STATE OF DELAWARE

UNIVERSITY OF DELAWARE

DELAWARE GEOLOGICAL SURVEY

SPECIAL PUBLICATION NO. 11

INSTRUCTIONS FOR PREPARATION OF DELAWARE GEOLOGICAL SURVEY DATA BASE SCHEDULES

BY

JOHN H. TALLEY

AND

DOROTHY C. WINDISH

NEWARK, DELAWARE

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John H. Talley
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INTRODUCTION

Protection and efficient utilization of energy, mineral, and water resources are of vital concern to the State of Delaware. The Delaware Geological Survey (DGS), as part of its statutory charge, is responsible for systematically investigating, analyzing, and reporting the conditions of these resources.

During the past four decades, the DGS has emphasized research and exploration to develop the geologic and hydrologic framework of the Delaware Coastal Plain. These efforts are supported by a comprehensive paper-file data base consisting of various geologic, hydrologic, geophysical, geochemical, and sample library data. The data base was initiated in 1951 and coincides with the founding of the DGS. The vast amount of raw and processed information contained in the data base is essential in research, exploration, and service activities of the DGS.

As a result of increased emphasis placed in recent years on the Atlantic Outer Continental Shelf (OCS) exploration of new energy sources including oil and gas, the DGS has expanded its work to include this region. This necessitated the acquisition and filing of pertinent scientific data related to the exploration in this region.

The DGS, in response to the needs for efficient storage, manipulation, retrieval, and report-generating capability, has proceeded with the conversion of the paper file data base to an integrated automated geologic, hydrologic, and mineral resource management information system. It is necessary to organize data in a systematic and standardized fashion for efficient entry into the automated system. To accomplish this, the DGS has made major revisions in the data recording and filing systems.

This report contains the new DGS data schedules, describes the information that should be recorded on each schedule, and presents instructions for preparation of the schedules. The schedules are designed to make various kinds of data consistent with the input format screens utilized in the automated system.

The types of schedules described include:

1. Well
2. Water Level
3. Lithologic Log
4. Sample
5. Aquifer Test
6. Geophysical Log
7. Field Water Quality
8. Laboratory Water Quality
9. OCS Well

The automated DGS geologic, hydrologic, and mineral resource management information system utilizes DMSII software. The software package consists of four major components: (1) DASDL, the language which describes the data elements complete with editing criteria and access keys; (2) INQUIRY, a generalized inquiry program which allows the user to work with the data base before any user supplied applications are available; (3) AUDIT-REPORTER, a set of routines which allow the user to specify relatively complex reports without programming assistance; (4) screen support which provides all of the screen handling and error checking. The system is written in ANS COBOL-74 and could be modified to run under other data base systems and screen handling software.

PLEASE NOTE that many of the data elements and definitions used in the well schedule are compatible with those contained in U. S. Geological Survey Open File Report 75-589 titled "National Water Data Storage and Retrieval System - Instructions for Preparation and Submission of Ground-Water Data" (Baker and Foulk, 1975). Many of the data elements and definitions used in the OCS Well Schedule are the same or are very similar to those contained in API Bulletin D12A titled "The API Well Number and Standard State and County Numeric Codes Including Offshore Waters" and in "Instructions for Completing Individual Well Tickets for U. S. Drilling Statistics, Part I and Part II, 1972."

ACKNOWLEDGMENTS

The staff of the Delaware Geological Survey provided invaluable input during preparation of this report. Special thanks are due to Kenneth D. Woodruff and Thomas E. Pickett, Associate Directors, DGS, for critically reviewing this report and to Richard N. Benson, DGS, for significant contributions to the design of the OCS Well Schedule.

Discussions of various topics related to the preparation of this report were held with Mr. William Osburn, Delaware Department of Natural Resources and Environmental Control and Edward C. Ratledge, College of Urban Affairs and Public Policy, University of Delaware. Their helpful suggestions and constructive criticism are greatly appreciated.

The preparation of this report was financed through Coastal Energy Impact Program (CEIP) OCS State Participation Grant No. NA-80-AA-D-CZ085 from the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, under the provisions of Section 308(C)(2) of the Coastal Zone Management Act of 1972 (Public Law 92-583) as amended. Funds were administered by the Department of Natural Resources and Environmental Control (DNREC) as contract number CEIP 80-2.

DGS WELL SCHEDULE

Well Identification

DGS ID: Enter the DGS well number assigned to the well. The State is divided into 5-minute quadrangles of latitude and longitude for the purpose of numbering wells in Delaware. The quadrangles are lettered north to south with capital letters, and from west to east with lower case letters. Each 5-minute quadrangle is further subdivided into 25 1-minute blocks which are numbered from north to south in series of 10 from 10 to 50 and are numbered from west to east in units from 1 to 5 (Figure 1). Wells within these 1-minute blocks are assigned numbers as they are scheduled. The identity of a well is established by prefixing the serial number with an upper and lower case letter followed by two numbers to designate the 5-minute and 1-minute blocks, respectively, in which the well is located. For example, well number Cb41-03 is the third well to be scheduled in the 1-minute block 41 that has coordinates "Cb41."

The authority to assign a DGS well number is restricted to DGS personnel. Use leading zeros if needed (i.e., Db24-01).

DNREC ID: Enter the 6-digit permit number assigned by the Water Supply Branch of the Department of Natural Resources and Environmental Control (DNREC). Use leading zeros if necessary. If the well was constructed under a Water and Air Resources Commission (WARC) permit (prior to 1968) enter the WARC application number. An effort should be made to determine either DNREC or WARC permit numbers for all wells.

Record By: Enter the first initial, middle initial, and last name of the individual who completes the Well Schedule.

(CODE) Do not make an entry in (CODE).

Date Filed: Record the month, day, and year (MM, DD, YY) that the Well Schedule was completed. If the month or day are not known enter 00 in the appropriate spaces. Use leading zeros for month, day, or year values less than 10.

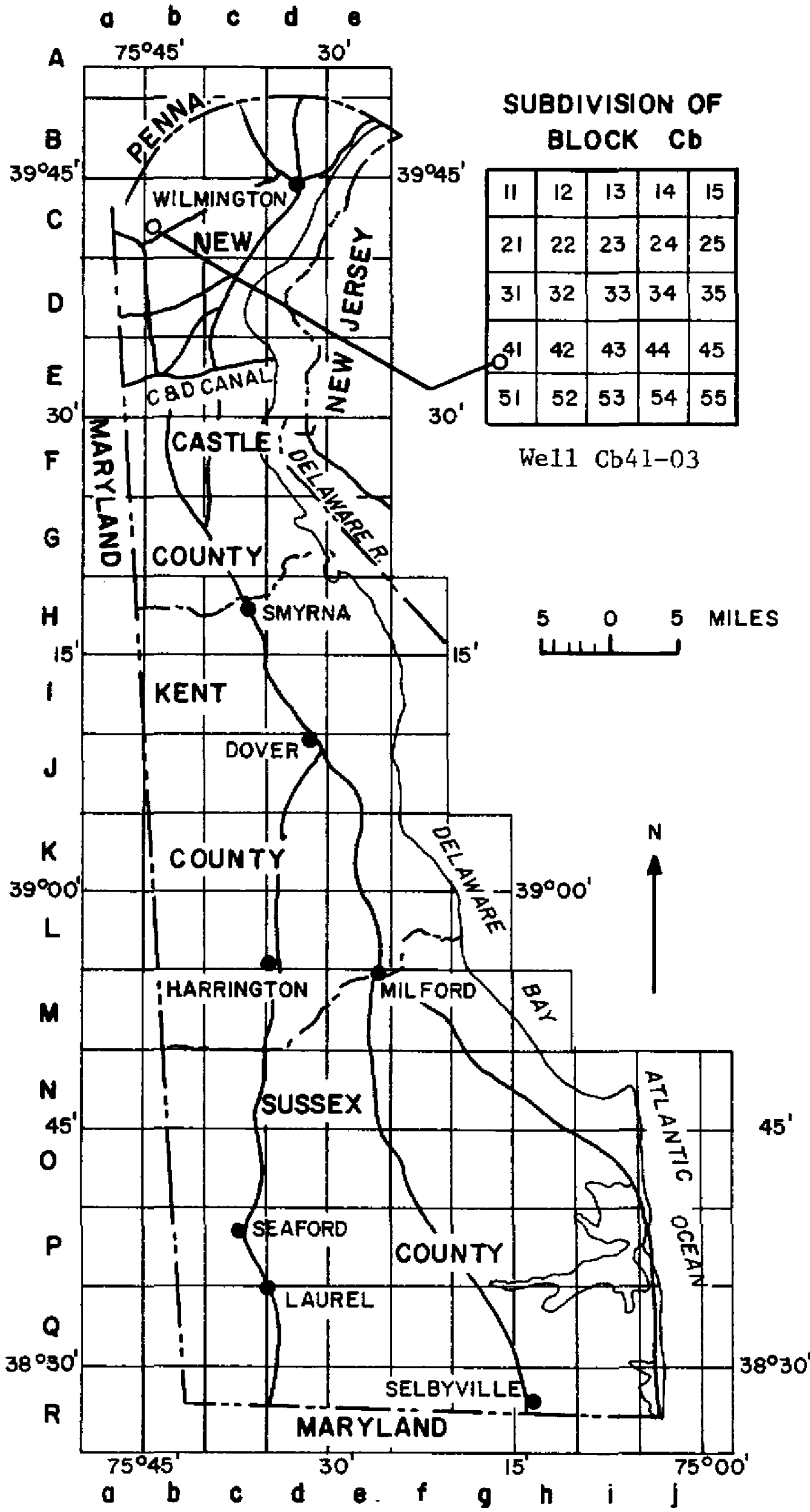


Figure 1. Map showing the coordinates for the DGS well-numbering system.

General Site Data

Data Source: Circle the appropriate code on the Well Schedule to indicate the agency or other source that submitted the data for completion of the Well Schedule. The codes are:

- D - Driller
- G - DGS (Delaware Geological Survey)
- N - DNREC (Dept. of Natural Resources and Environmental Control)
- O - Owner
- R - Other reported
- S - USGS (United States Geological Survey)
- U - Unknown

Local ID: If a local well numbering system is used, enter the system number for the well. The local number should be entered completely, as it is to be printed.

DRBC ID: Enter the 6-digit number assigned by the Delaware River Basin Commission (DRBC), if available. In most instances this number will not be available.

Latitude: Enter the best available value for the latitude of the site in degrees, minutes, and seconds. Use leading zeros if needed. Please refer to the technique described below for determining latitude.

Longitude: Enter the best available value for the longitude of the site in degrees, minutes, and seconds. Use leading zeros if needed. Use the technique described below for determining longitude.

It is suggested that the following technique be utilized to determine latitude and longitude:

(1) Locate the well on a topographic map (scale 1:24,000 or larger). Any available information should be used, with reference to map features, to locate the well as accurately as possible. If the available information is inadequate, judgment should be used to spot the well.

(2) The coordinates of the well can be scaled to a second even though the point may not represent the accurate location of the well on the ground.

Lat-Long Accuracy: Circle the appropriate code on the Well Schedule to indicate the estimated accuracy of the latitude-longitude values. The codes and their meanings are:

S - Seconds — T - Ten Seconds
F - Five Seconds — W - Twenty Seconds

Seconds (S) - field location is adequate to within one second of latitude (±100') and longitude (±79').

Five Seconds (F) - field location is adequate to within five seconds of latitude (±500') and longitude (±400'). This is equal to ± 0.25" on a 7.5 min. topographic map (1:24,000). Reduced accuracy may result from inadequate field location but scale and accuracy of map permits numbering to seconds.

Ten Seconds (T) - field location is adequate to within 10 seconds of latitude (±1,000') and longitude (±800'). This is equal to ± 0.5" on a 7.5 min. topographic map (1:24,000). Reduced accuracy may result from inadequate field location but scale and accuracy of map permits numbering to seconds.

Twenty Seconds (W) - field measurement is accurate to within 20 seconds of latitude (±2,000') and longitude (±1,600'). This is equal to ± 1" on a 7.5 min. topographic map (1:24,000).

- No value indicates that the accuracy is unknown and is, therefore, assumed to be beyond 20 seconds.

County: Circle the appropriate code on the Well Schedule to indicate the county in which the well is located. The codes are:

Kent - 1 New Castle - 3 Sussex - 5

Quadrangle: Enter the name of the 7.5 minute topographic quadrangle map on which the well can be located. A list of quadrangles and a map showing the locations of quadrangles are presented in Table 1 and Figure 2.

(CODE): Do not make an entry in (CODE).

Topographic Setting: Circle the code that best describes the topographic setting in which the well is located. The codes and their meanings are:

C - Stream Channel	L - Lake
D - Depression	M - Marsh
E - Dune	O - Offshore
F - Flat	S - Hillside
H - Hilltop	U - Upland draw
K - Sink	V - Valley Flat

Stream Channel (C) - refers to the bed in which a natural stream of water runs. This can include a man-made ditch or trench through which water runs during the entire year.

Depression (D) - refers to an area that has no external surface drainage, such as "Carolina Bays."

Dune (E) - refers to mounds or ridges of sand. Can also refer to mounds of unknown origin such as those which occur in the Seaford area.

Flat (F) - refers to a relatively flat area with little relief.

Hilltop (H) - refers to the upper part of a hill or ridge above a well-defined break in slope. This category is generally restricted to the Piedmont.

Sink (K) - refers to a specific type of depression that results from the solution of soluble rock and of subsequent collapse of material into a cavity. An interiorly drained basin in an area underlain by carbonate rock in which no collapse of material has taken place would be classified as a Depression.

Table 1. 7.5 minute topographic quadrangles in Delaware (scale 1:24,000).

(ASB)	Assawoman Bay (Md.)	(LTC)	Little Creek
(BDP)	Ben Davis Point (N.J.)	(MAH)	Marcus Hook (Pa.)
(BEP)	Bennetts Pier	(MAR)	Marydel
(BEB)	Bethany Beach	(MID)	Middletown
(BBH)	Bombay Hook	(MIL)	Milford
(BUR)	Burrsville	(MNT)	Millington (Md.)
(CAN)	Canton (N.J.)	(MSB)	Millsboro
(CAH)	Cape Henlopen	(MLT)	Milton
(CEC)	Cecilton (Md.)	(MIR)	Mispillion River
(CLA)	Clayton	(NEE)	Newark East
(DEC)	Delaware City	(NEW)	Newark West (Md.)
(DEL)	Delmar (Md.)	(PEG)	Penns Grove (N.J.)
(DOV)	Dover	(PIT)	Pittsville (Md.)
(ELK)	Elkton (Md.)	(REB)	Rehoboth Beach
(ELL)	Ellendale	(SAG)	Saint Georges
(FAI)	Fairmount	(SEE)	Seaford East
(FOR)	Fortescue (N.J.)	(SEW)	Seaford West
(FRA)	Frankford	(SEL)	Selbyville (Md.)
(FRE)	Frederica	(SHA)	Sharptown
(GEO)	Georgetown	(SMY)	Smyrna
(GRE)	Greenwood	(SUD)	Sudlersville (Md.)
(HBS)	Harbeson	(TAB)	Taylors Bridge
(HAR)	Harrington	(TRP)	Trap Pond
(HEB)	Hebron (Md.)	(WEG)	West Grove (Pa.)
(HIC)	Hickman	(WHA)	Whaleysville (Md.)
(KES)	Kennett Square (Pa.)	(WIN)	Wilmington North
(KEN)	Kenton	(WIS)	Wilmington South
(LAU)	Laurel	(WYO)	Wyoming
(LEW)	Lewes		

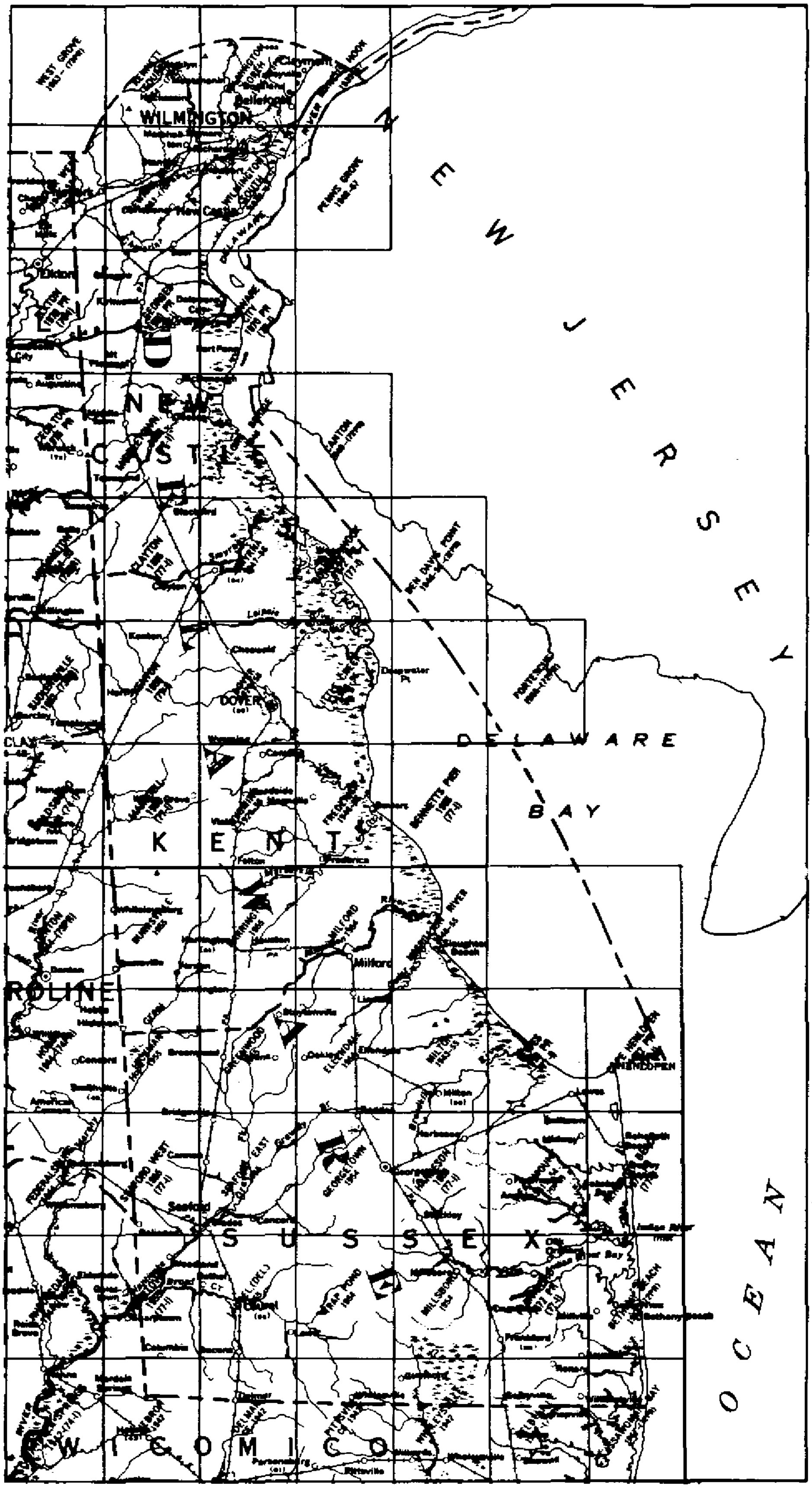


Figure 2. Map showing locations of 7.5 minute topographic quadrangles in Delaware (from Index to topographic maps of Maryland, Delaware, and District of Columbia, 1979: U. S. Geological Survey).

Lake (L) - refers to a body of inland water. This code can also be used for swampy areas where the ground is saturated or water may stand on the land surface for a period of time.

Marsh (M) - refers to a water-saturated area, intermittently or permanently water-covered by tidal waters.

Offshore (O) - refers to an area in the Delaware Bay or off the coast that is continuously submerged.

Hillside (S) - refers to the sloping side of a hill, part of a hill between the crest and drainage line at the foot of the hill.

Upland Draw (U) - refers to a small trough-like depression, usually dry, on a hillside or upland in the Piedmont.

Valley Flat (V) - refers to a low flat area between valley walls and bordering a stream channel. It includes the flood plain.

Drainage Basin: Enter the name of the drainage basin in which the well is located. A list of basins and a map showing the locations of drainage basins are presented in Table 2 and Figure 3.

(CODE): Do not make an entry in (CODE).

Altitude: Enter the altitude of the land surface at the well in feet above or below mean sea level. Precision can be extended to two decimal places. Altitudes below mean sea level should be preceded by a minus (-) sign. If the site is offshore, enter the altitude of the measuring point with respect to mean sea level (±).

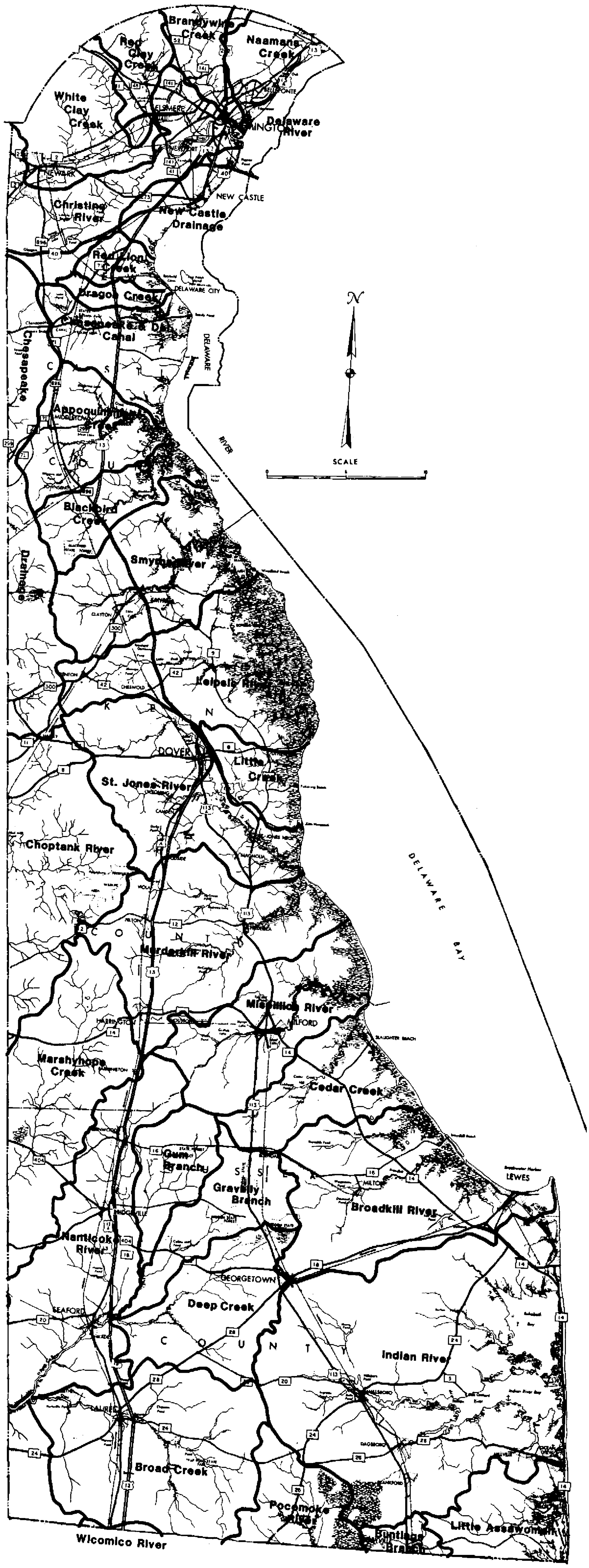
Altitude Method: Circle the appropriate code for the method used to determine altitude. The codes and their meanings are:

A - Altimeter	M - Map
L - Level	R - Relative

Table 2. Drainage basins in Delaware.

(009)	Delaware River	(206)	Murderkill River
(101)	Naamans Creek	(208)	Mispillion River
(104)	Brandywine Creek	(301)	Cedar Creek
(105)	White Clay Creek	(303)	Broadkill River
(103)	Red Clay Creek	(207)	Choptank River
(106)	Christina River	(304)	Nanticoke River
(113)	New Castle Drainage	(315)	Deep Creek
(107)	Red Lion Creek	(307)	Broad Creek
(111)	Dragon Creek	(302)	Marshyhope Creek
(108)	Chesapeake & Delaware Canal	(316)	Gravelly Branch
(109)	Appoquinimink Creek	(317)	Gum Branch
(110)	Blackbird Creek	(308)	Indian River
(112)	Chesapeake Drainage	(310)	Little Assawoman
(201)	Smyrna River	(311)	Buntings Branch
(202)	Leipsic River	(313)	Pocomoke River
(204)	Little Creek	(314)	Wicomico River
(205)	St. Jones River.		

Figure 3. Map showing locations of drainage basins in Delaware.



Altimeter (A)	- altitude was determined through the use of an altimeter.
Level (L)	- altitude was determined through the use of a level or other precision survey instrument or method.
Map (M)	- altitude was determined through interpolation of a topographic map. In most instances, altitudes determined from a map are accurate to ± one-half the contour interval.
Relative (R)	- altitude was determined through the use of a level or other precision survey instrument or method and tied into an arbitrarily selected benchmark or datum.

Delaware Modified Grid: Enter the 8-digit Delaware Modified Grid number obtained from maps showing the modified grid numbers. The Modified Grid is the 8-digit number of the grid location of the well site. The Modified Grid is defined by road boundaries within the State as depicted on the maps published by the Department of Transportation. The grids are based on a modification of the State Plane Coordinate Grid System. Most numbers on a map will appear to be 6-digit numbers such as 130-208. In reality the number is 8 digits. The first four describe the East-West grid and the second four the North-South grid. The number which would be entered in the above example would be 13002080. The fourth and eighth zeros in the example would have to be added to the Modified Grid number entered on the schedule.

Owner Identification

Owner Name:

First Name:	Enter the first name of the owner.
Middle Initial:	Enter the middle initial of the owner.
Last Name:	Enter the last name of the owner.

For ownership by a company, municipality, government agency, or other organization, enter the name in the field for the last name. Use meaningful abbreviations to keep the name within 15 characters. If the site is used, leased, or occupied by someone other than the owner, enter the appropriate data in the NOTES section of the Well Schedule. If the owner cannot be determined, write Unknown in the field for the last name.

Owner Address: Enter the owner's full mailing address, including city, state, and zip code. NOTE: ZIP CODE MUST BE ENTERED.

(CODE): Do not make an entry in (CODE).

Well Description

Drilling Contractor: Enter the name of the drilling contractor (company) that did the work. DO NOT enter the name of the person who actually did the drilling unless that person was the drilling contractor.

(CODE): Do not make an entry in (CODE).

Date Drilled: Record the month, day, and year (MM, DD, YY) that the work was completed. If the month or day are not known, enter 00 into the appropriate spaces. Use leading zeros for month, day, or year values less than 10. For many wells, this date will be the same as the date entered earlier in the Date Filed section.

Depth Drilled: Enter the total depth to which the hole was drilled, in feet below land surface datum, even though it may have been plugged back in completing the well at shallower depth. Precision may be carried to two decimal places.

Drill Method: Circle the code indicating the method by which the well was drilled. The codes and their meanings are:

A - Air Rotary	M - Hydraulic Rotary
B - Bored	P - Air Percussion
C - Cable Tool	R - Reverse Rotary
D - Dug	U - Unknown
E - Augered	V - Driven
J - Jetted	W - Wash-Drive

Air Rotary (A) - refers to the method in which a stream of air is used to cool the bit and bring the rock cuttings to the surface.

Bored (B) - refers to the method in which the earth materials are cut and removed from the hole with a large diameter, circular, bucket auger.

Cable Tool (C) - refers to a well drilled by the "percussion" or "churn-drill" method whereby a heavy drilling tool is raised and lowered with enough force to pulverize the rock. Rock cuttings are usually removed from the hole with a bailer.

Dug (D) - a well which is excavated by means of picks, shovels, or other hand tools, or by means of a power shovel or other dredging or trenching machinery, as distinguished from a well put down by a drill or auger.

Augered (E) - refers to the method in which the earth materials are cut and removed from the hole with a relatively small diameter auger, usually less than 12" in outside diameter.

Jetted (J) - refers to the method whereby the well is constructed by using high-velocity streams of water pumped through a pipe having a restricted opening or "jetting" nozzle. The material cut or washed from the hole is carried to the surface in the annular space outside the pipe.

Hydraulic Rotary (M)- refers to the method whereby the well is constructed by rotating a length of pipe (drill stem) equipped with a bit that cuts the rocks. Water or drilling mud is pumped down the pipe and carries the cuttings to the surface in the annular space between the pipe and the wall of the hole.

Air Percussion (P) - refers to the method which utilizes compressed air to power the cutting unit with a rapid hammering effect and to remove cuttings from the hole. This method is generally used in conjunction with air-rotary rigs to drill in hard rocks.

Reverse Rotary (R) - refers to the method similar to hydraulic rotary except that water or drilling mud flows down the annular space between the drilling stem and the wall of the hole and the cuttings are then pumped out through the drill stem.

Unknown (U) - method used to construct the well is unknown.

Driven (V) - refers to the method by which the well is constructed by driving a pipe, at the end of which there is a drive point and screen, without the use of any drilling, boring, or jetting device for other than an aid to driving.

Wash-Drive (W) - refers to the method by which a well is constructed by driving a small diameter, open-end casing a few feet into the earth, then washing out the material inside the casing with a jet of water. The process is repeated until the well has penetrated a sufficient depth into the aquifer.

Well Finish: Circle the code indicating the method of finish or the nature of the openings that allow water to enter the well. The codes and their meanings are:

C - Concrete	S - Screen
H - Horizontal Gallery	T - Sand Point
N - Not Finished	U - Unknown
O - Open Hole	W - Walled
P - Perforated or slotted	

<u>Concrete</u> (C)	- is concrete casing that allows ground water to enter the well. This can include bored wells lined with concrete rings or "Kelly" wells.
<u>Horizontal Gallery</u> (H)	- is a horizontal-type well in which the opening(s) is horizontal. Ranney collectors and infiltration galleries are of this type.
<u>Not Finished</u> (N)	- is a well that is drilled but not finished. Test wells and geologic/hydrologic research holes fall into this category if they were abandoned. If the test hole was converted to one of the Water Use categories, then the type of finish should be completed.
<u>Open Hole</u> (O)	- is a hole cased to a prescribed depth and then finished as an open hole. Most of the wells finished as open holes are completed in crystalline rocks in the Piedmont or in semi-consolidated formations in the Coastal Plain such as the Rancocas.
<u>Perforated or Slotted</u> (P)	- casing is well pipe that has holes or slots cut into it to admit water.
<u>Screen</u> (S)	- refers to a commercial well screen, manufactured for the purpose of admitting water to a well.
<u>Sand Point</u> (T)	- is the screen part of a drive point and is usually part of a driven well or may be used to deepen a drilled or dug well.
<u>Unknown</u> (U)	- indicates that the type of finish is not known.
<u>Walled</u> (W)	- is usually a dug well in which the walls have been shored up with open-jointed fieldstone, brick, tile, concrete blocks, or other material.

Site Use: Circle the code indicating the principal use of the well or the purpose for which the well was constructed. The codes and their meanings are:

A - Anode	P - Oil or Gas
E - Engineering Test Boring	R - Recharge
G - Geologic/Hydrologic Research	T - Test
	W - Withdrawal
O - Observation	Z - Other

Anode (A) - hole used as an electrical anode. Use this category only for holes used to ground pipelines or electrical installations.

Engineering Test Boring (E) - hole drilled for the purpose of determining the engineering properties of soils and rocks in support of foundation design.

Geologic/Hydrologic Research (G) - refers to a hole drilled for the purpose of obtaining information to support geologic mapping and/or hydrologic projects. This category will usually be restricted to holes drilled by the drill rig at the University of Delaware.

Observation (O) - hole drilled and cased for observation of water levels and/or water quality.

Oil or Gas (P) - a well or hole drilled in search of or for production of petroleum or gas. Includes any oil or gas production well, dry hole, or core hole.

Recharge (R) - well constructed for or converted for use in replenishing an aquifer. Use this category for wells that are used to return water to the aquifer after use, such as those for returning air conditioning water or water from ground-water heat pump systems.

Test (T) - an uncased hole (or one cased temporarily) used in the exploration for water or the testing of water-bearing units where the expected result is to gain knowledge of the underground water resources and/or find sources of water. It may be equipped temporarily with a pump in order to conduct an aquifer test, but if the well is abandoned after testing has been completed, it is still classified as a test hole.

Withdrawal (W) - refers to a well that supplies water for one of the purposes stated under the category Water Use (page 21). It includes a dewatering well if the dewatering is accomplished by pumping ground water.

Other (Z) - Any well that does not fit into the above stated categories.

Site Status: Circle the code indicating the status of the site at the time the Well Schedule was completed. The codes and their meanings are:

A - Abandoned	N - Not in Use
D - Destroyed	S - Standby
I - In Use	U - Unknown

Abandoned (A) - the well was abandoned according to procedures developed through the regulatory process by DNREC. The casings of most wells will be pulled; however, some will be plugged or filled. Use this category for geologic/hydrologic holes, engineering test borings, and test holes (not cased) that have been abandoned utilizing procedures prescribed by DNREC.

Destroyed (D) - wells destroyed (fire, run over, etc.) and not abandoned using acceptable procedures.

In Use (I) - the well is currently (at time Well Schedule was completed or updated) being used.

Not In Use (N) - the well exists but is not equipped for use.

Standby (S) - the well is not being used, but is available for immediate use. The well is usually equipped with a pump.

Unknown (U) - the status of the well is unknown.

Water Use: Circle the code indicating the principal use of water from the well. The codes and their meanings are:

A - Agricultural	M - Observation
C - Commercial	O - Other
D - Domestic	P - Public Supply
F - Fire	R - Irrigation
G - Geothermal	U - Unknown
I - Industrial	

Agricultural (A) - refers to a water supply used for the watering of livestock, poultry, and other uses related to farming in general, but not including the irrigation of lands or crops other than a household garden.

Commercial (C) - refers to a well which is not used to supply water to the public, but one from which the public may make use of the water (gas stations, laundries, stores, etc.). If some product is manufactured, assembled, remodeled, or fabricated, use of water for that process should be considered Industrial even though the water is not used directly in the product or in the manufacture of the product.

Domestic (D)	- use of water to supply household needs, principally for drinking, cooking, washing, and sanitary purposes. Most domestic wells will be at suburban or farm homes. If the water is used primarily for household use and not for stock, then the Domestic category should be used.
Fire (F)	- refers to the principal use of the water for fire protection purposes.
Geothermal (G)	- refers to a water supply used solely or principally for supplying water for ground-water source heat pump systems, even if some of the water is used for domestic purposes.
Industrial (I)	- refers to a well which is used in the processing, washing, packaging, manufacturing, or recovery of a product. Industrial water may be used to cool machinery, provide sanitary facilities for employees, or to air condition the facility.
Observation (M)	- refers to a well used for observation purposes, either water level or water quality. This category should be used to identify a test well which has been converted to an observation well.
Other (O)	- a well used for a purpose other than the ones presented.
Public Supply (P)	- refers to a well used to supply water for more than three household units, the public in general, employees, or in food preparation in a plant or restaurant. Such supplies may be owned by a municipality, community, or private concern.

Irrigation (R) - refers to a well used for watering of lands or crops other than household yards and gardens. This category should be used to include wells to water the grounds of schools, industrial plants, golf courses, if more than a small amount of water is pumped and irrigation is the sole use of the water.

Unknown (U) - the water use is not known.

Replacement Well: Circle the appropriate code indicating whether the well is (Y), or is not (N), a replacement well.

Replacement Reason: Circle the appropriate code on the Well Schedule indicating the reason that the existing well is being replaced. The codes and their meanings are:

- CL - High Chloride Concentration
- FE - High Iron Concentration
- IW - Insufficient Quantity of Water
- NI - High Nitrate Concentration
- OT - Other (describe in NOTES)
- WF - Well Failure

Geologic Unit: Enter the entire name of the deepest geologic group, formation, or unit penetrated by the drill. A complete list of geologic units is presented in Table 3.

(CODE): Do not make an entry in (CODE).

Aquifer Name: Enter the entire name of the aquifer(s) in which the open portion of the well is completed. If more than one aquifer is utilized, enter the name of the deepest one used. Any additional aquifers can be listed in the NOTES. A complete list of aquifer names is presented in Table 4.

(CODE): Do not make an entry in (CODE).

Table 3. Geologic units in Delaware.

	Symbol
Bryn Mawr Fm	bm
QUATERNARY	
Holocene (Recent)	Qho
Pleistocene	
Alluvial Fan	Qaf
Columbia Group	Qclg
Omar Fm	Qom
Beaverdam Fm	Qbd
Staytonville Unit	Qsu
Columbia Fm	Qcl
TERTIARY	
Miocene	
Chesapeake Group (undifferentiated)	Tchg
Calvert Fm	Tc
Eocene-Paleocene	
Piney Point Fm	Tpp
Nanjemoy Fm	Tna
Rancocas Group	Trng
Vincentown Fm	Tvt
Hornerstown Fm	TKht
Rancocas Fm	Trn
Pamunkey Fm	Tpa
*Unit C	TKuc
*Unit B	Tub
*Unit A	Tua
*Aquia Fm = Vincentown Fm	Taq
*Brightseat Fm = Hornerstown Fm	Tbr
CRETACEOUS	
Upper Cretaceous	
Monmouth Group	Kmog
*Redbank Fm	Krb
*Mt. Laurel-Navesink Fm	Kmln
Mt. Laurel Fm	Kml

Table 3. (continued)

	Symbol
Monmouth Fm	Kmo
Matawan Group	Kmag
*Wenonah Fm	Kw
Merchantville Fm	Kmv
Marshalltown Fm	Kmt
Englishtown Fm	Ket
Matawan Fm	Kma
Magothy Fm	Km
Lower Cretaceous	
Potomac Group	Kptg
*Raritan Fm	Kr
*Patapsco Fm	Kpa
*Patuxent Fm	Kpx
Potomac Fm	Kpt
CAMBRO-ORDOVICIAN	
Cockeysville Fm	COcm
Wissahickon Fm	COws
Wilmington Complex	COwx
Basement crystalline rock (beneath Coastal Plain)	Bcx

* These units are not formally recognized in Delaware in 1983. They have been included so that historical data can be entered into the DGS data system. The names will be phased out as data are reinterpreted.

Table 4. Aquifers in Delaware.

	Symbol
Bryn Mawr Fm	bm
QUATERNARY	
Holocene (Recent)	ho
Holocene-Columbia	hocl
Pleistocene	
Alluvial Fan	af
Columbia Group	clg
Omar Fm	om
Beaverdam Fm	bd
Columbia Fm	cl
Columbia Group - Pocomoke aquifer	clgpoc
Columbia Group - Manokin aquifer	clgmnk
Columbia Fm - Frederica aquifer	clfre
Columbia Fm - Cheswold aquifer	clchs
Columbia Fm - Potomac Fm	clpt
TERTIARY	
Miocene	
Chesapeake Group (undifferentiated)	chg
Pocomoke aquifer	poco
Manokin aquifer	mnkn
Ocean City aquifer	octy
Frederica aquifer	fred
Federalsburg aquifer	fedl
Cheswold aquifer	chs
Eocene-Paleocene	
Piney Point Fm	pp
Rancocas Group	rng
Vincentown Fm	vt
Hornerstown Fm	ht
Rancocas Fm	rn
*Aquia Fm - Vincentown Fm	aq
*Brightseat Fm - Hornerstown Fm	br

Table 4. (continued)

	Symbol
CRETACEOUS	
Upper Cretaceous	
Monmouth Group	mog
*Redbank Fm	rb
*Mt. Laurel-Navesink Fm	mln
Mt. Laurel Fm	ml
Monmouth Fm	mo
Matawan Group	mag
*Wenonah Fm	w
Marshalltown Fm	mt
Englishtown Fm	et
Matawan Fm	ma
Magothy Fm	m
Lower Cretaceous	
Potomac Group	ptg
*Raritan Fm	r
*Patapsco Fm	pa
*Patuxent Fm	px
Potomac Fm	pt
Upper Hydrologic Zone	ptu
Lower Hydrologic Zone	ptl
CAMBRO-ORDOVICIAN	
Cockeysville Fm	cm
Wissahickon Fm	ws
Wilmington Complex	wx
Basement Crystalline Rock (beneath Coastal Plain)	cx

* These units are not formally recognized in Delaware in 1983. They have been included so that historical data can be entered into the DGS data system. The names will be phased out as data are reinterpreted.

Casing

This section of the Well Schedule is used to record data on the casing(s) in a well. Space is provided to record information on four strings of casing; if more space is needed, use the NOTES section. Precision can be extended to two decimal places.

Top of Casing: Enter the depth to the top of this section of casing in feet above or below land surface. If the casing extends above land surface, enter the height of the casing preceded by a minus (-) sign.

Bottom of Casing: Enter the depth of the bottom of this section of casing in feet below land surface.

Diameter: Enter the nominal diameter of the casing in inches.

Material: Enter the code indicating the material from which the casing is made. The codes are:

- B - Brick
- C - Concrete
- F - Fiberglass
- G - Galvanized
- O - Other
- P - PVC
- R - Rock or Stone
- S - Steel
- U - Unknown

Openings

This section of the Well Schedule is used to record data about the opening(s) through which water enters the well. Space is provided to record information on four open intervals; if more space is needed, use the NOTES section. Precision can be extended to two decimal places.

Top of Opening: Enter the depth to the top of the open section in feet below land surface.

Bottom of Opening: Enter the depth to the bottom of the open section in feet below land surface.

Diameter: Enter the diameter, in inches, of whichever applies: the hole, if the well is finished open-hole, the nominal diameter of perforated or slotted pipe, or the nominal diameter of the screen.

Material: Enter the code indicating the type of material from which the screen or other open section is made. The codes are:

A - Brass	N - None
B - Bronze	P - PVC
C - Concrete	R - Stainless Steel
F - Fiberglass	S - Steel
G - Galvanized	U - Unknown
M - Monel	

Gravel Pack

Gravel Pack: Circle the appropriate code indicating whether the well is (Y), or is not (N), gravel packed. No entry indicates that it is unknown whether the well is, or is not, gravel packed.

Gravel Top: Enter the depth to the top of the gravel packed section in feet below land surface.

Gravel Bottom: Enter the depth to the bottom of the gravel packed section in feet below land surface.

Grout

Grout: Circle the appropriate code indicating whether the well is (Y), or is not (N), grouted. No entry indicates that it is unknown whether or not the well is grouted.

Grout Top: Enter the depth to the top of the grouted interval in feet below land surface.

Grout Bottom: Enter the depth to the bottom of the grouted interval in feet below land surface.

Grout Type: Circle the code indicating the type of material used for grouting. Grouting or cementing well casing involves filling the annular space around the well casing, usually between the pipe and the drilled hole, with cement, clay, or some other sealant. The codes are:

B - Bentonite	O - Other
C - Cement	U - Unknown
G - Cuttings	

Water-Level Data

Date: Record the month, day, and year (MM, DD, YY) that the water level was obtained. If the day is not known, enter 00 in the appropriate spaces. Use leading zeros for month, day, or year values less than 10.

Time: Record the time, using military time codes (24 hours), that the water level was obtained.

Water Level: Enter the depth to the water level in feet below the selected datum (land surface or top of casing). Precision may be carried to two decimal places.

Correction: Enter the correction in feet. The correction factor is the difference, in feet, between the measuring point and land surface datum. If the measuring point was land surface, then the correction factor is 0.00. If the measuring point is above the land surface such as the top of casing, then the correction factor is the distance from the measuring point to land surface preceded by a minus (-) sign. A plus (+) sign will precede correction factors below land surface. Precision may be carried to two decimal places.

Device Used: Circle the code indicating the method by which the water level was determined. The codes and their meanings are:

A - Air Line	S - Static Level
M - M-Scope	T - Tape Down
O - Other	W - Water-Level Recorder
R - Reported	

Air Line (A)	- the water level was determined through the use of an air line and pressure gage.
M - Scope (M)	- the water level was determined through the use of an electronic sensing device in which an electrode is suspended by a pair of insulated wires and an ammeter indicates a closed circuit and flow of current when the electrode touches the water surface.
Other (O)	- the water level was determined using a method other than described in this section.
Reported (R)	- the method used to determine the water level is not known.
Static Level (S)	- the water level was determined by the contractor and reported to DGS.
Tape Down (T)	- the water level was determined through the use of a wetted steel tape.
Water-Level Recorder (W)	- the water level was determined using an automatic, continuous water-level recorder.

Log, Test, and Sample Data

Enter the appropriate code indicating whether information is (Y), or is not (N), available for:

- Geologist's Log
- Driller's Log
- Aquifer Test
- Water Quality
- Supplemental File

Enter the beginning and ending sample numbers in the spaces provided for ditch and/or core samples available for this particular well.

Geophysical Log Data

Enter the appropriate code indicating whether information is (Y), or is not (N), available for:

Caliper	Induction
Differential Single Point	Multiple Point
Differential Temperature	Neutron
Flowmeter	Single Point
Gamma	Sonic
Gamma Density	Spherically Focused
Gamma Spectral	Temperature
	Other

Notes

This space is provided for entering meaningful information for which no specific field is provided. Comments should be kept to a minimum.

Location Map

This space can be used for drawing a sketch map of the location of the well as it occurs in the field. An effort should be made to locate the well using landmarks, and at least, pace and compass accuracy.

DGS WATER-LEVEL SCHEDULE

Well Identification

DGS ID: Enter the DGS well number assigned to this well. Please note: a DGS Well Schedule containing the assigned well number must be in the data system for water-level data to be accepted.

Record By: Enter the first initial, middle initial, and last name of the individual who completes the Water-Level Schedule.

(CODE): Do not make an entry in (CODE).

Date Filed: Record the month, day, and year (MM, DD, YY) that the Water-Level Schedule was completed. If the month or day are not known enter 00 in the appropriate spaces. Use leading zeros for month, day, or year values less than 10.

Data Source: Circle the appropriate code on the Water-Level Schedule to indicate the agency or other source that submitted the data for completion of the schedule. The codes are:

D - Driller
G - DGS (Delaware Geological Survey)
N - DNREC (Dept. of Natural Resources and Environmental Control)
O - Owner
R - Other Reported
S - USGS (U. S. Geological Survey)
U - Unknown

Water-Level Data

Date: Record the month, day, and year (MM, DD, YY) that the water level was obtained. If the day is not known, enter 00 in the appropriate spaces. Use leading zeros (0) for month, day, or year values less than 10.

Time: Record the time, using military time codes (24 hours), that the water level was obtained.

Water-Level: Enter the depth to the water level in feet below the selected datum (land surface or top of casing). Precision may be carried to two decimal places.

Correction: Enter the correction in feet. The correction factor is the difference, in feet, between the measuring point and land surface datum. If the measuring point was land surface, then the correction factor is 0.00. If the measuring point is above the land surface such as the top of casing, then the correction factor is the distance from the measuring point to land surface preceded by a minus (-) sign. A plus (+) sign will precede correction factors below land surface. Precision may be carried to two decimal places.

Device Used: Circle the code indicating the method by which the water level was determined. The codes and their meanings are:

A - Air Line	S - Static Level
M - M-Scope	T - Tape Down
O - Other	W - Water-Level Recorder
R - Reported	

<u>Air Line</u> (A) - the water level was determined through the use of an air line and pressure gage.

<u>M-Scope</u> (M) - the water level was determined through the use of an electronic sensing device in which an electrode is suspended by a pair of insulated wires and an ammeter indicates a closed circuit and flow of current when the electrode touches the water surface.

<u>Other</u> (O) - the water level was determined using a method other than described in this section.

<u>Reported</u> (R) - the method used to determine the water level is not known.

<u>Static Level</u> (S) - the water level was determined by the contractor and reported to DGS.

<u>Tape Down</u> (T) - the water level was determined through the use of a wetted steel tape.

<u>Water-Level Recorder</u> (W) - the water level was determined using an automatic, continuous water-level recorder.

Notes

This space is provided for entering meaningful information for which no specific field is provided. Comments should be kept to a minimum.

DGS LITHOLOGIC LOG SCHEDULE

Well Identification

DGS ID: Enter the DGS well number assigned to this particular well. Please note: a DGS Well Schedule containing the assigned well number must be in the data system for Lithologic Log data to be accepted.

Page Number: Enter the page number. This entry is provided to keep track of multiple pages often required by detailed descriptive logs of deep test holes or wells.

Record By: Enter the first initial, middle initial, and last name of the individual who completes the Lithologic Log Schedule.

(CODE): Do not make an entry in (CODE).

Date Filed: Record the month, day, and year (MM, DD, YY) that the Lithologic Log Schedule was completed. If the month or day are not known, enter 00 in the appropriate spaces. Use leading zeros (0) for month, day, or year values less than 10.

Data Source: Circle the appropriate code on the schedule to indicate the agency or other source that submitted the data for completion of the schedule. The codes are:

- D - Driller
- G - DGS (Delaware Geological Survey)
- N - DNREC (Dept. of Natural Resources and Environmental Control)
- O - Owner
- R - Other Reported
- S - USGS (U. S. Geological Survey)
- U - Unknown

Lithologic Log Data

Log Type: Circle the appropriate code on the schedule to indicate the type of lithologic log. The codes are:

D - Driller's G - Geologist's

Depth: Enter the beginning (from) and ending (to) depths for the associated description. Precision may be carried to one decimal place. Depths are measured from land surface datum.

Description: Enter the description of the rock contained in the appropriate interval. Please use abbreviations where possible to reduce storage requirements.

PLEASE NOTE: "Lithologic Log Schedule Continuation Sheets" are available if additional lithologic input space is required for a particular well.

DGS SAMPLE LOG SCHEDULE

Well Identification

DGS ID: Enter the DGS well number assigned to this particular well. Please note: a DGS Well Schedule containing the assigned well number must be in the data system for Sample Log data to be accepted.

Page Number: Enter the page number. This entry is provided to keep track of multiple pages often required by detailed sampling of deep test holes or wells.

Record By: Enter the first initial, middle initial, and last name of the individual who completes the Sample Log Schedule.

(CODE): Do not make an entry in (CODE).

Date Filed: Record the month, day, and year (MM, DD, YY) that the Sample Log Schedule was completed. If the month or day are not known, enter 00 in the appropriate spaces. Use leading zeros (0) for month, day, or year values less than 10.

Data Source: Circle the appropriate code on the schedule to indicate the agency or other source that submitted the data for completion of the schedule. The codes are:

- D - Driller
- G - DGS (Delaware Geological Survey)
- N - DNREC (Dept. of Natural Resources and Environmental Control)
- O - Owner
- R - Other Reported
- S - USGS (U. S. Geological Survey)
- U - Unknown

Date Collected: Record the month, day, and year (MM, DD, YY) that the samples were collected. If the month or day are not known, enter 00 in the appropriate spaces. Use leading zeros (0) for month, day, or year values less than 10.

Project Name: Enter the name of the project if applicable.

Sample Data

This section of the schedule is used to record sample numbers and associated depths. Space has been provided to record 32 samples. A DGS Sample Log Continuation form is available for recording samples in excess of 32 for a particular well. Auger flight and cutting samples are assigned sample numbers in the 80,000 series while all core samples (split spoon, sidewall, and wireline) are assigned to sample numbers in the 20,000 series.

Sample Number: Enter the DGS sample number assigned to a particular sample.

Depth: Enter the beginning (from) and ending (to) depths for the associated sample number. Precision may be carried to one decimal place. Depths are measured from land surface datum.

Sampling Method: Enter the appropriate code to indicate the method of sample collection. The codes are:

A - Auger Flight	SSC - Split Spoon Core
C - Cuttings	SWC - Sidewall Core
	WLC - Wireline Core

DGS AQUIFER TEST SCHEDULE

Well Identification

DGS ID: Enter the DGS well number assigned to this particular well. Please note: a DGS Well Schedule containing the assigned well number must be in the data system for Aquifer Test data to be accepted. An Aquifer Test Schedule shall be completed for each well for which aquifer parameters have been determined during a specific test. For example, an individual schedule should be completed for the pumping well and for each observation well used as part of a single aquifer test.

Record By: Enter the first initial, middle initial, and last name of the individual who completes the Aquifer Test Schedule.

(CODE): Do not make an entry in (CODE).

Date Filed: Record the month, day, and year (MM, DD, YY) that the Aquifer Test Schedule was completed. If the month or day are not known, enter 00 in the appropriate spaces. Use leading zeros (0) for month, day, or year values less than 10.

General Site Data

Data Source: Circle the appropriate code on the schedule to indicate the agency or other source that submitted the data for completion of the schedule. The codes are:

D - Driller
G - DGS (Delaware Geological Survey)
N - DNREC (Dept. of Natural Resources and Environmental Control)
O - Owner
R - Other Reported
S - USGS (U. S. Geological Survey)
U - Unknown

Test Date: Record the month, day, and year (MM, DD, YY) that the test was started. If the month or day are not known enter 00 in the appropriate spaces. Use leading zeros (0) for month, day, or year values less than 10.

Well Type: Circle the appropriate code on the schedule to indicate whether the analysis was performed on data collected from the pumping well or observation well. The codes are:

O - Observation Well P - Pumping Well

Distance From Pumping Well: Enter the distance, in feet, from the pumping well to the observation well. No entry will be made if "Well Type P" is circled.

Pumping Well ID: Enter the DGS well number assigned to the well being pumped. A DGS Well Schedule containing the assigned well number must be in the data system before an entry is made in this field. No entry will be made if "Well Type P" is circled.

Discharge Rate: Enter the discharge rate in gallons per minute (gpm) for the pumping well.

Comments: Enter pertinent comments.

Duration: Enter the duration of the aquifer test. The duration should be reported in hours to the nearest 10th of an hour.

Pertinent Reference: If the data were extracted from a report, enter the last name(s) of the author(s) and the year the report was published.

(CODE): Do not make an entry in (CODE).

Analysis

Analysis Agency: Circle the appropriate code on the schedule to indicate the agency or other source that was responsible for analyzing the data. The codes are:

D - Driller
G - DGS (Delaware Geological Survey)
N - DNREC (Dept. of Natural Resources and Environmental Control)
O - Owner
R - Other Reported
S - USGS (U. S. Geological Survey)
U - Unknown

Other Reported - Enter the name of the agency that was responsible for analyzing the data in the space provided.

Analysis By: Enter the first name, middle initial, and last name of the person who determined the coefficients.

(CODE): Do not make an entry in (CODE).

Method of Analysis: Circle the appropriate code on the schedule to indicate the method used to determine the coefficients. Do not make an entry in this section for specific capacity. The codes are:

CJ - Cooper-Jacob
HA - Hantush Modified Leaky Artesian
TD - Theis Drawdown
TM - Theis Modified
TN - Theis Non-Leaky Artesian
TR - Theis Recovery
OT - Other
NC - Not Calculated
UK - Unknown

Other: - Enter the method used to analyze the data in the space provided.

Coefficients

Specific Capacity:	Enter the value of specific capacity, in gallons per minute per foot of drawdown (gpm/ft of drawdown). Precision may be carried to one decimal place.
Transmissivity:	Enter the value of transmissivity in square feet per day (ft^2/day). To convert gallons per day per foot (gal/day/ft) to square feet per day (ft^2/day), divide gal/day/ft by 7.48.
Horizontal Conductivity:	Enter the value of horizontal hydraulic conductivity (K), in ft/day.
Vertical Conductivity:	Enter the value of vertical hydraulic conductivity (K_z), in ft/day.
Storage Coefficient:	Enter the value of storage coefficient or specific yield (S).
Leakance:	Enter the value of the coefficient of leakance (L).
Diffusivity:	Enter the value of hydraulic diffusivity ($\frac{T}{S}$).
Specific Storage:	Enter the value of the storage coefficient per vertical unit of thickness (S_s).

Notes

This space is provided for entering meaningful information for which no specific field is provided. Comments should be kept to a minimum.

DGS GEOPHYSICAL LOG SCHEDULE

Well Identification

DGS ID: Enter the DGS well number assigned to this particular well. Please Note: a DGS Well Schedule containing the assigned well number must be in the data system for Geophysical Log data to be accepted.

Record By: Enter the first initial, middle initial, and last name of the individual who completes the Geophysical Log Schedule.

(CODE): Do not make an entry in (CODE).

Date Filed: Record the month, day, and year (MM, DD, YY) that the Geophysical Log Schedule was completed. If the month or day are not known enter 00 in the appropriate spaces. Use leading zeros (0) for month, day, or year values less than 10.

Geophysical Log Data

Date Logged: Record the month, day, and year (MM, DD, YY) that the well was logged. If the month or day are not known enter 00 in the appropriate spaces. Use leading zeros (0) for month, day, or year values less than 10.

Log Type: Enter the appropriate three character code to indicate the type of log available. The codes are:

- CAL - Caliper
- DFT - Differential Temperature
- DSP - Differential Single Point Electric
- FLO - Flowmeter
- GAM - Gamma
- GGL - Gamma Density
- GRS - Gamma Spectral
- IND - Induction
- MPE - Multiple Point Electric
- NEU - Neutron
- SFL - Spherically Focused
- SON - Sonic
- SPE - Single Point Electric
- TEM - Temperature
- OTH - Other

Log Source: Circle the appropriate code on the schedule to indicate the source responsible for running the log. The codes are:

- G - DGS (Delaware Geological Survey)
- R - Other
- S - USGS (U. S. Geological Survey)
- U - Unknown

Please note that if R is circled, one can enter the name in the "NOTES" section at the end of the schedule.

Log Start: Enter the depth to the top of the section logged, in feet.

Log Stop: Enter the depth to the bottom of the section logged, in feet.

Measuring Point: Circle the code indicating the reference point used for logging purposes. The codes are:

- GS - Ground Surface
- KB - Kelly Bushing or Rotary Table
- O - Other
- TC - Top of Casing

Please note that if O is circled, one can identify the measuring point in the "NOTES" section at the end of the schedule.

Correction: Enter the correction in feet. The correction factor is the difference in feet between the measuring point and land surface datum. If the measuring point was land surface datum, then the correction factor is 0.00. If the measuring point is above land surface such as the KB or TC, then the correction factor is the distance from the measuring point to land surface preceded by a minus (-) sign.

Notes

This space is provided for entering meaningful information for which no specific field is provided. Comments should be kept to a minimum.

DGS FIELD WATER QUALITY SCHEDULE

Well Identification

DGS ID: Enter the DGS well number assigned to this particular well. Please note: A DGS Well Schedule containing the assigned well number must be in the data system for Field Water Quality data to be accepted.

Record By: Enter the first initial, middle initial, and last name of the individual who completes the Field Water Quality Schedule.

(CODE): Do not make an entry in (CODE).

Date Filed: Record the month, day, and year (MM, DD, YY) that the Field Water Quality Schedule was completed. If the month or day are not known, enter 00 in the appropriate spaces. Use leading zeros (0) for month, day, or year values less than 10.

Water Quality Data

Date Sampled: Record the month, day, and year (MM, DD, YY) that the well was sampled. If the month or day are not known enter 00 in the appropriate spaces. Use leading zeros (0) for month, day, or year values less than 10.

Depth: Enter the depth from which the sample was taken in feet below land surface. Precision may be carried to two decimal places.

Flow: Enter the pumping rate in gallons per minute (gpm) at the time of sampling. Precision may be carried to one decimal place.

Water Level: Enter the depth to the water level in feet below land surface. Precision may be carried to two decimal places.

Collection Agency:	Enter the name of the agency responsible for collecting the sample in the field and conducting field analysis.
(CODE):	Do not make an entry in (CODE).
Analysis By:	Enter the first name, middle initial, and last name of the person who conducted the field analysis.
(CODE):	Do not make an entry in (CODE).
pH:	Enter the value of pH. Precision may be carried to one decimal place.
Temperature:	Enter the value of the temperature in degrees Centigrade. Precision may be carried to one decimal place. Temperature ^{o}C = (temperature ^{o}F - 32)/1.8.
Specific Conductance:	Enter the value of specific conductance in micromhos per centimeter. Precision may be carried to one decimal place.
Constituent:	Enter the code for the constituent analyzed. The codes for individual constituents are presented in Table 5. Individual constituents not currently included in Table 5 will be added as conditions warrant.
Value:	Enter the value of the amount of the constituent determined from the analysis. Precision may be carried to three decimal places.
Unit of Measurement:	Circle the code indicating the unit of measurement. The codes are: L - Less Than Detection M - Milligrams/liter (ppm) U - Micrograms/liter (ppb)

Table 5. Water quality constituents and associated codes.

AL	Aluminum	CU	Copper	NI	Nickel
AN	Antimony	F	Fluoride	P	Phosphorus
AS	Arsenic	I	Iodide	K	Potassium
BA	Barium	FED	Iron, Dissolved	SE	Selenium
BE	Beryllium	FET	Iron, Total	SI	Silica
B	Boron	PB	Lead	AG	Silver
BR	Bromide	LI	Lithium	NA	Sodium
CD	Cadmium	MG	Magnesium	SR	Strontium
CA	Calcium	MN	Manganese	TI	Titanium
CL	Chloride	HG	Mercury	VA	Vanadium
CR	Chromium	MD	Molybdenum	ZN	Zinc
CO	Cobalt				
AC	Acidity as $CaCO_3$	HD	Hardness as Ca, Mg	PH	pH
ALK	Alkalinity as $CaCO_3$	HDC	Hardness, Calcium	PN	Phenols
AM	Ammonium	HDM	Hardness, Magnesium	PO4	Phosphate
BAC	Bacteriological	HDT	Hardness, Total	SC	Specific Conductance
BC	Bicarbonate	MBA	Methylene Blue Active Substance	SO4	Sulfate
BOD	Biochemical Oxygen Demand	NCH	Noncarbonate Hardness	S	Sulfide
CAR	Carbonate	NAM	Nitrogen, Ammonia	SO3	Sulfite
CO2	Carbon Dioxide	NKT	Nitrogen, Total Kjeldahl	TE	Temperature °C
COD	Chemical Oxygen Demand	N3	Nitrogen, Nitrate	TOC	Total Organic Carbon
COF	Coliform, Fecal	N2	Nitrogen, Nitrite	DS	Solids, Dissolved Residue at 180°
COT	Coliform, Total	NO	Nitrogen, Organic	TDS	Solids, Total Dissolved
COL	Color	NOT	Nitrogen, Total Oxidized	TU	Turbidity (units)
CY	Cyanide	NT	Nitrogen, Total		
DO	Dissolved Oxygen	OD	Odor		
GR	Grease				

Method of Analysis: Enter the appropriate code to indicate the method of analysis. The codes are:

COL - Colorimetric
SIE - Specific Ion Electrode
SPM - Spectrophotometric
WCA - Wet Chemical Analysis
OTH - Other

Notes

This space is provided for entering meaningful information for which no specific field is provided. Comments should be kept to a minimum.

DGS LABORATORY WATER QUALITY SCHEDULE

Well Identification

DGS ID: Enter the DGS well number assigned to this particular well. Please note: A DGS Well Schedule containing the assigned well number must be in the data system for Laboratory Water Quality data to be accepted.

Record By: Enter the first initial, middle initial, and last name of the individual who completes the Laboratory Water Quality Schedule.

(CODE): Do not make an entry in (CODE).

Date Filed: Record the month, day, and year (MM, DD, YY) that the Laboratory Water Quality Schedule was completed. If the month or day are not known, enter 00 in the appropriate spaces. Use leading zeros (0) for month, day, or year values less than 10.

Water Quality Data

Date Collected:	Record the month, day, and year (MM, DD, YY) that the well was sampled. If the month or day are not known enter 00 in the appropriate spaces. Use leading zeros (0) for the month, day, or year values less than 10.
Analysis Agency:	Enter the name of the agency responsible for analyzing the sample in the laboratory.
(CODE):	Do not make an entry in (CODE).
Analysis By:	Enter the first name, middle initial, and last name of the person who conducted the laboratory analysis.
(CODE):	Do not make an entry in (CODE).
Laboratory Sample Number:	Enter the laboratory sample number, right justified.
Date of Analysis:	Record the month, day, and year (MM, DD, YY) that the laboratory analysis was performed. If the month or day are not known enter 00 in the appropriate spaces. Use leading zeros (0) for month, day, or year values less than 10.
Constituent:	Enter the code for the constituent analyzed. The codes for individual constituents are presented in Table 5. Individual constituents not currently included in Table 5 will be added as conditions warrant.
Value:	Enter the value of the amount of the constituent determined from the analysis. Precision may be carried to three decimal places.

Unit of Measurement:	Circle the code indicating the unit of measurement. The codes are:

L - Less Than Detection
M - Milligrams/liter (ppm)
U - Micrograms/liter (ppb)

Please note the specific conductance will automatically be recorded in micromhos/centimeter.

Method of Analysis:	Enter the appropriate code to indicate the method of analysis. The codes are:

AA - Flame Atomic Absorption
CR - Flameless Atomic Absorption
CV - Cold Vapor Generation
GC - Gas Chromatography
HPC - High Performance Liquid Chromatography
SIE - Specific Ion Electrode
WC - Wet Chemical Analysis
AAS - Flame Atomic Absorption Standard Addition
CRS - Flameless Atomic Absorption Standard Addition
CVS - Cold Vapor Generation Standard Addition
WCS - Wet Chemical Analysis Standard Addition
OTH - Other

Synthetic Organic Compounds:	Circle the appropriate code indicating whether synthetic organic compounds have (Y) or have not (N) been analyzed.

Notes

This space is provided for entering meaningful information for which no specific field is provided. Comments should be kept to a minimum.

Well Identification

API Well Number:	For detailed instructions for assigning an API well number see API Bulletin D12A titled "The API Well Number and Standard State and County Numeric Codes Including Offshore Waters" and "Instructions for Completing Individual Well Tickets for U. S. Drilling Statistics." The publications are in the DGS Technical Services Library. The API well number is a control number for a well. The original hole from total depth to surface is identified by a ten-digit number consisting of three parts - the state code, the county code, and the unique well code. When a well is directionally sidetracked, a fourth code of two digits is added.
State Code:	The State Code will be <u>61</u> for all offshore Atlantic wells. Enter the appropriate State Code listed on pages 30 and 31 in API Bulletin D12A.
Pseudo-County Code:	Enter the offshore area code associated with the specific UTM Quad, shown in Figure 4 and listed in Table 6. Refer to the API manuals for Pseudo-County Codes for onshore wells.
Well Code Original Hole:	Enter the API well code. In states which do not have an agency assigning API well numbers, one should assign API numbers serially with a new sequence for each pseudo-county (offshore wells), according to the following guidelines: for wells completed in 1970, use series 70,000, with the first well completed having a well code number 70,001; in 1971, use series 71,000; in 1972, use series 72,000, etc. Prior to assigning a Well Code, check with API to ascertain whether or not a number has been assigned by them.
Side Track:	Entries are made only to identify: (1) directional (deviated) wells or (2) Old Wells Drilled Deeper (OWDD).

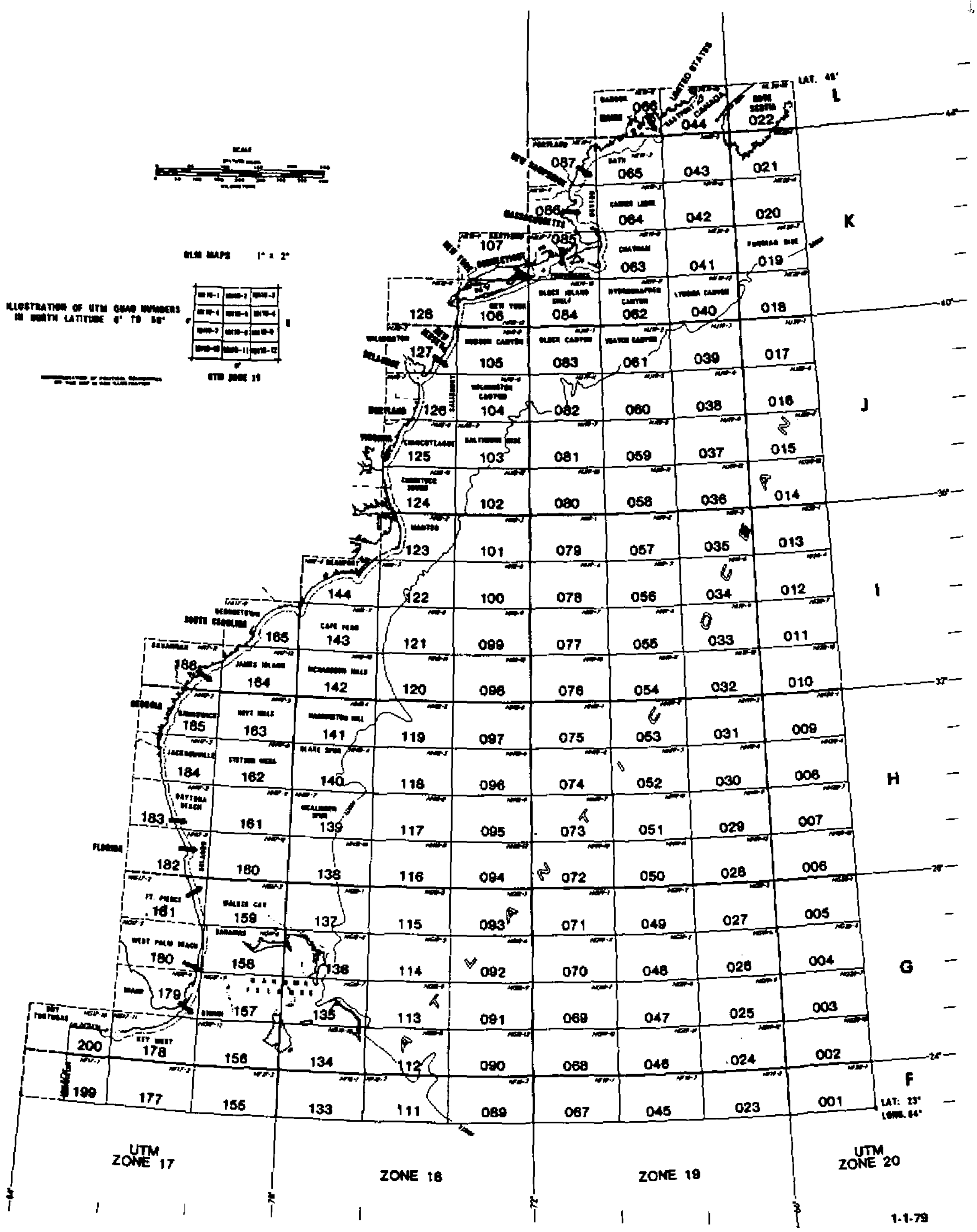


Figure 4. Map showing locations of UTM quadrangles and pseudo-county codes for Atlantic coast offshore federal waters (from API Bulletin D12A, January 1979).

Table 6. BLM area name, UTM quadrangles, and pseudo-county codes for Atlantic coast offshore federal waters (from API Bulletin D12A).

BLM AREA NAME	UTM QUAD	PSEUDO-COUNTY CODE
	NF 20-1	001
	NG 10-10	002
	NG 20-7	003
	NG 20-4	004
	NG 20-1	005
	NH 20-10	006
	NH 20-7	007
	NH 20-4	008
	NH 20-1	009
	NI 20-10	010
	NI 20-7	011
	NI 20-4	012
	NI 20-1	013
	NJ 20-10	014
	NJ 20-7	015
	NJ 20-4	016
	NJ 20-1	017
	NK 20-10	018
Fundian Rise	NK 20-7	019
	NK 20-4	020
	NK 20-1	021
	NL 20-10	022
	NF 19-3	023
	NG 19-12	024
	NG 19-9	025
	NG 19-6	026
	NG 19-3	027
	NH 19-12	028
	NH 19-9	029
	NH 19-6	030
	NH 19-3	031
	NI 19-12	032
	NI 19-9	033
	NI 19-6	034
	NI 19-3	035
	NJ 19-12	036
	NJ 19-9	037
	NJ 19-6	038
	NJ 19-3	039
Lydonia Canyon	NK 19-12	040
	NK 19-9	041
	NK 19-6	042
	NK 19-3	043
Eastport	NL 19-12	044
	NF 19-2	045
	NG 19-11	046
	NG 19-8	047
	NG 19-5	048
	NG 19-2	049
	NH 19-11	050
	NH 19-8	051
	NH 19-5	052
	NH 19-2	053

BLM AREA NAME	UTM QUAD	PSEUDO-COUNTY CODE
	NI 19-11	054
	NI 19-8	055
	NI 19-5	056
	NI 19-2	067
	NJ 19-11	058
	NJ 19-8	059
	NJ 19-5	060
Veach Canyon	NJ 19-2	061
Hydrographer Canyon	NK 19-11	062
Chatham	NK 19-8	063
Cashes Ledge	NK 19-5	064
Bath	NK 19-2	065
Bangor	NL 19-11	066
	NF 19-1	067
	NG 19-10	068
	NG 19-7	069
	NG 19-4	070
	NG 19-1	071
	NH 19-10	072
	NH 19-7	073
	NH 19-4	074
	NH 19-1	075
	NI 19-10	076
	NI 19-7	077
	NI 19-4	078
	NI 19-1	079
	NJ 19-10	080
	NJ 19-7	081
	NJ 19-4	082
Block Canyon	NJ 19-1	083
Block Island Shelf	NK 19-10	084
Providence	NK 19-7	085
Boston	NK 19-4	086
Portland	NK 19-1	087
	NF 18-3	089
	NG 18-12	090
	NG 18-9	091
	NG 18-6	092
	NG 18-3	093
	NH 18-12	094
	NH 18-9	095
	NH 18-6	096
	NH 18-3	097
	NI 18-12	098
	NI 18-9	099
	NI 18-6	100
	NI 18-3	101
	NJ 18-12	102
Baltimore Rise	NJ 18-9	103
Wilmington Canyon	NJ 18-6	104
Hudson Canyon	NJ 18-3	105
New York	NK 18-12	106
Hartford	NK 18-9	107

BLM AREA NAME	UTM QUAD	PSEUDO-COUNTY CODE
	NF 18-2	111
	NG 18-11	112
	NG 18-8	113
	NG 18-5	114
	NG 18-2	115
	NH 18-11	116
	NH 18-8	117
	NH 18-5	118
	NH 18-2	119
	NI 18-11	120
	NI 18-8	121
	NI 18-5	122
Manteo	NI18-2	123
Currituck Sound	NJ 18-11	124
Chincoteague	NJ 18-8	125
Salisbury	NJ 18-5	126
Wilmington	NJ 18-2	127
	NF 18-1	133
	NG 18-10	134
	NG 18-7	135
	NG 18-4	136
	NG 18-1	137
	NH 18-10	138
McAlinden Spur	NH 18-7	139
Blake Spur	NH 18-4	140
Harrington Hill	NH 18-1	141
Richardson Hills	NI 18-10	142
Cape Fear	NI 18-7	142
Beaufort	NI 18-4	144
	NF 17-3	155
	NG 17-12	156
Bimini	NG 17-9	157
Bahamas	NG 17-6	158
Walker Cay	NG 17-3	159
	NH 17-12	160
	NH 17-9	161
Stetson Mesa	NH 17-6	162
Hoyt Hills	NH 17-3	163
James Island	NI 17-12	164
Georgetown	NI 17-9	165
	NF 17-2	177
*Key West	NG 17-11	178
*Miami	NG 17-8	179
*West Palm Beach	NG 17-5	180
Ft. Pierce	NG 17-2	181
Orlando	NH 17-11	182
Daytona Beach	NH 17-8	183
Jacksonville	NH 17-5	184
Brunswick	NH 17-2	185
Savannah	NI 17-11	186
*	NF 17-1	199
*Dry Trotugas	NG 17-10	200

*Atlantic Waters

A directional well (deviated) is a well purposely deviated from the vertical using controlled angles to reach a new objective location and one other than the one directly below the surface location. A directional well may be the original hole or a directionally drilled hole which deviates from the original bore at some point below the surface.

If there is a common bore from which two or more wells are drilled, the first complete bore from the surface to the original objective is classified and reported as a well drilled. Each of the deviations from the common bore is reported as a separate well. A directional (deviated) well will have the same state, county, and well code as the original bore hole. The original bore hole, however, will have no entry for Side Track, but the first directionally deviated bore to a new objective will be identified by an entry of "01." If there is a second directionally drilled hole to a new objective, enter "02." Enter "03" for a third directionally drilled hole, etc.

Do not use Side Track to identify multiple deviations (controlled directional drilling) from a caisson, such as in the case of offshore wells, unless there is a directionally deviated bore to reach a new objective.

Do not use Side Track to identify a new hole drilled for the purposes of detouring around junk, redrilling lost hole, or straightening key seats and crooked holes. (For a detailed explanation and illustrations of directional wells, see API Bulletin D12A, December 1970).

Old Wells Drilled Deeper (OWDD) were not previously assigned a suffix in Side Track. However, effective January 1, 1972, you may enter an "80" when reporting all OWDDs including those converted to service wells.

Block Number: Enter the block number in which the well is located. The block number can be obtained from the Protraction Diagram. The block number can also be obtained from well logs supplied by the oil industry. The number should be right justified, i.e. 0286.

Record By: Enter the first initial, middle initial, and last name of the individual who completes the Well Schedule.

(CODE): Do not make an entry in (CODE).

Date Filed: Record the month, day, and year (MM, DD, YY) that the Well Schedule was completed. If the month or day are not known enter 00 in the appropriate spaces. Use leading zeros (0) for month, day, or year values less than 10.

Well Number: Enter the well number. This number can be obtained from well logs supplied by the oil industry. The number should be right justified, i.e. 002.

UTM Quad: Enter the appropriate UTM Quad number. UTM Quad numbers are contained in Table 6.

Operator: Enter the name of the operator of the lease block, i.e. Shell Oil Co., Exxon, etc.

(CODE): Do not make an entry in (CODE).

OCS Lease Number: Enter the appropriate lease number for that particular block as assigned by the Minerals Management Service (MMS). For example: OCS-A-0377.

General Site Data

Latitude: Enter the value for the latitude of the well in degrees, minutes, and seconds. Precision for seconds can be extended to two decimal places (hundredths of a second).

Longitude: Enter the value for the longitude of the well in degrees, minutes, and seconds. Precision for seconds can be extended to two decimal places (hundredths of a second). NOTE: Three spaces are provided for degrees. Degree values must be right justified, i.e. 071.

Location Data: Enter a description of the location of the well as measured from two sides of the lease block. For example: 1,000 feet north of the southern boundary and 500 feet east of the western boundary.

KB Elevation: Enter the elevation of the Kelly Bushing at the well, in feet above mean sea level. Precision can be extended to one decimal place.

Water Depth: Enter the depth of the water at the well site in feet. The depth will be the distance from mean sea level to the sea floor (mud line).

Well Description

Completion Date: Record the month, day, and year (MM, DD, YY) that the work on the well was completed. If the month or day are not known enter 00 into the appropriate spaces. Use leading zeros (0) for month, day, or year values less than 10.

The date of completion of an oil well or a gas well is the date on which the installation of permanent equipment is completed (for the production of oil or gas) as reported to the appropriate regulatory agency.

The date of completion of a dry hole is the date of abandonment as reported to the appropriate regulatory agency.

The date of completion of a service well is the date on which the well is equipped to perform the service for which it was intended.

Depth Drilled: Enter the deepest total depth of the well, in feet. The deepest total depth of a given well is the distance from a surface reference point (usually the Kelly Bushing) to the point of deepest penetration measured along the well bore. If a well is drilled from a platform or barge over water and the reference point is above water, the depth of the water is included in the total length of the well bore. Please note that if the well is directionally drilled use length of the well bore, <u>not</u> true vertical depth.

Bypass SDTR: (Deeper Drilled Footage) Enter; (1) the sum of all bypassed footage, or (2) in the case of a directional (deviated) well or an old well drilled deeper, include the actual new footage which has been drilled to a new total depth, plus any bypassed footage related to the new section of hole. Bypassed footage is the footage in that section of hole which is abandoned as a result of remedial sidetrack drilling operations for the purposes of detouring around junk, redrilling lost hole, or straightening key seats and crooked holes. Please note that the purpose of this entry is to account for footage drilled other than that from the surface to total depth. For example, an old well with an original total depth of 9,000 feet is reentered and deepened. In drilling to a new total depth the drill pipe twisted off at 10,500 feet and could not be recovered. A whipstock was set at 10,000 feet and the junk was bypassed to a new total depth of 11,500 feet.

New footage drilled = 11,500 - 9,000 = 2,500 feet
Bypass footage = 10,500 - 10,000 = 500 feet
New footage + bypassed footage = 2,500 + 500 = 3,000 feet

Enter 3,000 feet in Bypass SDTR.

Deepest Formation Drilled: For Atlantic OCS wells, entry in this category has usually included geologic age, i.e., Jurassic sands. However, the entry may change in response to different stratigraphic terminology.

Well Class, Initial and Final: Enter the appropriate code numbers for initial and final when applicable. Refer to Figure 5 titled "AAPG and API classification of wells" to select the proper code. Occasionally you will find that the final classification of a well differs from its initial classification. An example of this would be a deeper pool test (exploratory) which is plugged back and completed in a field pay (development). You should classify this well as "development." The codes and their meanings are:

(1) New Field Wildcat - A new field wildcat is a well located on a structural feature or other type of trap which has not previously produced oil or gas. In regions where local geological conditions have little or no control over accumulations, these wells are generally at least two miles from the nearest productive area. Distance, however, is not the determining

<table>
<tr><th colspan="4" rowspan="2">OBJECTIVE OF DRILLING</th><th rowspan="2">INITIAL CLASSIFICATION ϕ WHEN DRILLING IS STARTED</th><th colspan="4">FINAL CLASSIFICATION AFTER COMPLETION OR ABANDONMENT</th></tr>
<tr><th colspan="2">SUCCESSFUL ● ☼ ☼</th><th colspan="2">UNSUCCESSFUL ⌖</th></tr>
<tr><td colspan="4">Drilling for a new field on a structure or in an environment never before productive</td><td>1. NEW-FIELD WILDCAT</td><td colspan="2">NEW-FIELD DISCOVERY WILDCAT</td><td colspan="2">DRY NEW-FIELD WILDCAT</td></tr>
<tr><td rowspan="3">Drilling for a new pool on a structure or in a geological environment already productive</td><td rowspan="3">NEW POOL TESTS</td><td colspan="2">Drilling outside limits of a proved area of pool</td><td>2. NEW-POOL (PAY) WILDCAT</td><td rowspan="3">NEW-POOL DISCOVERY WELLS (Sometimes extension wells)</td><td>NEW-POOL DISCOVERY WILDCAT (Sometimes an extension well)</td><td rowspan="3">DRY NEW-POOL TESTS</td><td>DRY NEW-POOL WILDCAT</td></tr>
<tr><td rowspan="2">Drilling inside limits of proved area of pool</td><td>For a new pool below deepest proven pool</td><td>3. DEEPER POOL (PAY) TEST</td><td>DEEPER POOL DISCOVERY WELL</td><td>DRY DEEPER POOL TEST</td></tr>
<tr><td>For a new pool above deepest proven pool</td><td>4. SHALLOWER POOL (PAY) TEST</td><td>SHALLOWER POOL DISCOVERY WELL</td><td>DRY SHALLOWER POOL TEST</td></tr>
<tr><td colspan="4">Drilling for long extension of a partly developed pool</td><td>5. OUTPOST or EXTENSION TEST</td><td colspan="2">EXTENSION WELL (Sometimes a new-pool discovery well)</td><td colspan="2">DRY OUTPOST OR DRY EXTENSION TEST</td></tr>
<tr><td colspan="4">Drilling to exploit or develop a hydrocarbon accumulation discovered by previous drilling</td><td>6. DEVELOPMENT WELL</td><td colspan="2">DEVELOPMENT WELL</td><td colspan="2">DRY DEVELOPMENT WELL</td></tr>
</table>

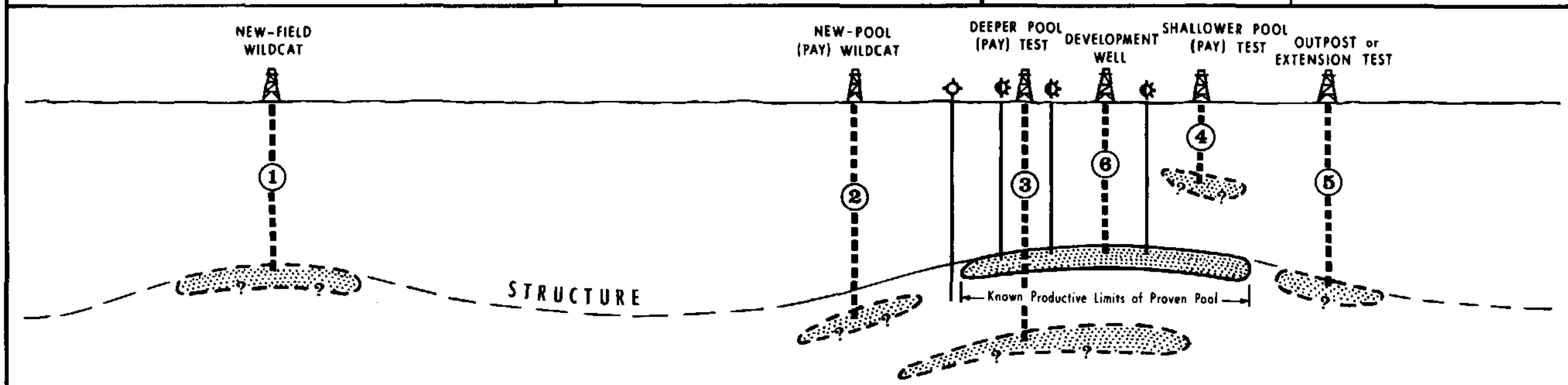


Figure 5. AAPG and API classification of wells (from Instructions for completing individual well tickets for U. S. drilling statistics, Part I and Part II, 1972: American Petroleum Institute).

factor. Of greater importance is the degree of risk assumed by the operator and his intention to test a structure or stratigraphic condition not previously proven productive.

(2) New Pool Wildcat - A new pool wildcat is a well located to explore for a new pool on a structural feature or other type of trap already producing oil or gas, but outside the known limits of the presently producing area. In some regions where local geological conditions exert an almost negligible control, exploratory holes of this type may be called "near wildcats." Such wells will usually be less than two miles from the nearest productive area.

(3) Deeper Pool Test - A deeper pool test is an exploratory hole located within the productive area of a pool, or pools, already partly or wholly developed. It is drilled below the deepest productive pool in order to explore for deeper unknown prospects.

(4) Shallower Pool Test - A shallower pool test is an exploratory well drilled in search of a new productive reservoir, unknown but possibly suspected from data secured from other wells, and shallower than known productive pools. The test is located within the productive area of a pool, or pools, previously developed.

(5) Outpost or Extension Test - An outpost is a well located and drilled with the expectation of extending for a considerable distance the productive area of a partly developed pool. It is usually two or more locations distant from the nearest productive site.

(6) Development Well - In general, a development well is a well drilled within the proved area of an oil or gas reservoir to the depth of a stratigraphic horizon known to be productive. If the well is completed for production it is classified as an oil or gas development well. If the well is not completed for production, it is classified as a dry development hole. If the well

deepened is within the proved area of an oil or gas reservoir and deep drilling is to the depth of a stratigraphic horizon known to be productive, enter code number 6.

(7) Stratigraphic Test - A stratigraphic test is a drilling effort, geologically directed, to obtain information pertaining to a specific geological condition that might lead toward the discovery of an accumulation of hydrocarbons. Such wells are customarily drilled without the intention of being completed for hydrocarbon production. This classification also includes tests identified as core tests and all types of expendable holes related to hydrocarbon exploration.

(8) Service Well - A service well is a well drilled or completed for the purpose of supporting production in an existing field. Wells of this class are drilled for the following specific purposes:

Gas injection (natural gas, propane, butane, or flue gas)
Water injection
Steam injection
Air injection
Salt water disposal
Water supply for injection
Observation
Injection for *in-situ* combustion

An exploration well is a well drilled:

(a) to find and produce oil or gas in an unproven area;
(b) to find a new reservoir in a field previously found to be productive of oil or gas in another reservoir;
(c) to extend the limits of a known oil and gas reservoir.

Exploration wells include:

(1) New Field Wildcat
(2) New Pool Wildcat
(3) Deeper Pool Test
(4) Shallower Pool Test
(5) Outpost (Extension) Test

Well Class, OWDD:	An old well drilled deeper is a previously drilled hole which is reentered and deepened by additional drilling. Such wells should be reported as: (1) oil or gas wells if completed for the production of oil or gas; (2) dry holes if sufficient quantities of oil or gas are not found to justify completion at the greater depth.
Number of Oil Completions:	Enter the total number of separately producing oil reservoirs or oil zones in this well. If unknown, do not make an entry. Do not include so-called "gas-condensate" completions regardless of the gas-condensate ratio. Such completions should be shown as gas completions. NOTE: A dry hole will be recorded by entering zeros (00).
Number of Gas Completions:	Enter the total number of separately producing gas or gas-condensate reservoirs or zones in this well. If unknown, do not make an entry. NOTE: A dry hole will be recorded by entering zeros (00).
Name of Field:	Enter the name of the field, if known.
Pay Name:	Enter a generalized description, for example, Upper Jurassic sands. There may be more than one pay per well. Pay intervals will be described in the section titled "Producing Intervals."

Tested Intervals

This section of the schedule is used to record data pertaining to the intervals tested for oil and/or gas. Space is provided to record information on six intervals. Datum is the Kelly Bushing. Measurements are in feet.

Top:	Enter the depth to the top of the tested interval.
Bottom:	Enter the depth to the bottom of the tested interval.

Oil BBl/day: Enter the oil yield for the particular interval being tested in barrels per day.

Gas MMCFD: Enter the gas yield for the particular interval being tested in millions of cubic feet per day.

Condensate: Enter the appropriate number for the particular interval being tested.

BBl/day or BBl/MMCF: Enter a (Y) in the appropriate block to indicate whether the condensate yield is measured in BBl/day <u>or</u> BBl/MMCF. No entry indicates that the unit of measurement is unknown or different from the above two.

Producing Intervals

This section of the schedule is used to record data pertaining to the intervals producing oil and/or gas. Space is provided to record information on six intervals. Datum is the Kelly Bushing. Measurements are in feet.

Top: Enter the depth to the top of the producing interval.

Bottom: Enter the depth to the bottom of the producing interval.

Oil BBl/day: Enter the oil yield for the particular producing interval in barrels per day.

Gas MMCFD: Enter the gas yield for the particular producing interval in millions of cubic feet per day.

Condensate: Enter the appropriate number for the producing interval.

BBl/day or BBl/MMCF: Enter a (Y) in the appropriate block to indicate whether the condensate yield is measured in BBl/day <u>or</u> BBl/MMCF. No entry indicates that the unit of measurement is unknown or different from the above two.

Well Log Data

This section of the schedule is used to identify intervals in the well for which logs are available. Space has been provided to record information on 19 intervals. Datum is the Kelly Bushing. Measurements are in feet.

Log Type: Enter the appropriate code indicating the type of log available for a particular interval. The codes and their meanings are listed in Table 7. Please note: "OCS Well Log Data Continuation Sheets" are available for additional well log data.

Log Start: Enter the depth of the top of the section logged.

Log Stop: Enter the depth of the bottom of the section logged.

Scale: Enter the vertical scale of the log. For example: 1:200.

Paper: Enter (Y) if the particular log is available in paper form at the DGS. If not available in this form at DGS, leave blank.

Microfilm: Enter (Y) if the particular log is available on microfilm at the DGS. If not available in this form at the DGS, leave blank.

Sample Data

This section of the schedule is used to identify intervals for which samples are available. Space has been provided to record information on 19 intervals. Datum is Kelly Bushing. Please note that entries can be made in the start and stop columns even though there may not be any corresponding DGS sample number. Measurements are in feet.

DGS Sample Number: Enter the DGS sample numbers which have been assigned to the first and last samples in a particular depth interval.

Table 7. List of OCS well logs and corresponding abbreviations (provided by Petroleum Information Corporation, Midland, Texas).

Abbreviation	Log
ACS	Acoustic
ACS-BND	Acoustic Bond
ACS-BND-DEN	Acoustic Bond Density
ACS-BND-DEN-GR	Acoustic Bond Density Gamma Ray
ACS-BND-GR	Acoustic Bond Gamma Ray
ACS-BND-GRN	Acoustic Bond Gamma Ray Neutron
ACS-BND-NEU	Acoustic Bond Neutron
ACS-BND-MSG	Acoustic Bond Micro Seismogram
ACS-BND-VAR-DEN	Acoustic Bond Variable Density
ACS-CAL	Acoustic Caliper
ACS-EVAL	Acoustic Evaluation
ACS-EVAL-GR	Acoustic Evaluation Gamma Ray
ACS-FRAC	Acoustic Fracture Log
ACS-FRAC-ID	Acoustic Fracture Identification
ACS-GR	Acoustic Gamma Ray
ACS-GR-CAL	Acoustic Gamma Ray Caliper
ACS-NEU	Acoustic Neutron
ACS-PAR	Acoustic Parameter
ACS-SCOPE	Acoustic Scope Picture
ACS-SN	Acoustic Sidewall Neutron
ACS-SP	Acoustic Spontaneous Potential
ACS-VEL	Acoustic Velocity
ACS-VEL-CAL	Acoustic Velocity Caliper
ACS-VEL-GR	Acoustic Velocity Gamma Ray
ACS-VEL-GRN	Acoustic Velocity Gamma Ray Neutron
ACS-VEL-NEU	Acoustic Velocity Neutron
AMP-SON	Amplitude Sonic
AMP-VAR-DEN	Amplitude Variable Density
AMP-WAVE	Amplitude Wave Formation
ANALYSIS	Analysis Log
ARROW PLOT	Arrow Plot Log
AUDIO	Audio
BH-GEO	Borehole Geometry Tool
BH-GEO-GR	Borehole Geometry Tool Gamma Ray
BH-TV	Borehole Televiewer
BHC-ACS	Borehole Compensated Acoustic
BHC-ACS-GR	Borehole Compensated Acoustic Gamma Ray
BHC-ACS-GRN	Borehole Compensated Acoustic Gamma Ray Neutron
BHC-ACS-NEU	Borehole Compensated Acoustic Neutron
BHC-ACS-TEMP	Borehole Compensated Acoustic Temperature
BHC-ACS-VEL	Borehole Compensated Acoustic Velocity
BHC-DEN	Borehole Compensated Density
BHC-DEN-GR	Borehole Compensated Density Gamma Ray
BHC-DEN-NEU	Borehole Compensated Density Neutron
BHC-DEN-TEMP	Borehole Compensated Density Temperature
BHC-DEN-ENP	Borehole Compensated Density Epithermal Neutron Porosity
BHC-FRAC-ACS	Borehole Compensated Fracture Acoustic
BHC-GEO	Borehole Compensated Geometry Tool
BHC-NEU	Borehole Compensated Neutron
BHC-SON	Borehole Compensated Sonic
BHC-SON-CAL	Borehole Compensated Sonic Caliper
BHC-SON-CNFD	Borehole Compensated Sonic Compensated Neutron Formation Density
BHC-SON-DI-LL	Borehole Compensated Sonic Dual Induction Laterlog
BHC-SON-DEN	Borehole Compensated Sonic Density
BHC-SON-FOR-DEN	Borehole Compensated Sonic Formation Density
BHC-SON-GR	Borehole Compensated Sonic Gamma Ray
BHC-SON-GRN	Borehole Compensated Sonic Gamma Ray Neutron
BHC-SON-NEU	Borehole Compensated Sonic Neutron
BHC-VAR-DEN	Borehole Compensated Variable Density
BND	Bond (Cement)
BND-CCL	Bond Casing Collar Log
BND-DEN-CCL	Bond Density Casing Collar Log
BND-DEN-CCL-GR	Bond Density Casing Collar Log Gamma Ray
BND-DEN-GR	Bond Density Gamma Ray
BND-GR	Bond Gamma Ray
BND-SON-GR	Bond Sonic Gamma Ray
BND-VAR-DEN	Bond Variable Density
BULK-DEN	Bulk Density
C-ACS	Compensated Acoustic
C-ACS-VEL	Compensated Acoustic Velocity
C-ACS-VEL-DI	Compensated Acoustic Velocity Dual Induction
COMP-AMP	Compressional Amplitude
C-DEN	Compensated Density
C-DEN-IE	Compensated Density Induction Electricity
C-DEN-MIL	Compensated Density Minilog
C-DEN-NEU	Compensated Density Neutron
C-DEN-SN	Compensated Density Sidewall Neutron
C-FOR	Compensated Formation
C-FOR-DEN	Compensated Formation Density
C-FOR-DEN-GR	Compensated Formation Density Gamma Ray
C-FOR-NEU	Compensated Formation Neutron
C-GRN	Compensated Gama Ray Neutron
C-I-E-M-D	Casing Inspection Electro Magnetic Detector
C-LITH	Compensated Lithology Log
C-NEU	Compensated Neutron
C-NEU-FOR-DEN	Compensated Neutron Formation Density
C-NEU-POR	Compensated Neutron Porosity
C-SN	Compensated Sidewall Neutron
C-SON	Compensated Sonic
CAL	Caliper
CAL-FRX	Caliper Forxo
CAL-PERF-CCL	Caliper Perforating Casing Collar Log
CARBON OXYGEN	Carbon Oxygen
CCL	Casing Collar Log
CEMETON	Cemeton
CHEMICAL	Chemical Log
CHANNEL	Channel Survey
CHLORINILOG	Chlorinilog
CNFD-SNP	Compensated Neutron Formation Density Sidewall Neutron Porosity
CON-CAL	Contact Caliper
CONT-DIP	Continuous Dipmeter
CONT-FLOW	Continuous Flow
COR	Coriband
CORE	Core Graph
CORE-REC	Core Record
CORR	Correlation
CPD	Computed
CPR	Computer
CPR-ACOUSTIC	Computer Acoustic
CPR-ANALYSIS	Computer Analysis
CYB	Cyberlook (Computer Processed Log)
CYB-EM-PROP	Cyberlook Electromagnetic Propagation
CYBERDIP	Cyberdip
CYB-GRAPHIC	Cyberlook Graphic
D-DET-NLL	Dual Detector Neutron Lifetime Log
D-GRD	Dual Guard
D-GRD-FRX	Dual Guard Forxo
D-LL	Dual Laterolog
D-H-CAL	Down Hole Caliper
D-LL-DI	Dual Laterolog Dual Induction
D-LL-DI-LL	Dual Laterolog Dual Induction Laterolog
D-LL-FOC	Dual Laterolog Focus
D-LL-FOC-GR	Dual Laterolog Focus Gamma Ray
D-LL-GR	Dual Laterolog Gamma Ray
D-LL-ML	Dual Laterolog Microlog
D-LL-GR-MLL	Dual Laterolog Gamma Ray Microlaterolog
D-LL-ML-FOC	Dual Laterolog Microlog Focus
D-LL-MLL	Dual Laterolog Micro Laterolog
D-LL-MSFL	Dual Laterolog Micro Spherically Focused
D-LL-MSFL-SNP	Dual Laterolog Micro Spherically Focused Sidewall Neutron Porosity
D-LL-SFL	Dual Laterolog Spherically focused Log
D-SP-ACS	Dual Spaced Acoustic
D-SP-C-NEU	Dual Spaced Compensated Neutron
D-SP-NEU-DEC	Dual Spacing Thermal Neutron Decay Time Log
D-SP-NEU-DEN	Dual Spaced Neutron Density
DATA-PROFILE	Data Acquisition & Technical Analysis Profile
D-SP-SON	Dual Spaced Borehole Compensated Sonic
DELTACHLORIDE	Deltachloride Log
DEN	Density
DEN-BND	Density Bond
DEN-C-NEU	Compensated Density Compensated Neutron
DEN-CAL	Density Caliper
DEN-GR	Density Gamma Ray
DEN-GR-CAL	Density Gamma Ray Caliper
DEN-GR-TEMP	Density Gamma Ray Temperature
DEN-GRN	Density Gamma Ray Neutron
DEN-GRN-TEMP	Density Gamma Ray Temperature
DEN-MIL	Density Minilog
DEN-MIL-GR	Density Minilog Gamma Ray
DEN-ML	Density Microlog
DEN-NEU	Density Neutron
DEN-NEU-MIL	Density Neutron Minilog
DEN-NEU-ML	Density Neutron Microlog
DEN-NEU-SON	Density Neutron Sonic
DEN-SN	Density Sidewall Neutron
DEN-SN-TEMP	Density Sidewall Neutron Temperature
DEN-SNP	Density Sidewall Neutron Porosity
DEN-SNP-TEMP	Density Sidewall Neutron Porosity Temperature
DEN-SON	Density Sonic
DEN-TEMP	Density Temperature
DEPTH-CORR	Depth Correlation
DEPTH-DET	Depth Detector
DETAIL	Detail Log
DEV-PLOT	Deviation Plot
DI	Dual Induction
DIAM-INV	Diameter of Invasion
DI-BHC-ACS	Dual Induction Borehole Compensated Acoustic
DI-BHC-SON	Dual Induction Borehole Compensated Sonic
DI-C-DEN	Dual Induction Compensated Density
DI-CNFD	Dual Induction Compensated Neutron Formation Density
DI-DEN-GRN	Dual Induction Density Gamma Ray Neutron
DI-E	Dual Induction Electric
DIELECTRIC	Dielectric Constant Log
DI-FOC	Dual Induction Focus
DI-FOC-ACS	Dual Induction Focus Acoustic
DI-FOC-BHC-ACS	Dual Induction Focus Borehole Compensated Acoustic
DI-FOC-DEN	Dual Induction Focus Density
DI-FOC-DEN-GR	Dual Induction Focus Density Gamma Ray
DI-FOC-GR	Dual Induction Focus Gamma Ray
DI-GR	Dual Induction Gamma Ray
DI-GRN	Dual Induction Gamma Ray Neutron
DI-GRD	Dual Induction Guard
DI-GRD-GRN	Dual Induction Guard Gamma Ray Neutron

Table 7. (continued).

DI-GRD-C-ACS	Dual Induction Guard Compensated Acustic
DI-LL	Dual Induction Laterolog
DI-LL-BHC-ACS	Dual Induction Borehole Compensated Acoustic
DI-LL-BHC-SON	Dual Induction Borehole Compensated Sonic
DI-LL-CNFD	Dual Induction Laterolog Compensated Neutron Formation Density
DI-LL-D-LL-ML	Dual Induction Laterolog Dual Laterolog Microlog
DI-LL-GRD	Dual Induction Laterolog Guard
DI-LL-IE	Dual Induction Laterolog Induction Electric
DI-LL-ML	Dual Induction Laterolog Microlog
DI-LL-MSFL	Dual Induction Laterolog Micro Spherically Focused Log
DI-LL-SFL	Dual Induction Laterolog Spherically Focused
DI-LL-SON	Dual Induction Laterolog Sonic
DI-ML	Dual Induction Microlog Focus
DI-LL-MSFL	Dual Induction Laterolog Micro Spherically Focused Log
DI-LL-SFL	Dual Induction Laterolog Spherically Focused
DI-LL-SON	Dual Induction Laterolog Sonic
DI-ML	Dual Induction Microlog
DL-ML-FOC	Dual Induction Microlog Focus
DL-MSFL	Dual Induction Micro Spherically Focused Log
DI-SFL	Dual Induction Spherically Focused Log
DI-LL-SON	Dual Induction Laterolog Sonic
DI-ML	Dual Induction Microlog
DI-ML-FOC	Dual Induction Microlog Focus
DI-MSFL	Dual Induction Micro Spherically Focused Log
DI-SFL	Dual Induction Spherically Focused Log
DI-SFL-BHC-SON	Dual Induction Spherically Focused Borehole Compensated Sonic
DI-SFL-C-NEU	Dual Induction Spherically Focused Compensated Neutron
DI-SFL-CNFD	Dual Induction Spherically Focused Compensated Neutron Formation Density
DI-SFL-E	Dual Induction Spherically Focused Electric
DI-SFL-GR	Dual Induction Spherically Focused Log Gamma Ray
DI-SFL-SON	Dual Induction Spherically Focused Sonic
DI-SON	Dual Induction Sonic
DIFF-TEMP	Differantial Temperature
DIP	Dipmeter
DIP-CPD	Dipmeter Computed
DIP-NCPD	Dipmeter Not Computed
DIR	Directional
DIR-CPD	Directional Computed
DIS-GRD	Deep Induction Short Guard
DITCH-SAMPLE	Ditch Sample
DRIFT	Drift Log
DRLG-TIME	Drilling Time Log
DRI	Dual Resistivity Tool
DRILL-STEM	Drill Stem Test
DRILLERS	Drillers Log
DRGL-PORO	Drilling Porosity
E	Electric Survey
E-CAL	Electric Survey Caliper
E-DEN-GRD	Electric Survey Density Guard
E-GR	Electric Survey Gamma Ray
E-GRN	Electric Survey Gamma Ray Neutron
E-IE	Electric Survey Induction Electric
E-ML	Electric Survey Microlog (Micro Resistivity)
E-PROP	Electric Survey Propagation Log
EM-PROP	Electromagnetic Propagation Log
ENG-PROD	Engineered Production Logging
ENP	Epithermal Neutron Porosity
ENP-WSS	Epithermal Neutron Porosity Well Bore Sibilation Survey
EP	Epithermal
EP-SN	Epithermal Sidewall Neutron
EPI	Epilog
EPI-GRN	Epilog Gamma Ray Neutron
EPI-NEU	Epilog Neutron
EPI-NEU-POR	Epilog Neutron Porosity
EVAL	Evaluation
EXPONENT	Exponent
F-LOG	F-Overlay
FLOW METER	Continuous Flow
FLUID DEN	Fluid Density
FLUID TRAVEL	Fluid Travel Log
FOC	Focused
FOC-GR	Focused Gamma Ray
FOR	Formation
FOR-ANALYSIS	Formation Analysis
FOR-DEN	Formation Density
FOR-DEN-GR	Formation Density Gamma Ray
FOR-DEN-GRN	Formation Density Gamma Ray Neutron
FOR-DEN-ML	Formation Density Microlog
FOR-DEN-SN	Formation Density Sidewall Neutron
FOR-FAC	Formation Factor
FOR-PRESSURE	Formation Pressure
FOR-TEST	Formation Tester
FRAC	Fracture
FRAC-ID	Fracture Identification Log
FRF	Fracture Finder Log
FRF-MSG	Fracture Finder Micro Seismogram
FRF-MSG-BND	Fracture Finder Micro Seismogram Bond
FRX	Forxo
FRX-GR	Forxo Gamma Ray
FRX-GRD	Forxo Guard
GAS-DET	Ultra Sonic Gas Detector
GEOGRAM	Geogram
GEOLOGIC	Geologic Log of Drill Hole
GEOPHONE	Geophone
GEOPHYSICAL	Geophysical Log
GR	Gamma Ray (Radioactivity)
GR-BND-VAR-DEN	Gamma Ray Bond Variable Density
GR-CAL	Gamma Ray Caliper
GR-CCL	Gamma Ray Casing Collar Log
GR-CCL-BND	Gamma Ray Casing Collar Log Bond
GR-CCL-PERF	Gamma Ray Casing Collar Log Perforating
GR-CORR	Gamma Ray Correlation
GR-CPD	Gamma Ray Computed
GR-DEN-CCL	Gamma Ray Density Casing Collar Log
GR-DIFF-TEMP	Gamma Ray Differential Temperature
GR-GRD-FRX	Gamma Ray Guard Forxo
GR-PDC	Gamma Ray Perforation Depth Control
GR-PDC-BND	Gamma Ray Perforating Depth Control Bond
GR-PDC-CCL	Gamma Ray Perforating Depth Control Casing Collar Log
GR-SEC-GAUGE	Gamma Ray Section Gauge
GR-SMG	Gamma Ray Seismogram
GR-SMG-BND	Gamma Ray Seismogram Bond
GR-SPECTRO	Gamma Ray Spectroscopy
GR-TEMP	Gamma Ray Temperature
GR-TEMP-CCL	Gamma Ray Temperature Casing Collar Log
GR-TEMP-TRACER	Gamma Ray Temperature Tracer
GR-TRACER	Gamma Ray Tracer
GR-VERTICAL	Gamma Ray Vertical
GR-WS-1	Gamma Ray Whipstock 1
GR-WS-2	Gamma Ray Whipstock 2
GR-WSS	Gamma Ray Wellbore Sibilation Survey
GR-WSS-TEMP	Gamma Ray Wellbore Sibilation Survey Temperature
GRD	Guard
GRD-CAL	Guard Caliper
GRD-GR	Guard Gamma Ray
GRD-GRN	Guard Gamma Ray Neutron
GRN	Gamma Ray Neutron
GRN-ACS	Gamma Ray Neutron Acoustic
GRN-BND	Gamma Ray Neutron Bond
GRN-CAL	Gamma Ray Neutron Caliper
GRN-CCL	Gamma Ray Neutron Casing Collar Log
GRN-DEN-CAL	Gamma Ray Neutron Density Caliper
GRN-DEN-GRD	Gamma Ray Neutron Density Guard
GRN-FOR-DEN	Gamma Ray Neutron Formation Density
GRN-PDC	Gamma Ray Neutron Perforating Depth Control
GRN-TEMP	Gamma Ray Neutron Temperature
GRN-VERTICAL	Gamma Ray Neutron Vertical
GRN-WS-1	Gamma Ray Neutron Whipstock 1
GRN-WS-2	Gamma Ray Neutron Whipstock 2
GRAPHIC	Graphic Log
GYROSCOPIC	Gyroscopic and Magnetic Survey
HC	Hydrocarbon
HDT	Geological Stratigraphic Log
HOLE-SEC	Hole Section Survey
HR-DIP	High Resolution Dipmeter
HR-TEMP	High Resolution Temperature
HYDRO	Hydro
I	Induction
I-CNFD	Induction Compensated Neutron Formation Density
I-C-DEN-GR	Induction Compensated Density Gamma Ray
I-C-DEN-GRN	Induction Compensated Density Gamma Ray Neutron
I-DEN-SNP	Induction Density Sidewall Neutron Porosity
I-DEL	Porosity-Pore Pressure
IE-TVD	Induction Electric True Vertical Depth
I-GR	Induction Gamma Ray
I-FOR-DEN	Induction Formation Density
I-GRD	Induction Guard
I-GRD-C-ACS	Induction Guard Compensated Acoustic
I-GRN	Induction Gamma Ray Neutron
I-LL	Induction Laterolog
I-LL-SON	Induction Laterolog Sonic
I-NEU	Induction Neutron
I-SFL	Induction Spherically Focused Log
I-SFL-GR	Induction Spherically Focused Log Gamma Ray
I-SFL-C-NEU	Induction Spherically Focused Compensated Neutron
I-SFL-CNFD	Induction Spherically Focused Compensated Neutron Formation Density Log
I-SF-E	Induction Spherically Focused Electric
I-SFL-LL	Induction Spherically Focused Laterolog
I-SON	Induction Sonic Log
I-SON-GR	Induction Sonic Gamma Ray Log
I-SFL-TVD	Induction Spherically Focused Log-True Vertical Depth
I-VEL	Induction Velocity
IE	Induction Electric
IE-BHC-ACS	Induction Electric Borehole Compensated Acoustic

Table 7. (continued).

IE-BHC-SON	Induction Electric Borehole Compensated Sonic
IE-BHC-NEU	Induction Electric Borehole Compensated Neutron
IE-DEN	Induction Electric Density
IE-DEN-GR	Induction Electric Density Gamma Ray
IE-DEN-LASER	Induction Electric Density Laser Log
IE-DEN-NEU	Induction Electric Compensated Density Compensated Neutron
IE-FOC	Induction Electric Focus Log
IE-GR	Induction Electric Gamma Ray Log
IE-GRD	Induction Electric Guard Log
IE-GRN	Induction Electric Gamma Ray Neutron Log
IE-LL	Induction Electric Laterolog
IE-ML	Induction Electric Microlog
IE-ML-E	Induction Electric Microlog Electrical Survey
INJ	Injection
ISF-NEU-SON	Induction Spherically Focused Neutron Sonic
ISF-SON	Induction Spherically Focused Sonic
ISF-SON-GRN	Induction Spherically Focused Gamma Ray Neutron
INJ-TEMP	Injection Temperature
INJ-TRACER	Injection Tracer
ISF-SON-TRD	Induction Spherically Focused Sonic TRD
KUT	Potassium Uranium Thorium Log
LASER	Laser Log
LASER-CPD	Laser Log Computer Processed Log
LASER-CROSS	Laser Cross Plot
LASER-MOP	Laser Moveable Oil Plot
LDT	Litho Density Tool
LIN-DEN	Linear Density
LIN-NEU	Linear Neutron
LIN-NEU-DEN	Linear Neutron Density
LIN-NEU-DEN-GR	Linear Neutron Density Gamma Ray
LIN-NEU-DEN-POR	Linear Neutron Density Porosity
L-I-INJ	Liquid Isotope Injector
LITH	Lithology
LITH-MATRIX	Lithology Matrix
LL	Laterolog
LL-GR	Laterolog Gamma Ray
LL-GRN	Laterolog Gamma Ray Neutron
LL-ML	Laterolog Mircolog
LOL	Logarithmic Overlay
MAG	Magna Log
MAGNETIC	Magnetic
MAGNETIC-CAL	Magnetic Caliper
MLL	Micro Laterolog
MLL-CAL	Micro Laterolog Caliper
MLL-GR	Micro Laterolog Gamma Ray
MLL-LL	Micro Laterolog Laterolog
MLL-ML	Micro Laterolog Microlog
ML	Microlog
ML-CAL	Microlog Caliper
ML-E-CAL	Microlog Electric Survey Caliper
ML-EM-PROP	Microlog Electromagnetic Propagation
ML-GR	Microlog Gamma Ray
ML-GRD	Microlog Guard
MSFL	Micro Spherically Focused Log
MSG	Micro Seismogram
MSG-BND	Micro Seismogram Bond
MSG-GR	Micro Seismogram Gamma Ray
ML-GRN	Micro Gamma Ray Neutron
MINERAL	Mineral Log
MIF	Minifocused
MIL	Minilog
MIL-CAL	Minilog Caliper
MOB-PIC	Mobile Picture
MOP	Moveable Oil Plot
MSS	Multi Shot Survey
NDT	Neutron Density Tension (with Gamma Ray)
NEU	Neutron
NEU-BND	Neutron Bond
NEU-CCL	Neutron Casing Collar Log
NEU-FOR-DEN	Neutron Formation Density
NEU-FLO	Neutron Flo Log
NEU-LITH-DEN	Neutron Lithology Density
NEU-MSG	Neutron Micro Seismogram
NEU-POR	Neutron Porosity
NLL	Neutron Lige Time Log
NOISE	Noise Log
NUC-MAG	Nuclear Magnetism
NUCLEAR FLOW	Nuclear Flow
PDC	Perforating Depth Control
PEP	Pressure Evaluation Profile
PERF	Perforating
PERF-CCL	Perforating Casing Collar Log
PERF-FOR	Perforating Formation
PERF-GR	Perforating Gamma Ray
PERF-REC	Perforating Record
PFC	Perforating Formation Collar
PFC-GR	Perforating Formation Collar Gamma Ray
PFC-GRN	Perforating Formation Collar Gamma Ray Neutron
PHCL	Photoclinometer
PHOTON	Photon Log (CA)
PHYSICAL-FOR	Physical Formation
PIPE-REC	Pipe Record
POLAR PLOT	Polar Plot
PRESS	Press Log
PRES-DET	Pressure Detection Log
PROD	Production Log
PROD-PROFILE	Production Profile Log
PROFILE	Profile Log
PRX	Proximity
PRX-MIL-CAL	Proximity Minilog Caliper
PRX-ML	Proximity Microlog
PRX-ML-CAL	Proximity Microlog Caliper
ML	Perma
RFT	Repeat Formation Tester
REFRACT	Refracture
RES-DIP	Resistivity Dipmeter
RO	RØ Curve (California)
SAMPLE	Sample Log
SAMPLE STUDY	Sample Study Log
SAR	Saraband
SATA-CEM	Sata Cement
SEC-GAGE	Section Gage
SHALE-DEN	Shale Density
SHEAR-AMP	Shear Amplitude
SN	Sidewall Neutron
SN-GR	Sidewall Neutron Gamma Ray
SN-GR-CAL	Sidewall Neutron Gamma Ray Caliper
SN-GR-GRD	Sidewall Neutron Gamma Ray Guard
SN-GR-MIL	Sidewall Neutron Gamma Ray Mini Log
SN-GRD	Sidewall Neutron Guard
SNP	Sidewall Neutron Porosity
SNP-BHC-SON	Sidewall Neutron Porosity Borehole Compensated Sonic
SON	Sonic
SON-AMP	Sonic Amplitude
SON-BND	Sonic Bond
SON-GR	Sonic Gamma Ray
SON-GRN	Sonic Gamma Ray Neutron
SON-NEU-FOR-DEN	Sonic Neutron Formation Density
SON-TEMP	Sonic Temperature
SONAN-TEMP	Sonan Temperature
SONAN	Sonan
SPA	Scope Picture Analysis
SPECTRA	Spectra Log
SPECTRA-GR	Spectra Gamma Ray
SPECTRA-GRN	Spectra Gamma Ray Neutron
SPECTRUM	Seismic Spectrum
SPINNER	Spinner Survey
SRS-NEU	Seismic Reference Survey Neutron
STRATA	Strata Log
STRUCT-EXPL	Structural Exploration
SUB-PRESSURE	Subsurface Pressure Log
SW-CORE	Sidewall Core
SYN	Synergetic
SYN-COR	Synergetic Coriband
SYN-SAR	Synergetic Saraband
TEMP	Temperature
THER-NEU	Thermal Neutron
TRAC-III	Trac-III
TRACER	Tracer
TRANSIT TIME	Transit Time Log or EPT
TVD-CDP	True Vertical Depth Computed
TVD-DI-SON	True Vertical Depth Dual Induction Sonic
URANIUM	Uranium Log
VAR-DEN	Variable Density
VAR-DEN-SON	Variable Density Sonic
VEL	Velocity
VEL-GR	Velocity Gamma Ray
VERTI	Vertilog
WAVEFORM	Waveform Digitized Log
WEIGHTED (CA)	Weighted Log
WSS	Wellbore Sibilation Survey
WTR-ENTRY	Water Entry Log
X-Y CAL	X-Y Caliper
2-D-VEL	2 Dimensional Velocity Log
3-D-VEL	3 Dimensional Velocity Log
3-ARM-DIP	3 Arm Dipmeter
4-ARM-DIP	4 Arm Dipmeter
4-ARM-CAL	4 Arm Caliper

SCHLUMBERGER USES SON

DRESSER ATLAS USES ACS

Depth: Enter the beginning (from) and ending (to) depths for the particular depth interval.

Sampling Method: Enter the appropriate code to indicate the method of sample collection. The codes are:

- C - Cuttings
- SWC - Sidewall Core
- WLC - Wireline Core

Please note: "OCS Sample Data Continuation Sheets" are available for additional sample data.

Notes

This space is provided for entering meaningful information for which no specific field is provided. Comments should be kept to a minimum.

Location Map

This outline map represents a standard OCS lease block of 2304 hectares. The block is 4,800 meters on a side.

REFERENCES

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APPENDICES A - J

APPENDIX A

Delaware Geological Survey

Well Schedule

DELAWARE GEOLOGICAL SURVEY
WELL SCHEDULE

DGS ID [ ] DNREC Id [ ]

Record By [ ] (code) Date Filed [ ]

GENERAL SITE DATA

Data Source: D (driller), G (DGS), N (DNREC), O (owner), R (other reported), S (USGS), U (unknown)

Local Id [ ] DRBC Id [ ]

Latitude [ ] Longitude [ ] Lat-Long Accuracy: S (sec), F (5 sec), T (10 sec), W (20 sec)

County: 1 (Kent), 3 (New Castle), 5 (Sussex) Quadrangle [ ] (code)

Topo Setting: C (stream channel), D (depression), E (dune), F (flat), H (hilltop), K (sink), L (lake), M (marsh), O (offshore), S (hillside), U (upland draw), V (valley flat)

Drainage Basin [ ] (code) Altitude [.] Altitude Method: A (altimeter), L (level), M (map), R (relative)

Delaware Mod. Grid [ ]

OWNER IDENTIFICATION

First [ ] Middle Initial [ ] Last [ ]

Address [ ] (code)

Address [ ]

City [ ] State [ ] Zip Code [ ]

WELL DESCRIPTION

Drilling Contractor [ ] (code)

Date Drilled [ ] Depth Drilled [.]

Drill Method: A (air rotary), B (bored), C (cable tool), D (dug), E (augered), J (jetted), M (hydraulic rotary), P (air percussion), R (reverse rotary), U (unknown), V (driven), W (wash-drive)

Well Finish: C (concrete), H (horizontal gallery), N (not finished), O (open hole), P (perforated or slotted), S (screen), T (sand point), U (unknown), W (walled)

Site Use	A	E	G	O	P	R	T	W	Z
	anode	eng. test boring	geo/hydro research	observation	oil or gas	recharge	test	withdrawal	other

Site Status	A	D	I	N	S	U
	abandoned	destroyed	in use	not in use	standby	unknown

Water Use	A	C	D	F	G	I	M	O	P	R	U
	agricultural	commercial	domestic	fire	geothermal	industrial	observation	other	public supply	irrigation	unknown

Replacement Well	Y	N

Replacement Reason	CL	FE	IW	NI	OT	WF
	chlorides	iron	inadequate quantity	nitrate	other	well failure

Geologic Unit ______________________ ________ (code)

Aquifer Name ______________________ ________ (code)

CASING

	top of casing	bottom of casing	diameter	material
1	.	.	.	
2	.	.	.	
3	.	.	.	
4	.	.	.	

Casing Material	B	C	F	G	O	P	R	S	U
	brick	concrete	fiber-glass	galvanized	other	PVC	rock or stone	steel	unknown

OPENINGS

	top of opening	bottom of opening	diameter	material
1	.	.	.	
2	.	.	.	
3	.	.	.	
4	.	.	.	

Opening Material	A	B	C	F	G	M	N	P	R	S	U
	brass	bronze	concrete	fiber-glass	galvanized	monel	none	PVC	stainless steel	steel	unknown

GRAVEL PACK

Y N

Top

Bottom

GROUT

Y N

DGS ID

Top

Bottom

Type B C G O U
bentonite cement cuttings other unknown

WATER-LEVEL DATA

Date

Time

Water Level

Correction

Device Used A M O R S T W
air line m-scope other reported static level tape down water-level recorder

LOG, TEST, AND SAMPLE DATA

Geologist's Log

Water Quality

Ditch Samples

Driller's Log

Supplemental File

Core Samples

Aquifer Test

GEOPHYSICAL LOG DATA

Caliper

Gamma-Density

Single Point Electric

Differential Single Point

Gamma Spectral

Sonic

Differential Temperature

Induction

Spherically Focused

Flowmeter

Multiple Point

Temperature

Gamma

Neutron

Other

Date Filed

NOTES

LOCATION MAP

APPENDIX B

Delaware Geological Survey

Water-Level Schedule

DELAWARE GEOLOGICAL SURVEY
WATER-LEVEL SCHEDULE

DGS ID

Record By | (code) | Date Filed

Data Source: D (driller), G (DGS), N (DNREC), O (owner), R (other reported), S (USGS), U (unknown)

WATER-LEVEL DATA

Date | Time

Water Level | Correction

Device Used: A (air line), M (m-scope), O (other), R (reported), S (static level), T (tape down), W (water-level recorder)

NOTES

DGS ID

Record By | (code) | Date Filed

Data Source: D (driller), G (DGS), N (DNREC), O (owner), R (other reported), S (USGS), U (unknown)

WATER-LEVEL DATA

Date | Time

Water Level | Correction

Device Used: A (air line), M (m-scope), O (other), R (reported), S (static level), T (tape down), W (water-level recorder)

NOTES

DGS/1-84

APPENDIX C

Delaware Geological Survey

Lithologic Log Schedule

and

Continuation Sheet

DELAWARE GEOLOGICAL SURVEY
LITHOLOGIC LOG SCHEDULE

DGS ID [ ] Page No. [ ]

Record By [ ] (code) Date Filed [ ]

Data Source: D (driller) G (DGS) N (DNREC) O (owner) R (other reported) S (USGS) U (unknown)

LITHOLOGIC LOG DATA

Log Type: D (Driller's) G (Geologist's)

Depth From [ ] To [ ]

Description [ ]

Description [ ]

Depth From [ ] To [ ]

Description [ ]

Description [ ]

Depth From [ ] To [ ]

Description [ ]

Description [ ]

Depth From [ ] To [ ]

Description [ ]

Description [ ]

(OVER)

From To

Depth Page No.

Description

Description

From To

Depth

Description

Description

From To

Depth

Description

Description

From To

Depth

Description

Description

From To

Depth

Description

Description

From To

Depth

Description

Description

DGS/1-84

DELAWARE GEOLOGICAL SURVEY
LITHOLOGIC LOG SCHEDULE
CONTINUATION SHEET

DGS ID

Page No.

From To

Depth

Description

Description

From To

Depth

Description

Description

From To

Depth

Description

Description

From To

Depth

Description

Description

From To

Depth

Description

Description

(OVER)

From To

Depth

Page No.

Description

Description

From To

Depth

Description

Description

From To

Depth

Description

Description

From To

Depth

Description

Description

From To

Depth

Description

Description

From To

Depth

Description

Description

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APPENDIX D

Delaware Geological Survey

Sample Log Schedule

and

Continuation Sheet

DELAWARE GEOLOGICAL SURVEY
SAMPLE LOG SCHEDULE

DGS ID

Page No.

Record By

(code)

Date Filed

Data Source

D	G	N	O	R	S	U
driller	DGS	DNREC	owner	other reported	USGS	unknown

Date Collected

Project Name

Sampling Method

A	C	SSC	SWC	WLC
auger flight	cuttings	split spoon	sidewall core	wireline core

SAMPLE DATA

Sample Number		From	To	Sampling Method
	Depth			
	Depth			
	Depth			
	Depth			
	Depth			
	Depth			
	Depth			
	Depth			
	Depth			
	Depth			
	Depth			
	Depth			
	Depth			

(OVER)

Page No.

Sample Number		From	To	Sampling Method
	Depth	.	.	
	Depth	.	.	
	Depth	.	.	
	Depth	.	.	
	Depth	.	.	
	Depth	.	.	
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	Depth	.	.	
	Depth	.	.	

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DELAWARE GEOLOGICAL SURVEY
SAMPLE LOG SCHEDULE
CONTINUATION SHEET

DGS ID

Page No.

SAMPLE DATA

Sample Number		From	To	Sampling Method
	Depth			
	Depth			
	Depth			
	Depth			
	Depth			
	Depth			
	Depth			
	Depth			
	Depth			
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	Depth			
	Depth			
	Depth			

(OVER)

Page No.

Sample Number		From	To	Sampling Method
	Depth			
	Depth			
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APPENDIX E

Delaware Geological Survey

Aquifer Test Schedule

DELAWARE GEOLOGICAL SURVEY
AQUIFER TEST SCHEDULE

DGS ID [ ]

Record By [ ] (code)

Date Filed [ ]

GENERAL SITE DATA

Data Source: D driller · G DGS · N DNREC · O owner · R other reported · S USGS · U unknown

Test Date [ ]

Well Type: O Obs. · P Pumping

Distance From Pumping Well [ ]

Pumping Well ID [ ]

Discharge Rate [ ]

Comments [ ]

Duration [ ]

Pertinent Reference [ ] (code)

ANALYSIS

Analysis Agency: D driller · G DGS · N DNREC · O owner · R other reported · S USGS · U unknown

Other Reported [ ]

Analysis by: First [ ] Middle Initial [ ] Last [ ] (code)

Method of Analysis: CJ Cooper-Jacob · HA Hantush Mod. Leaky Art. · TD Theis Drawdown · TM Theis Modified · TN Theis Non-Leaky Art. · TR Theis Recovery · OT Other · NC Not Calculated · UK Unknown

Other [ ]

COEFFICIENTS

Specific Capacity [ ] gpm/ft of drawdown

Storage [0.]

Transmissivity [ ] ft²/day

Leakance [ ]

Horizontal Conductivity [ ] ft/day

Diffusivity [ ]

Vertical Conductivity [ ] ft/day

Specific Storage [ ]

(OVER)

NOTES

APPENDIX F

Delaware Geological Survey

Geophysical Log Schedule

DELAWARE GEOLOGICAL SURVEY
GEOPHYSICAL LOG SCHEDULE

DGS ID

Record By (code)

Date Filed

GEOPHYSICAL LOG DATA

Date Logged

Log Type

Log Source: G DGS, R Other, S USGS, U Unknown

Log Start

Log Stop

Measuring Point: GS Grd. Sfc., KB Kelly Bushing, O Other, TC Top Casing

Correction

LOG TYPES

CAL - Caliper
DFT - Differential Temperature
DSP - Differential Single Point
FLO - Flowmeter
GAM - Gamma
GGL - Gamma Density
GRS - Gamma Spectral
IND - Induction
MPE - Multiple Point Elec.
NEU - Neutron
SFL - Spherically Focused
SON - Sonic
SPE - Single Point Elec.
TEM - Temperature
OTH - Other

NOTES

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APPENDIX G

Delaware Geological Survey

Field Water Quality Schedule

DELAWARE GEOLOGICAL SURVEY
FIELD WATER QUALITY SCHEDULE

DGS ID

Record By (code)

Date Filed

WATER QUALITY DATA

Date Sampled

Depth

Flow (gpm)

Water Level

Collection Agency (code)

Analysis By: First

Middle Initial

Last (code)

pH

Temperature

Specific Conductance

Constituent	Value	Unit	Method of Analysis
		L (less than detection) M (mg/l ppm) U (µg/l ppb)	
		L M U	
		L M U	
		L M U	
		L M U	
		L M U	
		L M U	

METHOD OF ANALYSIS

COL - Colorimetric
SIE - Specific Ion Electrode
SPM - Spectrophotometric
WC - Wet Chemical Analysis
OTH - Other

(OVER)

NOTES

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APPENDIX H

Delaware Geological Survey

Laboratory Water Quality Schedule

DELAWARE GEOLOGICAL SURVEY
LABORATORY WATER QUALITY SCHEDULE

DGS ID

Record By (code)

Date Filed

WATER QUALITY DATA

Date Collected

Analysis Agency (code)

Analysis By: First Middle Initial Last (code)

Laboratory Sample Number

Date of Analysis

Constituent	Value	Unit	Method of Analysis
		L (less than detection) M (mg/l ppm) U (µg/l ppb)	
		L M U	
		L M U	
		L M U	
		L M U	
		L M U	
		L M U	
		L M U	

METHOD OF ANALYSIS

AA - Flame Atomic Absorption
CR - Flameless Atomic Absorption
CV - Cold Vapor Generation
GC - Gas Chromatography
HPC - High Performance Liquid Chromatography
SIE - Specific Ion Electrode
WC - Wet Chemical Analysis
AAS - Flame Atomic Absorption Standard Addition
CRS - Flameless Atomic Absorption Standard Addition
CVS - Cold Vapor Generation Standard Addition
WCS - Wet Chemical Analysis Standard Addition
OTH - Other

(OVER)

Constituent	Value	Unit	Method of Analysis
		L M U less than detection · mg/l ppm · µg/l ppb	
		L M U	
		L M U	
		L M U	
		L M U	
		L M U	
		L M U	
		L M U	
		L M U	
		L M U	
		L M U	
		L M U	
		L M U	

Synthetic Organic Compounds: Y N

NOTES

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APPENDIX I

Delaware Geological Survey

OCS Well Schedule, OCS Well Log Data, and

OCS Sample Data Continuation Sheets

DELAWARE GEOLOGICAL SURVEY
OCS WELL SCHEDULE

API Well No. (State Code | Pseudo County Code | Well Code Original Hole | Side Track)

Block No.

Record By (code)

Well No.

Date Filed

UTM Quad

Operator (code)

OCS Lease No.

GENERAL SITE DATA

Latitude (degrees | min. | seconds)

Longitude (degrees | min. | seconds)

Location Data

KB Elevation

Water Depth

WELL DESCRIPTION

Completion Date

Depth Drilled

Bypass SDTR

Deepest Formation Drilled

WELL CLASS		
INITIAL	FINAL	OWDD

Number of Completions

Oil

Gas

Name of Field

Pay Name

TESTED INTERVALS

	Top	Bottom	(1) Oil BBl/day	(2) Gas MMCFD	(3) Condensate	Check One: (1) BBl/day	Check One: (2) BBl/MMCF
1							
2							
3							
4							
5							
6							

PRODUCING INTERVALS

	Top	Bottom	(1) Oil BBl/day	(2) Gas MMCFD	(3) Condensate	Check One: (1) BBl/day	Check One: (2) BBl/MMCF
1							
2							
3							
4							
5							
6							

WELL LOG DATA

Log type		Log start	Log stop	Scale	(1) Paper	(2) Microfilm
	Depth					
	Depth					
	Depth					
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	Depth					

SAMPLE DATA

Sampling Method: C (cuttings) | SWC (sidewall core) | WLC (wireline core)

DGS Sample Number		From / To	Sampling Method
	Depth		
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	Depth		
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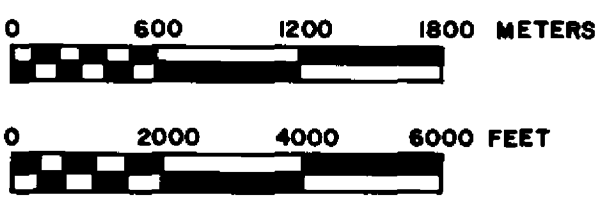
NOTES

LOCATION MAP

Scale



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DELAWARE GEOLOGICAL SURVEY
OCS WELL LOG DATA
CONTINUATION SHEET

API Well No. (State Code | Pseudo County Code | Well Code Original Hole | Side Track)

Page No.

WELL LOG DATA

Log type		Log start – Log stop	Scale	(1) Paper	(2) Microfilm
	Depth	–			
	Depth	–			
	Depth	–			
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	Depth	–			
	Depth	–			

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Page No.

Log type		Log start — Log stop	Scale	(1) Paper	(2) Microfilm
	Depth	—			
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DELAWARE GEOLOGICAL SURVEY
OCS SAMPLE DATA
CONTINUATION SHEET

API Well No. | State Code | Pseudo County Code | Well Code Original Hole | Side Track

Page No.

SAMPLE DATA

Sampling Method: C (cuttings) SWC (sidewall core) WLC (wireline core)

DGS Sample Number	Depth From	To	Sampling Method
—	Depth —		
—	Depth —		
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Page No.

DGS Sample Number		From	To	Sampling Method
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APPENDIX J

Conversion of Measurement Units

The following factors may be used to convert data from the English units published herein to the International System of Units (SI).

English Unit	Multiply By	Metric Unit
inches (in)	25.4	millimeters (mm)
inches (in)	0.0254	meters (m)
feet (ft)	0.3048	meters (m)
feet per day (ft/day)	0.3048	meters per day (m/day)
feet squared per day (ft^2/day)	0.0929	meters squared per day (m^2/day)
gallons per minute (gal/min)	0.06309	liters per second (L/s)
gallons per minute per foot (gal/min)/ft	0.207	liters per second per meter (L/s)/m
miles (mi)	1.609	kilometers (km)