



A Look Into A Sinkhole Disaster



National Corvette Museum



Information courtesy of the National Corvette Museum



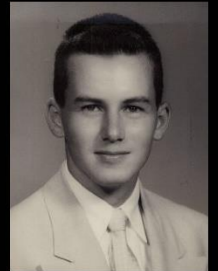
1962 ***FAST FACTS***



- Purchased brand new in '62, only one owner
- All 1962 Corvettes were Convertibles
- David replaced the rag top with a hard top.

DID YOU KNOW

- A total of 14,531 Corvettes were made in 1962 and were available in seven colors... this one being "Tuxedo Black."
- The conventional trunk design of the 1962 was the last for many years. Models to follow had no external rear storage access until 1982, but a trunk comparable to 1962's did not reappear until 1998.
- David saved up enough money to buy this 1962 brand new when he was in high school.
- David owned four Corvettes in his lifetime, all garage kept, and donated this one to the Museum to ensure it would be well maintained by those who would protect it.



David had the nickname "The Weather Man" because his friends would tease him about how closely he would watch the weather, and quickly take his Corvette home when there was a chance of rain.



**Donated by
David Donoho of Zionsville, IN**



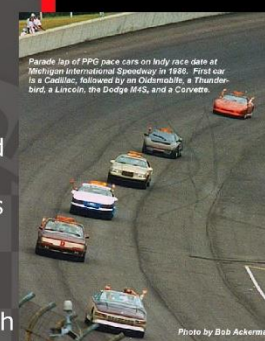
1984 **FAST FACTS**



- 401 CU. IN. V-8, 450 HP
- Performance Suspension
- Warner T-5 5-Speed Transmission with Modified Overdrive

DID YOU KNOW

- A bright orange Corvette, this one-of-a-kind concept car developed by PPG in cooperation with the Chevrolet Division of General Motors was designed to serve as an official pace car.
- It was one of several pace cars which alternated in pacing the races in the world's richest racing series, the PPG Indy Car World Series.
- The car features a Katech engine with chassis by George Foller. The body is by Diversified Glass Products and assembly is by Triad Service, Inc. The finish is Deltron Acrylic Urethane Orange Glow Candy.



This Corvette was one of the exhibits on display when the National Corvette Museum opened its doors September 2, 1994.

**On Permanent Loan From
PPG Industries**

1990

ZR-1

**FAST
FACTS**



SPYDER

- Full Performance ZR-1 Convertible ●
- Unique Deck lid with aero bars ●

DID YOU KNOW

- The ZR-1 Spyder features unique hood and front quarter panel vents to aid in engine compartment cooling. A new tonneau cover flows from the rear deck lid into the passenger compartment, reflective of Corvettes from the late 50s and early 60s. Individual aero bars are integrated into the bodywork behind the seat. The windshield and side glass have been lowered, accenting the "slingshot" design treatment.
- The CHMSL is located under the fuel filler door that automatically pops up when the brakes are applied. A stow away emergency top can be attached in case of foul weather. The car also has accented exhaust tips and brake calipers and a four-point racing harness.

This ZR-1 Spyder made its debut in the 1991 North American Auto Show.

The car was produced at the CPC Bowling Green Plant and the signatures of those involved in the building are on the underside of the hood and rear deck lid.



1992

**FAST
FACTS**

One Millionth Corvette



**5.7 LT1 V8 Engine, •
4 speed Automatic**

DID YOU KNOW

- Like the very first Corvette in 1953, the Millionth is a white convertible with red interior.
- Other features include: pass-key theft deterrent system, multi-port fuel injection, 4-wheel anti-lock brake system, acceleration slip regulation, 4-wheel independent suspension, uniframe construction, driver side air bag, 5-Link independent rear suspension.



**Donated by
General Motors Corporation**



**The 1,000,000th
Corvette was built at
about 2:00 PM on
July 2, 1992 at the
Bowling Green
Corvette Assembly
Plant.**

VIN 1G1YY33PXM5119134



1993

FAST FACTS



- 40th Anniversary Corvette
- 6,749 Built
- #14768 out of 21590
- Corvettes built for 1993

DID YOU KNOW

Hill's love for Corvettes began when he would wash his neighbor's brand new '63 split window Vette, and in exchange the neighbor allowed Hill to use the Corvette for an hour – in which Hill would take Karen cruising. Then in 1970 the newlyweds purchased their own 'Vette... a 1970 Mulsanne Blue Coupe. When son Craig was born Hill created a harness system so Craig could ride around with mom and dad. A few years later daughter Shannon was born and a reluctant decision was made to sell the car. But wife Karen began saving change from grocery shopping money, and in 1993 when their daughter entered college she surprised Hill on his 50th birthday with "Ruby" – a brand new 1993 40th Anniversary Coupe.

In addition to the 1970 LT-1 and "Ruby" the Clarks have owned 1997 and 2005 Black Corvette Z51 Coupes and in 2012 a Museum Delivered, 2012 Supersonic Blue Corvette Grand Sport. Most certainly there are more to come.

Donated by
Hill & Karen Clark of Bay Village, OH



"To have our 'Ruby' on display for others to enjoy and learn of our unique story is totally fitting. We could never sell her and with this donation we will be able to visit her whenever we so choose."
- Hill & Karen Clark



2001

FAST FACTS



- Mallett Hammer Conversion
- 700hp, 575 torque at flywheel
- Qtr. Mile: 10.6 sec. @ 128 mph
- Low mileage, 16k
- AntiVenom 436 Conversion

DID YOU KNOW

- Mallett Conversion completed June 2002; build number 009 of all ever built
- AntiVenom LSX Performance completed AV436 conversion, one of one - June 2008
- The car participated in a one mile top speed event - where cars go from a dead stop to one mile using radar and GPS speed measurement - running a 178 on radar and 181 on GPS (in 120 degree track temp. with 100% humidity).
- The car was featured on the cover of GM High Tech magazine.



Kevin and Linda donated the car to the Museum to help with the continued growth, and because they felt it would be a good vehicle for training other drivers at the Motorsports Park.

They are Lifetime Members of the Museum and have participated in many R8C Deliveries.



Donated by Kevin & Linda
Helmintoller of Land O' Lakes, FL





2009

**FAST
FACTS**



This Corvette started out as a 2008 Z06, but was converted to a 2009 ZR1.

DID YOU KNOW

If you remember early press photos of the ZR1 – this is the car! Nicknamed the “Blue Devil” by the media, spy photos began circulating well before the C6 debuted in 2005.



The 2009 ZR1 is Corvette’s 200+mph supercar, and with 638hp it was the most powerful automobile ever sold by GM. The ZR1’s chassis is an aluminum frame derived from the Z06, but also has Selective Magnetic Ride Control. A base ZR1 retails for \$103,300.

This car has an experimental VIN: 1G1YY26EX850022EX

VIN 22EX is a sister car to 23EX, which ran at Nurburgring as a Z06/Z07.

**On Loan from:
General Motors Corporation**

2009

FAST FACTS

1,500,000th Corvette



- 3LT Preferred Equipment •
Group
- Z51 Performance Package •
- 6.2L V8 / 430 HP •

DID YOU KNOW

- 3LT Package: AM/FM stereo, 6-disc in-dash CD changer, Bose premium 7 speaker system, head-up display, power telescoping steering wheel, heated seats, memory package, universal home remote, side impact airbags, driver and passenger adjustable sport bucket seats with perforated leather inserts, six-way power seats, luggage shade and parcel net, Bluetooth, power convertible top, custom leather wrapped interior.
- Z51 Performance Package: larger cross-drilled brake rotors, performance-tuned tires, stabilizer bars, spring, shocks, gear ratios
- Other features: forged chrome Aluminum wheels, DVD Navigation, Dual Mode Performance Exhaust, Arctic White exterior with black top and red interior, 6-speed paddle shift automatic transmission.

Purchased by the NCM Foundation

This Corvette was purchased by the National Corvette Museum Foundation to preserve its place in history.

The 1,500,000th Corvette was built on May 28, 2009. It was painted white and has a red interior to honor the first 300 Corvettes built in '53.

VIN 1G1YY36W295114471



The Event:

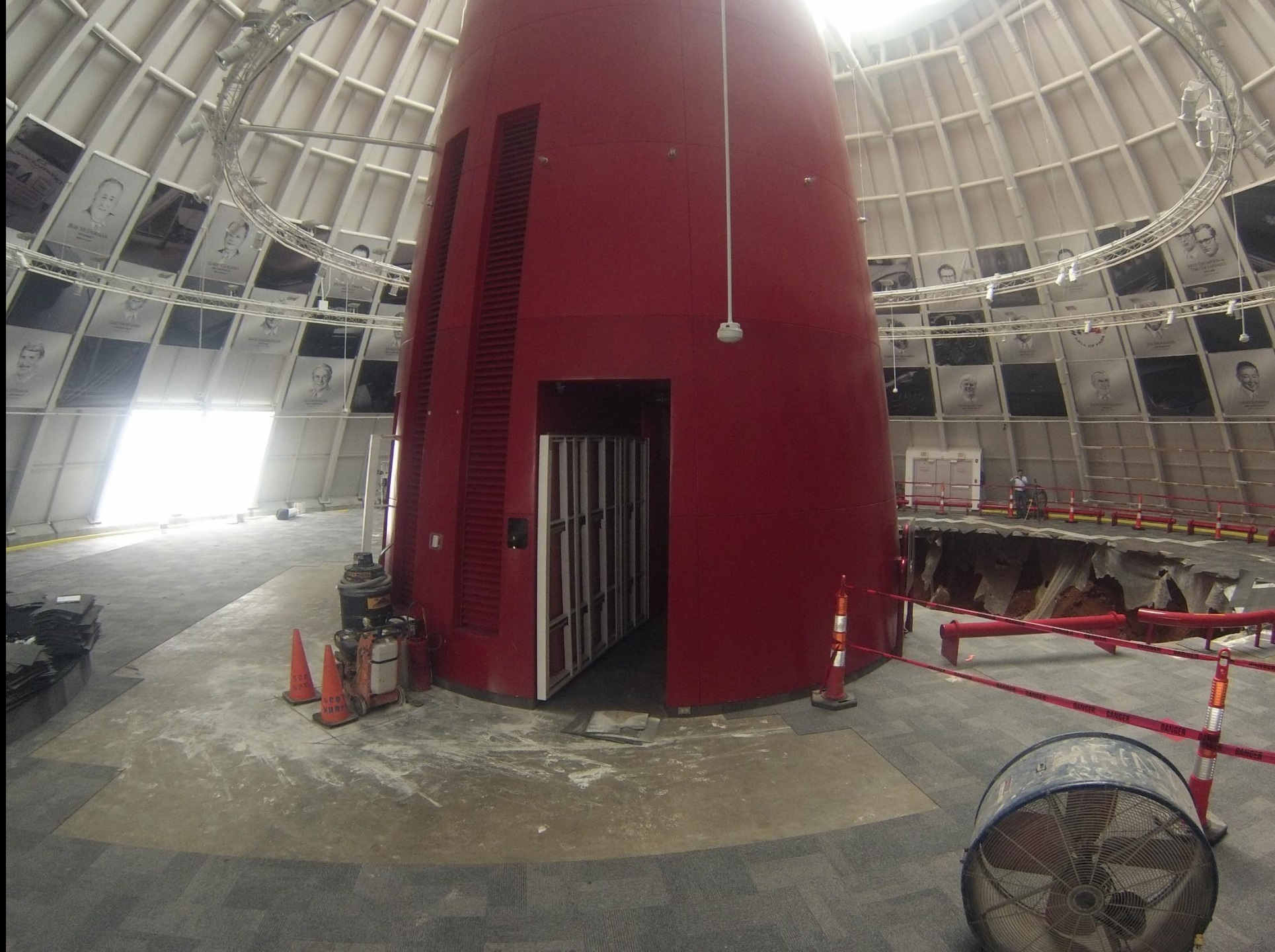


The Morning After:









The Challenges:

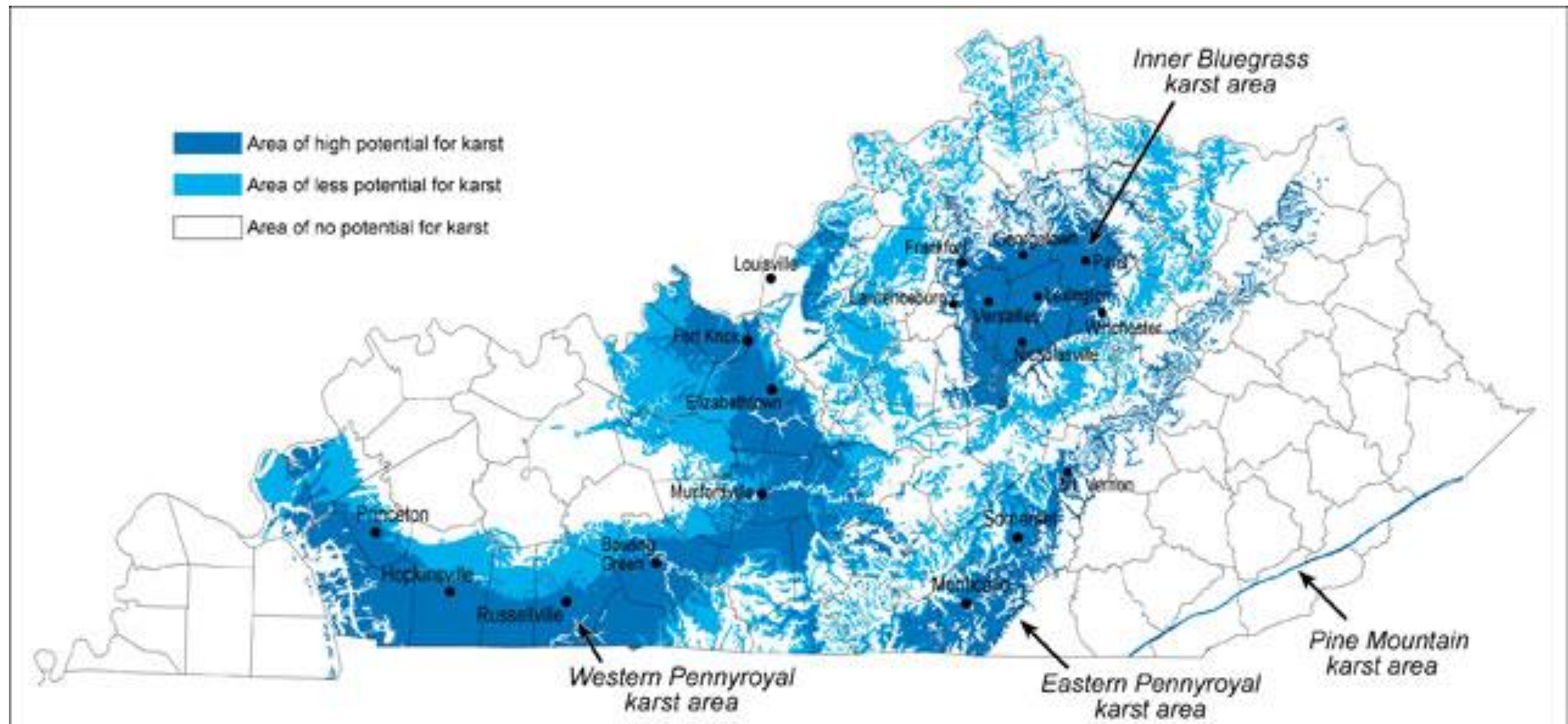
- ☐ Lack of Information
 - ☐ No soils report
 - ☐ No structural loads
 - ☐ No obvious cause
- ☐ Need for Immediate Response
- ☐ Achieving Consensus
 - ☐ Owner
 - ☐ GC
 - ☐ Insurance Co
 - ☐ Peer Reviewers
- ☐ Access
- ☐ 20th Anniversary Gala
- ☐ Tourists
- ☐ Solicitors





The Environment:

Karst in Kentucky



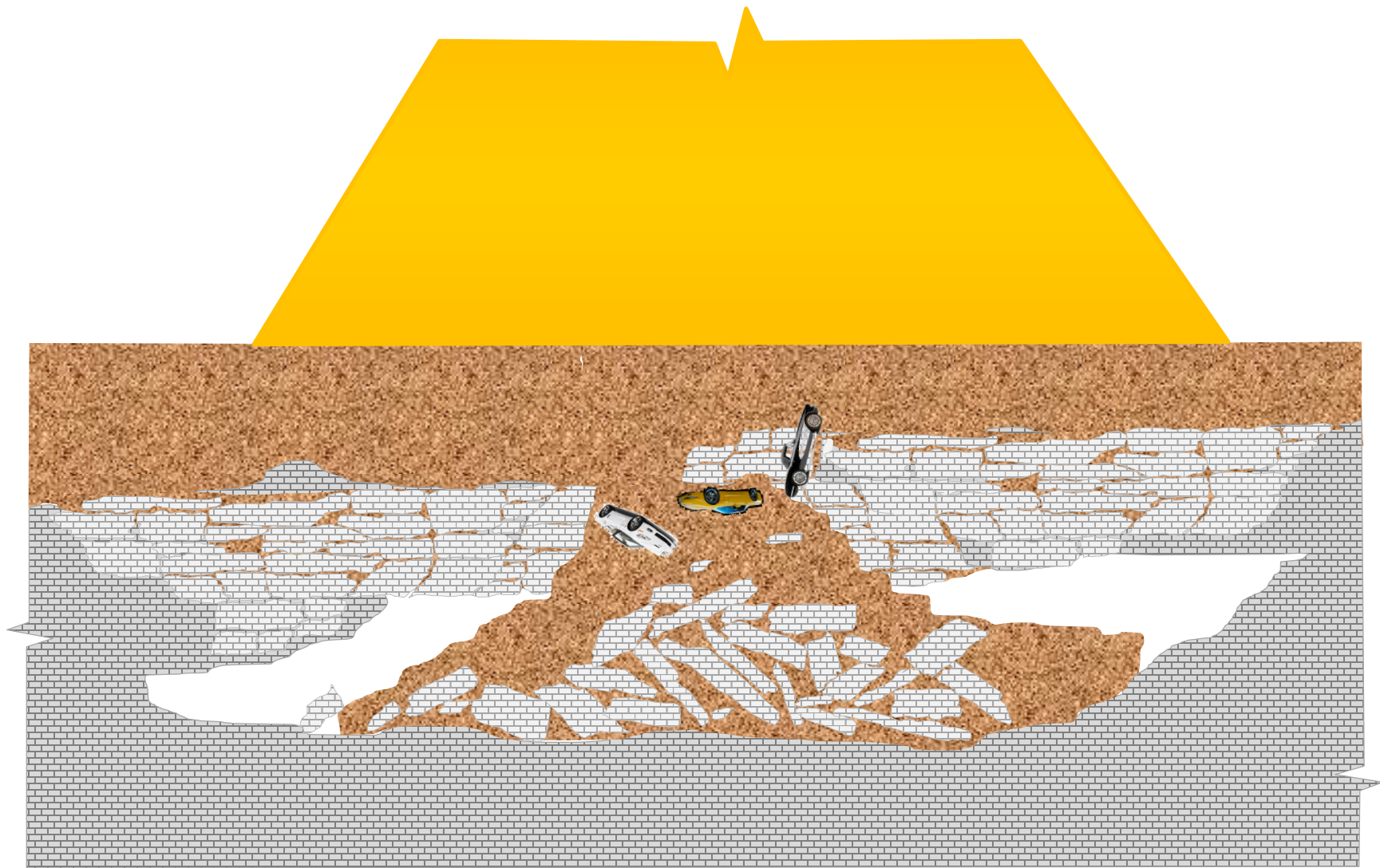
Sinkholes in Bowling Green, KY

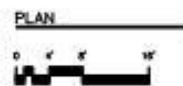
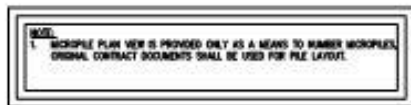


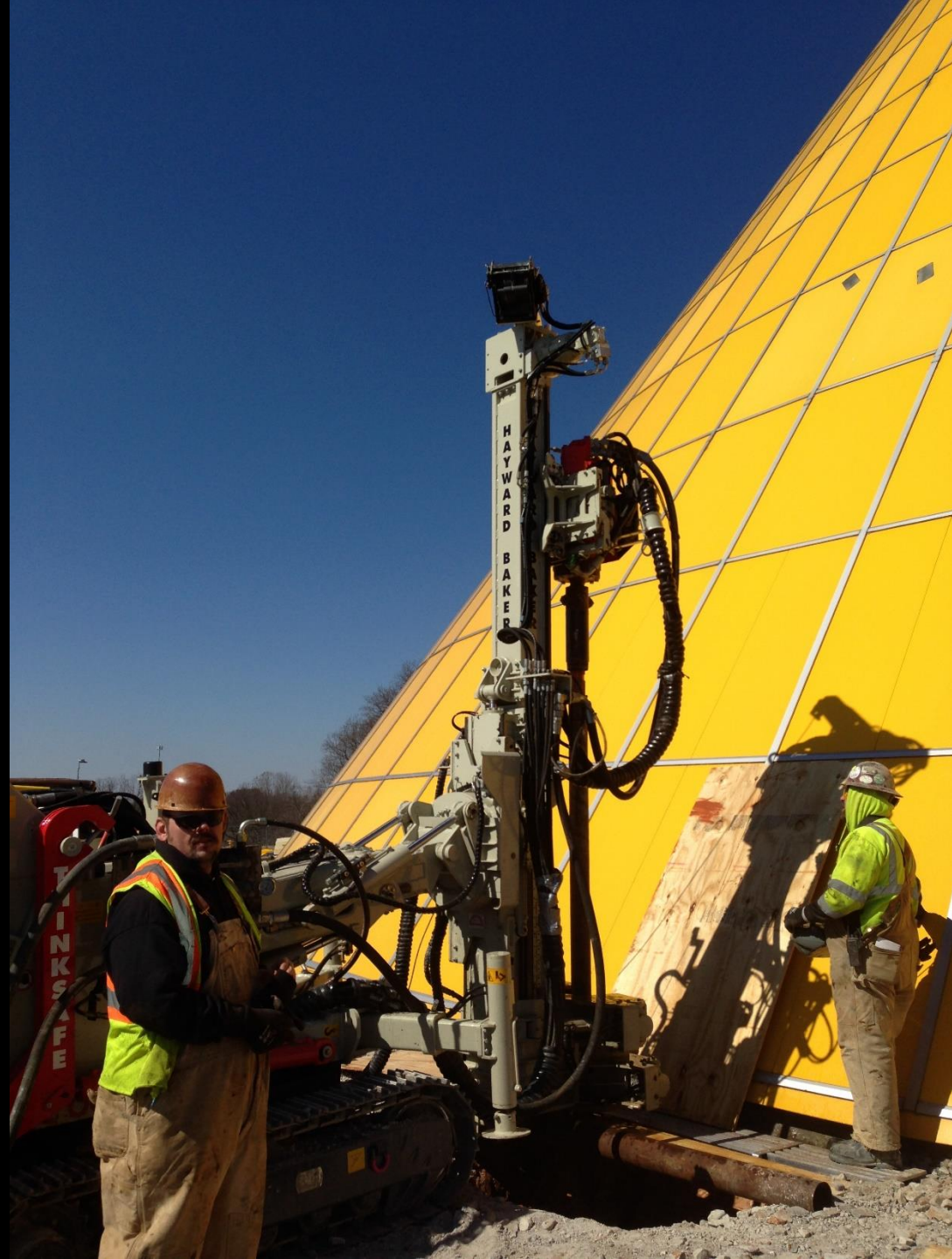
By: Gary Berdeaux



The Work:







NCM SKYDOME COLLAPSE

MICROPILE UNDERPINNING

GENERAL NOTES:

1. THE MICROPILES HAVE BEEN DESIGNED IN GENERAL ACCORDANCE WITH IRC 2009.
2. AN ULTIMATE GROUT TO ROCK BOND OF 100 PSI HAS BEEN USED IN THE DESIGN OF THE PILES.
3. LAYOUT OF THE PILES SHALL BE BY THE GENERAL CONTRACTOR.
4. THE MICROPILES WERE DESIGNED BASED UPON THE LOADS PROVIDED BY K&S ENGINEERING, PLLC.

MATERIAL SPECIFICATIONS:

1. PROVIDE A NEAT CEMENT GROUT THAT HAS A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF $f'_c = 4,000$ PSI. THE GROUT SHALL BE MADE WITH CEMENT THAT MEETS ASTM C150 TYPE I/II OR II, WITH 5 TO 5.5 GAL. WATER TO 94 LB BAG OF CEMENT.
2. PROVIDE H80 CASING WITH A MINIMUM YIELD STRENGTH OF 80 KSI FOR ALL PILE TYPES.
3. ALL THREAD REINFORCEMENT SHALL MEET ASTM A722 150 KSI.
4. BRACKETS SHALL BE MAGNUM PIERING MICROPILE BRACKET OR EQUIVALENT WITH 50 KIP ALLOWABLE CAPACITY.
5. LONG GROUT SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF $f'_c = 3,000$ PSI. THE GROUT SHALL BE MADE WITH CEMENT THAT MEETS ASTM C150 TYPE I/II OR II.
6. LONG GROUT SHALL HAVE A SLUMP OF 3 TO 5 INCHES.

TYPICAL MICROPILE CONSTRUCTION SEQUENCE:

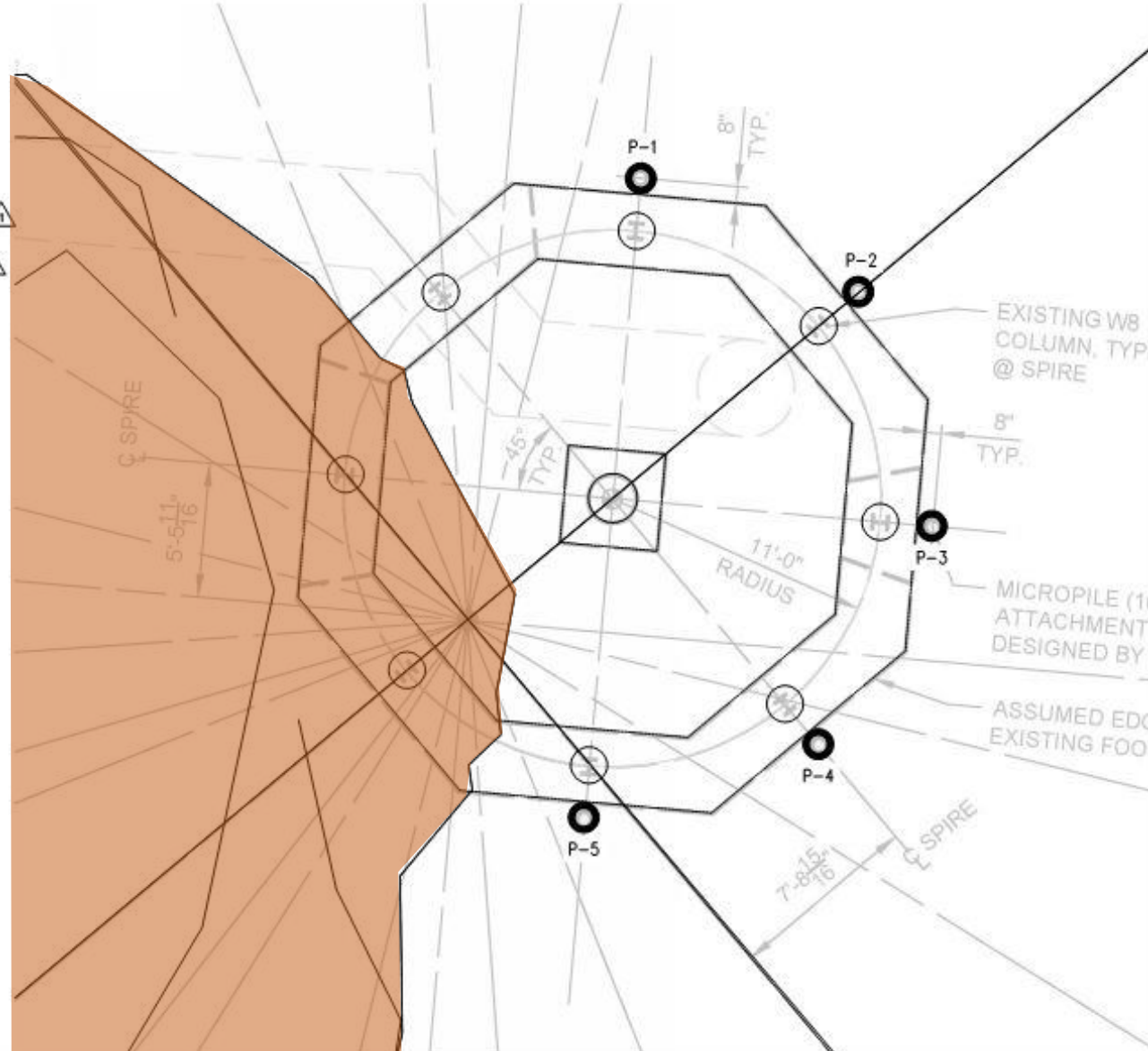
1. PRE-EXCAVATE TO WORKING GRADE PRIOR TO INSTALLATION OF THE PILES (BY OTHERS).
2. ROTARY FLUSH CASING TO TOP OF ROCK USING AIR OR WATER AS FLUSHING MEDIUM. USE ROTARY PERCUSSIVE DRILLING TO DRILL ROCK SOCKET TO REQUIRED DEPTH. THE BOND LENGTH CAN BE CUMULATIVE WITH SMALL DISCONTINUITIES SO LONG AS THE LAST 5'-0" IS CONTINUOUS.
3. PULL THE MICROPILE CASING TO THE TOP OF THE ROCK SOCKET AND SUSPEND THE CASING A MINIMUM OF 2 FEET IN THE ROCK SOCKET.
4. PLACE GROUT FOR PILES BY ONE OF THE FOLLOWING METHODS:
 - 5.1. BY TREMIE METHOD FROM BOTTOM OF THE HOLE FOR COMP. ROCK BOND ZONE.
 - 5.2. LONG METHOD FOR ALTERNATE BOND ZONE.
 - 5.2.1. LONG GROUT BOTTOM 25' BROKEN ROCK (SEE NOTES ON SHEET S3.0 FOR GROUTING CRITERIA).
5. INSTALL CENTER CORE REINFORCEMENT STEEL (STEEL MAY BE PLACED PRIOR TO OR IMMEDIATELY AFTER GROUTING).
6. CUT TOPS OF PILES TO FINAL ELEVATION AND INSTALL UNDERFOOTING BRACKET PER MANUFACTURER'S SPECIFICATIONS.

MATERIAL TESTING REQUIREMENT:

1. A MINIMUM OF SIX (6) GROUT SAMPLES SHALL BE CAST DAILY DURING GROUTING OPERATIONS WITH A MINIMUM OF ONE TESTED AT THREE (3) AND SEVEN (7) DAYS. THE REMAINING GROUT SAMPLES SHALL BE PRESERVED UNTIL THE DESIGN GROUT STRENGTH HAS BEEN ACHIEVED. SAMPLES SHALL BE CAST IN 308 CYLINDERS.

MISCELLANEOUS:

1. MICROPILE PLAN VIEW IS PROVIDED ONLY AS A MEANS TO NUMBER MICROPILES. ORIGINAL CONTRACT DOCUMENTS SHALL BE USED FOR PILE LAYOUT.
2. FIELD VERIFY ALL DIMENSIONS AND JOB SITE CONDITIONS PRIOR TO BEGINNING WORK.
3. ALL UNDERGROUND UTILITIES SHALL BE LOCATED BY THE GENERAL CONTRACTOR PRIOR TO DRILLING. H&S SHALL BE NOTIFIED OF ANY UTILITIES.





The Exploration:

DISCLAIMER

Designs, sketches, specifications, and/or reports prepared by Hayward Baker, Inc. ("HBI") and/or its employees have been prepared for the sole use of the client and are not to be used for any other purpose without the written consent of HBI. HBI makes no warranty or representation as to the accuracy or completeness of the information provided to HBI by the client, and HBI is not responsible for any errors or omissions in the information provided. HBI is not a professional engineering firm and does not provide engineering services. HBI is not a geotechnical engineering firm and does not provide geotechnical engineering services. HBI is not a geotechnical engineering firm and does not provide geotechnical engineering services.

THIS DRAWING HAS BEEN PREPARED BASED UPON INFORMATION PROVIDED BY THE CLIENT. HBI HAS CONDUCTED VISUAL INSPECTIONS OF THE SITE AND HAS REVIEWED THE INFORMATION PROVIDED BY THE CLIENT. HBI HAS CONDUCTED VISUAL INSPECTIONS OF THE SITE AND HAS REVIEWED THE INFORMATION PROVIDED BY THE CLIENT. HBI HAS CONDUCTED VISUAL INSPECTIONS OF THE SITE AND HAS REVIEWED THE INFORMATION PROVIDED BY THE CLIENT.

REVISIONS

NO.	DATE	DESCRIPTION
1	03/19/14	ISSUED FOR PERMIT
2	03/19/14	ISSUED FOR PERMIT
3	03/19/14	ISSUED FOR PERMIT
4	03/19/14	ISSUED FOR PERMIT
5	03/19/14	ISSUED FOR PERMIT

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REVISIONS

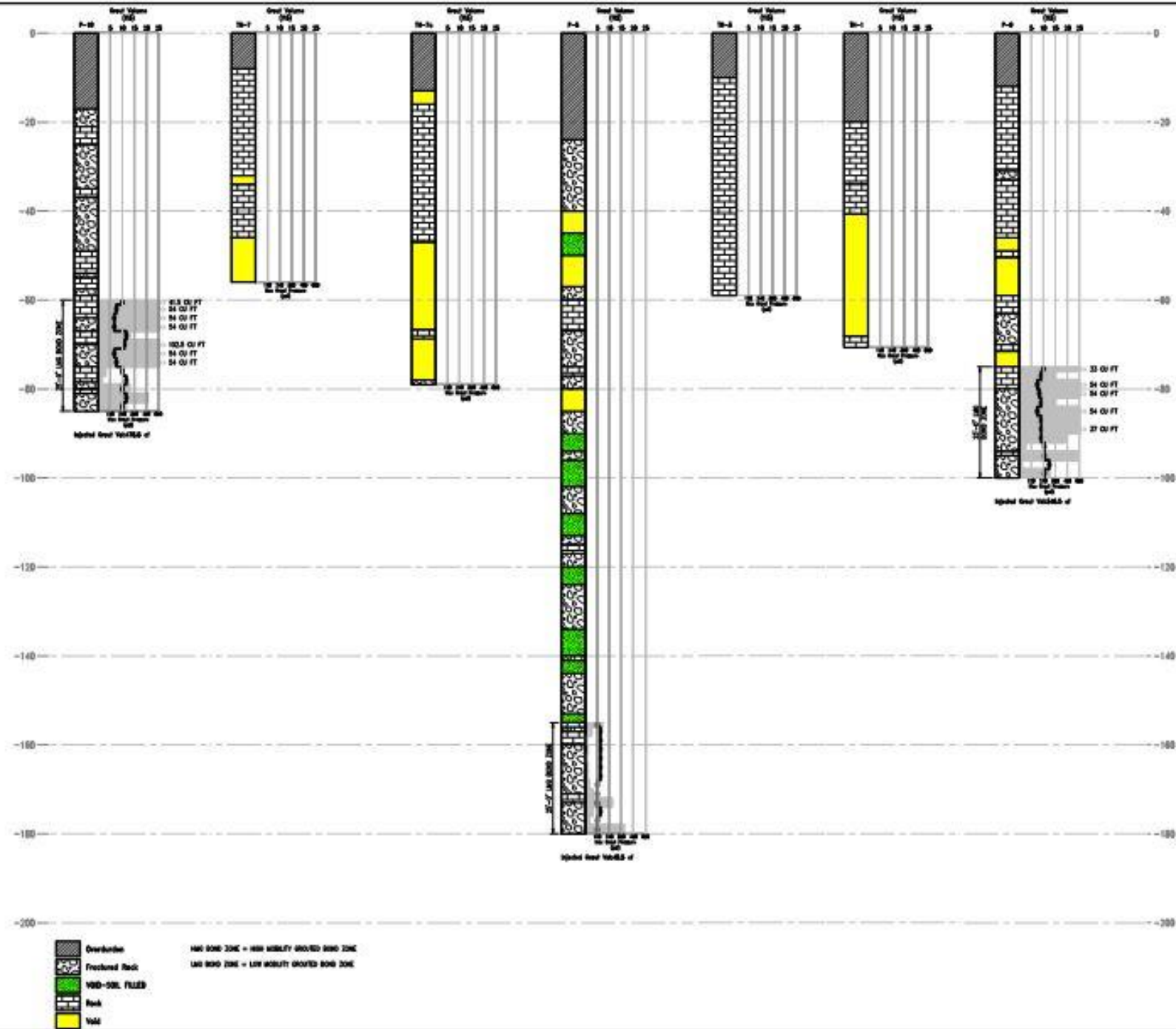
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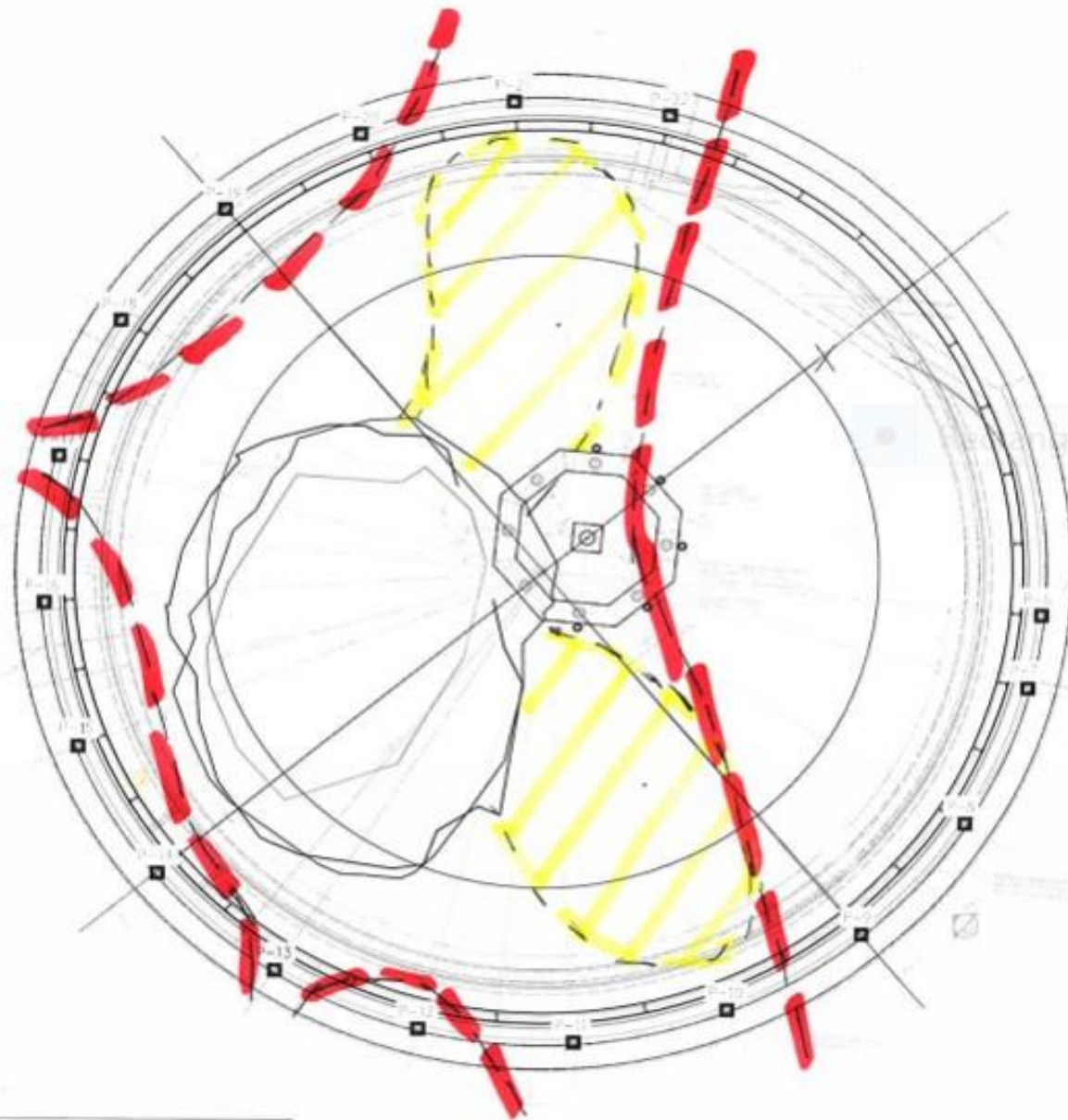
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REVISIONS

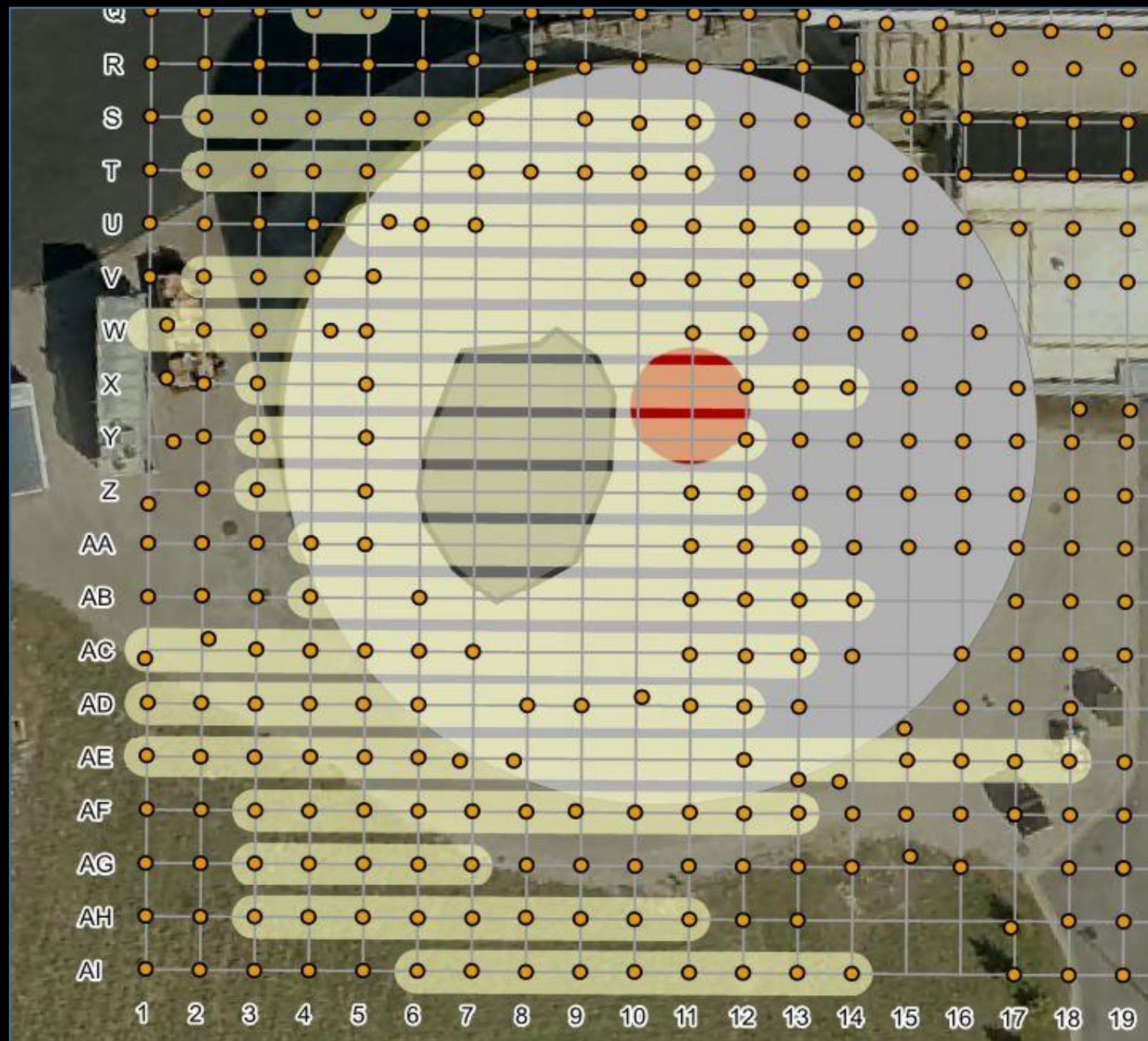
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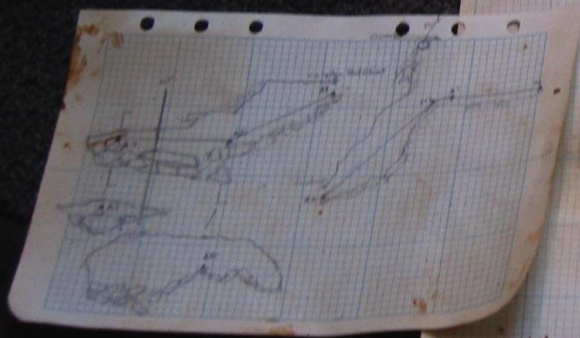
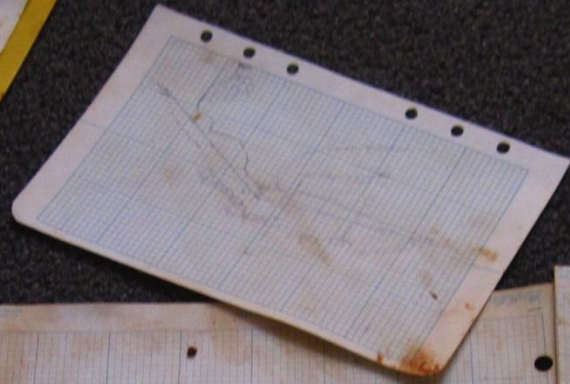
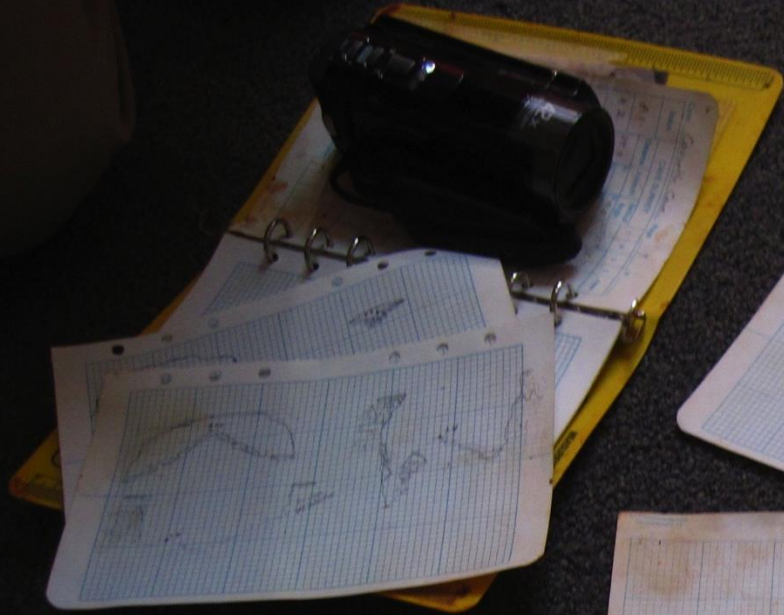
NOTE:
THIS PLAN VIEW IS PROVIDED ONLY AS A MEANS TO GUIDE THE CONTRACTOR.
THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE FINAL DESIGN.







Dr Jason Polk and associate



Skydome Collapse

National Corvette Museum

Bowling Green, Kentucky

Cartography by Jason S. Polk

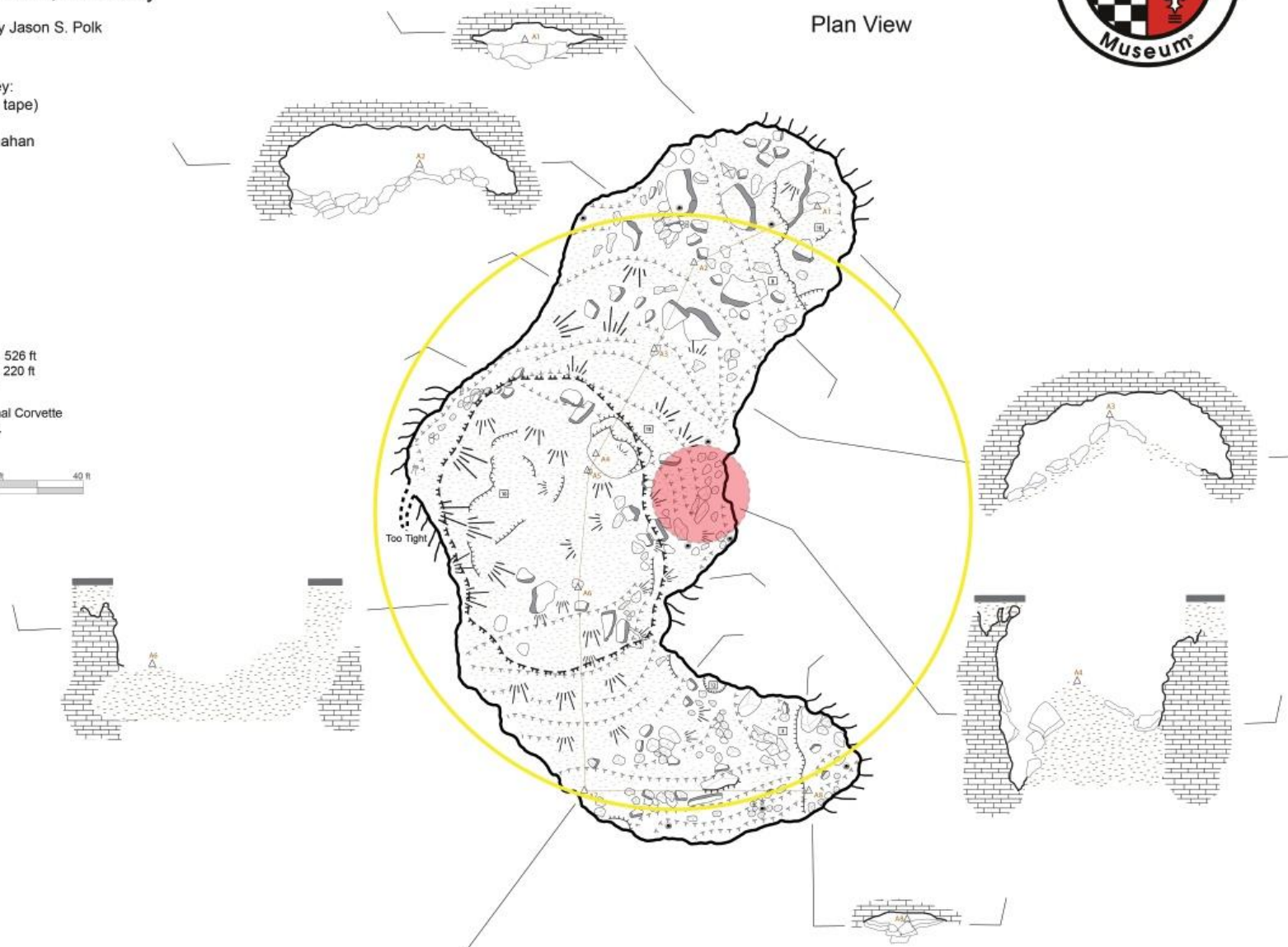
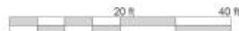


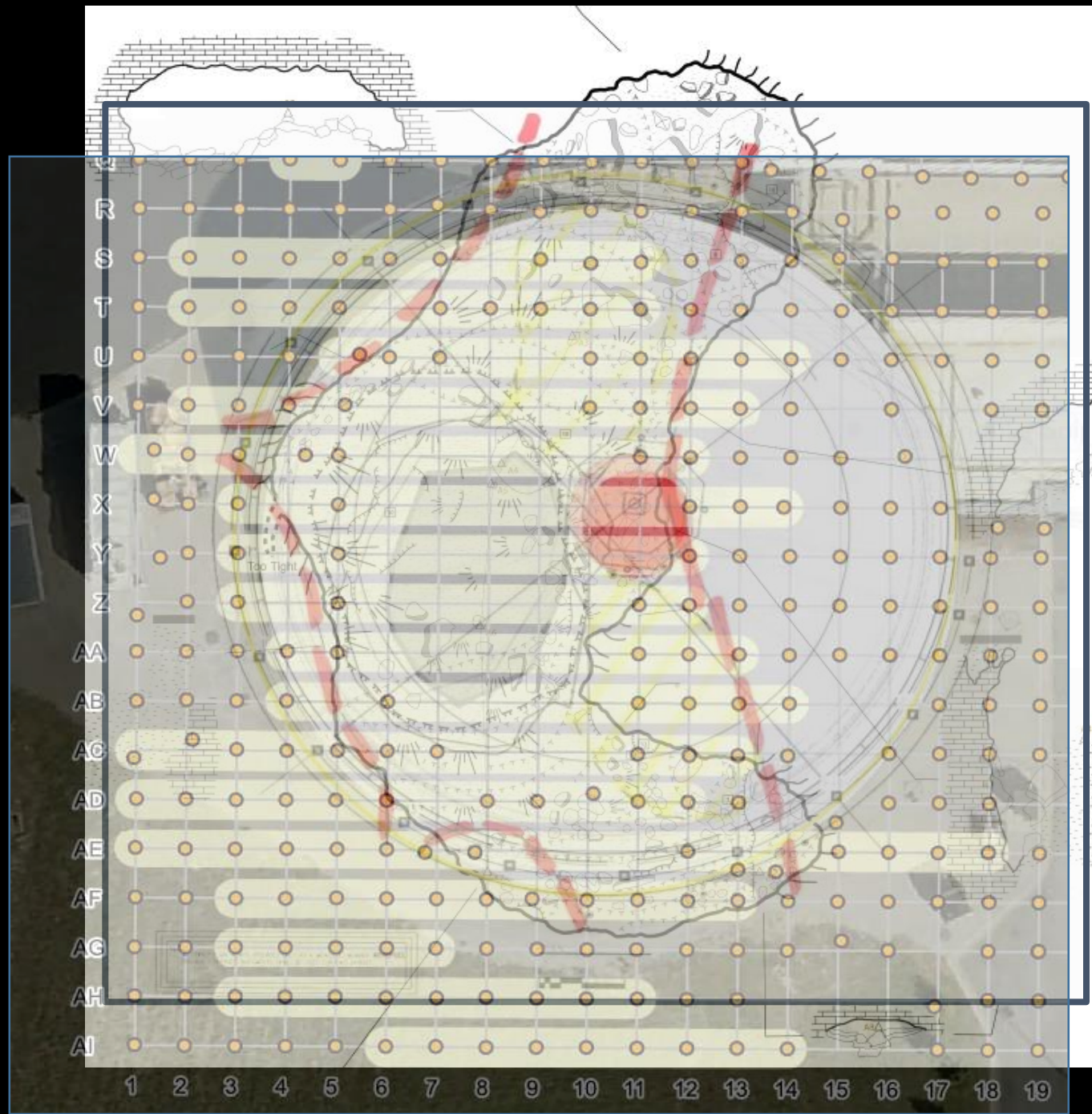
4/5/2014 survey:
(Suunto, disto, tape)
Brian Ham
Kegan McClanahan
Jason Polk



Datum Elevation: 526 ft
Surveyed length: 220 ft
Declination: -4.31

Cave is on National Corvette Museum property.













The Cars:

In order of retrieval

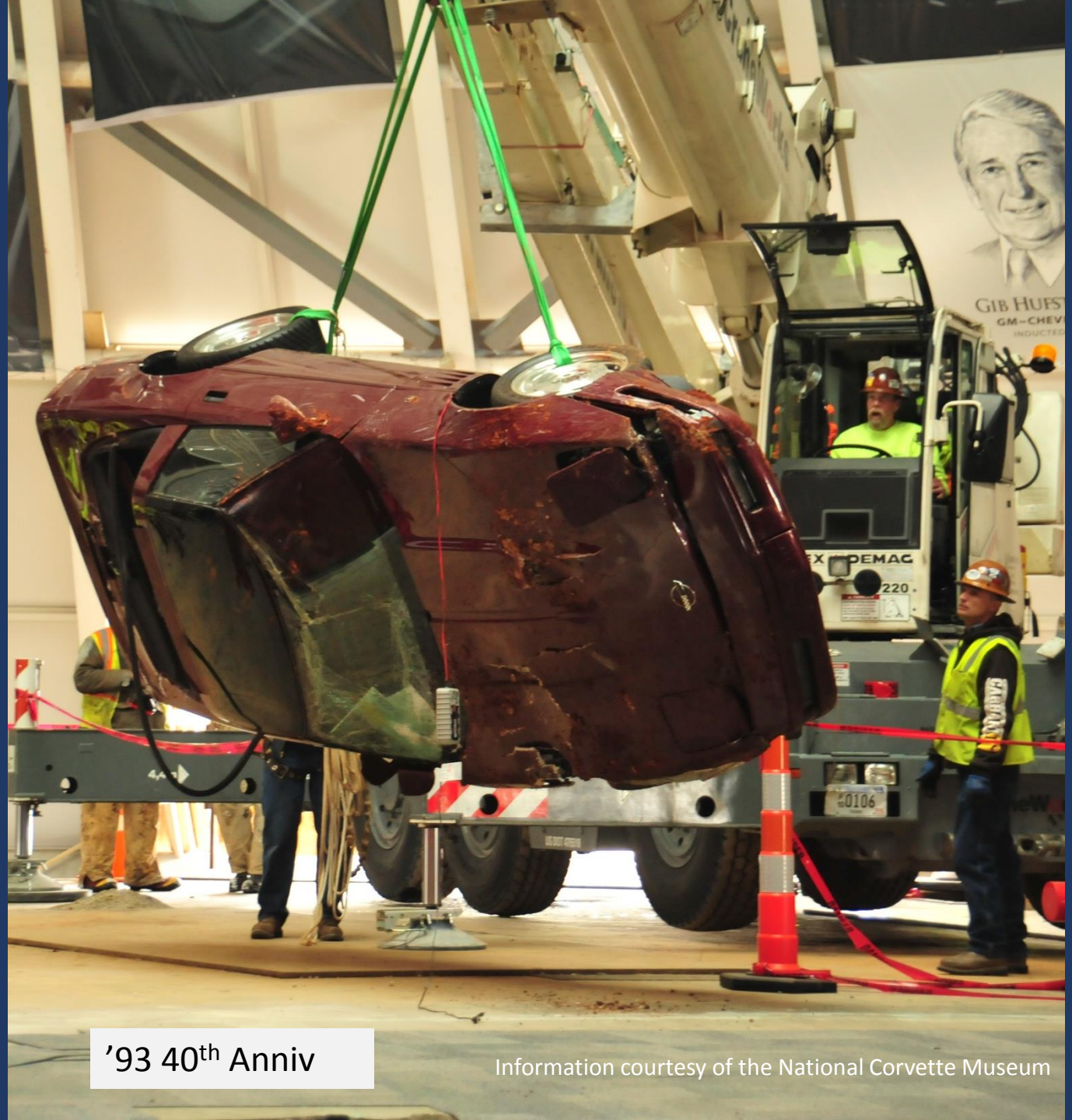


'09 Blue Devil

Information courtesy of the National Corvette Museum



'62



'93 40th Anniv

Information courtesy of the National Corvette Museum





'84 Pace Car

Information courtesy of the National Corvette Museum



'90 ZR-1 Spyder

Information courtesy of the National Corvette Museum



'09 1.5M

Information courtesy of the National Corvette Museum



'01 Mallett Hammer

Information courtesy of the National Corvette Museum



Information courtesy of the National Corvette Museum

The Future:

The Lemonade:



- Attendance for July is up 63% over July 2013... since Feb. overall attendance is up about 60%.
- 1.7 million website visits between Feb. 12 and July 31 (increase of 274.55% or 454,278 visits in 2013)
- 872,420 unique visitors through July 31 (increase of 255.31% or 245,535 visitors for 2013)
- Average time on site 3:47 (increase of 45.98% over 2:36 in 2013)
- 49% are new visitors
- 8,597 TV & Radio Stories Feb. 12 to NOV. 18
 - Report includes ~2,000 major news sources (US, Canada, UK, Middle East)
 - 1,363 Radio Clips, 7,234 TV Clips
 - \$18.7 Million Value on TV alone
 - Estimated over 95 million viewers
- TV documentaries on:
 - Discovery Channel's Daily Planet
 - Velocity Channel's AmeriCARna
 - Velocity Channel's Corvette Nation
 - History Channel's "Book of Secrets"
 - Weather Channel's "The Strangest Weather on Earth"
 - Weather Channel's "OK, Now What"
 - Weather Channel's "Secrets of the Earth"

www.corvettemuseum.org

