

**PROFESSIONAL SERVICES AGREEMENT BETWEEN
FISHBECK, THOMPSON, CARR & HUBER, INC.
AND THE CITY OF ANN ARBOR
FOR A BIODIGESTER FEASABILITY STUDY**

The City of Ann Arbor, a Michigan municipal corporation, having its offices at 301 E. Huron St. Ann Arbor, Michigan 48103 ("City"), and FISHBECK, THOMPSON, CARR & HUBER, INC ("Contractor"), a(n) Michigan corporation with its address at 1515 Arboretum Drive SE, Grand Rapids, Michigan 49546, agree as follows on this ___ day of _____, 2016.

The Contractor agrees to provide services to the City under the following terms and conditions:

I. DEFINITIONS

Administering Service Area/Unit means PUBLIC SERVICES AREA/SYSTEMS PLANNING UNIT.

Contract Administrator means MATTHEW NAUD, acting personally or through any assistants authorized by the Administrator/Manager of the Administering Service Area/Unit.

Deliverables means all Plans, Specifications, Reports, Recommendations, and other materials developed for and delivered to City by Contractor under this Agreement

Project means BIODIGESTER FEASABILITY STUDY

II. DURATION

This Agreement shall become effective on _____, 2016, and shall remain in effect until satisfactory completion of the Services specified below unless terminated as provided for in Article XI.

III. SERVICES

- A. The Contractor agrees to provide PROFESSIONAL ENGINEERING AND CONSULTING SERVICES ("Services") in connection with the Project as described in Exhibit A. The City retains the right to make changes to the quantities of service within the general scope of the Agreement at any time by a written order. If the changes add to or deduct from the extent of the services, the contract sum shall be adjusted accordingly. All such changes shall be executed under the conditions of the original Agreement.
- B. Quality of Services under this Agreement shall be of the level of quality performed by persons regularly rendering this type of service. Determination of acceptable quality shall be made solely by the Contract Administrator.
- C. The Contractor shall perform its Services for the Project in compliance with all statutory, regulatory and contractual requirements now or hereafter in effect as may be applicable to the rights and obligations set forth in the Agreement.
- D. The Contractor may rely upon the accuracy of reports and surveys provided to it by the City (if any) except when defects should have been apparent to a

reasonably competent professional or when it has actual notice of any defects in the reports and surveys.

IV. INDEPENDENT CONTRACTOR

The Parties agree that at all times and for all purposes under the terms of this Agreement each Party's relationship to any other Party shall be that of an independent contractor. Each Party will be solely responsible for the acts of its own employees, agents, and servants. No liability, right, or benefit arising out of any employer/employee relationship, either express or implied, shall arise or accrue to any Party as a result of this Agreement.

V. COMPENSATION OF CONTRACTOR

- A. The Contractor shall be paid in the manner set forth in Exhibit B. Payment shall be made monthly, unless another payment term is specified in Exhibit B, following receipt of invoices submitted by the Contractor, and approved by the Contract Administrator.
- B. The Contractor will be compensated for Services performed in addition to the Services described in Section III, only when the scope of and compensation for those additional Services have received prior written approval of the Contract Administrator.
- C. The Contractor shall keep complete records of work performed (e.g. tasks performed/hours allocated) so that the City may verify invoices submitted by the Contractor. Such records shall be made available to the City upon request and submitted in summary form with each invoice.

VI. INSURANCE/INDEMNIFICATION

- A. The Contractor shall procure and maintain during the life of this contract such insurance policies, including those set forth in Exhibit C, as will protect itself and the City from all claims for bodily injuries, death or property damage which may arise under this contract; whether the act(s) or omission(s) giving rise to the claim were made by the Contractor, any subcontractor or anyone employed by them directly or indirectly. In the case of all contracts involving on-site work, the Contractor shall provide to the City, before the commencement of any work under this contract, documentation satisfactory to the City demonstrating it has obtained the policies and endorsements required by Exhibit C.
- D. Any insurance provider of Contractor shall be admitted and authorized to do business in the State of Michigan and shall carry and maintain a minimum rating assigned by A.M. Best & Company's Key Rating Guide of "A-" Overall and a minimum Financial Size Category of "V". Insurance policies and certificates issued by non-admitted insurance companies are not acceptable unless approved in writing by the City.
- C. To the fullest extent permitted by law, Contractor shall indemnify, defend and hold the City, its officers, employees and agents harmless from all suits, claims, judgments and expenses, including attorney's fees, resulting or alleged to result, from any acts or omissions by Contractor or its employees and agents occurring

in the performance of or breach in this Agreement, except to the extent that any suit, claim, judgment or expense are finally judicially determined to have resulted from the City's negligence or willful misconduct or its failure to comply with any of its material obligations set forth in this Agreement.

VII. COMPLIANCE REQUIREMENTS

- A. Nondiscrimination. The Contractor agrees to comply, and to require its subcontractor(s) to comply, with the nondiscrimination provisions of MCL 37.2209. The Contractor further agrees to comply with the provisions of Section 9:158 of Chapter 112 of the Ann Arbor City Code and to assure that applicants are employed and that employees are treated during employment in a manner which provides equal employment opportunity.
- B. Living Wage. If the Contractor is a "covered employer" as defined in Chapter 23 of the Ann Arbor City Code, the Contractor agrees to comply with the living wage provisions of Chapter 23 of the Ann Arbor City Code. The Contractor agrees to pay those employees providing Services to the City under this Agreement a "living wage," as defined in Section 1:815 of the Ann Arbor City Code, as adjusted in accordance with Section 1:815(3); to post a notice approved by the City of the applicability of Chapter 23 in every location in which regular or contract employees providing services under this Agreement are working; to maintain records of compliance; if requested by the City, to provide documentation to verify compliance; to take no action that would reduce the compensation, wages, fringe benefits, or leave available to any employee or person contracted for employment in order to pay the living wage required by Section 1:815; and otherwise to comply with the requirements of Chapter 23.

VIII. WARRANTIES BY THE CONTRACTOR

- A. The Contractor warrants that the quality of its Services under this Agreement shall conform to the level of quality performed by persons regularly rendering this type of service.
- B. The Contractor warrants that it has all the skills, experience, and professional licenses necessary to perform the Services specified in this Agreement.
- C. The Contractor warrants that it has available, or will engage, at its own expense, sufficient trained employees to provide the Services specified in this Agreement.
- D. The Contractor warrants that it is not, and shall not become overdue or in default to the City for any contract, debt, or any other obligation to the City including real and personal property taxes.
- E. The Contractor warrants that its proposal for services was made in good faith, it arrived at the costs of its proposal independently, without consultation, communication or agreement, for the purpose of restricting completion as to any matter relating to such fees with any competitor for these Services; and no attempt has been made or shall be made by the Contractor to induce any other perform or firm to submit or not to submit a proposal for the purpose of restricting competition.

IX. OBLIGATIONS OF THE CITY

- A. The City agrees to give the Contractor access to the Project area and other City-owned properties as required to perform the necessary Services under this Agreement.
- B. The City shall notify the Contractor of any defects in the Services of which the Contract Administrator has actual notice.

X. ASSIGNMENT

- A. The Contractor shall not subcontract or assign any portion of any right or obligation under this Agreement without prior written consent from the City. Notwithstanding any consent by the City to any assignment, Contractor shall at all times remain bound to all warranties, certifications, indemnifications, promises and performances, however described, as are required of it under the Agreement unless specifically released from the requirement, in writing, by the City.
- B. The Contractor shall retain the right to pledge payment(s) due and payable under this Agreement to third parties.

XI. TERMINATION OF AGREEMENT

- A. If either party is in breach of this Agreement for a period of fifteen (15) days following receipt of notice from the non-breaching party with respect to a breach, the non-breaching party may pursue any remedies available to it against the breaching party under applicable law, including but not limited to, the right to terminate this Agreement without further notice. The waiver of any breach by any party to this Agreement shall not waive any subsequent breach by any party.
- B. The City may terminate this Agreement, on at least thirty (30) days advance notice, for any reason, including convenience, without incurring any penalty, expense or liability to Contractor, except the obligation to pay for Services actually performed under the Agreement before the termination date.
- C. Contractor acknowledges that, if this Agreement extends for several fiscal years, continuation of this Agreement is subject to appropriation of funds for this Project. If funds to enable the City to effect continued payment under this Agreement are not appropriated or otherwise made available, the City shall have the right to terminate this Agreement without penalty at the end of the last period for which funds have been appropriated or otherwise made available by giving written notice of termination to Contractor. The Contract Administrator shall give Contractor written notice of such non-appropriation within thirty (30) days after it receives notice of such non-appropriation.
- D. The provisions of Articles VI and VIII shall survive the expiration or earlier termination of this Agreement for any reason. The expiration or termination of this Agreement, for any reason, shall not release either party from any obligation or liability to the other party, including any payment obligation that has already accrued and Contractor's obligation to deliver all Deliverables due as of the date of termination of the Agreement.

XII. REMEDIES

- A. This Agreement does not, and is not intended to, impair, divest, delegate or contravene any constitutional, statutory and/or other legal right, privilege, power, obligation, duty or immunity of the Parties.
- B. All rights and remedies provided in this Agreement are cumulative and not exclusive, and the exercise by either party of any right or remedy does not preclude the exercise of any other rights or remedies that may now or subsequently be available at law, in equity, by statute, in any agreement between the parties or otherwise.
- C. Absent a written waiver, no act, failure, or delay by a Party to pursue or enforce any rights or remedies under this Agreement shall constitute a waiver of those rights with regard to any existing or subsequent breach of this Agreement. No waiver of any term, condition, or provision of this Agreement, whether by conduct or otherwise, in one or more instances, shall be deemed or construed as a continuing waiver of any term, condition, or provision of this Agreement. No waiver by either Party shall subsequently effect its right to require strict performance of this Agreement.

XIII. NOTICE

All notices and submissions required under this Agreement shall be delivered to the respective party in the manner described herein to the address stated in this Agreement or such other address as either party may designate by prior written notice to the other. Notices given under this Agreement shall be in writing and shall be personally delivered, sent by next day express delivery service, certified mail, or first class U.S. mail postage prepaid, and addressed to the person listed below. Notice will be deemed given on the date when one of the following first occur: (1) the date of actual receipt; (2) the next business day when notice is sent next day express delivery service or personal delivery; or (3) three days after mailing first class or certified U.S. mail.

If Notice is sent to the CONTRACTOR, it shall be addressed and sent to:

John C. Rafter Jr., P.E., BCEE
Fishbeck, Thompson, Carr & Huber, Inc.
1515 Arboretum Drive SE
Grand Rapids, Michigan 49546

If Notice is sent to the CITY, it shall be addressed and sent to:

CRAIG HUPY
Public Services Area Administrator
City of Ann Arbor
301 E. Huron St.
Ann Arbor, Michigan 48104

XIV. CHOICE OF LAW AND FORUM

This Agreement will be governed and controlled in all respects by the laws of the State of Michigan, including interpretation, enforceability, validity and construction, excepting the principles of conflicts of law. The parties submit to the jurisdiction and venue of the Circuit Court for Washtenaw County, State of Michigan, or, if original jurisdiction can be established, the United States District Court for the Eastern District of Michigan, Southern Division, with respect to any action arising, directly or indirectly, out of this Agreement or the performance or breach of this Agreement. The parties stipulate that the venues referenced in this Agreement are convenient and waive any claim of non-convenience.

XV. OWNERSHIP OF DOCUMENTS

Upon completion or termination of this Agreement, all documents (i.e., Deliverables) prepared by or obtained by the Contractor as provided under the terms of this Agreement shall be delivered to and become the property of the City. Original basic survey notes, sketches, charts, drawings, partially completed drawings, computations, quantities and other data shall remain in the possession of the Contractor as instruments of service unless specifically incorporated in a deliverable, but shall be made available, upon request, to the City without restriction or limitation on their use. The City acknowledges that the documents are prepared only for the Project. Prior to completion of the contracted Services the City shall have a recognized proprietary interest in the work product of the Contractor.

Unless otherwise stated in this Agreement, any intellectual property owned by Contractor prior to the effective date of this Agreement (i.e., Preexisting Information) shall remain the exclusive property of Contractor even if such Preexisting Information is embedded or otherwise incorporated in materials or products first produced as a result of this Agreement or used to develop Deliverables. The City's right under this provision shall not apply to any Preexisting Information or any component thereof regardless of form or media.

XV. CONFLICTS OF INTEREST OR REPRESENTATION

Contractor certifies it has no financial interest in the Services to be provided under this Agreement other than the compensation specified herein. Contractor further certifies that it presently has no personal or financial interest, and shall not acquire any such interest, direct or indirect, which would conflict in any manner with its performance of the Services under this Agreement.

Contractor agrees to advise the City if Contractor has been or is retained to handle any matter in which its representation is adverse to the City. The City's prospective consent to the Contractor's representation of a client in matters adverse to the City, as identified above, will not apply in any instance where, as the result of Contractor's representation, the Contractor has obtained sensitive, proprietary or otherwise confidential information of a non-public nature that, if known to another client of the Contractor, could be used in any such other matter by the other client to the material disadvantage of the City. Each matter will be reviewed on a case by case basis.

XVII. SEVERABILITY OF PROVISIONS

Whenever possible, each provision of this Agreement will be interpreted in a manner as to be effective and valid under applicable law. However, if any provision of this Agreement or the application of any provision to any party or circumstance will be prohibited by or invalid under applicable law, that provision will be ineffective to the extent of the prohibition or invalidity without invalidating the remainder of the provisions of this Agreement or the application of the provision to other parties and circumstances.

XVIII. EXTENT OF AGREEMENT

This Agreement, together with any affixed exhibits, schedules or other documentation, constitutes the entire understanding between the City and the Contractor with respect to the subject matter of the Agreement and it supersedes, unless otherwise incorporated by reference herein, all prior representations, negotiations, agreements or understandings whether written or oral. Neither party has relied on any prior representations, of any kind or nature, in entering into this Agreement. No terms or conditions of either party's invoice, purchase order or other administrative document shall modify the terms and conditions of this Agreement, regardless of the other party's failure to object to such form. This Agreement shall be binding on and shall inure to the benefit of the parties to this Agreement and their permitted successors and permitted assigns and nothing in this Agreement, express or implied, is intended to or shall confer on any other person or entity any legal or equitable right, benefit, or remedy of any nature whatsoever under or by reason of this Agreement. This Agreement may only be altered, amended or modified by written amendment signed by the Contractor and the City. This Agreement may be executed in counterparts, each of which shall be deemed an original, but all of which together shall be deemed to be one and the same agreement.

FOR CONTRACTOR

By _____

Its _____

FOR THE CITY OF ANN ARBOR

By _____
Christopher Taylor, Mayor

By _____
Jacqueline Beaudry, City Clerk

Approved as to substance

Tom Crawford, Interim City Administrator

Craig A. Hupy, PE, Public Services Area
Administrator

Approved as to form and content

Stephen K. Postema, City Attorney

EXHIBIT A SCOPE OF SERVICES

Task 1 — Information Gathering

The study will kick off with an information-gathering task. This is also an opportunity for City staff and the FTCH Team to jointly review the proposed work plan. Suggested attendees include City staff from the WWTP, Solid Waste Division, Energy Office, and Sustainability Office. Other attendees may include the University of Michigan and potential faculty partners.

Many of these stakeholder contacts are already in place for Team FTCH based on earlier participation in the 2014 Biodigester Feasibility Study.

Team FTCH will also meet with the City's compost partner, WeCare Organics, to review the project scope as it relates to the management of digested solids and options for coordination with composting operations. The previous study benefited from detailed data on food waste provided by Ms. Tracy Artley from the University of Michigan Waste Reduction and Recycling office (WR&R). Updated data from Ms. Artley's office will be used for the 2015 Study.

Task 2 — INPUTS – Expanded analysis of biomass availability

The use of diverse organic wastes like biodigester feedstocks is an emerging trend. By adding organics, such as food waste and FOG, to municipal sludge or manure, biogas production can be substantially increased. This fact has been borne out at the Flint Biogas Plant (operated by Bioworks).

Our team has substantial experience identifying organic feedstocks for biodigesters. In particular, the Flint Biogas Plant (operated by C. Antle of Team FTCH) has over 5 years of experience identifying and contracting for feedstock deliveries to the Flint facility. Other Team FTCH members have identified regional feedstocks near Reed City and Grand Valley. This hands-on experience with the feedstock market (specifically in Michigan) is far superior to the use of databases to identify potential feedstocks. Task 2 will estimate the available organic feedstocks in and around Ann Arbor in terms of quality and quantity.

Task 2.1—Estimate quantity of biosolids from Ann Arbor WWTP

The team will meet with City WWTP staff to obtain the latest operational data and clearly understand the daily production of sewage sludge. Team FTCH's experience designing and operating WWTPs means we can closely coordinate with City WWTP staff, asking the right questions to understand current plant operation and operational constraints. This data sharing is critical for successful acceptance and digestion of wastewater sludge and co-feedstocks. This data, and all other relevant information, will be gathered from City WWTP personnel to assess the potential quantity of municipal waste available for the biodigester. Actual biogas production is dependent on digester configuration, operation protocols, and actual feedstocks.

For a complete picture of the available feedstocks, the biomethane potential (BMP) and other biochemical parameters should be measured. As a value-added service, Team FTCH can gather this data at the BioWorks process laboratory on the campus of Kettering University in Flint, Michigan, where a number of different analyses can be performed to better qualify potential waste streams. The test results can be used in the subsequent modeling of the different alternatives and will provide a higher level of confidence in the outcomes of these models.

Task 2.2—Estimate quantity of commercial organics within the City of Ann Arbor

The 2014 Biodigester Feasibility Study demonstrated the potential and the challenge of capturing commercial organics from sources in the City of Ann Arbor. We found only small quantities of waste per business, and the low cost of current collection is a substantial barrier. However, several exceptions exist to the overall challenge: sources at larger institutions such as the University of Michigan, hotels and restaurants, and FOG collection services. Due to the City's limited budget for the 2015 Study, FTCH will focus on potential suppliers of organic waste listed below.

University of Michigan Food Waste

The office of WR&R at the University of Michigan tracks food waste on campus each year. The 2014 Biodigester Study showed the average pre-consumer food waste from the Michigan Campus in CY2013 averages 4.3 tons/week, with a high value of 8.1 tons/week in November and a low of 1.2 tons/week in May. The high variability of food waste at universities is typical, and has also been seen at Michigan State University.

Primary Sludge: Ann Arbor WWTP

The 2015 study will again coordinate with Ms. Artley at the WR&R office to estimate food waste generated on campus. Her preliminary numbers indicate a total of 267 tons of potential food waste for the 2014 school year. In addition, we will also examine the logistics for how the waste can be gathered and stored on campus, and then transported to an Ann Arbor biodigester.

Commercial organics from businesses within the City of Ann Arbor.

The 2014 Biodigester Study evaluated the following sources of food waste:

- **Larger restaurants, cafeterias, hotels:** Pre-consumer food waste from kitchen prep areas was most desirable for biodigestion. Food service staff were willing to separate food waste in food preparation areas.
- **Food processors:** A limited number of food processors near Ann Arbor produce sufficient quantities of food waste to justify segregation and separate logistics for pickup. Cost is a key motivator for choosing the waste disposal method.
- **Grocery stores:** Local store managers are generally supportive of food waste diversion, but for some large grocery chains, the disposal process is dictated by management outside Michigan.

Using our Team's experience with the first study, we will focus on the organics available from the largest food waste producers in each of the three categories above. We recognize the City learned from the 2014 Biodigester Study that the costs of transportation and disposal will decrease the effective value of a given waste material to the biodigester. (In this case, value is measured in available energy and earned tipping fees.) For this study, we will develop a metric to balance the energy/amount of waste against logistics and current disposal costs. Up to the top three producers for each source (listed above) will be surveyed to identify the following data:

- Daily or weekly food waste production. Current cost of disposal and cost/method of transportation.
- Potential methods for segregating food waste from non-organic waste.

The quantity and quality of each source's waste will be described, along with potential issues such as contaminants or non-digestible materials like PLA flatware.

(Note: If the City wishes for a larger survey, Team FTCH can supply this as a fee-for-service. See the Fee Proposal for details.)

FOG from local grease- trap hauling companies (within the City of Ann Arbor)

FOG is an outstanding potential co- feedstock, both in energy production terms and from an environmental standpoint. However, the 2014 Biodigester Study discovered the work hours needed to determine the quantities of FOG produced in the local area is not trivial. FOG is gathered from restaurants and other locations by specialized FOG hauling companies, with each hauler competing vigorously for material. Bioworks has spent significant effort to acquire FOG for the Flint Biodigester. For this task, Team FTCH will take two approaches:

- 1) Review the current FOG manifests on file with MDEQ. FOG is considered a liquid industrial waste and must be tracked with a manifest and filed with the MDEQ. We will work with existing manifest data to determine the following:
 - a. Identify quantities of FOG material available in the Ann Arbor area and major FOG haulers.
 - b. Identify locations where the largest quantities of material are produced.
- 2) Our Team will also contact FOG hauling companies directly for data. However, we request that City staff generate a letter indicating that our team is gathering information on behalf of the City. This will alleviate concerns on the part of the hauling companies regarding competition and information sharing.

Using the data obtained from manifests and direct feedback from companies, Team FTCH will approximate the amounts of FOG potentially available from sources in Ann Arbor.

Task 2.3 – Additional Feedstocks from Regional Facilities (outside the City)

The next part of Task 2 will look at available biosolids from regional facilities outside the City of Ann Arbor (within 50 miles) and also commercial organic materials outside the City of Ann Arbor. Potentially competitive biodigesters will also be identified.

Survey of municipal WWTPs within 50 miles of Ann Arbor

This task will develop a survey of the WWTP facilities around Ann Arbor (within 50 miles). The goal is to identify potential feedstocks that could be accepted at the Ann Arbor biodigester on a fee- for- product basis. Data on each WWTP facility will include (but are not limited to): facility flow rate, percent of capacity, and potential for out- sourcing organic material to the Ann Arbor biodigester facility.

Survey of commercial organics including FOG and compostable packaging materials

In addition to the analysis of the organic feed stocks as mentioned above, the team will estimate the availability of co- feedstocks from larger food processing establishments within a 50- mile radius of the City of Ann Arbor. As with Task 2.2, we will focus on the largest producers that can supply meaningful quantities of feedstocks. Estimated FOG shipping costs will be included as well.

Using the Team's experience and a food processor database from the Michigan Department of Agricultural and Rural Development, we will identify major organic waste suppliers and tally food waste quantity and type. We will also conduct case studies on three types of food waste

producers within the region to understand their disposal options, costs, and social drivers that may incentivize the company to send waste to the proposed digester.

Potential competitive biodigesters within 100 miles

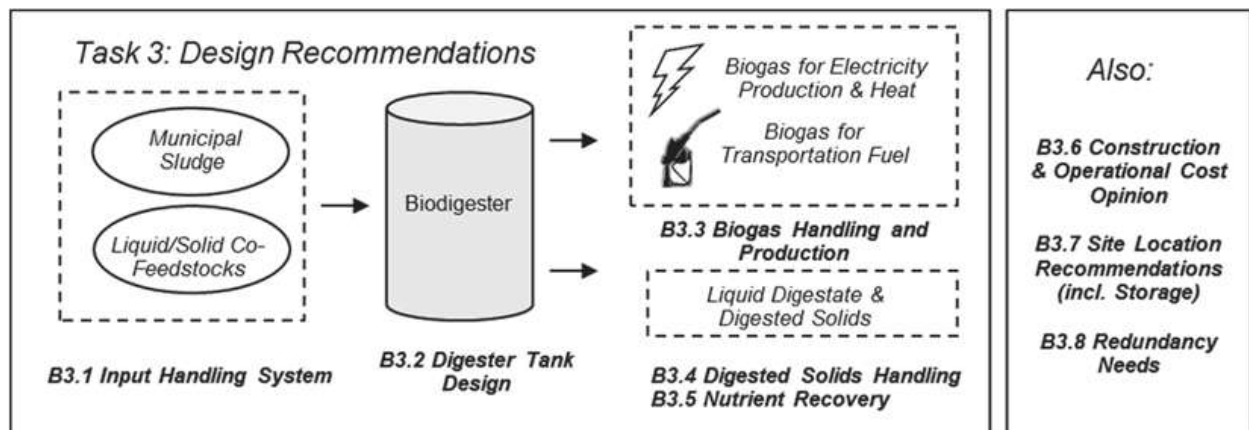
While the total number of biodigesters in the upper Midwest is small, it is prudent to identify potential competitive facilities that may also seek to accept food waste as co- feedstocks. This can include community digesters as well as biodigesters at WWTPs. A detailed list of existing biodigesters within a 100- mile radius of Ann Arbor will be supplied, including information on capacity and capabilities.

Summary of Task 2:

Intelligent feedstock management is a key to success for all biodigesters. A combination of municipal sludge and food waste can supply substantially more biogas production than sludge alone. For this reason, a good understanding of the amount and type of food waste in and around Ann Arbor is critical.

Task 3 — Design Recommendations

In Task 3, Team FTCH will develop a schematic biodigester design of the most appropriate scenarios listed in Task 2. This design can act as a stepping stone to be used by the City to develop an implementation program. The schematics will include the following design considerations:



Task 3.1–Input Handling Systems Design

The conceptual design of the input handling system is the first subtask. This stage feeds the digester and will allow for a range of feedstocks to be accepted at the biodigester site. The primary input to the biodigester will be municipal biosolids. Additional co- feed substrates require an equalization/mixing tank to co- mingle the feedstocks before feeding the primary tank.

Note on Acceptable Feedstocks: This part of the conceptual design task will also discuss material handling/sorting for different feedstocks that may clog or foul the digester if not removed from the incoming feedstock. As an example, paper and compostable bags cannot be digested, and need to be separated and sent to composting facilities. Plastics (PTA and other) and metals need proper disposal as well. Members of Team FTCH have evaluated sorting systems at community digesters in Germany and Sweden, and will include sorting technology as part of Task 3.1.

Task 3.2–Digester Tank Design

The volumetric quantity and solids content of input streams dictate the size of the digester tanks. Team FTCH will model the input stream's volume to determine tank size, accounting for the variability of feedstocks. Trade-offs between single and multiple tanks will be examined to balance redundancy/reliability and cost. Mixing technology and external heat exchangers will be identified for addition of heat to maintain optimal temperature during digestion. Additional tank capacity will be considered as it relates to potential future growth in the biosolids stream as well as the potential for co-feed substrates.

Task 3.3–Gas Handling and Processing System Design

There are several considerations to take into account during this task. The digesters themselves will be fitted with gas-holder covers for storage of the raw bio-gas. These must be sized appropriately for the estimated usage versus storage needs. In addition, as with all storage systems, safety is a major consideration, and our team implements the best practices for flame traps, flares, and following building codes including the NEC and NFPA- 820.

This part of Task 3 will also examine the power needs of the facility itself and alternate usage or utilities, heat demands of the facility or nearby facilities, and the potential to upgrade to vehicle fleet fuel or natural gas pipeline quality will be considered. This will be an iterative conceptual design step in conjunction with Task 5, as each consideration will have economic impacts to the project cost and return on investment.

Calculations and lab testing during Task 2 will supply estimates on the anticipated biogas production from various feedstocks. This baseline biogas production will be available for the multiple beneficial outlets identified in the RFP. Our team will review and conceptually design systems for these outlets, including:

- Cogeneration equipment for the production of heat and power.
- Biogas upgrading equipment (for transportation or other fuel or other outlets uses).

Task 3.4–Digested Solids Handling System Design

There are a range of options for handling the post-digestion solids. Team FTCH's past experience with by-products allows for the exploration of several options, including: use of the existing WWTP storage tanks, thickening/dewatering/composting or direct end-use such as land application, composting, or other beneficial reuses.

This will be an iterative step with Task 5, as different handling options may have economic impacts to the project. This type of subtask has been completed many times by our team on municipal treatment plant designs.

Task 3.5–Nutrient Recovery System Design:

An additional output from the solids handling system is liquid filtrate. On one hand, filtrate disposal may pose a cost burden if sent to the Ann Arbor WWTP. Alternately, this filtrate may have economic value if nutrients can be removed and sold as a usable product (or if the capital equipment necessary to remove these nutrients can be paid for by reduced operational costs at the WWTP).

An analysis and conceptual design of nutrient removal processes will be conducted to determine if nutrient removal is cost-effective. FTCH is ideally suited to this evaluation since they have specific knowledge of the Ann Arbor WWTP. For the past 8 years, FTCH has been the NPDES advisor to Ann Arbor WWTP, and thoroughly understands the facility.

Task 3.6–Construction and Operational Cost Opinion

The importance of accurate capital costs for conceptual design is key to understanding the required initial investment and developing the financial model in Task 5. Professional estimators at FTCH will develop cost opinions for construction of the Ann Arbor biodigester. Our estimator uses the same equipment suppliers, trade contractors, and bidding guides as the general contractors or construction management (CM) firms that will build the project. This allows our project estimates to reflect the latest construction costs and can account for changing market factors. In addition, Team FTCH will also use their experience operating biodigesters to estimate operational expenses (OpEx).

Task 3.7–Site Location Recommendations

An evaluation of site requirements is a critical part of any design exercise. Facility size and transportation logistics must be evaluated to ensure the new facility will have community acceptance, and be financially viable. Parameters to consider include: site cost (if not currently owned), zoning, onsite storage capacity, transportation access, and potential co- location of other facilities to leverage waste heat, power, and nutrients.

Our team will recommend an optimal site size for City planners to consider with identified prioritized qualities that will allow the City to identify locations that may be considered for the siting of the facility. The City will need to provide information on the estimated value of potential sites or a general area within the City that may be appropriate for the facility's location.

Task 3.8–Redundancy Needs

As with all municipal waste systems, the public must be assured the plant will process organic waste without interruption. Even for low probability events, redundancy must be inherent in the system. This subtask will develop a redundancy analysis to protect against equipment malfunction, loss of electric power, extreme weather events, or other possible scenarios.

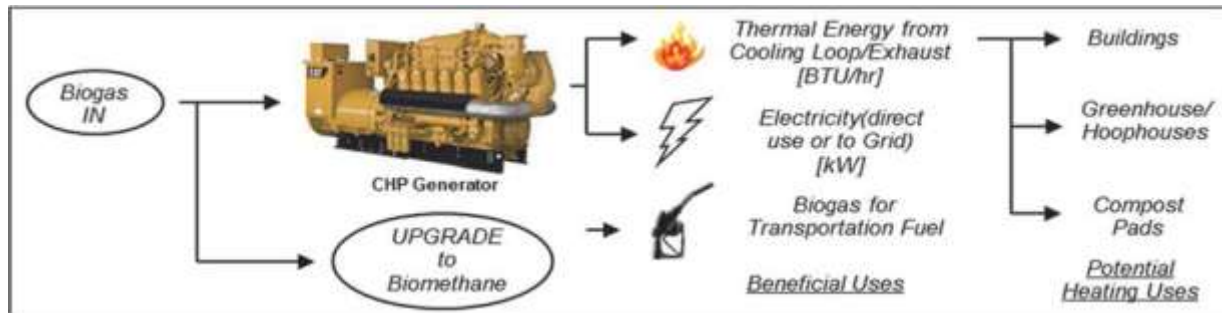
Task 4 — OUTPUTS–Expanded analysis of Biogas and other outputs

In seeking to choose the best way to operate a biodigester, municipal decision- makers will face often conflicting goals based on economics, sustainability and regulations. Task 4 will develop an initial Excel-based model to explore different uses for the biogas and digested solids. Key model parameters include:

- BMP, which determines biogas production.
- Biogas characteristics (%CH₄, %CO₂, trace gases including H₂S).
- Electrical production given CHP efficiency.
- Net BTU content of exhaust heat and net BTU content of coolant loop.
- Market value of BTU production compared to petro- fuels.
- Value of digested solids (positive or negative)

The Excel- based input/model (I/O) model will calculate the production of biogas and digested solids based on the feedstock recipe and quantities determined in Task 2. Once accurate estimates of biogas production have been established, the benefits and costs of using biogas for various beneficial uses (electricity, fuel, etc.) will be calculated. The cost/benefit for each beneficial use will be determined.

Costs/revenues will be compared to existing solutions such as petro- fuels or natural gas.



Input Data – Biogas from Municipal Sludge: Data from the City’s WWTP will determine the quantity of sludge available for the model. A number of factors affect biogas production for municipal sludge. As an example, Table 7 shows data from the Ann Arbor WWTP from the 2014 Biodigester Study. Actual biogas production is highly dependent on digester configuration, operation protocols, and actual feed stocks. Note in Table 8 that the fraction of volatile solids reduction achieved during biodigestion has a substantial effect on total biogas production

Input Data – Biogas from Food Waste: Food waste is typically an amalgam of different foods. To determine biogas production, an average of 0.549 [$Nm^3 CH_4/mton VS$] will be used to estimate biogas production for a given amount of food waste. This is a generally accepted value from Brown *et al* from 2013, and compares favorably to the data measured by Michigan State University for food waste from MSU dorms.

Input Data – Biogas from FOG: FOG is a reasonably well characterized material for biodigestion. For the Task 4 model, a BMP of 600 [$Nm^3 CH_4/mton VS$] will be used, which is an industry accepted value for biogas production.

Task 4.2–Beneficial Use Modeling

Biogas generated by the Ann Arbor Biodigester can be converted to a number of beneficial uses. The model will describe the benefits and costs for typical beneficial uses.

Beneficial Use – Electrical production: The model will output electrical production potential from all feedstocks. Municipal sludge alone is relatively constant at 100 kW per 4.5 MGD of flow into a WWTP3. When food waste and FOG are added to municipal sludge, biogas production increases substantially.

Electricity can be sold to the grid, or used onsite. The model will allow the user to select “gridsale” or “site use”, using current utility payments and potential standby charges as input parameters.

Beneficial Use – Thermal energy: A well accepted energy value of biogas from municipal sludge is 600 BTU/ft³. Biogas production increases with co- feedstocks, and so does the fraction of methane in the biogas (typically from 60% to 65- 70%). The model will use the overall biogas production to compute BTU- based energy. The economic value of this energy will be compared to natural gas and propane on a BTU- equivalent basis. The model will also allow the user to calculate the scale of buildings, hoop houses or compost pads that could use the thermal energy.

Beneficial Use – Transportation Fuels: The City of Ann Arbor operates a fleet of trucks based out of the Wheeler Center for recycling and other curbside pickup. Total fuel usage can be substantial, with approximately 47,000 gallons of diesel, B5, and B10 used in 20126. This

subtask will evaluate the potential for converting existing fleet to compressed biomethane, or to a dual- fuel combination of diesel/biomethane. We will work with Swedish Biogas (SBI) on this task7. SBI has been upgrading biogas from anaerobic digesters in Linkoping Sweden for over a decade, and has substantial practical experience with vehicle biofuels. We will develop a preliminary design for a fueling solution to meet current and future fuel demand by the City.

Beneficial Uses – Compost production: The City of Ann Arbor currently contracts with WeCare Organics to manage composting facilities for the City. The contractor is paid a tipping fee for compost processing and sales, and a per- ton fee for incoming merchant organics and another fee for outgoing finished products. In this subtask, Team FTCH will meet with the contractor to determine:

- Delivery of digested solids to compost facility, including required moisture levels and tonnage.
- Pricing structure for materials, transportation and labor.
- Market value for nutrients, and available technology for nutrient extraction.
- Potential concerns about the inclusion of biosolids into the compost supply (regulatory issues).

Results of this task will be compiled into a market assessment for compost production using digested solids from the WWTP, or for managing the digested solids separately. Regulatory considerations will be included in the assessment. Recommendations for more in- depth marketing studies will be included.

Beneficial Uses – Digestate Management: A critical requirement for any biodigester is to provide temporary storage of the digestate materials for periods of time that require the material to be retained onsite before further processing or distribution. Scenarios including system maintenance, weather, or season. Digestate management for both liquid and solids digestate storage will be assessed and options described. Due to the limited budget of this study, digestate enhancement will not be part of the overall digest management investigation.

Summary: Each beneficial use will be modeled in the Excel model, and a comparison sheet will be developed to allow the user to compare options in terms of:

- Financial cost or savings as compared to different fossil fuels
- Environmental benefits (carbon reduction, landfill reduction, nutrient management)

Task 5– Financial Model

To allow the City to several financial options, an Excel- based financial model will be developed to evaluate the performance of different financing structures. The following scenarios will be supported in the model.

| Item | Scenario 1 | Scenario 2 | Scenario 3 |
|--|---|---|--|
| Financing Structure | Municipal Debt | Municipal Debt | Private Capital |
| Ownership of Capital | City | City | Private |
| Ops & Maintenance | City Staff | Contracted Operation | Contracted Operation |
| Responsibility for Outside Feedstocks | City Staff | Contractor | Contractor |
| Incentive for outside feedstocks | n/a | Adjustable parameters in the Model | Adjustable parameters in the Model |
| Profit sharing | n/a | Negotiated with City | Negotiated with City |
| Compensation for Debt | n/a | Debt sharing potential | Roll into monthly pymts |
| Unit Processing payments | Coordinate between City business units | Per dry ton charges + addl contractor expense | Per dry ton charges + addl contractor expense |
| Electrical Generation Payments | Onsite use value compared to grid sales | Per kWh charges to City, or sold to Grid, or combination thereof. | Per kWh charges to City, or sold to Grid, or combination thereof |

A detailed model of financial performance will be a useful tool to project financial performance over the lifetime of the project (typically 20- 30 years). As a city with a strong financial status (AA+ rating), Ann Arbor has the ability to obtain low- interest financing from multiple sources including the municipal bond market (either general obligation or enterprise revenue bonds). For example, a recent bond issue from Ann Arbor for parking structures was issued in 2013 at 3.75%. This low rate is due primarily to the City’s AA+ bond rating. Accessing the municipal bond market can provide Ann Arbor substantial savings in interest over the life of the project.

Outputs from the model will be in a Pro Forma format to allow various financing and operational scenarios to be explored. The model will deliver financial predictions for the Biodigester over a 20- to 30- year lifespan. (Lifespan and a host of other variables will be user- selectable).

Several key tradeoffs can be explored, including (but not limited to):

Incentive for outside feedstocks: For Scenarios 2 and 3, an incentive structure can be included in the operation contract. Bioworks Energy has direct experience with incentives due to its long term contract with the City of Flint to bring in additional feedstocks to the Flint Biogas Plant. The incentive structure offered by Flint will provide one of many possible incentive structures.

Unit processing: Depending on the financing structure, the unit processing fee (per dry ton) can include operational expenses, debt service and other contractor expenses. Once debt is retired, unit processing fee will decrease.

Electrical generation: The production of electricity represents both revenue and expense, and is complex to model. For contractor- operation scenarios, electricity is often sold back to the City at the current electrical rate charged by the electric utility provider. Contracts for electrical generation are typically indexed to the Consumer Price Index (CPI). Most utilities levy a standby charge to self-generation locations (expense).

In all scenarios, excess electrical production can be sold to the local utility, assuming a Net Metering or purchase power agreement can be negotiated.

A summary of revenues and cost savings parameters include (but are not limited to):

| Revenues and Expenses | |
|---|---|
| Revenues (incl. cost savings) | Expenses |
| Electrical Power generation revenue | Labor for operations, maintenance and management |
| Reduced biosolids disposal costs | Electrical power generation (pass-through at utility rates) |
| Reduced chemical costs (polymer & lime) | Biogas conditioning |
| Reduced odor control costs | Thickening polymer (as needed) |
| Reduced labor costs | Utility standby charges |
| Shared revenue from tipping fees | Equipment maintenance |
| Revenue from digestate sales | Laboratory analysis |

Task 6: Environmental Benefits

A Sustainability Framework developed in 2013 helps guide City of Ann Arbor planners to ensure overarching sustainability goals are met. The proposed Ann Arbor Biodigester project fits very well in the categories shown in the following table.

| Resource Management | | |
|--|---|--|
| Clean Air and Water | Healthy Ecosystems | Responsible Resource Use |
| Reduction in greenhouse gas emissions by biodigester with cogeneration unit enhances air quality, and reduces emission from fossil-fuels sources (coal). | “Green” power and reduced chemical usage reduces community impact on local ecosystems. | Landfill diversion contributes to the goal of “zero waste”, and will help optimize the positive use of waste in the community. |
| Reduced lime use for biosolids disposal will reduce chemicals in run-off of land applied biosolids. | Waste diversion from landfills decreases potential for leachate fouling ground water | Conversion of organic waste into economic value by avoided costs, direct payments for electricity and nutrient recovery. |
| Climate and Energy | | |
| Sustainable Energy | Energy Conservation | Sustainable Buildings |
| Local generation of energy for local use. Mitigate impact of City vehicles by using renewable biofuels. | Decrease greenhouse gas emissions from decomposing materials. Convert to beneficial use | Heat from the cogeneration unit could be used to heat any of the buildings associated with the project, |

As part of the 2015 feasibility study, Team FTCH will use the models developed in previous tasks to identify the actual impact of a biodigester. Specific values can be supplied for parameters such as: reduced CO2 emissions, tons of lime saved, gallons of diesels saved, and BTUs of heat recovered. This data will *quantify* the environmental benefits of an investment in an Ann Arbor Biodigester by City planners.

Conclusion

The results of all tasks will be combined into a comprehensive Feasibility Report and delivered to the City of Ann Arbor. Team FTCH proposes a 6-month period-of-performance so adequate time is provided to coordinate with City staff and the current operators of the composting facility at the Wheeler Center. The technical results for each task will be clearly presented, and a discussion will accompany each section that will inform the reader on each topic’s benefits as well as the challenges.

| Task Matrix | | Individual Task | Month | | | | | |
|-------------|-----------------|---|-------|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 |
| Task 1 | Information | Meet with stakeholders and review previous study | | | | | | |
| Task 2 | Inputs | Develop a series of biomass estimates (3 scenarios) | | | | | | |
| Task 3 | Design | System design recommendations (3 scenarios) | | | | | | |
| Task 4 | Outputs | Analysis of beneficial outputs. I/O model (3 scenarios) | | | | | | |
| Task 5 | Finances | Develop Financial model for all scenarios | | | | | | |
| Task 6 | Envir. Benefits | Environmental benefits gained by biodigestion | | | | | | |
| Final | Final Report | Document all results and deliver Final Report to City Staff | | | | | | |

**EXHIBIT B
COMPENSATION**

General

Contractor shall be paid for those Services performed pursuant to this Agreement inclusive of all reimbursable expenses (if applicable), in accordance with the terms and conditions herein. The Compensation Schedule below/attached states the nature and amount of compensation the Contractor may charge the City:

C. Engineering Fee Proposal by Team FTCH

Proposal in response to RFP-949

| HOURS | | | | | | | | | |
|--|-----------------|-----------------|------------------|------------------|-----------------|-----------------|-----------------|------------------|-----------|
| Firm/Staff | Task 1 | Task 2 | Task 3 | Task 4 | Task 5 | Task 6 | Final Report | Total | |
| FTCH/J. Rafter - Project Manager/ Sr. Engineer | 6 | 4 | 62 | 12 | 4 | 2 | 8 | 98 | |
| BWE/C. Antle - Sr. Engineer | 8 | 60 | | 66 | 40 | | 4 | 178 | |
| BWE/ J. Tesar - Analyst/Engineer | 4 | 17 | | 20 | 40 | 12 | 40 | 133 | |
| M&B/ B. Hannon - Sr. Engineer | 8 | 4 | 72 | 4 | 4 | 10 | 4 | 106 | |
| Totals: | 26 | 85 | 134 | 102 | 88 | 24 | 56 | 515 | |
| FEE | | | | | | | | | |
| Firm/Staff | Rate | Task 1 | Task 2 | Task 3 | Task 4 | Task 5 | Task 6 | Final Report | Total |
| FTCH/J. Rafter - Project Manager | \$ 365 | \$ 990 | \$ 660 | \$ 10,230 | \$ 1,980 | \$ 660 | \$ 330 | \$ 1,320 | \$ 16,170 |
| BWE/C. Antle - | \$ 100 | \$ 800 | \$ 6,000 | \$ - | \$ 4,300 | \$ 4,000 | \$ - | \$ 400 | \$ 15,500 |
| BWE/ J. Tesar - | \$ 100 | \$ 400 | \$ 1,700 | \$ - | \$ 4,300 | \$ 4,000 | \$ 1,200 | \$ 4,000 | \$ 15,600 |
| M&B/ B. Hannon | \$ 120 | \$ 960 | \$ 480 | \$ 8,640 | \$ 480 | \$ 480 | \$ 1,200 | \$ 480 | \$ 12,720 |
| Totals: | \$ 3,150 | \$ 8,840 | \$ 18,870 | \$ 11,060 | \$ 9,140 | \$ 2,730 | \$ 6,200 | \$ 58,990 | |

Firm Multipliers: Fishbeck (3.19), BioWorks Energy (2.5), Moore & Bruggink (3.05)

Fee Clarification

Task 1: All Key Project Team Members will meet in Ann Arbor with Key City Representatives and other stakeholders at an initial Kickoff meeting. Additional one-on-one meetings between individual stakeholders and individual team members can also take place as needed.

Task 2: Due to the broad scope of this Task, the FTCH Team will limit our investigation to larger quantities of materials with significant energy potential. For a more extensive evaluation of feedstocks in and around Ann Arbor, Team FTCH will be pleased to offer additional effort on a fee-for-service.

Task 3: The design task will present a conceptual design and cost estimate. We will also provide the City with an estimate of the acreage needed for a site and the limitation for distances from main substrate sources and output consumers. The Design task does not include reevaluating the WWTP MAHL based on organic loads from the biogas digester.

Task 4: The Output Model will calculate results for the 3 scenarios from Task 2. If the City desires additional analysis for different scenarios, Team FTCH will be pleased to provide additional analysis at our normal rates.

Task 5: The Financial Model will be delivered to the City structured to deliver results for the 3 scenarios: Municipal financing (2 options) and Design/build/operate by the City.

In order to enhance the value of the Biodigester Feasibility Study, Team FTCH offers the following additional services:

| Additional Services Available |
|---|
| Task 2.1: Laboratory testing of feedstocks (sludge and food waste feedstocks) can be performed by Bioworks Energy. Hours for this additional work are billed at the above-listed rates. |
| Task 2.2: Additional commercial food waste sources INSIDE Ann Arbor can be evaluated in terms of amount and transportation costs. In addition, on-site storage issues can be evaluated, with suggested storage options (containers) provided. Hours for this additional work are billed at the above-listed rates. |
| Task 2.3: Additional detail on commercial food waste sources OUTSIDE Ann Arbor can be gathered in terms of amount and transportation costs. Hours for this additional work are billed at the above-listed rates. |
| Task 3: The Design can include a process flow diagram for the biodigester facility. This can be included in the report for an additional \$5,300. |
| Task 4: If the City desires to explore different scenarios with the I/O model, Team FTCH will be pleased to work with the City to analyze different scenarios. Additional funds can be added to Task 4, billed at the rates listed above. |
| Task 5: If the City wishes to explore more complex financing scenarios, Team FTCH will be pleased to collaborate with City Staff to analyze and document additional financing scenarios. Additional funds can be applied to Task 5 to support this work, billed at the rates listed above. |

D. Authorized Negotiator:

Tim McNamara, PE
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Fishbeck, Thompson, Carr and Huber
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**EXHIBIT C
INSURANCE REQUIREMENTS**

Effective the date of this Agreement, and continuing without interruption during the term of this Agreement, Contractor shall provide to the City on behalf of itself, and when requested any subcontractor(s), certificates of insurance and other documentation required by the City that shall show that the Contractor has insurance that meets the following minimum requirements:

- A. The Contractor shall have insurance that meets the following minimum requirements:
 - 1. Professional Liability Insurance or Errors and Omissions Insurance protecting the Contractor and its employees in an amount not less than \$1,000,000.
 - 2. Worker's Compensation Insurance in accordance with all applicable state and federal statutes. Further, Employers Liability Coverage shall be obtained in the following minimum amounts:
 - Bodily Injury by Accident - \$500,000 each accident
 - Bodily Injury by Disease - \$500,000 each employee
 - Bodily Injury by Disease - \$500,000 each policy limit
 - 3. Commercial General Liability Insurance equivalent to, as a minimum, Insurance Services Office form CG 00 01 07 98 or current equivalent. The City of Ann Arbor shall be an additional insured. There shall be no added exclusions or limiting endorsements which diminish the City's protections as an additional insured under the policy. Further, the following minimum limits of liability are required:
 - \$1,000,000 Each occurrence as respect Bodily Injury Liability or Property Damage Liability, or both combined
 - \$2,000,000 Per Job General Aggregate
 - \$1,000,000 Personal and Advertising Injury
 - 4. Motor Vehicle Liability Insurance, including Michigan No-Fault Coverages, equivalent to, as a minimum, Insurance Services Office form CA 00 01 07 97 or current equivalent. Coverage shall include all owned vehicles, all non-owned vehicles and all hired vehicles. Further, the limits of liability shall be \$1,000,000 for each occurrence as respects Bodily Injury Liability or Property Damage Liability, or both combined.
 - 5. Umbrella/Excess Liability Insurance shall be provided to apply in excess of the Commercial General Liability, Employers Liability and the Motor Vehicle coverage enumerated above, for each occurrence and for aggregate in the amount of \$1,000,000.
- B. Insurance required under A.3 above shall be considered primary as respects any other valid or collectible insurance that the City may possess, including any self-insured retentions the City may have; and any other insurance the City does possess shall be considered excess insurance only and shall not be required to

contribute with this insurance. Further, the Contractor agrees to waive any right of recovery by its insurer against the City.

- C. Insurance companies and policy forms are subject to approval of the City Attorney, which approval shall not be unreasonably withheld. Documentation must provide and demonstrate an unconditional 30 day written notice of cancellation in favor of the City of Ann Arbor. Further, the documentation must explicitly state the following: (a) the policy number; name of insurance company; name and address of the agent or authorized representative; name and address of insured; project name; policy expiration date; and specific coverage amounts; (b) any deductibles or self-insured retentions which shall be approved by the City, in its sole discretion; (c) that the policy conforms to the requirements specified. Contractor shall furnish the City with satisfactory certificates of insurance and endorsements prior to commencement of any work. Upon request, the Contractor shall provide within 30 days a copy of the policy(ies) to the City. If any of the above coverages expire by their terms during the term of this contract, the Contractor shall deliver proof of renewal and/or new policies to the Administering Service Area/Unit at least ten days prior to the expiration date.