RESOLUTION NO. 11-2016

A RESOLUTION AUTHORIZING AND DIRECTING THE CHAIRPERSON AND THE TREASURER OF THE BOARD OF TRUSTEES TO ENTER INTO A PROFESSIONAL ENGINEERING SERVICES AGREEMENT WITH GPD GROUP

WHEREAS, the Board of Trustees has identified a need for professional engineering services in connection with the assessment of the condition of the structural concrete dams contained within the RJRD Property; and

WHEREAS, the Board selected GPD Group from among the engineering firms with current qualifications on file with the RJRD; and

WHEREAS, the RJRD and GPD Group have discussed the terms and conditions of an agreement for provision of such services.

NOW THEREFORE, BE IT RESOLVED by the Board of Trustees of the Richfield Joint Recreation District, County of Summit, State of Ohio:

SECTION 1. That the Chairperson and Treasurer be, and they hereby are, authorized and directed to enter into a Professional Engineering Services Agreement with GPD Group for an amount not to exceed Forty-Nine Thousand Eight Hundred Dollars ($49,800.00), substantially in accordance with the agreement attached hereto as Exhibit A and subject to final approval of the Board's legal counsel.

SECTION 2. That this Board finds and determines that all formal actions of this Board concerning and relating to this Resolution were taken in an open meeting of this Board, and that all deliberations of this Board and of any of its committees that resulted in those formal actions were in meetings open to the public in compliance with the law.

SECTION 3. That this Resolution shall be in full force and effect from and immediately upon its adoption.

05/09/2016
Date Passed

Chairperson, Richfield Joint Recreation District Board of Trustees

ATTEST:

Administrator, Richfield Joint Recreation District

Secretary, Richfield Joint Recreation District Board of Trustees

TO: **Administrator, Members of the Board**

FROM: **Capital /Special Projects Committee**
Chairperson, Dominic Cugini
Capital Projects Manager Keith Shy

RE: **April 22, 2016 GPD Group Dam Structural Assessment & Modification of Scope**

Date: **Monday, May 9, 2016**

ACTION BEING REQUESTED	TYPE OF REQUEST
Adoptive Resolution	**To Enter Into an Agreement with GPD to Perform Dam Structural Condition Assessment**

Background Information:

See Briefing Memo dated March 28, 2016
See Briefing Memo dated April 15, 2016
See Record of Proceedings dated march 21, 2016 and March 28, 2016

For the Board of Trustees' Consideration:

The Capital/Special Projects Committee is recommending that the Board consider the attached proposal from GPD Group. The Committee has reviewed the proposal and is in consensus to enter into an agreement with GPD Group to assess the conditions of the two (2) dams on the property.

GPD Group was selected by the Board from among the engineering firms with current qualifications on file in the Administration Office.

BOARD ACTION BEING REQUESTED

Work Session & Special Meeting, May 9, 2016:

Motion to adopt Resolution 11-2016 authorizing and directing the Chairperson and the Treasurer of the Board of Trustees to enter into a professional engineering services agreement with GPD Group in the amount of $49,800.00 and in accordance with the agreement attached as Exhibit A.

GPD GROUP®
Glaus, Pyle, Schomer, Burns & DeHaven, Inc.

Akron Office
520 South Main Street
Suite 2531
Akron, OH 44311

tel 330.572.2100
fax 330.572.2101
www.gpdgroup.com

April 22, 2016

Ms. Debbie Bluso-Rogers
Administrator
Richfield Joint Recreation District
4410 West Streetsboro Road
Richfield, Ohio 44286

Proposal for Professional Engineering Services
Dam Structural Concrete Conditions Assessment
Richfield Joint Recreation District (RJRD)
4374 Broadview Road
Richfield, Ohio 44286

Dear Ms. Bluso-Rogers:

Thank you for the opportunity to submit our proposal for professional engineering services for the above named project. Based on our meeting with the RJRD Trustees, the Request for Proposal including Board Briefing Memo dated April 15, 2016, review of the provided project records, and various site visits, we offer the following proposal for your consideration.

Project Description
The RJRD recently acquired the 336-acre property previously utilized as the Lake Erie Girl Scout Camp, and is currently developing a master plan to upgrade the natural setting for operation of a park and recreation asset within the community. The property contains two lakes in series, each created by run-of-the-river dam structures. The dammed up streams drain a 1.78 square mile watershed and are tributary to the East Branch of the Rocky River.

The upper dam, installed in 1926 and known as Camp Hilaka Lake Dam, is 30.5' high and 520' long. The dam is ODNR jurisdictional as a Class II Dam based on downstream hazard conditions. The latest ODNR Dam Safety Inspection Report (File Number: 1115-002, Inspection dated April 23, 2014) indicates that no investigation or engineering action required as a result of the inspection; only monitoring of deteriorating concrete on the spillway and monitoring of observed seepage is required. Based on our site observation, the concrete principal spillway has significant spalling and possible displacement of the structure base, which in our opinion, warrants the need for a current conditions assessment. Note that our visit was made nearly two years after the ODNR inspection.

The lower dam, installed in 1920 and known as Camp Julia Crowell Lake Dam, is 25.1' high and 140' long. The dam is also ODNR jurisdictional as a Class II Dam based on downstream hazard conditions. The latest ODNR Dam Safety Inspection Report (File Number: 1115-003, Inspection dated April 23, 2014) indicates that investigation and engineering action is required. In order to address the ODNR requirements, a multiple-phased program should be considered, which would include field survey, conditions assessment, geotechnical investigation, stability analysis, hydraulic modeling, and an alternatives analysis study.

However, prior to progressing into an all-inclusive study, we recommend that the RJRD first consider a physical assessment of the concrete dam structures. Based on our initial site observation, we believe that both the upper and lower dams should be assessed. In order to consider alteration improvements of the existing dam(s) and/or emergency spillway in response to the 2014 ODNR inspection, the condition of the 90+ year old concrete structures must first

be determined. The physical integrity of the concrete dams must be studied to ascertain if rehabilitation and modification can be considered to meet ODNR requirements, or if full structure replacement is necessary. The results of the Structural Concrete Conditions Assessment will assist the RJRD Board of Trustees in the decision how to proceed with the appropriate management of the lakes and dam structures. Identification of need for dam rehabilitation versus replacement will determine the necessary action and additional scope of services required.

The RJRD has requested GPD to provide a proposal for the following summarized items based on the recommended Structural Concrete Conditions Assessment task:

1. Review existing dam plan records
2. Generate CAD base mapping (per current state/county mapping and provided dam records); field topographic survey is not recommended at this stage of the project
3. Conduct a field inspection and concrete structure assessment of the visible surfaces (surface inspection, including soundings testing to be performed by professional structural engineer)
4. Conduct a minor sediment dredging (expose approximately 3' to 5' of the dam face at upper lake) utilizing subcontractor excavator equipment and labor
5. Obtain concrete core samples, including petrographic analysis and report of the concrete conditions; soils subsurface investigation is not recommended at this stage of the project
6. Prepare a Structural Condition Assessment report with summary of results and recommendation for rehabilitation or replacement, including order of magnitude opinion of probable costs for repair or replacement; hydraulic modeling, dam alternatives analysis, and/or pricing of options to meet ODNR criteria is not recommended at this stage of the project
7. Client meeting and review of report; provide support for next steps

Scope of Services

The principal spillway structure at the upper dam is showing visible areas of deterioration. Therefore, we would like to perform an inspection on the front and back face of the structure. Due to the accumulation of sediment at the dam face, we will retain a contractor to mechanically clear the sediment and provide/operate a man-lift to allow access for our structural inspection. We require that the RJRD operate the lake drain to release 3' to 5' of the dam pool prior to this operation. We do not intend to expose or inspect the front face (water side) of structure at lower dam.

A soundings test of the visible surfaces of both concrete spillway structures will be conducted using hammer and chaining techniques.

We will also retain a specialist to retrieve three (3) four-inch diameter core samples at each concrete spillway structure, followed by a petrographic analysis of the concrete samples. Refer to the attached article describing the various concrete/steel characteristics evaluated during the petrographic analysis. The petrographic analysis results will provide pertinent information relative to the integrity and remaining life-span of the concrete and steel within the spillway structure. This information will support our professional opinion and recommendation for rehabilitation or replacement.

Upon the authorization of the RJRD, GPD shall notify the Ohio Department of Natural Resources Dam Safety Division prior to the start of the Structural Conditions Assessment. The intent will be to provide cursory notice that a concrete structure inspection and assessment shall be initiated in response to the latest ODNR inspection report.

The assessment of the dam structures will initiate a process strategized to provide informative results to assist the RJRD to make decisions and determine the scope of services needed to complete the following future tasks (not included in this proposal):

- Crowell Lake Dam H&H/PMF Study
- Crowell Lake Dam Structural Alternatives Study
- Hilaka Lake Dam Rehabilitation or Replacement
- Emergency Action Plan (EAP) for both dams
- Operations, Maintenance, and Inspection (OMI) manual for both dams

If the concrete condition of either dam is not suited to support a rehabilitation or dam modification project, then redirection for alternatives to replace or remove the structure may be considered. A decision to remove one or both of the dams would omit the need to perform a PMF study and the alternatives analysis study. Given this circumstance, various alternatives for protection of the historic mill house structure, as well as restoration of the lake bed would need to be considered per a separate defined scope.

Exclusions

The following services are not included in this proposal; however, if necessary, can be added to our scope per separate fee:

- Operation of Lake Drains (to be provided by RJRD)
- Topographic Survey
- Bathymetric Survey
- Ecological Assessments (i.e., lake fringe & tributary streams)
- Geotechnical Subsurface Investigation
- Dam Structure and Earthen Embankment Slope Stability Analysis
- Dam Seepage Analysis
- Hydrologic & Hydraulic Analysis (including PMF Study)
- Dam Structure Alternatives Analysis
- Detailed Engineering & Construction Documents
- ODNR Construction Document Approval
- FEMA coordination, submittals or map revision
- Emergency Action Plan (EAP)
- Operations, Maintenance, and Inspection (OMI) manual

Base Scope Fees and Expenses
The proposed lump sum fee includes an estimate for reimbursable expenses, such as but not limited to, travel, mileage and reproduction costs, etc. All reimbursable expenses are billed as a direct pass through with no mark up.

Dam Structural Concrete Conditions Assessment
Scope Fees and Expenses

Task #	Description	LS Fee
140	Meetings & Coordination	$1,400
141	Project Mapping	$2,900
142	Structure Conditions Assessment*	$45,500
	Proposed Total	**$49,800**

*Indicates inclusion of labor, material and equipment allowances for partial sediment clearing/pumping ($10,000), concrete core samples ($4,000), and petrographic test/report ($6,500).

Schedule
The projected schedule is estimated at 3-6 weeks starting from the notice to proceed and assuming suitable weather condition for field work. GPD shall require the RJRD to coordinate the timing for opening the lake drain, so that efficient scheduling of our contractor can be achieved.

Authorization
We are prepared to begin work immediately upon receipt of your notice to proceed and execution of a mutual contract agreement.

Feel free to contact us with any questions or requests for additional information; or visit us on our website at www.gpdgroup.com for additional background on our firm. Thank you for the opportunity to submit our proposal.

Respectfully submitted,
GPD Group

Matthew A. Lascola, P.E., LEED-AP
Project Manager

What Can Petrography Tell You About the Condition of Concrete Structures?

December 9, 2014, By April Snyder

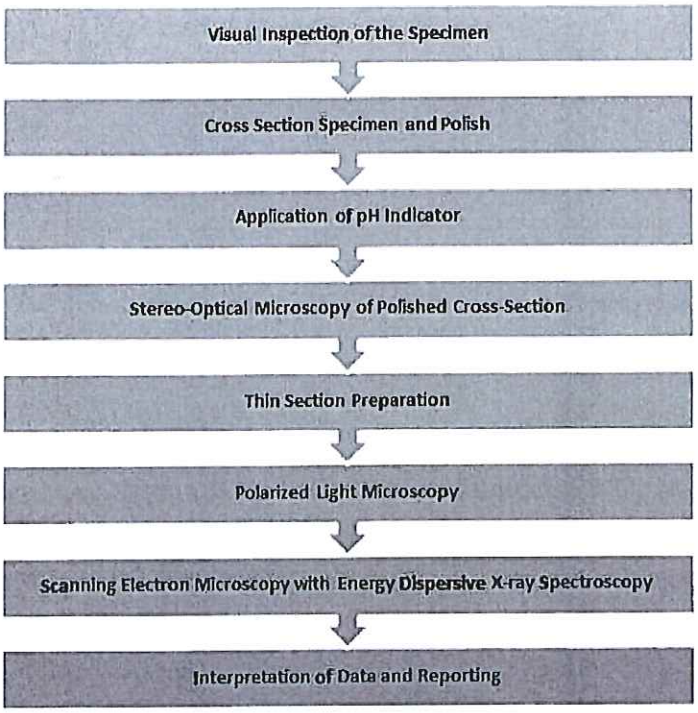
According to a 2013 Report Card for America's Infrastructure, 1 in 9 bridges in metropolitan areas are structurally deficient. The estimated investment needed to eliminate the backlog of deficient bridges by 2028 is $20.5 billion annually—that's $8 billion more per year than currently invested. Recently, CBS addressed the topic of crumbling roads and bridges in its 60 Minutes special, "Falling Apart: America's Neglected Infrastructure." The report explained that the United States, which once had the best infrastructure in the world, has fallen to 16th place.

Due to the astounding costs of infrastructure replacement, it is critical to conduct a thorough material assessment to understand when repairs can save or extend the service life of the structure. A petrographic analysis provides pertinent information about the structure's concrete and steel materials to help engineers determine the best-suited repair strategy.

Petrography is a branch of geology that is applied to concrete and concrete raw materials. This technique examines and evaluates the optical properties and microstructural characteristics of the materials. Petrographic examinations for concrete begin by accepting an aggregate for use in concrete (ASTM C295). Once the concrete is hardened, a petrographic examination that follows American Society for Testing and Materials (ASTM) C856 and ASTM C457 can be applied to verify that the product was mixed as designed and that the appropriate or specified materials were used.

Concrete petrography also helps to identify the nature of deterioration or defects, to determine the degree of damage, and to evaluate whether the damage will continue. Perhaps most critically, petrographic analyses aid repair versus replace decisions, making them an integral part of evaluation strategies.

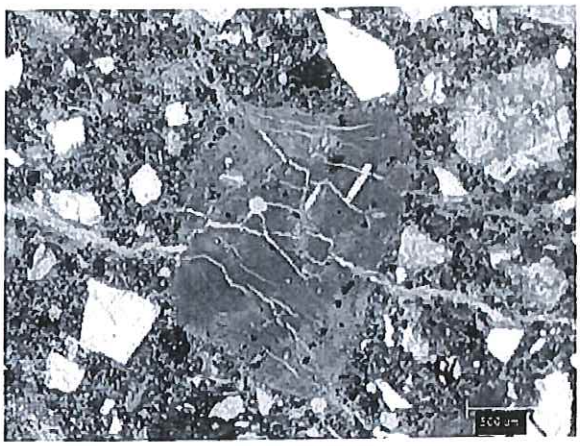
What Happens During Petrographic Analyses?



Some of the information provided during a petrographic analysis includes:

- Air content and distribution – Concrete is often entrained with small air bubbles to provide resistance to damage due to freeze thaw cycles. Petrography techniques are used to evaluate air void amount and distribution, to determine whether they are present in sufficient amounts, and to determine whether their spacing provides freeze thaw durability in their environment. Entrapped air and the locations where bleed water has left air voids are also examined and evaluated. The location, distribution, and size of air voids can uncover placement and finishing issues.

- Aggregate information (type, max size, grading) – Aggregate generally makes up 70% of concrete composite. Aggregate is evaluated with ASTM C295 before use in concrete to determine its suitability. ASTM methods provide technical standards for material evaluation and testing. A petrographic exam of the aggregate in hardened concrete will identify the aggregate type, size, shape, and amount to determine if it is within the design specifications. The bond to the cement paste is also evaluated which often correlates with strength. Chemical reaction can occur between the aggregate and cement paste or aggregate and the environment. One of the most common examples is alkali aggregate reactions (ASR/ACR) which can cause cracking within concrete and eventually lead to material failure. During a petrographic examination the potential, occurrence, and degree of ASR/ACR is evaluated.

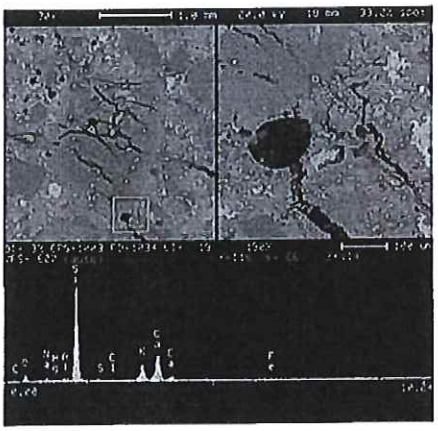


Plane Polarized Light micrograph of alkali silica reaction (ASR) induced cracking of andesite aggregate.

- Cracking – Concrete cracking is a common issue with building owners. Cracks can be harmless, but they can also lead to water ingress-inducing chemical attack, or affect the strength of the material. Cracks are measured and patterns and sources are identified through a visual and microscopic inspection. The characteristics of the cracks are then compared with typical causes such as drying shrinkage, thermal contraction, plastic shrinkage, settlement, applied loads, chemical reactions, etc. Identification of the cause and extent of cracking can assist with repair decisions.

- Steel reinforcement – Concrete often contains steel reinforcement rods. The integrity of the steel (is it corroding, properly placed, etc.) and its effect on the surrounding concrete is evaluated. Corrosion and corrosion-induced cracking, consolidation issues, and cracking typical of thermal contraction can also be identified.

- Secondary deposits – Chemical reactions of the concrete components, whether with each other or with their exposure environment, can occur and may be detrimental to the integrity of the structure. These reactions result in specific formation of minerals or deposits which sometimes lead to expansion and cracking within the concrete. Internal and external sulfate attack, alkali aggregate reactions, and chloride ingress can be identified and evaluated. Detailed evaluation of these reactions are best viewed using scanning electron microscopy with energy dispersive x-ray spectroscopy (SEM/EDS).



Backscattered electron images with energy dispersive x-ray spectroscopy (EDS) spectrum of ASR gel extruding from the andesite aggregate.

- Water/cement ratio and Porosity Distribution – Correlations between the density of the concrete cement paste and the water/cement ratio can be made using fluorescent microscopy and backscattered electron microscopy. These analyses help to determine whether the material is appropriately dense for its application and specifications, and whether it was well mixed. Evaluation of the porosity distribution can also uncover finishing issues at the surface.

- Binder Type and Paste content – The type of binder or cementitious material used in concrete is specifically designed for the specified performance and application it was placed. Concrete is typically composed of ordinary Portland cement, and/or supplementary cementitious materials (SCMs) such as fly ash, ground granulated blast furnace slag, or silica fume. Paste content is correlated to the cement content in the mix. The area volume of cement paste is estimated or calculated and compared to the typical range for good performing concretes, and/or to the design specifications. Identification and evaluation of the binder is critical to petrographic examination.

- Depth of carbonation – Carbonation occurs when calcium in the material reacts with carbon dioxide from the air. By examining how deep the carbonation has penetrated, impacts to steel passivity (protection from environmental conditions) or surface durability can be determined.

The information from a petrographic analysis is most commonly used to uncover performance issues or degradation mechanisms and the extent of damage, though it can also be used to verify mix design. While understanding the material at a microscopic level is necessary for a concrete investigation, having a comprehensive picture of the material's designed use and exposure conditions provides another layer of information necessary for making engineering decisions.

Building a Concrete Team

Petrographic analysis is only a small piece of the puzzle when evaluating a structure for durability and performance. While petrographers analyze characteristics of concrete at the micro level, engineers or inspectors provide the visual inspection data required to have a complete understanding of the structural issues. A construction inspector or engineer with knowledge of the site, history, and exposure conditions may also identify the need for supplementary tests to evaluate the concrete mechanical properties, steel, and chemical ingress. Interpretation of the observations gathered during a petrographic examination is greatly improved with knowledge of this supplementary information about the structure and reason for the petrography testing request. When the engineer or other professional inspecting a concrete structure works directly with the petrographer to provide supporting information the collaboration leads to better decisions for repair or replacement of the structure.

Case Study – Petrographic Examination Saves Department of Transportation $100 Million

As part of a team, RJ Lee Group was asked by a state DOT to perform a condition assessment on a 55-year old bridge. The DOT was concerned that the structure's deterioration was so advanced that they were going to have to replace a portion of the road on an overpass. They wanted to know if anything could be done to extend the road's service life another 25 years. Visual inspection suggested corrosion of the steel reinforcement that was beyond repair.

During the investigation, 38 cores were taken at different sampling sites. The lab testing program included compressive strength, petrographic, and chloride profiling. In this case, petrographic examination saved the bridge. The corrosion was NOT the cause of cracking. Cracks were confined to a 6-foot section near the joints where the air entrainment was not able to prevent freeze thaw damage. The freeze thaw damage in turn allowed moisture to penetrate the area, which triggered an alkali silica reaction (ASR). The ASR was confined to a small perimeter, and it was projected that the structure could be repaired for a minimum investment and the service life could be extended about 25 years through a combination of repairs and maintenance. The DOT estimated that it saved $100 million since it did not need to replace the bridge. To read more about this case study and others, click here.

Conclusion

The root cause of concrete deterioration can often be attributed to quality issues seen at the microscopic level of the material. In situations where critical structures could cost millions of dollars to replace, a trained petrographer may be able to determine whether a repair solution is feasible.

To learn more, read our article on the Top 10 Things to Tell Your Petrographer

- Related Information
  - Case Studies
  - Experts
  - Publications

Posted In: Construction Materials

Tagged: Alkali-silica Reaction (ASR), Concrete, construction materials, Failure Analysis, petrographic analysis, Petrography

About the Author

Ms. Snyder has 17 years' experience in concrete petrographic studies and serves as the Construction Materials Laboratory Manager at RJ Lee Group. She conducts evaluations of cementitious materials to identify failure and distress mechanisms using petrographic techniques in combination with... Read more

Comments are closed.

- Careers

CERTIFICATE OF AVAILABILITY OF FUNDS

It is hereby certified that the amount required to meet the obligations of this contract in the fiscal year in which the contract has been made has been lawfully appropriated for the purposes of the contract and is in the treasury or in the process of collection to the credit of an appropriate fund free from any previous encumbrances, obligations, or certificates now outstanding.

GPD Group: $49,800.00

Fund: Capital

Sandy Lenk

Fiscal Officer/Fiscal Agent

5-9-16

Date