VILLAGE OF WEBSTER
Ground Water Contamination Study
Wisconsin Department of
Natural Resources

Prepared By:

AYRES ASSOCIATES
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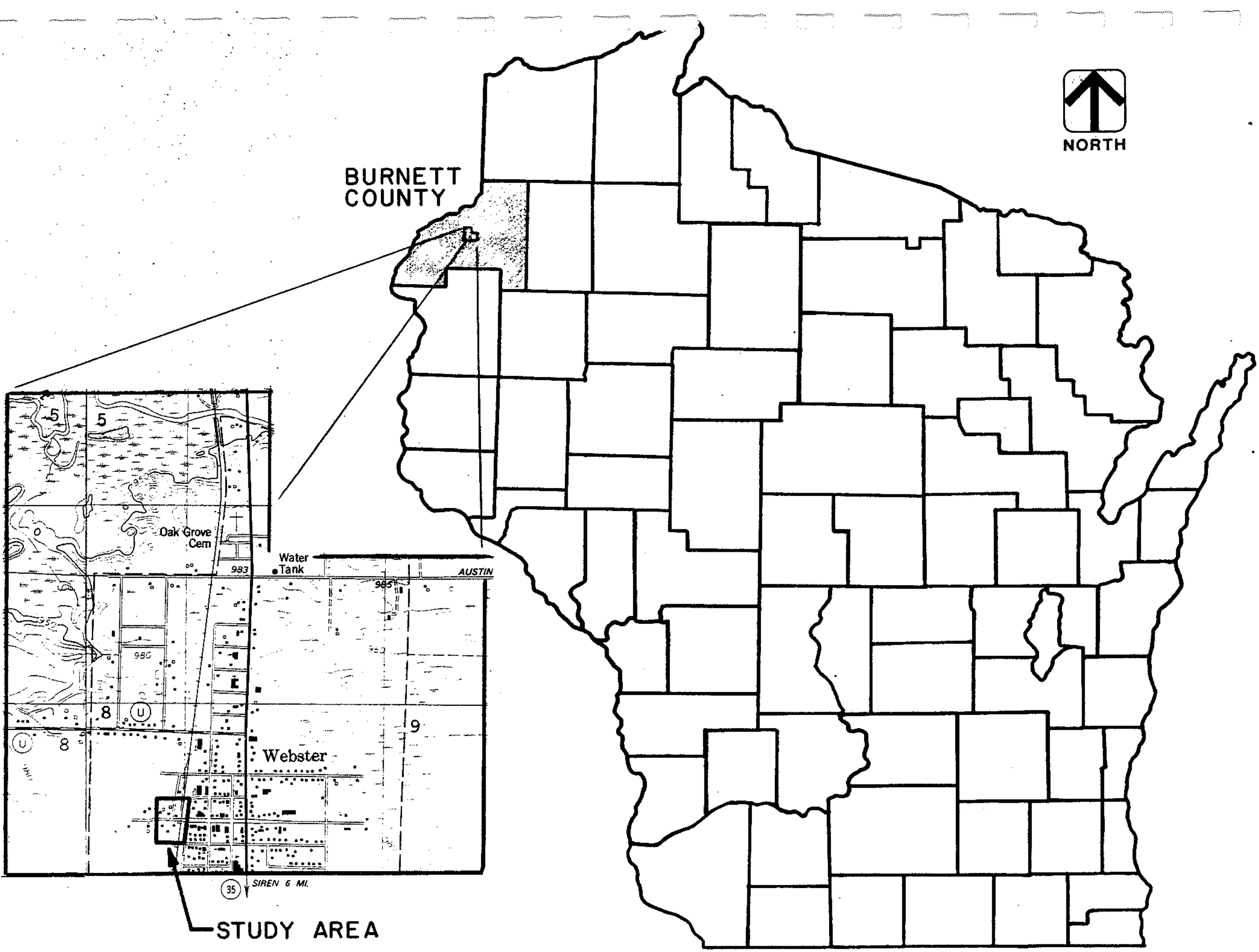
1.0 INTRODUCTION

Webster, Wisconsin is shown in Figure 1, "Project Location Map". Testing of wells supplying the municipal water system for Webster showed the presence of two volatile organic compounds (VOC's) in Village Well No. 1 in November of 1984. Testing of the adjacent Village Well No 2 (170 feet away) did not detect contaminants at that time. Resampling the Village Well No. 1 (VW-1) in December, 1984 and January, 1985 confirmed the presence of 1,2-dichloroethane and tetrachloroethylene at concentrations of about 22 parts per billion (ppb) and 17 ppb, respectively. This well was taken out of service and the Village water supply was obtained principally from a new well, VW-3, which had been recently completed and was located approximately one mile away. In addition, Village Well No. 2 (VW-2) was refurbished in December, 1984, with a new vertical turbine pump installation. VW-2 was pumped monthly to obtain water samples per the State code but was seldom used otherwise. Sampling for VOC analyses in November, 1985 was positive in VW-2 and confirmed with sampling again in December, 1985.

Meanwhile, shallow auger borings were performed by the Wisconsin DNR in May, 1985 in an area just north and northeast of VW-1. A petroleum product odor was noted in some of the footage drilled in three borings lying between VW-1 and an abandoned petroleum bulk storage facility. Other May, 1985 borings in the general area did not produce soil samples having any odors.



PROJECT LOCATION MAP

Figure 1

Subsequent to the discovery of contamination in VW-2, the Wisconsin DNR made a decision to undertake a study to further analyze the problem. A scope of work was developed by the DNR and proposals were requested for completion of the work. In May, 1986, Ayres Associates was retained to perform an investigation per the specified scope of work. The purpose of this report is to present the findings of that study for which the objectives are: 1) to investigate extent and quantity of contamination in the soil and ground water near the contaminated Village Well; 2) to determine the source(s) of contamination; 3) to evaluate contamination with respect to relevant environmental criteria, and; 4) to summarize data collected, and formulate opinions for remedial action methods.

1.1 SCOPE OF INVESTIGATION

The field investigations undertaken to achieve the objectives listed above included: 1) nine soil borings at selected sites to document the near-surface geologic environment and provide soil samples for analysis of selected volatile organic compounds (VOC's), 2) installation of nine ground water monitoring wells, 3) two rounds of ground water sampling and analysis for the selected VOC's, 4) a site survey to define topography, cultural features, and boring and monitoring well locations in the study area, 5) laboratory analyses to determine the physical properties of the major soil layers sampled in the soil borings, and 6) a pump test of the contaminated Village Well No. 2 to determine hydraulic parameters of the aquifer.

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This work has been completed and is discussed in the body of this report. Supporting data and field and laboratory test results are presented in the appendices. Four plan sheets accompany this report and include: Plan Sheet 1, a site plan showing topography, buildings, utilities, streets, soil boring locations, and other natural and man-made features; Plan Sheet 2, a map showing water table contours; Plan Sheet 3, a hydrogeologic cross-section across the study area; and Plan Sheet 4, a map of contaminated sample locations. These plan sheets are included in map pockets near the back cover of this report.

1.2 SITE CHARACTERISTICS

The project study area is shown on Figure 2, "Study Area, Village of Webster". The study area is approximately 500 feet wide (east-west) by 800 feet long (north-south). The Soo Line Railroad right-of-way passes along the east side of the study area in a general north-south direction. The study area is on the fringe of the Webster business district, and is very flat. Except for the northwest quadrant, the study area is generally open. Woods occupy most of that quadrant.

In addition to Village owned property where both Village Wells No. 1 and No. 2 are located, structures in the study area include an auto repair shop (Bud's Auto Repair), one private residence, one

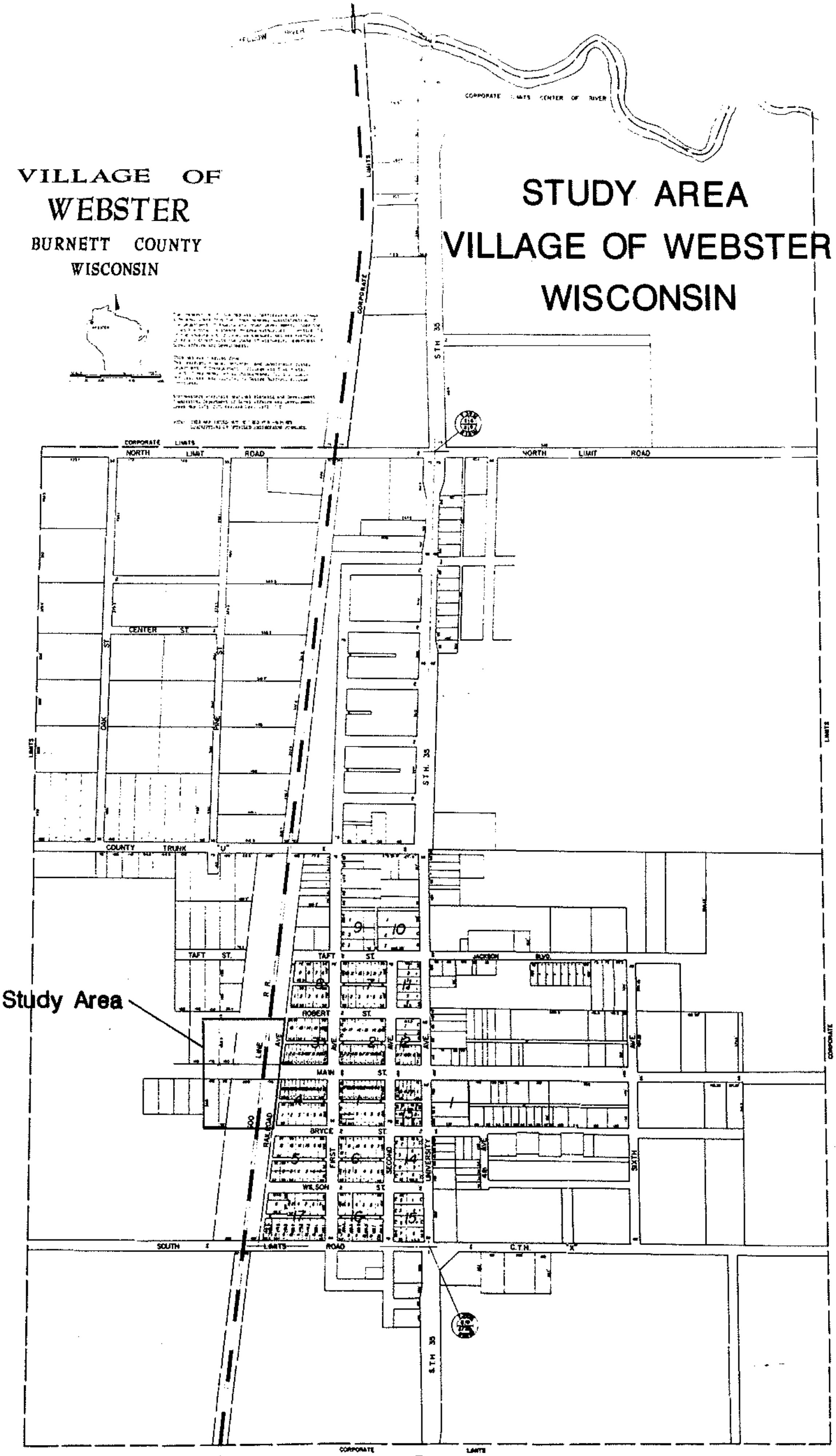

VILLAGE OF
WEBSTER
BURNETT COUNTY
WISCONSIN
STUDY AREA
VILLAGE OF WEBSTER
WISCONSIN
Study Area
NORTH LIMIT ROAD
CENTER ST.
OAK ST.
PINE ST.
S.T.H. 35
COUNTY TRUNK "U"
TAFT ST.
JACKSON BLVD.
ROBERT ST.
MAIN ST.
BRYCE ST.
WILSON ST.
SOUTH LIMITS ROAD
C.T.H. "X"
RAILROAD
FIRST AVE.
SECOND AVE.
UNIVERSITY AVE.
SIXTH AVE.
CORPORATE LIMITS

Figure 2

empty warehouse, an LP gas bulk facility (Milltown Gas Co.), a petroleum product warehouse facility (Burnett County Oil Company), and the site of a second petroleum product bulk storage facility (Hoffman Corner Oil Company) which was torn down and removed prior to the site survey performed as a part of this study. To the east, just outside the project study area, is a second auto repair shop (Webster Auto Repair).

2.0 PROCEDURES

Field investigations included sub-surface exploration, ground water monitoring well installation and sampling, site survey and a pump test of Village Well No. 2 (VW-2).

2.1 SOIL BORINGS AND SAMPLING

Based on the scope of the investigation, nine soil borings were made in the study area. Their locations were selected based on the desire to investigate the ground water flow field on essentially all sides of VW-2 as well as to provide soil and water samples for analysis from along possible flow paths toward VW-2.

Soil borings were made using hollow stem auger drilling techniques with a CME 45 trailer mounted drill rig and a CME 750 all-terrain drill rig. The drilling was performed during the period of July 7-8, 1986.

Standard split spoon samples (ASTM 1586) were obtained every five (5) feet to allow visual description and classification of the soil, and to provide soil for containerization and later analysis for selected volatile organic compounds. Samples from all nine borings were numbered consecutively beginning with Sample 1 (S-1) at 5.0 feet. In borings OW-4 and OW-7, an additional soil sample was taken from the auger wrap at a depth of 2.5-4.0 feet. These samples were numbered S-0. This was done because the soil above 4 feet deep was substantially different than that soil deeper than 4 feet.

Soil sampling quality assurance and quality control (QA/QC) procedures involved cleaning the sampling spoon prior to obtaining each sample. The cleaning procedure consisted of: 1) a tap water rinse during which soil particles were removed with a wire brush; 2) an acetone rinse to remove organic compounds present; 3) a distilled water rinse; 4) a nitric acid rinse; and 5) a final distilled water rinse.

After driving, retrieving, and opening the split spoon, the outside portion of the sample, was removed because of sidewall smear. The inner portion was representatively sampled and containerized in pairs of prepared glass vials with teflon septa.

Filling the vials was accomplished with a teflon coated spatula which was cleaned after every sample interval utilizing the same procedure described for the sampling spoon. The vials were immediately refrigerated for organic compound analyses. The remaining soil was saved in standard drilling sample jars for later use.

Physical testing of drilling samples was performed to verify field classifications and to document parameters of the major soil layers found during drilling. Per the work scope, testing included five grain size gradations through the P-200 fraction. The samples selected were OW-5, S-1; OW-5, S-9; OW-7, S-3; OW-9, S-4; and OW-9, S-7.

Also, three samples were tested to determine Atterberg limits and grain size gradation below the #200 sieve by the hydrometer method. These samples were OW-2, S-1; OW-4, S-0; and OW-7, S-0. All testing was performed according to ASTM procedures.

2.2 GROUND WATER MONITORING WELLS

All monitoring wells were installed in the soil boring holes. The construction diagrams are included in Appendix A. All wells were constructed with 2 inch I.D. threaded, flush-joint PVC well casing and 0.010 inch slotted PVC well screen. After lowering the well screen and casing in a boring, the well was backflushed with clear water from the Village municipal system. Water was circulated down the casing and up the annulus until the return water was visibly free of fines. The screened sections of all wells were backfilled with washed, graded sand above which bentonite plugs were set. The remainder of each boring annulus was backfilled with cement-bentonite grout placed downhole through a tremie tube. Protective, locked, steel tops were installed in a concrete cap on all wells. Wooden fence barricades were installed around wells OW-1, OW-2, OW-3, OW-7, OW-8, and OW-9 because of their locations in areas where off-road vehicles are prone to travel.

Four weeks after well installation, the wells were surged and bailed to remove fine sediment and to characterize the water level recovery rate following drawdown.

Two rounds of water sampling were conducted on the wells. A volume of water equal to four times the volume of water present within the well was extracted prior to drawing a sample. The well purging was accomplished using a PVC bottom loading bail, but for drawing the sample, a teflon bail was used. Samples were not filtered prior to placing in 40 ml. glass vials with teflon septa in the covers. No head space was allowed to remain in the vial. Duplicate samples were obtained in most cases, and the samples were refrigerated during transit to the analytical laboratory.

2.3 SITE SURVEY

The site survey was performed to define the topography and to identify and locate all man-made features. In this way, potential sources of contamination might be identified and possible topographic controls on any surface spills could be defined.

The survey documented the physical and cultural features of the study area. A 100 foot grid was established over the site and topography was mapped at a one foot contour interval. Vertical control was referenced to the east side flange of the hydrant at the corner of Main Street and State Trunk Highway 35. This is an established bench mark used by the Village surveyor and is referenced to USGS datum. Observation well and soil boring locations are also tied-in and all features are shown on Plan Sheet 1. Conventional surveying techniques, using a Wild T-2 theodolite, an AGA 220 EDM, and a Zeiss Ni 2 level, were employed to complete this work. The locations of the water and sewer mains was obtained from utility maps provided by the Village of Webster.

2.4 PUMP TEST

The Village Well No. 2 (VW-2) was test pumped following the second round of water sample collection. Pumping was begun at 4:40 PM on September 23, and concluded at 1:10 PM on September 24, 1986. During this time, water levels were monitored at the nine observation wells, and VW-1 and VW-2. The flow volume was continuously measured by a flow meter. The total flow from VW-2 was recorded so that the average flow rate could be calculated for various periods throughout the 20.5 hour pump test duration. After pump shut-down, the water level recovery at selected observation wells was recorded to aid in the determination of the aquifer's hydraulic parameters. At a point early in the pump test, and again just before shut-down, water samples were drawn from a sample tap at the VW-2 wellhead for VOC analyses. These samples had not been included in the original scope of work, but were added after discussion with the DNR's project manager.

3.0 RESULTS

3.1 SOIL BORING AND SAMPLING

All nine borings were drilled to approximately 45 feet. The logs for the borings, which are designated OW-1 through OW-9, are included in Appendix B. A summary of soil properties and individual grain size curves are included in Appendix C.

The boring logs show that below a thin veneer of sand or silty sand fill at the surface, a silt or clay layer is found generally extending down to about six feet. This interval also includes some organic material in borings OW-2, OW-3, and OW-6. The clay varies in color from grey-green to red-brown in a given boring and from one boring to another. Of the three cohesive soil samples analyzed for Atterberg limits, two were determined to be high plasticity clay (CH). Those samples were OW-2, sample S-1, and OW-7, sample S-0. The other sample (OW-4, S-0) was classified as CL. Typically, if a silty sand is found below the clay, it is a transition to the poorly graded sand below and there is no abrupt change from the silty sand to the sand. In most borings, the remainder of the soil column is poorly graded sand (SP). In some borings, an occasional zone of sand with an increased silt fraction is found. Boring OW-3 is unique in that a green clay is present in thin layers in sample S-7 from 35 to 36.5 feet. The clay again appears in sample S-9 from 45 to 46.5 feet, but here it is the predominant soil type in the sample.

3.2 GROUND WATER MONITORING WELLS

Well construction diagrams are included in Appendix A and the Department of Natural Resources' Well Information Form (WIF) and the Ground Water Monitoring Inventory Form (GIN) are in Appendix D.

All nine borings encountered the ground water table at depths of approximately 30 feet to 35 feet. Consequently, the bottom of the well screens were set at about 45 feet deep in all nine borings due to the flat land surface.

3.3 ENVIRONMENTAL MONITORING

Thirty soil samples and twenty water samples (2 rounds from 9 monitoring wells and 2 samples from VW-2) were analyzed for selected volatile organic compounds (VOC's). The compounds, consisting of all those identified by EPA Methods 601 and 602 plus xylenes, are listed in Table 1. Among those analyzed for are several constituents of gasoline, namely toluene, benzene, xylene, and ethylbenzene. Also included are the two compounds found by the DNR in analyses of Village Wells No. 1 and 2. The analytical results are tabulated in Appendix E.

TABLE 1

ORGANIC COMPOUNDS INCLUDED

IN EPA METHODS 601 AND 602

APPENDIX A TO PART 136—METHODS FOR ORGANIC CHEMICAL ANALYSIS OF MUNICIPAL AND INDUSTRIAL WASTEWATER.

Method 601—Purgeable Halocarbons

1. Scope and Application

1.1 This method covers the determination of 29 purgeable halocarbons.

The following parameters may be determined by this method:

Parameter	STORET No.	CAS No.
Bromodichloromethane	32101	75-27-4
Bromoform	32104	75-25-2
Bromomethane	34413	74-83-9
Carbon tetrachloride	32102	56-23-5
Chlorobenzene	34301	108-90-7
Chloroethane	34311	75-00-3
2-Chloroethylvinyl ether	34576	100-75-8
Chloroform	32106	67-66-3
Chloromethane	34418	74-87-3
Dibromochloromethane	32105	124-48-1
1,2-Dichlorobenzene	34536	95-50-1
1,3-Dichlorobenzene	34566	541-73-1
1,4-Dichlorobenzene	34571	106-46-7
Dichlorodifluoromethane	34668	75-71-8
1,1-Dichloroethane	34496	75-34-3
1,2-Dichloroethane	34531	107-06-2
1,1-Dichloroethane	34501	75-35-4
trans-1,2-Dichloroethene	34546	156-60-5
1,2-Dichloropropane	34541	78-87-5
cis-1,3-Dichloropropene	34704	10061-01-5
trans-1,3-Dichloropropene	34699	10061-02-6
Methylene chloride	34423	75-09-2
1,1,2,2-Tetrachloroethane	34516	79-34-5
Tetrachloroethene	34475	127-18-4
1,1,1-Trichloroethane	34506	71-55-6
1,1,2-Trichloroethane	34511	79-00-5
Tetrachloroethene	39180	79-01-6
Terichlorofluoromethane	34488	75-69-4
Vinyl chloride	39715	75-01-4

Method 602–Purgeable Aromatics

1. Scope and Application

1.1 This method covers the determination of various purgeable aromatics. The following parameters may be determined by this method:

Parameter	STORET No.	CAS No.
Benzene	34030	71-43-2
Chlorobenzene	34301	108-90-7
1,2-Dichlorobenzene	34536	95-50-1
1,3-Dichlorobenzene	34566	541-73-1
1,4-Dichlorobenzene	34571	106-46-7
Ethylbenzene	34371	100-41-4
Toluene	34010	108-88-3

3.3.1 Soil Samples

The soil samples analyzed were selected on the following basis: 1) the vertical position of the sample within a boring, 2) the location of the boring, and 3) the presence or absence of odor in the given sample and the adjacent samples from the same boring. Typically, at least one sample from the near surface unsaturated zone and one sample from below the water table was analyzed in each boring.

Of the thirty samples analyzed, fourteen samples showed contaminant detects. No contaminants were detected at all in borings OW-4,5,8, and 9.

Borings OW-1 and OW-2 were contaminated at several intervals with aromatic hydrocarbons including ethylbenzene, benzene, toluene and xylenes.

Borings OW-3, OW-6, and OW-7 did not have aromatic hydrocarbons detected but the halogenated compounds of dichloromethane and trichlorofluoromethane were detected at one or more depths in each boring.

3.3.2 Ground Water Sampling

Ground water samples were taken on August 4 and September 23, 1986. A total of seven compounds were detected in the two rounds of sampling from the nine observation wells. Those compounds were: chloroform, dichloromethane, tetrachloroethylene, toluene, 1,1,1-trichloroethane, 1,1,2-trichloroethane and trichloroethylene.

Each compound was found in one or more of all wells except OW-3 and OW-4. These two wells did not show detects of any of the compounds tested for on either sampling date.

After discussion with the DNR project manager, it was decided that the Village Well No. 2 should be sampled during the time the well was being pumped for the pump test. This was not included in the original project work scope. Samples of the pump discharge were taken at a sampling tap on the discharge line early in the 20.5 hour pump test period and again just prior to cessation of the test. The first sample showed benzene, 1,2-dichloromethane, tetrachloroethylene, and trichloroethylene. The second sample showed only 1,2-dichloroethane and tetrachloroethylene to be present. These two compounds are the compounds originally found by the DNR in VW-2.

3.4 GROUND WATER LEVELS

Ground water level data was collected in conjunction with the two water sampling rounds. The ground water levels for September 23 are plotted and contoured on Plan Sheet 2. The data shows a very flat water table gradient sloping to the southwest across the study site. The general gradient on September 23 was approximately 0.0006 to 0.0007 feet per foot based on the water table contours shown on Plan Sheet 2.

The August 4 water level data supports the second data set. It should be noted, however, that the general water table did rise on the order of 0.1 - 0.2 feet between the two readings. The only exception to the general water table rise was at OW-7 where the level fell by 0.14 feet.

3.5 PUMP TEST

A pump test of Village Well No. 2 was performed on September 23 and 24, 1986. The data is tabulated in Appendix F.

A type curve matching analysis was performed with time VS drawdown data from Wells OW-3, OW-4, OW-5, and OW-6. This data was analyzed on the basis of an unconfined aquifer. The values of transmissivity (T), specific yield (Sy), and horizontal and vertical hydraulic conductivity (Kh, Kv) are listed below:

Well OW-3

Transmissivity	209,000 gpd/ft
Specific Yield	0.008
Horizontal Hydraulic Conductivity	5,970 gpd/ft^2
Vertical Hydraulic Conductivity	0.11 gpd/ft^2

Well OW-4

Transmissivity	79,000 gpd/ft
Specific Yield	0.054
Horizontal Hydraulic Conductivity	2,256 gpd/ft^2
Vertical Hydraulic Conductivity	564 gpd/ft^2

Well OW-5

Transmissivity	55,000 gpd/ft
Specific Yield	0.09
Horizontal Hydraulic Conductivity	1,570 gpd/ft^2
Vertical Hydraulic Conductivity	1,400 gpd/ft^2

Well OW-6

Transmissivity	15,800 gpd/ft
Specific Yield	0.005
Horizontal Hydraulic Conductivity	450 gpd/ft^2
Vertical Hydraulic Conductivity	7 gpd/ft^2

These results show some variance of hydraulic conductivity values which is believed to reflect the anisotropic nature of the alluvial soils comprising the aquifer.

Sufficient data from Wells OW-1 and OW-2 were not obtained to allow the type curve fitting technique to be used. This is due to the relatively longer radial distance from the pumped well (VW-2) to these observation wells. Also, the drawdown data for these wells shows drawdown values of only 0.11 ft. and 0.13 ft. at the end of the pump test for wells OW-1 and OW-2, respectively. This flat drawdown curve makes type curve matching imprecise.

The Well OW-4 plot of log time VS log drawdown shows an increasing rate of drawdown at data points late in the pump test. This could be due to an impermeable barrier in the aquifer. Other well drawdown data do not show this feature, possibly because the duration of the pump test was too short for the influence of the boundary, if present, to be manifest in the data. If this is the case, then the potential boundary is too far away from Village Well No. 2 to have an effect on normal water supply usage of the well. Typical pumping durations are much less than the 20.5 hours of pumping during this pump test.

A second method of pump test data analysis was undertaken using distance - drawdown data and Jacob's form of the Theis equation. The least squares method was used to obtain a best fit line on the data. This technique employed the use of a micro-computer and software which was written by M. Beljin at the International Ground Water Modeling Center. Drawdown data at the end of the pump test was used from all monitoring wells. With distance VS drawdown data lumped in one analysis, the transmissivity determined by this method was 66,400 gpd/ft and the storativity (specific yield) was 0.057.

Lumping all the data together, however, results in an "average" hydraulic conductivity which may be meaningless in an aquifer with strong anisotropy.

A third analysis was performed using the same distance drawdown data but analyzing only pairs of wells lying in the same general direction in order to explore the question of anisotropy in the aquifer. The aquifer parameters determined this way are listed below.

Monitoring Well Pairs

OW-3 and OW-9

Transmissivity	67,300 gpd/ft
Specific Yield (Storativity)	0.064

OW-1 and OW-2

Transmissivity	187,000 gpd/ft
Specific Yield (Storativity)	0.085

OW-6 and OW-7

Transmissivity	60,600 gpd/ft
Specific Yield (Storativity)	0.038

OW-4 and OW-5

Transmissivity	31,100 gpd/ft
Specific Yield (Storativity)	0.21

These values also appear to show a preferred transmissivity in the approximate ground water flow direction determined from the water table contours shown on Plan Sheet 3. It is noted, too, that these values of transmissivity do not agree well with values determined by the type curve matching method in all cases. It must be realized that the transmissivity values determined by the Jacob method utilizing pairs of data is based on the premise that the aquifer parameters in a given radial direction from well VW-2 are reasonably uniform. This may not be true in all directions herein analyzed. Furthermore, limitations on the use of the Jacob method must be considered when analyzing data developed in early pump test time for the radial distance to a given monitoring well. Typically, the recommended use of the Jacob method is limited to the time/distance/drawdown domain where $u \leq 0.05$ and $u = \frac{Sr^2}{4Tt}$. The variables are defined below:

T = transmissivity

S = storativity

r = radial distance

t = time since pumping began

The purpose of using the distance VS drawdown Jacob method, in this case, is to analyze as much of the available data as possible as a check on other methods, and to provide insights to this aquifer system that the type curve matching technique cannot provide due to lack of sufficient data.

It was assumed that the effect on the measured drawdown due to partial penetration by the monitoring wells was negligible based on the radial distance to aquifer thickness ratio greater than 1.5. This is a threshold value suggested by M.S. Hantush (1961) above which the effects of partial penetration can be neglected for practical purposes. The lowest radial distance to aquifer thickness ratio at this site is represented by well OW-4 where the ratio has a value of 2.0. This is based on an aquifer thickness of 35 feet determined from boring and well construction logs of VW-1 and VW-2.

Drawdown measurements were taken at Village Well No. 2 using the air line installed in the well. The data showed a drawdown of 16 feet within a minute of initiating pumping and then stabilized for the duration of the pump test. Similarly, water level recovery after pump shut-off was very rapid, as indicated by the air line and pressure gauge. Because of this, analysis of the drawdown and recovery data for VW-2 is not practical.

4.0 DISCUSSION

4.1 NATURE AND EXTENT OF CONTAMINATION

The soil data show that only soil samples from OW-1 and OW-2 contained aromatic hydrocarbons. Those compounds were benzene, ethylbenzene, toluene and xylenes. These are all constituents of fuels, particularly gasoline. Because a petroleum product odor was detected at the time of drilling these two borings, several samples throughout each boring were analyzed, thus providing a picture of the contamination versus depth which can be seen plotted on Plan Sheet 4, the hydrogeologic cross-section. Of the two borings, soils from boring OW-1 are more heavily contaminated. This boring is at the location of the bulk storage fuel facility that was razed in early summer, 1986. Outside of this area, three of the remaining seven borings show VOC's to be present in the soil samples analyzed. Those borings, OW-3, OW-6, and OW-7, had small quantities (ppb range) of dichloromethane or trichlorofluormethane in some of the samples analyzed. Detects occurred in both shallow and deep samples in OW-3 (10 ft. and 40 ft.) and OW-6 (10ft. and 45 ft.) and only the deep sample (45 ft.) in OW-7. These compounds, referred to as halogenated hydrocarbons, are typical constituents of degreasing compounds. Because the two groups of compounds were not found in any of the same samples or borings, it suggests that two separate sources are responsible for the presence of the compounds found.

Subsequent to the field investigation for this study, Village personnel, while excavating a hole to transplant a new tree approximately 30 feet north of Village Well No. 1, located a zone of strong soil contamination with a heavy petroleum product odor. The depth of the top of the zone was only two to three feet deep. Depth to the bottom of the zone was not determined. It is not known if this contamination zone is due to a local spill or whether it is part of a plume in transit from a source at another location. Village personnel indicated that, prior to the drilling of VW-1 in the early 1950's, a dairy farm had been located on this site. Since that time, this area has been open lawn.

Water samples from one or both sampling rounds show the presence of halogenated compounds in all monitoring wells except OW-3 and OW-4. No detects occurred in either of these wells in either sampling round. Detects did occur in water samples from borings where there were none in the soil samples. This possibly suggests that, at least in some wells, the VOC's found were transported to the well(s) with the water table rather than migrating vertically downward from the unsaturated zone above. For example, the presence of halogenated compounds in wells OW-8 and OW-9 was detected where no detects in the soil occurred. These two wells are located on the east side of the study area, which is nearest the business district of the Village and also up gradient of both Village wells VW-1 and VW-2.

Wells OW-1 and OW-5 were the only monitoring wells with an aromatic hydrocarbon present in the water. Toluene was found in both wells. Because toluene was very prevalent in the soils at OW-1, it's presence in the water is not totally unexpected. Well OW-5 did not have any aromatic hydrocarbons detected in the soil, however, but it is essentially directly down gradient from OW-1.

Interestingly, the Village Well No. 2 was found to have two VOC's in the first sample (0.88 hours after beginning pumping) in addition to the two reported by the DNR in their testing in late 1984 (VW-1) and late 1985 (VW-2). The DNR reported compounds were 1,2-dichloroethane and tetrachloroethylene. The two additional compounds found were benzene and trichloroethylene. In the second water sample, taken from VW-2 after approximately 20 hours of continuous pumping, only the two compounds which were first reported by the DNR were detected.

The total hydrocarbon concentration for this well was 82.3 ug/l in the first sample and 15.4 ug/l in the second sample. The first, higher concentration is probably due to the contaminants, excluding benzene, having a density greater than unity and thus sinking in the aquifer. As can be seen on Plan Sheet 3, the screened interval in VW-2 is deeper in the aquifer than the monitoring wells are.

The second, lower concentration is probably due to dilution caused by mixing at the pumping well of uncontaminated water from the south with contaminated water from the east and north.

These data suggest that the aromatic hydrocarbons (indicative of fuel) are essentially limited to the soil in the area just south of Main Street and west of the Soo Line tracks. The presence of the halogenated hydrocarbons in both rounds of water samples, in conjunction with the presence in some soils, would appear to suggest that more than one source has contributed these compounds and one or more of these sources may be to the east of the study area, which is also up gradient of the Village wells.

Based on the aquifer parameters determined from analysis of the pump test data, the following travel times have been determined for ground water flow from various points to VW-2.

	From VW-1	From OW-8
Distance, ft.	170	555
Travel time, days	30	90

The above travel times are based on a gradient of 0.0006, a hydraulic conductivity of 5,300 gpd/ft^2, and effective soil porosity equivalent to the specific yield of 0.085 as determined by water table monitoring and the pump test. These parameters are based on the Jacob method distance VS drawdown analysis for Wells OW-1 and OW-2.

The computed travel times show only that the contaminant front easily traveled from VW-1 to VW-2 between the time water samples showed contaminants present in wells VW-1 and VW-2, respectively.

The zone of influence of drawdown due to pumping VW-2 for the 20.5 hour pump test was approximately 760 feet, based on the drawdown measured at Well OW-1. The zone of influence that would be expected due to normal use of VW-2 for municipal supply purposes is dependent on the length of time of pumping and would normally be less than that determined during the pump test. If the well were pumped continuously for twelve hours, the radius of influence would be approximately 660 based on the same aquifer parameters used above to calculate travel times.

However, because VW-2 lies down gradient from the apparent contaminant source(s), the extent of the zone of pumping influence is not important because the natural regional gradient is apparently transporting contaminants almost directly to the well, even during long periods of not pumping.

4.2 POTENTIAL FOR ENVIRONMENTAL IMPACT

Obviously, the potential for environmental impact to occur does exist. In fact, some impact, as measured by the loss of use of Village Well No. 2, has occurred already. Because the Village wells are the only known wells in the study area, additional future impacts are limited to the possibility that contaminant concentrations could rise. Whereas the present contamination level does not completely prevent the limited use of VW-2 for municipal water supply, a future rise in contaminant concentrations would, most likely, preclude the use of the local ground water aquifer within the study area.

Outside the study area, particularly down gradient (i.e. southwest) some impact potential does exist. The Vernon Bushey residence, located approximately 500 feet west of the study area, is supplied by a private well and could be impacted at the present time. It is believed that this question is currently being addressed by the DNR and that sampling and analysis, which is beyond the scope of this study, is in progress.

Certainly the potential to impact other water supplies down gradient, either now or in the future, does exist. The 1979 USGS Yellow Lake, WI-MN and Webster, WI 7.5 minute quadrangle maps show residences or other buildings approximately 3,700 feet west of the study area. It is presumed that these structures have private water wells and that they are down gradient.

Considering the pattern of contamination as shown on Plan Sheet 4 and discussed above in Section 4.1, it seems possible that some impact of ground water up gradient (i.e. east or northeast) of the study area may already have occurred. However, the potential threat to humans is at a minimum because no reason for ground water withdrawal exists in light of the safe municipal supply provided by the Village well on the northeast edge of the Village.

Until the source(s) of the present contamination are found and eliminated, it can not be certain that the potential for future impact does not exist.

4.3 ENVIRONMENTAL CRITERIA

Strict environmental criteria that help to form the basis for assessing the need for remedial action is limited to portions of NR140 and NR181, at least until the source(s) of contamination are determined. Then other applicable administrative rules may apply as well.

Presently, the seriousness of the contamination of the wells sampled during this study as represented by the water quality data collected can be judged by the Preventive Action Limits and Enforcement Standards for drinking water as set forth by NR140.10. These are listed in Table 2.

With regard to contaminated soils, the present basis for assessing the need for remedial action is formed, in part, by NR181.16.

Therein are listed those compounds, elements, and mixtures which are categorically, or specifically defined as hazardous wastes or hazardous constituents. The compounds found that are listed in NR181.16 are ethylbenzene, toluene, and benzene.

TABLE 2

WELL CONTAMINATION AND GROUND WATER QUALITY STANDARDS

CONSTITUENTS DETECTED (Detection Limit, ug/l)	PREVENTIVE ACTION LIMIT (ug/l)	ENFORCEMENT STANDARD (ug/l)	OW-1 (ug/l)		OW-2 (ug/l)		OW-5 (ug/l)		OW-6 (ug/l)		OW-7 (ug/l)	
			8/4/86	9/23/86	8/4/86	9/23/86	8/4/86	9/23/86	8/4/86	9/23/86	8/4/86	9/23/86
Benzene (0.2)	0.067	0.67										
Toluene (0.1)	68.6	343	0.5				0.1					
1,2-Dichloroethane (0.3)	0.05	0.5										
1,1,1-Trichloroethane (0.1)	40	200										0.4
1,1,2-Trichloroethane (0.1)	0.06	0.6									1.2	
Trichloroethylene (0.1)	0.18	1.8										
Tetrachloroethylene (0.1)	0.10	1.0	0.6	3.3		0.7	0.1	3.3		0.1		

CONSTITUENTS DETECTED (Detection Limit, ug/l)	PREVENTIVE ACTION LIMIT (ug/l)	ENFORCEMENT STANDARD (ug/l)	OW-8 (ug/l)		OW-9 (ug/l)		Village Well No. 2 (ug/l)	
			8/4/86	9/23/86	8/4/86	9/23/86	9/23/86	9/24/86
Benzene (0.2)	0.067	0.67					0.3	
Toluene (0.1)	68.6	343						
1,2-Dichloroethane (0.3)	0.05	0.5					69.3	9.9
1,1,1-Trichloroethane (0.1)	40	200						
1,1,2-Trichloroethane (0.1)	0.06	0.6						
Trichloroethylene (0.1)	0.18	1.8					0.2	
Tetrachloroethylene (0.1)	0.10	1.0	0.9	3.0		0.2	12.5	5.5

NOTES: 1) Absence of a value indicates compound was not detected.
2) Wells OW-3 and OW-4 did not have any detects of the compounds that were analyzed for.
3) Compounds not listed in this Table, but that were found in any samples, do not have Preventive Action Limits or Enforcements Standards established at this time.

4.4 REMEDIAL ACTION ALTERNATIVES

Action from this point forward can be considered in two subject areas. The first area is that of further investigation to directly determine the source(s) of ground water contamination now documented by this report. The second area is that of dealing with the contamination of soil and ground water with the ultimate goal of rendering the Village Well No. 2 usable again.

Further investigation could include the following:

1. Enlarge the study area to the east of the present east boundary in order to "track" the presence of VOC's farther up gradient. Additional monitoring wells would be required.

2. Dig backhoe test pits in the area of the Village property located between VW-1 and Main Street and from the pumphouse driveway on the west to the Soo Line tracks on the east. The purpose of these pits would be to further identify and refine the location(s) of additional contaminated soil zones in this area.

Considering the proximity of the Webster business district to the study area, alternative 1 above may not be practical. Furthermore, the very flat nature of the water table may be allowing compounds from a source generally west of OW-8 to materialize in OW-8 because of dispersion in the vadose zone, even though it is apparently up gradient.

Alternative 2 above is needed to further define a contaminated soil area north of VW-1 as discussed in Section 4.1.

There appear to be six remedial action alternatives with respect to the contamination by VOC's in the aquifer within the study area. They are:

1. Pump Village Well No. 2 to waste as a means of purging the aquifer. Periodic monitoring of the discharge for VOC's would be necessary.

2. Pump VW-1 to waste for a period of time without pumping VW-2. This may help to flush the aquifer without continuing to draw contaminants to VW-2.

3. a). Pump VW-1 at a steady rate to create a hydraulic sink which will intercept VOC's that are heavier than water and, therefore, are sinking in the aquifer.

   b). Pump VW-2 to supply the Village as drawdown conditions permit.

   c). Use a suitable treatment process to remove contaminants from VW-2.

4. Pump well VW-2 and treat the discharge for removal of VOC's prior to discharging into the Village water system.

5. Leave well VW-2 on stand-by and periodically monitor the monitoring wells in the study area for significant changes in contaminant concentrations.

6. Depending on the Village's need, a new water supply well could be drilled in another area, possibly in the vicinity of the Village's Well No. 3 on the north side of the Village. VW-2 could then be held on stand-by or abandoned.

If alternative 1 were selected and carried out, a satisfactory means of accommodating the contaminated discharge would require piping or surface channels.

Alternative 2 is much like alternative 1, but would require more expense to install a pump and controls, as well as accommodating the contaminated discharge. The benefit may lie in drawing contaminants away from VW-2 rather than toward it.

The third alternative may provide the fastest way of putting well VW-2 back on line to provide the Village with water and accelerate flushing the aquifer at the same time. The expense of pumping VW-1 could potentially be justified by the shorter period of treatment of the VW-2 discharge allowed by the accelerated flushing of the aquifer. Pumping VW-1 also acts to intercept contaminants that would otherwise be drawn to VW-2.

Alternative 4 is similar to alternative 3 except that the contaminants are all drawn to VW-2, and must be treated by an effective means. Also, because the rate of water withdrawal is lower, flushing of the aquifer will take longer, thereby involving operational treatment expenses for a longer time period.

The fifth alternative would be least expensive in terms of cash outlay. However, it would certainly require a considerable time period before natural dilution and biological activity reduced the contaminant concentration in the local aquifer to generally acceptable levels of concentration that would allow the use of VW-2.

Alternative 6 may be the most expensive action and, though it would provide a second usable well for the Village, does not specifically address the question of aquifer remediation.

For any of these alternatives requiring water treatment, either a packed column air stripping system, an activated carbon system, or a combination of the two may be needed. This will depend on the final concentration standards that must be achieved.

The success of any of the alternatives for aquifer remediation depends on the success of finding and terminating the cause of the contamination. Additionally, the portion of contamination adsorbed on the soil in the vadose zone could be a factor in the ultimate treatment effectiveness in that selection of an aquifer remediation approach must be coupled to an appropriate approach to the vadose zone soil clean-up.

Regarding contamination of the soils found to date, there are four remediation alternatives. Alone or in combination they are:

1. No action
2. Soil removal
3. In-situ enhanced biologic degradation
4. Soil vapor flushing and treatment

The first alternative could prevent satisfactory clean-up of the aquifer assuming that goal is established as a part of the aquifer remediation alternative(s) selected.

The second alternative would be practical only in areas of significant near surface contamination, possibly in the vicinity of OW-1 and/or north of VW-1 should future test pits, as discussed above, delineate contaminated areas.

The third alternative is a documented viable alternative with respect to the aromatic compounds detected in various soil samples, but may not be effective in treating the halogenated compounds. This technique may be most cost effective when used in conjunction with removal of grossly contaminated near surface soil.

The fourth alternative has been documented to be technologically feasible and effective in certain soil environments. The predominantly granular soils in the study area are expected to be suitable, however, the fine grained, cohesive soils at the surface may require special consideration. Like alternative three, above, this alternative would be most effective when used in conjunction with removal of grossly contaminated soil.

The advantages and disadvantages of any of these alternatives for soil and/or aquifer remediation are dependent on the degree to which any one of them is carried out.

The costs of clean-up must be compared to the current environmental criteria and standards and to the immediate and long term needs of the Village to determine the optimum solution. Such a comparison, on a rigorous basis, is beyond the scope of this study, and furthermore, additional definition of the environmental impacts attributable to the clean-up alternatives is needed.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the information gathered to date, the following conclusions can be drawn:

1. The aquifer from which VW-2 derives it's water when pumping has been impacted and will continue to be impacted until

remedial actions, either by man or nature, remove the contaminants.

2. Environmental impacts to the southwest and out of the study area will occur to the ground water aquifer.

3. The source(s) of the halogenated compounds found in the ground water within the study area cannot be determined with the presently available information, but the data suggests a source up gradient of Village Well No. 2 and approximately along a line from VW-2 to OW-8.

4. A source location for water contamination outside the study area has not been ruled out by the data collected to date.

5. The contaminants detected in the soil samples analyzed are most likely derived from various surface spills of petroleum fuels and degreasing solvents over time within the study area.

6. One such location of contaminant spillage is the site of the former Hoffman Corner Oil Company bulk fuel storage facility.

7. On the basis of the soil sample analytical results to date, the present contaminants detected at the Hoffman Corner Oil Company site are petroleum fuel product related.

8. The principal contaminants in water samples from Village Well No. 2 are constituents primarily of degreasing solvents, and therefore may have a different source or sources than the aromatic compounds detected in some soil samples.

9. A significant area of soil and possibly ground water contamination exists in the area generally 30-50 feet north of Village Well No. 1. The source of this contamination is not now known.

Recommendations for further steps to the solution of the aquifer contamination problems are:

1. Excavate backhoe test pits north of Village Well No. 1 to verify the presence of contaminants there. Obtain soil samples as needed for laboratory analyses per the EPA 601/602 methods.

2. Expand the area examined by backhoe test pits, as needed, to define the impacted area and "track" any contaminated soil "plume".

3. Evaluate the potential of contaminant source locations up gradient from VW-2 and out of the study area. A review of businesses generally along a line from VW-2 to OW-8 would be appropriate as a minimum.

4. Once the source or sources of ground water contamination, and the location(s) of concentrated soil contamination are known, the alternatives for clean-up should be evaluated on an economic basis as a means of identifying the best alternative.

5. Depending on the needs of the community, the remedial actions listed on pages 31 and 32 could be economically evaluated and a selected choice initiated prior to completing selection and work on remedial treatment of the soil as discussed on pages 34 and 35.

REFERENCES

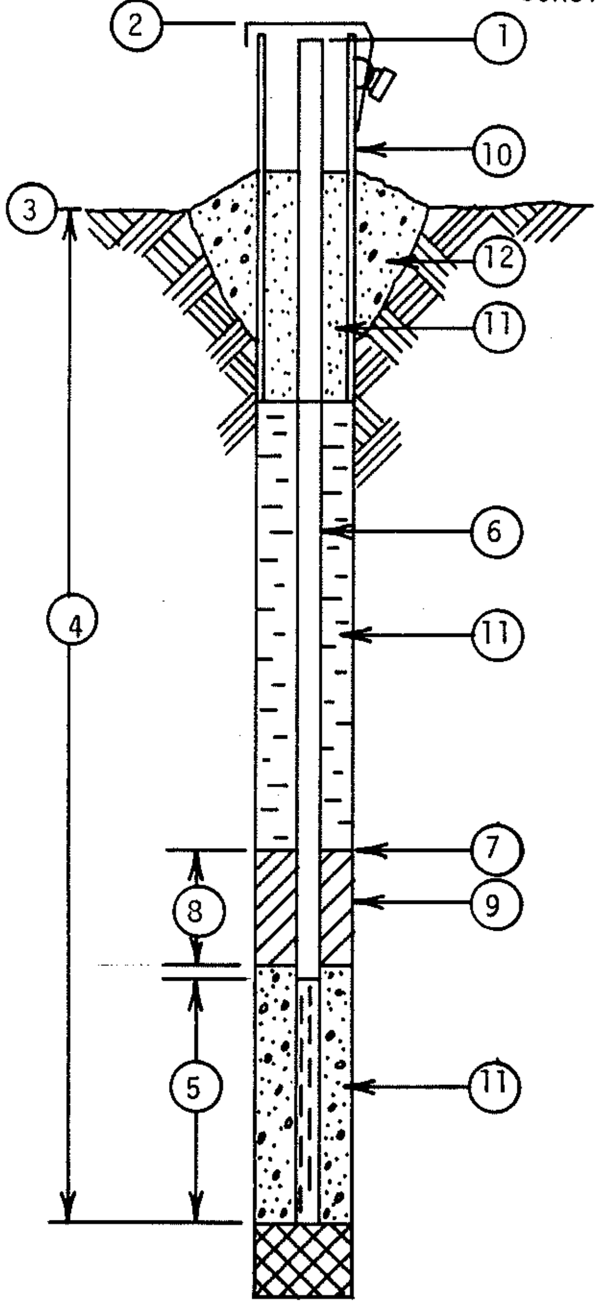
HANTUSH, M.S., AQUIFER TESTS ON PARTIALLY PENETRATING WELLS, JOURNAL OF HYD. DIV., ASCE, SEPT. 1961

APPENDIX A

MONITORING WELL CONSTRUCTION DETAILS

MONITORING WELL OW-1

CONSTRUCTION DETAILS



1 REFERENCE ELEVATION: 983.36 FEET

2 CAP ELEVATION: ______ FEET

3 GROUND SURFACE ELEVATION: 981.3 FEET

4 DEPTH OF WELL FROM GROUND SURFACE: 44.1 FEET

5 LENGTH OF ~~WELL POINT~~, PVC WELL SCREEN, ~~OR SLOTTED PIPE~~: 15.0 FEET

6 SIZE OF PIPE: 2.0 IN. DIA.

7 ELEVATION OF TOP OF SEAL: 959.3 FEET

8 THICKNESS OF SEAL: 4.0 FEET

9 TYPE OF SEAL: BENTONITE PELLETS

10 PROTECTIVE CASING? YES ✓ NO ____
LOCKING CAP? YES ✓ NO ____

11 TYPE OF BACKFILL:
AROUND SCREEN FLINT SAND 45/50
DRILL HOLE CEMENT/BENT. GROUT
IN PROTECTIVE TOP CEMENT

12 CONCRETE CAP? YES ✓ NO ____

LOCATION 9+63N, 8+43E

JOB NO. 6525.00

DATE 7-8-86

DRILLER WISC. TEST DRILLING

WATER LEVEL CHECKS

From Reference Elevation

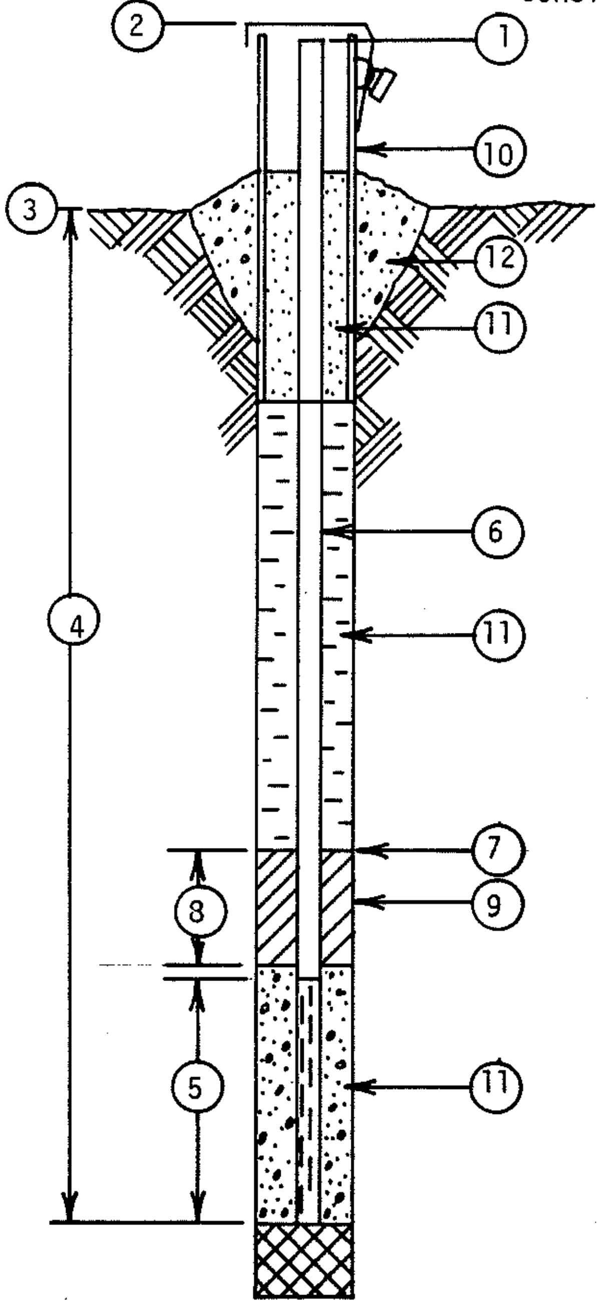
DATE	TIME	DEPTH TO WATER	WATER ELEVATION	REMARKS

AYRES ASSOCIATES

Engineers
Architects
Planners
Surveyors

MONITORING WELL OW-2

CONSTRUCTION DETAILS



1 REFERENCE ELEVATION: 983.48 FEET

2 CAP ELEVATION: ______ FEET

3 GROUND SURFACE ELEVATION: 981.3 FEET

4 DEPTH OF WELL FROM GROUND SURFACE: 43.9 FEET

5 LENGTH OF ~~WELL POINT,~~ PVC WELL SCREEN, ~~OR SLOTTED PIPE:~~ 15.0 FEET

6 SIZE OF PIPE: 2.0 IN. DIA.

7 ELEVATION OF TOP OF SEAL: 959.5 FEET

8 THICKNESS OF SEAL: 3.0 FEET

9 TYPE OF SEAL: BENTONITE PELLETS

10 PROTECTIVE CASING? YES ✓ NO ____
LOCKING CAP? YES ✓ NO ____

11 TYPE OF BACKFILL:
AROUND SCREEN SAND 60/65
DRILL HOLE CEMENT/BENTONITE GROUT
IN PROTECTIVE TOP CEMENT

12 CONCRETE CAP? YES ✓ NO ____

LOCATION 8+94N, 8+30E

JOB NO. 6525.00

DATE 7-8-86

DRILLER WISCONSIN TEST DRILLING

WATER LEVEL CHECKS

From Reference Elevation

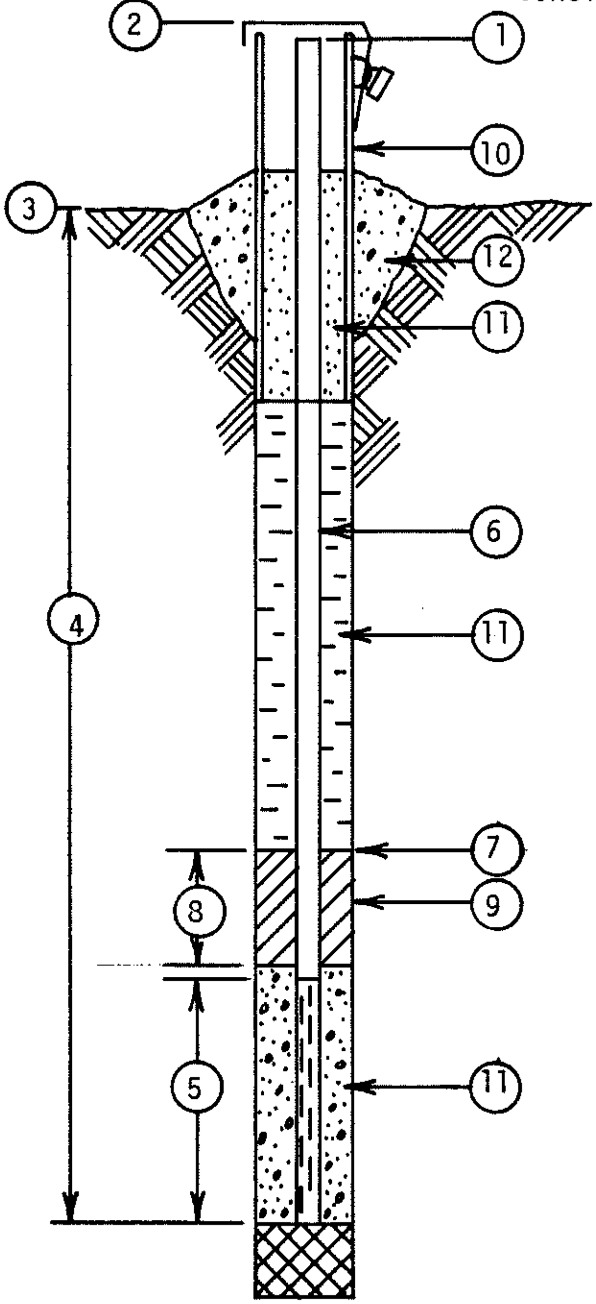
DATE	TIME	DEPTH TO WATER	WATER ELEVATION	REMARKS

AYRES ASSOCIATES

Engineers
Architects
Planners
Surveyors

MONITORING WELL OW-3

CONSTRUCTION DETAILS



1 REFERENCE ELEVATION: 982.65 FEET

2 CAP ELEVATION: ______ FEET

3 GROUND SURFACE ELEVATION: 980.7 FEET

4 DEPTH OF WELL FROM GROUND SURFACE: 44.0 FEET

5 LENGTH OF ~~WELL POINT~~, PVC WELL SCREEN, ~~OR SLOTTED PIPE~~: 15.0 FEET

6 SIZE OF PIPE: 2.0 IN. DIA.

7 ELEVATION OF TOP OF SEAL: 961.7 FEET

8 THICKNESS OF SEAL: 5.0 FEET

9 TYPE OF SEAL: Bentonite Pellets

10 PROTECTIVE CASING? YES ✓ NO ____
LOCKING CAP? YES ✓ NO ____

11 TYPE OF BACKFILL:
AROUND SCREEN Flint sand 60/65
DRILL HOLE Cement/Bentonite grout
IN PROTECTIVE TOP Cement

12 CONCRETE CAP? YES ✓ NO ____

LOCATION 6+57N , 7+86E

JOB NO. 6525.00

DATE 7-8-86

DRILLER Wisconsin Test Drilling

WATER LEVEL CHECKS

From Reference Elevation

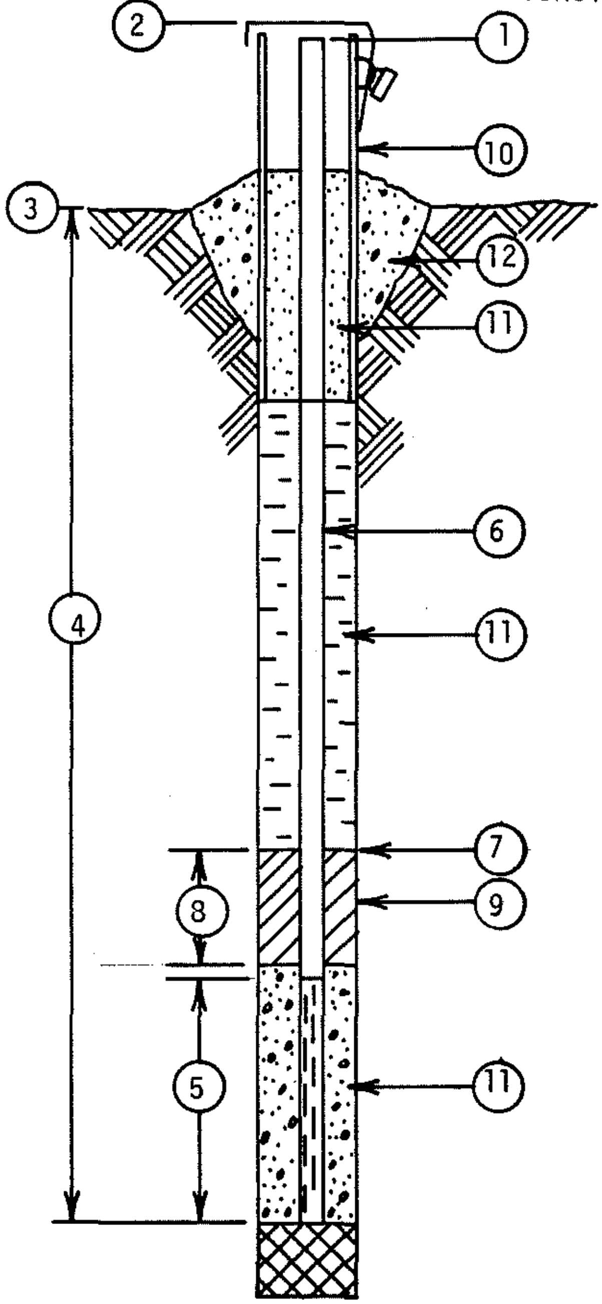
DATE	TIME	DEPTH TO WATER	WATER ELEVATION	REMARKS

AYRES ASSOCIATES

Engineers
Architects
Planners
Surveyors

MONITORING WELL OW-4

CONSTRUCTION DETAILS



1 REFERENCE ELEVATION: 981.80 FEET

2 CAP ELEVATION: ______ FEET

3 GROUND SURFACE ELEVATION: 980.1 FEET

4 DEPTH OF WELL FROM GROUND SURFACE: 43.5 FEET

5 LENGTH OF ~~WELL POINT~~, PVC WELL SCREEN, ~~OR SLOTTED PIPE~~: 15 FEET

6 SIZE OF PIPE: 2.0 IN. DIA.

7 ELEVATION OF TOP OF SEAL: 962.1 FEET

8 THICKNESS OF SEAL: 5.0 FEET

9 TYPE OF SEAL: Bentonite Pellets

10 PROTECTIVE CASING? YES ✓ NO ____
LOCKING CAP? YES ✓ NO ____

11 TYPE OF BACKFILL:
AROUND SCREEN Flint sand 60/65
DRILL HOLE Cement/Bentonite grout
IN PROTECTIVE TOP Cement

12 CONCRETE CAP? YES ✓ NO ____

LOCATION 6+75N, 5+38E

JOB NO. 6525.00

DATE 7-8-86

DRILLER Wisconsin Test Drilling

WATER LEVEL CHECKS

From Reference Elevation

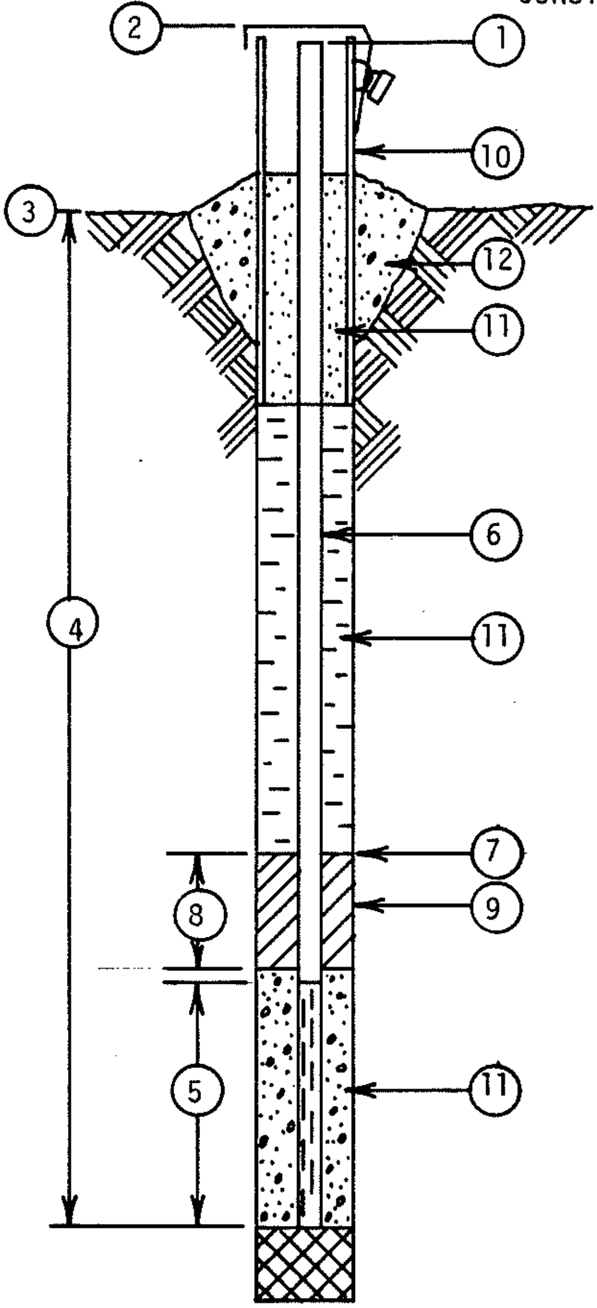
DATE	TIME	DEPTH TO WATER	WATER ELEVATION	REMARKS

AYRES ASSOCIATES

Engineers
Architects
Planners
Surveyors

MONITORING WELL OW-5

CONSTRUCTION DETAILS



1 REFERENCE ELEVATION: 982.46 FEET

2 CAP ELEVATION: ______ FEET

3 GROUND SURFACE ELEVATION: 979.8 FEET

4 DEPTH OF WELL FROM GROUND SURFACE: 45.0 FEET

5 LENGTH OF ~~WELL POINT~~, PVC WELL SCREEN, ~~OR SLOTTED PIPE~~: 15.0 FEET

6 SIZE OF PIPE: 2.0 IN. DIA.

7 ELEVATION OF TOP OF SEAL: 957.8 FEET

8 THICKNESS OF SEAL: 3.0 FEET

9 TYPE OF SEAL: Bentonite Pellets

10 PROTECTIVE CASING? YES ✓ NO ____
LOCKING CAP? YES ✓ NO ____

11 TYPE OF BACKFILL:
AROUND SCREEN Flint sand 40/45
DRILL HOLE Cement/Bentonite Grout
IN PROTECTIVE TOP Cement

12 CONCRETE CAP? YES ✓ NO ____

LOCATION 8+34N, 5+52E

JOB NO. 6525.00

DATE 7-7-86

DRILLER Wisconsin Test Drilling

WATER LEVEL CHECKS

From Reference Elevation

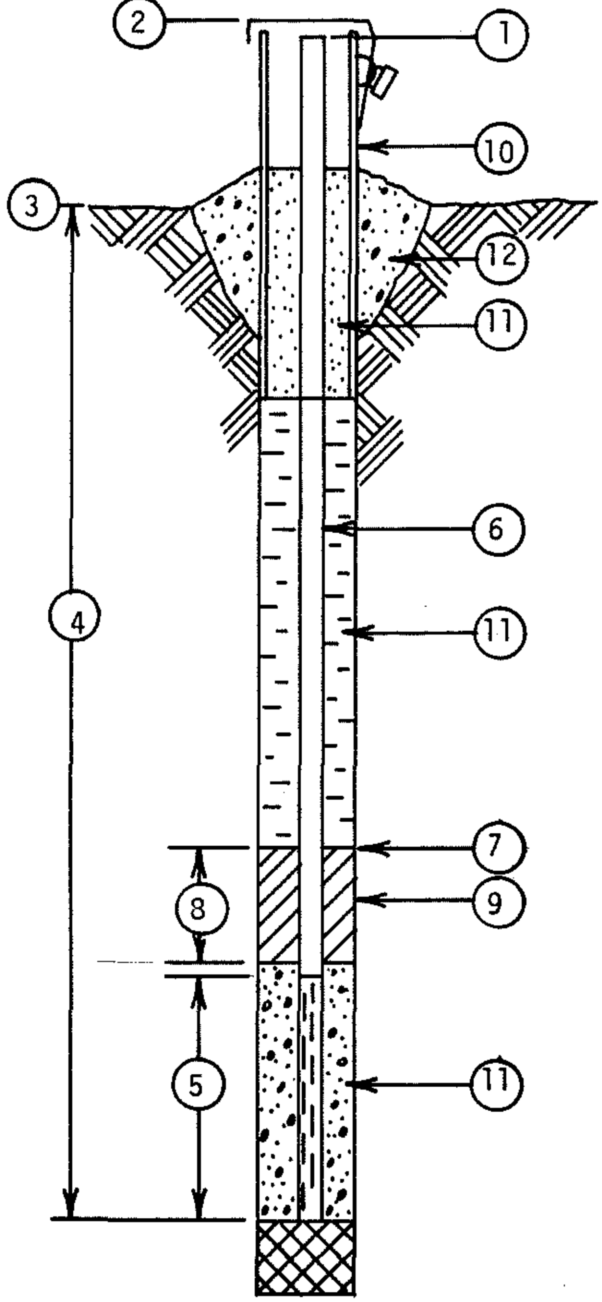
DATE	TIME	DEPTH TO WATER	WATER ELEVATION	REMARKS

AYRES ASSOCIATES

Engineers
Architects
Planners
Surveyors

MONITORING WELL OW-6

CONSTRUCTION DETAILS



1 REFERENCE ELEVATION: 982.59 FEET

2 CAP ELEVATION: _______ FEET

3 GROUND SURFACE ELEVATION: 980.0 FEET

4 DEPTH OF WELL FROM GROUND SURFACE: 43.9 FEET

5 LENGTH OF ~~WELL POINT~~, PVC WELL SCREEN, ~~OR SLOTTED PIPE~~ 15.0 FEET

6 SIZE OF PIPE: 2.0 IN. DIA.

7 ELEVATION OF TOP OF SEAL: 964.8 FEET

8 THICKNESS OF SEAL: 5.0 FEET

9 TYPE OF SEAL: BENTONITE PELLETS

10 PROTECTIVE CASING? YES ✓ NO _____
LOCKING CAP? YES ✓ NO _____

11 TYPE OF BACKFILL:
AROUND SCREEN FLINT SAND 40/45
DRILL HOLE CEMENT/BENTONITE GROUT
IN PROTECTIVE TOP CEMENT

12 CONCRETE CAP? YES ✓ NO _____

LOCATION 9+25N, 6+60E

JOB NO. 6525.00

DATE 7-7-86

DRILLER WISCONSIN TEST DRILLING

WATER LEVEL CHECKS

From Reference Elevation

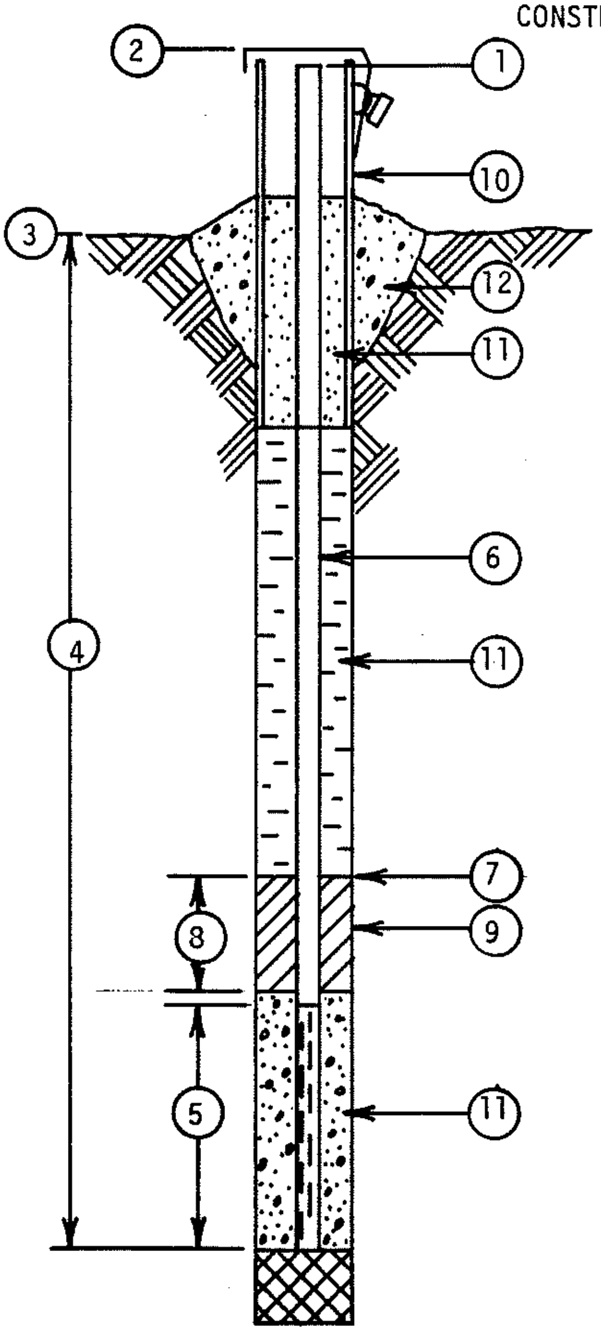
DATE	TIME	DEPTH TO WATER	WATER ELEVATION	REMARKS

AYRES ASSOCIATES

Engineers
Architects
Planners
Surveyors

MONITORING WELL OW-7

CONSTRUCTION DETAILS



1 REFERENCE ELEVATION: 981.25 FEET

2 CAP ELEVATION: ______ FEET

3 GROUND SURFACE ELEVATION: 979.3 FEET

4 DEPTH OF WELL FROM GROUND SURFACE: 43.5 FEET

5 LENGTH OF ~~WELL POINT~~, PVC WELL SCREEN, ~~OR SLOTTED PIPE~~ 15.0 FEET

6 SIZE OF PIPE: 2.0 IN. DIA.

7 ELEVATION OF TOP OF SEAL: 960.8 FEET

8 THICKNESS OF SEAL: 5.0 FEET

9 TYPE OF SEAL: BENTONITE PELLETS

10 PROTECTIVE CASING? YES ✓ NO ____
LOCKING CAP? YES — NO ____

11 TYPE OF BACKFILL:
AROUND SCREEN FLINTSAND 60/65
DRILL HOLE CEMENT / BENTONITE GROUT
IN PROTECTIVE TOP CEMENT

12 CONCRETE CAP? YES ✓ NO ____

LOCATION 12+50N, 7+70E

JOB NO. 6525.00

DATE 7-7-86

DRILLER WISCONSIN TEST DRILLING

WATER LEVEL CHECKS

From Reference Elevation

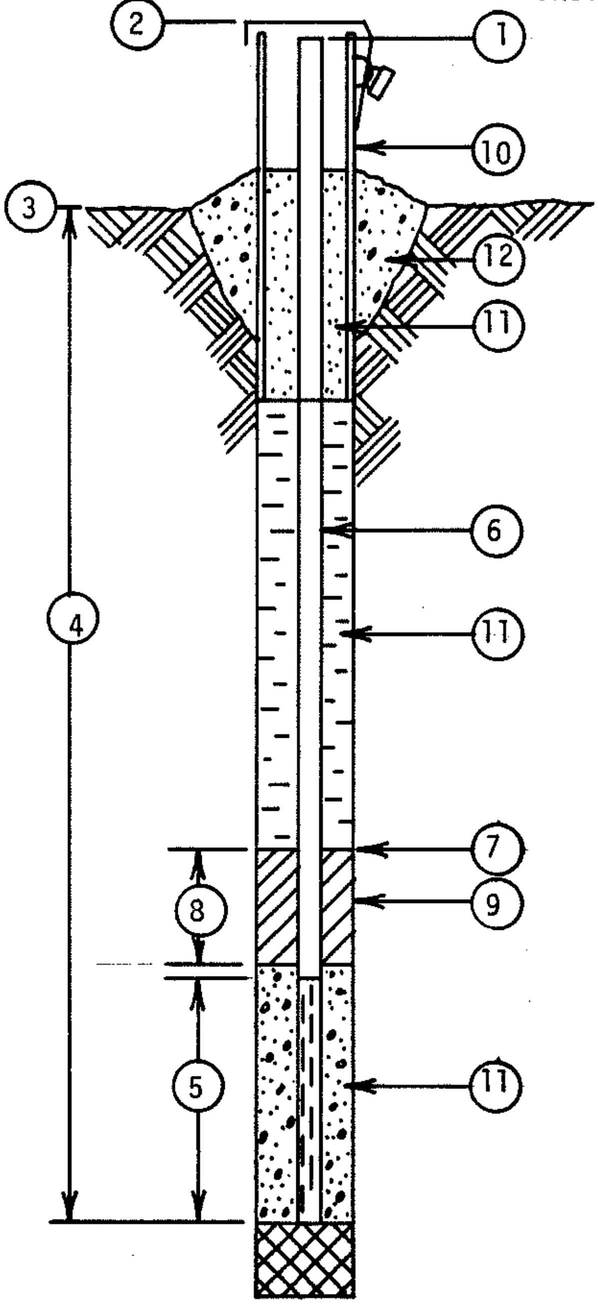
DATE	TIME	DEPTH TO WATER	WATER ELEVATION	REMARKS

AYRES ASSOCIATES

Engineers
Architects
Planners
Surveyors

MONITORING WELL OW-8

CONSTRUCTION DETAILS



1 REFERENCE ELEVATION: 983.11 FEET

2 CAP ELEVATION: ______ FEET

3 GROUND SURFACE ELEVATION: 980.8 FEET

4 DEPTH OF WELL FROM GROUND SURFACE: 44.7 FEET

5 LENGTH OF ~~WELL POINT~~, PVC WELL SCREEN, ~~OR SLOTTED PIPE~~: 15.0' FEET

6 SIZE OF PIPE: 2.0 IN. DIA.

7 ELEVATION OF TOP OF SEAL: 959.8 FEET

8 THICKNESS OF SEAL: 3.0 FEET

9 TYPE OF SEAL: Bentonite Pellets

10 PROTECTIVE CASING? YES ✓ NO ____
LOCKING CAP? YES ✓ NO ____

11 TYPE OF BACKFILL:
AROUND SCREEN Flint Sand 40/45
DRILL HOLE Cement / Bentonite Grout
IN PROTECTIVE TOP Cement

12 CONCRETE CAP? YES ✓ NO ____

LOCATION 10+58N, 10+07E

JOB NO. 6525.00

DATE 7-8-86

DRILLER Wisconsin Test Drilling

WATER LEVEL CHECKS

From Reference Elevation

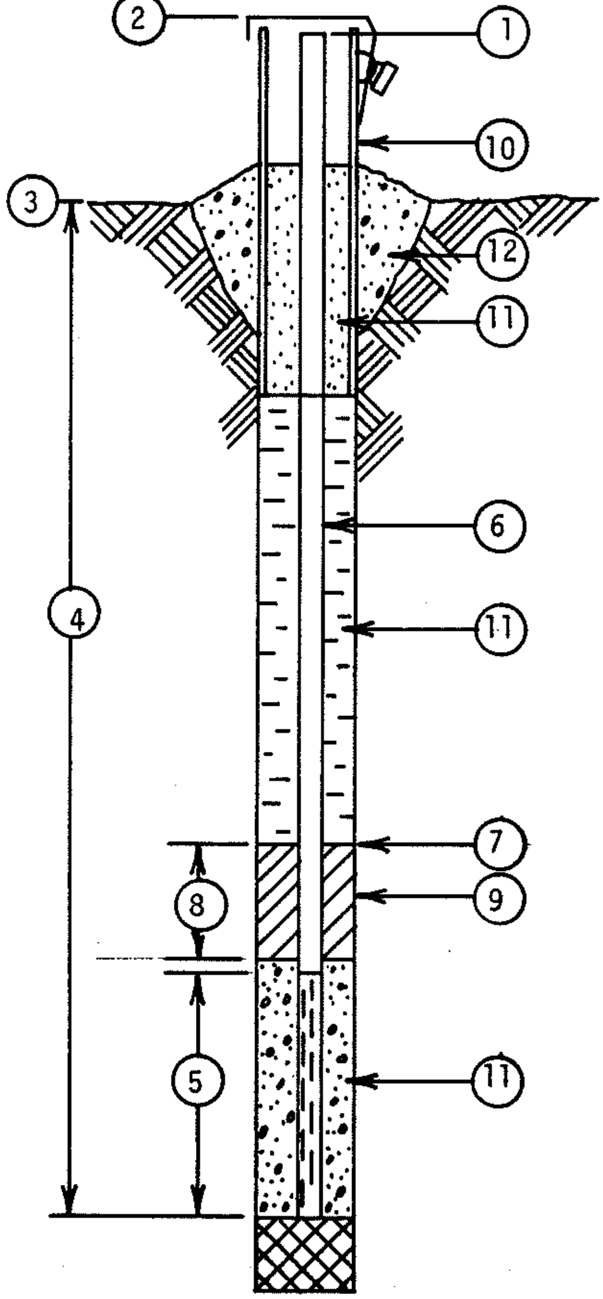
DATE	TIME	DEPTH TO WATER	WATER ELEVATION	REMARKS

AYRES ASSOCIATES

Engineers
Architects
Planners
Surveyors

MONITORING WELL OW-9

CONSTRUCTION DETAILS



1 REFERENCE ELEVATION: 981.0 FEET

2 CAP ELEVATION: ______ FEET

3 GROUND SURFACE ELEVATION: 979.2 FEET

4 DEPTH OF WELL FROM GROUND SURFACE: 42.5 FEET

5 LENGTH OF ~~[illegible]~~ PVC WELL SCREEN, ~~OR SLOTTED PIPE~~: 15.0 FEET

6 SIZE OF PIPE: 2.0 IN. DIA.

7 ELEVATION OF TOP OF SEAL: 961.7 FEET 18.7' 18.7 - 33.7

8 THICKNESS OF SEAL: 5.0 FEET

9 TYPE OF SEAL: BENTONITE PELLETS

10 PROTECTIVE CASING? YES ✓ NO ____
LOCKING CAP? YES ✓ NO ____

11 TYPE OF BACKFILL:
AROUND SCREEN FLINT SAND 60/65
DRILL HOLE CEMENT/BENTONITE GROUT
IN PROTECTIVE TOP CEMENT

12 CONCRETE CAP? YES ✓ NO ____

LOCATION 7+20N, 9+46E

JOB NO. 6525.00

DATE 7-8-86

DRILLER WISCONSIN TEST DRILLING

WATER LEVEL CHECKS

From Reference Elevation

DATE	TIME	DEPTH TO WATER	WATER ELEVATION	REMARKS

AYRES ASSOCIATES

Engineers
Architects
Planners
Surveyors

APPENDIX B

BORING LOGS

AYRES ASSOCIATES

TERMINOLOGY ON BORING LOGS

	Symbol	Explanation	Symbol	Explanation
BORING TYPES	HA	Hand Auger	TB	Test Boring
	AB	Auger Boring	TP	Test Pit

	Symbol	Explanation	Symbol	Explanation
SAMPLE TYPES AND TOOLS	A	Auger	HSA	Hollow Stem Augers
	X	Split Spoon Samples	SSA	Solid Stem Augers
	RC	Rock Core	N	Standard Penetration Test Blows Per Foot (ASTM D-1568)
	TWT	Thin Wall Tube Sample		

	Symbol	Explanation
MOISTURE CONTENT	D	Dry
	M	Moist
	W	Wet (Saturated)

	Symbol	Explanation
GRAIN SIZE	F	Fine Grained (between #40 and #200 sieve for sand, 3/4" and #4 sieve for gravel)
	M	Medium Grained (between #40 and #10 sieve size)
	C	Coarse Grained (between #10 and #4 sieve for sand, between 3/4" and 3" for gravel)

	Symbol	Explanation
DESCRIPTION	w/	With - 30 to 50% by weight
	so	Some - 15 to 30% by weight
		A Little - 5 to 15% by weight
	tr	Trace - 0 to 5% by weight
	lt	Light
	dk	Dark
	med	Medium
	mod	Moderate

	Symbol	Explanation
ROCK CORES	Rec	Recovery
	SS	Sandstone
	Dol	Dolomite
	Ls	Limestone
	RQD	Rock Quality Designation $\left(\frac{\text{Length of core pieces} > 4"}{\text{Length of core run}} \times 100\right)$

AYRES ASSOCIATES
FIELD BORING LOG

DRILLER Wisc. Test Drilling
LOGGED WFG
PROJECT: Webster H_2O Contamination DATE BEGIN 7-8-86 DATE END 7-8-86 PROJECT NO.: 6525.00
LOCATION: 9+63N, 8+43E SURFACE ELEV. 981.3' TEST BORING NO.: OW-1

Sample Depth	Sample No.	SPT N	Sample Type	Water Info.	Rec./Pen.	DESCRIPTION AND CLASSIFICATION	GEOLOGY	REMARKS
0-½'						SAND FILL		DEPTH BORING ___ CASING DEPTH ___ WATER LEVEL: ___ @ ___ ___ @ ___
½-3½						BL. SILTY TOPSOIL; STRONG FUEL OIL SMELL		
3½-5'						GRAY CLAY, TRC. SILT, SAND		
5.0-6.0	1	2/3/6	X	D	1.3/1.5	RD BRN CLAY CH		H.S.A.
6.0-6.5						W/ RD. BR., M-F SAND, TRC. SILT SP (STRONG FUEL OIL SMELL)		
10.0-11.5	2	3/12/14	X	D	1.5/1.5	SAND, A.A. (AS ABOVE), SLIGHT ODOR SP		
15.0-16.5	3	4/12/13	X	D	1.5/1.5	SAND, A.A., MOTTLED W/ SILT (SLIGHT ODOR) SP, W/SP-SM LAYERS (IRREG.)		
20.0-21.5	4	12/13/8	X	D	1.0/1.5	LT. RD-BRN, M-F SAND, TRC. GRAVEL, HAS ODOR SP		
25.0-26.5	5	4/8/8	X	D	1.2/1.5	LT. RD-BRN, M-F SAND, SLIGHT ODOR SP		
30.0-31.5	6	7/10/12	X	M	1.2/1.5	RD-BRN C-F SAND W/ GRV., TRC. SILT SP	▽	
35.0-36.5	7	3/2/7	X	W	1.0/1.5	RD-BRN, M-F SAND, TRC. SILT, POSSIBLE ORGANICS, LESS ODOR SP/SP-SM		
40.0-41.5	8	18/9/10	X	W	1.1/1.5	A.A.		
45.0-46.5	9	6/11/8	X	W	1.2/1.5	A.A.		
						E.O.B. 46.5' WELL SET 44.10'		

AYRES ASSOCIATES

FIELD BORING LOG

PROJECT: WEBSTER H_2O CONTAMINATION
DATE BEGIN 7-8-86 DATE END 7-8-86
DRILLER WISC. TEST DRILLING
LOGGED W.F.G.
PROJECT NO.: 6525.00
LOCATION: 8+94N, 8+30 E
SURFACE ELEV. 981.3'
TEST BORING NO.: OW-2

Sample Depth	Sample No.	SPT N	Sample Type	Water Info.	Rec./Pen.	DESCRIPTION AND CLASSIFICATION	GEOLOGY	REMARKS
0-2'						RD-BRWN, C-F SAND W/ SILT		DEPTH BORING ___ CASING DEPTH ___ WATER LEVEL: ___ @ ___ @
2-5'						LT. BRN - BRN SILT		
5.0-6.5	1	5/4/13	X	M	0.8/1.5	ORGANIC-RICH SAND (~1" THICK) @ TOP OF SPOON PT; GR BRN. HIGHLY PLASTIC CLAY (~5" THICK) CH; BOTTOM OF SPOON, RED→BRN. M-F SAND W/SILT, NO ODOR SP-SM		H.S.A. LL=63.9 PI=42.4 GS=2.70
10.0-11.5	2	6/13/18	X	M	0.6/1.5	SAND, SAME AS ABOVE (AA) AT BOTTOM OF SPOON, NO ODOR SP		
15.0-16.5	3	7/10/14	X	M	1.1/1.5	LT. RED-BRN, M-F SAND, W/ A LTTL. BRN-BLACK SILTY CLUMPS. NO ODOR SP		
20.0-21.5	4	6/7/10	X	D	1.0/1.5	PINK TO LT. BRN., M-F SAND, TRC. SILT NO ODOR SP		
25.0-26.5	5	4/6/8	X	D	1.1/1.5	A.A. (AS ABOVE), NO ODOR SP		
30.0-31.5	6	5/8/12	X	M	0.9/1.5	A.A., NO ODOR SP	▽	
35.0-36.5	7	4/5/7	X	W	1.3/1.5	A.A., NO ODOR SP		
40.0-41.5	8	8/11/15	X	W	1.2/1.5	A.A., LITTLE OR NO SILT, NO ODOR SP		
45.0-46.5	9	9/13/12	X	W	1.0/1.5	A.A., NO ODOR SP		
						E.O.B. 46.5 WELL SET 43.9		

AYRES ASSOCIATES

FIELD BORING LOG

PROJECT: WEBSTER H_2O CONTAMINATION
DATE BEGIN 7/8/86 DATE END 7/8/86
LOCATION: 6+57N, 7+86E
SURFACE ELEV. 980.7

DRILLER W.T.D.
LOGGED W.F.G.
PROJECT NO.: 6525.00
TEST BORING NO.: OW-3

Sample Depth	Sample No.	SPT N	Sample Type	Water Info.	Rec./Pen.	DESCRIPTION AND CLASSIFICATION	GEOLOGY	REMARKS
0-1'						FILL - RED→BRN VC-F SAND, W/ GRAVEL		DEPTH BORING ____ CASING DEPTH ____ WATER LEVEL: ____ @ ____ @
1-4'						PEAT, ORGANIC MAT'L		
5.0-6.5	1	100	X	M	0.9/1.5	RED-BRN, M-F SAND, A LITTLE SILT SP-SM		HSA ↓
10.0-11.5	2	4/15/20	X	D	1.0/1.5	RED-BRN SAND, TRC. SILTY CLAY SP		
15.0-16.5	3	3/7/13	X	D	1.2/1.5	A.A. (AS ABOVE) SP		
20.0-21.5	4	8/11/13	X	D	1.1/1.5	RED-BRN C-F (MOSTLY MED.) SAND (STARTS @ 18') SP		
25.0-26.5	5	6/10/12	X	D	1.2/1.5	LT. BRN, W/ RED, M-F SAND SP	▽	
30.0-31.5	6	7/15/15	X	W	1.2/1.5	A.A.		
35.0-36.5	7	5/6/6	X	W	1.3/1.5	RED-BRN C-F (M) SAND. (GRN CLAY PRESENT IN LAYERS, CH) SP (W/ CH)		
40.0-41.5	8	3/2/3	X	W	1.1/1.5	A.A.; VF SAND IN TIP (NO CLAY PRESENT)		
45.0-46.5	9	1/1/1	X	W	0.1/1.5	GRAY CLAY (PLASTIC), W/ SO M-F SAND CH WELLSET 44.0 E.O.B. 46.5		

AYRES ASSOCIATES

FIELD BORING LOG

PROJECT: WEBSTER H_2O CONTAMINATION
LOCATION: 6+75N, 5+38E
DATE BEGIN 7/8/86 DATE END 7/8/86
SURFACE ELEV. 980.1
DRILLER W.T.D.
LOGGED WFG
PROJECT NO.: 6525.00
TEST BORING NO. OW-4

Sample Depth	Sample No.	SPT N	Sample Type	Water Info.	Rec./Pen.	DESCRIPTION AND CLASSIFICATION		GEOLOGY	REMARKS
0-1½'						FILL SAND - RED-BRN, VC-F, W/GRAVEL			DEPTH BORING ____ CASING DEPTH ____ WATER LEVEL: ____ @ ____ ____ @ ____
1½'-5	ϕ					LT BRN TO BRN CLAY	CH	LL = 37.3 PI = 20.8 Gs = 2.68	
5.0-6.5	1	3/13/18	×	M	0.9/1.5	RED-BRN SAND, TRC. SILT	SP		HSA
10.0-11.5	2	10/18/23	×	D	1.0/1.5	LT. BRN-RED M-F SAND	SP		
15.0-16.5	3	5/5/8	×	D	1.1/1.5	A.A. (AS ABOVE)	SP		
20.0-21.5	4	4/7/7	×	D	1.1/1.5	RED-BRN M-F SAND, A.A	SP		
25.0-26.5	5	6/8/11	×	M	1.2/1.5	LT BRN-RED SAND, MOSTLY FINE	SP		
30.0-31.5	6	5/7/8	×	W	1.0/1.5	A.A., M-F	SP		
35.0-36.5	7	17/10/7	×	W	1.1/1.5	BRN-RED F-VF SAND, TRC SILT	SP		
40.0-41.5	8	5/7/7	×	W	1.2/1.5	BRN-RED C-F SAND	SP		
45.0-46.5	9	11/11/15	×	W	1.0/1.5	A.A. (MOSTLY MED.) WELL SET 43.5 EOB 46.5	SP		

AYRES ASSOCIATES
FIELD BORING LOG

PROJECT: WEBSTER H_2O CONTAMINATION

DATE BEGIN 7-7-86 DATE END 7-7-86

LOCATION: 8+34N, 5+52E

SURFACE ELEV. 979.8'

DRILLER WISC. TEST DRILLING

LOGGED W.F.G.

PROJECT NO.: 6525.00

TEST BORING NO.: OW-5

Sample Depth	Sample No.	SPT N	Sample Type	Water Info.	Rec./Pen.	DESCRIPTION AND CLASSIFICATION	GEOLOGY	REMARKS
0-½'						TOPSOIL		DEPTH BORING ____ CASING DEPTH ____ WATER LEVEL: ____ @ ____ ____ @ ____
½'-3½'						BRN C-F SAND, W/GRV. + SILT		
3½'-5'						GRAY-BRN CLAY, W/SILT, GRVL, + C-F SAND		
5.0-6.5	1	4/13/19	X	D	1.2/1.5	RED-BRN, M-F SAND, TRC - A LITTLE SILT SP-SM		HSA P200 = 9%
10.0-11.5	2	9/10/12	X	D	1.3/1.5	A.A. (AS ABOVE), LESS SILT SP		
15.0-16.5	3	4/7/10	X	D	1.1/1.5	M-F LT. BRN SAND (COARSER THAN ABOVE) TRC SILT, NO ODOR SP		
20.0-21.5	4	4/12/18	X	D	1.3/1.5	M-F LT. BRN SAND, NO ODOR, TRC SILT SP		
25.0-26.5	5	3/13/19	X	D	1.2/1.5	A.A., NO ODOR SP		
30.0-31.5	6	7/10/18	X	M/W	1.1/1.5	DK BRN, M-GR. SAND. TRC. SILT, NO ODOR SP	▽	
35.0-36.5	7	1/1/3	X	W	1.0/1.5	BRN, M. GR. SAND, TRC. F. GRAVEL, ORGANIC LENS (BLACK, ½" THICK) @ SPOON BOTTOM. NO ODOR SP		
40.0-41.5	8	11/7/4	X	W	0.5/1.5	A.A., NO ODOR, NO ORGANICS SP		
45.0-46.5	9	13/10/10	X	W	1.0/1.5	A.A.; NO ODOR SP E.O.B. 46.5' WELL SET @ 45.0'		P200 = 3%

AYRES ASSOCIATES

FIELD BORING LOG

PROJECT: Webster H₂O Contamination
LOCATION: 9+25 N, 6+60 E
DATE BEGIN 7-7-86 DATE END 7-7-86
SURFACE ELEV. 980.0'
DRILLER Wisc. Test Drill.
LOGGED W.F.G.
PROJECT NO.: 6525.00
TEST BORING NO.: OW-6

Sample Depth	Sample No.	SPT N	Sample Type	Water Info.	Rec./Pen.	DESCRIPTION AND CLASSIFICATION	GEOLOGY	REMARKS
0-1'						TOPSOIL		DEPTH BORING ___ CASING DEPTH ___ WATER LEVEL: ___ @ ___ ___ @ ___
1-3½'						BRN C-F SILTY SAND, W/GRVL		
3.5'-5.0'						GRAY CLAY (V. PLASTIC, SOMEWHAT ORGANIC), W/ SILT + M-F SAND. NO ODOR CH		
5.0-6.5	1	1/1/2	X	M	1.2/1.5	RD-BRN M-F SAND W/SILT BOTTOM OF SPOON. NO ODOR SP		HSA
10.0-11.5	2	7/14/15	X	D	1.3/1.5	LT RED BRN M-F SAND, TRC SILT NO ODOR SP [GRN-GRY PLASTIC CLAY, SOMEWHAT ORG.; CH ? LOCATION; "BLOW-UP"]		
15.0-16.5	3	5/5/7	X	D	1.1/1.5	LT. RED-BRN, M-F SAND, TRC SILT NO ODOR SP		
20.0-21.5	4	8/9/13	X	D	1.0/1.5	A.A. (AS ABOVE), NO ODOR SP		
25.0-26.5	5	6/8/10	X	D	1.3/1.5	LT PINK - LT BRN, M-F SAND, A.A. NO ODOR SP		
30.0-31.5	6	4/9/17	X	M	1.4/1.5	BRN-LT BRN M-F GR. SAND, NO ODOR SP BRN TO GRN SILT W/F. SAND @ BOTTOM OF SPOON		
35.0-36.5	7	1/1/1	X	W	1.0/1.5	BRN. F. GRAINED SAND, TRC. SILT SP NO ODOR	▽	
40.0-41.5	8	1/1/1	X	W	0.6/1.5	A.A., TRC. F. GRVL, NO ODOR SP		
45.0-46.5	9	1/1/1	X	W	1.0/1.5	A.A., NO GRAVL, NO ODOR SP		↓

WELL SET 43.9'

E.O.B. 46.5'

AYRES ASSOCIATES
FIELD BORING LOG

PROJECT: Webster H_2O Contamination
DATE BEGIN 7-7-86 DATE END 7-7-86
LOCATION: 12+50 N, 7+70 E
SURFACE ELEV. 979.3'
DRILLER Wisc. Test Drilling
LOGGED WFG
PROJECT NO.: 6525.00
TEST BORING NO. OW-7

Sample Depth	Sample No.	SPT N	Sample Type	Water Info.	Rec./Pen.	DESCRIPTION AND CLASSIFICATION	GEOLOGY	REMARKS
0-½'						TOPSOIL OF DK BRN M-F SILTY SAND	S-Φ: 2.5-4.0' LL=52.4 PI=35.3; GS=2.70	DEPTH BORING ___ CASING DEPTH ___ WATER LEVEL: ___ @ ___ @
½'-1½'						RED-BRN M-F SAND		
1½'-4	Φ					LT BRN-BRN. CLAY CH		
5.0-6.5	1	6/13/23	X	M	1.2/1.5	LT RED-LT BRN M-F SAND, TRC SILT No odor SP		HSA ↓
10.0-11.5	2	6/13/20	X	D	1.1/1.5	LT. RED-BRN M-GR. SAND. TRC TO A LITTLE SILT. NO ODOR		
15.0-16.5	3	5/11/15	X	D	1.2/1.5	LT. RED-BRN, M-F, SAND, TRC SILT SP		P200 = 2%
20.0-21.5	4	5/10/17	X	D	1.3/1.5	M-F LT RED-BRN. SAND, TRC SILT. NO ODOR (START@48') SP		
25.0-26.5	5	5/9/13	X	D	1.2/1.5	A.A. (AS ABOVE). NO ODOR SP	▽	
30.0-31.5	6	3/4/5	X	W	1.1/1.5	A.A.; NO ODOR; A LTTL. SILT SP		
35.0-36.5	7	3/2/3	X	W	1.2/1.5	A.A.; NO ODOR; ½" OF GRAY CLAY IN SPOON (? LOCATION) SP		
40.0-41.5	8	4/4/5	X	W	0.4/1.5	A.A., TRC. SILT, SOME GRAY CLAY PIECES. NO ODOR SP		
45.0-46.5	9	8/9/11	X	W	0.3/1.5	A.A., NO CLAY WELL SET 43.5' E.O.B. 46.5'		

AYRES ASSOCIATES
FIELD BORING LOG

PROJECT: Webster H_2O Contamination

DATE BEGIN 7-8-86 DATE END 7-8-86

LOCATION: 10+58N, 10+07 E

SURFACE ELEV. 980.8'

DRILLER Wisc. Test Drill.

LOGGED WFG

PROJECT NO.: 6525.00

TEST BORING NO.: OW-8

Sample Depth	Sample No.	SPT N	Sample Type	Water Info.	Rec./Pen.	DESCRIPTION AND CLASSIFICATION	GEOLOGY	REMARKS
0 - ½'						Topsoil		DEPTH BORING ____ CASING DEPTH ____ WATER LEVEL: ____ @ ____ ____ @ ____
½ - 3'						Red-Brn M-F Sand, trc silt		
						Red Brn Clay, a little sand/silt, Plastic CL		HSA
5.0-6.5	1	8/12/13	X	M	1.2/1.5	Top 6" is AA (As Above). Rest of spoon is Red-Brn M-F Sand, trc Silt SP		
10.0-11.5	2	7/10/12	X	M	1.2/1.5	V. uniform M-F Lt. Brn-Red Sand. 'Cinnamon Sugar' appearance SP		
15.0-16.5	3	4/4/6	X	D	1.4/1.5	A.A.		
20.0-21.5	4	10/19/17	X	D/M	1.4/1.5	A.A., w/ CS Med. zones separated from fine sand zones SP		
25.0-26.5	5	3/5/6	X	D/M	1.2/1.5	AA, C-F sand layer SP		
30.0-31.5	6	5/4/6	X	Top-D/M Bot.-W	1.0/1.5	AA, course fraction increasing		
35.0-36.5	7	1/3/3	X	W	1.0/1.5	A.A.		
40.0-41.5	8	12/5/2	X	W	1.0/1.5	A.A., trc silt SP		
45.0-46.5	9	7/3/1	X	W	0.9/1.5	A.A. Well set 44.7 E.O.B. 46.5		

AYRES ASSOCIATES

FIELD BORING LOG

PROJECT: WEBSTER H_2O CONTAMINATION DATE BEGIN 7-8-86 DATE END 7-8-86

LOCATION: 7+20N, 9+46E SURFACE ELEV. 979.2'

DRILLER Wisc. TEST DRILLING

LOGGED WFG

PROJECT NO.: 6525.00

TEST BORING NO.: OW-9

Sample Depth	Sample No.	SPT N	Sample Type	Water Info.	Rec./Pen.	DESCRIPTION AND CLASSIFICATION	GEOLOGY	REMARKS
0-1'						DK BRN, M-F SILTY SAND TOPSOIL		DEPTH BORING ___ CASING DEPTH ___ WATER LEVEL: ___ @ ___ ___ @ ___
1'-2'						BRN - LT BRN SILT		
5.0-6.5'	1	3/7/14	X	M	1.0/1.5	RED-BRN M-F SAND w/ SILT SM		HSA
10.0-11.5	2	10/14/12	X	D	0.9/1.5	RED-BRN F. SAND (UNIFORM), SO. SILT SM		
15.0-16.5	3	3/5/7	X	D	1.1/1.5	15.0'-16.0' AS ABOVE SM 16.0-16.5' RED-BRN, M-f SAND SP		
20.0-21.5	4	5/10/15	X	D	1.0/1.5	A.A., CS-F SP		P200 = 3%
25.0-26.5	5	8/23/29	X	D	1.1/1.5	LT. BRN W/RED, F-VF SAND, SO. SILT IN LUMPS (GRY-GRN) SP-SM		
30.0-31.5	6	3/2/4	X	W	1.2/1.5	A.A., NO SILT SP		
35.0-36.5	7	3/2/3	X	W	1.3/1.5	RED-BRN. C-F SAND SP		P200 = 1%
40.0-41.5	8	10/18/23	X	W	1.2/1.5	BRN-RED, M-F SAND SP		
45.0-46.5	9	1/1/1	X	W	0.5/1.5	AA, TRC SILT SP E.O.B. 46.5 WELL SET 42.5		

APPENDIX C

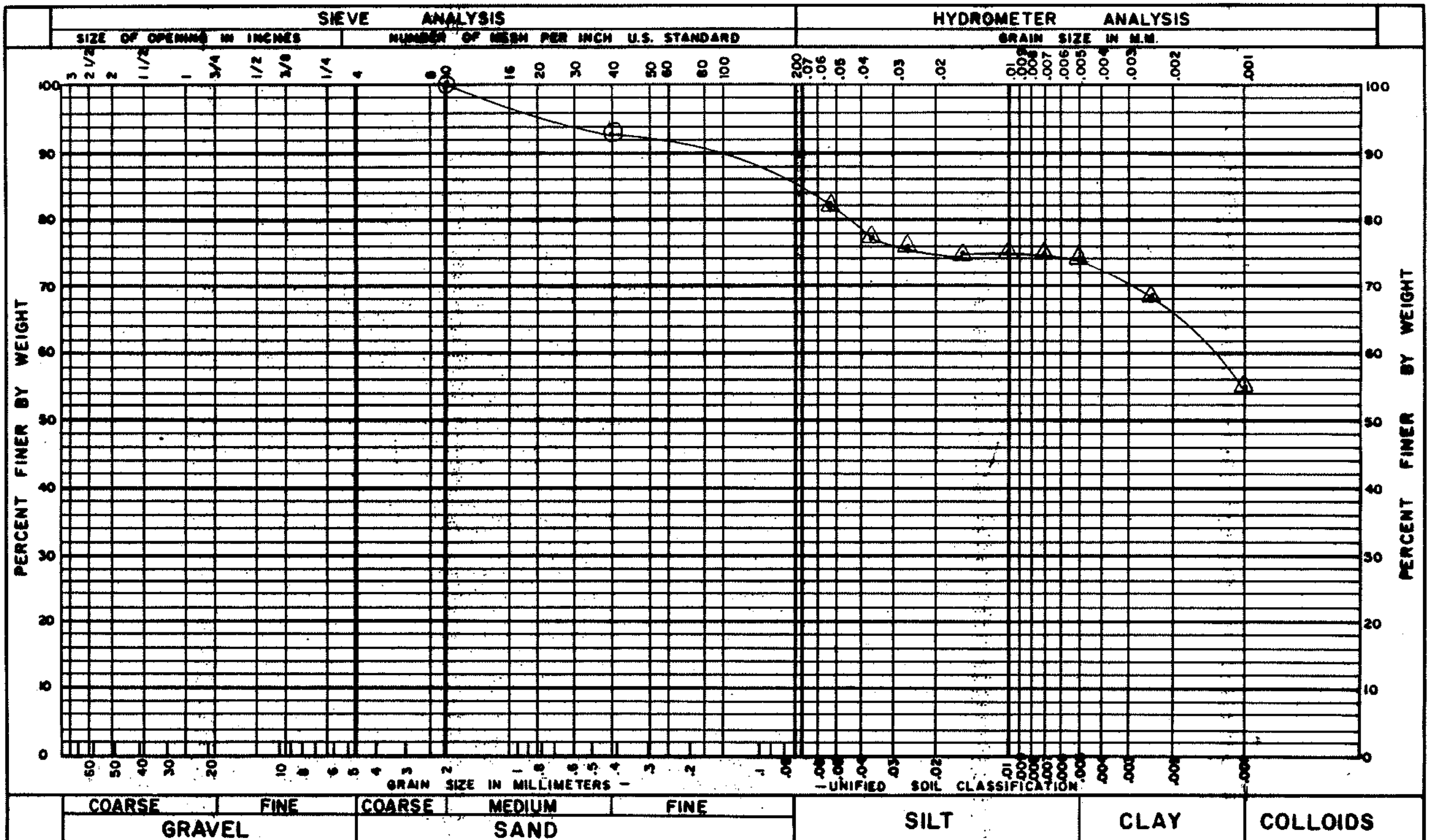
SOIL PROPERTY SUMMARY AND PARTICLE SIZE ANALYSIS

AYRES ASSOCIATES

Engineers / Architects / Planners / Surveyors

PROJECT: WEBSTER, DNR **JOB NO.** 6525-98 **DATE** AUG. 21, 1986

BORING NO.	SAMPLE NO.	DEPTH	FIELD CLASS	GRADATION - % PASSING .005	.02	.05	.074	#40	#10	#4	3/4"	1 1/2"	LL	PI	USCS	Wn %	e	γd P.C.F.	GS	k - (CM/S)
OW-2	S-1	5.0-5.5		74	74.5	81	85	93.3	100				63.9	42.4	CH				2.70	
OW-4	S-Ø	2.5-4.0		50	53	56	59	92.1	100				37.3	20.8	CL				2.68	
OW-5	S-1	5.0-6.5	SP-SM				9.2	88.9	100						SP-SM					
OW-5	S-9	45.0-46.5	SP				2.7	82.1	99.7	100					SP					
OW-7	S-Ø	2.5-4.0		59	62	64	67	96.3	100				52.4	35.3	CH				2.70	
OW-7	S-3	15.0-16.5	SP				2.1	74.2	100						SP					
OW-9	S-4	20.0-21.5	SP				2.9	39.1	91.7	96.3	100 — 3/8"				SP					
OW-9	S-7	35.0-36.5	SP				0.8	27.6	84.3	94.5	100				SP					



BORING NO.	OW-2	GRAVEL	—	F. SAND	8%	D_{60}	C_U
SAMPLE NO.	S-1	C. SAND	—	SILT	11.0%	D_{30}	C_Z
DEPTH	5.0'-5.5'	M. SAND	7.0%	CLAY	19.0%	D_{10}	UNIFIED CLASS CH
ELEV.				Colloids 55%			

PROJECT: WEBSTER- DNR

REMARKS:

DATE:

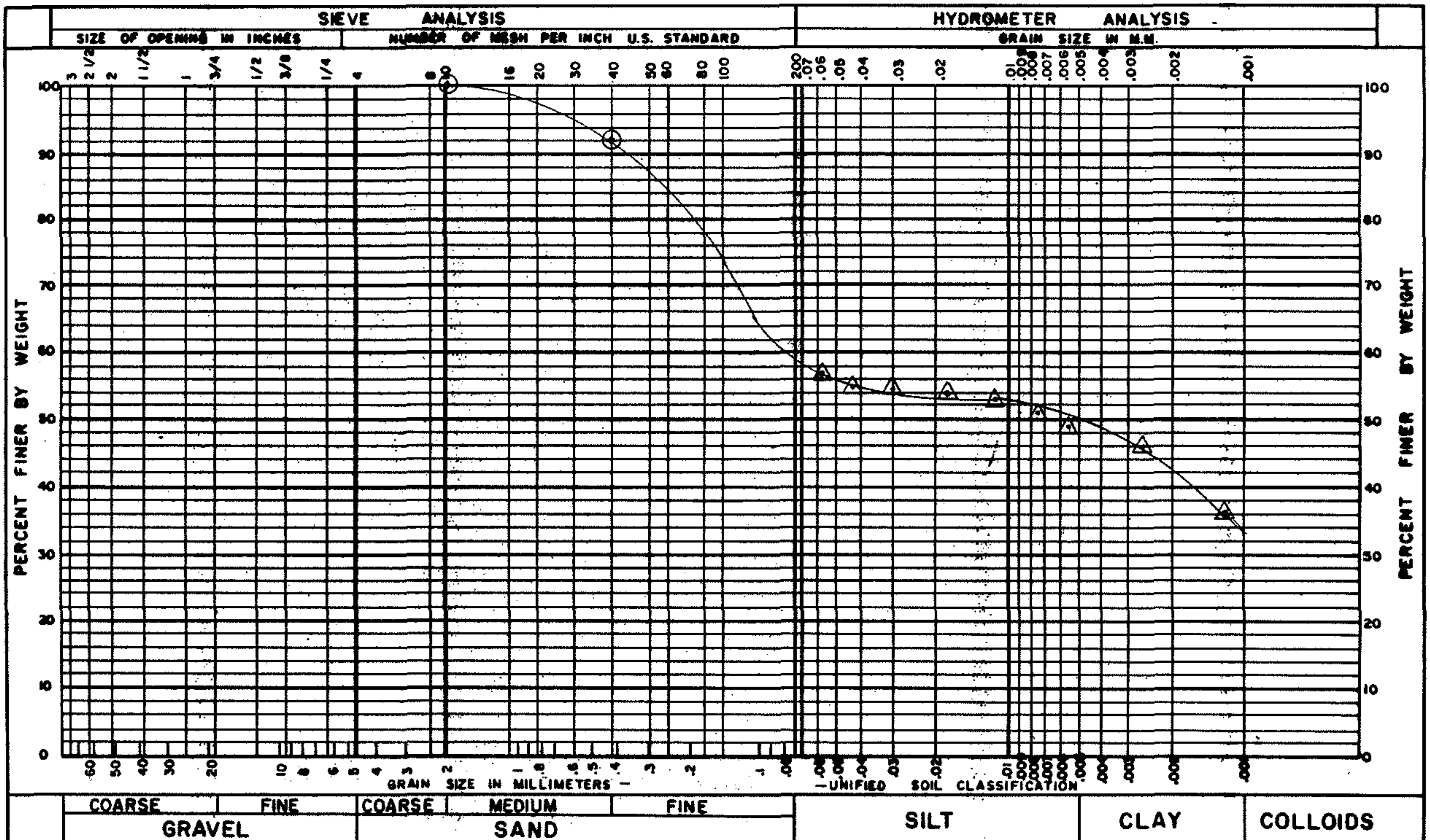
JOB NO: 6525.98

⊙ MECHANICAL

△ HYDROMETER

AYRES ASSOCIATES

Engineers / Architects / Planners / Surveyors

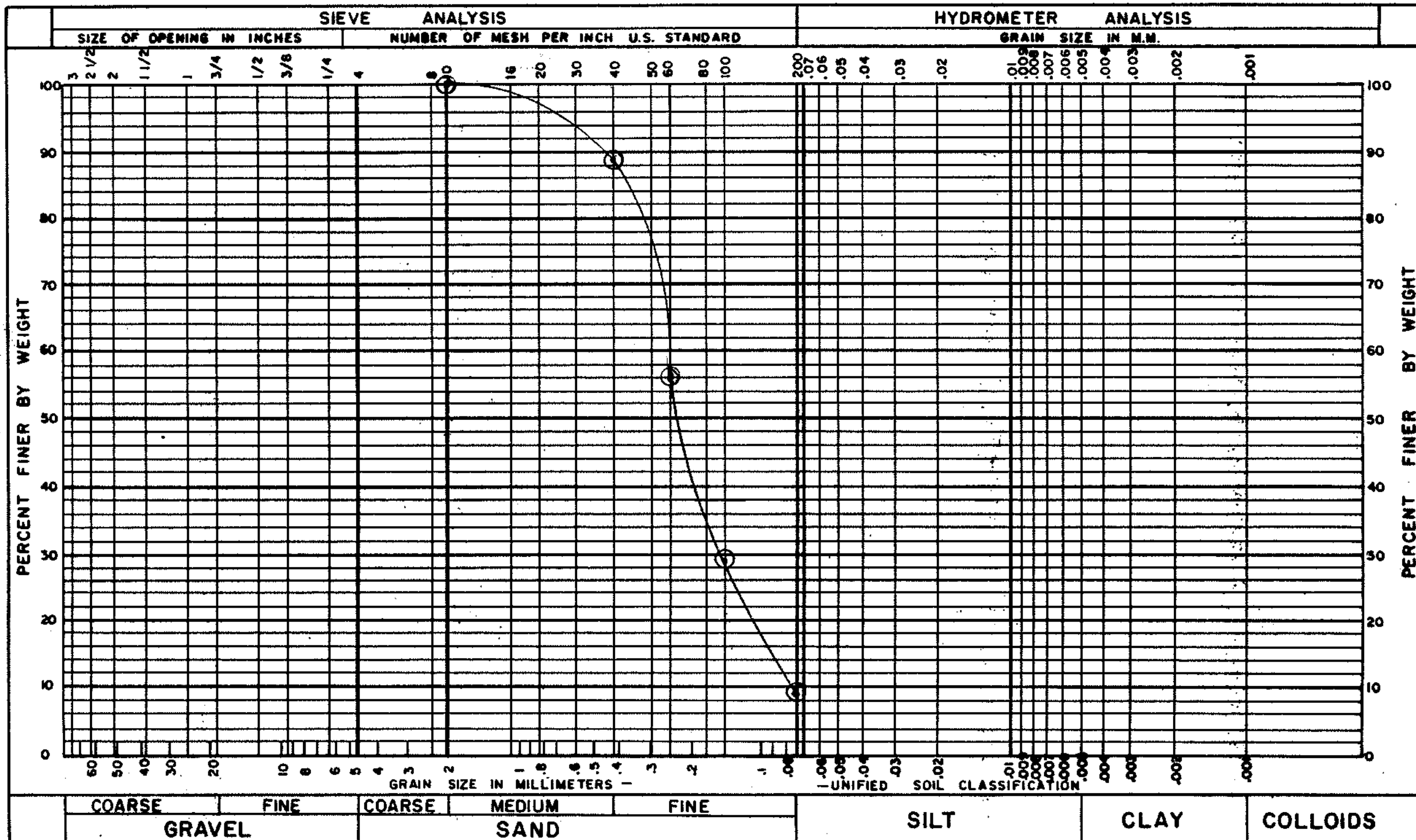


BORING NO. OW-4	GRAVEL	F SAND 33%	D_{60}	C_U	PROJECT: Webster - DNR
SAMPLE NO. S-Ø	C. SAND	SILT 9%	D_{30}	C_Z	
DEPTH 2.5-4.0	M. SAND 8%	CLAY 17%	D_{10}	UNIFIED CLASS CL	REMARKS: Auger Wrap Sample
ELEV.		Colloids - 33%			

AYRES ASSOCIATES Engineers / Architects / Planners / Surveyors

⊙ MECHANICAL
△ HYDROMETER

DATE:
JOB NO: 6525.98



BORING NO. OW-5	GRAVEL	F. SAND 80.0	D_{60} 0.25 C_U 3.1
SAMPLE NO. S-1	C. SAND	SILT } 9.0	D_{30} 0.16 C_Z 1.28
DEPTH 5.0' - 6.5	M. SAND 11.0	CLAY }	D_{10} 0.08 UNIFIED CLASS SP-SM
ELEV.			

PROJECT: Webster - DNR

REMARKS:

DATE:

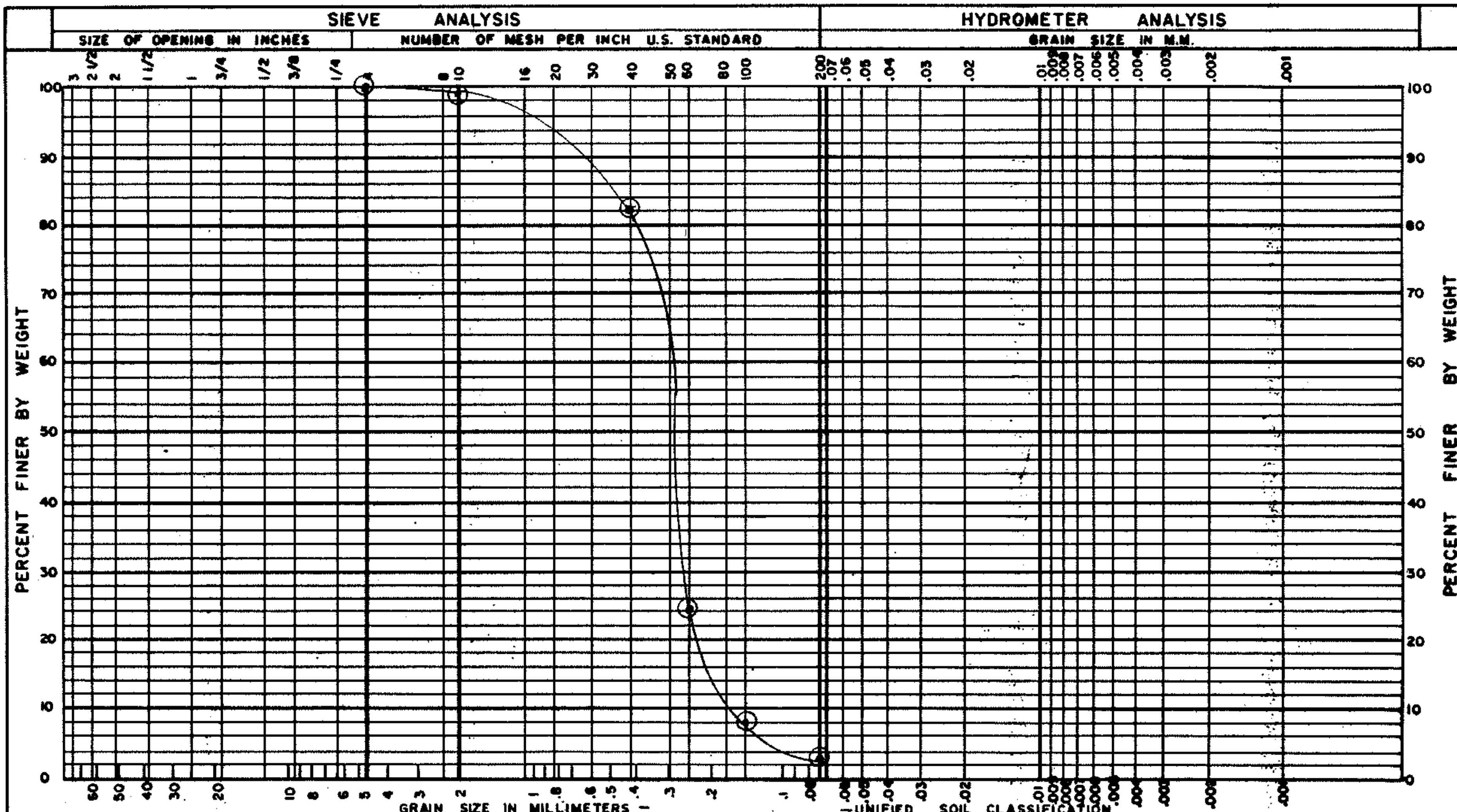
JOB NO: 6525.98

⊙ MECHANICAL

△ HYDROMETER

AYRES ASSOCIATES

Engineers / Architects / Planners / Surveyors



GRAVEL		SAND			SILT	CLAY	COLLOIDS
COARSE	FINE	COARSE	MEDIUM	FINE			

BORING NO. OW-5	GRAVEL	F. SAND 79.0%	D_{60} 0.29	C_U 1.6
SAMPLE NO. S-9	C. SAND 1.0	SILT } 3.0	D_{30} 0.26	C_Z 1.3
DEPTH 45'-46.5'	M. SAND 17.0	CLAY }	D_{10} 0.18	UNIFIED CLASS SP
ELEV.				

PROJECT: WEBSTER - DNR

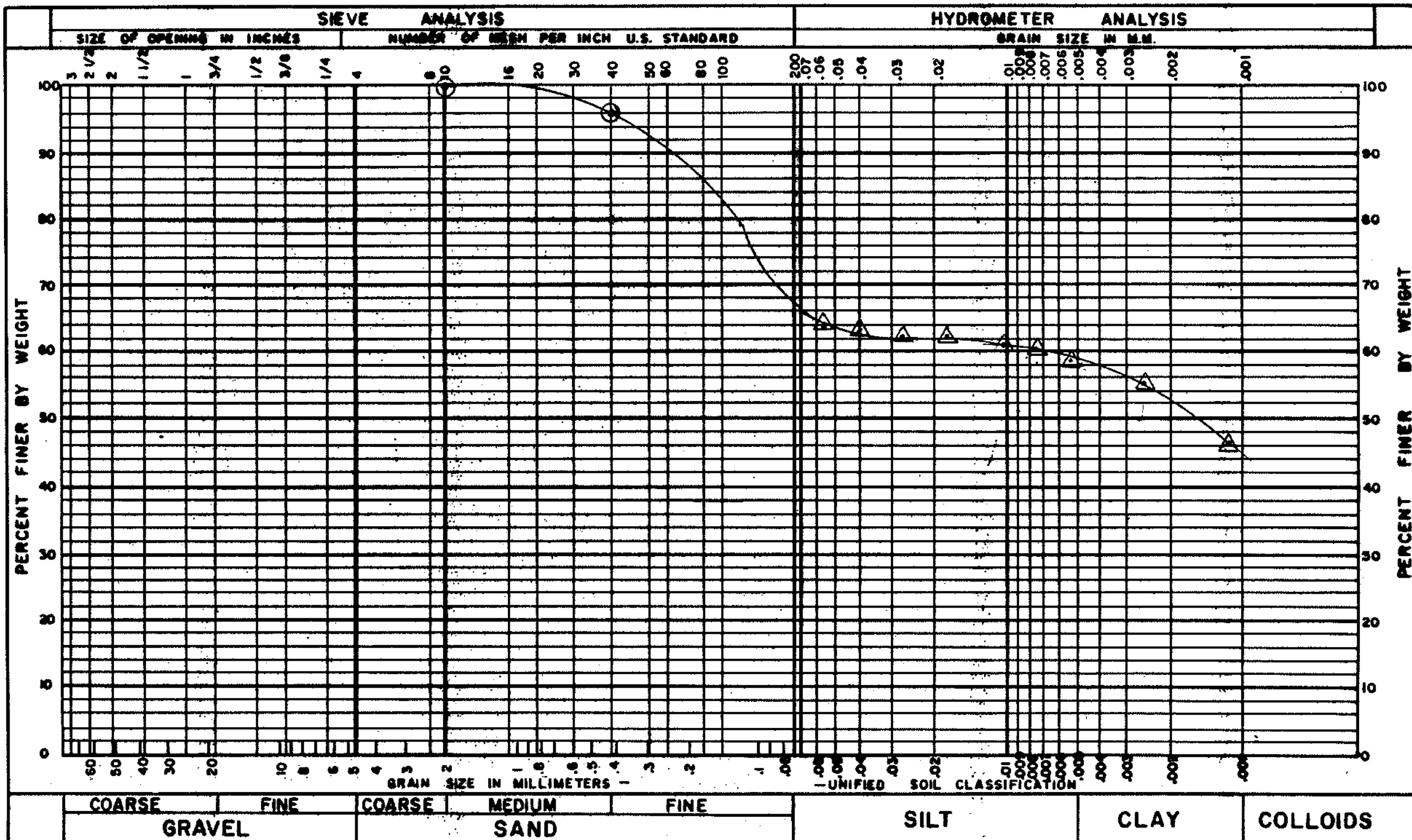
REMARKS:

DATE:

JOB NO: 6525.98

AYRES ASSOCIATES
Engineers / Architects / Planners / Surveyors

⊙ MECHANICAL
△ HYDROMETER

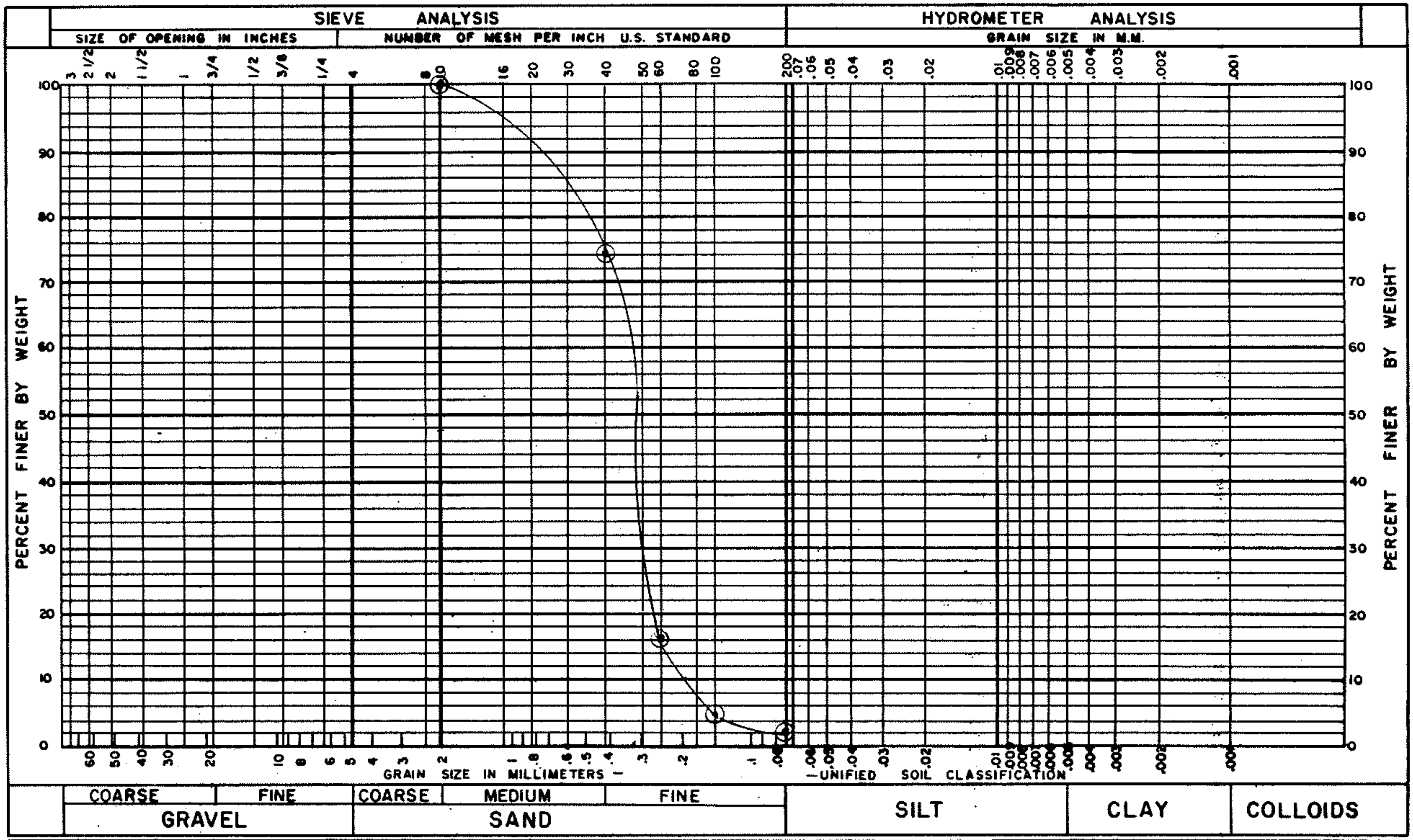


BORING NO. OW-7	GRAVEL	F. SAND 29%	D_{60}	C_U	PROJECT: WEBSTER - DNR
SAMPLE NO. S-Ø	C. SAND	SILT 8%	D_{30}	C_Z	
DEPTH 2.5'-4.0	M. SAND 4.0%	CLAY 14%	D_{10}	UNIFIED CLASS CH	REMARKS: AUGER WRAP SAMPLE
ELEV.		Colloids 45%			

AYRES ASSOCIATES Engineers / Architects / Planners / Surveyors

⊙ MECHANICAL
△ HYDROMETER

DATE:
JOB NO:



BORING NO. OW-7	GRAVEL	F. SAND 72.0	D_{60} .32	C_U 1.6
SAMPLE NO. S-3	C. SAND	SILT }	D_{30} .30	C_Z 1.4
DEPTH 15'-16.5'	M. SAND 26.0	CLAY } 2.0	D_{10} .2	UNIFIED CLASS SP
ELEV.				

AYRES ASSOCIATES Engineers / Architects / Planners / Surveyors

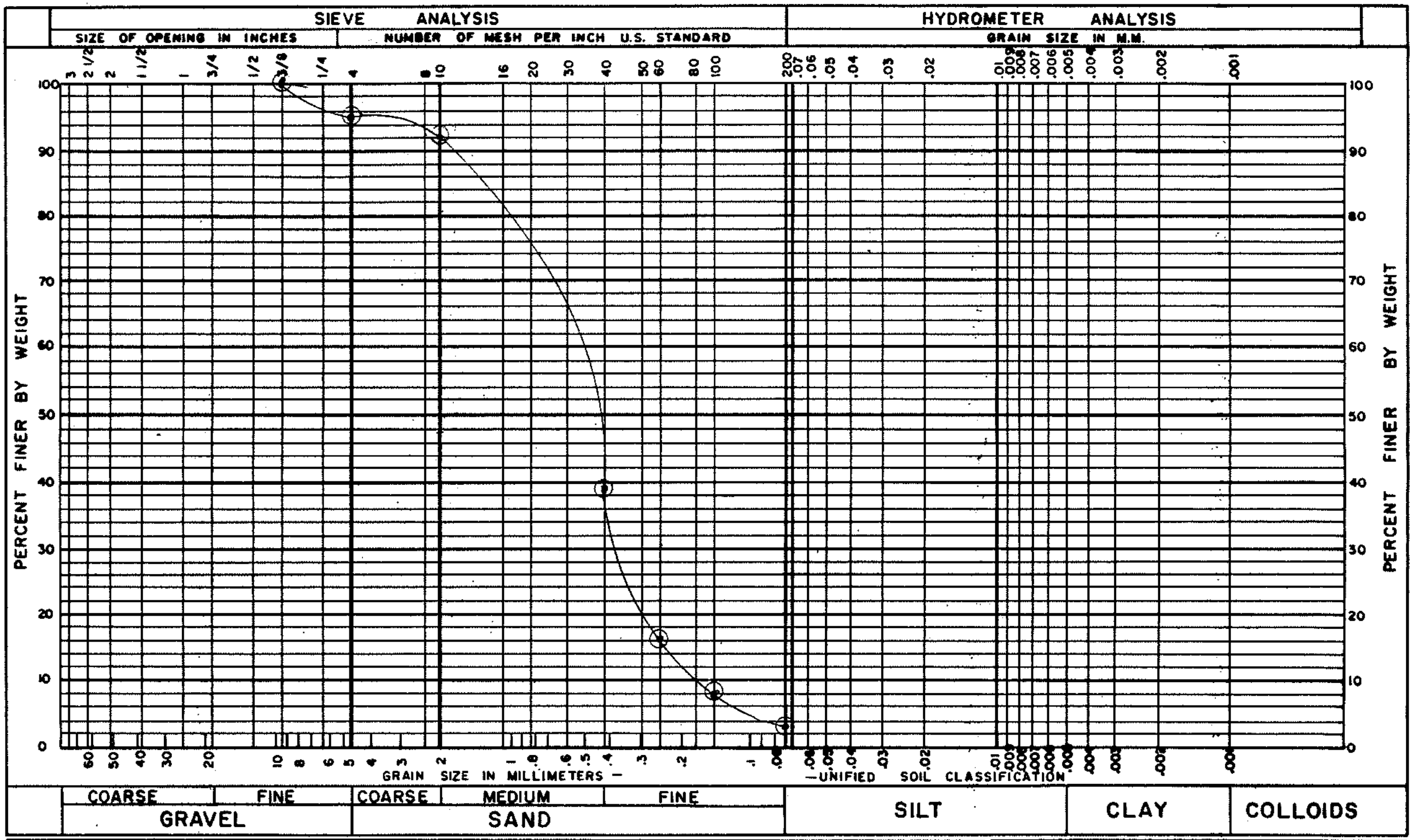
⊙ MECHANICAL
△ HYDROMETER

PROJECT: WEBSTER - DNR

REMARKS:

DATE:

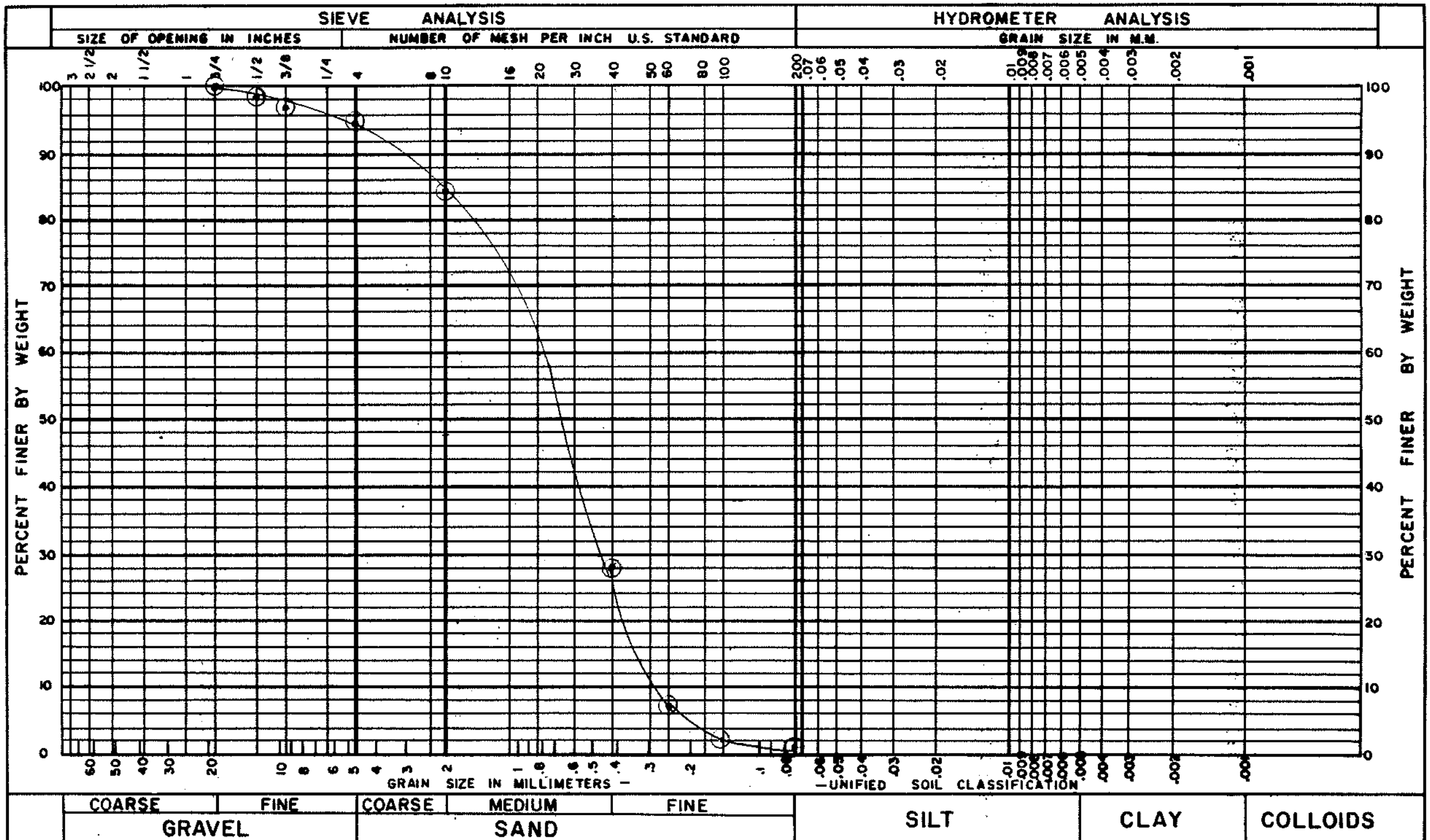
JOB NO: 6525.98



BORING NO. OW-9	GRAVEL 5.0	F. SAND 36.0	D_{60} 0.50	C_U 2.8	PROJECT:	WEBSTER - DNR
SAMPLE NO. S-4	C. SAND 3.0	SILT } 3.0	D_{30} 0.39	C_Z 1.7		
DEPTH 20'-21.5	M. SAND 53.0	CLAY }	D_{10} 0.18	UNIFIED CLASS SP	REMARKS:	
ELEV.					DATE:	
					JOB NO:	6525.98

AYRES ASSOCIATES Engineers / Architects / Planners / Surveyors

⊙ MECHANICAL
△ HYDROMETER



BORING NO. OW-9	GRAVEL 5.0	F SAND 27.0%	D_{60} 0.75	C_U 2.6
SAMPLE NO. S-7	C. SAND 11.0	SILT } 1.0%	D_{30} 0.45	C_Z 0.93
DEPTH 35'-36.5'	M.SAND 56.0	CLAY }	D_{10} 0.29	UNIFIED CLASS SP
ELEV.				

PROJECT: WEBSTER - DNR

REMARKS:

DATE:

JOB NO: 6525.98

⊙ MECHANICAL
△ HYDROMETER

AYRES ASSOCIATES Engineers / Architects / Planners / Surveyors

APPENDIX D

WELL INFORMATION FORM (WIF)
AND
GROUND WATER MONITORING INVENTORY FORM (GIN)

GROUNDWATER MONITORING WELL INFORMATION FORM

Facility Name	Facility ID Number	Date	Completed By (Name and Firm)
VILLAGE OF WEBSTER		9/22/86	T.J. PASCOE; AYRES ASSOCIATES

Well Name	Well ID Number (DNR No.)	Well Location	N	S	E	W	Date Established	Well Casing Diam.	Well Casing Type	Elevations: Top of Well Casing	Elevations: Ground Surface	Elevations: Screen Top	Reference: MSL (✓)	Reference: Site Datum (✓)	Screen Length	Screen Material	Well Depth	PIEZ	OW	PW	LYS	Other
W-1		9+63	X				7-8-86	2"	PVC	983.36	981.3	952.2'	✓		15.0'	PVC	44.1'		✓			
		8+43			X																	
W-2		8+94	X				7-8-86	2"	PVC	983.48'	981.3'	952.4'	✓		15.0'	PVC	43.9'		✓			
		8+30			X																	
W-3		6+57	X				7-8-86	2"	PVC	982.65	980.7'	951.7'	✓		15.0'	PVC	44.0'		✓			
		7+86			X																	
W-4		6+75	X				7-8-86	2"	PVC	981.80'	980.1'	951.6'	✓		15.0'	PVC	43.5'		✓			
		5+38			X																	
W-5		8+34	X				7-7-86	2"	PVC	982.46'	979.8'	949.8'	✓		15.0'	PVC	45.0'		✓			
		5+52			X																	
W-6		9+25	X				7-7-86	2"	PVC	982.59'	980.0'	951.1'	✓		15.0'	PVC	43.9'		✓			
		6+60			X																	
W-7		12+50	X				7-7-86	2"	PVC	981.25'	979.3'	950.8'	✓		15.0'	PVC	43.5'		✓			
		7+70			X																	
W-8		10+58	X				7-8-86	2"	PVC	983.11'	980.8'	951.8'	✓		15.0'	PVC	44.0'		✓			
		10+07			X																	
W-9		7+20	X				7-8-86	2"	PVC	981.0'	979.2'	951.7'	✓		15.0'	PVC	42.5'		✓			
		9+46			X																	

Location Coordinates Are:

☑ Grid System

State Plane Coordinate
☐ Northern
☐ Central

Received In:

District: ______ Area: ______ Bureau: ______

By: ______

SMS Use:

File Maint. Completed: ______ Date

Other: ______

Department of Natural Resources

GROUNDWATER MONITORING INVENTORY FORM
Form 3300-67 Rev. 1-86

File Maintenance Code: (A) — Add (New Facility)
C — Change (Existing Facility)
D — Delete from Inventory

T.J. PASCOE; AYRES ASSOCIATES — Form completed and sample collected by — Date (MM DD YY): 09 22 86

Directions on reverse side of form. Volatile Organic Sampling Program [✓] Pesticide Program [ ] Other [ ]

INVENTORY INFORMATION Mandatory Information (See Instructions)

Present name of establishment or facility (public system):

Facility I.D. or Check Here If New Facility [✓]

Name of owner or manager (last name first): WDNR-NORTHWEST DISTRICT

Owner's Address (street or route): P.O. BOX 309

Area code: 715 Telephone number: 635-2101

City: SPOONER State: WI Zip Code: 54801

County: BURNETT Co. code: 07 Township: MEENON

Name of occupant (if different than owner) (last name first):

Occupant's address (street or route):

City: VILLAGE OF WEBSTER State: WI Zip Code: 54893

Water System Type (check ✓ one)

Non-potable wells
- [✓] M Monitoring
- [ ] I Irrigation
- [ ] X Other

Potable wells
- [ ] M Community — municipal
- [ ] O Community — other than municipal
- [ ] N Non-community
- [ ] P Private

High cap. permanent well no.: Well no.: W-1 Parcel No.: Government lot number:

Well Location: ¼ ¼: SE ¼ Sec.: SE Sec.: 08 Town: T 39 N Range: R 16 W

WELL DATA

Well Construction Report Available? [✓] Yes [ ] No

Date well constructed	Constructed by	Casing depth	Depth to water	Depth to bedrock
7-8-86	WISCONSIN TEST DRILLING	44.1 ft.	35 ft.	~270 ft.

Casing diameter (inches): 2.0

Distance casing above or below grade (inches): 24.7

Total well depth: 44.1 ft.

Water bearing formation
- [ ] S — Sandstone
- [ ] G — Granite
- [ ] H — Shale
- [ ] Q — Quartzite
- [ ] L — Limestone
- [✓] U — Unconsolidated

SOURCE OF WELL DATA

- [✓] C — Construction Report
- [ ] D — Well Driller
- [ ] I — Inspection Form or Sanitary Survey
- [ ] O — Owner or Occupant
- [ ] N — Data Not Available

4. WELL STATUS

- [✓] A — Active
- [ ] I — Inactive
- [ ] B — Abandoned

ADDITIONAL COMMENTS (Directions to Site, Possible Contaminant Sources. See Back)

W-1 (9+63N, 8+43W)

Department of Natural Resources

GROUNDWATER MONITORING INVENTORY FORM

Form 3300-67 Rev. 1-86

File Maintenance Code: (A) — Add (New Facility)
C — Change (Existing Facility)
D — Delete from Inventory

T.J. PASCOE ; AYRES ASSOCIATES — Form completed and sample collected by — Date: 09 22 86 (M M D D Y Y)

Directions on reverse side of form. Volatile Organic Sampling Program ☑ Pesticide Program ☐ Other ☐

1 INVENTORY INFORMATION Mandatory Information (See Instructions)

Present name of establishment or facility (public system):

Facility I.D. or Check Here If New Facility ☑

Name of owner or manager (last name first): WDNR - NORTHWEST DISTRICT

Owner's Address (street or route): P. O. BOX 309

Area code: 715 Telephone number: 635 2101

City: SPOONER State: WI Zip Code: 54801

County: BURNETT Co. code: 07 Township: MEENON

Name of occupant (if different than owner) (last name first):

Occupant's address (street or route):

City: VILLAGE OF WEBSTER State: WI Zip Code: 54893

Water System Type (check ✓ one)

Non-potable wells: ☑ M Monitoring ☐ I Irrigation ☐ X Other

Potable wells: ☐ M Community — municipal ☐ O Community — other than municipal ☐ N Non-community ☐ P Private

High cap. permanent well no.: Well no.: W-2 Parcel No.: Government lot number:

Well Location: ¼ ¼: SE ¼ Sec.: SE Sec.: 08 Town: T 39 N Range: R 16 W

2 WELL DATA

Well Construction Report Available? ☑ Yes ☐ No

Date well constructed: 7-8-86 Constructed by: WISCONSIN TEST DRILLING Casing depth: 43.9 ft. Depth to water: 35 ft. Depth to bedrock: ~270 ft.

Casing diameter (inches): 2.0 Distance casing above or below grade (inches): 26.2 Total well depth: 43.9 ft.

Water bearing formation: ☐ S — Sandstone ☐ H — Shale ☐ L — Limestone ☐ G — Granite ☐ Q — Quartzite ☑ U — Unconsolidated

3 SOURCE OF WELL DATA

☑ C — Construction Report ☐ I — Inspection Form or Sanitary Survey ☐ O — Owner or Occupant ☐ D — Well Driller ☐ N — Data Not Available

4. WELL STATUS

☑ A — Active ☐ B — Abandoned ☐ I — Inactive

5 ADDITIONAL COMMENTS (Directions to Site, Possible Contaminant Sources. See Back)

W-2 (8+94N, 8+30E)

Department of Natural Resources

GROUNDWATER MONITORING INVENTORY FORM

Form 3300-67 Rev. 1-86

File Maintenance Code: (A) — Add (New Facility)
C — Change (Existing Facility)
D — Delete from Inventory

T.J. PASCOE; AYRES ASSOCIATES — 09 22 86
Form completed and sample collected by — Date (M M D D Y Y)

Directions on reverse side of form. Volatile Organic Sampling Program [x] Pesticide Program [ ] Other [ ]

1. INVENTORY INFORMATION Mandatory Information (See Instructions)

Present name of establishment or facility (public system):

Facility I.D. or Check Here If New Facility: [x]

Name of owner or manager (last name first): WDNR - NORTHWEST DISTRICT

Owner's Address (street or route): P.O. BOX 309

Area code: 715 Telephone number: 6352101

City: SPOONER State: WI Zip Code: 54801

County: BURNETT Co. code: 07 Township: MEENON

Name of occupant (if different than owner) (last name first):

Occupant's address (street or route):

City: VILLAGE OF WEBSTER State: WI Zip Code: 54893

Water System Type (check ✓ one)

Non-potable wells:
- [x] M Monitoring
- [ ] I Irrigation
- [ ] X Other

Potable wells:
- [ ] M Community — municipal
- [ ] O Community — other than municipal
- [ ] N Non-community
- [ ] P Private

High cap. permanent well no.: Well no.: W-3 Parcel No.: Government lot number:

Well Location: ¼ ¼: SE ¼ Sec.: SE Sec.: 08 Town: T 39 N Range: R 16 W

2. WELL DATA

Well Construction Report Available? [x] Yes [ ] No

Date well constructed	Constructed by	Casing depth	Depth to water	Depth to bedrock
7-8-86	WISCONSIN TEST DRILLING	44 ft.	30 ft.	~270 ft.

Casing diameter (inches)	Distance casing above or below grade (inches)	Total well depth
2.0	23.4	44 ft.

Water bearing formation:
- [ ] S — Sandstone
- [ ] G — Granite
- [ ] H — Shale
- [ ] Q — Quartzite
- [ ] L — Limestone
- [x] U — Unconsolidated

3. SOURCE OF WELL DATA

- [x] C — Construction Report
- [ ] D — Well Driller
- [ ] I — Inspection Form or Sanitary Survey
- [ ] O — Owner or Occupant
- [ ] N — Data Not Available

4. WELL STATUS

- [x] A — Active
- [ ] I — Inactive
- [ ] B — Abandoned

5. ADDITIONAL COMMENTS (Directions to Site, Possible Contaminant Sources. See Back)

W-3 (6+57N, 7+86E)

Department of Natural Resources

GROUNDWATER MONITORING INVENTORY FORM
Form 3300-67 Rev. 1-86

File Maintenance Code: (A) — Add (New Facility)
C — Change (Existing Facility)
D — Delete from Inventory

T.J. PASCOE; AYRES ASSOCIATES — Form completed and sample collected by — Date (MM DD YY): 09 22 86

Directions on reverse side of form. Volatile Organic Sampling Program ☑ Pesticide Program ☐ Other ☐

1. INVENTORY INFORMATION Mandatory Information (See Instructions)

Present name of establishment or facility (public system):

Facility I.D. or Check Here If New Facility: ✓

Name of owner or manager (last name first): WDNR-NORTHWEST DISTRICT

Owner's Address (street or route): P.O. BOX 309

Area code: 715 Telephone number: 635 2101

City: SPOONER State: WI Zip Code: 54801

County: BURNETT Co. code: 07 Township: MEENON

Name of occupant (if different than owner) (last name first):

Occupant's address (street or route):

City: VILLAGE OF WEBSTER State: WI Zip Code: 54893

Water System Type (check ✓ one)

Non-potable wells: ☑ M Monitoring ☐ I Irrigation ☐ X Other

Potable wells: ☐ M Community — municipal ☐ O Community — other than municipal ☐ N Non-community ☐ P Private

High cap. permanent well no.: Well no.: W-4 Parcel No.: Government lot number:

Well Location: ¼ ¼: SW ¼ Sec.: SE Sec.: 08 Town: T 39 N Range: R 16 W

2. WELL DATA

Well Construction Report Available? ☑ Yes ☐ No

Date well constructed: 7-8-86

Constructed by: WISCONSIN TEST DRILLING

Casing depth: 43.5 ft. Depth to water: 30 ft. Depth to bedrock: ~270 ft.

Casing diameter (inches): 2.0

Distance casing above or below grade (inches): 20.4

Total well depth: 43.5 ft.

Water bearing formation: ☐ S — Sandstone ☐ G — Granite ☐ H — Shale ☐ Q — Quartzite ☐ L — Limestone ☑ U — Unconsolidated

3. SOURCE OF WELL DATA

☐ C — Construction Report ☐ D — Well Driller ☐ I — Inspection Form or Sanitary Survey ☐ O — Owner or Occupant ☐ N — Data Not Available

4. WELL STATUS

☑ A — Active ☐ I — Inactive ☐ B — Abandoned

5. ADDITIONAL COMMENTS (Directions to Site, Possible Contaminant Sources. See Back)

W-4 (6+75N, 5+38E)

Department of Natural Resources

GROUNDWATER MONITORING INVENTORY FORM
Form 3300-67 Rev. 1-86

File Maintenance Code: (A) — Add (New Facility)
C — Change (Existing Facility)
D — Delete from Inventory

T.J. PASCOE, AYRES ASSOCIATES — Form completed and sample collected by — Date (MM DD YY): 09 22 86

Directions on reverse side of form. Volatile Organic Sampling Program ☑ Pesticide Program ☐ Other ☐

1. INVENTORY INFORMATION Mandatory Information (See Instructions)

Present name of establishment or facility (public system):

Facility I.D. or Check Here If New Facility ☑

Name of owner or manager (last name first): WDNR-NORTHWEST DISTRICT

Owner's Address (street or route): P.O. BOX 309

Area code: 715 Telephone number: 635 2101

City: SPOONER State: WI Zip Code: 54801

County: BURNETT Co. code: 07 Township: MEENON

Name of occupant (if different than owner) (last name first):

Occupant's address (street or route):

City: VILLAGE OF WEBSTER State: WI Zip Code: 54893

Water System Type (check ✓ one)

Non-potable wells: ☑ M Monitoring ☐ I Irrigation ☐ X Other

Potable wells: ☐ M Community — municipal ☐ O Community — other than municipal ☐ N Non-community ☐ P Private

High cap. permanent well no.: Well no.: W-5 Parcel No.: Government lot number:

Well Location: ¼ ¼: SW ¼ Sec.: SE Sec.: 08 Town: T 39 N Range: R 16 W

2. WELL DATA

Well Construction Report Available? ☑ Yes ☐ No

Date well constructed: 7-7-86

Constructed by: WISCONSIN TEST DRILLING

Casing depth: 45 ft. Depth to water: 30 ft. Depth to bedrock: ~270 ft.

Casing diameter (inches): 2.0

Distance casing above or below grade (inches): 31.9

Total well depth: 45.0 ft.

Water bearing formation: ☐ S — Sandstone ☐ G — Granite ☐ H — Shale ☐ Q — Quartzite ☐ L — Limestone ☑ U — Unconsolidated

3. SOURCE OF WELL DATA

☑ C — Construction Report ☐ I — Inspection Form or Sanitary Survey ☐ O — Owner or Occupant ☐ D — Well Driller ☐ N — Data Not Available

4. WELL STATUS

☑ A — Active ☐ B — Abandoned ☐ I — Inactive

5. ADDITIONAL COMMENTS (Directions to Site, Possible Contaminant Sources. See Back)

W-5 (8+34N, 5+52E)

Department of Natural Resources

GROUNDWATER MONITORING INVENTORY FORM

Form 3300-67 Rev. 1-86

File Maintenance Code: (A) — Add (New Facility)
C — Change (Existing Facility)
D — Delete from Inventory

T.J. PASCOE ; AYRES ASSOCIATES — Form completed and sample collected by — Date: 09 22 86 (MM DD YY)

Directions on reverse side of form. Volatile Organic Sampling Program [✓] Pesticide Program [ ] Other [ ]

1. INVENTORY INFORMATION Mandatory Information (See Instructions)

Present name of establishment or facility (public system):

Facility I.D. or Check Here If New Facility [✓]

Name of owner or manager (last name first): WDNR - NORTHWEST DISTRICT

Owner's Address (street or route): P.O. BOX 309

Area code: 715 Telephone number: 635 2101

City: SPOONER State: WI Zip Code: 54801

County: BURNETT Co. code: 07 Township: MEENON

Name of occupant (if different than owner) (last name first):

Occupant's address (street or route):

City: VILLAGE OF WEBSTER State: WI Zip Code: 54893

Water System Type (check ✓ one)

Non-potable wells: [✓] M Monitoring; [ ] I Irrigation; [ ] X Other

Potable wells: [ ] M Community — municipal; [ ] O Community — other than municipal; [ ] N Non-community; [ ] P Private

High cap. permanent well no.: Well no.: W-6 Parcel No.: Government lot number:

Well Location: ¼ ¼: SW ¼ Sec.: SE Sec.: 08 Town: T 39 N Range: R 16 W

2. WELL DATA

Well Construction Report Available? [✓] Yes [ ] No

Date well constructed: 7-7-86

Constructed by: WISCONSIN TEST DRILLING

Casing depth: 43.9 ft. Depth to water: 35 ft. Depth to bedrock: ~270 ft.

Casing diameter (inches): 2.0

Distance casing above or below grade (inches): 31.1

Total well depth: 43.9 ft.

Water bearing formation: [ ] S — Sandstone [ ] H — Shale [ ] L — Limestone [ ] G — Granite [ ] Q — Quartzite [✓] U — Unconsolidated

3. SOURCE OF WELL DATA

[✓] C — Construction Report [ ] I — Inspection Form or Sanitary Survey [ ] O — Owner or Occupant [ ] D — Well Driller [ ] N — Data Not Available

4. WELL STATUS

[✓] A — Active [ ] B — Abandoned [ ] I — Inactive

5. ADDITIONAL COMMENTS (Directions to Site, Possible Contaminant Sources. See Back)

W-6 (9+25N, 6+60E)

Department of Natural Resources

GROUNDWATER MONITORING INVENTORY FORM

Form 3300-67 Rev. 1-86

File Maintenance Code: (A) — Add (New Facility)
C — Change (Existing Facility)
D — Delete from Inventory

Form completed and sample collected by: T.J. PASCOE ; AYRES ASSOCIATES — Date: 09 22 86 (MM DD YY)

Directions on reverse side of form. Volatile Organic Sampling Program ☑ Pesticide Program ☐ Other ☐

1. INVENTORY INFORMATION Mandatory Information (See Instructions)

Present name of establishment or facility (public system):

Facility I.D. or Check Here If New Facility ☑

Name of owner or manager (last name first): WDNR - NORTHWEST DISTRICT

Owner's Address (street or route): P. O. BOX 309

Area code: 715 Telephone number: 635 2101

City: SPOONER State: WI Zip Code: 54801

County: BURNETT Co. code: 07 Township: MEENON

Name of occupant (if different than owner) (last name first):

Occupant's address (street or route):

City: VILLAGE OF WEBSTER State: WI Zip Code: 54893

Water System Type (check ✓ one)

Non-potable wells: ☑ M Monitoring ☐ I Irrigation ☐ X Other

Potable wells: ☐ M Community — municipal ☐ O Community — other than municipal ☐ N Non-community ☐ P Private

High cap. permanent well no.: Well no.: W-7 Parcel No.: Government lot number:

Well Location: ¼ ¼: NW ¼ Sec.: SE Sec.: 08 Town: T 39 N Range: R 16 W

2. WELL DATA

Well Construction Report Available? ☑ Yes ☐ No

Date well constructed: 7-7-86

Constructed by: WISCONSIN TEST DRILLING

Casing depth: 43.5 ft. Depth to water: 30 ft. Depth to bedrock: ~270 ft.

Casing diameter (inches): 2.0

Distance casing above or below grade (inches): 23.4

Total well depth: 43.5 ft.

Water bearing formation: ☐ S — Sandstone ☐ H — Shale ☐ L — Limestone ☐ G — Granite ☐ Q — Quartzite ☑ U — Unconsolidated

3. SOURCE OF WELL DATA

☑ C — Construction Report ☐ I — Inspection Form or Sanitary Survey ☐ O — Owner or Occupant ☐ D — Well Driller ☐ N — Data Not Available

4. WELL STATUS

☑ A — Active ☐ B — Abandoned ☐ I — Inactive

5. ADDITIONAL COMMENTS (Directions to Site, Possible Contaminant Sources. See Back)

W-7 (12+50N, 7+70E)

Department of Natural Resources

GROUNDWATER MONITORING INVENTORY FORM
Form 3300-67 Rev. 1-86

File Maintenance Code: (A) — Add (New Facility)
C — Change (Existing Facility)
D — Delete from Inventory

Form completed and sample collected by	Date
T.J. PASCOE; AYRES ASSOCIATES	09 22 86 (MM DD YY)

Directions on reverse side of form. Volatile Organic Sampling Program ☑ Pesticide Program ☐ Other ☐

1. INVENTORY INFORMATION Mandatory Information (See Instructions)

Present name of establishment or facility (public system):

Facility I.D. or Check Here If New Facility: ☑

Name of owner or manager (last name first): WDNR-NORTHWEST DISTRICT

Owner's Address (street or route): P.O. BOX 309

Area code: 715 Telephone number: 635 2101

City: SPOONER State: WI Zip Code: 54801

County: BURNETT Co. code: 07 Township: MEENON

Name of occupant (if different than owner) (last name first):

Occupant's address (street or route):

City: VILLAGE OF WEBSTER State: WI Zip Code: 54893

Water System Type (check ✓ one)

Non-potable wells: ☑ M Monitoring ☐ I Irrigation ☐ X Other

Potable wells: ☐ M Community — municipal ☐ O Community — other than municipal ☐ N Non-community ☐ P Private

High cap. permanent well no.: Well no.: W-8 Parcel No.: Government lot number:

Well Location: ¼ ¼: SE ¼ Sec.: SE Sec.: 08 Town: T 39 N Range: R 16 W

2. WELL DATA

Well Construction Report Available? ☑ Yes ☐ No

Date well constructed: 7-8-86 Constructed by: WISCONSIN TEST DRILLING

Casing depth: 44 ft. Depth to water: 30 ft. Depth to bedrock: >270 ft.

Casing diameter (inches): 2.0 Distance casing above or below grade (inches): 27.7

Total well depth: 44 ft.

Water bearing formation: ☐ S — Sandstone ☐ H — Shale ☐ L — Limestone ☐ G — Granite ☐ Q — Quartzite ☑ U — Unconsolidated

3. SOURCE OF WELL DATA

☑ C — Construction Report ☐ I — Inspection Form or Sanitary Survey ☐ O — Owner or Occupant ☐ D — Well Driller ☐ N — Data Not Available

4. WELL STATUS

☑ A — Active ☐ B — Abandoned ☐ I — Inactive

5. ADDITIONAL COMMENTS (Directions to Site, Possible Contaminant Sources. See Back)

W-8 (10+58 N, 10+07 E)

Department of Natural Resources

GROUNDWATER MONITORING INVENTORY FORM
Form 3300-67 Rev. 1-86

File Maintenance Code: (A) — Add (New Facility)
C — Change (Existing Facility)
D — Delete from Inventory

T.J. PASCOE ; AYRES ASSOCIATES — Form completed and sample collected by — Date: 09 22 86 (MM DD YY)

Directions on reverse side of form. Volatile Organic Sampling Program [x] Pesticide Program [ ] Other [ ]

1 INVENTORY INFORMATION Mandatory Information (See Instructions)

Present name of establishment or facility (public system):

Facility I.D. or Check Here If New Facility [x]

Name of owner or manager (last name first): WDNR - NORTHWEST DISTRICT

Owner's Address (street or route): P. O. BOX 309

Area code: 715 Telephone number: 635 2101

City: SPOONER State: WI Zip Code: 54801

County: URNETT Co. code: 07 Township: MEENON

Name of occupant (if different than owner) (last name first):

Occupant's address (street or route):

City: ILLAGE OF WEBSTER State: WI Zip Code: 54893

Water System Type (check ✓ one)

Non-potable wells
[x] M Monitoring
[ ] I Irrigation
[ ] X Other

Potable wells
[ ] M Community — municipal
[ ] O Community — other than municipal
[ ] N Non-community
[ ] P Private

High cap. permanent well no.: Well no.: W-9 Parcel No.: Government lot number:

Well Location: ¼ ¼: SE ¼ Sec.: SE Sec.: 08 Town: T 39 N Range: R 16 W

2 WELL DATA

Well Construction Report Available? [x] Yes [ ] No

Date well constructed	Constructed by	Casing depth	Depth to water	Depth to bedrock
7-8-86	WISCONSIN TEST DRILLING	42.5 ft.	30 ft.	~270 ft.

Casing diameter (inches)	Distance casing above or below grade (inches)	Total well depth
2.0	21.6	42.5 ft.

Water bearing formation:
[ ] S — Sandstone [ ] H — Shale [ ] L — Limestone
[ ] G — Granite [ ] Q — Quartzite [x] U — Unconsolidated

3. SOURCE OF WELL DATA

[ ] C — Construction Report
[ ] D — Well Driller
[ ] I — Inspection Form or Sanitary Survey
[ ] O — Owner or Occupant
[ ] N — Data Not Available

4. WELL STATUS

[x] A — Active
[ ] I — Inactive
[ ] B — Abandoned

5 ADDITIONAL COMMENTS (Directions to Site, Possible Contaminant Sources. See Back)

W-9 (7+20N, 9+46E)

APPENDIX E

FIELD SAMPLING REPORTS
AND
VOLATILE ORGANIC COMPOUND ANALYSIS RESULTS

FIELD SAMPLING REPORT

Site Name: Webster Water Contamination   Job #: 6525.00   Weather Conditions: Cldy, Windy - 68°

Relinquished by:	Date	Time	Received by:	Date	Time	Relinquished by:	Date	Time	Received by:	Date	Time
				8-4-86	6:45						

Sample Collector(s): Patrick Collins   Sample Handling Methods:

Add. Custody Info.: __ None   __ See Attached Sheet

Sampling Sequence: 1st 4, 5, 9, 8, 6, 7, 3, 2, 1   2nd ______   3rd ______

I.D.	① Type	Ref. Elev. Ft,MSL	Depth to H_2O / Water Depth Feet	Water Elev. Ft,MSL	② Sample Method	③ Purging Date/Time	③ Purging Vol.	Sampling Date/Time	Temp. Deg. C	Sp. Cond.	pH	Color	Turb.	Odor	General Indicators U	General Indicators F	COD H_2SO_4 U	COD H_2SO_4 F	Metals HNO_3 U	Metals HNO_3 F	VOC U	VOC F	U	F	U	F	U	F	④ Comments
4	WP2"	981.80	32.60	949.20	TB-2'	8-4 / 9:15	10gal	8-4 / 3:15	—	—	—	CLR	None	None							X								*
5	"	982.46	33.27	949.19	"	9:50	10gal	3:30	—	—	—	"	"	"							X								
9	"	981.00	31.44	949.56	"	10:20	10gal	3:45	—	—	—	"	SL	"							X								
8	"	983.11	33.46	949.65	"	10:45	10gal	4:00	—	—	—	"	None	"							X								
6	"	982.59	33.23	949.36	"	11:55	10gal	4:15	—	—	—	"	SL	"							X								
7	"	981.25	31.42	949.83	"	12:30	10gal	4:30	—	—	—	"	SL	"							X								
3	"	982.65	33.20	949.45	"	1:00	10gal	4:45	—	—	—	"	Mod.	"							X								
2	"	983.48	34.00	949.48	"	1:30	10gal	5:00	—	—	—	"	None	"							X								
1	"	983.36	33.91	949.55	"	2:00	10gal	5:15	—	—	—	"	"	"							X								

NOTE 1 - Sample Point

Code	Type Description
WP__	Well, PVC, Add Size (i.e. for 2" use WP2)
WPG__	Well, PVC, Galv. Top, Add Size
WS__	Well, Steel, Add Size
WSS__	Stainless Steel, Add Size
STR	Stream
LY	Lysimeter
LE	Leachate
P	Pond
O	Other

NOTE 2 - Sampling Equipment

Code	Description
4"	4" Electric Sub. Pump
FP	Fultz Pump, 1.75" ID
SSB__	Stainless Steel Bail, Add Length
PVCB__	PVC Bail, Add Length
TB__	Teflon Bail, Add Length
GS	Grab Sample
Tap	System Tap Sample
O	Other

NOTE 3 - Purge Volume

Size, In., I.D.	Vol(gal)/V.F.
2	.16
3	.4
4	.6
5	1.0
6	1.5
8	2.6

NOTE 4 - Comments

Use to note the following:

Deviation from standard procedures.
Status of sampling points.
Unusual sampling requirements.
Difficulties in sampling.
Suggested changes or repairs.
Sample volume

* Wells purged w/ PVC Bails, Sampled w/ Teflon,
PVC Bails rinsed 3 times w/distilled H_2O. Teflon rinsed 5 times w/distilled H_2O
Depth probe rinsed 3 times between wells

AYRES ASSOCIATES

Form FSR 1-86

FIELD SAMPLING REPORT

Site Name: VILLAGE OF WEBSTER Job # 6525.00 Weather Conditions: Sunny, Breezy, 70° ±

Relinquished by:	Date	Time	Received by:	Date	Time	Relinquished by:	Date	Time	Received by:	Date	Time

Sample Collector(s): M. MILLER Sample Handling Methods:

Add. Custody Info.: X None ___ See Attached Sheet

Sampling Sequence: 1st As Shown down page 2nd ________ 3rd ________

I.D.	① Type	Ref. Elev. Ft,MSL	Depth to Bottom / Depth to Water Feet	Depth of Water / Water Elev. Ft,MSL	② Sample Method	③ Purging Date / Time	③ Purging Vol.	Sampling Date / Time	Sampling Temp. Deg. C	Sampling Sp. Cond.	Sampling pH	Sampling Color	Sampling Turb.	Sampling Odor	Containers: General Indicators U	General Indicators F	COD H_2SO_4 U	COD H_2SO_4 F	Metals HNO_3 U	Metals HNO_3 F	VOCs U	VOCs F	U	F	U	F	U	F	④ Comments
W4	WP 2	981.80	45 / 32.38	12.62 / 949.42	TB 3	9/23/86 / 9:55	8 gal	9/23/86 / 10:30													4								
W3	WP 2	982.65	45.82 / 33.05	12.77 / 949.60	TB 3	" / 10:50	8 gal	" / 11:25													4								
W2	WP 2	983.48	45.45 / 33.82	11.63 / 949.66	TB 3	" / 11:55	7 gal	"													4								
W9	WP 2	981.00	44.10 / 31.25	12.85 / 949.75	TB 3	" / 12:45	8.5 gal	"													2								
W6	WP 2	982.59	46.19 / 33.02	13.17 / 949.57	TB-3	" / 1:30	8.5 gal	"													2								
W5	WP 2		SEE OTHER PAGE			"		"													2								BAILER BLANK AFTER W5 VOA
W8																													SEE OTHER PAGE
W7	WP 2	981.25	45.28 / 31.56	13.72 / 949.69	TB-3'	3:25	9 gal																						
W1																													SEE OTHER PAGE

NOTE 1 - Sample Point

Code	Type Description
WP__	Well, PVC, Add Size (i.e. for 2" use WP2)
WPG__	Well, PVC, Galv. Top, Add Size
WS__	Well, Steel, Add Size
WSS__	Stainless Steel, Add Size
STR	Stream
LY	Lysimeter
LE	Leachate
P	Pond
O	Other

NOTE 2 - Sampling Equipment

Code	Description
4"	4" Electric Sub. Pump
FP	Fultz Pump, 1.75" ID
SSB__	Stainless Steel Bail, Add Length
PVCB__	PVC Bail, Add Length
TB__	Teflon Bail, Add Length
GS	Grab Sample
Tap	System Tap Sample
O	Other

NOTE 3 - Purge Volume

Size, In., I.D.	Vol(gal)/V.F.
2	.16
3	.4
4	.6
5	1.0
6	1.5
8	2.6

.64

NOTE 4 - Comments

Use to note the following:

Deviation from standard procedures.
Status of sampling points.
Unusual sampling requirements.
Difficulties in sampling.
Suggested changes or repairs.
Sample volume

AYRES ASSOCIATES

Form FSR 1-86

FIELD SAMPLING REPORT

Site Name WEBSTER VILLAGE **Job #** 6525.00 **Weather Conditions** Sunny, Breezy, 70°

Relinquished by:	Date	Time	Received by:	Date	Time	Relinquished by:	Date	Time	Received by:	Date	Time

Sample Collector(s): Collection: M. Miller; ↓ THIS SHEET BAILED: W. GRIFFIN **Sample Handling Methods:**

Add. Custody Info.: X None ___ See Attached Sheet

Sampling Sequence: 1st ______ 2nd ______ 3rd ______

I.D.	① Type	Ref. Elev. Ft,MSL	Depth to Bottom / Depth to Water Feet	Depth of Water / Water Elev. Ft,MSL	② Sample Method	③ Purging Date / Time	③ Purging Vol.	Sampling Date / Time	Sampling Temp. Deg. C	Sampling Sp. Cond.	Sampling pH	Sampling Color	Sampling Turb.	Sampling Odor	Containers: General Indicators U	General Indicators F	COD H_2SO_4 U	COD H_2SO_4 F	Metals HNO_3 U	Metals HNO_3 F	VOCs U	VOCs F	U	F	U	F	U	F	④ Comments
W-5	WP2	982.46	47.84 / 33.00	14.84 / 949.46	TB-3'	9/23 / 1:50	10 gal	9/23					mod								2								
W-8	WP2	983.11	46.45 / 33.31	13.14 / 949.80	TB-3'	9/23	8.5	9/23					mod.								2								
W-1	WP-2	983.36*	46.90 / 33.67	13.23 / 949.69	TB-3'	9/23 / 3:50	8.5	9/23 / 4:10					mod.								2								

NOTE 1 - Sample Point

Code	Type Description
WP__	Well, PVC, Add Size (i.e. for 2" use WP2)
WPG__	Well, PVC, Galv. Top, Add Size
WS__	Well, Steel, Add Size
WSS__	Stainless Steel, Add Size
STR	Stream
LY	Lysimeter
LE	Leachate
P	Pond
O	Other

NOTE 2 - Sampling Equipment

Code	Description
4"	4" Electric Sub. Pump
FP	Fultz Pump, 1.75" ID
SSB__	Stainless Steel Bail, Add Length
PVCB__	PVC Bail, Add Length
TB__	Teflon Bail, Add Length
GS	Grab Sample
Tap	System Tap Sample
O	Other

NOTE 3 - Purge Volume

Size, In., I.D.	Vol(gal)/V.F.
2	.16
3	.4
4	.6
5	1.0
6	1.5
8	2.6

gal. = 0.64 × H_2O ft

NOTE 4 - Comments

Use to note the following:

Deviation from standard procedures.
Status of sampling points.
Unusual sampling requirements.
Difficulties in sampling.
Suggested changes or repairs.
Sample volume

Form FSR 1-86

AYRES ASSOCIATES

* 0.045 ft Top Steel to TOC (PVC): Top 2' PVC Cap unscrewed inside steel Top

ZIMPRO
ENVIRONMENTAL & ENERGY SYSTEMS

August 19, 1986

Ayres Associates
1300 W. Clairemont Ave.
P.O. Box 1590
Eau Claire, WI 54702-9977

Attn: Bill Griffin

Re: Soil Analysis

Attached are the VOC results for the samples received July 15, 1986. Samples from borings 1 and 2 were analyzed by the medium level method for sediment/soil samples where the soil is extracted with methanol and a portion of the extract is diluted with reagent water and analyzed according to EPA Method 601. The results are expressed in ug/g (ppm) one a dry weight basis.

The sample from borings 3-9 were analyzed by the low level method for sediment/soil samples where a mixture of the soil and reagent water is purged and analyzed according to EPA Method 601. The results are expressed in ng/g (ppb) on a dry weight basis.

If you have any questions, please call.

Sincerely,

ZIMPRO INC.

Mary C. Christie Heuser

Mary C. Christie Heuser
Instrumentation Chemist

MCCH/ls

cc: J.W. Barr
J.R. Salkowski

MILITARY ROAD
ROTHSCHILD, WISCONSIN 54474
TELEPHONE (715) 359-7211 TELEX 29-0495

ZIMPRO INC.
ENVIRONMENTAL & ENERGY SYSTEMS

Ayres Associates
VOC Analysis (ug/g)

	Detection Limit	OW-1 5'	OW-1 15'	OW-1 25'	OW-1 30'	OW-1 35'
Benzene	0.4	X	X	X	X	X
Bromoform	1.0	X	X	X	X	X
Bromomethane	2.0	X	X	X	X	X
Carbon Tetrachloride	0.2	X	X	X	X	X
Chlorobenzene	0.2	X	X	X	X	X
Chloroethane	2.0	X	X	X	X	X
2-Chloroethylvinyl Ether	4.0	X	X	X	X	X
Chloroform	0.2	X	X	X	X	X
Chloromethane	12.0	X	X	X	X	X
Dibromochloromethane	0.2	X	X	X	X	X
1,2-Dichlorobenzene	0.6	X	X	X	X	X
1,3-Dichlorobenzene	0.6	X	X	X	X	X
1,4-Dichlorobenzene	0.6	X	X	X	X	X
Dichlorobromomethane	0.2	X	X	X	X	X
1,1-Dichloroethane	0.2	X	X	X	X	X
1,2-Dichloroethane	0.6	X	X	X	X	X
1,1-Dichloroethylene	1.0	X	X	X	X	X
1,2-Dichloroethylene	0.6	X	X	X	X	X
Dichloromethane	0.4	X	X	X	X	X
1,2-Dichloropropane	1.0	X	X	X	X	X
cis-1,3-Dichloropropene	0.6	X	X	X	X	X
trans-1,3-Dichloropropene	2.0	X	X	X	X	X
Ethylbenzene	0.4	29.6	X	X	X	X
1,1,2,2-Tetrachloroethane	0.2	X	X	X	X	X
Tetrachloroethylene	0.2	X	X	X	X	X
Toluene	0.2	45.7	X	0.3	0.3	0.8
1,1,1-Trichloroethane	0.2	X	X	X	X	X
1,1,2-Trichloroethane	0.2	X	X	X	X	X
Trichloroethylene	0.2	X	X	X	X	X
Vinyl Chloride	4.0	X	X	X	X	X
Trichlorofluoromethane	0.4	X	X	X	X	X
Dichlorodifluoromethane	4.0	X	X	X	X	X
m-Xylene	1.0	51.0	X	X	X	X
o & p-Xylene (as o-Xylene)	1.0	60.7	X	X	X	X
Zimpro Analytical No.		20008	20009	20010	20011	20012

X = Analyzed but not detected

ZIMPRO INC.
ENVIRONMENTAL & ENERGY SYSTEMS

Ayres Associates
VOC Analysis (ug/g)

	Detection Limit	OW-1 45'	OW-2 5'	OW-2 15'	OW-2 25'	OW-2 30'
Benzene	Ø.4	Ø.6	X	X	X	X
Bromoform	1.Ø	X	X	X	X	X
Bromomethane	2.Ø	X	X	X	X	X
Carbon Tetrachloride	Ø.2	X	X	X	X	X
Chlorobenzene	Ø.2	X	X	X	X	X
Chloroethane	2.Ø	X	X	X	X	X
2-Chloroethylvinyl Ether	4.Ø	X	X	X	X	X
Chloroform	Ø.2	X	X	X	X	X
Chloromethane	12.Ø	X	X	X	X	X
Dibromochloromethane	Ø.2	X	X	X	X	X
1,2-Dichlorobenzene	Ø.6	X	X	X	X	X
1,3-Dichlorobenzene	Ø.6	X	X	X	X	X
1,4-Dichlorobenzene	Ø.6	X	X	X	X	X
Dichlorobromomethane	Ø.2	X	X	X	X	X
1,1-Dichloroethane	Ø.2	X	X	X	X	X
1,2-Dichloroethane	Ø.6	X	X	X	X	X
1,1-Dichloroethylene	1.Ø	X	X	X	X	X
1,2-Dichloroethylene	Ø.6	X	X	X	X	X
Dichloromethane	Ø.4	X	X	X	X	X
1,2-Dichloropropane	1.Ø	X	X	X	X	X
cis-1,3-Dichloropropene	Ø.6	X	X	X	X	X
trans-1,3-Dichloropropene	2.Ø	X	X	X	X	X
Ethylbenzene	Ø.4	X	X	X	X	X
1,1,2,2-Tetrachloroethane	Ø.2	X	X	X	X	X
Tetrachloroethylene	Ø.2	X	X	X	X	X
Toluene	Ø.2	1.2	X	Ø.2	Ø.4	Ø.5
1,1,1-Trichloroethane	Ø.2	X	X	X	X	X
1,1,2-Trichloroethane	Ø.2	X	X	X	X	X
Trichloroethylene	Ø.2	X	X	X	X	X
Vinyl Chloride	4.Ø	X	X	X	X	X
Trichlorofluoromethane	Ø.4	X	X	X	X	X
Dichlorodifluoromethane	4.Ø	X	X	X	X	X
m-Xylene	1.Ø	3.8	X	X	X	X
o & p-Xylene (as o-Xylene)	1.Ø	5.1	X	X	X	X
Zimpro Analytical No.		2ØØ13	2ØØ14	2ØØ15	2ØØ16	2ØØ17

X = Analyzed but not detected

ZIMPRO INC
ENVIRONMENTAL & ENERGY SYSTEMS

Ayres Associates
VOC Analysis (ug/g)

	Detection Limit	OW-2 35'	OW-2 45'
Benzene	0.4	X	X
Bromoform	1.0	X	X
Bromomethane	2.0	X	X
Carbon Tetrachloride	0.2	X	X
Chlorobenzene	0.2	X	X
Chloroethane	2.0	X	X
2-Chloroethylvinyl Ether	4.0	X	X
Chloroform	0.2	X	X
Chloromethane	12.0	X	X
Dibromochloromethane	0.2	X	X
1,2-Dichlorobenzene	0.6	X	X
1,3-Dichlorobenzene	0.6	X	X
1,4-Dichlorobenzene	0.6	X	X
Dichlorobromomethane	0.2	X	X
1,1-Dichloroethane	0.2	X	X
1,2-Dichloroethane	0.6	X	X
1,1-Dichloroethylene	1.0	X	X
1,2-Dichloroethylene	0.6	X	X
Dichloromethane	0.4	X	X
1,2-Dichloropropane	1.0	X	X
cis-1,3-Dichloropropene	0.6	X	X
trans-1,3-Dichloropropene	2.0	X	X
Ethylbenzene	0.4	X	X
1,1,2,2-Tetrachloroethane	0.2	X	X
Tetrachloroethylene	0.2	X	X
Toluene	0.2	0.3	X
1,1,1-Trichloroethane	0.2	X	X
1,1,2-Trichloroethane	0.2	X	X
Trichloroethylene	0.2	X	X
Vinyl Chloride	4.0	X	X
Trichlorofluoromethane	0.4	X	X
Dichlorodifluoromethane	4.0	X	X
m-Xylene	1.0	X	X
o & p-Xylene (as o-Xylene)	1.0	X	X
Zimpro Analytical No.		20018	20019

X = Analyzed but not detected

ZIMPRO INC
ENVIRONMENTAL & ENERGY SYSTEMS

Ayres Associates
VOC Analysis (ng/g)

	Detection Limit	OW-3 5'	OW-3 10'	OW-3 40'	OW-4 5'	OW-4 45'
Benzene	1.0	X	X	X	X	X
Bromoform	2.5	X	X	X	X	X
Bromomethane	5.0	X	X	X	X	X
Carbon Tetrachloride	0.5	X	X	X	X	X
Chlorobenzene	0.5	X	X	X	X	X
Chloroethane	5.0	X	X	X	X	X
2-Chloroethylvinyl Ether	10.0	X	X	X	X	X
Chloroform	0.5	X	X	X	X	X
Chloromethane	30.0	X	X	X	X	X
Dibromochloromethane	0.5	X	X	X	X	X
1,2-Dichlorobenzene	1.5	X	X	X	X	X
1,3-Dichlorobenzene	1.5	X	X	X	X	X
1,4-Dichlorobenzene	1.5	X	X	X	X	X
Dichlorobromomethane	0.5	X	X	X	X	X
1,1-Dichloroethane	0.5	X	X	X	X	X
1,2-Dichloroethane	1.5	X	X	X	X	X
1,1-Dichloroethylene	2.5	X	X	X	X	X
1,2-Dichloroethylene	1.5	X	X	X	X	X
Dichloromethane	1.0	X	2.0	0.6 *	X	X
1,2-Dichloropropane	2.5	X	X	X	X	X
cis-1,3-Dichloropropene	1.5	X	X	X	X	X
trans-1,3-Dichloropropene	5.0	X	X	X	X	X
Ethylbenzene	1.0	X	X	X	X	X
1,1,2,2-Tetrachloroethane	0.5	X	X	X	X	X
Tetrachloroethylene	0.5	X	X	X	X	X
Toluene	0.5	X	X	X	X	X
1,1,1-Trichloroethane	0.5	X	X	X	X	X
1,1,2-Trichloroethane	0.5	X	X	X	X	X
Trichloroethylene	0.5	X	X	X	X	X
Vinyl Chloride	10.0	X	X	X	X	X
Trichlorofluoromethane	1.0	X	X	X	X	X
Dichlorodifluoromethane	10.0	X	X	X	X	X
m-Xylene	2.5	X	X	X	X	X
o & p-Xylene (as o-Xylene)	2.5	X	X	X	X	X
Zimpro Analytical No.		20020	20021	20022	20023	20024

X = Analyzed but not detected

* per telecon w/ Zimpro this value should be "X".

ZIMPRO INC
ENVIRONMENTAL & ENERGY SYSTEMS

Ayres Associates
VOC Analysis (ng/g)

	Detection Limit	OW-7 5'	OW-7 10'	OW-7 45'	OW-8 5'	OW-8 10'
Benzene	1.0	X	X	X	X	X
Bromoform	2.5	X	X	X	X	X
Bromomethane	5.0	X	X	X	X	X
Carbon Tetrachloride	0.5	X	X	X	X	X
Chlorobenzene	0.5	X	X	X	X	X
Chloroethane	5.0	X	X	X	X	X
2-Chloroethylvinyl Ether	10.0	X	X	X	X	X
Chloroform	0.5	X	X	X	X	X
Chloromethane	30.0	X	X	X	X	X
Dibromochloromethane	0.5	X	X	X	X	X
1,2-Dichlorobenzene	1.5	X	X	X	X	X
1,3-Dichlorobenzene	1.5	X	X	X	X	X
1,4-Dichlorobenzene	1.5	X	X	X	X	X
Dichlorobromomethane	0.5	X	X	X	X	X
1,1-Dichloroethane	0.5	X	X	X	X	X
1,2-Dichloroethane	1.5	X	X	X	X	X
1,1-Dichloroethylene	2.5	X	X	X	X	X
1,2-Dichloroethylene	1.5	X	X	X	X	X
Dichloromethane	1.0	X	X	X	X	X
1,2-Dichloropropane	2.5	X	X	X	X	X
cis-1,3-Dichloropropene	1.5	X	X	X	X	X
trans-1,3-Dichloropropene	5.0	X	X	X	X	X
Ethylbenzene	1.0	X	X	X	X	X
1,1,2,2-Tetrachloroethane	0.5	X	X	X	X	X
Tetrachloroethylene	0.5	X	X	X	X	X
Toluene	0.5	X	X	X	X	X
1,1,1-Trichloroethane	0.5	X	X	X	X	X
1,1,2-Trichloroethane	0.5	X	X	X	X	X
Trichloroethylene	0.5	X	X	X	X	X
Vinyl Chloride	10.0	X	X	X	X	X
Trichlorofluoromethane	1.0	X	X	11.3	X	X
Dichlorodifluoromethane	10.0	X	X	X	X	X
m-Xylene	2.5	X	X	X	X	X
o & p-Xylene (as o-Xylene)	2.5	X	X	X	X	X
Zimpro Analytical No.		20030	20031	20032	20033	20034

X = Analyzed but not detected

ZIMPRO INC.
ENVIRONMENTAL & ENERGY SYSTEMS

Ayres Associates
VOC Analysis (ng/g)

	Detection Limit	OW-8 45'	OW-9 5'	OW-9 40'
Benzene	1.Ø	X	X	X
Bromoform	2.5	X	X	X
Bromomethane	5.Ø	X	X	X
Carbon Tetrachloride	Ø.5	X	X	X
Chlorobenzene	Ø.5	X	X	X
Chloroethane	5.Ø	X	X	X
2-Chloroethylvinyl Ether	1Ø.Ø	X	X	X
Chloroform	Ø.5	X	X	X
Chloromethane	3Ø.Ø	X	X	X
Dibromochloromethane	Ø.5	X	X	X
1,2-Dichlorobenzene	1.5	X	X	X
1,3-Dichlorobenzene	1.5	X	X	X
1,4-Dichlorobenzene	1.5	X	X	X
Dichlorobromomethane	Ø.5	X	X	X
1,1-Dichloroethane	Ø.5	X	X	X
1,2-Dichloroethane	1.5	X	X	X
1,1-Dichloroethylene	2.5	X	X	X
1,2-Dichloroethylene	1.5	X	X	X
Dichloromethane	1.Ø	X	X	X
1,2-Dichloropropane	2.5	X	X	X
cis-1,3-Dichloropropene	1.5	X	X	X
trans-1,3-Dichloropropene	5.Ø	X	X	X
Ethylbenzene	1.Ø	X	X	X
1,1,2,2-Tetrachloroethane	Ø.5	X	X	X
Tetrachloroethylene	Ø.5	X	X	X
Toluene	Ø.5	X	X	X
1,1,1-Trichloroethane	Ø.5	X	X	X
1,1,2-Trichloroethane	Ø.5	X	X	X
Trichloroethylene	Ø.5	X	X	X
Vinyl Chloride	1Ø.Ø	X	X	X
Trichlorofluoromethane	1.Ø	X	X	X
Dichlorodifluoromethane	1Ø.Ø	X	X	X
m-Xylene	2.5	X	X	X
o & p-Xylene (as o-Xylene)	2.5	X	X	X
Zimpro Analytical No.		2ØØ35	2ØØ36	2ØØ37

X = Analyzed but not detected

ZIMPRO
ENVIRONMENTAL & ENERGY SYSTEMS

SEP 05 1986

& ASSOC...

September 4, 1986

Ayres Associates
1300 W. Clairemont Ave.
P.O. Box 1590
Eau Claire, WI 54702-9977

Attn: Bill Griffin

Re: VOC Analysis

Attached are the results for the water samples received August 7, 1986. EPA Method 601 with PID (10.2 eV) and Hall detectors in series was used to complete the analysis.

If you have any questions, please call.

Sincerely,

ZIMPRO INC.

Mary C Christie Heuser

Mary C. Christie Heuser
Instrumentation Chemist

MCCH/ls

cc: J.W. Barr
J.R. Salkowski

MILITARY ROAD
ROTHSCHILD, WISCONSIN 54474
TELEPHONE (715) 359-7211 TELEX 29-0495

ZIMPRO INC
ENVIRONMENTAL & ENERGY SYSTEMS

Ayres Associates
VOC Analysis (ug/l)

	Detection Limit	OW-1 AA 1046	OW-2 AA 1047	OW-3 AA 1048	OW-4 AA 1049	OW-5 AA 1050
Benzene	0.2	X	X	X	X	X
Bromoform	0.5	X	X	X	X	X
Bromomethane	1.0	X	X	X	X	X
Carbon Tetrachloride	0.1	X	X	X	X	X
Chlorobenzene	0.1	X	X	X	X	X
Chloroethane	1.0	X	X	X	X	X
2-Chloroethylvinyl Ether	2.0	X	X	X	X	X
Chloroform	0.1	X	X	X	X	0.4
Chloromethane	6.0	X	X	X	X	X
Dibromochloromethane	0.1	X	X	X	X	X
1,2-Dichlorobenzene	0.3	X	X	X	X	X
1,3-Dichlorobenzene	0.3	X	X	X	X	X
1,4-Dichlorobenzene	0.3	X	X	X	X	X
Dichlorobromomethane	0.1	X	X	X	X	X
1,1-Dichloroethane	0.1	X	X	X	X	X
1,2-Dichloroethane	0.3	X	X	X	X	X
1,1-Dichloroethylene	0.5	X	X	X	X	X
1,2-Dichloroethylene	0.3	X	X	X	X	X
Dichloromethane	0.2	X	X	X	X	0.2
1,2-Dichloropropane	0.5	X	X	X	X	X
cis-1,3-Dichloropropene	0.3	X	X	X	X	X
trans-1,3-Dichloropropene	1.0	X	X	X	X	X
Ethylbenzene	0.2	X	X	X	X	X
1,1,2,2-Tetrachloroethane	0.1	X	X	X	X	X
Tetrachloroethylene	0.1	0.6	X	X	X	0.1
Toluene	0.1	0.5	X	X	X	0.1
1,1,1-Trichloroethane	0.1	X	X	X	X	X
1,1,2-Trichloroethane	0.1	X	X	X	X	X
Trichloroethylene	0.1	X	X	X	X	X
Vinyl Chloride	2.0	X	X	X	X	X
Trichlorofluoromethane	0.2	X	X	X	X	X
Dichlorodifluoromethane	2.0	X	X	X	X	X
m-Xylene	0.5	X	X	X	X	X
o & p-Xylene (as o-Xylene)	0.5	X	X	X	X	X
Zimpro Analytical No.		20630	20631	20632	20633	20634

X = Analyzed but not detected

ZIMPRO INC
ENVIRONMENTAL & ENERGY SYSTEMS

Ayres Associates
VOC Analysis (ug/l)

	Detection Limit	OW-6 AA 1051	OW-7 AA 1052	OW-8 AA 1053	OW-9 AA 1054
Benzene	0.2	X	X	X	X
Bromoform	0.5	X	X	X	X
Bromomethane	1.0	X	X	X	X
Carbon Tetrachloride	0.1	X	X	X	X
Chlorobenzene	0.1	X	X	X	X
Chloroethane	1.0	X	X	X	X
2-Chloroethylvinyl Ether	2.0	X	X	X	X
Chloroform	0.1	0.5	X	X	X
Chloromethane	6.0	X	X	X	X
Dibromochloromethane	0.1	X	X	X	X
1,2-Dichlorobenzene	0.3	X	X	X	X
1,3-Dichlorobenzene	0.3	X	X	X	X
1,4-Dichlorobenzene	0.3	X	X	X	X
Dichlorobromomethane	0.1	X	X	X	X
1,1-Dichloroethane	0.1	X	X	X	X
1,2-Dichloroethane	0.3	X	X	X	X
1,1-Dichloroethylene	0.5	X	X	X	X
1,2-Dichloroethylene	0.3	X	X	X	X
Dichloromethane	0.2	X	0.9	0.9	0.2
1,2-Dichloropropane	0.5	X	X	X	X
cis-1,3-Dichloropropene	0.3	X	X	X	X
trans-1,3-Dichloropropene	1.0	X	X	X	X
Ethylbenzene	0.2	X	X	X	X
1,1,2,2-Tetrachloroethane	0.1	X	X	X	X
Tetrachloroethylene	0.1	X	X	0.9	X
Toluene	0.1	X	X	X	X
1,1,1-Trichloroethane	0.1	X	X	X	X
1,1,2-Trichloroethane	0.1	X	1.2	X	X
Trichloroethylene	0.1	X	X	X	X
Vinyl Chloride	2.0	X	X	X	X
Trichlorofluoromethane	0.2	X	X	X	X
Dichlorodifluoromethane	2.0	X	X	X	X
m-Xylene	0.5	X	X	X	X
o & p-Xylene (as o-Xylene)	0.5	X	X	X	X
Zimpro Analytical No.		20635	20636	20637	20638

X = Analyzed but not detected

ZIMPRO INC.
ENVIRONMENTAL & ENERGY SYSTEMS

RECEIVED
OCT . 4 1986
OWEN AYRES
& ASSOCIATES INC.

October 9, 1986

Ayres Associates
1300 W. Clairemont Ave.
P.O. Box 1590
Eau Claire, WI 54702-9977

Attn: Donna Hainstock

Re: VOC Analysis

Attached are the results for the water samples received September 26, 1986. EPA Method 601 with PID (10.2 eV) and Hall detectors in series was used for the analysis.

If you have any questions, please call.

Sincerely,

ZIMPRO INC.

Mary C. Christie Heuser

Mary C. Christie Heuser
Instrumentation Chemist

MCCH/ls

MILITARY ROAD
ROTHSCHILD, WISCONSIN 54474
TELEPHONE (715) 359-7211   TELEX 29-0495

ZIMPRO INC
ENVIRONMENTAL & ENERGY SYSTEMS

Ayres Associates
VOC Analysis (ug/l)

	Detection Limit	OW-1 1165	OW-2 1166	OW-3 1167	OW-4 1168	OW-5 1169
Benzene	Ø.2	X	X	X	X	X
Bromoform	Ø.5	X	X	X	X	X
Bromomethane	1.Ø	X	X	X	X	X
Carbon Tetrachloride	Ø.1	X	X	X	X	X
Chlorobenzene	Ø.1	X	X	X	X	X
Chloroethane	1.Ø	X	X	X	X	X
2-Chloroethylvinyl Ether	2.Ø	X	X	X	X	X
Chloroform	Ø.1	X	X	X	X	X
Chloromethane	6.Ø	X	X	X	X	X
Dibromochloromethane	Ø.1	X	X	X	X	X
1,2-Dichlorobenzene	Ø.3	X	X	X	X	X
1,3-Dichlorobenzene	Ø.3	X	X	X	X	X
1,4-Dichlorobenzene	Ø.3	X	X	X	X	X
Dichlorobromomethane	Ø.1	X	X	X	X	X
1,1-Dichloroethane	Ø.1	X	X	X	X	X
1,2-Dichloroethane	Ø.3	X	X	X	X	X
1,1-Dichloroethylene	Ø.5	X	X	X	X	X
1,2-Dichloroethylene	Ø.3	X	X	X	X	X
Dichloromethane	Ø.2	X	X	X	X	X
1,2-Dichloropropane	Ø.5	X	X	X	X	X
cis-1,3-Dichloropropene	Ø.3	X	X	X	X	X
trans-1,3-Dichloropropene	1.Ø	X	X	X	X	X
Ethylbenzene	Ø.2	X	X	X	X	X
1,1,2,2-Tetrachloroethane	Ø.1	X	X	X	X	X
Tetrachloroethylene	Ø.1	3.3	Ø.7	X	X	3.3
Toluene	Ø.1	X	X	X	X	X
1,1,1-Trichloroethane	Ø.1	X	X	X	X	X
1,1,2-Trichloroethane	Ø.1	X	X	X	X	X
Trichloroethylene	Ø.1	X	X	X	X	X
Vinyl Chloride	2.Ø	X	X	X	X	X
Trichlorofluoromethane	Ø.2	X	X	X	X	X
Dichlorodifluoromethane	2.Ø	X	X	X	X	X
Zimpro Analytical No.		22215	22216	22217	22218	22219

X = Analyzed but not detected

ZIMPRO INC
ENVIRONMENTAL & ENERGY SYSTEMS

Ayres Associates
VOC Analysis (ug/l)

t ≃ 0.9 hr

	Detection Limit	OW-6 1170	OW-7 1171	OW-8 1172	OW-9 1173	VP-2 1174
Benzene	0.2	X	X	X	X	0.3
Bromoform	0.5	X	X	X	X	X
Bromomethane	1.0	X	X	X	X	X
Carbon Tetrachloride	0.1	X	X	X	X	X
Chlorobenzene	0.1	X	X	X	X	X
Chloroethane	1.0	X	X	X	X	X
2-Chloroethylvinyl Ether	2.0	X	X	X	X	X
Chloroform	0.1	0.3	X	X	X	X
Chloromethane	6.0	X	X	X	X	X
Dibromochloromethane	0.1	X	X	X	X	X
1,2-Dichlorobenzene	0.3	X	X	X	X	X
1,3-Dichlorobenzene	0.3	X	X	X	X	X
1,4-Dichlorobenzene	0.3	X	X	X	X	X
Dichlorobromomethane	0.1	X	X	X	X	X
1,1-Dichloroethane	0.1	X	X	X	X	X
1,2-Dichloroethane	0.3	X	X	X	X	69.3
1,1-Dichloroethylene	0.5	X	X	X	X	X
1,2-Dichloroethylene	0.3	X	X	X	X	X
Dichloromethane	0.2	X	X	X	X	X
1,2-Dichloropropane	0.5	X	X	X	X	X
cis-1,3-Dichloropropene	0.3	X	X	X	X	X
trans-1,3-Dichloropropene	1.0	X	X	X	X	X
Ethylbenzene	0.2	X	X	X	X	X
1,1,2,2-Tetrachloroethane	0.1	X	X	X	X	X
Tetrachloroethylene	0.1	0.1	X	3.0	0.2	12.5
Toluene	0.1	X	X	X	X	X
1,1,1-Trichloroethane	0.1	X	0.4	X	X	X
1,1,2-Trichloroethane	0.1	X	X	X	X	X
Trichloroethylene	0.1	X	X	X	X	0.2
Vinyl Chloride	2.0	X	X	X	X	X
Trichlorofluoromethane	0.2	X	X	X	X	X
Dichlorodifluoromethane	2.0	X	X	X	X	X
Zimpro Analytical No.		22220	22221	22222	22223	22224

X = Analyzed but not detected

ZIMPRO INC
ENVIRONMENTAL & ENERGY SYSTEMS

Ayres Associates
VOC Analysis (ug/l)

	Detection Limit	t ≃ 20 hr VP-2 1175	Bailer Blk 1176	Trip Blank
Benzene	Ø.2	X	X	X
Bromoform	Ø.5	X	X	X
Bromomethane	1.Ø	X	X	X
Carbon Tetrachloride	Ø.1	X	X	X
Chlorobenzene	Ø.1	X	X	X
Chloroethane	1.Ø	X	X	X
2-Chloroethylvinyl Ether	2.Ø	X	X	X
Chloroform	Ø.1	X	Ø.5	X
Chloromethane	6.Ø	X	X	X
Dibromochloromethane	Ø.1	X	X	X
1,2-Dichlorobenzene	Ø.3	X	X	X
1,3-Dichlorobenzene	Ø.3	X	X	X
1,4-Dichlorobenzene	Ø.3	X	X	X
Dichlorobromomethane	Ø.1	X	X	X
1,1-Dichloroethane	Ø.1	X	X	X
1,2-Dichloroethane	Ø.3	9.9	X	X
1,1-Dichloroethylene	Ø.5	X	X	X
1,2-Dichloroethylene	Ø.3	X	X	X
Dichloromethane	Ø.2	X	X	X
1,2-Dichloropropane	Ø.5	X	X	X
cis-1,3-Dichloropropene	Ø.3	X	X	X
trans-1,3-Dichloropropene	1.Ø	X	X	X
Ethylbenzene	Ø.2	X	X	X
1,1,2,2-Tetrachloroethane	Ø.1	X	X	X
Tetrachloroethylene	Ø.1	5.5	X	X
Toluene	Ø.1	X	X	X
1,1,1-Trichloroethane	Ø.1	X	Ø.5	X
1,1,2-Trichloroethane	Ø.1	X	X	X
Trichloroethylene	Ø.1	X	Ø.2	X
Vinyl Chloride	2.Ø	X	X	X
Trichlorofluoromethane	Ø.2	X	X	X
Dichlorodifluoromethane	2.Ø	X	X	X
Zimpro Analytical No.		22225	22226	22227

X = Analyzed but not detected

ZIMPRO
ENVIRONMENTAL & ENERGY SYSTEMS

NOV 20 1986

& ASSOCIATES INC.

November 19, 1986

Ayres Associates
1300 W. Clairemont Ave.
P.O. Box 1590
Eau Claire, WI 54702-9977

Attn: Bill Griffin

Re: VOC Analysis

Attached are the xylene results that had been omitted from my October 9, 1986 report to Donna Hainstock of your office.

I apologize for any inconvenience this may have caused. If you have any further questions, please call.

Sincerely,

ZIMPRO INC.

Mary C. Christie Heuser

Mary C. Christie Heuser
Instrumentation Chemist

MCCH/ls

MILITARY ROAD
ROTHSCHILD, WISCONSIN 54474
TELEPHONE (715) 359-7211 TELEX 29-0495

ZIMPRO INC
ENVIRONMENTAL & ENERGY SYSTEMS

Ayres
VOC Analysis (ug/l)

Sample	m-Xylene	o & p-Xylene (as o-Xylene)	Analytical No.
OW-1 1165	X	X	22215
OW-2 1166	X	X	22216
OW-3 1167	X	X	22217
OW-4 1168	X	X	22218
OW-5 1169	X	X	22219
OW-6 1170	X	X	22220
OW-7 1171	X	X	22221
OW-8 1172	X	X	22222
OW-9 1173	X	X	22223
VP-2 1174	X	X	22224
VP-2 1175	X	X	22225
Bailer Blank 1176	X	X	22226
Trip Blank	X	X	22227
Detection Limit	0.5	0.5	

X = Analyzed but not detected

APPENDIX F

PUMP TEST DATA AND ANALYSIS

Design Computations

AYRES ASSOCIATES

WELL OW-3 TYPE CURVE MATCH:

$W_{(u_A)} = 1.0$ $\qquad s = 0.068$ ft

$u_A = 1.0$ $\qquad t = 6.5$ min.

$\Gamma = 0.001$

$$T = \frac{114.6 \; Q \; W_{(u_A, \Gamma)}}{s}$$

$$T = \frac{114.6 \; (124) \; 1.0}{0.068}$$

$$T = 208,976 \simeq \underline{209,000} \text{ gpd/ft}$$

$$S = \frac{T t u_A}{1.87 r^2} = \frac{209,000 \; (6.5)\frac{1}{1440} \; (1.0)}{1.87 \; (255)^2}$$

$$\underline{S = 0.008}$$

$$* \; K_h = \frac{209,000}{35} \cong \underline{5,970 \text{ gpd/ft}^2}$$

$$K_z = \frac{\Gamma (b^2) K_h}{r^2} = \frac{0.001 \; (35)^2 \; 5,970}{(255)^2}$$

$$K_z = \underline{0.11 \text{ gpd/ft}^2}$$

* BASED ON AQUIFER THICKNESS = 35 FT.

Project No.	Remarks	Computation by WFB	Date 12/8/86
Project Name WEBSTER GROUND WATER CONTAMINATION		Checked by TJP	Date 12/8/86
		Sheet 1	Of 5

WEBSTER PUMP TEST

FROM THE TYPE CURVE FOR UNCONFINED AQUIFERS

THE MATCH POINT DATA FOR WELL OW-4 ARE:

$W(u_B) = 1.0$

$1/u_B = 1.0$

$\Gamma = 1.0$

$s = .18$ ft.

$t = 9$ min $= 540$ sec.

$$T = \frac{Q}{4\pi s} W(u_B, \Gamma) = \frac{114.6 \; Q \; W(u_B, \Gamma)}{s}$$

$$= \frac{124 \text{ gpm} \;\; 114.6 \;\; 1.0}{0.18}$$

$T \cong 78,950$ gpd/ft

$$S_y = \frac{4 T t u_B}{r^2} = \frac{T(t) \; u_B}{1.87 \; r^2}$$

$$= \frac{78,950 \; \frac{9}{1440} \; 1.0}{1.87 \; (70)^2}$$

$S_y \cong 0.054$

$$K_h = T/b$$

$$= \frac{78,950}{35}$$

$$K_h = 2,256 \text{ gpd/ft}^2$$

$$K_z = \frac{\Gamma b^2 K_h}{r^2}$$

$$= \frac{(1.0)(35)^2 \, 2256}{(70)^2}$$

$$K_z = 564^* \text{ gpd/ft}^2 \quad \text{i.e. } \frac{K_h}{K_z} = 4$$

* AQUIFER THICKNESS TAKEN TO BE 35 FT.

Design Computations

AYRES ASSOCIATES

WELL OW-5 TYPE CURVE MATCH:

$W(u_B) = 1.0$ $s = .26$ ft

$u_B = 1.0$ $t = 36$ min

$\Gamma = 6.0$

$$T = \frac{114.6\ Q\ W(u_B, \Gamma)}{s}$$

$$T = \frac{114.6\ (124)\ 1.0}{.26}$$

$T = 54,655$ gpd/ft $\cong$ 55,000 gpd/ft

$$S_y = \frac{T\ t\ u_B}{1.87\ r^2} = \frac{55,000\ \frac{36}{1440}\ 1.0}{1.87\ (90)^2}$$

$S_y \cong 0.09$

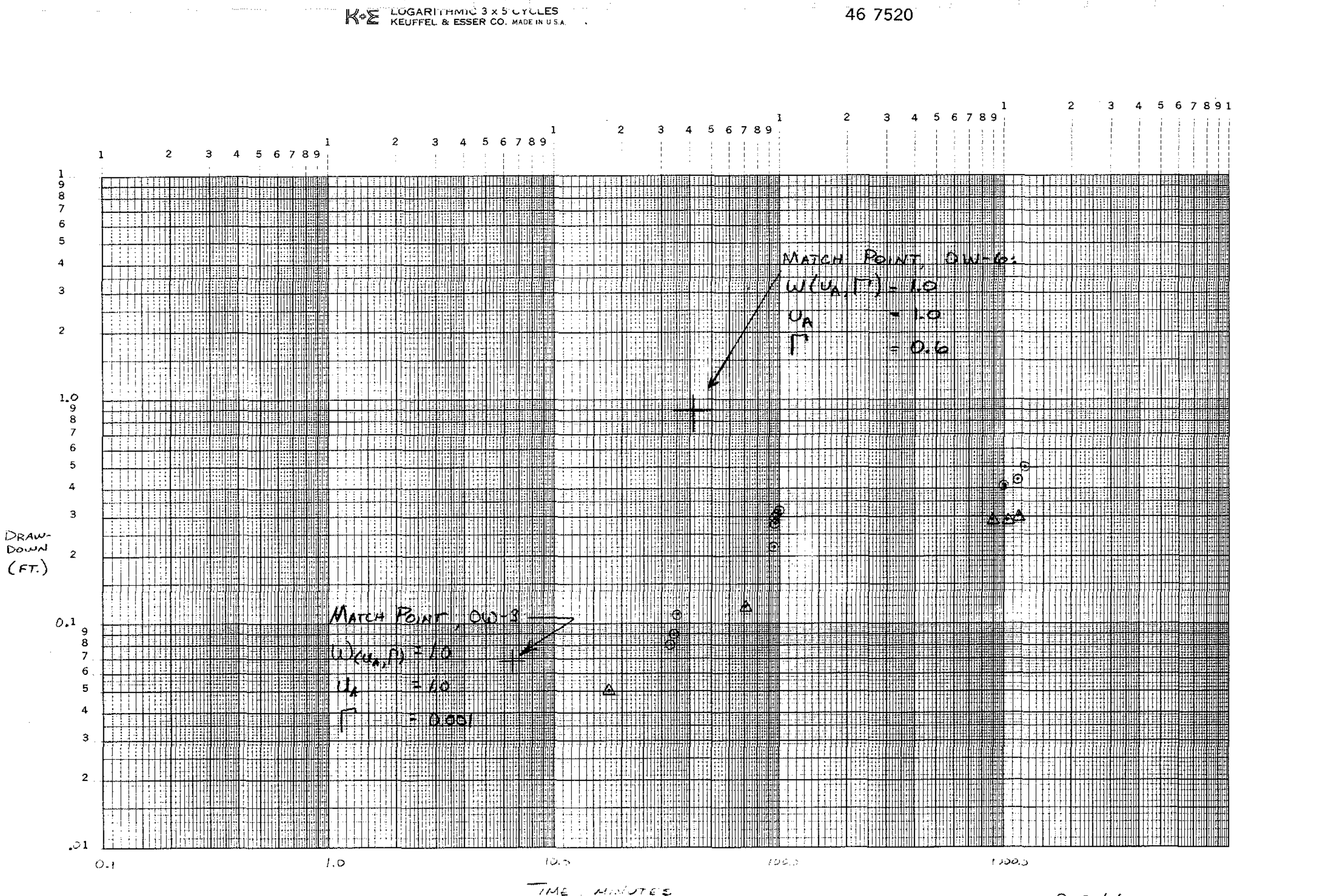
* $K_h = \frac{55,000}{35} \cong 1,570$ gpd/ft^2

* $K_z = \frac{\Gamma\ (b)^2\ K_h}{r^2} = \frac{6.0\ (35)^2\ 1,570}{(90)^2}$

$K_z \cong 1,400$* gpd/ft^2

* AQUIFER THICKNESS TAKEN TO BE 35 FT.

Project No.	Remarks	Computation by WFG	Date 11/11/86
Project Name WEBSTER GROUND WATER CONTAMINATION		Checked by TJP	Date 12/8/86
		Sheet	Of



WEBSTER GROUND WATER STUDY
WEBSTER, WI

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*******************************************************
*                                                     *
*              program:  Distance                     *
*              version:  IBM PC 1.0                   *
*                                                     *
*  A PROGRAM FOR PUMP TEST ANALYSIS USING JACOB'S     *
*  FORM OF THEIS EQUATION AND LEAST SQUARES' METHOD.  *
*                                                     *
*******************************************************
```

PROJECT......... = Webster DNR/ERF
LOCATION........ = Webster, WI
WELL............ = Village Well No. 2
DATE............ = Sept. 23-24, 1986

STATIC WATER LEVEL S.W.L. = 35 [ft]
DISCHARGE RATE............... = 124 [gpm]
TIME OF THE OBSERVATION...... = 1230 [min]

NO	DISTANCE [ft]	DRAWDOWN [ft]	u	DEVIATION	WELL
1	70.00	0.940	.919E-02	+.593E-01	OW-4
2	90.00	0.710	.152E-01	-.630E-01	OW-5
3	220.00	0.500	.908E-01	+.110E+00	OW-6
4	255.00	0.300	.122E+00	-.270E-01	OW-3
5	320.00	0.130	.192E+00	-.998E-01	OW-2
6	365.00	0.110	.250E+00	-.634E-01	OW-1
7	400.00	0.110	.300E+00	-.242E-01	OW-9
8	550.00	0.070	.567E+00	+.722E-01	OW-7
9	555.00	0.030	.578E+00	+.361E-01	OW-8

TRANSMISSIVITY T = .103E+00 [ft2/s]
T = 66356 [gpd/ft]
STORATIVITY S = .568E-01

DATA SEGMENT ANALYZED :
- starting with data pair 1
- ending with data pair 9

DETERMINATION COEFFICENT = .9507894

****

```
******************************************************
*                                                    *
*              program:  Distance                    *
*              version:  IBM PC 1.0                  *
*                                                    *
*  A PROGRAM FOR PUMP TEST ANALYSIS USING JACOB'S    *
*  FORM OF THEIS EQUATION AND LEAST SQUARES' METHOD. *
*                                                    *
******************************************************
```

PROJECT......... = Webster DNR/ERF
LOCATION........ = Webster, WI
WELL............ = Village Well No. 2
DATE............ = Sept. 23-24, 1986

STATIC WATER LEVEL   S.W.L.   = 35 [ft]
DISCHARGE RATE............... = 124 [gpm]
TIME OF THE OBSERVATION...... = 1230 [min]

NO	DISTANCE [ft]	DRAWDOWN [ft]	u	DEVIATION	WELL
1	320.00	0.130	.101E+00	+.399E-05	OW-2
2	365.00	0.110	.132E+00	-.407E-05	OW-1

TRANSMISSIVITY T = .289E+00 [ft2/s]
T = 187037 [gpd/ft]
STORATIVITY   S = .846E-01

DATA SEGMENT ANALYZED :
- starting with data pair 1
- ending   with data pair 2

DETERMINATION COEFFICENT = .999556

****

```
**********************************************************
*                                                        *
*              program:  Distance                        *
*              version:  IBM PC 1.0                      *
*                                                        *
*  A PROGRAM FOR PUMP TEST ANALYSIS USING JACOB'S        *
*  FORM OF THEIS EQUATION AND LEAST SQUARES' METHOD.     *
*                                                        *
**********************************************************
```

PROJECT......... = Webster DNR/ERF
LOCATION........ = Webster, WI
WELL............ = Village Well No. 2
DATE............ = Sept. 23-24, 1986

STATIC WATER LEVEL   S.W.L.   = 35 [ft]
DISCHARGE RATE............... = 124 [gpm]
TIME OF THE OBSERVATION...... = 1230 [min]

NO	DISTANCE [ft]	DRAWDOWN [ft]	u	DEVIATION	WELL
1	220.00	0.500	.667E-01	-.548E-05	OW-6
2	550.00	0.070	.417E+00	+.484E-05	OW-7

TRANSMISSIVITY T = .937E-01 [ft2/s]
T = 60556 [gpd/ft]
STORATIVITY S = .381E-01

DATA SEGMENT ANALYZED :
- starting with data pair 1
- ending with data pair 2

DETERMINATION COEFFICENT = 1.000025

****

```
*******************************************************
*                                                     *
*              program:  Distance                     *
*              version:  IBM PC 1.0                   *
*                                                     *
*  A PROGRAM FOR PUMP TEST ANALYSIS USING JACOB'S     *
*  FORM OF THEIS EQUATION AND LEAST SQUARES' METHOD.  *
*                                                     *
*******************************************************
```

PROJECT......... = Webster DNR/ERF
LOCATION........ = Webster, WI
WELL............ = Village Well No. 2
DATE............ = Sept. 23-24, 1986

STATIC WATER LEVEL   S.W.L.   = 35 [ft]
DISCHARGE RATE............... = 124 [gpm]
TIME OF THE OBSERVATION...... = 1230 [min]

NO	DISTANCE [ft]	DRAWDOWN [ft]	u	DEVIATION	WELLS
1	70.00	0.940	.720E-01	+.924E-05	OW-4
2	90.00	0.710	.119E+00	-.864E-05	OW-5

TRANSMISSIVITY T = .480E-01 [ft2/s]
T = 31055 [gpd/ft]
STORATIVITY S = .208E+00

DATA SEGMENT ANALYZED :
- starting with data pair 1
- ending with data pair 2

DETERMINATION COEFFICENT = .9999183

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WEBSTER CONTAMINATION STUDY PUMP TEST DATA

Well#	Depth to Water	TIME Day#	Hours	Minutes	Seconds	Elapsed Time Since Start,hrs	Drawdown,ft	Total Flow,gal	Pumping Rate,gpm
V.W. #2	35	0	16	40	0	0.000	0	679900	-----------
	51	0	18	26	25	1.774	16	693000	123.1
	51	0	18	40	0	2.000	16	-----------	-----------
	51	0	19	11	0	2.517	16	698510	120.3
	51	0	19	40	0	3.000	16	702150	125.5
	51	1	7	15	0	14.583	16	788000	123.5
	51	1	9	6	0	16.433	16	801790	124.2
	51	1	9	56	0	17.267	16	807990	124.0
	51	1	10	0	0	17.333	16	-----------	-----------
	51	1	11	25	0	18.750	16	818905	123.9
	51	1	12	26	0	19.767	16	826470	124.0
	51	1	13	3	0	20.383	16	831050	123.8
	51	1	13	10	0	20.500	16	831920	124.3
	35	1	13	10	15	20.504	0	831920	0.0

WEBSTER CONTAMINATION STUDY PUMP TEST DATA

Well#	Depth to Water	Day#	Hours	Minutes	Seconds	Elapsed Time Since Start,min	Drawdown,ft
OW-1	33.67	0	16	40	0	0	0
	33.67	0	18	55	0	135	0
	33.77	1	7	50	0	910	0.1
	33.78	1	9	54	0	1034	0.11
	33.78	1	12	1	0	1161	0.11
	33.76	1	14	22	0	1302	0.09

Well#	Depth to Water	Day#	Hours	Minutes	Seconds	Elapsed Time Since Start,min	Drawdown,ft
OW-2	33.82	0	16	40	0	0	0
	33.83	0	18	50	0	130	0.01
	33.94	1	7	54	0	914	0.12
	33.95	1	9	57	0	1037	0.13
	33.95	1	12	6	0	1166	0.13
	33.95	1	14	17	0	1297	0.13

Well#	Depth to Water	Day#	Hours	Minutes	Seconds	Elapsed Time Since Start,min	Drawdown,ft
OW-3	33.05	0	16	40	0	0	0
	33.1	0	16	57	30	17.5	0.05
	33.6	0	16	58	50	18.83	0.55
	33.6	0	17	0	30	20.5	0.55
	33.17	0	17	51	0	71	0.12
	33.18	0	17	52	30	72.5	0.13
	33.17	0	17	54	0	74	0.12
	33.12	0	19	15	0	155	0.07
	33.34	1	7	33	0	893	0.29
	33.33	1	9	50	0	1030	0.28
	33.35	1	11	52	0	1152	0.3
	33.35	1	13	31	0	1251	0.3
	33.39	1	13	49	0	1269	0.34

WEBSTER CONTAMINATION STUDY PUMP TEST DATA

Well#	Depth to Water	Day#	Hours	Minutes	Seconds	Elapsed Time Since Start,min	Drawdown,ft
OW-4	32.34	0	16	40	0	0	0
	32.37	0	16	40	30	0.5	0.03
	32.38	0	16	41	0	1	0.04
	32.4	0	16	41	30	1.5	0.06
	32.4	0	16	42	0	2	0.06
	32.41	0	16	42	30	2.5	0.07
	32.41	0	16	43	0	3	0.07
	32.42	0	16	43	30	3.5	0.08
	32.42	0	16	44	0	4	0.08
	32.42	0	16	45	0	5	0.08
	32.43	0	16	46	0	6	0.09
	32.44	0	16	47	0	7	0.1
	32.44	0	16	48	0	8	0.1
	32.44	0	16	49	0	9	0.1
	32.45	0	16	50	0	10	0.11
	32.46	0	16	52	0	12	0.12
	32.48	0	16	55	0	15	0.14
	32.49	0	17	0	0	20	0.15
	32.51	0	17	5	0	25	0.17
	32.52	0	17	10	0	30	0.18
	32.54	0	17	15	0	35	0.2
	32.56	0	17	20	0	40	0.22
	32.56	0	17	25	0	45	0.22
	32.57	0	17	30	0	50	0.23
	32.59	0	17	35	0	55	0.25
	32.61	0	17	40	0	60	0.27
	32.62	0	17	50	0	70	0.28
	32.62	0	18	0	0	80	0.28
	32.66	0	18	10	0	90	0.32
	32.66	0	18	15	0	95	0.32
	32.67	0	18	20	0	100	0.33
	32.69	0	18	25	0	105	0.35
	32.69	0	18	30	0	110	0.35
	32.7	0	18	40	0	120	0.36

WEBSTER CONTAMINATION STUDY PUMP TEST DATA

Well#	Depth to Water	Day#	Hours	Minutes	Seconds	Elapsed Time Since Start,min	Drawdown,ft
		---TIME---					
OW-4	32.89	0	19	5	0	145	0.55
(con't.)	32.78	0	19	31	0	171	0.44
	33.6	1	7	26	0	886	1.26
	33.25	1	9	19	0	999	0.91
	33.21	1	9	22	0	1002	0.87
	33.27	1	9	31	0	1011	0.93
	33.28	1	11	48	0	1148	0.94
	33.17	1	13	14	0	1234	0.83
	33.16	1	13	15	0	1235	0.82
	33.16	1	13	16	0	1236	0.82
	33.15	1	13	18	0	1238	0.81
	33.14	1	13	20	0	1240	0.8
	33.14	1	13	22	0	1242	0.8
	33.12	1	13	25	0	1245	0.78
	33.1	1	13	30	0	1250	0.76
	33.09	1	13	35	0	1255	0.75
	33.06	1	13	40	0	1260	0.72
	33.05	1	13	45	0	1265	0.71

WEBSTER CONTAMINATION STUDY PUMP TEST DATA

		------------------TIME---------------				Elapsed Time	
Well#	Depth to Water	Day#	Hours	Minutes	Seconds	Since Start,min	Drawdown,ft
OW-5	33	0	16	40	0	0	0
	33	0	16	41	0	1	0
	33	0	16	44	0	4	0
	33.1	0	16	48	0	8	0.1
	33.32	0	16	52	30	12.5	0.32
	33.05	0	17	4	0	24	0.05
	33.06	0	17	7	0	27	0.06
	33.1	0	17	18	0	38	0.1
	33.105	0	17	27	30	47.5	0.105
	33.12	0	17	35	0	55	0.12
	33.13	0	17	42	0	62	0.13
	33.14	0	17	43	25	63.416666667	0.14
	33.14	0	17	45	0	65	0.14
	33.15	0	17	46	0	66	0.15
	33.16	0	17	58	0	78	0.16
	33.16	0	18	0	0	80	0.16
	33.17	0	18	6	0	86	0.17
	33.18	0	18	10	0	90	0.18
	33.2	0	18	23	0	103	0.2
	33.2	0	18	36	0	116	0.2
	33.21	0	18	42	0	122	0.21
	33.25	0	18	58	0	138	0.25
	33.29	0	19	28	0	168	0.29
	33.67	1	7	18	0	878	0.67
	33.67	1	9	35	0	1015	0.67
	33.71	1	11	43	0	1143	0.71
	33.69	1	13	14	0	1234	0.69
	33.71	1	13	23	0	1243	0.71
	33.64	1	13	35	0	1255	0.64
	33.63	1	13	40	0	1260	0.63
	33.63	1	13	45	0	1265	0.63
	33.61	1	13	55	0	1275	0.61
	33.61	1	14	0	0	1280	0.61
	33.61	1	14	10	0	1290	0.61

WEBSTER CONTAMINATION STUDY PUMP TEST DATA

Well#	Depth to Water	Day#	Hours	Minutes	Seconds	Since Start,min	Drawdown,ft
		---TIME---				Elapsed Time	
OW-8	33.31	0	16	40	0	0	0
	33.3	0	19	15	0	155	-0.01
	33.34	1	7	25	0	885	0.03
	33.34	1	9	41	0	1021	0.03
	33.34	1	11	51	0	1151	0.03

Well#	Depth to Water	Day#	Hours	Minutes	Seconds	Since Start,min	Drawdown,ft
		---TIME---				Elapsed Time	
OW-9	31.25	0	16	40	0	0	0
	31.28	0	19	25	0	165	0.03
	31.34	1	7	34	0	894	0.09
	31.34	1	9	49	0	1029	0.09
	31.36	1	11	57	0	1157	0.11

Well#	Depth to Water	Day#	Hours	Minutes	Seconds	Since Start,min
		---TIME---				Elapsed Time
V.W. #1	UNKNOWN	0	16	40	0	0
	34.62	1	12	30	0	1190
	34.62	1	12	45	0	1205
	34.62	1	12	58	0	1218
	34.59	1	13	49	0	1269
	34.59	1	13	55	0	1275
	34.59	1	14	0	0	1280
	34.59	1	14	5	0	1285
	34.59	1	14	10	0	1290