Province of British Columbia
Ministry of Environment
WATER INVESTIGATIONS BRANCH

MEMORANDUM

Mr. A.P. Kohut
Senior Geological Engineer
Groundwater
Hydrology Section

Date: May 12, 1980

File: 92 G/1 (30)

Re: Sumas Prairie Water Supply - Farmer Road Well No. 2

INTRODUCTION

At the request of J.D.C. Fuller, Head of Engineering Section, Inventory and Engineering Branch, a preliminary groundwater study has been completed on the impact of additional withdrawals from the Abbotsford aquifer, as a result of the proposed pumping of the Farmer Road Production Wells (Figure 1). The possibility that some wells located in the upland area (near the airport, Figure 1), were affected during the period of a pumping test undertaken on the Farmer Road Well No. 2 in July, 1977, has also been investigated.

The following report is based upon an evaluation of available pumping test data, observation well hydrographs, well logs and discussions with individuals aware of the situation in the upland area during the time the test was carried out.

AVAILABLE DATA

1. Farmer Road Production Well No. 2 Pumping Test

Farmer Road Well No. 2 is an 18-inch diameter well constructed in June 1977 to a depth of 198 feet. This well, completed in sand and gravel and screened between 115 feet and 155 feet, was pump-tested for a continuous period of five days in late July, 1977, to determine aquifer parameters and well capacity. According to H. Harris of Ker, Priestman and Associates, who supervised the pumping test and analysed some of the data, the specific capacity of the well was found to be 33.8 USgpm. A maximum design capacity (i.e., safe yield) of 1800 USgpm was recommended by Mr. Harris. A nearby shallow well approximately 340 feet from the pumping well was used for a short period to monitor the drawdown effect during the pumping test.

2. Provincial Observation Well Hydrographs

The Province of B.C. currently monitors the water level fluctuations in several wells in the Abbotsford area. The hydrographs of three observation wells (WR 4-62, WR 13-62, and F.V.T.H. No. 5) are shown in Figure 2, for the period of record between 1974 and 1979 (inclusive).

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3. Upland Area Wells

During recent conversations with E.C. Halstead (Hydrologist, Federal Hydrology Research Division, Vancouver), regarding possible interference effects during the five-day pumping test of Farmer Road Well No. 2, Mr. Halstead indicated that he had received reports from water well drilling contractors in the Abbotsford area, of several wells in the upland area, near the airport, that had gone dry in the late summer of 1977. These would appear to have been improperly constructed wells for the most part. Mr. Halstead suggested that these wells may have gone dry as a result of the five-day pumping test; since, as he indicated, large quantities of water whose source may have been the recharge area (where the affected(?) wells were located) were removed from the aquifer during the 5-day pumping test.

ANALYSIS OF PUMPING TEST DATA

During the July, 1977 pumping test, it was reported that several shallow wells in the immediate vicinity (i.e., within 1000 feet) of the pumping well, had gone dry within 24 hours of the start of the test. No water level readings were taken in these shallow wells prior to the test, so that it was not possible to ascertain the amount of interference drawdown caused by the pumping. Nevertheless, as previously noted, Ker, Priestman and Associates used a nearby shallow well (approximately 340 feet from the pumped well) as an observation well to monitor the drawdown effects during pumping. This shallow observation well recorded less than 1.5 feet of drawdown after 24 hours of pumping. The data from this well appears to be representative of the drawdown effects in shallow wells in the area, but may not necessarily be representative of the drawdown effects in deeper wells. Based upon available well log data, it appears that the shallow wells in the area of the Farmer Road production well, are constructed in a sand and gravel zone which may be separated from the main aquifer, in which the production well is constructed. An interpretation of the logs of several deep holes indicates that there may be silty or clayey layers separating the shallow sand and gravel zone from the main sand and gravel aquifer. The fact that there were drawdown responses to pumping, in the shallow wells, indicate that there is some hydraulic inter-connection between the formations. In order to obtain representative drawdown data for the main aquifer in which the production well is constructed, observation wells completed to approximately the same depth as the screened section of the pumped well, are required.

ANALYSIS OF PROVINCIAL OBSERVATION WELL HYDROGRAPHS

An analysis of the hydrograph data (Figure 2), indicates that water levels, as recorded in observation wells WR 4-62, WR 13-62, and FVTH No. 5, respond seasonally to precipitation. In the fall of 1976 to early 1977, below average precipitation resulted in lower than average recharge to the aquifer. Consequently, the hydrographs indicate that the water levels in the observation wells during this period did not recover fully as in previous years. Continued lower than average precipitation in subsequent

y rs has undoubtedly been a major factor in the overall decline in water levels throughout the Abbotsford area. However, further monitoring into a period(s) of increased annual precipitation will be required before it can be determined more assuredly that groundwater withdrawals from other major well users have not also been a factor in the present water level declines. Presently, water levels continue to remain below average for the period of record.

As can be seen in Figure 2, the water levels in the observation wells during July and August of 1977 (i.e., the time during which Farmer Road Well No. 2 was tested) were declining, following the normal seasonal trend. More detailed hydrograph records during the pumping period are shown in Figure 3, 4, and 5. As can be seen in each hydrograph, there were no immediate drawdown effects or unusual changes in the observation well water levels that can be attributed to the pumping of Farmer Road Well No. 2. In each hydrograph record, the water levels were declining at a normal seasonal rate.

Observation well WR 4-62 near the airport, is located in the same area as the reported wells which dried up in late summer of 1977. Based upon the above analysis, the apparent reason for their "drying-up" can be attributed to a decline in the water levels throughout the area, as a result of lower than average precipitation, and not necessarily as a result of the 5-day pumping test of Farmer Road Well No. 2. In fact, observation wells WR 13-62 and FVTH No. 5, located less than 5,000 feet from Farmer Road Well No. 2, showed no interference effects from pumping of Farmer Road Well No. 2, so that it appears the major pumping "zone of influence" for this production well is less than 4,000 feet from the well.

CONCLUSIONS AND RECOMMENDATIONS

The analyses of three Provincial observation wells located from 4,000 to 17,000 feet from Farmer Road Well No. 2, during the period of the 5-day pumping test of Well No. 2, showed that there were no discernable interference effects in those wells, as a result of pumping of Farmer Road Well No. 2. An analysis of the water level data, taken in a shallow monitor well, located approximately 340 feet from Farmer Road Well No. 2, during the pumping test indicated that there are interference effects upon shallow wells in the immediate area surrounding production wells. However, because the shallow well used as a monitor well was possibly not in the same aquifer as the pumped well, the drawdown data may not be representative. Therefore, it is recommended that up to three properly constructed observation wells penetrating the main aquifer, be completed within the "zone of influence" of the pumping well (see Figure 6). One of these wells should be located within 100 feet of the pumping well to obtain aquifer parameters such as the transmissivity and storage coefficient, and to more clearly define the "cone of depression" during pumping conditions. The other two wells, one located within 1000 feet north of the pumping well to monitor the pumping effects between the Farmer Road Production wells and the Fraser Valley Trout Hatchery wells; and the other, located within 1000 feet west of the pumping well to monitor the long term pumping effects between the Farmer Road Production wells and local well users. It is recommended

these wells be equipped with monitoring devices, so that documented data can be available for future reference should well users in the area have any complaints to the effect that pumping from Farmer Road Production Well No. 2 and/or No. 1 are seriously affecting their groundwater supply.

According to Callan (1971), the safe annual yield from the eastern section of the Abbotsford uplands aquifer (based upon available data up to that time) was estimated at 10.5 cfs, which was approximately equal to the natural discharge at that time, through springs, along the eastern bluffs of the uplands. Presently, according to Zubel (1979), there is an estimated 1800 USgpm (4.0 cfs) being withdrawn from the aquifer by the Fraser Valley Trout Hatchery; an estimated 1640 USgpm (3.7 cfs) by the district of Abbotsford; an estimated 1000 USgpm (2.2 cfs) by the district of Matsqui; and an estimated 3000 USgpm (6.7 cfs) from all other well owners; or an estimated total withdrawal of 7440 USgpm or 16.6 cfs. If Farmer Road Well No. 2 goes into production at a maximum rate of 1800 USgpm (i.e., 4.0 cfs), then the total withdrawal from the aquifer will exceed 20.0 cfs, or almost double the estimated safe yield from the aquifer according to Callan (1971). Hence, it is imperative that monitoring of the water levels in the vicinity of the Farmer Road production wells be made and further observation wells constructed, to provide more detailed data concerning the water level conditions as a result of future pumping activities.

A preliminary cost estimate for the construction of 3 observation wells and monitoring equipment, less engineering supervisory costs, is as follows:

A. Drilling and Construction of Observation Wells

	ITEM	UNITS	COST
1.	Mob., set up and Demob.	Lump Sum	$ 150.00
2.	Surface casing (8-in. diam. X 10 ft.)	$30/ft.	$ 300.00
3.	Cased Drilling (6-in. diam. X 120 ft.)	$25/ft.	$ 3,000.00
4.	Drive Shoe (6-in. diam.)	Lump Sum	$ 80.00
5.	Screen (6-in. diam. X 8 ft.)	$110/ft.	$ 880.00
6.	Hourly work: screen assembly, well development, bail test, etc., (8 hrs.)	$100/hr.	$ 800.00
		TOTAL	$ 5,210.00
		+ 15% Contingencies	781.50
		TOTAL	$ 5,991.50
		X 3 wells	$17,974.50
B.	Monitoring Equipment X 3 Wells		$ 3,300.00
		ESTIMATED TOTAL COST	$21,274.50

It is recommended that the proposed observation wells be constructed and equipped before Production Well No. 2 is put on line, so that sufficient base-line data can be collected to compare the pre-pumping water level conditions and the water level conditions after production pumping begins.

Marc Zubel.

M. Zubel
Geological Engineer
Groundwater
Hydrology Section
Inventory and Engineering Branch

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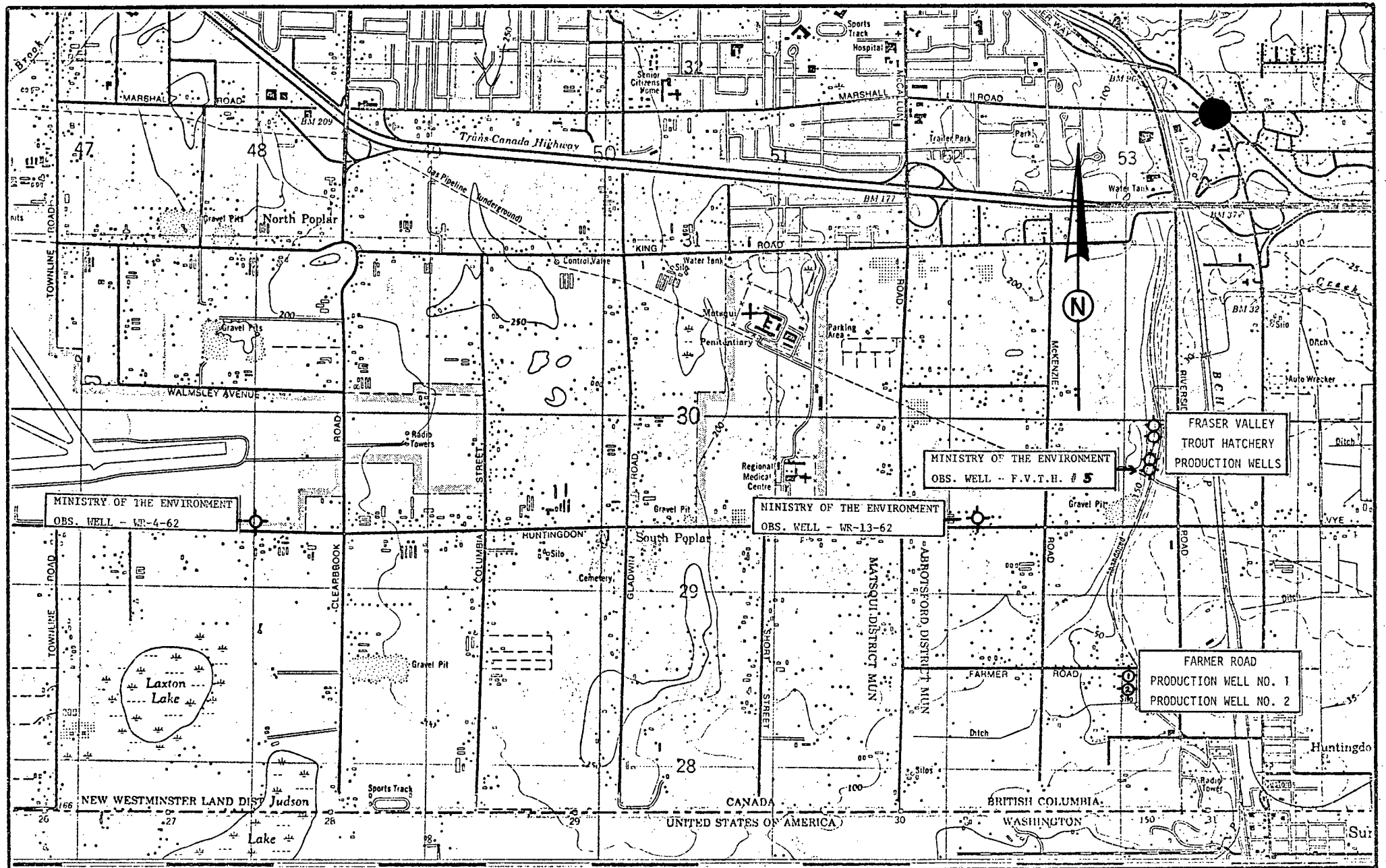
References

Callan, D.M. (1971). "Recommendations for Development of a Groundwater Aquifer at the Fraser Valley Trout Hatchery near Abbotsford". Groundwater Files, 92 G/1 (0239016), Water Investigations Branch, Ministry of Environment, January 22nd.

Zubel, M. (1979). "Fraser Valley Trout Hatchery - Production Well Performance and Data Analysis". Groundwater Files 92 G/1 (29), Water Investigations Branch, Ministry of Environment, June 26th.



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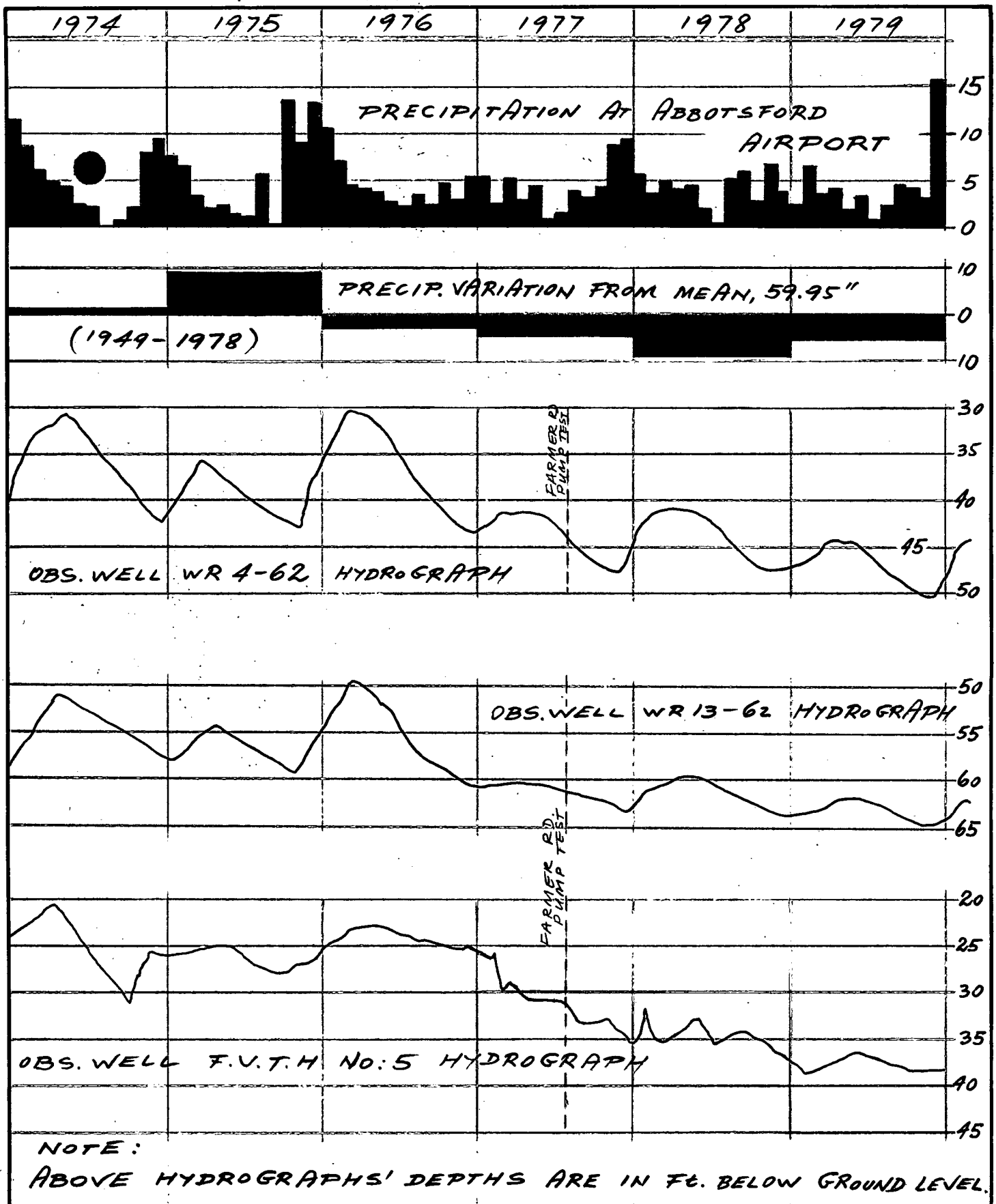
ABBOTSFORD UPLAND AREA
WELL LOCATION PLAN

SCALE: VERT. 1" = 1800'
HOR.

DATE: May, 1980

M. Zubel ENGINEER

FILE No. 92 G/1 DWG. No. FIG. 1



NOTE:
ABOVE HYDROGRAPHS' DEPTHS ARE IN Ft. BELOW GROUND LEVEL.

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HYDROGRAPH DATA
PROVINCIAL OBSERVATION WELLS
ABBOTSFORD, B.C.

SCALE: VERT. N/A
HOR. N/A

DATE May 1980

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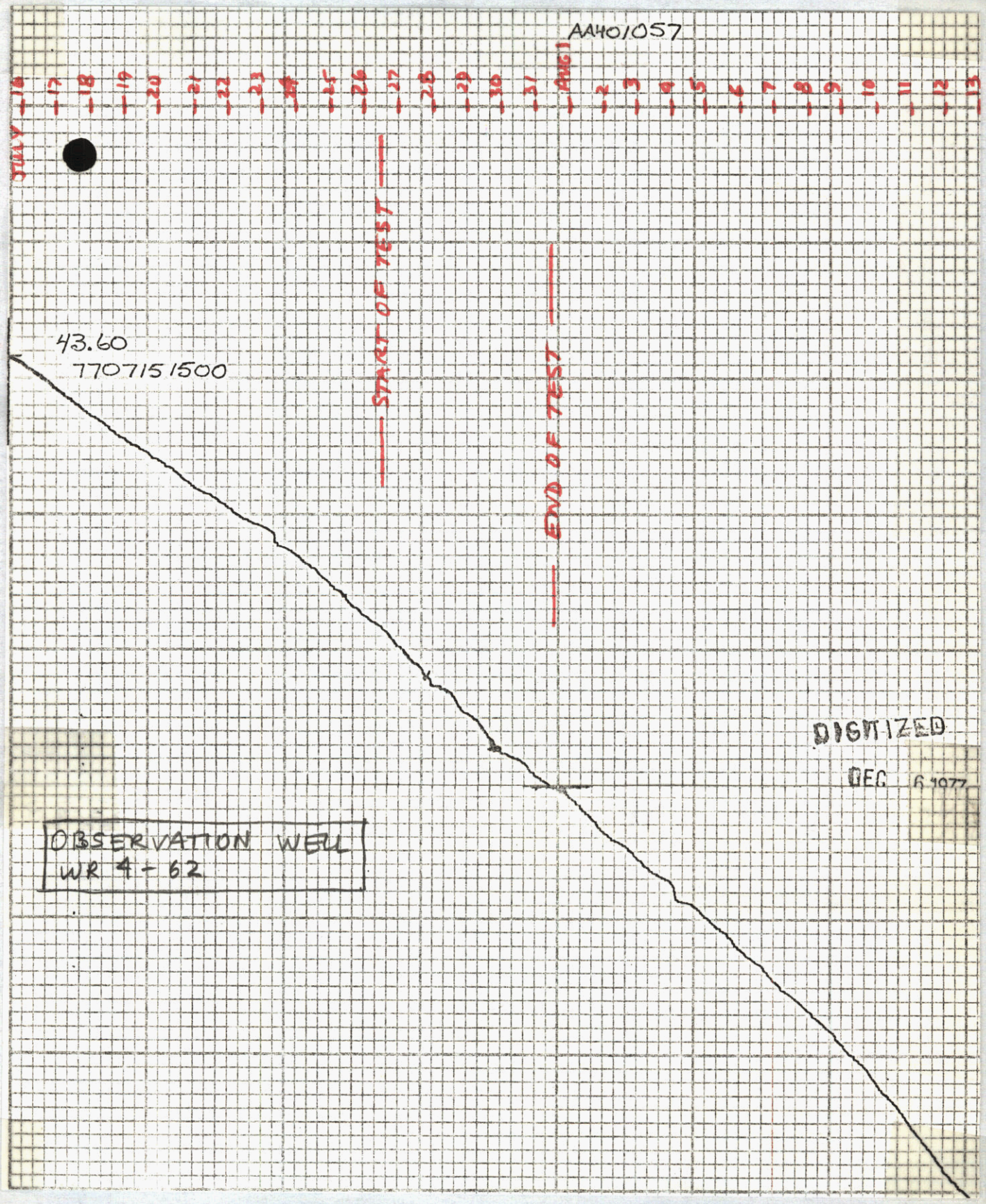
FILE No. 92 G/1 DWG. No. FIG. 2

bcil 6660 wrs



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HYDROGRAPH OF
OBSERVATION WELL WR 4-62
(JULY-AUGUST 1977)

SCALE: VERT. N/A
HOR. N/A

DATE
MAY 1980

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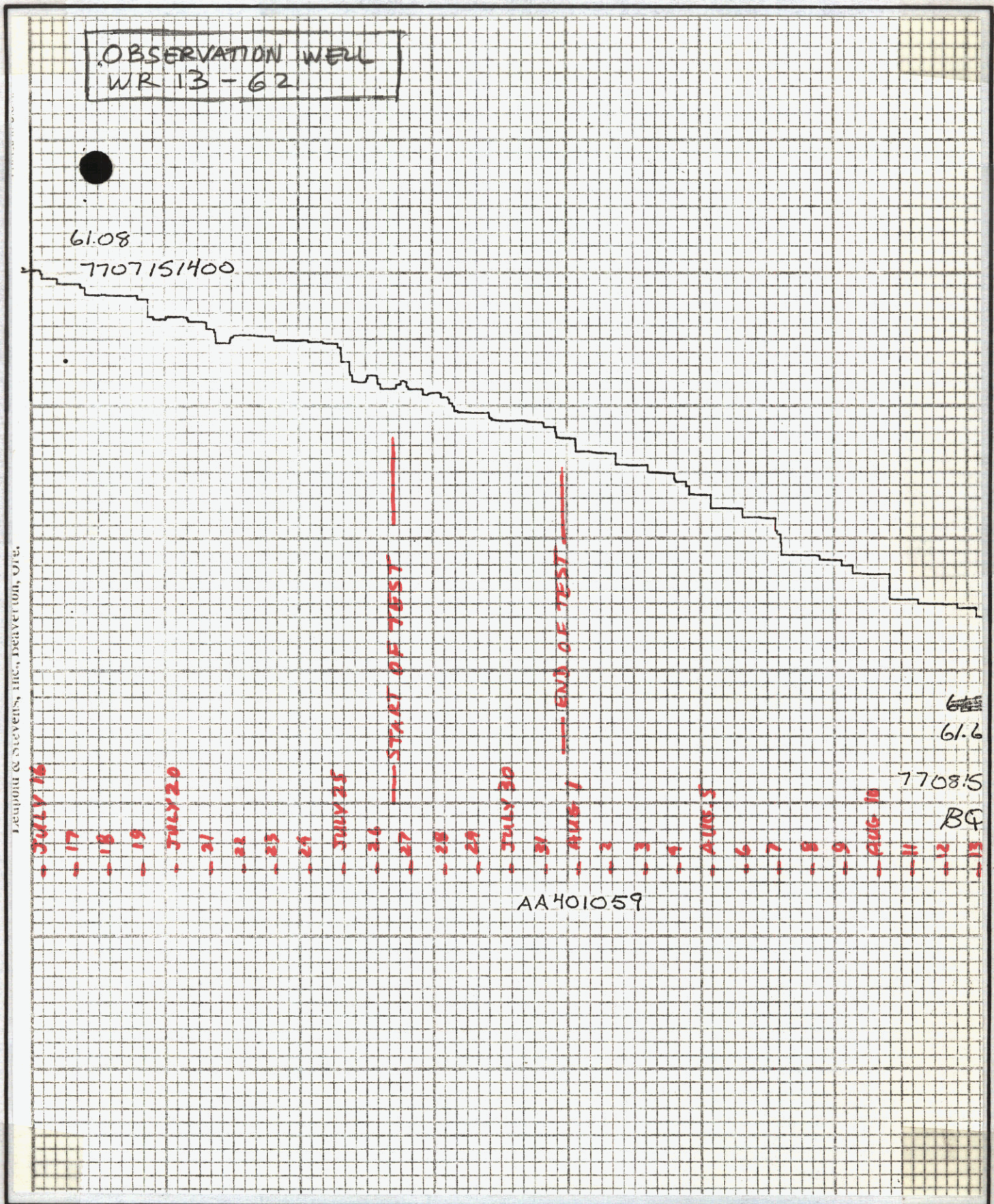
FILE No. 92 G/1 DWG. No. FIG. 3

bcil 6660 wrs



Langford & Stevens, Inc., Beaverton, Ore.

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HYDROGRAPH OF
OBSERVATION WELL WR 13-62
(JULY-AUGUST 1977)

SCALE: VERT. N/A
HOR. N/A

DATE
MAY 1980

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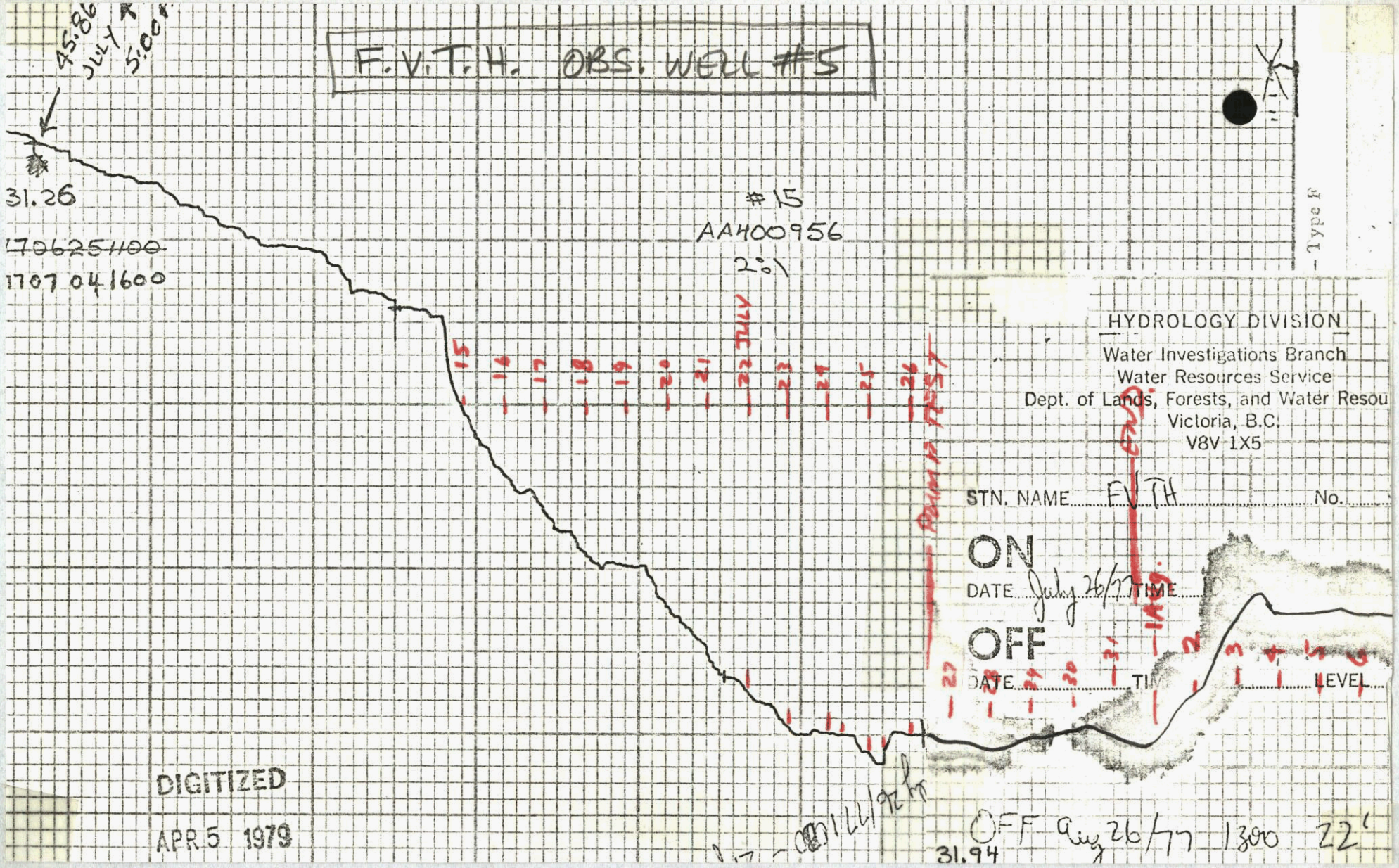
FILE No. 92 G/1 DWG. No. FIG. 4

bcil 6660 wrs



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HYDROGRAPH OF
OBSERVATION WELL F.V.T.H. #5
(JULY-AUGUST 1977)

SCALE: VERT. N/A
HOR. N/A
DATE MAY 1980
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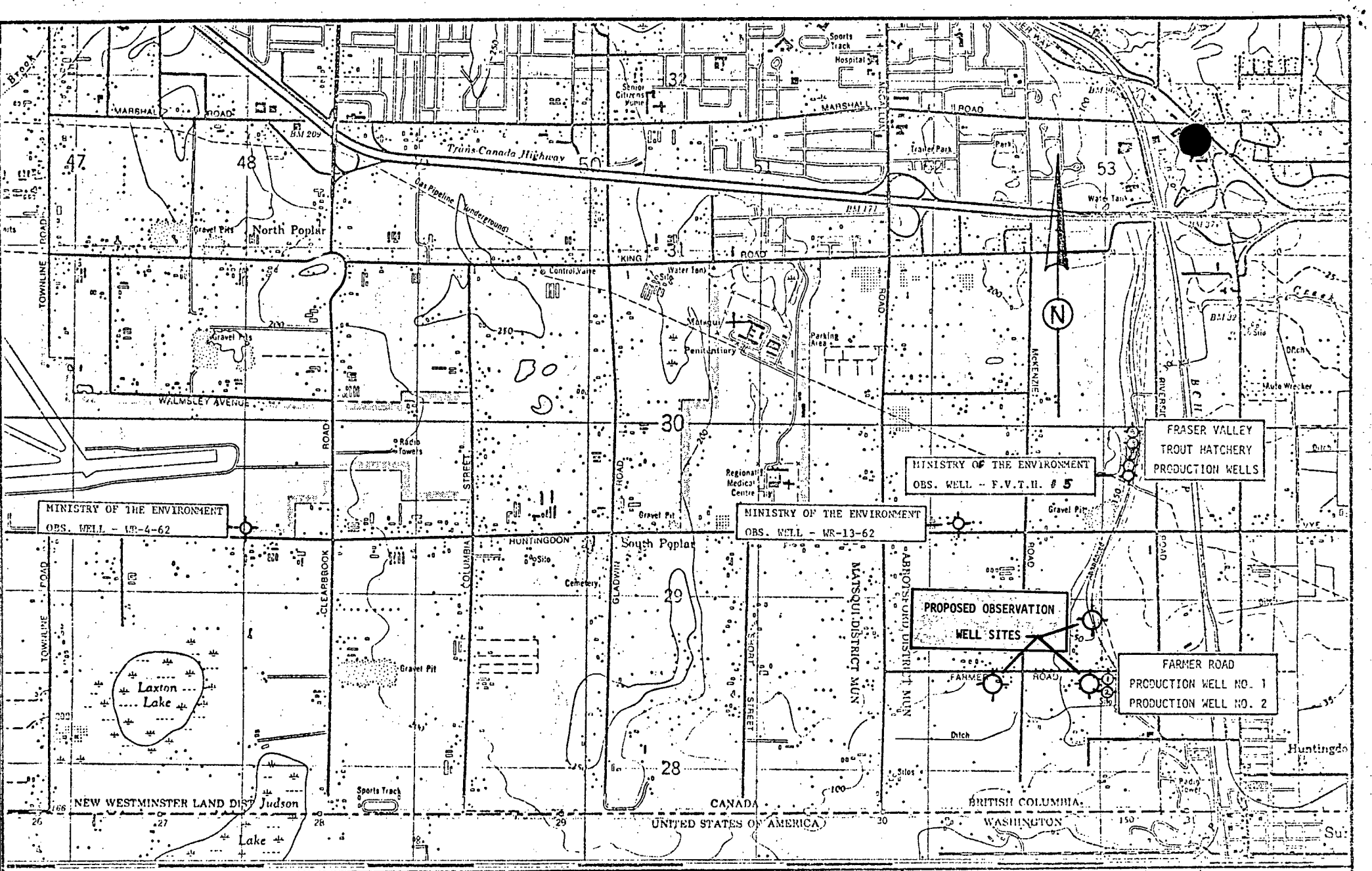
FILE No. 92 G/1 DWG. No. FIG. 5

bcil 6661 wrs



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ABBOTSFORD UPLAND AREA
WELL LOCATION PLAN
PROPOSED OBSERVATION WELL SITES

SCALE: VERT. 1" = 1800'
HOR.

DATE: May, 1980

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FILE No. 92 G/1 DWG. No. FIG. 6