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Project No. 19002

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Town of Erie
645 Holbrook St (PO Box 750)
Erie, CO 80516

Attention: Mr. Todd Fessenden
Public Works Director

Mr. Lucas Workman
Economic Development Specialist

Regarding: Proposal for Erie Parkway Coal Mine Subsidence Evaluation
NW Corner, Erie Parkway and I-25
Erie, Colorado

Mr. Fessenden and Mr. Workman,

Lithos Engineering (Lithos) is pleased to provide this proposal to the Town of Erie for the subject project.

PROJECT UNDERSTANDING

The Town of Erie (Erie) and their consultant, CGRS, has requested Lithos assist them in evaluating a parcel of land located northwest of the Erie Parkway and Interstate-25 intersection. The Town envisions this property to be the "Gateway" to the community and has expressed strong interest in ensuring development aligns with the Town's vision.

The project site (provided by CGRS to Lithos as a Google Earth file on December 18, 2018) is mapped as extensively undermined by the Eagle Mine at depths between approximately 250 and 400 feet. The site is bounded to the south, east, and north by Erie Parkway, I-25, and CR-10, respectively, and extends approximately 0.5 miles west of I-25. Two adjacent plots for consideration were provided to Lithos, including a northern plot consisting of 246 acres, and a southern plot consisting of 48 acres. As with most of the historic coal mines in the area, it is believed the mine boundaries are controlled by geologic faulting and coal quality. In our experience, the existing coal mine maps often do not account for all of the coal mining in the area. It is common for additional mine workings to be encountered in areas not mapped as undermined.

Based on conversations between Lithos, Erie, and CGRS at a meeting on December 20, 2018, Lithos proposes to: 1) Evaluate coal mine presence and depths, 2) Estimate accuracy of the existing coal mine extents and characteristics, 3) Evaluate subsidence hazards associated with the site, and 4) provide recommendations to reduce coal mine subsidence risk during site development and for the life of potential structures.

PROPOSED SCOPE OF SERVICES

Presently, there are several maps available which show the extent and depth of underground coal mining in the region; however, the accuracy of these maps is generally questionable and subject to geotechnical investigation. Thus, most coal mine subsidence evaluations are focused on first establishing the accuracy of the mine map and second assessing the geological conditions which may produce subsidence risk, including presence of groundwater, geologic units, history of subsidence, mining type, voids, and rubblization state of the mine.

To complete the evaluation as described above, Lithos proposes a phased approach. An initial phase would include a general investigation involving desktop research, a site visit, and geotechnical borehole drilling. If it becomes apparent during the drilling investigation that additional data will be required to evaluate the site, or should Erie wish to further explore risk posed to specific locations, we will recommend further phases which include additional investigation steps to characterize mine hazards and/or risks.

Based on our understanding of the project, Lithos proposes the following scope of services for an initial phase:

Task 1 – Literature Review and Site Reconnaissance

Lithos will procure all relevant and public literature and coal mine subsidence data available for the site vicinity. Most of these data are available through the Colorado Geological Survey and include:

- Geologic maps;
- Historic mine maps;
- Publicly-available aerial photography;
- Previous coal mine subsidence investigations/evaluations; and
- GIS data with compiled borehole and past subsidence data

Lithos will conduct a site visit to observe the surface conditions of the site, look for surficial expressions of coalmine subsidence, and plan access and boring locations for the geotechnical investigation (Task 2).

Additionally, we will incorporate data from our own experience assessing coal mine subsidence in the Eagle Mine. The literature and data, and quality thereof, may influence Task 2 and will be summarized in a concise memorandum for Erie's review and comments.

Task 2 – Geotechnical Investigation

To assess mine presence, depth and subsurface conditions relevant to subsidence, Lithos will:

- Engage a qualified, local drilling subcontractor to drill up to eight (8) borings at select locations to a maximum depth of 350 feet below existing grades or 20 feet below the depth of the mined coal seam or mine workings, whichever is shallower. Presently, Lithos assumes there is only one mined coal seam at the project location.
 - It is possible that drilling at some locations will not extend to the mined coal seam depth; in which case, the drilling confirms that shallower mining did not occur and does not pose a significant threat to overlying development.

- Distribute six boreholes across the site in equal intervals to assess general mine depth. Two boreholes will be reserved for the southern portion of the site nearest Erie Parkway since that will likely be the focus of further development.
- Engage a qualified subcontractor to perform downhill caliper logging and downhole gamma/resistivity testing at each borehole which encounters mine workings. Downhole testing will assist in evaluating the condition of mine workings and mine rubble.
- Attend a pre-construction meeting or conference call with Erie and CGRS to discuss site safety and procedures.
- Call in UNCC utility locations for each of the borings.
- Use standard air or mud rotary drilling techniques and targeted wireline coring as applicable. In general, most of the borings will be drilled with air or mud rotary.
- Provide full-time oversight of drilling operations.
- Log each bore hole in general accordance with the applicable ASTM standard for rock and/or soil.
- Perform downhole caliper and gamma logging of each borehole.
- Measure groundwater depth at completion of drilling.
- Backfill the borings using cuttings, bentonite chips, and/or sand.
- Dispose of excess drill cuttings and drilling fluids by spreading at a location on the site directed by the Town or backfilling the hole.

Task 3 – Recommendations Report

Lithos will first meet with the Town and CGRS to summarize our findings and recommendations. After the meeting, Lithos will provide a concise report presenting our findings and recommendations for site development as it relates to risk of coal mine subsidence potential. Specifically, the report will:

- Summarize the results of Tasks 1 and 2 in a report;
- Include a Site Vicinity and Boring Location Plan
- Include a map showing the probable extent of mining and mine depth contours;
- Include detailed boring logs and the results of field exploration and laboratory testing;
- Include recommendations to limit mine subsidence risk to development. Design of a structure-specific subsidence mitigation system or program is not included in the current scope of work;
- Include a coal mine subsidence overlay map for the site.
 - The displayed hazard zones will include recommendations for further investigation needs which a future developer should consider implementing prior to development within each zone.
- Submit a draft version of the report (in electronic format) for review and revise up to two times as necessary to address comments; and
- Submit an electronic copy of our final report.

Additional Services

Based on the results of the initial boreholes, Lithos may recommend further investigation steps to characterize the mine subsidence risk to site development. Upon approval by Erie, Lithos is prepared to implement the following services:

- **Additional Boreholes**

Based on existing mine maps, the initial boreholes are likely sufficient for establishing preliminary mine depths and extents. However, mine maps are frequently incorrect. If the mine maps are revealed to be incorrect during the investigation, Lithos will seek approval from all parties to drill additional borings to aid in verifying mine extents and complete the boreholes for downhole testing as appropriate. Additionally, Erie may request Lithos to drill boreholes at specific locations with planned improvements. These additional borings will serve to identify the presence of unmapped mine workings, or assess the condition of mapped mine workings, which may present a risk to overlying infrastructure.

- **Downhole Testing and Crosshole Geophysics**

Downhole testing may include acoustic televiewers and core sample collection. Acoustic televiewers are useful for verifying mine condition by showing fractures, rubble, and voids. Core samples can be tested in the laboratory to determine general material strengths, which can aid in modeling subsidence above the site. Crosshole geophysics is a technique used to identify the presence of mine voids, faulting, or other anomalous conditions at a consistent depth between two boreholes. Boreholes are inherently limited in that they portray a 3-inch window into the subsurface and can easily miss critical adjacent features. Crosshole geophysics would allow a “picture” between boreholes and identify features such as mine rubble zones, passages, rooms, and pillars which might be missed by the boreholes.

- **Ground Deformation Modeling**

Results from the lithologic models and laboratory results will be analyzed in a numerical model to determine anticipated deformation and percent strain at the ground surface.

Assumptions:

- Traffic control will not be required for this project.
- A “buggy” style drill rig will be required to access borehole locations. A 2WD truck-mounted drill rig is not sufficient.
- Contaminated soil and groundwater will not be encountered. Handling and disposing of contaminated materials is not included in this scope of work.
- Erie will coordinate right-of-entry, obtain all permits necessary for site access and drilling, and facilitate site access for Lithos and all subcontractors.

FEE ESTIMATE

Based on our proposed Scope of Services outlined above, we estimate a total fee for our services of \$115,300. Lithos proposes to provide these services on a lump sum basis and subject to the attached terms and conditions. Any additional services requested in writing by Erie will be invoiced on a time and expense basis utilizing the attached fee schedule.

The lump sum amounts to be billed per task are as follows:

Task 1 (Literature Review and Site Reconnaissance):	\$9,300.00
Task 2 (Geotechnical Investigation):	\$93,700.00
Task 3 (Recommendations Report):	\$12,300.00

SCHEDULE

The timing of the geotechnical investigation will depend heavily on driller availability. In our experience, it takes approximately 4-6 weeks to schedule a driller with availability. The total time commitment for this project is approximately 8-12 weeks, as follows:

- Task 1: Two weeks.
- Task 2: Eight weeks – up to six weeks for driller availability (one of which can be used for Task 1), one week (10-15 work days) for the investigation.
- Task 3: Two weeks. Lithos can provide preliminary recommendations prior to submittal of the full report and laboratory results.
- Should additional services be requested by CGRS, Lithos will provide an estimated schedule with those tasks.

CLOSING

We appreciate the opportunity to submit a proposal for this project and look forward to the opportunity to work with you and your team on this project. For this project, Ryan Marsters will be your key contact and Project Manager.

If you have any questions regarding the contents of this proposal, please contact the undersigned.

Sincerely,

Lithos Engineering



Ryan Marsters, PE, PG
Geological Engineer



Robin Dornfest, PG
President

If you understand and accept the terms of this proposal, please sign below:

Accepted by: _____

Printed Name: _____

Date: _____

Attachments: Fee Schedule
Standard Terms and Conditions (2020)

**FEE SCHEDULE
2020**

1. Services will be billed on the time worked by staff personnel as follows unless noted otherwise in the proposal or contract. Overtime hours will be charged a straight time rates.

Senior Consultant	\$200
President	\$195
Vice President	\$180
Senior Professional II	\$175
Senior Professional I	\$155
Professional II	\$140
Professional I	\$125
Staff Professional III	\$105
Staff Professional II	\$95
Staff Professional I	\$90
Administrative	\$65

2. Mileage for use of personal or company vehicles will be billed at the current IRS rate.
3. Billing rates are subject to change once per year per the agreed-on contract terms.



STANDARD TERMS AND CONDITIONS 2020

SECTION 1: Scope of Work

Lithos Engineering, LLC (hereafter referred to as Lithos) shall perform the services defined in the contract and shall invoice the client for those services at the fee schedule rates or percentage of the fixed contract amount based on work completed. Any cost estimates stated in this contract shall not be considered as a firm figure unless otherwise specifically stated in this contract. If unexpected site conditions are discovered, the scope of work may change. Lithos will provide additional services at the contract fee schedule rate.

SECTION 2: Access to Sites

Unless otherwise agreed, the client will furnish Lithos with right-of-access to the site in order to conduct the planned investigation. While Lithos will take reasonable precautions to minimize any damage to the property, it is understood by the client that in the normal course of work some damage may occur, the restoration of which is not part of this agreement.

In the performance of its work, Lithos will take reasonable precautions to avoid damage or injury to underground structures or utilities. The client agrees to hold Lithos harmless and indemnify Lithos for any claims, payments or other liability, including costs and attorney fees incurred by Lithos for any damages to underground structures which are not called to Lithos attention and correctly shown on the plans furnished to Lithos.

SECTION 3: Unanticipated Hazardous Materials

It shall be the duty of the client to advise Lithos of any known or suspected hazardous substances which are or may be related to the services provided. Such hazardous substances include but are not limited to products, materials, by-products, wastes or samples of the foregoing which Lithos may be provided or obtain performing its services or which exist or may exist on or near any premises upon which work is to be performed by Lithos employees, agents or subcontractors.

If during the course of providing services Lithos observes or suspects the existence of unanticipated hazardous materials, Lithos may at its option terminate further work on the project and notify client of the condition. Services will be resumed only after a renegotiation of scope of services and fees. In the event that such renegotiation cannot occur to the satisfaction of Lithos, Lithos may, at its option, terminate this contract.

It is understood and agreed that Lithos is not, and has no responsibility as, a handler, generator, operator, treater or storer, transporter or disposer of hazardous or toxic substances found or identified at a site, and that Client shall undertake or arrange for the handling, removal, treatment, storage, transportation and disposal of hazardous substances or constituents found or identified at a site.

SECTION 4: Invoices and Payment

Lithos will submit invoices to the client monthly and a final bill upon completion of services. Payment is due upon presentation of invoice and is past due thirty (30) days from the invoice date. Client agrees to pay a finance charge of two percent (2%) per month, but not exceeding the maximum rate allowed by law, on past due accounts.

SECTION 5: Ownership of Documents

All reports, boring logs, field data, field notes, laboratory test data, calculations, estimates, and other documents prepared by Lithos as instruments of service, shall remain the property of Lithos unless there are other contractual agreements. Any and all unauthorized reuse of Lithos' Instruments of Service will be at the Owner's sole risk and without liability to the Consultant.

SECTION 6: Standard of Care

Services performed by Lithos under this Agreement will be conducted in the manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty, express or implied, is made or intended by the proposal for consulting services or by furnishing oral or written reports of the findings made.

The client recognizes that subsurface conditions may vary from those encountered at the location where borings, surveys, or explorations are made by Lithos and that the data, interpretations, and recommendations of Lithos are based solely upon the data available to Lithos. Lithos will be responsible for those data, interpretations, and recommendations, but shall not be responsible for the interpretation by others of the information developed.

SECTION 7: Confidentiality

Lithos shall hold confidential all business or technical information obtained from the client or his affiliates or generated in the performance of services under this agreement and identified in writing by the client as "confidential". Lithos shall not disclose such information without the client's consent except to the extent required for 1) Performance of services under this agreement; 2) Compliance with professional standards of conduct for preservation of public safety, health, and welfare; 3) Compliance with any court order or other governmental directive and/or 4) Protection of Lithos against claims or liabilities arising from performance of services under this agreement. Lithos obligations hereunder shall not apply to information in the public domain or lawfully acquired on a non-confidential basis from others.

SECTION 8: Limitation of Liability

The client agrees to limit the liability of Lithos and Lithos' officers, directors, partners, employees, shareholders, owners, and subconsultants to the owner and all other parties arising from Lithos performance of services such that the total aggregate liability of Lithos shall not exceed \$50,000 or Lithos' total fee for the services rendered on this project, whichever is greater, and client agrees to indemnify and hold harmless Lithos and Lithos' officers, directors, partners, employees, shareholders, owners, and subconsultants from and against all liabilities in excess of this monetary limit. The owner further agrees to require of the contractor and his subcontractors an identical limitation of Lithos liability for damages offered by the contractor or the subcontractor arising from Lithos professional acts, errors, or omissions. Neither the contractor nor any of its subcontractors assumes any liability for damages to others which may arise on account of Lithos professional acts, errors or omissions.

The limitations on liability and indemnities in this agreement are business understandings between the parties voluntarily and knowingly entered into, and shall apply to all theories of recovery including, but not limited to, breach of contract, warranty, tort (including negligence), strict or statutory liability, or any other cause of action, except for willful misconduct or gross negligence.

SECTION 9: Insurance

9.1 Lithos represents that it and its staff are protected by worker's compensation insurance and that Lithos has such coverage under public liability and property damage insurance policies which Lithos deems to be adequate. It is the policy of Lithos to require certificates of insurance from all consultants or subcontractors employed by Lithos. Certificates for all such policies of insurance will be provided to client upon request in writing. Client agrees that the Company will not be liable or responsible for any loss or damage beyond the amounts, limits, exclusions, terms and conditions of such insurance.

- a. Professional Liability: Insurance claims made and in the aggregate: \$1,000,000
- b. Commercial General Liability: \$1,000,000 per occurrence and in aggregate \$2,000,000
- c. Workers Compensation and Employer's Liability Insurance: Employer's liability shall be an amount not less than \$1,000,000 for each accident for bodily injury and disease.
- d. Automobile Liability: Combined single limit each accident \$1,000,000.

9.2 Additional Coverage. Client may request that the Company obtain insurance coverage broader or higher than the Company's existing coverage through project-specific insurance, if available, provided that Client shall pay an additional fee based on the additional premium cost.

SECTION 10: Indemnity

Within the limits and conditions of such insurance set out in SECTION 9, Lithos agrees to indemnify and save client harmless from and against any loss, damage, injury, or liability arising out of the negligence of Lithos or its subcontractors. Lithos shall not be responsible for any loss, damage, or liability arising from any acts by the client, its agents, staff, or other consultants employed by others.

Lithos compensation hereunder is not commensurate with the potential risk of injury or loss that may be caused by exposures to pollution, hazardous waste, or toxic or other dangerous substances or conditions. Accordingly, except as expressly provided in this contract, the client waives any claim against Lithos and agrees to indemnify and save Lithos, its agents, and employees harmless from any claim, liability, or defense cost for injury or loss sustained by any party from such exposures arising out of the negligence of the client or related to Lithos' performance or services hereunder.

SECTION 11: Termination for Default

This Agreement may be terminated by either party upon seven (7) days written notice in the event of substantial failure by the other party to perform in accordance with the terms hereof. Such termination shall not be effective if that substantial failure has been remedied before expiration of the period specified in the written notice. In the event of termination, Lithos shall be paid for services performed to the termination notice date plus reasonable termination expenses. Expenses of termination or suspension shall include all direct costs of Lithos required to complete analyses and records necessary to complete its files and may also include a report of the services performed to the date of notice of termination or suspension.

SECTION 12: Termination for Convenience

The Client, for its convenience, may in its sole discretion terminate the Services in whole or in part at any time by written notice to Lithos which shall state the extent and effective date of such termination. On the effective date thereof, Lithos shall (a) stop all Services and place no further orders or subcontracts, (b) terminate work orders and subcontracts outstanding, (c) take any necessary action to protect property in its possession in which Consultant has or may acquire an interest, and (d) take any other action which Client may direct. Client shall reimburse Lithos for those costs necessarily incurred by Lithos because of the termination only to the extent Client reimburses such costs. In no case shall the total amount paid to Lithos exceed the authorized fees for Services.

SECTION 13: Third-Party Beneficiaries

Nothing contained in this Agreement shall create a contractual relationship with or a cause of action in favor of a third party against either the Client or Lithos. Lithos' services under this Agreement are being performed solely for the Client's benefit, and no other party or entity shall have any claim against Lithos because of this Agreement or the performance or nonperformance of services hereunder.

SECTION 14: Corporate Protection

It is intended by the parties to this Agreement that Lithos' services in connection with the Project shall not subject Lithos' individual employees, officers or directors to any personal legal exposure for the risks associated with this Project. Therefore, and notwithstanding anything to the contrary contained herein, the Client agrees that as the Client's sole and exclusive remedy, any claim, demand or suit shall be directed and/or asserted only against Lithos, a Colorado company, and not against any of Lithos' individual employees, officers or directors.

SECTION 15: Consequential Damages

Notwithstanding any other provision of this Agreement, and to the fullest extent permitted by law, neither the Client nor Lithos, their respective officers, directors, partners, employees, contractors or subconsultants shall be liable to the other or shall make any claim for any incidental, indirect or consequential damages arising out of or connected in any way to the Project or to this Agreement. This mutual waiver of consequential damages shall include, but is not limited to, loss of use, loss of profit, loss of business, loss of income, loss of reputation and any other

consequential damages that either party may have incurred from any cause of action including negligence, strict liability, breach of contract and breach of strict or implied warranty.

SECTION 16: Precedence

These Standards, Terms, and Conditions shall take precedence over any inconsistent or contradictory provisions contained in any proposal, contract, purchase order, requisition, notice to proceed, or like document regarding Lithos services. This agreement shall be governed by the laws of the State of Colorado.

SECTION 17: Dispute Resolution

All claims, disputes or controversies arising out of or related to the Services, the Contract Documents or these Terms and Conditions, or any breach thereof, shall first be submitted to mediation. If the Contract Documents require arbitration of claim, dispute or controversy by the American Arbitration Association (AAA), the mediation shall be conducted by the AAA pursuant to its applicable mediation or conciliation rules. If the Contract Documents do not require arbitration by the AAA, the parties shall agree upon a mediator and participate, in person, in a mediation session within 45 days after mediation has been requested.