LEIGH CREEK COALFIELD

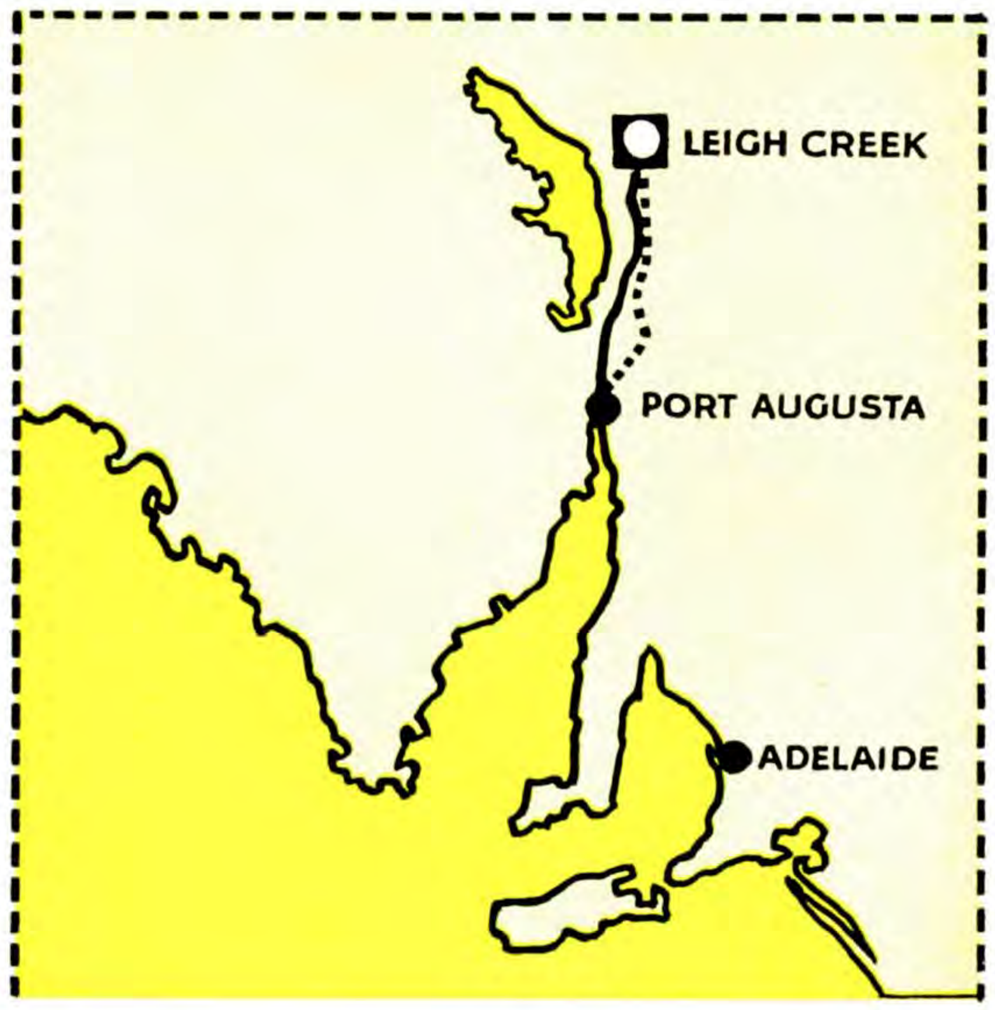
Leigh Creek

COALFIELD

THE ELECTRICITY TRUST OF SOUTH AUSTRALIA

August, 1956

HISTORY AND DEVELOPMENT



Although the Leigh Creek coal deposits lie close to the surface in many places, there are no outcrops to reveal their presence.

The first evidence of coal at the Field was obtained in 1888 when coal was discovered by a contractor sinking a dam for the Railway. This discovery aroused considerable interest and the Leigh Creek Coal Mining Company was formed and obtained a lease to exploit the Field. A shaft was dug near the railway line at Telford but was abandoned at 75 feet on striking water. Further exploratory work was done and a new shaft sunk in 1892. This intersected a 48 foot seam of coal at a depth of 239 feet. In the following year, about 200 tons of coal were raised from this shaft and sent southwards chiefly for experimental purposes, but no real market could be found for the coal and mining operations ceased in 1894.

The lease passed to the Tasmanian Copper Company Limited in 1906 and that company raised over 12,000 tons of coal from the main shaft. The coal was used for general mining and smelting purposes at the group of copper mines being worked in the north of the State by this company and some coal was sold as household fuel. In 1908, the lease expired and was not renewed.

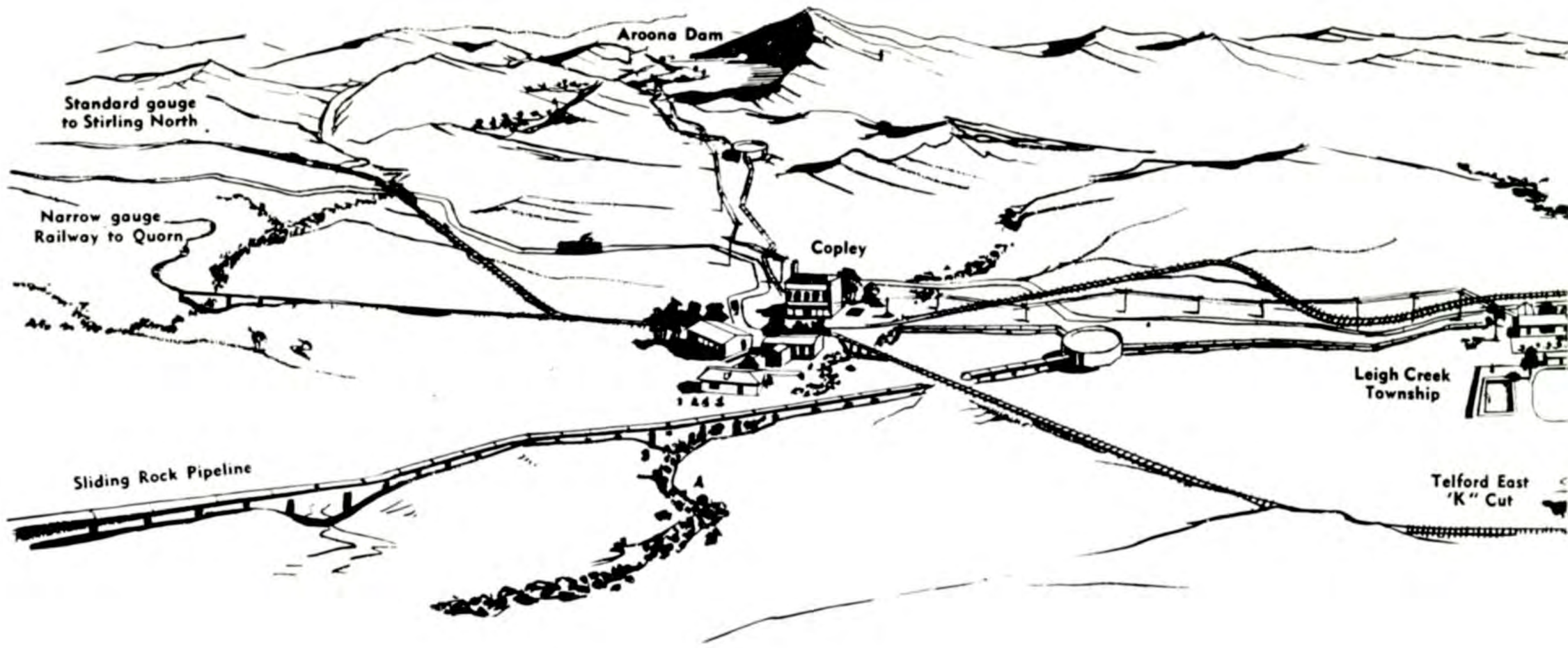
In 1917-18, the South Australian Department of Mines carried out some further exploratory work at the Field and a small amount of coal was raised and sent to Adelaide for experimental burning. These activities did not lead to further production and work at the Field ceased until 1941.

Early in World War II, difficulty was experienced in obtaining sufficient coal from New South Wales for South Australia's power supply and industrial purposes, and the Government gave serious consideration to the possibility of obtaining local fuel. Reports on the various known coal deposits in South Australia indicated that the Leigh Creek Field offered the best possibility of economic exploitation and in August, 1941, boring work was undertaken by the Department of Mines to determine whether shallow coal was available for mining by open-cut methods.

This exploratory work was successful and coal was discovered over a wide area, in some places quite close to the surface. The South Australian Government decided to go ahead with the development of the Field and the project was placed under the control of the Engineering and Water Supply Department. The first production of any consequence was in 1944 when over 18,000 tons of Leigh Creek coal were used by power supply and industry in Adelaide.

Early development was hampered mainly by the fact that the existing plant of coal users had all been designed to burn New South Wales coal. It was difficult to use this plant for burning Leigh Creek coal containing over 30 per cent. moisture and having only about half the Calorific Value of New South Wales coal. Under wartime conditions, new plant properly designed to burn Leigh Creek coal was practically unobtainable, but by modifications to existing plant, the consumption of Leigh Creek coal expanded steadily and reached 128,000 tons in the year 1947. Of this amount 45,000 tons were used for electricity production and 31,000 tons by Railway locomotives.

It was apparent that the electricity supply industry would be the largest user of the fuel and the Electricity Trust of South Australia Act was amended to transfer the control of the Coalfield to the Electricity Trust. The Trust



took over the administration of the Field on the 6th February, 1948. Since then, the development of the Field has proceeded rapidly and the sale of coal exceeded 400,000 tons per annum by 1952.

This expansion of output was brought about by the installation by coal users of suitable equipment to burn Leigh Creek coal. The Electricity Trust, for instance, installed two new boilers in the Osborne "A" Power Station in 1950 and the first of five new boilers in the Osborne "B" Power Station in 1951, all capable of operating efficiently on this fuel. Work on the Port Augusta Power Station started in 1948 and electricity production from this Station began in 1954.

Port Augusta Power Station relies entirely on Leigh Creek coal and the plant at Port Augusta, together with that at Osborne, used 375,126 tons of Leigh Creek coal last year.

These installations removed much of the difficulty of using the fuel, but a further limitation on the output of the Field was imposed by the capacity of the railway from the Field. Although it had been a fortunate coincidence that the northern railway passed through the Field, this railway had never been intended to transport the quantities of coal which were wanted. The narrow gauge line had been severely tested during the war and was in urgent need of rehabilitation.

The Commonwealth Railways Department decided to reconstruct the line for standard gauge and, following an investigation by a Royal Commission into the route to be adopted, the present route running west of the old line in open country from Leigh Creek to Stirling North was adopted. This new line is now in use and has removed the last bottleneck on the coal consignments.

THE COAL DEPOSITS

The coal deposits at the Field lie in four distinct basins.

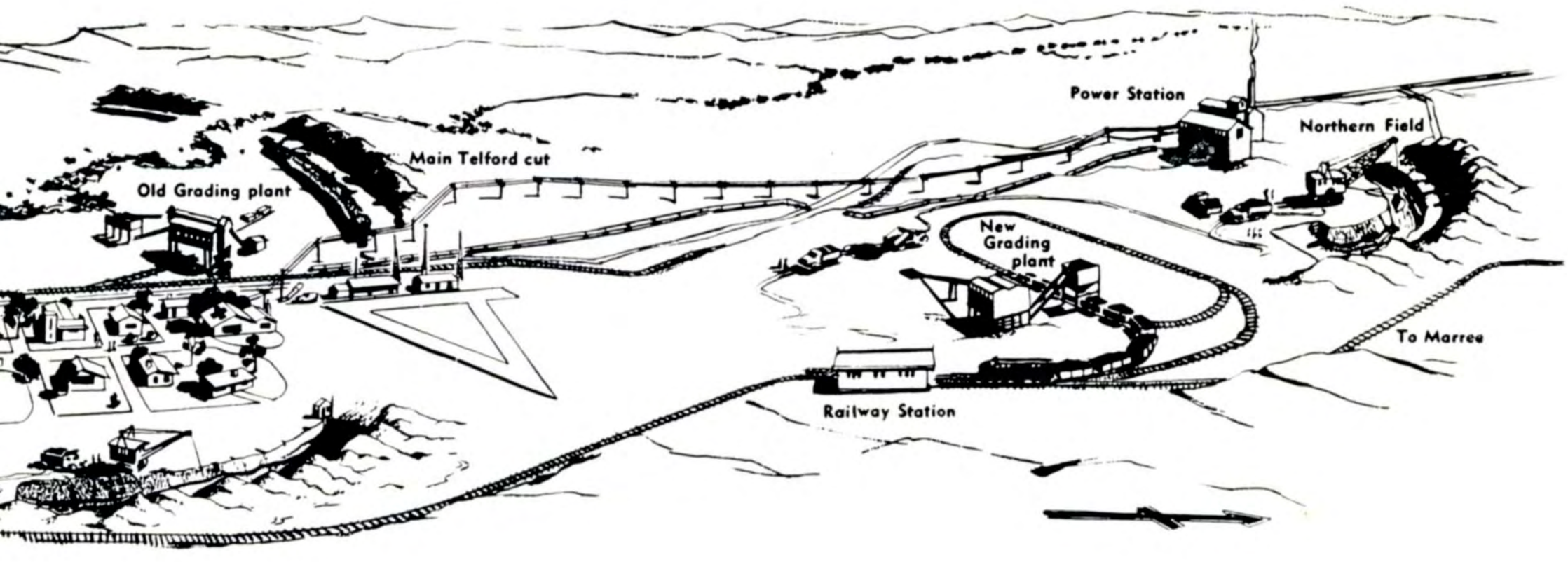
Telford Basin is the largest. It lies under and around the township of Leigh Creek and consists of an inclined seam of coal about 40 feet thick covered by clay and shale of shallow depth at places on the rim of the basin, but over 1,500 feet deep near the centre.

The two basins at the North Field, known as Lobe C and Lobe D, are joined by a narrow neck. Lobe D contains two seams of coal separated by about 30 feet of shale. The upper seam is about 20 feet thick and the lower, 35 feet thick. The top seam is only 140 feet from the surface at its deepest point and the whole of the coal at the North Field, some 29 million tons, can be won by open-cut methods.

The fourth basin—the Copley Basin—lies about five miles south of the Leigh Creek township and is less promising than the others, its seam being only about 7 feet thick.

In general, the seams dip radially towards the centre of each basin but in several instances they have been geologically folded and in some places dip very steeply. Faulting is fairly common particularly in the Telford Basin. Overlying the coal is a layer of coarse sediments up to 20 feet in thickness sometimes comprising a very dense layer of conglomerate which is troublesome to remove.

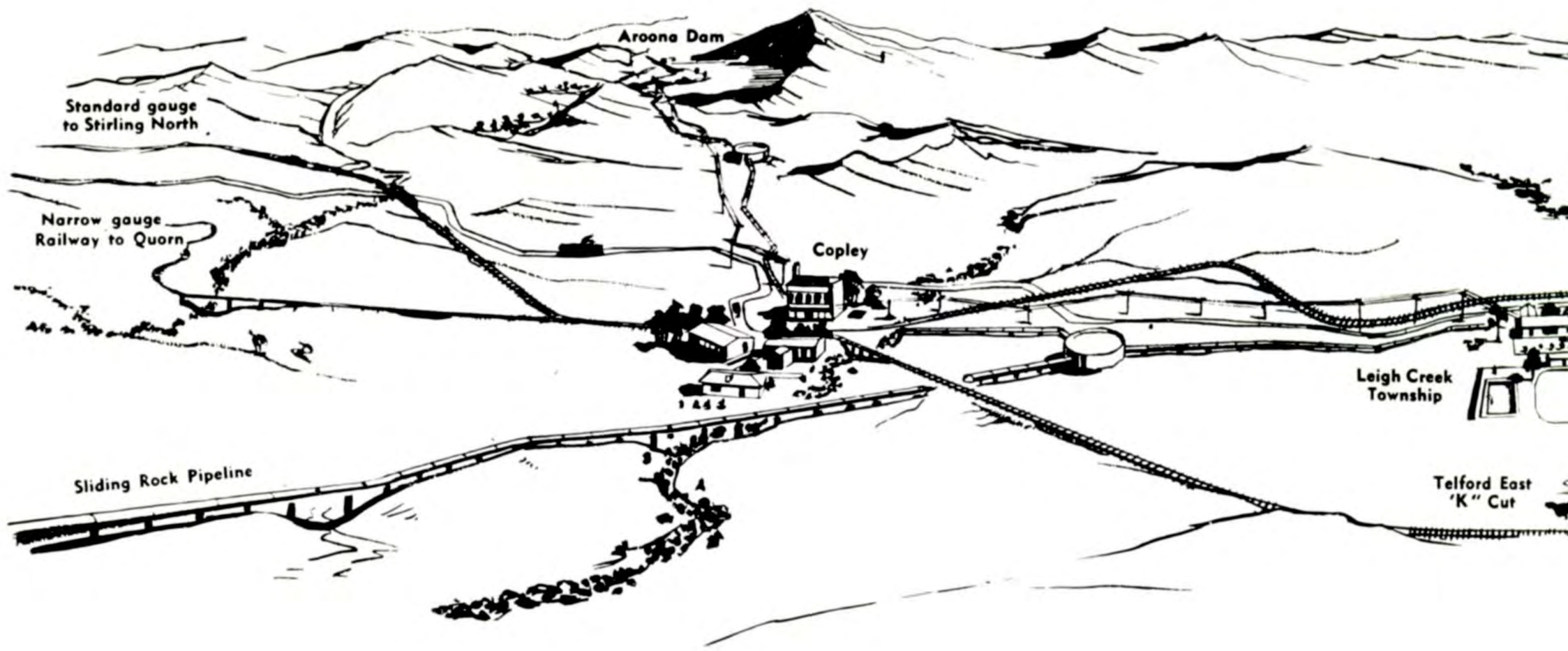
The total coal still available for production by open-cut methods on the whole Field is 43 million tons. To achieve this it will be necessary to remove overburden to a depth of 110 feet, although at the North Field deeper overburden than this will be removed to obtain the whole of the coal available.



Leigh Creek coal is a sub-bituminous coal ranking higher than brown coal. Its quality varies from one basin to another and from one seam to another. In general, it has an inherent moisture content between 30 per cent. and 35 per cent., and an ash content ranging between 7 per cent. and 21 per cent. in the various seams. The Calorific Value is about 6,250 British Thermal Units per pound but is as high as 6,600 British Thermal Units per pound in the upper seam of the Northern Basin.

The coal tends to disintegrate on exposure to air and if left loosely stockpiled, may spontaneously ignite. It can be held in stock if it is consolidated and compacted when being stored.

Typical open cut. The coal seam has been exposed by removal of the overburden. The steep dip towards the left of the coal seam is a characteristic formation.



WINNING THE COAL

All coal is obtained by open-cut methods, that is, the overburden above the coal is completely removed in order to obtain access to the coal seam.

This method is economic only as long as the amount of overburden to be removed is not excessive in relation to the thickness of the coal seam exposed. Fortunately, the Leigh Creek seams are of good thickness and deep overburden removal can be justified. For example, it will be worthwhile to remove the complete overburden of the Northern Basin, which at its maximum point is 140 feet deep.

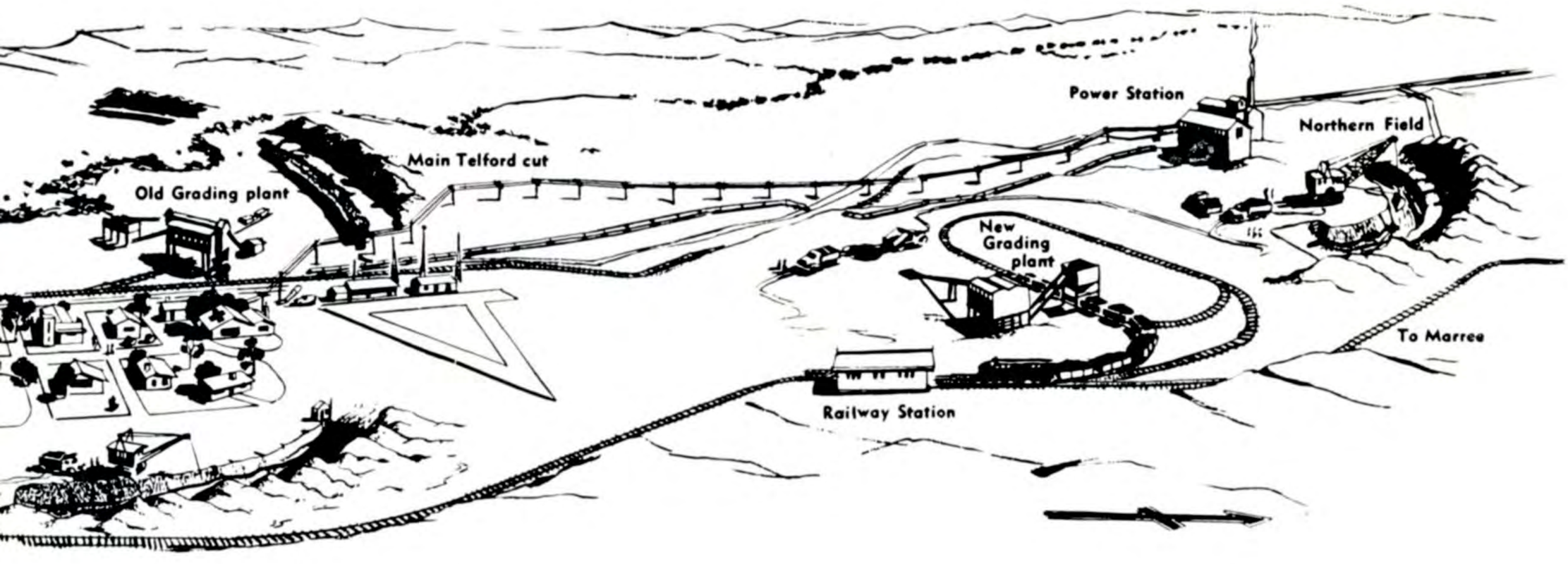
The fact that the coal seams may dip steeply and that faulting is common add to the difficulties of coal removal. It is necessary by boring to obtain detailed information of the seam structure and the type of extraction plant used must be more versatile than would be the case with a more horizontal and uniform field. The Telford Basin open cuts give a clear indication of the complex nature of the deposit.

The overburden is generally removed by dragline excavators. In some areas the excavators can dig in the undisturbed ground but frequently it is necessary to break up the material by blasting before digging is possible. The conglomerate layer is particularly hard and needs extensive blasting.

The largest excavator is a Bucyrus Erie walking dragline, with a 160 feet boom and a 10 cub. yard bucket. The boom can be extended to 200 feet for use with a 7 cub. yard bucket. There are two other dragline machines with 5 cub. yard buckets and one of 4 cub. yards.

The coal, after being loosened by blasting, is loaded into road haulage trucks by mechanical shovels, the largest of which is of 4 cub. yards capacity. The present list of main excavating machinery at the Field is as follows:—

9W Walking Dragline shown removing overburden from an open cut. This machine may be used with a 160 ft. boom and a 10 cub. yard bucket, or a 200 ft. boom and a 7 cub. yard bucket, depending on the depth of overburden to be handled.



	Cub. Yds.
Bucyrus-Erie 9W dragline (electric) - - -	10
Ruston Bucyrus 5W dragline (electric) No. 1	5
Ruston Bucyrus 5W dragline (electric) No. 2	5
Ruston Bucyrus 100RB dragline (electric) - -	4
Ruston Bucyrus 100RB shovel (electric) - -	3½
Ruston Bucyrus 54RB shovel (electric) - -	4
Harman M dragline (diesel) - - - - - - -	2½
Ruston Bucyrus 55RB dragline (diesel) - -	2½
Osgood dragline (diesel) - - - - - - - -	2½
Northwest dragline (diesel) - - - - - - -	1½
Linkbelt K580 shovel (diesel) - - - - -	2½
Lorain 82 shovel (diesel) - - - - - - -	2

The largest machines are electrically operated, and a steam power station, using Leigh Creek coal as fuel, has been built, adjacent to the North Field. This station contains 4,400 kilowatts of generating plant and supplies power to the township as well as to the excavating machinery.

When coal is loaded into the haulage trucks, it is in various-sized pieces, some of which may be very large. In order to obtain a product which will be uniform and suitable for consumption, it must be passed through a series of crushers and screened through various standard mesh screens in order to obtain the sizes and grades required.

The original crushing and screening plant was established close to the township. Much of it was second-hand equipment obtained from various sources in the difficult post-war period.

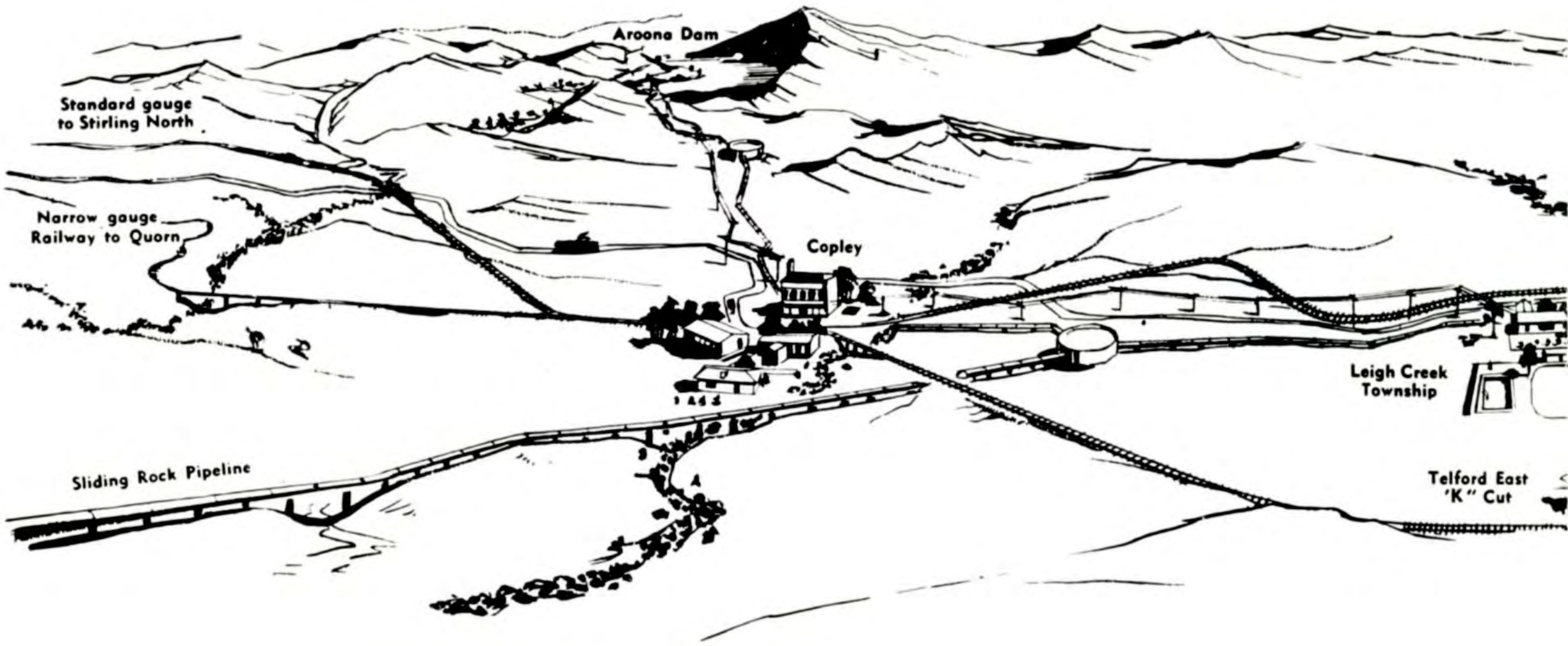
A new plant has now been constructed at the North Field which will be capable of handling 400 tons of coal per hour in the various grades required by consumers. The new standard gauge railway line runs to this plant and it is intended that train loads of 3,500 tons of coal shall be loaded and dispatched from this point. Although work on the railway line is not yet completed, trains carrying up to 1,600 tons of coal are already in operation.

The railway trucks are loaded with the respective grades of coal by the loading equipment associated with the North Field crushing and screening plant. Large bins will be erected at this site so that trucks can be loaded rapidly if necessary. The large railway loop line is designed for the trucks to move always in the one direction and the line is arranged with a slight fall so that the trucks can move by gravity into and out of the loading point.

Coal train at new grading plant.

Until 6th February, 1948, 417,077 tons of Leigh Creek coal had been produced and sold to consumers. Since then the amounts have been as follows:—

	Tons
Up to February 6, 1948 - - - -	417,077
From February 6, 1948, to June 30, 1948	78,292
Year ended June, 1949 - - - -	296,191
" " " 1950 - - - -	310,859
" " " 1951 - - - -	310,872
" " " 1952 - - - -	413,002
" " " 1953 - - - -	399,546
" " " 1954 - - - -	455,510
" " " 1955 - - - -	483,603
" " " 1956 - - - -	436,577
Total to 1956 - - -	3,601,529



THE LEIGH CREEK TOWNSHIP

The development of the Coalfield has required the establishment of a new community with all the facilities necessary to serve the 800 people who now live at Leigh Creek. The proper establishment of these facilities has been given a high priority from the beginning and at present there are 170 houses in the township, a large proportion of brick construction and all of modern design; others are being built.

To offset the natural disabilities of the area, the standard of the accommodation has been made as high as practicable. The houses are provided with electricity, water supply and sewerage and air-conditioning units and refrigerators are available at a low rental.

Much experimental work has been done on the growing of suitable trees in the area and large numbers are now well established. This policy is being continued and attractive conditions are being created at the township despite the natural difficulties.

A swimming pool has recently been completed and another attractive addition to the township is the new building for the Co-operative Store. The school, attended by over 150 children, and the community hall have been built for some years.

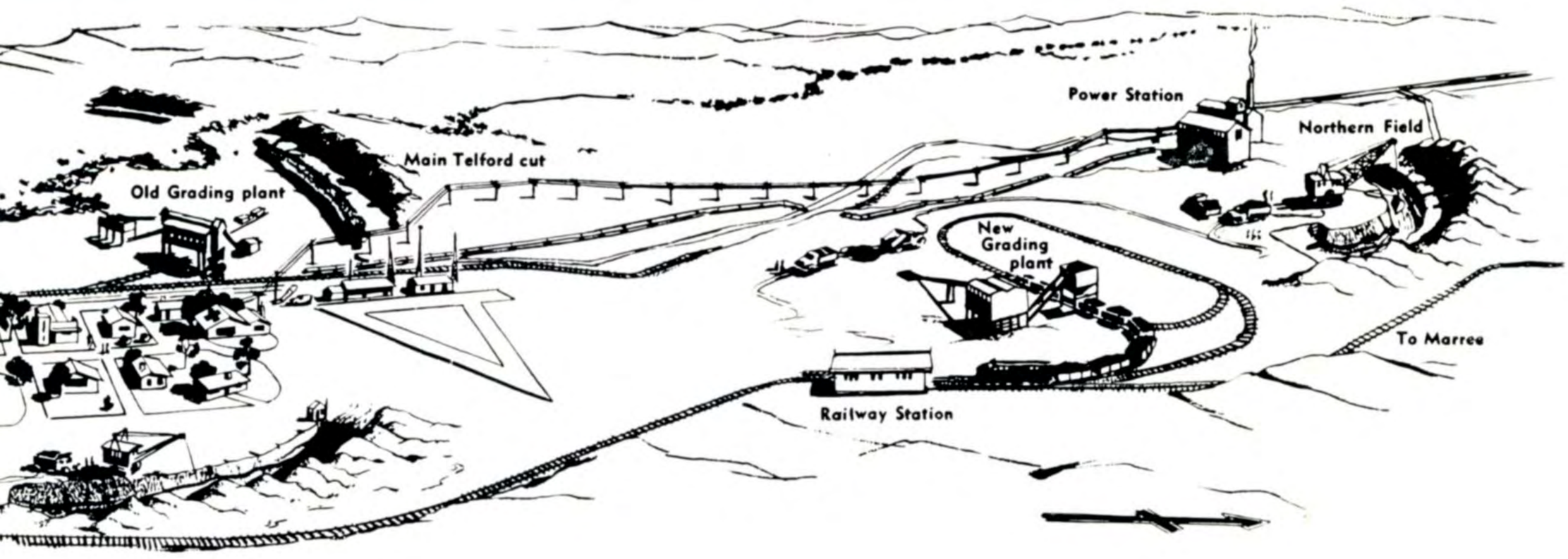
A doctor lives in the township and a new hospital is now under construction, to supplement the existing buildings. Up-to-date medical facilities are not only a benefit to the townspeople but are a big advantage to the surrounding area with its scattered population.

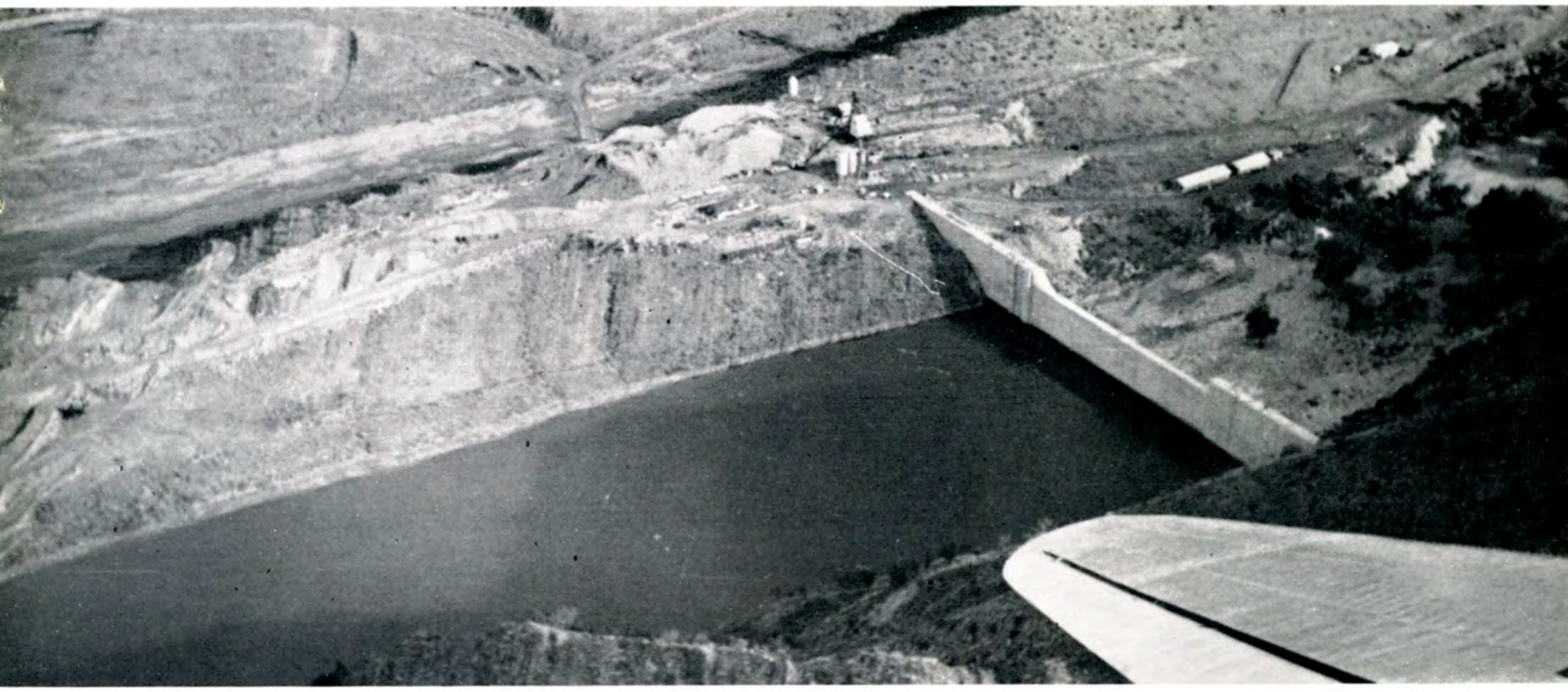
An aerodrome has been built and Leigh Creek is one of the stopping places on the Adelaide-Darwin route.

The township is well past the temporary and makeshift stage which is often unavoidably associated with a new venture of this type. Its permanent nature has been justified by the construction of the Port Augusta Power Stations which will regularly use a high level of production from the Field for many years.

Architect's drawing of hospital now under construction.

Township amenities include a modern swimming pool.





The Aroona Reservoir can hold the equivalent of three years' supply for the Leigh Creek area.

WATER SUPPLY

Leigh Creek is situated in an area having an average annual rainfall of about 7 inches. Water is required for normal township use and also in considerable quantities for the steam power station. Until recently, water was obtained from bores at Sliding Rock, about 28 miles southeast of Leigh Creek. This water had a high saline content and its supply in the quantity needed was precarious. The decision was therefore made to construct a reservoir at Aroona Gorge, about 8 miles southwest of the township. The concrete dam, 65 feet high, was started in 1952, and has now been completed at a cost of almost £1 million. This forms a reservoir with a capacity of 1,650 million gallons which is adequate storage to cover the possible long dry spells which can be experienced. Because of the relative levels it is necessary to pump the water from the reservoir to the township and an electric pumping station at the dam is supplied by an 11,000 volt transmission line from the township.

Before the dam was completed to its full height, sufficient water was impounded to serve the needs of the Field and further creek flows have stored over 12 months' water requirements. For the first time since its inception, the Field has had a reliable water supply of good quality. This not only provides for the industrial needs of the Field but has given much stimulus to the extension of trees and gardens in Leigh Creek township.

FINANCE

The establishment of the township with all its facilities; the building of the Aroona reservoir, the erection of the power station and the purchase of excavating machinery and other equipment have involved a capital expenditure which at 30th June, 1956, amounted to £4,960,000.

In the early years, while preliminary developmental work was still taking place, the money received for the coal sold each year was insufficient to cover all annual expenses. As improved machinery and equipment were introduced and the output was stepped up, the financial position improved and in 1952, a surplus above all operating expenditure was made for the first time. Since then, the Field has shown a profit in its operations every year.

The table below shows the financial results since the Trust took over administration of the Field:—

The financial success of the Field is particularly gratifying in view of the conditions under which it has been established. The Field is now not only contributing to the welfare of South Australia by providing a cheap reliable fuel supply, but is also operating without any burden on the taxpayer and making consistent surpluses over operating costs.

With the completion of the new standard gauge railway, the sales of coal can be increased and the financial results should continue to improve. The accumulated deficit, which in 1951 had reached £307,336, has been reduced to approximately £145,000 at the end of 1956, and should be completely eliminated in the near future.

In accordance with the Electricity Trust Act the finances of the Leigh Creek Coalfield are kept separate from the Trust's general finances. Coal is sold to the Electricity Undertaking at a price agreed between the Trust and the Minister of Works. Coal to other consumers is sold at a price approved by the Prices Minister and must compete with New South Wales coal prices allowing for the difference in quality.

Financial Year	Income	Operating Expense	Surplus	Deficit	Accumulated Deficit
1948	£293,931	£347,524	—	£53,593	£84,830
1949	£423,610	£596,880	—	£173,270	£258,100
1950	£481,297	£528,794	—	£47,497	£305,597
1951	£590,482	£592,221	—	£1,739	£307,336
1952	£1,065,842	£1,000,673	£65,169	—	£242,167
1953	£1,153,671	£1,145,441	£8,230	—	£233,937
1954	£1,299,356	£1,273,061	£26,295	—	£207,642
1955	£1,258,473	£1,221,542	£36,931	—	£170,711
1956	£1,112,000*	£1,087,000*	£25,000*	—	£145,711*

* Preliminary figures. Final figures not available.

THE FUTURE

The more spectacular part of Leigh Creek development has now been completed. The Field at present could produce over one million tons of coal per annum if required. With additions to its existing excavating plant but without any substantial addition to other ancillary services, the Field could produce up to 1½ million tons of coal per annum which is the output envisaged when the Port Augusta "B" Power Station is in operation.

The 43 million tons of coal conveniently available for open-cut winning will be sufficient to provide the requirements of the two Port Augusta Power Stations throughout their foreseeable life.

Work will be concentrated at the North Field for many years until all the coal available in the northern basins is extracted. Operations will then return to the Telford Basin.

With an established township, an assured water supply and well developed coal-winning facilities, the Field is now capable of meeting all demands. For the first time in the history of the State, a locally-produced fuel is available in adequate quantity and in reliable supply. With the new standard gauge railway to transport the coal to where it is required, the Leigh Creek Coalfield has brought to fruition one of the most important actions ever taken to advance South Australia's industrial progress.

TECHNICAL INFORMATION

THE COAL

Sub-bituminous. Average calorific value 6,250 B.T.U. per lb.

Proximate Analyses

	Moisture	Volatile	Fixed Carbon	Ash
	%	%	%	%
Telford Basin	33.8	21.1	28.4	16.7
Lobe D, Upper Seam	38.0	22.67	31.84	7.49
Lobe D, Lower Seam	35.82	22.08	29.81	12.29
Lobe C	29.08	22.18	27.84	20.90

Sulphur Content

	Sulphur %
Telford Basin	0.21
Lobe D, Upper Seam	0.44
Lobe D, Lower Seam	0.32-3.8
Lobe C	2.46-4.2

EXCAVATING PLANT

Bucyrus Erie 9W Dragline—Is the largest machine on the Field. *Weight* — 460 tons — Ward Leonard operation. Driving motor, motor-generator set — synchronous, 450 H.P.-0.9 P.F. 3,300 volts. *Walking Speed* 0.15 m.p.h. in 7' 6" steps. For information on other machines, see body of report.

COAL PREPARATION PLANT—NORTH FIELD

Input: "Run of Mine" coal from open cut. *Output*: Variable proportions (to suit) of Grade 2 (plus 2" to minus 4"); Grade 3 (plus 1¼" to minus 2"); Grade 4 (plus 0" to minus 1¼"). *Capacity*: 300 to 500 tons per hour depending on proportions of grades produced.

STEAM POWER STATION

Installed Capacity: 4,400 kW. *Steam Conditions* (at turbine stop valve): Pressure — 200 p.s.i. Temperature—600 deg. F. *Boilers*: Three Babcock and Wilcox. Maximum steam output 25,000 p.p.h. each. Rotograte Spreader Stokers. Fuel—coal from coal preparation plant. *Turbo-Alternators*: No. 1 Metropolitan-Vickers 1,000 kW. No. 2 Bellis and Morcom 400 kW. No. 3 Brush 1,500 kW. No. 4 Brush 1,500 kW. *Cooling Tower*: Atmospheric Cross-Draught type.

AROONA DAM

Type	Concrete gravity
Capacity	1,650,000,000 gallons
Flow Capacity of Spillway	50,000 cub. ft. per sec.
Catchment Area	280 sq. miles
Average Annual Rainfall	7" approximately
Average Run-off	6 per cent. approximately
Average Annual Evaporation	8 ft. approximately
Overall Length of Top of Wall	775 ft.
Overall Height	80 ft. nominal
Length of Spillway	308 ft.
Height of Spillway	65 ft. nominal
Concrete	58,100 cub. yds.