Memorandum

To:	Grant Trigger, RACER	Ref. No.:	017303
From:	Beth Landale//172/Det.	Date:	March 10, 2016
CC:	Kevin Lund, MDEQ		

Re: 2014 Membrane Interface Probe Investigation Summary
RACER - Willow Run Company Vehicle Operations
2901 Tyler Road
Ypsilanti, Michigan

1. Introduction

On behalf of Revitalizing Auto Communities Environmental Response Trust (RACER), GHD has prepared this memorandum to summarize the results of the Membrane Interface Probe (MIP) investigation completed in December 2014 at the Company Vehicle Operations in Ypsilanti, Michigan (Site). The MIP investigation was designed to evaluate chlorinated volatile organic compounds (CVOC) as part of the ongoing evaluation of remedial options for the Site. Despite many rounds of investigation at the Site, there were several data gaps that, if investigated, may more fully inform the identification, evaluation and selection of effective remedial alternatives by defining or eliminating the potential of additional source areas. The MIP investigation included installation of 82 MIP soil boring locations to clay and working with Matrix Environmental (Matrix) (MIP contractor) to generate isocontour maps and a 3D model of the investigated area.

The proposed locations are presented on Figure 1a and are categorized by four investigation objectives:

- Pink Locations – to provide additional information into unidentified sources for hotspots such as MW19-07 and MW19-12. Some of these locations also fill in large data gaps where high contaminate levels were detected (MW19-42), but there was limited upgradient data to define the extent of upgradient impacts, despite current understanding of source areas.
- Orange Locations – to provide information on transport of impacts to the east into a potential off-site migration pathway.
- Blue Locations –to provide additional delineation of impacts laterally and vertically related to the groundwater–surface water interface pathway and transport of impacts along the bank of the Site and Tyler Pond.

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- Green Locations – to provide additional information to determine if there are impacts pooling at the clay surface. A close review of the field logs from this area indicated that there appears to be shallow bowl in the clay in the area.

The following sections summarize the investigation and the results.

2. MIP Advancement and Results

Prior to the beginning of the scope of work, locations were field marked, cleared by a private utility locate contractor, and surveyed. Between December 2 and December 18, 2014, 82 MIP soil boring locations were installed throughout the northwestern portion of the Site (west of the north-south running sanitary sewer corridor that bisects the Site) and generally north and east of the Haulaway Building (Figure 1b). Soil borings were advanced to the massive, continuous clay approximately 25 feet below ground surface (bgs), as detected by rate of push and electric resistivity.

The MIP probe is attached to a geoprobe rig and advanced through the soil to log the relative concentrations of volatile organic compounds (VOCs) in the soils. For this scope of work, the MIP probe was outfitted with:

- Photoionization detector (PID) that detects VOCs in the hydrocarbon range (e.g., benzene, toluene, ethylbenzene, xylene [BTEX]).
- Flame ionization detector (FID) that detects total VOCs and methane.
- Halogen specific detector (XSD) that detects VOCs in the chlorinated range (i.e., trichloroethylene [TCE] and tetrachloroethylene [PCE]).

With the direct push nature of the MIP probe, no soil cuttings were generated.

The Matrix Report provided in Attachment 1 provides:

- General background on the equipment used including the MIP probe, the detectors, response tests, etc.
- Site specific information for this with respect to locations where refusals and repairs took place.
- MIP Field Log Summary which includes date completed depth and comments which include refusals, additional wait times, significant fuel responses, repairs, questionable readings.
- MIP Analytical Interpretation table which provides maximum detections and depths for each detector per location and estimated concentration ranges at intervals.
- MIP logs with PID/FID/XSD and electrical conductivity results plotted side by side.
- QA/QC pre and post log checks.

3. Evaluation of Results

Utilizing the MIP results, Matrix generated several isocontour figures based on the XSD, FID, PID, and PID minus XSD which is the PID results corrected by lowering the results in direct relation to elevated XSD results (Figures 2 – 6). The PID minus XSD results, like all of the MIP results, should be viewed as strictly relative. XSD results indicated that highest chlorinated impacts are located north-northeast of the Haulaway building along the groundwater divide on-Site and extend eastward to the north-south running sewer corridor

to the east. A pocket of additional elevated chlorinated impacts is located in the northwest portion of the Site. The corrected PID isocontour figure indicates that the hydrocarbon impacts are in basically the same areas as the chlorinated impacts, though the extent is somewhat larger. One area of note is the hot spot near MIP-059 northwest of the Haulaway Building on the XSD and PID isocontours. These impacts are further upgradient than impacts were previously known to extend. The FID isocontour, as it detects the entire VOC range, shows a much larger area of impacts; however, the large range of detection also means that it is hard to discern what type of impacts elevated results indicate. Two notable areas of elevated VOCs that showed up on the FID isocontour but not on the XSD or PID isocontours are located near the northeast area of investigation adjacent to the bank of Tyler Pond and the sewer corridor and the other area is located near the southeast portion of the investigation area. These locations do not show up as particularly "hot" on the XSD or PID results, but the elevated FID results are consistent with historical constituent sampling in the area.

In addition to the isocontours, Matrix created a 3D model of the investigation which is on file at GHD. Several screen shots of the model are presented in Figures 7 through 12. The figures present slices of the models of the PID and XSD results; cross section locations are presented in Figure 1b. The vertical and horizontal extent of both PID and XSD (gasoline and chlorinated range VOCs, respectively) along line A-A' is illustrated on Figures 7 and 8. The highly elevated PID and somewhat elevated XSD readings in the northwestern portion of the line (near MIP-27) are likely due to debris and tar/tar-sludge encountered in this area during previous test pitting. The downgradient elevation of both PID and XSD readings near MIP-20 along A-A' may be from migration. Along line B-B' (Figures 9 and 10), the impacts near MIP-072 are obvious in both the PID and XSD responses. Drums containing DNAPL were removed from this area in 2005 and impacts from those drums likely account for the elevated responses throughout the boring. Elevated PID responses extending to/into the clay layer may be the result of system delay to flush out the elevated constituents. The separate pocket of elevated XSD readings between MIP-073 and MIP-036 to the northeast is fairly cross-gradient. PID and XSD impacts are undelineated at MIP-011, adjacent to the bluff leading down to Tyler Pond. On the C-C' section, the XSD and PID impacts follow the same basic pattern with the exception of greater vertical PID impacts at MIP-059. XSD impacts are undefined to the northeast at MIP-005, adjacent to the bluff leading down to Tyler Pond.

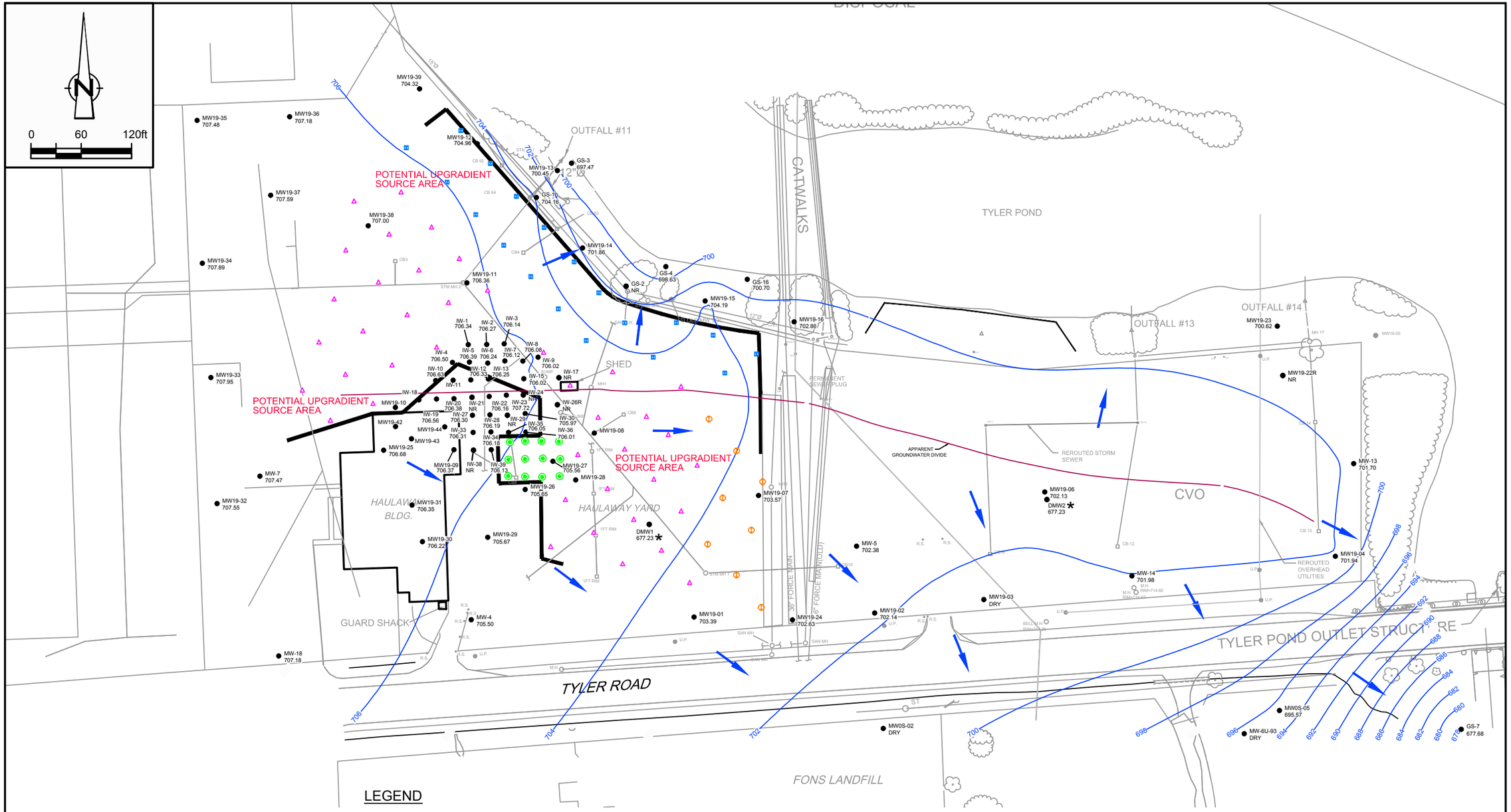
4. Conclusions

Several Site issues have been highlighted by the MIP investigation. From a source investigation viewpoint, the elevated FID, PID and XSD results northwest of the Haulaway building near MIP-028 indicate a previously unidentified potential upgradient source. During previous test pitting investigations in this area, automotive debris, some drum remnants, and solidified tar were found in this area. During drilling, non-aqueous phase liquid (NAPL) was observed on the rods while advancing MIP-027. The elevated FID results in the northeast investigation area near MIP-10 suggest a potential additional source area, though the nature of impacts is unknown.

The impacts at MIP-072 stand out in the model as the impacts extend from the ground surface to the underlying clay. As mentioned, several drums were removed from this area, some of which contained DNAPL. After removal, soil from the excavation that was field screened as "clean" with a PID was returned to the excavation. It is likely that these backfilled soils are the cause of the vertical extent of impacts up to the ground surface. The extent down to the clay may be a drag-down effect where very highly elevated levels can take an extended amount of time to flush out of the MIP system and affect the results below.

Several of the MIP borings along the northern edge of the investigation area indicated elevated FID, PID, and/or XSD readings, leaving the delineation of potential impacts to Tyler Pond incomplete.

The results discussed in this memorandum will be incorporated into an updated conceptual site model along with groundwater and other media results.



LEGEND

	DITCH, STREAM OR RIVER
	FENCE LINE
	TREE LINE
	FORMER SLUDGE LINE
	APPARENT GROUNDWATER DIVIDE
U.P.	UTILITY POLE
	POTENTIAL "SINKERS" SOURCE EVALUATION
	TRANSPORT/REMEDIATION EVALUATION - NORTHEAST TOWARDS TYLER POND
	TRANSPORT/REMEDIATION EVALUATION - EAST/SOUTHEAST
	UNIDENTIFIED SOURCE EVALUATION

702.95	GROUNDWATER ELEVATION (AMSL)(DECEMBER 2013)
*	ELEVATION NOT INCLUDED IN CONTOUR. WELL SCREENS DEEP AQUIFER
NR	NO LEVEL RECORDED. WELL WAS INACCESSIBLE (DECEMBER 2013)
708	GROUNDWATER CONTOUR (DECEMBER 2013)
	GROUNDWATER FLOW DIRECTION (DECEMBER 2013)
	EXTENT OF MIP INVESTIGATION

figure 1a

PROPOSED MIP LOCATIONS
2014 MIP INVESTIGATION SUMMARY
FORMER COMPANY VEHICLE OPERATIONS AREA

Ypsilanti, Michigan

017303-T05(MEMO172)GN-DE008 MAR 15, 2016

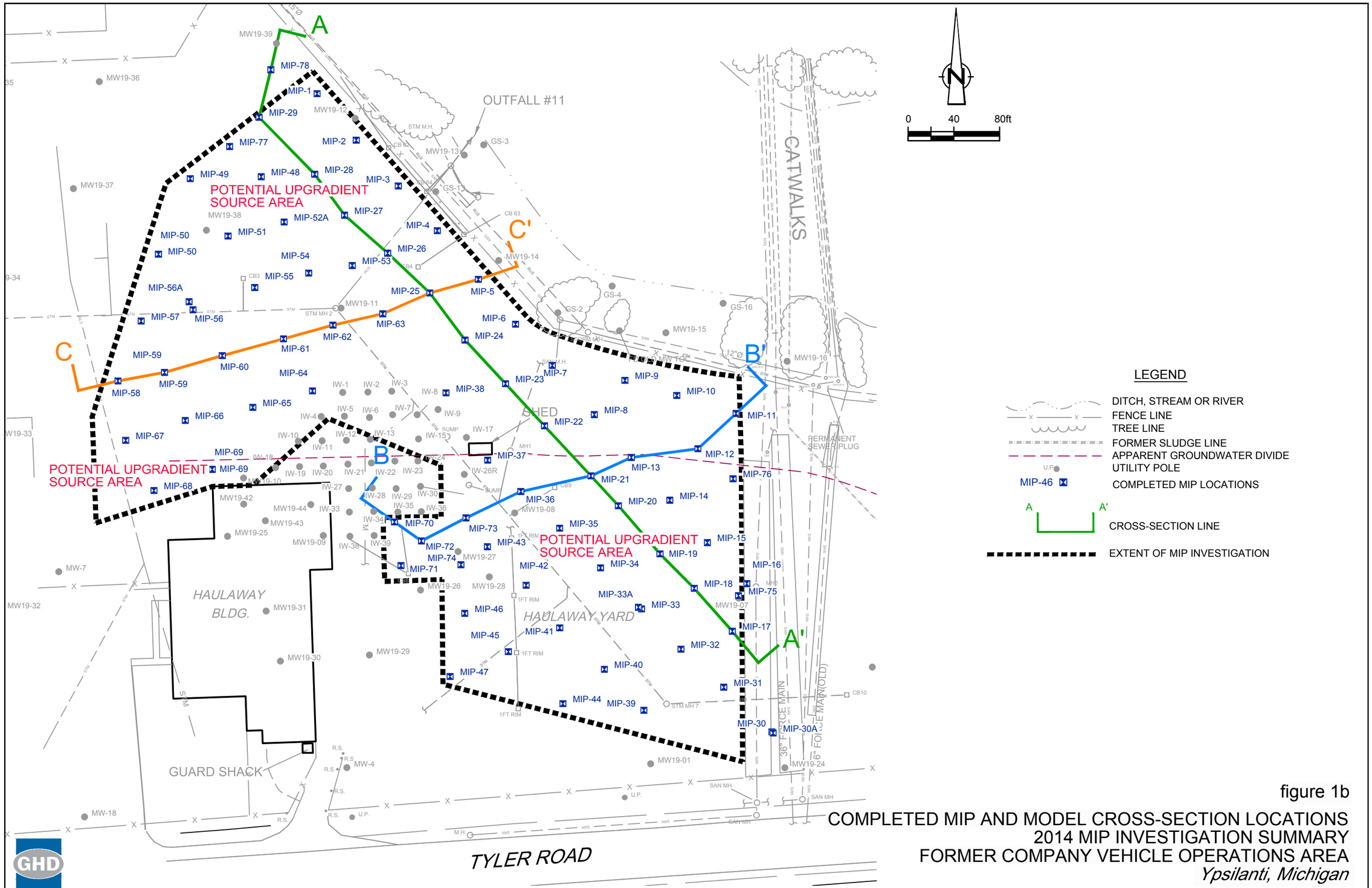
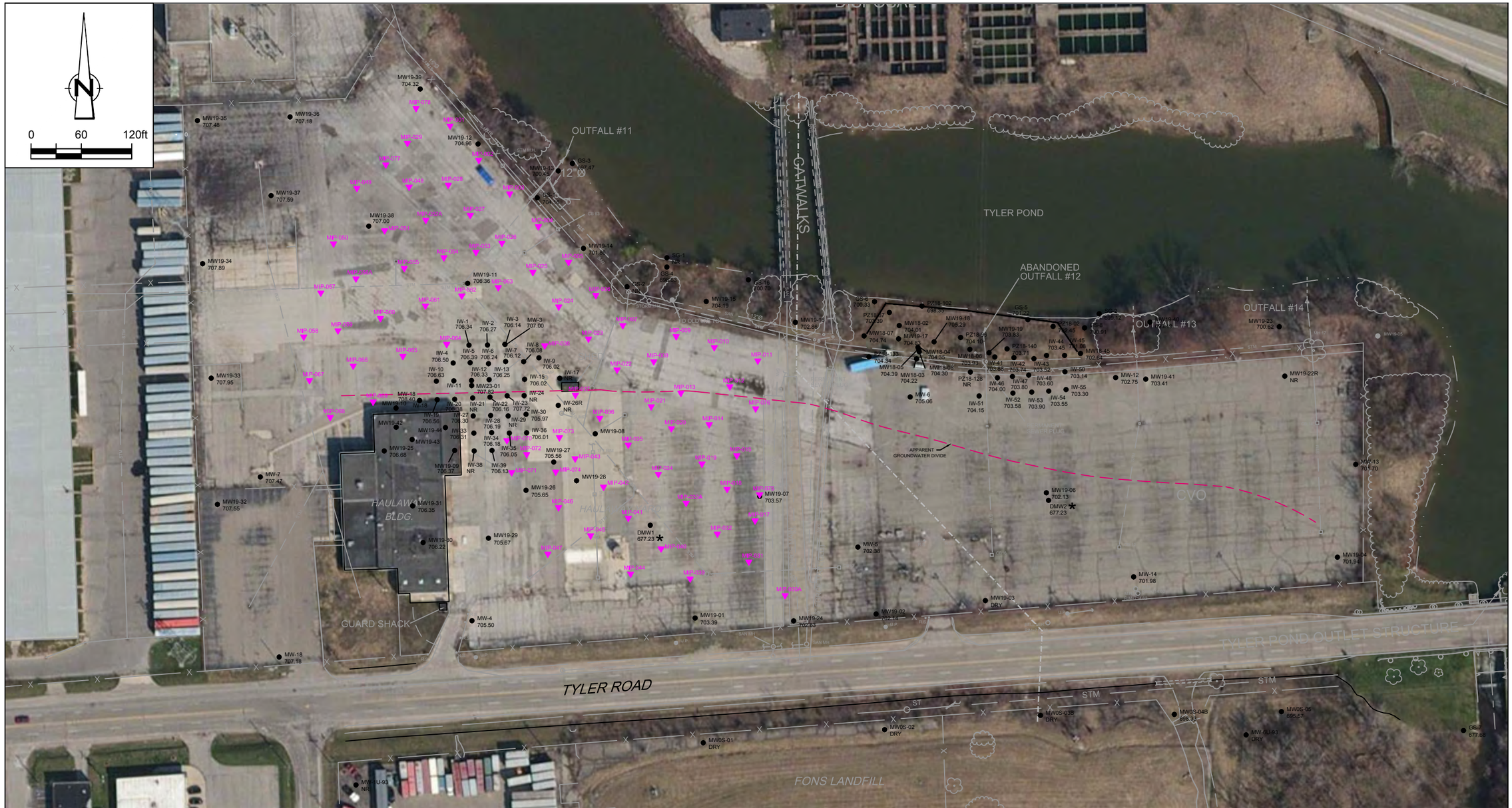


figure 1b

COMPLETED MIP AND MODEL CROSS-SECTION LOCATIONS
2014 MIP INVESTIGATION SUMMARY
FORMER COMPANY VEHICLE OPERATIONS AREA
Ypsilanti, Michigan



LEGEND

- DITCH, STREAM OR RIVER
- FENCE LINE
- TREE LINE
- FORMER SLUDGE LINE
- APPARENT GROUNDWATER DIVIDE
- U.P. UTILITY POLE
- MIP-047 MIP BOREHOLE
- MW-18 707.18 MONITORING WELL

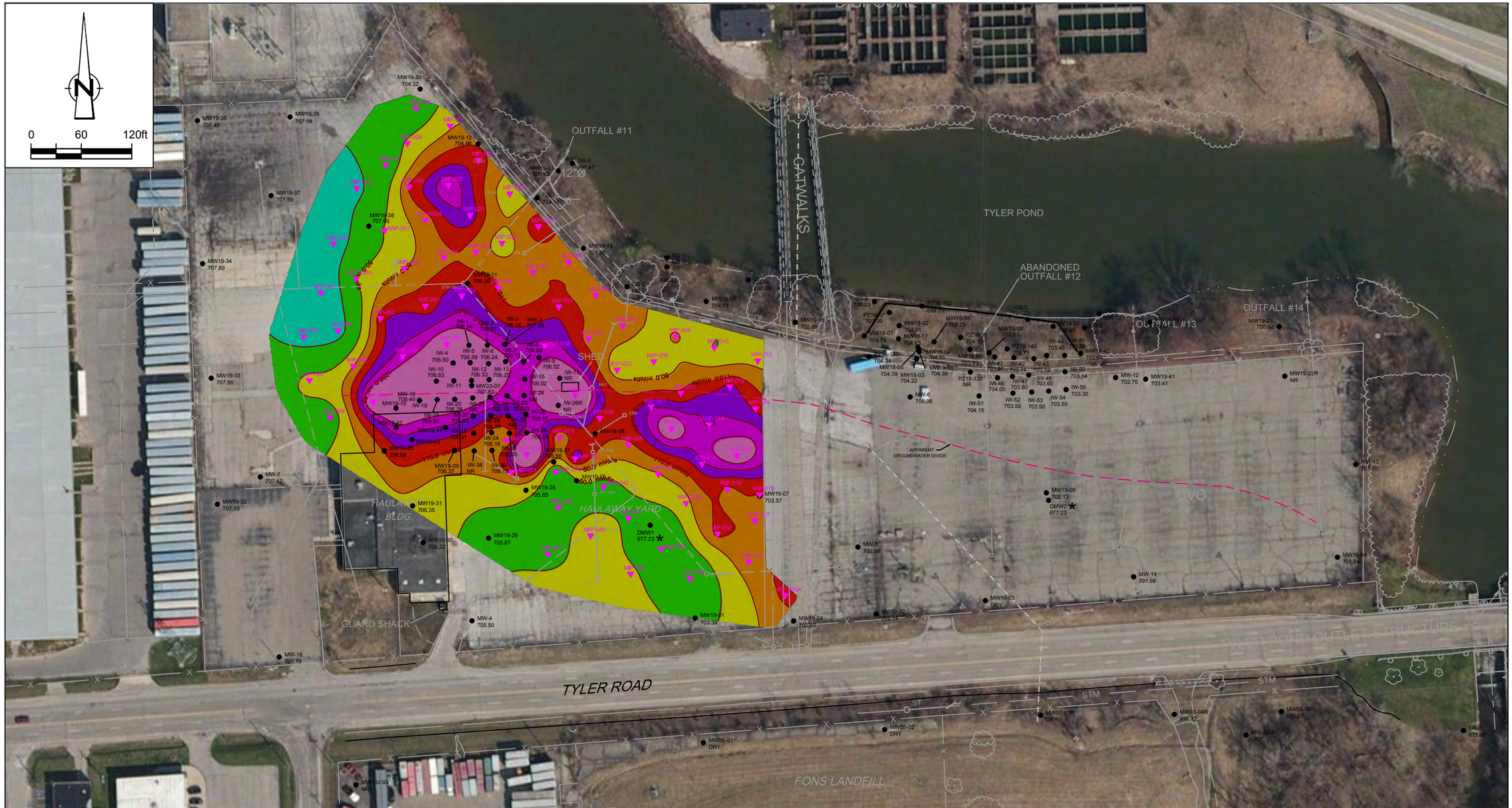
MIP & ISV BY:

MATRIX ENVIRONMENTAL LLC
A WCEC COMPANY

figure 2

MEMBRANE INTERFACE PROBE (MIP) BOREHOLE LOCATIONS
FORMER GENERAL MOTORS COMPANY VEHICLE OPERATIONS AREA
Ypsilanti, Michigan

017303-T01(MEMO170)GN-DE001 NOV 18/2014 -Modified by Matrix using former CRA Base file



LEGEND

- DITCH, STREAM OR RIVER
- FENCE LINE
- TREE LINE
- FORMER SLUDGE LINE
- APPARENT GROUNDWATER DIVIDE
- UTILITY POLE
- MIP BOREHOLE
- MONITORING WELL

XSD mVolts

- >200
- 170-200
- 140-170
- 110-140
- 80-110
- 50-80
- 20-50
- 7-20

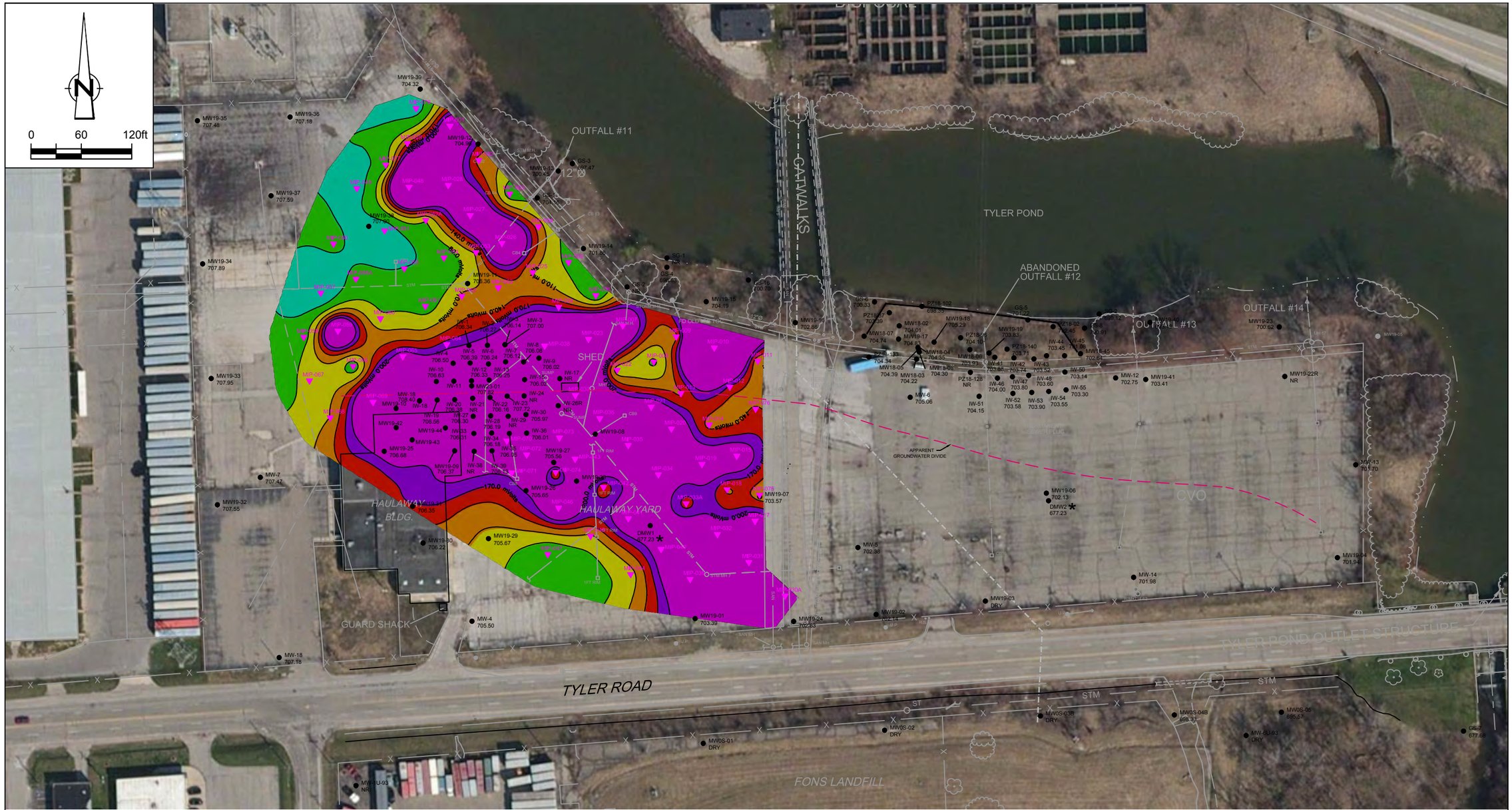
MIP & ISV BY:

MATRIX ENVIRONMENTAL LLC
A WCEC COMPANY

figure 3

XSD 2D CONTOUR MAP DERIVED FROM MIP INVESTIGATION
FORMER GENERAL MOTORS COMPANY VEHICLE OPERATIONS AREA
Ypsilanti, Michigan

017303-T01(MEMO170)GN-DE001 NOV 18/2014 -Modified by Matrix using former CRA Base file



LEGEND

- DITCH, STREAM OR RIVER
- FENCE LINE
- TREE LINE
- FORMER SLUDGE LINE
- APPARENT GROUNDWATER DIVIDE
- UTILITY POLE
- MIP BOREHOLE
- MONITORING WELL

FID mVolts

- >200
- 170-200
- 140-170
- 110-140
- 80-110
- 50-80
- 20-50

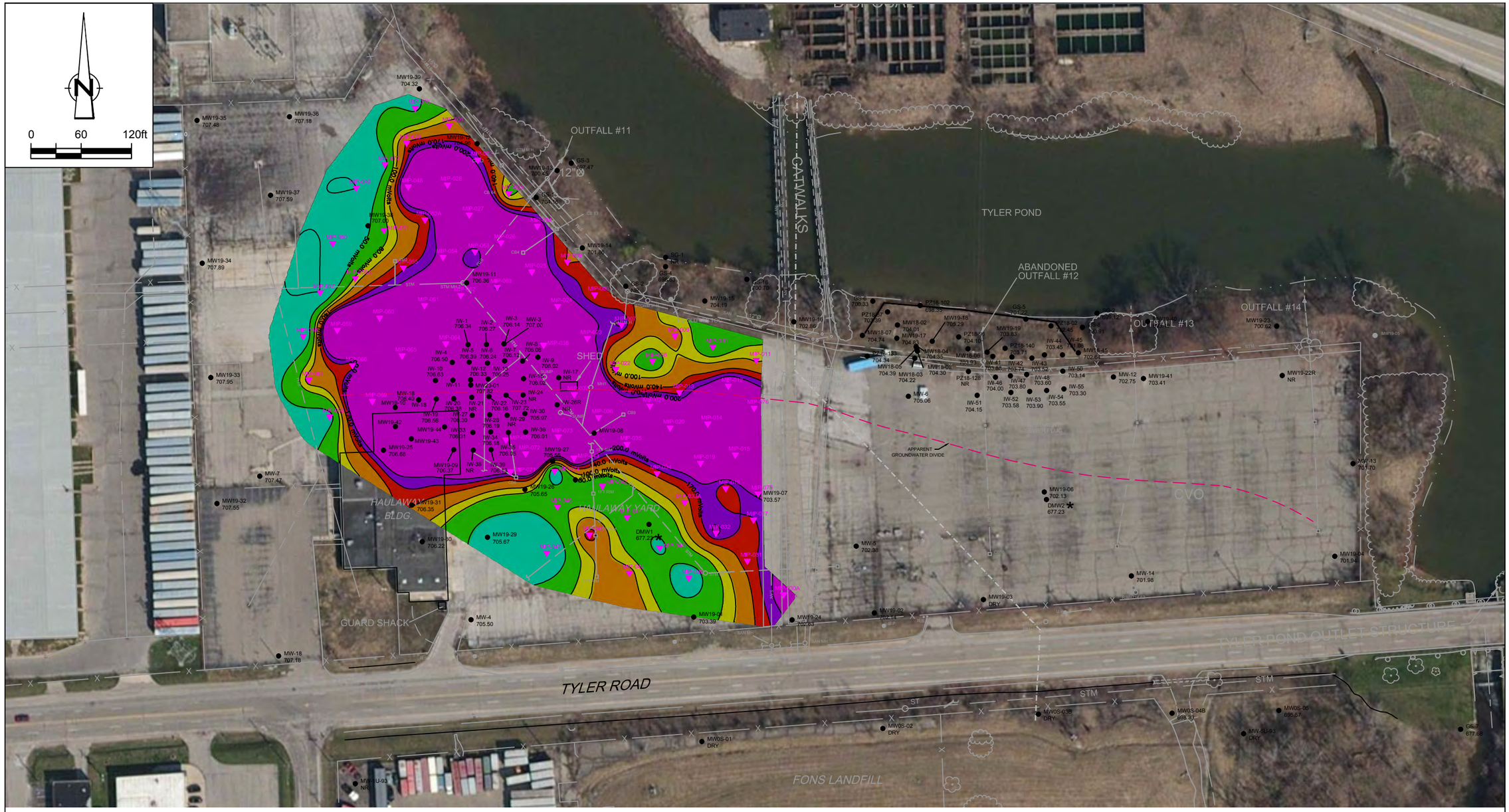
MIP & ISV BY:

MATRIX ENVIRONMENTAL LLC
A WCEC COMPANY

figure 4

FID 2D CONTOUR MAP DERIVED FROM MIP INVESTIGATION
FORMER GENERAL MOTORS COMPANY VEHICLE OPERATIONS AREA
Ypsilanti, Michigan

017303-T01(MEMO170)GN-DE001 NOV 18/2014 -Modified by Matrix using former CRA Base file



LEGEND

- DITCH, STREAM OR RIVER
- FENCE LINE
- TREE LINE
- FORMER SLUDGE LINE
- APPARENT GROUNDWATER DIVIDE
- UTILITY POLE
- MIP BOREHOLE
- MONITORING WELL

PID mVolts

- >200
- 170-200
- 140-170
- 110-140
- 80-110
- 50-80
- 20-50

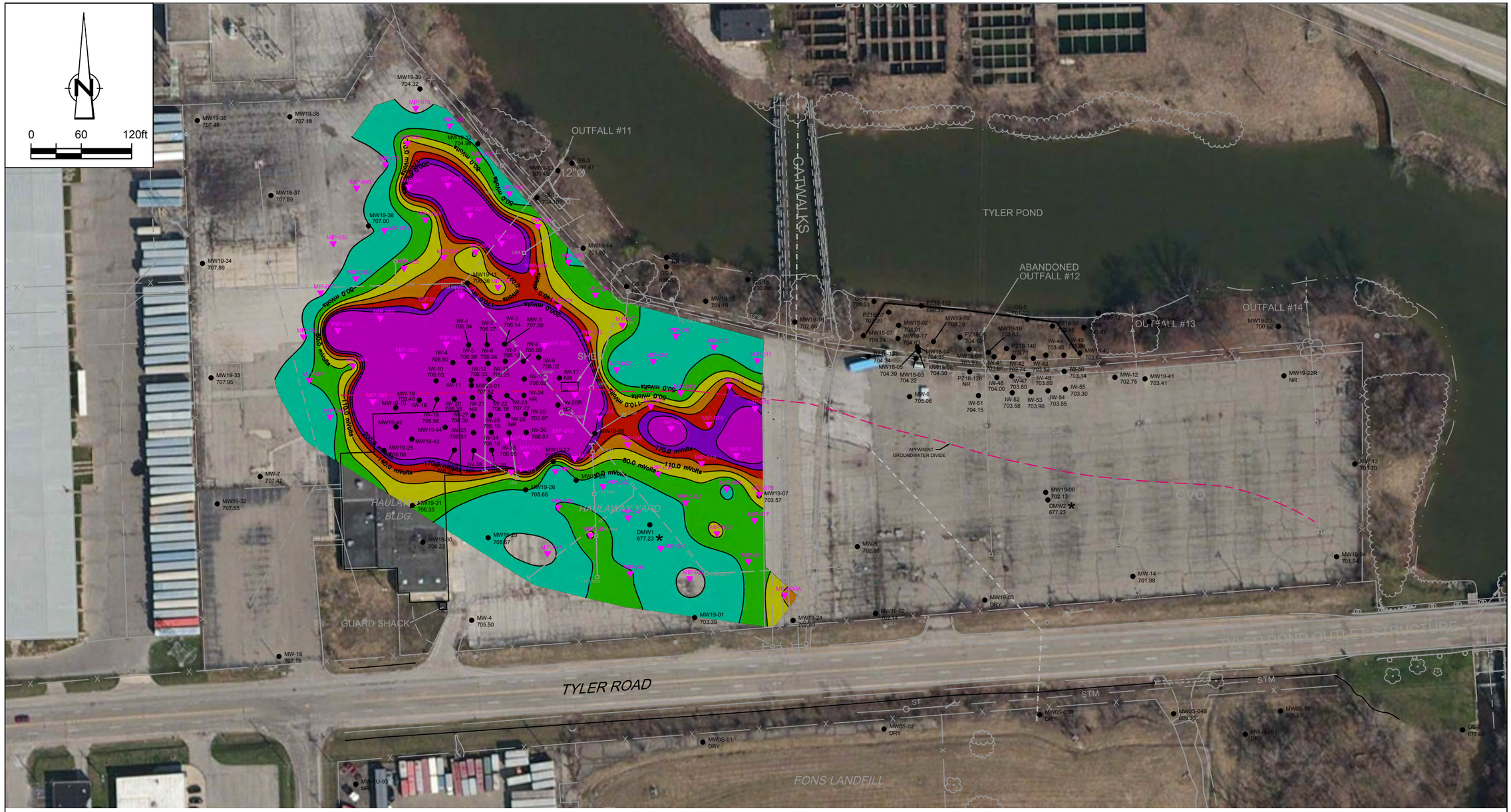
MIP & ISV BY:

MATRIX ENVIRONMENTAL LLC
A WCEC COMPANY

figure 5

PID 2D CONTOUR MAP DERIVED FROM MIP INVESTIGATION
FORMER GENERAL MOTORS COMPANY VEHICLE OPERATIONS AREA
Ypsilanti, Michigan

017303-T01(MEMO170)GN-DE001 NOV 18/2014 -Modified by Matrix using former CRA Base file



LEGEND

- DITCH, STREAM OR RIVER
- FENCE LINE
- TREE LINE
- FORMER SLUDGE LINE
- APPARENT GROUNDWATER DIVIDE
- UTILITY POLE
- MIP BOREHOLE
- MONITORING WELL

PID-XSD mVolts

- >200
- 170-200
- 140-170
- 110-140
- 80-110
- 50-80
- 20-50

MIP & ISV BY:

MATRIX ENVIRONMENTAL LLC
A WCEC COMPANY

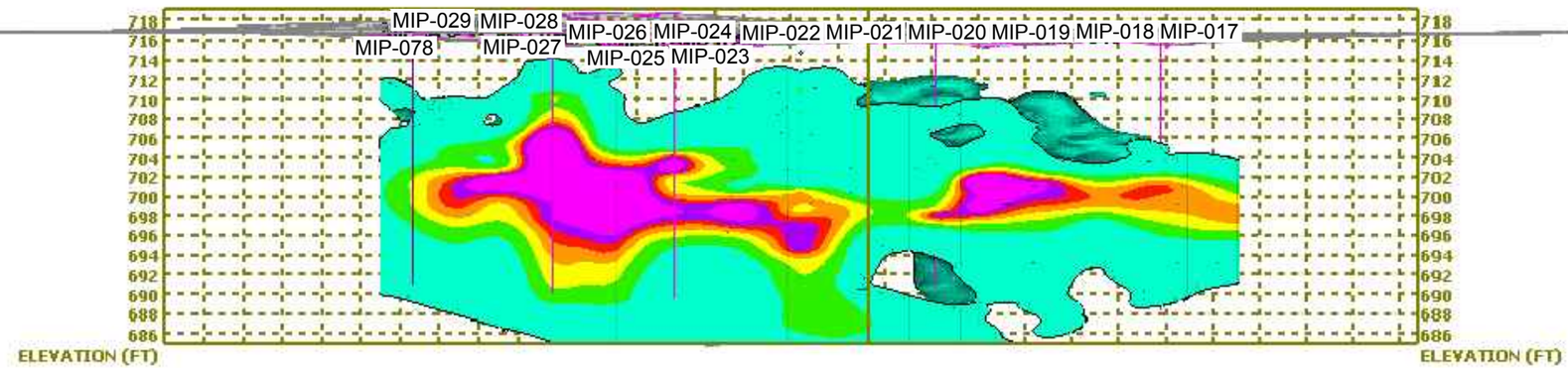
figure 6

PID (MINUS XSD) 2D CONTOUR MAP DERIVED FROM MIP INVESTIGATION
FORMER GENERAL MOTORS COMPANY VEHICLE OPERATIONS AREA
Ypsilanti, Michigan

017303-T01(MEMO170)GN-DE001 NOV 18/2014 -Modified by Matrix using former CRA Base file

3D Visualization of PID Response
Former Willow Run
Ypsilanti, MI

Vertical Slice, Easting = 13,344,208.5 ft
Slice Azimuth = 140 degrees



PID mVolts
- >200
- 170-200
- 140-170
- 110-140
- 80-110
- 50-80
- 20-50

PID above 20 mVolts

Vertical Exaggeration = 8:1

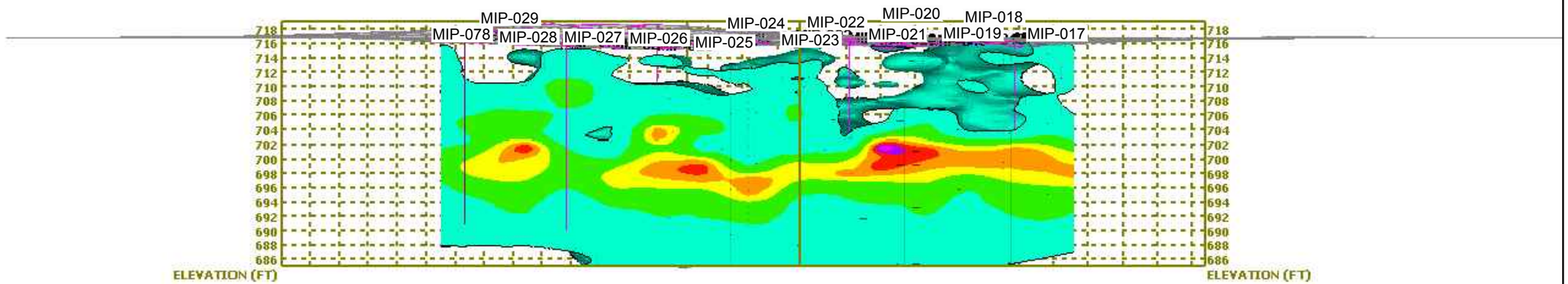
December 2014 Integrated Site Visualization (ISV)

figure 7

EASTING SLICES A-A' - PID RESPONSE
2014 MIP INVESTIGATION SUMMARY
FORMER COMPANY VEHICLE OPERATIONS AREA
Ypsilanti, Michigan

3D Visualization of XSD Response
Former Willow Run
Ypsilanti, MI

Vertical Slice, Easting = 13,344,208.5 ft
Slice Azimuth = 140 degrees



XSD mVolts

- >200
- 170-200
- 140-170
- 110-140
- 80-110
- 50-80
- 20-50
- 7-20

XSD above 7.0 mVolts

Vertical Exaggeration = 8:1

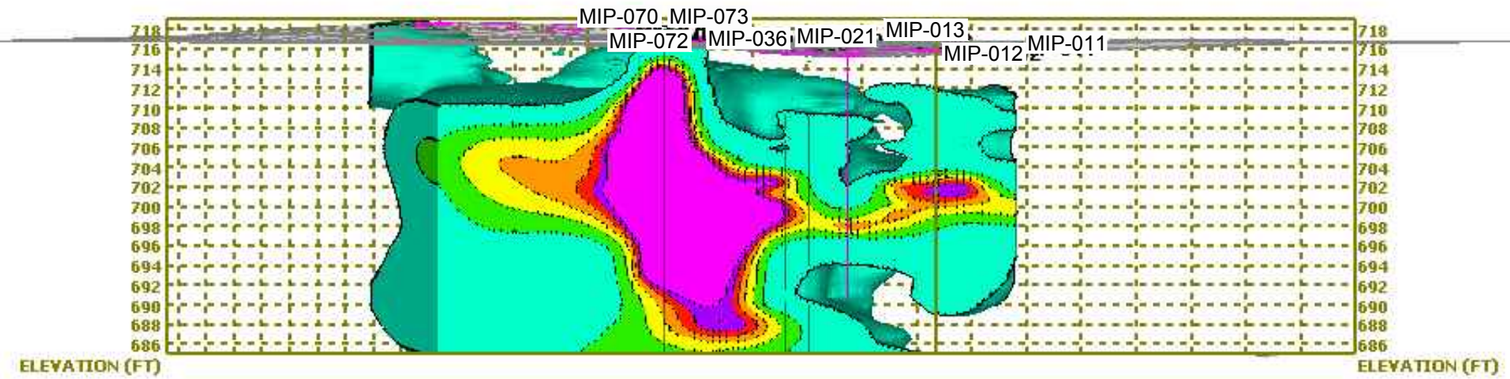
December 2014 Integrated Site Visualization (ISV)

figure 8

EASTING SLICES A-A' - XSD RESPONSE
2014 MIP INVESTIGATION SUMMARY
FORMER COMPANY VEHICLE OPERATIONS AREA
Ypsilanti, Michigan

3D Visualization of PID Response
Former Willow Run
Ypsilanti, MI

Vertical Slice, Northing = 268,304.2 ft
Slice Azimuth = 72 degrees



PID mVolts
- >200
- 170-200
- 140-170
- 110-140
- 80-110
- 50-80
- 20-50

PID above 20 mVolts

Vertical Exaggeration = 8:1

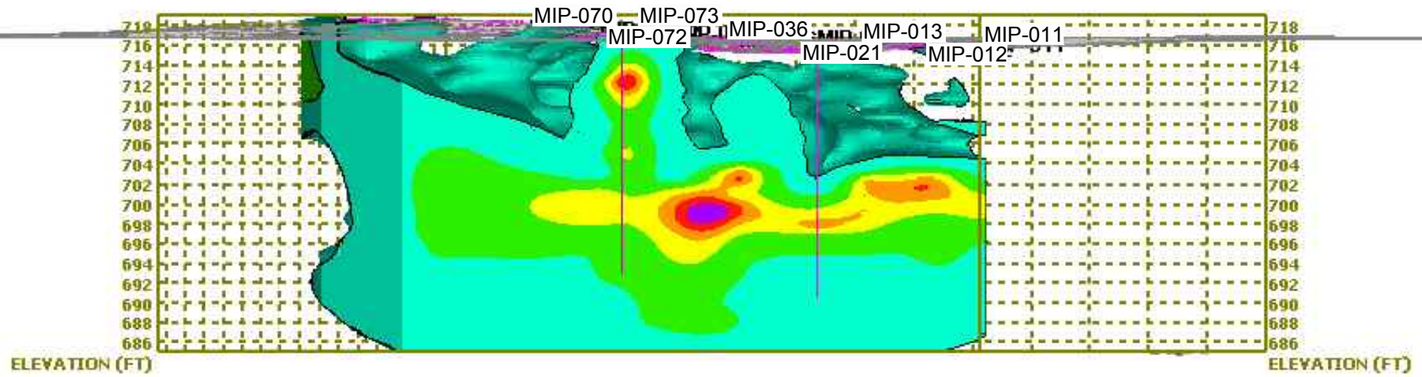
December 2014 Integrated Site Visualization (ISV)

figure 9

NORTHING SLICES B-B' - PID RESPONSE
2014 MIP INVESTIGATION SUMMARY
FORMER COMPANY VEHICLE OPERATIONS AREA
Ypsilanti, Michigan

3D Visualization of XSD Response
Former Willow Run
Ypsilanti, MI

Vertical Slice, Northing = 268,304.2 ft
Slice Azimuth = 72 degrees



XSD mVolts
- >200
- 170-200
- 140-170
- 110-140
- 80-110
- 50-80
- 20-50
- 7-20

XSD above 7.0 mVolts

Vertical Exaggeration = 8:1

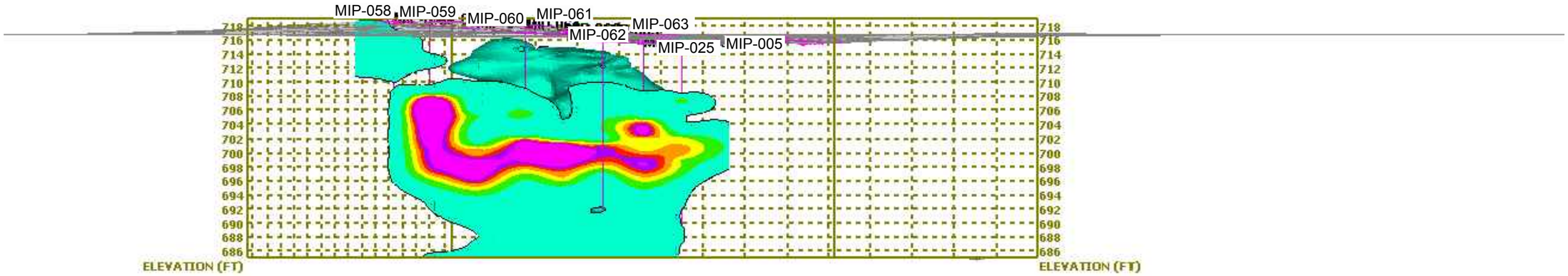
December 2014 Integrated Site Visualization (ISV)

figure 10

NORTHING SLICES B-B' - XSD RESPONSE
2014 MIP INVESTIGATION SUMMARY
FORMER COMPANY VEHICLE OPERATIONS AREA
Ypsilanti, Michigan

3D Visualization of PID Response
Former Willow Run
Ypsilanti, MI

Vertical Slice, Northing = 268,497.5 ft
Slice Azimuth = 72 degrees



PID mVolts
- >200
- 170-200
- 140-170
- 110-140
- 80-110
- 50-80
- 20-50

PID above 20 mVolts

Vertical Exaggeration = 8:1

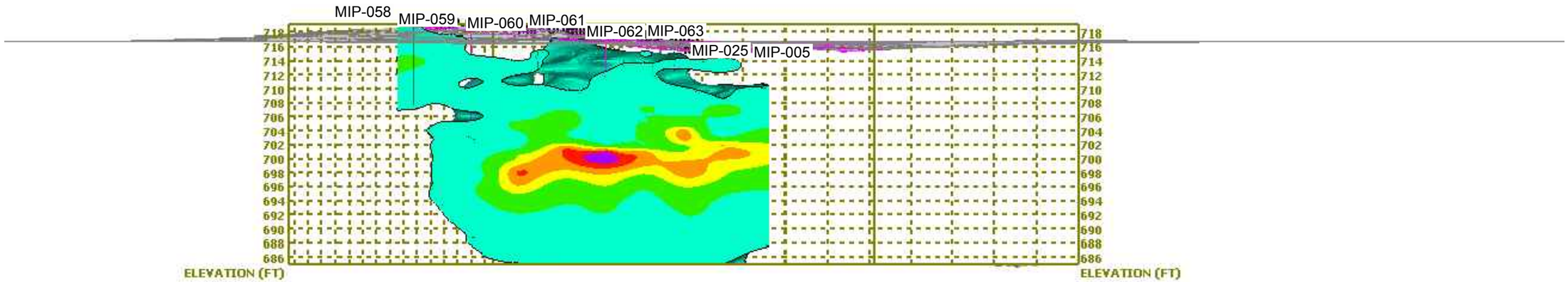
December 2014 Integrated Site Visualization (ISV)

figure 11

NORTHING SLICES C-C' - PID RESPONSE
2014 MIP INVESTIGATION SUMMARY
FORMER COMPANY VEHICLE OPERATIONS AREA
Ypsilanti, Michigan

3D Visualization of XSD Response
Former Willow Run
Ypsilanti, MI

Vertical Slice, Northing = 268,497.5 ft
Slice Azimuth = 72 degrees



XSD mVolts
- >200
- 170-200
- 140-170
- 110-140
- 80-110
- 50-80
- 20-50
- 7-20

XSD above 7.0 mVolts

Vertical Exaggeration = 8:1

December 2014 Integrated Site Visualization (ISV)

figure 12

NORTHING SLICES C-C' - XSD RESPONSE
2014 MIP INVESTIGATION SUMMARY
FORMER COMPANY VEHICLE OPERATIONS AREA
Ypsilanti, Michigan

Attachment 1
MIP Report Matrix

MATRIX ENVIRONMENTAL LLC

Monday, January 26, 2015

11253 91st Ave N.
Maple Grove, MN 55369
763-424-4803
FAX: 763-424-9452

-Direct Sensing Report, MIP-

Client:	**CRA**
Project Name:	**Former Willow Run**
Location:	**Ypsilanti, MI**
Project Number:	**319.14**

The analysis and opinions expressed in this report are based upon data obtained from the samples collected at the indicated locations and from other information discussed in this report. Exceptions, if any, are discussed in the accompanying comments section of this report. This report is prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted laboratory practices. Reported results shall not be reproduced, except in full, without written approval of Matrix Environmental, LLC. The sample results relate only to the analytes of interest tested. No warranties, expressed or implied are intended or made.

I certify that the data contained in this final report has been generated and reviewed in accordance with approved methods and our Standard Operating Procedure. Release of this final report is authorized by Laboratory management, which is verified by the following signature.

James R Ruby 01/27/15

Approval Signature Date

MIP SYSTEM DESCRIPTION AND ON-SITE CHEMICAL ANALYSIS

VOCs are semi-quantitatively analyzed in-situ using a membrane interface probe (MIP). The probe is pushed into the ground at a rate of 1 foot per minute (including 45 second residence time). The membrane block heats to a temperature of approximately 90-120°C. Any volatile organic compounds present diffuse across the membrane into the trunkline carrier gas tubing and are brought to the surface and into the GC analytical system. The carrier gas containing samples from the subsurface then passes through a naphion dryer (if used) and a heated GC oven to remove any moisture prior to detector analysis. Compounds appropriate for the detectors and in high enough concentrations (about 1 ppm or higher for Standard MIP and about 100 ppb or higher for Low Level MIP) will produce an electrical signal which is analyzed.

The GC system is comprised of the following three-detector system: Lab grade PID/FID tandem and an XSD. The MIP's trunkline return gas is Y-split in the GC to accomplish this detector configuration. The PID utilizes a 10.0 eV lamp and will ionize aromatic, olefinic, and unsaturated halogenated hydrocarbons with an ionization potential of 10.0 eV or less. The FID will respond to all types of hydrocarbons including methane, halogenated hydrocarbons and other saturated hydrocarbons (generally the FID response gives a good indication of total hydrocarbons present.) The XSD responds selectively to only halogenated compounds (hydrocarbons containing Cl or Br atoms).

Electrical Conductivity (EC) is a measure of the soils ability to conduct an electrical current between two dipoles on the MIP/EC probe. Conductivity is the reciprocal of electrical resistivity and has the units (in our application) of millisiemens per meter (mS/m). Since soil is in the pathway of the charge flow, the grain size can be determined by comparing the EC log to a soil boring. Conductivity readings in the 100s indicate smaller grain (size such as clay). Larger grain size (sand and gravels) are typically in the 10s of mS/m range. Prior to every log the EC point of the MIP probe is checked for proper operation by performing a voltage test with a voltage meter and a conductivity test with a test block.

Since the MIP system is a screening tool, some laboratory analysis of soil or groundwater samples or some historical analytical data is needed in order to obtain optimum MIP log correlation. The following quality assurance/control measures are routinely conducted to ensure the validity of the analytical results:

Chemical Response Test: MIP data needs to be validated with passing QC at the beginning and end of every log. The probe is immersed into a 500 mL cylinder of water containing the compound(s) of interest. This test will be performed at multiple concentration levels at the beginning of each day to verify detector response and generate detection limits of the system (For example: 3 levels of TCE @ 1, 5, & 25 ppm). QC tests of at least one level are checked between each boring to determine system integrity and monitor membrane and detector fluctuations. The results of this are listed in the QA/QC report.

Butane response: May be run between each boring by dispensing butane over the membrane. Measuring the lag time of the carrier gas from the probe to the detectors is used to determine trip time and to verify FID detector response.

Continuity check: Performed before and after each boring to verify system continuity throughout the project for the electrical conductivity data.

DISCUSSION AND COMMENTS

Matrix performed chemical response tests at 0, 1, 5, and 10 ppm TCE at various times throughout the project. At a minimum, a one level response test was performed before or after each log on the MIP system (PID/FID/XSD) to assure data quality. The response tests appeared normal and were indicative of a functional MIP system

For each log, the probe was advanced one foot and then the probe was allowed residence time of 45 seconds or longer - time for the probe to reach temperature and for volatile organic compounds to diffuse through the membrane and into the trunkline. The trip time was about 60 seconds for the trunkline.

Electrical conductivity (EC) data was collected simultaneously at each MIP location. The EC was tested before and after each log for continuity and performance. All tests passed Geoprobe QC specs.

Geoprobe's recommended refusal push rate is 1 foot per minute. This project required pushing the probe at 0.5-1 foot/minute in the 10-14 foot interval for several locations in order to achieve desired depth. See ROP logs (rate of push, by date). Because of these harder drilling conditions, we did encounter refusals at 2 locations:
MIP-016 - refusal @ 12.7 feet.
MIP-056 – refusal @ 9.55 feet. Moved over 2 feet the next day – MIP-056A.
Also, the nitrogen-sending gas line on the probe broke @ MIP-030.

The stringpot (depth control) malfunctioned during MIP-052. The Pre-Log QC passed and this data was retained for this location so we moved over 2 feet and started again naming it MIP-052A.

The detector starting baselines (see *Field Summary Logs*) were elevated for some logs due to high fuel or tar contamination at the previous location. The elevated baselines were allowed due to the time constraints of waiting for the trunkline to clear out. Observing the Post-Log QC after a very contaminated log does help to gauge the amount of baseline shift for each detector independently and it should be noted that the XSD baseline was generally much less affected. The detector baselines were elevated at the start of MIP-072 because that location was very hot. As soon as the probe was lowered into the open pre-probed borehole, the membrane began collecting volatiles that were present. Note that the baselines in the Pre-Log QC are at a normal level (probe not in ground yet).

MIP-048, MIP-069 and MIP-072 contain EC readings above the clay which seem to be associated with high contamination levels (possibly tar, creosote or paint sludge). After retracting rods from location MIP-048 it was observed that the rods smelled like creosote or fuel. The probe and rod treads were covered with a "fuel" sheen (NAPL) and the probe was also covered heavily with tar. According to the site map it was noted that MIP-048 was in between 2 "tar laden" test pits.

During MIP-030 the gas line cracked on the probe/trunkline connection. The line was repaired, but the trunkline may have become compromised with fine soil particles and moisture. After observing some erratic pressure and detector readings, the trunkline and probe were changed after MIP-033. The detector data between 7-14 feet and after 20 feet was disregarded for MIP-031.

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Client: CRA
Contact: Beth Landale
Services: MIP Logging

Date: 12/01/14 - 12/19/14
Project: Former Willow Run
Project #: 319.14
Address: Ypsilanti, MI

MIP Field Log Summary

		QA/QC (pass/fail)					
File Log ID	Date	Pre-Log EC test	Post-Log EC test	Chemical response test	Final Depth *(ft)*	preprobed *Depth (ft)*	Comments (HP GC w/ PID/FID and XSD detectors, MIP Probe Part MP6520, MIP Trunkline Part P150
MIP-001	12/02/14	pass	pass	pass	25.90	3	Start project with trunkline P150 1491, Probe MP6520 4449R
MIP-002	12/02/14	pass	pass	pass	26.00	3	NC (no comment)
MIP-003	12/02/14	pass	pass	pass	28.05	3	Turn down trunkline flow @ 12 feet
MIP-004	12/02/14	pass	pass	pass	28.05	3	NC
MIP-005	12/02/14	pass	pass	pass	28.05	3	NC
MIP-006	12/03/14	pass	pass	pass	25.80	3	NC
MIP-007	12/03/14	pass	pass	pass	25.80	3	Turn up trunkline flow 1 psi @ 17 feet
MIP-008	12/03/14	pass	pass	pass	26.25	3	Drill rig down. Electrical issues
MIP-009	12/03/14	pass	pass	pass	26.00	3	NC
MIP-010	12/03/14	pass	pass	pass	25.95	3	Very hard drilling @ 4-10 feet.
MIP-011	12/03/14	pass	pass	pass	26.00	3	NC
MIP-012	12/03/14	pass	pass	pass	25.85	3	NC
MIP-013	12/04/14	pass	pass	pass	29.00	3	Wait 5 minutes (instead of typical 1 min) between 28 and 29 feet.
MIP-014	12/04/14	pass	pass	pass	26.00	3	NC
MIP-015	12/04/14	pass	pass	pass	27.05	3	NC
MIP-016	12/04/14	pass	pass	pass	12.70	3	Refusal @ 12.7 feet.
MIP-017	12/04/14	pass	pass	pass	28.05	3	NC
MIP-018	12/04/14	pass	pass	pass	26.00	3	Wait 5 minutes (instead of typical 1 min) between 25 and 26 feet.
MIP-019	12/04/14	pass	pass	pass	28.05	3	NC
MIP-020	12/05/14	pass	pass	pass	25.85	3	NC
Total Footage					***520.40***	(this sheet)	

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MIP Field Log Summary

File Log ID	Date	QA/QC (pass/fail) Pre-Log EC test	Post-Log EC test	Chemical response test	Final Depth *(ft)*	prep robed *Depth (ft)*	Comments (HP GC w/ PID/FID and XSD detectors, MIP Probe Part MP6520, MIP Trunk line Part P150
MIP-021	12/05/14	pass	pass	pass	25.85	3	Turned up trunkline flow @ 10 feet.
MIP-022	12/05/14	pass	pass	pass	25.90	3	NC
MIP-023	12/05/14	pass	pass	pass	25.85	3	NC
MIP-024	12/05/14	pass	pass	pass	25.95	3	NC
MIP-025	12/08/14	pass	pass	pass	25.85	3	Very hard drilling @ 5-14 feet.
MIP-026	12/08/14	pass	pass	pass	25.95	3	Significant fuel response (PID/FID) starting @ 11 feet. Elevated Post-Log QC as a result
MIP-027	12/08/14	pass	pass	pass	25.90	3	Very significant fuel response (PID/FID) starting @ 8 feet. NAPL visually observed on probe/rods
MIP-028	12/08/14	pass	pass	pass	25.95	3	NC
MIP-029	12/08/14	pass	pass	pass	25.95	3	NC
MIP-030	12/09/14	pass	pass	pass	17.80	3	Charge hammer on rig. Stopped log @ 15', system pressure loss, repaired cracked teflon gas line.
MIP-030A	12/09/14	pass	pass	pass	25.95	3	NC
MIP-031	12/09/14	pass	pass	pass	34.95	3	Use data from 14-20 feet only. Erratic pressure and detector readings. Changed MIP membrane.
MIP-032	12/09/14	pass	pass	pass	25.90	3	Pressure/flow fluctuations at bottom of boring (water/soil particles entered trunkline @ MIP-030?)
MIP-033	12/09/14	pass	pass	pass	9.00	3	Pressure/flow fluctuations. After MIP-033 - restring MIP system with new trunkline & probe
MIP-033A	12/09/14	pass	pass	pass	25.90	3	Probe 4655, Trunkline 1492
MIP-034	12/10/14	pass	pass	pass	25.90	3	NC
MIP-035	12/10/14	pass	pass	pass	25.95	3	NC
MIP-036	12/10/14	pass	pass	pass	25.95	3	NC
MIP-037	12/10/14	pass	pass	pass	29.90	3	Very hot location, especially on PID/FID (fuel) Waited 5 min between 29 and 30 feet.
MIP-038	12/10/14	pass	pass	pass	29.10	3	Waited 90 minutes for detector baselines prior to this log (trunkline carry-over)
Total Footage					***509.45***	(this sheet)	

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MIP Field Log Summary

		QA/QC (pass/fail)					
File Log ID	Date	Pre-Log EC test	Post-Log EC test	Chemical response test	Final Depth *(ft)*	preprobed *Depth (ft)*	Comments (HP GC w/ PID/FID and XSD detectors, MIP Probe Part MP6520, MIP Trunkline Part P150
MIP-039	12/10/14	pass	pass	pass	25.95	3	NC (no comments)
MIP-040	12/10/14	pass	pass	pass	25.95	3	NC
MIP-041	12/10/14	pass	pass	pass	28.05	3	NC
MIP-042	12/11/14	pass	pass	pass	25.95	3	NC
MIP-043	12/11/14	pass	pass	pass	25.85	3	NC
MIP-044	12/11/14	pass	pass	pass	26.00	3	NC
MIP-045	12/11/14	pass	pass	pass	29.00	3	NC
MIP-046	12/11/14	pass	pass	pass	25.85	3	New MIP membrane
MIP-047	12/11/14	pass	pass	pass	21.90	3	Questionable response on XSD (somewhat atypical XSD plot shape, PID doesn't confirm response)
MIP-048	12/12/14	pass	pass	pass	25.95	3	New MIP membrane. Significant "tar" response, Wait 5 minutes between 25 and 26'.
MIP-049	12/12/14	pass	pass	pass	25.05	3	Detector baseline dropping throughout log due to "tar" from MIP-048. See Post-Log QC -048-049.
MIP-050	12/12/14	pass	pass	pass	25.95	3	NC
MIP-051	12/12/14	pass	pass	pass	27.10	3	NC
MIP-052	12/15/14	pass	pass	pass	2.75	3	Abort run, stringpot malfunction. Save Pre-Log QC for MIP-052A.
MIP-052A	12/15/14	pass	pass	pass	25.90	3	NC
MIP-053	12/15/14	pass	pass	pass	29.95	3	NC
MIP-054	12/15/14	pass	pass	pass	25.95	3	NC
MIP-055	12/15/14	pass	pass	pass	25.85	3	NC
MIP-056	12/15/14	pass	pass	pass	9.55	3	Refusal @ 9.55 feet, very hard obstruction.
MIP-056A	12/16/14	pass	pass	pass	25.95	3	NC
Total Footage					***484.45***	(this sheet)	

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Address: Ypsilanti, MI

MIP Field Log Summary

		QA/QC (pass/fail)					
File Log ID	Date	Pre-Log EC test	Post-Log EC test	Chemical response test	Final Depth *(ft)*	preprobed *Depth (ft)*	Comments (HP GC w/ PID/FID and XSD detectors, MIP Probe Part MP6520, MIP Trunkline Part P150
MIP-057	12/15/14	pass	pass	pass	25.95	3	Possibly a very low XSD response @ 14 feet.
MIP-058	12/16/14	pass	pass	pass	22.90	3	NC
MIP-059	12/16/14	pass	pass	pass	21.85	3	High "fuel" response @ 11 feet. Turn up flow @ 17 feet to facilitate clean-up.
MIP-060	12/16/14	pass	pass	pass	29.00	3	Clay (& XSD response) are a few feet deeper at this location.
MIP-061	12/16/14	pass	pass	pass	25.85	3	NC
MIP-062	12/16/14	pass	pass	pass	39.50	3	NC
MIP-063	12/16/14	pass	pass	pass	25.05	3	NC
MIP-064	12/16/14	pass	pass	pass	25.70	3	NC
MIP-065	12/17/14	pass	pass	pass	25.95	3	Significant "Fuel" response reflected in Post-Log QC baselines.
MIP-066	12/17/14	pass	pass	pass	25.80	3	NC
MIP-067	12/17/14	pass	pass	pass	25.85	3	Chlorinated solvent response near surface. No response @ the clay.
MIP-068	12/17/14	pass	pass	pass	21.45	3	Questionable response on XSD @ 5-10 feet. (PID does not confirm response)
MIP-069	12/17/14	pass	pass	pass	27.05	3	NC
MIP-070	12/17/14	pass	pass	pass	25.95	3	High "fuel" response starting @ 5 feet.
MIP-071	12/17/14	pass	pass	pass	25.95	3	NC
MIP-072	12/18/14	pass	pass	pass	24.00	3	High "fuel" response starting @ 3 feet. Baseline increased as soon as probe was put into hole.
MIP-073	12/18/14	pass	pass	pass	25.85	3	High "fuel" response starting @ 11 feet.
MIP-074	12/18/14	pass	pass	pass	21.00	3	Detector baselines dropping throughout log due to "fuel at precious locations.
MIP-075	12/18/14	pass	pass	pass	25.90	3	NC
MIP-076	12/18/14	pass	pass	pass	24.05	3	NC
MIP-077	12/18/14	pass	pass	pass	25.95	3	NC
MIP-078	12/18/14	pass	pass	pass	25.90	3	NC
Total Footage					***566.45***	(this sheet)	

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Address: Ypsilanti, MI

MIP Analytical Interpretation

Max mV‡ detector response @ indicated depth

File Log ID	Date	*PID (mVolts)*	*Depth (feet)*	*FID (mVolts)*	*Depth (feet)*	*XSD (mVolts)*	*Depth (feet)*	Comments: Some petroleum/hydrocarbon (PID/FID) responses in addition to chlorinated solvents are noted
MIP-001	12/02/14	**98**	16.0	**314**	16.0	**71**	16.0	Estimated 1-5 ppm chlorinated solvent responses @ 7-16 feet. 20 ppm starting @ 20 feet.
MIP-002	12/02/14	**167**	16.0	**122**	12.0	**123**	16.0	Estimated 2 ppm chlorinated solvent responses @ 9-10 feet. 10 ppm @ 14-16 feet. 30 ppm starting @ 16 feet.
MIP-003	12/02/14	**55**	10.5	**48**	13.6	**52**	10.5	Estimated 6-13 ppm chlorinated solvent responses @ 7-11 feet. 4-12 ppm 13.6-19 feet.
MIP-004	12/02/14	**238**	16.0	**112**	16.0	**139**	16.0	Estimated 1-3 ppm chlorinated solvent responses @ 7-11 feet. 12-35 ppm 13-19 feet. Petroleum observed on PID/FID in addition to chlorinated.
MIP-005	12/02/14	**123**	15.0	**58**	17.0	**87**	15.0	Estimated 14 ppm chlorinated solvent response @ 8 feet. 22 ppm 12.5-16 feet. Hydrocarbon responses on FID @ 17-20'
MIP-006	12/03/14	**148**	13.9	**40**	13.9	**91**	13.9	Estimated 2 ppm chlorinated solvent responses @ 8.5 & 9.8 feet. 14-23 ppm 11.9-16 feet.
MIP-007	12/03/14	**194**	17.0	**435**	3.8	**101**	16.0	Estimated 2 ppm chlorinated solvent response @ 14.4', 12 ppm 15-16'. 25 ppm starting @ 16 feet. Petroleum responses on FID @ 3-7 & 10-14.5'
MIP-008	12/03/14	**47**	17.3	**58**	14.6	**50**	17.3	Estimated 1 ppm chlor solv responses @ 12.7-14.5'. 2 ppm @ 14.5-15.2'. 7-13 ppm starting at 15'. Additional petroleum observed on PID/FID
MIP-009	12/03/14	**100**	16.1	**110**	13.7	**80**	16.1	Estimated 2 ppm chlorinated solvent responses @ 7.1 & 12'. 8-20 ppm starting @ 14 feet. Hydrocarbon responses on FID @ 12-14 feet.
MIP-010	12/03/14	**41**	15.1	**290**	5.2	**43**	13.1	Estimated 7-11 ppm chlorinated solvent responses starting @ 121 feet. Petroleum observed starting at 4'on PID/FID in addition to chlorinated.
MIP-011	12/03/14	**80**	15.2	**98**	4.5	**67**	15.2	Estimated 1 ppm chlor solv responses @ 7.9-8.2'. 2-7 ppm @ 12-15. 17 ppm starting @ 15.2 feet. Petroleum responses on PID/FID @ 4-7.6 feet.
MIP-012	12/03/14	**310**	13.4	**143**	13.4	**148**	13.5	Estimated 1 ppm chlorinated solvent responses @ 5 &7 feet. 35 ppm 12.5-13.9 feet. Petroleum observed on PID/FID in addition to chlorinated.
MIP-013	12/04/14	**150**	14.2	**120**	3.7	**110**	13.9	Estimated 16-28 ppm chlorinated solvent responses starting @ 13.8 feet. Petroleum observed on PID/FID in addition to chlorinated.
MIP-014	12/04/14	**304**	13.4	**114**	13.4	**158**	13.4	Estimated 6-13 ppm chlorinated solvent responses @ 11.7-13 feet. 40 ppm starting @ 13.2 feet.
MIP-015	12/04/14	**487**	13.3	**264**	13.3	**244**	13.3	Estimated 1-2 ppm chlorinated solvent responses @ 9.9-10.9 feet, 6-18 ppm @ 12.3-13'. 61 ppm starting @ 13.3 feet.
MIP-016	12/04/14	**11**	10.5	**22**	10.5	**4***	12.7	Refusal @ 12.7 feet. Starting to detect chlorinated solvent at the bottom of boring. Some petroleum observed on PID/FID @ 10.5 feet.
MIP-017	12/04/14	**153**	15.1	**253**	14.7	**103**	15.1	Estimated 25 ppm chlorinated solvent responses starting @ 14 feet. Petroleum responses on PID/FID @ 5.6 feet.
MIP-018	12/04/14	**125**	16.1	**118**	14.0	**97**	16.1	Estimated 6-11 ppm chlorinated solvent responses starting @ 13.5-15'. 25 ppm starting @ 15'. Petroleum responses on PID/FID @ 5.3-5.8 feet.
MIP-019	12/04/14	**192**	14.7	**256**	14.6	**160**	14.7	Estimated 6-16 ppm chlorinated solvent responses @ 10-13.9 feet. 40 ppm starting @ 14.7 feet.
MIP-020	12/05/14	**585**	14.8	**331**	14.8	**253**	14.8	Estimated 6-32 ppm chlorinated solvent responses @ 13.1-14 feet, 63 ppm starting @ 14.3 feet. Petroleum responses on PID/FID @ 6.8-7.8 feet.

** Indicates @ or near detection limit.*
‡ (For Standard MIP) 1-5 mVolt response on PID or XSD detector = very approximately 1 ppm and on the FID detector 1mVolt = very approximately 10 ppm

Cl solvent response *could also refer to other halogens (e.g. fluorine, bromine…)*
petroleum response *may refer to gasoline or other lighter constituents of fuels and other hydrocarbons.*

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MIP Analytical Interpretation

Max mV[ŧ] detector response @ indicated depth

File Log ID	Date	*PID (mVolts)*	*Depth (feet)*	*FID (mVolts)*	*Depth (feet)*	*XSD (mVolts)*	*Depth (feet)*	Comments: Some petroleum/hydrocarbon (PID/FID) responses in addition to chlorinated solvents are noted
MIP-021	12/05/14	**303**	18.2	**250**	18.1	**163**	18.2	Estimated 1-14 ppm chlorinated solvent responses @ 13.9-17.9'. 41 ppm starting @ 18.2'. Petroleum responses on PID/FID @ 8 & 9'.
MIP-022	12/05/14	**68**	18.0	**77**	103.0	**59**	18.0	Estimated 1 ppm chlorinated solvent responses @ 4.8-8.9'. 5 ppm @ 9.1-11.5'. 15 ppm starting at 17.2'. Additional hydrocarbons observed on FID
MIP-023	12/05/14	**207**	21.9	**1,006**	21.8	**91**	20.0	Estimated 2-4 ppm chlorinated solvent responses @ 5, 12.4-15.8, 16.9-19'. 23 ppm starting @ 19'. Petroleum responses on PID/FID @ 15.2-17'.
MIP-024	12/05/14	**271**	17.1	**156**	13.2	**130**	17.1	Estimated 2-12 ppm chlorinated solvent responses @ 9.9-12.5. , 19-33 ppm @ 16-19'. Additional hydrocarbons observed on FID @ 12-14 feet.
MIP-025	12/08/14	**252**	12.2	**91**	12.2	**102**	12.2	Estimated 5-7 ppm chlorinated solvent responses @ 7.2 & 9-11'. 25 ppm @ 11-13' and @ 16-18 feet.
MIP-026	12/08/14	**595**	13.9	**634**	12.6	**63**	17.9	Estimated 1 ppm chlor solv responses @ 5.1-9.8, 14'. 8-16 ppm starting at 16.2'. Significant additional petroleum observed on PID/FID starting @ 11'.
MIP-027	12/08/14	**845**	11.9	**370**	12.2	**163**	5.4	Estimated 40 ppm chlor solv response @ 5.4'. 8-11 ppm @ 7-8'. 4 ppm @ 14-18'. Significant additional petroleum observed on PID/FID starting @ 10'.
MIP-028	12/08/14	**499**	14.7	**218**	14.6	**200**	14.7	Estimated 9-14 ppm chlorinated solvent responses @ 9.8-12'. 40-50 ppm @ 14-15.2 feet.
MIP-029	12/08/14	**130**	13.9	**126**	13.9	**50**	18.0	Estimated 5-10 ppm chlorinated solvent responses @ 11.1-13.9, 15.6, & 17.1'. 13 ppm @ 18'. Petroleum responses on PID/FID @ 13.9-15.5'.
MIP-030	12/09/14	NA	NA	NA	NA	NA	NA	No useful data acquired. See summary comments
MIP-030A	12/09/14	**220**	18.9	**205**	18.9	**112**	18.9	Estimated 9-28 ppm chlorinated solvent responses @ 15-20 feet.
MIP-031	12/09/14	**145**	15.1	**197**	19.2	**98**	15.1	Estimated 13-24 ppm chlorinated solvent responses @ 14.5-19.3 feet.
MIP-032	12/09/14	**200**	15.0	**233**	14.8	**115**	15.0	Estimated 1 ppm chlorinated solvent responses @ 5.5-6 & 7.7-11.5'. 1-10 ppm @ 12.5-13.9. 13-29 ppm starting @ 15'.
MIP-033	12/09/14	NA	NA	NA	NA	NA	NA	Questionable data acquired. See summary comments
MIP-033A	12/09/14	**113**	16.0	**140**	16.0	**67**	16.1	Estimated 3-9 ppm chlorinated solvent responses @ 12.6-16 feet. 17 ppm starting @ 16'.
MIP-034	12/10/14	**139**	16.0	**272**	14.8	**73**	16.0	Estimated 8-15 ppm chlorinated solvent responses @ 12-14 feet. 11-18 ppm @ 16-19 feet.
MIP-035	12/10/14	**209**	16.1	**380**	15.0	**96**	15.0	Estimated 15-24 ppm chlorinated solvent responses @ 12.6-18 feet.
MIP-036	12/10/14	**276**	17.0	**362**	15.4	**120**	13.7	Estimated 18-30 ppm chlorinated solvent responses @ 12.5-18 feet.
MIP-037	12/10/14	**3,140**	20.1	**6,700**	19.1	**390**	18.0	Estimated 12-50 ppm chlorinated solvent responses @ 13-17 feet. 78-98 ppm starting @ 17 feet.
MIP-038	12/10/14	**966**	18.0	**270**	18.0	**173**	18.0	Estimated 1-2 ppm chlorinated solvent responses @ 12.7-15.7 feet. 13 ppm @ 16 feet. 28-44 ppm @ 17-20 feet.

** Indicates @ or near detection limit.*
ŧ (For Standard MIP) 1-5 mVolt response on PID or XSD detector = very approximately 1 ppm and on the FID detector 1mVolt = very approximately 10 ppm

Cl solvent response *could also refer to other halogens (e.g. fluorine, bromine…)*
petroleum response *may refer to gasoline or other lighter constituents of fuels and other hydrocarbons.*

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Address: Ypsilanti, MI

MIP Analytical Interpretation

Max mV[ŧ] detector response @ indicated depth

File Log ID	Date	*PID (mVolts)*	*Depth (feet)*	*FID (mVolts)*	*Depth (feet)*	*XSD (mVolts)*	*Depth (feet)*	Comments: Some petroleum/hydrocarbon (PID/FID) responses in addition to chlorinated solvents are noted
MIP-039	12/10/14	**126**	16.1	**344**	23.1	**20**	16.1	Estimated 1 ppm chlorinated solvent responses @ 11.2-13.1' & 14'-14.5'. 4-5 ppm @ 15-16.8'. Hydrocarbon responses on FID @ 22.6-24'.
MIP-040	12/10/14	**30**	13.1	**231**	13.1	**18**	16.1	Estimated 1-3 ppm chlorinated solvent responses @ 12-13.2'. 2-5 ppm @ 15.1-17.9'. Hydrocarbon responses on FID @ 13.1-16.2'.
MIP-041	12/10/14	**46**	14.0	**274**	15.1	**40**	21.2	Estimated 1 ppm chlorinated solvent responses @ 13. 8 ppm @ 14'. 3-10 ppm @ 18-22'. Hydrocarbon responses on FID @ 14-18'.
MIP-042	12/11/14	**34**	17.1	**133**	14.0	**32**	17.1	Estimated 3-8 ppm chlorinated solvent responses @ 15-19.1'. Hydrocarbon responses on FID @ 10-16'.
MIP-043	12/11/14	**372**	18.2	**605**	18.2	**164**	18.0	Est. 1 ppm chl sol responses @ 4.9, 6.9, 7.9, 9, & 10-11.4'. 2-14 ppm @ 11.4-17.1'. 10-41 ppm @ 17.5-19.2'. Hydrocarbon responses on FID @ 4-15'.
MIP-044	12/11/14	**98**	17.2	**82**	16.1	**56**	17.2	Estimated 1 ppm chlorinated solvent responses @ 8-12.5 feet. 13 ppm @ 12.5-18 feet.
MIP-045	12/11/14	**156**	13.0	**88**	19.0	**75**	13.0	Estimated 2-6 ppm chlorinated solvent responses @ 10.8-12.9 feet. 8-19 ppm @ 13-15 feet. Additional hydrocarbon responses on FID @ 11-19'.
MIP-046	12/11/14	**62**	13.0	**332**	13.0	**27**	17.1	Estimated 2-7 ppm chlorinated solvent responses @ 12.6-20 feet. Additional hydrocarbon responses on FID @ 12.5-19 feet.
MIP-047	12/11/14	**6***	11.7	**40**	14.7	**5***	17.1	Estimated 1 ppm chlorinated solvent responses @ 17.1 & 18 feet. Additional hydrocarbon responses on FID @ 10.4-15.1 feet.
MIP-048	12/12/14	**387**	10.0	**1,450**	5.1	**112**	9.1	Estimated 13-28 ppm chlorinated solvent responses @ 7.1-11'. 7-13 ppm @ 15.1-19.1'. Additional hydrocarbon responses on FID @ 5.1-6.1 feet.
MIP-049	12/12/14	**10**	16.7	**26**	11.3	**12**	17.1	Estimated 1-3 ppm chlorinated solvent responses @ 15.1-19.1' & 23.2 feet. Additional hydrocarbon responses on FID @ 9.7-13.9 feet.
MIP-050	12/12/14	**9**	121.0	**44**	18.4	**9**	17.1	Estimated 1 ppm chlorinated solvent responses @ 7.2, 8, 9, 17 & 20-25? feet. Additional hydrocarbon responses on FID @ 8-14 & 18.4 feet.
MIP-051	12/12/14	**55**	18.0	**17**	19.0	**47**	19.1	Estimated 3 ppm chlorinated solvent responses @ 11-12 feet and 5-12 ppm @ 13-19 feet.
MIP-052	12/15/14	NA	NA	NA	NA	NA	NA	Stringpot malfunction
MIP-052A	12/15/14	**119**	13.8	**67**	13.8	**87**	13.8	Estimated 1 ppm chlorinated solvent responses @ 9.4-9.8, 11 & 12 feet. 8-22 ppm @ 12.9-19.1 feet.
MIP-053	12/15/14	**155**	15.3	**100**	15.2	**90**	15.3	Estimated 1 ppm chlorinated solvent responses @ 5.6 & 7 feet. 2-8 ppm @ 8-13 feet. 12-23 ppm @ 14.4-19 feet.
MIP-054	12/15/14	**202**	16.1	**41**	11.7	**99**	16.1	Estimated 1-4 ppm chlorinated solvent responses @ 8-15'. 11-25 ppm starting @ 15'. Additional hydrocarbon responses on FID @ 8.9-13.7 feet.
MIP-055	12/15/14	**152**	17.0	**39**	11.3	**74**	17.0	Estimated 2 ppm chlorinated solvent responses @ 11-12 & 14.5'. 13-19 ppm @ 15-19'. Additional hydrocarbon responses on FID @ 9 & 11.3 feet.
MIP-056	12/15/14	NA	NA	NA	NA	NA	NA	Refusal @ 9.5 feet.
MIP-056A	12/16/14	**67**	18.0	**42**	15.2	**45**	18.0	Estimated 3 ppm chlorinated solvent responses @ 12-17'. 8-11 ppm starting @ 17'. Additional hydrocarbon responses on FID @ 13.8-15.2 feet.

** Indicates @ or near detection limit.*
ŧ (For Standard MIP) 1-5 mVolt response on PID or XSD detector = very approximately 1 ppm and on the FID detector 1mVolt = very approximately 10 ppm

Cl solvent response *could also refer to other halogens (e.g. fluorine, bromine…)*
petroleum response *may refer to gasoline or other lighter constituents of fuels and other hydrocarbons.*

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Client: CRA
Contact: Beth Landale
Services: MIP Logging

Date: 12/01/14 - 12/19/14
Project: Former Willow Run
Project #: 319.14
Address: Ypsilanti, MI

MIP Analytical Interpretation

Max mV[ŧ] detector response @ indicated depth

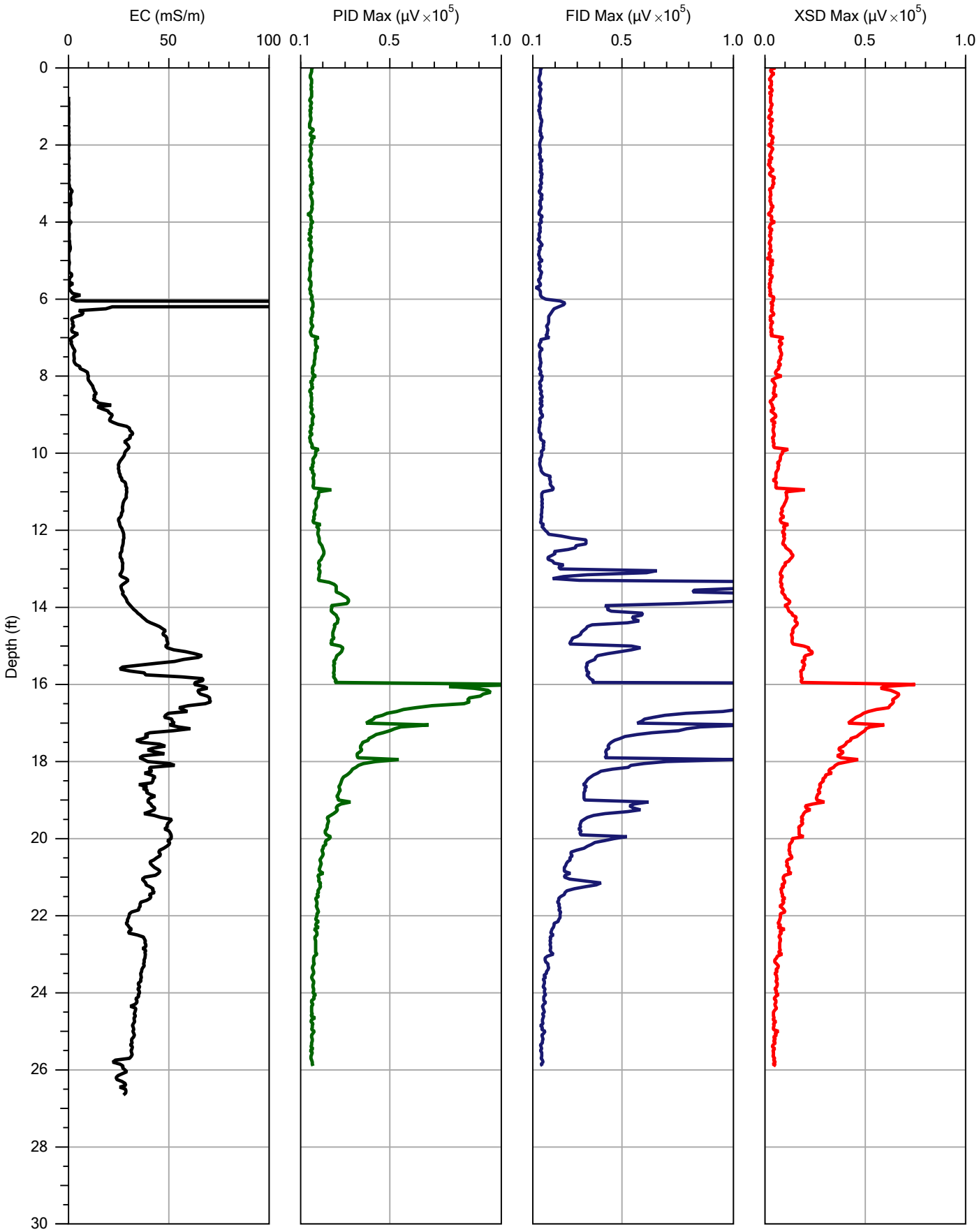
File Log ID	Date	*PID (mVolts)*	*Depth (feet)*	*FID (mVolts)*	*Depth (feet)*	*XSD (mVolts)*	*Depth (feet)*	Comments: Some petroleum/hydrocarbon (PID/FID) responses in addition to chlorinated solvents are noted
MIP-057	12/15/14	**7**	1.9	**9**	18.0	**3***	13.0	Estimated 1 ppm chlorinated solvent responses @ 3-5 & 11-14 feet.
MIP-058	12/16/14	**11**	4.9	**47**	15.0	**11**	4.9	Estimated 2 ppm chlorinated solvent responses @ 4.9-5.7 feet. 1 ppm @ 15 feet. Hydrocarbon responses on FID @ 14-16 feet.
MIP-059	12/16/14	**1,197**	12.7	**557**	12.0	**8**	5.2	Estimated 2 ppm chlor solv response @ 5-5.9' & 1 ppm @ 7-8'. 1 ppm @ 8.9-20'. Significant petroleum observed on PID/FID starting @ 11 feet.
MIP-060	12/16/14	**358**	20.0	**69**	17.6	**124**	20.1	Estimated 1 ppm chlor solv responses @ 5'. 5 ppm @ 8.9, 10, 13-14 & 16.6'. 15-31 ppm @ 17.7-22'. Hydrocarbon responses on FID @ 14-16 feet.
MIP-061	12/16/14	**250**	16.0	**50**	16.0	**117**	16.0	Estimated 2 ppm chlorinated solvent responses @ 10.1 feet. 8 ppm @ 10.9-12.5 feet. 29 ppm starting @ 16 feet.
MIP-062	12/16/14	**420**	17.1	**107**	17.1	**160**	17.1	Estimated 33 ppm chlorinated solvent responses starting @ 316.1 feet.
MIP-063	12/16/14	**180**	16.1	**100**	16.1	**104**	16.1	Estimated 2-6 ppm chlor solv responses @ 7.9-13.7'. 9 ppm @ 15.4 feet. 26 ppm starting @ 16.1'. Hydrocarbon responses on FID @ 10.8-13.9 feet.
MIP-064	12/16/14	**1,125**	18.0	**171**	18.0	**249**	18.0	Estimated 1-2 ppm chlor solv responses @ 11.9-15'. 28 ppm @ 17.1, 62 ppm starting @ 18'. Hydrocarbon responses on FID @ 11.5-14.6 feet.
MIP-065	12/17/14	**760**	15.1	**219**	12.3	**181**	15.1	Estimated 45 ppm chlor solv response starting @ 14 feet'. Significant petroleum observed on PID/FID starting @ 8 feet.
MIP-066	12/17/14	**130**	20.1	**39**	14.3	**72**	20.1	Estimated 3-4 ppm chlor solv responses @ 16.9-19'. 14 ppm @ 19.1, 18 ppm starting @ 20.1'. Hydrocarbon responses on FID @ 12-17.9 feet.
MIP-067	12/17/14	**102**	4.9	**75**	14.1	**59**	4.9	Estimated 9-15 ppm chlorinated solvent responses @ 2-4.9'. 1-2 ppm @ 20, 23.1, 24.1 & 25'. Hydrocarbon responses on FID @ 10.6-16'.
MIP-068	12/17/14	**23**	12.0	**91**	12.7	**28**	6.0	Estimated 7 ppm chlorinated solvent responses starting @ 5 feet. Hydrocarbon responses on PID/.FID @ 12-16 feet.
MIP-069	12/17/14	**1,165**	12.1	**433**	12.1	**273**	12.1	Estimated 15-39 ppm chl solv response @ 9.9-11.1', 69 ppm starting @ 12.1', 19-27 ppm @ 17.1-20'. Additional petroleum on PID/FID starting @ 9 feet.
MIP-070	12/17/14	**785**	12.0	**273**	13.4	**72**	17.1	Estimated 2-5 ppm chlor solv response @ 4.9-7.1'. 4 ppm @ 11.9 & 14.9'. 15-18 ppm starting @ 16'. Significant petroleum on PID/FID starting @ 5'.
MIP-071	12/17/14	**203**	15.0	**205**	15.0	**110**	15.0	Estimated 3-11 ppm chlorinated solvent responses @ 5.2-13.9 feet. 27 ppm starting @ 15 feet.
MIP-072	12/18/14	**436**	54.0	**1,169**	5.0	**735**	4.1	Estimated 25 ppm chl solv response @ 2-3'. 75-183 ppm @ 3-5.9'. 32-58 ppm @ 7-8' & 9.9-12.9'. Significant additional petroleum on PID/FID.
MIP-073	12/18/14	**393**	17.0	**228**	4.1	**81**	17.9	Estimated 9 ppm chlorinated solvent response @ 15-15.7'. 17-21 ppm 16-19'. Additional petroleum on PID/FID & FID only @ 1.8-10.2'.
MIP-074	12/18/14	**16**	17.1	**123**	12.7	**20**	14.1	Estimated 1 ppm chlorinated solvent responses @ 5 & 14.1 feet. 3-5 ppm @ 16-19.1 feet. Hydrocarbon responses on FID @ 5.4-15.1'.
MIP-075	12/18/14	**197**	17.1	**109**	14.1	**103**	14.5	Estimated 1 ppm chlorinated solvent responses @ 1.9 & 2.9-3.5 feet. 26 ppm starting @ 14.5 feet.
MIP-076	12/18/14	**326**	14.5	**131**	14.5	**123**	14.5	Estimated 1 ppm chlorinated solvent responses @ 7, 8, 9-9.9 & 11-12'. 5 ppm @ 13.3'. 32 ppm @ 13.9-14.9'. 18 ppm @ 16-17'. 2 ppm @ 21-22'.
MIP-077	12/18/14	**35**	18.0	**50**	13.8	**25**	17.1	Estimated 2 ppm chlor solvent responses @ 4.2, 7.1 & 8-11'. 3-6 ppm @ 13.9-20.1'. 1 ppm @ 23-25.4'. Hydrocarbon responses on FID @ 11-14.5'.
MIP-078	12/18/14	**34**	16.1	**24**	19.1	**28**	17.1	Estimated 4 ppm chlorinated solvent responses @ 15-16 feet. 4-7 ppm @ 16.1-19.1'. 2 ppm @ 19.6-25.1 feet.

** Indicates @ or near detection limit.*
ŧ (For Standard MIP) 1-5 mVolt response on PID or XSD detector = very approximately 1 ppm and on the FID detector 1mVolt = very approximately 10 ppm

Cl solvent response *could also refer to other halogens (e.g. fluorine, bromine…)*
petroleum response *may refer to gasoline or other lighter constituents of fuels and other hydrocarbons.*

MIP LOGS

With detectors @ 100 mVolts



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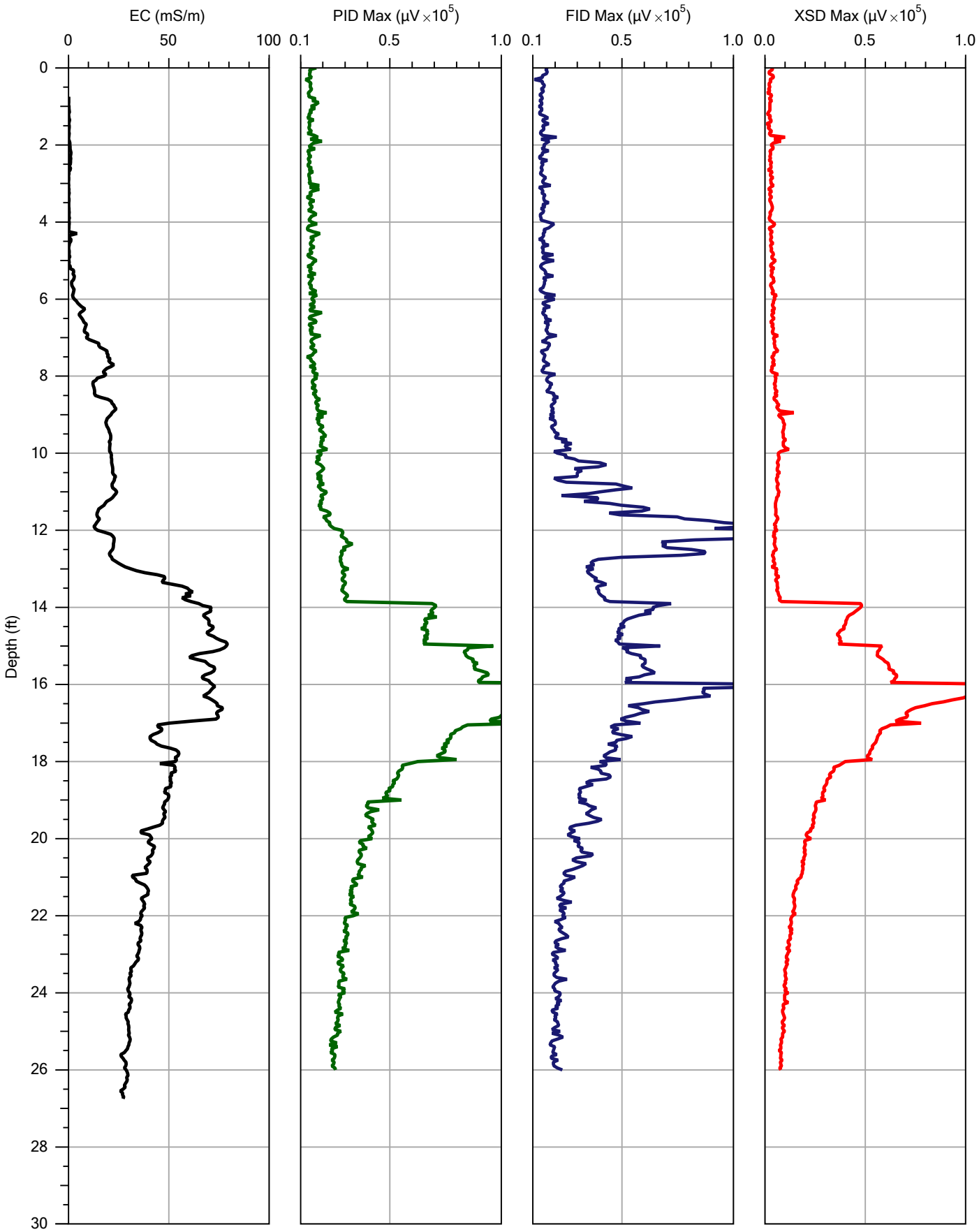

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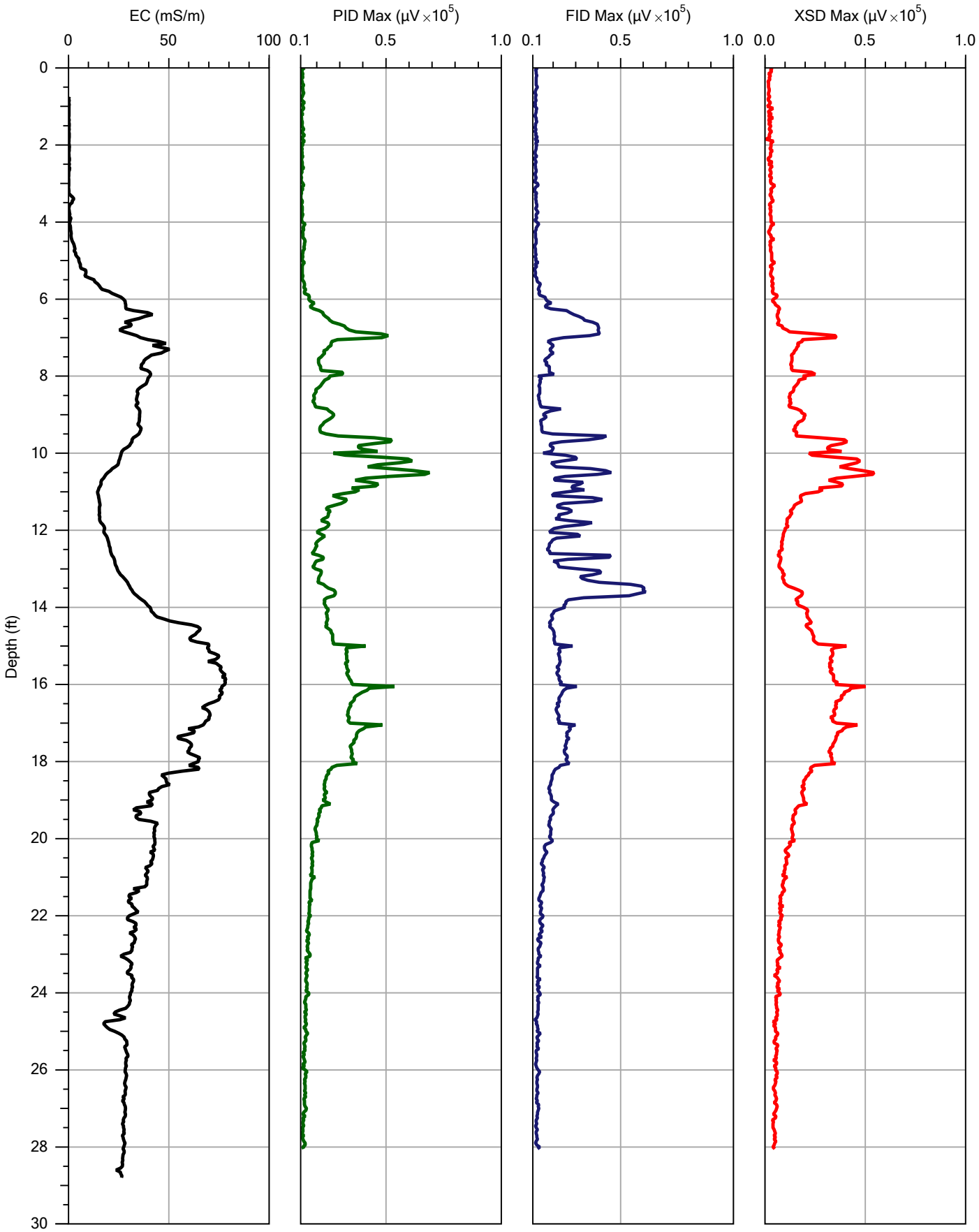

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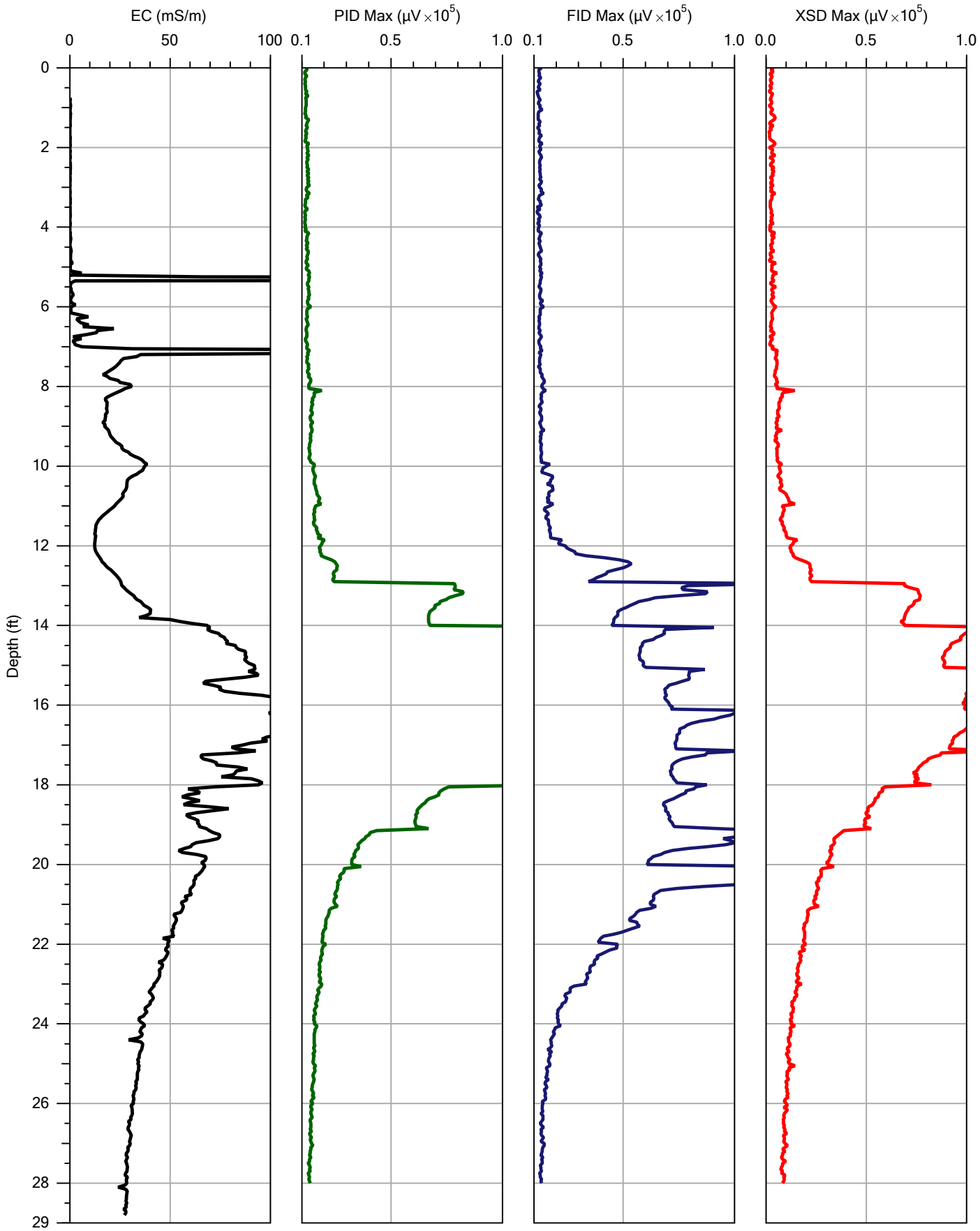

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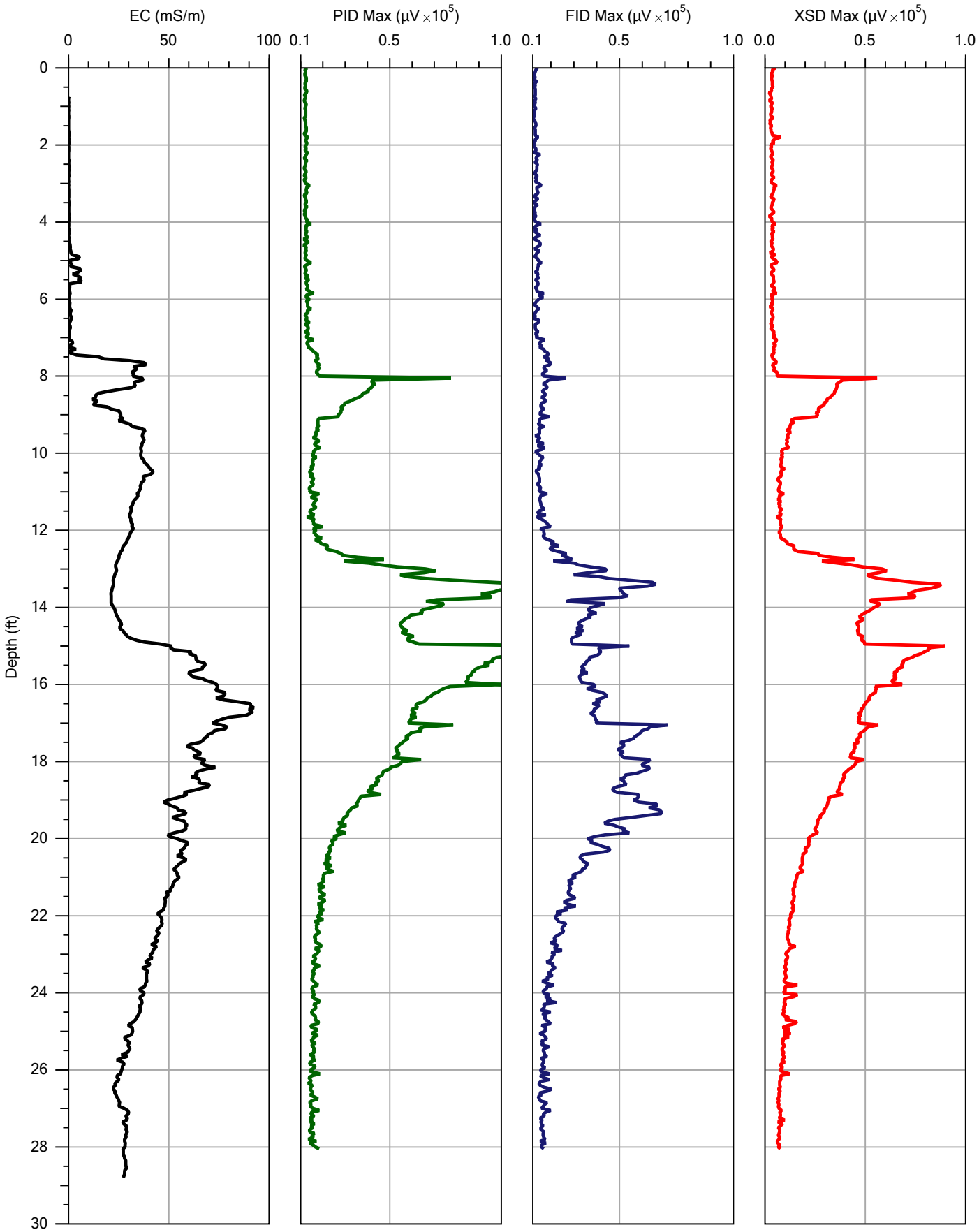

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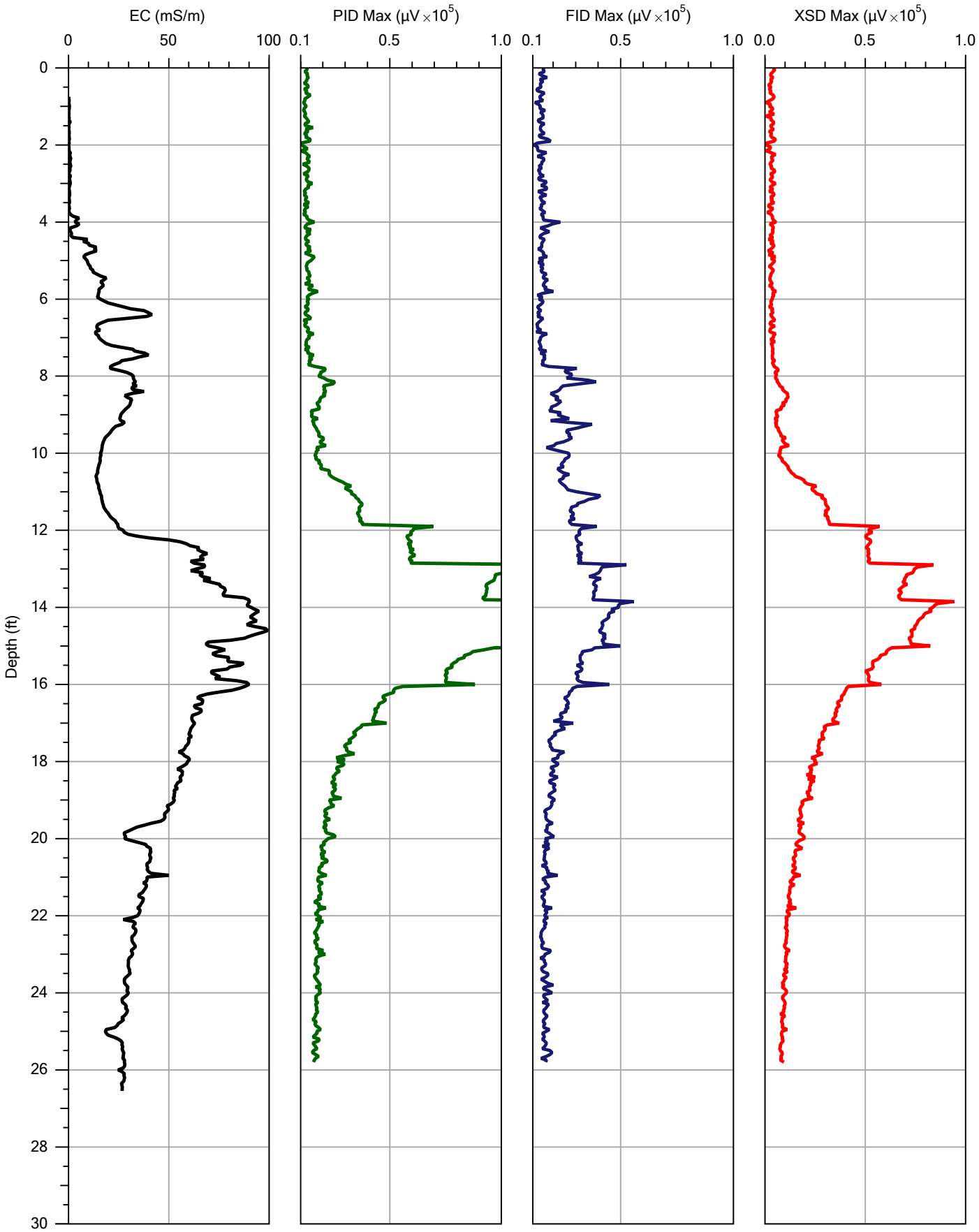

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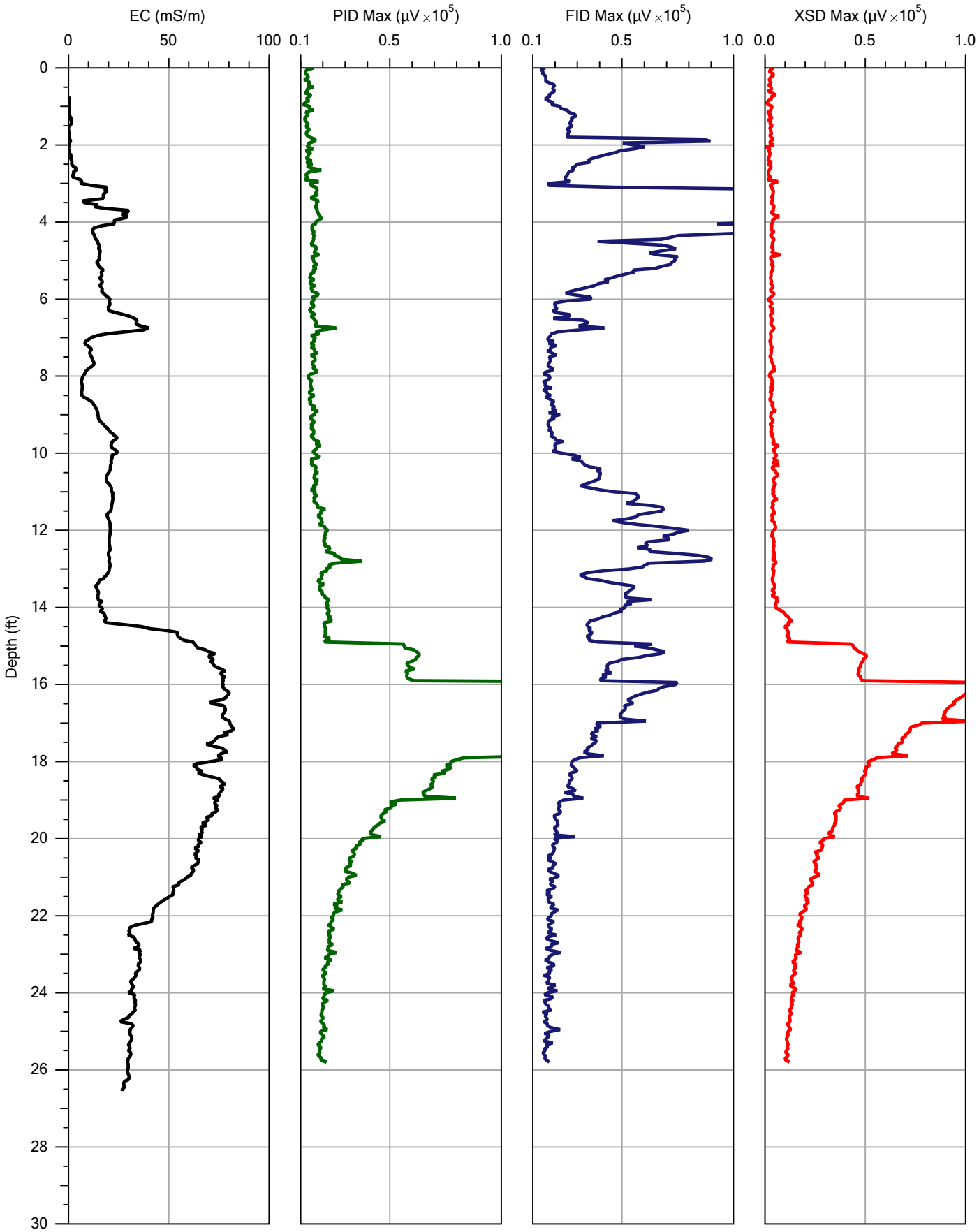

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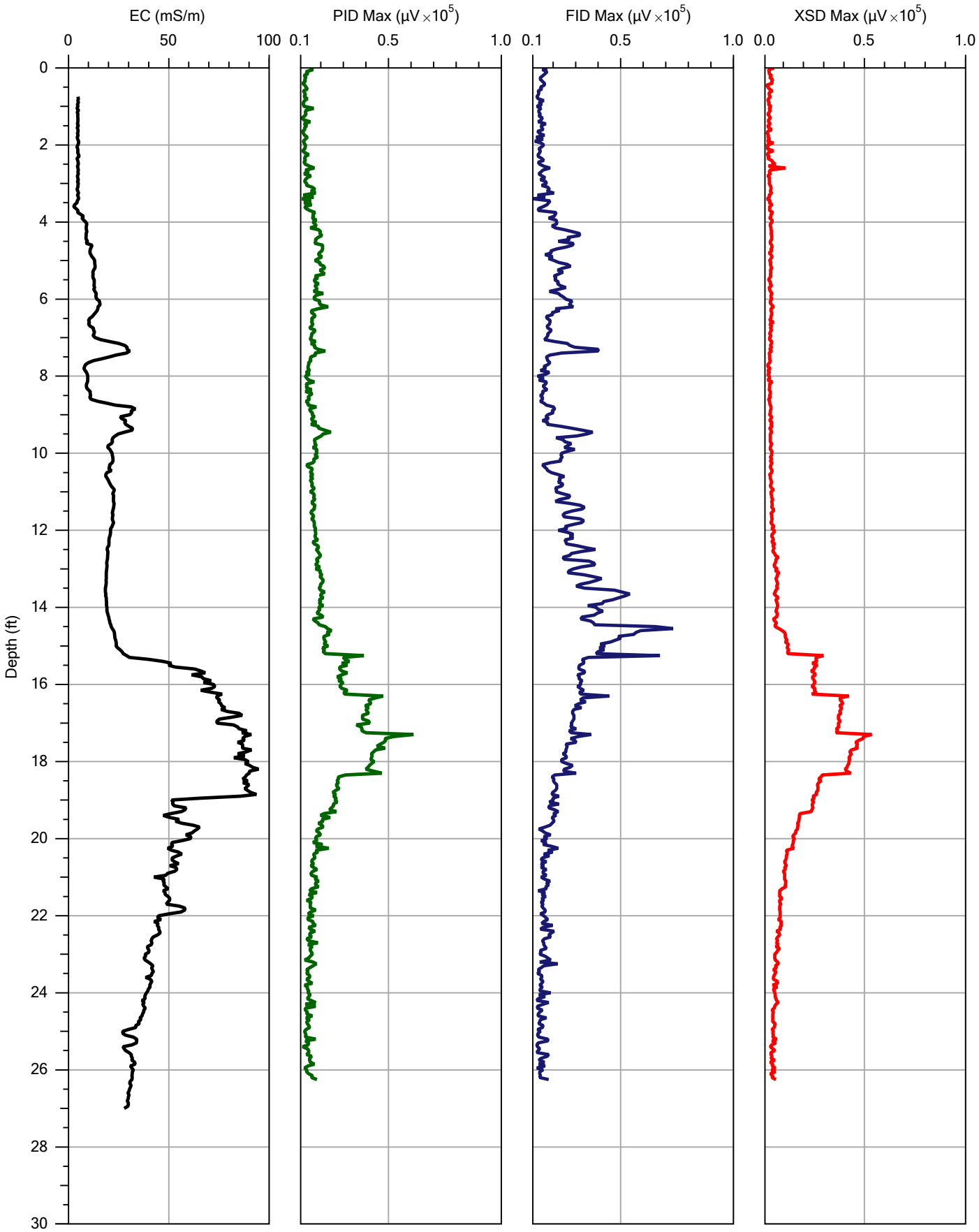

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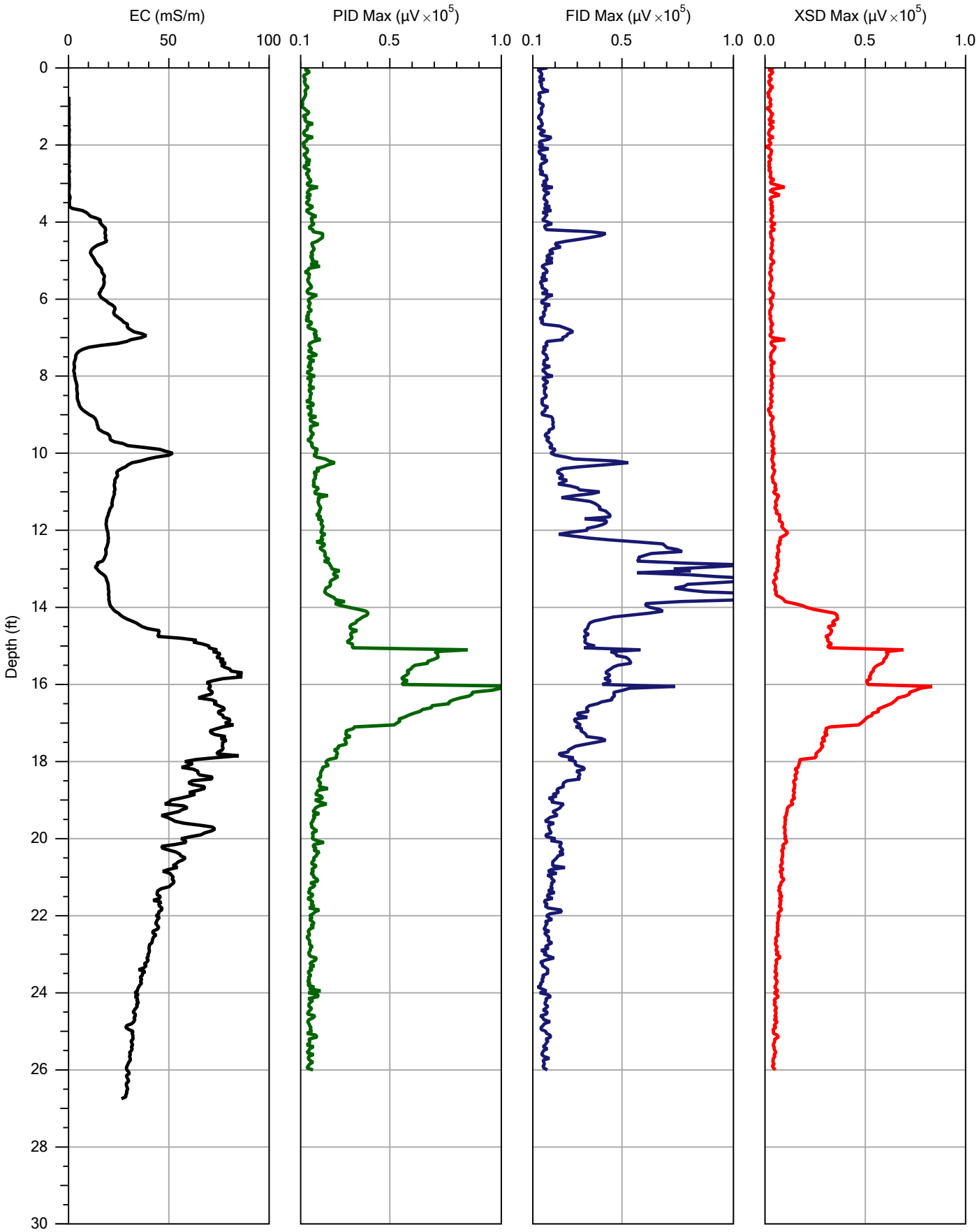

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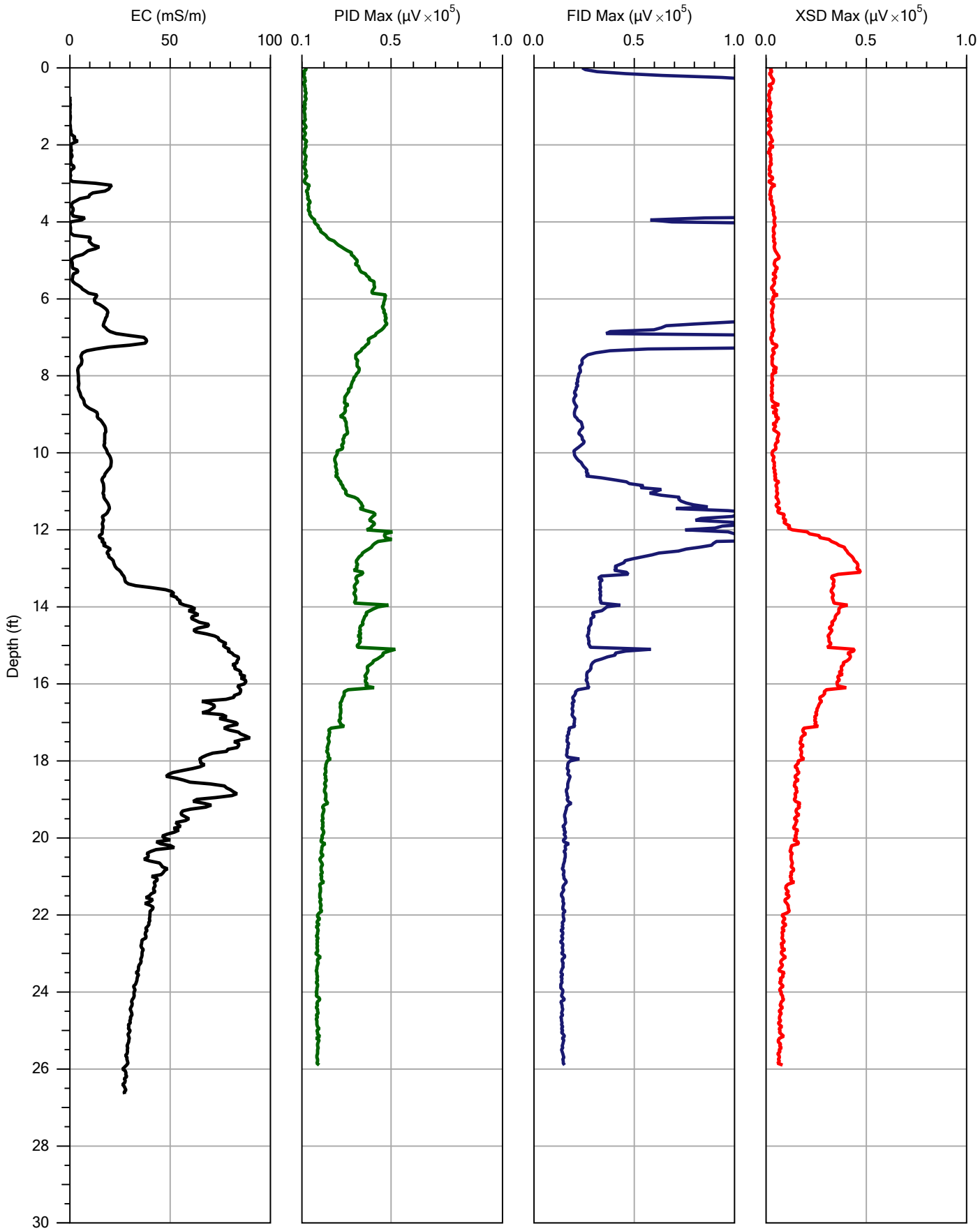

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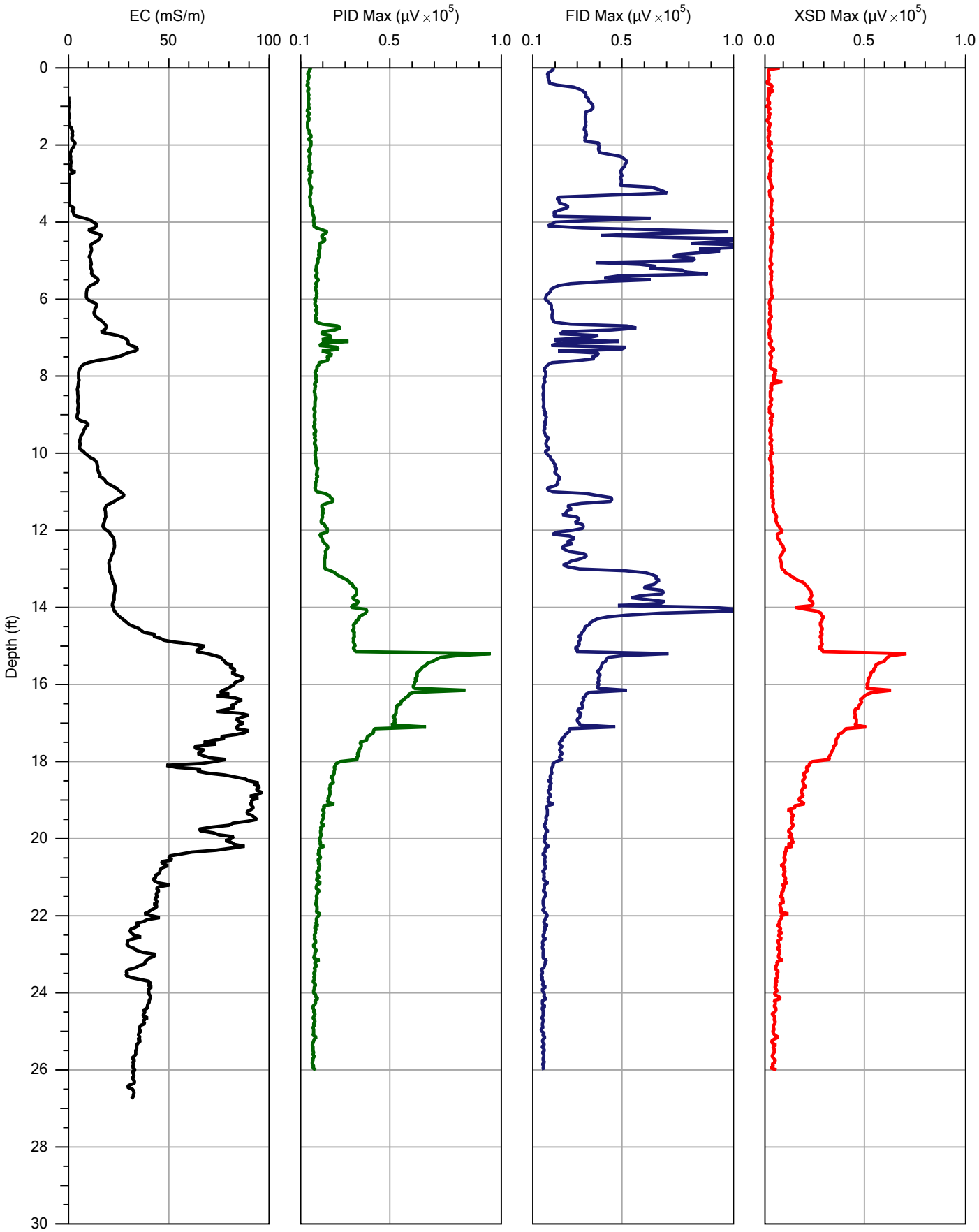

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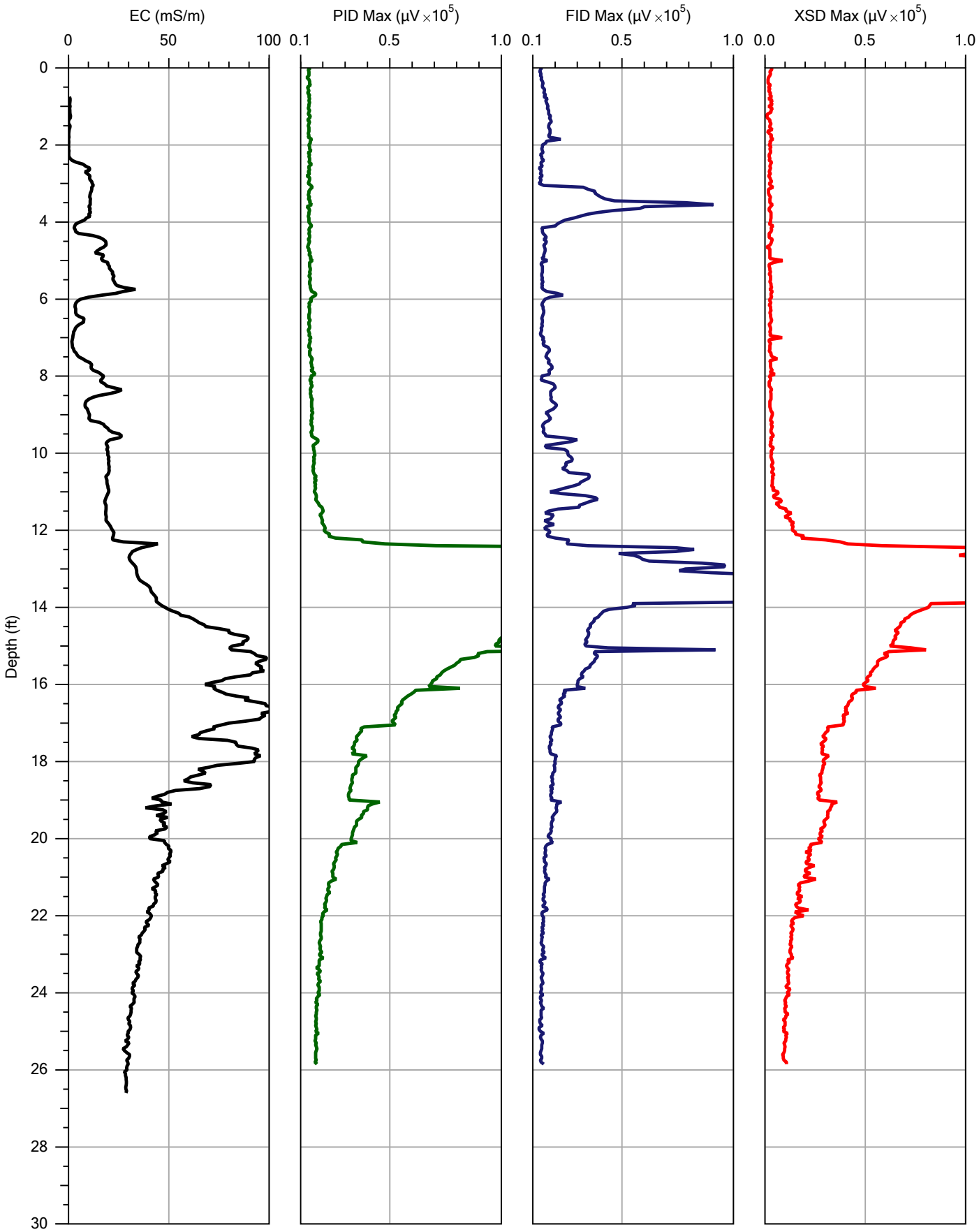

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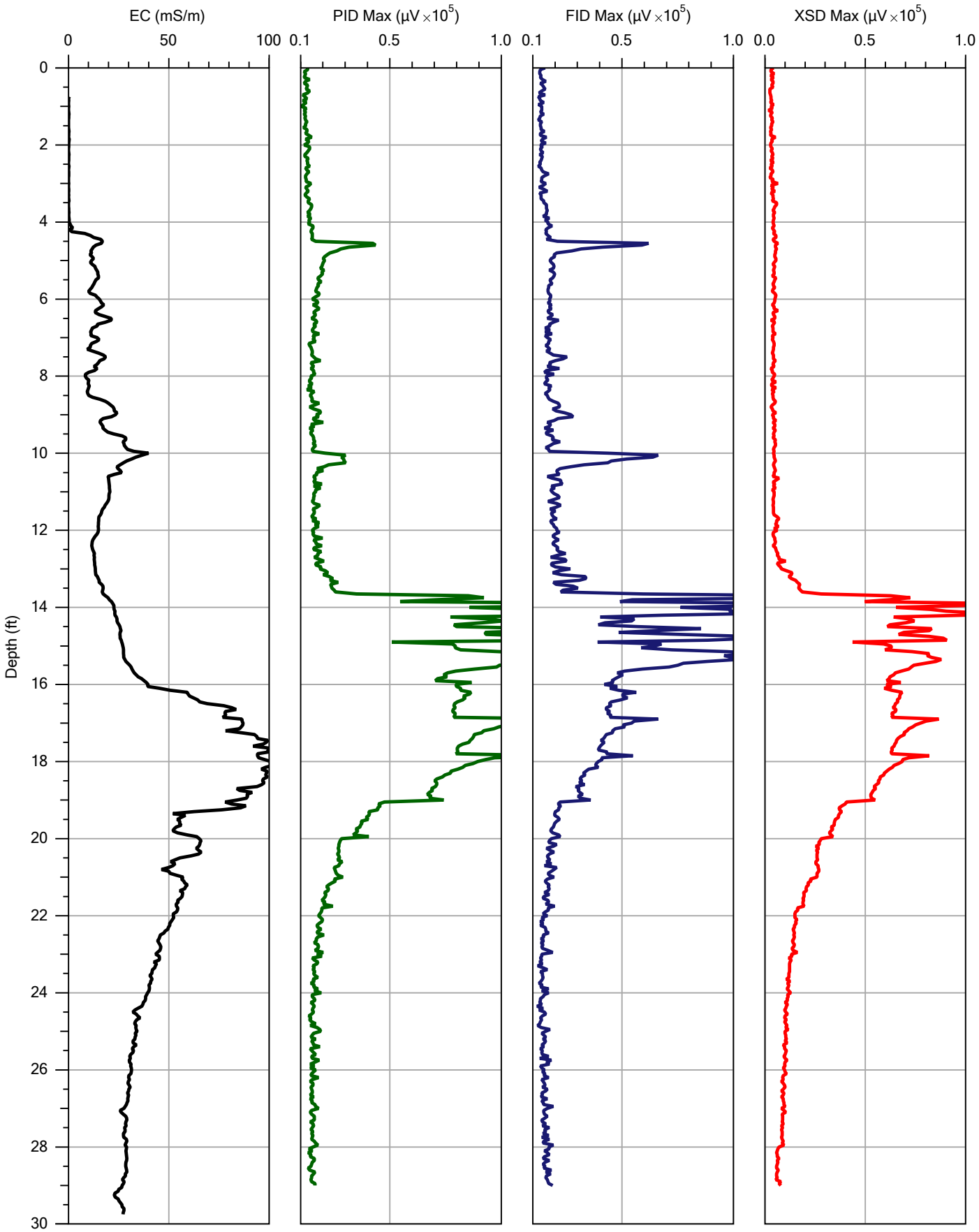

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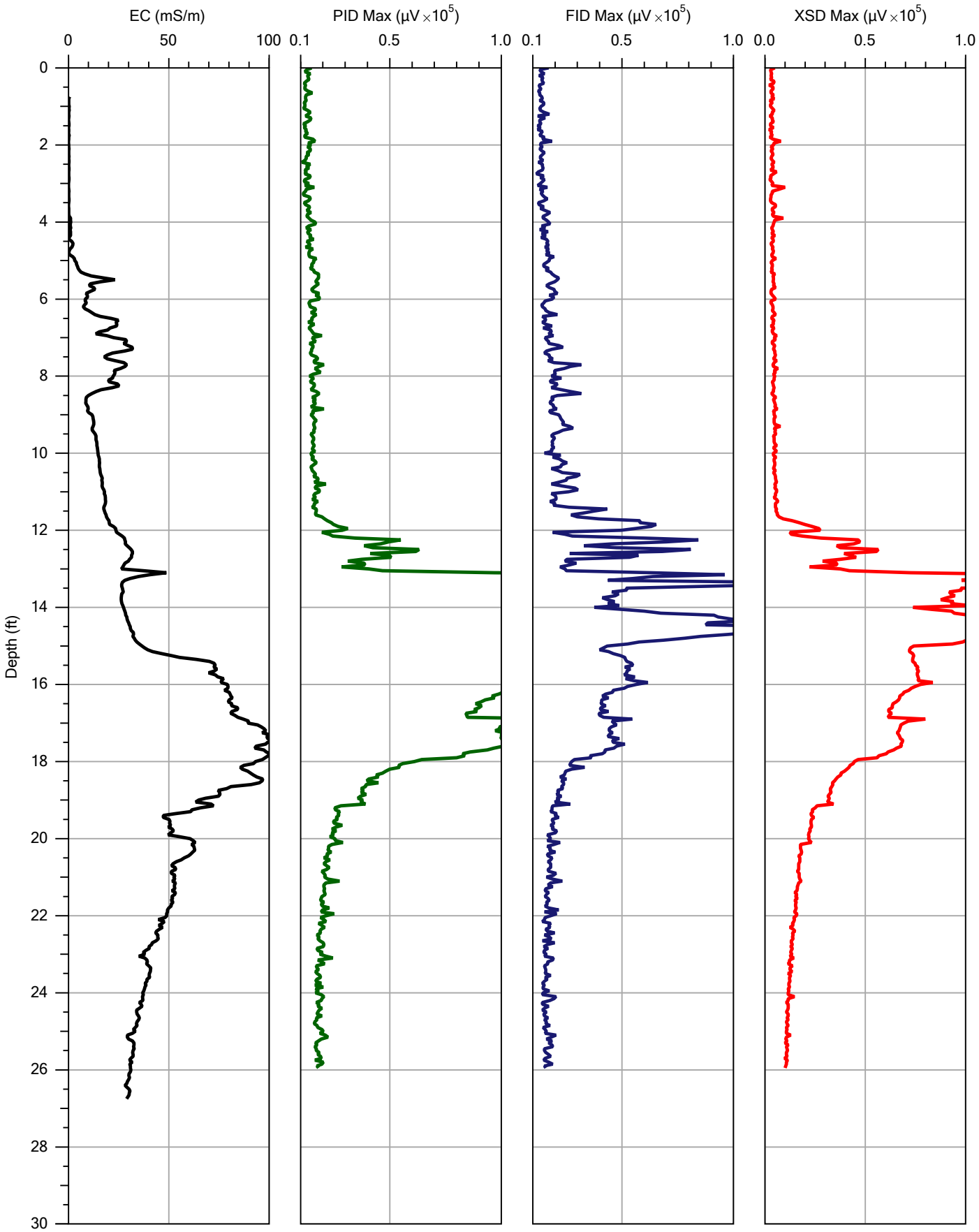

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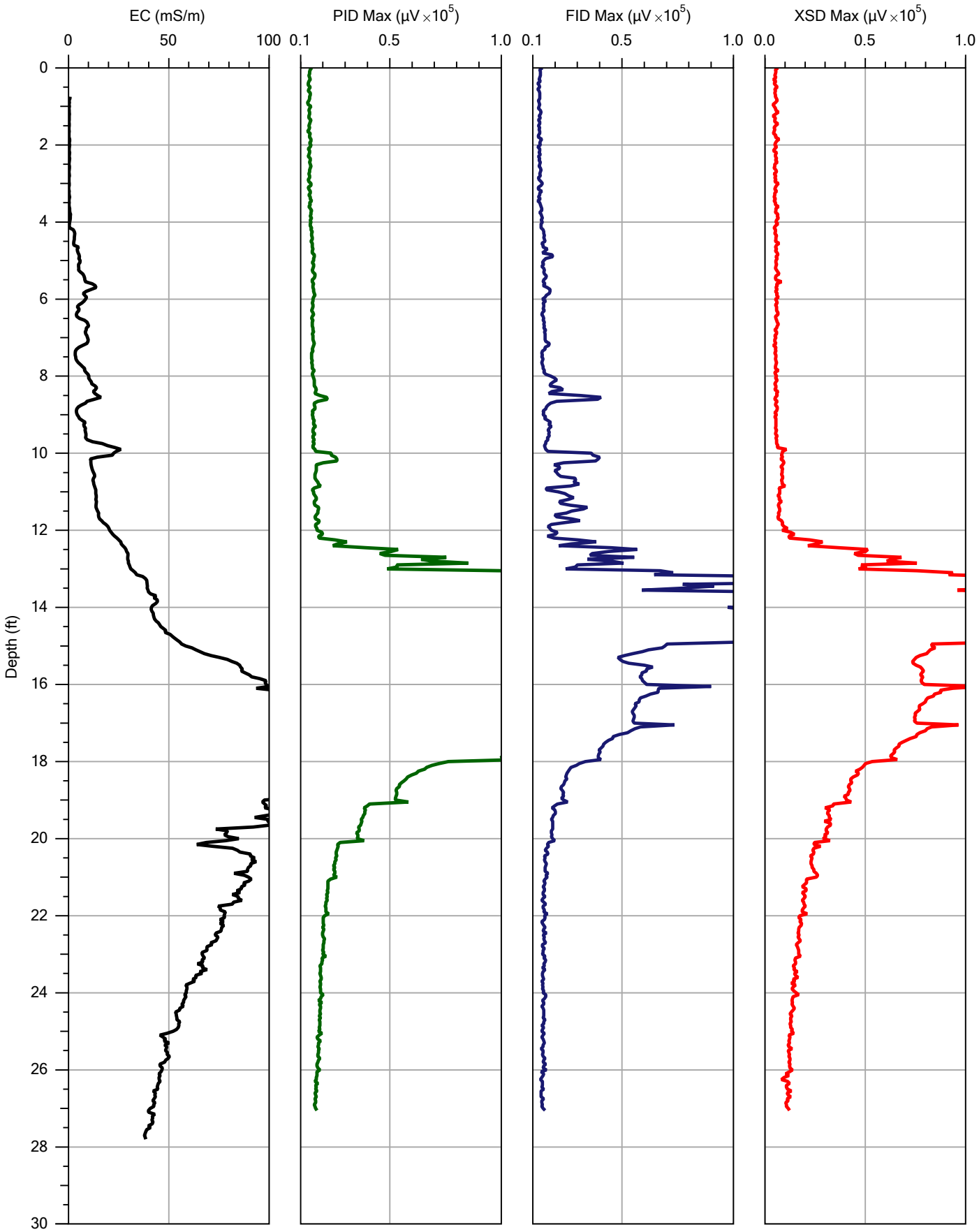

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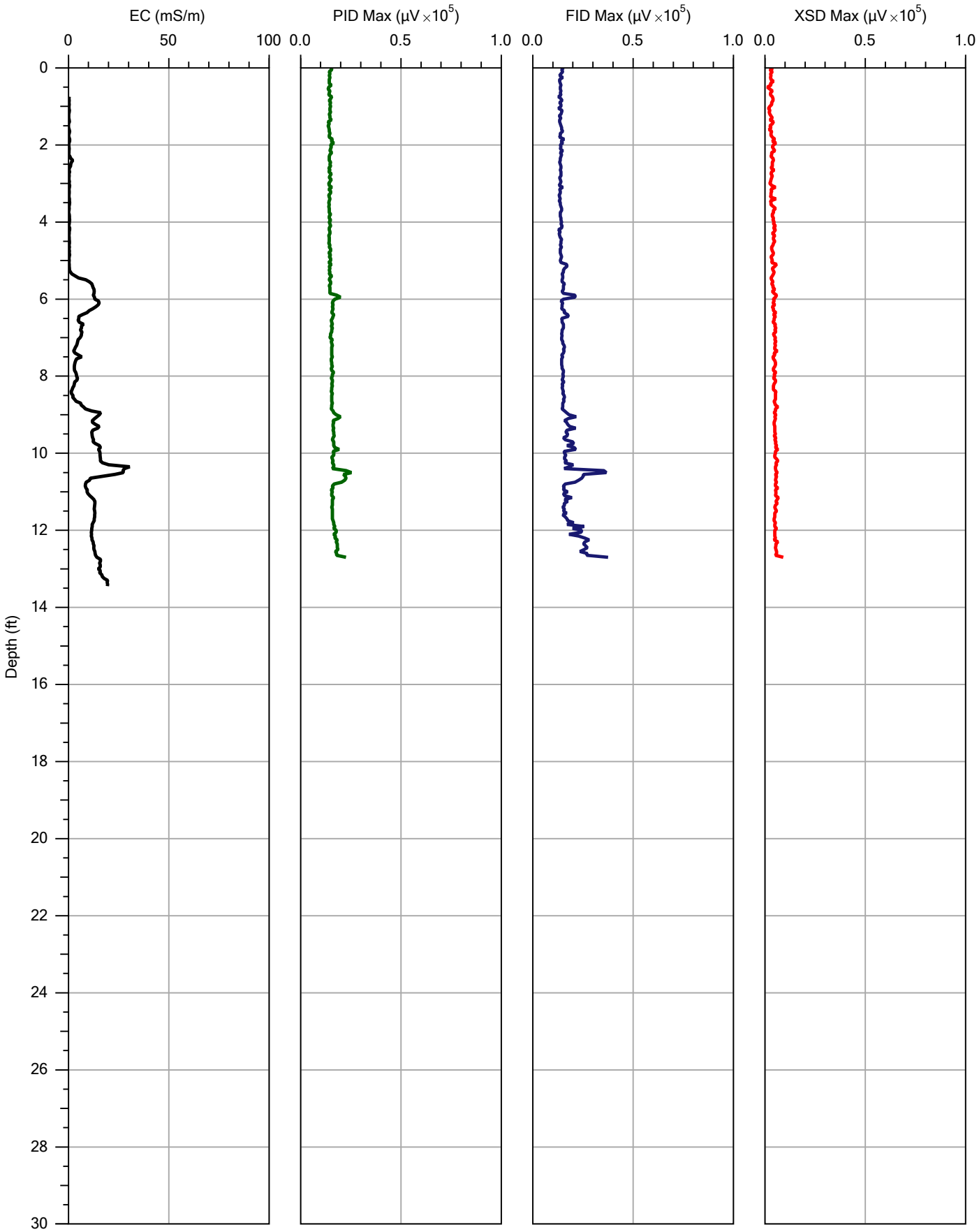

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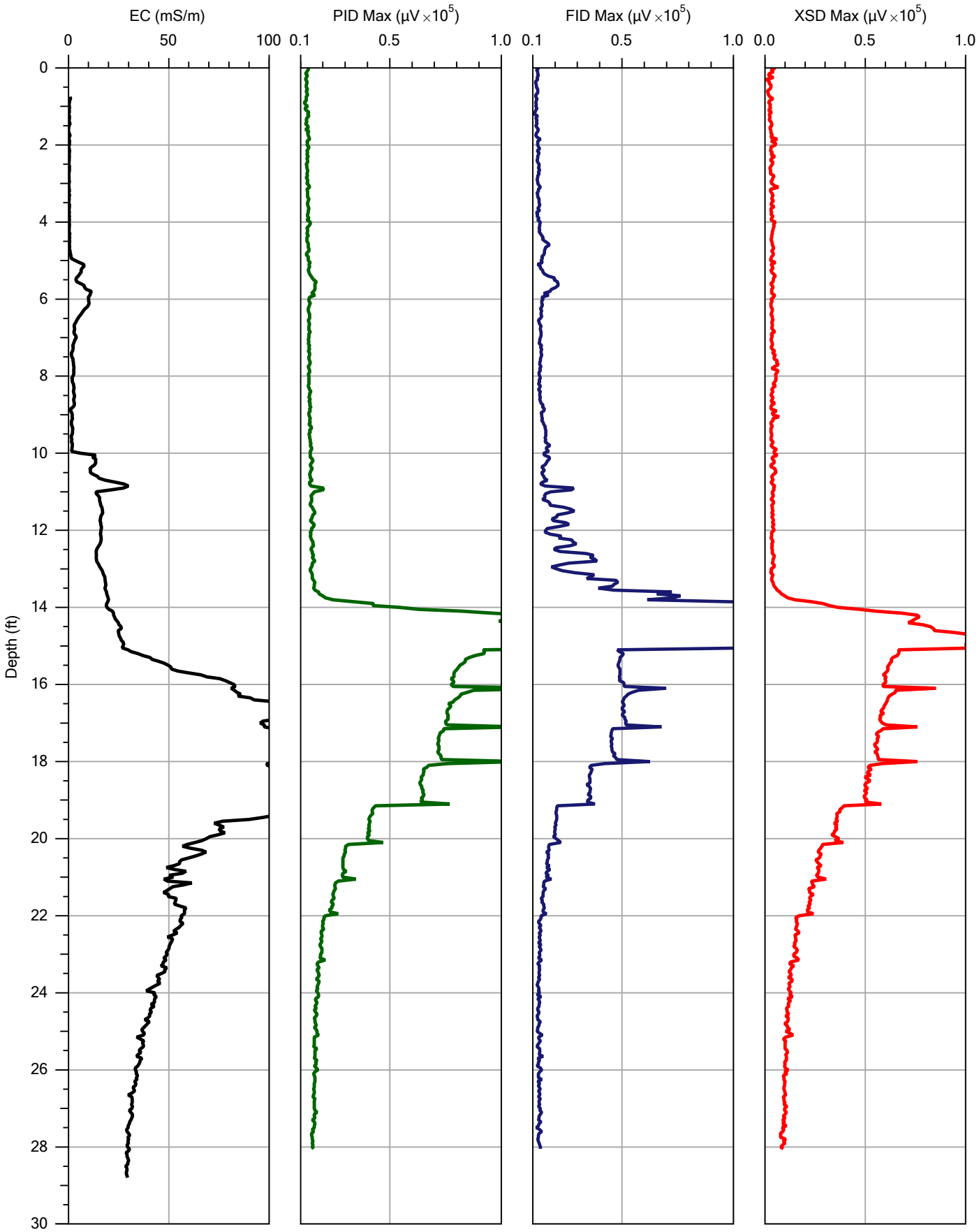

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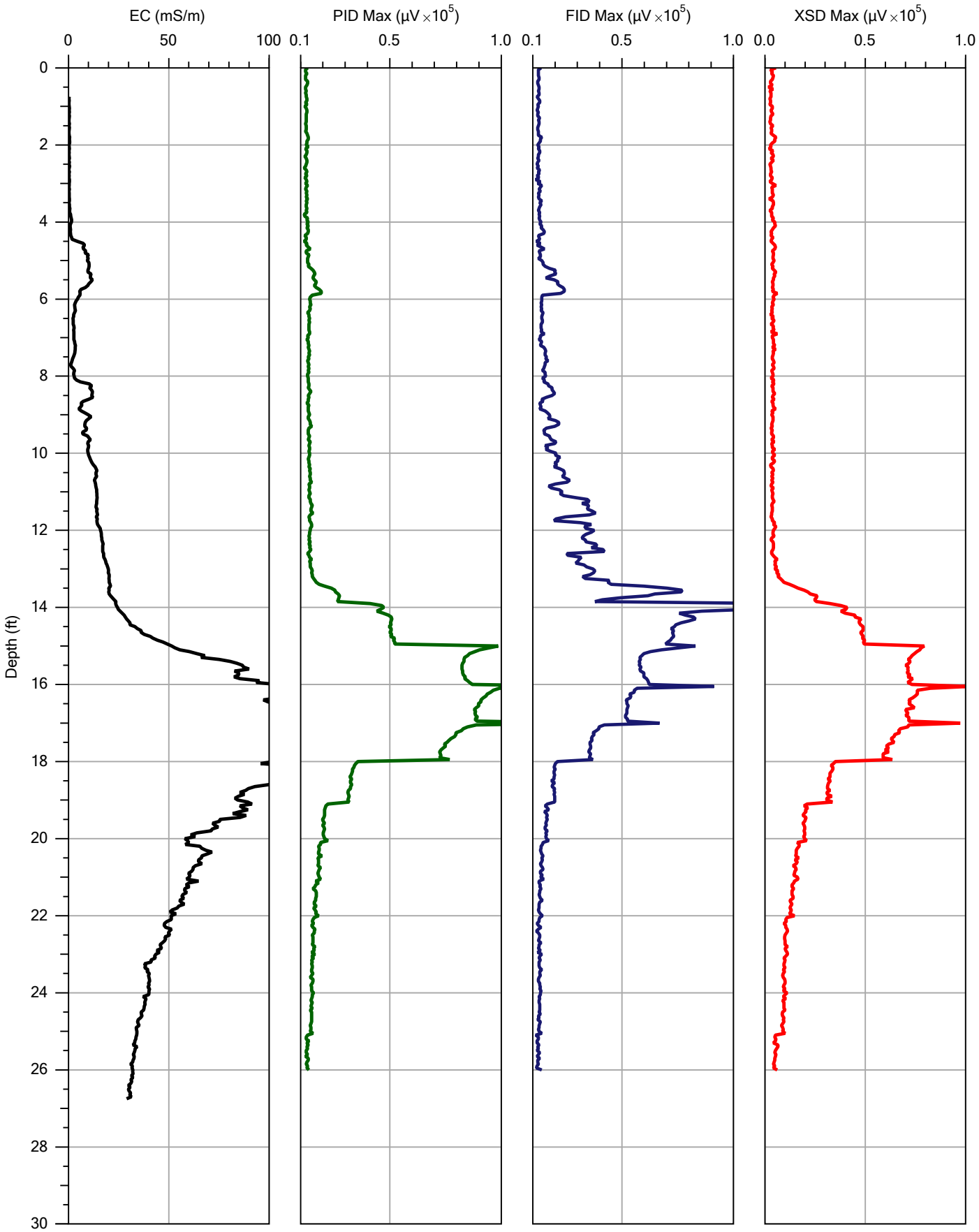

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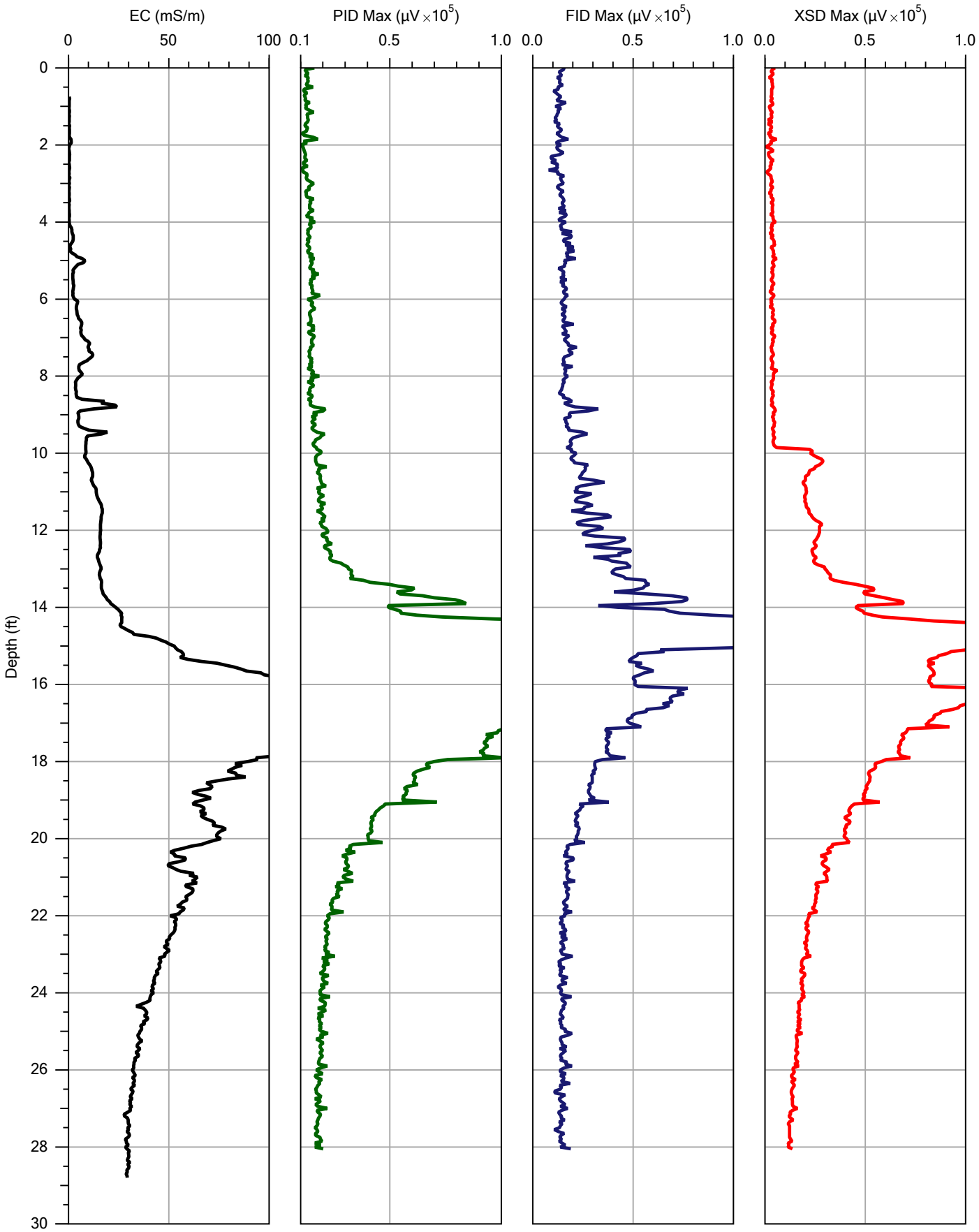

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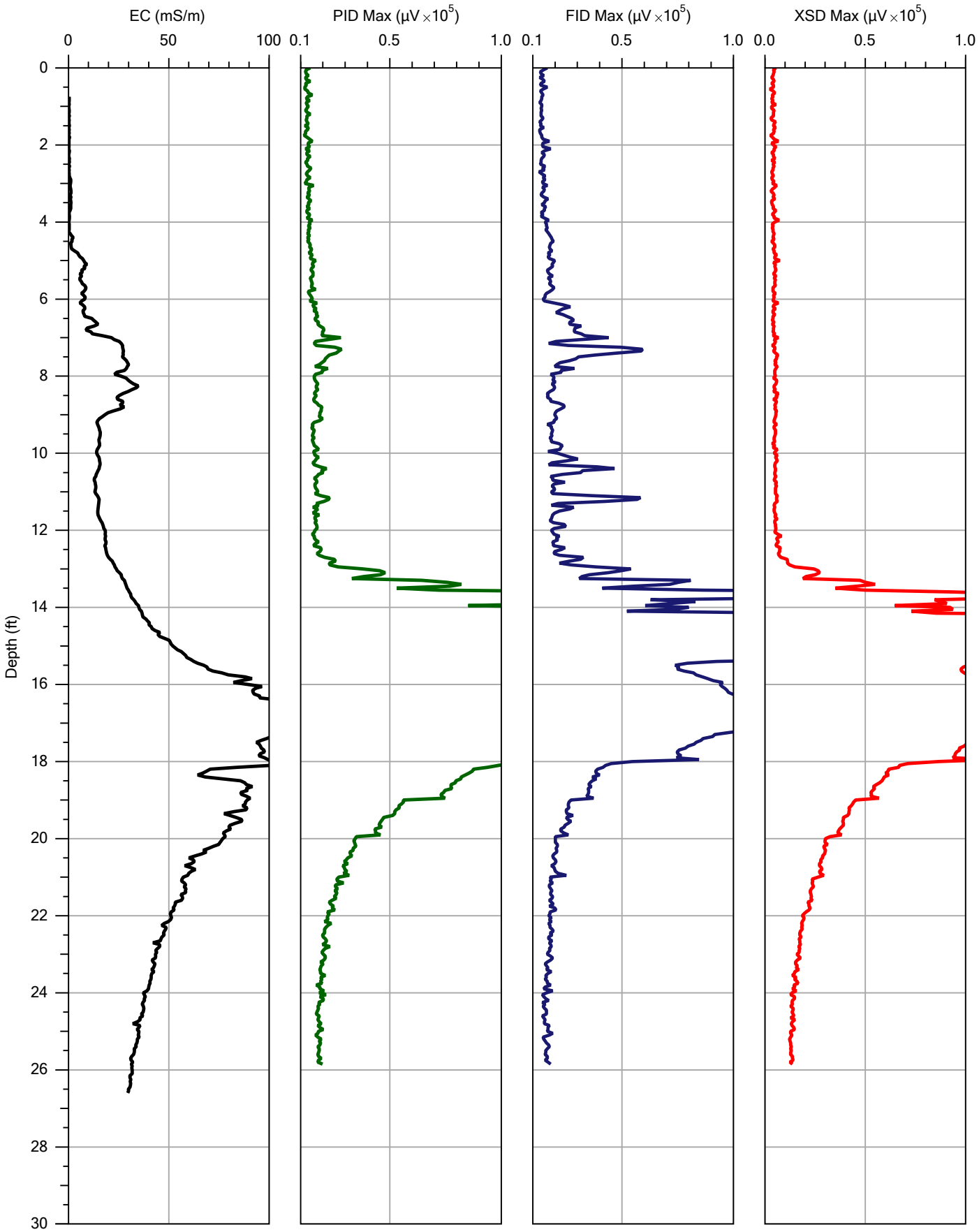

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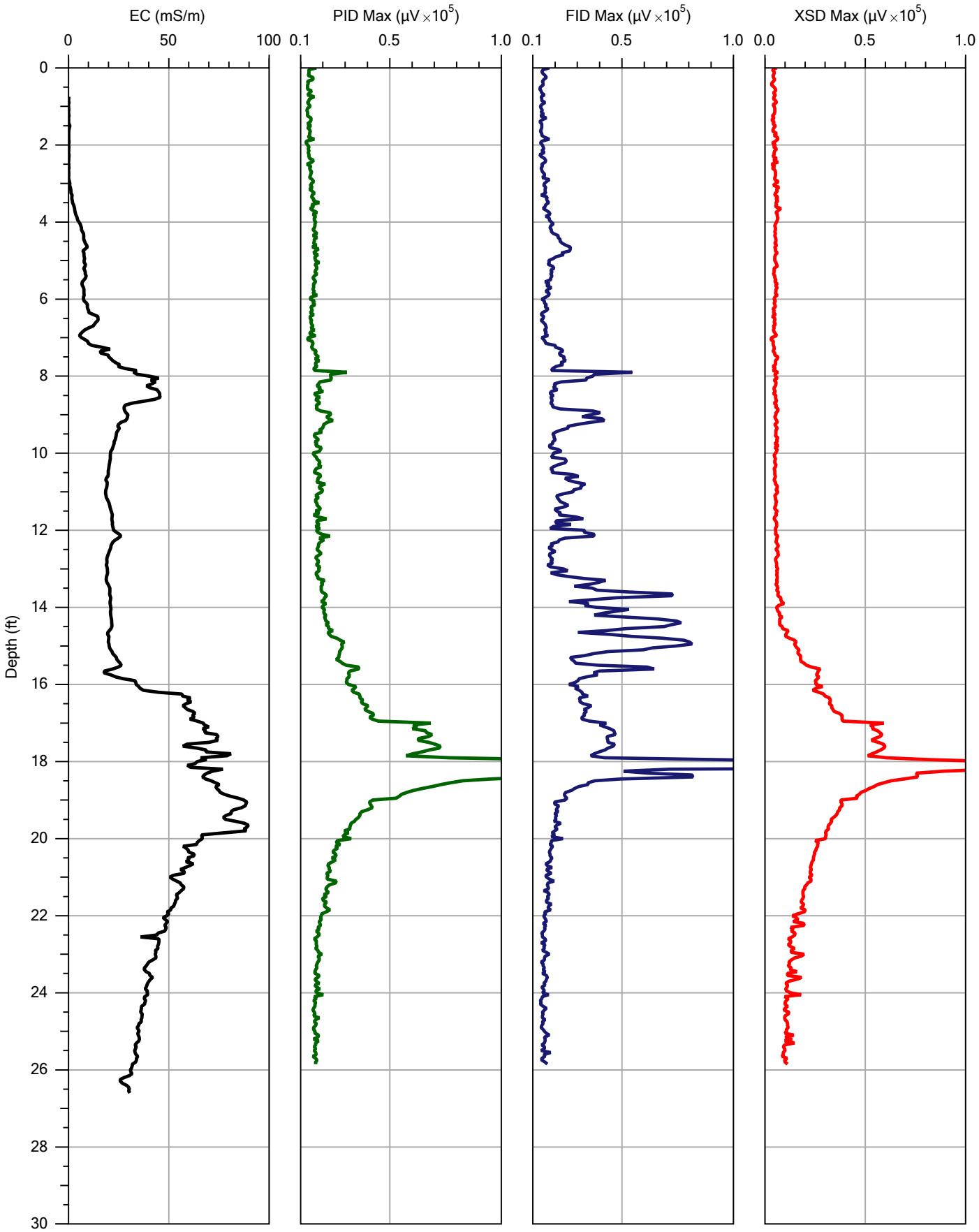

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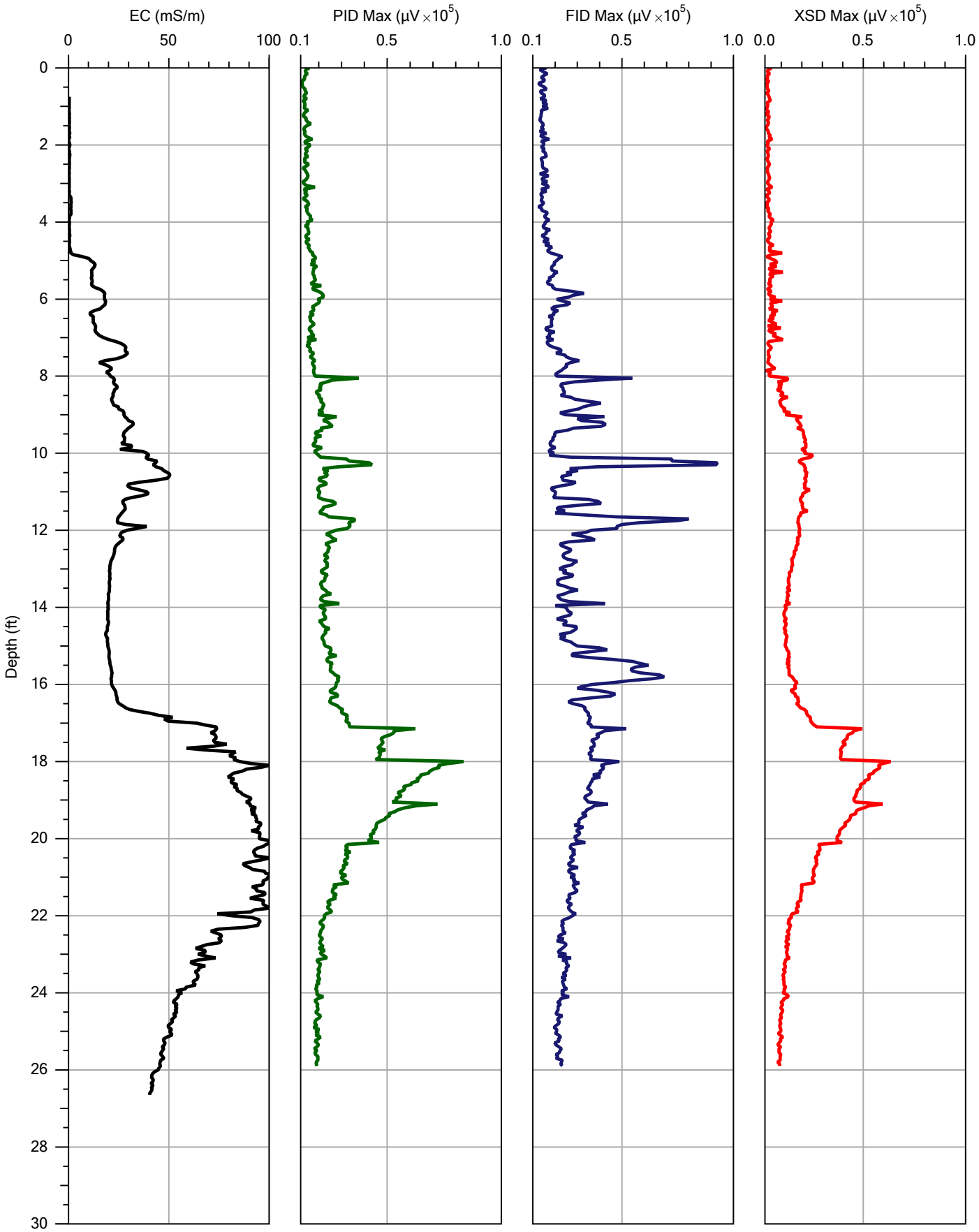

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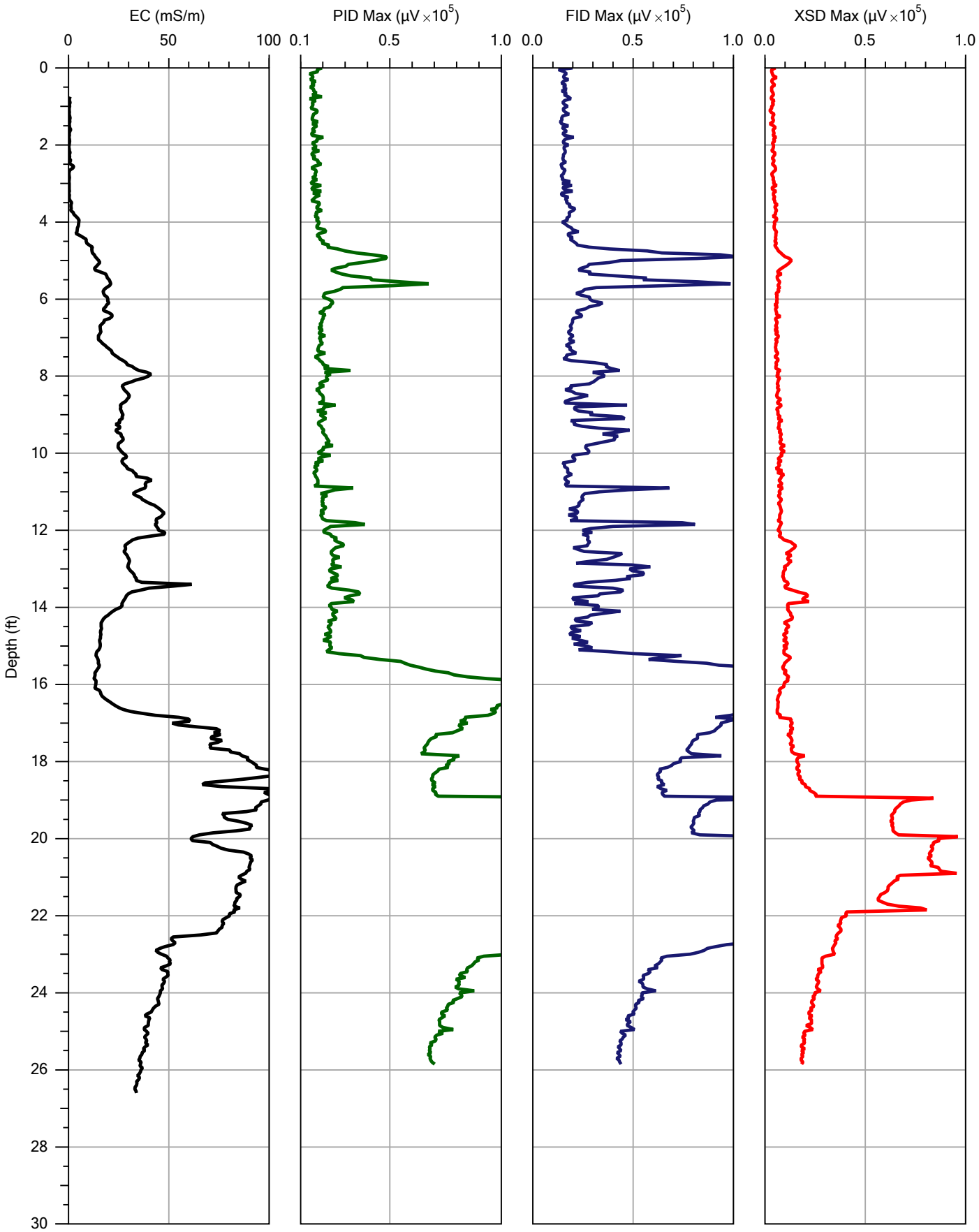

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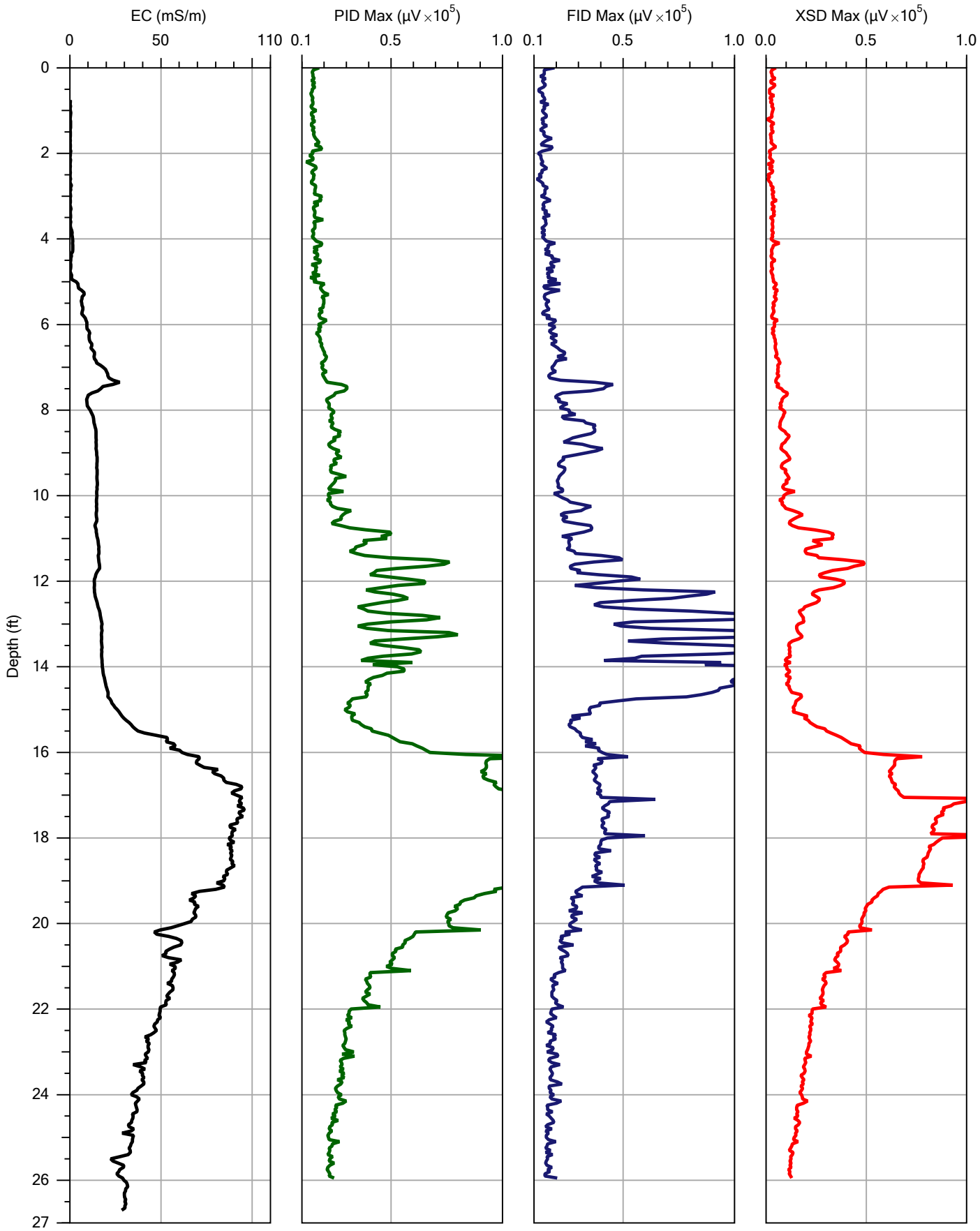

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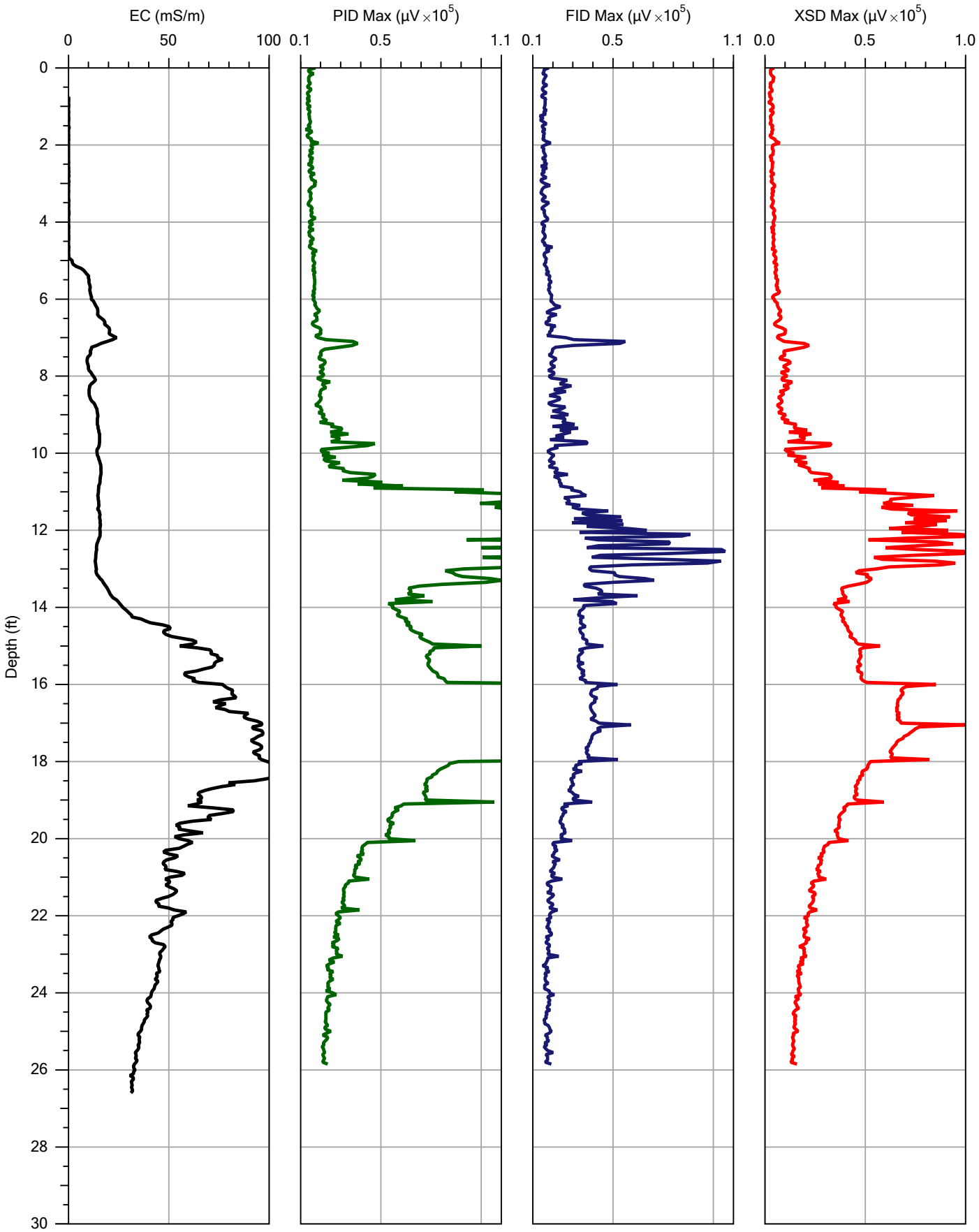

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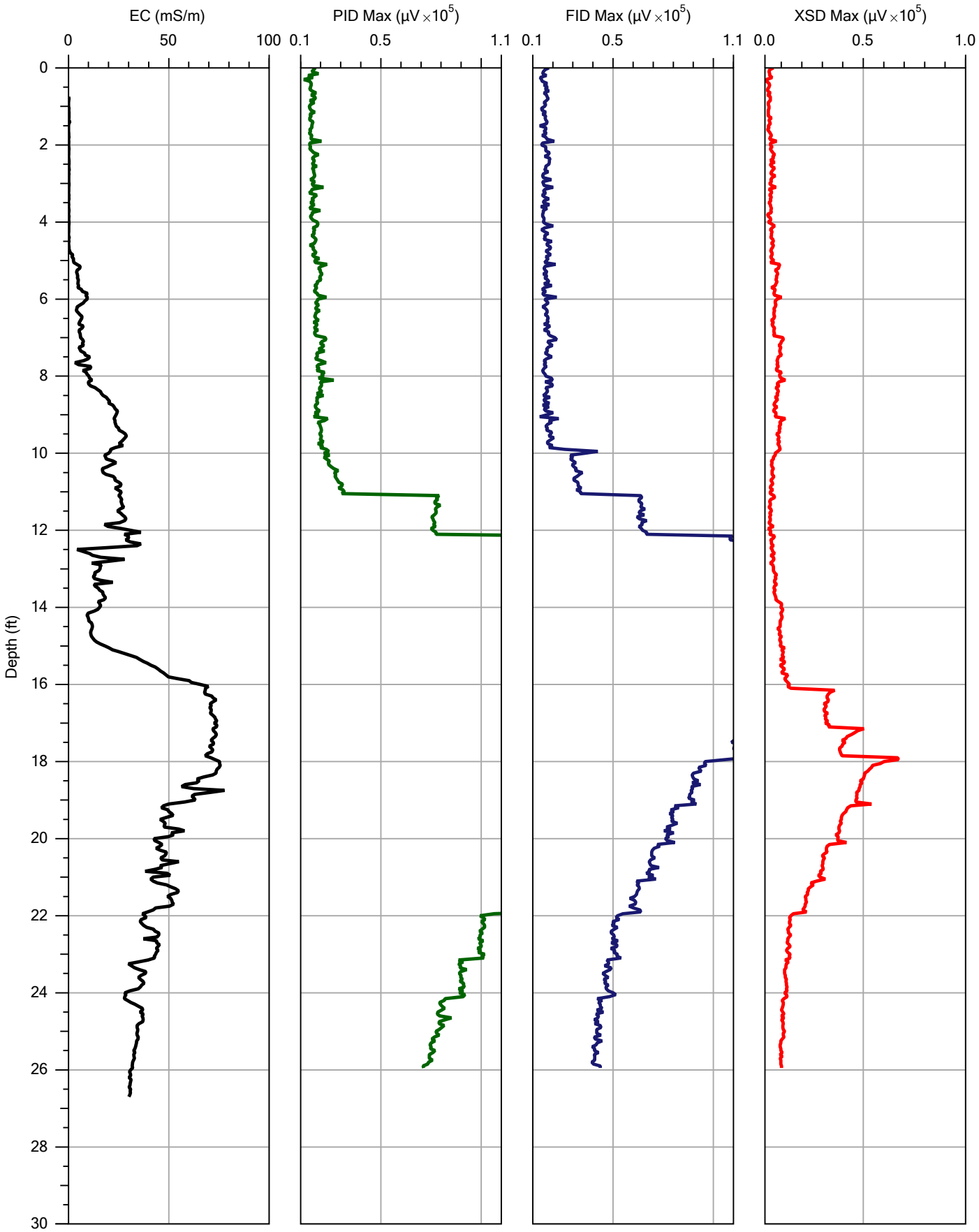

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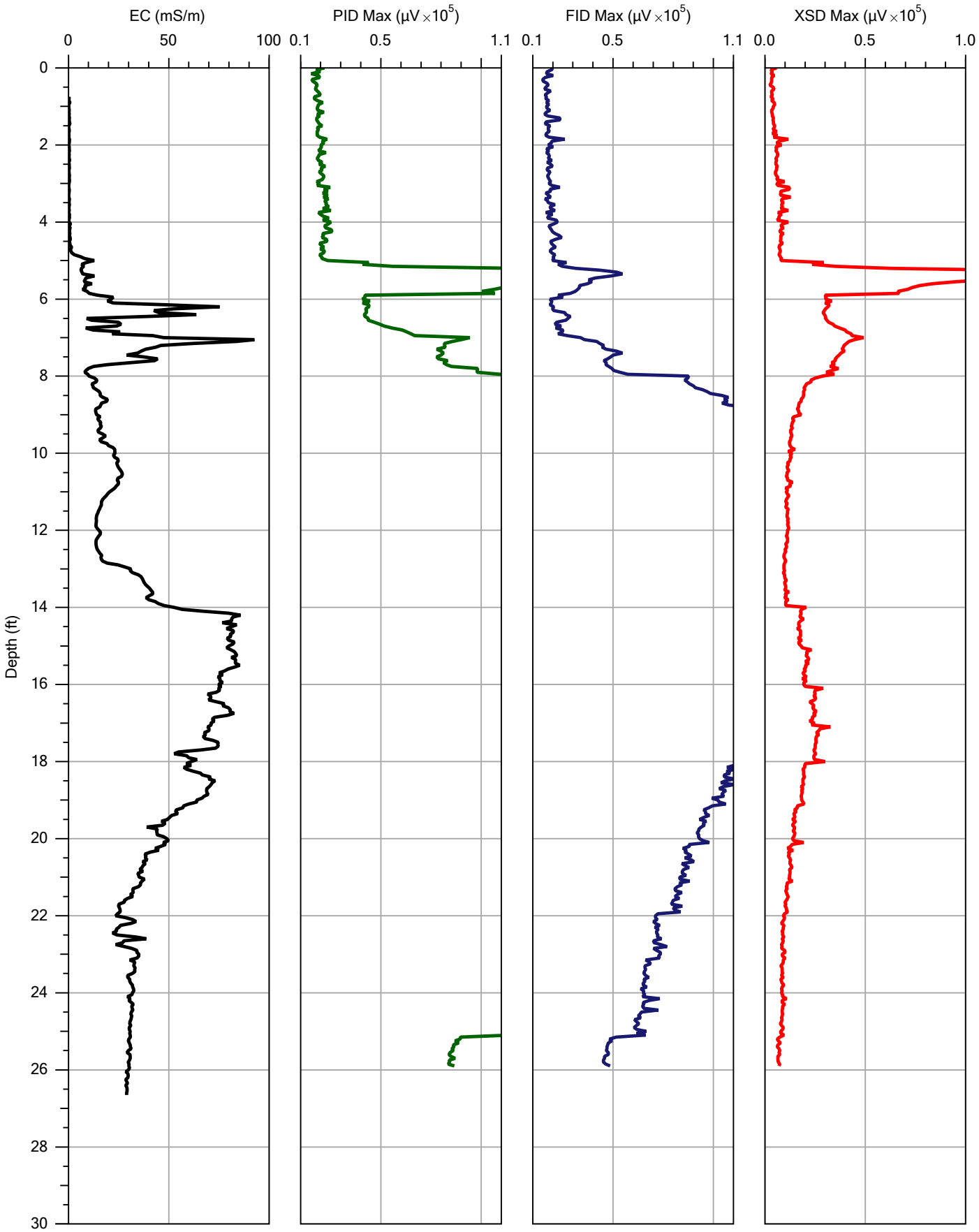

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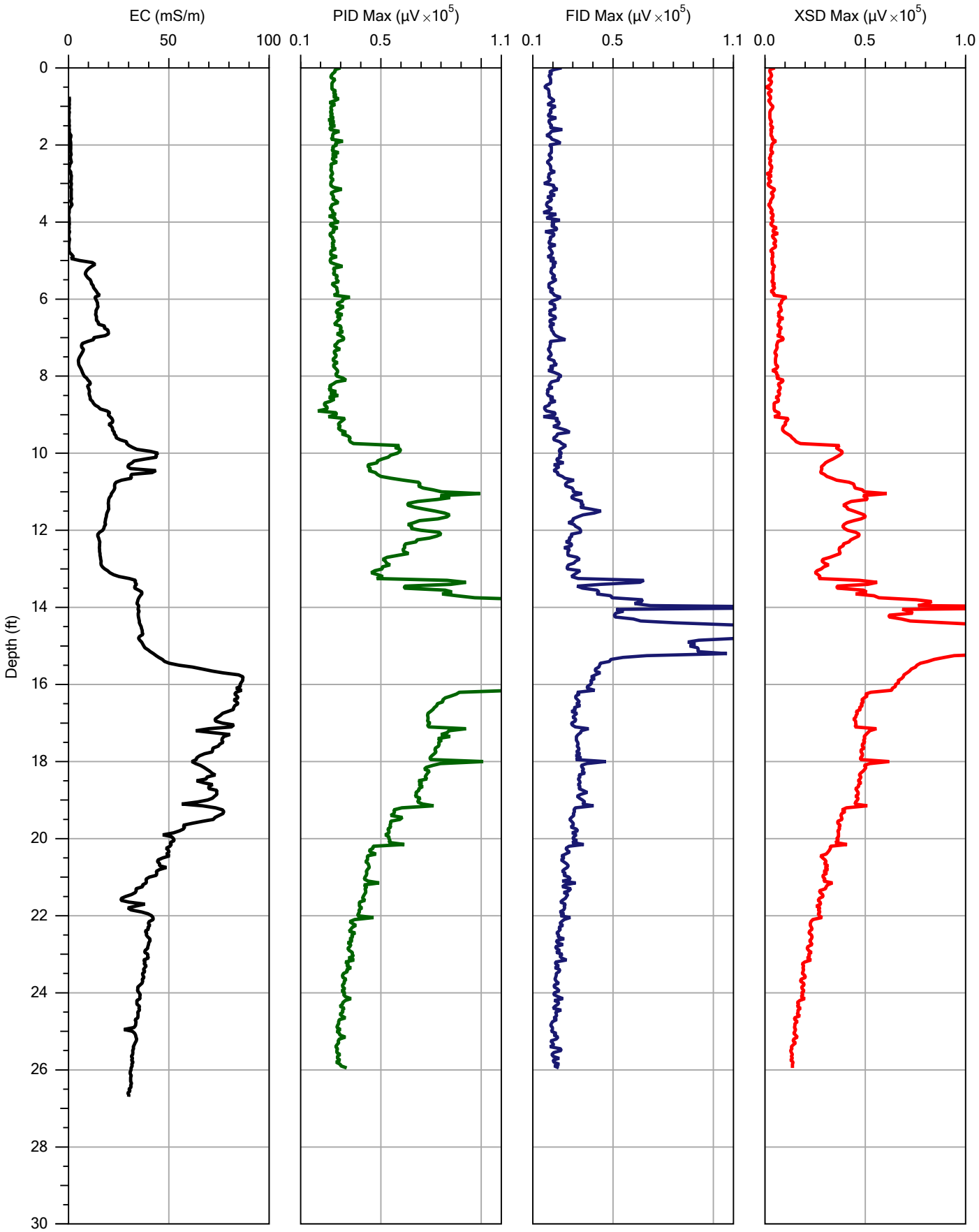

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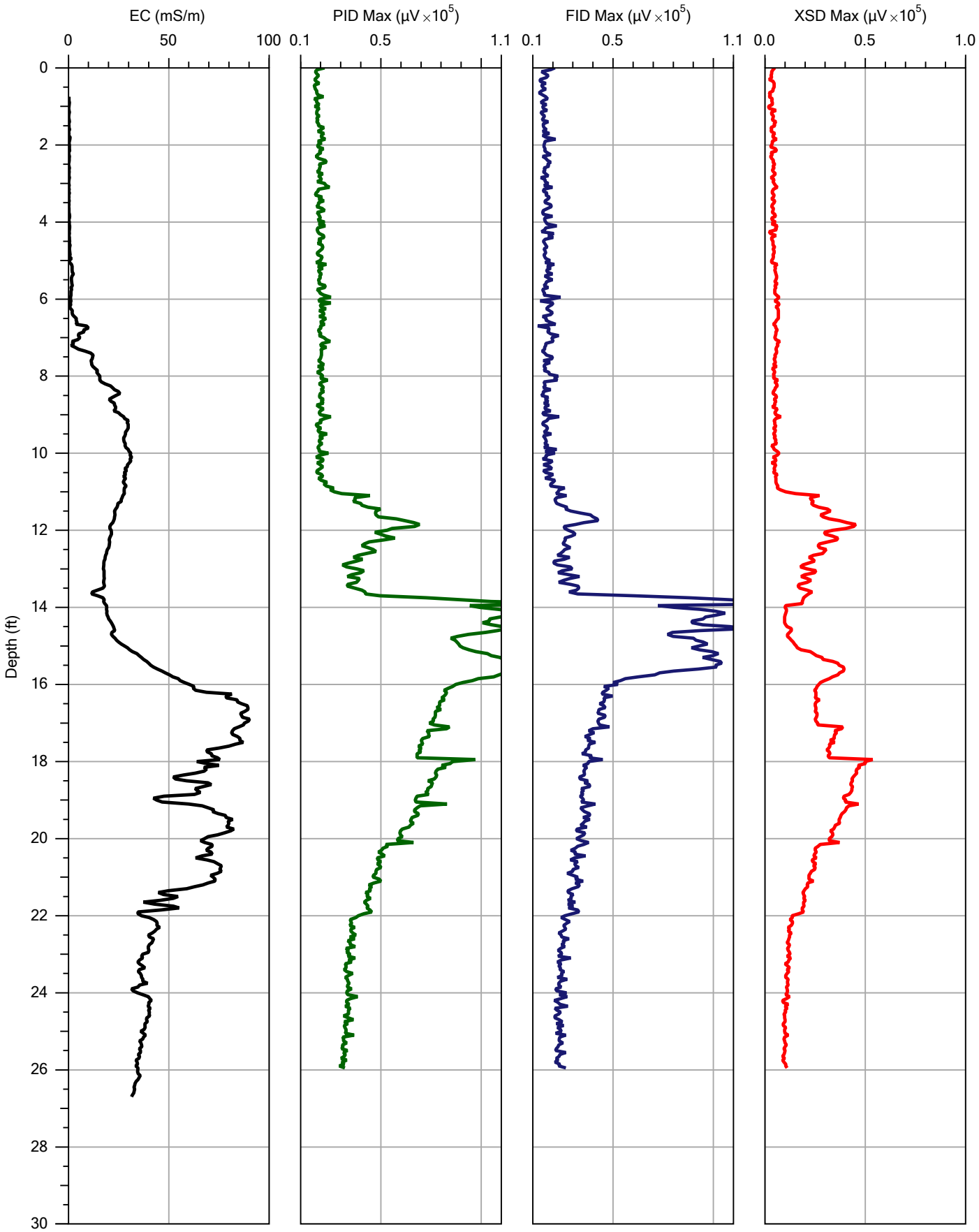

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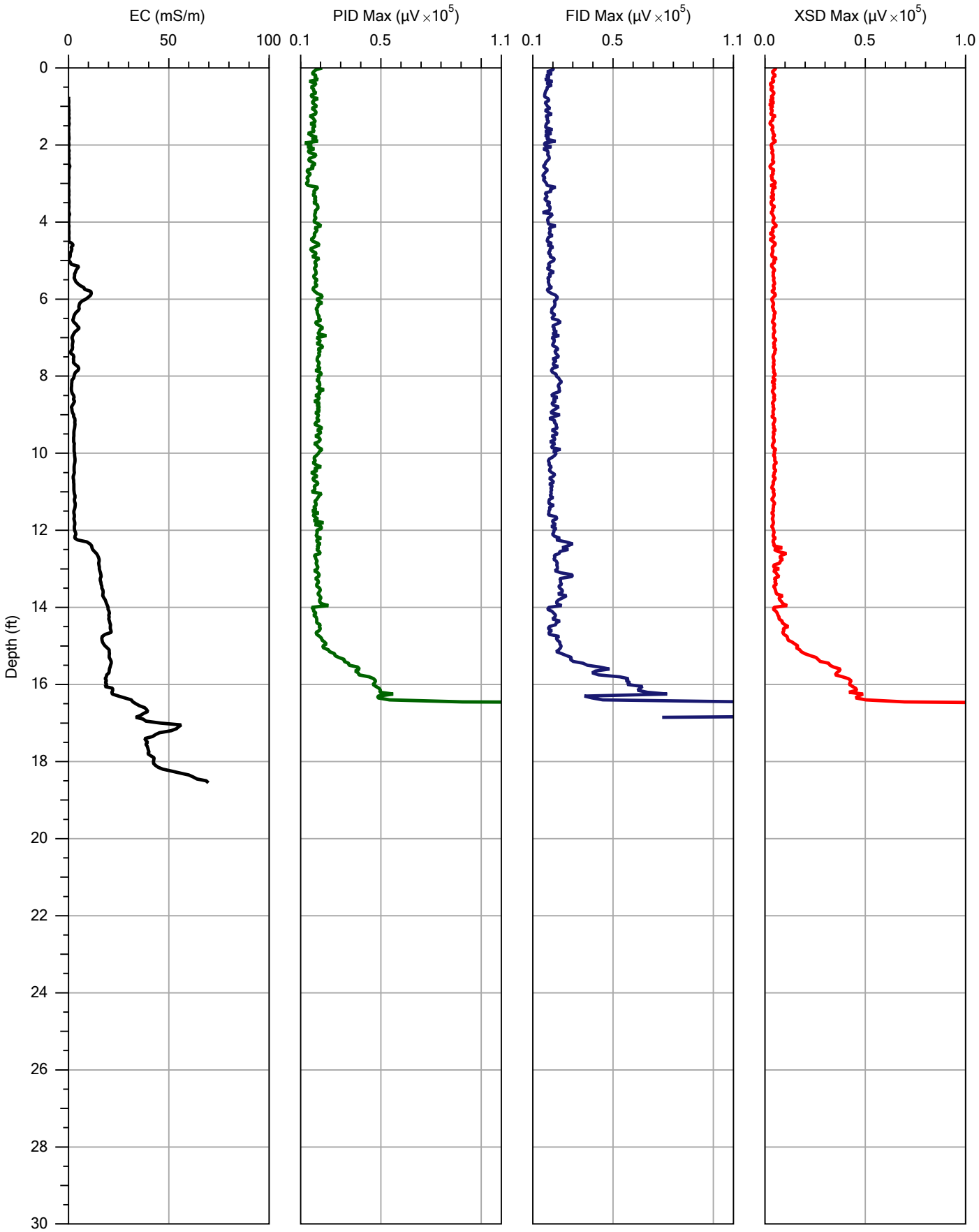
Company: Matrix Environmental		Operator: M Jenson	Date: 12/8/2014
Project ID: 319.14		Client: CRA	Location:



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Company: Matrix Environmental		Operator: M Jenson	Date: 12/9/2014
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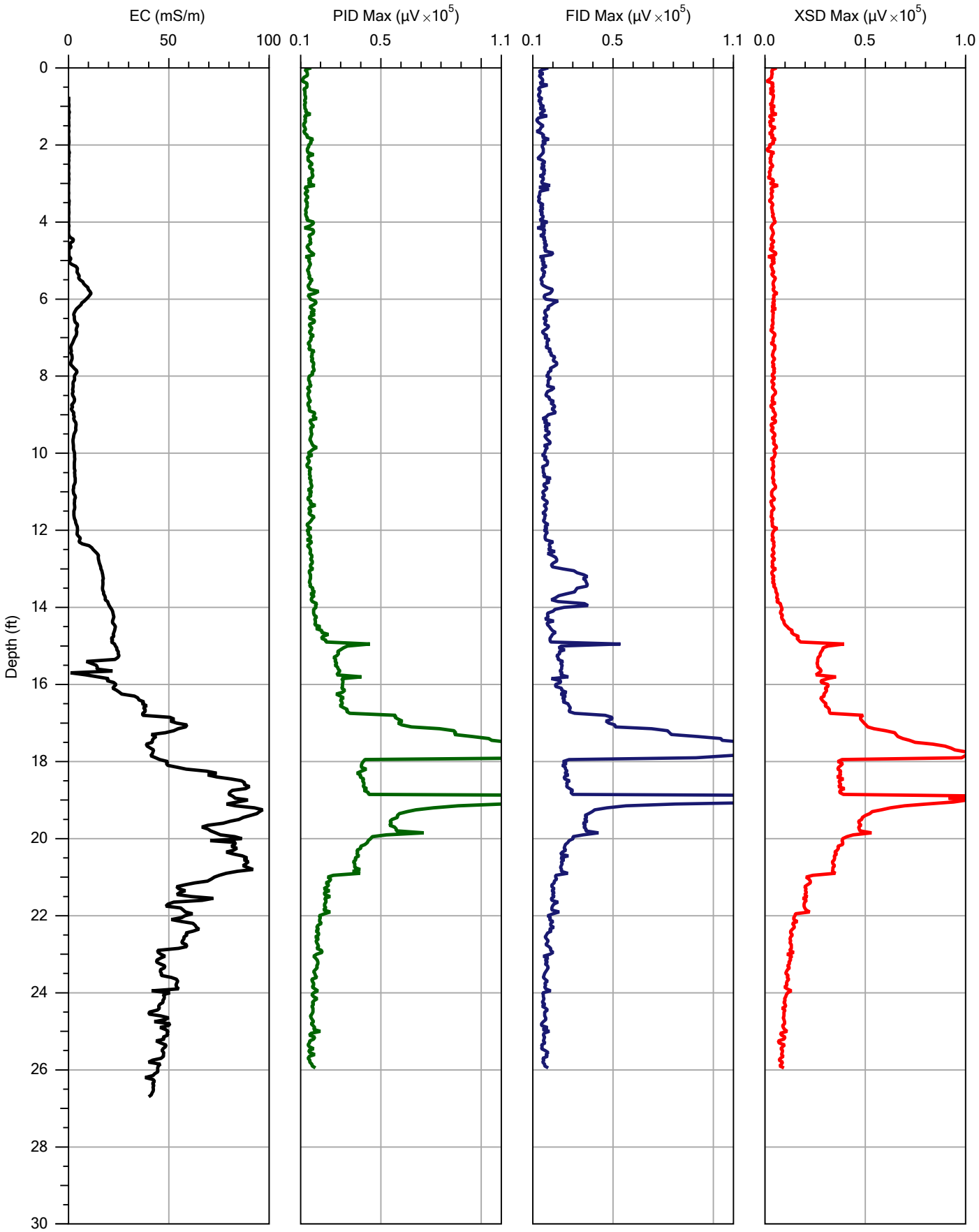

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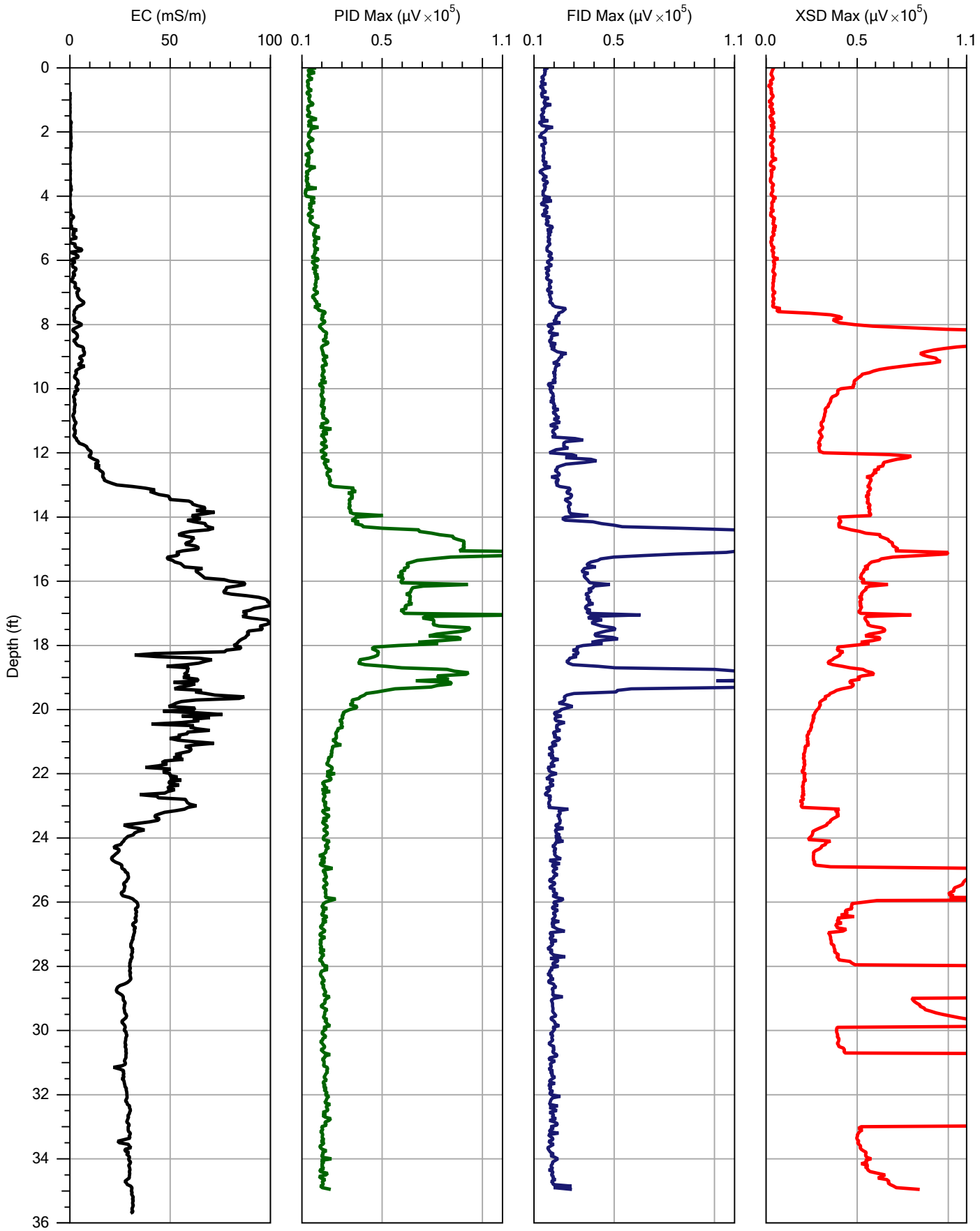
Company: Matrix Environmental		Operator: M Jenson	Date: 12/9/2014
Project ID: 319.14		Client: CRA	Location:



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Company: Matrix Environmental		Operator: M Jenson	Date: 12/9/2014
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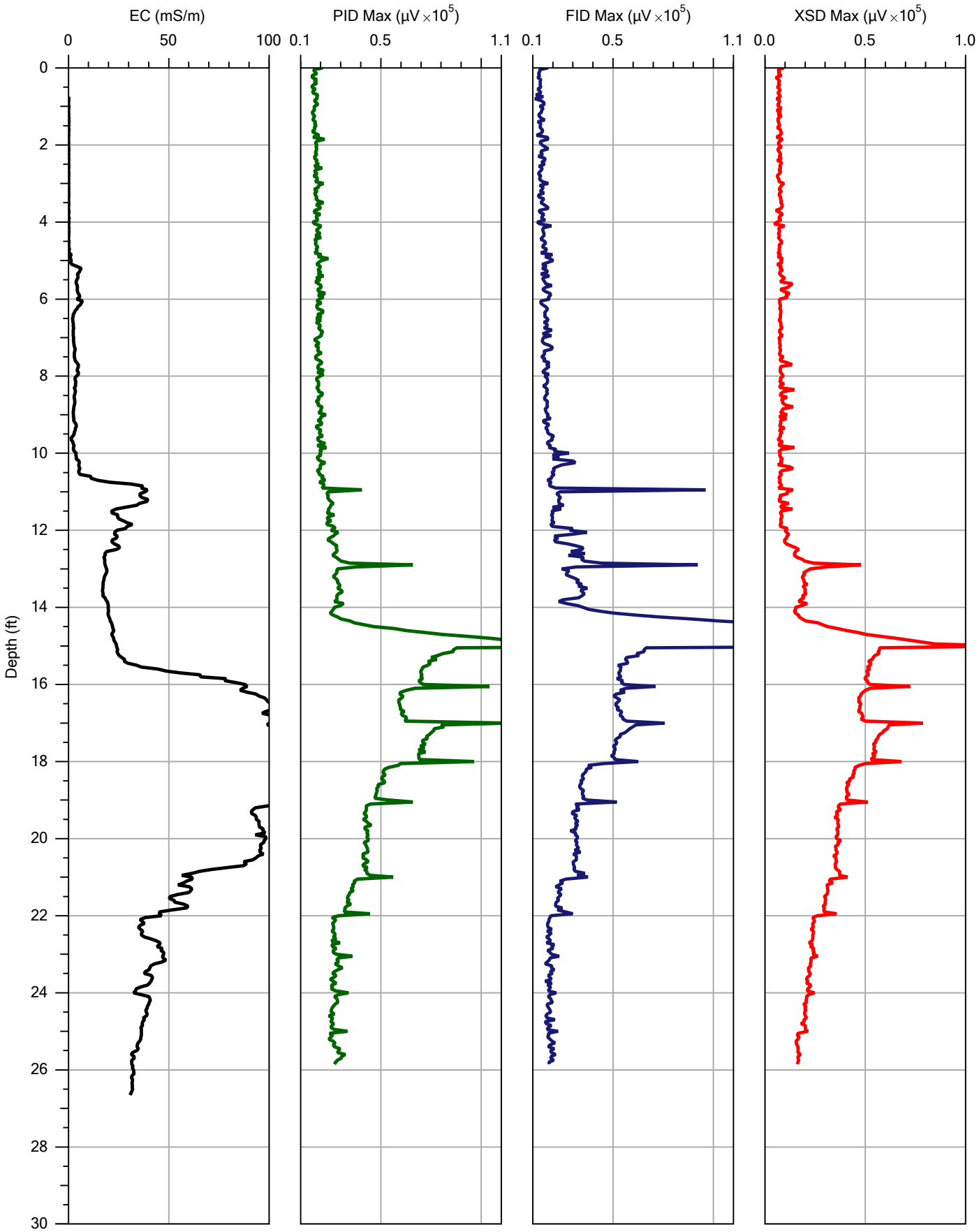

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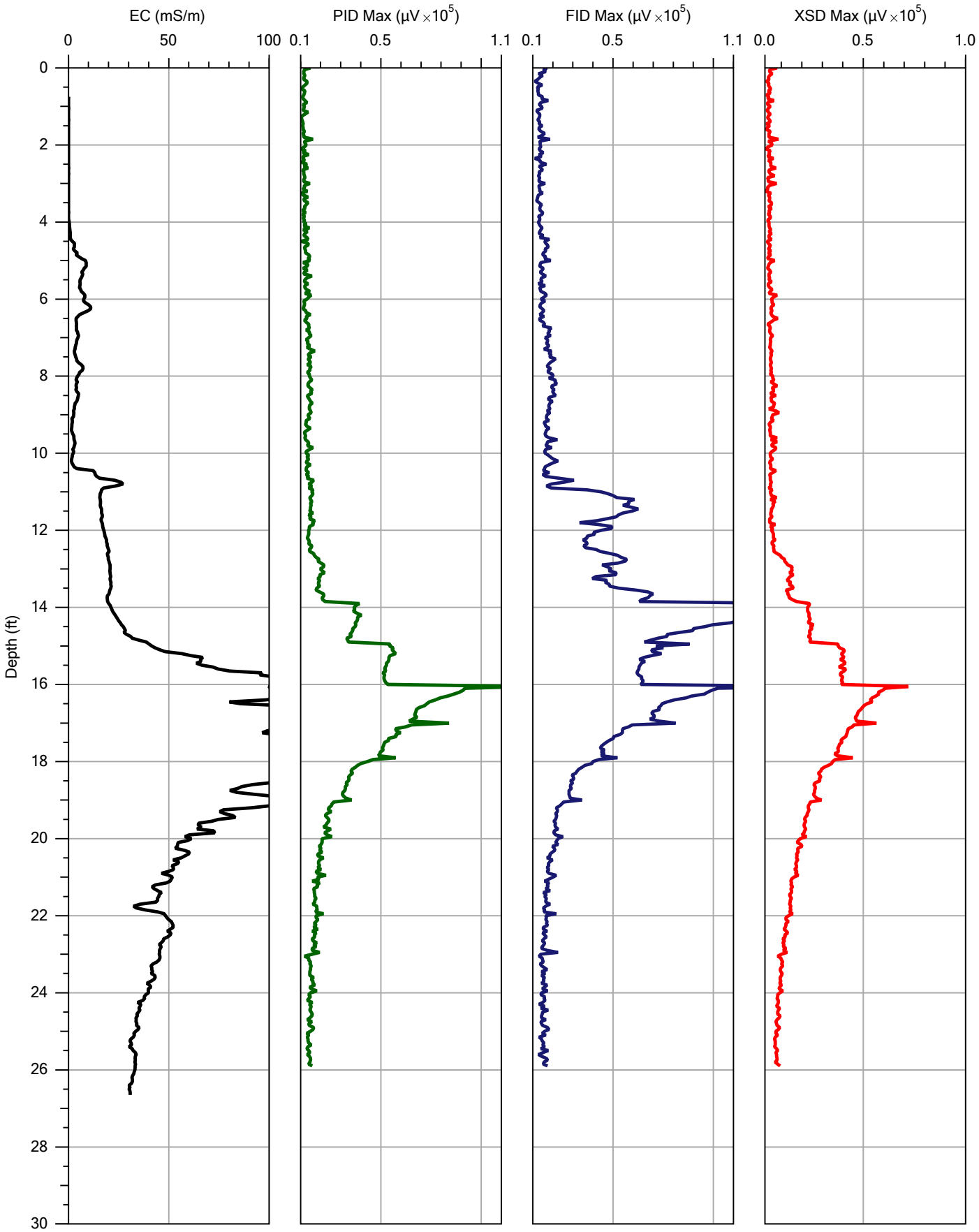

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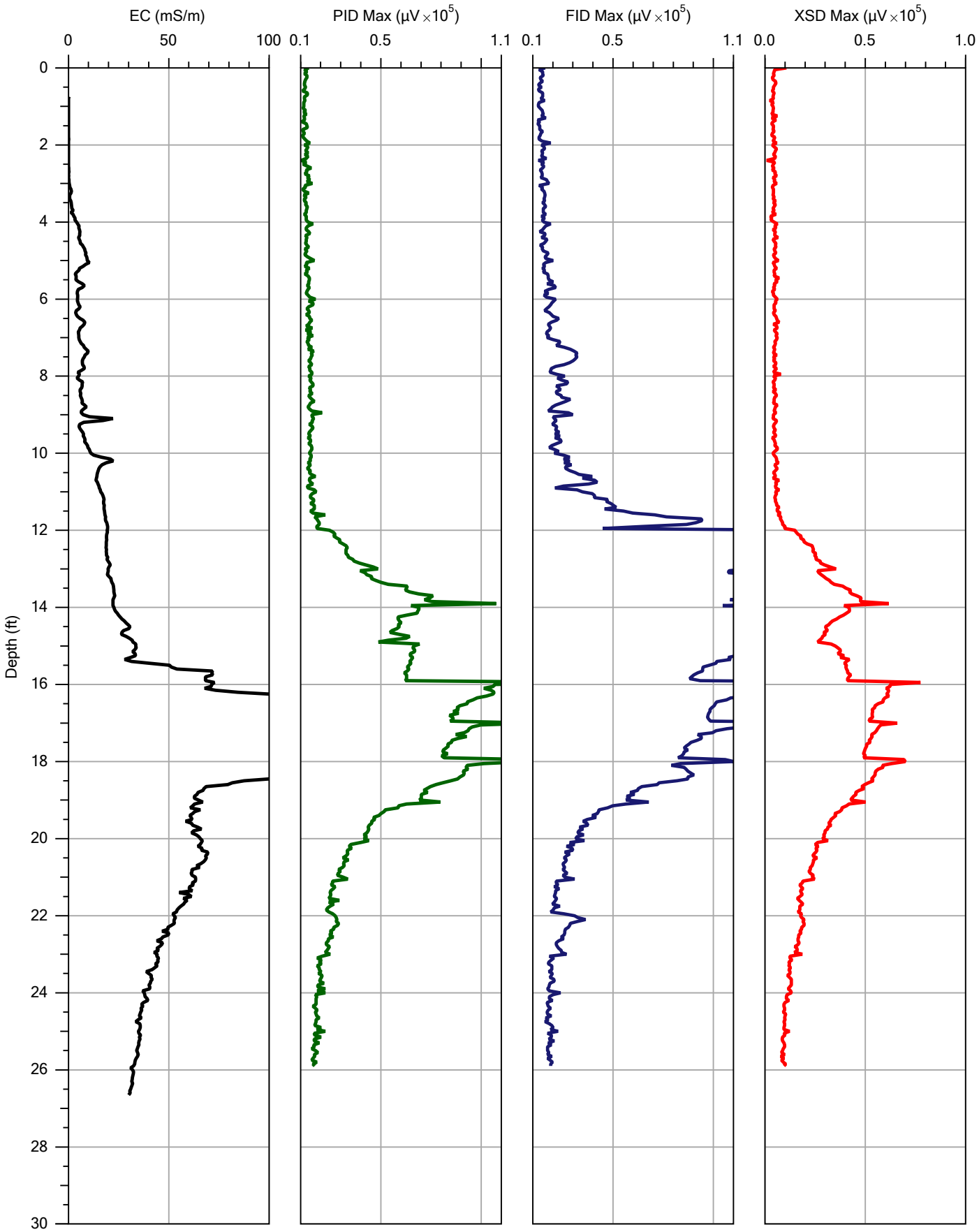

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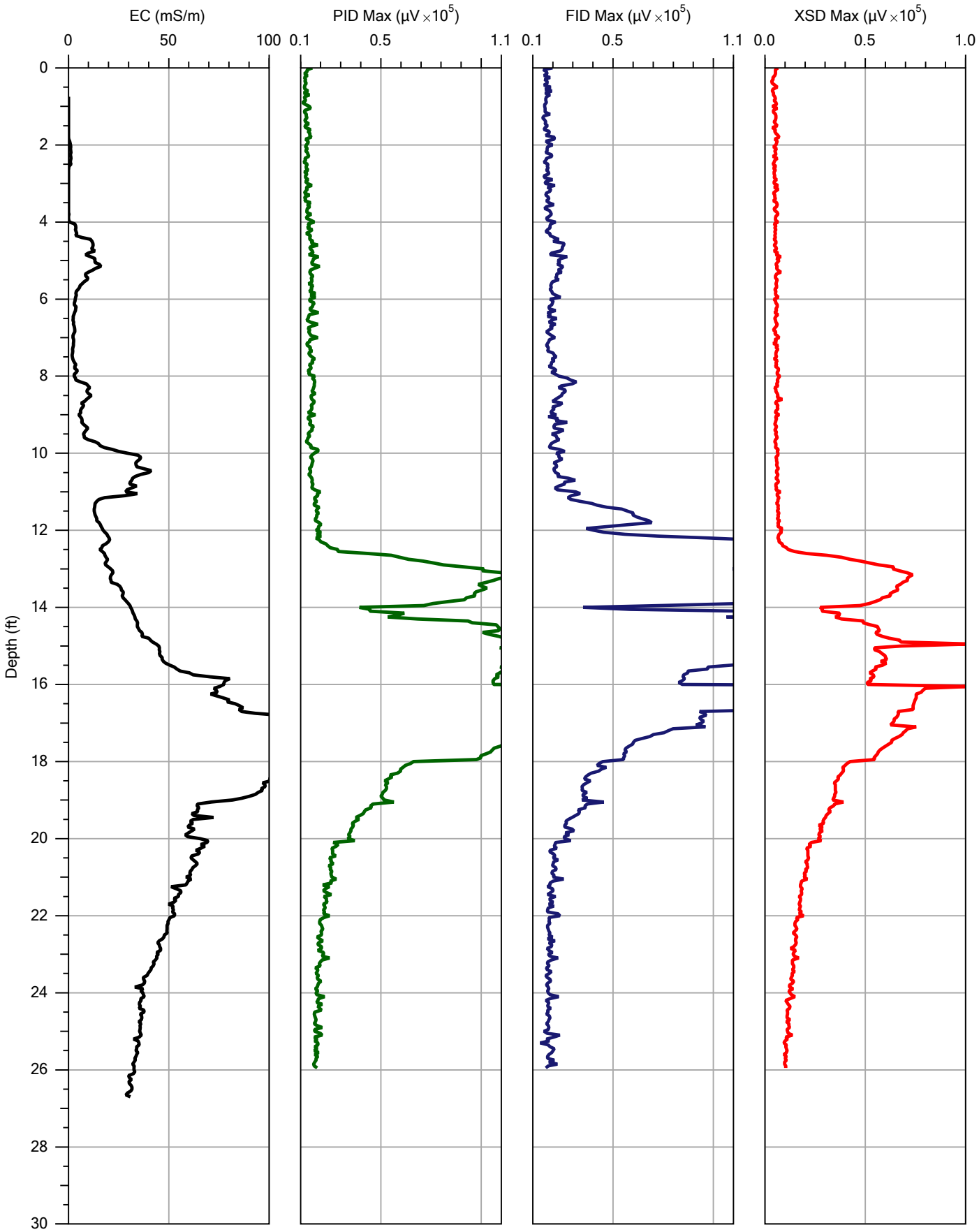
Project ID: 319.14		Client: CRA	Location:



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Company: Matrix Environmental		Operator: M Jenson	Date: 12/10/2014
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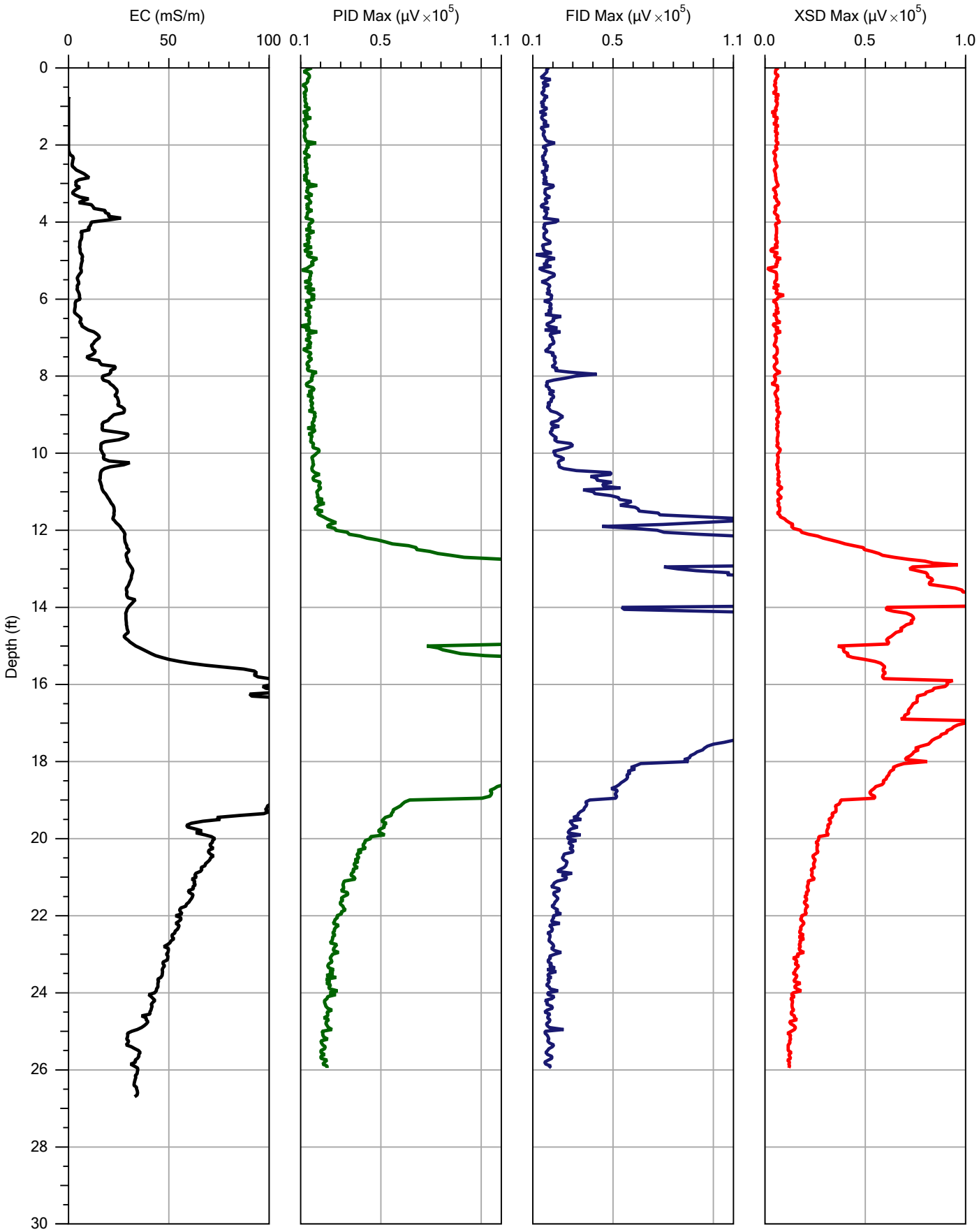

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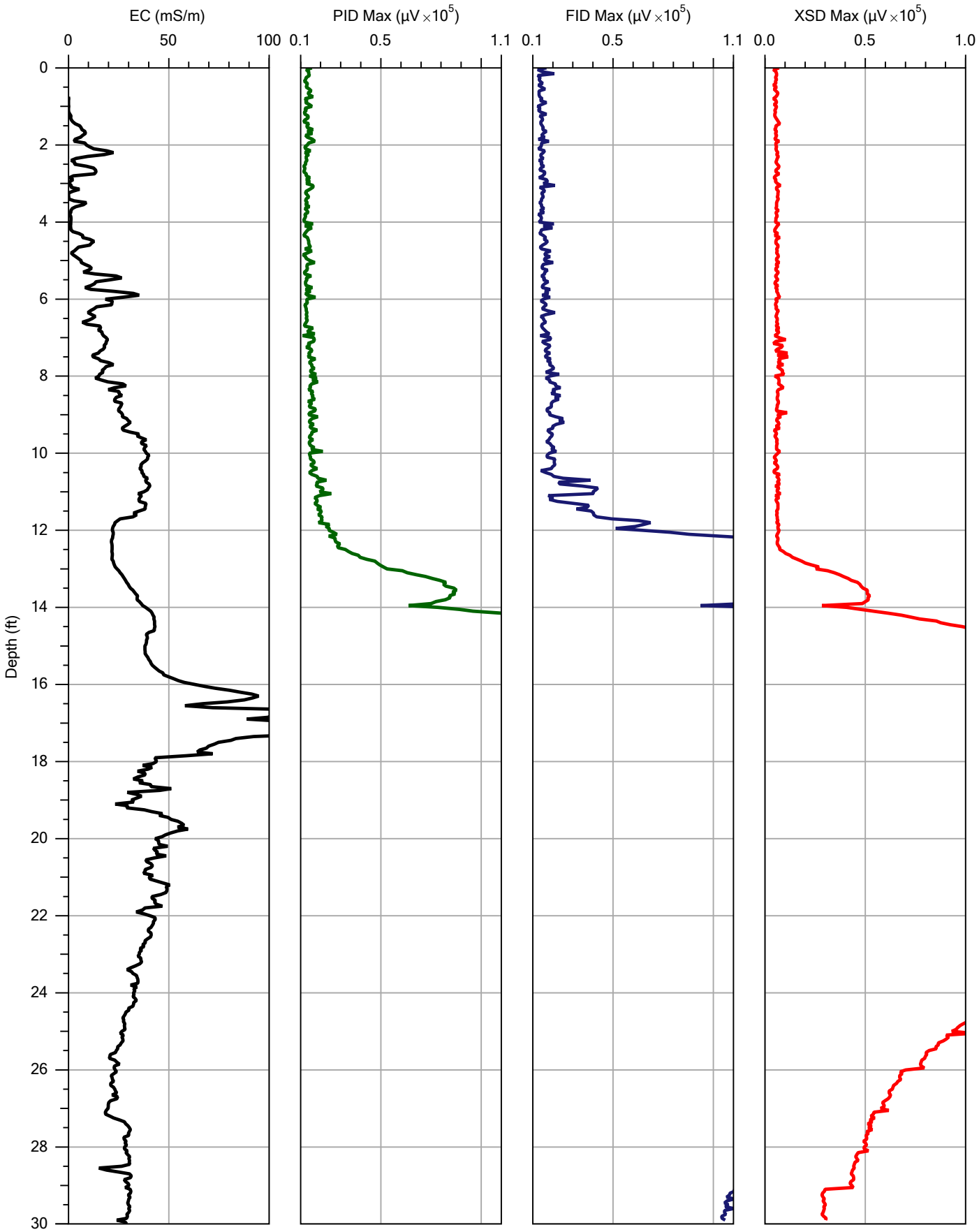

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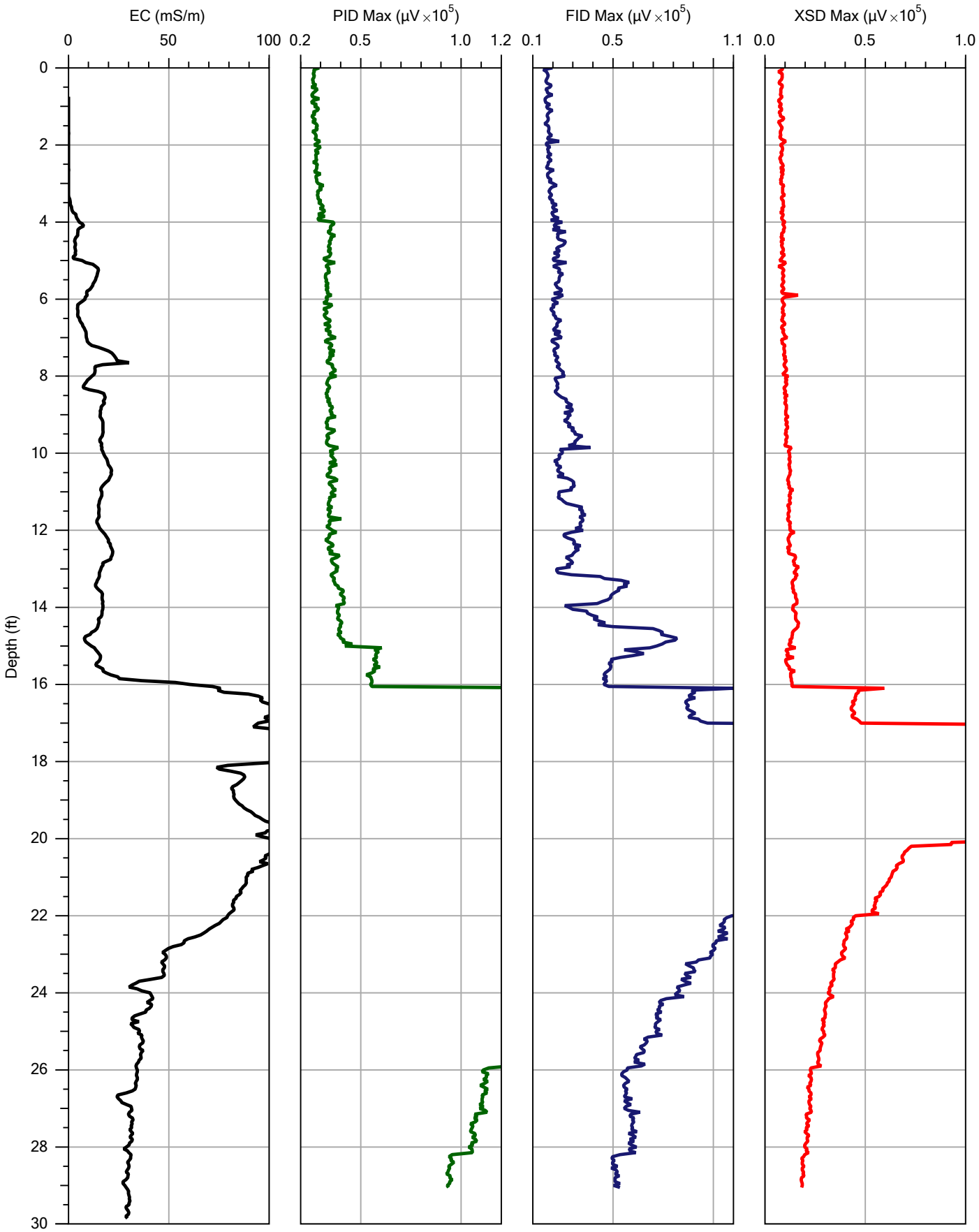
Company: Matrix Environmental		Operator: M Jenson	Date: 12/10/2014
Project ID: 319.14		Client: CRA	Location:



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Company: Matrix Environmental		Operator: M Jenson	Date: 12/10/2014
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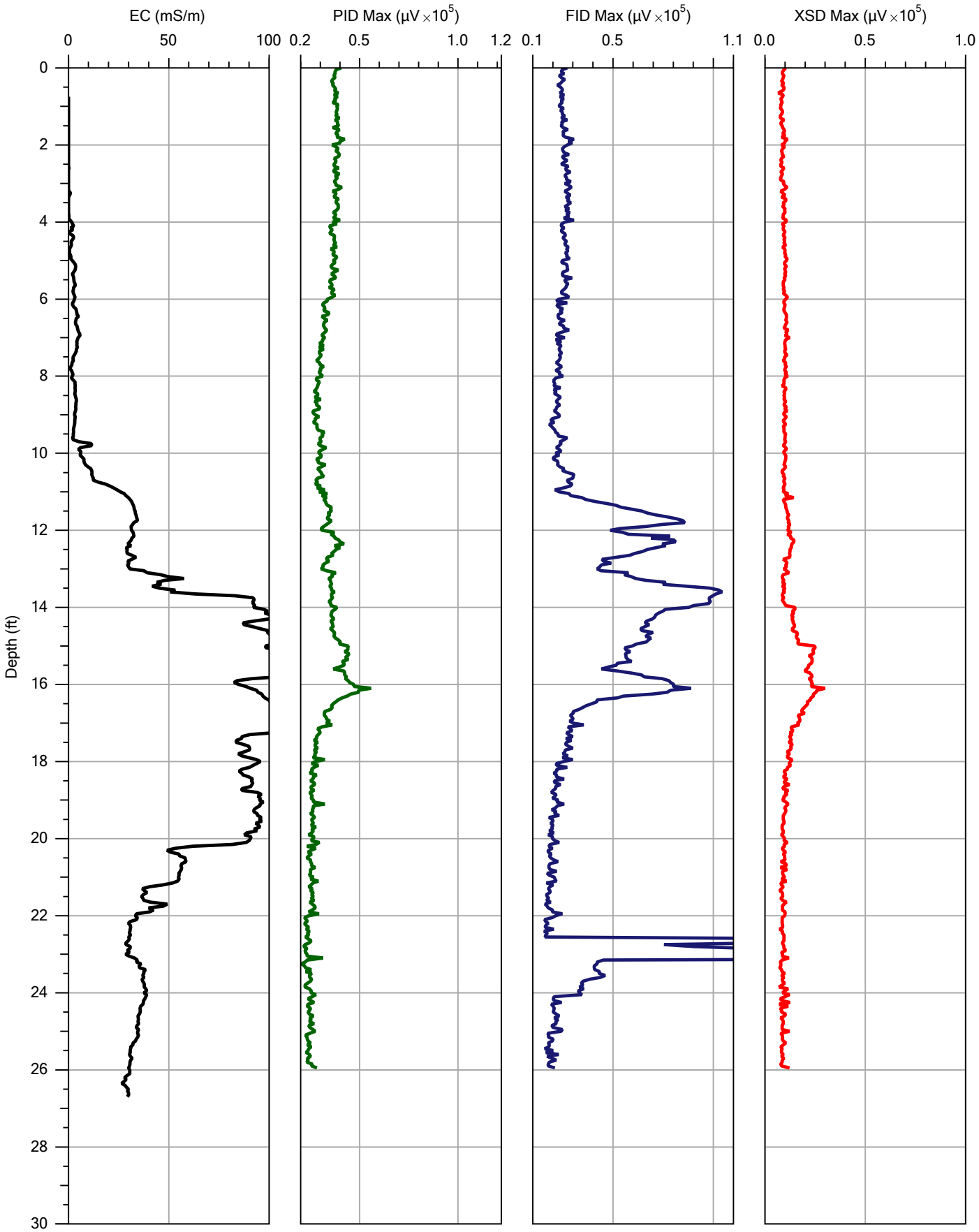

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Company: Matrix Environmental		Operator: M Jenson	Date: 12/10/2014
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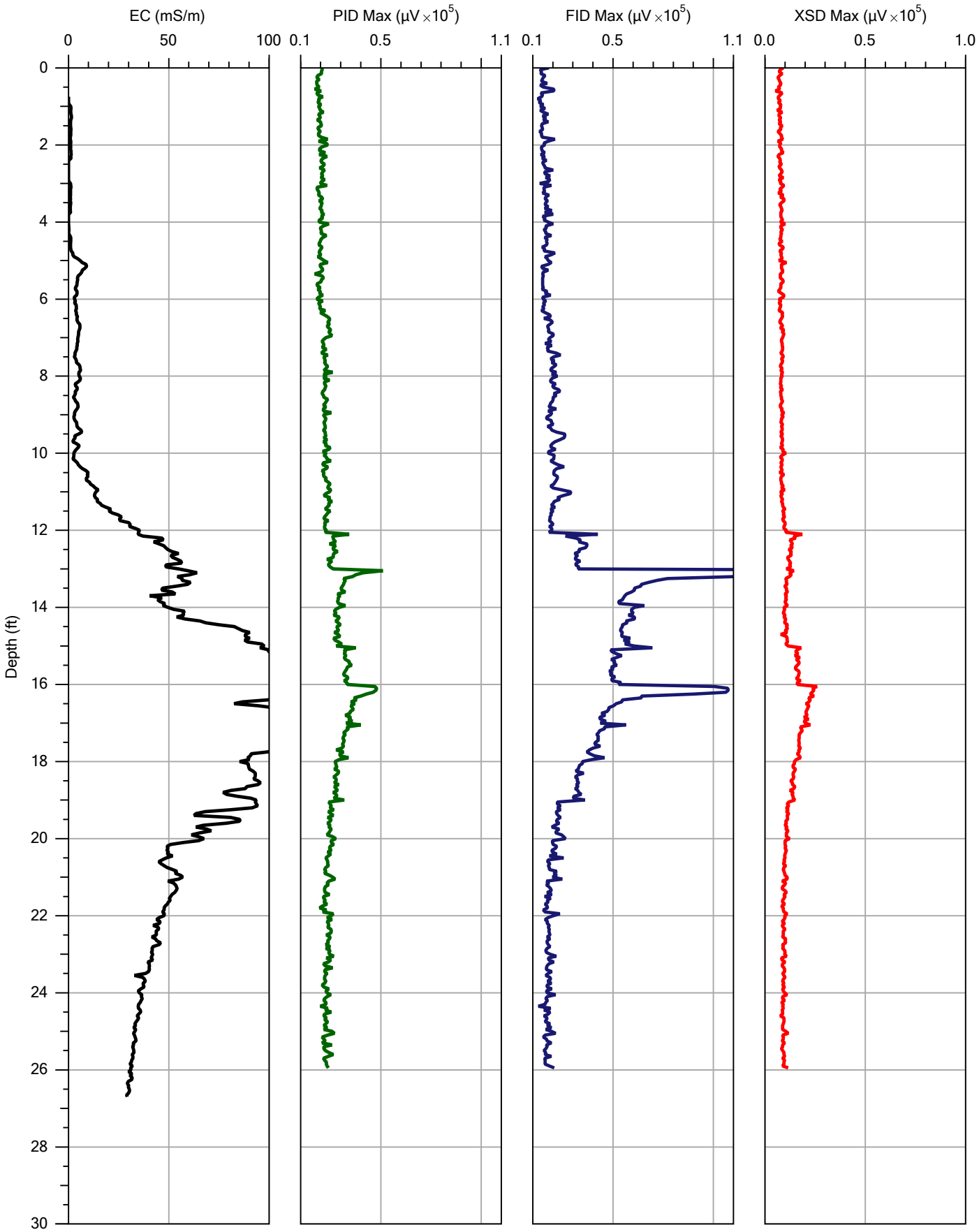

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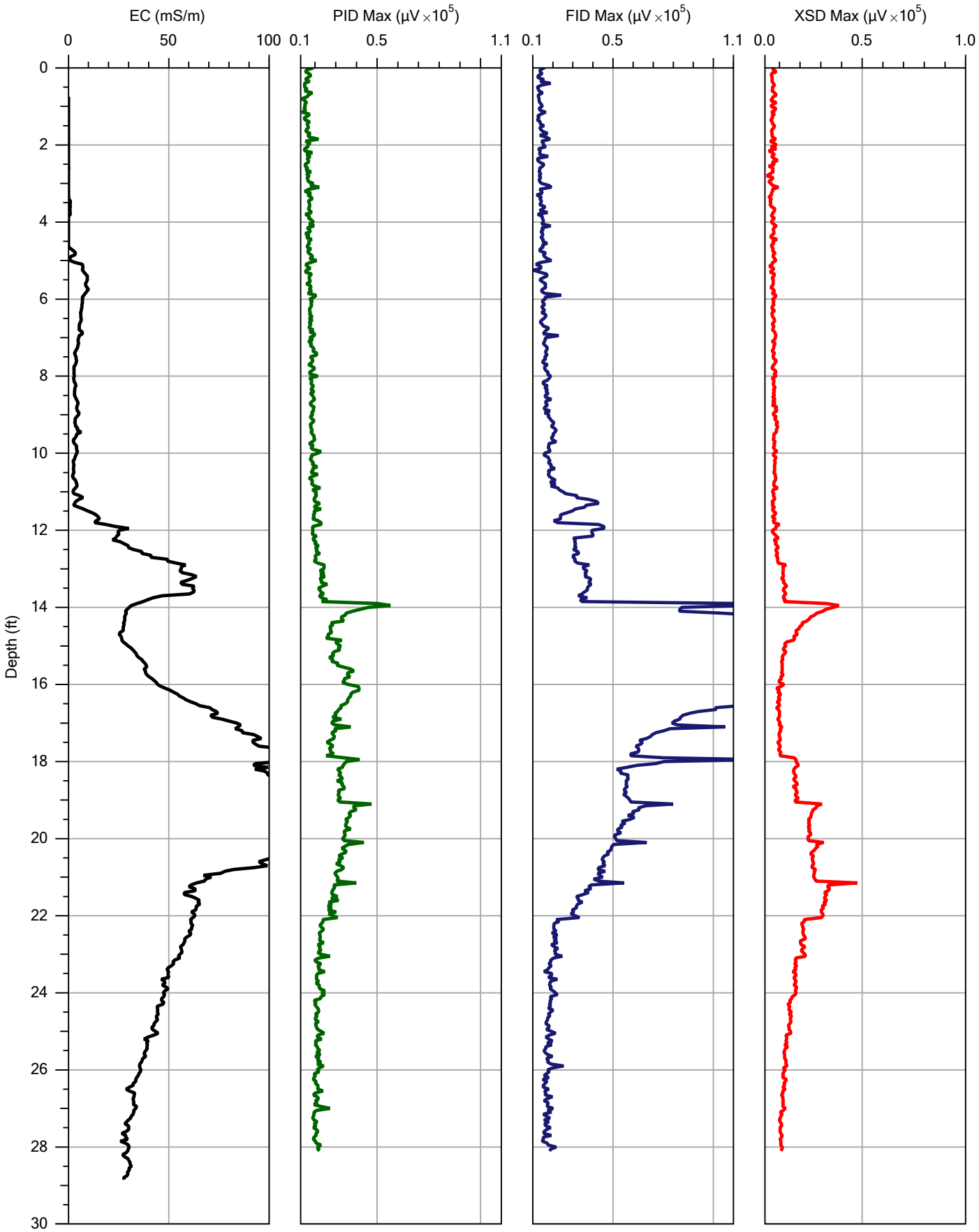
Company: Matrix Environmental		Operator: M Jenson	Date: 12/10/2014
Project ID: 319.14		Client: CRA	Location:



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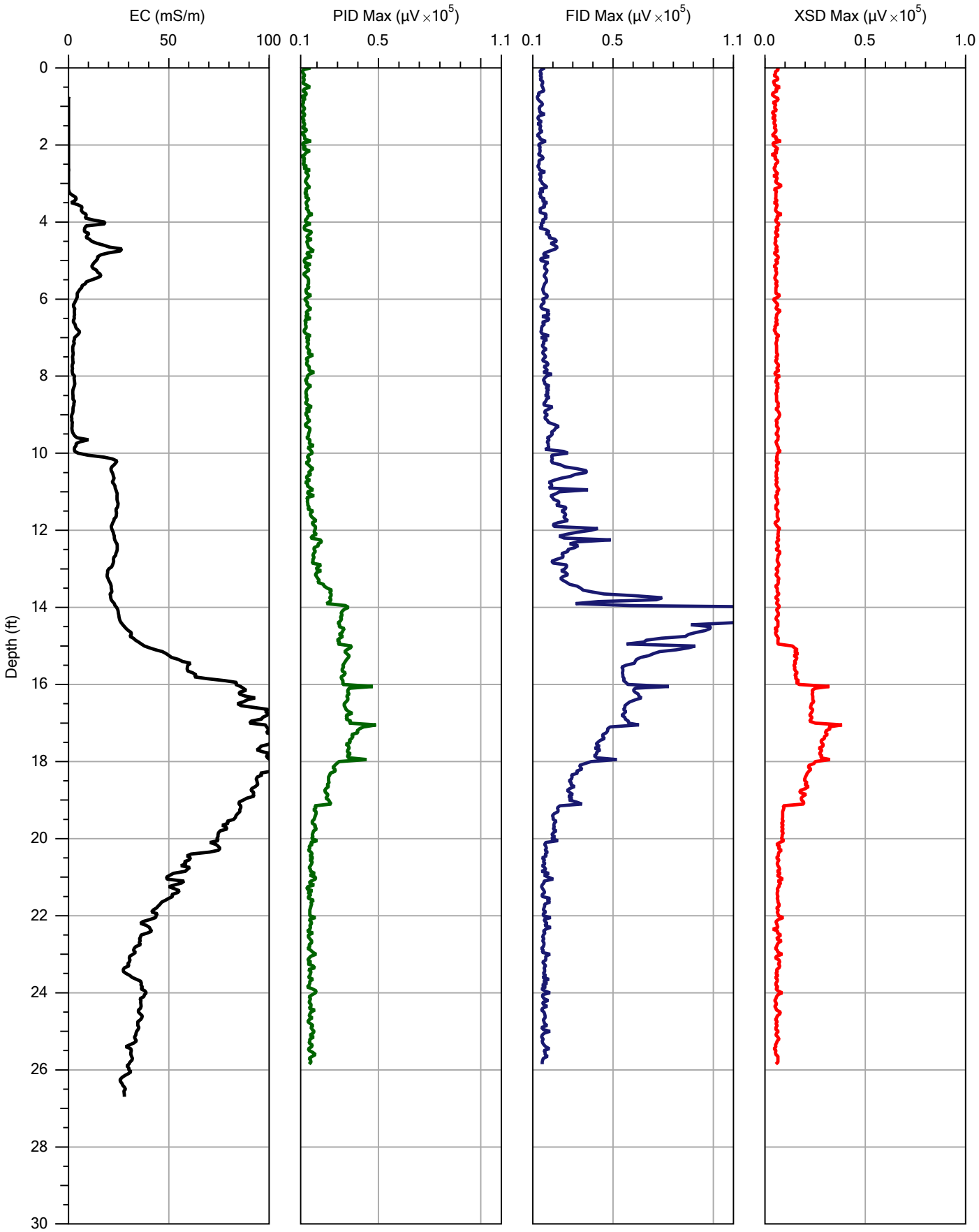
Project ID: 319.14		Client: CRA	Location:



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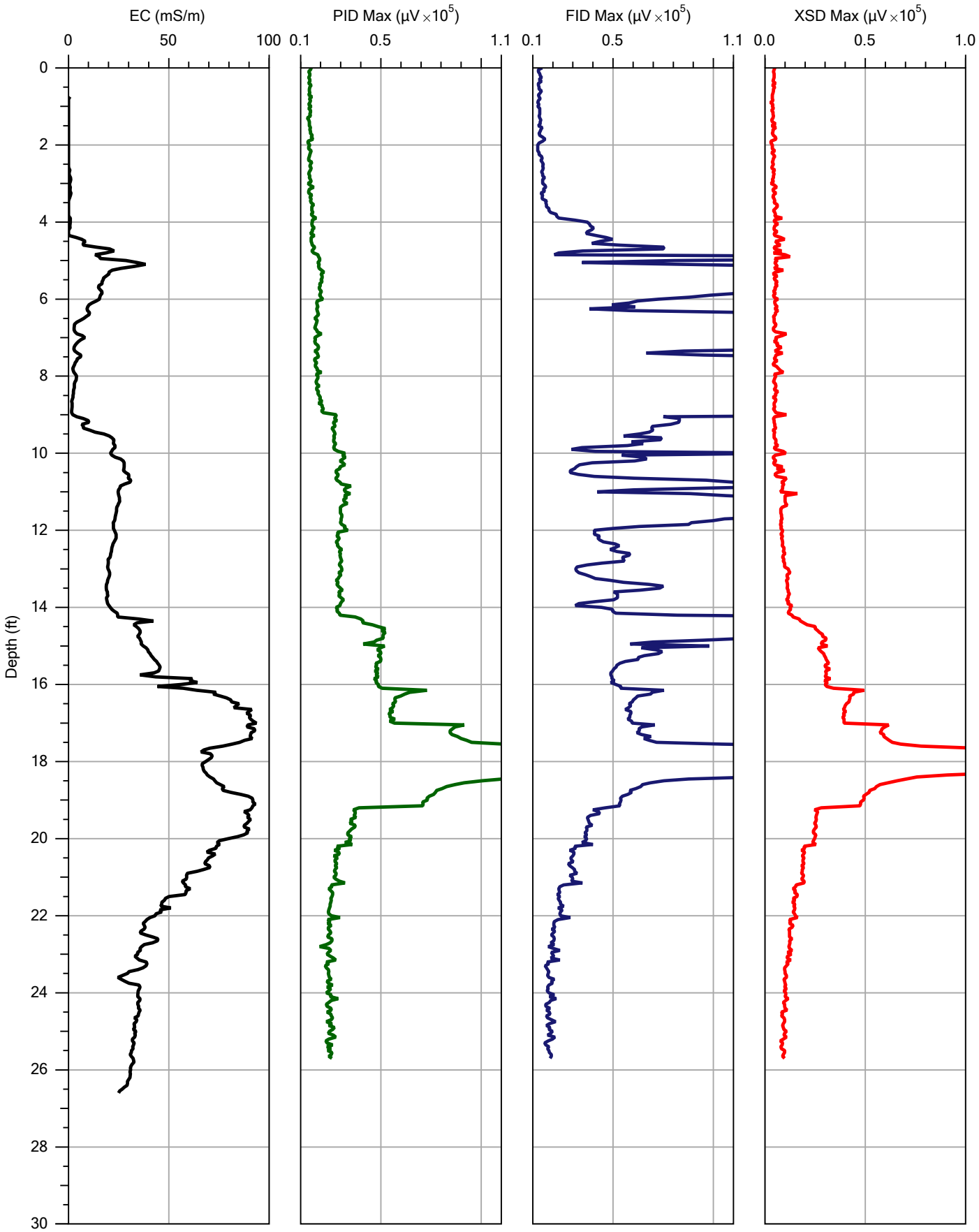
Company: Matrix Environmental		Operator: M Jenson	Date: 12/11/2014
Project ID: 319.14		Client: CRA	Location:



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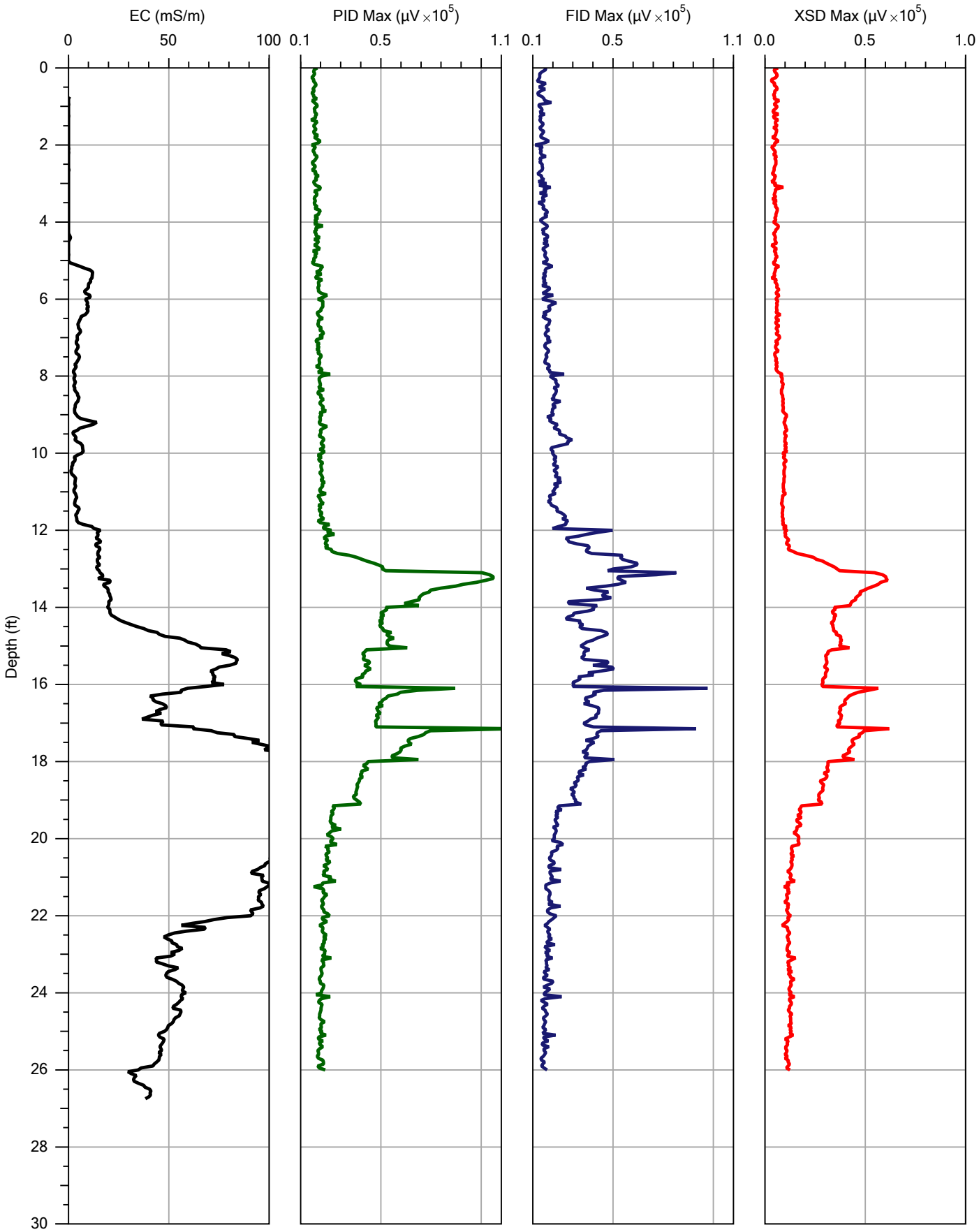
Company: Matrix Environmental		Operator: M Jenson	Date: 12/11/2014
Project ID: 319.14		Client: CRA	Location:



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Company: Matrix Environmental		Operator: M Jenson	Date: 12/11/2014
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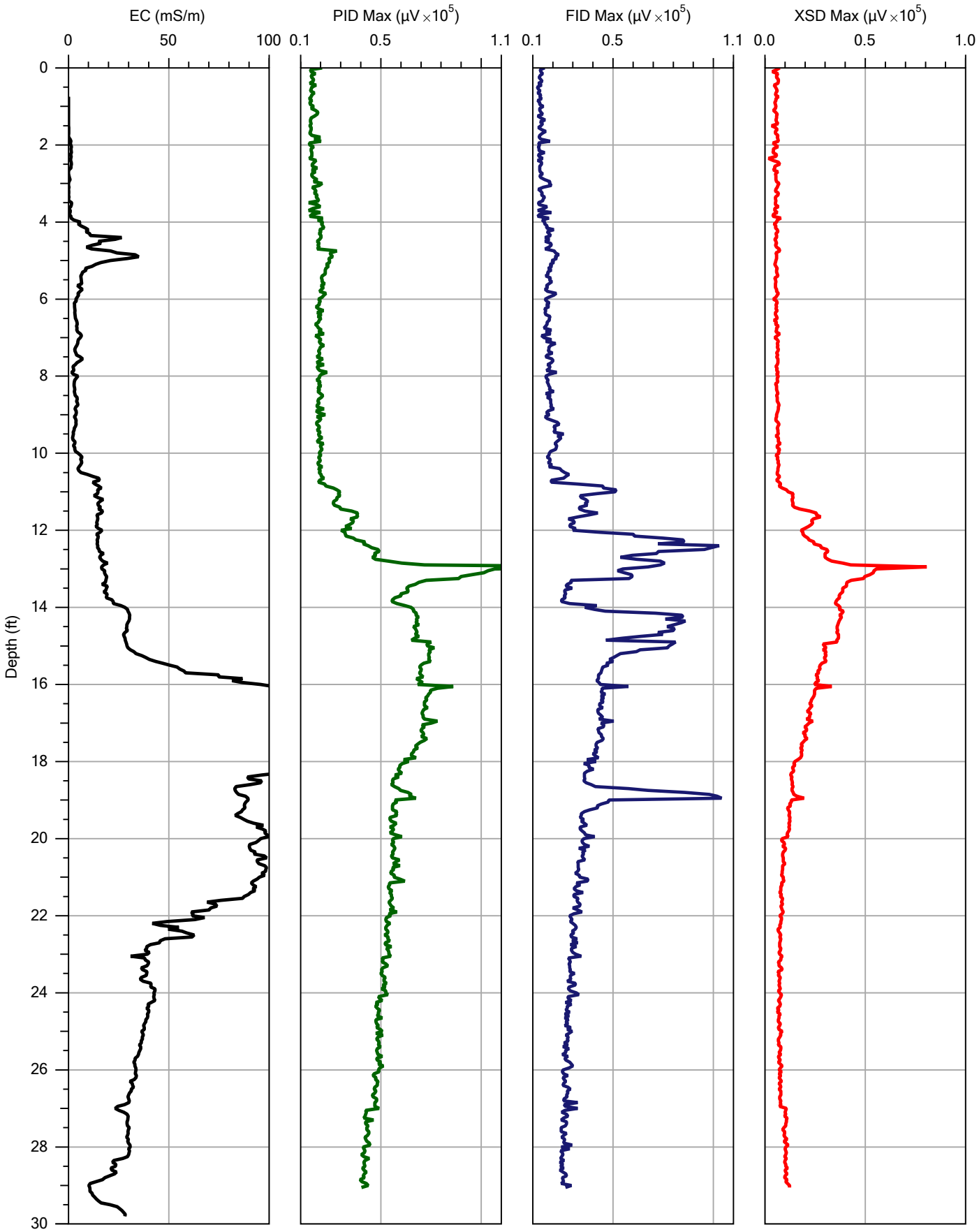

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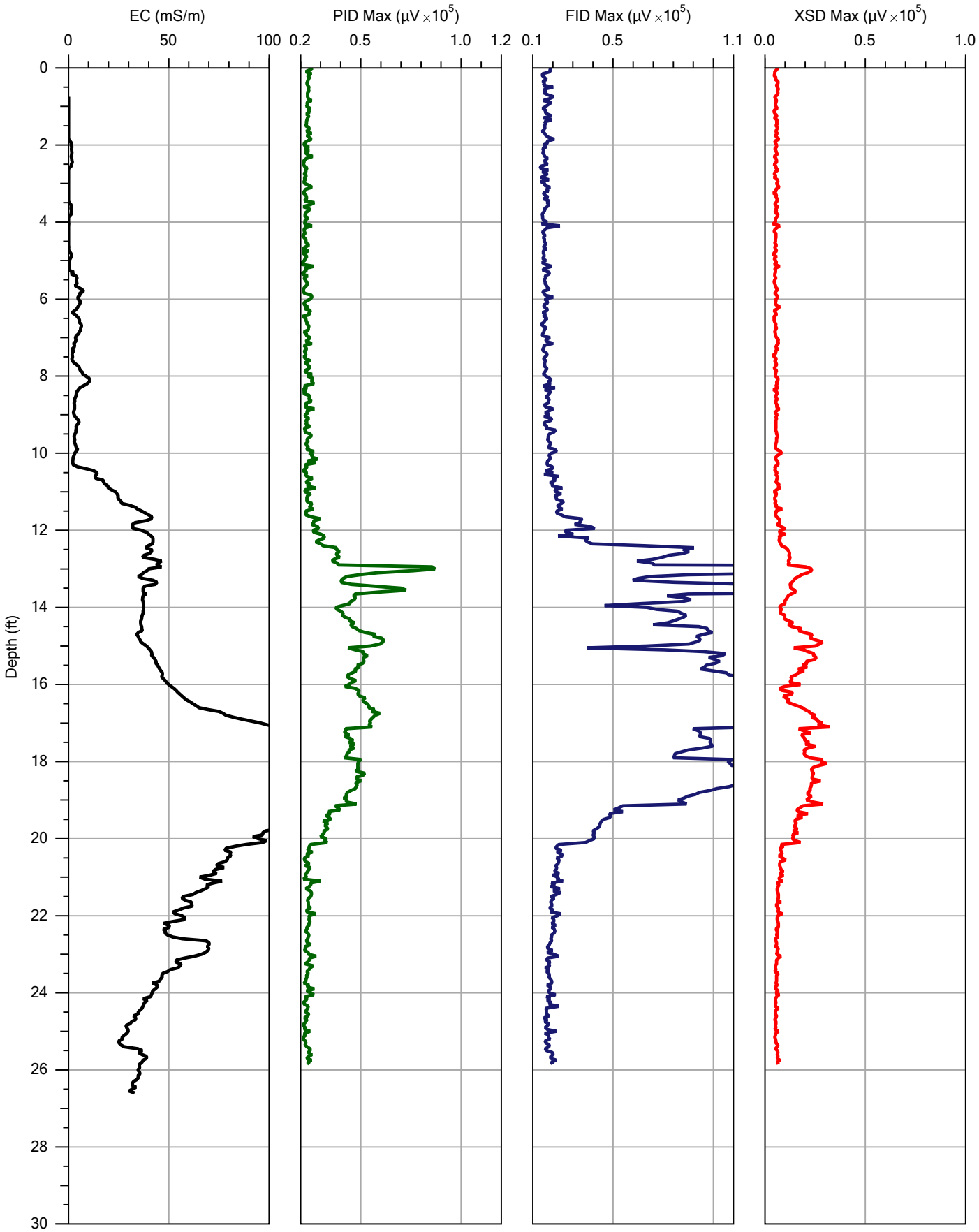

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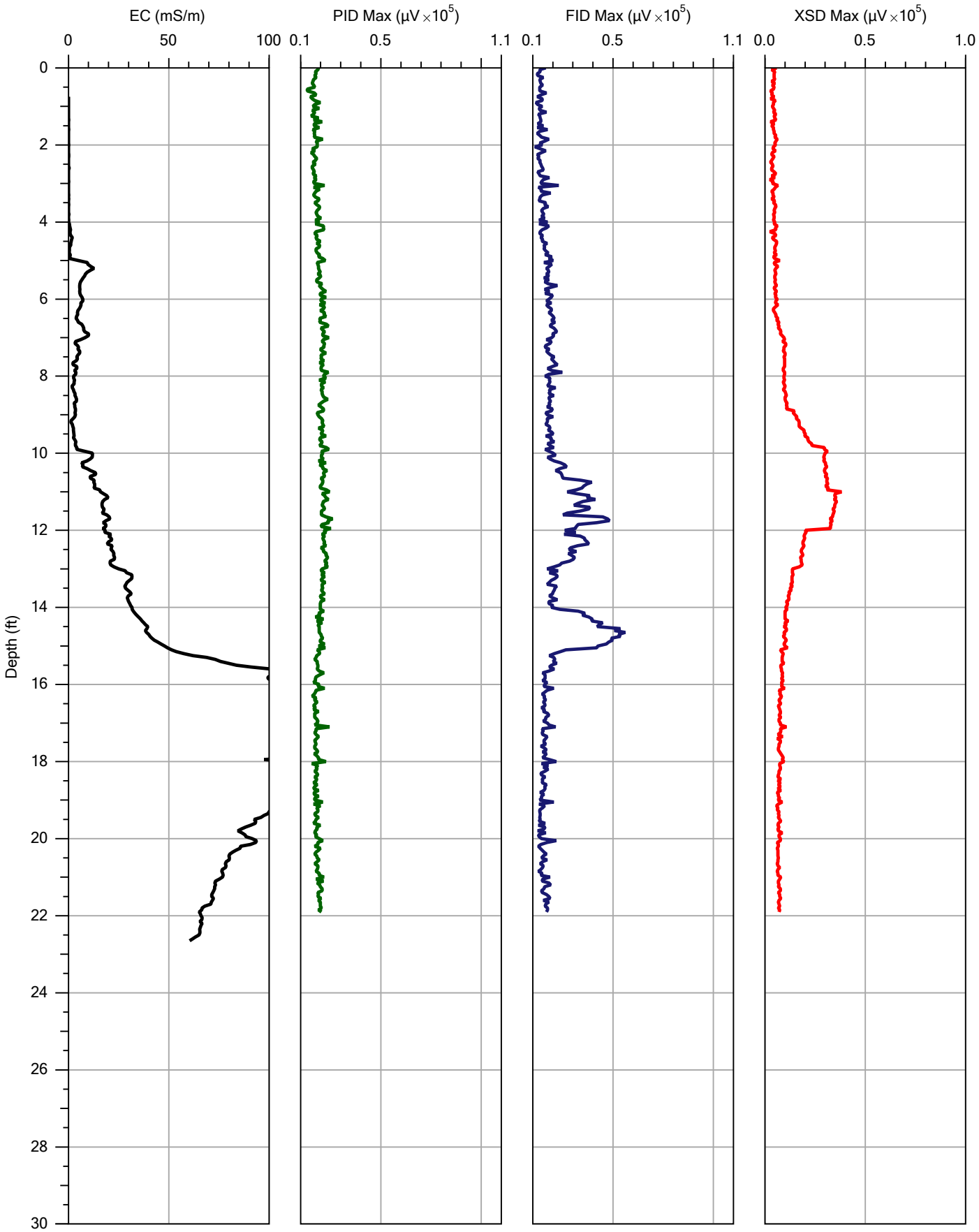

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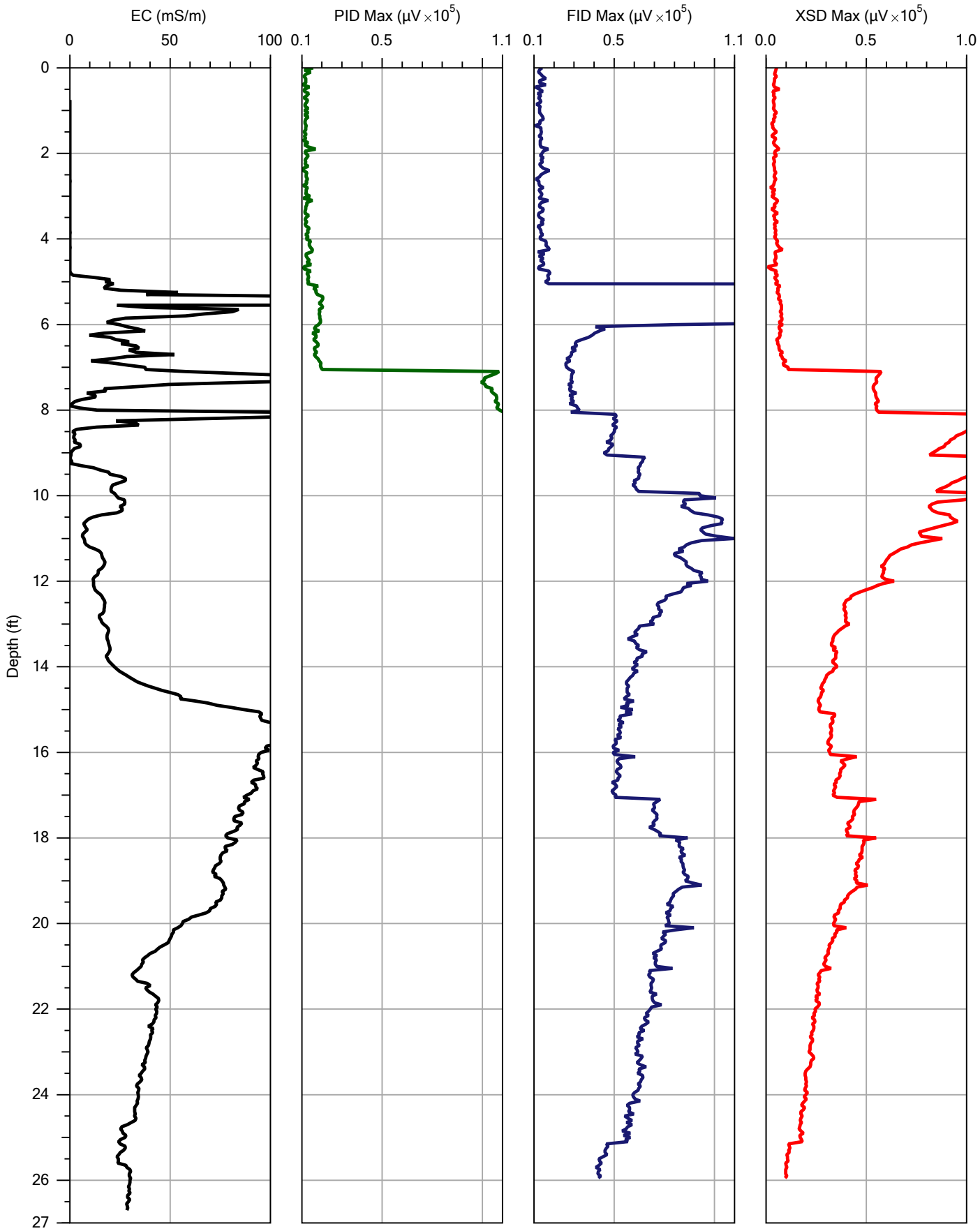

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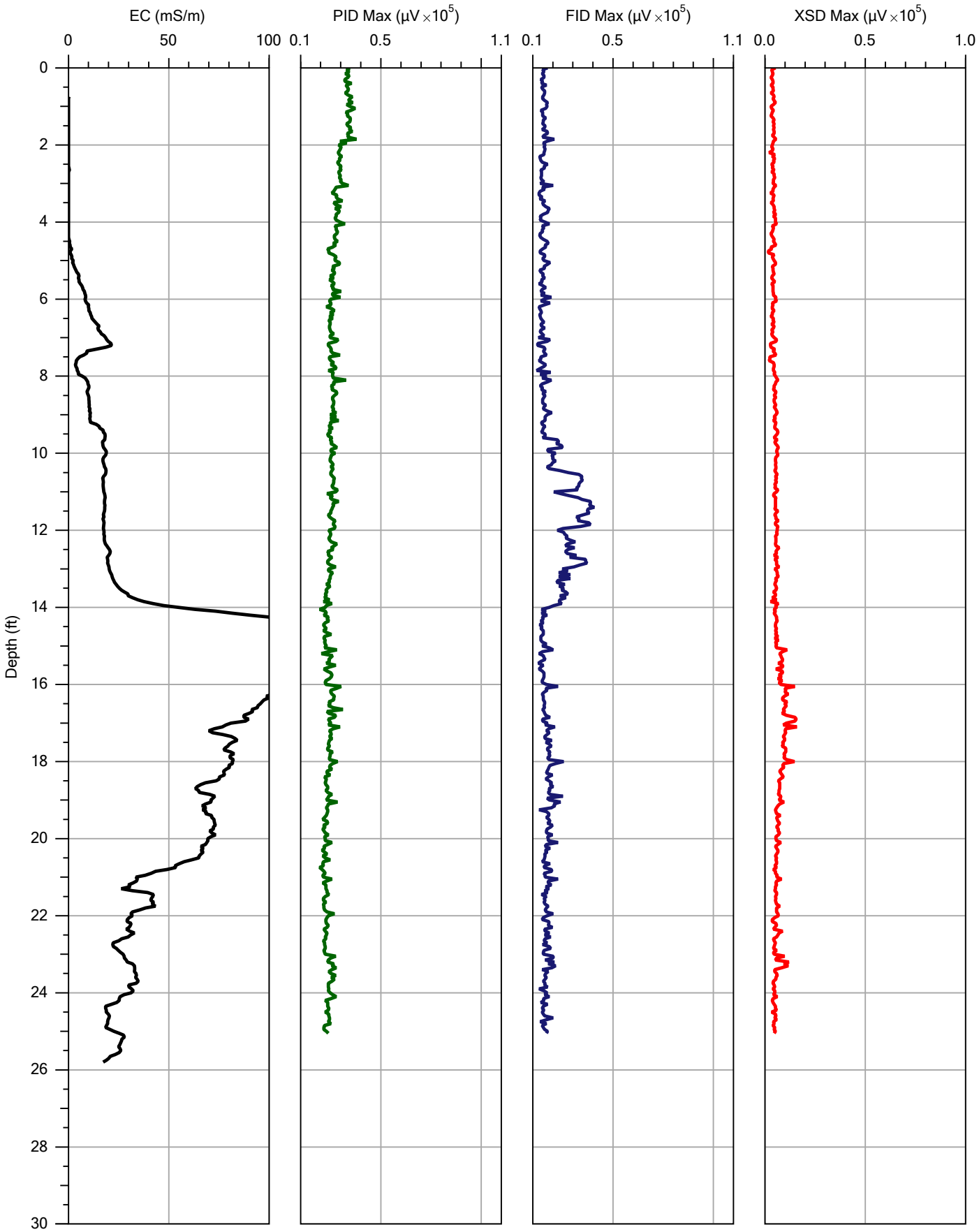

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Company: Matrix Environmental	Operator: M Jenson	Date: 12/12/2014
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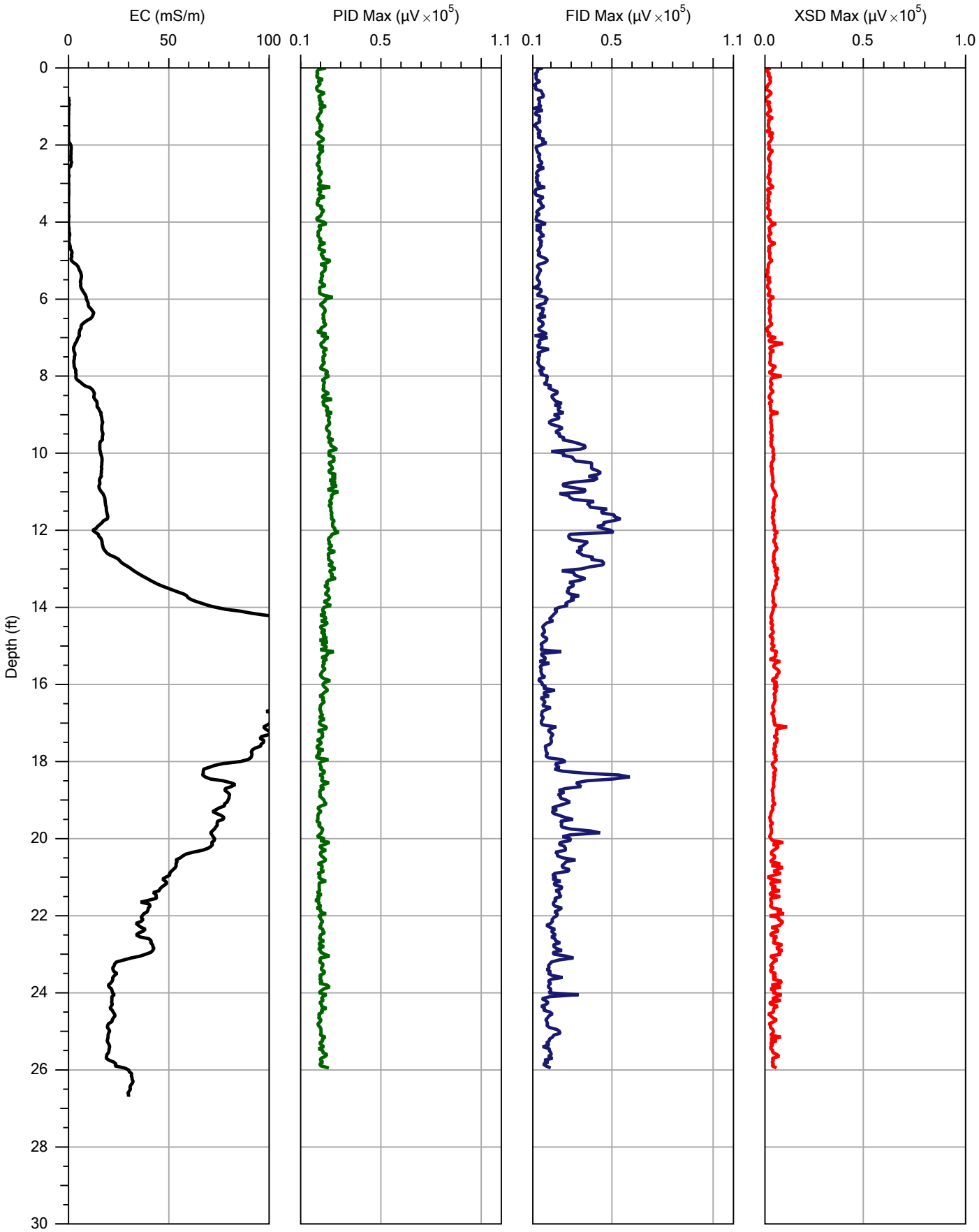

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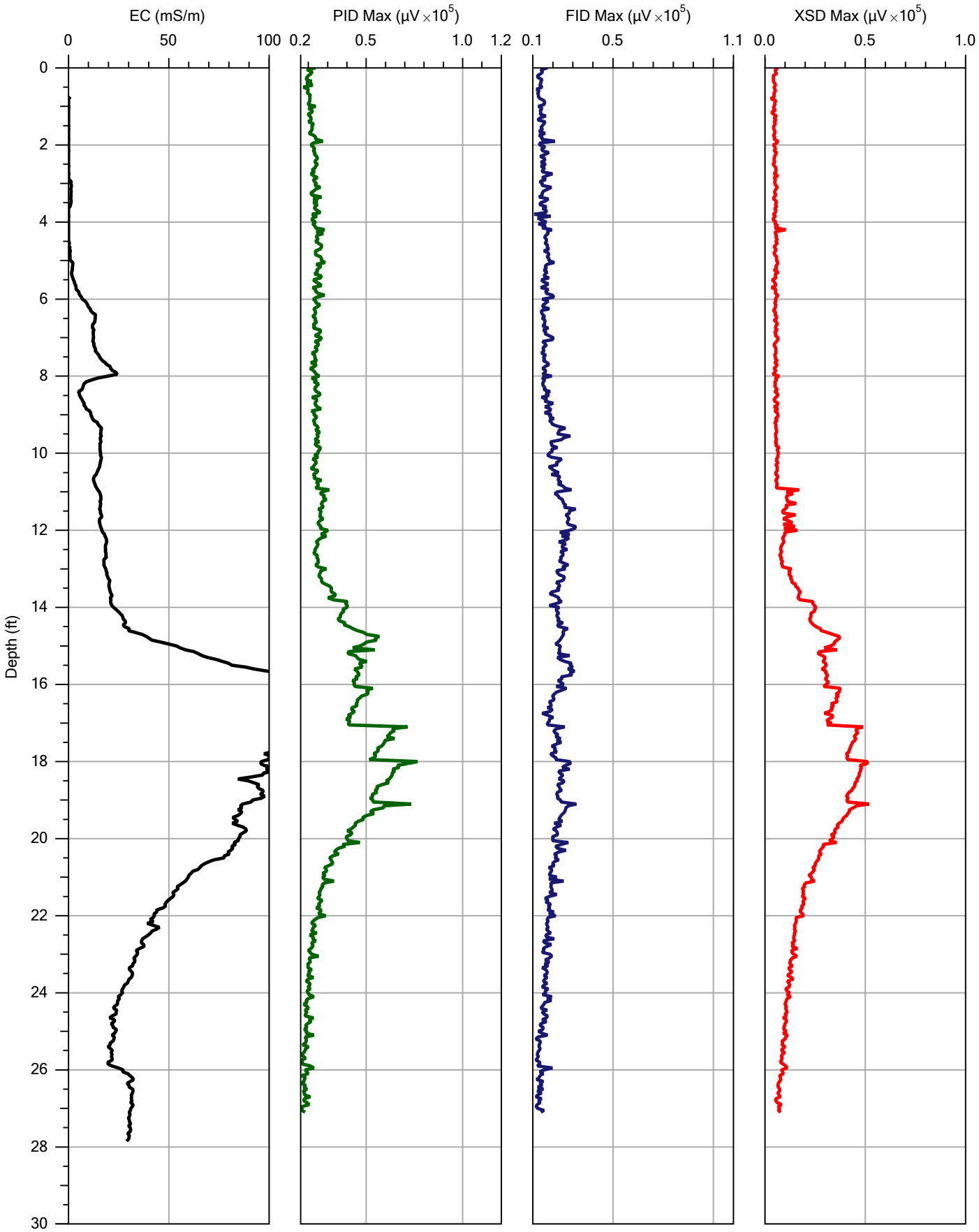

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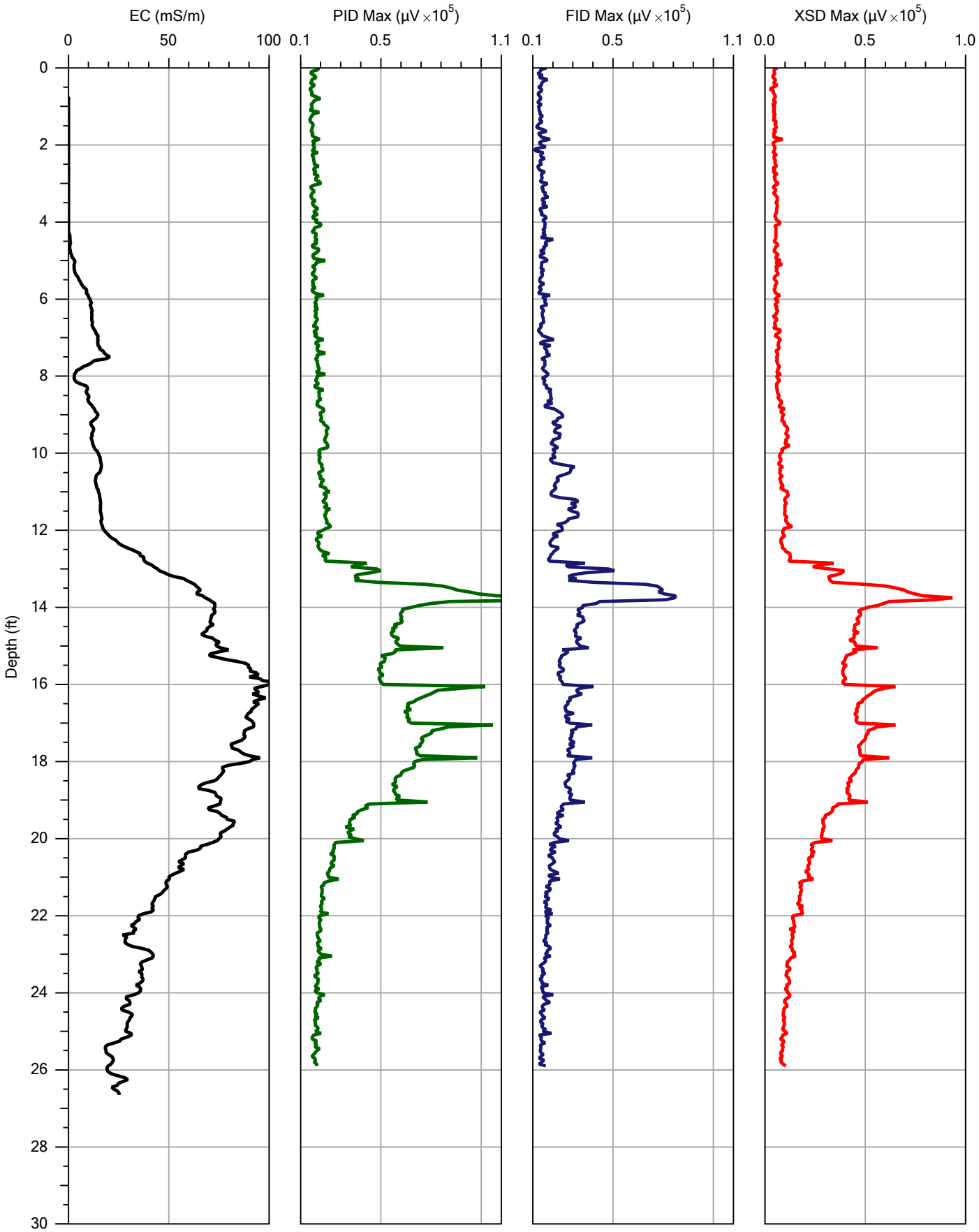

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Company: Matrix Environmental		Operator: M Jenson	Date: 12/15/2014
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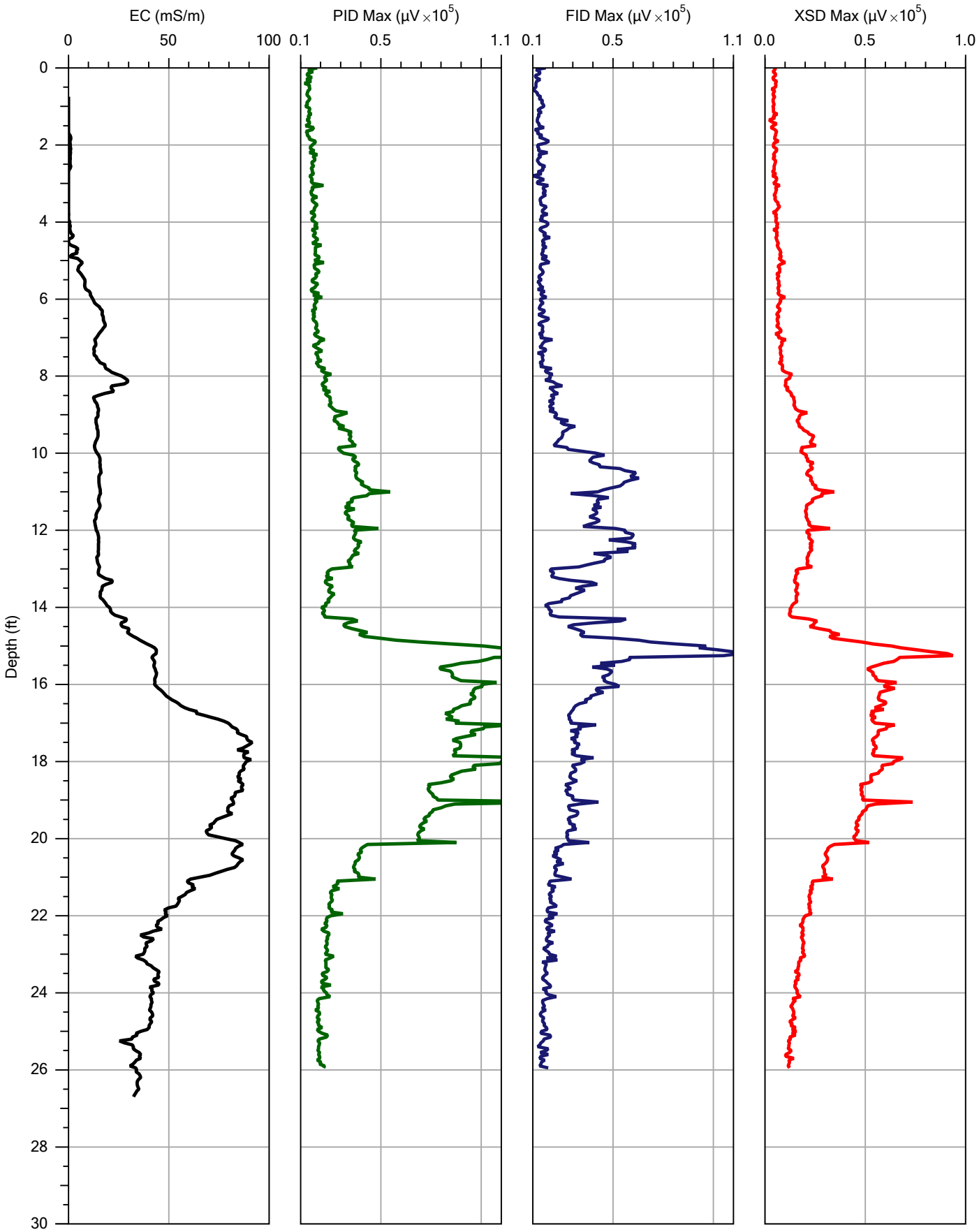

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Company: Matrix Environmental		Operator: M Jenson	Date: 12/15/2014
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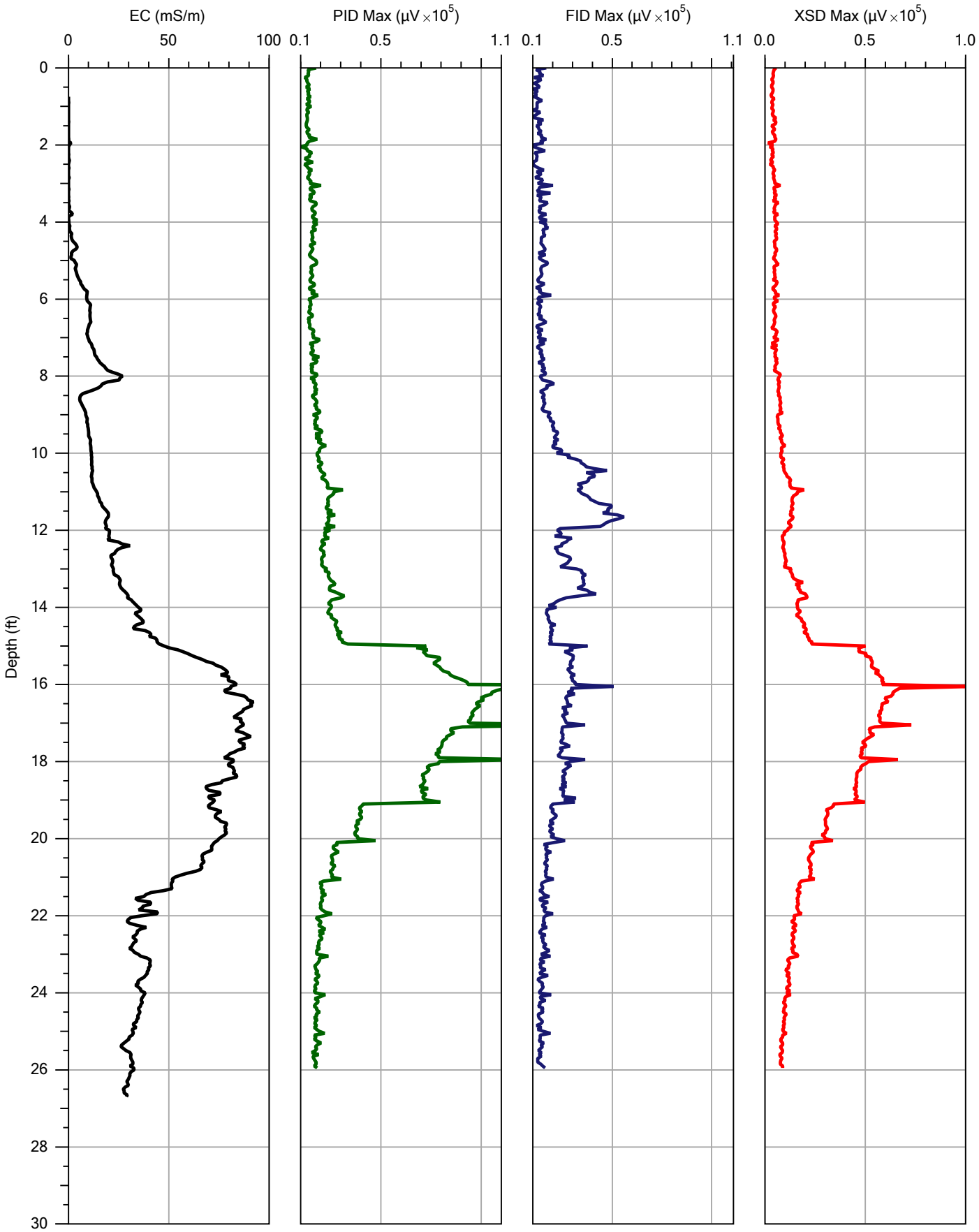

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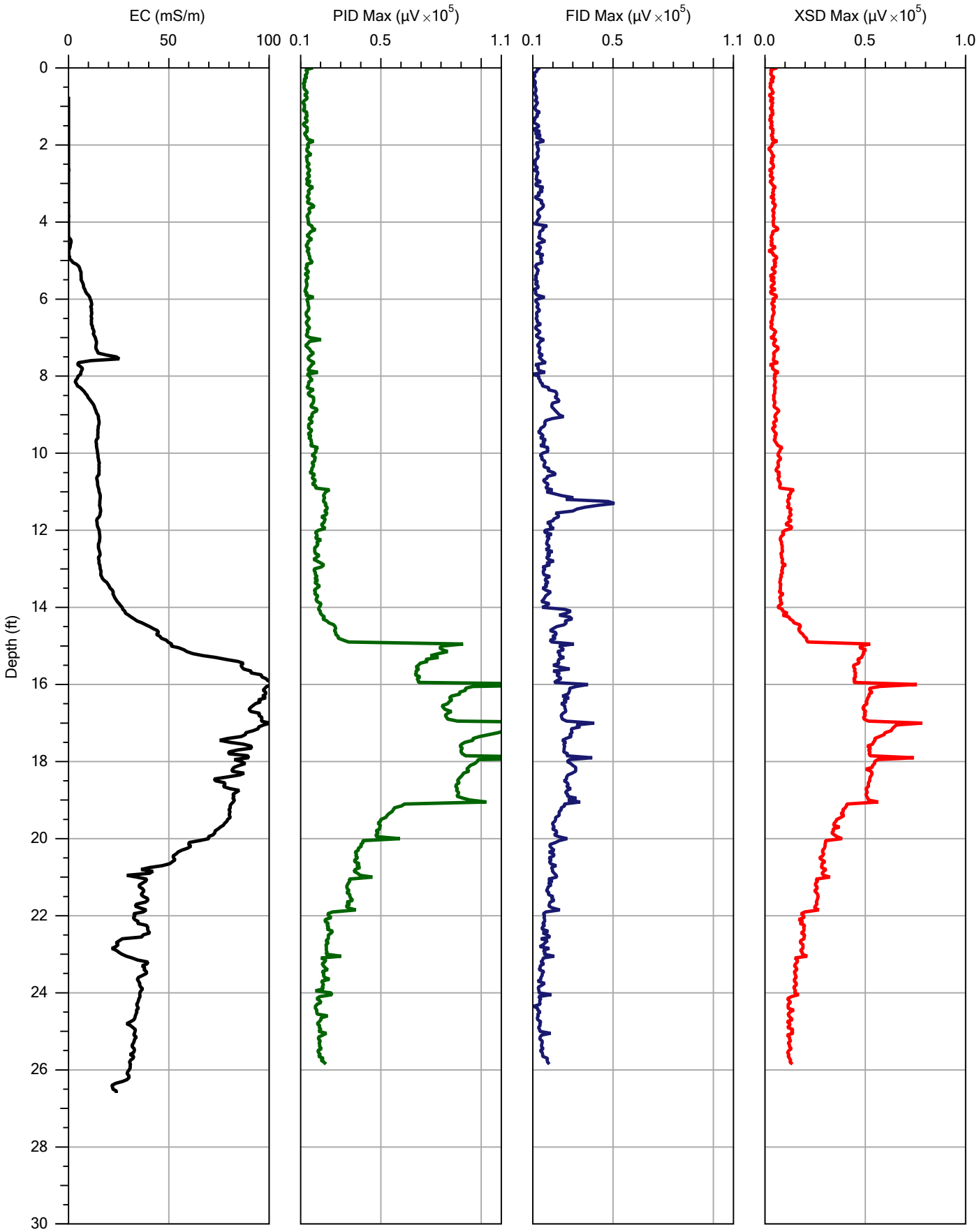
Company: Matrix Environmental		Operator: M Jenson	Date: 12/15/2014
Project ID: 319.14		Client: CRA	Location:



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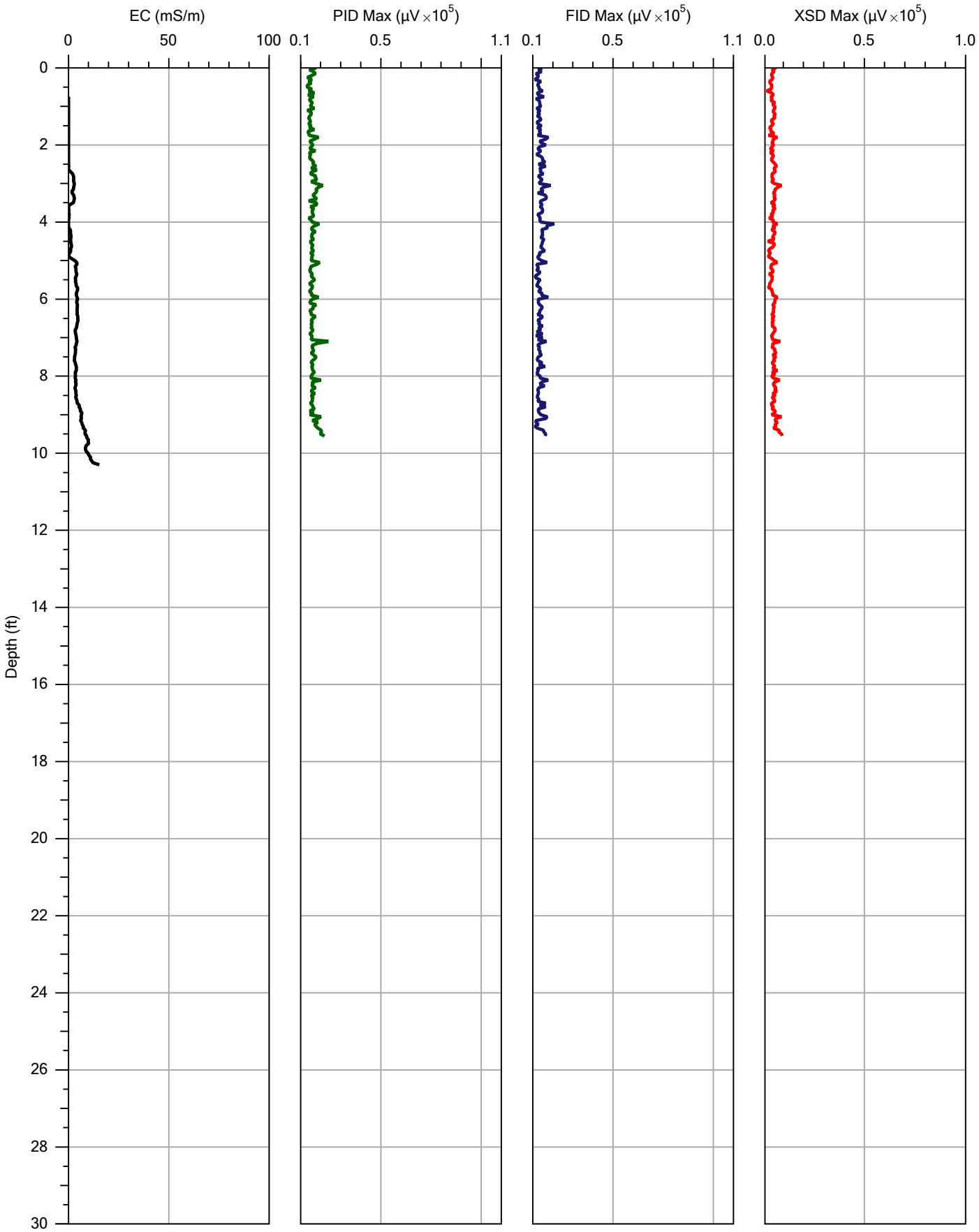

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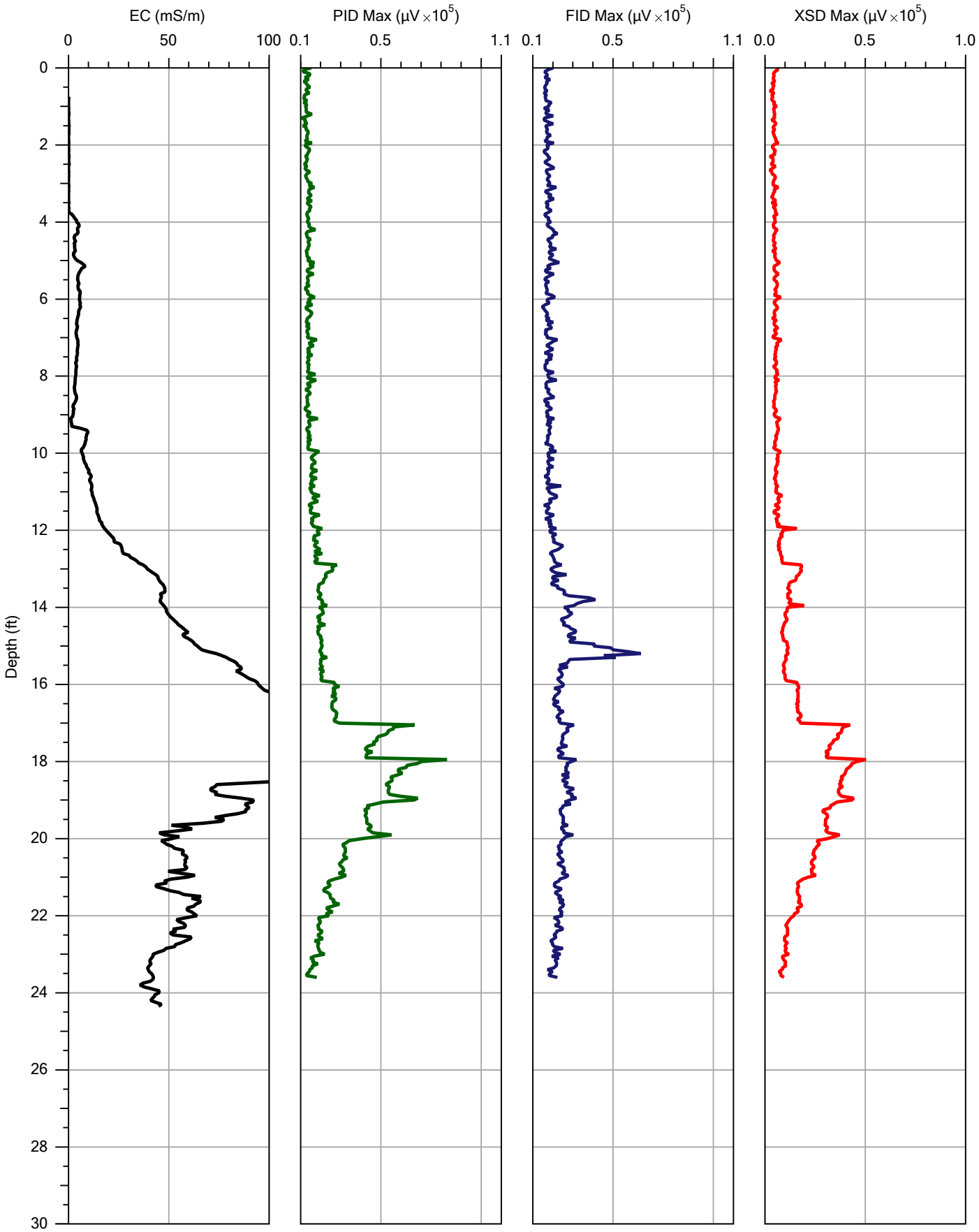

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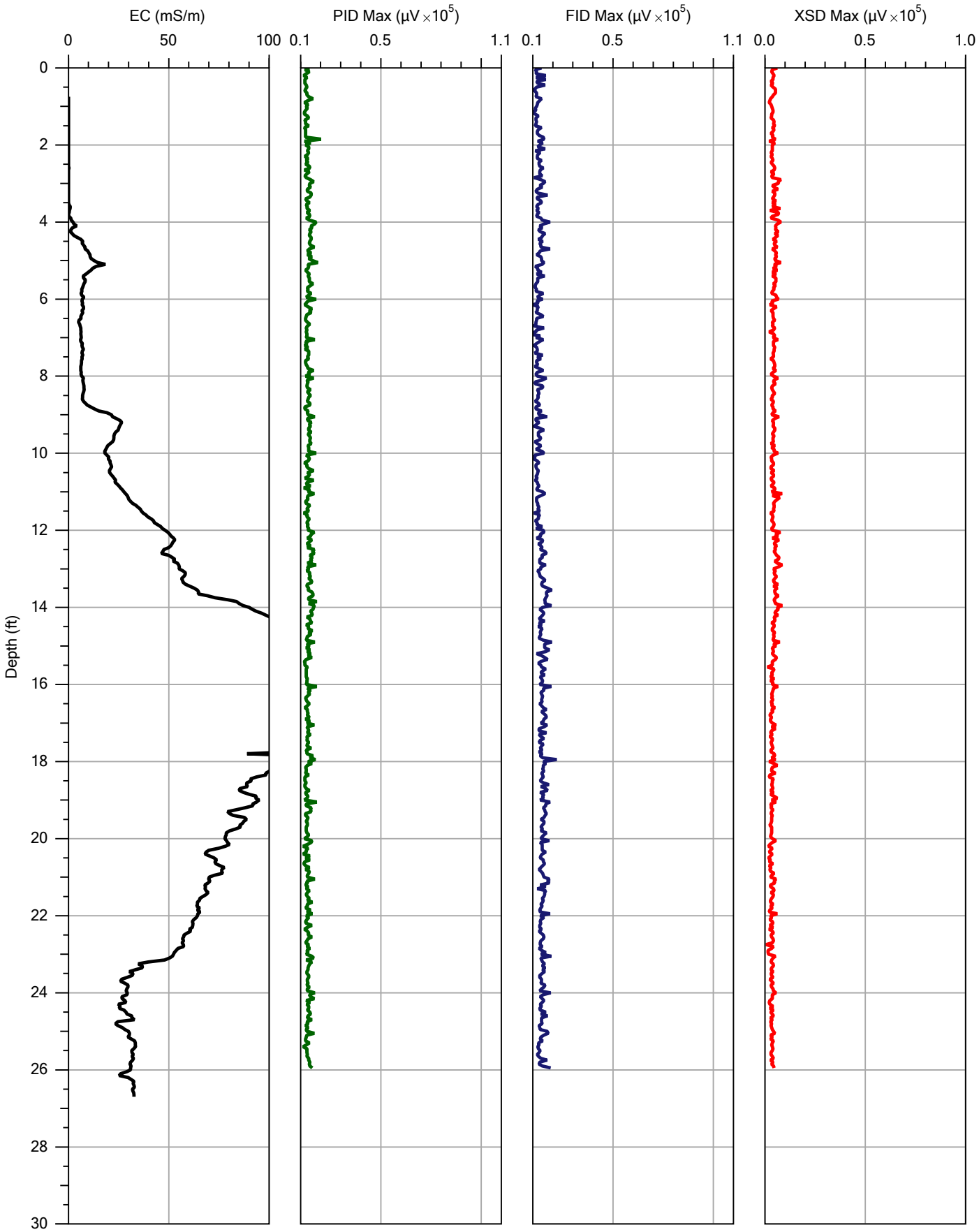
Company: Matrix Environmental		Operator: M Jenson	Date: 12/16/2014
Project ID: 139.14		Client: CRA	Location:



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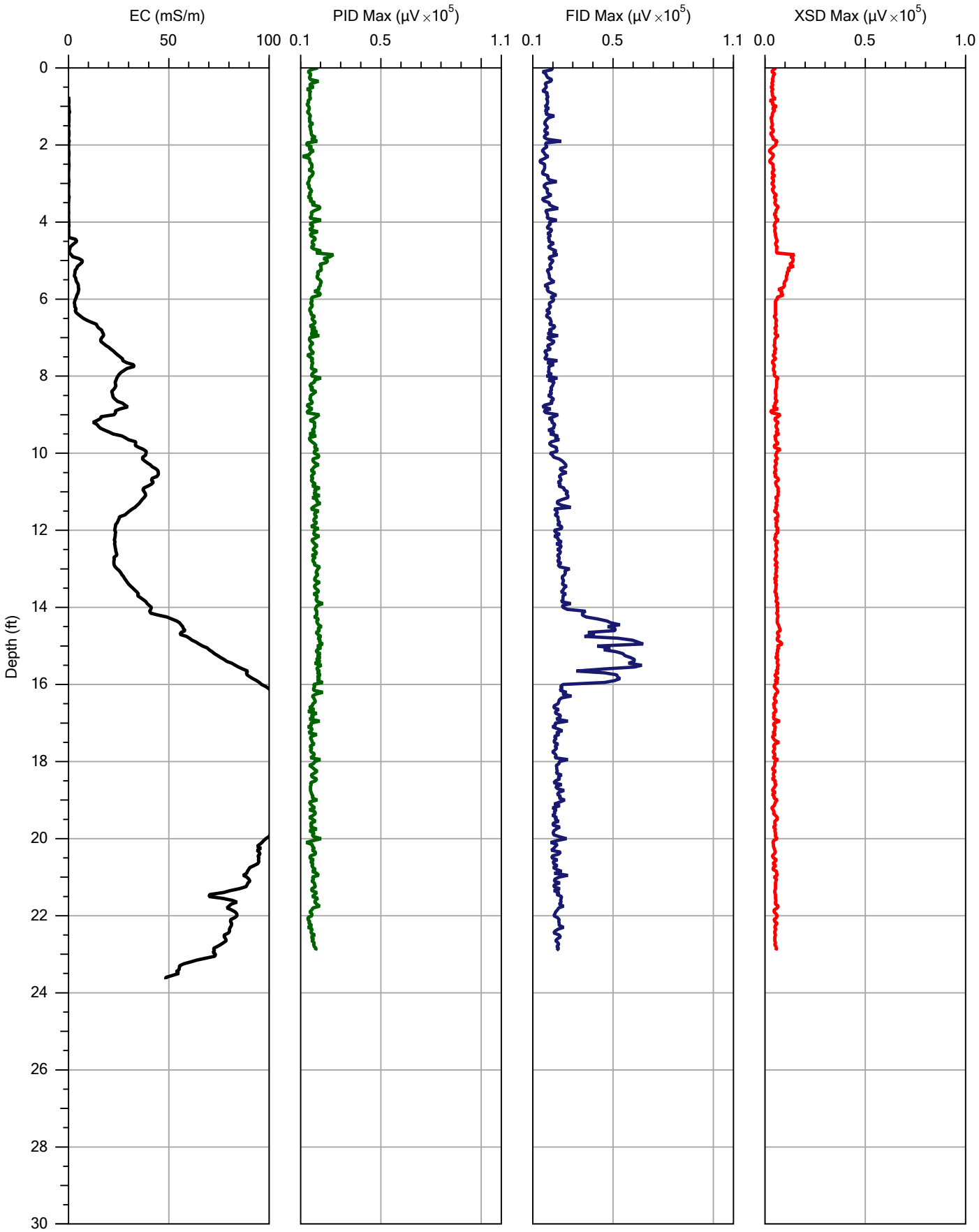

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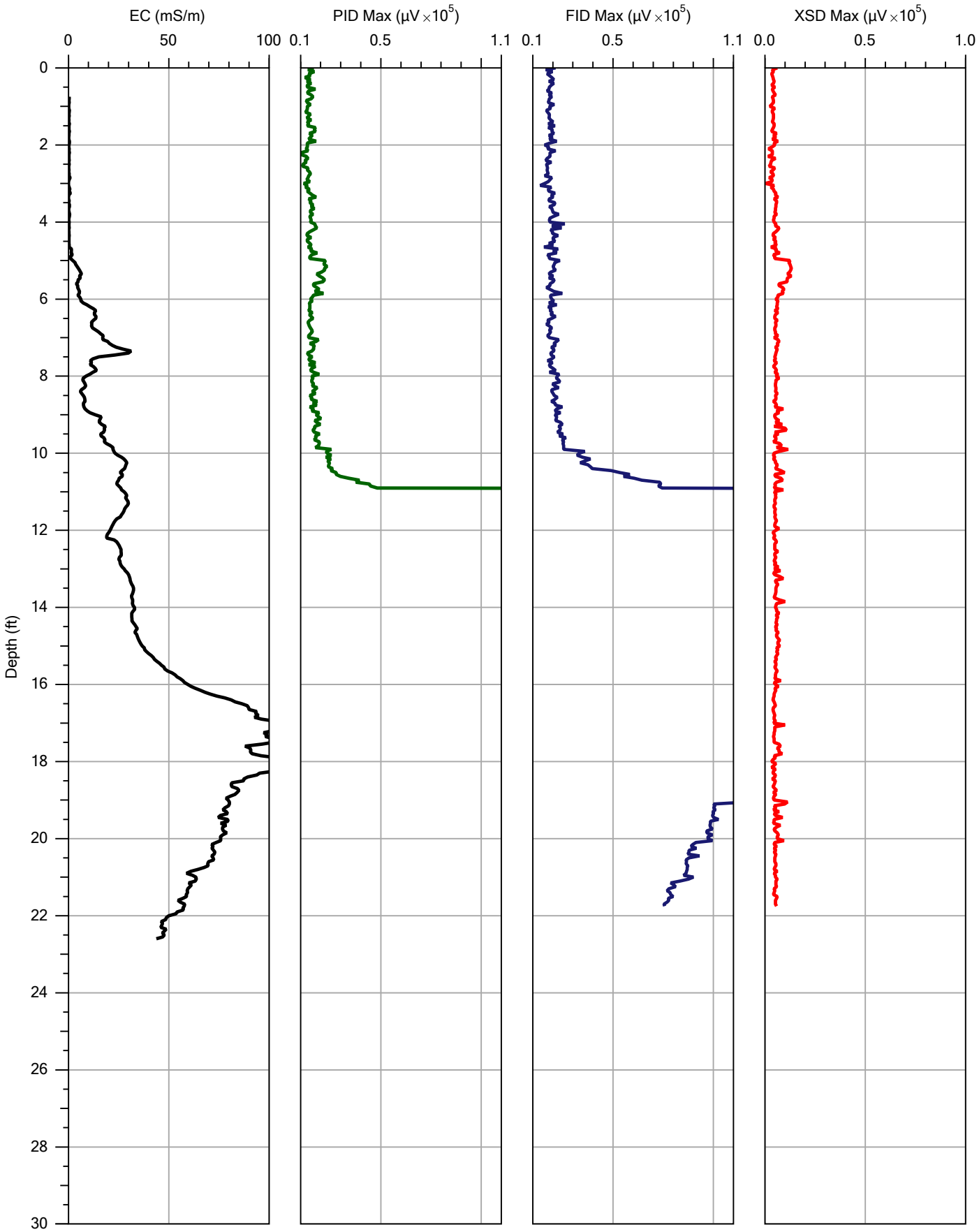

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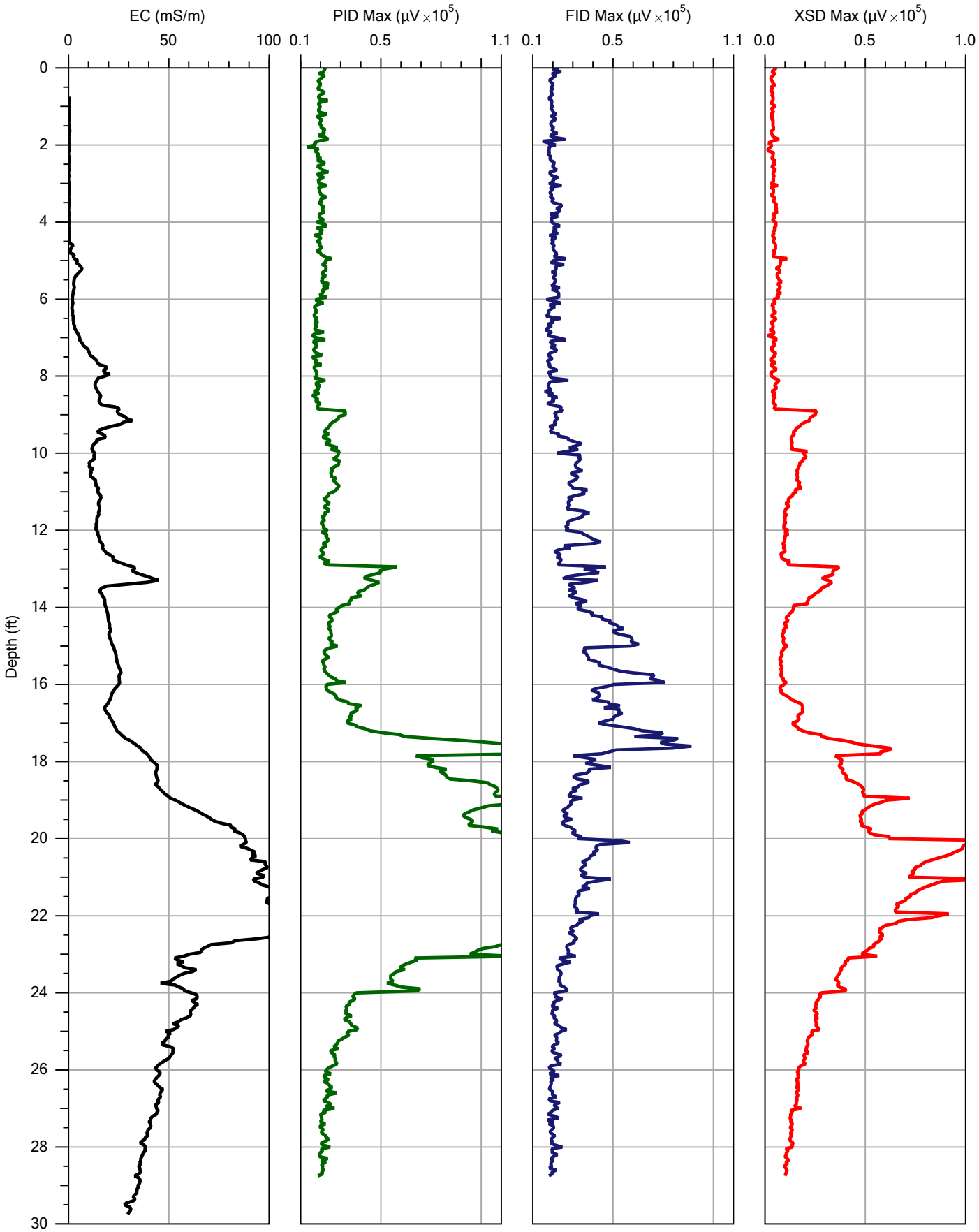

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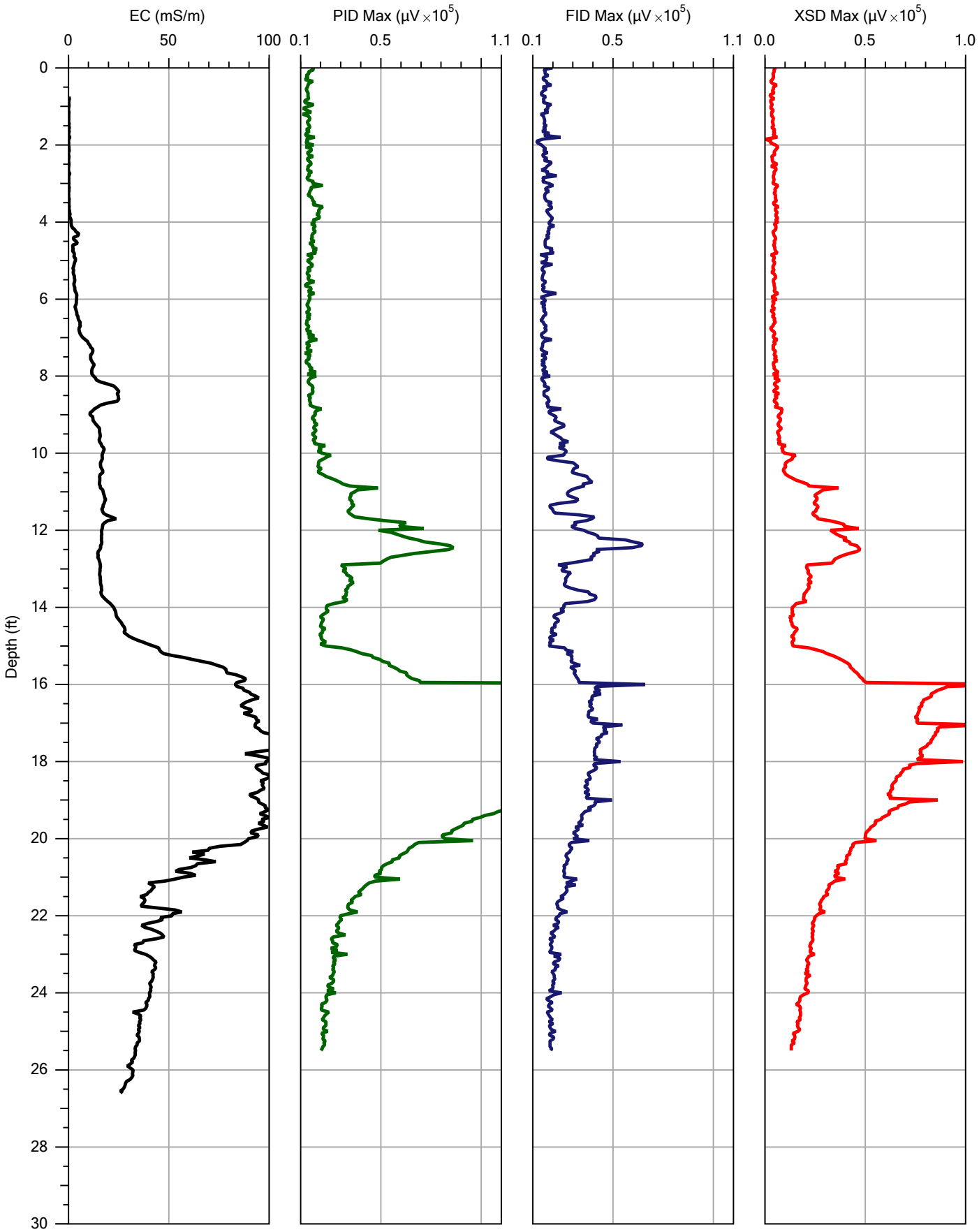

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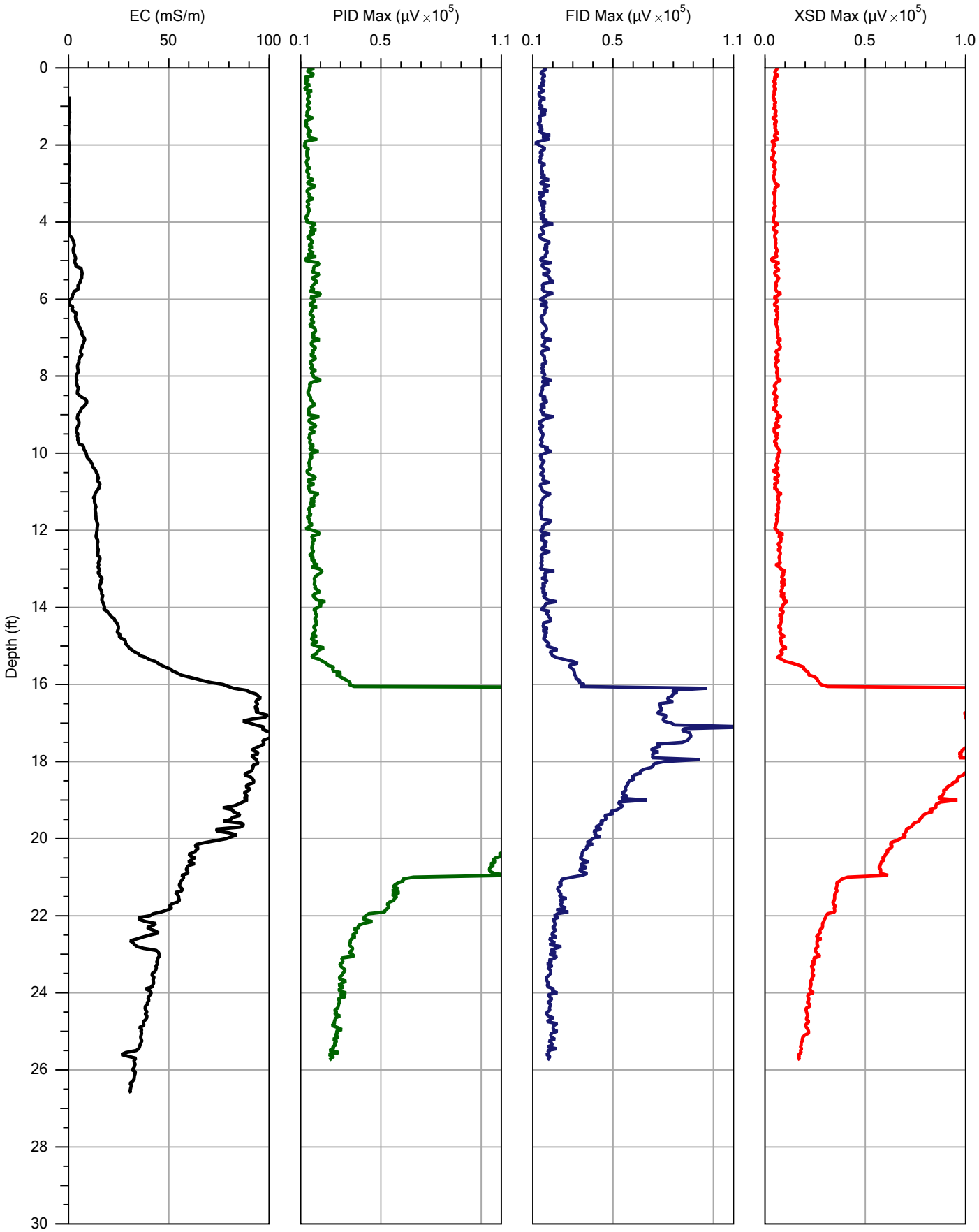
Project ID: 139.14		Client: CRA	Location:



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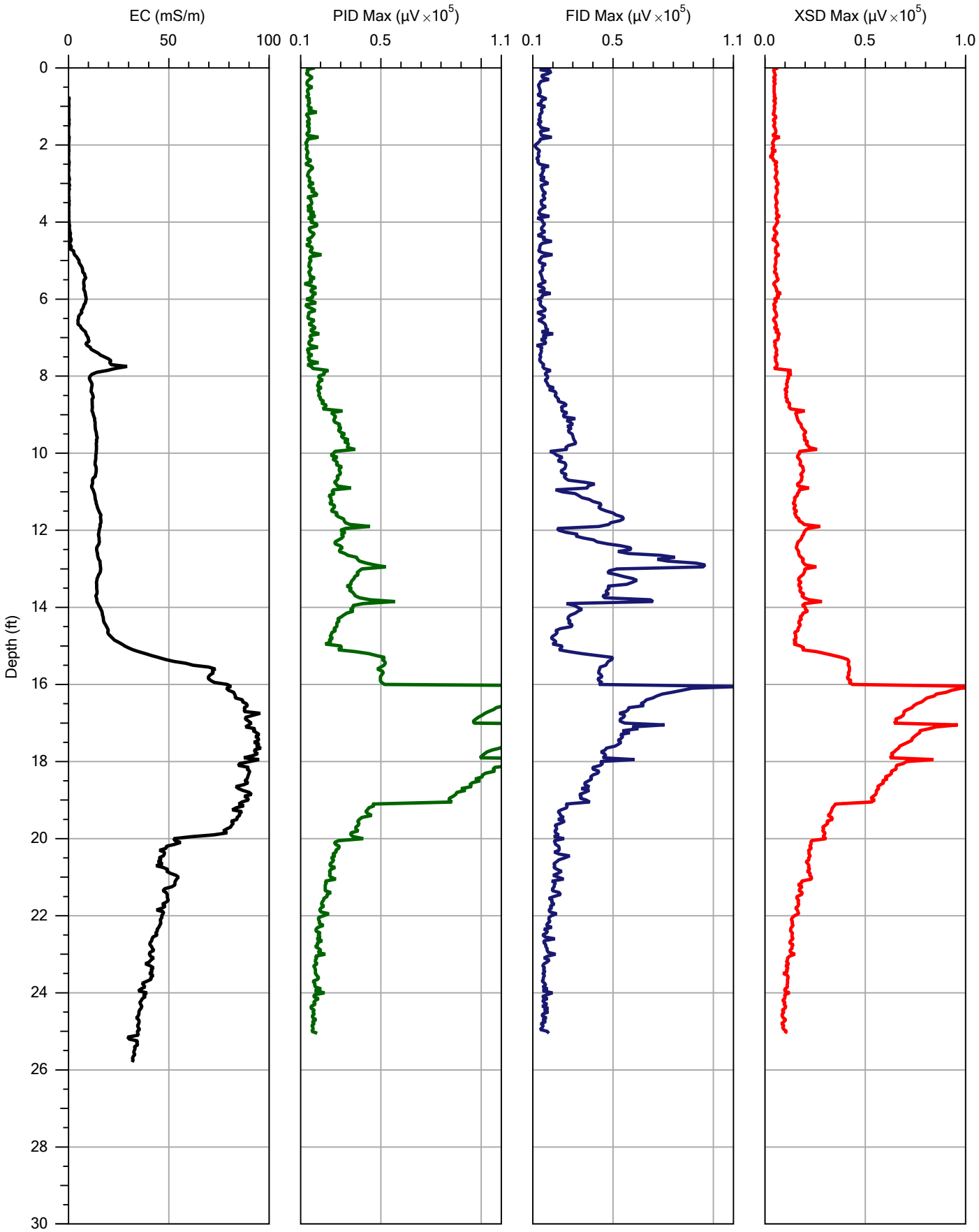

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Company: Matrix Environmental		Operator: M Jenson	Date: 12/16/2014
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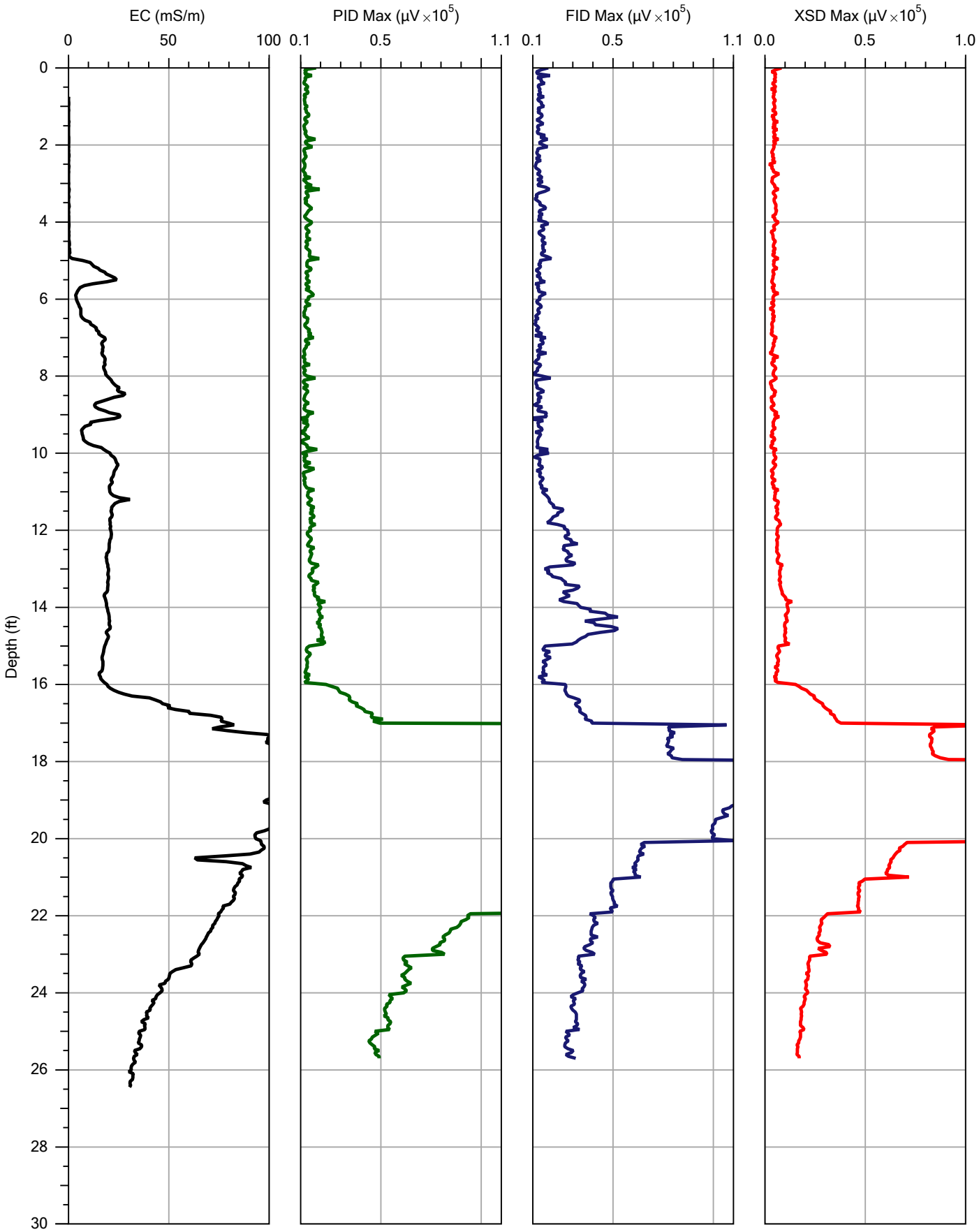

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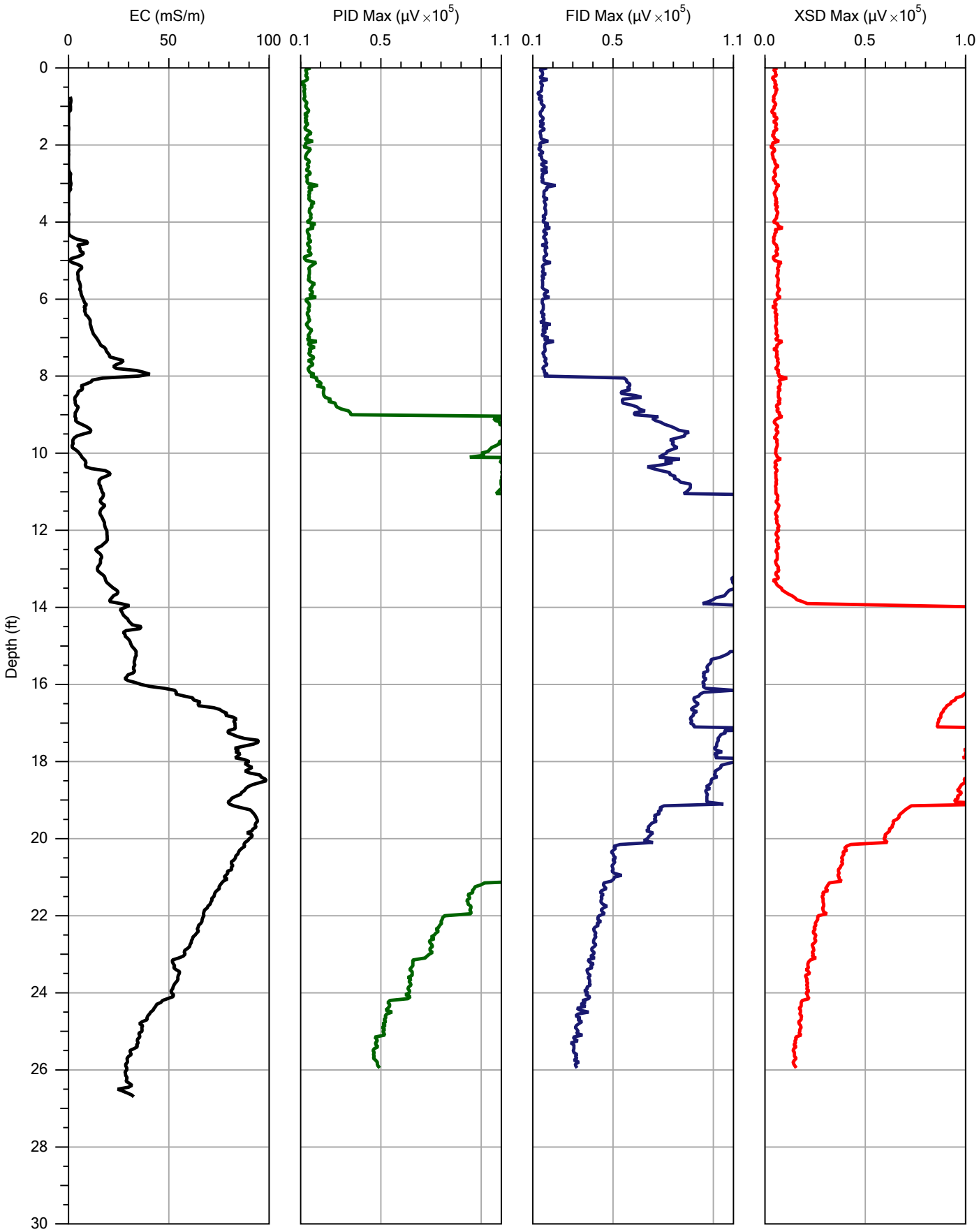

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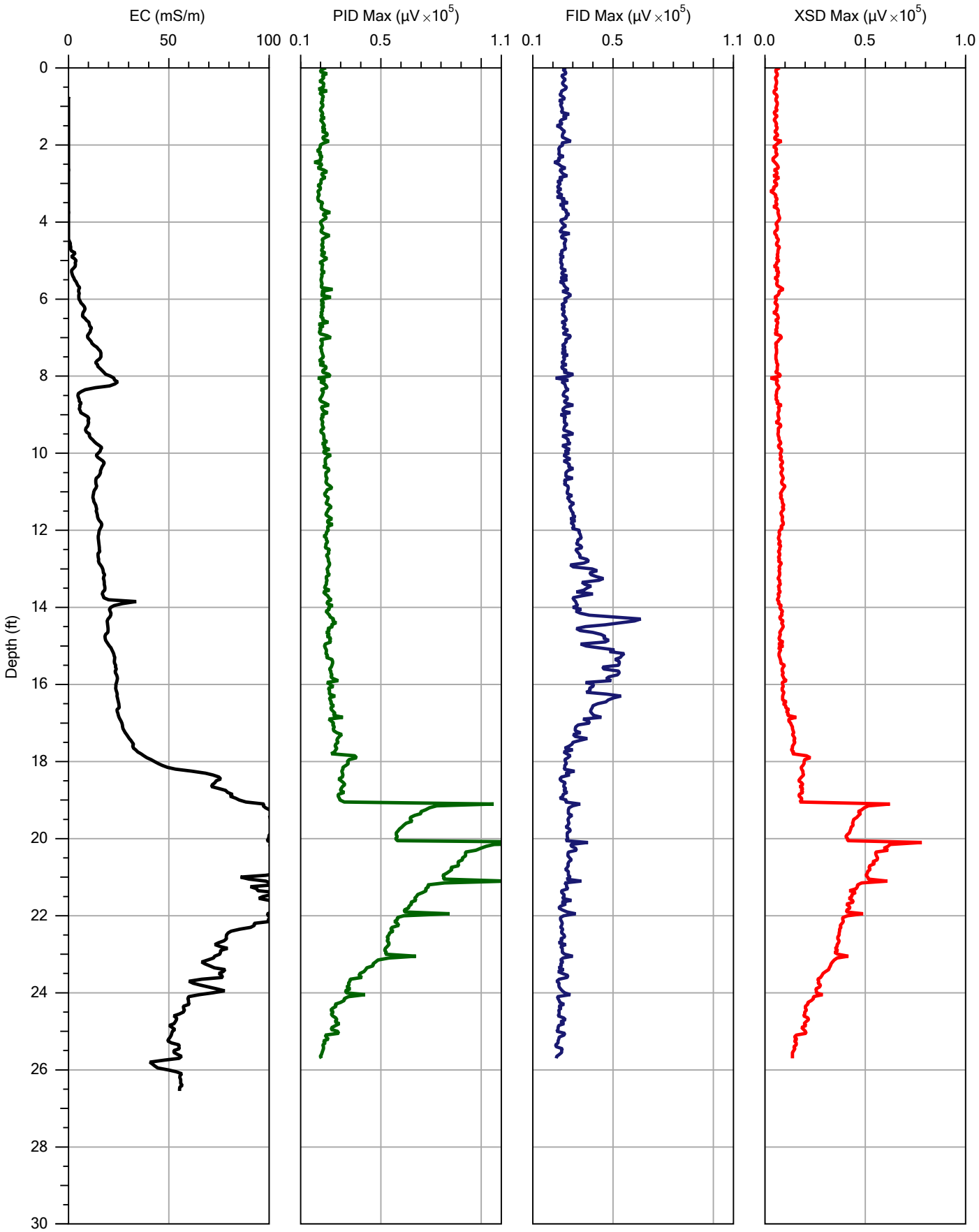

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Company: Matrix Environmental		Operator: M Jenson	Date: 12/17/2014
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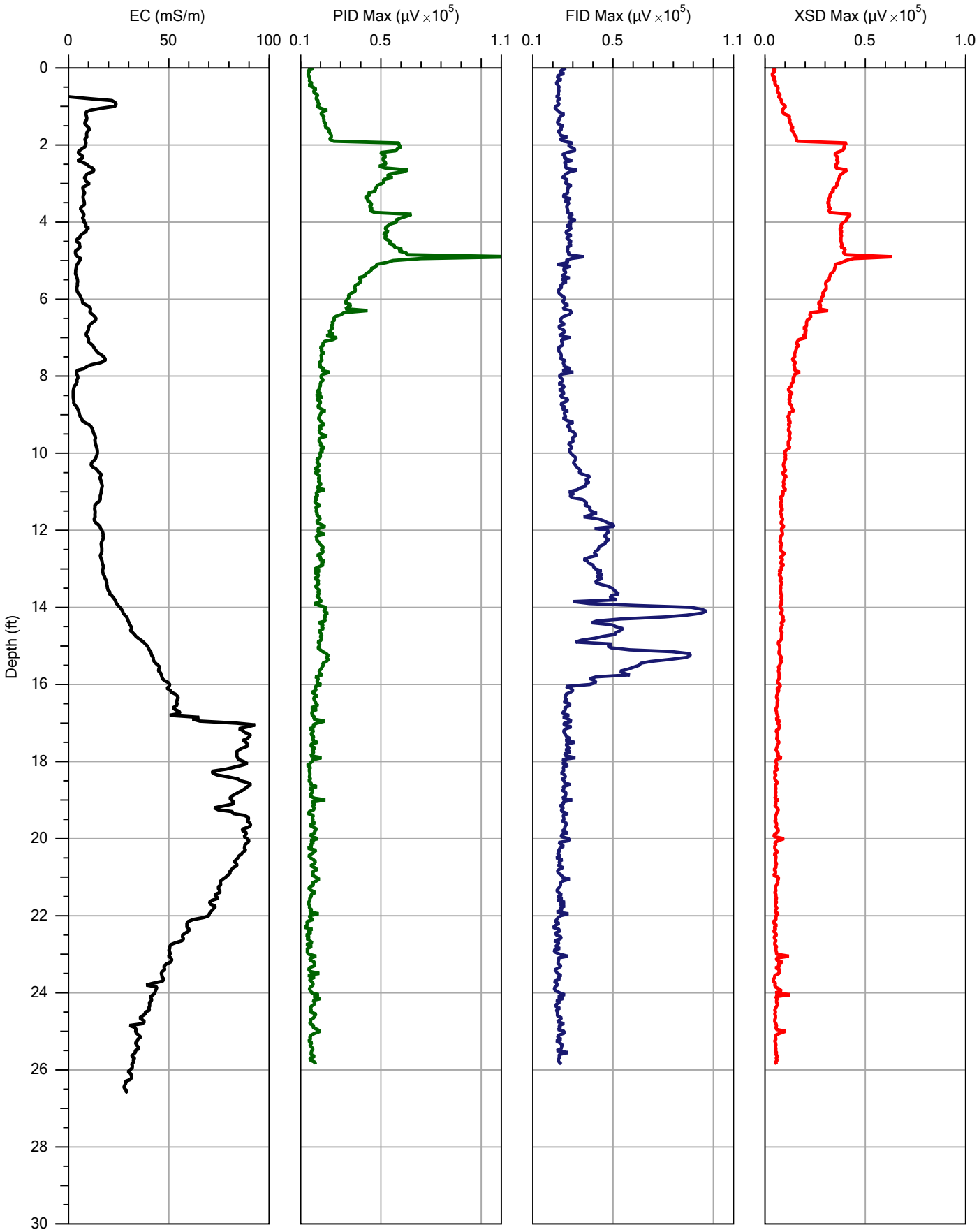

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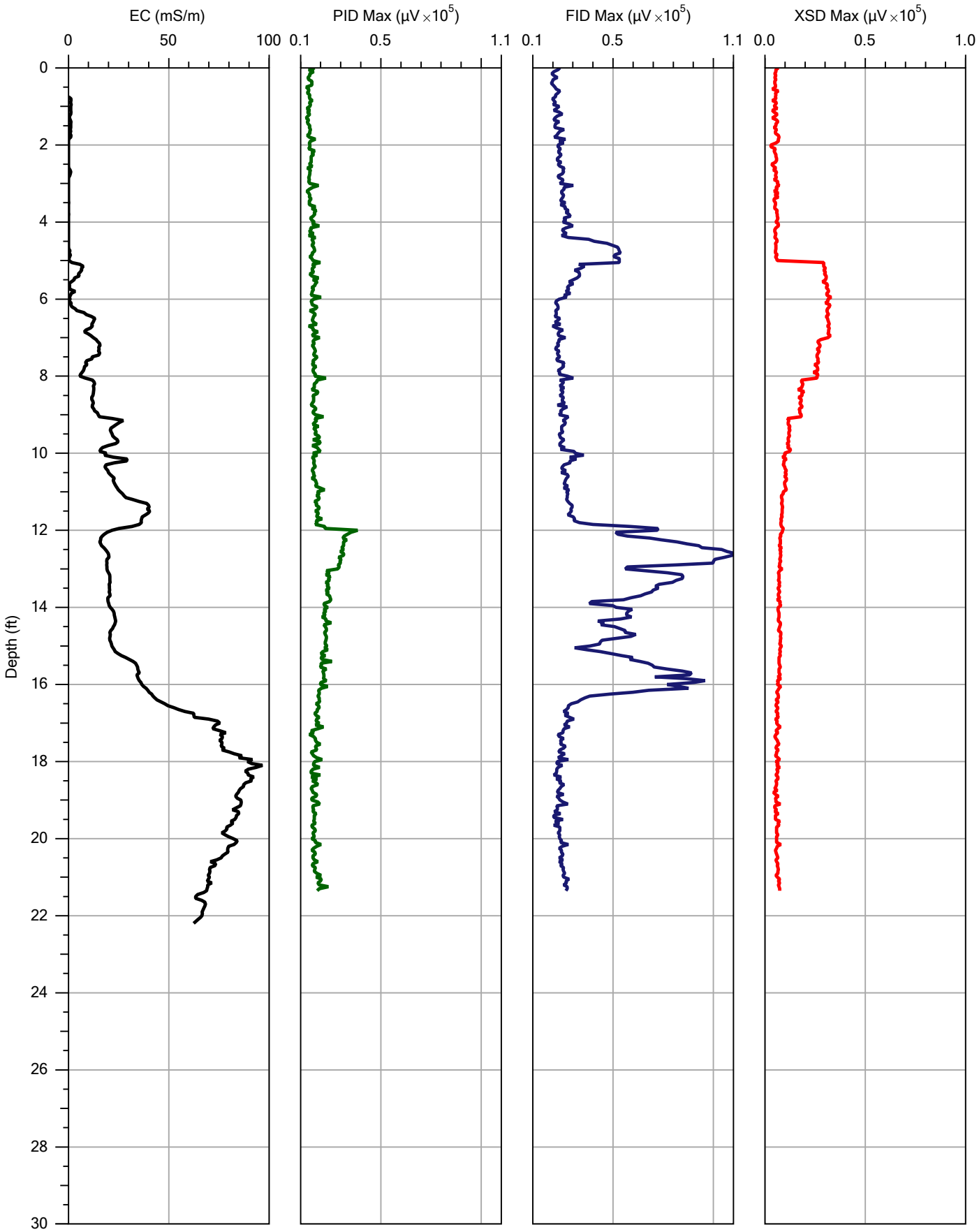

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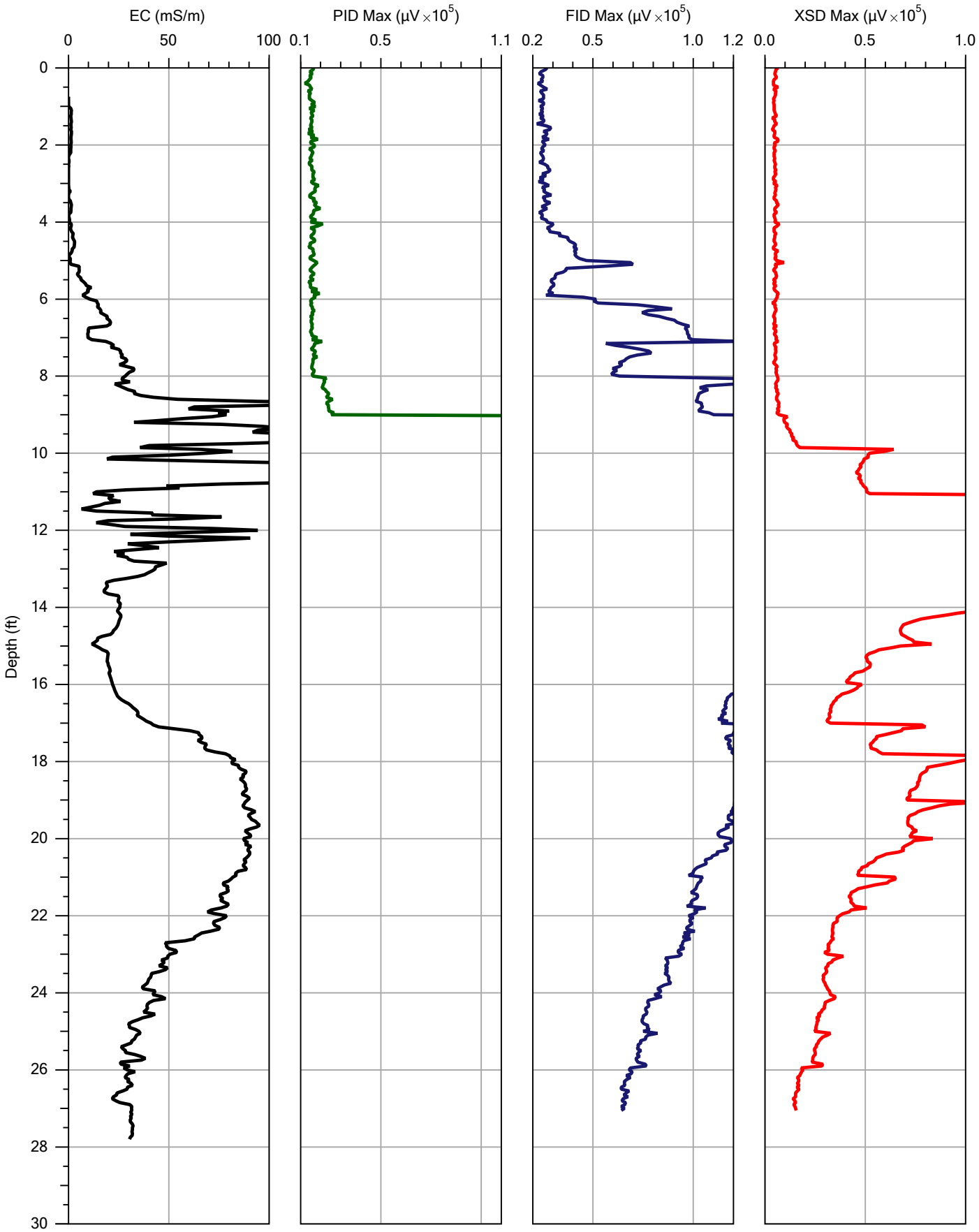

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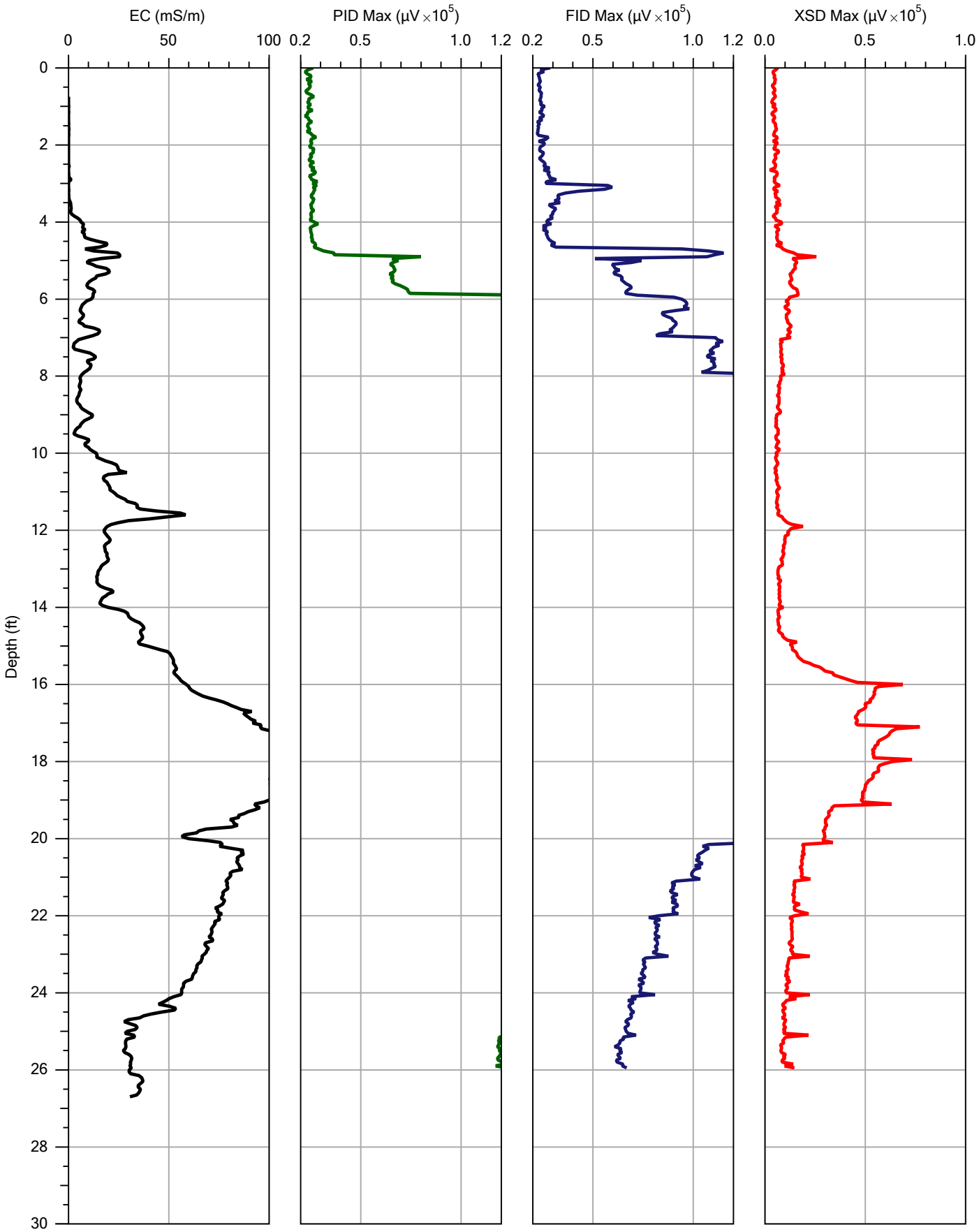

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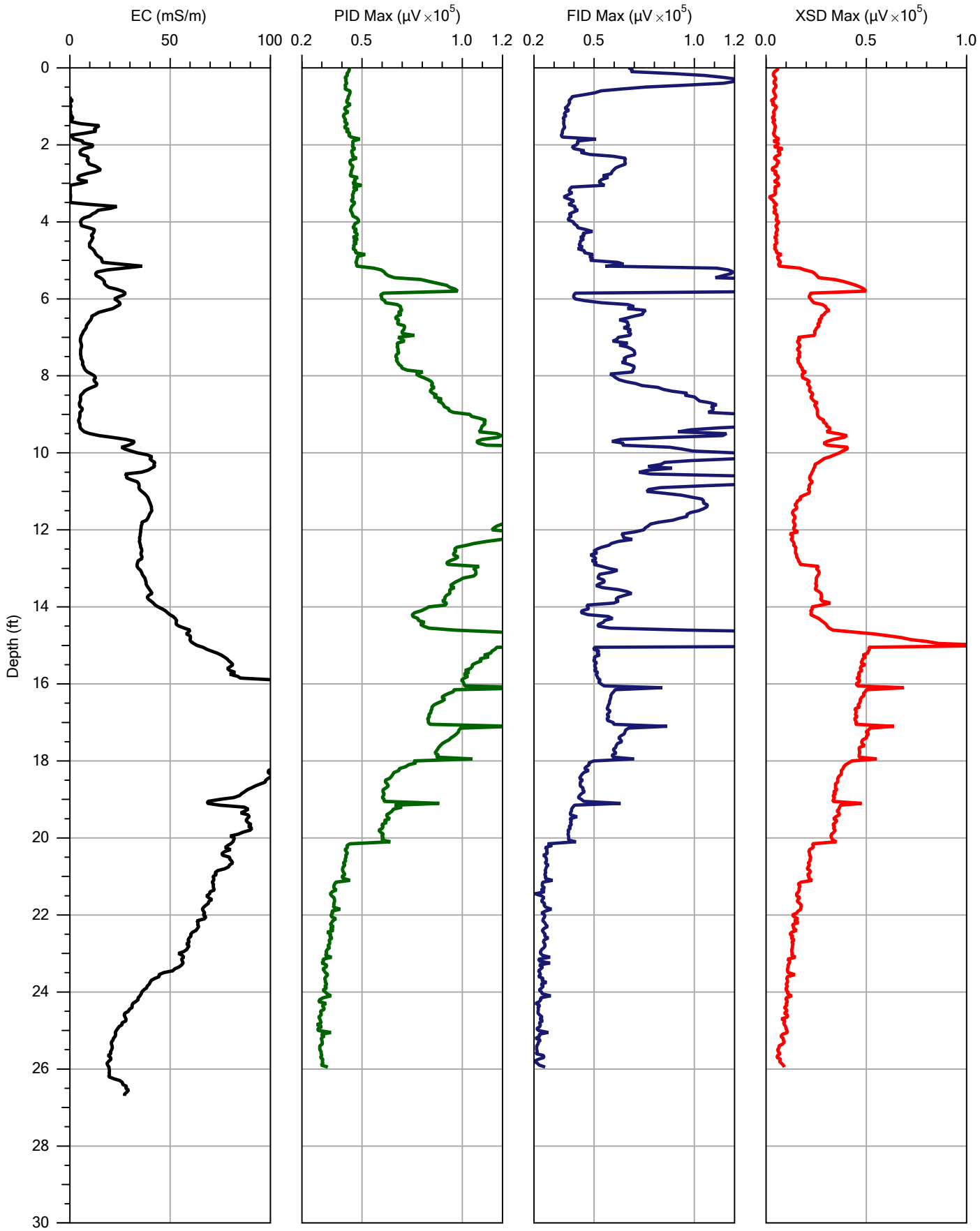

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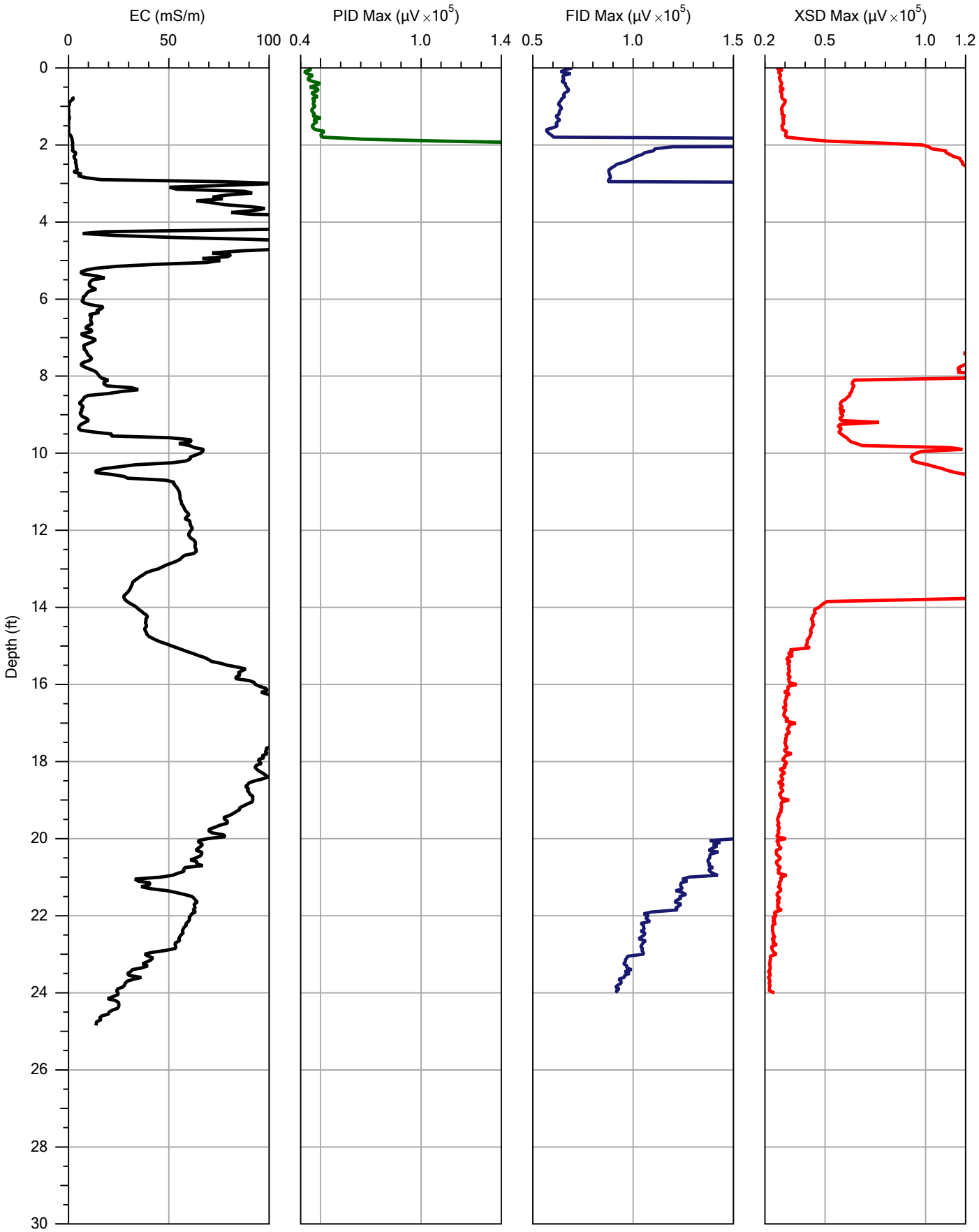
Company: Matrix Environmental		Operator: M Jenson	Date: 12/17/2014
Project ID: 139.14		Client: CRA	Location:



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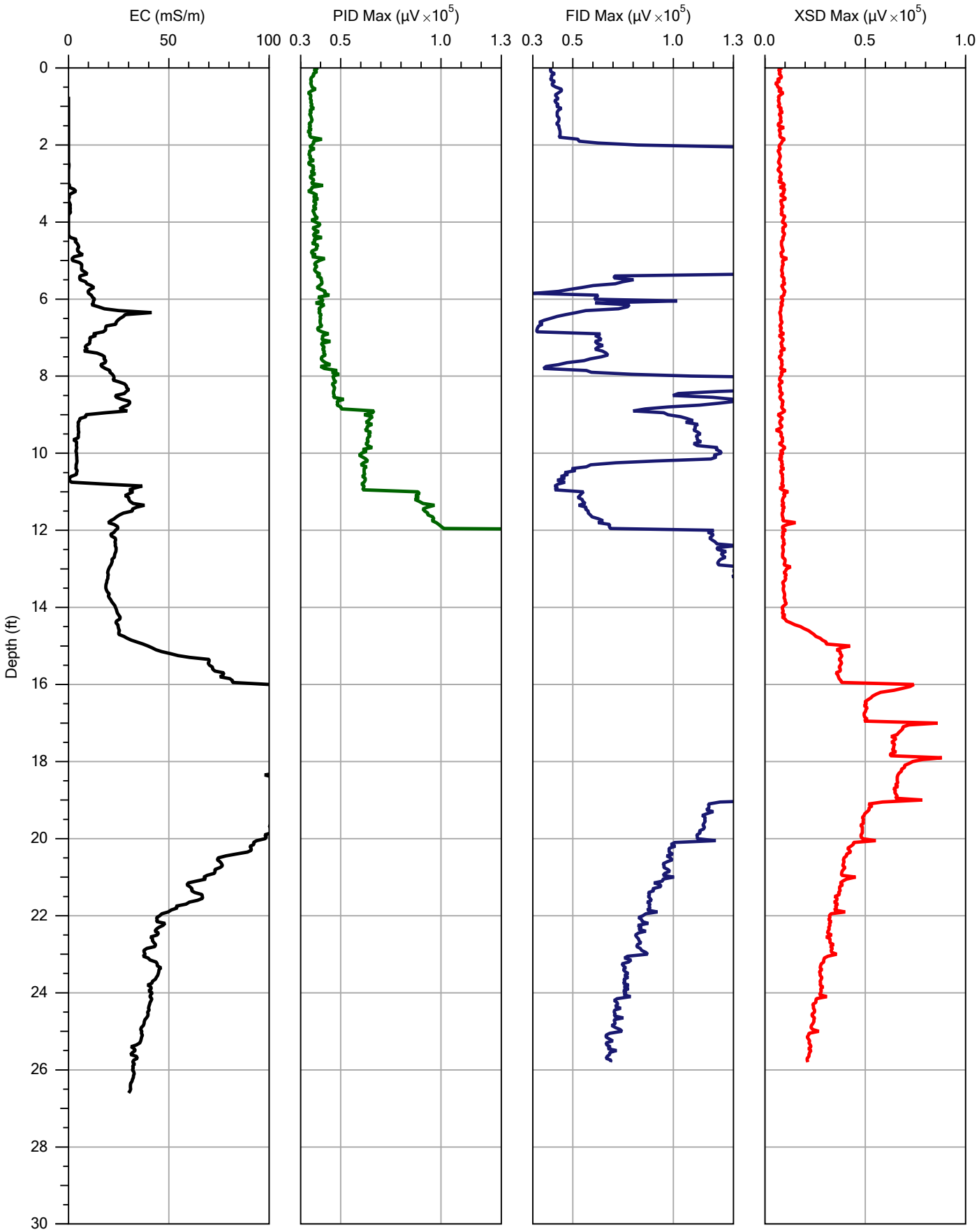
Company: Matrix Environmental		Operator: M Jenson	Date: 12/18/2014
Project ID: 139.14		Client: CRA	Location:



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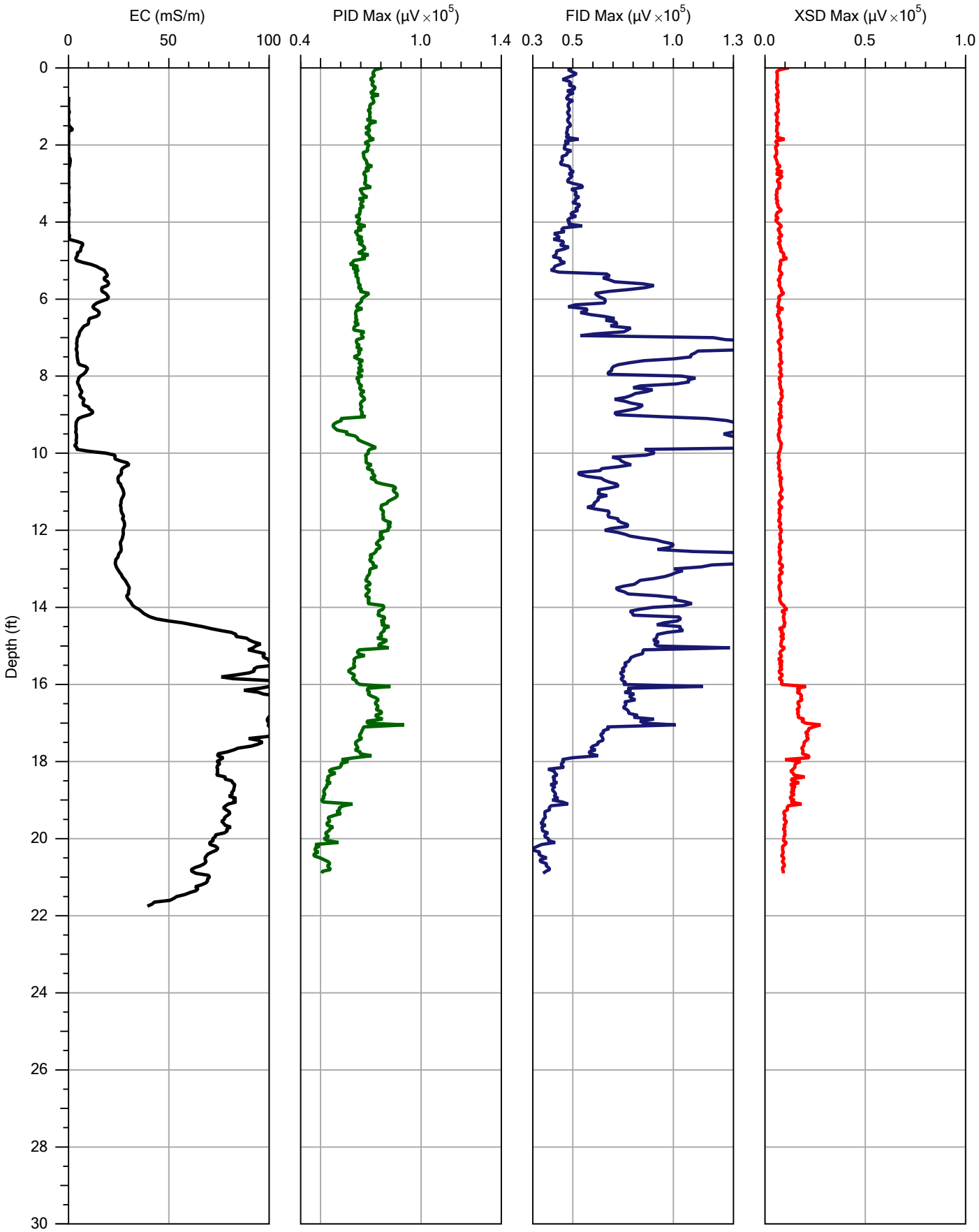
Company: Matrix Environmental		Operator: M Jenson	Date: 12/18/2014
Project ID: 139.14		Client: CRA	Location:



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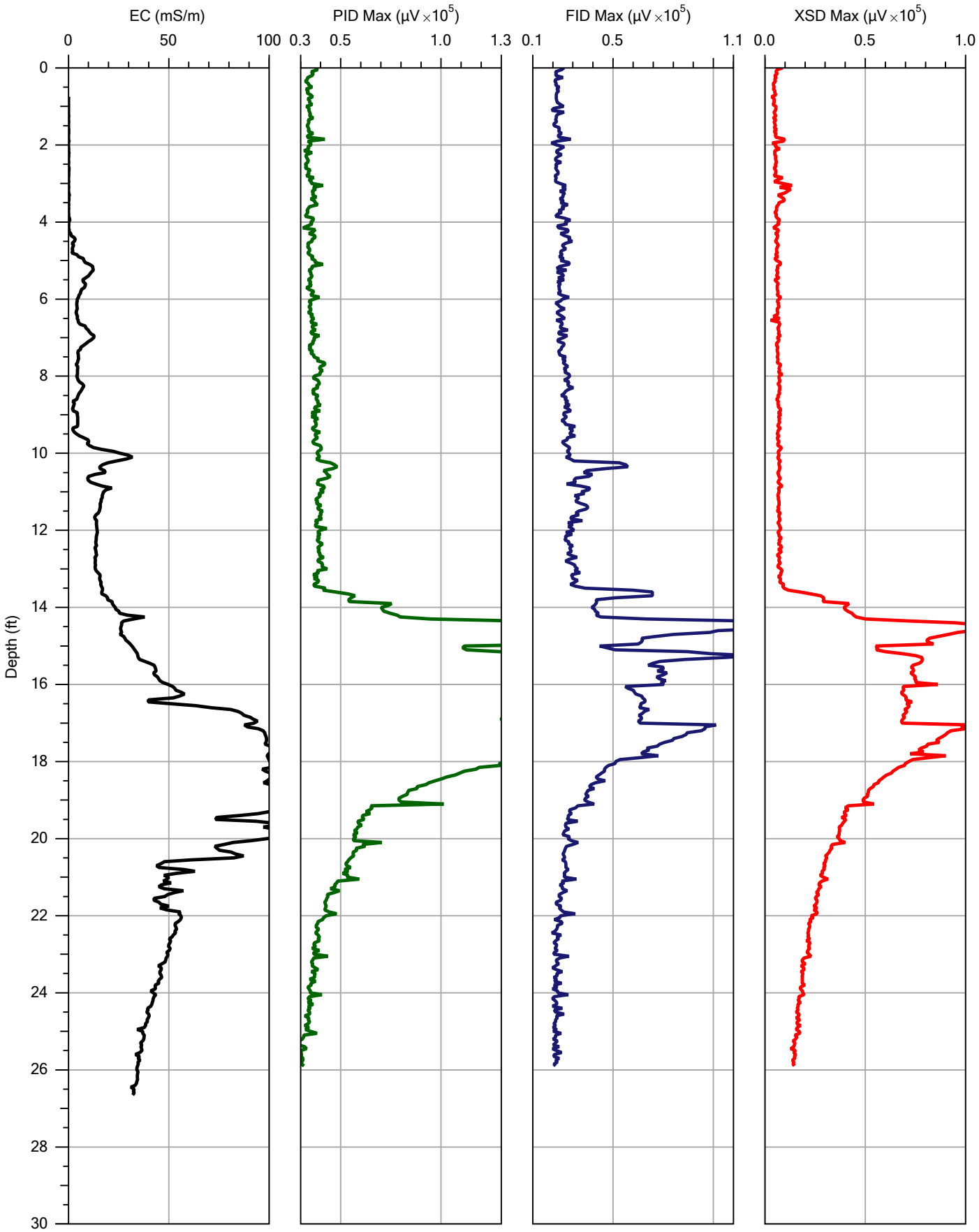

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Company: Matrix Environmental		Operator: M Jenson	Date: 12/18/2014
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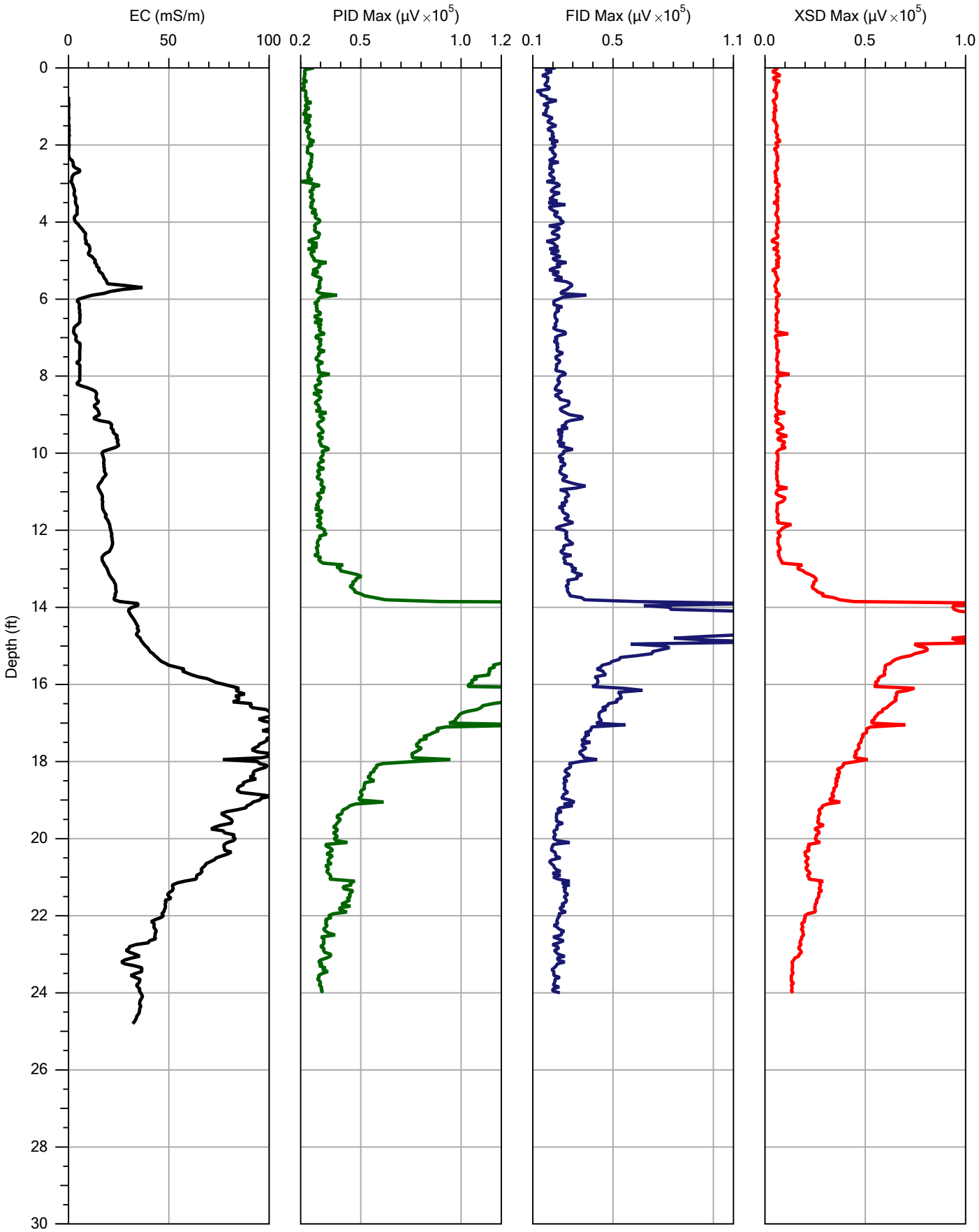

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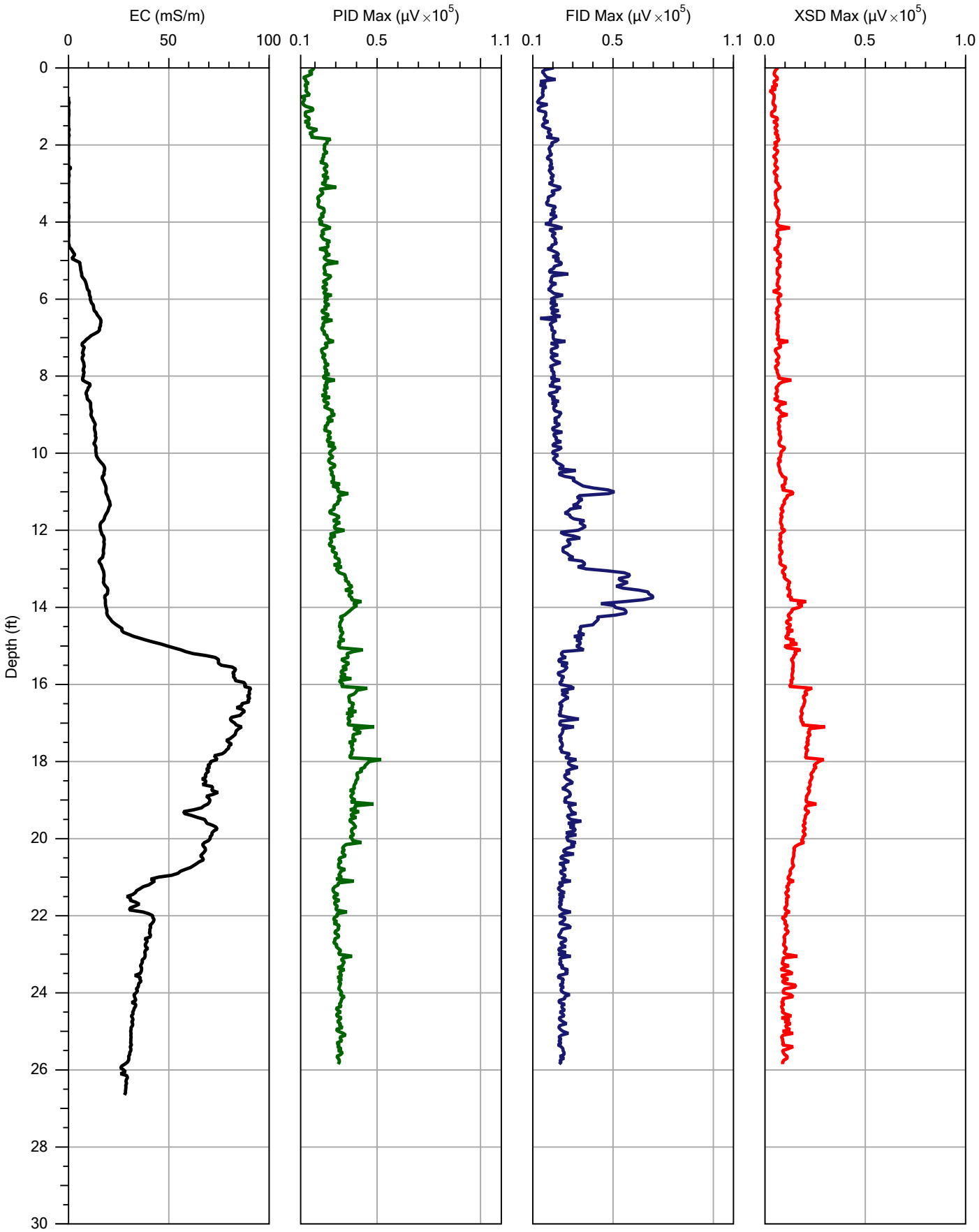

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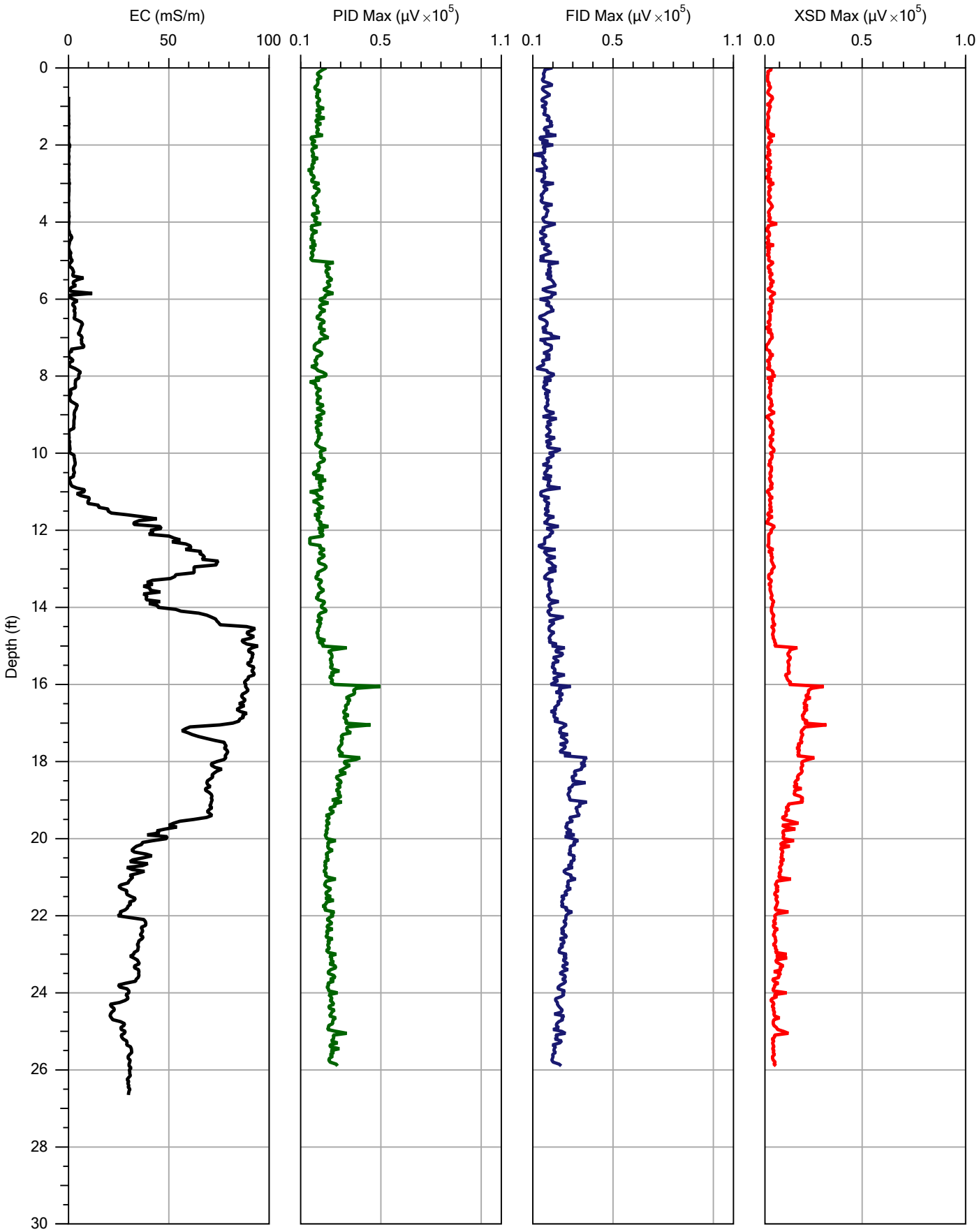

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