	2	3	4	2	3
(D) I		1800	1800	1810	1780	1770	1750	1770	1750	1750	1750	1740
(E) Vdc (avg)		12.25	3.45	13.60	3.16	1.353	14.95	3.79	1.38	.80	3.96	1.588
(F) DCcal used	1.10	→	→	→	→	→	→	→	→	→	→	→
(G) Kn x 10^{-3}		1.5	6.0	1.5	6.0	15.0	1.5	6.0	15.0	30.0	6.0	15.0
(H) ρ dc=ExFxGx10^3/D		11.2	12.6	12.4	11.7	12.6	14.1	14.1	13.0	15.1	14.9	15.0
(I) Vac Σ		11.4	3.2	12.6	2.85	1.25	14.0	3.5	1.25	.72	3.64	1.46
(J) AC noise x 2		.06	.06	.08	.08	.08	.10	.10	.10	.10	.10	.10
(K) Vac(corr) = $\sqrt{I^2 - J^2}$		11.4	3.20	12.6	2.85	1.25	14.0	3.50	1.25	.714	3.64	1.46
(L) AC-DC cal. used	.959	→	→	→	→	→	→	→	→	→	→	→
(M) ρ dc/ρac=ExL/K		1.030	1.033	1.036	1.062	1.039	1.023	1.039	1.059	1.073	1.042	1.041
(N) PFE=(M-1)(10^2)		3	3	4	6	4	2	4	6	7	4	4
(O) MCF=(M-1)(10^5)/H		268	262	290	530	309	163	276	454	483	282	274

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	3-4	4-5	1-2	2-3	3-4	4-5	CAL	→	→	→	→	→
(B) Receive	→	→	2.5-3.0N	→	→	→	1-2	→	→	→	→	→
(C) n separation	4	5	3	4	5	6						
(D) I	1730	1720	1730	1730	1720	1720	680	144.0	1880	660	1370	1710
(E) Vdc (avg)	.778	.478	1.615	.82	.48	.30	60.0	138.5	164.0	56.0	132.0	154.0
(F) DCcal	→	→	→	→	→	→	1.132	1.040	1.147	1.138	1.039	1.110
(G) Kn x 10^{-3}	30.0	52.5	15.0	30.0	52.5	84.0			~1.10			
(H) ρ dc=ExFxGx10^3/D	14.9	16.0	15.4	15.6	16.1	16.1						
(I) Vac Σ	.70	.42	1.47	.76	.42	.28	58.0	133.0	155.0	56.0	128.0	146.0
(J) AC noise x 2	.10	.10	.10	.10	.10	.10						
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	.693	.407	1.47	.754	.407	.261						
(L) AC-DC cal. used	.959	→	→	→	→	→	.967	.960	.945	.966	.970	.948
(M) ρdc/ρac =ExL/K	1.077	1.126	1.053	1.043	1.130	1.102			~.959			
(N) PFE=(M-1)(10^2)	8	13	5	4	13	10						
(O) MCF=(M-1)(10^5)/H	517	787	344	276	808	633						

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: Sunizona Line: 5 Spr. 9 N½ Int.Cal _____ Date: 4/20/62

Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
Rec.	.5 -	1.0N	1.0N	1.5N	→							
Time	1323	13.28	1350	1356	1359	1410	1414	1417	1420	1433	1436	1440
DC-1	4.28 4.20	1.68 1.66	6.78 6.8	1.56 1.53	.70 .70	7.6 7.7	1.93 1.93	.70 .70	.36 .36	1.98 1.94	.79 .79	.38 .39
DC-2	4.05 4.05	1.78 1.30	6.82 6.8	1.60 1.62	.66 .66	7.3 7.2	1.87 1.87	.68 .68	.44 .44	1.99 2.02	.80 .80	.40 .39
Σ	12.25 12.25	3.46 3.46	13.6 13.6	3.16 3.15	1.36 1.36	14.9 14.9	3.80 3.80	1.38 1.38	.80 .80	3.97 3.96	1.59 1.59	.78 .78
DC-3	6.20 6.20	1.68 1.68	6.8 6.8	1.58 1.58	.72 .76	7.5 7.5	1.96 1.96	.70 .70	.37 .37	1.90 1.90	.82 .83	.39 .39
Dc-4	6.05 6.05	1.77 1.77	6.8 6.8	1.58 1.57	.63 .68	7.5 7.5	1.83 1.83	.68 .68	.43 .43	2.06 2.06	.77 .75	.39 .38
Σ	12.25 12.25	3.45 3.45	13.6 13.6	3.16 3.15	1.35 1.34	15.0 15.0	3.79 3.79	1.38 1.38	.80 .80	3.96 3.96	1.59 1.58	.78 .77
DC-AV	12.25	3.45	13.60	3.16	1.353	14.95	3.79	1.38	.80	3.96	1.588	.778
AC-1	5.7	1.60	6.3	1.43	.62	7.0	1.75	.62	.36	1.82	.73	.36
AC-2	5.7	1.60	6.3	1.42	.63	7.0	1.75	.63	.36	1.82	.73	.35
Σ	11.4	3.2	12.6	2.85	1.25	14.0	3.50	1.25	.72	3.64	1.46	.70
S. P.		-.8			-.8				-2.1			
AC-N		.63			.04				.05			

Burr Brown Meter

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: Sunrona Line: S Spr. 9N 1/2 Int.Cal 45.5 1st 45.0 2nd Date: 4/20/62

Send	4-5	1-2	2-3	3-4	4-5		CAL	1-2				
Rec.												
Time	1443	1452	1455	1459	1502		1345	1343	1310	1523	1518	1520
DC-1	.24 .25	.82 .87	.42 .45	.24 .23	.15 .16		30.0	69.0	82.0	29.0	66.0	77.0
DC-2	.23 .23	.76 .75	.41 .38	.23 .25	.15 .15		30.0	69.5	82.0	29.0	66.0	77.0
Σ	.47 .48	1.61 1.62	.83 .83	.47 .48	.30 .30		60.0	138.5	164.0			
DC-3	.20 .20	.88 .88	.45 .48	.21 .19	.16 .17		30.0	69.0	82.0	29.0	66.0	77.0
Dc-4	.28 .28	.74 .73	.37 .33	.27 .29	.14 .13		30.0	69.5	82.0	29.0	66.0	77.0
Σ	.48 .48	1.62 1.61	.82 .81	.48 .48	.30 .30		60.0	138.5	164.0			
DC-AV	.478	1.615	.82	.48	.30		60.0	138.5	164.0	58.0	132.0	154.0
AC-1	.21	.73	.38	.21	.14		29.0	66.5	77.0	28.0	64.0	73.0
AC-2	.21	.74	.38	.21	.14		29.0	66.5	78.0	28.0	64.0	73.0
Σ	.42	1.47	.76	.42	.28		58.0	133.0	155.0	56.0	128.0	146.0
S. P.	-8.4				-4.4							
AC-N	.05				.05							

INDUCED POLARIZATION SENDER NOTES

Project: Sunizona Line: 5 SPR. 9 N5 Date: 4-20-62

Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
Receive												
Time	13:23	13:28	13:50	13:56	13:59	14:10	14:14	14:17	14:20	14:33	14:36	14:40
Range	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
V	220	220	220	240	240	200	200	250	240	220	200	240
Current AC	1790	1790	1790	1750	1740	1770	1770	1725	1725	1740	1730	1700
Current DC	1800	1800	1810	1780	1770	1750	1770	1750	1750	1750	1740	1730

Send	4-5	1-2	2-3	3-4	4-5		CRL 1-2					
Receive												
Time	14:43	14:52	14:55	14:59	15:02		13:15	13:13	13:10	15:24	15:18	17:20
Range	2.0	2.0	2.0	2.0	2.0		.75	1.5	2.0	.75	1.5	2.0
V	240	220	220	240	240		140	180	220	180	200	240
Current AC	1710	1730	1725	1680	1690		670	1430	1830	660	1370	1700
Current DC	1720	1730	1730	1720	1720		680	1440	1880	660	1370	1710

Ω 1-2 100, 2-3 100, 3-4 130, 4-5 120

BB

#95½

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project Sunrizona Line ½ Spr 9 S½ Field date 4/23/62 Data page_____ Comp. date 4/24/62 Comp by E.G.H.

(A) Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
(B) Receive	.5-1.05	→	1.0-	1.55	→	1.5-	2.05	→	→	2.0-	2.55	→
(C) n separation	1	2	1	2	3	1	2	3	4	2	3	4
(D) I	1835	1790	1772	1770	1755	1750	1735	1745	1730	1735	1725	1775
(E) Vdc (avg)	14.55	3.36	11.16	10.0	1.12	11.4	2.71	1.19	.66	3.32	1.22	.705
(F) DCcal 1.103												→
(G) Kn x 10^{-3}	1.5	6.0	1.5	6.0	15.0	1.5	6.0	15.0	30.0	6.0	15.0	30.0
(H) ρ dc=ExFxGx10^3/D	13.1	12.4	10.4	~~37.4~~ 3.7	10.6	10.8	10.3	11.3	12.6	12.7	~~31.8~~	13.1
(I) Vac Σ	13.4	3.11	10.58	9.40	1.07	10.8	2.56	1.12	.60	3.06	1.13	.68
(J) AC noise x 2	.10	.10	.08	.08	.08	.10	.10	.10	.10	.10	.10	.10
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	13.4	3.11	10.58	9.40	1.07	10.8	2.56	1.12	.592	3.06	1.13	.672
(L) AC-DC cal. USED	.955											
(M) ρ dc/ρac=ExL/K	1.037	1.030	1.008	1.016	1.000	1.009	1.011	1.013	1.064	1.036	1.032	1.002
(N) PFE=(M-1)(10^2)	4	3	1	2	0	1	1	1	6	4	3	
(O) MCF=(M-1)(10^5)/H	282	242	77	129	0	83	107	115	508	283	274	15

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	1-2	4-5	3-4	2-3	1-2		CAL	4-5				
(B) Receive	→	2.5-	3.0-	5	→							
(C) n separation	5	3	4	5	6							
(D) I	1765	1755	1740	1745	1740		673	1465	1830	653	1365	1720
(E) Vdc (avg)	.46	1.29	.68	.45	.30		60.0	140.4	164.0	56.4	131.0	151.0
(F) DCcal 1.103					→		1.122	1.043	1.116	1.158	1.042	1.139
(G) Kn x 10^{-3}	52.5	15.0	30.0	52.5	84.0							
(H) ρ dc=ExFxGx10^3/D	15.1	12.2	12.9	14.9	16.0							
(I) Vac Σ	.39	1.20	.60	.38	.24		56.0	134.0	156.0	55.0	127.0	144.0
(J) AC noise x 2	.10	.10	.10	.10	.10							
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	.377	1.20	.592	.366	.218							
(L) AC-DC cal.							.934	.953	.952	.975	.969	.954
(M) ρdc/ρac =ExL/K	1.167	1.028	1.098	1.174	1.312				~ .955			
(N) PFE=(M-1)(10^2)	17	3	10	17	31							
(O) MCF=(M-1)(10^5)/H	1108	229	760	1169	1950							

INDUCED POLARIZATION - REC[illegible]ES PAGE _____

Project: Sunizona Line: 5 Spr. 95½ Int.Cal _____ Date: 4/23/62

500a

Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
Rec.	.5-1.0	S	1.0	.1.5	S →	1.5 -	2.0	S	→	2.0	- 2.5	S.
Time	13:03	13:29	13:50	14:13	14:23	14:54	14:57	14:59	15:02	15:14	15:21	16:25
DC-1	7.25 7.35	1.70 1.70	5.6 5.59	5.10 5.05	5.8 6.10	5.6 5.6	1.38 1.40	.62 .64	.33 .34	1.59 1.52	.58 .53	.38 .40
DC-2	7.30 7.30	1.66 1.67	5.55 5.57	4.90 4.95	5.5 5.3	5.8 5.8	1.34 1.32	.57 .55	.33 .32	1.72 1.78	.64 .69	.32 .29
Σ	14.55 14.55	3.36 3.37	11.15 11.16	10.00 10.00	1.13 1.12	11.4 11.4	2.72 2.72	1.19 1.19	.66 .66	3.32 3.30	1.22 1.22	.70 .69
DC-3	7.25 7.25	1.69 1.69	5.60 5.60	5.00 4.95	6.2 4.9	5.6 5.55	1.46 1.42	.66 .68	.36 .37	1.66 1.59	.50 .45	.36 .35
Dc-4	7.30 7.30	1.67 1.67	5.56 5.57	5.00 5.05	5.0 6.3	5.8 5.85	1.30 1.26	.53 .50	.30 .29	1.66 1.42	.72 .76	.35 .36
Σ	14.55 14.55	3.36 3.36	11.16 11.17	10.00 10.00	1.12 1.12	11.4 11.4	2.70 2.70	1.19 1.18	.66 .66	3.32 3.32	1.22 1.21	.71 .71
DC-AV	14.55	3.36	11.16	10.0	1.12	11.4	2.71	1.19	.66	3.32	1.22	.705
AC-1	6.7	1.56	5.3	4.7	.53	5.4	1.28	.56	.30	1.53	.57	.34
AC-2	6.7	1.55	5.28	4.7	.54	5.4	1.28	.56	.30	1.53	.56	.34
Σ	13.4	3.11	10.58	9.4		10.8	2.56	1.12	.60	3.06	1.13	.68
S. P.		+15.2			+14.4				+34.3			
AC-N		0.05			0.04				.05			
	No	5 electrode @	N-S	Fence	line							

71
71
695
321153 7.05

INDUCED POLARIZATION - RECEIVER [illegible]ES PAGE _____

Project: Sunizona Line: 5 Spr. 9 5½ Int.Cal 46.0 AM 46.0 P.M. Date: 4/23/62

Send	1-2	4-5	3-4	2-3	1-2		CAL	4-5				
Rec.	→	2.5	3.0	5	→							
Time	1631	1642	1645	1648	1652		12:46	12:49	12:52	17:04	1707	1709
DC-1	.37 .23	.63 .62	.32 .30	.22 .21	.15 .16		30.0	70.2	82.0	28.2	65.5	75.0
DC-2	.15 .23	.66 .67	.36 .38	.23 .24	.14 .14		30.0	70.2	82.0	28.2	65.5	75.0
Σ	.48 .46	1.29 1.29	.68 .68	.45 .45	.29 .30							150.0
DC-3	.29 .32	.61 .60	.31 .28	.20 .19	.16 .17		30.0	70.2	82.0	28.2	65.5	75.0
Dc-4	.17 .24	.68 .70	.37 .40	.26 .26	.14 .13		30.0	70.2	82.0	28.2	65.5	76.0
Σ	.46 .46	1.29 1.30	.68 .68	.46 .45	.30 .30							152.0
DC-AV	.46	1.29	.68	.45	.30		60.0	140.4	164.0	56.4	131.0	151.0
AC-1	.19	.60	.30	.19	.12		28.0	67.0	78.0	27.5	63.5	72.0
AC-2	.20	.60	.30	.19	.12		28.0	67.0	78.0	27.5	63.5	72.0
Σ	.39	1.20	.60	.38	.24		56.0	134.0	156.0	55.0	127.0	144.0
S. P.	+37.1				+15.7							
AC-N	.05				.05							

INDUCED POLARIZATION SENDER NOTES

Project: Sunizona Line: 5 Spr 9 S½ Date: 4-23-62

Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
Receive	.5 →	1.0	1.0	→	1.5-S	1.5	→		2.05	2.05	→	
Time	13:03	13:29	13:50	14:13	14:23	14:54	14:57	14:59	15:02	15:14	15:21	16:25
Range	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Current AC	180	220	220	240	240	240	240	240	240	240	250	160
	1830	1790	1775	1770	1750	1750	1730	1740	1730	1730	1720	1770
DC	1840	1790	1770	1770	1760	1750	1740	1750	1730	1740	1730	1780

Send	1-2	4-5	3-4	2-3	1-2		Ca/	4-5				
Receive	2.5-S	2.5	→		3.05							
Time	16:31	16:42	16:45	16:49	16:52		12:46	12:49	12:52	17:04	17:07	17:09
Range	2.0	2.0	2.0	2.0	2.0		.75	1.5	2.0	.75	1.5	2.0
	200	200	200	160	180		80	200	220	100	170	220
Current AC	1760	1750	1740	1740			670	1460	1830	650	1360	1720
DC	1770	1760	1740	1750	1740		675	1470	1830	655	1370	1720

Ω 1-2 ~~70~~ 130, 2-3 ~~80~~ 150, 3-4 100, 4-5 80

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: Sunizona Line: 2 Spr. 4 Int.Cal _____ Date: 4/11/62

500a N.W 1/2

Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
Rec.	.5-1.0	NW →	1.0 -	1.5 NW	→	1.5	-2.0	NW	→	2.0	- 2.5	NW →
Time	10:02	10:09	10:38	10:43	10:50	11:01	11:04	11:07	11:09	11:20	11:24	11:29
DC-1	5.80 5.80	1.58 1.62	5.85 5.90	1.63 1.54	.66 .63	5.32 5.32	1.32 1.36	.61 .62	.30 .31	1.31 1.36	.52 .52	.35 .35
DC-2	6.05 6.05	1.52 1.48	6.05 6.02	1.55 1.52	.66 .61	5.28 5.30	1.30 1.28	.53 .52	.32 .31	1.30 1.26	.55 .55	.25 .25
Σ	11.85 11.85	3.10 3.10	11.90 11.92	3.08 3.06	1.32 1.32	10.60 10.62	2.62 2.64	1.14 1.14	.62 .62	2.61 2.62	1.07 1.07	.60 .60
DC-3	5.80 5.80	1.62 1.62	6.05 6.05	1.52 1.57	.71 .62	5.30 5.30	1.36 1.36	.60 .61	.32 .34	1.35 1.39	.58 .50	.20 .21
Dc-4	6.05 6.05	1.48 1.48	5.85 5.85	1.55 1.56	.60 .70	5.32 5.32	1.28 1.27	.53 .54	.29 .28	1.26 1.23	.57 .57	.38 .38
Σ	11.85 11.85	3.10 3.08	11.90 11.90	3.07 3.07	1.31 1.32	10.62 10.62	2.64 2.63	1.13 1.15	.61 .62	2.61 2.62	1.07 1.07	.58 .59
DC-AV	11.85	3.10	11.90	3.07	1.32	10.62	2.63	1.14	.62	2.62	1.07	.595
AC-1	5.75	1.51	5.75	1.50	.64	5.18	1.30	.58	.30	1.30	.52	.30
AC-2	5.75	1.51	5.75	1.50	.64	5.18	1.30	.58	.30	1.30	1.52	.30
Σ	11.50	3.02	11.50	3.00	1.28	10.36	2.60	1.16	.60	2.60	1.04	.60
S. P.		+5.7			-6.0				-6.7			
AC-N		0.07			.07				.06			

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: Sunizona Line: 2 Spr. 4 Int.Cal 53.0 17.M Date: 4/11/62

Send	4-5	1-2	2-3	3-4	4-5		CAL	1-2				
Rec.	→	2.5	3.0	NW	→							
Time	11:33	13:12	13:17	13:19	13:22		9:46	9:49	9:51			
DC-1	.20 .18	.59 .52	.29 .28	.20 .20	.15 .12		35.5	78.0	99.0	89?		
DC-2	.18 .19	.49 .56	.30 .31	.19 .18	.13 .15		35.5	77.8	99.0	89?		
Σ	.38 .37	1.08 1.08	.59 .59	.39 .38	.28 .27		71.0	155.8	198.0	178		
DC-3	.19 .18	.56 .52	.30 .30	.21 .22	.15 .12		35.8	78.0	99.0			
Dc-4	.20 .20	.53 .56	.29 .29	.17 .17	.14 .15		35.8	77.8	99.0			
Σ	.39 .38	1.09 1.08	.59 .59	.38 .39	.29 .27		71.6	155.8	198.0			
DC-AV	.38	1.08	.59	.385	.28		71.3	156.8	198.0			
AC-1	.18	.52	.29	.18	.13		35.9	75.8	99.0			
AC-2	.18	.52	.29	.19	.13		35.9	75.8	99.0			
Σ	.36	1.04	.58	.37	.26		71.8	151.6	198.0			
S. P.	+.4				+.7							
AC-N	.07				.06							

INDUCED POLARIZATION - SENDER NOTES

Project: Sanizona Line: 2 spread 4 N 1/2 Date: 4/11/62

Send		3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3
Receive												
Time		1002	1009	1038	1043	1050	1101	1104	1107	1109	1120	1124
Range		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Current		1735 1730	1705 1700	1775 1770	1755 1755	1745 1740	1730 1730	1720 1720	1715 1715	1705 1705	1700 1700	1700 1695
Send	3-4	4-5	1-2	2-3	3-4	4-5	Cal	1-2				
Receive												
Time	1129	1132	1312	1317	1319	1322	945	949	951			
Range	2.0	2.0	2.0	2.0	2.0	2.0	.75	1.5	2.0			
Current	1690 1690	1680 1675	1680 1685	1690 1685	1680 1675	1665 1655	660 660	1450 1450	1730 1730			

Ω 1-2 = 140 / 2-3 = 110 / 3-4 = 75 / 4-5 = 135

2

9.23

9.31

8.73

9.61

9.51

9.58

55.97

9.32

6) 55.92

54

19

18

12