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JEB FORT STORY, VA
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# FORT STORY FINAL GEOTECHNICAL INFORMATION DOCUMENT VOLUME 2 OF 2 FORT STORY VA

8/1/1991

JAMES M. MONTGOMERY CONSULTING ENGINEERS

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# U.S. Army Corps of Engineers
# Missouri River Division,
# Omaha District

## *Fort Story Final Geotechnical Information Document*

Ft. Story, Virginia
August 1991

Volume 2 of 2

JMM James M. Montgomery

## Soil and Monitoring Well Boring Lithologic Logs

Site 6

BORING/WELL NUMBER *SB-112*
DATE STARTED *3/21/90* COMPLETED *3/21/90*
SITE NUMBER *6*
GROUND ELEVATION *7.69 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *MARK SHUPE*



COORDINATES *N226178, E2724432*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-2 | 1 8 10 12 | 30.1 | | | SAND (SP), quartz, dark gray, fine-medium grained, well sorted, subrounded, trace silt, possible perched water table. | Apparent oily residue on grains, hydrocarbon odor. |
| | LITH | 2-4 | 10 12 18 24 | 21 | | | | |
| 5 | LITH | 4-6 | 15 18 25 32 | 58.6 | | SP | SAND (SP), quartz, light gray, fine-medium grained, subrounded, clean. | PID Instrumentation OVM 580B Thermo Environmental Instruments, Inc. 10.2 eV lamp PID Background=0.0 ppm. |
| | BH | 8-10 | 28 53 82 100/4" | 71.3 | | | | |
| 10 | | | | | | | Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

LITH=Lithology

GS=Ground Surface

BH=Bottom of Hole

**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-113*
DATE STARTED *3/21/90* COMPLETED *3/21/90*
SITE NUMBER *6*
GROUND ELEVATION *8.98 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *MARK SHUPE*



COORDINATES *N226175, E2724560*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS DUP SPLIT | 0-2 | 1 3 3 16 | 41 | | | SAND (SP), quartz, brown, fine-medium grained, subrounded, well sorted, trace silt. | 0-2 foot interval drive 2 spoons for additional sample volume Blow counts: 1,3,3,16 1,1,3,12 |
| 5 ▼ | LITH | 4-6 | 14 20 28 30 | 35.3 | | SP | SAND (SP), quartz, tan-light gray, fine-medium grained, subrounded, clean. | PID Instrumentation OVM 580B Thermo Environmental Instruments, Inc. 10.2 eV lamp PID Background=0.0 ppm. |
| | BH | 8-10 | 14 20 28 30 | 59.7 | | | SAND (SP), quartz, tan-gray, medium gray, medium grained, fair sorting, clean, sulfurous. | |
| 10 | | | | | | | Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

DUP=Duplicate

SPLIT=Split Sample

LITH=Lithology

BH=Bottom of Hole

▼ =Water table during drilling

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DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-114*
DATE STARTED *3/22/90* COMPLETED *3/22/90*
SITE NUMBER *6*
GROUND ELEVATION *9.72 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *MARK SHUPE*



COORDINATES *N226161, E2724690*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-2 | 5<br>15<br>17<br>20 | 45 | | | SAND (SP), quartz, black, medium-fine grained, subrounded. | Oily residue in grains. |
| 5 | LITH | 4-6 | 8<br>10<br>15<br>22 | 49 | | SP | SAND (SP), (4-5 feet) quartz, tan, as above.<br>SAND (SP), (5-6 feet) quartz, gray, as above; water table encountered at 5.5 feet. | PID Instrumentation<br>OVM 580B<br>Thermo Environmental Instruments, Inc.<br>10.2 eV lamp<br>PID Background=0.0 ppm. |
| | BH | 8-10 | 8<br>9<br>14<br>23 | 22 | | | SAND (SP), quartz, gray, fine-medium grained, subrounded, poor sorting. | |
| 10 | | | | | | | Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

LITH=Lithology

BH=Bottom of Hole

▼ =Water table during drilling

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DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-115*
DATE STARTED *3/22/90* COMPLETED *3/22/90*
SITE NUMBER *6*
GROUND ELEVATION *9.01 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *MARK SHUPE*



COORDINATES *N226101, E2724446*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS DUP SPLIT | 0-2 | 1 1 4 8 | 26.3 | | | SAND (SW), quartz, brown-tan, medium-fine grained, poor sorting, subrounded, trace silt, trace oil residue in grains. | 0-2 foot interval drive 2 spoons for additional sample volume Blow counts: 1,1,4,8 2,1,3,7 |
| 5 | LITH | 4-6 | 17 35 22 33 | 22 | | SW | SAND (SW), (4-5 feet) quartz, tan-brown. SAND (SW), (5-6 feet) quartz, gray, water table encountered at 5 feet. | PID Instrumentation OVM 580B Thermo Environmental Instruments, Inc. 10.2 eV lamp PID Background=0.0 ppm. |
| | BH | 8-10 | 8 10 13 15 | 48.5 | | | SAND (SW), quartz, gray, medium-fine grained, subrounded, poor sorting. | |
| 10 | | | | | | | Total depth of hole=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

DUP=Duplicate

SPLIT=Split Sample

LITH=Lithology

BH=Bottom of Hole

▼ =Water table during drilling

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DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-116*
DATE STARTED *3/22/90* COMPLETED *3/22/90*
SITE NUMBER *6*
GROUND ELEVATION *9.45 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *MARK SHUPE*



COORDINATES *N226092, E2724572*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-2 | 5<br>12<br>12<br>10 | 4.1 | | SW | SAND (SW), quartz, dark gray-black, medium grained, well sorted, subrounded. | Gum-like oily residue on grains. |
| 5 | LITH | 4-6 | 19<br>21<br>28<br>15 | 60 | | SP | SAND (SP), quartz, medium gray-light gray, medium grained, fair sorting; water table encountered at 5.6 feet. | PID Instrumentation<br>OVM 580B<br>Thermo Environmental Instruments, Inc.<br>10.2 eV lamp<br>PID Background=0.0 ppm. |
| | BH | 8-10 | 7<br>9<br>12<br>5 | 61 | | | SAND (SP), quartz, tan, medium-fine grained, poor sorting, subrounded. | |
| 10 | | | | | | | Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

LITH=Lithology

BH=Bottom of Hole

▼ =Water table during drilling

**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-117*
DATE STARTED *3/22/90* COMPLETED *3/22/90*
SITE NUMBER *6*
GROUND ELEVATION *11.05 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *MARK SHUPE*



COORDINATES *N226093, E2724730*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-2 | 2 3 4 3 | 25 | | | SAND (SW), quartz, dark gray-black, fine-medium grained, poor sorting. | Oily residue in grains. |
| 5 | LITH | 4-6 | 2 5 9 16 | 194 | | SW | SAND (SW), quartz, light-medium gray, medium-fine grained, poor sorting; water table encountered at 4 feet. | PID Instrumentation OVM 580B Thermo Environmental Instruments, Inc. 10.2 eV lamp PID Background=0.0 ppm. |
| 10 | BH | 8-10 | 8 16 17 24 | 51 | | | SAND (SW), quartz, gray, fine-medium grained, subrounded-subangular, poor sorting. Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | GS=Ground Surface LITH=Lithology BH=Bottom of Hole ▼=Water table during drilling |

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DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-118*
DATE STARTED *3/21/90* COMPLETED *3/21/90*
SITE NUMBER *6*
GROUND ELEVATION *11.83 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *GARY B. ENLOE*



COORDINATES *N226030, E2724676*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Concrete | |
| | GS | 1.5-3.5 | 5<br>9<br>18<br>6 | 2.0 | | | SAND (SP), brown, fine, organic material. | 1.5-3.5 foot interval drive 2 spoons for additional sample volume<br>Blow counts: 5,9,18,6<br>6,7,18,20 |
| 5 | | | | | | SP | | |
| | LITH | 5-7 | 7<br>8<br>9<br>10 | | | | SAND (SP), buff, fine, graded, subrounded, water at 3.5 feet. | |
| | BH | 8-10 | 6<br>8<br>9<br>10 | 2.8 | | | SAND (SP), tan to gray, medium, graded. | 8-10 foot interval drive 2 spoons for additional sample volume<br>Blow counts: 6,8,9,10<br>1,3,4,4 |
| 10 | | | | | | | Total depth of boring=10 feet. | |
| | | | | | | | | PID Instrumentation<br>PI 101 HNu Systems<br>10.2 eV lamp<br>PID Background=0.0 ppm. |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | GS=Ground Surface<br>LITH=Lithology<br>BH=Bottom of Hole<br>▼=Water table during drilling |

**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-119*
DATE STARTED *3/22/90* COMPLETED *3/22/90*
SITE NUMBER *6*
GROUND ELEVATION *12.14 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *MARK SHUPE*



COORDINATES *N226028, E2724757*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-2 | 18 19 25 28 | 25 | | SP | SAND (SP), quartz, tan, fine-medium grained, subrounded, well sorted, clean. | PID Instrumentation OVM 580B Thermo Environmental Instruments, Inc. 10.2 eV lamp PID Background=0.0 ppm. |
| 5 | LITH | 4-6 | 7 8 10 12 | 45 | | PT | PEAT (PT), black, soft-moderately soft, blocky fragments, vitreous; water table encountered at 4 feet. | |
| | | | | | | SW | | |
| 10 | BH | 8-10 | 8 10 14 15 | 52 | | | SAND (SW), quartz, medium-dark gray, fine-medium grained, subrounded, poor sorting. | |
| | | | | | | | Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

LITH=Lithology

BH=Bottom of Hole

▼ =Water table during drilling

**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-120*
DATE STARTED *3/21/90* COMPLETED *3/21/90*
SITE NUMBER *6*
GROUND ELEVATION *11.65 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *MARK SHUPE*



COORDINATES *N225950, E2724553*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-0.5 | | 13.3 | | | SAND (SP), quartz, tan-brown, medium to fine grained, well sorted. | Hydrocarbon odor/oily residue on grains. |
| 5 | LITH | 4.5-5 | | 0.58 | | SP | SAND (SP), quartz, tan-brown, medium to fine grained, well sorted. | PID Instrumentation OVM 580B Thermo Environmental Instruments, Inc. 10.2 eV lamp PID Background=0.0 ppm. |
| 10 | BH | 9.5-10 | | 0.44 | | | SAND (SP), quartz, tan-brown, medium to fine grained, sulfurous odor: water table encountered at 8 feet. | |
| | | | | | | | Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

LITH=Lithology

BH=Bottom of Hole

▼ =Water table during drilling

**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HAND AUGER*
HOLE DIAMETER *3 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-121*
DATE STARTED *3/21/90* COMPLETED *3/21/90*
SITE NUMBER *6*
GROUND ELEVATION *11.96 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *MARK SHUPE*



COORDINATES *N225956, E2724590*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-0.5 | | 41 | | | SAND (SP), quartz, dark brown, fine to medium grained, subrounded, well sorted. | Hydrocarbon odor, oily residue on grains, oily staining. |
| 5 | LITH | 4.5-5 | | 38 | | SP | SAND (SP), quartz, tan, fine-medium grained, subrounded, well sorted, hydrocarbon odor. | PID Instrumentation OVM 580B Thermo Environmental Instruments, Inc. 10.2 eV lamp PID Background=0.0 ppm. |
| ▼ 10 | BH | 9.5-10 | | 34.4 | | | SAND (SP), quartz, light gray, medium to fine grained, subrounded, fair-poor sorting, hydrocarbon odor. | |
| | | | | | | | Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | GS=Ground Surface<br>LITH=Lithology<br>BH=Bottom of Hole<br>▼=Water table during drilling |

**JMM** James M. Montgomery Consulting Engineers, Inc.

DRILLER *EDDIE DOWDY*
METHOD OF DRILLING *HAND AUGER*
HOLE DIAMETER *3 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-122*
DATE STARTED *3/20/90* COMPLETED *3/20/90*
SITE NUMBER *6*
GROUND ELEVATION *13.66 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *GARY B. ENLOE*



COORDINATES *N225403, E2724495*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS DUP SPLIT | 0-2 | 8 9 14 16 | 3.0 | | SP | SAND (SP), brown, fine, graded, subrounded, moist, fill, debris. | 0-2 foot interval drive 4 spoons for additional sample volume Blow counts: 8,9,14,16 7,7,14,7 3,6,10,10 6,6,18,14 |
| | | | | | | SM | SAND (SM), dark brown, silty, fine, subrounded, moist, tight. | |
| | LITH | 2-4 | 8 9 13 13 | | | | SAND (SP), buff, fine, graded, moist. | |
| 5 | LITH | 4-6 | 6 5 6 8 | | | SP | SAND (SP), brown, fine, graded, moist, buff colored from 4-4.5 feet. | |
| ▼ | LITH | 6-8 | 2 2 3 2 | | | | SAND (SP), buff, fine, graded, subrounded, water table at approximately 7 feet, hydrocarbon odor. | PID Instrumentation PI 101 HNu Systems 10.2 eV lamp PID Background=0.0 ppm. |
| | BH | 8-10 | 4 8 9 11 | 11.0 | | | SAND (SP), buff to tan, medium, graded, strong hydrocarbon odor. | |
| 10 | | | | | | | Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

DUP=Duplicate

SPLIT=Split Sample

LITH=Lithology

BH=Bottom of Hole

▼ =Water table during drilling

**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-123*
DATE STARTED *3/20/90* COMPLETED *3/20/90*
SITE NUMBER *6*
GROUND ELEVATION *14.29 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *MARK SHUPE*



COORDINATES *N225341 E2724503*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-2 | 3 3 3 3 | 0.9 | | | SAND (SP), quartz, tan to buff, fine-medium grained, subrounded, well sorted, trace silt. | 0-2 foot interval drive 2 spoons for additional sample volume Blow counts: 3,3,3,3 1,2,2,3 |
| 5 | LITH | 4-6 | 1 2 2 3 | | | | SAND (SP), quartz, tan to buff, medium grained, subrounded, well sorted. | PID Instrumentation PI 101 HNu Systems 10.2 eV lamp PID Background=0.0 ppm. |
| ▼ | LITH | 6-8 | 4 7 6 8 | | | SP | SAND (SP), quartz, white to tan, medium grained, subrounded,well sorted; encountered water table at 7 feet, strong hydrocarbon odor. | |
| | LITH | 8-10 | 7 10 6 10 | | | | | |
| 10 | LITH | 10-12 | 6 2 2 3 | 12 | | | SAND (SP), quartz, tan, fine-medium grained, subrounded, well sorted, clean, hydrocarbon odor. | |
| | BH | 12-14 | 8 4 2 3 | | | | | |
| 15 | | | | | | | Total depth of boring=14 feet. | |
| 20 | | | | | | | | |
| 25 | | | | | | | | GS=Ground Surface<br>LITH=Lithology<br>BH=Bottom of Hole<br>▼ =Water table during drilling |

**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *14 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *MW-115*
DATE STARTED *3/21/90* COMPLETED *3/21/90*
SITE NUMBER *6*
GROUND ELEVATION *10.00 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *GARY B. ENLOE*



COORDINATES *N225998, E2724411*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Concrete. | |
| | GS | 1.5-3.5 | 28 28 28 30 | 4.0 | | ML | SILT (ML), brown, sandy, gravel, fill, hydrocarbon odor, quartz. | 1.5-3.5 foot interval drive 3 spoons for additional sample volume Blow counts: 28,28,28,30 26,28,38,25 12,21,30,40 |
| | SI GEO | 3.5-5.5 | 6 12 18 21 | 1.0 | | SP | SAND (SP), brown, fine, graded, rounded, moist, quartz. | |
| 5 | | | | | | | SAND (SP), tan, medium, graded, subrounded; water at 3.5 feet. | |
| | | | | | | | SAND (SP), brown, medium, 2 inch silty sand seam at 6 feet, grading into gray color at 10 feet. | PID Instrumentation PI 101 HNu Systems 10.2 eV lamp PID Background=0.0 ppm. |
| 10 | LITH | 10-12 | 3 6 9 13 | | | | | |
| | | | | | | | Total depth of boring=12.5 feet. | |
| 15 | | | | | | | | |
| ▼ | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

SI=Soil/Groundwater Interface

GEO=Geotechnical

LITH=Lithology

▼ =Water table during drilling

JMM James M. Montgomery Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *12.5 FEET*

WELL COMPLETION DEPTH *12 FEET*
WELL DIAMETER *2 INCH*
WELL MATERIAL *SCHEDULE 40 PVC*

BORING/WELL NUMBER *MW-116*
DATE STARTED *3/21/90* COMPLETED *3/21/90*
SITE NUMBER *6*
GROUND ELEVATION *10.04 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *GARY B. ENLOE*



COORDINATES *N226023, E2724537*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Concrete. | |
| | GS | 1.5-3.5 | 25 35 40 42 | 2.0 | | ML | SILT (ML), brown, sandy. SAND (SP), buff, fine, subrounded, graded, moist. SAND (SP), green, silty, tight, gravel, fill, water at 3.5 feet. | 1.5-3.5 foot interval drive 2 spoons for additional sample Blow counts: 25,35,40,42 12,14,18,12 |
| | SI GEO | 3.5-5.5 | 15 29 30 29 | 2.2 | | | SAND (SP), buff, medium. | PID Instrumentation PI 101 HNu Systems 10.2 eV lamp PID Background=0.0 ppm. |
| 5 | LITH | 5.5-7.5 | 1 6 4 4 | | | SP | SAND (SP), dark brown, medium, well sorted, subrounded, wood/fill. SAND (SP), brown, fine, graded, subrounded, quartz. | 3.5-5.5 foot interval drive 2 spoons for additional sample Blow counts: 15,29,30,29 8,7,7,6 |
| 10 | LITH | 10-12 | 3 6 7 9 | | | | SAND (SP), buff, medium, graded. | Auger advanced to 14 feet to hammer out flowing sand w/roller bit. |
| | | | | | | | Total depth of boring=12 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

SI=Soil/Groundwater Interface

GEO=Geotechnical

LITH=Lithology

▼ =Water table during drilling

**JMM** James M. Montgomery Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *12 FEET*

WELL COMPLETION DEPTH *12 FEET*
WELL DIAMETER *2 INCH I.D.*
WELL MATERIAL *SCHEDULE 40 PVC*

BORING/WELL NUMBER *MW-117*
DATE STARTED *3/20/90* COMPLETED *3/20/90*
SITE NUMBER *6*
GROUND ELEVATION *13.97 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *GARY B. ENLOE*



COORDINATES *N225436, E2724496*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-2 | 7<br>6<br>10<br>8 | 0 | | | SAND (SP), brown, fine, graded, subrounded, gravel/fill at 6-12 inches. | 0-2 foot interval drive 3 spoons for additional sample volume<br>Blow counts: 7,6,10,8<br>5,5,8,12<br>5,5,6,7 |
| 5 ▼ | SI<br>GEO | 5-7 | 6<br>5<br>12<br>8 | 0.2 | | SP | SAND (SP), buff to tan, medium, moist, graded, subrounded, water table at approximately 6 feet, hydrocarbon odor below saturated zone. | 5-7 foot interval drive 3 spoons for additional sample volume<br>Blow counts: 6,5,12,8<br>4,5,8,6<br>1,2,3,4 |
| 10 | | 10-2 | 2<br>2<br>2<br>3 | | | | SAND (SP), gray, medium to coarse, poorly graded. | PID Instrumentation<br>PI 101 HNu Systems<br>10.2 eV lamp<br>PID Background=0.0 ppm. |
| 15 | | | | | | | Total depth of boring=15 feet. | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

SI=Soil/Groundwater Interface

GEO=Geotechnical

▼ =Water table during drilling

**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *15 FEET*

WELL COMPLETION DEPTH *14 FEET*
WELL DIAMETER *2 INCH I.D.*
WELL MATERIAL *SCHEDULE 40 PVC*

BORING/WELL NUMBER *MW-118*
DATE STARTED *3/20/90* COMPLETED *3/20/90*
SITE NUMBER *6*
GROUND ELEVATION *13.71 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *MARK SHUPE*



COORDINATES *N225250, E2724498*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | | | | | | Cement: thickness=19 inches. | Core through cement. |
| | LITH | 1.5-3.5 | 6 16 32 35 | 1 | | SP | SAND (SP), quartz, tan to brown, medium grained, subrounded, well sorted, trace silt. | PID Instrumentation PI 101 HNu Systems 10.2 eV lamp PID Background=0.0 ppm. |
| 5 | | | | | | | | |
| ▼ | LITH | 6-8 | 6 10 8 9 | 1 | | | SAND (SP), quartz, dark gray, medium grained, subrounded, increase moisture content. | |
| | SI | 8-10 | 6 9 9 8 | 1 | | | SAND (SP), quartz, gray-buff-clear, medium grained, well sorted, water table encountered at 7 feet. | |
| 10 | GEO | 10-12 | 2 5 7 11 | 1 | | | SAND (SP), quartz, tan-brown, subrounded, trace silt. | |
| | LITH | 13-15 | 9 12 15 18 | 1 | | | SAND (SP), quartz, clear-light gray, medium grained, subrounded. | |
| 15 | | | | | | | Total depth of boring=15 feet. | |
| 20 | | | | | | | | |
| 25 | | | | | | | | GS=Ground Surface<br>SI=Soil/Groundwater Interface<br>GEO=Geotechnical<br>▼ =Water table during drilling |

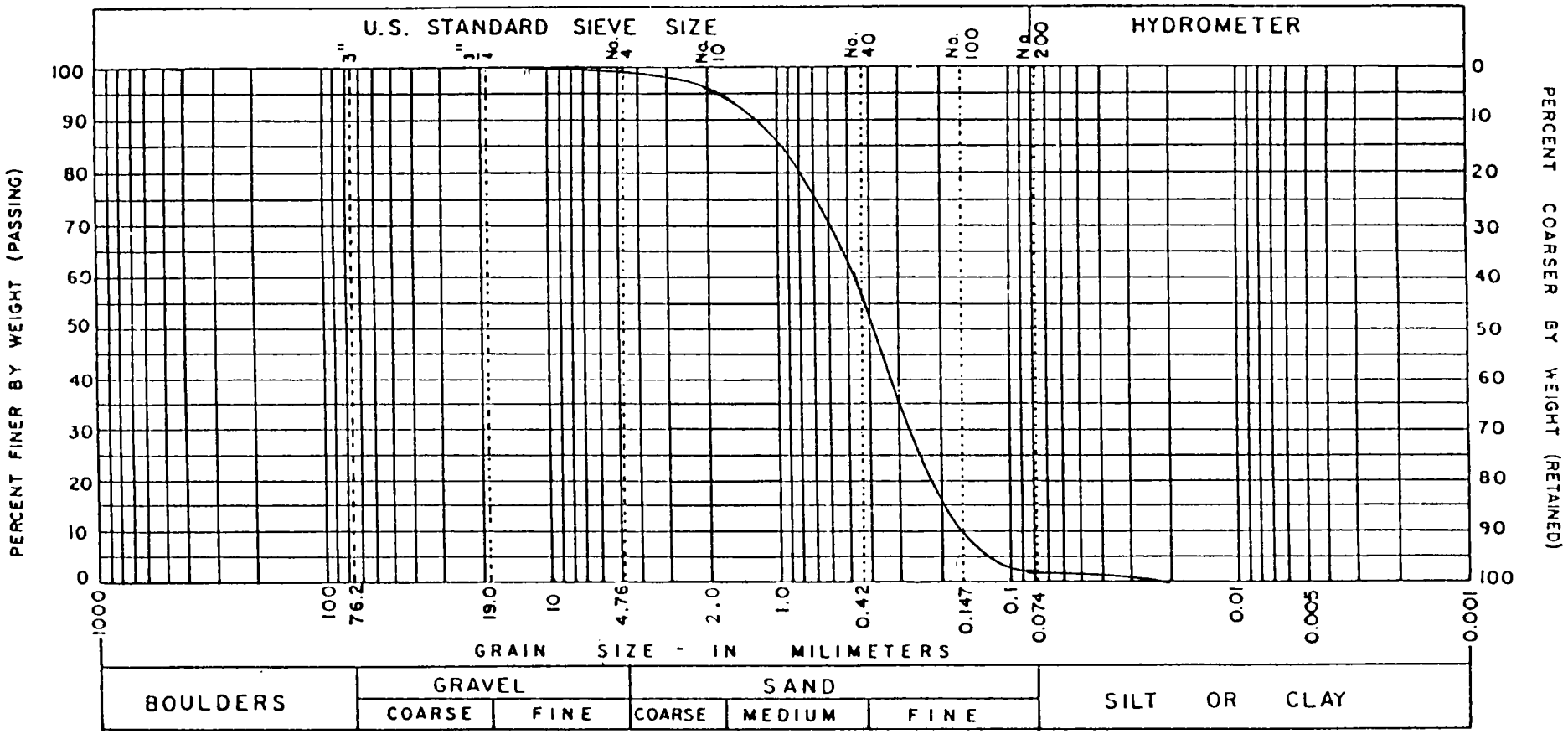
**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *15 FEET*

WELL COMPLETION DEPTH *15 FEET*
WELL DIAMETER *2 INCHES*
WELL MATERIAL *SCHEDULE 40 PVC*

# Geotechnical Grain Size Analyses

| PROJECT: Fort Story | | LOCATION: Virginia Beach, VA. | |
|---|---|---|---|
| BORING NO. Site 6 | SAMPLE NO. S6MW115 | DEPTH: 6' | CONTRACT NO. 90-075 |




| SAMPLE NO. | DEPTH | L.L. | P.I. | M.C. | Unified | Soil Description |
|---|---|---|---|---|---|---|
| S6MW115 | 6' | - | N.P. | 21.3 | SP | Tan sand |

FESI Earth Engineering & Sciences, Inc.

GRAIN-SIZE DISTRIBUTION

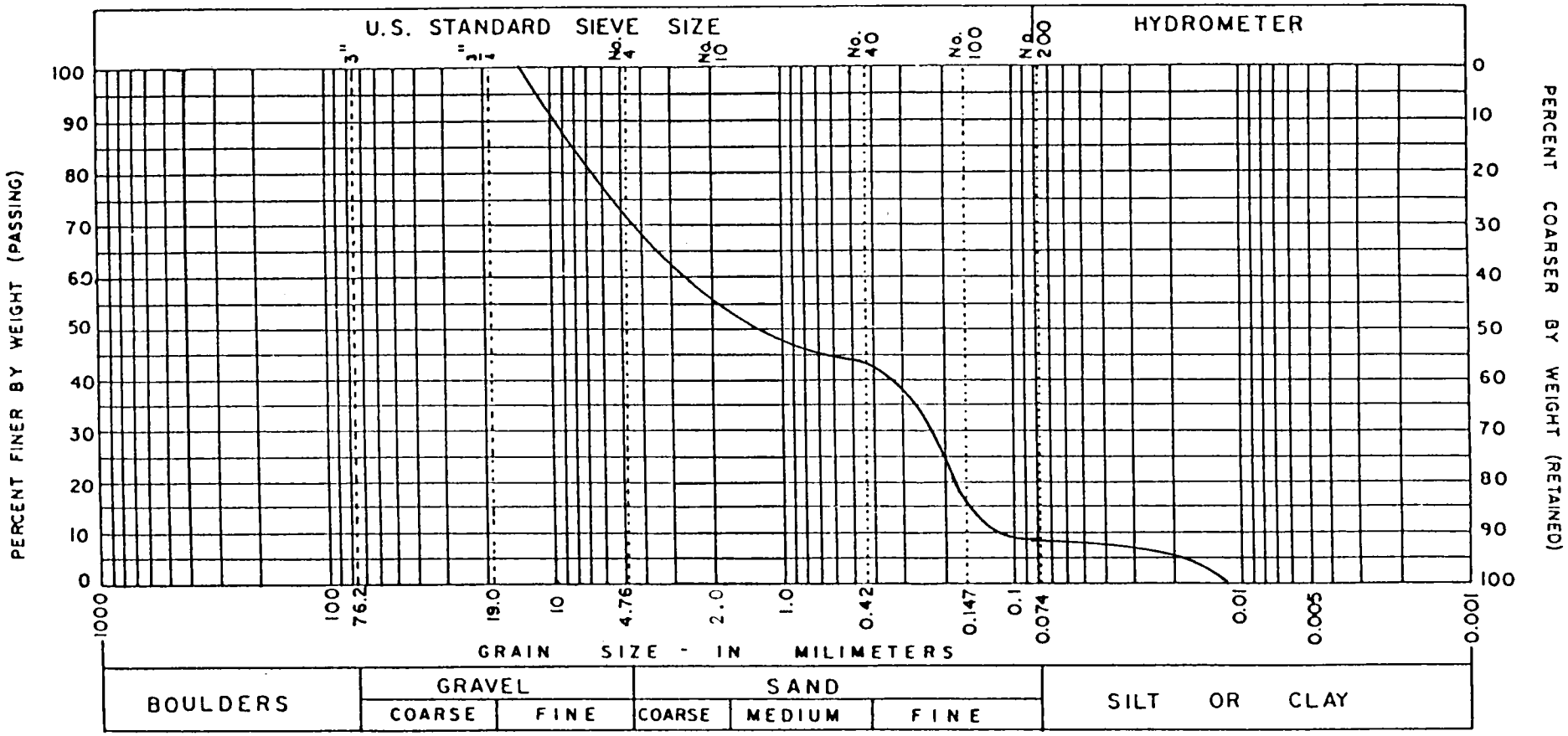
TESTED BY: RMP

DATE: 7-12-90

CHECKED BY: PAD

SHEET No. 19 OF 32

| PROJECT: Fort Story | | LOCATION: Virginia Beach, VA. | |
|---|---|---|---|
| BORING NO. Site 6 | SAMPLE NO. S6MW116 | DEPTH: 4' | CONTRACT NO. 90-075 |



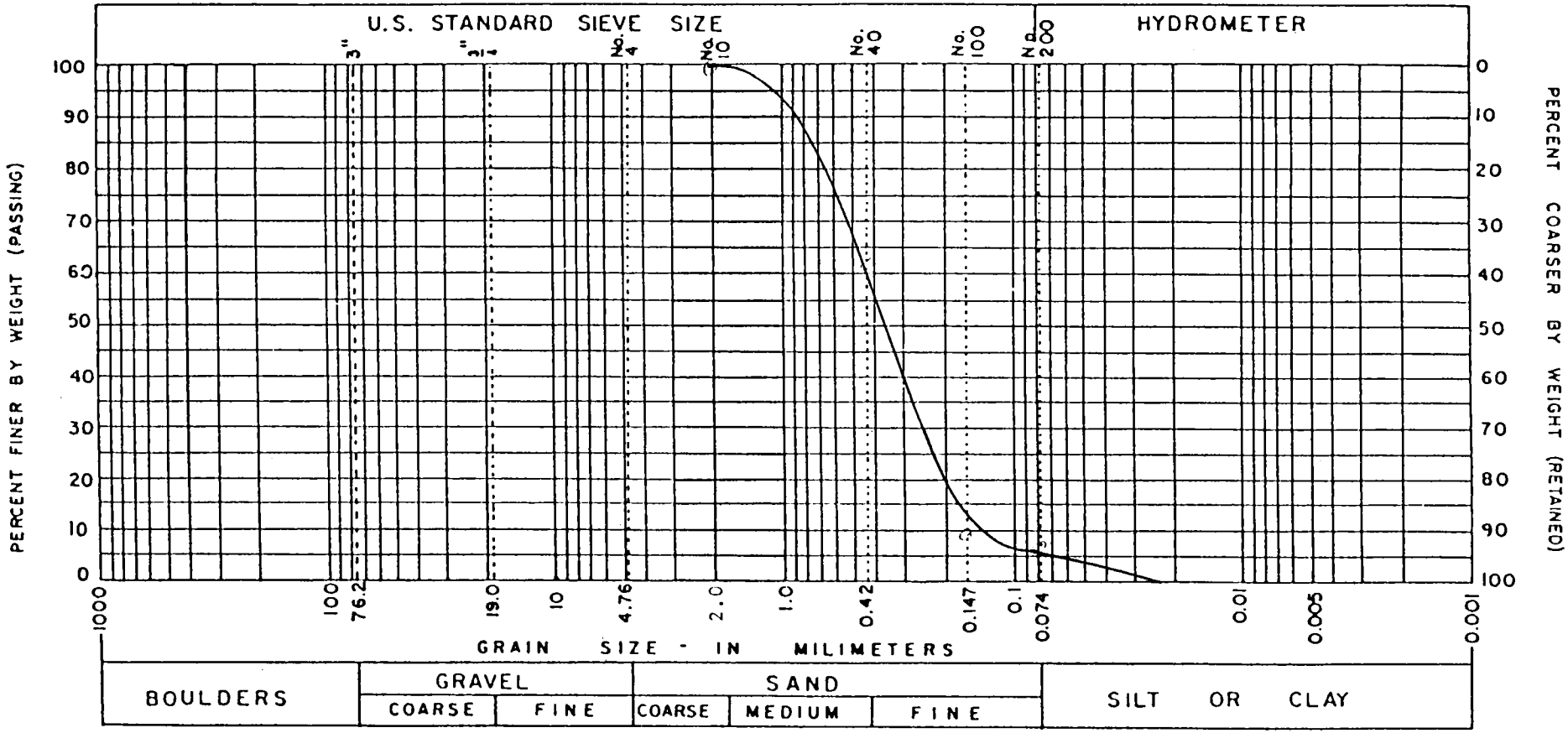

| SAMPLE NO. | DEPTH | L.L. | P.I. | M.C. | Unified | Soil Description |
|---|---|---|---|---|---|---|
| S6MW116 | 4' | - | N.P. | 9.0 | SP-SM | Tan slightly silty sand w/some gravel |

Earth Engineering & Sciences, Inc.

GRAIN-SIZE DISTRIBUTION

| TESTED BY: RMP | DATE: 7-12-90 |
|---|---|
| CHECKED BY: PAD | SHEET No. 20 OF 32 |

| PROJECT: Fort Story | | LOCATION: Virginia Beach, VA. | |
|---|---|---|---|
| BORING NO. Site 6 | SAMPLE NO. S6MW117 | DEPTH: 5' | CONTRACT NO. 90-075 |



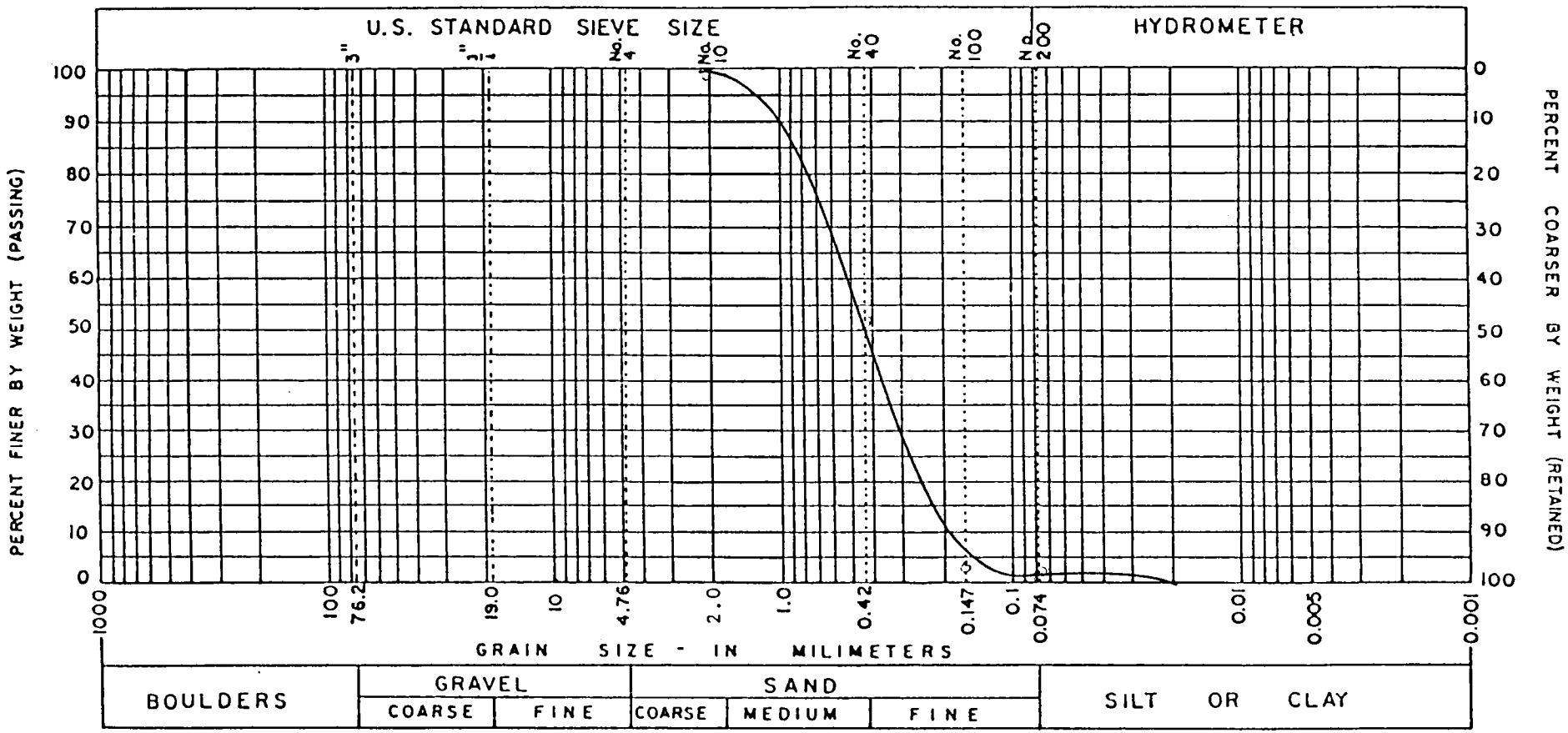

| SAMPLE NO. | DEPTH | L.L. | P.I. | M.C. | Unified | Soil Description |
|---|---|---|---|---|---|---|
| S6MW117 | 5' | - | N.P. | 19.1 | SP-SM | Tan slightly silty sand |

Earth Engineering & Sciences, Inc.

GRAIN-SIZE DISTRIBUTION

| TESTED BY: RMP | DATE: 7-12-90 |
|---|---|
| CHECKED BY: PAD | SHEET No. 21 OF 32 |

| PROJECT: Fort Story | | LOCATION: Virginia Beach, VA. | |
|---|---|---|---|
| BORING NO. Site 6 | SAMPLE NO. S6MW118 | DEPTH: 10.0' | CONTRACT NO. 90-075 |




| SAMPLE NO. | DEPTH | L.L. | P.I. | M.C. | Unified | Soil Description |
|---|---|---|---|---|---|---|
| S6MW118 | 10' | - | N.P. | 21.2 | SP | Tan sand |

Earth Engineering & Sciences, Inc.

GRAIN-SIZE DISTRIBUTION

| TESTED BY: RMP | DATE: 7-12-90 |
|---|---|
| CHECKED BY: PAD | SHEET No. 22 OF 32 |

# Monitoring Well Construction Summary Sheets

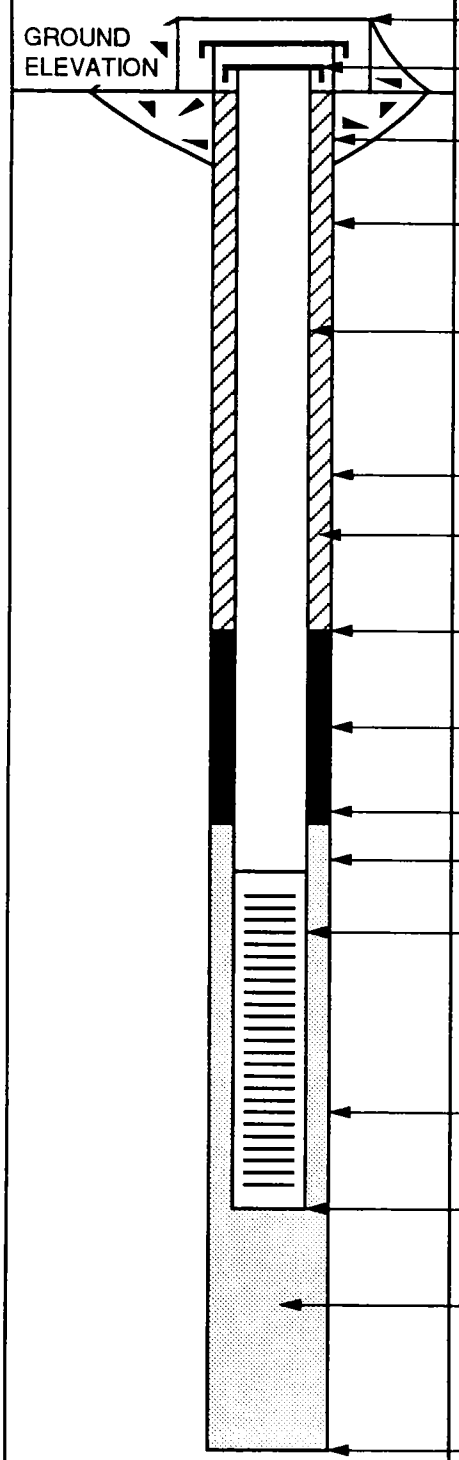
JMM James M. Montgomery
Consulting Engineers, Inc.

BORING NO. MW-115

# MONITORING WELL SHEET

PROJECT Fort Story PA/IS
LOCATION Site 6
PROJECT NO. 1868.0401
BORING MW-115
ELEVATION
DATE 3/21/90
FIELD GEOLOGIST Gary B. Enloe

DRILLER Hardin and Huber Inc.
DRILLING METHOD Hollow Stem Auger
DEVELOPMENT METHOD Air Suring/Pumping




ELEVATION OF TOP OF SURFACE CASING: 10.00 ft.
ELEVATIONS OF TOP OF RISER PIPE: 9.36 ft.

TYPE OF SURFACE SEAL: Cement Grout

I.D. OF SURFACE CASING: 8 inch
TYPE OF SURFACE CASING: Steel

RISER PIPE I.D.: 2 inch
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 8 1/4 inch

TYPE OF BACKFILL: Cement Grout

ELEVATION/DEPTH OF SEAL: 1.5 ft.

TYPE OF SEAL: Granular Bentonite

DEPTH TO TOP OF SAND PACK: 2.0 ft.
ELEVATION/DEPTH TOP OF SCREEN: 2.5 ft.

TYPE OF SCREEN: Schedule 40 PVC
SLOT SIZE X LENGTH: 0.020 inch X 10 feet
I.D. OF SCREEN: 2 inch

TYPE OF SAND PACK: No. 2 Filter Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: 12.5 ft.

ELEVATION/DEPTH BOTTOM OF SANDPACK: 12.5 ft.
TYPE OF BACKFILL BELOW OBSERVATION WELL:
Formation

ELEVATION/DEPTH OF HOLE: 12.5 ft.

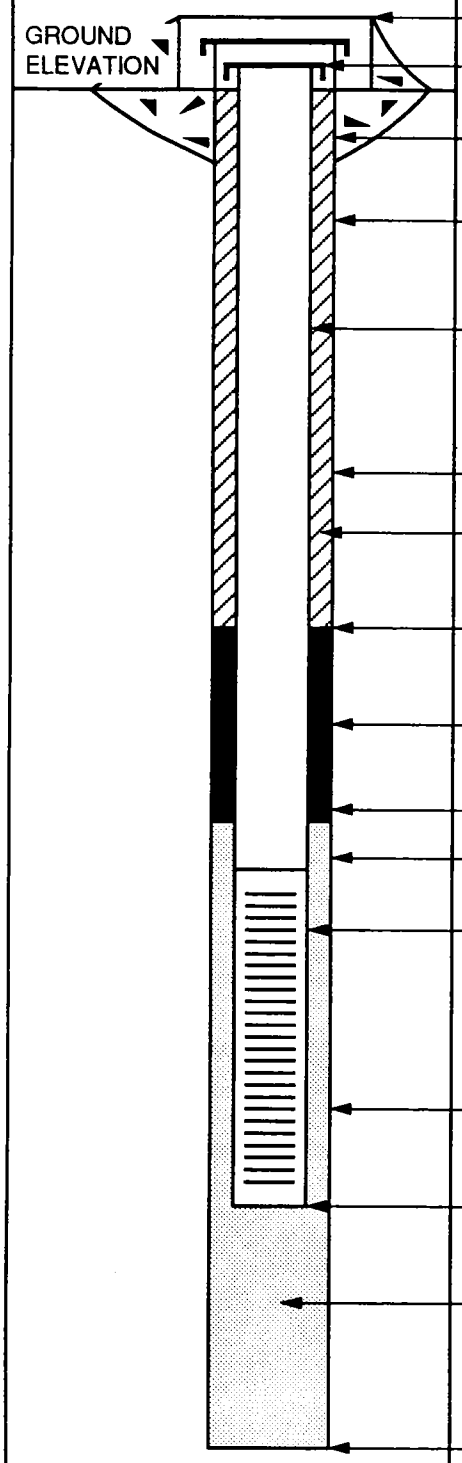
James M. Montgomery
Consulting Engineers, Inc.

BORING NO. MW-116

# MONITORING WELL SHEET

PROJECT Fort Story PA/IS
LOCATION Site 6
PROJECT NO. 1868.0401
BORING MW-116
ELEVATION
DATE 3/21/90
FIELD GEOLOGIST Gary B. Enloe

DRILLER Hardin and Huber Inc.
DRILLING METHOD Hollow Stem Auger
DEVELOPMENT METHOD Air Surging/Pumping




ELEVATION OF TOP OF SURFACE CASING: 10.04 ft.
ELEVATIONS OF TOP OF RISER PIPE: 9.77 ft.
TYPE OF SURFACE SEAL: Cement Grout
I.D. OF SURFACE CASING: 8 inch
TYPE OF SURFACE CASING: Steel
RISER PIPE I.D.: 2 inch
TYPE OF RISER PIPE: Schedule 40 PVC
BOREHOLE DIAMETER: 8 1/4 inch
TYPE OF BACKFILL: Cement Grout
ELEVATION/DEPTH OF SEAL: 1.0 ft.
TYPE OF SEAL: Granular Bentonite
DEPTH TO TOP OF SAND PACK: 2.0 ft.
ELEVATION/DEPTH TOP OF SCREEN: 2.5 ft.
TYPE OF SCREEN: Schedule 40 PVC
SLOT SIZE X LENGTH: 0.020 inch X 10 feet
I.D. OF SCREEN: 2 inch
TYPE OF SAND PACK: No. 2 Filter Sand
ELEVATION/DEPTH BOTTOM OF SCREEN: 12.5 ft.
ELEVATION/DEPTH BOTTOM OF SANDPACK:
TYPE OF BACKFILL BELOW OBSERVATION WELL: No. 2 Filter Sand
ELEVATION/DEPTH OF HOLE: 14.0 ft.

James M. Montgomery
Consulting Engineers, Inc.

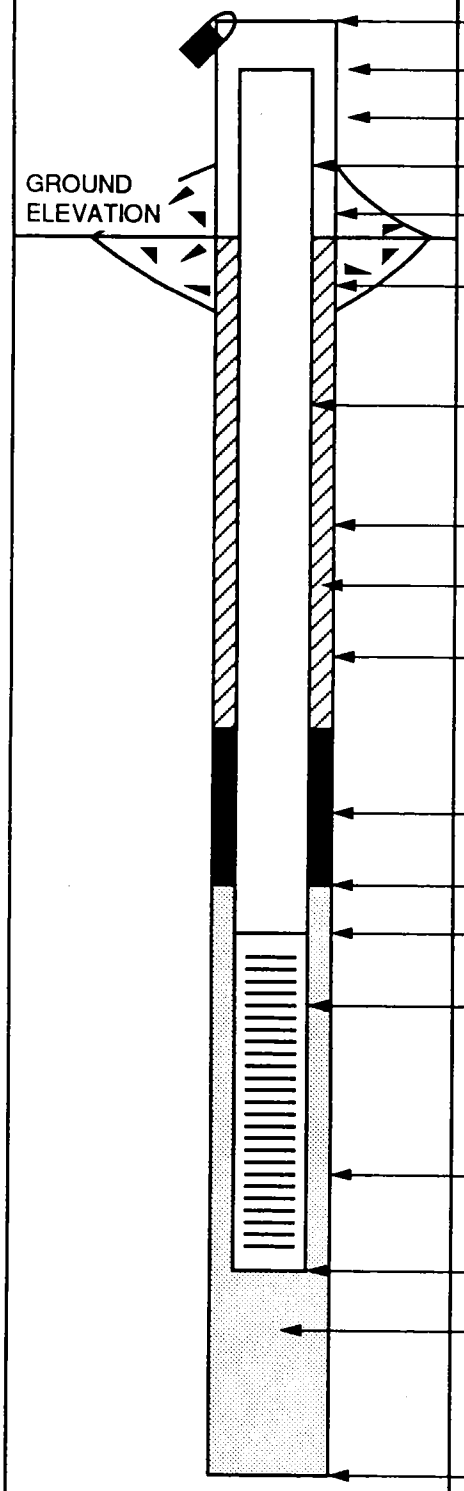
BORING NO. MW-117

# MONITORING WELL SHEET

PROJECT Fort Story PA/SI
PROJECT NO. 1868.0401
ELEVATION
FIELD GEOLOGIST Gary B. Enloe

LOCATION Site 6
BORING MW-117
DATE 03/20/90

DRILLER Hardin and Huber Inc.
DRILLING METHOD Hollow Stem Auger
DEVELOPMENT METHOD Bailing/Pumping




ELEVATION OF TOP OF SURFACE CASING: 16.28 ft.
ELEVATIONS OF TOP OF RISER PIPE: 16.00 ft.
STICK-UP TOP OF SURFACE CASING: 2.31 ft.
STICK-UP RISER PIPE: 2.03 ft.
TYPE OF SURFACE SEAL: Cement Grout
I.D. OF SURFACE CASING: 4 inch
TYPE OF SURFACE CASING: Steel
RISER PIPE I.D.: 2 inch
TYPE OF RISER PIPE: Schedule 40 PVC
BOREHOLE DIAMETER: 8 1/4 inch
TYPE OF BACKFILL: Cement Grout
ELEVATION/DEPTH OF SEAL: 2.0 ft.
TYPE OF SEAL: Granular Bentonite
DEPTH TO TOP OF SAND PACK: 3.0 ft.
ELEVATION/DEPTH TOP OF SCREEN: 4.0 ft.
TYPE OF SCREEN: Schedule 40 PVC
SLOT SIZE X LENGTH: .020 inch X 10 feet
I.D. OF SCREEN: 2 inch
TYPE OF SAND PACK: No. 2 Filter Sand
ELEVATION/DEPTH BOTTOM OF SCREEN: 14.0 ft.
ELEVATION/DEPTH BOTTOM OF SANDPACK: 14.0 ft.
TYPE OF BACKFILL BELOW OBSERVATION WELL: Formation
ELEVATION/DEPTH OF HOLE: 14.0 ft.

JMM James M. Montgomery
Consulting Engineers, Inc.

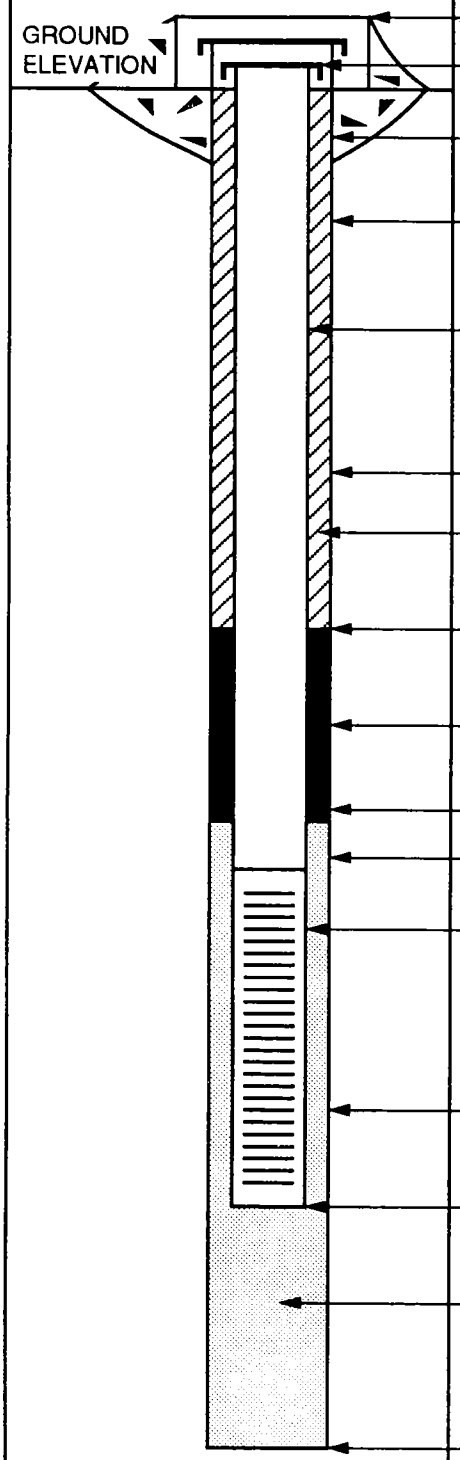
BORING NO. MW-118

# MONITORING WELL SHEET

PROJECT Fort Story PA/IS
PROJECT NO. 1868.0401
ELEVATION
FIELD GEOLOGIST Mark Shupe

LOCATION Site 6
BORING MW-118
DATE 3/20/90

DRILLER Hardin and Huber Inc.
DRILLING METHOD Hollow Stem Auger
DEVELOPMENT METHOD Bailing/Pumping




ELEVATION OF TOP OF SURFACE CASING: 13.71 ft.
ELEVATIONS OF TOP OF RISER PIPE: 13.24 ft.

TYPE OF SURFACE SEAL: Cement Grout

I.D. OF SURFACE CASING: 8 inch
TYPE OF SURFACE CASING: Steel

RISER PIPE I.D.: 2 inch
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 8 1/4 inch

TYPE OF BACKFILL: Cement Grout

ELEVATION/DEPTH OF SEAL: 2.8 ft.

TYPE OF SEAL: Granular Bentonite

DEPTH TO TOP OF SAND PACK: 3.8 ft.
ELEVATION/DEPTH TOP OF SCREEN: 5.0 ft.

TYPE OF SCREEN: Schedule 40 PVC
SLOT SIZE X LENGTH: 0.020 inch X 10 feet
I.D. OF SCREEN: 2 inch

TYPE OF SAND PACK: No. 2 Filter Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: 15.0 ft.

ELEVATION/DEPTH BOTTOM OF SANDPACK:
TYPE OF BACKFILL BELOW OBSERVATION WELL: Formation

ELEVATION/DEPTH OF HOLE: 15.0 ft.

# Monitoring Well Development Sheets

Earth Engineering & Sciences, Inc.

## Monitoring Well Development Sheet MW-115

Project: Ft Story Location: Site 6

Project No. 1968.0401 Dates:

Field Geologists: G. Towson & D. England

Barrel ID: SG MW 115 No. of Barrels: 3 - 55 gal

Initial Development Method Air Surges Init. Dev. Date: 3-25-90

Initial Volume Removed: 19 gal Time Started: 1540 Finished: 1600

Initial Team Members: Gary Enloe

Water Level (Initial): 4.33

Total Depth (BOH): 11.06

Designed Depth: 12.5

Depth of Sediment: 1.44

Water Level After Initial Development: 4.43

BOH After Initial Development: 12.51

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Final Development Method: Pumping Fin. Dev. Date: 4-6-90

Final Volume Removed: 165 gal Time Start: 1645 Finished: 1729

Final Team Members: G. Towson & D. England (EESI Geologists)

Water Level Start: 4.38 Finished: 4.38 Ph: 6.50 EC: 145 T°C: 16.3

Total Depth Start: 12.5 Finished: 12.5

$O_2$, TOX, Lel and Organic Vapor Problems Encountered: H-Nuc 2ppm LEL >250% $O_2$ 3.1 in Hole

Action: ☐ None Needed
☒ Need: Maintain upwind & monitor ambient air

Earth Engineering & Sciences, Inc.

| Date | Time | Initial Development | Final Development | Depth to Water (ft.) | Total Depth (ft) | Design Depth (ft.) | Estimated Sediment Thickness (ft.) | Air Surging | Bailing | Pumping | Flow Rate (gal/min) | Well Volume (gal.) | Total Vol. of Develop. Water | Water Temp. (°C)* | pH | EC (µΩ) * | Turbidity (Ntu) | Team Members |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4-6-00 | 1645 | | ✓ | 4.35 | 12.50 | 12.5 | — | | | ✓ | 0 | 8.12 | | 16.0 | | 250 | | G. TOWSON D. ENGLAND |
| | 1646 | | | | | | | | | ✓ | 2 | | 0 | 16.0 | 6.45 | 190 | | |
| | 1650 | | | | | | | | | ✓ | 2 | | 8 | 16.2 | 6.52 | 180 | | |
| | 1654 | | | | | | | | | ✓ | 2 | | 16 | 16.2 | 6.49 | 179 | | |
| | 1658 | | | | | | | | | ✓ | 2 | | 24 | 16.3 | 6.50 | 177 | | |
| | 1702 | | | | | | | | | ✓ | 2 | | 32 | 16.2 | 6.55 | 170 | | |
| | 1706 | | | | | | | | | ✓ | 5 | | 52 | 16.1 | 6.53 | 169 | | |
| | 1711 | | | | | | | | | ✓ | 5 | | 77 | 16.1 | 6.53 | 161 | | |
| | 1715 | | | | | | | | | ✓ | 5 | | 92 | 16.2 | 6.51 | 158 | | |
| | 1720 | | | | | | | | | ✓ | 5 | | 117 | 16.3 | 6.45 | 150 | | |
| | 1724 | | | | | | | | | ✓ | 5 | | 137 | 16.3 | 6.45 | 150 | | |
| | 1729 | | | | | | | | | ✓ | 5 | | 165 | 16.3 | 6:50 | 145 | | |
| 4-10 | | | | | | | | | ✓ | ✓ | .5 | | 166 | 16.2 | 6.48 | 190 | 1.13 | G. TOWSON D. ENGLAND |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |

Location: FORT STORY LARC AREA

Site #: 6

Well #: MW 115

* IN HOLE

TURBIDITY TAKEN 2 HRS AFTER SAMPLES REMOVED FROM WELL

Earth Engineering & Sciences, Inc.

## Monitoring Well Development Sheet MW 116

Project: FORT STORY Location: SITE 6

Project No. 1868.0401 Dates: 3-27-90 & + 4-8-90

Field Geologists:

Barrel ID: S6 MW 116 DEV $H_2O$ No. of Barrels: 2 - 55 gal

Initial Development Method AIR SURGED Init. Dev. Date: 3-27-90

Initial Volume Removed: NOT given Time Started: 1600 Finished: 1630

Initial Team Members: GARY ENLOE

Water Level (Initial): 4.91

Total Depth (BOH): 12.51

Designed Depth: 12.50

Depth of Sediment: -0-

Water Level After Initial Development: 4.94

BOH After Initial Development: 12.08

---

Final Development Method: PUMPED Fin. Dev. Date: 4-8-90

Final Volume Removed: 110 Time Start: 1000 Finished: 1034

Final Team Members: G. TOWSON & D. ENGLAND

Water Level Start: 4.55 Finished: 4.55 Ph: 6.33 EC: 185 T°C: 16.0

Total Depth Start: 12.60 Finished: 12.60

$O_2$, TOX, Lel and Organic Vapor Problems Encountered: NONE

Action: ☒ None Needed
☐ Need:

Earth Engineering & Sciences, Inc.

| Date | Time | Initial Development | Final Development | Depth to Water (ft.) | Total Depth (ft) | Design Depth (ft.) | Estimated Sediment Thickness (ft.) | Air Surging | Bailing | Pumping | Flow Rate (gal/min) | Well Volume (gal.) | Total Vol. of Develop. Water | Water Temp. (°C) * | pH | EC (µΩ) * | Turbidity (Ntu) | Team Members |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4-8-90 | 1000 | | ✓ | 4.55 | 12.60 | 12.50 | 0 | | | ✓ | 2 | 7.81 | 1 | 16.5 | 6.16 | 195 | | G. TOWSON D. ENGLAND |
| | 1005 | | ✓ | | | | | | | ✓ | 2 | | 9 | 16.5 | 6.22 | 195 | | |
| | 1009 | | ✓ | | | | | | | ✓ | 2 | | 17 | 16.5 | 6.27 | 190 | | |
| | 1013 | | ✓ | | | | | | | ✓ | 2 | | 25 | 16.5 | 6.23 | 190 | | |
| | 1017 | | ✓ | | | | | | | ✓ | 5 | | 33 | 16.5 | 6.26 | 190 | | |
| | 1019 | | ✓ | | | | | | | ✓ | 5 | | 43 | 16.5 | 6.31 | 195 | | |
| | 1022 | | ✓ | | | | | | | ✓ | 5 | | 58 | 16.5 | 6.30 | 190 | | |
| | 1024 | | ✓ | | | | | | | ✓ | 5 | | 68 | 16.2 | 6.33 | 195 | | |
| | 1027 | | ✓ | | | | | | | ✓ | 5 | | 83 | 16.2 | 6.33 | 190 | | |
| | 1029 | | ✓ | | | | | | | ✓ | 5 | | 93 | 16.0 | 6.33 | 190 | | |
| | 1032 | | ✓ | | | | | | | ✓ | 5 | | 103 | 16.0 | 6.33 | 185 | | |
| | 1034 | | ✓ | | | | | | | ✓ | 5 | | 110 | 16.0 | 6.33 | 195 | | |
| 4-10 | | | | | | | | | | | | | 111 | 16.3 | 6.24 | 215 | 1.57 | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |

Location: _____

Site #: _____

Well #: _____

* . IN HOLE

TURBIDITY TAKEN 2 HRS AFTER SAMPLE REMOVED FROM WELL

Earth Engineering & Sciences, Inc.

## Monitoring Well Development Sheet MW-117

Project: FORT STORY Location: SITE 6

Project No. ~~185~~ 1868.0101 Dates: 4-2-90 & 4-6-90

Field Geologists: G. TOWSON & D ENGLAND (EESI GEOLOGISTS

Barrel ID: S6 MW 117 DEU $H_2O$ No. of Barrels: 3 · 55 GAL

Initial Development Method BAILING Init. Dev. Date: 4-2-90

Initial Volume Removed: 33 GAL Time Started: 1105 Finished: 1515 BREAK TAK IN BETWEEN

Initial Team Members: G. TOWSON & D. ENGLAND

Water Level (Initial): 7.35

Total Depth (BOH): 14.11

Designed Depth: 14

Depth of Sediment: 0

Water Level After Initial Development: 7.35

BOH After Initial Development: 14.14

---

Final Development Method: PUMPING Fin. Dev. Date: 4-6-90

Final Volume Removed: 165 Time Start: 1500 Finished: 1540

Final Team Members: G. TOWSON & D ENGLAND

Water Level Start: 7.21 Finished: 7.21 Ph: 6.45 EC: 155 T°C: 16.5

Total Depth Start: 14.14 Finished: 14.14

$O_2$, TOX, Lel and Organic Vapor Problems Encountered: LEL 3% $O_2$ 7.6 H-NUE 13.2 IN HOLE

Action: ☐ None Needed
☒ Need: MAINTAINED UPWIND FROM WELL & SAMPLES & MONITORED AMBIENT AIR

Earth Engineering & Sciences, Inc.

| Date | Time | Initial Development | Final Development | Depth to Water (ft.) | Total Depth (ft) | Design Depth (ft.) | Estimated Sediment Thickness (ft.) | Air Surging | Bailing | Pumping | Flow Rate (gal/min) | Well Volume (gal.) | Total Vol. of Develop. Water | Water Temp. (°C) | pH | EC (µΩ) | Turbidity (Ntu) | Team Members |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4-2-90 | 1105 | ✓ | | 7.35 | 14.11 | 14 | 0 | | ✓ | | .5 | 6.35 | | 16.1 | 6.42 | 250 | | G. Tomson D. England |
| " | 1415 | ✓ | | | | | | | ✓ | | .5 | | | 16.2 | 6.37 | 220 | | |
| | 1515 | ✓ | | 7.35 | 14.14 | 14 | .03 | | ✓ | | .5 | | #33 | 16.4 | 6.60 | 210 | | |
| 4-6-90 | 1500 | | ✓ | 7.21 | | | | | | ✓ | 2 | | 35 | 16.2* | - | 140* | | G. Tomson D. England |
| | 1501 | | ✓ | | | | | | | ✓ | 2 | | 43 | 16.2 | 6.36 | 35 | | |
| | 1505 | | ✓ | | | | | | | ✓ | 2 | | 51 | 16.4 | 6.41 | 40 | | |
| | 1509 | | ✓ | | | | | | | ✓ | 2 | | 59 | 16.4 | 6.45 | 40 | | |
| | 1513 | | ✓ | | | | | | | ✓ | 2 | | 67 | 16.3 | 6.45 | 60 | | |
| | 1517 | | ✓ | | | | | | | ✓ | 5 | | 73 | 16.5 | 6.44 | 150 | | |
| | 1521 | | ✓ | | | | | | | ✓ | 5 | | 93 | 16.5 | 6.45 | 155 | | |
| | 1525 | | ✓ | | | | | | | ✓ | 5 | | 110 | 16.5 | 6.44 | 155 | | |
| | 1530 | | ✓ | | | | | | | ✓ | 5 | | 130 | 16.5 | 6.44 | 155 | | |
| | 1534 | | ✓ | | | | | | | ✓ | 5 | | 150 | 16.5 | 6.45 | 155 | | |
| | 1539 | | ✓ | | | | | | | ✓ | 5 | | 160 | 16.5 | 6.45 | 155 | | |
| | 1540 | | ✓ | 7.21 | | | | | | ✓ | 5 | | 165 | 16.5 | 6.45 | 155 | | |
| 4-10 | | | ✓ | | | | | | | ✓ | .5 | | 166 | 16.2 | 6.43 | 170 | 6.4 | D. England G. Tomson |

Location: Fort Story CARC A/C4

Site #: #6

Well #: MW 117

* - in Hole

Turbidity taken 2 hrs after sample removed from well

JMM JAMES M. MONTGOMERY, CONSULTING ENGINEERS, INC.

BY _____ DATE _____ CLIENT _____ SHEET _____ OF _____

CHKD. BY _____ DESCRIPTION FORT STORY JOB NO. _____

Well No. 117 Date:
Site No. 6

BEFORE ~~SURGING~~ BAILING

Depth to Water (DTW) = 7.35

Total Depth (TD) = 14.14

Design Total Depth = 14

Calculated depth of sediment = 0

~~SURGING~~ BAILING

Time begin = 1105 — LUNCH TAKEN

Time end = 1515

Development water clarity = Brown, Detergent like Bubbles on Sample

Estimated volume of development water = 33

Discharge rate during development =

AFTER SURGING

Depth to Water =

Total Depth =

Calculated depth of sediment =

Earth Engineering & Sciences, Inc.

## Monitoring Well Development Sheet MW-118

Project: FORT STORY IRP Location: SITE #6

Project No. 1366.0101 Dates: 4-2-90 & 4-6-90

Field Geologists: GEORGE TOWSON

Barrel ID: S6MW118 DEV $H_2O$ No. of Barrels: 3 · 55 gal

Initial Development Method BAILING Init. Dev. Date: 4-2-90

Initial Volume Removed: 13 gal Time Started: 1605 Finished: 1705

Initial Team Members: G. TOWSON & D. ENGLAND

Water Level (Initial): 6.85

Total Depth (BOH): 13.77

Designed Depth: 15.0

Depth of Sediment: 1.38'

Water Level After Initial Development: 6.85

BOH After Initial Development: 15.15

---

Final Development Method: PUMPING Fin. Dev. Date: 4-6-90

Final Volume Removed: 166 gal Time Start: 1350 Finished: 1431

Final Team Members: G. TOWSON & D. ENGLAND CESI GEOLOGISTS

Water Level Start: 6.60 Finished: 6.60 Ph: 5.36 EC: 50 T°C: 16.6

Total Depth Start: 15.15 Finished: 15.15

$O_2$, TOX, Lel and Organic Vapor Problems Encountered: NONE

Action: ☒ None Needed
☐ Need:

Earth Engineering & Sciences, Inc.

| Date | Time | Initial Development | Final Development | Depth to Water (ft.) | Total Depth (ft) | Design Depth (ft.) | Estimated Sediment Thickness (ft.) | Air Surging | Bailing | Pumping | Flow Rate (gal/min) | Well Volume (gal.) | Total Vol. of Develop. Water | Water Temp. (°C)* | pH | EC (µΩ)* | Turbidity (Ntu) | Team Members |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4-6-90 | 1350 | | ✓ | 6.60 | 15.10 | 15.0 | 0 | | | ✓ | 2 | 7.99 | 15 | 16.3 | 5.92 | 30 | | |
| | 1355 | | | | | | | | | | | | 25 | 16.5 | 5.93 | 30 | | |
| | 1403 | | | | | | | | | | | | 41 | 16.5 | 5.71 | 32 | | |
| | 1406 | | | | | | | | | | | | 47 | 16.5 | 5.60 | 35 | | |
| | 1409 | | | | | | | | | | | | 53 | 16.5 | 5.51 | 50 | | |
| | 1412 | | | | | | | | | | | | 64 | 16.5 | 5.50 | 50 | | |
| | 1415 | | | | | | | | | | | | 81 | 16.7 | 5.47 | 49 | | |
| | 1418 | | | | | | | | | | | | 95 | 16.7 | 5.45 | 50 | | |
| | 1421 | | | | | | | | | | | | 115 | 16.5 | 5.42 | 50 | | |
| | 1424 | | | | | | | | | | | | 132 | 16.8 | 5.40 | 50 | | |
| | 1429 | | | | | | | | | | | | 149 | 16.7 | 5.40 | 50 | | |
| | 1431 | | | | | | | | | | | | 165 | 16.6 | 5.36 | 50 | | |
| 4-10 | | | | | | | | | | | | | 166 | 16.4 | 5.50 | 50 | 2.05 | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |

Location: FORT STORY LARC AREA

Site #: SITE #6

Well #: MW 11S

* - IN HOLE

TURBIDITY VALUE TAKEN 2 HOURS AFTER SAMPLE TAKEN FROM HOLE

JMM JAMES M. MONTGOMERY, CONSULTING ENGINEERS, INC.

BY _____ DATE _____ CLIENT _____ SHEET _____ OF _____

CHKD. BY _____ DESCRIPTION FORT STORY JOB NO. _____

Well No. MW118 Date: 4-2-90
Site No. #6

BEFORE SURGING

Depth to Water (DTW) = 6.95

Total Depth (TD) = 13.77

Design Total Depth = 15.00

Calculated depth of sediment = 1.23

~~SURGING~~ BAILING

Time begin = 1605

Time end = 1705

Development water clarity = Brown

Estimated volume of development water = 13 gal

Discharge rate during development = NA

AFTER SURGING

Depth to Water = 6.95

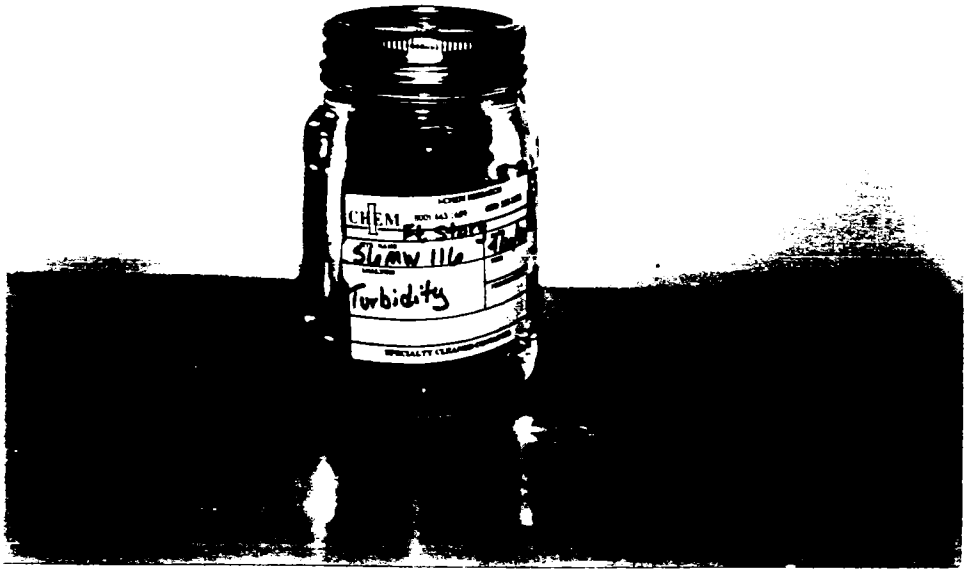
Total Depth = 15.15

Calculated depth of sediment = 1.38

# Monitoring Well Development Photographs

Fort Story, Virginia

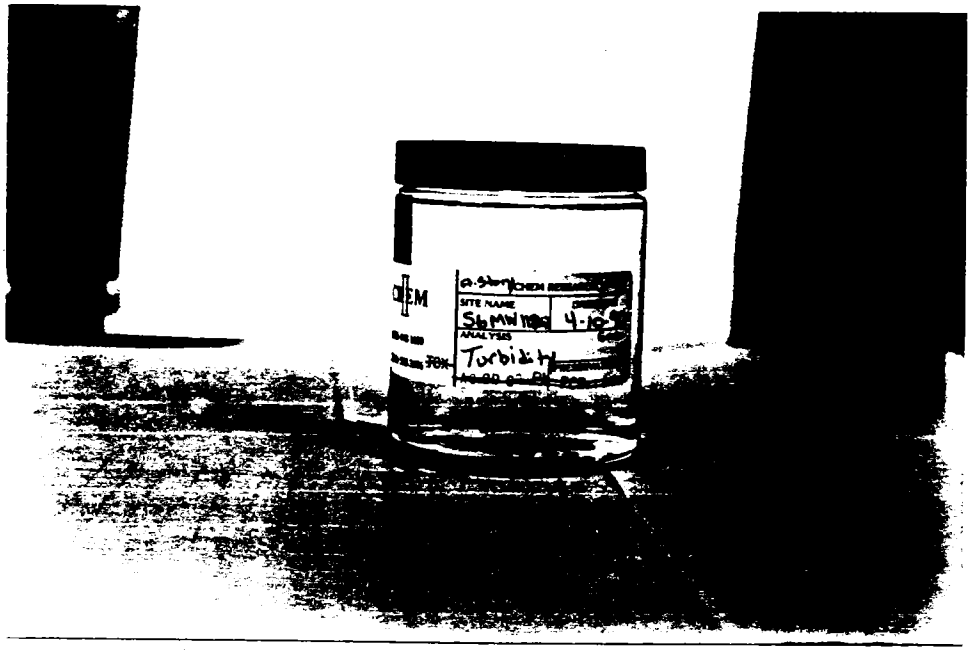
Site Number: 6
Well Number: MW-115




Site Number: 6
Well Number: MW-116

Fort Story, Virginia

Site Number: 6
Well Number: MW-117




Site Number: 6
Well Number: MW-118

# In Situ Permeability Data

RAW DATA

WELL # S6MW115

WELL DIAMETER= 8.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER= .28 GALLONS
LENGTH OF AQUIFER TESTED= 20.00 FEET
VALUE OF HO= 1.72 FEET
STATIC WATER LEVEL= 3.95 FEET
LENGTH OF SCREEN= 10.00 FEET
WATER TABLE TO BOTTOM OF WELL= 7.80 FEET

SLUG TEST DATA:

| TIME | WATER LEVEL (FEET) | TIME SINCE TEST BEGAN (MINUTES) |
|---|---|---|
| 16. 6. 3 | 4.40 | .06 |
| 16. 6. 4 | 4.24 | .08 |
| 16. 6. 5 | 4.13 | .10 |
| 16. 6. 6 | 4.08 | .11 |
| 16. 6. 7 | 4.05 | .13 |
| 16. 6. 8 | 4.03 | .15 |
| 16. 6. 9 | 4.01 | .16 |
| 16. 6.10 | 4.00 | .18 |
| 16. 6.11 | 4.00 | .20 |
| 16. 6.12 | 3.99 | .21 |
| 16. 6.13 | 3.98 | .23 |
| 16. 6.14 | 3.98 | .25 |
| 16. 6.15 | 3.98 | .26 |
| 16. 6.16 | 3.97 | .28 |
| 16. 6.17 | 3.97 | .30 |
| 16. 6.18 | 3.97 | .31 |
| 16. 6.19 | 3.97 | .33 |
| 16. 6.24 | 3.97 | .41 |
| 16. 6.29 | 3.96 | .50 |
| 16. 6.34 | 3.96 | .58 |
| 16. 6.39 | 3.96 | .66 |

WELL # S6MW115

WELL DIAMETER= 8.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER REMOVED OR ADDED TO WELL= .28 GALLONS
LENGTH OF AQUIFER TESTED= 20.00 FEET
VALUE OF HO= 1.72 FEET
STATIC WATER LEVEL= 3.95 FEET

SLUG TEST DATA:

| TIME SINCE TEST BEGAN (MINUTES) | WATER LEVEL (FEET) | DRAWDOWN (FEET) | HEAD RATIO | RECIPROCAL TIME (1/MINUTES) |
|---|---|---|---|---|
| .06 | 4.40 | .45 | .262 | 15.789 |
| .08 | 4.24 | .29 | .169 | 12.500 |
| .10 | 4.13 | .18 | .105 | 10.345 |
| .11 | 4.08 | .13 | .076 | 8.824 |
| .13 | 4.05 | .10 | .058 | 7.692 |
| .15 | 4.03 | .08 | .047 | 6.818 |
| .16 | 4.01 | .06 | .035 | 6.122 |
| .18 | 4.00 | .05 | .029 | 5.556 |
| .20 | 4.00 | .05 | .029 | 5.085 |
| .21 | 3.99 | .04 | .023 | 4.688 |
| .23 | 3.98 | .03 | .017 | 4.348 |
| .25 | 3.98 | .03 | .017 | 4.054 |
| .26 | 3.98 | .03 | .017 | 3.797 |
| .28 | 3.97 | .02 | .012 | 3.571 |
| .30 | 3.97 | .02 | .012 | 3.371 |
| .31 | 3.97 | .02 | .012 | 3.191 |
| .33 | 3.97 | .02 | .012 | 3.030 |
| .41 | 3.97 | .02 | .012 | 2.419 |
| .50 | 3.96 | .01 | .006 | 2.013 |
| .58 | 3.96 | .01 | .006 | 1.724 |
| .66 | 3.96 | .01 | .006 | 1.508 |

WELL # S6MW115

---

PERMEABILITY BASED ON COOPER, BREDEHOEFT, AND PAPADOPULOS METHOD

PERMEABILITY=1.76E-04/ MATCH TIME (IN MINUTES)
STORAGE COEF= 5.88E-02* ALPHA
COMPUTER CALCULATES
ALPHA=1.00E-05 MATCH TIME= 8.75E-03
PERMEABILITY= 2.02E-02 CM/SEC
STORAGE COEF=5.88E-07
CORRELATION NUMBER= 1.00

---

PERMEABILITY BASED ON REGRESSION FIT OF HEAD RATIO DATA

HVORSLEV PERMEABILITY=3.58E-04 / LAG TIME
BOUWER PERMEABILTY=8.84E-04 * -SLOPE

COMPUTER CALCULATES
PERMEABILITY VARIES MORE THAN 20% DEPENDING ON THEEQUATION USED

FOR X ON Y: HVORSLEV PERMEABILITY=1.58E-02 CM/SEC
BOUWER PERMEABILITY=6.00E-03CM/SEC
FOR Y ON X: HVORSLEV PERMEABILITY=1.26E-02 CM/SEC
BOUWER PERMEABILITY=6.32E-03 CM/SEC
AVERAGE HVORSLEV PERMEABILITY=1.40E-02 CM/SEC
AVERAGE BOUWER PERMEABILITY=6.16E-03 CM/SEC
REGRESSION STATISTICS
X ON Y
INTERCEPT= -.28
SLOPE= -6.8
Y ON X
INTERCEPT= -.23
SLOPE= -7.2
CORRELATION COEFFICIENT= -.97
CALCULATIONS INDICATE THAT A VALUE OF 2.19 FEET FOR HO
OR A VALUE OF 1.769 INCHES FOR EFFECTIVE CASING DIA.
MAY YIELD BETTER RESULTS

---

PERMEABILITY BASED ON REGRESSION FIT OF DATA - FERRIS & KNOWLES METHOD

INSUFFICIENT DATA POINTS WITH RECIPROCAL TIMES LESS THAN .300
NUMBER OF USABLE DATA POINTS= 0

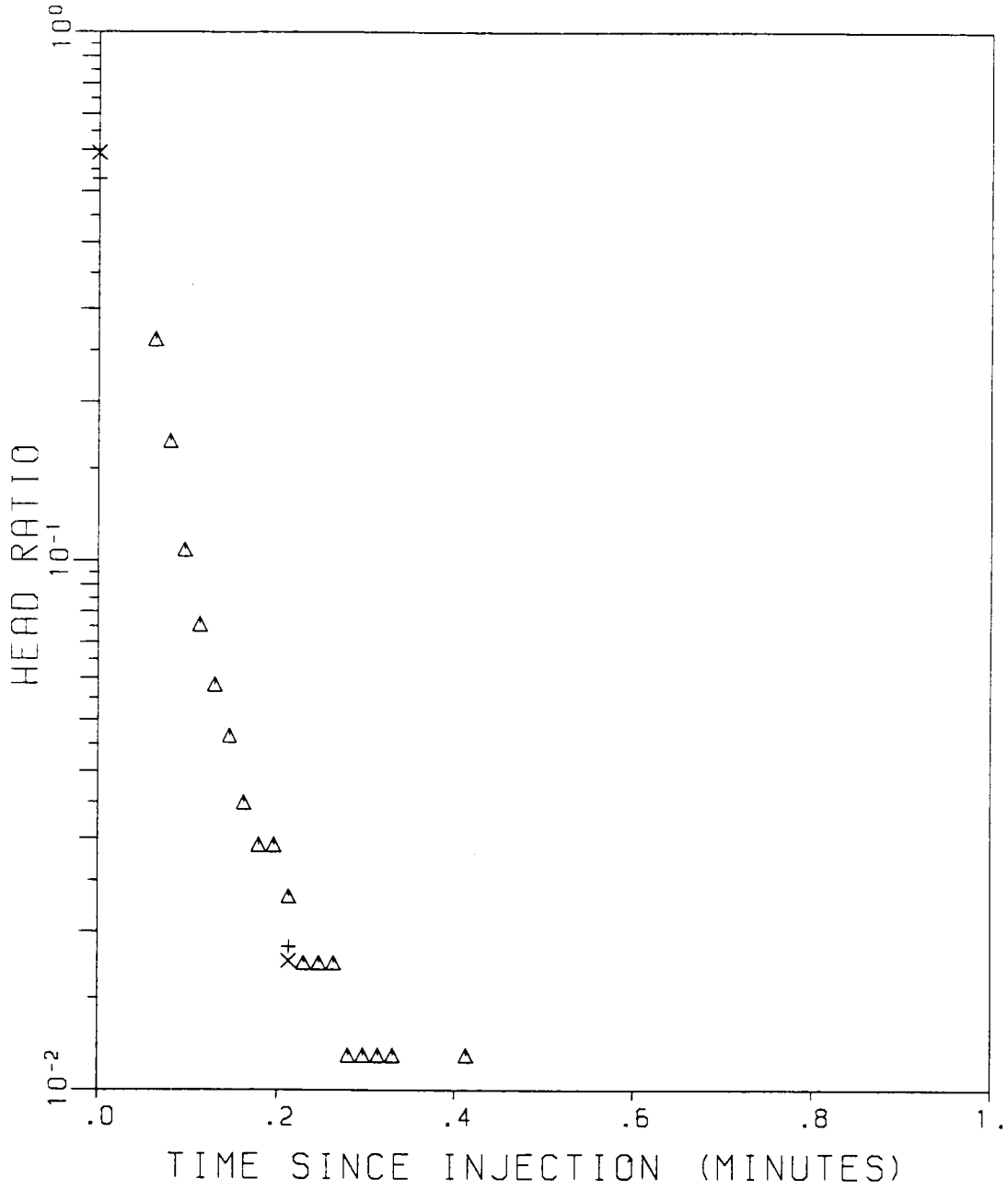
| WELL # | PERMEABILITY METHOD 1 | PERMEABILITY METHOD 2 | STORAGE COEF METHOD 2 | PERMEABILITY METHOD 3 | PERMEABILITY METHOD 4 |
|---|---|---|---|---|---|
| S6MW115 | 1.40E-02 | 2.02E-02 | 5.88E-07 | .00 | 6.16E-03 |

* METHOD 1 IS HVORSLEV
METHOD 2 IS COOPER, BREDEHOEFT, AND PAPADOPULOS
METHOD 3 IS FERRIS AND KNOWLES
METHOD 4 IS BOUWER

SITE 6, LACV FACILITY, WELL S6MW115

MON 11-05-1990

07:07:45.52




SLUG TEST OF WELL S6MW115

LOG HEAD RATIO VS TIME

RAW DATA

WELL # S6MW116

WELL DIAMETER= 8.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER= .28 GALLONS
LENGTH OF AQUIFER TESTED= 20.00 FEET
VALUE OF H0= .13 FEET
STATIC WATER LEVEL= 4.52 FEET
LENGTH OF SCREEN= 10.00 FEET
WATER TABLE TO BOTTOM OF WELL= 8.03 FEET

SLUG TEST DATA:

| TIME | WATER LEVEL (FEET) | TIME SINCE TEST BEGAN (MINUTES) |
|---|---|---|
| 17.56. 9 | 4.57 | .16 |
| 17.56.10 | 4.57 | .18 |
| 17.56.11 | 4.57 | .19 |
| 17.56.12 | 4.56 | .21 |
| 17.56.13 | 4.56 | .23 |
| 17.56.14 | 4.55 | .24 |
| 17.56.15 | 4.55 | .26 |
| 17.56.16 | 4.55 | .28 |
| 17.56.17 | 4.55 | .29 |
| 17.56.18 | 4.54 | .31 |
| 17.56.23 | 4.53 | .39 |
| 17.56.28 | 4.53 | .48 |
| 17.56.33 | 4.53 | .56 |

WELL # S6MW116

WELL DIAMETER= 8.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER REMOVED OR ADDED TO WELL= .28 GALLONS
LENGTH OF AQUIFER TESTED= 20.00 FEET
VALUE OF H0= .13 FEET
STATIC WATER LEVEL= 4.52 FEET

SLUG TEST DATA:

| TIME SINCE TEST BEGAN (MINUTES) | WATER LEVEL (FEET) | DRAWDOWN (FEET) | HEAD RATIO | RECIPROCAL TIME (1/MINUTES) |
|---|---|---|---|---|
| .16 | 4.57 | .05 | .385 | 6.250 |
| .18 | 4.57 | .05 | .385 | 5.660 |
| .19 | 4.57 | .05 | .385 | 5.172 |
| .21 | 4.56 | .04 | .308 | 4.762 |
| .23 | 4.56 | .04 | .308 | 4.412 |
| .24 | 4.55 | .03 | .231 | 4.110 |
| .26 | 4.55 | .03 | .231 | 3.846 |
| .28 | 4.55 | .03 | .231 | 3.614 |
| .29 | 4.55 | .03 | .231 | 3.409 |
| .31 | 4.54 | .02 | .154 | 3.226 |
| .39 | 4.53 | .01 | .077 | 2.542 |
| .48 | 4.53 | .01 | .077 | 2.098 |
| .56 | 4.53 | .01 | .077 | 1.786 |

WELL # S6MW116

---

PERMEABILITY BASED ON COOPER, BREDEHOEFT, AND PAPADOPULOS METHOD

PERMEABILITY=1.76E-04/ MATCH TIME (IN MINUTES)
STORAGE COEF= 5.88E-02* ALPHA
COMPUTER CALCULATES
ALPHA=1.00E-05 MATCH TIME= 4.86E-02
PERMEABILITY= 3.63E-03 CM/SEC
STORAGE COEF=5.88E-07
CORRELATION NUMBER= 1.00

---

PERMEABILITY BASED ON REGRESSION FIT OF HEAD RATIO DATA

HVORSLEV PERMEABILITY=3.58E-04 / LAG TIME
BOUWER PERMEABILTY=8.90E-04 * -SLOPE

COMPUTER CALCULATES
HVORSLEV PERMEABILITY=2.05E-03 CM/SEC
BOUWER PERMEABILITY=1.99E-03 CM/SEC
REGRESSION STATISTICS
X ON Y
INTERCEPT= -.07
SLOPE= -2.1
Y ON X
INTERCEPT= -.01
SLOPE= -2.4
CORRELATION COEFFICIENT= -.95
CALCULATIONS INDICATE THAT A VALUE OF .13 FEET FOR HO
OR A VALUE OF 2.021 INCHES FOR EFFECTIVE CASING DIA.
MAY YIELD BETTER RESULTS

---

PERMEABILITY BASED ON REGRESSION FIT OF DATA - FERRIS & KNOWLES METHOD

INSUFFICIENT DATA POINTS WITH RECIPROCAL TIMES LESS THAN .300
NUMBER OF USABLE DATA POINTS= 0

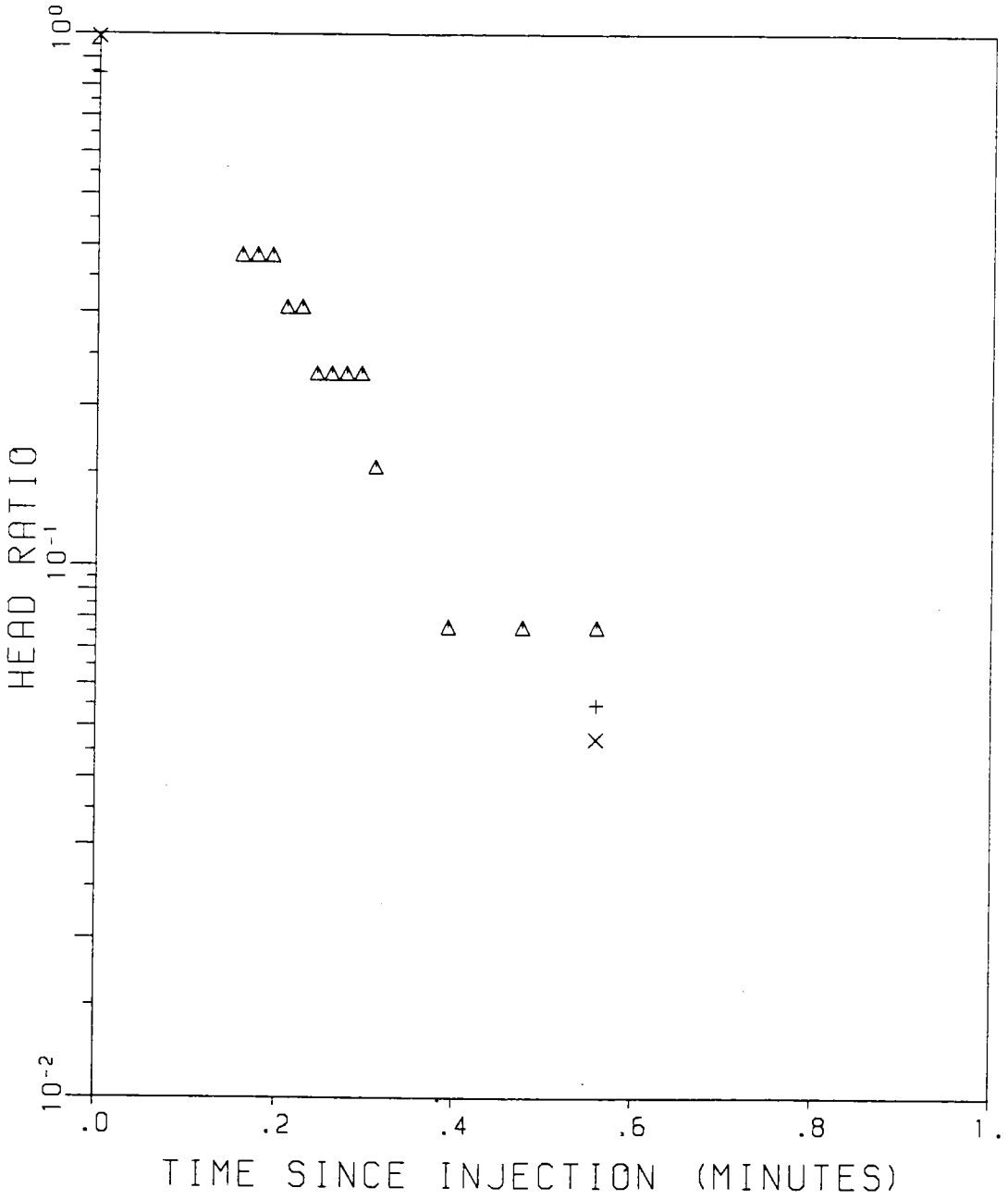
| WELL # | PERMEABILITY METHOD 1 | PERMEABILITY METHOD 2 | STORAGE COEF METHOD 2 | PERMEABILITY METHOD 3 | PERMEABILITY METHOD 4 |
|---|---|---|---|---|---|
| S6MW116 | 2.05E-03 | 3.63E-03 | 5.88E-07 | .00 | 1.99E-03 |

* METHOD 1 IS HVORSLEV
METHOD 2 IS COOPER, BREDEHOEFT, AND PAPADOPULOS
METHOD 3 IS FERRIS AND KNOWLES
METHOD 4 IS BOUWER

SITE 6. LARC FACILITY. WELL S6MW116

MON 11-05-1990

07:13:22.99




SLUG TEST OF WELL S6MW116

LOG HEAD RATIO VS TIME

RAW DATA

WELL # S6MW117

WELL DIAMETER= 8.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER= .28 GALLONS
LENGTH OF AQUIFER TESTED= 20.00 FEET
VALUE OF H0= .17 FEET
STATIC WATER LEVEL= 9.13 FEET
LENGTH OF SCREEN= 10.00 FEET
WATER TABLE TO BOTTOM OF WELL= 7.16 FEET

SLUG TEST DATA:

| TIME | WATER LEVEL (FEET) | TIME SINCE TEST BEGAN (MINUTES) |
|---|---|---|
| 15.20. 4 | 9.34 | .08 |
| 15.20. 5 | 9.26 | .09 |
| 15.20. 6 | 9.24 | .11 |
| 15.20. 7 | 9.22 | .13 |
| 15.20. 8 | 9.20 | .14 |
| 15.20. 9 | 9.20 | .16 |
| 15.20.10 | 9.19 | .18 |
| 15.20.11 | 9.18 | .19 |
| 15.20.12 | 9.17 | .21 |
| 15.20.13 | 9.16 | .23 |
| 15.20.14 | 9.17 | .24 |
| 15.20.15 | 9.16 | .26 |
| 15.20.16 | 9.16 | .28 |
| 15.20.17 | 9.15 | .29 |
| 15.20.18 | 9.15 | .31 |
| 15.20.19 | 9.15 | .33 |

WELL # S6MW117

WELL DIAMETER= 8.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER REMOVED OR ADDED TO WELL= .28 GALLONS
LENGTH OF AQUIFER TESTED= 20.00 FEET
VALUE OF HO= .17 FEET
STATIC WATER LEVEL= 9.13 FEET

SLUG TEST DATA:

| TIME SINCE TEST BEGAN (MINUTES) | WATER LEVEL (FEET) | DRAWDOWN (FEET) | HEAD RATIO | RECIPROCAL TIME (1/MINUTES) |
|---|---|---|---|---|
| .08 | 9.34 | .21 | 1.235 | 13.043 |
| .09 | 9.26 | .13 | .765 | 10.714 |
| .11 | 9.24 | .11 | .647 | 9.091 |
| .13 | 9.22 | .09 | .529 | 7.895 |
| .14 | 9.20 | .07 | .412 | 6.977 |
| .16 | 9.20 | .07 | .412 | 6.250 |
| .18 | 9.19 | .06 | .353 | 5.660 |
| .19 | 9.18 | .05 | .294 | 5.172 |
| .21 | 9.17 | .04 | .235 | 4.762 |
| .23 | 9.16 | .03 | .176 | 4.412 |
| .24 | 9.17 | .04 | .235 | 4.110 |
| .26 | 9.16 | .03 | .176 | 3.846 |
| .28 | 9.16 | .03 | .176 | 3.614 |
| .29 | 9.15 | .02 | .118 | 3.409 |
| .31 | 9.15 | .02 | .118 | 3.226 |
| .33 | 9.15 | .02 | .118 | 3.061 |

WELL # S6MW117

---

PERMEABILITY BASED ON COOPER, BREDEHOEFT, AND PAPADOPULOS METHOD

```
          PERMEABILITY=1.76E-04/ MATCH TIME (IN MINUTES)
          STORAGE COEF= 5.88E-02* ALPHA
     COMPUTER CALCULATES
          ALPHA=1.00E-05 MATCH TIME= 4.50E-02
          PERMEABILITY= 3.92E-03 CM/SEC
          STORAGE COEF=5.88E-07
          CORRELATION NUMBER=   .98
```

---

PERMEABILITY BASED ON REGRESSION FIT OF HEAD RATIO DATA

```
          HVORSLEV PERMEABILITY=3.58E-04 / LAG TIME
          BOUWER PERMEABILTY=8.65E-04 * -SLOPE

     COMPUTER CALCULATES
          HVORSLEV PERMEABILITY=2.11E-03 CM/SEC
          BOUWER PERMEABILITY=3.13E-03 CM/SEC
               REGRESSION STATISTICS
                    X ON Y
                      INTERCEPT=  .17
                      SLOPE= -3.5
                    Y ON X
                      INTERCEPT=  .20
                      SLOPE= -3.7
                    CORRELATION COEFFICIENT= -.98
     CALCULATIONS INDICATE THAT A VALUE OF    .42 FEET FOR HO
          OR A VALUE OF    1.269 INCHES FOR EFFECTIVE CASING DIA.
          MAY YIELD BETTER RESULTS
```

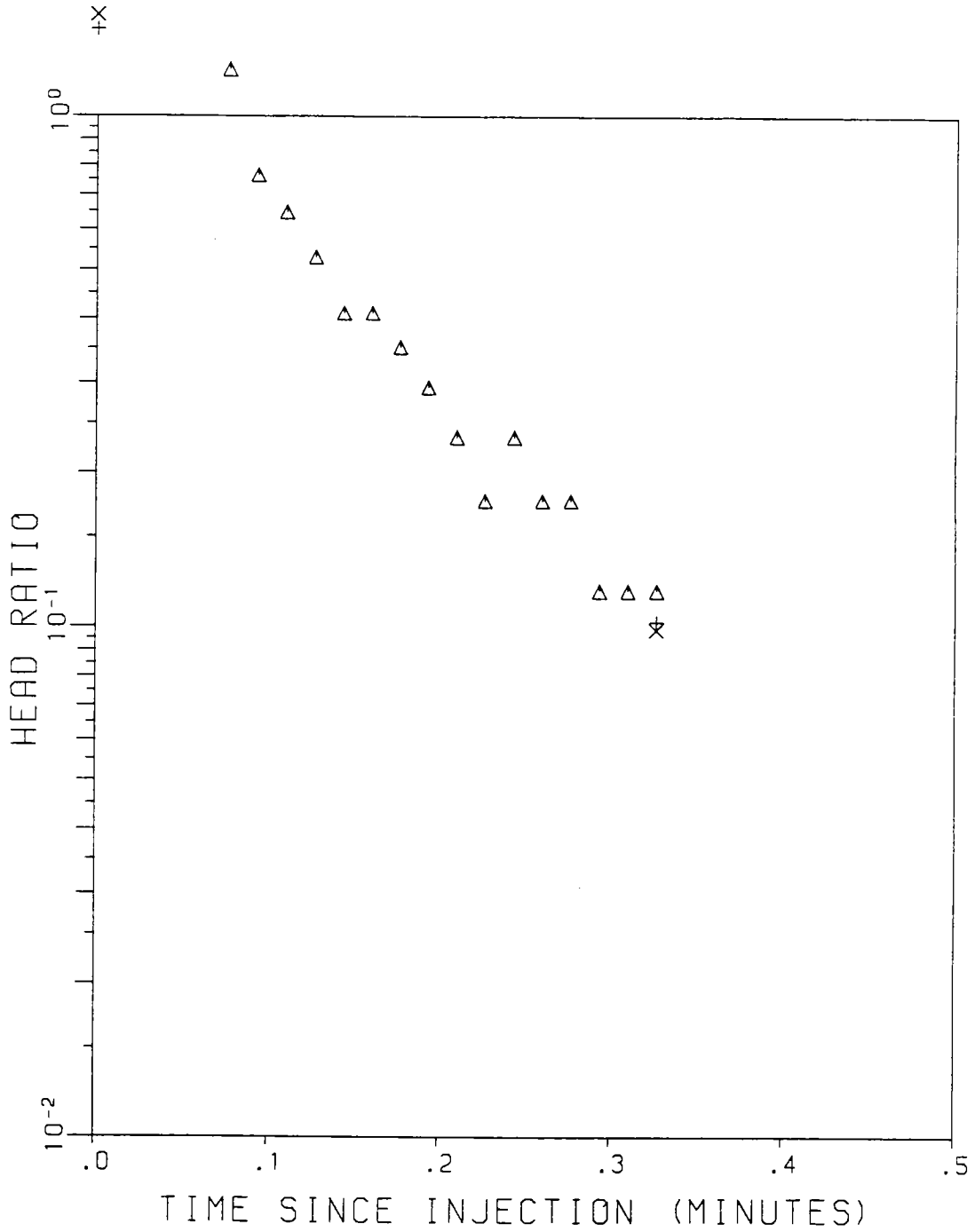
---

PERMEABILITY BASED ON REGRESSION FIT OF DATA - FERRIS & KNOWLES METHOD

```
     INSUFFICIENT DATA POINTS WITH RECIPROCAL TIMES LESS THAN .300
  NUMBER OF USABLE DATA POINTS= 0
```

| WELL # | PERMEABILITY METHOD 1 | PERMEABILITY METHOD 2 | STORAGE COEF METHOD 2 | PERMEABILITY METHOD 3 | PERMEABILITY METHOD 4 |
|---|---|---|---|---|---|
| S6MW117 | 2.11E-03 | 3.92E-03 | 5.88E-07 | .00 | 3.13E-03 |

* METHOD 1 IS HVORSLEV
METHOD 2 IS COOPER, BREDEHOEFT, AND PAPADOPULOS
METHOD 3 IS FERRIS AND KNOWLES
METHOD 4 IS BOUWER




SLUG TEST OF WELL S6MW117
LOG HEAD RATIO VS TIME

SITE 6. LARC FACILITY. WELL S6MW117
MON 11-05-1990
07:18:23.48

RAW DATA

WELL # S6MW118

WELL DIAMETER= 8.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER= .28 GALLONS
LENGTH OF AQUIFER TESTED= 20.00 FEET
VALUE OF H0= 1.72 FEET
STATIC WATER LEVEL= 6.02 FEET
LENGTH OF SCREEN= 10.00 FEET
WATER TABLE TO BOTTOM OF WELL= 8.67 FEET

SLUG TEST DATA:

| TIME | WATER LEVEL (FEET) | TIME SINCE TEST BEGAN (MINUTES) |
|---|---|---|
| 16.33. 1 | 7.04 | .03 |
| 16.33. 2 | 6.38 | .04 |
| 16.33. 3 | 6.17 | .06 |
| 16.33. 4 | 6.09 | .08 |
| 16.33. 5 | 6.07 | .09 |
| 16.33. 6 | 6.05 | .11 |
| 16.33. 7 | 6.04 | .13 |
| 16.33. 8 | 6.04 | .14 |
| 16.33. 9 | 6.03 | .16 |
| 16.33.10 | 6.03 | .18 |
| 16.33.11 | 6.03 | .19 |
| 16.33.12 | 6.03 | .21 |
| 16.33.13 | 6.03 | .23 |

WELL # S6MW118

WELL DIAMETER= 8.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER REMOVED OR ADDED TO WELL= .28 GALLONS
LENGTH OF AQUIFER TESTED= 20.00 FEET
VALUE OF H0= 1.72 FEET
STATIC WATER LEVEL= 6.02 FEET

SLUG TEST DATA:

| TIME SINCE TEST BEGAN (MINUTES) | WATER LEVEL (FEET) | DRAWDOWN (FEET) | HEAD RATIO | RECIPROCAL TIME (1/MINUTES) |
|---|---|---|---|---|
| .03 | 7.04 | 1.02 | .594 | 37.500 |
| .04 | 6.38 | .36 | .210 | 23.077 |
| .06 | 6.17 | .15 | .087 | 16.667 |
| .08 | 6.09 | .07 | .041 | 13.043 |
| .09 | 6.07 | .05 | .029 | 10.714 |
| .11 | 6.05 | .03 | .017 | 9.091 |
| .13 | 6.04 | .02 | .012 | 7.895 |
| .14 | 6.04 | .02 | .012 | 6.977 |
| .16 | 6.03 | .01 | .006 | 6.250 |
| .18 | 6.03 | .01 | .006 | 5.660 |
| .19 | 6.03 | .01 | .006 | 5.172 |
| .21 | 6.03 | .01 | .006 | 4.762 |
| .23 | 6.03 | .01 | .006 | 4.412 |

WELL # S6MW118

---

PERMEABILITY BASED ON COOPER, BREDEHOEFT, AND PAPADOPULOS METHOD

PERMEABILITY=1.76E-04/ MATCH TIME (IN MINUTES)
STORAGE COEF= 5.88E-02* ALPHA
COMPUTER CALCULATES
ALPHA=1.00E-05 MATCH TIME= 5.47E-03
PERMEABILITY= 3.23E-02 CM/SEC
STORAGE COEF=5.88E-07
CORRELATION NUMBER= .98

---

PERMEABILITY BASED ON REGRESSION FIT OF HEAD RATIO DATA

HVORSLEV PERMEABILITY=3.58E-04 / LAG TIME
BOUWER PERMEABILTY=9.06E-04 * -SLOPE

COMPUTER CALCULATES
HVORSLEV PERMEABILITY=1.08E-02 CM/SEC
BOUWER PERMEABILITY=1.84E-02 CM/SEC
REGRESSION STATISTICS
X ON Y
INTERCEPT= .22
SLOPE= -20.
Y ON X
INTERCEPT= .26
SLOPE= -21.
CORRELATION COEFFICIENT= -.99
CALCULATIONS INDICATE THAT A VALUE OF 3.98 FEET FOR HO
OR A VALUE OF 1.314 INCHES FOR EFFECTIVE CASING DIA.
MAY YIELD BETTER RESULTS

---

PERMEABILITY BASED ON REGRESSION FIT OF DATA - FERRIS & KNOWLES METHOD

INSUFFICIENT DATA POINTS WITH RECIPROCAL TIMES LESS THAN .300
NUMBER OF USABLE DATA POINTS= 0

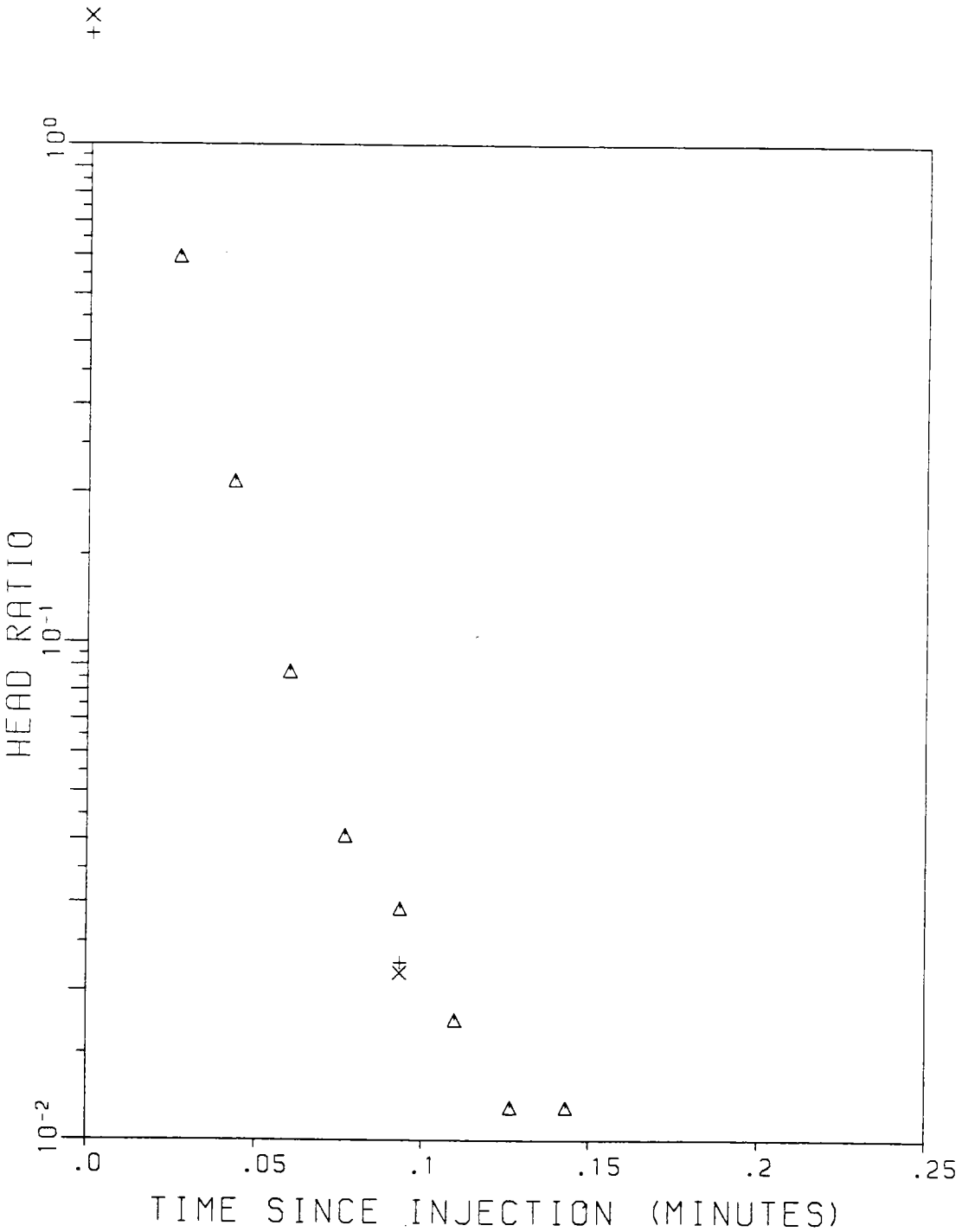
| WELL # | PERMEABILITY METHOD 1 | PERMEABILITY METHOD 2 | STORAGE COEF METHOD 2 | PERMEABILITY METHOD 3 | PERMEABILITY METHOD 4 |
|---|---|---|---|---|---|
| S6MW118 | 1.08E-02 | 3.23E-02 | 5.88E-07 | .00 | 1.84E-02 |

* METHOD 1 IS HVORSLEV
METHOD 2 IS COOPER, BREDEHOEFT, AND PAPADOPULOS
METHOD 3 IS FERRIS AND KNOWLES
METHOD 4 IS BOUWER

SITE 6, LARC FACILITY, WELL S6MW118

MON 11-05-1990

07:22:49.32




SLUG TEST OF WELL S6MW118

LOG HEAD RATIO VS TIME

# Groundwater Sampling Logs

MW 115

# GROUNDWATER SAMPLING LOG

## FORT STORY



CLIENT USACE
SITE 6
WELL NUMBER MW 115
JOB NUMBER 1868.04.01

TOTAL WELL DEPTH 12.5
WELL DIAMETER 2"
BOREHOLE DIAMETER 8 3/4"

MIN NUMBER WELL VOL TO BE PURGED 3
VOL PER VERTICAL FT CASING (GAL) .95
VOL PER FT BOREHOLE (LESS CASING)(GAL)

STATIC WATER LEVEL (FT) 4.7
STANDING WATER COLUMN (FT) 7.8

AMT ONE WELL VOL (GAL) 7.41
TOTAL GAL TO BE PURGED 22.3

PURGING SYSTEM TEFLON BAILER
SAMPLING SYSTEM TEFLON BAILER

| DATE | TIME | AMOUNT PURGED (GAL) | EC | pH | TEMP | TURBIDITY | PID | | | COMMENTS | SAMPLER |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | FIELD PARAMETERS MEASURED | | | | | | | | |
| 6 6 96 | 0826 | 0 | 290 | 6.31 | 23.1 | | | | | GRAY BROWN 0% SED | MDS/EJD |
| " | 0829 | 5 | 290 | 6.32 | 23.6 | | | | | GRAY-BROWN 0% SED | MDS/EJD |
| " | 0832 | 10 | 290 | 6.22 | 23.8 | | | | | GRAY-BROWN 0% SED | MDS/EJD |
| " | 0835 | 15 | 290 | 6.27 | 22.6 | | | | | GRAY-BROWN 0% SED | MDS/EJD |
| " | 0838 | 20 | | | | | | | | N/A | MDS/EJD |
| " | 0841 | 25 | 28 | 6.36 | 22.6 | | | | | GRAY-BROWN 0% SED | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| FINAL READING | 0930 | 6* | 290 | 6.35 | 22.3 | 239.6 | 0.0 | | | GRAY-BROWN 0% SED | MDS/EJD |

NOTES: Purge rate = 2.6 g/min

TURBIDITY: 50 x 119.8

# GROUNDWATER SAMPLING LOG

## FORT STORY



CLIENT USACE
SITE 6
WELL NUMBER MW 115
JOB NUMBER 1868.04C1

TOTAL WELL DEPTH 12.5
WELL DIAMETER 2"
BOREHOLE DIAMETER 8 3/4"

MIN NUMBER WELL VOL TO BE PURGED 3
VOL PER VERTICAL FT CASING (GAL) .95
VOL PER FT BOREHOLE (LESS CASING)(GAL)

STATIC WATER LEVEL (FT) 5.9
STANDING WATER COLUMN (FT) 6.8

AMT ONE WELL VOL (GAL) 6.46
TOTAL GAL TO BE PURGED 19.4

PURGING SYSTEM TEFLON BAILER
SAMPLING SYSTEM TEFLON BAILER

| DATE | TIME | AMOUNT PURGED (GAL) | EC | FIELD PARAMETERS MEASURED pH | TEMP | TURBIDITY | PID | | | COMMENTS | SAMPLER |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8-3 | 0710 | 0 | 160 | 6.49 | 24.6 | | | | | MURKY-BROWN 0% SED | MDS/EJD |
| " | 0713 | 5 | 170 | 6.80 | 24.9 | | | | | MURKY-BROWN 0% SED | MDS/EJD |
| " | 0716 | 10 | | | | | | | | N/A | MDS/EJD |
| " | 0719 | 15 | 190 | 6.75 | 24.3 | | | | | CLOUDY 0% SED | MDS/EJD |
| " | 0723 | 20 | 190 | 6.88 | 24.0 | | | | | CLOUDY 0% SED | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| FINAL READING | 0731 | 9 Litres | 170 | 6.89 | 24.8 | 475.6 | 0.0 | | | CLOUDY 0% SED | MDS/CTP |

NOTES: Rate 2.5 g/min

TURBIDITY: 2x 2x 118.9

MW 116

# GROUNDWATER SAMPLING LOG

## FORT STORY



CLIENT USACE
SITE 6
WELL NUMBER MW 116
JOB NUMBER 1868.0401

TOTAL WELL DEPTH 14.6
WELL DIAMETER 2"
BOREHOLE DIAMETER 8 3/4"

MIN NUMBER WELL VOL TO BE PURGED 3
VOL PER VERTICAL FT CASING (GAL) .95
VOL PER FT BOREHOLE (LESS CASING)(GAL)

STATIC WATER LEVEL (FT) 4.9
STANDING WATER COLUMN (FT) 9.1

AMT ONE WELL VOL (GAL) 8.6
TOTAL GAL TO BE PURGED 25.8

PURGING SYSTEM TEFLON BAILER
SAMPLING SYSTEM TEFLON BAILER

| DATE | TIME | AMOUNT PURGED (GAL) | EC | pH | TEMP | TURBIDITY | PID | | | COMMENTS | SAMPLER |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | FIELD PARAMETERS MEASURED | | | | | | | | |
| 6-4-R | 1108 | 0 | 650 | 6.26 | 22.3 | | | | | Gray - Brown Trace Sand | MDS/EJD |
| " | 1111 | 5 | 600 | 6.64 | 24.6 | | | | | Brown 0% Sand | MDS/EJD |
| " | 1113 | 10 | 600 | 6.33 | 24.9 | | | | | Brown 0% Sand | MDS/EJD |
| " | 1116 | 15 | | | | | | | | N/A | MDS/EJD |
| " | 1119 | 20 | | | | | | | | N/A | MDS/EJD |
| " | 1122 | 25 | | | | | | | | Brown 0% Sand | MDS/EJD |
| " | 1125 | 30 | 600 | 6.30 | 24.2 | | | | | Brown Sand | MDS/EJD |
| " | | | | | | | | | | Brown - Clear 0% Sand | MDS/EJD |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| FINAL READING | 1148 | 6* | 600 | 6.31 | 23.6 | 131.7 | 0.0 | | | murky - Brown 0% Sand | MDS/EJD |

NOTES: Purge Rate 2.5 gl/min

TURBIDITY: N

IT's no metal Cover
Free Sampler
Water est color

# GROUNDWATER SAMPLING LOG

## FORT STORY



CLIENT USACE
SITE 6
WELL NUMBER MW 116
JOB NUMBER 1868.0401

TOTAL WELL DEPTH 12.5
WELL DIAMETER 2"
BOREHOLE DIAMETER 8 3/4"

MIN NUMBER WELL VOL TO BE PURGED 3
VOL PER VERTICAL FT CASING (GAL) .95
VOL PER FT BOREHOLE (LESS CASING)(GAL)

STATIC WATER LEVEL (FT) 6.2
STANDING WATER COLUMN (FT) 6.3

AMT ONE WELL VOL (GAL) 5.9
TOTAL GAL TO BE PURGED 17.7

PURGING SYSTEM TEFLON BAILER
SAMPLING SYSTEM TEFLON BAILER

| DATE | TIME | AMOUNT PURGED (GAL) | EC | FIELD PARAMETERS MEASURED pH | TEMP | TURBIDITY | PID | | | COMMENTS | SAMPLER |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8-3 | 0825 | 0 | 390 | 6.8 | 28.6 | | | | | yellow Tint trace sed | MDS/EJD |
| " | 0831 | 5 | 360 | 6.1 | 28.0 | | | | | Brownish Tint 0% Sed | MDS/EJD |
| " | 0834 | 10 | 370 | 6.4 | 28.5 | | | | | yellow clear 0% Sed | MDS/EJD |
| " | 0837 | 15 | | | | | | | | N/A | MDS/EJD |
| " | 0837 | 20 | 370 | 7.1 | 28.0 | | | | | yellow clear 0% sed | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| FINAL READING | 0901 | 2 Liter | 350 | 7.3 | 28.0 | 464 | 6.8 | | | yellow clear 0% sed | MDS/EJD |

NOTES: Rate 2.5 gl/min

TURBIDITY: 2x 2x 116.0

MW 117

# GROUNDWATER SAMPLING LOG

## FORT STORY



CLIENT USACE
SITE 6
WELL NUMBER MW 117
JOB NUMBER 1868.0401

TOTAL WELL DEPTH 14.0
WELL DIAMETER 2"
BOREHOLE DIAMETER 8 3/4"

MIN NUMBER WELL VOL TO BE PURGED 3
VOL PER VERTICAL FT CASING (GAL) .95
VOL PER FT BOREHOLE (LESS CASING)(GAL)

STATIC WATER LEVEL (FT) 4.6
STANDING WATER COLUMN (FT) 4.4

AMT ONE WELL VOL (GAL) 4.18
TOTAL GAL TO BE PURGED 12.6

PURGING SYSTEM TEFLON BAILER
SAMPLING SYSTEM TEFLON BAILER

| DATE | TIME | AMOUNT PURGED (GAL) | EC | FIELD PARAMETERS MEASURED pH | TEMP | TURBIDITY | PID | | | COMMENTS | SAMPLER |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [illegible] | 1035 | 0 | 170 | 6.34 | 21.6 | | | | | 0% Sed Clear | MDS/EJD |
| " | 1039 | 5 | 140 | 6.49 | 21.0 | | | | | 0% Sed Clear | MDS/EJD |
| " | 1041 | 10 | 140 | 6.54 | 22.0 | | | | | 0% Sed Clear | MDS/EJD |
| " | 1043 | 15 | 150 | 6.49 | 20.8 | | | | | 0% Sed Clear | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| FINAL READING | 1100 | 6* | 140 | 6.56 | 19.0 | 67.6 | 0.0 | | | Clear 0% Sed | MDS/EJD |

NOTES: Purge Rate: 2.6 gl/min

TURBIDITY:

# GROUNDWATER SAMPLING LOG

## FORT STORY



CLIENT USACE
SITE 3
WELL NUMBER MW 117
JOB NUMBER 1868.

TOTAL WELL DEPTH 14
WELL DIAMETER 2"
BOREHOLE DIAMETER 8 3/4"

MIN NUMBER WELL VOL TO BE PURGED 3
VOL PER VERTICAL FT CASING (GAL) .95
VOL PER FT BOREHOLE (LESS CASING)(GAL)

STATIC WATER LEVEL (FT) 4.7
STANDING WATER COLUMN (FT) 9.3

AMT ONE WELL VOL (GAL) 8.8
TOTAL GAL TO BE PURGED 26.4

PURGING SYSTEM TEFLON BAILER
SAMPLING SYSTEM TEFLON BAILER

| DATE | TIME | AMOUNT PURGED (GAL) | EC | FIELD PARAMETERS MEASURED pH | TEMP | TURBIDITY | PID | | | COMMENTS | SAMPLER |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8-7 | 0913 | 0 | 140 [redacted] | 6.78 | 25.0 | | | | | MURKY BROWN 0% SED | MDS/EJD |
| " | 0915 | 5 | 140 [redacted] | 6.7 | 24.6 | | | | | MURKY-BROWN 0% SED | MDS/EJD |
| " | 0917 | 10 | 150 | 6.63 | 26.5 | | | | | CLEAR 0% SED | MDS/EJD |
| " | 0919 | 15 | 220 | 6.64 | 24.1 | | | | | CLEAR 0% SED | MDS/EJD |
| " | 0921 | 20 | 220 | 6.0 | 24.6 | | | | | CLEAR 0% SED | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| FINAL READING | 1001 | 2 Liters | 220 | 6.3 | 24.2 | 274.8 | 0.0 | | | CLEAR 0% SED | MDS/EJD |

NOTES: Rate 2.0 gl/min

TURBIDITY: 2x2x68.7

MW 118

# GROUNDWATER SAMPLING LOG

## FORT STORY



CLIENT USACE
SITE @
WELL NUMBER MW 118
JOB NUMBER 1868.0401

TOTAL WELL DEPTH 15.0
WELL DIAMETER 2"
BOREHOLE DIAMETER 8 3/4"

MIN NUMBER WELL VOL TO BE PURGED 3
VOL PER VERTICAL FT CASING (GAL) .95
VOL PER FT BOREHOLE (LESS CASING)(GAL)

STATIC WATER LEVEL (FT) 7.0
STANDING WATER COLUMN (FT) 8.0

AMT ONE WELL VOL (GAL) 7.6
TOTAL GAL TO BE PURGED 22.8

PURGING SYSTEM TEFLON BAILER
SAMPLING SYSTEM TEFLON BAILER

| DATE | TIME | AMOUNT PURGED (GAL) | EC | FIELD PARAMETERS MEASURED pH | TEMP | TURBIDITY | PID | | | COMMENTS | SAMPLER |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6-7-96 | 0641 | 0 | 210 | 5.97 | 24.8 | | | | | Brown - Clear 0% Sand | MDS/EJD |
| " | 0643 | 5 | 200 | 5.63 | 24.6 | | | | | Brown 0% Sen | MDS/EJD |
| " | 0647 | 10 | 210 | 5.87 | 24.5 | | | | | Brown 0% Sed | MDS/EJD |
| " | 0651 | 15 | 240 | 5.83 | 24.8 | | | | | Brown 0% Sed | MDS/EJD |
| " | 0653 | 20 | | | | | | | | N/A | MDS/EJD |
| " | 0655 | 25 | 230 | 5.89 | 24.9 | | | | | Brown 0% Sed | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| FINAL READING | 0700 | 6 | 200 | 5.88 | 24.3 | 544.4 | 0.0 | | | Brown 0% Sed | MDS/EJD |

NOTES: Purge Rate 2.5 gl/min

TURBIDITY: 80 x 50 x 136.1

## Soil and Monitoring Well Boring Lithologic Logs

Site 7

BORING/WELL NUMBER *SB-124*
DATE STARTED *3/25/90* COMPLETED *3/25/90*
SITE NUMBER *7*
GROUND ELEVATION *13.61 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *AUTOCRAFT BUILDING*
GEOLOGIST *M. KELLY*



COORDINATES *N224795, E2728692*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-6" | | | | | SAND (SP), dark brown - brown, fine, subrounded, poorly graded. | PID Instrumentation<br>PI 101 HNu Systems<br>10.2 eV lamp<br>PID Background=0.0 ppm. |
| 5 | | | | | | SP | SAND (SP), tan to brown, poorly graded, subrounded, iron staining at 7 feet. | |
| 10 | BH | 9.5-10 | | 3.1 | | | SAND (SP), tan and gray, medium, poorly graded, subrounded.<br>Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | GS=Ground Surface<br>BH=Bottom of Hole<br>▼=Water table during drilling |

**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *M. KELLY*
METHOD OF DRILLING *HAND AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-125*
DATE STARTED *3/25/90* COMPLETED *3/25/90*
SITE NUMBER *7*
GROUND ELEVATION *13.86 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *AUTOCRAFT BUILDING*
GEOLOGIST *M. KELLY*



COORDINATES *N224790, E2728681*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-0.5 | | 3.2 | | SW | SAND (SW), dark brown, silty, well graded, subrounded. | PID Instrumentation<br>PI 101 HNu Systems<br>10.2 eV lamp<br>PID Background=0.0 ppm. |
| | | | | | | | SAND (SP), dark brown, fine, poorly graded, subrounded. | |
| 5 | | | | | | SP | | |
| | | | | | | | SAND (SP), brown to tan, medium, poorly graded, subrounded, iron staining at 7.5 feet. | |
| ▼ | | | | | | | | |
| 10 | BH | 9.5-10 | | 3.0 | | | SAND (SP), gray, medium, subrounded, poorly graded. | |
| | | | | | | | Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | GS=Ground Surface<br>BH=Bottom of Hole<br>▼ =Water table during drilling |

**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *M. KELLY*
METHOD OF DRILLING *HAND AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-126*
DATE STARTED *3/25/90* COMPLETED *3/25/90*
SITE NUMBER *7*
GROUND ELEVATION *14.14 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *AUTOCRAFT BUILDING*
GEOLOGIST *M. KELLY*



COORDINATES *N224784, E2728688*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-0.5 | | 1.3 | | | SAND (SP), brown, fine, subrounded, poorly graded. | PID Instrumentation<br>PI 101 HNu Systems<br>10.2 eV lamp<br>PID Background=0.0 ppm. |
| 5 | | | | | | SP | SAND (SP), tan to buff, fine medium, poorly graded, subrounded, iron staining at about 7 feet. | |
| ▼ | | | | | | | | |
| 10 | BH | 9.5-10 | | 1.6 | | | Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | GS=Ground Surface<br>BH=Bottom of Hole<br>▼ =Water table during drilling |

**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *M. KELLY*
METHOD OF DRILLING *HAND AUGER*
HOLE DIAMETER *3 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-127*
DATE STARTED *3/22/90* COMPLETED *3/22/90*
SITE NUMBER *7*
GROUND ELEVATION *14.32 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *AUTOCRAFT BUILDING*
GEOLOGIST *GARY B. ENLOE*



COORDINATES *N224778, E2728699*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-6" | | | | | SAND (SP), brown, fine, subrounded, poorly graded. | |
| 5 | | | | | | SP | SAND (SP), tan to buff, fine, poorly graded, subrounded, iron staining at 7 feet, water at 7.5 feet. | |
| ▼ | | | | | | | | |
| 10 | BH | 9.5-10 | | | | | SAND (SP), tan-gray, medium, subrounded, poorly graded. | |
| | | | | | | | Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | GS=Ground Surface<br>BH=Bottom of Hole<br>▼ =Water table during drilling |

**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *M. KELLY*
METHOD OF DRILLING *HAND AUGER*
HOLE DIAMETER *3 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-128*
DATE STARTED *3/22/90* COMPLETED *3/22/90*
SITE NUMBER *7*
GROUND ELEVATION *15.40 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *AUTOCRAFT BUILDING*
GEOLOGIST *GARY B. ENLOE*



COORDINATES *N224747, E2728667*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-2 | 3 4 4 7 | 2.0 | | | Asphalt | 0-2 foot interval drive 2 spoons for additional sample volume. Blow counts actually reflect 18" sample<br>Blow counts: 3,4,4,7<br>6,2,4,3 |
| 5 | LITH | 5-7 | 4 6 3 9 | | | SP | SAND (SP), tan, fine, graded, subrounded, moist, iron staining, grading to medium, SAND at 5 feet, thin dark brown silty SAND seam at 6 feet, water at approximately 8 feet. | PID Instrumentation<br>PI 101 HNu Systems<br>10.2 eV lamp<br>PID Background=0.0 ppm. |
| ▼ | BH | 8-10 | 2 8 8 6 | 3.8 | | | | 8-10 foot interval drive 2 spoons for additional sample volume<br>Blow counts: 2,8,8,6<br>2,8,8,13 |
| 10 | | | | | | | Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

LITH=Lithology

BH=Bottom of Hole

▼ =Water table during drilling

**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 FEET*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-129*
DATE STARTED *3/22/90* COMPLETED *3/22/90*
SITE NUMBER *7*
GROUND ELEVATION *15.42 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *AUTOCRAFT BUILDING*
GEOLOGIST *GARY B. ENLOE*



COORDINATES *N224733, E2728627*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Asphalt | |
| | GS | 0.5-2.5 | 5 8 3 7 | 1.4 | | SM | SILTY SAND (SM), dark brown, sandy, organic material, blocky, dry. | 0.5-2.5 foot interval drive 3 spoons for additional sample volume Blow counts: 5,8,3,7 1,2,1,4 4,3,1,2 |
| | | | | | | | SILTY SAND (SM), brown, sandy, moist. | |
| 5 | LITH | 5-7 | 5 5 7 8 | | | SP | SAND (SP), tan, fine, subrounded, graded, iron staining, thin dark brown, sandy SILT seam at 8 feet, water at 8 feet. | PID Instrumentation PI 101 HNu Systems 10.2 eV lamp PID Background=0.0 ppm. |
| | BH | 10-12 | 1 2 2 1 | 2.0 | | | | 10-12 foot interval drive 2 spoons for additional sample volume Blow counts: 1,2,2,1 2,2,2,4 |
| 10 | | | | | | | Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

LITH=Lithology

BH=Bottom of Hole

▼ =Water table during drilling

**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-130*
DATE STARTED *3/22/90* COMPLETED *3/22/90*
SITE NUMBER *7*
GROUND ELEVATION *15.71 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *AUTOCRAFT BUILDING*
GEOLOGIST *GARY B. ENLOE*



COORDINATES
*N224707, E2728649*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS DUP SPLIT | 0.5-2.5 | 12 12 14 12 | 0.8 | | | Asphalt<br>SAND (SW), brown, fine, subrounded, well graded, asphalt, rubble. | 0.5-2.5 foot interval drive 5 spoons. for additional sample volume.<br>Blow counts: 12,12,14,12<br>2,4,6,9<br>2,4,6,8<br>2,4,8,9<br>2,3,12,13 |
| 5 | LITH | 5-7 | 2 4 7 13 | | | SW | SAND (SW), tan, fine, subrounded, well graded, water at approximately 8 feet. | PID Instrumentation<br>PI 101 HNu Systems<br>10.2 eV lamp<br>PID Background=0.0 ppm. |
| ▼ | BH | 8-10 | 8 3 3 4 | 1.2 | | | | |
| 10 | | | | | | | Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

DUP=Duplicate

LITH=Lithology

BH=Bottom of Hole

▼ =Water table during drilling

**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-131*
DATE STARTED *3/22/90* COMPLETED *3/22/90*
SITE NUMBER *7*
GROUND ELEVATION *15.71 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *AUTOCRAFT BUILDING*
GEOLOGIST *GARY B. ENLOE*



COORDINATES *N224645, E2728773*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0.5-2.5 | 14 18 25 28 | 1.0 | | SC | Asphalt<br>SANDY CLAY (SC), brown, tight, iron staining. | 0.5-2.5 foot interval drive 2 spoons for additional sample volume<br>Blow counts: 14,18,25,28 9,5,5,8 |
| 5 | LITH | 5-7 | 5 7 11 10 | | | SW | SAND (SW), buff, fine, graded, subrounded, iron staining, water at approximately 7-8 feet. | PID Instrumentation<br>PI 101 HNu Systems<br>10.2 eV lamp<br>PID Background=0.0 ppm. |
| | BH | 8-10 | 5 8 9 10 | 1.6 | | | | 8-10 foot interval drive 2 spoons for additional sample volume<br>Blow counts: 5,8,9,10 5,8,9,13 |
| 10 | | | | | | | Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

LITH=Lithology

BH=Bottom of Hole

▼ =Water table during drilling

**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC,*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *MW-119*
DATE STARTED *3/21/90* COMPLETED *3/21/90*
SITE NUMBER *7*
GROUND ELEVATION *12.87 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *AUTOCRAFT BUILDING*
GEOLOGIST *GARY B. ENLOE*



COORDINATES *N224825, E2728718*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-2 | 5 5 6 8 | 1.0 | | OL | SILT (OL), brown, blocky, vegetation & roots at surface. | 0-2 foot interval drive 3 spoons for additional sample volume. Blow counts: 5,5,6,8 3,3,3,5 3,3,3,4 |
| | | | | | | ML | SANDY SILT (ML), brown, silty, fine, moist, subrounded. | |
| | SI GEO | 2-4 | 5 5 7 7 | 1.4 | | | | 2-4 foot interval drive 2 spoons for additional sample volume. Blow counts: 5,5,7,7 5,6,9,11 |
| 5 | LITH | 5-7 | 4 4 4 5 | | | SP | SAND (SP), buff, fine, graded, subrounded, iron staining, water at approximately 3.5 feet. | |
| 10 | LITH | 10-12 | 2 4 6 7 | | | | | |
| | | | | | | | Total depth of boring=12 feet. | Auger advanced to 13 feet to hammer out flowing sands with roller bit. |
| 15 | | | | | | | | PID Instrumentation PI 101 HNu Systems 10.2 eV lamp PID Background=0.0 ppm. |
| 20 | | | | | | | | |
| 25 | | | | | | | | GS=Ground Surface<br>SI=Soil/Groundwater Interface<br>GEO=Geotechnical<br>LITH=Lithology<br>▼ =Water table during drilling |

**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *12 FEET*

WELL COMPLETION DEPTH *12 FEET*
WELL DIAMETER *2 INCHES*
WELL MATERIAL *SCHEDULE 40 PVC*

BORING/WELL NUMBER *MW-120*
DATE STARTED *3/23/90* COMPLETED *3/23/90*
SITE NUMBER *7*
GROUND ELEVATION *15.59 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *AUTOCRAFT BUILDING*
GEOLOGIST *GARY B. ENLOE*



COORDINATES *N224725, E2728729*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0.5-2.5 | 10 13 15 22 | 0.8 | | SM | Asphalt<br>SILTY SAND (SM), brown, sandy, hard, tight. | 0.5-2.5 foot interval drive 2 spoons for additional sample volume.<br>Blow counts: 10,13,15,22 2,3,4,5 |
| 5 | LITH | 5-7 | 4 4 4 3 | | | SP | SAND (SP), buff, fine, subrounded, poorly graded. | |
| | LITH | 7-9 | 5 7 9 9 | | | | | |
| 10 | SI GEO | 9-11 | 6 7 6 4 | 2.8 | | | SAND (SP), buff, medium, poorly graded, subrounded, water at 9 feet, iron staining at 10 feet. | 9-11 foot interval drive 2 spoons for additional sample volume.<br>Blow counts: 6,7,6,4 1,0,0,0 |
| 15 | LITH | 15-17 | 6 8 9 10 | | | SM<br>SP | SILTY SAND (SM), brown, medium, organic odor, wood at 16 feet, some fines.<br>SAND (SP), tan, medium, poorly graded, subrounded.<br>Total depth of boring=17 feet. | Augers advanced to 20 feet to push out flowing sands. Screen and filter sand set at 20 feet and the well was later pulled up to 17 feet (i.e. 3 feet of filter sand below screened interval). |
| 20 | | | | | | | | PID Instrumentation<br>PI 101 HNu Systems<br>10.2 eV lamp<br>PID Background=0.0 ppm. |
| 25 | | | | | | | | GS=Ground Surface<br>SI=Soil/Groundwater Interface<br>GEO=Geotechnical<br>LITH=Lithology<br>▼ =Water table during drilling |

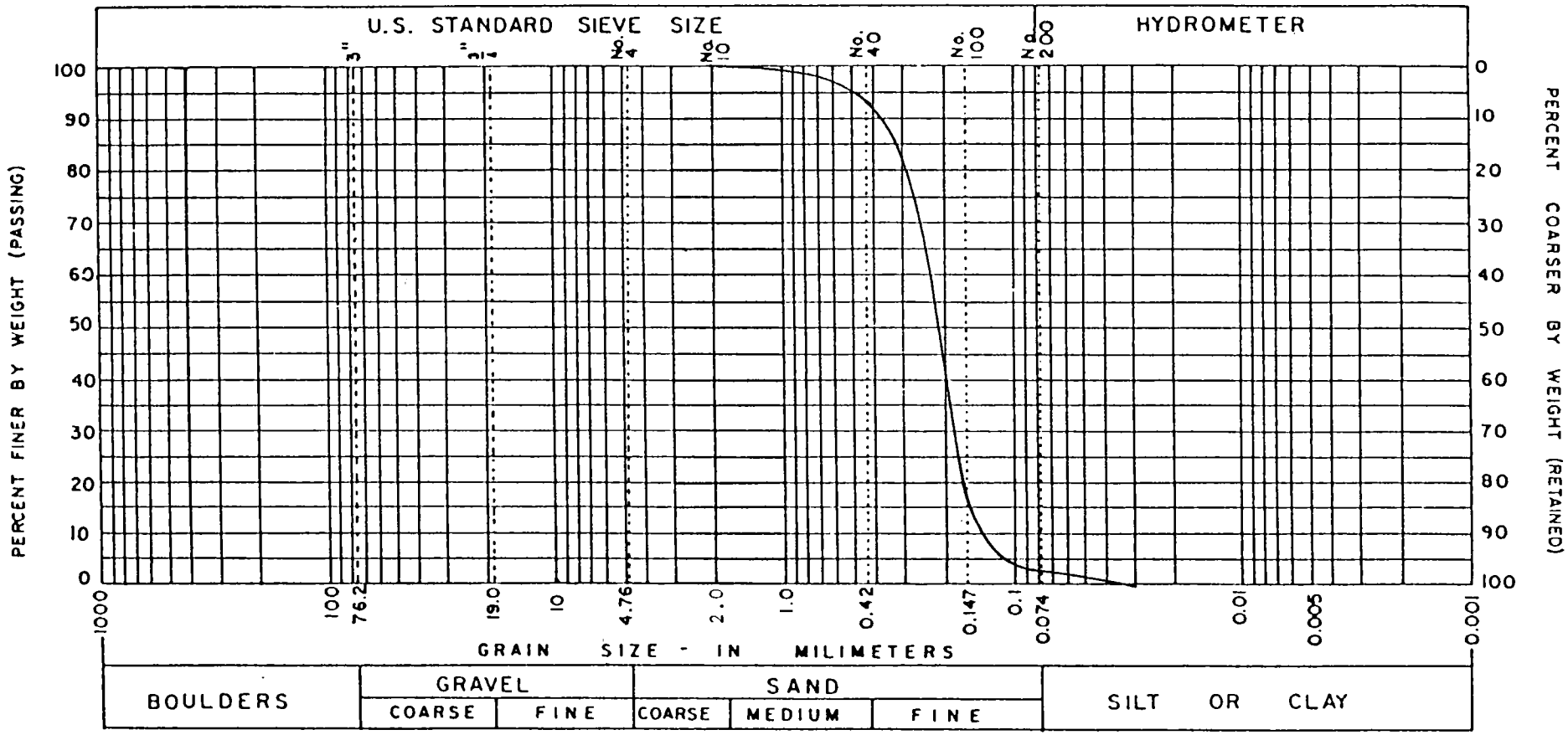
**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *17 FEET*

WELL COMPLETION DEPTH *17 FEET*
WELL DIAMETER *2 INCH*
WELL MATERIAL *SCHEDULE 40 PVC*

# Geotechnical Grain Size Analyses

| PROJECT: Fort Story | | LOCATION: Virginia Beach, VA. | |
|---|---|---|---|
| BORING NO. Site 7 | SAMPLE NO. S7MW119 | DEPTH: 4' | CONTRACT NO. 90-075 |




| SAMPLE NO. | DEPTH | L.L. | P.I. | M.C. | Unified | Soil Description |
|---|---|---|---|---|---|---|
| S7MW119 | 4' | - | N.P. | 5.9 | SP | Tan sand |

Earth Engineering & Sciences, Inc.

GRAIN-SIZE DISTRIBUTION

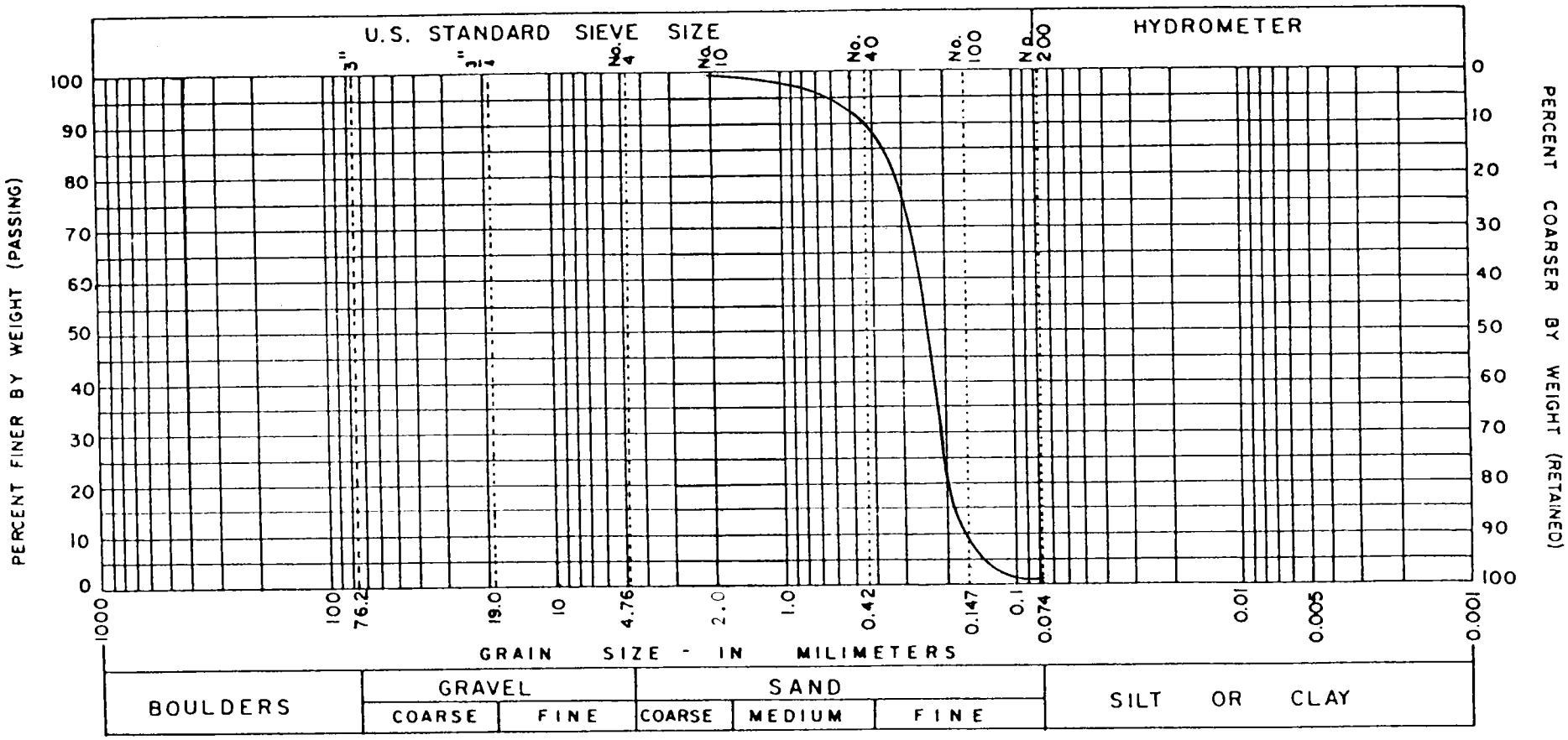
TESTED BY: RMP

DATE: 7-12-90

CHECKED BY: PAD

SHEET No. 23 OF 32

| PROJECT: Fort Story | | LOCATION: Virginia Beach, VA. | |
|---|---|---|---|
| BORING NO. Site 7 | SAMPLE NO. S7MW120 | DEPTH: 10' | CONTRACT NO. 90-075 |




| SAMPLE NO. | DEPTH | L.L. | P.I. | M.C. | Unified | Soil Description |
|---|---|---|---|---|---|---|
| S7MW120 | 10' | - | N.P. | 21.8 | SP | Tan sand |

Earth Engineering & Sciences, Inc.

## GRAIN-SIZE DISTRIBUTION

| TESTED BY: RMP | DATE: 7-12-90 |
|---|---|
| CHECKED BY: PAD | SHEET No. 24 OF 32 |

# Monitoring Well Construction Summary Sheets

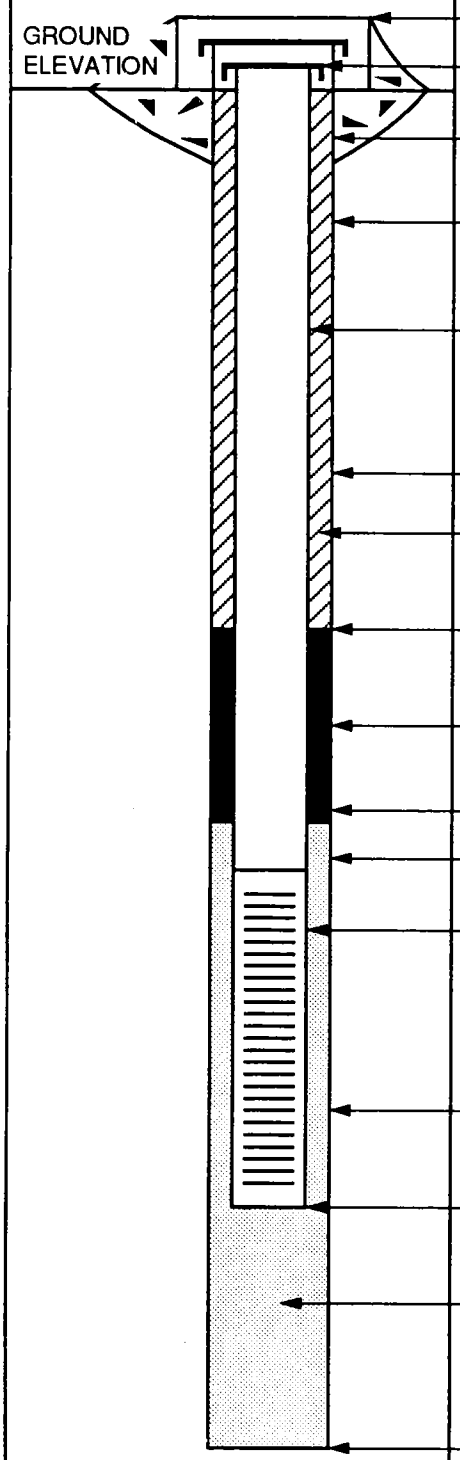
James M. Montgomery
Consulting Engineers, Inc.

BORING NO. MW-119

# MONITORING WELL SHEET

PROJECT Fort Story PA/SI
LOCATION Site 7
PROJECT NO. 1868.0401
BORING MW-119
ELEVATION
DATE 3/21/90
FIELD GEOLOGIST Gary B. Enloe

DRILLER Hardin and Huber Inc.
DRILLING METHOD Hollow Stem Auger
DEVELOPMENT METHOD Air Surging/Bailing/Pumping




ELEVATION OF TOP OF SURFACE CASING: 12.87 ft.
ELEVATIONS OF TOP OF RISER PIPE: 12.47 ft.

TYPE OF SURFACE SEAL: Cement Grout

I.D. OF SURFACE CASING: 8 inch
TYPE OF SURFACE CASING: Steel

RISER PIPE I.D.: 2 inch
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 8 1/4 inch

TYPE OF BACKFILL: Cement Grout

ELEVATION/DEPTH OF SEAL: 1.0 ft.

TYPE OF SEAL: Granular Bentonite

DEPTH TO TOP OF SAND PACK: 2.0 ft.
ELEVATION/DEPTH TOP OF SCREEN: 2.5 ft.

TYPE OF SCREEN: Schedule 40 PVC
SLOT SIZE X LENGTH: 0.020 inch X 10 feet
I.D. OF SCREEN: 2 inch

TYPE OF SAND PACK: No. 2 Filter Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: 12.5 ft.

ELEVATION/DEPTH BOTTOM OF SANDPACK:
TYPE OF BACKFILL BELOW OBSERVATION WELL:
No. 2 Filter Sand

ELEVATION/DEPTH OF HOLE: 13.0 ft.

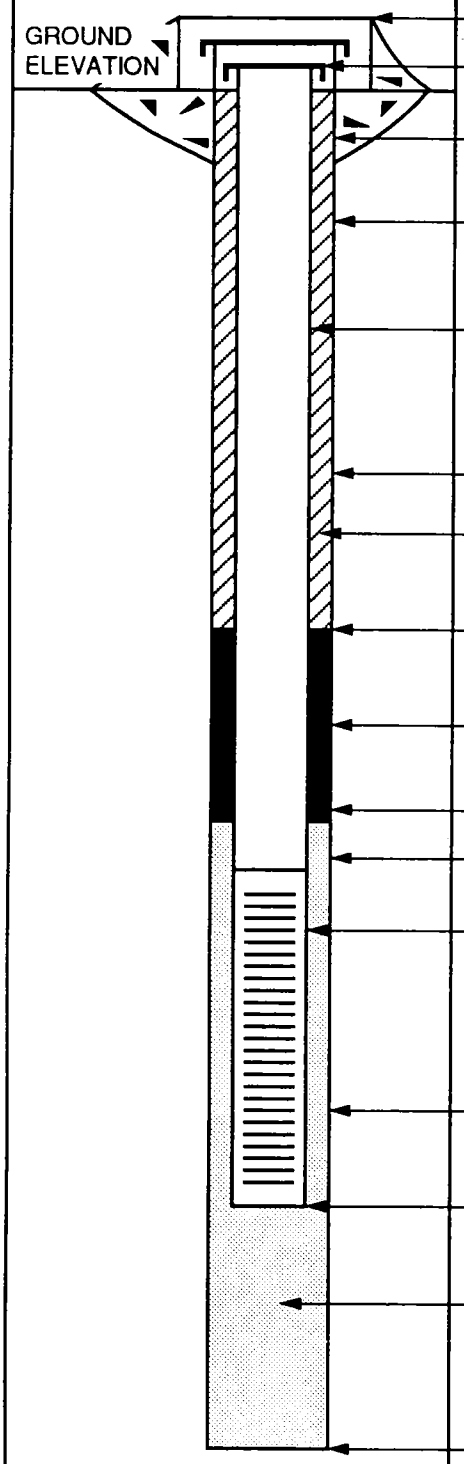
James M. Montgomery
Consulting Engineers, Inc.

BORING NO. MW-120

# MONITORING WELL SHEET

PROJECT Fort Story PA/SI
LOCATION Site 7
PROJECT NO. 1868.0401
BORING MW-120
ELEVATION
DATE 3/23/90
FIELD GEOLOGIST Gary B. Enloe

DRILLER Hardin and Huber Inc.
DRILLING METHOD Hollow Stem Auger
DEVELOPMENT METHOD Air Surging/Bailing/Pumping




ELEVATION OF TOP OF SURFACE CASING: 15.59 ft.
ELEVATIONS OF TOP OF RISER PIPE: 15.21 ft.

TYPE OF SURFACE SEAL: Cement Grout

I.D. OF SURFACE CASING: 8 inch
TYPE OF SURFACE CASING: Steel

RISER PIPE I.D.: 2 inch
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 8 1/4 inch
TYPE OF BACKFILL: Cement Grout

ELEVATION/DEPTH OF SEAL: 1.5 ft.

TYPE OF SEAL: Granular Bentonite

DEPTH TO TOP OF SAND PACK: 5.0 ft.
ELEVATION/DEPTH TOP OF SCREEN: 7.0 ft.

TYPE OF SCREEN: Schedule 40 PVC
SLOT SIZE X LENGTH: 0.020 inch X 10 feet
I.D. OF SCREEN: 2 inch

TYPE OF SAND PACK: No. 2 Filter Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: 20.0 ft.

ELEVATION/DEPTH BOTTOM OF SANDPACK: 20.0 ft.
TYPE OF BACKFILL BELOW OBSERVATION WELL:
No. 2 Filter Sand

ELEVATION/DEPTH OF HOLE: 20.0 ft.

# Monitoring Well Development Sheets

Earth Engineering & Sciences, Inc.

## Monitoring Well Development Sheet MW 119

Project: FORT STORY Location: FORT STORY SITE 7

Project No. 1865.0401 Dates: 4-9-90

Field Geologists: GEORGE TOWSON & DIANE ENGLAND

Barrel ID: 57 MW 119 DEV $H_2O$ No. of Barrels: 2-55 GAL

Initial Development Method 2 AIR SURGING Init. Dev. Date: 3/25/90

Initial Volume Removed: 28 GAL Time Started: 0915 Finished: 1010

Initial Team Members: GARY ENLOE

Water Level (Initial): 7.43'

Total Depth (BOH): 11.25

Designed Depth: 12.5

Depth of Sediment: 1.25'

Water Level After Initial Development: 7.8'

BOH After Initial Development: 11.16

---

Final Development Method: BAILING & PUMPING Fin. Dev. Date: 4-9-90

Final Volume Removed: 110 GAL Time Start: 0800 Finished: 0835

Final Team Members: GEORGE TOWSON & DIANE ENGLAND

Water Level Start: 7.48 Finished: 7.48 Ph: 5.99 EC: 290 T°C: 15.5

Total Depth Start: 2 11.87 Finished: 12.8

$O_2$, TOX, Lel and Organic Vapor Problems Encountered: NONE

Action: ☒ None Needed
☐ Need:

Earth Engineering & Sciences, Inc.

| Date | Time | Initial Development | Final Development | Depth to Water (ft.) | Total Depth (ft) | Design Depth (ft.) | Estimated Sediment Thickness (ft.) | Air Surging | Bailing | Pumping | Flow Rate (gal/min) | Well Volume (gal.) | Total Vol. of Develop. Water | Water Temp. (°C) | pH | EC (µΩ) | Turbidity (Ntu) | Team Members |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4-9-90 | 0800 | | ✓ | 7.45 | 11.87 | 12.5 | .63 | | ✓ | | | 5.0 | 0 | 15.5 | 5.34 | 215 | | GEORGE TOWSON DIANE ENGLAND |
| | 0815 | | ✓ | | 12.5 | 12.5 | — | | | ✓ | 2 | | 9 | 15.5 | 5.50 | 219 | | |
| | 0817 | | ✓ | | | | | | | ✓ | 2 | | 13 | 15.5 | 5.73 | 210 | | |
| | 0819 | | ✓ | | | | | | | ✓ | 2 | | 17 | 15.5 | 5.98 | 209 | | |
| | 0821 | | ✓ | | | | | | | ✓ | 5 | | 21 | 15.5 | 5.99 | 210 | | |
| | 0823 | | ✓ | | | | | | | ✓ | 5 | | 31 | 15.5 | 6.01 | 252 | | |
| | 0825 | | ✓ | | | | | | | ✓ | 5 | | 41 | 15.5 | 6.00 | 252 | | |
| | 0827 | | ✓ | | | | | | | ✓ | 5 | | 51 | 15.5 | 6.00 | 250 | | |
| | 0829 | | ✓ | | | | | | | ✓ | 5 | | 61 | 15.5 | 6.00 | 252 | | |
| | 0831 | | ✓ | | | | | | | ✓ | 5 | | 71 | 15.5 | 6.03 | 255 | | |
| | 0833 | | ✓ | | | | | | | ✓ | 5 | | 81 | 15.5 | 6.03 | 257 | | |
| | 0835 | | ✓ | | | | | | | ✓ | 5 | | 91 | 15.5 | 6.00 | 259 | | |
| | 0837 | | ✓ | | | | | | | ✓ | 5 | | 101 | 15.5 | 6.00 | 290 | | |
| | 0839 | | ✓ | | | | | | | ✓ | 5 | | 110 | 15.5 | 5.99 | 290 | | |
| 4-11 | | | | 7.35 | 12.5 | | | | ✓ | | .5 | | 111 | 15.5 | 5.93 | 290 | 6.51 | GEORGE TOWSON DIANE ENGLAND |
| | | | | | | | | | | | | | | | | | | |

Location: _____

Site #: _____

Well #: MW 119

Earth Engineering & Sciences, Inc.

## Monitoring Well Development Sheet MW120

Project: Ft STORY Location: SITE 7

Project No. 1865.0401 (SMM) Dates: 4-8-90

Field Geologists: GEORGE TOWSON & DIANE ENGLAND

Barrel ID: S7 MW 120 No. of Barrels: 2.55 GAL

Initial Development Method AIR SURGING Init. Dev. Date: 3/25/90

Initial Volume Removed: NOT GIVEN Time Started: 1125 Finished: 1212

Initial Team Members: GARY ONLOE

Water Level (Initial): 10.15'

Total Depth (BOH): 15.50'

Designed Depth: 17.0'

Depth of Sediment: 1.50'

Water Level After Initial Development: 10.45

BOH After Initial Development: 16.15

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Final Development Method: BAILING & PUMPING Fin. Dev. Date: 4-8-90

Final Volume Removed: 106 GAL Time Start: 1615 Finished: 1705

Final Team Members: GEORGE TOWSON & DIANE ENGLAND

Water Level Start: 9.91 Finished: 9.90 Ph: 5.84 EC: 600 T°C: 17.2

Total Depth Start: 16.95 Finished: 16.93

$O_2$, TOX, Lel and Organic Vapor Problems Encountered: NONE

Action: ☒ None Needed
☐ Need:

Earth Engineering & Sciences, Inc.

| Date | Time | Initial Development | Final Development | Depth to Water (ft.) | Total Depth (ft) | Design Depth (ft.) | Estimated Sediment Thickness (ft.) | Air Surging | Bailing | Pumping | Flow Rate (gal/min) | Well Volume (gal.) | Total Vol. of Develop. Water | Water Temp. (°C) * | pH | EC (µΩ) * | Turbidity (Ntu) | Team Members |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4-3-90 | 1615 | | ✓ | 9.91 | 16.95 | 20? | | | X | | .5 | 6.62 | 0 | 17.3 | | 620 | | GEORGE TOWSON DIANE ENGLAND |
| | 1642 | | ✓ | | 16.93 | 17.0 ** | | | X | ✓ | .5 | | 15 | 17.3 | | 650 | | |
| | 1645 | | ✓ | | | | | | | ✓ | 2 | | 16 | 17.2 | 5.94 | 610 | | |
| | 1647 | | ✓ | | | | | | | ✓ | 2 | | 19 | 17.2 | 5.90 | 600 | | |
| | 1649 | | ✓ | | | | | | | ✓ | 2 | | 22 | 17.2 | 5.95 | 600 | | |
| | 1651 | | ✓ | | | | | | | ✓ | 2 | | 26 | 17.2 | 5.88 | 600 | | |
| | 1653 | | ✓ | | | | | | | ✓ | 5 | | 36 | 17.2 | 5.91 | 600 | | |
| | 1655 | | ✓ | | | | | | | ✓ | 5 | | 46 | 17.2 | 5.97 | 600 | | |
| | 1657 | | ✓ | | | | | | | ✓ | 5 | | 56 | 17.2 | 5.89 | 600 | | |
| | 1659 | | ✓ | | | | | | | ✓ | 5 | | 66 | 17.2 | 5.94 | 600 | | |
| | 1701 | | ✓ | | | | | | | ✓ | 5 | | 76 | 17.2 | 5.96 | 600 | | |
| | 1703 | | ✓ | | | | | | | ✓ | 5 | | 86 | 17.2 | 5.90 | 600 | | |
| | 1705 | | ✓ | | | | | | | ✓ | 5 | | 96 | 17.2 | 5.95 | 600 | | |
| 4-6 | | | ✓ | | | | | | | ✓ | 5 | | 106 | 17.2 | 5.94 | 600 | | |
| | | | | | | | | | ✓ | | .5 | | 107 | 17.2 | 5.91 | 615 | 3.37 | GEORGE TOWSON DIANE ENGLAND |
| | | | | | | | | | | | | | | | | | | |

Location: FORT STORY

Site #: 7

Well #: MW120

* in Hole

** - Checked w/ M. Kelley JMM

# Monitoring Well Development Photographs

Fort Story, Virginia

Site Number: 7
Well Number: MW-119

Site Number: 7
Well Number: MW-120

# In Situ Permeability Data

RAW DATA

WELL # S7MW119

WELL DIAMETER= 8.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER= .14 GALLONS
LENGTH OF AQUIFER TESTED= 20.00 FEET
VALUE OF HO= .55 FEET
STATIC WATER LEVEL= 7.40 FEET
LENGTH OF SCREEN= 10.00 FEET
WATER TABLE TO BOTTOM OF WELL= 5.14 FEET

SLUG TEST DATA:

| TIME | WATER LEVEL (FEET) | TIME SINCE TEST BEGAN (MINUTES) |
|---|---|---|
| 14. 7. 3 | 7.61 | .06 |
| 14. 7. 4 | 7.54 | .08 |
| 14. 7. 5 | 7.51 | .09 |
| 14. 7. 6 | 7.49 | .11 |
| 14. 7. 7 | 7.48 | .13 |
| 14. 7. 8 | 7.47 | .14 |
| 14. 7. 9 | 7.46 | .16 |
| 14. 7.10 | 7.45 | .18 |
| 14. 7.11 | 7.45 | .19 |
| 14. 7.12 | 7.44 | .21 |
| 14. 7.13 | 7.43 | .23 |
| 14. 7.14 | 7.43 | .24 |
| 14. 7.15 | 7.42 | .26 |
| 14. 7.16 | 7.42 | .28 |
| 14. 7.17 | 7.42 | .29 |
| 14. 7.18 | 7.42 | .31 |
| 14. 7.19 | 7.41 | .33 |

WELL # S7MW119

WELL DIAMETER= 8.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER REMOVED OR ADDED TO WELL= .14 GALLONS
LENGTH OF AQUIFER TESTED= 20.00 FEET
VALUE OF H0= .55 FEET
STATIC WATER LEVEL= 7.40 FEET

SLUG TEST DATA:

| TIME SINCE TEST BEGAN (MINUTES) | WATER LEVEL (FEET) | DRAWDOWN (FEET) | HEAD RATIO | RECIPROCAL TIME (1/MINUTES) |
|---|---|---|---|---|
| .06 | 7.61 | .21 | .382 | 16.667 |
| .08 | 7.54 | .14 | .255 | 13.043 |
| .09 | 7.51 | .11 | .200 | 10.714 |
| .11 | 7.49 | .09 | .164 | 9.091 |
| .13 | 7.48 | .08 | .145 | 7.895 |
| .14 | 7.47 | .07 | .127 | 6.977 |
| .16 | 7.46 | .06 | .109 | 6.250 |
| .18 | 7.45 | .05 | .091 | 5.660 |
| .19 | 7.45 | .05 | .091 | 5.172 |
| .21 | 7.44 | .04 | .073 | 4.762 |
| .23 | 7.43 | .03 | .055 | 4.412 |
| .24 | 7.43 | .03 | .055 | 4.110 |
| .26 | 7.42 | .02 | .036 | 3.846 |
| .28 | 7.42 | .02 | .036 | 3.614 |
| .29 | 7.42 | .02 | .036 | 3.409 |
| .31 | 7.42 | .02 | .036 | 3.226 |
| .33 | 7.41 | .01 | .018 | 3.061 |

WELL # S7MW119

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PERMEABILITY BASED ON COOPER, BREDEHOEFT, AND PAPADOPULOS METHOD

```
          PERMEABILITY=1.76E-04/ MATCH TIME (IN MINUTES)
          STORAGE COEF= 5.88E-02* ALPHA
     COMPUTER CALCULATES
          ALPHA=1.00E-05 MATCH TIME= 1.64E-02
          PERMEABILITY= 1.07E-02 CM/SEC
          STORAGE COEF=5.88E-07
          CORRELATION NUMBER=  1.00
```

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PERMEABILITY BASED ON REGRESSION FIT OF HEAD RATIO DATA

```
          HVORSLEV PERMEABILITY=3.58E-04 / LAG TIME
          BOUWER PERMEABILTY=7.90E-04 * -SLOPE

     COMPUTER CALCULATES
          HVORSLEV PERMEABILITY=1.01E-02 CM/SEC
          BOUWER PERMEABILITY=3.23E-03 CM/SEC
               REGRESSION STATISTICS
                    X ON Y
                      INTERCEPT= -.30
                      SLOPE= -4.0
                    Y ON X
                      INTERCEPT= -.28
                      SLOPE= -4.2
                    CORRELATION COEFFICIENT= -.98
     CALCULATIONS INDICATE THAT A VALUE OF    .55 FEET FOR HO
          OR A VALUE OF    1.998 INCHES FOR EFFECTIVE CASING DIA.
          MAY YIELD BETTER RESULTS
```

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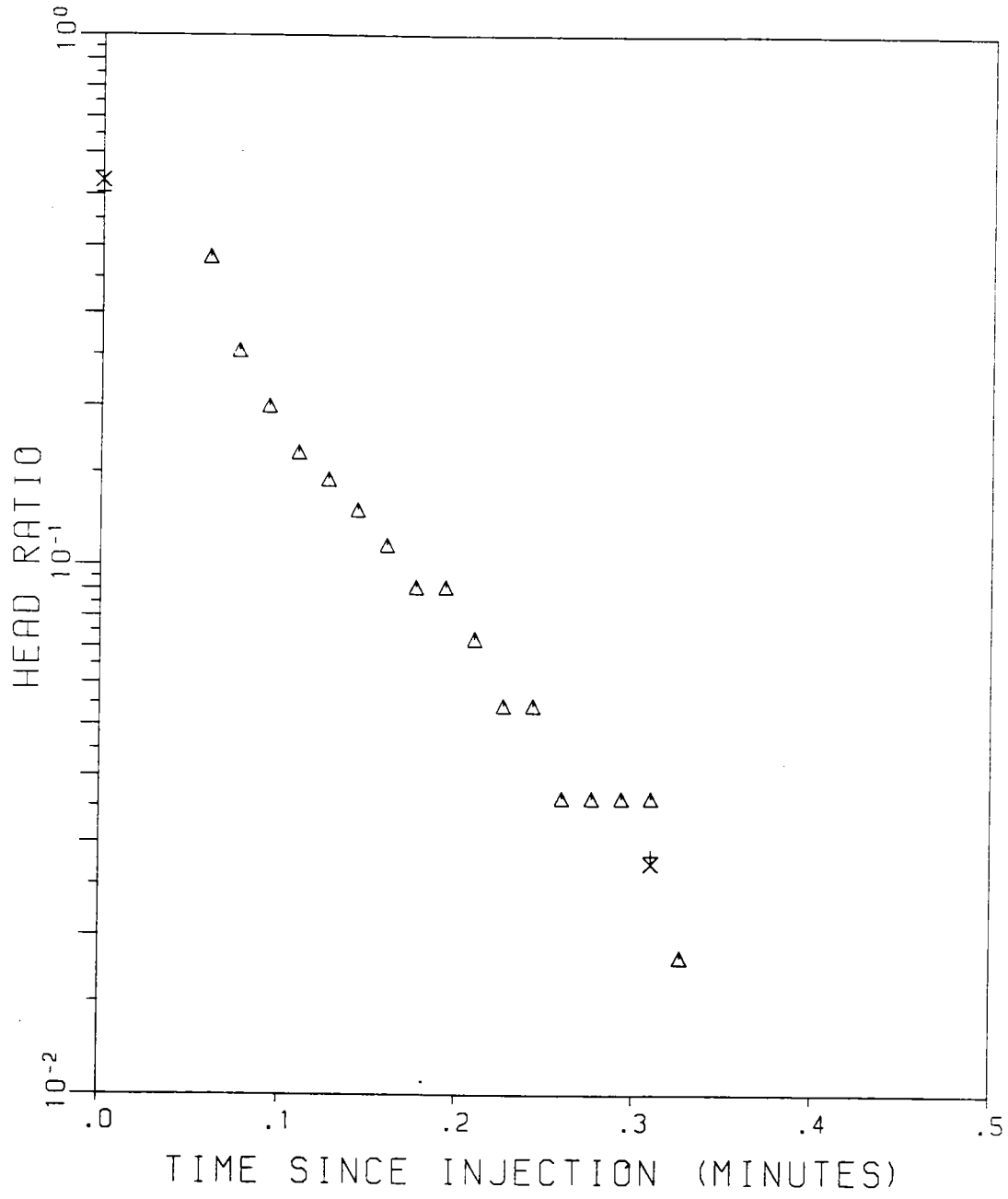
PERMEABILITY BASED ON REGRESSION FIT OF DATA - FERRIS & KNOWLES METHOD

```
     INSUFFICIENT DATA POINTS WITH RECIPROCAL TIMES LESS THAN .300
  NUMBER OF USABLE DATA POINTS= 0
```

| WELL # | PERMEABILITY METHOD 1 | PERMEABILITY METHOD 2 | STORAGE COEF METHOD 2 | PERMEABILITY METHOD 3 | PERMEABILITY METHOD 4 |
|---|---|---|---|---|---|
| S7MW119 | 1.01E-02 | 1.07E-02 | 5.88E-07 | .00 | 3.23E-03 |

* METHOD 1 IS HVORSLEV
METHOD 2 IS COOPER, BREDEHOEFT, AND PAPADOPULOS
METHOD 3 IS FERRIS AND KNOWLES
METHOD 4 IS BOUWER




SLUG TEST OF WELL S7MW119
LOG HEAD RATIO VS TIME

SITE 7. AUTOCRAFT BUILDING. WELL S7MW119
MON 11-12-1990
07:06:12.15

RAW DATA

WELL # S7MW120

WELL DIAMETER= 8.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER= .14 GALLONS
LENGTH OF AQUIFER TESTED= 20.00 FEET
VALUE OF HO= .86 FEET
STATIC WATER LEVEL= 9.87 FEET
LENGTH OF SCREEN= 10.00 FEET
WATER TABLE TO BOTTOM OF WELL= 6.70 FEET

SLUG TEST DATA:

| TIME | WATER LEVEL (FEET) | TIME SINCE TEST BEGAN (MINUTES) |
|---|---|---|
| 13.50. 1 | 10.39 | .02 |
| 13.50. 1 | 10.29 | .02 |
| 13.50. 2 | 10.02 | .04 |
| 13.50. 3 | 9.95 | .05 |
| 13.50. 4 | 9.94 | .07 |
| 13.50. 5 | 9.92 | .09 |
| 13.50. 6 | 9.91 | .10 |
| 13.50. 7 | 9.91 | .12 |
| 13.50. 8 | 9.90 | .14 |
| 13.50. 9 | 9.89 | .15 |
| 13.50.10 | 9.89 | .17 |
| 13.50.11 | 9.89 | .19 |
| 13.50.12 | 9.88 | .20 |
| 13.50.13 | 9.88 | .22 |
| 13.50.14 | 9.88 | .24 |
| 13.50.15 | 9.88 | .25 |

WELL # S7MW120

WELL DIAMETER= 8.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER REMOVED OR ADDED TO WELL= .14 GALLONS
LENGTH OF AQUIFER TESTED= 20.00 FEET
VALUE OF H0= .86 FEET
STATIC WATER LEVEL= 9.87 FEET

SLUG TEST DATA:

| TIME SINCE TEST BEGAN (MINUTES) | WATER LEVEL (FEET) | DRAWDOWN (FEET) | HEAD RATIO | RECIPROCAL TIME (1/MINUTES) |
|---|---|---|---|---|
| .02 | 10.39 | .52 | .606 | 60.000 |
| .02 | 10.29 | .42 | .490 | 50.000 |
| .04 | 10.02 | .15 | .175 | 27.273 |
| .05 | 9.95 | .08 | .093 | 18.750 |
| .07 | 9.94 | .07 | .082 | 14.286 |
| .09 | 9.92 | .05 | .058 | 11.538 |
| .10 | 9.91 | .04 | .047 | 9.677 |
| .12 | 9.91 | .04 | .047 | 8.333 |
| .14 | 9.90 | .03 | .035 | 7.317 |
| .15 | 9.89 | .02 | .023 | 6.522 |
| .17 | 9.89 | .02 | .023 | 5.882 |
| .19 | 9.89 | .02 | .023 | 5.357 |
| .20 | 9.88 | .01 | .012 | 4.918 |
| .22 | 9.88 | .01 | .012 | 4.545 |
| .24 | 9.88 | .01 | .012 | 4.225 |
| .25 | 9.88 | .01 | .012 | 3.947 |

WELL # S7MW120

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PERMEABILITY BASED ON COOPER, BREDEHOEFT, AND PAPADOPULOS METHOD

PERMEABILITY=1.76E-04/ MATCH TIME (IN MINUTES)
STORAGE COEF= 5.88E-02* ALPHA
COMPUTER CALCULATES
ALPHA=1.00E-05 MATCH TIME= 6.92E-03
PERMEABILITY= 2.55E-02 CM/SEC
STORAGE COEF=5.88E-07
CORRELATION NUMBER= 1.00

---

PERMEABILITY BASED ON REGRESSION FIT OF HEAD RATIO DATA

HVORSLEV PERMEABILITY=3.58E-04 / LAG TIME
BOUWER PERMEABILTY=8.50E-04 * -SLOPE

COMPUTER CALCULATES
PERMEABILITY VARIES MORE THAN 20% DEPENDING ON THEEQUATION USED

FOR X ON Y: HVORSLEV PERMEABILITY=6.33E-02 CM/SEC
BOUWER PERMEABILITY=6.64E-03CM/SEC
FOR Y ON X: HVORSLEV PERMEABILITY=2.10E-02 CM/SEC
BOUWER PERMEABILITY=7.59E-03 CM/SEC
AVERAGE HVORSLEV PERMEABILITY=3.16E-02 CM/SEC
AVERAGE BOUWER PERMEABILITY=7.11E-03 CM/SEC
REGRESSION STATISTICS
X ON Y
INTERCEPT= -.39
SLOPE= -7.8
Y ON X
INTERCEPT= -.28
SLOPE= -8.9
CORRELATION COEFFICIENT= -.93
CALCULATIONS INDICATE THAT A VALUE OF 1.18 FEET FOR HO
OR A VALUE OF 1.706 INCHES FOR EFFECTIVE CASING DIA.
MAY YIELD BETTER RESULTS

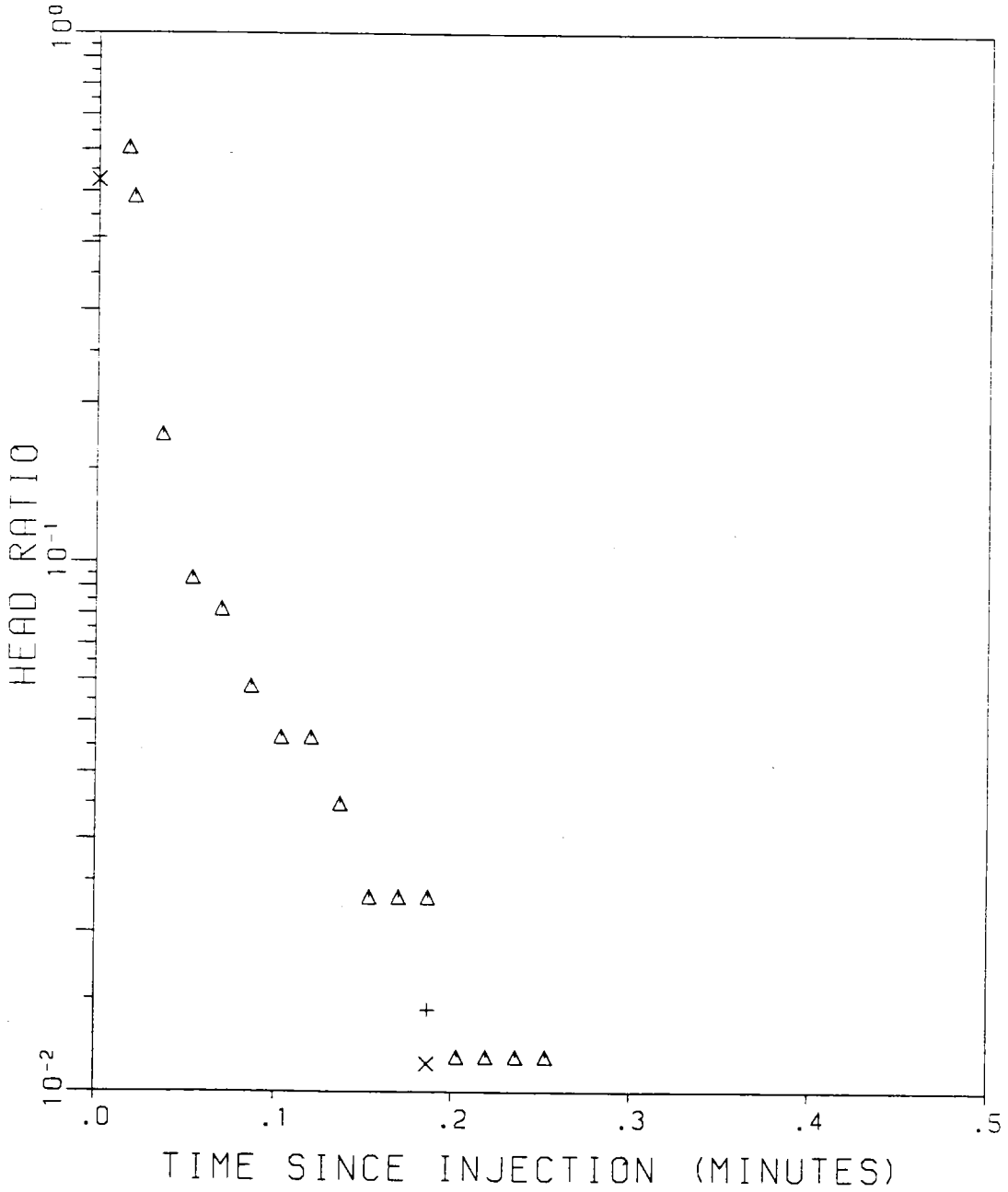
---

PERMEABILITY BASED ON REGRESSION FIT OF DATA - FERRIS & KNOWLES METHOD

INSUFFICIENT DATA POINTS WITH RECIPROCAL TIMES LESS THAN .300
NUMBER OF USABLE DATA POINTS= 0

| WELL # | PERMEABILITY METHOD 1 | PERMEABILITY METHOD 2 | STORAGE COEF METHOD 2 | PERMEABILITY METHOD 3 | PERMEABILITY METHOD 4 |
|---|---|---|---|---|---|
| S7MW120 | 3.16E-02 | 2.55E-02 | 5.88E-07 | .00 | 7.11E-03 |

* METHOD 1 IS HVORSLEV
METHOD 2 IS COOPER, BREDEHOEFT, AND PAPADOPULOS
METHOD 3 IS FERRIS AND KNOWLES
METHOD 4 IS BOUWER




SLUG TEST OF WELL S7MW120
LOG HEAD RATIO VS TIME

SITE 7, AUTOCRAFT BUILDING, WELL S7MW120
MON 11-12-1990
07:12:58.27

# Groundwater Sampling Logs

MW 11 9

# GROUNDWATER SAMPLING LOG
## FORT STORY



CLIENT USACE
SITE 7
WELL NUMBER MW 11 9
JOB NUMBER 1868.0401

TOTAL WELL DEPTH 13.0
WELL DIAMETER 2"
BOREHOLE DIAMETER 8 3/4"

MIN NUMBER WELL VOL TO BE PURGED 3
VOL PER VERTICAL FT CASING (GAL) .95
VOL PER FT BOREHOLE (LESS CASING)(GAL)

STATIC WATER LEVEL (FT) 6.9
STANDING WATER COLUMN (FT) 6.1

AMT ONE WELL VOL (GAL) 5.8
TOTAL GAL TO BE PURGED 17.4

PURGING SYSTEM TEFLON BAILER
SAMPLING SYSTEM TEFLON BAILER

| DATE | TIME | AMOUNT PURGED (GAL) | EC | pH | TEMP | TURBIDITY | PID | | | COMMENTS | SAMPLER |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | FIELD PARAMETERS MEASURED | | | | | | | | |
| 6-7-10 | 0810 | 0 | 410 | 6.22 | 25.5 | | | | | 5% Sand Cloudy | MDS/EJD |
| " | 0813 | 5 | 420 | 6.3 | 24.9 | | | | | Cloudy 5% Sand | MDS/EJD |
| " | 0815 | 10 | 390 | 6.10 | 25.0 | | | | | Brown 0% Sand | MDS/EJD |
| " | 0817 | 15 | 400 | 6.09 | 24.8 | | | | | Brown 0% Sand | MDS/EJD |
| " | 0819 | 20 | 400 | 6.13 | 24.3 | | | | | Brown 0% Sand | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| FINAL READING | 0905 | 6* | 400 | 6.09 | 24.1 | 425.2 | 0.0 | | | Brown 0% Sand | MDS/EJD |

NOTES: Purge Rate 2.6 gal/min

TURBIDITY: 50/500/1063

# GROUNDWATER SAMPLING LOG

## FORT STORY



CLIENT USACE
SITE 7
WELL NUMBER MW 119
JOB NUMBER 1868.0401

TOTAL WELL DEPTH 12.5
WELL DIAMETER 2"
BOREHOLE DIAMETER 8 3/4"

MIN NUMBER WELL VOL TO BE PURGED 3
VOL PER VERTICAL FT CASING (GAL) .95
VOL PER FT BOREHOLE (LESS CASING)(GAL)

STATIC WATER LEVEL (FT) 3.9
STANDING WATER COLUMN (FT) 8.6

AMT ONE WELL VOL (GAL) 8.2
TOTAL GAL TO BE PURGED 24.6

PURGING SYSTEM TEFLON BAILER
SAMPLING SYSTEM TEFLON BAILER

| DATE | TIME | AMOUNT PURGED (GAL) | EC | pH | TEMP | TURBIDITY | PID | | | COMMENTS | SAMPLER |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | FIELD PARAMETERS MEASURED | | | | | | | | |
| 8-3 | 0834 | 0 | 210 | 6.49 | 23.6 | | | | | murky - Brown 5% sed | MDS/EJD |
| " | 0835 | 5 | 210 | 6.31 | 23.2 | | | | | murky - Brown 5% sed | MDS/EJD |
| " | 0837 | 10 | | | | | | | | N/A | MDS/EJD |
| " | 0839 | 15 | 200 | 6.34 | 23.0 | | | | | cloudy 0% sed | MDS/EJD |
| " | 0841 | 20 | | | | | | | | N/A | MDS/EJD |
| " | 0843 | 25 | 190 | 6.30 | 23.4 | | | | | cloudy 0% sed | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| FINAL READING | 0910 | 2 LITERS | 190 | 6.35 | 23.6 | 195.1 | 0.0 | | | cloudy 0% sed | MDS/EJD |

NOTES: Rate 2.5 g/min

TURBIDITY:

Dupl 1 MW 720

# GROUNDWATER SAMPLING LOG

## FORT STORY



CLIENT USACE
SITE 37
WELL NUMBER MW 720
JOB NUMBER 1868.0401

TOTAL WELL DEPTH 20.0
WELL DIAMETER 2"
BOREHOLE DIAMETER 8 3/4"

MIN NUMBER WELL VOL TO BE PURGED 3
VOL PER VERTICAL FT CASING (GAL) .95
VOL PER FT BOREHOLE (LESS CASING)(GAL)

STATIC WATER LEVEL (FT) 10.6
STANDING WATER COLUMN (FT) 9.4

AMT ONE WELL VOL (GAL) 8.93
TOTAL GAL TO BE PURGED 26.8

PURGING SYSTEM TEFLON BAILER
SAMPLING SYSTEM TEFLON BAILER

| DATE | TIME | AMOUNT PURGED (GAL) | EC | FIELD PARAMETERS MEASURED pH | TEMP | TURBIDITY | PID | | | COMMENTS | SAMPLER |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6-7-90 | 1020 | 0 | 650 | 5.68 | 25.1 | | | | | 5% SED Brown | MDS/EJD |
| " | 1023 | 5 | 700 | 5.82 | 24.3 | | | | | 5% SED Brown-Clear | MDS/EJD |
| " | 1026 | 10 | | | | | | | | N/A | MDS/EJD |
| " | 1029 | 15 | 750 | 5.80 | 24.9 | | | | | 5% Sand Brown-Clear | MDS/EJD |
| " | 1031 | 20 | 750 | 5.91 | 25.1 | | | | | 0% SED Brown-Clear | MDS/EJD |
| " | 1033 | 25 | | | | | | | | N/A | MDS/EJD |
| " | 1036 | 30 | 650 | 5.9 | 24.3 | | | | | 0% SED Brown-Clear | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| FINAL READING | 1048 | 6* | 700 | 5.77 | 22.2 | 89.6 | 0.0 | | | Clear-Brown 0% SED | MDS/EJD |

NOTES: 2.5 gl/min = Purge Rate

TURBIDITY: 89.6

# Soil and Monitoring Well Boring Lithologic Logs

Site 8

BORING/WELL NUMBER *SB-132*
DATE STARTED *3/28/90* COMPLETED *3/28/90*
SITE NUMBER *8*
GROUND ELEVATION *4.5 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FT. STORY PA/SI*
SITE NAME *DRAINAGE OUTFALL LINE*
GEOLOGIST *M. KELLY*



COORDINATES *N226655, E2724216*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | BH | 2.5-3 | | 5.0 | | SP | SAND (SP), brown and tan, fine, subrounded, poorly graded.<br>SAND (SP), dark brown, subrounded, poorly graded.<br>SAND (SP), tan, medium, subrounded, poorly graded. | PID Instrumentation<br>OVM 580 B<br>Thermo Environmental Instruments, Inc.<br>10.2 eV<br>PID Background=0.0 ppm.<br>Borehole collapsed at 3 feet due to shallow water table. |
| 5 | | | | | | | Total depth of boring=3 feet. | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | ▼ =Water table during drilling |

**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *M. KELLY*
METHOD OF DRILLING *HAND AUGER*
HOLE DIAMETER *3 INCHES*
TOTAL DEPTH *N/A*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-133*
DATE STARTED *3/28/90* COMPLETED *3/28/90*
SITE NUMBER *8*
GROUND ELEVATION *4.6 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FT. STORY PA/SI*
SITE NAME *DRAINAGE OUTFALL LINE*
GEOLOGIST *M. KELLY*



COORDINATES *N226658, E2724055*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | | | | | | SM | SANDY SILT (SM), subrounded, poorly graded. | PID Instrumentation OVM 580 B Thermo Environmental Instruments, Inc. 10.2 eV PID Background=0.0 ppm. Borehole collapsed at 3 feet due to shallow water table. |
| | BH | 2.5-3 | | 6.2 | | SP | SAND (SP), medium grained, poorly graded. | |
| | | | | | | | Total depth of boring=3 feet. | |
| 5 | | | | | | | | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | ▼ =Water table during drilling |

**JMM** James M. Montgomery Consulting Engineers, Inc.

DRILLER *M. KELLY*
METHOD OF DRILLING *HAND AUGER*
HOLE DIAMETER *3 INCHES*
TOTAL DEPTH *N/A*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *MW-121* CLIENT *U.S. ARMY CORPS OF ENGINEERS* PAGE 1 OF 1

DATE STARTED *3/23/90* COMPLETED *3/23/90* PROJECT *FT. STORY PA/SI*

SITE NUMBER *8* SITE NAME *DRAINAGE OUTFALL LINE* COORDINATES

GROUND ELEVATION *7.06 FEET, NGVD* GEOLOGIST *MARK SHUPE* *N226669, E2724327*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | LITH | 0-2 | 2 3 3 2 | 32.7 | | | SAND (SP), quartz, brown, medium-fine, subrounded-subangular, poorly graded, trace silt. | PID Instrumentation OVM 580 B Thermo Environmental Instruments, Inc. 10.2 eV PID Background=0.0 ppm. |
| | | | | | | | SAND (SP), quartz, tan as above, decrese silt. | |
| 5 | LITH | 4-6 | 4 7 8 6 | 43.3 | | SP | SAND (SP), quartz, light gray, medium-fine grained, subrounded, poor grading. | |
| | GEO | 8-10 | 6 6 5 7 | 44.2 | | | SAND (SP), quartz, light gray, medium grained, fair grading. | |
| 10 | | | | | | | Total depth of boring=11.5 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | LITH=Lithology GEO=Geotechnical |
| 25 | | | | | | | | ▼=Water table during drilling |

**JMM** James M. Montgomery Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.* WELL COMPLETION DEPTH *11.5 FEET*

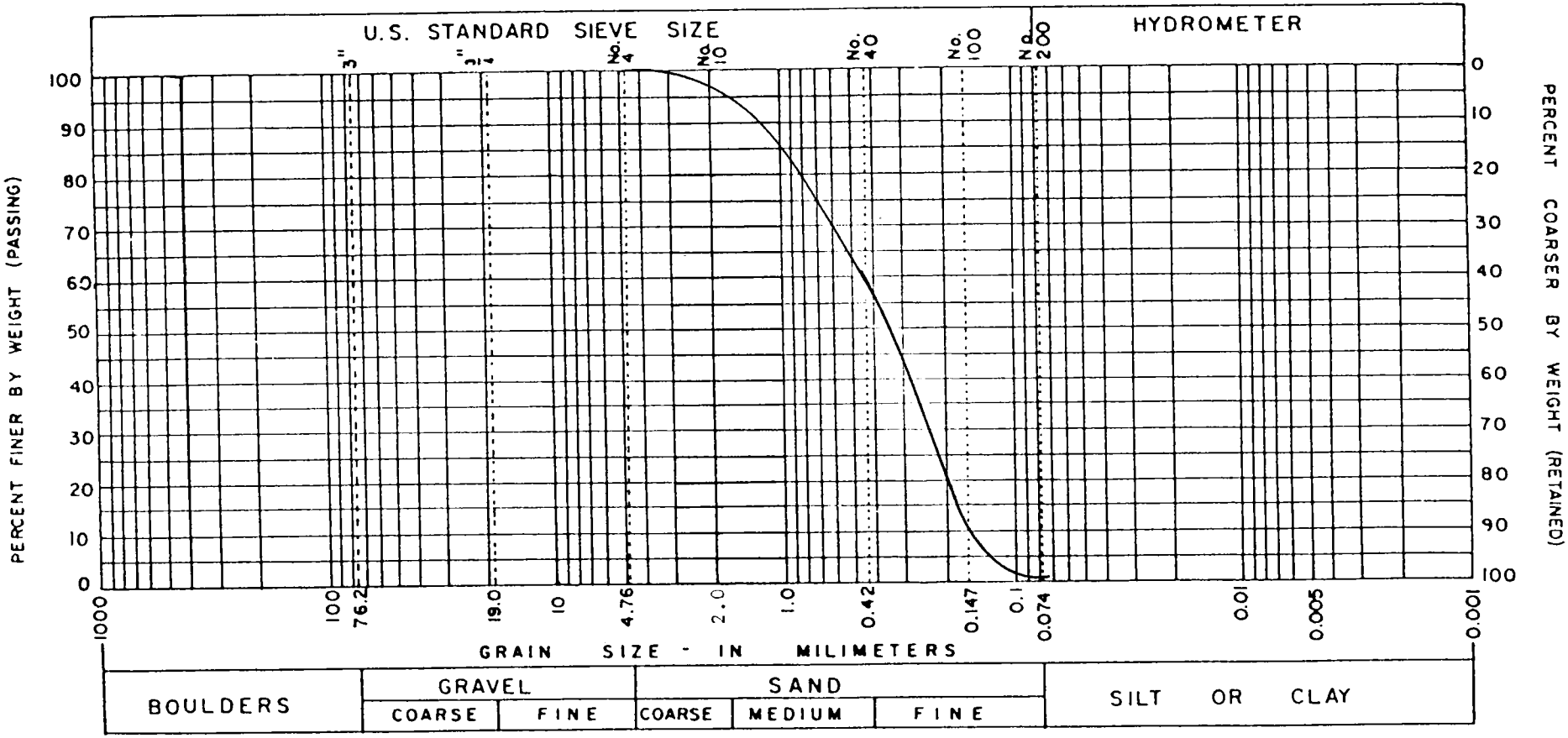
METHOD OF DRILLING *HOLLOW STEM AUGER* WELL DIAMETER *2 INCH*

HOLE DIAMETER *8 1/4 INCHES* WELL MATERIAL *SCHEDULE 40 PVC*

TOTAL DEPTH *11.5 FEET*

# Geotechnical Grain Size Analyses

| PROJECT: Fort Story | | LOCATION: Virginia Beach, VA. | |
|---|---|---|---|
| BORING NO. Site 8 | SAMPLE NO. S8MW121 | DEPTH: 10' | CONTRACT NO. 90-075 |




| SAMPLE NO. | DEPTH | L.L. | P.I. | M.C. | Unified | Soil Description |
|---|---|---|---|---|---|---|
| S8MW121 | 10' | - | N.P. | 19.7 | SP | Tan sand |

Earth Engineering & Sciences, Inc.

## GRAIN-SIZE DISTRIBUTION

TESTED BY: RMP

DATE: 7-12-90

CHECKED BY: PAD

SHEET No. 25 OF 32

# Monitoring Well Construction Summary Sheets

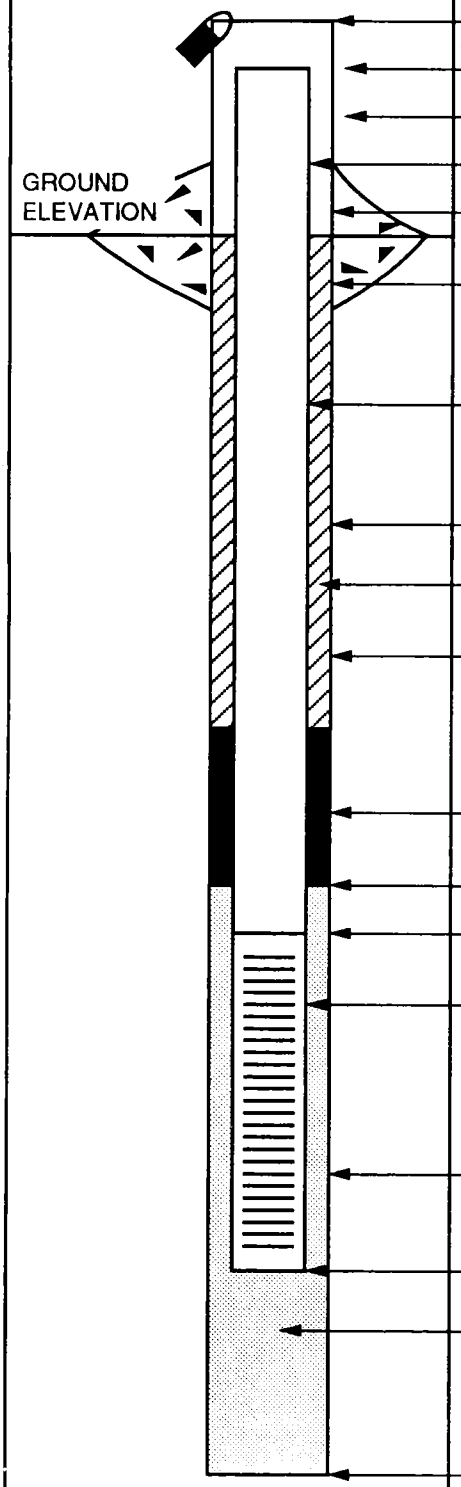
James M. Montgomery
Consulting Engineers, Inc.

BORING NO. MW-121

# MONITORING WELL SHEET

PROJECT Fort Story PA/SI
LOCATION Site 8
PROJECT NO. 1868.0401
BORING MW-121
ELEVATION
DATE 3/23/90
FIELD GEOLOGIST Mark Shupe

DRILLER Hardin and Huber Inc.
DRILLING METHOD Hollow Stem Auger
DEVELOPMENT METHOD N/A




ELEVATION OF TOP OF SURFACE CASING: 10.03 ft.
ELEVATIONS OF TOP OF RISER PIPE: 9.92 ft.
STICK-UP TOP OF SURFACE CASING: N/A
STICK-UP RISER PIPE: N/A
TYPE OF SURFACE SEAL: Cement Grout
I.D. OF SURFACE CASING: 4 inch
TYPE OF SURFACE CASING: Steel
RISER PIPE I.D.: 2 inch
TYPE OF RISER PIPE: Schedule 40 PVC
BOREHOLE DIAMETER: 4 1/4 inch
TYPE OF BACKFILL: Cement Grout
ELEVATION/DEPTH OF SEAL: 0.5 ft.
TYPE OF SEAL: Granular Bentonite
DEPTH TO TOP OF SAND PACK: 1.0 ft.
ELEVATION/DEPTH TOP OF SCREEN: 1.5 ft.
TYPE OF SCREEN: Schedule 40 PVC
SLOT SIZE X LENGTH: 0.020 inches X 10 feet
I.D. OF SCREEN: 2 inch
TYPE OF SAND PACK: No. 2 Filter Sand
ELEVATION/DEPTH BOTTOM OF SCREEN: N/A
ELEVATION/DEPTH BOTTOM OF SANDPACK:
TYPE OF BACKFILL BELOW OBSERVATION WELL: Formation
ELEVATION/DEPTH OF HOLE: 11.5 ft.

# Monitoring Well Development Sheets

Earth Engineering & Sciences, Inc.

## Monitoring Well Development Sheet MW 121

Project: FORT STORY IRP Location: SITE 8

Project No. 1868.0401 Dates: 4-6-90

Field Geologists: GEORGE TOWSON & DIANE ENGLAND

Barrel ID: S8 MW 121 DEV $H_2O$ No. of Barrels: 2 · 55 GAL

Initial Development Method ? AIR SURGING Init. Dev. Date: 3/25/90

Initial Volume Removed: 28 GAL Time Started: 1050 Finished: 1106

Initial Team Members: GARY ENLOE

Water Level (Initial): 6.08* ≡

Total Depth (BOH): 10.59* ≡

Designed Depth: 11.5

Depth of Sediment: .91

Water Level After Initial Development: 6.25

BOH After Initial Development: 11.18

* FROM TOP OF CASING

Final Development Method: BAILING & PUMPING Fin. Dev. Date: 4-6-90

Final Volume Removed: 110 Time Start: 1230 Finished: 1332

Final Team Members: GEORGE TOWSON & DIANE ENGLAND

Water Level Start: 3.0 Finished: 3.0 Ph: 5.95 EC: 121 T°C: 13.7

Total Depth Start: 8.7 Finished: 11.5

$O_2$, TOX, Lel and Organic Vapor Problems Encountered: NONE

Action: ☒ None Needed
☐ Need:

Earth Engineering & Sciences, Inc.

| Date | Time | Initial Development | Final Development | Depth to Water (ft.) | Total Depth (ft) | Design Depth (ft.) | Estimated Sediment Thickness (ft.) | Air Surging | Bailing | Pumping | Flow Rate (gal/min) | Well Volume (gal.) | Total Vol. of Develop. Water | Water Temp. (°C) * | pH | EC (µΩ) * | Turbidity (Ntu) | Team Members |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4-6-90 | 1230 | ✓ | | 3.0 | 8.7 | 11.5 | 2.8 | | ✓ | | .5 | 7.99 | 0 | | | | | G. TOWSON D. ENGLAND |
| | 1235 | ✓ | | 3.0 | 9.2 | | | | ✓ | | .5 | | 2.5 | 14.2 | 6.41 | 100 | | |
| | 1250 | | ✓ | 3.0 | 11.5 | | 0 | | ✓ | | .5 | | 7.5 | 13.7 | 5.93 | 102 | | |
| | 1300 | | ✓ | | | | | | | ✓ | 2 | | 12.5 | 14.3 | 5.97 | 100 | | |
| | 1310 | | ✓ | | | | | | | ✓ | 2 | | 33 | 13.8 | 5.97 | 100 | | |
| | 1320 | | ✓ | | | | | | | ✓ | 5 | | 53 | 13.7 | 5.99 | 100 | | |
| | 1322 | | ✓ | | | | | | | ✓ | 5 | | 63 | 13.7 | 5.91 | 100 | | |
| | 1324 | | ✓ | | | | | | | ✓ | 5 | | 73 | 13.8 | 5.90 | 120 | | |
| | 1325 | | ✓ | | | | | | | ✓ | 5 | | 83 | 13.7 | 5.90 | 130 | | |
| | 1330 | | ✓ | | | | | | | ✓ | 5 | | 93 | 13.5 | 5.93 | 125 | | |
| | 1332 | | ✓ | | | | | | | ✓ | 5 | | 110 | 13.7 | 5.95 | 121 | | |
| 4-10 | | | ✓ | | | | | | ✓ | · | .5 | | 111 | 13.0 | 5.92 | 129 | 20.1 | D. ENGLAND G. TOWSON |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |

Location: _____

Site #: _____

Well #: _____

* IN HOLE

# Monitoring Well Development Photographs

For: Story, Virginia

Site Number: 8
Well Number: MW-121

# In Situ Permeability Data

RAW DATA

WELL # S8MW121

WELL DIAMETER= 8.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER= .28 GALLONS
LENGTH OF AQUIFER TESTED= 20.00 FEET
VALUE OF H0= 1.72 FEET
STATIC WATER LEVEL= 6.50 FEET
LENGTH OF SCREEN= 10.00 FEET
WATER TABLE TO BOTTOM OF WELL= 7.88 FEET

SLUG TEST DATA:

| TIME | WATER LEVEL (FEET) | TIME SINCE TEST BEGAN (MINUTES) |
|---|---|---|
| 11.22. 6 | 6.91 | .11 |
| 11.22. 7 | 6.73 | .13 |
| 11.22. 8 | 6.63 | .14 |
| 11.22. 9 | 6.57 | .16 |
| 11.22.10 | 6.55 | .18 |
| 11.22.11 | 6.54 | .19 |
| 11.22.12 | 6.53 | .21 |
| 11.22.13 | 6.53 | .23 |
| 11.22.14 | 6.52 | .24 |
| 11.22.15 | 6.52 | .26 |
| 11.22.16 | 6.52 | .28 |
| 11.22.17 | 6.52 | .29 |
| 11.22.18 | 6.51 | .31 |

WELL # S8MW121

WELL DIAMETER= 8.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER REMOVED OR ADDED TO WELL= .28 GALLONS
LENGTH OF AQUIFER TESTED= 20.00 FEET
VALUE OF H0= 1.72 FEET
STATIC WATER LEVEL= 6.50 FEET

SLUG TEST DATA:

| TIME SINCE TEST BEGAN (MINUTES) | WATER LEVEL (FEET) | DRAWDOWN (FEET) | HEAD RATIO | RECIPROCAL TIME (1/MINUTES) |
|---|---|---|---|---|
| .11 | 6.91 | .41 | .239 | 9.091 |
| .13 | 6.73 | .23 | .134 | 7.895 |
| .14 | 6.63 | .13 | .076 | 6.977 |
| .16 | 6.57 | .07 | .041 | 6.250 |
| .18 | 6.55 | .05 | .029 | 5.660 |
| .19 | 6.54 | .04 | .023 | 5.172 |
| .21 | 6.53 | .03 | .017 | 4.762 |
| .23 | 6.53 | .03 | .017 | 4.412 |
| .24 | 6.52 | .02 | .012 | 4.110 |
| .26 | 6.52 | .02 | .012 | 3.846 |
| .28 | 6.52 | .02 | .012 | 3.614 |
| .29 | 6.52 | .02 | .012 | 3.409 |
| .31 | 6.51 | .01 | .006 | 3.226 |

WELL # S8MW121

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PERMEABILITY BASED ON COOPER, BREDEHOEFT, AND PAPADOPULOS METHOD

PERMEABILITY=1.76E-04/ MATCH TIME (IN MINUTES)
STORAGE COEF= 5.88E-02* ALPHA
COMPUTER CALCULATES
ALPHA=1.00E-05 MATCH TIME= 1.09E-02
PERMEABILITY= 1.62E-02 CM/SEC
STORAGE COEF=5.88E-07
CORRELATION NUMBER= .98

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PERMEABILITY BASED ON REGRESSION FIT OF HEAD RATIO DATA

HVORSLEV PERMEABILITY=3.58E-04 / LAG TIME
BOUWER PERMEABILTY=8.86E-04 * -SLOPE

COMPUTER CALCULATES
HVORSLEV PERMEABILITY=3.92E-03 CM/SEC
BOUWER PERMEABILITY=1.12E-02 CM/SEC
REGRESSION STATISTICS
X ON Y
INTERCEPT= .71
SLOPE= -13.
Y ON X
INTERCEPT= .75
SLOPE= -13.
CORRELATION COEFFICIENT= -.99
CALCULATIONS INDICATE THAT A VALUE OF 19.95 FEET FOR HO
OR A VALUE OF .587 INCHES FOR EFFECTIVE CASING DIA.
MAY YIELD BETTER RESULTS

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PERMEABILITY BASED ON REGRESSION FIT OF DATA - FERRIS & KNOWLES METHOD

INSUFFICIENT DATA POINTS WITH RECIPROCAL TIMES LESS THAN .300
NUMBER OF USABLE DATA POINTS= 0

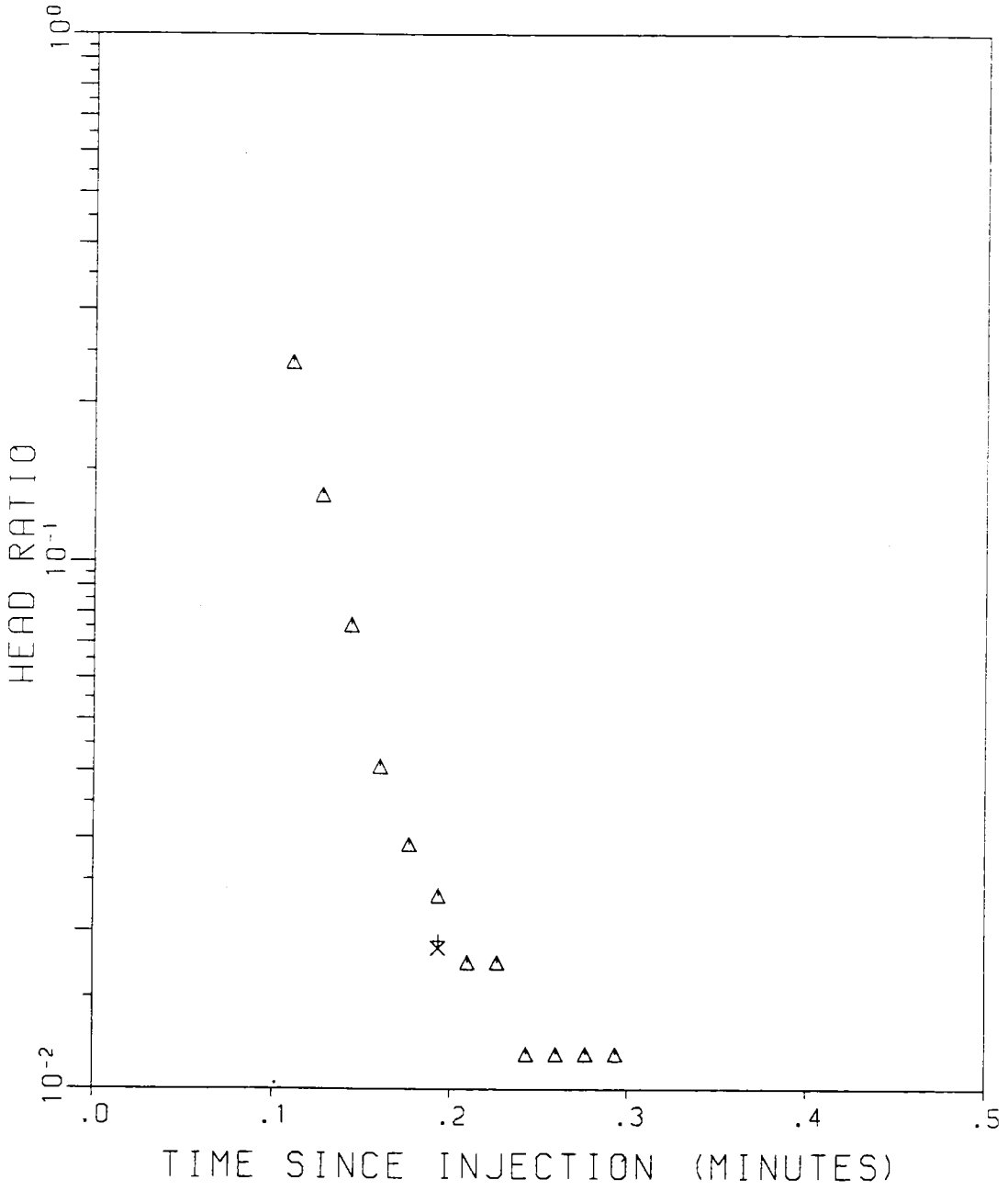
| WELL # | PERMEABILITY METHOD 1 | PERMEABILITY METHOD 2 | STORAGE COEF METHOD 2 | PERMEABILITY METHOD 3 | PERMEABILITY METHOD 4 |
|---|---|---|---|---|---|
| S8MW121 | 3.92E-03 | 1.62E-02 | 5.88E-07 | .00 | 1.12E-02 |

* METHOD 1 IS HVORSLEV
  METHOD 2 IS COOPER, BREDEHOEFT, AND PAPADOPULOS
  METHOD 3 IS FERRIS AND KNOWLES
  METHOD 4 IS BOUWER

SITE 8. DRAINAGE OUTFALL LINE. WELL S8MW121

MON 11-12-1990

07:17:40.42




SLUG TEST OF WELL S8MW121

LOG HEAD RATIO VS TIME

# Groundwater Sampling Logs

MW 121

# GROUNDWATER SAMPLING LOG

## FORT STORY



CLIENT USACE
SITE 3
WELL NUMBER MW 121
JOB NUMBER 1868.0401

TOTAL WELL DEPTH 11.5
WELL DIAMETER 2"
BOREHOLE DIAMETER 8 3/4"

MIN NUMBER WELL VOL TO BE PURGED 3
VOL PER VERTICAL FT CASING (GAL) .95
VOL PER FT BOREHOLE (LESS CASING)(GAL)

STATIC WATER LEVEL (FT) 6.8
STANDING WATER COLUMN (FT) 4.7

AMT ONE WELL VOL (GAL) 4.5
TOTAL GAL TO BE PURGED 13.5

PURGING SYSTEM TEFLON BAILER
SAMPLING SYSTEM TEFLON BAILER

| DATE | TIME | AMOUNT PURGED (GAL) | EC | FIELD PARAMETERS MEASURED pH | TEMP | TURBIDITY | PID | | | COMMENTS | SAMPLER |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6-7-90 | 1125 | 0 | 170 | 6.32 | 25.1 | | | | | Brown → Clear 0% Sed | MDS/EJD |
| " | 1128 | 5 | 180 | 6.04 | 26.1 | | | | | Cloudy 0% Sed | MDS/EJD |
| " | 1131 | 10 | 170 | 6.14 | 25.8 | | | | | Cloudy 0% Sed | MDS/EJD |
| " | 1133 | 15 | | | | | | | | N/A | MDS/EJD |
| " | 1136 | 20 | 180 | 6.20 | 25.2 | | | | | Cloudy 0% Sed | MDS/EJD |
| " | 1139 | 25 | 190 | 6.25 | 26.0 | | | | | Cloudy 0% Sed | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| FINAL READING | 1210 | 6* | 170 | 5.93 | 25.6 | 82.2 | 0.0 | | | Clear 0% Sed | MDS/EJD |

NOTES: 2.6 g/min Purge Rate

TURBIDITY: 82.2

**Soil and Monitoring Well Boring Lithologic Logs**

Site 9

BORING/WELL NUMBER *SB-112*
DATE STARTED *3/21/90* COMPLETED *3/21/90*
SITE NUMBER *6*
GROUND ELEVATION *7.69 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *MARK SHUPE*



COORDINATES *N226178, E2724432*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-2 | 1 8 10 12 | 30.1 | | | SAND (SP), quartz, dark gray, fine-medium grained, well sorted, subrounded, trace silt, possible perched water table. | Apparent oily residue on grains, hydrocarbon odor. |
| | LITH | 2-4 | 10 12 18 24 | 21 | | | | |
| 5 | LITH | 4-6 | 15 18 25 32 | 58.6 | | SP | SAND (SP), quartz, light gray, fine-medium grained, subrounded, clean. | PID Instrumentation OVM 580B Thermo Environmental Instruments, Inc. 10.2 eV lamp PID Background=0.0 ppm. |
| | BH | 8-10 | 28 53 82 100/4" | 71.3 | | | | |
| 10 | | | | | | | Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

LITH=Lithology

GS=Ground Surface

BH=Bottom of Hole

**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-113*
DATE STARTED *3/21/90* COMPLETED *3/21/90*
SITE NUMBER *6*
GROUND ELEVATION *8.98 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *MARK SHUPE*



COORDINATES *N226175, E2724560*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS DUP SPLIT | 0-2 | 1 3 3 16 | 41 | | | SAND (SP), quartz, brown, fine-medium grained, subrounded, well sorted, trace silt. | 0-2 foot interval drive 2 spoons for additional sample volume Blow counts: 1,3,3,16 1,1,3,12 |
| 5 | LITH | 4-6 | 14 20 28 30 | 35.3 | | SP | SAND (SP), quartz, tan-light gray, fine-medium grained, subrounded, clean. | PID Instrumentation OVM 580B Thermo Environmental Instruments, Inc. 10.2 eV lamp PID Background=0.0 ppm. |
| | BH | 8-10 | 14 20 28 30 | 59.7 | | | SAND (SP), quartz, tan-gray, medium gray, medium grained, fair sorting, clean, sulfurous. | |
| 10 | | | | | | | Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

DUP=Duplicate

SPLIT=Split Sample

LITH=Lithology

BH=Bottom of Hole

▼ =Water table during drilling

**JMM** James M. Montgomery Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-114*
DATE STARTED *3/22/90* COMPLETED *3/22/90*
SITE NUMBER *6*
GROUND ELEVATION *9.72 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *MARK SHUPE*



COORDINATES *N226161, E2724690*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-2 | 5<br>15<br>17<br>20 | 45 | | | SAND (SP), quartz, black, medium-fine grained, subrounded. | Oily residue in grains. |
| 5 | LITH | 4-6 | 8<br>10<br>15<br>22 | 49 | | SP | SAND (SP), (4-5 feet) quartz, tan, as above.<br>SAND (SP), (5-6 feet) quartz, gray, as above; water table encountered at 5.5 feet. | PID Instrumentation<br>OVM 580B<br>Thermo Environmental Instruments, Inc.<br>10.2 eV lamp<br>PID Background=0.0 ppm. |
| | BH | 8-10 | 8<br>9<br>14<br>23 | 22 | | | SAND (SP), quartz, gray, fine-medium grained, subrounded, poor sorting. | |
| 10 | | | | | | | Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

LITH=Lithology

BH=Bottom of Hole

▼ =Water table during drilling

JMM James M. Montgomery
Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-115*
DATE STARTED *3/22/90* COMPLETED *3/22/90*
SITE NUMBER *6*
GROUND ELEVATION *9.01 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *MARK SHUPE*



COORDINATES *N226101, E2724446*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS DUP SPLIT | 0-2 | 1 1 4 8 | 26.3 | | | SAND (SW), quartz, brown-tan, medium-fine grained, poor sorting, subrounded, trace silt, trace oil residue in grains. | 0-2 foot interval drive 2 spoons for additional sample volume Blow counts: 1,1,4,8 2,1,3,7 |
| 5 | LITH | 4-6 | 17 35 22 33 | 22 | | SW | SAND (SW), (4-5 feet) quartz, tan-brown. SAND (SW), (5-6 feet) quartz, gray, water table encountered at 5 feet. | PID Instrumentation OVM 580B Thermo Environmental Instruments, Inc. 10.2 eV lamp PID Background=0.0 ppm. |
| 10 | BH | 8-10 | 8 10 13 15 | 48.5 | | | SAND (SW), quartz, gray, medium-fine grained, subrounded, poor sorting. Total depth of hole=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

DUP=Duplicate

SPLIT=Split Sample

LITH=Lithology

BH=Bottom of Hole

▼ =Water table during drilling

**JMM** James M. Montgomery Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-116*
DATE STARTED *3/22/90* COMPLETED *3/22/90*
SITE NUMBER *6*
GROUND ELEVATION *9.45 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *MARK SHUPE*



COORDINATES *N226092, E2724572*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-2 | 5<br>12<br>12<br>10 | 4.1 | | SW | SAND (SW), quartz, dark gray-black, medium grained, well sorted, subrounded. | Gum-like oily residue on grains. |
| 5 | LITH | 4-6 | 19<br>21<br>28<br>15 | 60 | | SP | SAND (SP), quartz, medium gray-light gray, medium grained, fair sorting; water table encountered at 5.6 feet. | PID Instrumentation<br>OVM 580B<br>Thermo Environmental Instruments, Inc.<br>10.2 eV lamp<br>PID Background=0.0 ppm. |
| | BH | 8-10 | 7<br>9<br>12<br>5 | 61 | | | SAND (SP), quartz, tan, medium-fine grained, poor sorting, subrounded. | |
| 10 | | | | | | | Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

LITH=Lithology

BH=Bottom of Hole

▼ =Water table during drilling

**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-117*
DATE STARTED *3/22/90* COMPLETED *3/22/90*
SITE NUMBER *6*
GROUND ELEVATION *11.05 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *MARK SHUPE*



COORDINATES *N226093, E2724730*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-2 | 2 3 4 3 | 25 | | | SAND (SW), quartz, dark gray-black, fine-medium grained, poor sorting. | Oily residue in grains. |
| 5 | LITH | 4-6 | 2 5 9 16 | 194 | | SW | SAND (SW), quartz, light-medium gray, medium-fine grained, poor sorting; water table encountered at 4 feet. | PID Instrumentation OVM 580B Thermo Environmental Instruments, Inc. 10.2 eV lamp PID Background=0.0 ppm. |
| 10 | BH | 8-10 | 8 16 17 24 | 51 | | | SAND (SW), quartz, gray, fine-medium grained, subrounded-subangular, poor sorting. Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | GS=Ground Surface LITH=Lithology BH=Bottom of Hole ▼=Water table during drilling |

**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-118*
DATE STARTED *3/21/90* COMPLETED *3/21/90*
SITE NUMBER *6*
GROUND ELEVATION *11.83 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *GARY B. ENLOE*



COORDINATES *N226030, E2724676*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Concrete | |
| | GS | 1.5-3.5 | 5 9 18 6 | 2.0 | | | SAND (SP), brown, fine, organic material. | 1.5-3.5 foot interval drive 2 spoons for additional sample volume Blow counts: 5,9,18,6 6,7,18,20 |
| 5 | LITH | 5-7 | 7 8 9 10 | | | SP | SAND (SP), buff, fine, graded, subrounded, water at 3.5 feet. | |
| 10 | BH | 8-10 | 6 8 9 10 | 2.8 | | | SAND (SP), tan to gray, medium, graded. | 8-10 foot interval drive 2 spoons for additional sample volume Blow counts: 6,8,9,10 1,3,4,4 |
| | | | | | | | Total depth of boring=10 feet. | |
| 15 | | | | | | | | PID Instrumentation PI 101 HNu Systems 10.2 eV lamp PID Background=0.0 ppm. |
| 20 | | | | | | | | |
| 25 | | | | | | | | GS=Ground Surface<br>LITH=Lithology<br>BH=Bottom of Hole<br>▼=Water table during drilling |

**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-119*
DATE STARTED *3/22/90* COMPLETED *3/22/90*
SITE NUMBER *6*
GROUND ELEVATION *12.14 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *MARK SHUPE*



COORDINATES *N226028, E2724757*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-2 | 18 19 25 28 | 25 | | SP | SAND (SP), quartz, tan, fine-medium grained, subrounded, well sorted, clean. | PID Instrumentation OVM 580B Thermo Environmental Instruments, Inc. 10.2 eV lamp PID Background=0.0 ppm. |
| 5 | LITH | 4-6 | 7 8 10 12 | 45 | | PT | PEAT (PT), black, soft-moderately soft, blocky fragments, vitreous; water table encountered at 4 feet. | |
| | | | | | | SW | | |
| 10 | BH | 8-10 | 8 10 14 15 | 52 | | | SAND (SW), quartz, medium-dark gray, fine-medium grained, subrounded, poor sorting. | |
| | | | | | | | Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

LITH=Lithology

BH=Bottom of Hole

▼ =Water table during drilling

**JMM** James M. Montgomery Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-120*
DATE STARTED *3/21/90* COMPLETED *3/21/90*
SITE NUMBER *6*
GROUND ELEVATION *11.65 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *MARK SHUPE*



COORDINATES *N225950, E2724553*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-0.5 | | 13.3 | | | SAND (SP), quartz, tan-brown, medium to fine grained, well sorted. | Hydrocarbon odor/oily residue on grains. |
| 5 | LITH | 4.5-5 | | 0.58 | | SP | SAND (SP), quartz, tan-brown, medium to fine grained, well sorted. | PID Instrumentation OVM 580B Thermo Environmental Instruments, Inc. 10.2 eV lamp PID Background=0.0 ppm. |
| 10 | BH | 9.5-10 | | 0.44 | | | SAND (SP), quartz, tan-brown, medium to fine grained, sulfurous odor: water table encountered at 8 feet. | |
| | | | | | | | Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

LITH=Lithology

BH=Bottom of Hole

▼ =Water table during drilling

**JMM** James M. Montgomery Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HAND AUGER*
HOLE DIAMETER *3 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-121*
DATE STARTED *3/21/90* COMPLETED *3/21/90*
SITE NUMBER *6*
GROUND ELEVATION *11.96 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *MARK SHUPE*



COORDINATES *N225956, E2724590*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-0.5 | | 41 | | | SAND (SP), quartz, dark brown, fine to medium grained, subrounded, well sorted. | Hydrocarbon odor, oily residue on grains, oily staining. |
| 5 | LITH | 4.5-5 | | 38 | | SP | SAND (SP), quartz, tan, fine-medium grained, subrounded, well sorted, hydrocarbon odor. | PID Instrumentation OVM 580B Thermo Environmental Instruments, Inc. 10.2 eV lamp PID Background=0.0 ppm. |
| ▼ 10 | BH | 9.5-10 | | 34.4 | | | SAND (SP), quartz, light gray, medium to fine grained, subrounded, fair-poor sorting, hydrocarbon odor. | |
| | | | | | | | Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

LITH=Lithology

BH=Bottom of Hole

▼ =Water table during drilling

JMM James M. Montgomery Consulting Engineers, Inc.

DRILLER *EDDIE DOWDY*
METHOD OF DRILLING *HAND AUGER*
HOLE DIAMETER *3 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-122*
DATE STARTED *3/20/90* COMPLETED *3/20/90*
SITE NUMBER *6*
GROUND ELEVATION *13.66 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *GARY B. ENLOE*



COORDINATES *N225403, E2724495*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS DUP SPLIT | 0-2 | 8 9 14 16 | 3.0 | | SP | SAND (SP), brown, fine, graded, subrounded, moist, fill, debris. | 0-2 foot interval drive 4 spoons for additional sample volume Blow counts: 8,9,14,16 7,7,14,7 3,6,10,10 6,6,18,14 |
| | | | | | | SM | SAND (SM), dark brown, silty, fine, subrounded, moist, tight. | |
| | LITH | 2-4 | 8 9 13 13 | | | SP | SAND (SP), buff, fine, graded, moist. | |
| 5 | LITH | 4-6 | 6 5 6 8 | | | | SAND (SP), brown, fine, graded, moist, buff colored from 4-4.5 feet. | |
| ▼ | LITH | 6-8 | 2 2 3 2 | | | | SAND (SP), buff, fine, graded, subrounded, water table at approximately 7 feet, hydrocarbon odor. | PID Instrumentation PI 101 HNu Systems 10.2 eV lamp PID Background=0.0 ppm. |
| | BH | 8-10 | 4 8 9 11 | 11.0 | | | SAND (SP), buff to tan, medium, graded, strong hydrocarbon odor. | |
| 10 | | | | | | | Total depth of boring=10 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

DUP=Duplicate

SPLIT=Split Sample

LITH=Lithology

BH=Bottom of Hole

▼ =Water table during drilling

**JMM** James M. Montgomery Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *10 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-123*
DATE STARTED *3/20/90* COMPLETED *3/20/90*
SITE NUMBER *6*
GROUND ELEVATION *14.29 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *MARK SHUPE*



COORDINATES *N225341 E2724503*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-2 | 3 3 3 3 | 0.9 | | | SAND (SP), quartz, tan to buff, fine-medium grained, subrounded, well sorted, trace silt. | 0-2 foot interval drive 2 spoons for additional sample volume Blow counts: 3,3,3,3 1,2,2,3 |
| 5 | LITH | 4-6 | 1 2 2 3 | | | | SAND (SP), quartz, tan to buff, medium grained, subrounded, well sorted. | PID Instrumentation PI 101 HNu Systems 10.2 eV lamp PID Background=0.0 ppm. |
| ▼ | LITH | 6-8 | 4 7 6 8 | | | SP | SAND (SP), quartz, white to tan, medium grained, subrounded,well sorted; encountered water table at 7 feet, strong hydrocarbon odor. | |
| | LITH | 8-10 | 7 10 6 10 | | | | | |
| 10 | LITH | 10-12 | 6 2 2 3 | 12 | | | SAND (SP), quartz, tan, fine-medium grained, subrounded, well sorted, clean, hydrocarbon odor. | |
| | BH | 12-14 | 8 4 2 3 | | | | | |
| 15 | | | | | | | Total depth of boring=14 feet. | |
| 20 | | | | | | | | |
| 25 | | | | | | | | GS=Ground Surface<br>LITH=Lithology<br>BH=Bottom of Hole<br>▼ =Water table during drilling |

JMM James M. Montgomery
Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *14 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *MW-115*
DATE STARTED *3/21/90* COMPLETED *3/21/90*
SITE NUMBER *6*
GROUND ELEVATION *10.00 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *GARY B. ENLOE*



COORDINATES *N225998, E2724411*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 1.5-3.5 | 28 28 28 30 | 4.0 | | ML | Concrete. SILT (ML), brown, sandy, gravel, fill, hydrocarbon odor, quartz. | 1.5-3.5 foot interval drive 3 spoons for additional sample volume Blow counts: 28,28,28,30 26,28,38,25 12,21,30,40 |
| | SI GEO | 3.5-5.5 | 6 12 18 21 | 1.0 | | SP | SAND (SP), brown, fine, graded, rounded, moist, quartz. SAND (SP), tan, medium, graded, subrounded; water at 3.5 feet. SAND (SP), brown, medium, 2 inch silty sand seam at 6 feet, grading into gray color at 10 feet. | PID Instrumentation PI 101 HNu Systems 10.2 eV lamp PID Background=0.0 ppm. |
| 5 | | | | | | | | |
| 10 | LITH | 10-12 | 3 6 9 13 | | | | | |
| | | | | | | | Total depth of boring=12.5 feet. | |
| 15 | | | | | | | | |
| ▼ | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

SI=Soil/Groundwater Interface

GEO=Geotechnical

LITH=Lithology

▼ =Water table during drilling

**JMM** James M. Montgomery Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *12.5 FEET*

WELL COMPLETION DEPTH *12 FEET*
WELL DIAMETER *2 INCH*
WELL MATERIAL *SCHEDULE 40 PVC*

BORING/WELL NUMBER *MW-116*
DATE STARTED *3/21/90* COMPLETED *3/21/90*
SITE NUMBER *6*
GROUND ELEVATION *10.04 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *GARY B. ENLOE*



COORDINATES *N226023, E2724537*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Concrete. | |
| | GS | 1.5-3.5 | 25 35 40 42 | 2.0 | | ML | SILT (ML), brown, sandy. SAND (SP), buff, fine, subrounded, graded, moist. SAND (SP), green, silty, tight, gravel, fill, water at 3.5 feet. | 1.5-3.5 foot interval drive 2 spoons for additional sample Blow counts: 25,35,40,42 12,14,18,12 |
| | SI GEO | 3.5-5.5 | 15 29 30 29 | 2.2 | | | SAND (SP), buff, medium. | PID Instrumentation PI 101 HNu Systems 10.2 eV lamp PID Background=0.0 ppm. |
| 5 | LITH | 5.5-7.5 | 1 6 4 4 | | | SP | SAND (SP), dark brown, medium, well sorted, subrounded, wood/fill. SAND (SP), brown, fine, graded, subrounded, quartz. | 3.5-5.5 foot interval drive 2 spoons for additional sample Blow counts: 15,29,30,29 8,7,7,6 |
| 10 | LITH | 10-12 | 3 6 7 9 | | | | SAND (SP), buff, medium, graded. | Auger advanced to 14 feet to hammer out flowing sand w/roller bit. |
| | | | | | | | Total depth of boring=12 feet. | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

SI=Soil/Groundwater Interface

GEO=Geotechnical

LITH=Lithology

▼ =Water table during drilling

**JMM** James M. Montgomery Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *12 FEET*

WELL COMPLETION DEPTH *12 FEET*
WELL DIAMETER *2 INCH I.D.*
WELL MATERIAL *SCHEDULE 40 PVC*

BORING/WELL NUMBER *MW-117*
DATE STARTED *3/20/90* COMPLETED *3/20/90*
SITE NUMBER *6*
GROUND ELEVATION *13.97 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *GARY B. ENLOE*



COORDINATES *N225436, E2724496*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-2 | 7<br>6<br>10<br>8 | 0 | | | SAND (SP), brown, fine, graded, subrounded, gravel/fill at 6-12 inches. | 0-2 foot interval drive 3 spoons for additional sample volume<br>Blow counts: 7,6,10,8<br>5,5,8,12<br>5,5,6,7 |
| 5 ▼ | SI<br>GEO | 5-7 | 6<br>5<br>12<br>8 | 0.2 | | SP | SAND (SP), buff to tan, medium, moist, graded, subrounded, water table at approximately 6 feet, hydrocarbon odor below saturated zone. | 5-7 foot interval drive 3 spoons for additional sample volume<br>Blow counts: 6,5,12,8<br>4,5,8,6<br>1,2,3,4 |
| 10 | | 10-2 | 2<br>2<br>2<br>3 | | | | SAND (SP), gray, medium to coarse, poorly graded. | PID Instrumentation<br>PI 101 HNu Systems<br>10.2 eV lamp<br>PID Background=0.0 ppm. |
| 15 | | | | | | | Total depth of boring=15 feet. | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |

GS=Ground Surface

SI=Soil/Groundwater Interface

GEO=Geotechnical

▼ =Water table during drilling

**JMM** James M. Montgomery Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *15 FEET*

WELL COMPLETION DEPTH *14 FEET*
WELL DIAMETER *2 INCH I.D.*
WELL MATERIAL *SCHEDULE 40 PVC*

BORING/WELL NUMBER *MW-118*
DATE STARTED *3/20/90* COMPLETED *3/20/90*
SITE NUMBER *6*
GROUND ELEVATION *13.71 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *LARC MAINTENANCE AREA*
GEOLOGIST *MARK SHUPE*



COORDINATES *N225250, E2724498*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | | | | | | Cement: thickness=19 inches. | Core through cement. |
| | LITH | 1.5-3.5 | 6 16 32 35 | 1 | | SP | SAND (SP), quartz, tan to brown, medium grained, subrounded, well sorted, trace silt. | PID Instrumentation PI 101 HNu Systems 10.2 eV lamp PID Background=0.0 ppm. |
| 5 | | | | | | | | |
| ▼ | LITH | 6-8 | 6 10 8 9 | 1 | | | SAND (SP), quartz, dark gray, medium grained, subrounded, increase moisture content. | |
| | SI | 8-10 | 6 9 9 8 | 1 | | | SAND (SP), quartz, gray-buff-clear, medium grained, well sorted, water table encountered at 7 feet. | |
| 10 | GEO | 10-12 | 2 5 7 11 | 1 | | | SAND (SP), quartz, tan-brown, subrounded, trace silt. | |
| | LITH | 13-15 | 9 12 15 18 | 1 | | | SAND (SP), quartz, clear-light gray, medium grained, subrounded. | |
| 15 | | | | | | | Total depth of boring=15 feet. | |
| 20 | | | | | | | | |
| 25 | | | | | | | | GS=Ground Surface<br>SI=Soil/Groundwater Interface<br>GEO=Geotechnical<br>▼ =Water table during drilling |

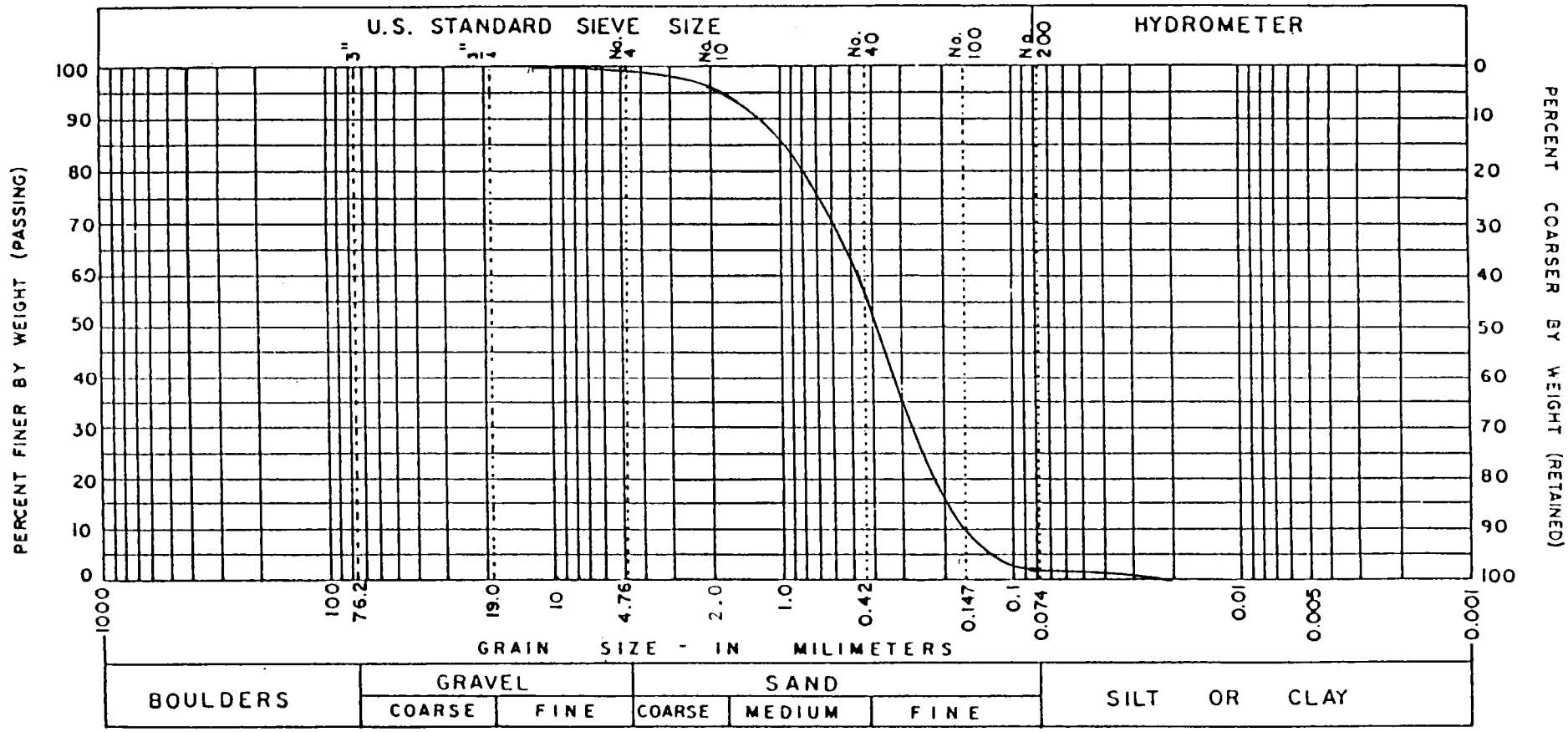
**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *15 FEET*

WELL COMPLETION DEPTH *15 FEET*
WELL DIAMETER *2 INCHES*
WELL MATERIAL *SCHEDULE 40 PVC*

# Geotechnical Grain Size Analyses

| PROJECT: Fort Story | | LOCATION: Virginia Beach, VA. | |
|---|---|---|---|
| BORING NO. Site 6 | SAMPLE NO. S6MW115 | DEPTH: 6' | CONTRACT NO. 90-075 |




| SAMPLE NO. | DEPTH | L.L. | P.I. | M.C. | Unified | Soil Description |
|---|---|---|---|---|---|---|
| S6MW115 | 6' | - | N.P. | 21.3 | SP | Tan sand |

Earth Engineering & Sciences, Inc.

GRAIN-SIZE DISTRIBUTION

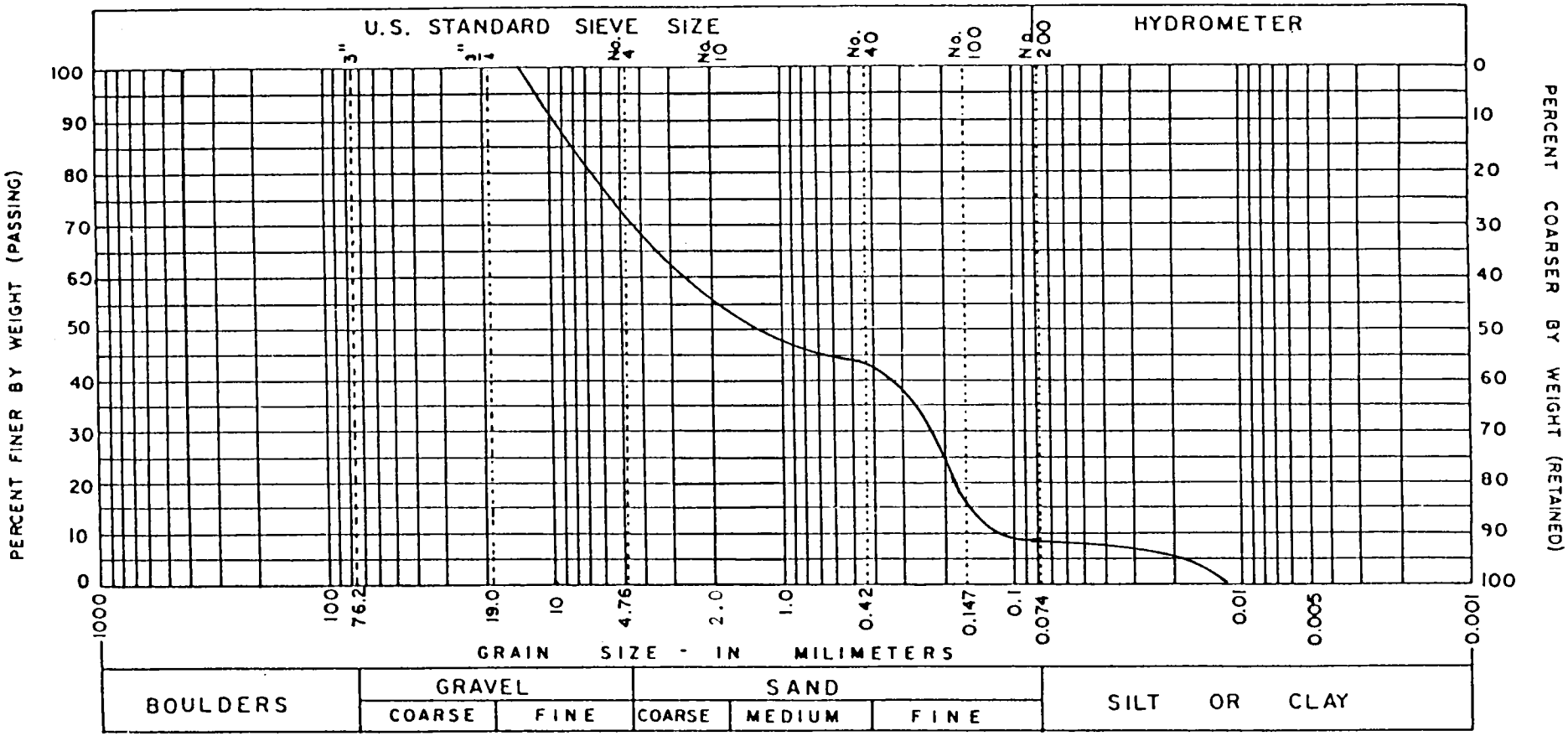
TESTED BY: RMP

DATE: 7-12-90

CHECKED BY: PAD

SHEET No. 19 OF 32

| PROJECT: Fort Story | | LOCATION: Virginia Beach, VA. | |
|---|---|---|---|
| BORING NO. Site 6 | SAMPLE NO. S6MW116 | DEPTH: 4' | CONTRACT NO. 90-075 |




| SAMPLE NO. | DEPTH | L.L. | P.I. | M.C. | Unified | Soil Description |
|---|---|---|---|---|---|---|
| S6MW116 | 4' | - | N.P. | 9.0 | SP-SM | Tan slightly silty sand w/some gravel |

Earth Engineering & Sciences, Inc.

GRAIN-SIZE DISTRIBUTION

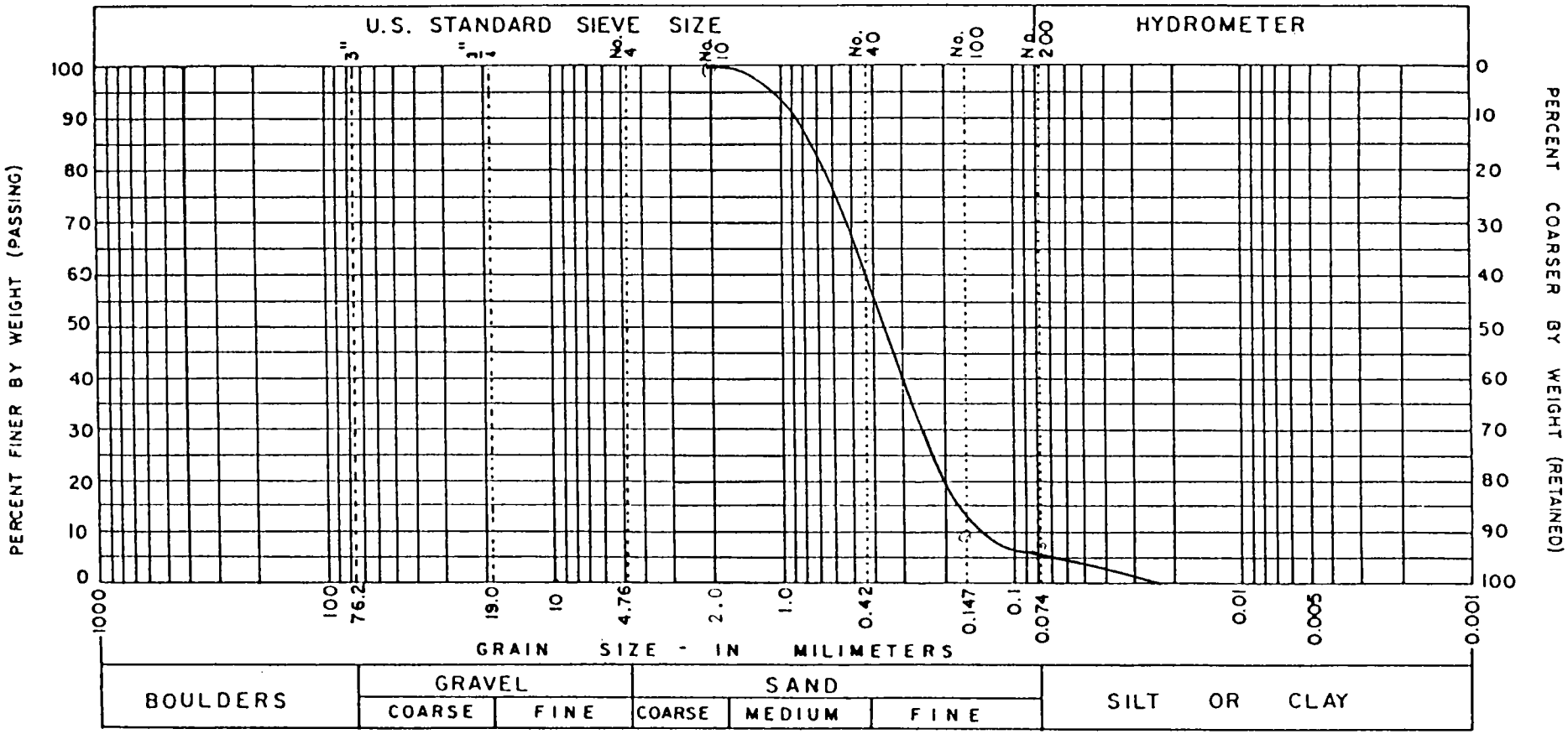
TESTED BY: RMP

DATE: 7-12-90

CHECKED BY: PAD

SHEET No. 20 OF 32

| PROJECT: Fort Story | | LOCATION: Virginia Beach, VA. | |
|---|---|---|---|
| BORING NO. Site 6 | SAMPLE NO. S6MW117 | DEPTH: 5' | CONTRACT NO. 90-075 |



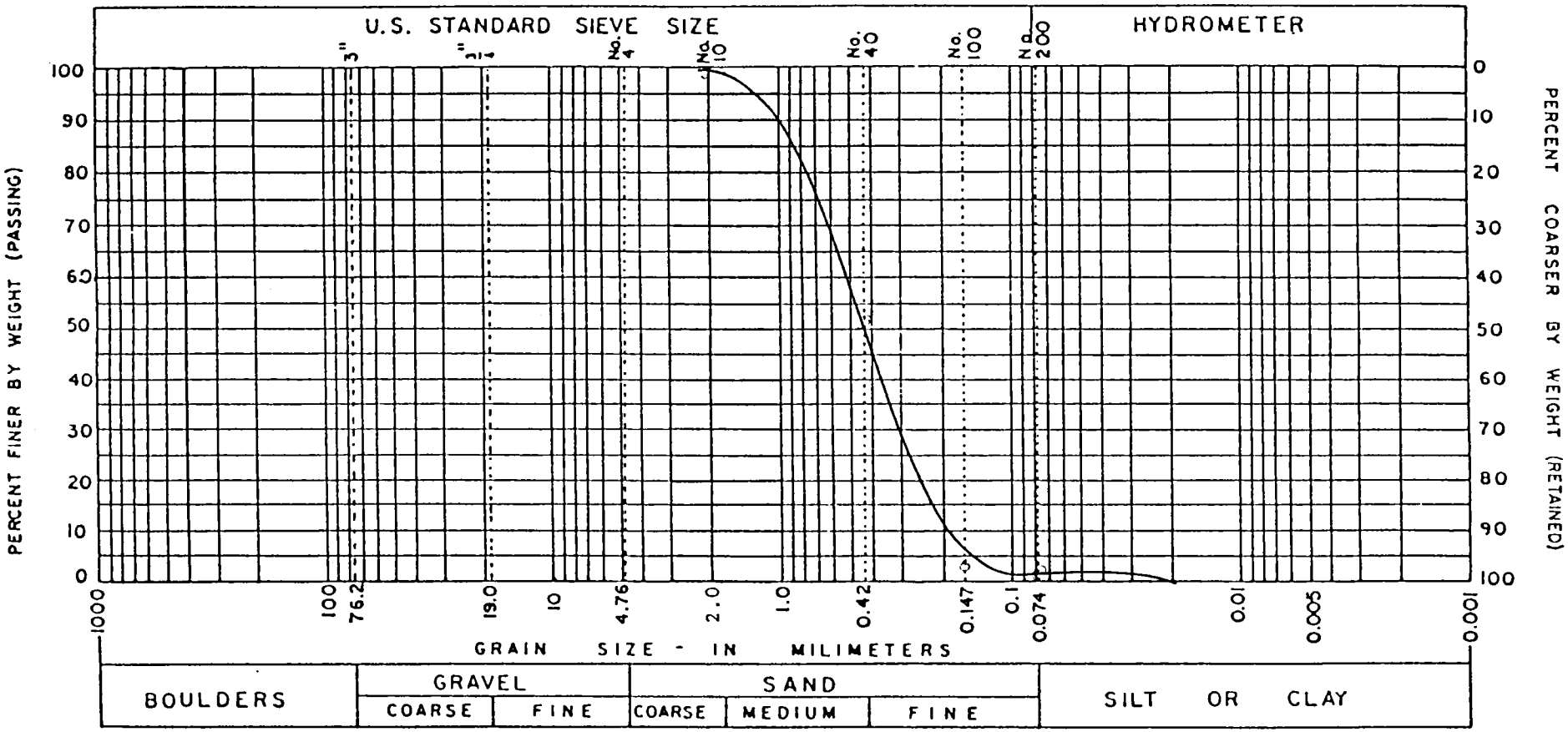

| SAMPLE NO. | DEPTH | L.L. | P.I. | M.C. | Unified | Soil Description |
|---|---|---|---|---|---|---|
| S6MW117 | 5' | - | N.P. | 19.1 | SP-SM | Tan slightly silty sand |

Earth Engineering & Sciences, Inc.

GRAIN-SIZE DISTRIBUTION

| TESTED BY: RMP | DATE: 7-12-90 |
|---|---|
| CHECKED BY: PAD | SHEET No. 21 OF 32 |

| PROJECT: Fort Story | | LOCATION: Virginia Beach, VA. | |
|---|---|---|---|
| BORING NO. Site 6 | SAMPLE NO. S6MW118 | DEPTH: 10.0' | CONTRACT NO. 90-075 |




| SAMPLE NO. | DEPTH | L.L. | P.I. | M.C. | Unified | Soil Description |
|---|---|---|---|---|---|---|
| S6MW118 | 10' | - | N.P. | 21.2 | SP | Tan sand |

Earth Engineering & Sciences, Inc.

GRAIN-SIZE DISTRIBUTION

| TESTED BY: RMP | DATE: 7-12-90 |
|---|---|
| CHECKED BY: PAD | SHEET No. 22 OF 32 |

# Monitoring Well Construction Summary Sheets

James M. Montgomery
Consulting Engineers, Inc.

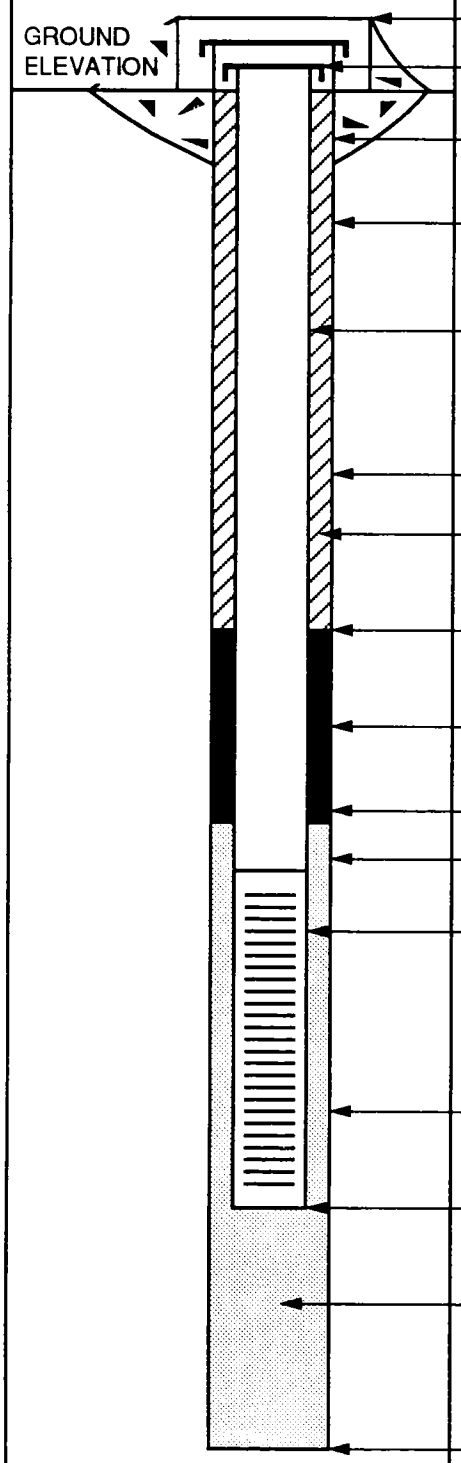
BORING NO. MW-115

# MONITORING WELL SHEET

PROJECT Fort Story PA/IS
PROJECT NO. 1868.0401
ELEVATION
FIELD GEOLOGIST Gary B. Enloe

LOCATION Site 6
BORING MW-115
DATE 3/21/90

DRILLER Hardin and Huber Inc.
DRILLING METHOD Hollow Stem Auger
DEVELOPMENT METHOD Air Suring/Pumping




ELEVATION OF TOP OF SURFACE CASING: 10.00 ft.
ELEVATIONS OF TOP OF RISER PIPE: 9.36 ft.

TYPE OF SURFACE SEAL: Cement Grout

I.D. OF SURFACE CASING: 8 inch
TYPE OF SURFACE CASING: Steel

RISER PIPE I.D.: 2 inch
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 8 1/4 inch

TYPE OF BACKFILL: Cement Grout

ELEVATION/DEPTH OF SEAL: 1.5 ft.

TYPE OF SEAL: Granular Bentonite

DEPTH TO TOP OF SAND PACK: 2.0 ft.
ELEVATION/DEPTH TOP OF SCREEN: 2.5 ft.

TYPE OF SCREEN: Schedule 40 PVC
SLOT SIZE X LENGTH: 0.020 inch X 10 feet
I.D. OF SCREEN: 2 inch

TYPE OF SAND PACK: No. 2 Filter Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: 12.5 ft.

ELEVATION/DEPTH BOTTOM OF SANDPACK: 12.5 ft.
TYPE OF BACKFILL BELOW OBSERVATION WELL:
Formation

ELEVATION/DEPTH OF HOLE: 12.5 ft.

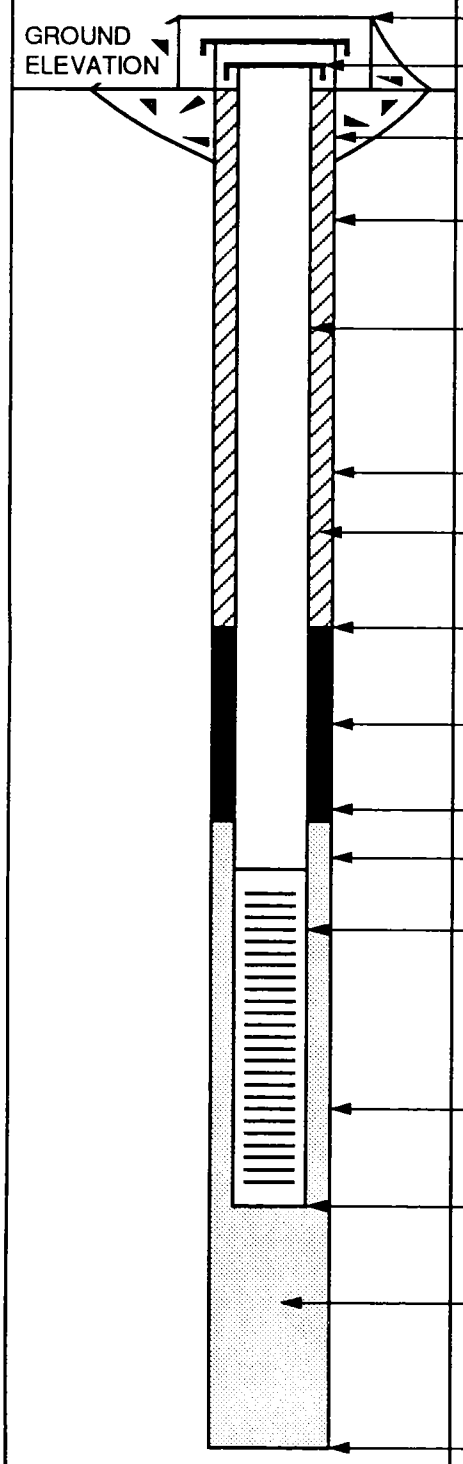
James M. Montgomery
Consulting Engineers, Inc.

BORING NO. MW-116

# MONITORING WELL SHEET

PROJECT Fort Story PA/IS
LOCATION Site 6
PROJECT NO 1868.0401
BORING MW-116
ELEVATION
DATE 3/21/90
FIELD GEOLOGIST Gary B. Enloe

DRILLER Hardin and Huber Inc.
DRILLING METHOD Hollow Stem Auger
DEVELOPMENT METHOD Air Surging/Pumping




ELEVATION OF TOP OF SURFACE CASING: 10.04 ft.
ELEVATIONS OF TOP OF RISER PIPE: 9.77 ft.

TYPE OF SURFACE SEAL: Cement Grout

I.D. OF SURFACE CASING: 8 inch
TYPE OF SURFACE CASING: Steel

RISER PIPE I.D.: 2 inch
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 8 1/4 inch

TYPE OF BACKFILL: Cement Grout

ELEVATION/DEPTH OF SEAL: 1.0 ft.

TYPE OF SEAL: Granular Bentonite

DEPTH TO TOP OF SAND PACK: 2.0 ft.
ELEVATION/DEPTH TOP OF SCREEN: 2.5 ft.

TYPE OF SCREEN: Schedule 40 PVC
SLOT SIZE X LENGTH: 0.020 inch X 10 feet
I.D. OF SCREEN: 2 inch

TYPE OF SAND PACK: No. 2 Filter Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: 12.5 ft.

ELEVATION/DEPTH BOTTOM OF SANDPACK:
TYPE OF BACKFILL BELOW OBSERVATION WELL:
No. 2 Filter Sand

ELEVATION/DEPTH OF HOLE: 14.0 ft.

James M. Montgomery
Consulting Engineers, Inc.

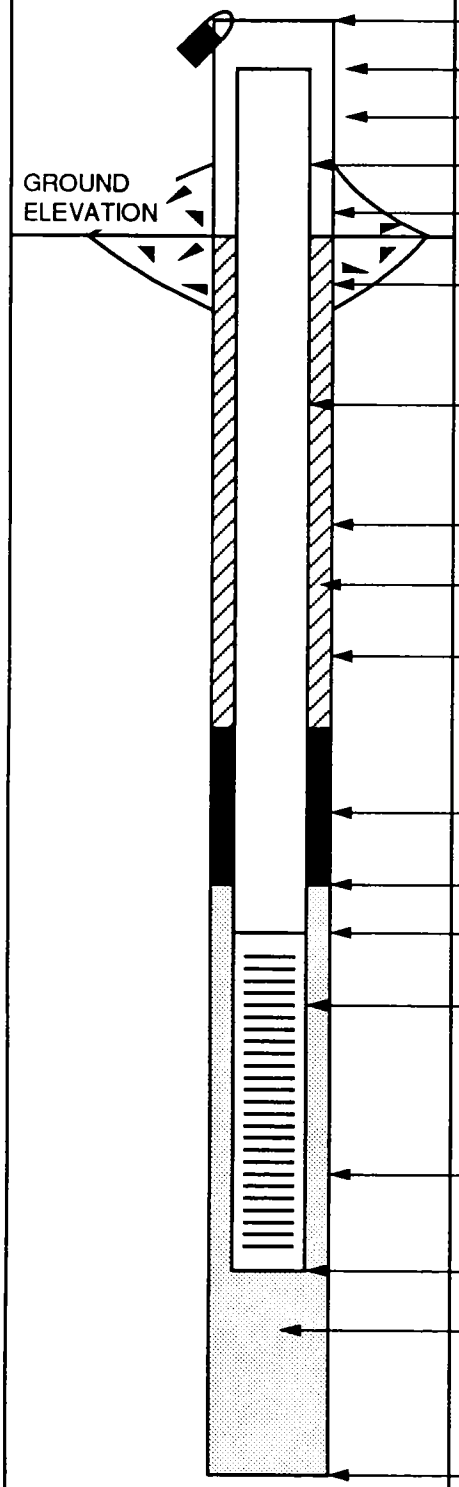
BORING NO. MW-117

# MONITORING WELL SHEET

PROJECT Fort Story PA/SI
PROJECT NO. 1868.0401
ELEVATION
FIELD GEOLOGIST Gary B. Enloe

LOCATION Site 6
BORING MW-117
DATE 03/20/90

DRILLER Hardin and Huber Inc.
DRILLING METHOD Hollow Stem Auger
DEVELOPMENT METHOD Bailing/Pumping




ELEVATION OF TOP OF SURFACE CASING: 16.28 ft.
ELEVATIONS OF TOP OF RISER PIPE: 16.00 ft.
STICK-UP TOP OF SURFACE CASING: 2.31 ft.
STICK-UP RISER PIPE: 2.03 ft.
TYPE OF SURFACE SEAL: Cement Grout
I.D. OF SURFACE CASING: 4 inch
TYPE OF SURFACE CASING: Steel
RISER PIPE I.D.: 2 inch
TYPE OF RISER PIPE: Schedule 40 PVC
BOREHOLE DIAMETER: 8 1/4 inch
TYPE OF BACKFILL: Cement Grout
ELEVATION/DEPTH OF SEAL: 2.0 ft.
TYPE OF SEAL: Granular Bentonite
DEPTH TO TOP OF SAND PACK: 3.0 ft.
ELEVATION/DEPTH TOP OF SCREEN: 4.0 ft.
TYPE OF SCREEN: Schedule 40 PVC
SLOT SIZE X LENGTH: .020 inch X 10 feet
I.D. OF SCREEN: 2 inch
TYPE OF SAND PACK: No. 2 Filter Sand
ELEVATION/DEPTH BOTTOM OF SCREEN: 14.0 ft.
ELEVATION/DEPTH BOTTOM OF SANDPACK: 14.0 ft.
TYPE OF BACKFILL BELOW OBSERVATION WELL: Formation
ELEVATION/DEPTH OF HOLE: 14.0 ft.

James M. Montgomery
Consulting Engineers, Inc.

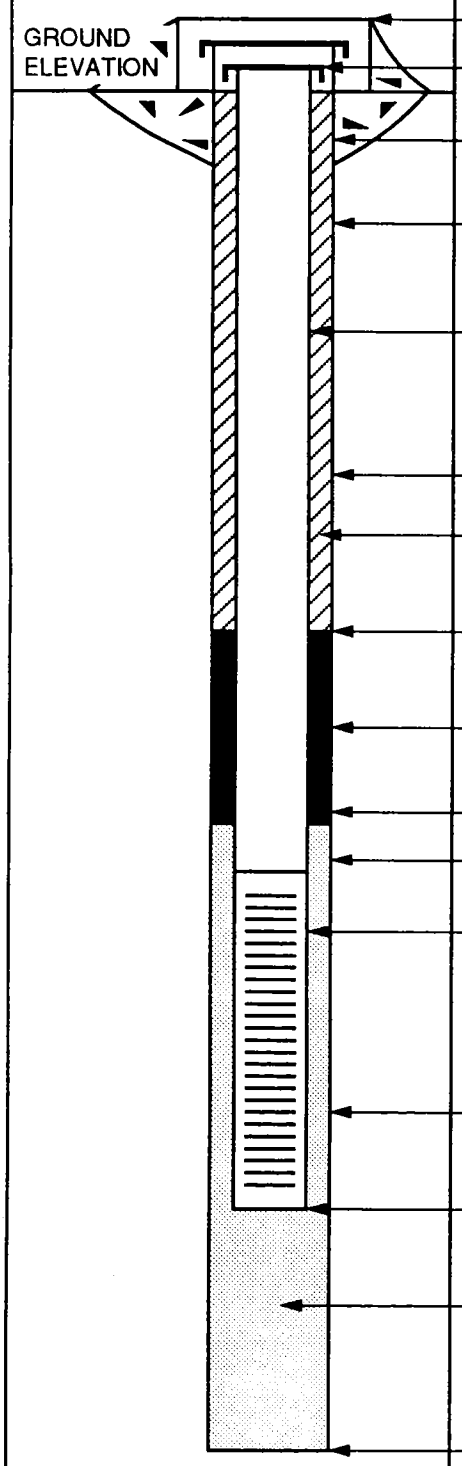
BORING NO. MW-118

# MONITORING WELL SHEET

PROJECT Fort Story PA/IS
PROJECT NO. 1868.0401
ELEVATION
FIELD GEOLOGIST Mark Shupe

LOCATION Site 6
BORING MW-118
DATE 3/20/90

DRILLER Hardin and Huber Inc.
DRILLING METHOD Hollow Stem Auger
DEVELOPMENT METHOD Bailing/Pumping




ELEVATION OF TOP OF SURFACE CASING: 13.71 ft.
ELEVATIONS OF TOP OF RISER PIPE: 13.24 ft.

TYPE OF SURFACE SEAL: Cement Grout

I.D. OF SURFACE CASING: 8 inch
TYPE OF SURFACE CASING: Steel

RISER PIPE I.D.: 2 inch
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 8 1/4 inch

TYPE OF BACKFILL: Cement Grout

ELEVATION/DEPTH OF SEAL: 2.8 ft.

TYPE OF SEAL: Granular Bentonite

DEPTH TO TOP OF SAND PACK: 3.8 ft.
ELEVATION/DEPTH TOP OF SCREEN: 5.0 ft.

TYPE OF SCREEN: Schedule 40 PVC
SLOT SIZE X LENGTH: 0.020 inch X 10 feet
I.D. OF SCREEN: 2 inch

TYPE OF SAND PACK: No. 2 Filter Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: 15.0 ft.

ELEVATION/DEPTH BOTTOM OF SANDPACK:
TYPE OF BACKFILL BELOW OBSERVATION WELL: Formation

ELEVATION/DEPTH OF HOLE: 15.0 ft.

# Monitoring Well Development Sheets

Earth Engineering & Sciences, Inc.

## Monitoring Well Development Sheet MW-115

Project: Ft Story Location: Site 6

Project No. 1969.0401 Dates:

Field Geologists: G. Towson & D. England

Barrel ID: SG MW 115 No. of Barrels: 3 - 55 gal

Initial Development Method Air Surges Init. Dev. Date: 3-25-90

Initial Volume Removed: 18 gal Time Started: 1540 Finished: 1600

Initial Team Members: Gary Enloe

Water Level (Initial): 4.33

Total Depth (BOH): 11.06

Designed Depth: 12.5

Depth of Sediment: 1.44

Water Level After Initial Development: 4.43

BOH After Initial Development: 12.51

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Final Development Method: Pumping Fin. Dev. Date: 4-6-90

Final Volume Removed: 165 gal Time Start: 1645 Finished: 1729

Final Team Members: G. Towson & D. England (EESI Geologists)

Water Level Start: 4.38 Finished: 4.38 Ph: 6.50 EC: 145 T°C: 16.3

Total Depth Start: 12.5 Finished: 12.5

$O_2$, TOX, Lel and Organic Vapor Problems Encountered: H-Nuc 2ppm LEL >250% $O_2$ 3.1 in Hole

Action: ☐ None Needed
☒ Need: Maintain upwind & monitor ambient air

Earth Engineering & Sciences, Inc.

| Date | Time | Initial Development | Final Development | Depth to Water (ft.) | Total Depth (ft) | Design Depth (ft.) | Estimated Sediment Thickness (ft.) | Air Surging | Bailing | Pumping | Flow Rate (gal/min) | Well Volume (gal.) | Total Vol. of Develop. Water | Water Temp. (°C)* | pH | EC (µΩ) * | Turbidity (Ntu) | Team Members |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4-6-98 | 1645 | | ✓ | 4.35 | 12.50 | 12.5 | — | | | ✓ | 0 | 8.12 | | 16.0 | | 250 | | G. TOWSON D. ENGLAND |
| | 1646 | | | | | | | | | ✓ | 2 | | 0 | 16.0 | 6.45 | 190 | | |
| | 1650 | | | | | | | | | ✓ | 2 | | 8 | 16.2 | 6.52 | 180 | | |
| | 1654 | | | | | | | | | ✓ | 2 | | 16 | 16.2 | 6.49 | 179 | | |
| | 1658 | | | | | | | | | ✓ | 2 | | 24 | 16.3 | 6.50 | 177 | | |
| | 1702 | | | | | | | | | ✓ | 2 | | 32 | 16.2 | 6.55 | 170 | | |
| | 1706 | | | | | | | | | ✓ | 5 | | 52 | 16.1 | 6.53 | 169 | | |
| | 1711 | | | | | | | | | ✓ | 5 | | 77 | 16.1 | 6.53 | 161 | | |
| | 1715 | | | | | | | | | ✓ | 5 | | 92 | 16.2 | 6.51 | 158 | | |
| | 1720 | | | | | | | | | ✓ | 5 | | 117 | 16.3 | 6.45 | 150 | | |
| | 1724 | | | | | | | | | ✓ | 5 | | 137 | 16.3 | 6.45 | 150 | | |
| | 1729 | | | | | | | | | ✓ | 5 | | 165 | 16.3 | 6:50 | 145 | | |
| 4-10 | | | | | | | | | ✓ | ✓ | .5 | | 166 | 16.2 | 6.48 | 190 | 1.13 | G. TOWSON D. ENGLAND |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |

Location: FORT STORY LARC AREA

Site #: 6

Well #: MW 115

* in Hole

TURBIDITY TAKEN 2 HRS AFTER SAMPLES REMOVED FROM WELL

Earth Engineering & Sciences, Inc.

## Monitoring Well Development Sheet MW 116

Project: FORT STORY Location: SITE 6

Project No. 1868.0401 Dates: 3-27-90 & + 4-8-90

Field Geologists:

Barrel ID: S6 MW 116 DEV $H_2O$ No. of Barrels: 2 - 55 gal

Initial Development Method AIR SURGED Init. Dev. Date: 3-27-90

Initial Volume Removed: NOT given Time Started: 1600 Finished: 1630

Initial Team Members: GARY ENLOE

Water Level (Initial): 4.91

Total Depth (BOH): 12.51

Designed Depth: 12.50

Depth of Sediment: -0-

Water Level After Initial Development: 4.94

BOH After Initial Development: 12.08

---

Final Development Method: PUMPED Fin. Dev. Date: 4-8-90

Final Volume Removed: 110 Time Start: 1000 Finished: 1034

Final Team Members: G. TOWSON & D. ENGLAND

Water Level Start: 4.55 Finished: 4.55 Ph: 6.33 EC: 185 T°C: 16.0

Total Depth Start: 12.60 Finished: 12.60

$O_2$, TOX, Lel and Organic Vapor Problems Encountered: NONE

Action: ☒ None Needed
☐ Need:

Earth Engineering & Sciences, Inc.

| Date | Time | Initial Development | Final Development | Depth to Water (ft.) | Total Depth (ft) | Design Depth (ft.) | Estimated Sediment Thickness (ft.) | Air Surging | Bailing | Pumping | Flow Rate (gal/min) | Well Volume (gal.) | Total Vol. of Develop. Water | Water Temp. (°C) * | pH | EC (µΩ) * | Turbidity (Ntu) | Team Members |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4-8-20 | 1000 | | ✓ | 4.55 | 12.60 | 12.50 | 0 | | | ✓ | 2 | 7.81 | 1 | 16.5 | 6.16 | 195 | | G. TOWSON D. ENGLAND |
| | 1005 | | ✓ | | | | | | | ✓ | 2 | | 9 | 16.5 | 6.22 | 195 | | |
| | 1009 | | ✓ | | | | | | | ✓ | 2 | | 17 | 16.5 | 6.27 | 190 | | |
| | 1013 | | ✓ | | | | | | | ✓ | 2 | | 25 | 16.5 | 6.23 | 190 | | |
| | 1017 | | ✓ | | | | | | | ✓ | 5 | | 33 | 16.5 | 6.26 | 190 | | |
| | 1019 | | ✓ | | | | | | | ✓ | 5 | | 43 | 16.5 | 6.31 | 195 | | |
| | 1022 | | ✓ | | | | | | | ✓ | 5 | | 58 | 16.5 | 6.30 | 190 | | |
| | 1024 | | ✓ | | | | | | | ✓ | 5 | | 68 | 16.2 | 6.33 | 195 | | |
| | 1027 | | ✓ | | | | | | | ✓ | 5 | | 83 | 16.2 | 6.33 | 190 | | |
| | 1029 | | ✓ | | | | | | | ✓ | 5 | | 93 | 16.0 | 6.33 | 190 | | |
| | 1032 | | ✓ | | | | | | | ✓ | 5 | | 103 | 16.0 | 6.33 | 185 | | |
| | 1034 | | ✓ | | | | | | | ✓ | 5 | | 110 | 16.0 | 6.33 | 195 | | |
| 4-10 | | | | | | | | | | | | | 111 | 16.3 | 6.24 | 218 | 1.57 | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |

Location: _____

Site #: _____

Well #: _____

* - in Hole

TURBIDITY TAKEN 2 HRS AFTER SAMPLE REMOVED FROM WELL

Earth Engineering & Sciences, Inc.

## Monitoring Well Development Sheet MW-117

Project: FORT STORY Location: SITE 6

Project No. ~~1869~~ 1869.0101 Dates: 4-2-90 & 4-6-90

Field Geologists: G. TOWSON & D ENGLAND (EESI GEOLOGISTS

Barrel ID: S6 MW 117 DEU $H_2O$ No. of Barrels: 3 · 55 GAL

Initial Development Method BAILING Init. Dev. Date: 4-2-90

Initial Volume Removed: 33 GAL Time Started: 1105 Finished: 1515 BREAK TAK IN BETWEEN

Initial Team Members: G. TOWSON & D. ENGLAND

Water Level (Initial): 7.35

Total Depth (BOH): 14.11

Designed Depth: 14

Depth of Sediment: 0

Water Level After Initial Development: 7.35

BOH After Initial Development: 14.14

---

Final Development Method: PUMPING Fin. Dev. Date: 4-6-90

Final Volume Removed: 165 Time Start: 1500 Finished: 1540

Final Team Members: G. TOWSON & D ENGLAND

Water Level Start: 7.21 Finished: 7.21 Ph: 6.45 EC: 155 T°C: 16.5

Total Depth Start: 14.14 Finished: 14.14

$O_2$, TOX, Lel and Organic Vapor Problems Encountered: LEL 3% $O_2$ 7.6 H-NUE 13.2 IN HOLE

Action: ☐ None Needed
☒ Need: MAINTAINED UPWIND FROM WELL & SAMPLES & MONITORED AMBIENT AIR

Earth Engineering & Sciences, Inc.

| Date | Time | Initial Development | Final Development | Depth to Water (ft.) | Total Depth (ft) | Design Depth (ft.) | Estimated Sediment Thickness (ft.) | Air Surging | Bailing | Pumping | Flow Rate (gal/min) | Well Volume (gal.) | Total Vol. of Develop. Water | Water Temp. (°C) | pH | EC (µΩ) | Turbidity (Ntu) | Team Members |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4-2-90 | 1105 | ✓ | | 7.35 | 14.11 | 14 | 0 | | ✓ | | .5 | 6.35 | | 16.1 | 6.42 | 250 | | G. Tomson D. Engram |
| " | 1415 | ✓ | | | | | | | ✓ | | .5 | | | 16.2 | 6.37 | 220 | | |
| | 1515 | ✓ | | 7.35 | 14.14 | 14 | .03 | | ✓ | | .5 | | 133 | 16.4 | 6.60 | 210 | | |
| 4-6-90 | 1500 | | ✓ | 7.21 | | | | | | ✓ | 2 | | 35 | 16.2* | - | 140* | | G. Tomson D. Engram |
| | 1501 | | ✓ | | | | | | | ✓ | 2 | | 43 | 16.2 | 6.36 | 35 | | |
| | 1505 | | ✓ | | | | | | | ✓ | 2 | | 51 | 16.4 | 6.41 | 40 | | |
| | 1509 | | ✓ | | | | | | | ✓ | 2 | | 59 | 16.4 | 6.45 | 40 | | |
| | 1513 | | ✓ | | | | | | | ✓ | 2 | | 67 | 16.3 | 6.45 | 60 | | |
| | 1517 | | ✓ | | | | | | | ✓ | 5 | | 73 | 16.5 | 6.44 | 150 | | |
| | 1521 | | ✓ | | | | | | | ✓ | 5 | | 93 | 16.5 | 6.45 | 155 | | |
| | 1525 | | ✓ | | | | | | | ✓ | 5 | | 110 | 16.5 | 6.44 | 155 | | |
| | 1530 | | ✓ | | | | | | | ✓ | 5 | | 130 | 16.5 | 6.44 | 155 | | |
| | 1534 | | ✓ | | | | | | | ✓ | 5 | | 150 | 16.5 | 6.45 | 155 | | |
| | 1539 | | ✓ | | | | | | | ✓ | 5 | | 160 | 16.5 | 6.45 | 155 | | |
| | 1540 | | ✓ | 7.21 | | | | | | ✓ | 5 | | 165 | 16.5 | 6.45 | 155 | | |
| 4-10 | | | ✓ | | | | | | | ✓ | .5 | | 166 | 16.2 | 6.43 | 170 | 6.4 | D. Engram G. Tomson |

Location: FORT STORY CARC AICT

Site #: #6

Well #: MW 117

* - IN HOLE

TURBIDITY TAKEN 2 HRS AFTER SAMPLE REMOVED FROM WELL

JMM JAMES M. MONTGOMERY, CONSULTING ENGINEERS, INC.

BY _____ DATE _____ CLIENT _____ SHEET _____ OF _____

CHKD. BY _____ DESCRIPTION FORT STORY JOB NO. _____

Well No. 117 Date:
Site No. 6

BEFORE ~~SURGING~~ BAILING

Depth to Water (DTW) = 7.35

Total Depth (TD) = 14.14

Design Total Depth = 14

Calculated depth of sediment = 0

~~SURGING~~ BAILING

Time begin = 1105 — LUNCH TAKEN

Time end = 1515

Development water clarity = Brown, Detergent Like Bubbles on Sample

Estimated volume of development water = 33

Discharge rate during development =

AFTER SURGING

Depth to Water :

Total Depth :

Calculated depth of sediment :

Earth Engineering & Sciences, Inc.

## Monitoring Well Development Sheet MW-118

Project: FORT STORY IRP Location: SITE #6

Project No. 1966.0101 Dates: 4-2-90 & 4-6-90

Field Geologists: GEORGE TOWSON

Barrel ID: S6MW118 DEV $H_2O$ No. of Barrels: 3 · 55 gal

Initial Development Method BAILING Init. Dev. Date: 4-2-90

Initial Volume Removed: 13 GAL Time Started: 1605 Finished: 1705

Initial Team Members: G. TOWSON & D. ENGLAND

Water Level (Initial): 6.85

Total Depth (BOH): 13.77

Designed Depth: 15.0

Depth of Sediment: 1.38'

Water Level After Initial Development: 6.85

BOH After Initial Development: 15.15

---

Final Development Method: PUMPING Fin. Dev. Date: 4-6-90

Final Volume Removed: 166 gal Time Start: 1350 Finished: 1431

Final Team Members: G. TOWSON & D. ENGLAND CESI GEOLOGISTS

Water Level Start: 6.60 Finished: 6.60 Ph: 5.36 EC: 50 T°C: 16.6

Total Depth Start: 15.15 Finished: 15.15

$O_2$, TOX, Lel and Organic Vapor Problems Encountered: NONE

Action: ☒ None Needed
☐ Need:

Earth Engineering & Sciences, Inc.

| Date | Time | Initial Development | Final Development | Depth to Water (ft.) | Total Depth (ft) | Design Depth (ft.) | Estimated Sediment Thickness (ft.) | Air Surging | Bailing | Pumping | Flow Rate (gal/min) | Well Volume (gal.) | Total Vol. of Develop. Water | Water Temp. (°C)* | pH | EC (µΩ)* | Turbidity (Ntu) | Team Members |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4-6-90 | 1350 | | ✓ | 6.60 | 15.10 | 15.0 | 0 | | | ✓ | 2 | 7.99 | 15 | 16.3 | 5.92 | 30 | | |
| | 1355 | | | | | | | | | | | | 25 | 16.5 | 5.83 | 30 | | |
| | 1403 | | | | | | | | | | | | 41 | 16.8 | 5.71 | 32 | | |
| | 1406 | | | | | | | | | | | | 47 | 16.5 | 5.60 | 35 | | |
| | 1409 | | | | | | | | | | | | 53 | 16.5 | 5.51 | 50 | | |
| | 1412 | | | | | | | | | | | | 64 | 16.8 | 5.50 | 50 | | |
| | 1415 | | | | | | | | | | | | 81 | 16.7 | 5.47 | 45 | | |
| | 1418 | | | | | | | | | | | | 95 | 16.7 | 5.45 | 50 | | |
| | 1421 | | | | | | | | | | | | 115 | 16.5 | 5.42 | 50 | | |
| | 1424 | | | | | | | | | | | | 132 | 16.8 | 5.40 | 50 | | |
| | 1429 | | | | | | | | | | | | 149 | 16.7 | 5.40 | 50 | | |
| | 1431 | | | | | | | | | | | | 165 | 16.6 | 5.36 | 50 | | |
| 4-10 | | | | | | | | | | | | | 166 | 16.4 | 5.50 | 50 | 2.09 | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |

Location: FORT STORY LARC AREA

Site #: SITE #6

Well #: MW 119

* - IN HOLE

TURBIDITY VALUE TAKEN 2 HOURS AFTER SAMPLE TAKEN FROM HOLE

JMM JAMES M. MONTGOMERY, CONSULTING ENGINEERS, INC.

BY _____ DATE _____ CLIENT _____ SHEET _____ OF _____

CHKD. BY _____ DESCRIPTION FORT STORY JOB NO. _____

Well No. MW118 Date: 4-2-90
Site No. #6

BEFORE SURGING

Depth to Water (DTW) = 6.95

Total Depth (TD) = 13.77

Design Total Depth = 15.00

Calculated depth of sediment = 1.23

~~SURGING~~ BAILING

Time begin = 1605

Time end = 1705

Development water clarity = Brown

Estimated volume of development water = 13 gal

Discharge rate during development = NA

AFTER SURGING

Depth to Water = 6.95

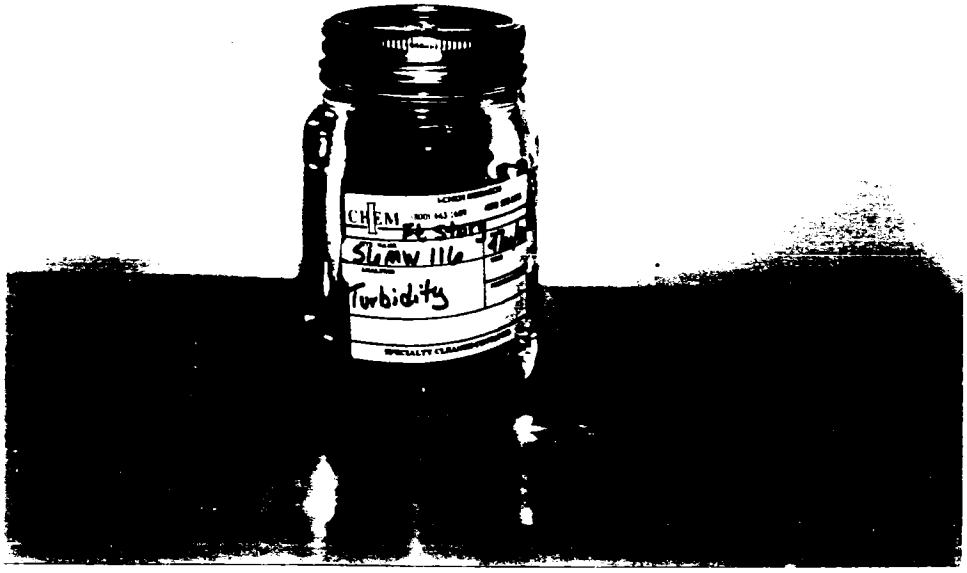
Total Depth = 15.15

Calculated depth of sediment = 1.38

# Monitoring Well Development Photographs

Fort Story, Virginia

Site Number: 6
Well Number: MW-115




Site Number: 6
Well Number: MW-116

Fort Story, Virginia

Site Number: 6
Well Number: MW-117

Site Number: 6
Well Number: MW-118

# In Situ Permeability Data

RAW DATA

WELL # S6MW115

WELL DIAMETER= 8.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER= .28 GALLONS
LENGTH OF AQUIFER TESTED= 20.00 FEET
VALUE OF H0= 1.72 FEET
STATIC WATER LEVEL= 3.95 FEET
LENGTH OF SCREEN= 10.00 FEET
WATER TABLE TO BOTTOM OF WELL= 7.80 FEET

SLUG TEST DATA:

| TIME | WATER LEVEL (FEET) | TIME SINCE TEST BEGAN (MINUTES) |
|---|---|---|
| 16. 6. 3 | 4.40 | .06 |
| 16. 6. 4 | 4.24 | .08 |
| 16. 6. 5 | 4.13 | .10 |
| 16. 6. 6 | 4.08 | .11 |
| 16. 6. 7 | 4.05 | .13 |
| 16. 6. 8 | 4.03 | .15 |
| 16. 6. 9 | 4.01 | .16 |
| 16. 6.10 | 4.00 | .18 |
| 16. 6.11 | 4.00 | .20 |
| 16. 6.12 | 3.99 | .21 |
| 16. 6.13 | 3.98 | .23 |
| 16. 6.14 | 3.98 | .25 |
| 16. 6.15 | 3.98 | .26 |
| 16. 6.16 | 3.97 | .28 |
| 16. 6.17 | 3.97 | .30 |
| 16. 6.18 | 3.97 | .31 |
| 16. 6.19 | 3.97 | .33 |
| 16. 6.24 | 3.97 | .41 |
| 16. 6.29 | 3.96 | .50 |
| 16. 6.34 | 3.96 | .58 |
| 16. 6.39 | 3.96 | .66 |

WELL # S6MW115

WELL DIAMETER= 8.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER REMOVED OR ADDED TO WELL= .28 GALLONS
LENGTH OF AQUIFER TESTED= 20.00 FEET
VALUE OF HO= 1.72 FEET
STATIC WATER LEVEL= 3.95 FEET

SLUG TEST DATA:

| TIME SINCE TEST BEGAN (MINUTES) | WATER LEVEL (FEET) | DRAWDOWN (FEET) | HEAD RATIO | RECIPROCAL TIME (1/MINUTES) |
|---|---|---|---|---|
| .06 | 4.40 | .45 | .262 | 15.789 |
| .08 | 4.24 | .29 | .169 | 12.500 |
| .10 | 4.13 | .18 | .105 | 10.345 |
| .11 | 4.08 | .13 | .076 | 8.824 |
| .13 | 4.05 | .10 | .058 | 7.692 |
| .15 | 4.03 | .08 | .047 | 6.818 |
| .16 | 4.01 | .06 | .035 | 6.122 |
| .18 | 4.00 | .05 | .029 | 5.556 |
| .20 | 4.00 | .05 | .029 | 5.085 |
| .21 | 3.99 | .04 | .023 | 4.688 |
| .23 | 3.98 | .03 | .017 | 4.348 |
| .25 | 3.98 | .03 | .017 | 4.054 |
| .26 | 3.98 | .03 | .017 | 3.797 |
| .28 | 3.97 | .02 | .012 | 3.571 |
| .30 | 3.97 | .02 | .012 | 3.371 |
| .31 | 3.97 | .02 | .012 | 3.191 |
| .33 | 3.97 | .02 | .012 | 3.030 |
| .41 | 3.97 | .02 | .012 | 2.419 |
| .50 | 3.96 | .01 | .006 | 2.013 |
| .58 | 3.96 | .01 | .006 | 1.724 |
| .66 | 3.96 | .01 | .006 | 1.508 |

WELL # S6MW115

---

PERMEABILITY BASED ON COOPER, BREDEHOEFT, AND PAPADOPULOS METHOD

PERMEABILITY=1.76E-04/ MATCH TIME (IN MINUTES)
STORAGE COEF= 5.88E-02* ALPHA
COMPUTER CALCULATES
ALPHA=1.00E-05 MATCH TIME= 8.75E-03
PERMEABILITY= 2.02E-02 CM/SEC
STORAGE COEF=5.88E-07
CORRELATION NUMBER= 1.00

---

PERMEABILITY BASED ON REGRESSION FIT OF HEAD RATIO DATA

HVORSLEV PERMEABILITY=3.58E-04 / LAG TIME
BOUWER PERMEABILTY=8.84E-04 * -SLOPE

COMPUTER CALCULATES
PERMEABILITY VARIES MORE THAN 20% DEPENDING ON THEEQUATION USED

FOR X ON Y: HVORSLEV PERMEABILITY=1.58E-02 CM/SEC
BOUWER PERMEABILITY=6.00E-03CM/SEC
FOR Y ON X: HVORSLEV PERMEABILITY=1.26E-02 CM/SEC
BOUWER PERMEABILITY=6.32E-03 CM/SEC
AVERAGE HVORSLEV PERMEABILITY=1.40E-02 CM/SEC
AVERAGE BOUWER PERMEABILITY=6.16E-03 CM/SEC
REGRESSION STATISTICS
X ON Y
INTERCEPT= -.28
SLOPE= -6.8
Y ON X
INTERCEPT= -.23
SLOPE= -7.2
CORRELATION COEFFICIENT= -.97
CALCULATIONS INDICATE THAT A VALUE OF 2.19 FEET FOR HO
OR A VALUE OF 1.769 INCHES FOR EFFECTIVE CASING DIA.
MAY YIELD BETTER RESULTS

---

PERMEABILITY BASED ON REGRESSION FIT OF DATA - FERRIS & KNOWLES METHOD

INSUFFICIENT DATA POINTS WITH RECIPROCAL TIMES LESS THAN .300
NUMBER OF USABLE DATA POINTS= 0

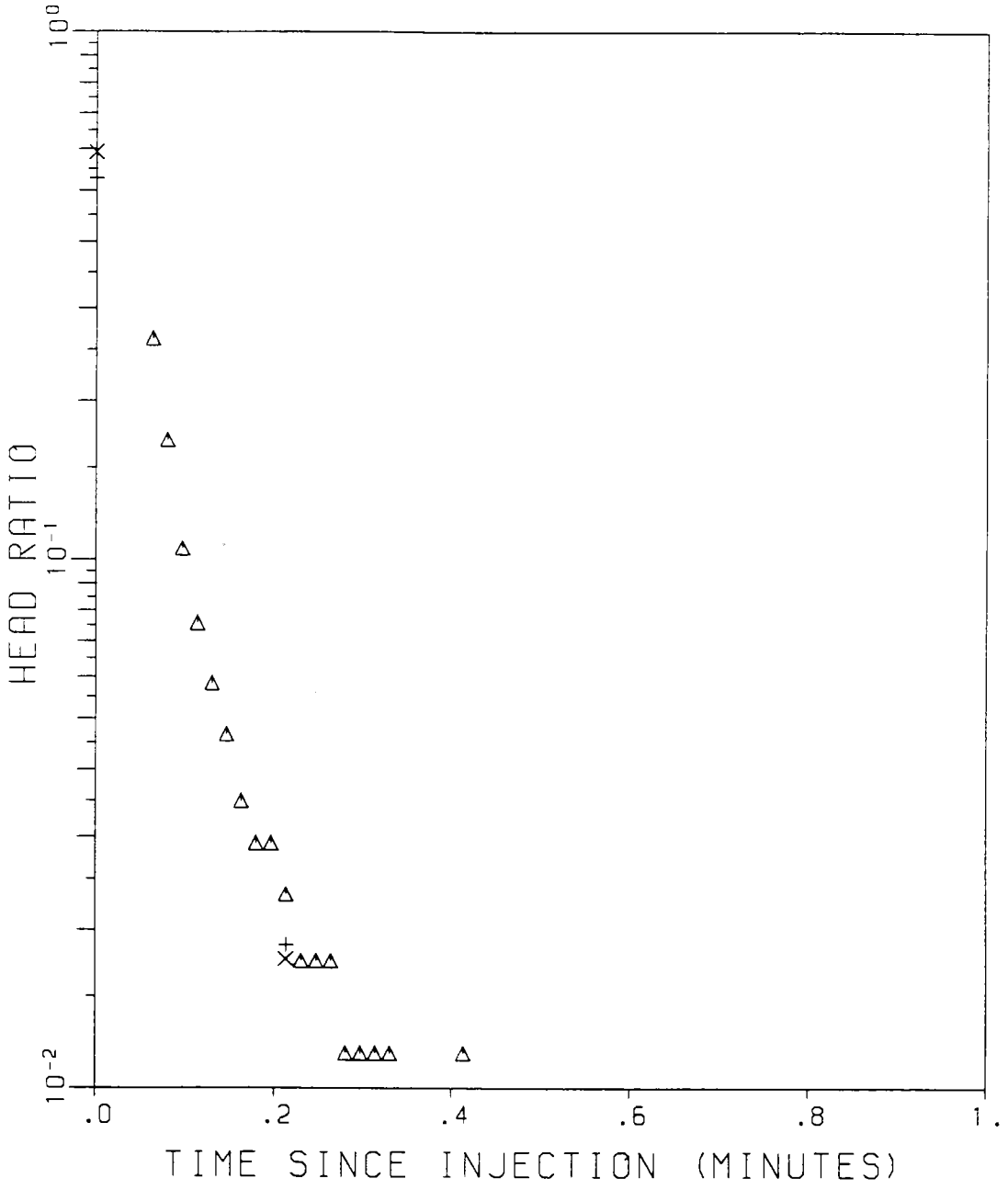
| WELL # | PERMEABILITY METHOD 1 | PERMEABILITY METHOD 2 | STORAGE COEF METHOD 2 | PERMEABILITY METHOD 3 | PERMEABILITY METHOD 4 |
|---|---|---|---|---|---|
| S6MW115 | 1.40E-02 | 2.02E-02 | 5.88E-07 | .00 | 6.16E-03 |

* METHOD 1 IS HVORSLEV
METHOD 2 IS COOPER, BREDEHOEFT, AND PAPADOPULOS
METHOD 3 IS FERRIS AND KNOWLES
METHOD 4 IS BOUWER

SITE 6. LACV FACILITY. WELL S6MW115

MON 11-05-1990

07:07:45.52




SLUG TEST OF WELL S6MW115

LOG HEAD RATIO VS TIME

RAW DATA

WELL # S6MW116

WELL DIAMETER= 8.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER= .28 GALLONS
LENGTH OF AQUIFER TESTED= 20.00 FEET
VALUE OF H0= .13 FEET
STATIC WATER LEVEL= 4.52 FEET
LENGTH OF SCREEN= 10.00 FEET
WATER TABLE TO BOTTOM OF WELL= 8.03 FEET

SLUG TEST DATA:

| TIME | WATER LEVEL (FEET) | TIME SINCE TEST BEGAN (MINUTES) |
|---|---|---|
| 17.56. 9 | 4.57 | .16 |
| 17.56.10 | 4.57 | .18 |
| 17.56.11 | 4.57 | .19 |
| 17.56.12 | 4.56 | .21 |
| 17.56.13 | 4.56 | .23 |
| 17.56.14 | 4.55 | .24 |
| 17.56.15 | 4.55 | .26 |
| 17.56.16 | 4.55 | .28 |
| 17.56.17 | 4.55 | .29 |
| 17.56.18 | 4.54 | .31 |
| 17.56.23 | 4.53 | .39 |
| 17.56.28 | 4.53 | .48 |
| 17.56.33 | 4.53 | .56 |

WELL # S6MW116

WELL DIAMETER= 8.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER REMOVED OR ADDED TO WELL= .28 GALLONS
LENGTH OF AQUIFER TESTED= 20.00 FEET
VALUE OF H0= .13 FEET
STATIC WATER LEVEL= 4.52 FEET

SLUG TEST DATA:

| TIME SINCE TEST BEGAN (MINUTES) | WATER LEVEL (FEET) | DRAWDOWN (FEET) | HEAD RATIO | RECIPROCAL TIME (1/MINUTES) |
|---|---|---|---|---|
| .16 | 4.57 | .05 | .385 | 6.250 |
| .18 | 4.57 | .05 | .385 | 5.660 |
| .19 | 4.57 | .05 | .385 | 5.172 |
| .21 | 4.56 | .04 | .308 | 4.762 |
| .23 | 4.56 | .04 | .308 | 4.412 |
| .24 | 4.55 | .03 | .231 | 4.110 |
| .26 | 4.55 | .03 | .231 | 3.846 |
| .28 | 4.55 | .03 | .231 | 3.614 |
| .29 | 4.55 | .03 | .231 | 3.409 |
| .31 | 4.54 | .02 | .154 | 3.226 |
| .39 | 4.53 | .01 | .077 | 2.542 |
| .48 | 4.53 | .01 | .077 | 2.098 |
| .56 | 4.53 | .01 | .077 | 1.786 |

WELL # S6MW116

---

PERMEABILITY BASED ON COOPER, BREDEHOEFT, AND PAPADOPULOS METHOD

PERMEABILITY=1.76E-04/ MATCH TIME (IN MINUTES)
STORAGE COEF= 5.88E-02* ALPHA
COMPUTER CALCULATES
ALPHA=1.00E-05 MATCH TIME= 4.86E-02
PERMEABILITY= 3.63E-03 CM/SEC
STORAGE COEF=5.88E-07
CORRELATION NUMBER= 1.00

---

PERMEABILITY BASED ON REGRESSION FIT OF HEAD RATIO DATA

HVORSLEV PERMEABILITY=3.58E-04 / LAG TIME
BOUWER PERMEABILTY=8.90E-04 * -SLOPE

COMPUTER CALCULATES
HVORSLEV PERMEABILITY=2.05E-03 CM/SEC
BOUWER PERMEABILITY=1.99E-03 CM/SEC
REGRESSION STATISTICS
X ON Y
INTERCEPT= -.07
SLOPE= -2.1
Y ON X
INTERCEPT= -.01
SLOPE= -2.4
CORRELATION COEFFICIENT= -.95
CALCULATIONS INDICATE THAT A VALUE OF .13 FEET FOR HO
OR A VALUE OF 2.021 INCHES FOR EFFECTIVE CASING DIA.
MAY YIELD BETTER RESULTS

---

PERMEABILITY BASED ON REGRESSION FIT OF DATA - FERRIS & KNOWLES METHOD

INSUFFICIENT DATA POINTS WITH RECIPROCAL TIMES LESS THAN .300
NUMBER OF USABLE DATA POINTS= 0

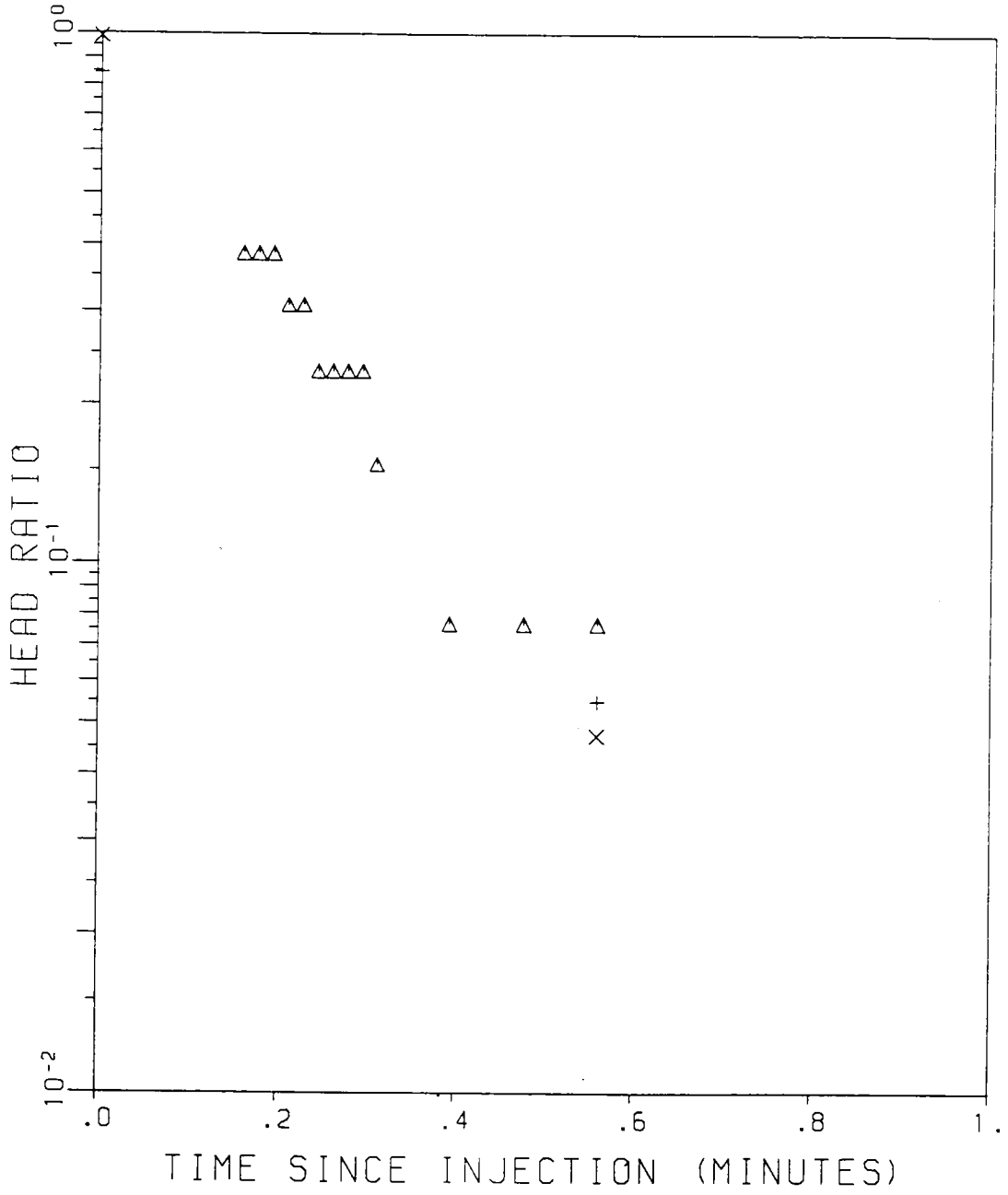
| WELL # | PERMEABILITY METHOD 1 | PERMEABILITY METHOD 2 | STORAGE COEF METHOD 2 | PERMEABILITY METHOD 3 | PERMEABILITY METHOD 4 |
|---|---|---|---|---|---|
| S6MW116 | 2.05E-03 | 3.63E-03 | 5.88E-07 | .00 | 1.99E-03 |

* METHOD 1 IS HVORSLEV
METHOD 2 IS COOPER, BREDEHOEFT, AND PAPADOPULOS
METHOD 3 IS FERRIS AND KNOWLES
METHOD 4 IS BOUWER

SITE 6, LARC FACILITY, WELL S6MW116

MON 11-05-1990

07:13:22.99




SLUG TEST OF WELL S6MW116

LOG HEAD RATIO VS TIME

RAW DATA

WELL # S6MW117

WELL DIAMETER= 8.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER= .28 GALLONS
LENGTH OF AQUIFER TESTED= 20.00 FEET
VALUE OF H0= .17 FEET
STATIC WATER LEVEL= 9.13 FEET
LENGTH OF SCREEN= 10.00 FEET
WATER TABLE TO BOTTOM OF WELL= 7.16 FEET

SLUG TEST DATA:

| TIME | WATER LEVEL (FEET) | TIME SINCE TEST BEGAN (MINUTES) |
|---|---|---|
| 15.20. 4 | 9.34 | .08 |
| 15.20. 5 | 9.26 | .09 |
| 15.20. 6 | 9.24 | .11 |
| 15.20. 7 | 9.22 | .13 |
| 15.20. 8 | 9.20 | .14 |
| 15.20. 9 | 9.20 | .16 |
| 15.20.10 | 9.19 | .18 |
| 15.20.11 | 9.18 | .19 |
| 15.20.12 | 9.17 | .21 |
| 15.20.13 | 9.16 | .23 |
| 15.20.14 | 9.17 | .24 |
| 15.20.15 | 9.16 | .26 |
| 15.20.16 | 9.16 | .28 |
| 15.20.17 | 9.15 | .29 |
| 15.20.18 | 9.15 | .31 |
| 15.20.19 | 9.15 | .33 |

WELL # S6MW117

WELL DIAMETER= 8.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER REMOVED OR ADDED TO WELL= .28 GALLONS
LENGTH OF AQUIFER TESTED= 20.00 FEET
VALUE OF H0= .17 FEET
STATIC WATER LEVEL= 9.13 FEET

SLUG TEST DATA:

| TIME SINCE TEST BEGAN (MINUTES) | WATER LEVEL (FEET) | DRAWDOWN (FEET) | HEAD RATIO | RECIPROCAL TIME (1/MINUTES) |
|---|---|---|---|---|
| .08 | 9.34 | .21 | 1.235 | 13.043 |
| .09 | 9.26 | .13 | .765 | 10.714 |
| .11 | 9.24 | .11 | .647 | 9.091 |
| .13 | 9.22 | .09 | .529 | 7.895 |
| .14 | 9.20 | .07 | .412 | 6.977 |
| .16 | 9.20 | .07 | .412 | 6.250 |
| .18 | 9.19 | .06 | .353 | 5.660 |
| .19 | 9.18 | .05 | .294 | 5.172 |
| .21 | 9.17 | .04 | .235 | 4.762 |
| .23 | 9.16 | .03 | .176 | 4.412 |
| .24 | 9.17 | .04 | .235 | 4.110 |
| .26 | 9.16 | .03 | .176 | 3.846 |
| .28 | 9.16 | .03 | .176 | 3.614 |
| .29 | 9.15 | .02 | .118 | 3.409 |
| .31 | 9.15 | .02 | .118 | 3.226 |
| .33 | 9.15 | .02 | .118 | 3.061 |

WELL # S6MW117

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PERMEABILITY BASED ON COOPER, BREDEHOEFT, AND PAPADOPULOS METHOD

PERMEABILITY=1.76E-04/ MATCH TIME (IN MINUTES)
STORAGE COEF= 5.88E-02* ALPHA
COMPUTER CALCULATES
ALPHA=1.00E-05 MATCH TIME= 4.50E-02
PERMEABILITY= 3.92E-03 CM/SEC
STORAGE COEF=5.88E-07
CORRELATION NUMBER= .98

---

PERMEABILITY BASED ON REGRESSION FIT OF HEAD RATIO DATA

HVORSLEV PERMEABILITY=3.58E-04 / LAG TIME
BOUWER PERMEABILTY=8.65E-04 * -SLOPE

COMPUTER CALCULATES
HVORSLEV PERMEABILITY=2.11E-03 CM/SEC
BOUWER PERMEABILITY=3.13E-03 CM/SEC
REGRESSION STATISTICS
X ON Y
INTERCEPT= .17
SLOPE= -3.5
Y ON X
INTERCEPT= .20
SLOPE= -3.7
CORRELATION COEFFICIENT= -.98
CALCULATIONS INDICATE THAT A VALUE OF .42 FEET FOR HO
OR A VALUE OF 1.269 INCHES FOR EFFECTIVE CASING DIA.
MAY YIELD BETTER RESULTS

---

PERMEABILITY BASED ON REGRESSION FIT OF DATA - FERRIS & KNOWLES METHOD

INSUFFICIENT DATA POINTS WITH RECIPROCAL TIMES LESS THAN .300
NUMBER OF USABLE DATA POINTS= 0

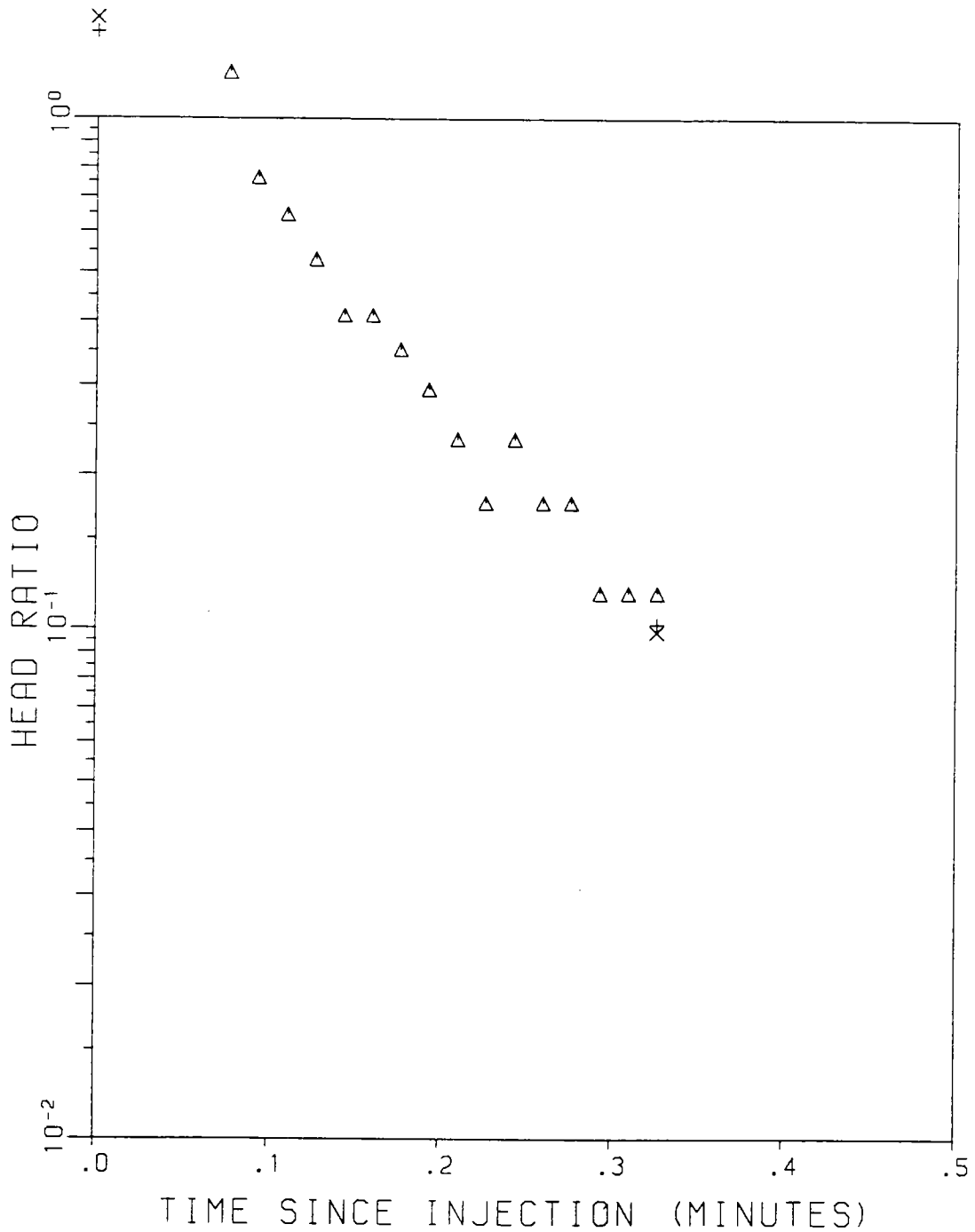
| WELL # | PERMEABILITY METHOD 1 | PERMEABILITY METHOD 2 | STORAGE COEF METHOD 2 | PERMEABILITY METHOD 3 | PERMEABILITY METHOD 4 |
|---|---|---|---|---|---|
| S6MW117 | 2.11E-03 | 3.92E-03 | 5.88E-07 | .00 | 3.13E-03 |

* METHOD 1 IS HVORSLEV
METHOD 2 IS COOPER, BREDEHOEFT, AND PAPADOPULOS
METHOD 3 IS FERRIS AND KNOWLES
METHOD 4 IS BOUWER

SITE 6. LARC FACILITY. WELL S6MW117

MON 11-05-1990

07:18:23.48




SLUG TEST OF WELL S6MW117

LOG HEAD RATIO VS TIME

RAW DATA

WELL # S6MW118

WELL DIAMETER= 8.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER= .28 GALLONS
LENGTH OF AQUIFER TESTED= 20.00 FEET
VALUE OF H0= 1.72 FEET
STATIC WATER LEVEL= 6.02 FEET
LENGTH OF SCREEN= 10.00 FEET
WATER TABLE TO BOTTOM OF WELL= 8.67 FEET

SLUG TEST DATA:

| TIME | WATER LEVEL (FEET) | TIME SINCE TEST BEGAN (MINUTES) |
|---|---|---|
| 16.33. 1 | 7.04 | .03 |
| 16.33. 2 | 6.38 | .04 |
| 16.33. 3 | 6.17 | .06 |
| 16.33. 4 | 6.09 | .08 |
| 16.33. 5 | 6.07 | .09 |
| 16.33. 6 | 6.05 | .11 |
| 16.33. 7 | 6.04 | .13 |
| 16.33. 8 | 6.04 | .14 |
| 16.33. 9 | 6.03 | .16 |
| 16.33.10 | 6.03 | .18 |
| 16.33.11 | 6.03 | .19 |
| 16.33.12 | 6.03 | .21 |
| 16.33.13 | 6.03 | .23 |

WELL # S6MW118

WELL DIAMETER= 8.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER REMOVED OR ADDED TO WELL= .28 GALLONS
LENGTH OF AQUIFER TESTED= 20.00 FEET
VALUE OF H0= 1.72 FEET
STATIC WATER LEVEL= 6.02 FEET

SLUG TEST DATA:

| TIME SINCE TEST BEGAN (MINUTES) | WATER LEVEL (FEET) | DRAWDOWN (FEET) | HEAD RATIO | RECIPROCAL TIME (1/MINUTES) |
|---|---|---|---|---|
| .03 | 7.04 | 1.02 | .594 | 37.500 |
| .04 | 6.38 | .36 | .210 | 23.077 |
| .06 | 6.17 | .15 | .087 | 16.667 |
| .08 | 6.09 | .07 | .041 | 13.043 |
| .09 | 6.07 | .05 | .029 | 10.714 |
| .11 | 6.05 | .03 | .017 | 9.091 |
| .13 | 6.04 | .02 | .012 | 7.895 |
| .14 | 6.04 | .02 | .012 | 6.977 |
| .16 | 6.03 | .01 | .006 | 6.250 |
| .18 | 6.03 | .01 | .006 | 5.660 |
| .19 | 6.03 | .01 | .006 | 5.172 |
| .21 | 6.03 | .01 | .006 | 4.762 |
| .23 | 6.03 | .01 | .006 | 4.412 |

WELL # S6MW118

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PERMEABILITY BASED ON COOPER, BREDEHOEFT, AND PAPADOPULOS METHOD

PERMEABILITY=1.76E-04/ MATCH TIME (IN MINUTES)
STORAGE COEF= 5.88E-02* ALPHA
COMPUTER CALCULATES
ALPHA=1.00E-05 MATCH TIME= 5.47E-03
PERMEABILITY= 3.23E-02 CM/SEC
STORAGE COEF=5.88E-07
CORRELATION NUMBER= .98

---

PERMEABILITY BASED ON REGRESSION FIT OF HEAD RATIO DATA

HVORSLEV PERMEABILITY=3.58E-04 / LAG TIME
BOUWER PERMEABILTY=9.06E-04 * -SLOPE

COMPUTER CALCULATES
HVORSLEV PERMEABILITY=1.08E-02 CM/SEC
BOUWER PERMEABILITY=1.84E-02 CM/SEC
REGRESSION STATISTICS
X ON Y
INTERCEPT= .22
SLOPE= -20.
Y ON X
INTERCEPT= .26
SLOPE= -21.
CORRELATION COEFFICIENT= -.99
CALCULATIONS INDICATE THAT A VALUE OF 3.98 FEET FOR H0
OR A VALUE OF 1.314 INCHES FOR EFFECTIVE CASING DIA.
MAY YIELD BETTER RESULTS

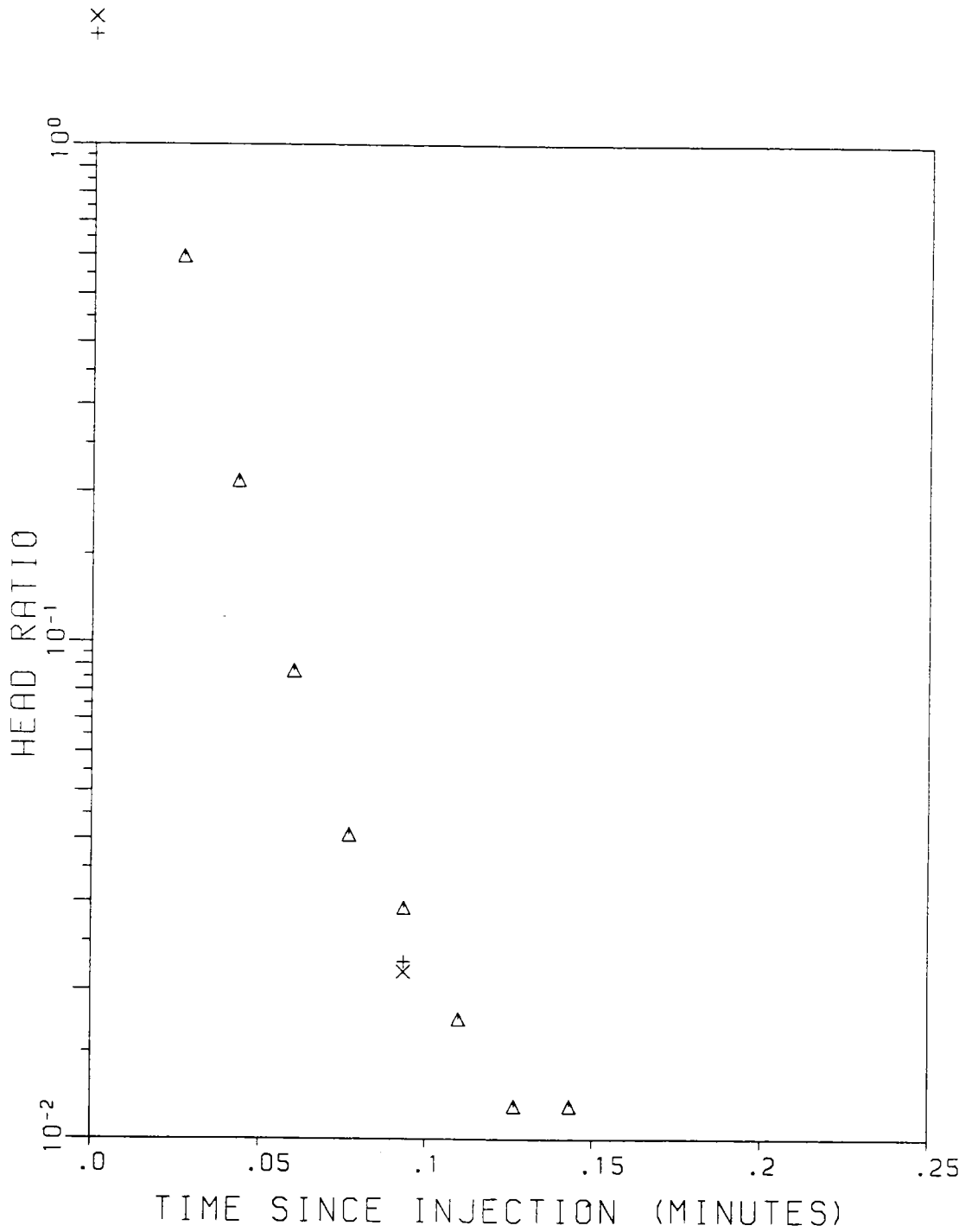
---

PERMEABILITY BASED ON REGRESSION FIT OF DATA - FERRIS & KNOWLES METHOD

INSUFFICIENT DATA POINTS WITH RECIPROCAL TIMES LESS THAN .300
NUMBER OF USABLE DATA POINTS= 0

| WELL # | PERMEABILITY METHOD 1 | PERMEABILITY METHOD 2 | STORAGE COEF METHOD 2 | PERMEABILITY METHOD 3 | PERMEABILITY METHOD 4 |
|---|---|---|---|---|---|
| S6MW118 | 1.08E-02 | 3.23E-02 | 5.88E-07 | .00 | 1.84E-02 |

* METHOD 1 IS HVORSLEV
METHOD 2 IS COOPER, BREDEHOEFT, AND PAPADOPULOS
METHOD 3 IS FERRIS AND KNOWLES
METHOD 4 IS BOUWER




SLUG TEST OF WELL S6MW118
LOG HEAD RATIO VS TIME

SITE 6. LARC FACILITY. WELL S6MW118
MON 11-05-1990
07:22:49.32

# Groundwater Sampling Logs

MW 115

# GROUNDWATER SAMPLING LOG

## FORT STORY



CLIENT USACE
SITE 6
WELL NUMBER MW 115
JOB NUMBER 1868.0401

TOTAL WELL DEPTH 12.5
WELL DIAMETER 2"
BOREHOLE DIAMETER 8 3/4"

MIN NUMBER WELL VOL TO BE PURGED 3
VOL PER VERTICAL FT CASING (GAL) .95
VOL PER FT BOREHOLE (LESS CASING)(GAL)

STATIC WATER LEVEL (FT) 4.7
STANDING WATER COLUMN (FT) 7.8

AMT ONE WELL VOL (GAL) 7.41
TOTAL GAL TO BE PURGED 22.3

PURGING SYSTEM TEFLON BAILER
SAMPLING SYSTEM TEFLON BAILER

| DATE | TIME | AMOUNT PURGED (GAL) | EC | pH | TEMP | TURBIDITY | PID | | | COMMENTS | SAMPLER |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | FIELD PARAMETERS MEASURED | | | | | | | | |
| 6-6-96 | 0826 | 0 | 290 | 6.31 | 23.1 | | | | | GRAY-BROWN 0% SED | MDS/EJD |
| " | 0829 | 5 | 290 | 6.32 | 23.6 | | | | | GRAY-BROWN 0% SED | MDS/EJD |
| " | 0832 | 10 | 280 | 6.22 | 23.8 | | | | | GRAY-BROWN 0% SED | MDS/EJD |
| " | 0835 | 15 | 290 | 6.27 | 22.6 | | | | | GRAY-BROWN 0% SED | MDS/EJD |
| " | 0838 | 20 | | | | | | | | N/A | MDS/EJD |
| " | 0841 | 25 | 28 | 6.36 | 22.6 | | | | | GRAY-BROWN 0% SED | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| FINAL READING | 0930 | 6* | 290 | 6.35 | 22.3 | 239.6 | 0.0 | | | GRAY-BROWN 0% SED | MDS/EJD |

NOTES: Purge rate: 2.6 g/min

TURBIDITY: 50 x 119.8

# GROUNDWATER SAMPLING LOG

## FORT STORY



CLIENT USACE
SITE 6
WELL NUMBER MW 115
JOB NUMBER 1868.04C1

TOTAL WELL DEPTH 12.5
WELL DIAMETER 2"
BOREHOLE DIAMETER 8 3/4"

MIN NUMBER WELL VOL TO BE PURGED 3
VOL PER VERTICAL FT CASING (GAL) .95
VOL PER FT BOREHOLE (LESS CASING)(GAL)

STATIC WATER LEVEL (FT) 5.9
STANDING WATER COLUMN (FT) 6.8

AMT ONE WELL VOL (GAL) 6.46
TOTAL GAL TO BE PURGED 19.4

PURGING SYSTEM TEFLON BAILER
SAMPLING SYSTEM TEFLON BAILER

| DATE | TIME | AMOUNT PURGED (GAL) | EC | FIELD PARAMETERS MEASURED pH | TEMP | TURBIDITY | PID | | | COMMENTS | SAMPLER |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8-3 | 0710 | 0 | 160 | 6.49 | 24.6 | | | | | MURKY-BROWN 0% SED | MDS/EJD |
| " | 0713 | 5 | 170 | 6.80 | 24.9 | | | | | MURKY-BROWN 0% SED | MDS/EJD |
| " | 0716 | 10 | | | | | | | | N/A | MDS/EJD |
| " | 0719 | 15 | 190 | 6.75 | 24.3 | | | | | CLOUDY 0% SED | MDS/EJD |
| " | 0723 | 20 | 190 | 6.88 | 24.0 | | | | | CLOUDY 0% SED | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| FINAL READING | 0731 | 9 Litres | 170 | 6.89 | 24.8 | 4756 | 0.0 | | | CLOUDY 0% SED | mps/c TP |

NOTES: Rate 2.5 g/min

TURBIDITY: 2x 2x 118.9

MW 116

# GROUNDWATER SAMPLING LOG

## FORT STORY



CLIENT USACE
SITE 6
WELL NUMBER MW 116
JOB NUMBER 1868.0401

TOTAL WELL DEPTH 14.6
WELL DIAMETER 2"
BOREHOLE DIAMETER 8 3/4"

MIN NUMBER WELL VOL TO BE PURGED 3
VOL PER VERTICAL FT CASING (GAL) .95
VOL PER FT BOREHOLE (LESS CASING)(GAL)

STATIC WATER LEVEL (FT) 4.9
STANDING WATER COLUMN (FT) 9.1

AMT ONE WELL VOL (GAL) 8.6
TOTAL GAL TO BE PURGED 25.8

PURGING SYSTEM TEFLON BAILER
SAMPLING SYSTEM TEFLON BAILER

| DATE | TIME | AMOUNT PURGED (GAL) | EC | pH | TEMP | TURBIDITY | PID | | | COMMENTS | SAMPLER |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | FIELD PARAMETERS MEASURED | | | | | | | | |
| 6-18 | 1108 | 0 | 650 | 6.26 | 22.3 | | | | | Gray - Brown Trace Sand | MDS/EJD |
| " | 1111 | 5 | 600 | 6.64 | 24.6 | | | | | Brown 0% Sand | MDS/EJD |
| " | 1113 | 10 | 600 | 6.33 | 24.9 | | | | | Brown 0% Sand | MDS/EJD |
| " | 1116 | 15 | | | | | | | | N/A | MDS/EJD |
| " | 1119 | 20 | | | | | | | | N/A | MDS/EJD |
| " | 1122 | 25 | | | | | | | | Brown 0% Sand | MDS/EJD |
| " | 1125 | 30 | 600 | 6.30 | 24.2 | | | | | Brown Sand | MDS/EJD |
| " | | | | | | | | | | Brown - Clear 0% Sand | MDS/EJD |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| FINAL READING | 1148 | 6* | 600 | 6.31 | 23.6 | 131.7 | 0.0 | | | Murky - Brown 0% Sand | MDS/EJD |

NOTES: Purge Rate 2.5 gl/min

TURBIDITY: N

Its no metal Cover
Collect Sample
Water poor color

# GROUNDWATER SAMPLING LOG

## FORT STORY



CLIENT USACE
SITE 6
WELL NUMBER MW 116
JOB NUMBER 1868.0401

TOTAL WELL DEPTH 12.5
WELL DIAMETER 2"
BOREHOLE DIAMETER 8 3/4"

MIN NUMBER WELL VOL TO BE PURGED 3
VOL PER VERTICAL FT CASING (GAL) .95
VOL PER FT BOREHOLE (LESS CASING)(GAL)

STATIC WATER LEVEL (FT) 6.2
STANDING WATER COLUMN (FT) 6.3

AMT ONE WELL VOL (GAL) 5.9
TOTAL GAL TO BE PURGED 17.7

PURGING SYSTEM TEFLON BAILER
SAMPLING SYSTEM TEFLON BAILER

| DATE | TIME | AMOUNT PURGED (GAL) | EC | FIELD PARAMETERS MEASURED pH | TEMP | TURBIDITY | PID | | | COMMENTS | SAMPLER |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8-3 | 0825 | 0 | 390 | 6.8 | 28.6 | | | | | yellow tint trace sed | MDS/EJD |
| " | 0831 | 5 | 360 | 6.1 | 28.0 | | | | | Brownish tint 0% sed | MDS/EJD |
| " | 0834 | 10 | 370 | 6.4 | 28.5 | | | | | yellow clear 0% sed | MDS/EJD |
| " | 0835 | 15 | | | | | | | | N/A | MDS/EJD |
| " | 0837 | 20 | 370 | 7.1 | 28.0 | | | | | yellow clear 0% sed | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| FINAL READING | 0901 | 2 Liter | 350 | 7.3 | 28.0 | 464 | 6.8 | | | yellow clear 0% sed | MDS/EJD |

NOTES: Rate 2.5 gl/min

TURBIDITY: 2x 2x 116.0

MW 117

# GROUNDWATER SAMPLING LOG

## FORT STORY



CLIENT USACE
SITE 6
WELL NUMBER MW 117
JOB NUMBER 1868.0401

TOTAL WELL DEPTH 14.0
WELL DIAMETER 2"
BOREHOLE DIAMETER 8 3/4"

MIN NUMBER WELL VOL TO BE PURGED 3
VOL PER VERTICAL FT CASING (GAL) .95
VOL PER FT BOREHOLE (LESS CASING)(GAL)

STATIC WATER LEVEL (FT) 4.6
STANDING WATER COLUMN (FT) 9.4

AMT ONE WELL VOL (GAL) 4.18
TOTAL GAL TO BE PURGED 12.6

PURGING SYSTEM TEFLON BAILER
SAMPLING SYSTEM TEFLON BAILER

| DATE | TIME | AMOUNT PURGED (GAL) | EC | FIELD PARAMETERS MEASURED pH | TEMP | TURBIDITY | PID | | | COMMENTS | SAMPLER |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-7-98 | 1035 | 0 | 170 | 6.34 | 21.6 | | | | | 0% Sed Clear | MDS/EJD |
| " | 1038 | 5 | 140 | 6.49 | 21.0 | | | | | 0% Sed Clear | MDS/EJD |
| " | 1041 | 10 | 140 | 6.54 | 22.0 | | | | | 0% Sed Clear | MDS/EJD |
| " | 1043 | 15 | 150 | 6.49 | 20.8 | | | | | 0% Sed Clear | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| FINAL READING | 1100 | 6* | 140 | 6.56 | 19.0 | 67.6 | 0.0 | | | Clear 0% Sed | MDS/EJD |

NOTES: Purge Rate: 2.6 gl/min

TURBIDITY:

# GROUNDWATER SAMPLING LOG

## FORT STORY



CLIENT USACE
SITE 6
WELL NUMBER MW 117
JOB NUMBER 1868.

TOTAL WELL DEPTH 14
WELL DIAMETER 2"
BOREHOLE DIAMETER 8 3/4"

MIN NUMBER WELL VOL TO BE PURGED 3
VOL PER VERTICAL FT CASING (GAL) .95
VOL PER FT BOREHOLE (LESS CASING)(GAL)

STATIC WATER LEVEL (FT) 4.7
STANDING WATER COLUMN (FT) 9.3

AMT ONE WELL VOL (GAL) 8.8
TOTAL GAL TO BE PURGED 26.4

PURGING SYSTEM TEFLON BAILER
SAMPLING SYSTEM TEFLON BAILER

| DATE | TIME | AMOUNT PURGED (GAL) | EC | pH | TEMP | TURBIDITY | PID | | | COMMENTS | SAMPLER |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | FIELD PARAMETERS MEASURED | | | | | | | | |
| 8-7 | 0913 | 0 | 140 [redacted] | 6.78 | 25.0 | | | | | MURKY BROWN 0% SED | MDS/EJD |
| " | 0915 | 5 | 140 [redacted] | 6.7 | 24.6 | | | | | MURKY-BROWN 0% SED | MDS/EJD |
| " | 0917 | 10 | 150 | 6.63 | 26.5 | | | | | CLEAR 0% SED | MDS/EJD |
| " | 0919 | 15 | 220 | 6.64 | 24.1 | | | | | CLEAR 0% SED | MDS/EJD |
| " | 0921 | 20 | 220 | 6.0 | 24.6 | | | | | CLEAR 0% SED | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| FINAL READING | 1001 | 2 Liters | 220 | 6.3 | 24.2 | 274.8 | 0.0 | | | CLEAR 0% SED | MDS/EJD |

NOTES: Rate 2.0 gl/min

TURBIDITY: 2x2x68.7

MW 118

# GROUNDWATER SAMPLING LOG

## FORT STORY



CLIENT USACE
SITE C
WELL NUMBER MW 118
JOB NUMBER 1868.04c1

TOTAL WELL DEPTH 15.0
WELL DIAMETER 2"
BOREHOLE DIAMETER 8 3/4"

MIN NUMBER WELL VOL TO BE PURGED 3
VOL PER VERTICAL FT CASING (GAL) .95
VOL PER FT BOREHOLE (LESS CASING)(GAL)

STATIC WATER LEVEL (FT) 7.0
STANDING WATER COLUMN (FT) 8.0

AMT ONE WELL VOL (GAL) 7.6
TOTAL GAL TO BE PURGED 22.8

PURGING SYSTEM TEFLON BAILER
SAMPLING SYSTEM TEFLON BAILER

| DATE | TIME | AMOUNT PURGED (GAL) | EC | FIELD PARAMETERS MEASURED pH | TEMP | TURBIDITY | PID | | | COMMENTS | SAMPLER |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6-7-96 | 0641 | 0 | 210 | 5.97 | 24.8 | | | | | Brown - Clear 0% Sand | MDS/EJD |
| " | 0643 | 5 | 200 | 5.63 | 24.6 | | | | | Brown 0% Sen | MDS/EJD |
| " | 0647 | 10 | 210 | 5.87 | 24.5 | | | | | Brown 0% Sed | MDS/EJD |
| " | 0651 | 15 | 240 | 5.83 | 24.8 | | | | | Brown 0% Sed | MDS/EJD |
| " | 0653 | 20 | | | | | | | | N/A | MDS/EJD |
| " | 0655 | 25 | 230 | 5.89 | 24.9 | | | | | Brown 0% Sed | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | N/A | MDS/EJD |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| " | | | | | | | | | | | |
| FINAL READING | 0700 | 6 | 200 | 5.88 | 24.3 | 544.4 | 0.0 | | | Brown 0% Sed | MDS/EJD |

NOTES: Purge Rate 2.5 gl/min

TURBIDITY: 30 x 50 x 136.1

# Soil and Monitoring Well Boring Lithologic Logs

BORING/WELL NUMBER *SB-134*
DATE STARTED *4/3/90* COMPLETED *4/3/90*
SITE NUMBER *N/A*
GROUND ELEVATION *4.70 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *BACKGROUND BORING*
GEOLOGIST *MARK SHUPE*



COORDINATES *N225533, E2718453*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-2 | 1<br>2<br>3<br>5 | 1.0 | | | SAND (SP), quartz, dark brown, medium-fine grained, subrounded, graded, trace silt, root material. | PID Instrumentation 0-2, 4-6 foot samples:<br>PI 101 HNu Systems<br>10.2 eV Lamp<br>PID Background=0.0 ppm. |
| ▼ | | | | | | | SAND (SP), quartz, tan, medium-fine, subrounded, graded. | |
| 5 | LITH | 4-6 | 8<br>30<br>31<br>33 | 2.0 | | | | 9-11, 13-15 foot samples<br>OVM 580B<br>Thermo Environmental Instruments, Inc.<br>10.2 eV lamp<br>PID Background = 3.6 ppm. |
| | | | | | | SP | SAND (SP), quartz, tan, coarse-fine, subrounded, graded. | |
| 10 | LITH | 9-11 | 5<br>7<br>8<br>12 | 12.4 | | | SAND (SP), quartz, medium gray, very coarse-fine, subrounded, well graded. | |
| | | | | | | SW | SAND (SW), quartz, green-gray, fine-very fine, subangular, well graded, trace silt. | |
| | BH | 13-15 | 5<br>10<br>12<br>18 | 4.4 | | SP | SAND (SP), quartz, tan-gray, coarse-fine, subrounded, graded. | |
| 15 | | | | | | | Total depth of boring=15 feet. | |
| 20 | | | | | | | | |
| 25 | | | | | | | | GS=Ground Surface<br>LITH = Lithology<br>BH=Bottom of Hole<br>▼ =Water table during drilling |

**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *15 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-135*
DATE STARTED *4/4/90* COMPLETED *4/4/90*
SITE NUMBER *N/A*
GROUND ELEVATION *58.15 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *BACKGROUND BORING*
GEOLOGIST *MARK SHUPE*



COORDINATES *N221240, E2730431*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS SPLIT DUP | 0-2 | 2 3 2 5 | 1.1 | | SP | SAND (SP), quartz, dark brown, fine-very fine, silty, frequent roots. | |
| | | | | | | | SAND (SP), quartz, tan - salt and pepper, fine-very fine, poor grading. | |
| 5 | LITH | 5-7 | 6 6 6 7 | 1.2 | | | SAND (SP), quartz, tan, medium-fine, subrounded, graded. | |
| 10 | LITH | 10-12 | 5 6 7 9 | 4.8 | | | SAND (SP), quartz, tan, medium-fine, subrounded, graded. | |
| 15 | LITH | 15-17 | 3 4 5 6 | 4.2 | | SP | SAND (SP), quartz, tan, medium-fine, subangular-subrounded, graded. | |
| 20 | LITH | 20-22 | 6 12 12 14 | 2.0 | | | SAND (SP), quartz, tan-gray, medium-fine, subrounded-subangular, graded. | |
| 25 | LITH | 25-27 | 6 5 6 7 | 3.0 | | | SAND (SP), quartz, tan, medium-fine, subrounded-subangular, graded. | |

**JMM** James M. Montgomery
Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *42 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*

BORING/WELL NUMBER *SB-135* CLIENT *U.S. ARMY CORPS OF ENGINEERS* 

DATE STARTED *4/4/90* COMPLETED *4/4/90* PROJECT *FORT STORY PA/SI*

SITE NUMBER *N/A* SITE NAME *BACKGROUND BORING* COORDINATES

GROUND ELEVATION *58.15 FEET, NGVD* GEOLOGIST *MARK SHUPE* *N221240, E2730431*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | LITH | 30-32 | 3 4 3 4 | 2.4 | | | SAND (SP), quartz, tan, medium-fine, subrounded-subangular, graded. | PID Instrumentation 0-2, 5-7, 10-12, 15-17 foot samples: PI 101 HNu Systems 10.2 eV Lamp PID Background=0.0 ppm. |
| 35 | LITH | 35-37 | 3 3 4 7 | 2.2 | | SP | SAND (SP), quartz, tan, medium-fine, subrounded-subangular, graded. | 20-22, 25-27, 30-32, 35-37, 40-42 foot samples: OVM 580B Thermo Environmental Instruments, Inc. 10.2 eV Lamp PID Background=0.0 ppm. |
| 40 | BH | 40-42 | 3 4 6 5 | 2.2 | | | SAND (SP), quartz, tan, medium-fine, subrounded-subangular, graded. | |
| | | | | | | | Total depth of boring=42 feet. | |
| 45 | | | | | | | | |
| 50 | | | | | | | | |
| 55 | | | | | | | | GS=Ground Surface LITH=Lithology BH=Bottom of Hole DUP=Duplicate SPLIT=Split Sample ▼=Water table during drilling |

JMM James M. Montgomery Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.* WELL COMPLETION DEPTH *N/A*

METHOD OF DRILLING *HOLLOW STEM AUGER* WELL DIAMETER *N/A*

HOLE DIAMETER *8 1/4 INCHES* WELL MATERIAL *N/A*

TOTAL DEPTH *42 FEET*

BORING/WELL NUMBER *SB-136*
DATE STARTED *4/3/90* COMPLETED *4/3/90*
SITE NUMBER *N/A*
GROUND ELEVATION *20.40 FEET, NGVD*

CLIENT *U.S. ARMY CORPS OF ENGINEERS*
PROJECT *FORT STORY PA/SI*
SITE NAME *BACKGROUND BORING*
GEOLOGIST *MARK SHUPE*



COORDINATES *N227048, E2722175*

| DEPTH (feet) | SAMPLE | SAMPLE INTERVAL (ft) | BLOWS/ 6 IN | PID (ppm) | GRAPHIC LOG | SOIL CLASS | GEOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | GS | 0-2 | 1 2 3 2 | 17.1 | | SP | SAND (SP), quartz, tan, medium-fine grained, subrounded-subangular, graded. | PID Instrumentation OVM 580B Thermo Environmental Instruments, Inc. 10.2 eV Lamp PID Background=3.6 ppm. |
| 5 | LITH | 4-6 | 11 9 7 4 | 26.1 | | | | |
| 10 | LITH | 9-11 | 8 10 15 16 | 16.4 | | SP | SAND (SP), quartz, tan, medium, subrounded, poorly graded. | |
| | LITH | 13-15 | 5 9 7 8 | 16.5 | | | | |
| 15 | LITH | 15-17 | 2 6 10 9 | 21.3 | | | | |
| ▼ 20 | BH | 20-22 | 7 11 14 19 | 21.4 | | | SAND (SP), quartz, tan, medium-fine grained, subrounded, poorly graded. | |
| | | | | | | | Total depth of boring=22 feet. | |
| 25 | | | | | | | | GS=Ground Surface BH=Bottom of Hole LITH=Lithology ▼=Water table during drilling |

**JMM** James M. Montgomery Consulting Engineers, Inc.

DRILLER *HARDIN AND HUBER, INC.*
METHOD OF DRILLING *HOLLOW STEM AUGER*
HOLE DIAMETER *8 1/4 INCHES*
TOTAL DEPTH *22 FEET*

WELL COMPLETION DEPTH *N/A*
WELL DIAMETER *N/A*
WELL MATERIAL *N/A*