CROMWELL

April 19, 2019

Randy Bates
Hot Springs National Park
101 Reserve Street
Hot Springs, AR 71901

RE: Final Report – Water Intrusion Issue Evaluation
Klipsch Heritage Museum, Hope Arkansas
Cromwell project number: 2018-238

Randy,

The following is our report on the water intrusion study for the basement of the Kiplisch Museum in Hope, Arkansas. The work was done under order number 140P5118P0121 dated 8/28/2018 from the National Park Service, MWY, Pres. Wm J. Clinton.

Statement of the Problem: The Klipsch Museum which houses the library of Paul W. Klipsch including technical journals in the fields of electronics and acoustics and several products produced by Mr. Klipsch is a one-story building with a basement. The museum needs additional storage space for the artifacts. The basement has been used in the past but is subject to water intrusion and is no longer usable for museum storage. The purpose of this study and report are to determine methods and the corresponding cost for implementing the improvements to eliminate the water intrusion to allow the basement to be used for museum storage.

Existing Building: The existing building is a one-story building with a basement with a footprint of approximately 34-foot by 43-feet. Characteristics of the building include the following:

a. Construction: The basement and first floor are constructed using cast-in-place concrete. The framing for the walls and roof of the building were not visible but appear to be framed with wood framing.
b. History: The building was constructed as part of the Southwest Proving Ground around 1941 as the telephone exchange building. From the engineering study from the closing of the Southwest Proving Ground in 1946 the building was referred to as building 116. Per Jim Hunter, the museum curator, the building is registered with the State of Arkansas as a historic landmark.
c. Basement walls and slab on grade: The basement walls and slab on grade appear to be in good condition. The water on the basement floor varied based on the site visit. Typical there were some dry areas in the higher elevation of the slab and lower areas holding water around the edges of the slab. The difference in the depth is expected to be due to the slab not being level when poured and possible uplift of the slab due to pressure from ground water.
d. Elevator / Lift Pit: The building has a lift pit on the north side of the building which was used to move equipment in and out of the basement. The pit for the lift is approximately 4-feet below the bottom of the basement floor. This pit had water in it of varying depths from 1-foot to 1½ foot at each visit.

e. Original Storm Drain system: The extent of the existing storm drain system is unknown. The existing roof drains on the front of the building feed into a storm drain system but it was found out in the study that the storm drain system has collapsed approximately 4-feet to 6-feet from the bottom of the boot where the downspout ties into the storm drain.
f. Recent improvements to the storm drain system: An attempt was made to add fill and piping on the back of the building to direct water from the gutters and downspouts away from the building. It appears that system has failed.
g. See the drawings in Attachment 1 for the drawings of the building developed from the site visit and scanning of the building. See Attachment 1 to Attachment 3 for photos of the building and aerial images of the site.
h. Flooding History: Per Jim Hunter, the museum curator, the basement flooding has gone on for about 30 years with the worst case being approximately 2-feet of water in the basement about 20 years ago.

Site and Soil Characteristics: The site in the area is relatively flat with minimal grade changes. Soils in the area vary from high-plasticity clay to sandy loam. The following site characteristics were noted:

1. Surrounding grade does not get below the bottom of the elevator pit until the drainage ditch for the area crosses under the high approximately one-quarter (¼) of a mile away.
2. The ditches on the highway in front of the building, which are approximately ten feet above the top of the basement floor, had standing water in the ditch on all of our site visits.
3. The land to the west of the building does not drain well. There is water standing in the field where the drainage from the site occurs. According to Jim Hunter, the museum curator, the adjacent land owner brought in a significant amount of fill which impeded the flow of water from the site. A Google image from November 28th, 2013 shows that the drainage from the southwest corner of the site at that time appears to be relatively continuous sheet flow across the property. Per Jim Hunter, the land owner has brought in fill. Our site observations are that the fill impedes water leaving the site with some standing water near the southwest corner of the property. See Image 2 for the image from Google Earth.

Study Approach and Tasks: The study for the building consisted of the following:

1. Original site visit and scanning: The initial site visit occurred on 10/10/18. See Attachment 3 for a copy of the report from that site visit and meeting. The following occurred in that site visit:
    a. A walk-through was done to see the issues, existing building, and the site
    b. The facility was scanned using a FARO 3D laser scanner to develop point clouds of the building and site.
    c. The area around the building was observed to see the conditions around the building.
    d. A meeting was held with the museum curator, Jim Hunter, to get information on the building and the water intrusion issues.
2. Development of plans for the building and site from the site visit: The point clouds from the scans from the 10/10/18 site visit were used to develop a Revit model of the existing building

and site. The Revit model was used to develop the Existing Building Drawings in Attachment 1 to this report for the drawings of the existing building developed in this study.

3. Scoping of the storm drain system to determine the extent of the storm drain system: The firm of ARTexElectric from Texarkana was contracted to come on site to scope the existing building downspout boots that the downspouts from the gutter in the front of the building drain into in order to determine the extent of the existing storm drainage system. They were on site on 12/18/18 and looked at the lines at the downspout boots on each end of the front of the building. The finding was the pipes connected to those downspout boots were filled with gravel or were crushed approximately 4 to 6 feet from the top of the downspout boot.
4. Consultation with a basement contractor: At the request of the museum board a contractor from the Dallas area who specializes in repairing basements, Willie King, was brought in to get his insight and thoughts on the basement issues and possible repair methods. See Attachment 5 for a report from his site visit.

Findings: The primary findings were the following:

1. Drainage in the ditches and property around the site is in poor condition which holds water on the surface above the level of the basement.
2. The existing foundation drainage system is suspected to have been compromised based on the collapsed or filled roof gutter downspout drainage boots in the front of the building. It is suspected that the downspouts on the front of the building drain into the failed drainage system and contribute to the water in the basement.
3. The top of the basement floor slab is below the elevation of the ground until approximately ¼ of a mile from the site where the drainage ditch for the area crosses under the highway.

Conclusion: The primary conclusion is that the ground water level during heavy rains is higher than the basement causing the ground water to drain into the basement through various cracks and construction joints. Fixing the problem will require a combination of the following:

1. Getting the surface and roof water away from the building
2. Reducing the ground water depth around the building
3. Waterproof the basement walls to and slab to reduce the infiltration of water into the basement.

Recommendations: The recommendation is to implement some offsite improvements as shown in item A below and one of the two following options in item B or C below:

A. Offsite Improvements: The following offsite improvements will most likely not resolve the problem but should reduce the ground water issues in the basement. The offsite improvements are noted as follows and shown in Image 1 at the end of this report:
    a. Get the local jurisdiction responsible for the ditches along the highway in front of the museum to clean out the ditches from approximately 250 yards up stream of the museum to the ditch that crosses the highway to the south (approximately 380 yards) to eliminate the standing water in the ditches along the highway in front of the museum.

b. Get the landowner to the south and west of the museum to cut a ditch across their property to the drainage ditch to the west to reduce standing water and improve the drainage from the area. Image 2 at the end of this report shows the approximate flow direction of water from the site prior to fill being placed from a Google Earth image dated 11/28/13.

B. On-Site Improvements - Option 1: Attack the problem from the exterior. The theory behind this fix is that waterproofing the walls below the exterior grade, fixing the existing foundation drainage system, installing exterior sumps below the water level of the basement floor, and pumping the water to the back of the property will lower the water table around the building allowing the basement to stay dry.

Attacking the problem from the exterior is much more expensive since it requires removing the soil around the building to below the bottom of the basement floor slab. This option has a better chance of taking care of the problem but is more expensive and runs the risk of an expensive repair if any of the systems fail in the future. The improvements are as follows:

a. Interior Improvements: Install a sump pump in the elevator pit and tie it into the manholes / sump pits behind the building.
b. Exterior Improvements:
    i. Install two approximately 14-foot deep sump-pits / manholes behind the building to collect water from the sump in the basement and the roof drains to flow in pipes to the back of the property. Provide a primary and a backup sump pump in the southernmost sump / manhole.
    ii. Basement wall waterproofing and foundation drainage improvements:
        1. Excavate the ground around the building to 6” below the bottom of the basement floor including shoring up the porch structures.
        2. Clean the basement walls
        3. Waterproof the basement walls
        4. Install a protection board (minimum 1” foam insulation) and/or a drainage mat over the top of the waterproofed wall.
        5. Install a foundation drainage system around the building to collect water around the building and drain it to the manholes / sump pits behind the building.
        6. Backfill the excavation
    iii. Install a gutter on the shed constructed over the stairwell and porch for the lift on the north side of the building. Put the downspout on the west end and pipe it to the nearest sump / manhole.
    iv. Install a 6” shallow drain line from the manholes to the back of the property to drain water away from the building.

v. Install 4" shallow drain lines on the north and south side of the building to take the water from the gutters in front of the building and from the window wells to the manholes behind the building.
vi. After the improvements above have been completed and tested for at least one season to see if they work, regrade and repave the drive in the front of the building as shown on the drawings. The regrading of the drive should provide a swale to drain water away from the building and around to each side of the building.

See Attachment 1 - Option 1 drawings (CI100 thru SI102) for more information on the option 1 work.

The cost estimate for both phases of Option 1 is approximately $267,000. See the cost estimates in Attachment 2 for a breakdown of the estimated costs.

C. On-Site Improvements - Option 2: Attack the problem from the interior with minimal exterior improvements. This option uses the existing lift/elevator pit as a sump to drop the ground water around the building and uses water proofing on the inside of the basement walls to keep the water out of the basement.

Attaching the problem from the interior is less expensive since it does not require excavating the soil around the building to below the level of the basement. The following are the interior and exterior improvements recommended:

a. Interior Improvements:
   i. Drill approximately 9 holes approximately ½" diameter in the wall of the elevator/lift pit approximately 2-feet from the bottom of the pit to drain water into the pit to pump it to the exterior.
   ii. Install a sump pump in the pit to pump the water to an exterior well to drain it to the back of the property.
   iii. Pour a concrete curb approximately 8" x 8" at the bottom of the opening to the elevator lift shaft and pit.
   iv. Infill the opening and provide a steel door between the basement and the elevator / lift shaft.
   v. Cut an approximately 1" x 1" groove in the floor at the bottom of the exterior basement wall all around the basement and fill with a crystalline waterproofing material
   vi. Waterproof the inside face of the exterior basement wall using a crystalline waterproofing to a minimum height of 2-feet above the floor level.
b. Exterior Improvements:
   i. Install two approximately 3-foot deep manholes behind the building to collect water from the sump in the basement and the roof drains to flow in pipes to the back of the property

ii. Install a gutter on the shed constructed over the stairwell and porch for the lift on the north side of the building. Put the downspout on the west end and pipe it to the nearest manhole.
iii. Install a 6" shallow drain line from the manholes to the back of the property to drain water away from the building.
iv. Install 4" shallow drain lines on the north and south side of the building to take the water from the gutters in front of the building and from the window wells to the manholes behind the building.
v. After the improvements above have been completed and tested for at least one season to see if they work, regrade and repave the drive in the front of the building as shown on the drawings. The regrading of the drive should provide a swale to drain water away from the building and around the building.

See Attachment 1 - Option 2 drawings (CI201 and SI201) for more information on the proposed improvements.

The cost estimate for Option 2 is $59,000 to $72,000 depending on if Alternate 1 for pouring a new concrete slab in the basement is done. See the cost estimates in Attachment 2 for a breakdown of the estimated costs.

Note that destructive testing and inspection was beyond the scope of this study. Destructive testing and inspection including excavating around the building to determine the extent of the existing storm drain system and possibly installing piezometers to monitor the height and flow of the groundwater around the building is recommended when plans are produced to design the final improvements.

Thank you for the opportunity to work on this project. Please let us know if you have questions or need additional information.

Sincerely,

Joe Hilliard, PE SECB
Executive Vice President

CC: Barbara Judy, National Park Service
Jim Hunter, Curator, Klipsch Museum

Attachments:
1 – Drawings
2 – Cost Estimates
3 – 2018-10-10 Site Visit Report
4 – 2018-11-09 Conference Call Meeting Notes
5 – 2019-03-08 Site Visit Meeting Notes

Report Image 1 – Off-Site Improvements

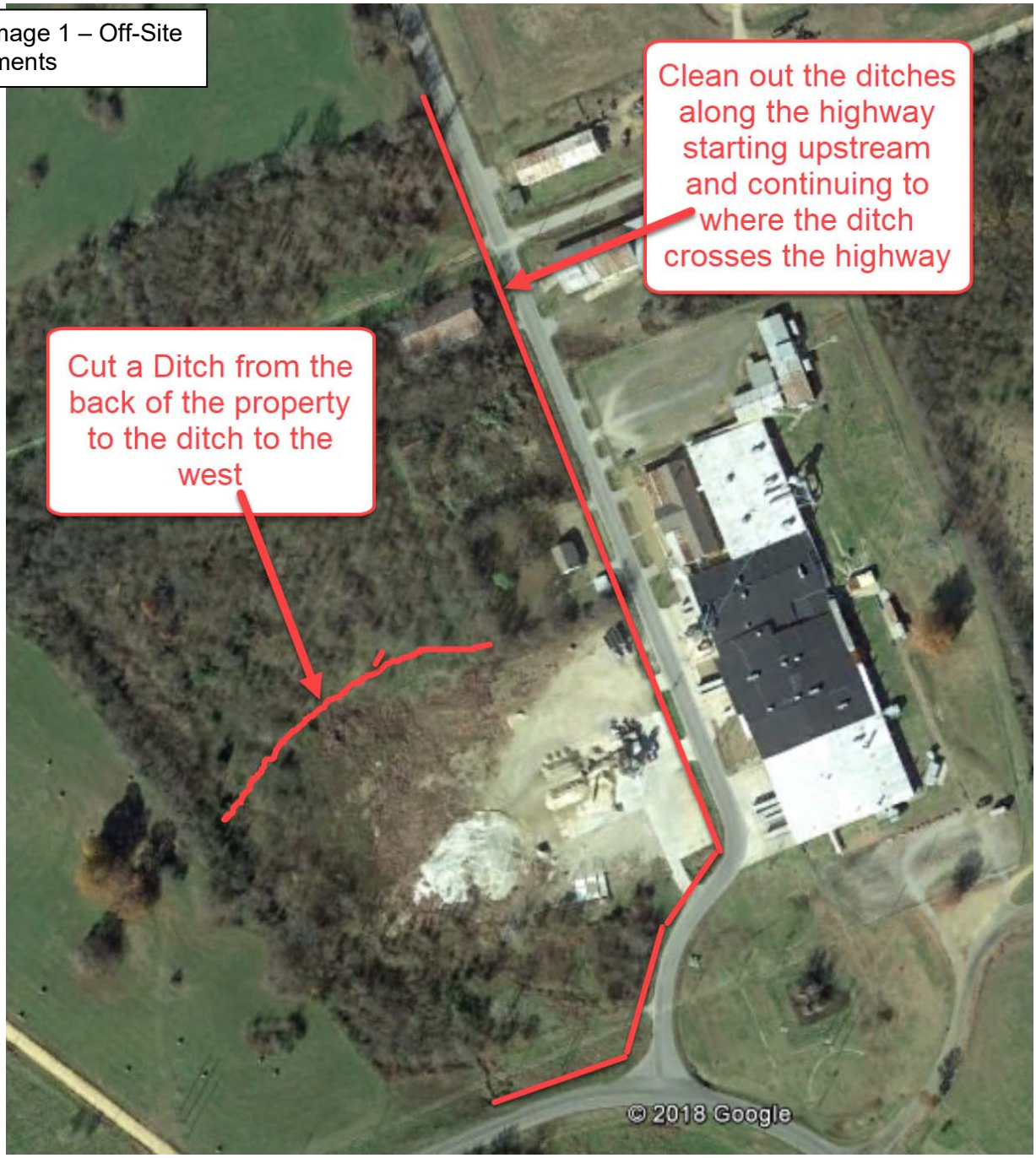

Image from Google Earth Pro

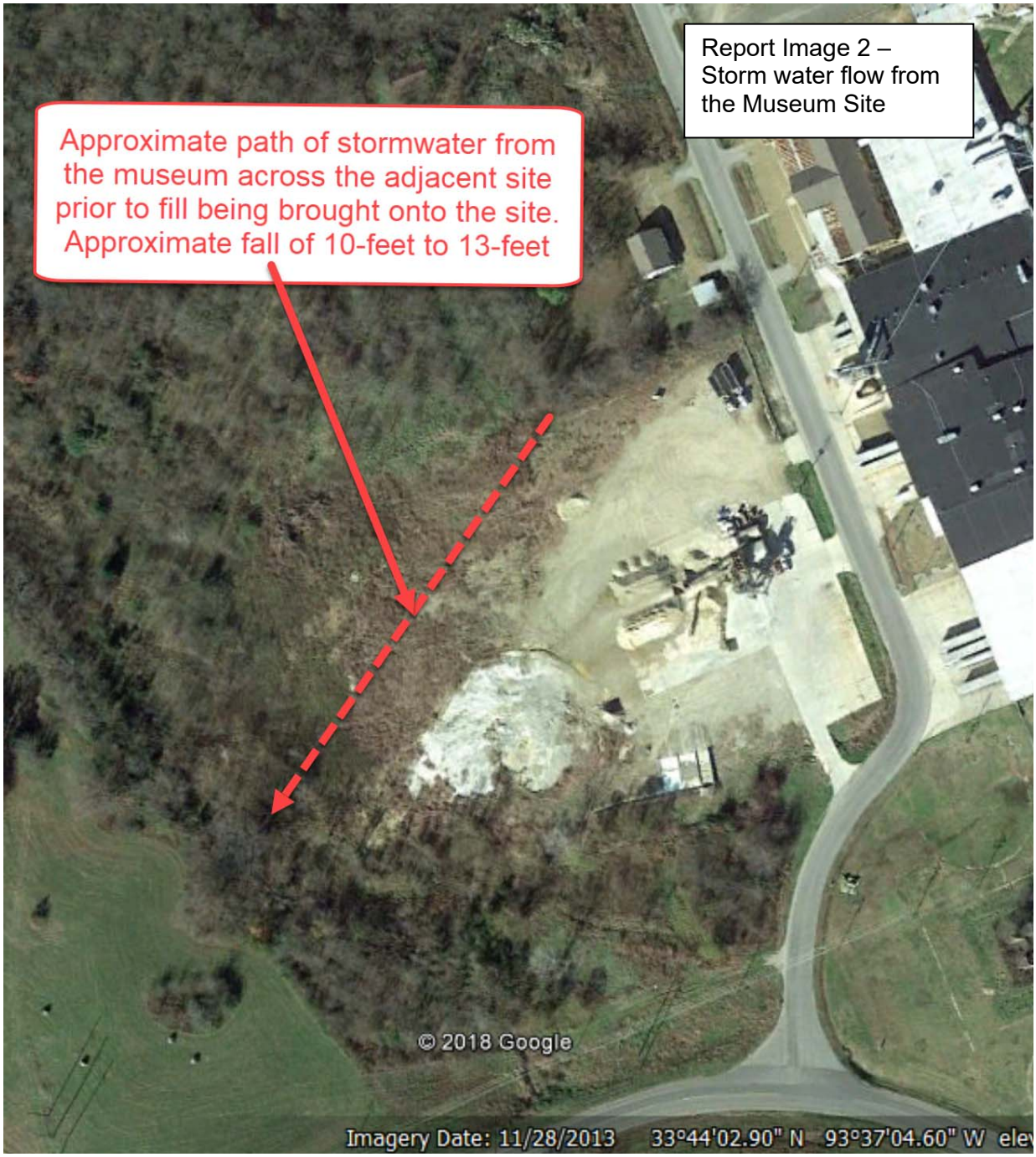

Image from Google Earth Pro

End of Primary Report – See following pages for Attachments

ATTACHMENT -1
FINAL REPORT - 4/19/2019

KLIPSCH MUSEUM
WATER INTRUSION EVALUATION

SHEET NUMBER	SHEET NAME
EXISTING	
G-101	COVER SHEET AND DRAWING INDEX
C-100	EXISTING SITE PLAN
S-101	EXISTING BASEMENT FLOOR PLAN
S-102	EXISTING FIRST FLOOR PLAN
S-103	EXISTING ROOF PLAN
S-201	EXISTING ELEVATIONS
S-202	EXISTING ELEVATIONS
S-203	EXISTING BUILDING SECTIONS
S-204	EXISTING BUILDING SECTIONS
OPTION 1 SCOPE OF WORK - EXTERIOR OPTION	
CI100	SITE PLAN - DISTURBED AREA
CI101	PROPOSED OPTION 1 PHASE 1 IMPROVEMENTS
CI102	PROPOSED OPTION 1 PHASE 2 IMPROVEMENTS
CI103	IMPROVEMENT DETAILS
SI101	PROPOSED OPTION 1 BUILDING SECTION
SI102	PROPOSED OPTION 1 BUILDING SECTION
OPTION 2 SCOPE OF WORK - INTERIOR OPTION	
CI201	PROPOSED OPTION 2 SITE IMPROVEMENTS
SI201	PROPOSED OPTION 2 BASEMENT IMPROVEMENTS

No	Date	Description

KLIPSCH MUSEUM WATER INTRUSION EVALUATION
HOPE, ARKANSAS
COVER SHEET AND DRAWING INDEX

Issue Date
04/19/19

Project Number
2018-238

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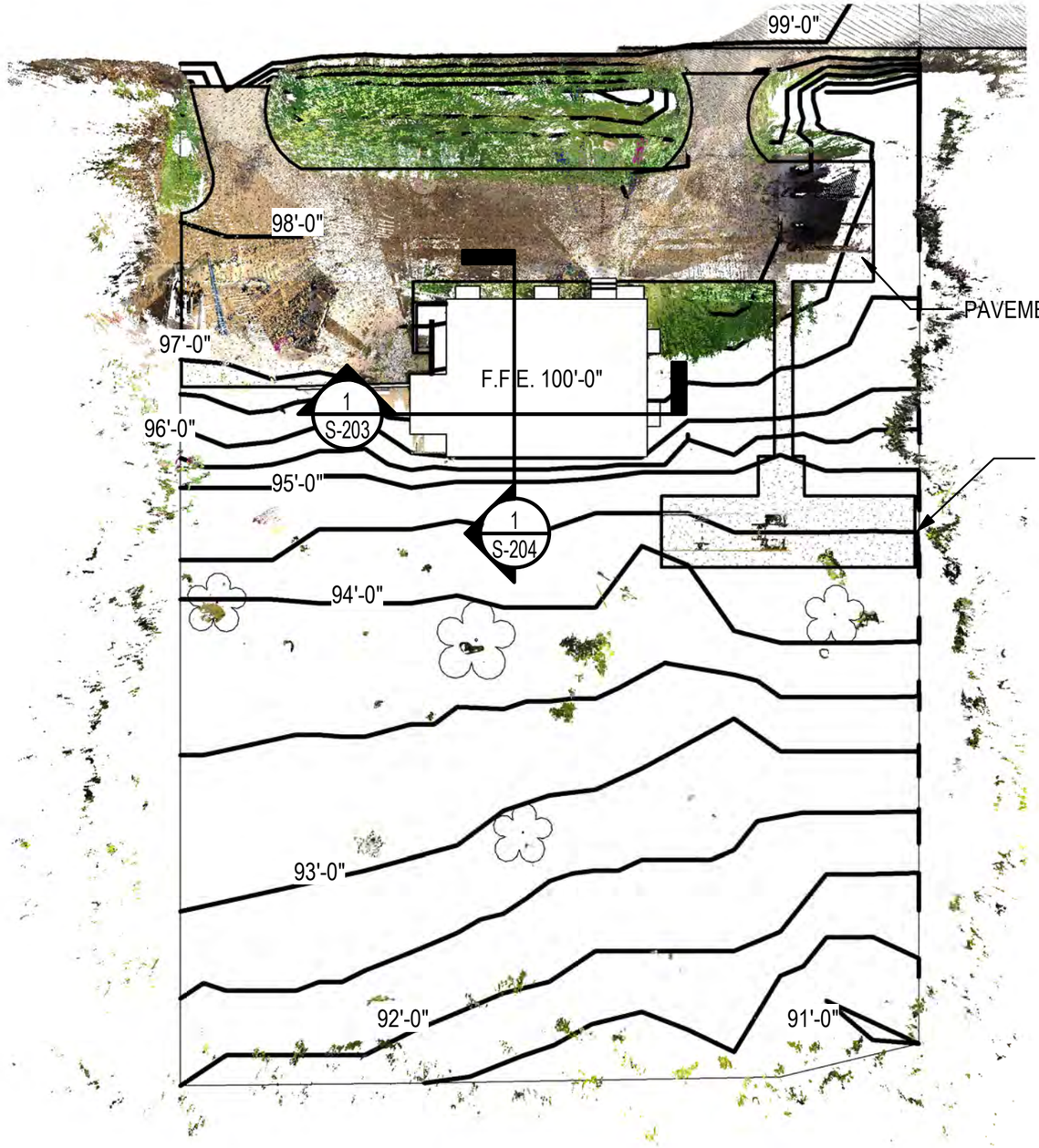
Drawing Number
G-101

FINAL STUDY DRAWINGS 4/19/19

NOT FOR CONSTRUCTION



1 SITE PLAN
1" = 30'-0"

NORTH

0 15 30 60

SCALE : 1" = 30'

No	Date	Description

KLIPSCH MUSEUM WATER INTRUSION EVALUATION

HOPE, ARKANSAS

EXISTING SITE PLAN

Issue Date
04/19/19

Project Number
2018-238

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Drawing Number
C-100

FINAL STUDY DRAWINGS 4/19/19

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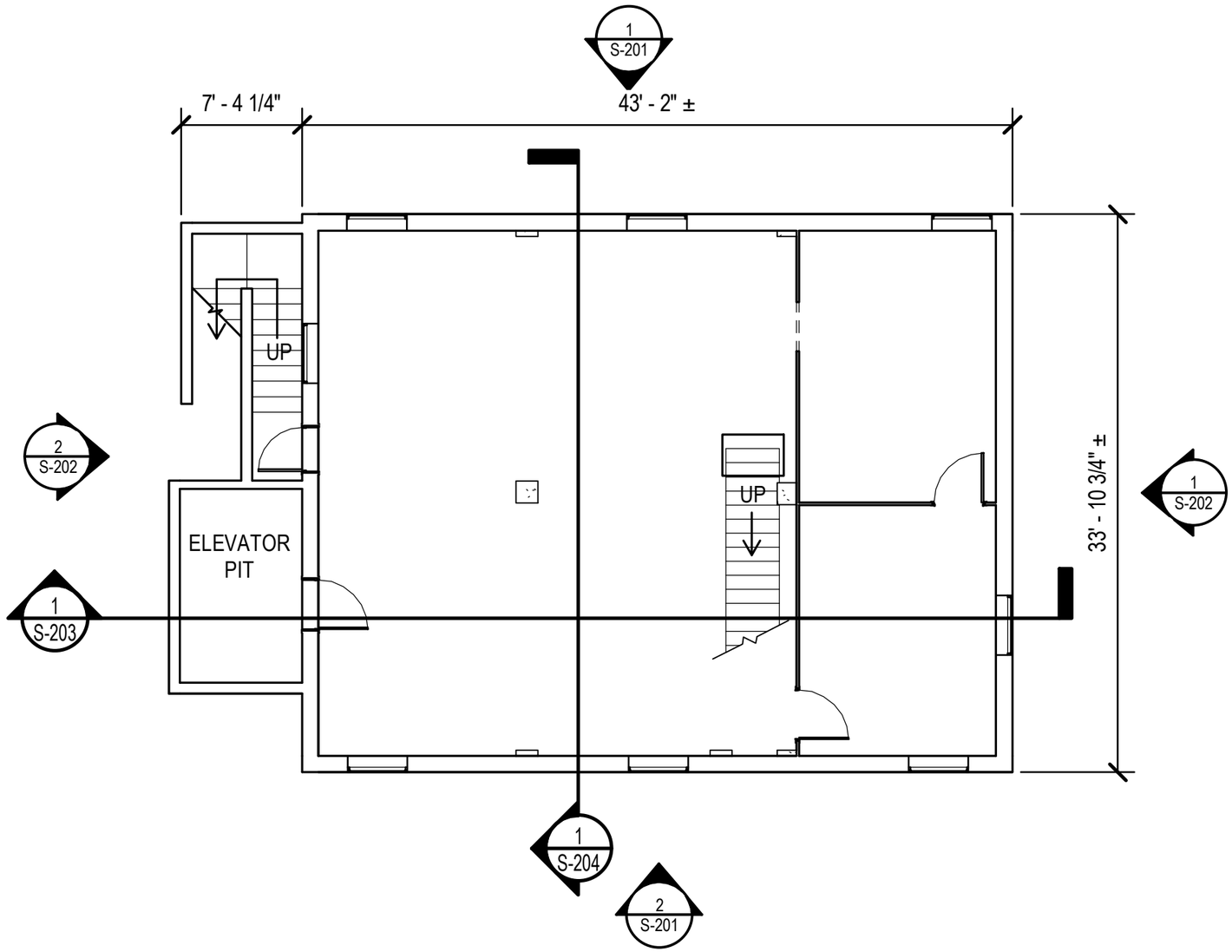

1 BASEMENT FLOOR PLAN

1/8" = 1'-0"

NORTH

0 4 8 16

SCALE : 1/8" = 1'-0"

No	Date	Description

KLIPSCH MUSEUM WATER INTRUSION EVALUATION

HOPE, ARKANSAS

EXISTING BASEMENT FLOOR PLAN

Issue Date
04/19/19

Project Number
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S-101

FINAL STUDY DRAWINGS 4/19/19

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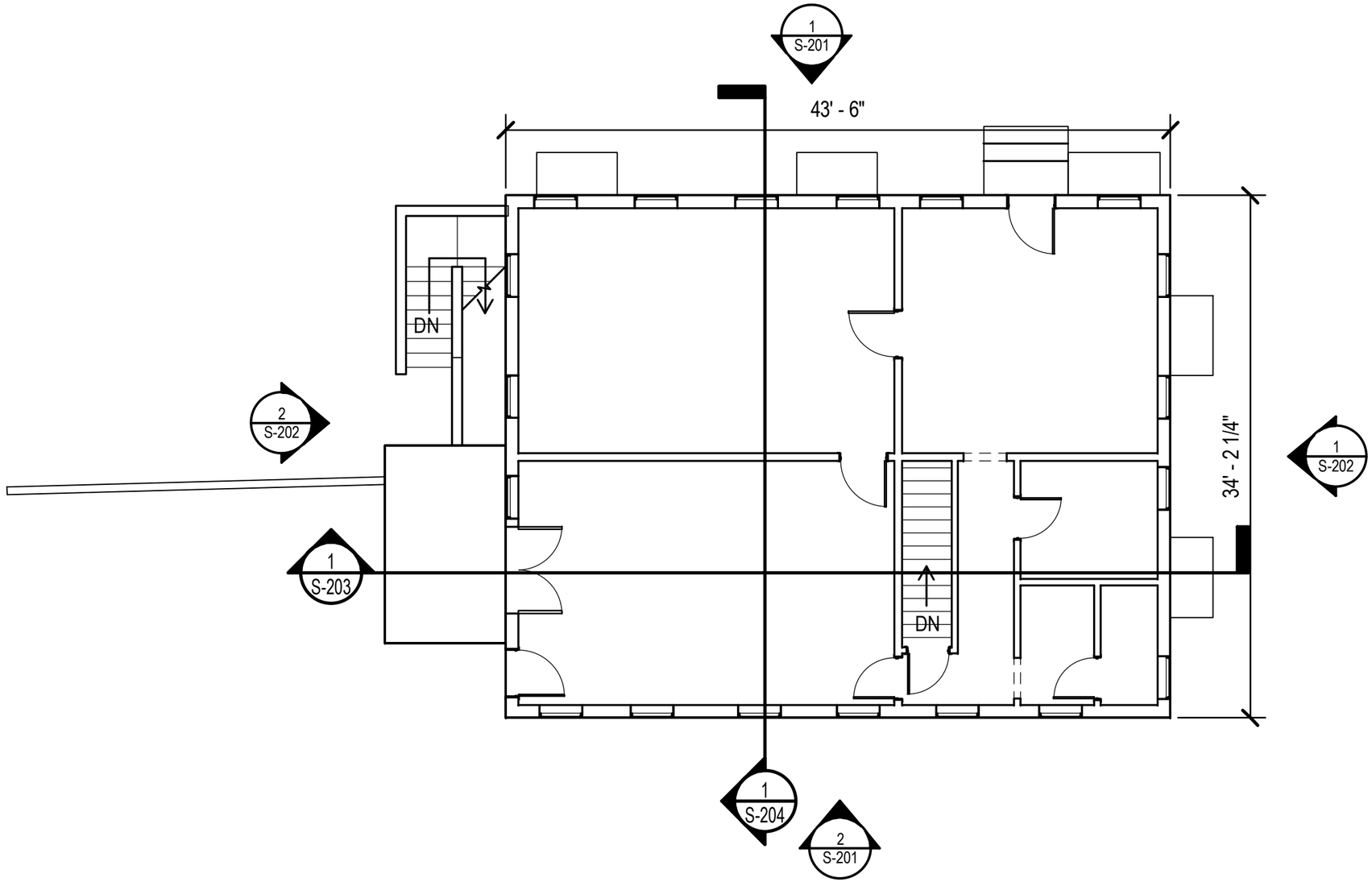

1 FIRST FLOOR PLAN

1/8" = 1'-0"

NORTH

0 4 8 16

SCALE : 1/8" = 1'-0"

No	Date	Description

KLIPSCH MUSEUM WATER INTRUSION EVALUATION

HOPE, ARKANSAS

EXISTING FIRST FLOOR PLAN

Issue Date
04/19/19

Project Number
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Drawing Number
S-102

FINAL STUDY DRAWINGS 4/19/19

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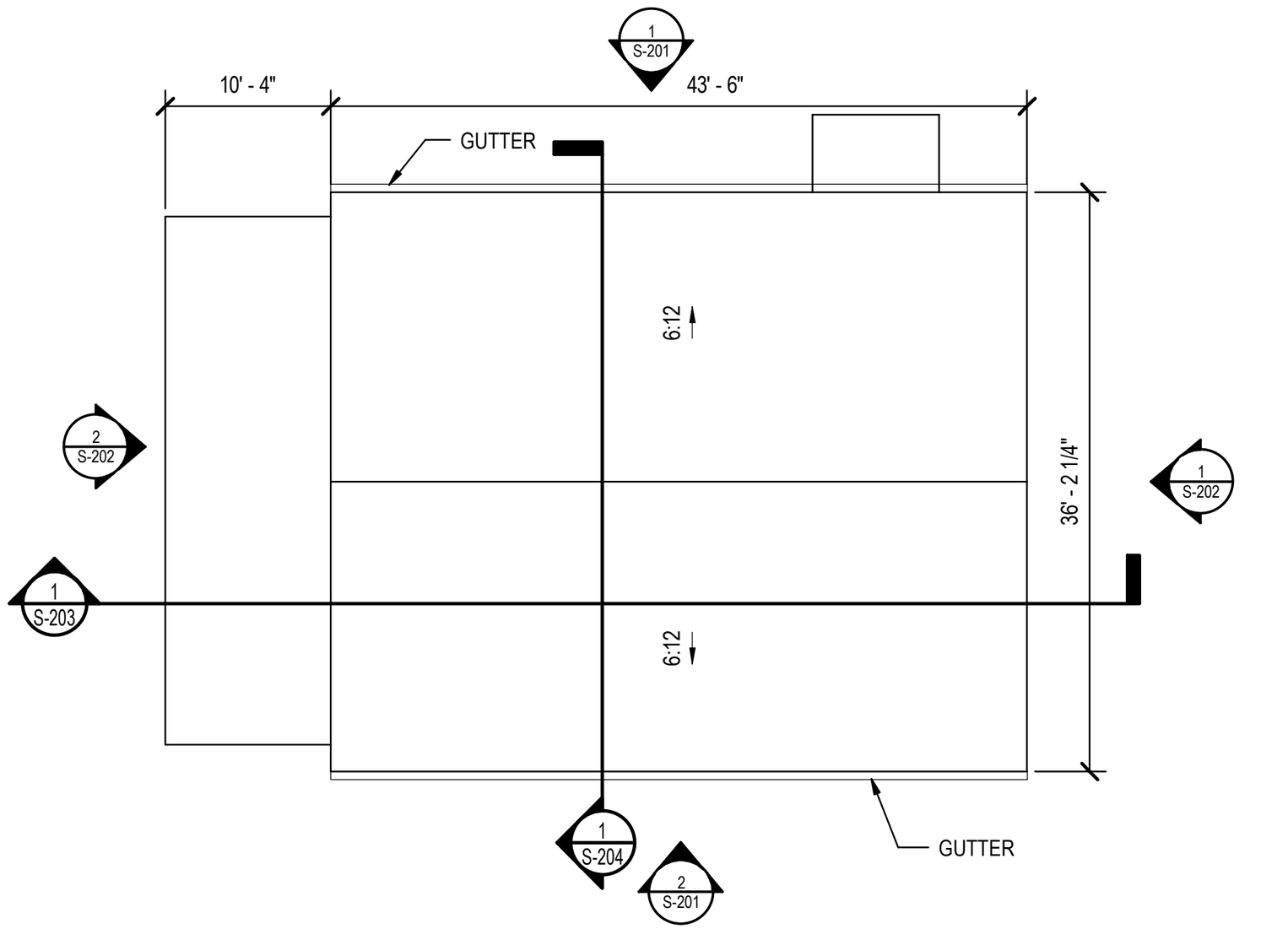

1 ROOF PLAN
1/8" = 1'-0"

NORTH

0 4 8 16

SCALE : 1/8" = 1'-0"

No	Date	Description

KLIPSCH MUSEUM WATER INTRUSION EVALUATION

HOPE, ARKANSAS

EXISTING ROOF PLAN

Issue Date
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Project Number
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Drawing Number
S-103

FINAL STUDY DRAWINGS 4/19/19

NOT FOR CONSTRUCTION

1 FRONT ELEVATION

1/16" = 1'-0"

2 BACK ELEVATION

1/16" = 1'-0"

0 8 16 32

SCALE : 1/16" = 1'-0"

No	Date	Description

KLIPSCH MUSEUM WATER INTRUSION EVALUATION

HOPE, ARKANSAS

EXISTING ELEVATIONS

Issue Date
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Drawing Number
S-201

FINAL STUDY DRAWINGS 4/19/19

NOT FOR CONSTRUCTION

1 SIDE ELEVATION

1/16" = 1'-0"

2 SIDE ELEVATION

1/16" = 1'-0"

0 8 16 32

SCALE : 1/16" = 1'-0"

No	Date	Description

KLIPSCH MUSEUM WATER INTRUSION EVALUATION

HOPE, ARKANSAS

EXISTING ELEVATIONS

Issue Date
04/19/19

Project Number
2018-238

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Drawing Number
S-202

FINAL STUDY DRAWINGS 4/19/19

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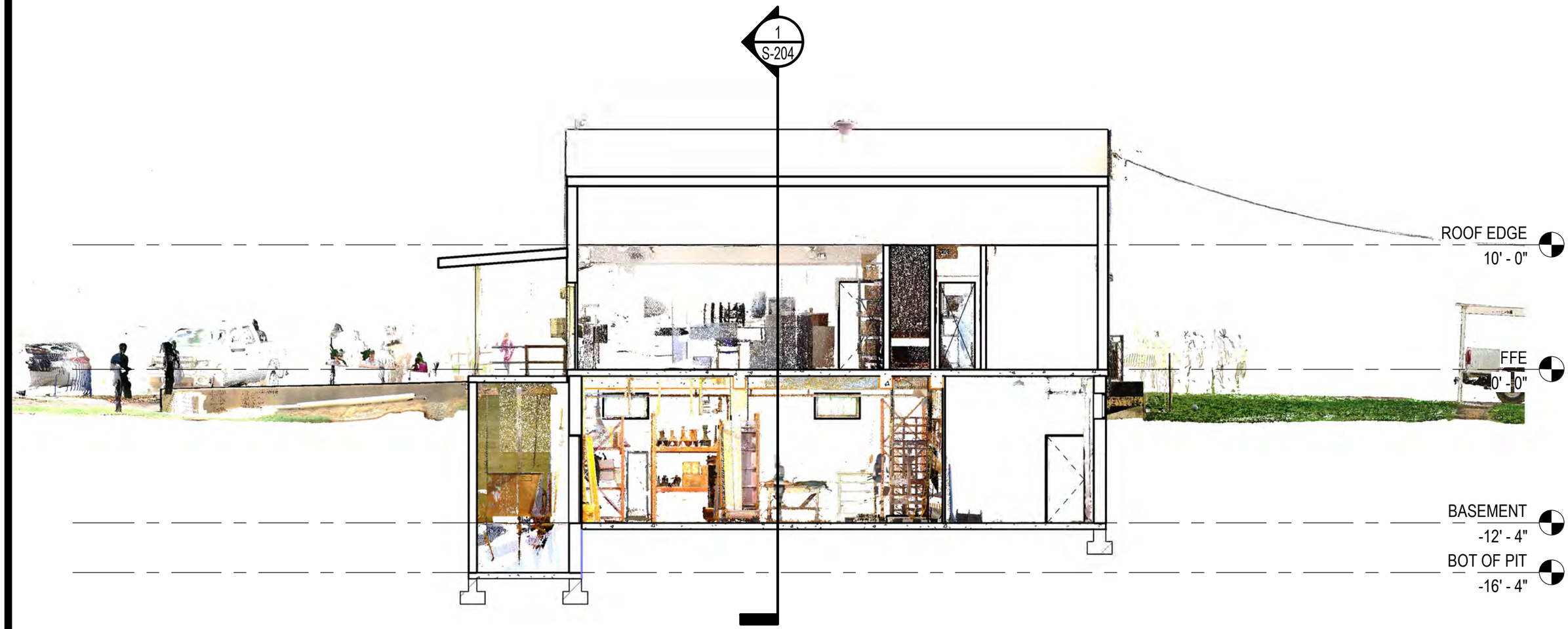

1 EXISTING BUILDING SECTION

1/8" = 1'-0"

0 4 8 16

SCALE : 1/8" = 1'-0"

No	Date	Description

KLIPSCH MUSEUM WATER INTRUSION EVALUATION

HOPE, ARKANSAS

EXISTING BUILDING SECTIONS

Issue Date
04/19/19

Project Number
2018-238

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Drawing Number
S-203

FINAL STUDY DRAWINGS 4/19/19

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1 BUILDING SECTION
1/8" = 1'-0"

0 4 8 16

SCALE : 1/8" = 1'-0"

No	Date	Description

KLIPSCH MUSEUM WATER INTRUSION EVALUATION

HOPE, ARKANSAS

EXISTING BUILDING SECTIONS

Issue Date
04/19/19

Project Number
2018-238

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Drawing Number
S-204

FINAL STUDY DRAWINGS 4/19/19

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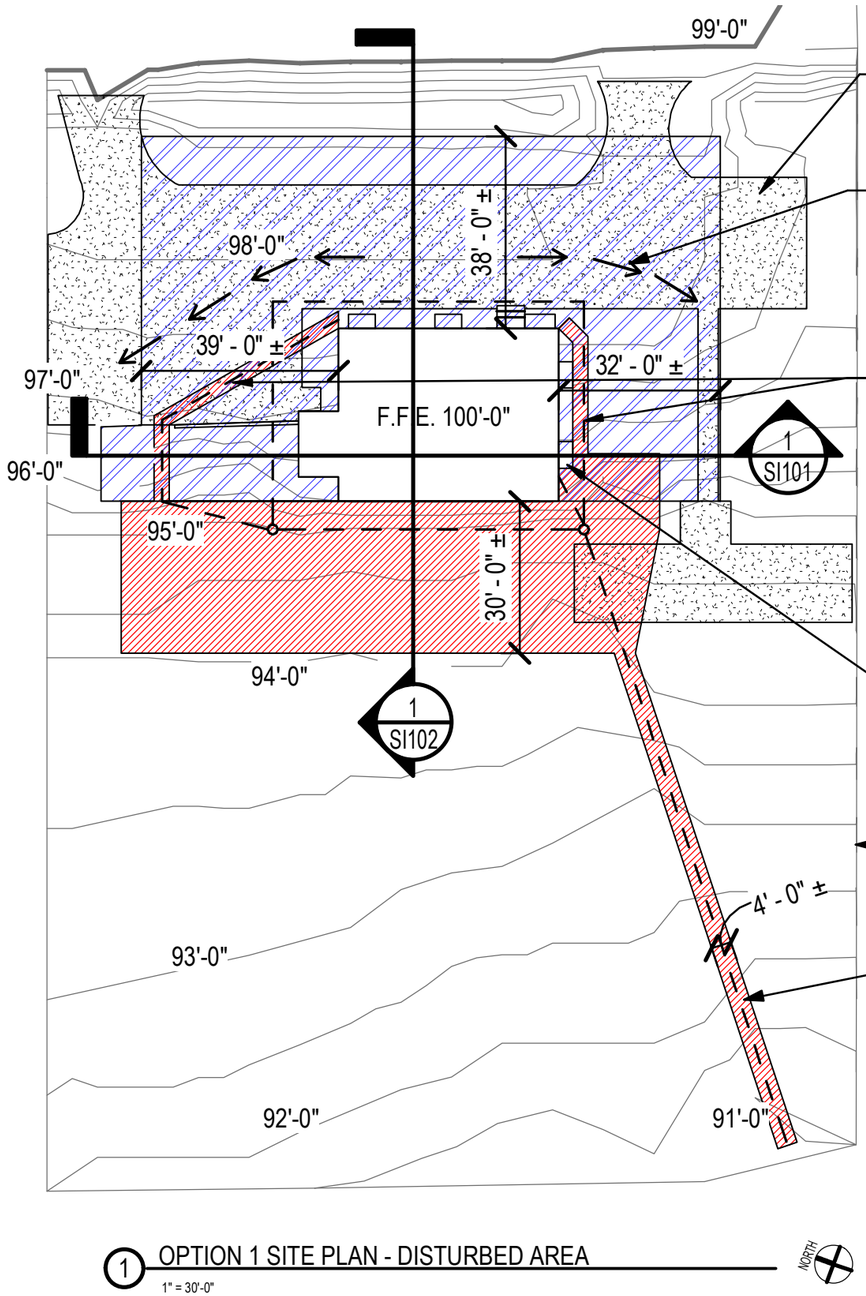

PAVEMENT

DISTURBED AREA - PHASE 2. REPLACE PAVEMENT THAT WAS REMOVED. GRADE PAVEMENT TO DRAIN WATER AWAY FROM BUILDING. PROVIDE A SWALE IN THE MIDDLE OF THE PARKING LOT TO DRAIN WATER TO THE NORTH AND SOUTH SIDE OF BUILDING

EXCAVATION IN PHASE 1 TO TIE DOWNSPOUTS INTO NEW DRAINAGE SYSTEM

SHORE UP LIGHT WELLS AND PORCH UNTIL BACKFILL IS COMPLETE AND FILL IS REPLACED UNDER LIGHT WELLS. GROUT BETWEEN BOTTOM OF LIGHT WELLS AND FILL

ASSUMED PROPERTY LINE

DISTURBED AREA - PHASE 1

1 OPTION 1 SITE PLAN - DISTURBED AREA

1" = 30'-0"

NORTH

NOTE: THE WORK SHOWN IS OCCURING IN TWO PHASES. THE WORK CAN OCCUR ALL AT ONCE OR IN TWO PHASES

No	Date	Description

KLIPSCH MUSEUM WATER INTRUSION EVALUATION

HOPE, ARKANSAS

SITE PLAN - DISTURBED AREA

Issue Date
04/19/19

Project Number
2018-238

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Drawing Number
CI100

FINAL STUDY DRAWINGS 4/19/19

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PHASE 1 IMPROVEMENT KEYED NOTES:

11 VERTICAL 24" DIAMETER SCHEDULE 40 PVC PIPE TO PLAN ELEVATION 82.67' (17'-4" BELOW 1ST FLOOR FINISHED FLOOR ELEVATION. PROVIDE TOP OF PIPE AT TOP GRADE ELEVATION. PROVIDE A MANHOLE COVER ON TOP OF PIPE. BOTTOM OF PIPE SHALL BE BURIED IN A MINIMUM OF 3' OF GRAVEL. PROVIDE ½" DIAMETER HOLES IN THE BOTTOM OF THE PIPE AT 6" ON CENTER. PROVIDE A FILTER SLEEVE AROUND THE PIPE. PROVIDE CONNECTIONS FOR 2 – 4" DIAMETER FOUNDATION DRAINS. SIMILAR TO CI103.

12 HORIZONTAL 4" DIAMETER PERFORATED MINIMUM SCHEDULE 20 PVC PIPE WRAPPED IN A FILTER SOCK AND SURROUNDED BY A MINIMUM OF 6-INCHES OF GRAVEL EACH SIDE. SLOPE PIPE FROM VERTICAL PIPE AT #11 TO BOTTOM OF VERTICAL PIPE AT #13 APPROXIMATELY 1-FOOT DROP.

13 VERTICAL 24" DIAMETER SCHEDULE 40 PVC PIPE TO PLAN ELEVATION 81.67' (18'-4" BELOW 1ST FLOOR FINISHED FLOOR ELEVATION. PROVIDE TOP OF PIPE AT TOP GRADE ELEVATION. PROVIDE A MANHOLE COVER ON TOP OF PIPE. BOTTOM OF PIPE SHALL BE BURIED IN A MINIMUM OF 3' OF GRAVEL. PROVIDE ½" DIAMETER HOLES IN THE BOTTOM OF THE PIPE AT 6" ON CENTER. PROVIDE A FILTER SLEEVE AROUND THE PIPE. PROVIDE CONNECTIONS FOR 2 – 4" DIAMETER FOUNDATION DRAINS. PROVIDE A PRIMARY & SECONDARY SUBMURSIBLE SUMP PUMP OPERATED BY A FLOAT IN THE BOTTOM OF THE PIPE. PROVIDE CONNECTIONS FOR THE 4" DIAMETER FOUNDATION DRAINS AND THE 6" DIAMETER OUTLET AND 3" DIAMETER CONDUIT FOR POWER. SEE SI-200.

14 HORIZONTAL #6 MINIMUM SCHEDULE 40 SOLID DRAIN LINE BURIED MINIMUM 2-FEET BELOW THE TOP OF THE VERTICAL PIPE SLOPING TO THE BACK OF THE PROPERTY WITH MINIMUM 1-FOOT COVER UNTIL THE PIPE COMES TO DAYLIGHT AT THE SOUTHWEST CORNER OF THE PROPERTY

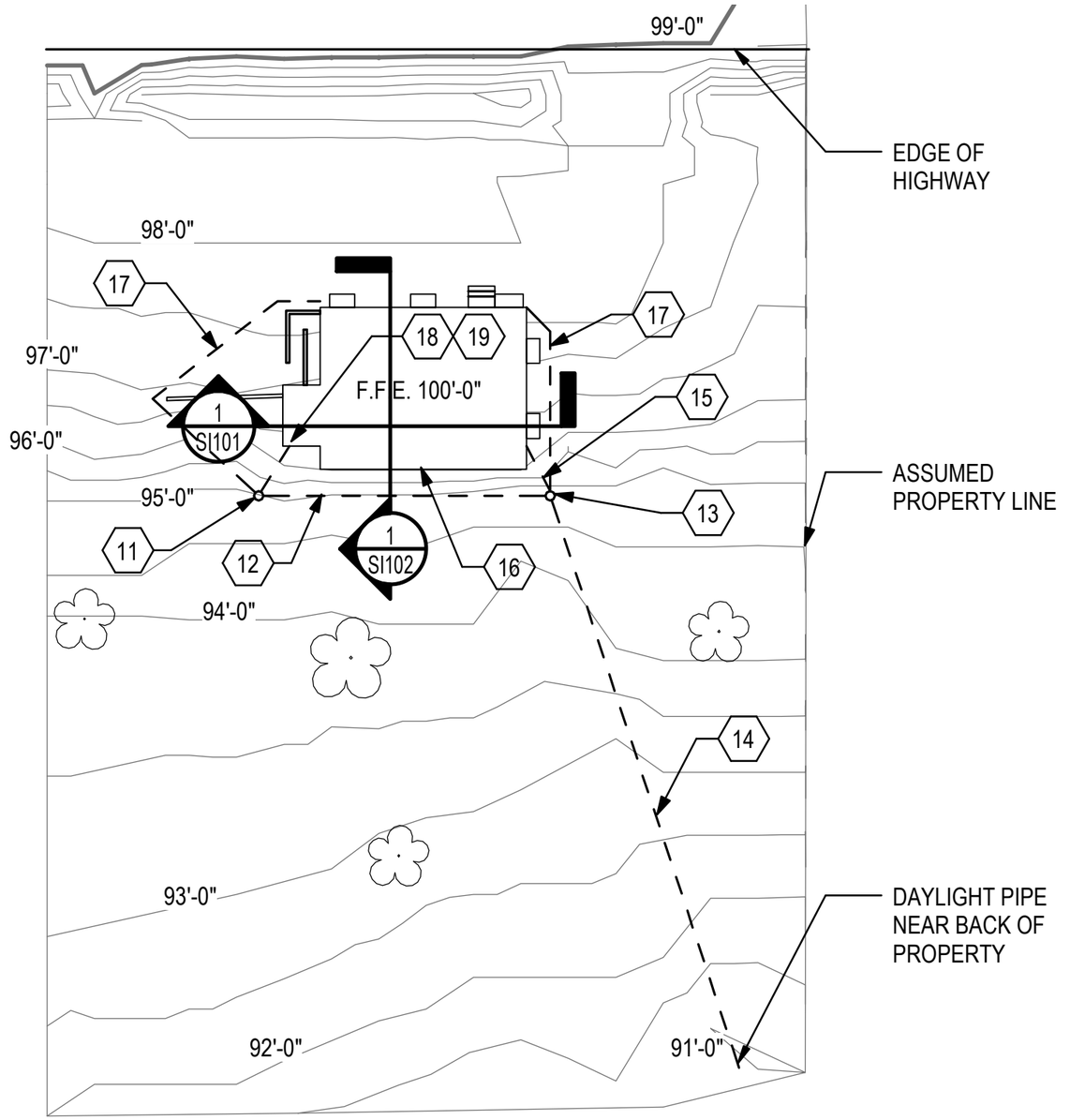
15 2" MINIMUM SCHEDULE 10 CONDUIT FROM A MINIMUM OF 2-FEET BELOW THE TOP OF THE VERTICAL PIPE BACK TO THE BUILDING TO PROVIDE POWER FOR THE SUMP PUMP.

16 WATERPROOF THE WEST WALL OF THE BUILDING BELOW GRADE USING A MINIMUM 40 MIL (DRY) LIQUID APPLIED WATERPROOFING MEMBRANE. PREPARE WALL AND ADJACENT SURFACES AS RECOMMENDED BY THE MANUFACTURER.

17 REMOVE EXISTING DOWNSPOUT DRAINAGE PIPING TO 3'-0" BELOW TOP OF GRADE AND SEAL THE PIPE. ADD 4"Ø PVC PIPING TO TAKE WATER FROM DOWNSPOUT TO ADDED SUMP. MIN DEPTH OF PIPE 2'-0" BELOW EXISTING GRADE.

18 INSTALL A DEHUMIDIFIER IN THE BASEMENT DRAINED TO THE ELEVATOR PIT. INSTALL A SUMP PUMP IN THE LIFT/ELEVATOR PIT AND DRAIN LINE TO THE CLOSEST VERTICAL PUMP. PUMP WATER TO EXTERIOR PIPES.

19 SEAL THE FLOOR DRAINS AND SANITARY SEWER LINES IN THE BASEMENT.



NORTH ① OPTION 1 PHASE 1 IMPROVEMENTS
1" = 30'-0"

0 15 30 60
SCALE : 1" = 30'

No	Date	Description

KLIPSCH MUSEUM WATER INTRUSION EVALUATION

HOPE, ARKANSAS

PROPOSED OPTION 1 PHASE 1 IMPROVEMENTS

Issue Date 04/19/19

Project Number 2018-238

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Drawing Number CI101

FINAL STUDY DRAWINGS 4/19/19

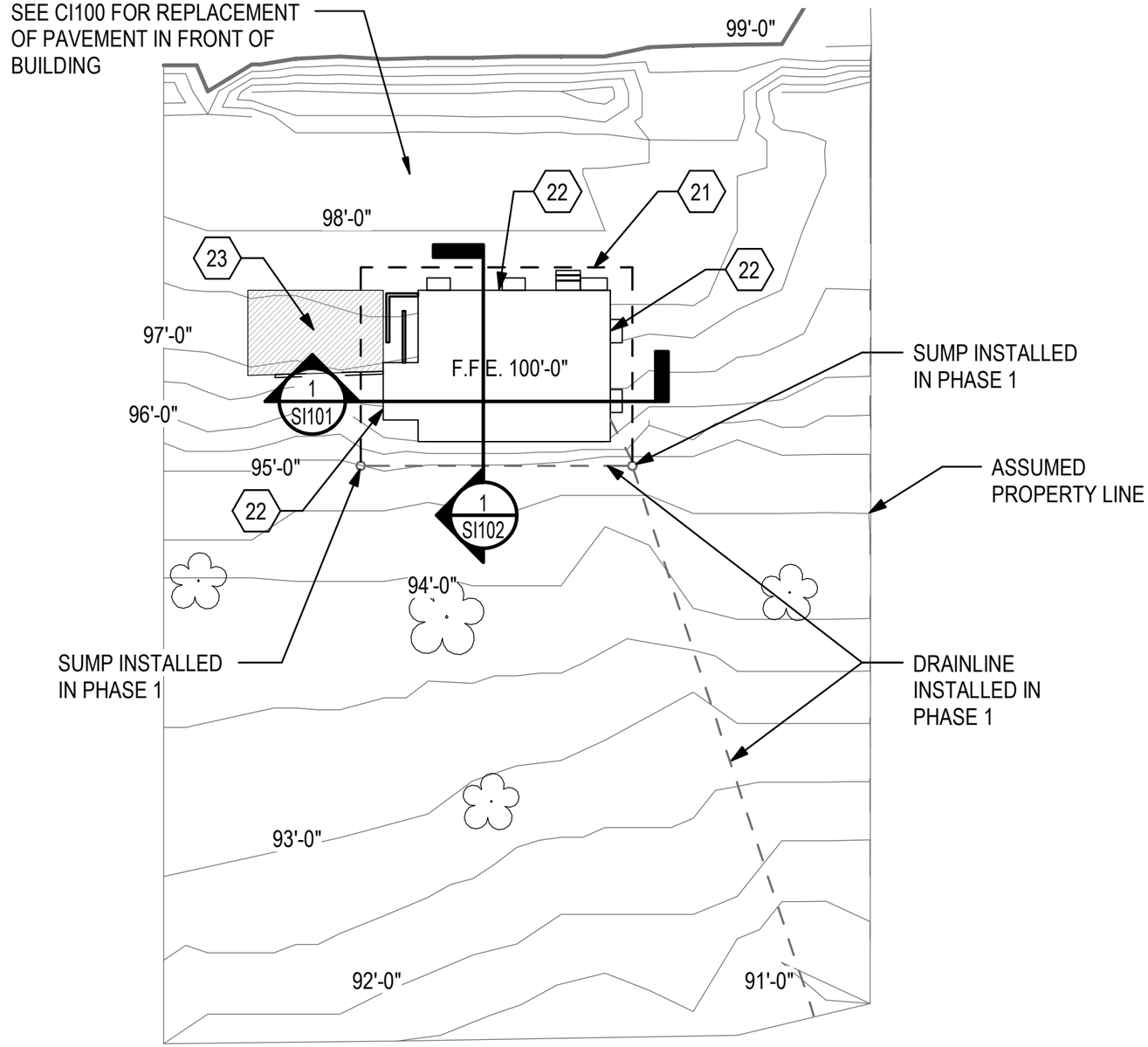
NOT FOR CONSTRUCTION

PHASE 2 IMPROVEMENT KEYED NOTES:

21 HORIZONTAL 4" DIAMETER PERFORATED MINIMUM SCHEDULE 20 PVC PIPE WRAPPED IN A FILTER SOCK AND SURROUNDED BY A MINIMUM OF 1-FOOT OF GRAVEL EACH SIDE. SLOPE PIPE APPROXIMATELY 1-FOOT TO BOTTOM OF VERTICAL PIPES / SUMP PITS INSTALLED ON THE BACK SIDE OF THE BUILDING AS PART OF THE PHASE 1 IMPROVEMENTS.

22 WATERPROOF THE NORTH, SOUTH, AND EAST WALLS OF THE BUILDING BELOW GRADE USING A MINIMUM 40 MIL (DRY) LIQUID APPLIED WATERPROOFING MEMBRANE. PREPARE WALL AND ADJACENT SURFACES AS RECOMMENDED BY THE MANUFACTURER.

23 REMOVE APPROXIMATELY 4" OF EXISTING PAVING AND GRAVEL, GRADE THE AREA TO DRAIN AWAY FROM THE BUILDING AND REPAVE AN APPROXIMATE AREA OF 20-FEET BY 32-FEET.



NORTH 1 OPTION 1 PHASE 2 IMPROVEMENTS
1" = 30'-0"

0 15 30 60
SCALE : 1" = 30'

No	Date	Description

KLIPSCH MUSEUM WATER INTRUSION EVALUATION

HOPE, ARKANSAS

PROPOSED OPTION 1 PHASE 2 IMPROVEMENTS

Issue Date 04/19/19

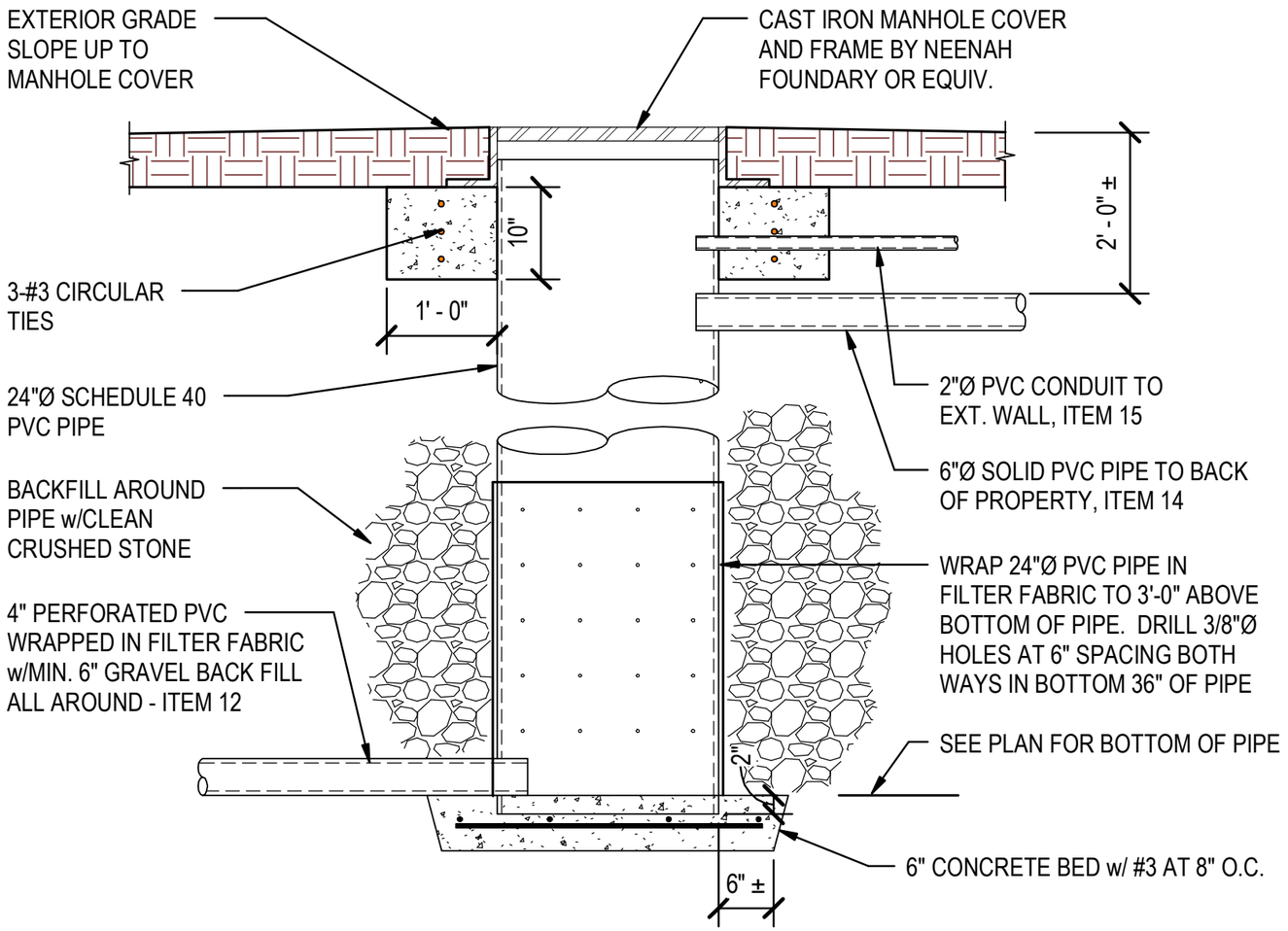
Project Number 2018-238

CROMWELL
1300 East 6th Street Little Rock, AR 72202
501.372.2900 cromwell.com

Drawing Number CI102

FINAL STUDY DRAWINGS 4/19/19

NOT FOR CONSTRUCTION



1 OPTION 1 SUMP PIT DETAIL

3/4" = 1'-0"

No	Date	Description

KLIPSCH MUSEUM WATER INTRUSION EVALUATION

HOPE, ARKANSAS

IMPROVEMENT DETAILS

Issue Date
04/19/19

Project Number
2018-238

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1300 East 6th Street Little Rock, AR 72202
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Drawing Number
CI103

FINAL STUDY DRAWINGS 4/19/19

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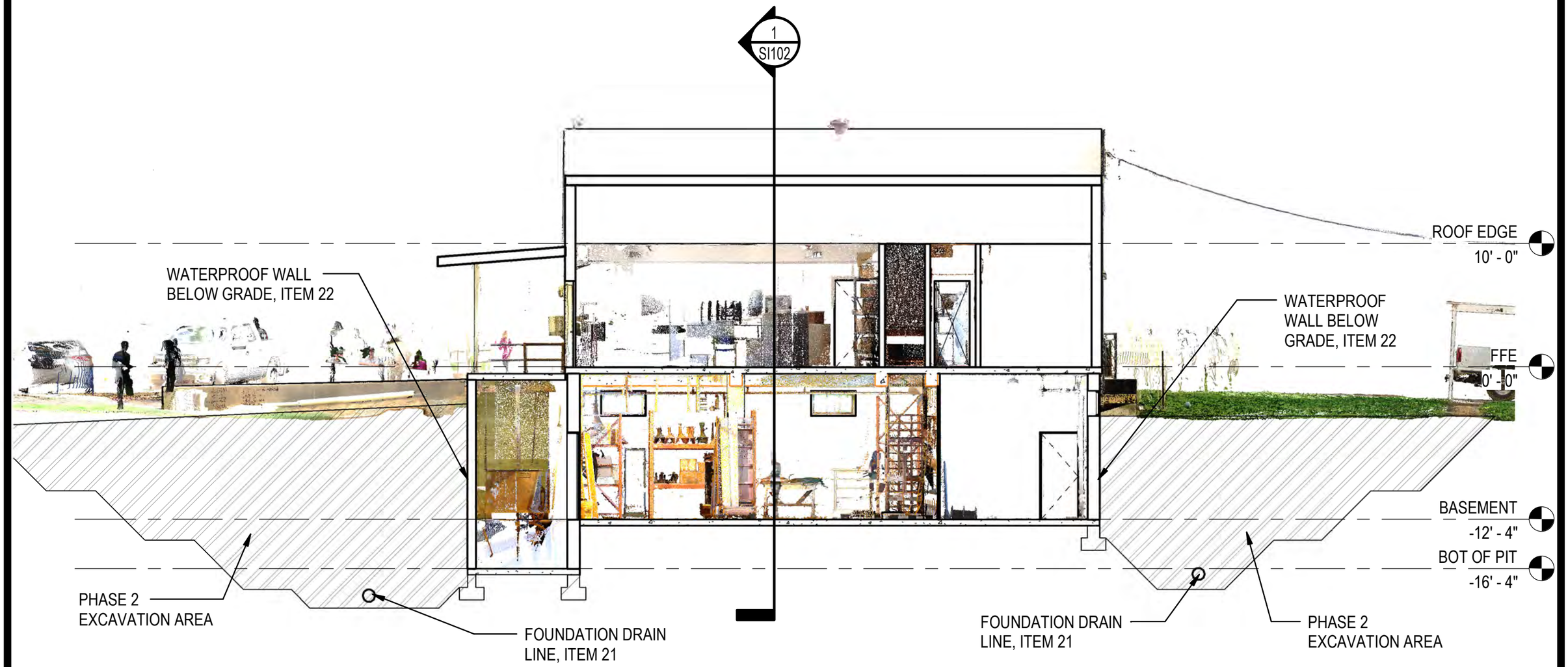


1 OPTION 1 BUILDING SECTION
1/8" = 1'-0"

0 4 8 16
SCALE : 1/8" = 1'-0"

No	Date	Description

KLIPSCH MUSEUM WATER INTRUSION EVALUATION

HOPE, ARKANSAS

PROPOSED OPTION 1 BUILDING SECTION

Issue Date
04/19/19

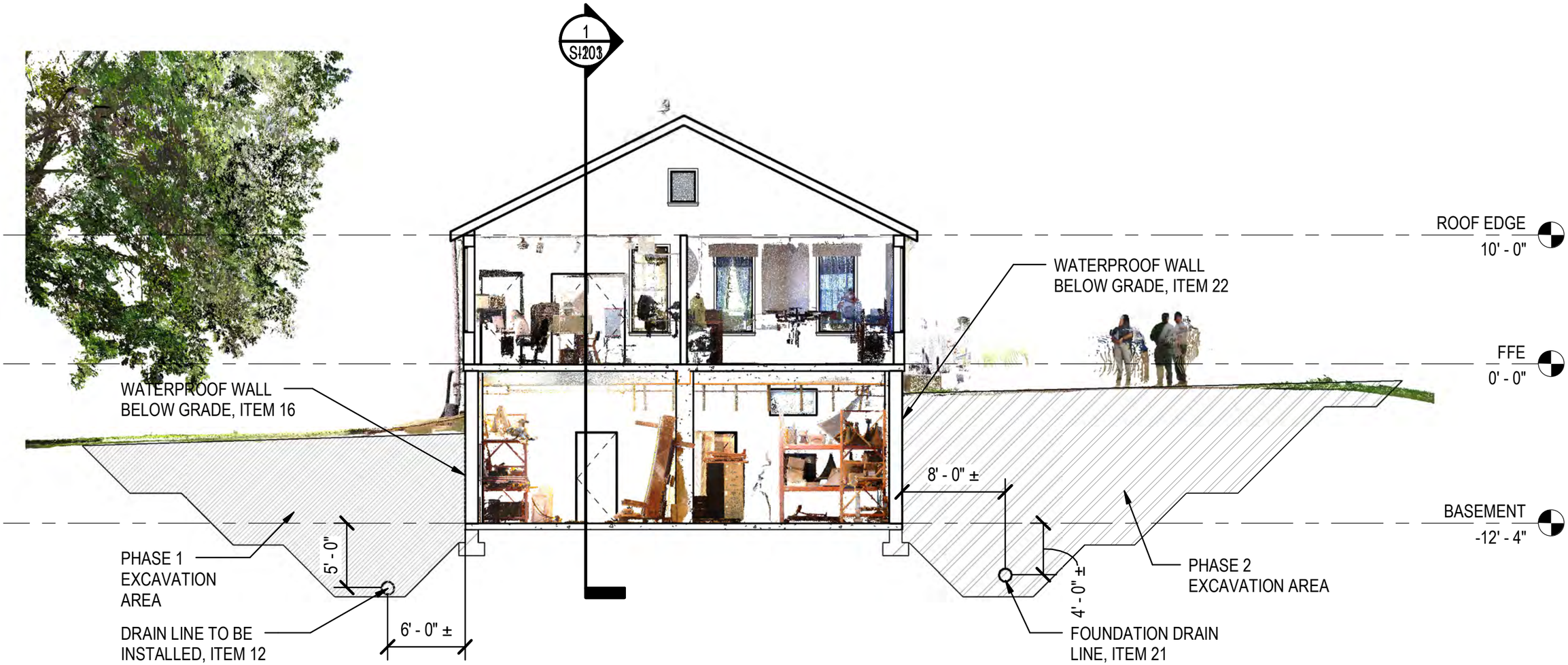
Project Number
2018-238

CROMWELL
1300 East 6th Street Little Rock, AR 72202
501.372.2900 cromwell.com

Drawing Number
SI101

FINAL STUDY DRAWINGS 4/19/19

NOT FOR CONSTRUCTION



1 OPTION 1 BUILDING SECTION
1/8" = 1'-0"

0 4 8 16

SCALE : 1/8" = 1'-0"

No	Date	Description

KLIPSCH MUSEUM WATER INTRUSION EVALUATION

HOPE, ARKANSAS

PROPOSED OPTION 1 BUILDING SECTION

Issue Date
04/19/19

Project Number
2018-238

CROMWELL

1300 East 6th Street Little Rock, AR 72202
501.372.2900 cromwell.com

Drawing Number
SI102

FINAL STUDY DRAWINGS 4/19/19

NOT FOR CONSTRUCTION

OPTION 2 IMPROVEMENT KEYED NOTES:

1. HORIZONTAL 4” DIAMETER MINIMUM SCHEDULE 20 PVC PIPE BURIED 2-FEET BELOW EXISTING GRADE TO CONNECT TO EXISTING DOWNSPOUTS AND SUMP PUMP.

2. HORIZONTAL 6" DIAMETER MINIMUM SCHEDULE 20 PVC PIPE BURIED 2-FEET BELOW GRADE CARRYING WATER FROM DOWNSPOUTS AND SUMP PIT. REDUCE DEPTH OF PIPE AT BACK OF PROPERTY UNTIL IT DAYLIGHTS 5-FEET FROM THE PROPERTY LINE.

3. CONNECT EXISTING ROOF DOWNSPOUT TO 4" PVC PIPE CONNECTED TO MANHOLE..

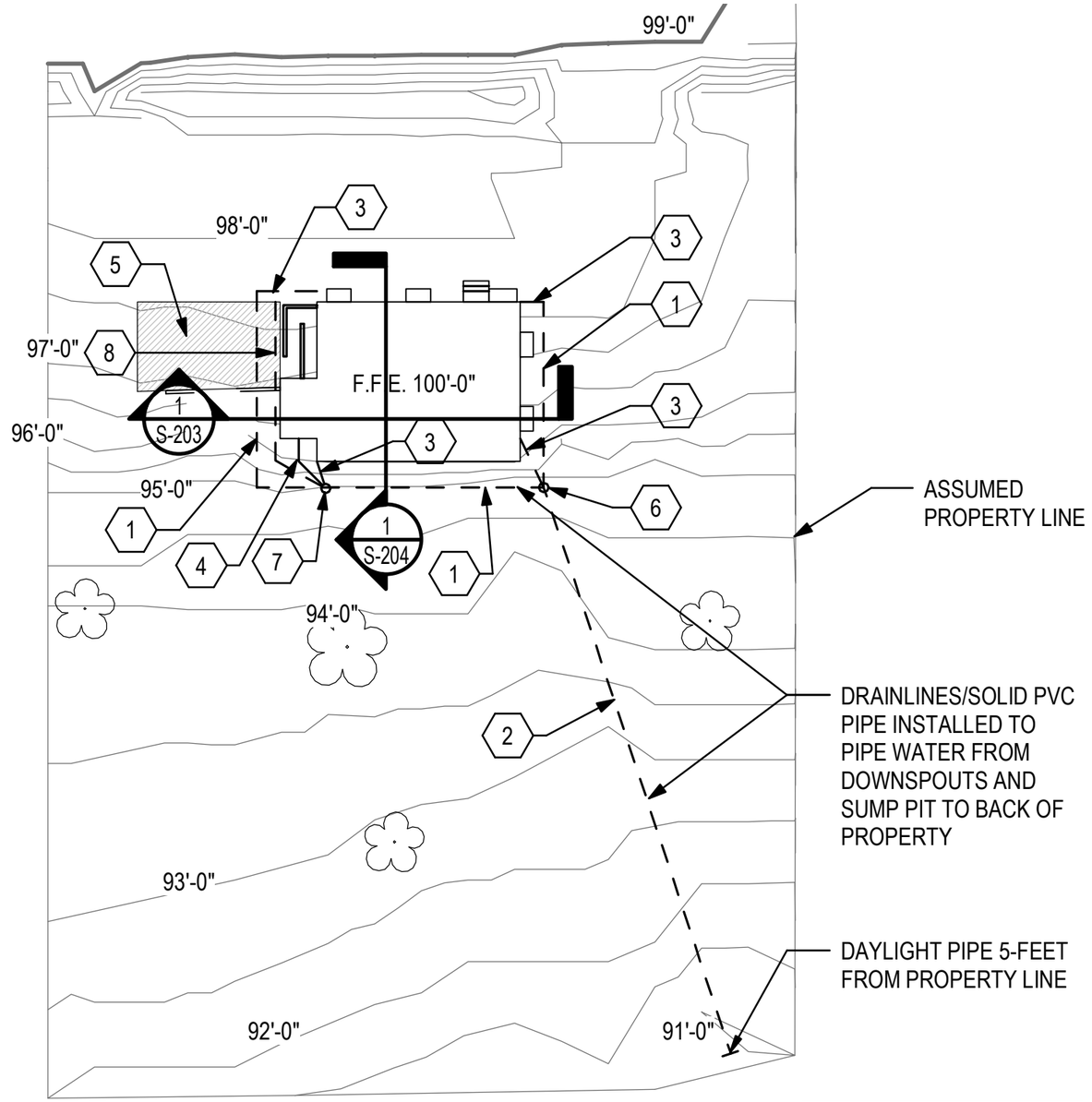
4. CONNECT PIPE FROM SUMP PIT TO 4" DIAMETER PVC PIPE CONNECTED TO MANHOLE.

5. REMOVE APPROXIMATELY 4” OF EXISTING PAVING AND GRAVEL, GRADE THE AREA TO DRAIN AWAY FROM THE BUILDING AND REPAVE AN APPROXIMATE AREA OF 20-FEET BY 32-FEET.

6. 3-FOOT DEEP MANHOLE CONSTRUCTED USING A 24"Ø x 3'-3" SCHEDULE 40 PVC PIPE SAT IN A MINIMUM OF 6" CAST IN PLACE CONCRETE BASE.

7. 2'-6" DEEP MANHOLE CONSTRUCTED USING A 24"Ø x 2'-9" SCHEDULE 40 PVC PIPE SAT IN A MINIMUM OF 6" CAST IN PLACE CONCRETE BASE.

8. ADD GUTTER ON END OF SHED OVER STAIRWELL AND LIFT PIT ACCESS. PROVIDE DOWNSPOUT ON WEST END AND 4" PVC LINE TO CONNECT PIPE TO MANHOLE.



NORTH

1 OPTION 2 SITE IMPROVEMENTS

1" = 30'-0"

0 15 30 60

SCALE : 1" = 30'

No	Date	Description

KLIPSCH MUSEUM WATER INTRUSION EVALUATION

HOPE, ARKANSAS

PROPOSED OPTION 2 SITE IMPROVEMENTS

Issue Date
04/19/19

Project Number
2018-238

CROMWELL

1300 East 6th Street Little Rock, AR 72202
501.372.2900 cromwell.com

Drawing Number
CI201

FINAL STUDY DRAWINGS 4/19/19

NOT FOR CONSTRUCTION

OPTION 2 IMPROVEMENT KEYED NOTES:

1. INSTALL A CONCRETE CURB IN THE EXISTING DOORWAY TO THE ELEVATOR PIT. INSTALL CMU AND A MINIMUM 3'-0"x7'-0" HOLLOW METAL DOOR.

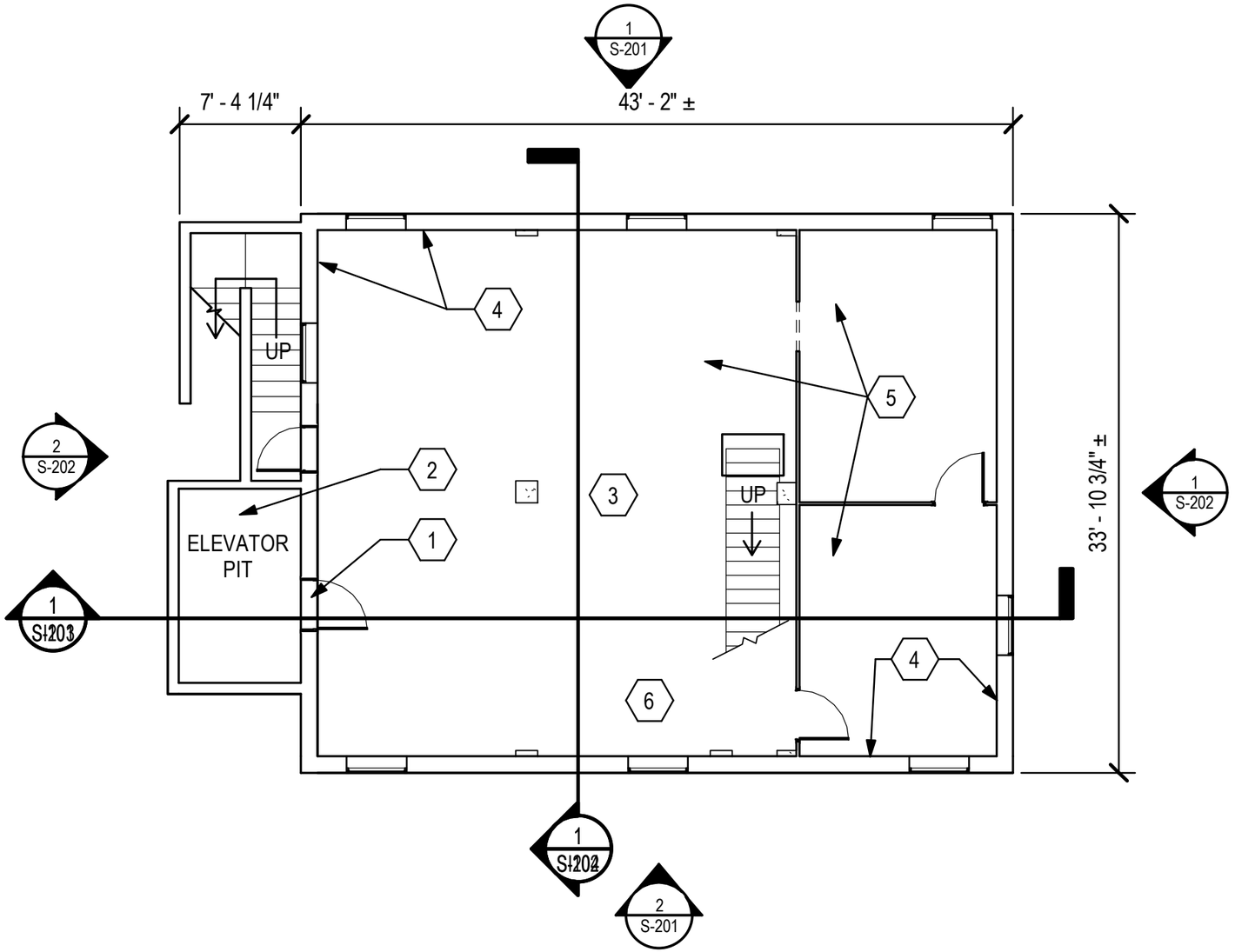
2. DRAIN THE WATER OUT OF THE ELEVATOR PIT. DRILL SMALL (1/2"Ø HOLES) IN THE SIDES OF THE PIT TO DRAIN WATER INTO THE PIT TO LOWER THE GROUND WATER LEVEL AROUND THE BUILDING. INSTALL A SUMP PUMP IN THE PIT AND PIPE IT TO THE MANHOLE INSTALLED BEHIND THE BUILDING.

3. SEAL CRACKS IN THE WALLS AND FLOOR SLAB USING PRESSURE INJECTED EPOXY OR HYDRAULIC WATER-STOP CEMENT.

4. SEAL THE WALLS OF THE BASEMENT USING A HIGH QUALITY CRYSTALLINE WATERPROOFING (KRYSTOL T1 CONCRETE WATERPROOFING OR EQUAL) TO A MINIMUM OF 2-FEET ABOVE THE FLOOR. PROVIDE A MINIMUM OF TWO COATS. PRIOR TO SEALING THE WALL CUT A 1"x1" TRENCH IN THE FLOOR SLAB AT THE BASE OF THE WALL AND FILL WITH A CRYSTALLINE REPAIR GROUT (KRYSTOL REPAIR GROUT BY KRYTON OR EQUAL). PREPARE ALL CONCRETE AS RECOMMENDED BY WATERPROOFING MANUFACTURER.

5. ALTERNATE 1 IN LIEU OF SEALING THE FLOOR SLAB CUT A SUMP PIT INSIDE OF THE LOWEST POINT OF THE FLOOR SLAB IN THE SPACE. INSTALL A DIMPLE MATERIAL TURNING IT UP THE WALL THE DEPTH OF THE SLAB, AND A REINFORCED 4" SLAB. PUMP THE WATER FROM THE SUMP PIT TO THE PUMP IN THE ELEVATOR PIT.

6. INSTALL A DEHUMIDIFIER IN THE BASEMENT. DRAIN THE HUMIDIFIER TO THE SUMP AT THE ELEVATOR/LIFT PIT.



1 OPTION 2 BASEMENT SCOPE OF WORK PLAN
1/8" = 1'-0"

0 4 8 16

SCALE : 1/8" = 1'-0"

No	Date	Description

KLIPSCH MUSEUM WATER INTRUSION EVALUATION

HOPE, ARKANSAS

PROPOSED OPTION 2 BASEMENT IMPROVEMENTS

Issue Date: 04/19/19

Project Number: 2018-238

CROMWELL
1300 East 6th Street Little Rock, AR 72202
501.372.2900 cromwell.com

Drawing Number: SI201

FINAL STUDY DRAWINGS 4/19/19

NOT FOR CONSTRUCTION

CROMWELL ARCHITECTS
ENGINEERS

PRICING WORKSHEET

PROJECT: KLIPSCH MUSEUM for NPS Southeast Regional Office

DESCRIPTION: Water Intrusion Evaluation-Final Study-Phase 1-Sheet CI100/CI101

DATE: April 19, 2019

DESCRIPTION	QUANTITY	UNIT	MAT	LAB	SUB	MAT$	LAB$	SUB$	TOTAL$
Remove exist. Asphalt and haul off	511.00	syd	0.00	0.00	25.00	0.00	0.00	12775.00	12775.00
Excavation of existing material/Stockpile	296.00	cyd	0.00	0.00	35.00	0.00	0.00	10360.00	10360.00
Install 36" class 7 gravel at 24" pipe	4.00	cyd	45.00	50.00	35.00	180.00	200.00	140.00	520.00
Horizontal 4" PVC Sch 20 Pipe/wrapped	60.00	lf	4.05	2.87	0.00	243.00	172.20	0.00	415.20
6" Pvc Schedule 40 Pipe to property line	130.00	lf	1.51	4.90	0.00	196.30	637.00	0.00	833.30
Horizantal 4" PVC pipe north of 24" PVC well to northeast of bldg then to south 24" PVC well	110.00	lf	4.05	2.87	0.00	445.50	315.70	0.00	761.20
Couplings, glue, etc. for pipe	1.00	LS	500.00	0.00	0.00	500.00	0.00	0.00	500.00
Vertical 24" PVC Schedule 20 Pipe	40.00	lf	4.35	4.45	0.00	174.00	178.00	0.00	352.00
Dril 3/8" dia Holes in 24" PVC Pipe	4.00	hrs	0.00	35.00	0.00	0.00	140.00	0.00	140.00
Collar at 24" PVC Pipe	1.00	LS	290.00	560.00	0.00	290.00	560.00	0.00	850.00
Steel frame and cover for 24" Pipe	2.00	ea	263.00	134.00	0.00	526.00	268.00	0.00	794.00
2" PVC conduit Pipe to pipe/House	30.00	lf	3.15	2.50	0.00	94.50	75.00	0.00	169.50
Class 7 backfill around pipes	30.00	cyd	45.00	5.00	20.00	1350.00	150.00	600.00	2100.00
Primary-secondary sump pumps	2.00	ea	300.00	100.00	0.00	600.00	200.00	0.00	800.00
Filter Fabric	1.00	LS	975.00	280.00	0.00	975.00	280.00	0.00	1255.00
Hook up power to pumps	1.00	LS	0.00	0.00	800.00	0.00	0.00	800.00	800.00
Waterproof west wall, 40 mil liquid/protection board	900.00	sf	0.00	0.00	18.00	0.00	0.00	16200.00	16200.00
Backfill and compact excavated area/Stockpile	250.00	cyd	0.00	0.00	33.00	0.00	0.00	8250.00	8250.00
Backfill and compact excavated area/borrow fill	120.00	cyd	35.00	0.00	45.00	4200.00		5400.00	9600.00
Seed and fertilize disturbed areas	1.00	ls	0.00	0.00	500.00	0.00	0.00	500.00	500.00
Seal floor drains and SS in basement	1.00	ls	0.00	0.00	500.00	0.00	0.00	500.00	500.00
Trench Safety Box	1.00	ls	1000.00	0.00	0.00	1000.00	0.00	0.00	1000.00
Dehumidifier & sump pump basement	1.00	ls	500.00	150.00	0.00	500.00	150.00	0.00	650.00
						$11,274.30	$3,325.90	$55,525.00	$70,125.20
SALES TAX	9.5000%								$1,071.06
PAYROLL TAX	42.0%								$1,396.88
									$72,593.14
General Conditions/Fee	20.00%								$14,518.63
Subtotal									$87,111.76
Contingency	20.00%								$17,422.35
TOTAL									**$104,534.12**

Source of Cost Data-RS Means Building Construction Cost 2018 76th Edition
Estimate Assumptions:
Work to be in two (2) Phases with Options
Phase I to take Approximately 3 Month's
Phase II to take Approximately 4 Month's

CROMWELL ARCHITECTS
ENGINEERS

PRICING WORKSHEET

PROJECT: KLIPSCH MUSEUM for NPS Southeast Regional Office

DESCRIPTION: Water Intrusion Evaluation-Final Study Option 1,-Phase 2-Sheets CI100/ CI102

DATE: April 19, 2019

DESCRIPTION	QUANTITY	UNIT	MAT	LAB	SUB	MAT$	LAB$	SUB$	TOTAL$
Replace and add to asphalt pavement, 3" hot mix on 8" Class 7 base	861.00	cyd	0.00	0.00	34.00	0.00	0.00	29274.00	29274.00
Remove existing paving and base	66.00	cyd	0.00	0.00	25.00	0.00	0.00	1650.00	1650.00
Excavation of existing material/Stockpile	486.00	cyd	0.00	0.00	35.00	0.00	0.00	17010.00	17010.00
4" PVC Sch 40 Pipe/wrapped-21	160.00	lf	4.05	2.87	0.00	648.00	459.20	0.00	1107.20
Couplings, glue, etc. for pipe	1.00	LS	300.00	0.00	0.00	300.00	0.00	0.00	300.00
Class 7 backfill around pipes	16.00	cyd	45.00	5.00	20.00	720.00	80.00	320.00	1120.00
Waterproof N, S & E walls 40 mil liquid	1900.00	sf	0.00	0.00	18.00	0.00	0.00	34200.00	34200.00
Backfill and compact excavated area/Stockpile	480.00	cyd	0.00	0.00	33.00	0.00	0.00	15840.00	15840.00
Backfill and compact excavated area/borrow fill	127.00	cyd	35.00	0.00	45.00	4445.00		5715.00	10160.00
Seed and fertilize disturbed areas	1.00	LS	0.00	0.00	500.00	0.00	0.00	500.00	500.00
Trench safety box	1.00	ls	1000.00	0.00	0.00	1000.00	0.00	0.00	1000.00
	0.00	ls	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						$7,113.00	$539.20	$104,509.00	$112,161.20
SALES TAX	9.5000%								$675.74
PAYROLL TAX	42.0%								$226.46
									$113,063.40
General Conditions/Fee	20.00%								$22,612.68
Subtotal									$135,676.08
Contingency	20.00%								$27,135.22
TOTAL									**$162,811.29**

Source of Cost Data-RS Means Building Construction Cost 2018 76th Edition
Estimate Assumptions:
Work to be in two (2) Phases with Options
Phase I to take Approximately 3 Month's
Phase II to take Approximately 4 Month's

CROMWELL ARCHITECTS ENGINEERS

PRICING WORKSHEET

PROJECT: KLIPSCH MUSEUM for NPS Southeast Regional Office
DESCRIPTION: Water Intrusion Evaluation-Final Study Option 2-Sheet CI201/SI201
DATE: April 19, 2019

DESCRIPTION	QUANTITY	UNIT	MAT	LAB	SUB	MAT$	LAB$	SUB$	TOTAL$
Remove existing conc-haul off	18.00	cyd	0.00	35.00	5.00	0.00	630.00	90.00	720.00
Horizontal 4" sch 20 wrapped PVC pipe	180.00	lf	4.05	2.87	0.00	729.00	516.60	0.00	1245.60
6" Pvc Schedule 40 Pipe-	140.00	lf	1.51	4.90	0.00	211.40	686.00	0.00	897.40
Couplings, glue, etc. for pipe	1.00	LS	500.00	0.00	0.00	500.00	0.00	0.00	500.00
24" PVC Schedule 20 Pipe	10.00	lf	6.00	10.00	0.00	60.00	100.00	0.00	160.00
Connect pipe from sump to 4"	1.00	ls	0.00	70.00	0.00	0.00	70.00	0.00	70.00
base at 24" PVC pipe	1.00	LS	290.00	560.00	0.00	290.00	560.00	0.00	850.00
Steel frame and cover for 24" Pipe	2.00	ea	263.00	134.00	0.00	526.00	268.00	0.00	794.00
2" PVC conduit Pipe to pipe/House	30.00	lf	1.10	1.52	0.00	33.00	45.60	0.00	78.60
Class 7 backfill around pipes	4.00	cyd	45.00	5.00	20.00	180.00	20.00	80.00	280.00
Sump Pumps	3.00	ea	300.00	100.00	0.00	900.00	300.00	0.00	1200.00
Concrete Curb at door & door	1.00	ls	1250.00	500.00	0.00	1250.00	500.00	0.00	1750.00
Hook up power to pumps	1.00	LS	0.00	0.00	800.00	0.00	0.00	800.00	800.00
Add gutter on end of shed	30.00	lf	0.00	0.00	15.00	0.00	0.00	450.00	450.00
Backfill and compact excavated area/Stockpile	45.00	cyd	0.00	0.00	50.00	0.00	0.00	2250.00	2250.00
Backfill and compact excavated area/borrow fill	10.00	cyd	35.00	0.00	50.00	350.00		500.00	850.00
Pour back removed concrete drive	640.00	sf	0.00	0.00	10.00	0.00	0.00	6400.00	6400.00
Seed and fertilize disturbed areas	1.00	ls	0.00	0.00	500.00	0.00	0.00	500.00	500.00
Seal Cracks in basement wall with epoxy injection	1.00	ls	2500.00	1000.00	0.00	2500.00	1000.00	0.00	3500.00
cut slot in slab/wall intersection	150.00	lf	2.25	6.00	0.00	337.50	900.00	0.00	1237.50
Crystalline waterproof basement walls	2780.00	sf	1.75	2.25	0.00	4865.00	6255.00	0.00	11120.00
Install Dehumidifer in basement	1.00	ea	400.00	105.00	0.00	400.00	105.00	0.00	505.00
Drill 1/2" holes in basement wall	12.00	hrs	0.00	35.00	0.00	0.00	420.00	0.00	420.00
Core drill and seal ext basement wall/install 4" pipe to 24" well	1.00	ls	40.00	240.00	0.00	40.00	240.00	0.00	280.00
						$12,442.90	$11,469.60	$10,980.00	$34,892.50
SALES TAX	9.5000%								$1,182.08
PAYROLL TAX	42.0%								$4,817.23
									$40,891.81
General Conditions/Fee	20.00%								$8,178.36
Subtotal									$49,070.17
Contingency	20.00%								$9,814.03
TOTAL									**$58,884.20**

Source of Cost Data-RS Means Building Construction Cost 2018 76th Edition

ALTERNATE NO. 1

DESCRIPTION	QUANTITY	UNIT	MAT	LAB	SUB	MAT$	LAB$	SUB$	TOTAL$
Saw cut and remove low spot in concrete	1.00	ls	0.00	280.00	400.00	0.00	280.00	400.00	680.00
Form and pour sump pit	1.00	ls	240.00	350.00	150.00	240.00	350.00	150.00	740.00
Dimple Waterproof pit and walls of pit/flo	1368.00	sf	0.00	0.00	3.25	0.00	0.00	4446.00	4446.00
Sump Pump	1.00	ea	300.00	200.00	0.00	300.00	200.00	0.00	500.00
hose to basement	1.00	ls	120.00	50.00	0.00	120.00	50.00	0.00	170.00
Deduct Crystalline waterproofing floor	1780.00	sf	(1.56)	(2.00)	0.00	(2776.80)	(3560.00)	0.00	(6336.80)
Deduct slot cut in wall/floor intersection	150.00	lf	(2.25)	(6.00)	0.00	(337.50)	(900.00)	0.00	(1237.50)
pour 4" topping slab	1340.00	sf	1.75	5.00	0.00	2345.00	6700.00	0.00	9045.00
						(109.30)	3120.00	4996.00	8006.70
SALES TAX	9.5000%								($10.38)
PAYROLL TAX	42.0%								$1,310.40
									$9,306.72
General Conditions/Fee	20.00%								$1,861.34
Subtotal									$11,168.06
Contingency	20.00%								$2,233.61
TOTAL									**$13,401.67**

Attachment 3
Final Report - 4/19/19
CAE Project: 2018-238

Date 10/23/2018

Project Name Klipsch Museum – Water Intrusion Study

Project Number 2018-238

SITE VISIT REPORT

By Joe Hilliard

Attending NPS: Randy Bates, Joe Lambert, Christian Davis, Tarona Armstrong
Klipsch Museum: Jim Hunter
Cromwell AE: Brittani Mitchell, Joe Hilliard

Subject Report from initial site visit on 10/10/18

Time: 9:15am until 3pm

Site visit purpose: The site visit was held to gather information on the building and site to start the study as to the cause and possible remedies to the water issues in the basement.

Site Visit Investigation Performed: The site visit work performed was the following:

1. Scanning the building using a laser scanner to develop drawings and establish relative elevations for the floors and the exterior site.
2. Photographing the interior and exterior of the building to record existing conditions and possible sources for the water intrusion into the basement.
3. Talking to Jim Hunter the museum curator as to the issues on site and the history of the museum.
4. Studying the area around the site to look for outside sources and influence on the water issues.

Weather: The weather was warm and sunny. Per the rain gauge maintained by Jim Hunter, the site had approximately 2¾" rain on the evening of 10/9/18.

Data and information received from the site visit: The data and information received from the site visit included the following:

a. Laser scans of the building
b. Photos from the site visit
c. Copy of the engineering report from the closing of the Southwest Proving Ground

Findings from the site visit:

1. Existing Building: The existing building is an approximately 34-foot by 43-foot one-story building with a basement.
    a. Construction: The basement and first floor are constructed using cast-in-place concrete. The walls and roof of the building are framed with wood framing.

b. History: The building was constructed as part of the Southwest Proving Ground around 1941 as the telephone exchange building. From the engineering study from the closing of the Southwest Proving Ground in 1946 the building was referred to as building 116. A copy of the study was provided by Jim Hunter. Per Jim Hunter the building is registered with the State of Arkansas as a historic landmark.
c. Basement walls and slab on grade: The basement walls and slab on grade appear to be in good condition. The water on the basement floor varied from none to approximately 2 inches. The difference in the depth is expected to be due to the slab not being level when poured and possible uplift of the slab due to pressure from ground water.
d. Original Storm Drain system: The extent of the existing storm drain system is unknown. The existing roof drains on the front of the building feed into a storm drain system but it is not known what that system drains into.
e. Recent improvements to the storm drain system: An attempt was made to add fill and piping on the back of the building to direct water from the gutters and downspouts away from the building. It appears that system has failed.

2. Water in the basement: There was water on the basement slab of varying depth plus approximately 18 inches of water in the elevator pit on the west side of the building.
3. Site: See Attachment 1 for an aerial photo of the site from Google Earth. The following were notice on the site:
    a. Standing water in the ditches in front of the building. The ditches on the front of the building do not drain well and hold water. The general flow of the water at the street in front of the building is from the west to the east. See Attachment 2 to this report to see the flow of water in the vicinity of the building.
    b. Evidence of water flowing across the site from the rainstorm the previous evening.
    c. Standing water in the property to the south of the site. See Attachment 3, photo 7 for water standing on the adjacent property. Per Jim Hunter, the land owner to the south has brought in fill and filled. The fill appears to have impeded the water flow away from the museum site.
    d. Sanitary Sewer: Per the report on the Southwest Proving ground received from Jim Hunter, the sanitary sewer flows from the building to a manhole just off of the southwest corner of the property. From there the sanitary sewer line goes to the south southeast toward a former sanitary sewer plant approximately one mile away. From driving by the former sanitary sewer plant site it appears that plant has been closed. It is unknown which way the sanitary sewer flows now.

Preliminary Theories and Recommendations from the Site Visit: The primary theory is that the water in the basement is due to ground water intrusion due to the ground water being higher than the elevation of the basement and elevator pit during certain parts of the year. This ground water intrusion is influenced by the following:

1. Poor drainage in the ditches along the highway in front of the building
2. Poor drainage at the rear of the property for surface water leaving the site

3. Possible water trapped in the area east of the retaining wall near the exterior access to the basement.

The preliminary recommendations to correct the issue are the following:

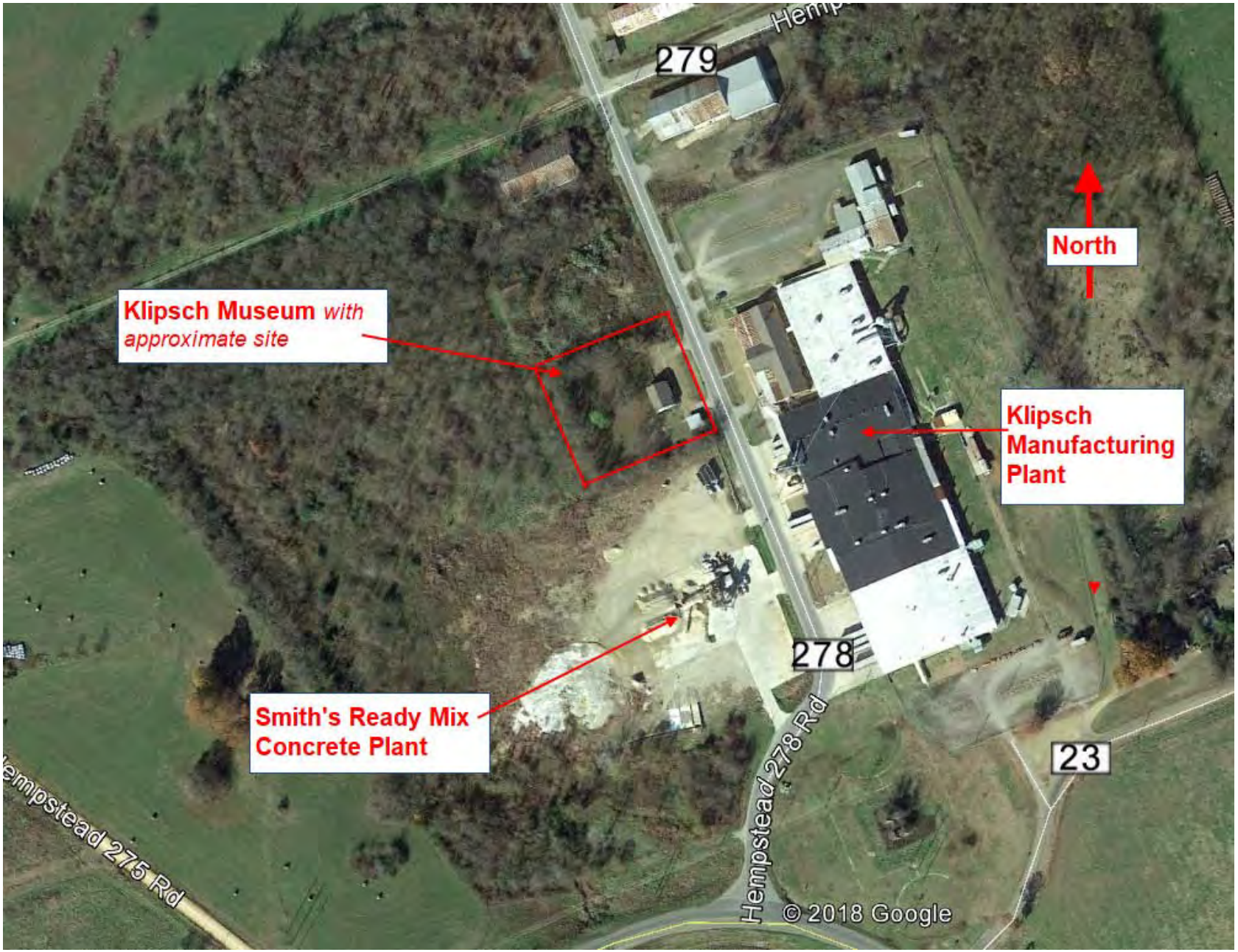
1. Have the county or state clean out the ditches along the road in front of the museum in order to reduce standing water near the building and to get water away from the site.
2. Get the neighbor to the west to cut in a ditch to reduce standing water in the field west of the site.
3. Install sump pits and a drain line outside on the west side of the building to pump out the water to lower the ground water level near the building.
4. Pave the area east of the retaining wall to drain water to the north away from the wall.

Items 1 and 2 above help reduce the problem but would most likely not solve the problem. Item 3 above especially done along with items 1 and 2 above should solve the problem. The issue is that there is not a good place to pump the water to on the property that is lower than the elevator pit.

Attachments:

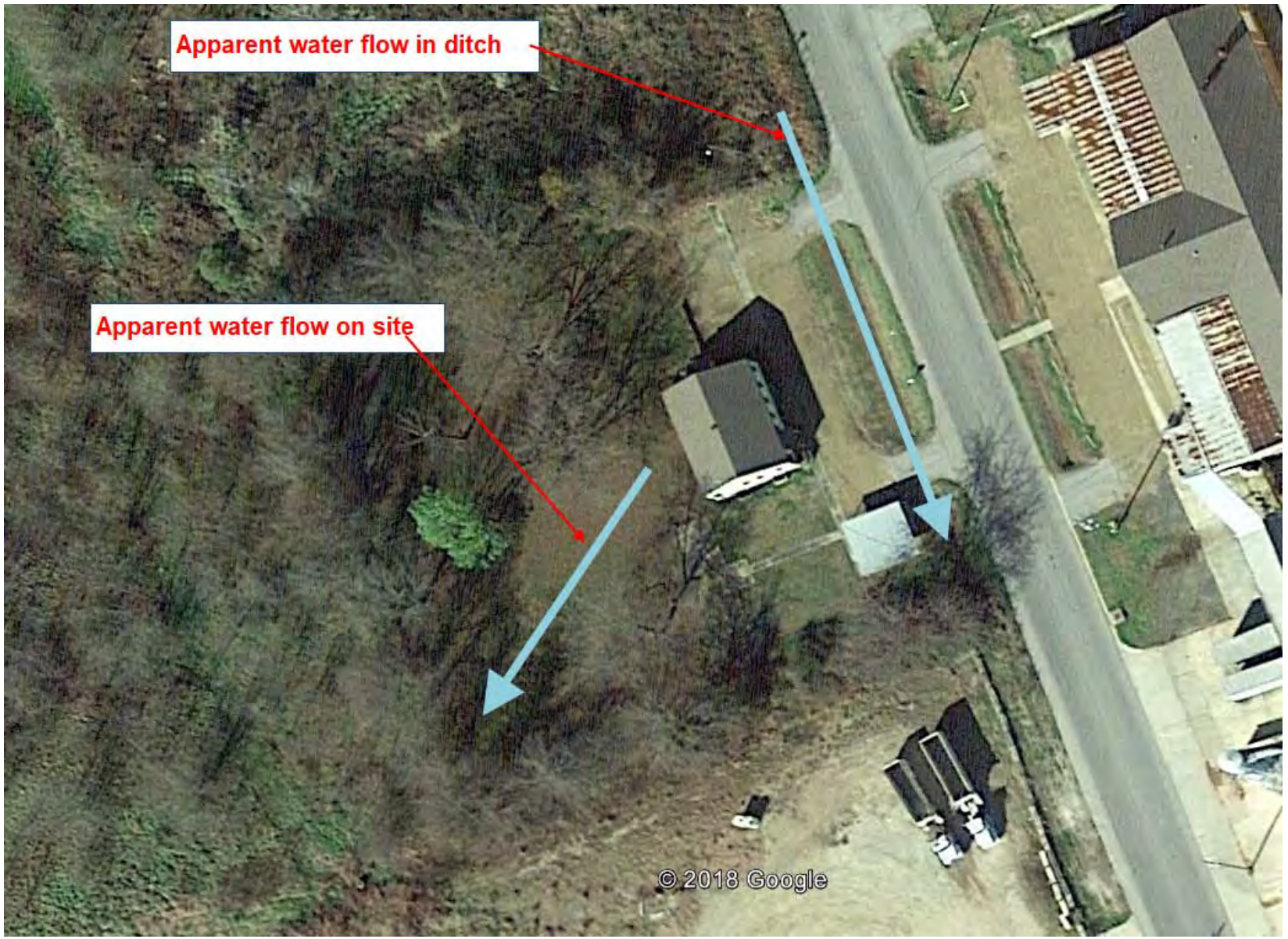
1. Attachment 1 – Aerial View of the site
2. Attachment 2 - Flow of water in the vicinity of the building
3. Attachment 3 - Photos from the site visit

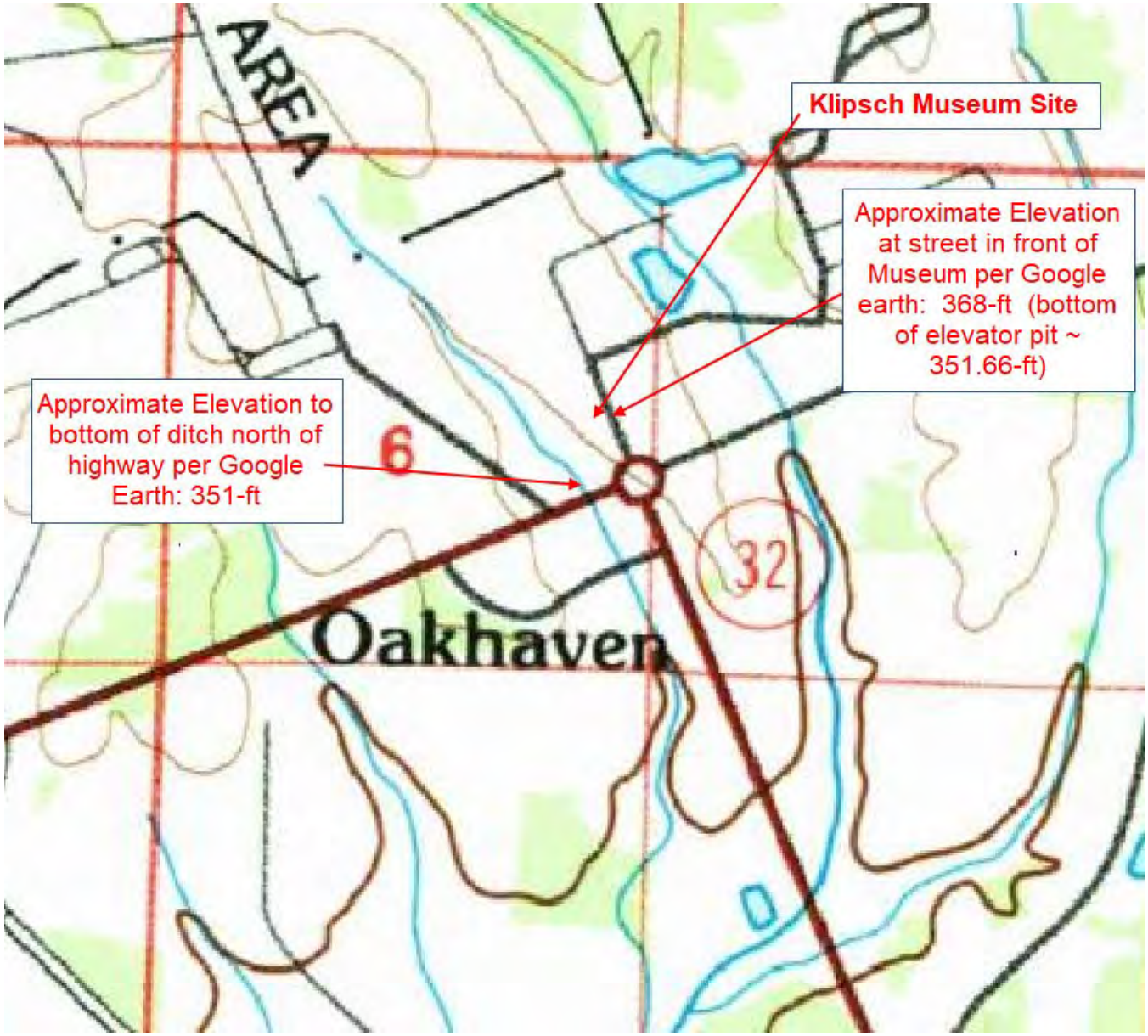
End of Site Visit Report


279
North
Klipsch Museum with approximate site
Klipsch Manufacturing Plant
278
Smith's Ready Mix Concrete Plant
23
Hempstead 278 Rd
Hempstead 275 Rd
© 2018 Google

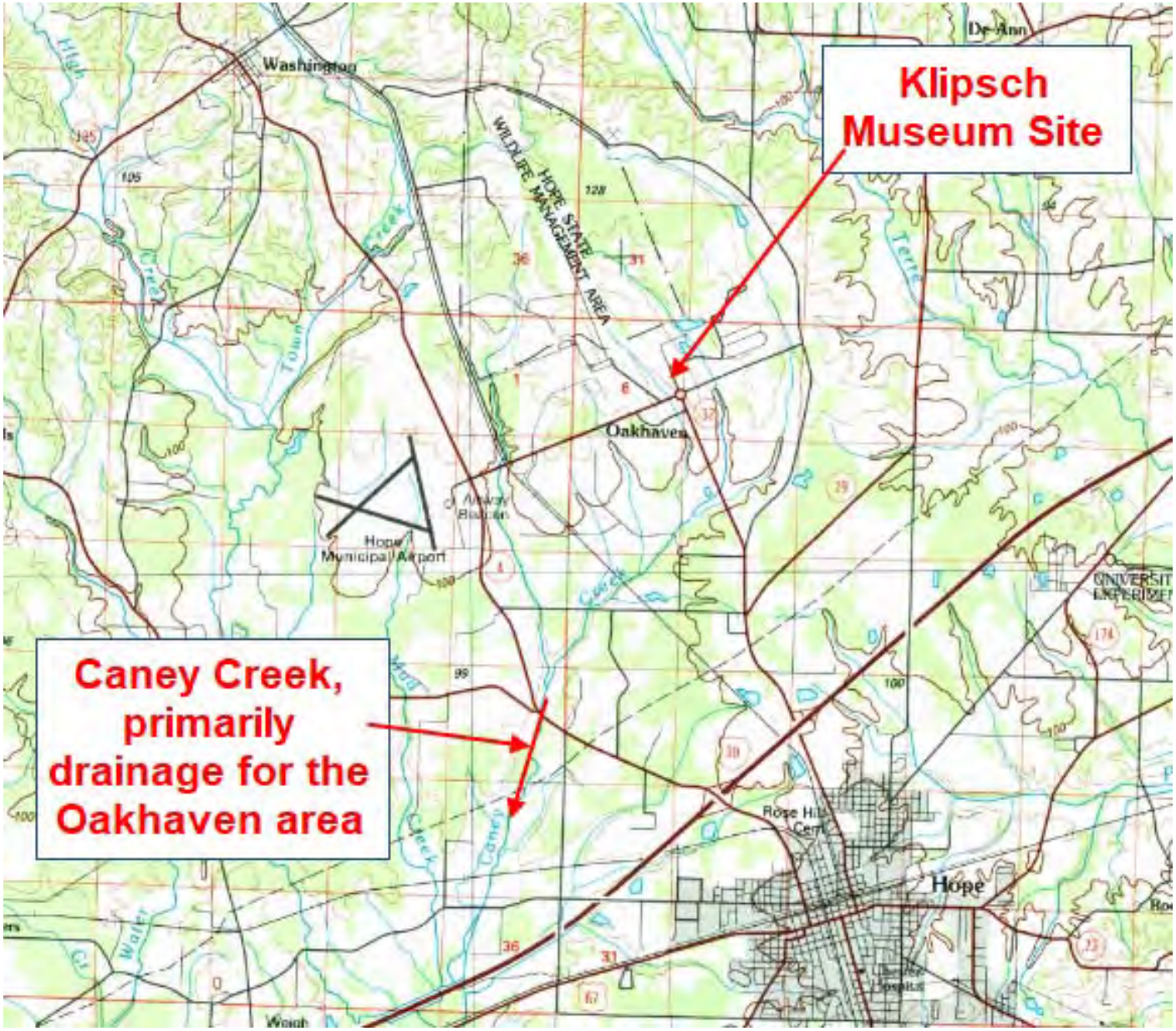

Hempstead County Road 278
Assumed property lines
Approximate location of Sanitary Sewer manhole
© 2018 Google

Apparent Water flow on site

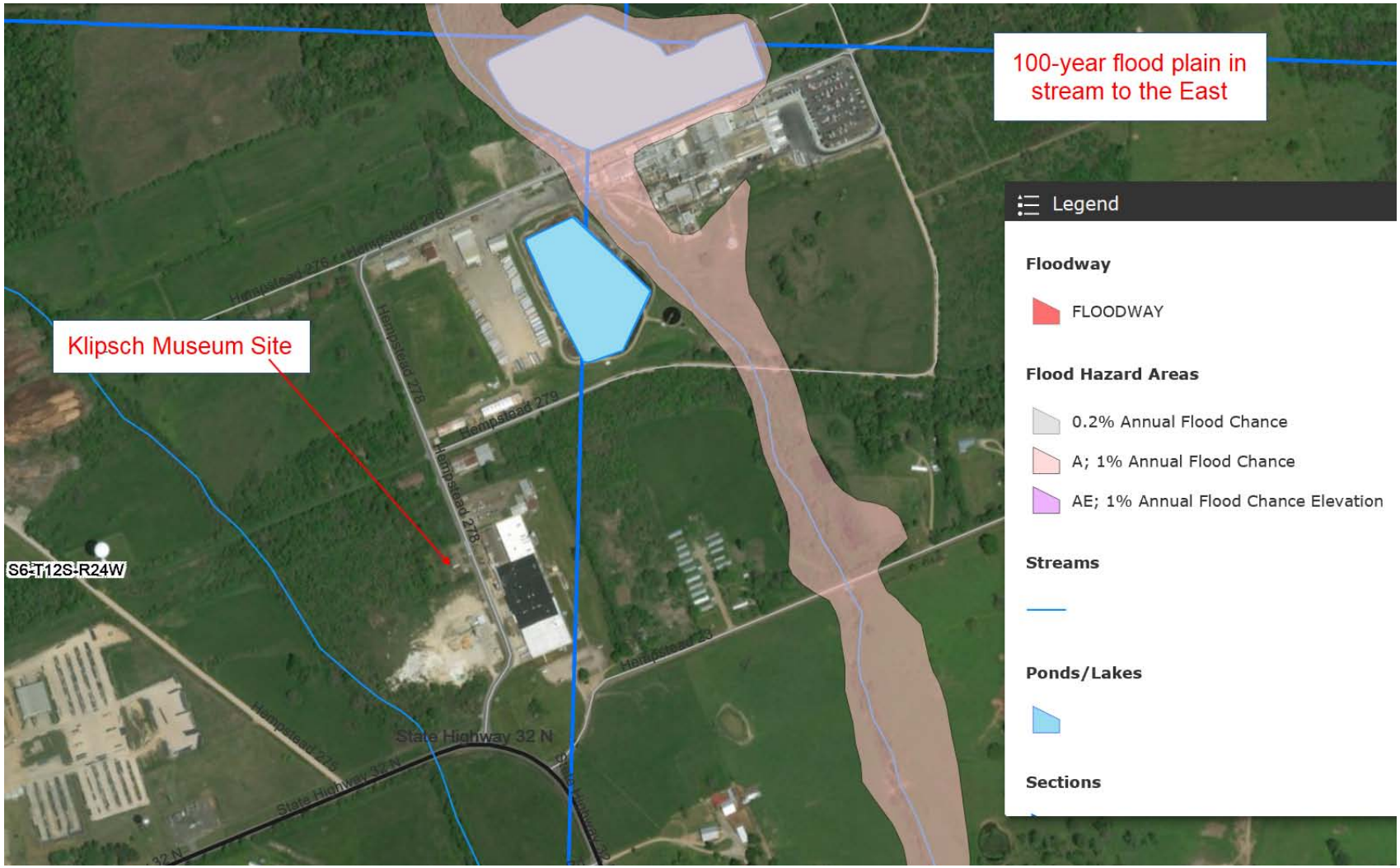




Map from U.S. Geological Survey, Hope Arkansas topographic map dated 1986



Map from U.S. Geological Survey, Hope Arkansas topographic map dated 1986



Map from City of Hope Flood Hazard Areas: https://hope.maps.arcgis.com

Photo 1 – Exterior Elevation of North Side of Building

Photo 2 – East and south side of Building

Photo 3 – Exterior Elevation of West / Back Side of Building

Photo 4 – Canopy on north side of building with stairs and lid for elevator pit

Photo 5 – Basement showing opening into the elevator pit and water in basement

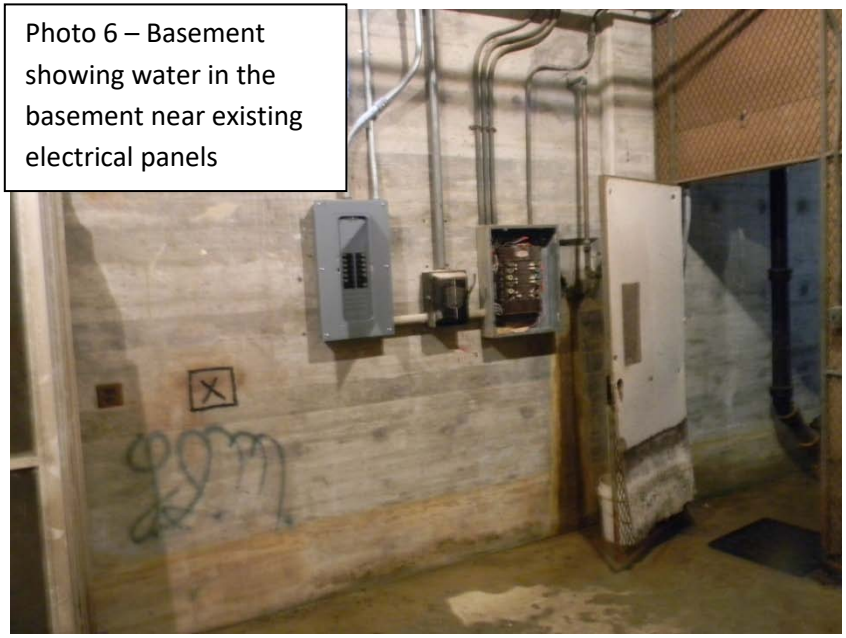


Photo 6 – Basement showing water in the basement near existing electrical panels

Photo 7 – Ponding water on the property to the west of the Museum site

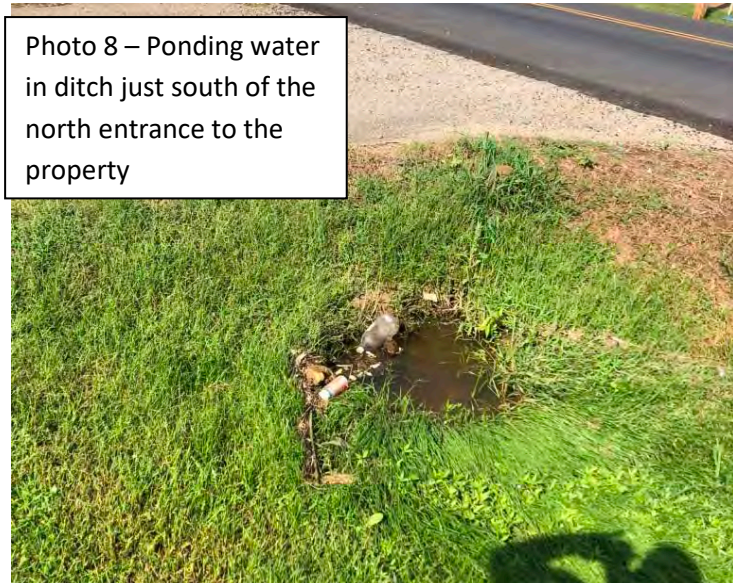


Photo 8 – Ponding water in ditch just south of the north entrance to the property

Photo 10 – Ponding water in the ditch on the northeast corner of the property

Photo 9 – Ponding water in ditch along highway on the south end of property

Attachment 4
Final Report - 4/19/19
CAE Project: 2018-238

Date 11/9/2018

Project Name Klipsch Museum – Water Intrusion Study

Project Number 2018-238

MEETING NOTES

By Joe Hilliard

Attending NPS: Randy Bates, Tarona Armstrong, Randy Bates
Klipsch Museum: Jim Hunter
Cromwell AE: Joe Hilliard

Subject Telephone Conference call to review the site visit report from the 10/10/18 Site Visit

Time: 11am until noon

The following items were discussed: (as captured from an email by Barbara Judy and notes by Joe Hilliiard)

1. Joe Hilliard reported that the issue appears to primarily be a ground water level issue. The bottom of the elevator pit is only about 1 ½ feet above the ditch elevation approximately ¼ of a mile down stream. Ground water is fed by the soils around the site, poorly draining ditches in the road in front of the museum, the standing water to the west of the site where the neighbor has placed fill which appears to reduce the flow of water off of the museum site. This is evidenced by the standing water just to the west of the low point on the site.
2. The Team reviewed and vetted the recommendations for managing water intrusion around the museum. In broad concept, the Klipsch Museum building should be thought of as a concrete boat sitting in water (groundwater), which is seeping through the building slab in many locations. Dewatering the site is the key to mitigating the water intrusion issues.
3. Joe Hilliard/Cromwell decided to use part of his remaining investigation budget to inspect the storm water runoff drain lines that the building is tied to. The condition of the lines is a significant unknown - it they are in poor condition then they may be worsening the groundwater issues at the site.
4. Jim Hunter felt comfortable with the idea of approaching the county to get the ditches cleaned out, and with approaching the neighboring site to get a ditch installed to route stormwater off the Klipsch site.
5. Joe Hilliard agreed that the Phase 1 cost estimate would include the following:
    a. Installation of a sump well and drain lines outside of the building
    b. Cost for waterproofing treatment to the exposed west wall of the Klipsch building - this wall will be exposed to install drains/sump pumps and installation of waterproofing would be a minor additional expense at that time.

6. Joe Hilliard stated that this fix should help the situation but would most likely not completely solve the problem.
7. Joe Hilliard is to provide a Phase 2 costing for the following should the phase 1 approach not completely take care of the problem:
    a. Installation of drain lines and sump pumps around three additional sides of the Klipsch building,
    b. Waterproofing the other three basement walls of the building
    c. Reworking the paving on the north side of the building to help water migrate away from the building.
8. Joe Hilliard stated that these measures should help the situation, but that if the ground water level is not dropped below the bottom of the floor slab or pit water will most likely come into the building through the slab which is not waterproofed.

End of Meeting Notes

Attachment 5
Final Report - 4/19/19
CAE Project: 2018-238

CROMWELL

Date 3/8/2019

Project Name Klipsch Museum – Water Intrusion Study

Project Number 2018-238

MEETING NOTES

By Joe Hilliard

Attending NPS: Evan Webber, Josiah Lambert, Michael Douglass
Klipsch Museum: Jim Hunter, Kevin Harmon
Basement Kings: Willie King
Cromwell AE: Joe Hilliard

Subject Meeting at the Klipsch Museum to consult with Willie King from Basement Kings about the water issues in the basement

Time 9:45am until noon

Weather Conditions: Warm (~63 degrees at 9:45am), Cloudy, with Recent Rains

Site Observations: The site was saturated from recent rains. The window wells on the south side (front left side) of the building had standing water in the wells. A probe camera was used to look at the storm sewer boots that the down spouts in the front of the building drain into. As was reported from the scoping study, both of the downspout boots are either clogged or collapsed. The one of the south end of the front of the building (front left) is filled with water starting about 4-feet down. The one on the north end of the front of the building (front right) is clogged about 4-feet down.

Interior Observations: The basement has some water on the slab. A pump in the elevator lift pit is keeping the water in the pit down to approximately 10" depth. Per Jim Hunter the water on the slab is primarily coming in at the intersection of the wall and the slab at the northwest corner of the basement (near the elevator pit). The elevator pit was measured to be approximately 4-feet deep. The dirt on the wall showing the high water mark of the water in the basement is approximately 17" above the basement floor slab. The floor drain in the basement and the sanitary sewer in the restroom in the basement have been sealed according to Jim Hunter.

The following items were discussed:

1. **Exterior Improvements:**
    a. Canopy of north end of building: Need a roof gutter on that canopy due to erosion from water falling off the canopy and getting water away from the building.
    b. Need to pipe water from the front gutter to the back side of the property to replace the existing stopped up storm drain system that the downspouts in front of the building tie into.
    c. Need to drain water from the window wells on the south side of the building.

2. **Interior Improvements:** The following interior improvements were discussed:
    a. Waterproofing of the interior basement wall: Willie recommended waterproofing the interior of the wall with a crystalline water proofing material applied with a masonry brush in a swirl pattern to the basement wall.
        i. Product Recommended:
            1. Manufacturer: Kryton (www.kryton.com)
            2. Product: Krystol T1 Concrete Waterproofing
                a. One coat of T1
                b. One coat of T2
        ii. Surface to be coated: Willie recommended going up the wall as high as possible. Jim Hunter stated that the wall is historic due to the look of the form work impressions on the wall and the writing on the wall. The determination was that waterproofing the bottom 2-feet of the wall might suffice.
        iii. Preparation for interior basement work: Typically runs dehumidifiers for a couple of days before washing the concrete to be coated with a power washer.
    b. Trench method at the intersection of the wall and the slab: Willie recommended cutting a 1" trench in the floor slab where the wall intersects with the slab and filling the trench with a Kryton Krystol Repair Grout.
        i. Product Recommended:
            1. Manufacturer: Kryton
            2. Product: Krystol Repair Grout
    c. Basement Slab: In order to avoid water on the floor it was discussed that a dimple material typically used to provide water flow on the back side of waterproofing on a basement wall could be placed on the floor and a concrete slab be poured on top of the material. The material would be turned up the wall to catch any water that may come down the wall and would be drained either to a new sump added in the floor slab and pumped to the elevator sump or just tied into the elevator sump.

Conclusion / Determination from the Meeting: Coating the interior of the wall with the crystalline waterproofing is a much more cost effective solution than trying to address the problem from the outside of the building. Joe Hilliard to finish the report by the end of March providing options and various measures to address the water in the basement.

Action Items:

1. Jim Hunter – find out of the limitations on coating the interior wall of the basement, either all of the wall or to at least to 2-feet above the floor.
2. Joe Hilliard – Finish the report with recommendations by the end of March.

End of Meeting Notes