State College Area School District
Office of Physical Plant
Ed Poprik, Director

To: Board of School Directors

From: Ed Poprik

RE: **Update on Memorial Field**

Date: October 8, 2012

Table of Contents:

1) Introduction:

(From the booklet, "The Public Schools of the State College Area: A History, The First Forty-Four Years: 1896-1940" by Jo Hays and Margaret Riley)

"The sink hole south of the Fraser Street building between Foster and Nittany Avenues, offered to the Board by owner John Noll at a fee of $3,000 and $15 for costs, was accepted at the October 26, 1914 meeting for $3,042. The next month the Board began protesting its continued use as a dump, without success for some time."

Currently, the sinkhole at Memorial Field drains storm water generated from approximately 50 acres of State College Borough surrounding the stadium. The field is the lowest elevation in this area, which has necessitated this arrangement.

An expanded early history of Memorial Field can be found in the appendix of this document.

2) Abbreviated Timeline of Events:

The most recent discussion regarding Memorial Field can be traced to the authorization of a District Wide Facilities Master Plan (DWFMP) in April of 2000. The following is a brief, abbreviated recap of significant events since the authorization of that study. (Throughout this time frame maintenance and monitoring of the stadium has been an ongoing process).

June 2000 – East Bleacher Remediation

-Work is contracted on the East Bleachers to close large gaps in the perimeter fence and seating areas, the previously "open style" bleachers presented a fall hazard. The cost is $50,000.

December 2001 – DWFMP published

-Recommends renovation to Memorial Field. The estimate for this work was $2.5 million and was suggested to begin in 2008 with a completion date projected for 2009.

April 2002 – Public Hearing on Memorial Field

-Most of the attendees favor "saving the field"

-At their 6/10/02 meeting, the Board "makes a commitment" to retain Memorial Field as primary football stadium

April 2003 – Board Awards Bid for Field Project

-Project includes work funding by 3 entities

-SCASD Board funds reconfiguration and expansion of the field area through retaining wall reconstruction in the amount of $388,220.00

-Detailed geo-technical analysis performed

-State College Borough funds replacement of storm water conveyance piping under the field and installation of "stormceptors" to clean water from the street sewer system

-A group of private citizens known as "SHFAST" funds removal of the natural grass field, installation of a new artificial turf surface, and a new drainage system that includes 2 injection wells to support the drainage of the new field surface

November 2004 – Bid awarded to replace lighting standards

-Original field lighting is replaced at a cost of $189,813.00

October 2006 - Stadium Master Plan from L. Robert Kimball

-Options range from $2.86 to $7.5 million for the bleachers and field with an additional $3.79 million for renovation of the 131 West Nittany Avenue building (Central Office) as a support facility

July 2007 – Minor East Bleacher upgrades

-Wooden footboards are replaced at a cost of $105,000.

-Physical Plant staff performs retrofits to reinforce the existing wooden seat boards.

January 2008 – Section of West Bleacher Closed

-As a temporary measure a 282 seat section of the west bleacher assembly is closed due to a failing retaining wall. Monitoring and testing of the wall is formalized.

June 2009 – District Wide Facilities Master Plan updated

-Recommends renovation of Memorial Field

February 2010 – Architect hired for Memorial Field Master Plan

-Crawford Palumbo Skibinski appointed

-Public engagement meetings conducted

April 2011 – Schematic design accepted for Field Master Plan

June 2011 – Design of Phase 1 project authorized

-Board authorizes design of west bleacher replacement and retaining wall stabilization project

August 2012 – SCASD staff discovers ground shift at sinkhole

-Structural engineer contacted

-Interim repairs and bracing performed in the vicinity of sinkhole

-Additional geo-technical testing performed

September 21, 2012 – Final Report issued by Hutchinson Group
September 27, 2012 – Hutchinson Report received by SCASD
October 1, 2012 – Bleachers closed

3) Technical Report on the Issues:

Shad Hoover, P.E., Geotechnical engineer with CMT Labs Inc., will discuss the findings of the geo-technical report. The conclusions are shown below. (The full text portion of the report is included in the appendix. Graphics from the report will be shared during the presentation.)

From the report by The Hutchinson Group:
Approximately 5,300 feet (1 mile) of EI profiles and over 300 microgravity records were collected within and near the Memorial Stadium, State College Pennsylvania.

The findings and conclusions in this report are stated with a reasonable degree of scientific certainty. THG's findings and conclusions are as follows:

- *A geophysical survey, consisting of EI and microgravity measurements, of the subsurface at Memorial Stadium; State College, Pennsylvania was completed April 2-3, 2003 and August 20 – 31, 2012;*
- *The site is an Astroturf-covered football field and contiguous bleachers; with bituminous asphalt, and concrete surface cover;*
- *The geophysical survey helped map a sub-regional fracture system that has well-developed Karst features;*
- *Dissolution, erosion and subsidence of the dolomite/limestone in the area of the sub- regional fracture created the sinkhole into which Memorial Stadium was built;*
- *An inlet or throat to a subsurface void beneath the northern bleachers is used for storm water discharge for approximately 50 acres of the surrounding area;*
- *The void beneath the inlet (throat) is approximately 40 feet long, 50 feet wide, and 20 feet deep and is probably mostly clay-filled;*
- *The void is hydraulically connected to a north-south sub-regional fracture;*
- *Surface expression for the dissolution and erosion of the sub-regional fracture was evident in minor subsidence near the driveway entrance to the field on the west side and collapse of the sidewalk and stadium along S. Fraser Street; and,*
- *Continued use of the inlet for storm water discharge will continue to erode, dissolve and create more subsidence.*

Robert Davis, consulting structural engineer, will discuss how these findings relate to the structural integrity of the East Bleacher.

4) Potential Options for Moving Forward:

Ed Poprik, SCASD Director of Physical Plant, and Robert Hoffman, Architect, will discuss a series of options for the long-term disposition of the field. While no detailed cost estimates have been developed, these are presented in likely order from least expensive to most expensive.

a) Repair
-Remove the current East Bleachers
-Repair the throat of the sinkhole with an “inverse filter”
-Build new structural bleachers that would span the throat area

b) Create new Memorial Field Master Plan
-Create a new “footprint” that would not have bleachers over the sinkhole
-Could potentially involve land acquisition

c) Move stadium to another site; consider sale of property
-Current High School site is constrained for space
-Zoning at current High School site would prevent field lighting
-Only suitably sized tract of land currently owned by the district is at Park Forest Middle school but it lacks infrastructure needs
-Likely need to acquire land
-High cost for development if not attached to another facility

d) Move stadium to another site; continue use of Field
-Above issues all apply
-Field would become a secondary outdoor venue for smaller events
-Funding would be required for West bleacher repair

e) Prevent storm water from entering sinkhole; redirect water
-Feasibility issues
-Extremely expensive
-Other storm water systems are already at capacity
-Lengthy design and implementation process

5) Interim Operations:

Two home football games remain scheduled for Memorial Field. Based on the experiences from the home game played on October 5, 2012, administration will discuss plans for the remainder of 2012.

Additional consideration for operations during 2013 must be considered. With some remedial work, the section of bleachers over the sinkhole could be separated from the remainder of the East Bleacher assembly and Press box. This would enable use of some portion of the East Grandstand and Press box. With Board direction, plans, costs, and an implementation calendar could be presented at a future meeting.

6) Next Steps:

Short term, the Board of School Directors should discuss and give direction on the West Bleacher project currently under development. Additionally, discussions with State College Borough regarding the storm water situation should commence. Staff has had preliminary communication and further sharing of information is planned. A joint meeting of the elected officials from both SCASD and State College Borough might be advisable.

Long term, administration recommends updating the District Wide Facilities Master Plan. This issue should be considered in context with all other facility issues facing the district. This update could be authorized by exercising the Add Alternate included in the Crabtree Rohrbaugh contract in the amount of $59,000.

7) Appendix:

a) The Hutchinson Group report date September 21, 2012 (text portion)
b) Memorial Field – A History

MEMORIAL STADIUM
SUBSURFACE GEOPHYSICAL INVESTIGATION
State College, Pennsylvania

Prepared for:
State College Area School District
131 West Nittany Avenue
State College, Pennsylvania 16801-4899
September 21, 2012

Prepared by:

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1.0 INTRODUCTION

1.1 Background

The State College Area School District retained THG Geophysics, Ltd. (THG) to investigate an existing sink hole beneath the northern bleachers at the Memorial Stadium, State College, Pennsylvania. THG electrically imaged the stadium in 2003 to determine if sink holes would develop in the playing field. THG determined that the playing field was on top of a large subsidence sink hole that has been plugged with clay and fill. In that study, THG recognized the sink hole beneath the stands that is currently used for storm water drainage; however, that area was not in the scope of work at the time.

1.2 Work Scope

THG conducted an electrical imaging (EI) and gravity survey of the Memorial Stadium and the surrounding area, State College, Pennsylvania from August 20 through August 31, 2012 (Figure 1). The work scope included mapping the footprint of the void beneath the north stadium bleachers. EI was selected as the most appropriate method for imaging the subsurface and microgravity methods were used to determine the sub-regional extent of the Karst feature and its potential impact to the bleachers.

2.0 GEOPHYSICAL METHODS

2.1 ELECTRICAL IMAGING

2.1.1 Theory

Electrical resistance is based upon Ohm's Law:

$$R = \frac{V}{I}$$

Where, resistance, **R** (Ohms), is equal to the ratio of potential, **V** (volts) to current flow, **I** (amperes). Resistivity is the measure of the resistance along a linear distance of a material with a known cross-sectional area. Consequently, resistivity is measured in Ohm-meters. This report presents the geophysical results as geo-electrical profiles of modeled resistivity versus depth, in units of feet.

Electrical currents propagate as a function of three material properties (1) ohmic conductivity, (2) electrolytic conductivity, and (3) dielectric conductivity. Ohmic conductivity is a property exhibited by metals. Electrolytic conductivity is a function of the concentration of total dissolved solids and salts in the groundwater that exists in the pore spaces of a material. Dielectric conductivity is a function of the permittivity of the matrix of the material. Therefore, the matrix of most soil and bedrock is highly resistive. Of these three properties, electrolytic conductivity is the dominant material characteristic that influences the apparent resistivity values collected by this method. In general, resistivity values decrease in water-bearing rocks and soil with increasing:

a. Fractional volume of the rock occupied by groundwater;
b. Total dissolved solid and chloride content of the groundwater;
c. Permeability of the pore spaces; and,
d. Temperature.

Materials with minimal primary pore space (i.e., limestone, granite) or lack groundwater in the pore spaces will exhibit high resistivity values (Mooney, 1980). Highly porous, moist or saturated soil, such as fat clays, will exhibit very low resistivity values. Most soil and bedrock exhibit medium to low resistivity values.

In homogeneous ground, the apparent resistivity is the true ground resistivity; however, in heterogeneous ground, the apparent resistivity represents a weighted average of all formations through which the current passes. Many electrode placements (arrays) have been proposed (for examples see Reynolds, 1998); however, the Schlumberger array has proven to be an effective configuration for imaging voids in bedrock settings. The following Schlumberger array was used in the collection of data:

$$R_i = \frac{\pi a^2}{b}\left[1 - \frac{b^2}{4a^2}\right]R;\ a = 5b$$

Where, R_i, resistivity, is related to the number of poles, ***n***, the separation distance between the current source and current sink ***b***, and the pole spacing, **a**.

Imaging depth (*D*) can be approximated using the maximum current and potential electrode separation distance (*AM*) and the pole spacing (*BA*) using the following equation:

$$D = \frac{BA}{2} + \frac{AM}{2}$$

For this survey, BA = 6 ft and AM = 97 ft resulting in a maximum imaging depth of approximately 40 feet. The vertical resolution for this spacing is approximately 2 feet.

2.1.2 Methods

The resistivity survey was performed using the ARES multi-electrode cable system (GF Instruments, s.r.o., Brno, Czech Republic). The survey was conducted using bronze electrodes and stainless-steel cylinder-bearing cables.

2.1.3 Processing

A forward modeling subroutine was used to calculate the apparent resistivity values using the EarthImager program (AGI, 2002). This program is based on the smoothness-constrained least-squares method (deGroot-Hedlin and Constable, 1990; Loke and Barker, 1996). The smoothness-constrained least-squares method is based upon the following equation:

$$J^T g = (J^T J + \mu F)d$$

Where, **F** is a function of the horizontal and vertical flatness filter, **J** is the matrix of partial derivatives, $\boldsymbol{\mu}$ is the damping factor, **d** is the model perturbation vector and **g** is the discrepancy vector.

The EarthImager program divides the subsurface 2-D space into a number of rectangular blocks. Resistivities of each block are then calculated to produce an apparent resistivity pseudosection. The pseudosection is compared to the actual measurements for consistency. A measure of the difference is given by the root-mean-squared (rms) error.

2.2 GRAVITY

2.2.1 Theory

Microgravity measurements are not readily impacted by cultural noise; consequently, microgravity measurements can be collected in buildings and adjacent to urban development. Microgravity has been used for many geologic purposes; however, for the environmental geophysicist, microgravity is used to determine the presence of subsurface voids, to image subsurface bedrock topography, and to find the depth of waste (Carmichael and George, 1977; Kick, 1985; Stewart, 1980).

Small changes in rock density produce small changes in the gravity field, which can be measured by the microgravimeter. These readings change from day to day due to tidal response and lunar pull, among other phenomenon that have an impact on the earth's gravitational flux. A microgravimeter measures the acceleration due to the earth's gravitational field (in mgal = 0.001 cm/sec^2) using an astatic spring mechanism (Carmichael and George, 1977). The Earth's gravitational field is roughly equivalent to a sphere with variations for sea level and elevation (Milsom, 1989). The 1930 International Gravity Formula (Nettleton, 1971) for calculating absolute gravity is:

$$g_\phi = g_o\left(1 + \alpha \sin^2 \phi - \beta \sin^2 2\phi\right)$$

Where, (***g$_F$***) the theoretical acceleration due to gravity at a given latitude (***F***) and **a** and **b** are constants that depend on the amount of flattening of the spheroid and upon the speed of rotation of the Earth (Reynolds, 1997). Gravity is calculated in g.u. (10 g.u. (10^{-6} m/sec^2) = 1 mgal, a c.g.s. unit).

The International Gravity Formula was refined to the Geodetic Reference System 1967 and is derived thus (Woollard, 1975):

$$g_\phi(1967) - g_\phi(1930) = \left(-172 + 136 \sin^2 \phi\right)\mu \text{ m/s}^2 \text{ (g.u.)}$$

2.2.2 Gravity Data Reduction

Processing raw gravity data includes corrections for latitude, elevation, Bouguer gravity, tidal, and terrain corrections.

2.2.2.1 Latitude

Latitude corrections were automatically corrected using the LaCoste & Romberg G-600 microgravity meter by subtracting the International Gravity Formula normal datum from the observed gravity:

$$G_l = \frac{8.12 \sin 2L g.u.}{km}$$

Where, ***G$_l$*** is the theoretical local gradient and ***L*** is the latitude.

2.2.2.2 Elevation

The elevation or free-air correction normalizes the gravity data to a given datum that does not have to be sea level. Free-air correction is based upon the free-air correction of 0.3086 mgals/meter (0.0941 mgals/ft). The normal elevation (***E$_n$***) adopted for this survey was 1120 feet above mean sea level (ft amsl) and elevation changes above this were corrected to ***E$_n$*** :

$$g_s = \left(E_m - E_n\right) * 0.0941 mgals / ft + g_m$$

Where, the free-air corrected value ($\boldsymbol{g_s}$) is the sum of the elevation difference between the actual elevation ($\boldsymbol{E_m}$) and the normal elevation times the free-air correction, and the measured gravity ($\boldsymbol{G_m}$) in mgals.

2.2.2.3 Bouguer

Bouguer corrections were applied to the dataset. Bouguer corrections account for the rock mass between the measuring station and sea level. Bouguer (*b*) corrections are based upon:

$$b = 2\pi\rho g_s h$$

Where, Bouguer gravity is related to density (**r** = 2.54 Mg/m^3) and known thickness (***h***) above sea level.

2.2.2.4 Tidal

The LaCoste & Romberg G-600 applied an automatic gravitational tidal correction to all data based upon the diurnal variation in the Earth's position to the moon and Sun.

2.2.2.5 Terrain

Terrain corrections were applied to the background elevation of 1120 ft amsl.

2.2.3 Methods

The microgravity survey was performed using the LaCoste & Romberg G-600. Three hundred and nine records were collected and continuous loops to a base station were performed to insure consistent data.

2.3 MODELING PROGRAM

The SURFER (Golden Software, Golden, CO) three-dimensional modeling program was used to smooth and contour the EI and the microgravity data. The kriging method, a statistical technique for spatial interpolation of data, was used to perform the map gridding. Cokriging, a variant of kriging where the value of the derived variable is estimated by weighted linear combination of neighboring samples (Parks and Bentley, 1996), was determined to be unnecessary due to the limited size of the study.

The profiles were derived from a forward modeling program (IX2D-GM, Interpex, 2012) and consists of the corrected gravity data on an upper graph and the inverted depth profile on the lower graph (Figures 7 and 8). The IX2D program creates a 2-D gravity forward modeled and inversion profile that is based on polygonal models which can be truncated asymmetrically along strike.

2.4 QUALITY ASSURANCE AND QUALITY CONTROL

The interpretation of geophysically-generated data is not an exact science since responses to induced disturbance is affected by many phenomena including buried metals, operator error, precipitation, and net changes in ground saturation conditions. Some sources of spurious data can be overcome through a QA/QC program and use of multiple geophysical methods. The quality control program employed with this study included frequent checks of the equipment and resurveys of lines and locations. The QA/QC program indicates that all geophysical equipment functioned as designed during the survey program.

3.0 GEOPHYSICAL ANALYSES

3.1 INTRODUCTION

Memorial Field is developed into the Karst-forming dolomitic Axeman Formation, a part of the Ordovician-aged carbonate Beekmantown Group. The Beekmantown is reportedly several thousand feet thick in this area (Thompson, 1999). Many Karst features within the State College environs have been identified and mapped (e.g., Hutchinson and Vidarsson, 2006). Many anomalies show only limited surface expression, and the surface expression usually occurs after surface disturbance or from construction; consequently if left undisturbed these features do not seem to readily enlarge or collapse.

EI profiles represent a geoelectrical response to subsurface conditions. The processed readings converted to a color represent solid rock, saturated fractured rock, and saturated voids. Rock is considered to have a reading of greater than 300 Ohm-m (red), saturated voids are represented by a low resistivity reading (less than 35 Ohm-m; blue) and saturated rock is represented by green colors (35 to 300 Ohm-m). Subsurface voids are interpreted as clay-filled and/or fully saturated, thus have a very low apparent resistivity; whereas surrounding limestone has a very high apparent resistivity. Further, it is difficult to electrically separate water-filled voids from clay-filled voids.

Due to the geometry of data collection, no information is available in the upper 3 feet below grade. Instead, this report presents the depth of the base of the shallow anomaly below the bleachers and provides information on the extent of Karst development in and near Memorial Field (Figures 2 and 3).

The differential gravity map provides a sub-regional view of the extent of Karst development within the football field (Figure 3). The differential gravity map shows that Memorial Field is a well-developed clay-plugged sinkhole (Figures 5 and 6).

Memorial Field has served many purposes since State College was incorporated in 1896. The following brief history was collected from a plaque on the western side of the field and from R. A. Smith (2011). Through much of the 19th and beginning of the 20th centuries the depression was used for waste disposal. In the early 1900s the site was cleaned up and; subsequently, used for athletic events. Later through the Works Project Administration in the late 1930s, the site was converted into the present field as a WPA works project.

Limestone mining reportedly occurred within the sinkhole; most of the stone quarrying appears to have occurred for the development of the field and the southern bleachers and not as a separate commercial endeavor.

At some point following the development of the field, a throat to the sinkhole was developed for street drainage and a series of pipes were connected from adjoining streets to the throat of the sinkhole. The throat, located beneath the bleachers on the north side of the field has shown steady subsidence in the decades since street runoff was routed to the sink hole. A major issue with exploiting the throat for disposal of runoff is that the throat will widen and the void beneath will grow due to erosion, dissolution, and subsidence.

3.2 EI INVESTIGATION

In 2003, THG imaged the field with 10 400-ft long profiles and found that the top of the limestone beneath the field is funnel-shaped beneath the field and the interior of the “funnel” is clay-filled (Figure 4). The interpretation did not show the potential for collapse or subsidence.

Structurally, though, clay tends to migrate towards the center or deepest part of the “funnel” over time; however, this phenomenon is not quantifiable within this work scope. Some basinward migration was noticed on the south side in the area of the closed bleachers suggesting that basinward migration is occurring.

The recent work completed in August 2012 included 10 profiles that targeted the throat of the sink hole located beneath the stadium bleachers (Figure 2). The throat has shown historical subsidence and recent subsidence triggered this investigation.

The void below the surface opening (throat) is rimmed with an inferred 5-foot thick cap or roof of dolomite/limestone (Figure 8). The void is estimated to be 40 ft by 50 ft in size aerially (Figures 5, 6, and 7). The base of the void beneath the throat is 20 ft below surface at its deepest part and is almost invariably clay-filled.

Structurally, the top of the void has supported the stands for many years; however, the long-term use of the void as a repository for storm water has probably opened the cavern up and possibly thinned the roof of the feature.

3.3 GRAVITY INVESTIGATION

The gravity investigation was pivotal in determining areas of hazard potential within Memorial Field. Microgravity mapping provides a “view” of the surface of the limestone based upon the assumption that thinner limestone with thicker clay has a lower gravitational “pull” than thicker suites of limestone with less clay (Figures 3, 5, 6, 7 and 8). Clay has a lower specific gravity than dolomite/limestone; consequently, a funnel-shape surface of the dolomite/limestone sink hole can be graphically displayed (Figures 3, 5, 7 and 8).

Profiles of the gravity data using a forward modeling program show a well-developed clay-filled sink hole beneath the bleachers (Figure 8). The south-north profile shows that the deepest portion of the sink hole beneath the bleachers is 20 feet deep and 10 feet wide (Figure 8). The forward model is based upon limited data so the model did not quite meet the same size dimensions as the EI profiles. The east-west model, however, shows that the void is nearly 30 feet wide and 20 feet deep consistent with the EI profiles (Figure 7).

The microgravity data also shows the regional fracture that accounts for the Karst features in this area (Figure 5). The deep-rooted fracture that is inferred to run nearly north-south is documented through 4 features:

(1) the surface subsidence noted near the copse of trees by the western access driveway;
(2) throat of the void;
(3) the deepest portion of the "funnel;" and,
(4) the subsidence noted along S. Fraser Street (Figures 3 and 5).

This fracture system probably opens to a larger series of voids at depths of greater than 60 feet (Figure 4).

3.4 SUMMARY

A sub-regional north-south oriented fracture system is inferred to cut through the center of Memorial Stadium. A sinkhole developed along the fracture trace that is centrally located within the stadium. The sinkhole is filled to grade with clay from the years of drainage, dissolution, weathering and subsidence.

A surface hole or throat to a void located beneath the northern bleachers to Memorial Stadium is situated along the alignment of the sub-regional fracture system. The throat is in communication with the subregional system, probably through a system of well-developed caverns and interconnected fracture-widened voids. The shallow void beneath the bleachers is approximately 40 feet by 50 feet located approximately 5 feet below the current grade and is probably a clay-filled void no deeper than 20 feet below grade at its deepest point.

The throat is currently a discharge point for the storm sewer for approximately 50 acres of area surrounding the stadium. Continued use of the throat for storm water disposal has likely weakened the rock supporting the roof of the void causing subsidence in the area around the inlet to the throat. This subsidence will likely continue as the void grows from erosion and dissolution caused by the continued use as a storm water catch basin.

4.0 CONCLUSION

Approximately 5,300 feet (1 mile) of EI profiles and over 300 microgravity records were collected within and near the Memorial Stadium, State College Pennsylvania.

The findings and conclusions in this report are stated with a reasonable degree of scientific certainty. THG's findings and conclusions are as follows:

- A geophysical survey, consisting of EI and microgravity measurements, of the subsurface at Memorial Stadium; State College, Pennsylvania was completed April 2-3, 2003 and August 20 – 31, 2012;
- The site is an Astroturf-covered football field and contiguous bleachers; with bituminous asphalt, and concrete surface cover;
- The geophysical survey helped map a sub-regional fracture system that has well-developed Karst features;
- Dissolution, erosion and subsidence of the dolomite/limestone in the area of the sub-regional fracture created the sinkhole into which Memorial Stadium was built
- An inlet or throat to a subsurface void beneath the northern bleachers is used for storm water discharge for approximately 50 acres of the surrounding area;
- The void beneath the inlet (throat) is approximately 40 feet long, 50 feet wide, and 20 feet deep and is probably mostly clay-filled:
- The void is hydraulically connected to a north-south sub-regional fracture;
- Surface expression for the dissolution and erosion of the sub-regional fracture was evident in minor subsidence near the driveway entrance to the field on the west side and collapse of the sidewalk and stadium along S. Fraser Street; and,
- Continued use of the inlet for storm water discharge will continue to erode, dissolve and create more subsidence.

RECOMMENDATION

The void beneath the bleachers should be abandoned as a discharge point for storm water runoff. Instead a pump station should be installed in the void. Water entering the pump station can then be piped out of the area.

5.0 REFERENCES

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Memorial Field - A History

(From the booklet, "The Public Schools of the State College Area: A History, The First Forty-Four Years: 1896-1940" by Jo Hays and Margaret Riley)

The sink hole south of the Fraser Street building between Foster and Nittany Avenues, offered to the Board by owner John Noll at a fee of $3,000 and $15 for costs, was accepted at the October 26, 1914 meeting for $3,042. The next month the Board began protesting its continued use as a dump, without success for some time. Requests to close Foster Ave. between Fraser Street and the alley behind the school building weren't honored until the early 1930s.

A detailed plan to adapt the sink hole as a "Hollow" for school activity - suggested by Arthur W. Cowell of Penn State's landscape architecture department - received a favorable hearing the next spring. In May 1916 the Board, cooperating with the PTA playground committee, approved construction of two tennis courts on the Nittany Avenue side of the new high school, naming James S. Dale to supervise this work along with leveling ground in the Hollow for baseball.

Bids were requested in June 1916 to complete the "Ball grounds as laid out, including walling and concreting." At an approximate cost of $1,000, this was the first effort to make the Hollow "one of the State's most modern playgrounds," as Mr. Briner described it in his 1915/16 annual report. Despite intermittent agitation, the unavailability of funds kept improvement minor for some time.

The State College Rotary Club paid for an outdoor running track in the Hollow, approved by the board in April 1926.

In March 1930, The Board adopted a detailed plan for building and renovation including this plan - Develop the Hollow for a full-size football field, track, and a playground for elementary school pupils. Embellish this central school area with trees, shrubs, and stone masonry. The plan also called for building the Nittany Street Grammar School in 1940. (The district at this time included only the buildings surrounding the Hollow: Fairmount (high school) and Fraser Street Elementary School as well as the small College Heights School)

Proceeding with the plan, in the summer of 1930 E.D. '"Jack" Frost of the Lowe Construction Company did the wall, steps, and landscaping at the south end of the Hollow on a cost plus 10% basis, and John Bracken, Professor of Landscape Architecture, submitted proposals for grading, walls, and landscaping at the Nittany Avenue Grammar school building abutting the field. A plaque on the Fields's wall now commemorates Professor Bracken's extensive contributions throughout this period.

As a means of getting the Hollow's development on the drawing board, Principal Hays suggested (December 1933) applying for federal Civil Works Administration aid. In September, the High School Activities Association gave the Board a $200 check to help pay the bill of H.O. Smith for hauling and erecting wooden bleachers (for the west side) which he had salvaged from New Beaver Field where Penn State had installed new west stands as part of its never-ending expansion. Thus the Hollow acquired its first permanent seating.

A complete survey was underway when newly elected Board president Thomas Haugh called a special meeting (January 1935) to consider plans. College student draftsmen supervised by Prof. Bracken readied proposals for partial development of the Hollow with federal funding. This was to be the first of several projects, vital to the school district, made possible through federal funding opportunities emanating from the Great Depression as unemployment relief measures.

In May 1935 the board accepted a completed plan from Carl W. Wild, landscape architecture instructor and consultant, which was approved and signed at the July meeting as s WPA (Works Projects Administration) project. The board had to guarantee to pay up to $5,000, while federal funds were to provide $38,120 of the total $42,778.63 cost.

Begun that fall with Calvin Graham of State College as general foreman, the program impressed a WPA inspector favorably enough for him to recommend application for a second project. Professors Bracken and Wild set to work on a tentative plans extending the stone walling-in to provide backing for concrete steps for stands along Fraser Street and also for space on the eastern side beside the Grammar School to increase playground and athletic facilities, including track pits.

The new project started a year later (fall 1936) and the following spring installation of grandstands and floodlights was being considered. Mrs. Gauger voted No on the latter at the May 1937 meeting, but on June 1 the board accepted a bid of Pittsburgh-Des Moines Steel Company to erect steel-plated deck and risers grandstands for $11,330, subject to approval by PA's Department of Labor and Industry. Advised by engineering professor S.D. Markle, the board next approved (June 15) the $3,650 bid of William Marshall of State College to install Westinghouse floodlights. Bill Marshall maintained the system as a community service until his death.

In 1946, "the Hollow" where high school football was played, was dedicated as Memorial Field to honor high school graduates who had given their lives in World Wars I and II. The field was rededicated in 1993 to honor all those fallen wars since the initial dedication. In 2004 another rededication was held after extensive renovations to the field, including storm water management, new scoreboard, and artificial turf, were completed.

In 1962 a long-standing tradition changed when commencement exercises shifted from Memorial Field, where many ceremonies had featured a student pageant on a theme such as Citizens of the World, to Penn State's Rec Hall. Except for 1964, commencement would continue at Rec Hall until 1996, when ceremonies moved to the university's new Bryce Jordan Center.

A photo taken during the construction in 1935 shows WPA laborers who worked for 15 cents an hour in mid-Depression---and were happy to be working at all. Mrs. Charles J. Graham, who gave this photograph to The Tavern, identified her husband, a foreman, as the man with his foot on the wheelbarrow. Trucks from Swartz Haulting and O.W. Houts distributed the last of the topsoil to complete the athletic field in The Hollow. Stone walls around the stadium represent less than 20 per cent of the rock removed from the town sinkhole to finish the project.