

2013 Esri International User Conference

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Mapping Electrical Panels and Capacity

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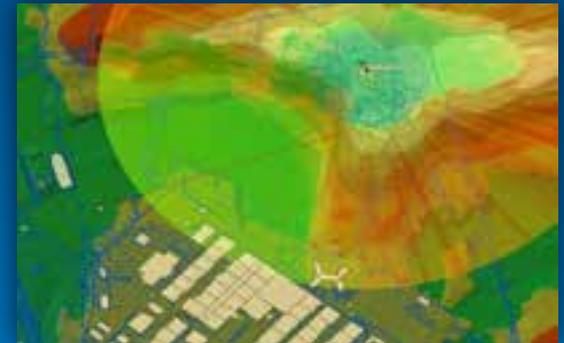
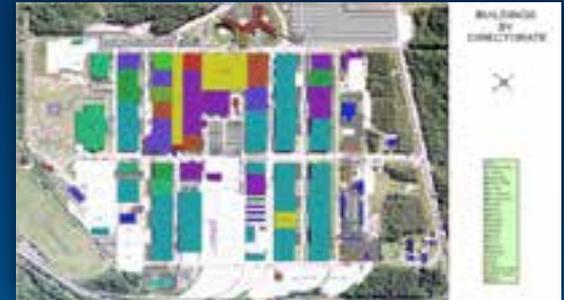
*"Providing World-Class Services for
World-Class Competitiveness"*

Tobyhanna Army Depot

History (60 years this year)

Brief History of Tobyhanna Army Depot

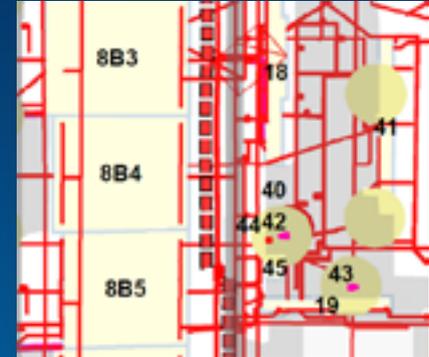
- The Army first used the Tobyhanna site as an artillery training camp in 1912.
- It was used as a training camp for recruits from Yale (artillery training), West Point Cadets, a temporary shelter facility for the homeless during the great depression, and later for anti-aircraft artillery training during V-VII, a storage and support facility, ambulance training, POW camp (briefly) and finally – Signal Depot.
- Today Tobyhanna Army Depot's mission is total sustainment – design, manufacture, repair and overhaul, of hundreds of electronic systems including electro-optics, radio and radar systems, night vision and anti-intrusion devices, airborne surveillance equipment, navigational instruments, navigational instruments..., and is DOD's recognized leader in automated test equipment, systems integration and downsizing of electronics systems. *



Electric Systems

What information did we start with?

- Transformers
- Substations
- Underground and above-ground (exterior) lines and (some) associated data for specific (more recent) projects.
 - The GIS data stopped at the building walls.
 - The rest was in years and years of historic and archived files, upon which hundreds of projects had been developed within the buildings by our primary tenant – AMC. These (mainly) industrial engineers had for years been pulling new equipment, new electric lines and very complex circuitry throughout the very complex building interiors –
 - What were once warehouses – now are industrial workspaces, customized, specialized, and undocumented.

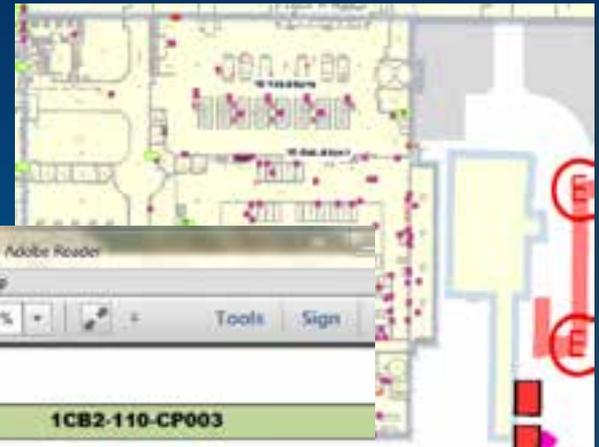


- ØLots of data
- ØSome incorrect
- ØLots missing
(data)
- ØPiles of project-specific, archived CAD files.
- ØLots of missing
(CAD files)

Examples of Electrical Data

Table of electrical panel data:

Field	Value
PkFidID	1CB2
floor_id	1
room_id	110
feat_desc	Electrical Control Panel
voltage00M	480 volts
Hertz00M	<null>
NoPhases	3
max_amps	400
AmpRate	125
no_drive	<null>
panel_dtm	30814136
width	30
depth	14
height	36
PkPlanuID	FLOW INTERNATIONAL CORPORATI
SerialNo	<null>
mounting	Surface



Detailed table of electrical panel data:

Field	Value
PkFidID	1CB2-110-CP003
schedule_id	1CB2-110-CP003_SCH-PDF
PkCoordID	0
UserFlag	1CB2-110-CP003
GridValue	<null>
CoordX	2606599.903452
CoordY	383686.403907
CoordZ	0
feed_from	1CB2-110-CP007
feed_to	WATER_BET
it_desc	CP
Secondary_voltage	<null>
Secondary_Phases	<null>
Secondary_AmpRate	<null>
Transformer_Capacity_KVA	<null>
Impedance_pct	<null>
Shape	Point Z
use_drive	<null>

Attachment: 1CB2-110-CP003_Schedule.pdf (Adobe Reader)

Basemapped exterior manholes, above ground

Capacity Planning

Data includes amperage, voltage, attachments to what equipment
And full panel is included as attachment.

OUTLINE

- ⌘ Electric Utilities Data Collection
- ⌘ Need a Better Way
- ⌘ New Solution – Mobile
- ⌘ Application Review
- ⌘ Data Management
- ⌘ Data Delivery
- ⌘ Report Creation
- ⌘ Communications

Electric Utilities Data Collection

- Where

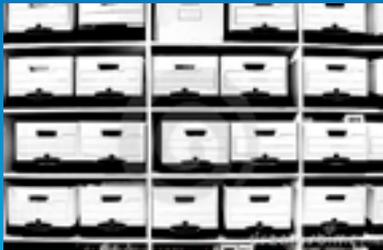
- Tobyhanna Army Depot
- Industrial Complex
- Challenging Indoor Environment



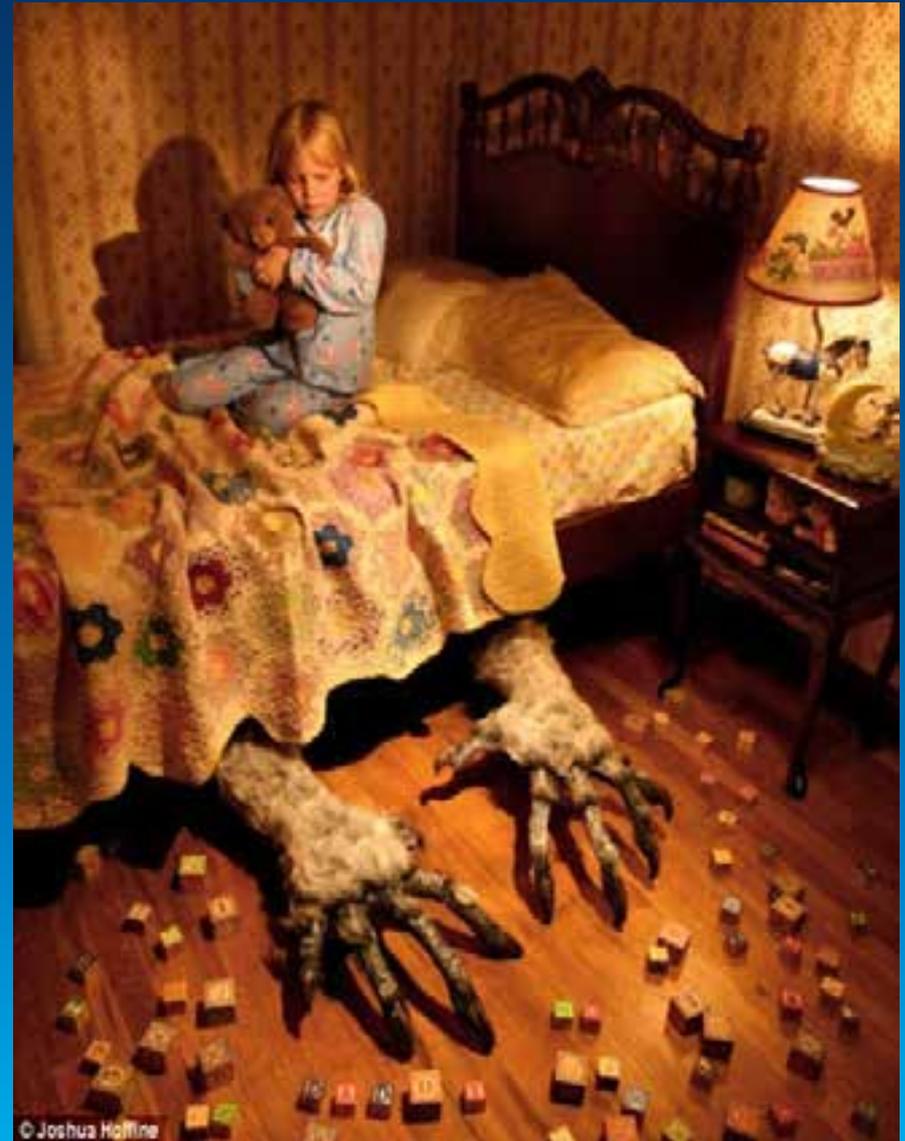
Electric Utilities Data Collection

NHow

- Personnel
 - GIS Analysts
 - Electricians
- Paper forms and printed CAD maps
- Data manually keyed in the office
- Management Nightmare
 - Electrical Equipment Location Maps
 - Location Dimension Marking Maps
 - Data Collection Forms



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© Joshua Hoffine

Need a Better Way

- Improving efficiencies – save Govt \$\$
- Requirements
 - No GPS
 - Disconnected Editing
 - Mobile
 - Long battery life
 - Prefer Touch Screen over stylus

New Solution – Mobile

- Windows Mobile

- Pros: Easy to use, out-of-the-box
- Cons: Windows OS, short battery life



- Android

- Pros: Flexibility, Open Platform, ease of app publishing, Low Cost, good battery life
- Cons: development required



- iOS

- Pros: good battery life
- Cons: development required, Closed Platform, hurdles to app publishing



Hardware

- Support 8-hour workday
 - Long battery life
 - Light-weight
- User-friendly (electricians)
- Durability



ASUS Android



Trimble Yuma



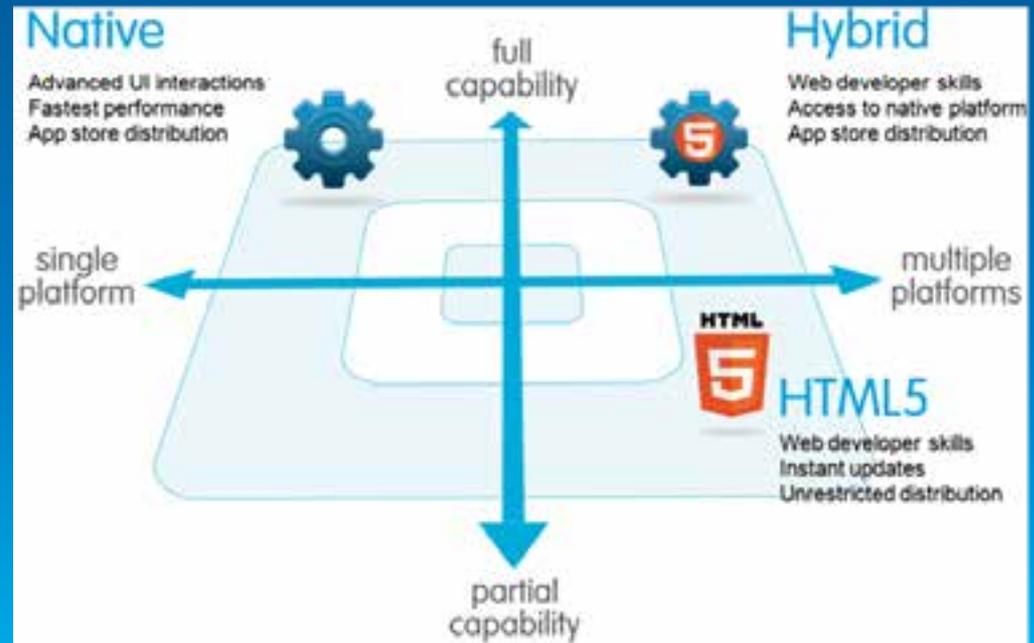
Panasonic Tough book



iPAD

Native App vs. Hybrid App

- Native App
 - Assembled computer program that is OS specific
 - Fast performance
 - Examples: PowerPoint, Angry Birds.
- Hybrid App
 - HTML-based app
 - Cross-platform



Development Environment

- Esri Software Development Kit (SDK)
- Android OS
- JAVA programming Language
- SDSFIE Specifications required
- Camera Capabilities

- Requirements:
 - Disconnected editing
 - Photo integration
 - Esri platform (client is Esri shop)
 - Attachment storage

Esri Android SDK

- Esri designed the SDK to use web services available from ArcGIS for Server and ArcGIS Online. Users of the platform can access dynamic, tiled, and image map services; overlay graphics; search and identify features; locate addresses; collect and update data; and perform GIS analysis. Developers and Esri partners can also use the SDK to create custom mapping applications for both internal and external use. ArcGIS Runtime SDK for Android is delivered via an Eclipse plug-in and contains
 - Native Java libraries
 - Integrated documentation, sample applications, and templates
 - Conceptual and reference guide help
 - Community resources including code galleries, forums, and blogs

Electrical Panel Schedules are Generated from the Circuit Tracing Related Table

1CB6-100-LP001			
			
1CB6-100-LP001			
Description	Circuits	Circuits	Description
Disconnect 1CB6-000-FA3-05001 feeds 1CB6-000-FA3-CP002 for heat curtain at overhead door C-27	1	2	
	3	4	Disconnect 1CB6-000-05005 feeds 1CB6-000-CP001 for heat curtain at overhead door C-27
	5	6	
Disconnect 1CB6-000-FA3-05005 feeds 1CB6-000-FA3-CP005 for heat curtain at overhead door C-27	7	8	
	9	10	Control panel 1CB6-000-CP005 for conveyor motors
	11	12	
Control panel 1CB6-000-CP001 at end of conveyor for pallet offer	13	14	Blank
	15	16	Blank
	17	18	Blank
Blank	19	20	Blank
Blank	21	22	Blank
Blank	23	24	Blank
Blank	25	26	Blank
Blank	27	28	Blank
Blank	29	30	Blank

Main: Supp. Fed from ID 011 021 M0001, BRK# 05.

If any changes are made to the panel or the panel schedule, please update the paper schedule at the panel and notify DPW of the changes within 48 hours at 570-625-7037 (x2017).

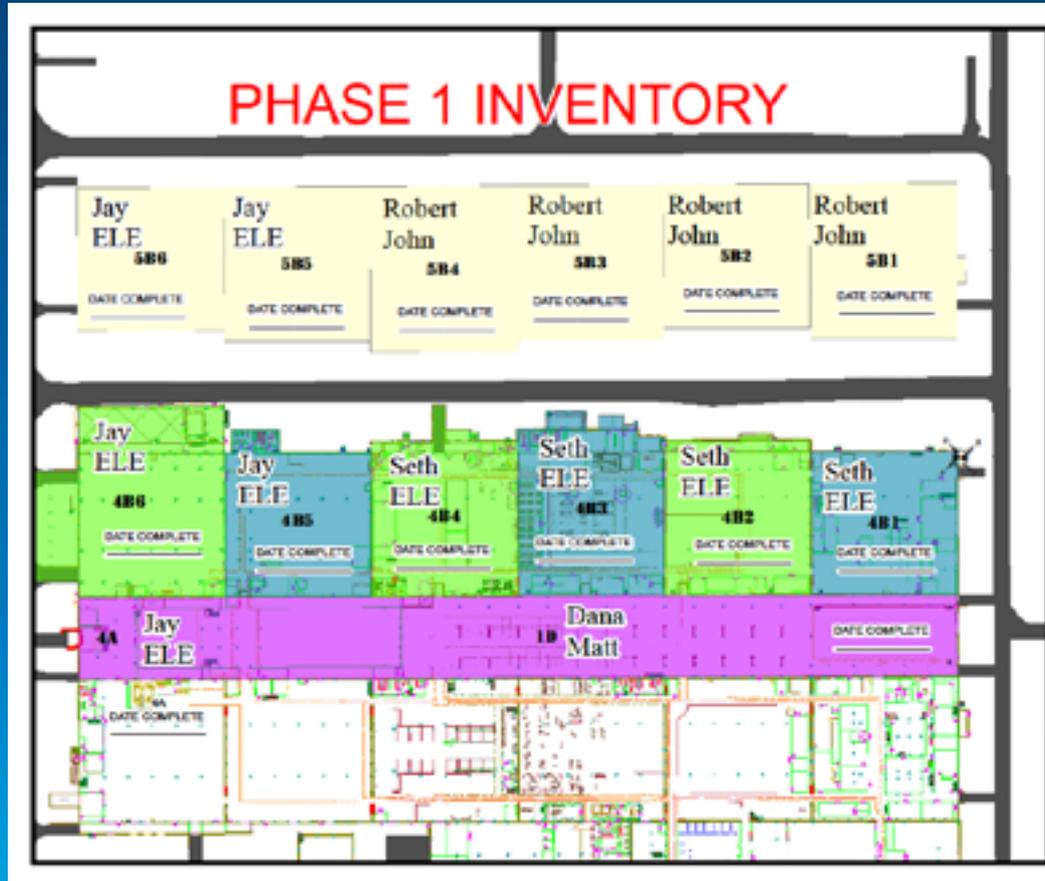
Last updated May 2011

Key:

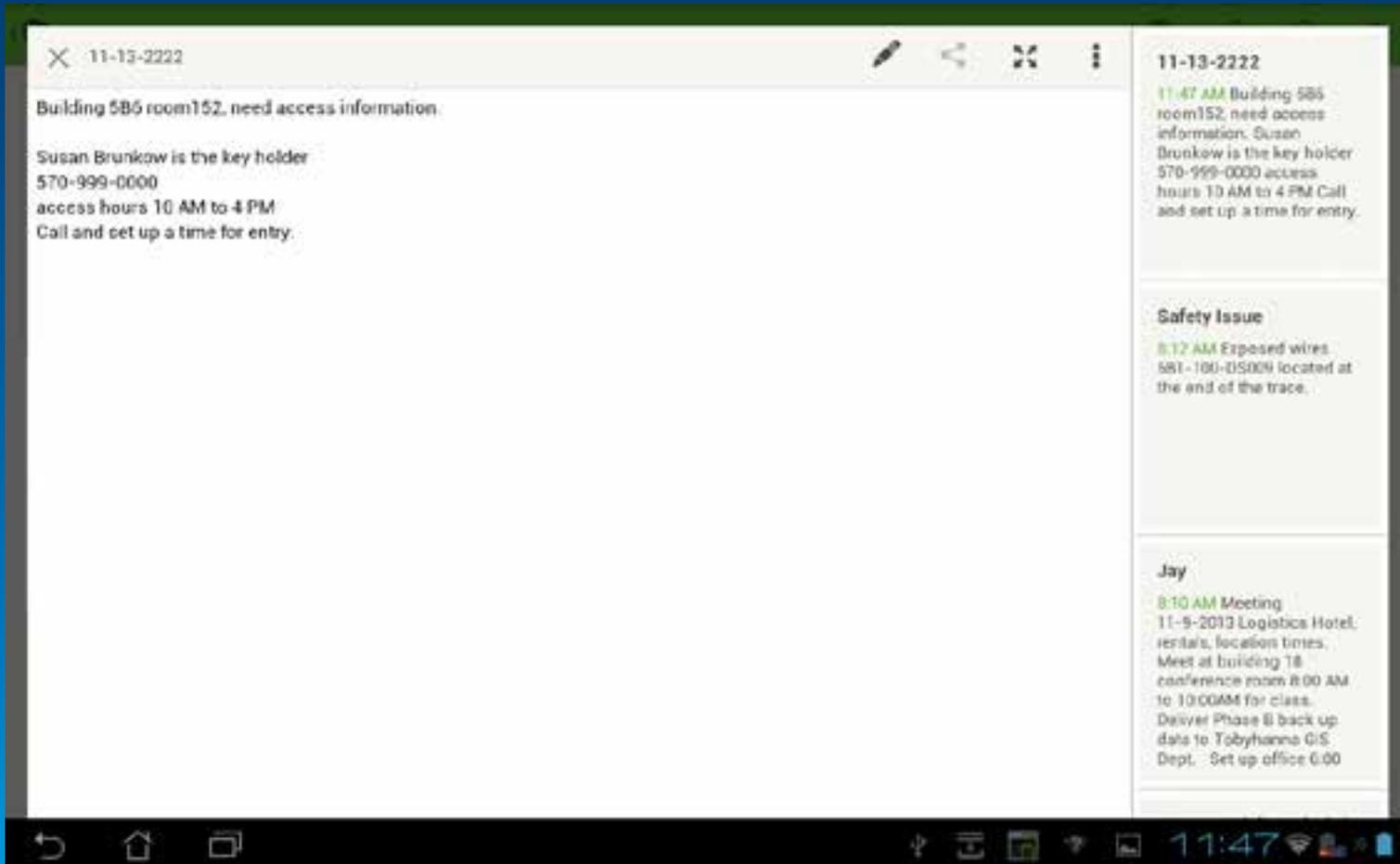
Blank: No circuit installed.
 Spare: Circuit installed, no load.

Electric Utilities Data Collection

- How
 - Organization Of Data Collection



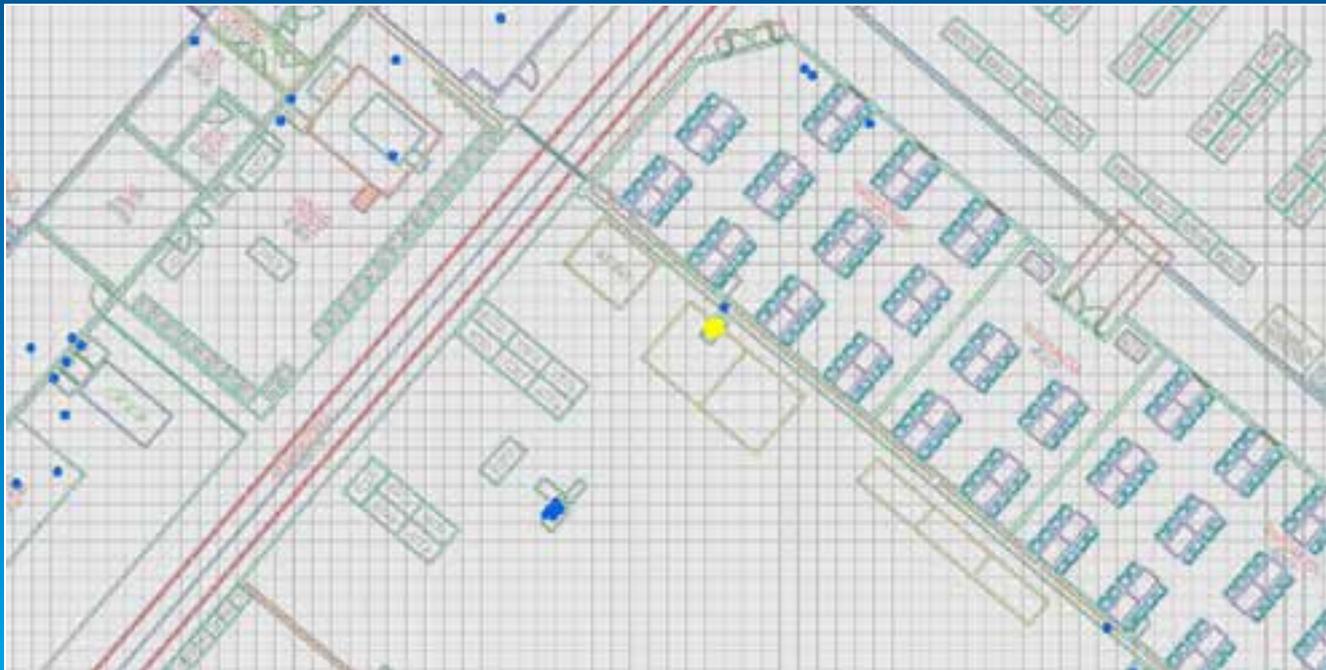
- Evernote



This note tool will allow you to identify and provide information on area locations of issues that need to be followed up on.

Base maps – CAD conversion

- Indoor Infrastructure as reference for data collection
- Converted CAD to shape file, built mobile cache



Application Review - Demo/slide captures



This is the Field Data Collector interface

Layer Visibility
Used to turn layers on and off.



Application Review - Demo/slide captures



Inventory Data Collection

Photo Collection Tool



Application Review - Demo/slide captures



A screenshot of a mobile application interface showing a 'Transformer Table Editing' form. The form is overlaid on a map background. It features a 'Form ID' field with the value '402-100M-7001'. Below this are several empty input fields for 'Capacity', 'Transformer ID', 'Use Class', 'Voltage', 'Phase', and 'Type Code'. At the bottom of the form are three buttons: 'Save', 'Back', and 'Cancel'.

Transformer Table Editing

Safety Issue Table Editing



A screenshot of a mobile application interface showing a 'Safety Issue Table Editing' form. The form is overlaid on a map background. It features a 'Form ID' field with the value '402-100M-7001'. Below this are several empty input fields for 'Event', 'Safety Issue', 'Safety Issue 1', 'Safety Issue 2', 'Safety Issue 3', and 'Safety Issue 4'. At the bottom of the form are three buttons: 'Save', 'Back', and 'Cancel'.

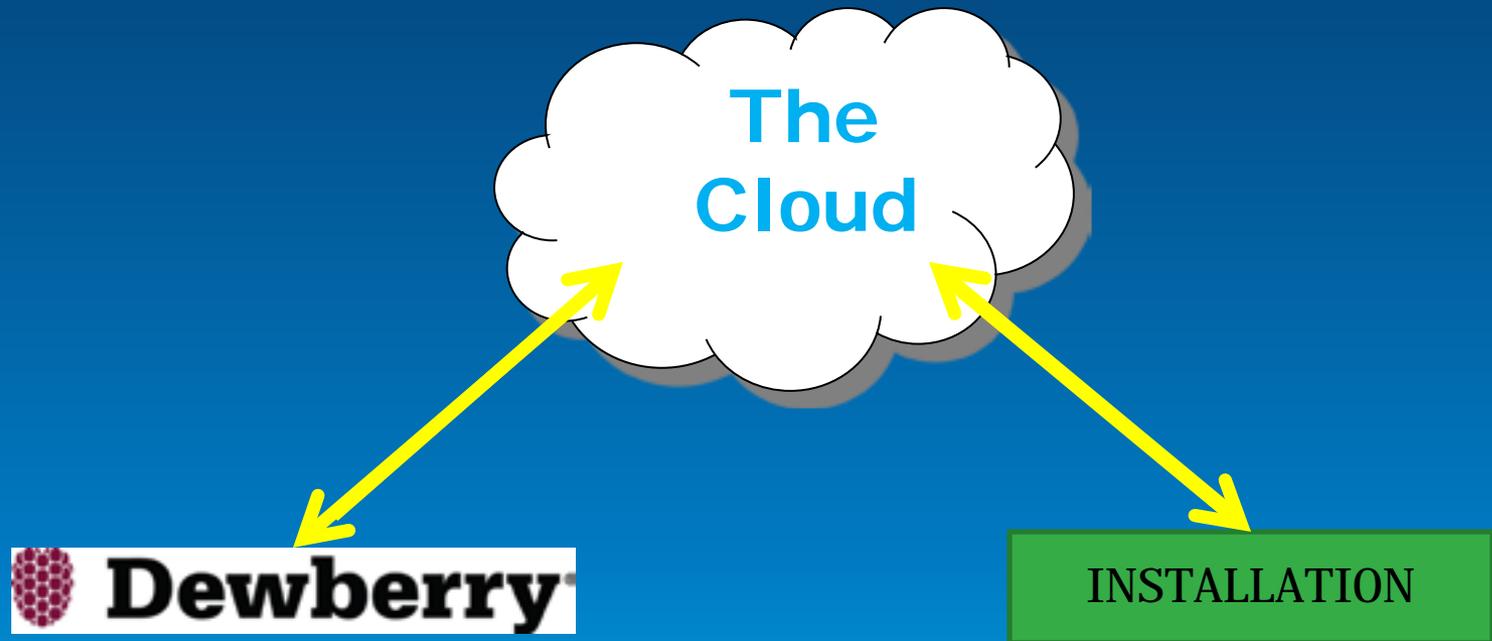
Training

- Training was prepared and presented to the Electricians.



Data Management

- Disconnected work – synchronizing



Data Management

- Photo Management
 - Photos taken and stored in folder
 - Attached in SDE Attachments with Panel Schedule
 - Not automated
- Data import QA/QC
 - Database files created
 - File GeoDatabase created (Staging Database)
 - QA/QC conducted
 - Staging Database synchronized with SDE Database for Final Delivery

QA/QC process

Dewberry Phase B QC of Panel IDs(COPY)

	A	B	C	D	E	
1	CURRENT PANEL #	CURRENT RM #	Actual New Number	Correction Made	Data Base Corr	Comments
2	11A-110-PP001	11A-120A	11A-120A-PP001			
3	11A-120NW-HP001	11A-100CN	11A-100CN-HP001			
4	11A-120NW-HP002	11A-100NW	11A-100NW-HP002			
5	11A-120NW-PP001	11A-100NW	11A-100NW-PP001			
6	11A-120NW-PP002	11A-100NW	11A-100NW-PP002			
7	11A-207-DS001	11A-207-C1	11A-207-C1-DS001			
8	11A-207-DS002	11A-207-C1	11A-207-C1-DS002			
9	11A-207-DS003	11A-207-C1	11A-207-C1-DS003			
10	11A-207-DS004	11A-207-C1	11A-207-C1-DS004			
11	11A-207-DS005	11A-207-C1	11A-207-C1-DS005			
12	11A-207-PP001	11A-207-C1	11A-207-C1-PP001			
13	11A-207-T001	11A-207-C1	11A-207-C1-T001			
14	11A-207-T002	11A-207-C1	11A-207-C1-T002			
15	11B-100-LP001	11B-100S-EC1	11B-100S-EC1-LP001			
16	11B-100-PP001	11B-100S-EC1	11B-100S-EC1-PP001			
17	11B-117-LP001	11B-117-C1	11B-117-C1-LP001			
18	11B-117-PP001	11B-117-C1	11B-117-C1-PP001			
19	11B-117-PP002	11B-117-C1	11B-117-C1-PP002			
20	11B-119A-DS001	11B-119-MC1	11B-119-MC1-DS001			
21	11B-119A-EX-DS001	11B-119-V1 (EX)	11B-119-V1-EX-DS001			
22	11B-119A-EX-DS002	11B-123 (EX)	11B-123-EX-DS002			
23	11B-119A-PP001	11B-119-MC1	11B-119-MC1-PP001			
24	11B-126-DS001	11B-126-EC1	11B-126-EC1-DS001			
25	11B-126-T001	11B-126-EC1	11B-126-EC1-T001			

Red = Not reconciled

Data Delivery

The screenshot displays the ArcMap interface with a floor plan of a building. The map shows various rooms and corridors, with electrical panel points marked by green symbols and labeled with IDs such as 'ICB-100-PP001'. The 'Attributes' window is open on the right, showing the details for the selected feature 'ICB-100-PP001'. The window lists various attributes including panel ID, existing ID, origin ID, FKInstID, FKAcID, floor ID, name ID, feet_desc, voltage(Dist), hertz(DOM), NoPhases, main_breaker, AmpRate, panel_size, width, depth, height, FKManufID, SerialNo, mounting, Narrative, FKInstID, FKAcID, schedule ID, and FKCoordID. The 'OBJECTID' section shows the Object ID and a note that null values are not allowed.

Attribute	Value
panel_id	ICB-100-PP001
existing_id	<Null>
orig_id	<Null>
FKInstID	42780
FKAcID	ICB6
floor_id	1
name_id	130
feet_desc	Electical Power Panel
voltage(Dist)	200V,120 volts
hertz(DOM)	60
NoPhases	3
main_breaker	lug
AmpRate	225
panel_size	20.25x60.25
width	20.25
depth	6
height	25
FKManufID	SQJIAN 0
SerialNo	<Null>
mounting	Surface
Narrative	<Null>
FKInstID	<Null>
FKAcID	ICB6-100-PP001
schedule_id	ICB6-100-PP001_3CHUPDF
FKCoordID	0

OBJECTID
Object ID
Null values not allowed
Table Of Contents | Attributes

Attributes

Data Delivery

The screenshot displays the ArcMap interface with a GIS map of electrical panel points. The map shows various panel points labeled with IDs such as ICB-100W-2000, ICB-100-MS TR001, and ICB-100-PP001. A photo viewer window is open, showing a photograph of an electrical panel. An attachments window is also open, listing files for the selected panel point (ICB-100-PP003):

Name	Size
ICB-100-PP003_Schedule.pdf	37 KB
ICB-100-PP003a.jpg	25 KB
ICB-100-PP003b.jpg	21 KB

The attachments window includes buttons for Open, Save As..., Save All..., Add, and Remove. The photo viewer window shows a photograph of an electrical panel with a door open, revealing internal components.

Attachments include Photos

Data Delivery

The screenshot displays the ArcMap interface with several key components:

- PDF Document (Left):** A window titled "1CB6-100-PP003_Schedule.pdf" showing a technical drawing of an electrical panel and a detailed schedule table.
- Map (Center):** A map view showing the spatial distribution of electrical panel points, with labels such as "1CB6-100-PP001", "1CB6-100-PP002", and "1CB6-100-PP003".
- Attachments Dialog (Bottom Right):** A dialog box titled "Attachments" listing files associated with the selected panel point. The list includes:

Name	Size
1CB6-100-PP003_Schedule.pdf	175 KB
1CB6-100-PP003a.jpg	158 KB
1CB6-100-PP003b.jpg	216 KB

Attachments include Panel Schedule

Report Creation

Electrical Panel Schedules
are Generated from the
Circuit Tracing Related Table

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	15	16	Blank
	17	18	Blank
Blank	19	20	Blank
Blank	21	22	Blank
Blank	23	24	Blank
Blank	25	26	Blank
Blank	27	28	Blank
Blank	29	30	Blank

Main: Supp. Fed from ID 011 021 M0001, BR01 W0.

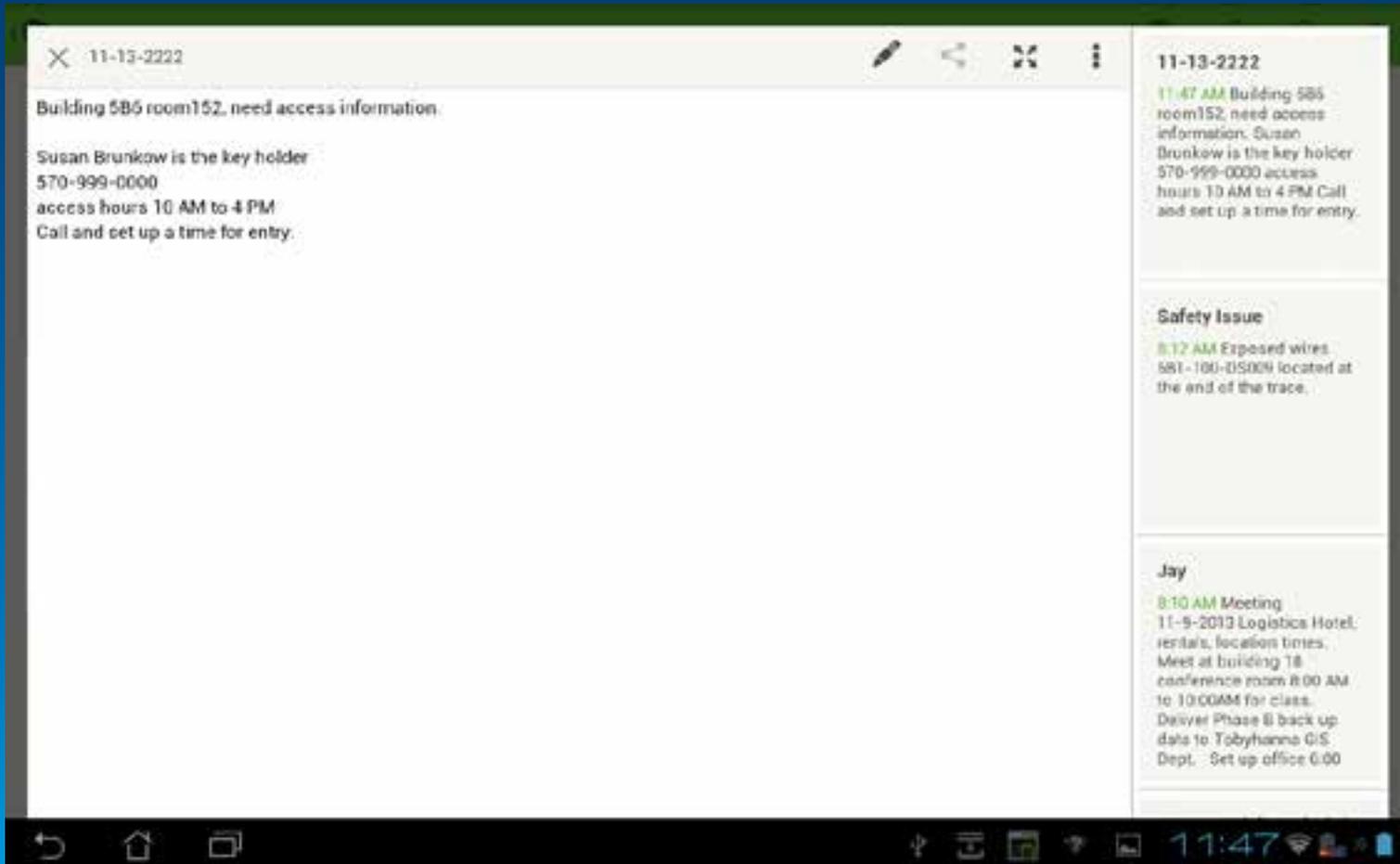
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Last updated May 2011

Key:

Blank: No circuit installed.
Space: Circuit installed, no load.

- Evernote



This note tool will allow you to identify and provide information on area locations of issues that need to be followed up on.

GIS Attribute Query

Select By Attributes

Layer: First Floor Panels

Method: Create a new selector

OBJECTID
panel_id
existing_id
orig_id
feat_desc

SELECT * FROM database_electrical_panel_point WHERE
'Tool_id' = '1CB2' AND 'Tool_desc' = 'Electrical Disconnect Switch:'

OBJECTID*	panel_id	existing_id	orig_id	FIDrefID	FAFrefID	floor_id	room_id	feat_desc	VoltageDCM	horizontal	NoPhases	main
956	1CB2-110-FA3-25901	<null>	<null>	42780	1CB2	1	100-PA5	Electrical Disconnect Switch	480 volts	00	3	N/A
956	1CB2-110-FA1-25902	<null>	<null>	42780	1CB2	1	100-PA1	Electrical Disconnect Switch	480 volts	00	3	N/A
957	1CB2-110-FA2-25903	<null>	<null>	42780	1CB2	1	100-PA2	Electrical Disconnect Switch	480 volts	00	3	N/A
958	1CB2-110-FA2-25904	<null>	<null>	42780	1CB2	1	100-PA2	Electrical Disconnect Switch	480 volts	00	3	N/A
959	1CB2-110-FA1-25905	<null>	<null>	42780	1CB2	1	100-PA1	Electrical Disconnect Switch	480 volts	00	3	N/A
960	1CB2-120-FA1-25906	<null>	<null>	42780	1CB2	1	120-PA1	Electrical Disconnect Switch	480 volts	00	3	N/A
961	1CB2-120-FA1-25907	<null>	<null>	42780	1CB2	1	120-PA1	Electrical Disconnect Switch	480 volts	00	3	N/A
962	1CB2-100-FA2-25908	<null>	<null>	42780	1CB2	1	100-PA2	Electrical Disconnect Switch	480 volts	00	3	N/A
963	1CB2-100-FA2-25909	<null>	<null>	42780	1CB2	1	100-PA2	Electrical Disconnect Switch	480 volts	00	3	N/A

Table: First Floor Panels

(38 out of 988 Selected)

How many electrical disconnect switches are in Building 1CB2?

Answer: 58

Dewberry Contacts

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 - Ethan Harner – CAD/GIS Technician
 - ethan.d.harner.ctr@mail.mil x5-9578
- Technologies Used
 - [ArcGIS Mobile for Android \(SDK\)](#)
 - ESRI GIS software
 - AutoCAD
 - SQL Server
 - Adobe Flex Viewer