Iowa City Climate Action Commission Agenda
Monday, February 1, 2020, 3:30 – 5:00 p.m.
Electronic Meeting, Zoom Platform

Electronic Meeting

(Pursuant to Iowa Code section 21.8)

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Meeting Agenda:

1. Call to Order

2. Roll Call

3. Approval of Jan. 4, 2021 minutes

4. Public Comment of items not on the Agenda
   -Commentators shall address the Commission for no more than 3 minutes. Commissioners shall not engage in discussion with the public concerning said items.

5. Staff Announcements
   a. Action items from last meeting
   b. Climate Action and Outreach Office Updates (see attachment)

6. Old Business:
   a. Discussion of ideas to restructure working groups
   b. Building Working Group Density GHG Memo (see attachement)

7. New Business:

   a. Follow up discussion with HDR on the Methane Feasibility Study
   b. Confirm meeting dates for 2021
   c. Updates on working groups (see reports in agenda packet)
      i. Buildings (Krieger, Karr, Soglin, Grimm)
      ii. Transportation (Leckband, Giannakouros, Grimm)
      iii. Outreach (Krieger, Fraser, Holbrook, Bradley)
      iv. Equity/Adaptation (Tate, Hutchinson)
      v. Waste (Bradley, Grimm)

8. Recap of actionable items for commission, working groups, and staff

9. Adjourn

If you will need disability-related accommodations in order to participate in this meeting, please contact Sarah Gardner, Climate Action Engagement Specialist, at 319-356-6162 or at sarah-gardner@iowa-city.org. Early requests are strongly encouraged to allow sufficient time to meet your access needs.

MINUTES **PRELIMINARY**

IOWA CITY CLIMATE ACTION COMMISSION
JANUARY 4, 2021 – 3:30 PM – FORMAL MEETING

Electronic Meeting

(Pursuant to Iowa Code section 21.8)

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ELECTRONIC MEETING

MEMBERS PRESENT:	Madeleine Bradley, Stratis Giannakouros, Ben Grimm, Megan Hill, Kasey Hutchinson, John Fraser, Matt Krieger Becky Soglin, Eric Tate
MEMBERS ABSENT:	Grace Holbrook, Jesse Leckband
STAFF PRESENT:	Ashley Monroe, Joe Welter
OTHERS PRESENT:	Morgan Mays, Marcella Thompson, Jeremy Cook

CALL TO ORDER:

Krieger called the meeting to order and introduced new member Megan Hill.

APPROVAL OF DECEMBER 7, 2020 MINUTES:

Fraser moved to approve the minutes from December 7, 2020.

Grimm seconded the motion. A vote was taken and the motion passed 9-0.

PUBLIC COMMENT OF ITEMS NOT ON THE AGENDA:

None.

STAFF ANNOUNCEMENTS:

Action Items from last meeting: Monroe noted there were three action items to follow up on from the last meeting. Gardner was asked to check with Wendy Ford about whether the TIF funded initiative requires participants to disclose whether they're participating in the utility funded energy efficiency programs. The City does include a question regarding that on the application with a note that some projects may qualify for both types of funding, so moving forward the plan would also be to follow up with the applicants on the question during the approval process. Staff also spoke with Brian Gibbs from MidAmerican Energy to make sure that participating in the program doesn't disqualify a business from participating in their program and it does not. Monroe explained there was initially some concern about double dipping. For example, companies applying to the City for a forgivable loan and then applying for a rebate on the same project but the total amount of funding from the City and the utilities would be less than half a million dollars and most of the projects would be exceeding a million dollars so the consensus was that it wouldn't be a concern. Additionally, the City's pool of funds is coming from a different set of funds than the utility programs so the companies that are utilizing the TIF rebate program have already paid into that into that pool with their tax dollars.

Staff also looked into whether the implicit bias training was recorded and able to be shared in the future. Unfortunately it was not recorded but the City offers it on a frequent basis generally, so future opportunities for more bias training will be made available to the Commission members.

Finally, Monroe said Gardner drafted a description for the idea about restructuring working groups and shared it with Soglin and Krieger to review in advance of today's meeting. It was included in the packet for the Commission's consideration.

Updated Action Plan Report: Monroe briefly stated that they are pleased that all of the items that were identified as something they wanted to initiate in 2020 are either in development or underway, and a couple of them are deemed as complete. For example, the creation of the climate ambassador program was identified as a completed project because the first round of it has been done and then further action on that can be developed in the future. Establishing preferences for an electric and fuel-efficient vehicle purchasing policy has also been marked as complete. Those revisions have been made and then further adaption of data can be expanded on in the future. Monroe noted they have a couple of things going with the community stakeholders in the buildings section that are focused on identifying opportunities for incentives for both residents and the development community to try and focus on energy efficiency in buildings. They've made progress on the transit study, which took place over the last year and a half, and the results of the study were presented this fall. The actions from that study outcome will be implemented with changes coming in the summer. Monroe noted staff would invite any additional feedback from the Commission about how to provide outreach to the community regarding the transit system changes, or other incentive programs, which they'll be focusing on into 2021.

Monroe explained there are a lot of the projects still in development and underway in 2020 that they will still be working on in 2021, and staff will continue with the help of the Commission and the working groups and community stakeholders. Staff has tried to balance the introduction of these new items, so the things that are in Phase Two of the Action Plan are basically estimated with a time to initiate. Staff wanted to ask the Commission how comfortable they are with what staff has identified and believe is appropriate to introduce in 2021. Staff also identified a couple of projects to start in 2022 and will continue to build on things done in 2020. Monroe asked if the

Commission has any concerns about the timeframe or projects in 2021.

Krieger said he doesn't have any issues with the timeline, noting staff has done a good job of outlining the reasoning behind which items are accelerated and such. He commented on the benchmarking and the other things associated with the incentive programs or the TIF programs, acknowledging those take time to work through, so he appreciates that the staff has incorporated the reasoning and the updated timeline.

Giannakouros agreed, saying this is all impactful measures. The one thing that may or may not impact the local level is with all the federal changes happening in the new administration. There's going to be an emphasis throughout every aspect of federal policy to be climate-oriented to some degree. Therefore, as policies and incentives and mandates roll out, the question becomes how does that impact this work – how does it enhance it or whether it doesn't change how they go about doing this stuff. He stated he feels this is something to keep an eye on and understand, saying within the next six months they may have to rethink a ton of stuff.

Monroe said that was really good feedback from Giannakouros and they will continue to be mindful of that at the federal and state levels as they are entering into a new legislative season at the state as well. As anything evolves the Commission will need to be sensitive to those changes, and staff will leave it again to the Commission to also to provide some guidance on anything they think staff should relook at and modify based on those new changes.

Monroe noted that they are looking at the objectives scheduled to start in this year she is energized by the fact that a great majority of them really center outside of the buildings. The buildings section is policy and project heavy, but further down in work plan they're talking about a lot of equity issues. She said she knows the Commission has been very sensitive to how to integrate equity principles and standards into each of the actions. So something that staff is especially attuned to going forward in this year is really continuing to build data for delving deeply into those things. They are already starting conversations with public health, for example, as well as other community organizations about how they can better partner to address both social issues and also climate issues as one. Monroe stated staff is excited about that and the real concentration of where they're going with these projects. Nothing will get done without an intent and a focus on the equity components of each of the proposals that they'll put together.

Krieger noted to that point there are quite a few references made to the equity report and he doesn't know if a final version of that document has made it to the full Commission. It might be good to have that as a point of reference if they're going to be talking about how working groups get restructured and how outreach is done. To have that as a as a guidance would be really good.

Monroe agreed they could certainly provide the Commission with what they have, noting they have been working on an amplification of that final equity report that she thinks will more specifically meet these needs and they'll make sure to share that with the Commission. Also, as an added bonus, she said staff is nearly there with coming to an agreement with the firm to help with a communications strategy and as part of that communications strategy there's an assessment specifically geared towards equitable outreach and building relationships.

Fraser commented he really appreciated Giannakouros' comment and thinks they're all on the

same wavelength that this is like a strategic plan and is a living document, and as such they need to maintain the discipline of working through it as it's published, but at the same time have the flexibility to change it as conditions require those changes because the political atmosphere that's coming up is a bit unknown. Everyone needs to keep their eyes and ears open and make sure that based on government policy the new policies that they put into place are flexible and can be changed as required.

Krieger also added they need to evaluate new research as it becomes available as well, saying there's many external forces that they need to be able to manage as part of the overall plan.

Tate stated their conversations around the topic of equity have deepened over the last year and he is glad to see progress with this climate analyst position who could start looking at some of the mapping and distributional dimensions of equity. Outreach has been mentioned as a key strategy, but Tate also noted there's some other dimensions that they might consider as they go along. One of them came up earlier, which was the procedural or eligibility with the tree planting plan and who could have access to it. He stated there's a broad swath of ways that they can look at distributional effects, but it tends to be something that's after the fact with some of these processes in who can participate, who's eligible and what barriers are there. He just wanted to make sure they keep that in mind and to use the tree issue as an example.

Monroe noted they don't have the December update of the report on the website yet, so they'll get that up as well as the 2021 plan.

Krieger noted that, similar to the equity report, staff mentioned the transit study recommendations. He said it might be good to distribute those as well, or at least the link to where those are located, because it was presented to Council, and having ready access to that as well would be handy.

Monroe agreed and said staff will be mindful of that and include some of the links within this report if those reports live somewhere on a pretty permanent basis on the website.

OLD BUSINESS:

Discussion of ideas to restructure working groups: Krieger tabled this item to later in the meeting to move onto new business due to time constraints.

NEW BUSINESS:

Nomination and Election of Commission Chair and Vice Chair: For the position of Chair there were two accepted nominations, Fraser and Giannakouros.

Fraser stated he is humbled by the talent among this group, and if he were the chair he would certainly count on these talented people in this organization who have a lot more fresh and diverse ideas then he perhaps has. As chair, he feels being a good listener is one of the key attributes, particularly of this Commission and particularly today with what's happening politically and economically. So many aspects of that, equity being one, require a huge focus and is very challenging. Fraser also acknowledged the staff does an awful lot of work and he wants to

make sure that the Commission is not dumping everything on staff and are stepping up and doing the fair share as Commission members. He reiterated during these times there are a lot of challenges coming up but also a lot of opportunities. He is excited about what may come with the new administration. He feels there needs to be a lot of emphasis to sell what they're doing to the state legislature. Iowa City needs to do this right so other cities follow, not just the larger cities, but every community in the state of Iowa needs to be on board to make a big difference.

Giannakouros stated he agrees with Fraser that this Commission has a responsibility to try to do things, saying it is easy to get overwhelmed and busy but with the right leadership to support big efforts change can happen. He added if they thought harder about what are the levers they need to pull to make this Commission execute on what it's supposed to do, like cutting carbon emissions in an equitable way, and really not losing sight of the fact that something that sounds really good and may not take a lot of effort for those endeavors. Other things are big, and they're hard, but the return to effort is there – things such as a light rail for North Liberty to Iowa City, that's a big deal and a game changer and this Commission should be advocating for something like that. Simpler things such as behavior change in the community are good, he said, but they know what moves the needle. They've had enough history of doing this kind of work to understand where they should focus their attention and where they shouldn't. Also with equity, it's simple to say that every single policy this group goes after should be at the outset designed to understand the impact it has on people who are powerless, who are not at the table, and who by design really don't benefit from carbon emissions, the upside, and the profit, yet they bear the consequences. Those things are big, but supporting City staff and making sure things are organized is important. If Fraser wants to take that on and do that, Giannakouros would support him entirely. He said he supports Fraser for the role as chair, so he no longer wishes to be nominated for chair.

A vote was taken and Fraser was elected as Chair (9-0).

Giannakouros was nominated for Vice Chair and a vote was taken and Giannakouros was elected as Vice Chair (9-0)

Presentation by HDR on the Methane Feasibility Study: Joe Welter, Senior Civil Engineer for the City of Iowa City, said he got the joy and pleasure to work on a couple of the action items that were in the Climate Action and Adaptation Plan as he has had a lot of experience in the past with environmental engineering. They had the opportunity to go through and screen a lot of different consultants and were very impressed with the team that is going to present today from HDR. Presenting today are team members from several of their offices in Iowa, Nebraska, and Toronto, Canada. They have had a lot of experience with these types of studies with other municipalities and other groups, and Iowa City had them look at the two different facilities, the wastewater treatment plant and the landfill, which produce an abundance of the biogas methane. Morgan Mays is the project manager for HDR and they also have Marcella Thompson and Jeremy Cook here tonight to discuss the study. Welter noted these were the three main people the City worked with from HDR but there was a plethora of very talented people at HDR that worked on this study for the City.

Morgan Mays (Project Manger, HDR) began with an introduction for their team. He serves as the project manager on this project and is in the Coralville office today, but also works out of the Cedar Rapids and Wilton offices. He has been with HDR for a couple years now and has covered a wide gamut of projects from climate studies to floodwall projects, to building bridges

and roads.

Marcella Thompson (Director of Sustainability and Resiliency, HDR) is from the Omaha, Nebraska, office and has worked in the sustainability field for just about 20 years.

Jeremy Cook (Senior Economist, HDR) is also from the Omaha Nebraska office and the lead for this part of the country on sustainable return on investment modeling that was used here for the City of Iowa City.

Mays gave a quick background on HDR. They are worldwide, working in over 40 countries, with ongoing projects across the world. They were established back in 1917 and now have 10,000 plus employees and a couple of those 200 offices are right here in Iowa. Mays noted the City has been a leader in environmental stewardship and sustainability for decades, what began as resource conservation and energy efficiency back in the 1980s and has really evolved into more of a focused effort to take action on climate change now. Back in September of 2018, the City Council adopted a Climate Action and Adaptation Plan and set goals for City-wide carbon emission reductions. Mays believes that goal was originally set at 25% to 28% from 2005 levels, reduce that down by 2025 and then 80% by 2050. The bar actually was raised recently by this Commission and City Council and by a unanimous resolution to increase reductions up to about 45% now from 2010 levels by 2030 with a net zero goal for 2050. This is a big push, very proactive approach, by the City. This project's general purpose was to evaluate those strategic alternatives that would efficiently capture and beneficially use or reuse methane from both the wastewater plant as well as landfill operations so as to enable the City to take that step forward for implementing their Action Plans. This project then was developed and started to focus on two priority action items: action item 3.7, which is a study to efficiently capture and use methane from the wastewater operations, as well as action item 3.8, which is, conversely to study the energy generation from the landfill methane. Mays noted this also tied back into a couple other action items such as frequency to increase the composting of organics, those organics certainly lead to the generation of methane, as well as action item 1.4 to increase the onsite renewable energy systems and electrification. This project really tied all those action items together and looked at it as a cohesive picture. The analysis also included a triple bottom line approach, or SROI, that looked at all of the capital investment needs, the lifecycle greenhouse gas impacts, as well as the energy return on investment. Cook will talk a little bit more on that later.

Mays next discussed a brief history of the project. They started this about a year ago, last February. They provided a waste shed analysis, looking at the solids and organics that are currently managed by both facilities, as well as what an incremental increase of waste could do to that biogas production. Then they looked at both facilities as a whole and looked at what their existing and future conditions of each facility was going to be, and the opportunity for any recovery and reuse of biogas through the study period, which was looking at a 30 year time period, from 2020 roughly to 2050. Then in May they provided a biogas utilization technical memo that really evaluated all the different options that they consider for utilizing that biogas at both facilities, and included a natural gas pipeline injection option, electricity generation, and then also a natural gas replacement. In August, they tied this all back together into the report that was in the agenda packet, that evaluated those current and future reuse alternatives and considered the greenhouse gas emission reductions to energy return on energy invested and the SROI framework.

With regards to the existing conditions at the two facilities, the wastewater treatment plant itself is the largest user of electricity and natural gas within the City. It processes just under 11 million gallons a day. Methane there is produced predominantly on site during that anaerobic digestion, and then its reused in on-site boilers that heat the biosolids and promote that digestion. The remainder is flared off. There is about 80 CSM is produced currently. The landfill serves Johnson County, Kalona, Riverside, and manages approximately 130,000 tons a year of waste. Food wastes are approximately 25% of that total waste mass and about 35,000 tons. Methane produced there during the waste decomposition process is collected and then flared. Current levels have that around 945 CSM, so there really is a true order of magnitude difference between the wastewater treatment plant and the landfill, which something to keep in mind when as they look at alternatives.

Thompson reiterated the feasibility study was included in the agenda packet and that she just wanted to point out that throughout the rest of presentation they'll see little footnotes that reference specific sections to that study. Thompson said she would be reviewing the alternatives as related to both the facilities, the waste diversion scenarios, and the greenhouse gas emission impacts that they built into the SROI model that Cook will talk about. She reiterated that of the two facilities the landfill produces orders of magnitude more biogas to work with, which certainly factors into the greenhouse gas emission reduction potential. Thompson noted what is interesting about these facilities, and that they see this across cities, is that while they in themselves often represent a very small part of the City's greenhouse gas inventory, they are also enablers of change. So in addition to managing emissions at the site, they can also offset emissions, which is why reuse is such a strong potential.

Thompson said the first option they looked at, which they will refer to as "Alternative One" and "One-A", is co-digestion and pipeline injection at the wastewater plant, and "Alternative One-B" is the same thing: pipeline injection at the landfill. This is where they would take that biogas, clean it up to pipeline quality, inject that into the pipeline to a standard that can meet the Renewable Fuel Standard, and sell that on the grid market. The City would benefit through some direct emission reduction on site, but there would not be the same offset within the City boundary as those purchasing the grid credits would get the reduction out in their realm. The second alternate is electricity generation. This also applies to both the wastewater treatment plant and the landfill. She explained this is the same concept but at different scales at both facilities. They would take that gas, clean it to a quality that it can be used in a generator on site and then in both cases they assume that the quantity of electricity generated is greater than that any of those facilities can consume so it would involve a partnership with the utilities to put that back onto the grid. They assume that through that agreement, the City would be able to retain that renewable energy credits, which would help offset a portion of the City's electricity use with that onsite renewable energy generation. The last option, "Alternative Three," is natural gas replacement, and that would only apply to the wastewater treatment plant. Similar to pipeline injection, this alternative is again where they're cleaning that gas up to an equivalent to natural gas, but it would be used on site to displace natural gas that used and there will be realized cost savings as well as the greenhouse gas reduction benefit. Thompson reiterated in all cases when they're thinking about biogas, it is considered a biogenic carbon source ,so when they're composing the City inventory, biogenic carbon is recorded separately and they would realize that reduction related to natural gas or electricity generation.

Thompson also noted as they walked through two facilities with three alternates, the other key factor was a lot of the City's climate action strategies are interrelated and certainly in the case of

organics management, and what the City pursues from incremental diversion will impact those. They looked at three scenarios, one is the business as usual, how much organic material is being diverted today. They also looked at a scenario which they called the “1500 tons per year” scenario, which represents the incremental capacity of the wastewater treatment plant to co-digest those organics. The second one is a low diversion alternative, which is a 20% incremental capture of organic material which equates to about 8500 tons per year. That would be in pursuit of the organic’s recovery climate action strategy. Thompson stated they looked at these scenarios, specifically in those earlier studies, in terms of how would that impact the methane generation both at the wastewater plant and the landfill, and then they ran through the SROI analysis for both facilities and the three alternatives for these three different scenarios.

The last thing Thompson wanted to touch on is the greenhouse gas emissions impact that they considered, which is shown on table 10 within the report. They looked at three different greenhouse gas emission impacts. One is the direct emissions which takes energy and results in emissions to add additional equipment to scrub the gas to run the generators, so there is some invested carbon in those technologies. They looked and accounted for any incremental emissions from those processes to beneficially reuse the gas, and they also use the EPA war model to consider lifecycle cradle-to-grave impacts. She noted that they went from the baseline business as usual, what is being diverted, to what happens if they pull that out of the landfill and co-digest that or if they composted that, et cetera. That accounted for the lifecycle emissions from those landfill diversion alternatives. The final one is avoided emissions, particularly in the electricity generation, the natural gas displacement, there are avoided emissions from not having to procure that electricity from the grid, or by natural gas, and combusting that, so those were accounted for as well. That's one of two key inputs into the SROI model, the second one was also the energy return on investment.

Cook next discussed the energy return on investment which is basically a fairly straightforward calculation, it's a ratio of the energy output that's gained against the energy input that's required. It can be thought of as a ratio of how much energy do they get versus the energy required to produce that level of energy output. Similar to the greenhouse gas emissions, for this analysis, they worked through what the equivalent amount of energy that's delivered is, whether it's natural gas or electricity, and then put those all in common units and compare the energy output minus any of what they call parasitic energy, or the energy used to produce that level of output. Then they created a ratio of that against the direct energy input into the calculation that gave a life cycle. They also competed this over the lifecycle of the project, so over a 30 year period, that ratio shows the rank and the overall score. The higher the score, the better the EROEI. Cook said they have the ranking of those for all 16 alternatives. Cook noted he has touched a little bit on SROI or sustainable return on investment and showed a table of the biogas utilization report. What SROI is, is a triple bottom line economic analysis framework that came out of the Clinton Global Initiative in 2007. It's something that HDR developed in partnership with the Clinton Global Initiative, as a way of evaluating broader climate and sustainability and resiliency effects of projects beyond just traditional cost benefit analysis frameworks. It relies on a few key principles, one is a triple bottom line accounting of impacts. Economic, environmental, and social are the key bins there, and they also try and monetize as much of the range of effects as possible. In this case, for this project, they focused on electricity generation benefits, greenhouse gas emissions against lifecycle costs. But then another aspect of this is to try to incorporate in as many of both economic or monetize values as they can, and also key performance indicators. Cook noted they can't always monetize everything, saying even as an economist he likes to try and monetize effects and put them into general comparisons because

that gives a common unit for comparing impacts, but it can't always be done. The EROEI as well as the greenhouse gas are the two key performance indicators that really relate to the effects and goals of the Climate Action Plan here for City of Iowa City. Cook said he basically will try and present as much as he can for both the performance indicators, non-monetary effects as well as economic values.

Cook showed a summary report (from table 12, page 28, of the feasibility report) and pointed out basically they had taken all the results from their economic framework, their benefit cost ratios, and they computed the EROEI as well as the greenhouse gas reductions and converted everything to an index. They then took those indexed values and combined them into basically a composite score that helps prioritize each of the three alternatives for the different diversion scenarios at both the wastewater treatment plant and the landfill location. Camp noted for example, if they just undertake pipeline injection, no diversion at the landfill location, that would be “Alternative One-B.” That alternative is given a score of 0.8, versus comparing to the low diversion scenario, which has a score of 0.86. Basically what they're saying here with these alternatives is the higher the score, the better the alternative, and that basically gives a ranking or hierarchy in terms of the outcomes. They also show the same outcomes basically doing nothing at the landfill and doing only actions at the wastewater treatment plant. Following this, they recognize that there's potential for combine ability of all these actions. For example, they could do something at the landfill location, maybe some electricity generation, and then do something at the wastewater treatment plant, following that same organization of alternatives. He showed how they need to follow the alternatives, because it's important to note that they've got to stay within diversion scenarios when comparing actions and trying to determine what is the best strategy. If they were to just think about the City staying at no diversion but doesn't increase any incremental diversion over where it's at, then they can show what is the best return is actually doing it first at the landfill location, doing pipeline injection, the alt one b, no diversion, but with a score of 0.8, and then that could be combined with pipeline injection at the wastewater treatment plant location for a combined score 1.02. Camp pointed out if they walk back through the individual results for EROEI, benefit cost ratio and the greenhouse gas emissions, they can see how those scores combined and get to the 0.8 and 0.23. Similarly, as they go up to the 1500 ton per year diversion they have a similar construction but this time it is actually the highest score because they're getting some value back in terms of electricity generation from the pipeline injection at the landfill as well as adding the electricity generation at the wastewater treatment plant. He stated that also holds true with the low diversion scenario, if they were to increase up to 8500 tons per year in terms of diversion, they would see again a score of 1.37, basically the highest ranked alternative which again includes pipeline injection and electricity generation. Cook noted this is all summarized with an explanation of how all this works in the in the feasibility study, and that section of the report lays out basically how to follow the logic for the table and combine alternatives.

With that in mind, they can see where the highest ranked alternatives are, so the next question that came out of this was what the financial implications of this are. Is it financially actionable? Cook said they added a supplemental analysis at the City's request to do like a financial payback period to see how this would all pencil out. Cook showed a quick summary of the financial analysis, and again pipeline injection at the landfill is the best alternative in terms of if they're just going to do one alternative initially. From a financial viability standpoint, it is actually the only alternative that generates a payback on its own within 10 to 30 year period. Camp did note however all of these alternatives can break even with a bond term of at least 18 years, which is a fairly robust result considering a lot of bond terms go as far as 20 to 25 years. For all

of these alternatives operating costs do exceed the financial benefits, so that is the thing that's really holding them back here in terms of the other alternatives. They did identify that there is potential that if on the electricity side the City could get $20 million in grant funding, or if the City were able to negotiate electricity sales buyback, then there would be potential for electricity generation at the landfill to break even within a 30 year period as well.

Giannakouros asked when discussing injecting if a high cost to clean up the water out of this natural gas and then get into the pipeline is where the big cost comes in. Could they use it there onsite in a boiler? Welter replied it not the water, it's the things that are in the gas other than methane that need to be scrubbed out of it. At the wastewater plant they have a lot of toxins and so there's special equipment that has to be put into to get it to the point where they can either put it in equipment and burn it and generate electricity with it without damaging that equipment. Or to get it to the quality that it needs to be to inject it into the MidAmerican pipeline, it has to be of a certain quality. It's all the extra things that are in it, because of the types of organics and the types of wastes that are there.

Giannakouros acknowledged obviously they're cleaning up the gas so that it can be put in a pipeline to a higher quality. However, keeping it on site and generating electricity, that's expensive versus cleaning it up. Welter said they will have to clean it up either way, whether it is used on site or off site, because it has to be to a quality where they can inject it into the pipeline meeting that requirements, or to a quality where they can actually burn it in the equipment that they have on site, a turbine or another system, and not damaging that equipment.

Mays summarized and laid out the potential next steps. The Commission all received a copy of the report, he believes. His whole team is going to be available at the next meeting to field any other more in depth questions and give the Commission the opportunity to go through that report in a little bit more detail. In a general summary, she said, this project looked at 18 unique possible combinations in addition to just those three scenarios at each facility. He did want to point out that when they look at low diversion, that low diversion is at 8500 tons a year. That actually exceeds the capacity that the existing wastewater treatment plant can take, so that does require a separate co-digestion facility or an expansion of the existing digester facility. He explained that is part of why those costs throughout the report are so high on those items. Mays noted the first step is really for the City and the Climate Commission to come to terms on what targeted diversion scenario makes the most sense. The report lists a couple different alternatives and options, and they really want to be able to narrow down the list so then they can look at what the next steps would be and dig further into the cost estimation. He added it is important to remember this is the study level. Those cost estimates that are put together have a fair amount of contingency in there to cover some of the unknowns that are certainly numerous at this point in the process. Once they have more of a clear path forward, they can start to connect the dots between other projects and maybe there's a chance to align projects, find some efficiencies and costs options to minimize that capital increase at the beginning. Mays noted the path forward is listed in both the executive summary of the report as well as at the end of the report and believes they offer at least an idea of what needs to take place for the City and the Commission to be engaged as well as the community level. Maybe there's public private partnerships that certainly come into play here to figure out a way to bring some of these action items to reality. But the next step will be more of a conceptual design process.

Soglin thanked them for writing something that's incredibly complex into something that they can start to grasp. She did glance at some pages in the study but was wondering if they

included case studies or examples that are in existence in other cities. If not, she asked if they can provide some links and some examples. Mays replied they didn't provide any case studies but they can give that some thought and get some.

Welter stated City staff did a lot of things leading up to the development of the request for proposals that they sent out and got back many responses from different consultants. They ended up interviewing three different teams and HDR was one of those. Staff went to Dubuque, Des Moines, Muscatine, and Amana and looked at a lot of other operations that were doing things that they thought they might be interested in. So City staff saw some of those case studies but didn't include that in the study because the idea of the study is for it to be an open sandbox and not some sort of preconceived notion for the consultant of what the City thought they wanted. The City wanted the consultant to be able to use their expertise to tell us what the most feasible options are. Soglin appreciated that but wonders if Staff would be willing to share with the Commission in the future their thoughts on what they saw when they went to other cities compared to the alternatives in the study.

Thompson noted that all three alternatives that were looked at are all viable, they're proven technologies. She thinks some of the things to think about strategically are things like electricity generation, does it meet the goal of doing it renewable generation onsite with renewable natural gas. They also know at the same time that the grid is changing, that's not a static comparison, and they did account for that in their analysis. As utilities continue to increase their renewables and the grid keep moving they have to think about that in the long term. She also added pipeline injection is essentially the same as natural gas displacement but instead of doing that onsite for their own equipment, they're putting it into the pipeline so that there's benefits outside of Iowa City that are being realized as people purchase that Renewable Fuel Standard.
She noted it was mentioned at the beginning of this call there may be some change across all fronts from a federal perspective, so how that affects Renewable Fuel Standard changes is anyone’s guess.

Tate wanted to raise a question to be answered at next month’s meeting around the SROI analysis, which is positive addressing the triple bottom line, but he thinks in reality here is mostly focused on environmental and economic dimensions of it, so wondering to what extent are social benefits and costs and burdens relevant or played a role in the analysis.

Monroe agreed the consultants will return at the next meeting, so the understanding is that the Commission will take time to review the materials and understand what the options are, and what exactly was done. They know that the potential projects are complex and they're extremely expensive. This is a long-term view or goal. This study was an aspirational goal of the Climate Action Plan, but if the Commission wants to recommend some action, either the incremental actions or planning for a larger project, the Commission is the recommending body to Council.

Welter acknowledged it was an excellent presentation. They got some 300 pages that went into the final study for different parts of that study, so this presentation was whittled into some of the more important aspects of that. He also wanted to note Tate’s comments on the SROI and that was one of the specific reasons the City picked the HDR team is because they had this approach, none of the other consultants brought such a broad reaching approach. Most of the other consultants ultimately were project based, and that approach was going to determine whether alternative was feasible mostly on economics. HDR was able to quantify in these indexes what the impact was on net greenhouse gas and what the impact was on net energy.

Additionally, their approach also brought in some of these health and community aspects, just based on the merits of what the SROI model was.

Update on Working Groups: Tabled to next meeting due to time constraints.

RECAP OF ACTIONABLE ITEMS FOR COMMISSION, WORKING GROUPS, AND STAFF:

Krieger noted next meeting's agenda will include the working group restructuring discussion, in addition to a follow up discussion for the methane project. He also reminded everyone if there are any working group meetings between now and the February meeting, make sure to get the report summary of the activities to Gardner and Monroe by the last Monday of January.

ADJOURNMENT:

Soglin made a motion to adjourn.

Giannakouros seconded the motion.

A vote was taken and the motion passed unanimously.

Climate Action and Outreach Office Updates: Dec. 2020/Jan. 2021

Recent Activity

Community-wide Climate Action

- TIF-funded climate action incentive program underway
    - Application portal opened, first project to be submitted
    - Ongoing discussions with MidAmerican; projects that qualify for their rebates will not be disqualified by participating in TIF-funded opportunity and, when combined, can have up to 75% of project cost covered.
- Smart Series partnership with Iowa City Area Business Partnership
    - Four dates selected Feb. 9, May 11, Aug. 10, and Nov. 9 for virtual presentations on climate action for area businesses
    - First session will focus on energy efficiency rebates and climate action grants
- Green Iowa AmeriCorps
    - 207 audits/Home Energy Kit completed so far
    - 69 education/outreach events so far
    - Application to host a team in 2021-2022 successful
    - AmeriCorps team working with upcoming Linn & Johnson County Grow Solar initiative
- Energy Efficiency Building Projects
    - Builder/project identified to showcase energy efficient home in Parade of Homes
    - Working with Neighborhood Services on energy efficiency demonstration rehab project
- Earth Day Neighborhood Energy Blitz
    - Door-to-door campaign will utilize AmeriCorps members, high school environmental clubs, and Climate Ambassadors
    - Staff committee formed to assist with program design
    - In communication with South District neighborhood as possible pilot site

Marketing RFP

- In negotiations with consultant over finalized scope/contract – going to Council for approval in Feburary
- Project will include a vulnerability analysis for populations in Iowa City and related communications strategies
- Compiling all climate-related communications and marketing collateral in anticipation of project start in February

Climate Ambassadors

- Second cohort schedule to participate in training Feb. 3-March 24
    - Drawn from pool of previous applicants
- Application portal for third cohort scheduled to open March 22 with next training to commence in late April

Current Grant Projects

- IEDA-Eastern Iowa EV Readiness Planning

    - Both virtual stakeholder events held in January had high attendance and participation
    - EV 101 presentation/project update available for viewing at https://youtu.be/0qUkZRi-4ZQ
    - Outreach has begun to multi-family housing landlords for barrier analysis
- Heartland Carbon Sequestration
    - GIS-based Carbon Management tool under development and nearing completion

Staffing

- Onboarding process to start Feb. 1 for new Climate Action Analyst

Ongoing Projects

Equity Outreach Program

- Collaborating with Equity and Human Rights Division on a Black History Month guest speaker, Richard Mabion, on fostering multi-racial partnerships for climate action and addressing historically disparate access to sustainability resources
- Outreach underway to Community Based Organizations (CBO) utilizing updated stakeholder list
- Shortened equity report being drafted for review

Implementation of Accelerating Iowa City's Climate Actions, tracking and reporting

- Planning/scheduling underway for 2021 (Phase 2) goals

Reporting and Metrics

- Anticipate analyst beginning data compilation for 2020 community-wide GHG inventory/CAAP metrics

Communications (with part-time Sustainability Communications Assistance)

- Ongoing monthly Sustainability Newsletter
- Climate Action Quiz launched in January newsletter: www.surveymonkey.com/r/G2PQ893
    - 124 quiz takers to date, roughly 1/3 provided email address to have chart sent to them showing their areas of high engagement as compared to emissions impacts
    - Analytics collected on quiz participation can help inform future marketing plan

Municipal Energy and Climate

- Data collection for municipal utilities ongoing
- Tracking water usage of municipal facilities
- Municipal GHG inventory reporting (~ every 5 years)
- Regular meetings with City departments
    - Working with staff to incorporate GHG reductions and increase sustainability practices within City operations (new analyst position will take over these responsibilities)

Ongoing Sustainability Groups and Committees

- Urban Sustainability Directors Network groups
- Heartland (Midwestern) Monthly calls, annual meeting
- Johnson County Sustainability Working Group, quarterly meetings

To: City Council of Iowa City

From: Iowa City Climate Action Commission

Date: Dec. 23, 2020

RE: Development Density and Carbon Emissions

CC: Sarah Gardner, Ashley Monroe, Anne Russett, Danielle Sitzman

BACKGROUND

Property developers can apply to the Iowa City staff Form-Based Code Committee, and, depending on the request, to the City Council for "bonuses" to add height to their projects beyond the maximum base height. In exchange for the additional height, the developers must provide prescribed community benefits. The City Council has questioned what impact granting these requests has on overall carbon emissions (also known as greenhouse gases or GHGs) and specifically on the Climate Action and Adaptation Plan (CAAP) the City adopted in September 2018. To aid their decision-making, the City Council asked the Climate Action Commission (CAC) to make recommendations.

SCOPE

This memo outlines the primary issues and offers advice based on the expertise and research of the CAC's Buildings Working Group (BWG) members. Preparing the memo included opportunities for input by City planning staff and the entire CAC. While BWG members have backgrounds in planning, sustainability, architecture, construction, facilities management and statistics, we want to be transparent that we are still limited in our ability to comprehensively address building height issues. With that in mind, this memo offers suggestions rather than prescriptive actions. We considered how selected CAAP actions (17 of the 35 total) might be impacted by increased building height and large-scale development projects. The crux of the matter relates to the pros and cons of taller buildings in terms of (1) amount of GHG emissions, (2) control of sprawl, (3) equity and community connection, and (4) the zoning code regarding maximum height allowed.

OVERALL FINDINGS

Taller buildings (defined for our community as those above six stories) that are built in areas zoned for increased density generally support CAAP goals. However, there are tradeoffs relative to other city and community goals, and within the plan's goals. At the same time, there can be co-benefits, such as for equity and community connection. In some cases, this may require policy change and other deliberate action. Each development proposal must be considered individually for its particular circumstances. We know City staff, the Planning and Zoning Commission, the Board of Adjustment and the City Council are already very mindful of many issues when reviewing development applications.

- We suggest that all staff and commission/board members involved in development decisions be trained on the CAAP goals.
- We also recommend there be an impact assessment and trend analysis of taller buildings and projects approved with a height bonus as they relate to the CAAP actions at a minimum of every five years to help measure effects. Measurement would help develop a greater understanding of the impact and assist with future decision-making. As City staff noted in discussions, other projects can significantly affect GHG emissions in the city core; however, this memo focuses on the specific inquiry from City Council to the Buildings Working Group to address the impact of taller buildings and greenhouse gas emissions.

KEY CONSIDERATIONS

Embodied Emissions vs Operational Emissions

Embodied carbon includes emissions related to project procurement and construction, while operational emissions are those GHG emissions attributed to day-to-day use. The CAAP is based on operational GHG emissions *within* the community, and the metrics are operational or consumption based. However, some plan actions, such as Sustainable Lifestyle actions on regional and global food production, also address emissions *beyond* the community borders. The embodied carbon of buildings fits into this latter category as the majority of building materials installed in Iowa City is harvested or sourced, manufactured, and shipped from outside the community. This memo includes a preliminary review of embodied carbon, but we recognize this is a rapidly developing area of research for the building industry.

What Scale of Development is Considered "Large" or "Tall"?

The zoning code limits building heights based on location, but frequently, the requests for height bonuses are to build above a six-story maximum height. At the same time, the Federal Aviation Administration and the community's airport flight paths limit buildings in Iowa City's downtown core to fewer than 20 stories, depending on the specific site location. This is important to understand because much of the available research reviews building size based on a much larger scale, comparing buildings anywhere from 3 stories to 100+ stories, which is well beyond the scope of the City Council's request.

Density Impacts on Affordability, Inclusion and Equity

Affordability and equity are also crucial considerations. Taller buildings constructed near the downtown core are located on more desirable properties, and thus the higher value of those properties makes development more expensive. A recent project downtown was purchased for the highest cost per square foot of any property in Johnson County. That, in turn, translates to higher purchase costs and rent rates for smaller square footage. More expensive housing in the downtown/near downtown neighborhoods then pushes affordable housing outward to other areas of the community, not allowing for people of diverse backgrounds and incomes to benefit from the more compact walkable neighborhood and services provided downtown.

RECOMMENDATIONS

- The BWG recommends the impact of land and development costs on affordable housing in the community be tracked over time to evaluate trends. The Riverfront Crossing Form-based Code already includes an affordable housing requirement for residential development.
- We also recommend that affordable housing units be incorporated into developments throughout downtown/near downtown, not just in the Riverfront Crossing District, to offer those benefits to a more diverse population rather than the "fee in lieu of" being the default solution. A height bonus is part of existing options for added affordable housing.

ANALYSIS OF CLIMATE ACTION AND ADAPTATION PLAN (CAAP) GOALS

The analysis outlined below reviews development density through the framework of the applicable 17 CAAP actions. Resources that helped shape our recommendations were more readily available for some actions than others. Generally, our review showed that in relation to the CAAP, there are more benefits to denser, taller buildings than negative impacts.

Buildings Action 1.3 – Increase Energy Efficiency in New Buildings

Building elements that most impact energy efficiency are the mechanical and electrical systems and the building envelope: wall materials, thermal insulation, air barriers, and openings (doors, windows, and louvers). A taller building can stack the same amount of living space into a smaller area as numerous shorter buildings spread out over a larger area. This stacking reduces exposure to elements and provides more insulation to each living unit within the structure. For example, imagine 10 single-family homes on one block as 10 cubes, each with six sides that need to be insulated and weather-protected. Now imagine the same 10 homes as apartments stacked on top of each other. The top and bottom of nearly every cube are now protected from the elements, reducing the amount of materials and insulation needed per unit. Typically, less energy is then needed to heat and cool those homes within the taller building. This is advantageous for both embodied and operational carbon emissions.

Compared to many locally existing buildings constructed when there was less concern with GHG emissions and thus may have lower performing envelopes, glazing, insulation, etc., new building construction has the ability to control those elements that may be installed and last for the lifetime of the building. New buildings can also take advantage of the latest technology and utilize more efficient mechanical and electrical systems. The question is whether an owner or developer will decide to install more efficient, lasting systems. Whether new buildings are short or tall is not the deciding factor; it's whether there is a drive or incentive to install higher performing systems.

The market can sometimes drive this--for example, home-seekers might purchase or rent more efficient homes if they know their utility bills will cost less. Most often, the biggest drivers to installing more efficient systems are initial cost or policy, any regulation that does or doesn't require it, and any incentives. Examples from other cities show that incentive programs that offset initial costs and streamline the regulatory approval process help overcome barriers to enhanced energy efficiency and performance. Iowa City currently has an incentive program tied to TIF monies that requires certification under a green building rating system, either LEED or NGBS.[1] Shorter buildings that meet current zoning regulations don't trigger a more thorough review process, and developers often don't seek financing incentives that would require certification and higher performance standards.

RECOMMENDATIONS

- We recommend that buildings that qualify for the utility's Commercial New Construction program or similar incentive programs should be required to participate in those programs. Sometimes, developers are unaware of these opportunities.
- Longer-term, we recommend that all development projects include a projected energy use and/or sustainability assessment as part of the permitting process. The assessment could be comparable to LEED or NGBS, or the City could develop a set of high-performance standards. However, at this time we have not found an "easy" assessment. More research is needed. For publicly owned buildings, there are many examples of programs to build sustainability into such buildings. These examples could inspire standards for private development. [2]

[1] LEED or Leadership in Energy and Environmental Design is a green building rating system managed by the U.S. Green Building Council. NGBS or National Green Building Standard is a green building rating system managed by Home Innovation Research Labs

[2] https://www.usgbc.org/articles/florida-city-passes-green-building-ordinance

Buildings Action 1.4 – Increase On-site Renewable Energy Systems and Electrification

A taller, denser building has higher energy demand over the same site area of a shorter building. With more demand but the same available space for rooftop solar arrays, the opportunity for on-site renewable energy systems to meet the increased demand on a taller building is very limited. For example, one recent downtown project projected that a rooftop solar array would meet only 5 to 10% of the building's total power needs. Recently updated mechanical and fire codes require more maintenance and safety clearances around roof-mounted solar arrays. These requirements reduce the overall area available for arrays and thus reduce the overall production capacity.

With the community's utility provider dedicated to achieving 100% renewable energy for its power production (determined by the annual average production across its entire portfolio), achieving higher production of on-site renewable energy is not as advantageous from an emissions point of view as it would be in a community that is supplied more by fossil-fuels on average. At the same time, solar can provide service when wind power from the utility is not available. In addition, the local utility will maintain some coal and/or natural gas plants so they can maintain a stable baseload of power, and there can be financial savings over the long run for buildings owners who use solar. It may be more important in the Iowa City community to convert building systems from natural gas to electrical power. Taller buildings with distributed systems tend to have mechanical systems that are electrical power-based, rather than natural gas-based, to minimize the number of gas meters and lines running through the building and to eliminate additional trades and materials in the project.

RECOMMENDATION: While we found no documented evidence shorter buildings (i.e. six stories or less) use natural gas more often than electrified systems, it could be more likely and should be reviewed further.

Buildings Action 1.6 – Support Energy Benchmarking Tools

Energy benchmarking and management tools are useful for at least two main reasons: they provide a reference for the market to compare projects and help identify trends and opportunities for decreasing energy use and/or costs. One significant disadvantage for some large developments relates to electrical utility meters. Oftentimes property owners prefer that each tenant pay their own utilities, determined by the meter serving an individual apartment or condo. When this is the case, the whole building can't be tracked in the benchmarking program; each individual unit would need to be added to the tracking program by the utility account holder. It makes for a very burdensome activity that's unlikely to be comprehensive (people may not have time, interest or computer/language skills to enter their own data and they may also lack incentives to do so). Alternatively, the City or the building owner should work with the utility to make this data readily available and work around barriers that rely on individual input.

RECOMMENDATIONS

- We recommend that energy benchmarking opportunities be extended through educational/outreach to developers of local properties, no matter the size or age of the property.
- We also recommend the City, community partners, and property owners advocate for a mandatory energy benchmarking program.

Transportation Action 2.1 – Increase Use of Public Transit Systems

Many factors relate to reducing vehicle miles traveled and overall transportation GHG emissions. Land development and density are major factors. When more people live in a denser area with services nearby, they could potentially drive less and have fewer vehicles per household. That decision is often dependent on mixed-use development, that is, having a mix of housing, workspace, and desirable services and amenities nearby.[3] Another major factor is the availability of public transit. When a robust transit system is available, more people use it.

If more people are concentrated in denser areas rather than in outlying areas, it could potentially shift the use of the public transit system. There might be an increased transit need within the denser area for accessing destinations, especially those located more than one mile from the core as well as for outbound travel to access outlying areas even further away. A transit primer for small cities in Oregon noted that linear routes can better serve downtowns versus circuitous routes (p. 34 of "Transit in Small Cities.").[4] The City of Ann Arbor also is considering some promising initiatives. We wanted to raise these observations while recognizing that the city's Transit and Resource Management Department is knowledgeable about trends here and those seen in cities of similar size.

Transportation Action 2.2 – Embrace Electric Vehicles, Alternative Fuel Vehicles, and Other Emerging Technologies

Parking provisions for low-rise development (six stories or fewer) and mid- to high-rise development (seven or more stories) have taken two different paths in our community. A cursory review of parking requirements for low-rise (and less dense) development often results in spaces provided at-grade in surface parking lots adjacent to the buildings or as one-story of parking located below the building. A building's residents may use on-street parking when the development doesn't provide enough space to meet needs. High-rise development (higher density) typically includes multiple levels of parking in the lower and/or underground floors of the buildings to meet the City's parking ordinances and/or they are located near managed parking structures and are able to take advantage of community-based approaches to off-street parking. These examples outline the potential benefits and synergies of taller/denser development and the importance of its location. In addition, it may be easier and less expensive to install electric vehicle (EV) charging stations within parking structures where the required infrastructure is nearby compared to surface parking lots where infrastructure needs to be added. This would seem to make a case for taller/denser development. When households in denser neighborhoods reduce their number of vehicles, they tend to increase use of car-sharing services.

RECOMMENDATION: There's a potential opportunity to increase EV use in the community by supporting and transitioning car-sharing services to electric vehicles.

Transportation Action 2.3 – Increase Bicycle and Pedestrian Transportation

Similar to points made in Transportation Action 2.2, denser developments in already developed areas reduce the need for or use of vehicles and their contributing GHG emissions. As outlined in the CAAP, more walkable neighborhoods increase the likelihood of walking and bicycling.

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[3] The National Academies Press, Transportation Research Board Special Report 298, "Driving and the Built Environment. The Effects of Compact Development on Motorized Travel, Energy Use, and CO2 Emissions".

[4] "Transit in Small Cities" Primer: https://www.oregon.gov/ODOT/RPTD/RPTD%20Document%20Library/transit-facilities-in-small-cities.pdf

RECOMMENDATION: Developers should continue to be encouraged/required to install bicycle parking and storage options that are protected from weather for the residents of the property.

Transportation Action 2.4 – Increase Compact and Contiguous Development

Taller, denser development in developed areas of the community such as downtown or the Riverfront Crossings neighborhoods directly meets the intent of this action although compact and contiguous development is not limited to larger developments. Compact development includes the "Five Ds": density, diversity, design, destination, and distance to travel ("Land Use and Driving" by the Urban Land Institute).[5] Mixed-use (i.e. diverse) developments, a combination of residential and commercial uses within the same property, help reduce vehicle miles traveled (VMT) across the community and should be encouraged and incentivized. Studies show mixed-used development and other features (design, etc.) can reduce VMT considerably within a particular area and by extension lower the average VMT throughout a community. Factors related to the Five Ds and VMT reduction were studied by a Massachusetts State Smart Transportation Initiative (2017), which found a 4.7% reduction through just mixed-use development. As this type of development is usually done in conjunction with other measures (e.g. density and sidewalk coverage), VMT reductions are even higher, around 16%.[6] A study by the Arizona Department of Transportation showed VMT can be reduced by approximately 25% through mixed-use development.[7] These reductions then translate to reduced greenhouse gas emissions and potentially savings in road maintenance. The City of Ann Arbor, Michigan, has VMT-and density-related information that one of the BWG members can share with staff.

Transportation Action 2.6 – Manage Parking Options

The recommendations associated with this CAAP action include reducing parking requirements for development projects and incorporating more comprehensive approaches to alternative modes of transportation for residents, including car-sharing, carpools, bicycles, and walking. As part of the site and/or design reviews for projects, City staff could work with developers to encourage the development of comprehensive transportation plans for their projects. It's our understanding staff plan to re-evaluate city parking standards.

A new report (October 2020) from the Brookings Institute, "Connecting People and Places: Exploring New Measures of Travel Behavior," addresses issues related to most of the Transportation actions and topics discussed above. The report shows how digital data and new tools can help large metro areas (e.g. Chicago) better understand how people actually do travel, and thus better inform municipal transportation-related decision-making and planning.[8]

RECOMMENDATION: While the geographic areas in the recent Brookings report have much larger populations than our metro area, the findings about geospatial data could help Iowa City's efforts.

Waste Action 3.1 – Increase Recycling at Multi-Family Properties

Unlike single-family residences and small (four or fewer units) multi-family housing, larger multi-family

[5] https://uli.org/wp-content/uploads/ULI-Documents/Land-Use-and-Driving-Low-Res.pdf

[6] https://usa.streetsblog.org/2017/02/21/a-six-point-plan-to-cut-traffic/

[7] https://archives.huduser.gov/scrc/sustainability/newsletter_092712_3.html

[8] https://www.brookings.edu/wp-content/uploads/2020/10/Corridors-of-Demand.pdf#page=17

properties do not have curbside pick-up provided by city services. Recycling at these properties must be contracted through independent hauling companies, which involves management and expenses that have been barriers to wider adoption by local developers. In 2016, the City began requiring that all multi-family facilities larger than four units provide recycling for their tenants. The policy is enforced through rental permit renewals. We applaud the City for taking action to fulfill this need.

Waste Action 3.2 – Increase Composting of Organics

See Waste Action 3.1 for similar issues. While recycling has been mandated for multi-family properties, composting has not.

RECOMMENDATION: While we understand composting is a newer service in the community and is growing, we recommend that in the future it follow a similar approach as recycling.

Waste Action 3.3 – Reduce Waste at the Source

Consumption is a personal choice, so there is limited impact on this issue; however, larger, denser developments provide opportunities to make a broader impact on source reduction and thus reduce GHG emissions. With more people living in one location, educating residents in multi-family facilities could be more efficient and effective.

Waste Action 3.4 – Establish Partnerships to Divert Construction Waste from the Landfill

Large developments with larger mass have higher volumes of construction waste than smaller projects and thus a greater potential impact if that waste could be diverted from the landfill. There is a unique opportunity to partner with developers of these projects to approach waste diversion in a more comprehensive way. Prefabrication can reduce on-site waste. However, locally, most prefabrication (prefab) has been limited to the building envelope on large-scale, multi-unit projects, per local architects' and builders' experience. Previously developed sites, such as those located in the downtown core and nearby neighborhoods, have more demolition waste as a result of removing existing structures, and this is an added concern as the downtown area is redeveloped. As with cardboard recycling, it is likely that a mandate along with facilitating the ease of depositing of debris (e.g. specific wood and masonry deposit areas at the former bus barn) would divert more construction waste from the landfill.

RECOMMENDATIONS

- A waste management plan could be required as part of permitting. Alternatively, the City could provide the service to these construction projects as an incentive to divert waste from the landfill. Involving Habitat for Humanity Restore and expanding their capacity to receive materials could also help.
- Expand Action 3.4 to explicitly include demolition waste, not just construction waste.

Adaptation Action 4.5 – ***Assess Citywide and Neighborhood Stormwater Management***

Developments of any size should be carefully reviewed for their stormwater management plans. While not always the case, taller, denser buildings tend to have zero lot lines based on their location, so most stormwater is collected on the roof. This stormwater could be managed in such a way as to slow outflow to the city's stormwater system through collection and holding for a period of time in at-grade or below-grade storage and water quality tanks or through use of green roofs to absorb the water. Currently, the City's Public Works uses a standard that is believed to meet this goal. Smaller,

less dense developments might have more surface parking and thus more hardscape and stormwater to manage, but potentially could have more site/landscape to infiltrate the stormwater on-site.

Adaptation Action 4.6 – Expand Iowa City's Tree Canopy

Because larger developments tend to have zero lot lines with little or no open space, there are fewer opportunities for trees on the property as compared to smaller developments. Trees can help capture carbon, as outlined in the CAAP. City staff is currently reviewing landscaping and street tree regulations.

REOMMENDATION: We recommend City staff work with developers to identify opportunities for tree planting as part of the site plan review within the property boundaries and/or within the right-of-way.

Sustainable Lifestyle Action 5.1 – Encourage a Plant-Rich Diet

Compared to single-family residences, multi-family properties of any size could take the opportunity to educate residents of the beneficial impacts of a plant-rich diet. More people in one location has the potential for larger impact. Building-wide programs and events could reinforce this education through targeted outreach.

Sustainable Lifestyle Action 5.2 – Expand Community Gardens and Access to Healthy, Local Food Trends

Multi-family developments of all sizes generally have less access to on-site or nearby community gardens as they tend to have less on-site open space and/or are located in denser, more developed neighborhoods.

RECOMMENDATIONS:

- Potential opportunities to expand community gardens for residents of these properties would be to incorporate urban agriculture practices including roof gardens and/or indoor vertical gardens, which could be discussed during the development review process and through other educational means. There could also be educational opportunities about access to existing community gardens; however, this could have a negative impact on GHG emissions related to residents traveling to the community garden locations.
- Another approach could be to encourage access to local CSAs (community supported agriculture) by designating the multi-family property as a hub for weekly distribution. This could have the added benefit of contributing to equity, wellness, and the local food economy.

Sustainable Lifestyle Action 5.3 – Encourage the Purchase of Local Products and Responsible Purchasing

The construction of larger developments requires more materials and resources than smaller projects. There is an opportunity to partner with, encourage, or mandate through new policies the use of responsible purchasing standards. These types of standards are included in green building rating systems, and the strategies could be required as part of incentives for developers. This type of purchasing may at first glance appear to do more to reduce embodied and offsite emissions than operational emissions. However, if durability, energy efficiency (as appropriate) and other procurement factors are considered, there is more chance to reduce operational GHGs as well.

Draft Proposal for Climate Action Commission Working Group Restructuring

Currently, the Climate Action Commission has five working groups focused on different aspects of the Climate Action and Adaptation Plan (CAAP) for Iowa City: Buildings, Transportation, Waste, Equity/Adaptation, and Outreach. Two of these groups, Buildings and Outreach, have regular monthly meetings, while the other groups have experimented with meeting on a monthly, quarterly, and/or as-needed basis. Recent discussions about restructuring the working groups have explored options to help make more efficient and productive use of the working groups, some of which have struggled to find and maintain a good work flow.

Two ideas were brought forth in the November meeting of the Climate Action Commission to explore. The first would be to allow the Transportation and Waste Working Groups to stand down or dissolve, as the majority of the projects identified in the CAAP in these areas are currently undertaken by City staff in departments responsible for transportation and resource management services. A new working group could then be formed to review adaptation plans and actions in other communities with a goal of making recommendations for the next CAAP update, a project not currently assigned to a specific department/City staff. The Outreach Group would continue to function as it currently does, and the Building Group would potentially revert to meeting approximately every other month instead of monthly until another major project is assigned. The Equity Working Group would focus primarily on equity while allowing the new Adaptation group to assume that half of its responsibilities. All Commission members would have the opportunity to move or stay in the working group(s) that most aligns with their knowledge and interests. Once the Adaptation group completed its project, it could then stand down until again needed.

The second idea brought forth was to move toward a project-based model for forming new working groups. Specific projects needing attention and input from Commission members would be identified, and then representatives from some or all of the five current working groups would be assigned to this subcommittee, so that perspectives related to buildings, transportation, waste, outreach, and equity/adaptation could be brought to bear on the projects as needed. Once the projects were completed, the subcommittee would dissolve. This model would require members to participate in both the current working groups as well as the project subcommittees to which they are assigned.

Biogas Utilization Feasibility Report

CAAP – Methane Recovery Feasibility Study

Completed by HDR Engineering, Inc. on behalf of the City of Iowa City, to support the Climate Action and Adaptation Plan (CAAP) and the associated Action Items 3.7 and 3.8.

Iowa City, Iowa
December 30, 2020

CITY OF IOWA CITY

VERSION: 2

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Executive Summary

In December 2019, the City of Iowa City (City) selected HDR Engineering, Inc. (HDR) to perform a Methane Recovery Feasibility Study to address two specific Action Items included in the Iowa City Climate Action and Adaptation Plan (CAAP):

> **Action Number 3.7: Take Action on a Study to Efficiently Capture and Use Methane from Wastewater Operations**
>
> *"After water is used by residents, it flows into the wastewater system and then goes to the City's Wastewater Treatment Facility. While the City currently captures methane gas from the digesters used in the wastewater treatment process, only a portion of the methane is used to offset natural gas usage for the plant. To explore other options for further management of wastewater greenhouse gas (GHG) emissions, the City should conduct a study to determine the feasibility of using all captured methane to create renewable fuel or electricity that can be used to operate the facility, and take specific actions based on the results of this study."*
>
> **Action Number 3.8: Take Action on a Feasibility Study on Energy Generation from Landfill Methane**
>
> *"The methane produced by decomposition of organic waste in the Iowa City Landfill is currently being flared to transform it into carbon dioxide, which is a less potent GHG. The City has been considering methods to use the methane as a renewable energy source, and to further explore this opportunity, the City will conduct a Feasibility Study in FY2019 and take specific actions based on the results of this study."*

This Feasibility Report incorporates a number of recently completed Technical Memorandums (TMs) that evaluated current and future biogas generation potential and identified alternatives for utilizing biogas at the Iowa City Wastewater Treatment Plant (WWTP) and/or the Landfill and Recycling Center (Landfill). HDR used its Sustainable Return on Investment (SROI) process to measure the feasibility of the objectives.

The Study objectives are to evaluate current and future methane generation, collection, processing, and reuses at the two facilities based on the following three categories for feasibility:

- Net GHG emissions, considering both incremental emission sources and direct and indirect reductions;
- Net Energy impacting, applying an Energy Return on Energy Invested (EROEI) methodology;
- Economics, using HDR's SROI framework to monetize the benefits associated with beneficial reuse of methane sourced from the Landfill and WWTP.

HDR analyzed three alternatives to beneficially reuse biogas generated at the WWTP and Landfill, as well as GHG emissions and financial impact of expanding composting operations to handle

incremental food waste diverted from the Landfill. The following is a description of each alternative:

- **Alternative 1: Natural Gas Pipeline Injection**. This alternative is divided into two sub-alternatives:
  - Alternative 1a – WWTP NG Pipeline Injection.
  - Alternative 1b – Landfill NG Pipeline Injection.
- **Alternative 2: Electricity Generation**. This alternative is divided into two sub-alternatives:
  - Alternative 2a – WWTP Electricity Generation.
  - Alternative 2b – Landfill Electricity Generation.
- **Alternative 3: WWTP Natural Gas Replacement**
- **Alternative 4: Composting**

Recognizing the synergy with another Action in the City's CAAP, Item 3.2 Increase Composting of Organics, the alternatives consider impacts of diverting incremental volumes of food waste from the Landfill to the existing WWTP, a new, dedicated anaerobic digester (AD) located at the WWTP, and expanded composting operations. Each of the alternatives listed except Alternative No. 4 consider three organics diversion scenarios:

1) No incremental organics diversion (No-Diversion)
2) Additional 1,500 tons organics diverted from Landfill, which represents the available capacity at the existing WWTP AD (1,500 tons)
3) 20% of food waste diverted from landfill to a future "new" AD (Low-Diversion)

HDR developed an opinion of probable construction costs (OPCC) and opinion of operations and maintenance (O&M) costs for the No-Diversion scenario for each alternative. The No-Diversion scenario costs were then extrapolated to estimate costs for the two diversion scenarios for each alternative.

The SROI analysis considers the triple bottom line (i.e., economic, environmental, and social) benefits of methane reuse. This study focuses on the economic and environmental impacts.

The analysis took into account:

- Estimated reductions in GHG emissions and the associated social cost of carbon;
- Value of Renewable Identification Number (RIN) credits under the Renewable Fuel Standard Program;
- Value of electricity exported to the grid under net metering and buyback agreements with MidAmerican Energy Company and the Eastern Iowa Light and Power Cooperative;
- Value of avoided natural gas purchases;
- Capital investment and O&M costs of biogas reuse alternatives; and
- Energy Return on Investment (EROEI).

The results of this study are intended to help the City assess the viability of, and prioritize, alternatives with the greatest potential to reduce GHG emissions under CAAP Action Items 3.7

and 3.8. This Report details technical information on the feasibility analysis and summarizes the previous Technical Memorandums (TMs) that were completed by HDR leading up to the SROI analysis:

1. Evaluation of Existing Facilities TM
2. Wasteshed Analysis TM
3. Biogas Utilization Alternatives TM

The monetary and non-monetary results and rankings by metric are presented in Table ES-1. The evaluation of economic and environmental impacts considered a time horizon or study period, which includes project development (construction and implementation) and 30 years of operation and benefit. This extends to 2050 and aligns with the planning horizon of the City's CAAP. All monetary Costs and benefits have been converted to present value using a 3% discount factor and are compared using a benefit to cost ratio (BCR), benefits divided by costs. BCR's exceeding 1.0 indicate that the benefits from the alternative exceed the costs of the investment over a 30 year period. The non-monetary metrics include EROEI and lifecycle change in CO_2e emissions.

Table ES-1: Summary and Ranking of Monetary and Non-Monetary Results

Alternative Description	Location	Alternative	GHG Reduction	GHG Rank	EROEI	EROEI Rank	BCR	BCR Rank
Pipeline Injection	WWTP	Alt. 1a - ND	40,500	15	6.9	9	0.20	11
		Alt. 1a - 1500	77,800	12	7.9	6	0.22	9
		Alt. 1a - LD	436,200	6	7.9	4	0.39	8
	Landfill	Alt. 1b - ND	820,500	3	7.5	8	1.62	3
		Alt. 1b - 1500	844,500	2	7.6	7	1.63	2
		Alt. 1b - LD	931,800	1	7.9	5	1.69	1
Electricity Generation	WWTP	Alt. 2a - ND	19,000	16	2.0	13	0.05	16
		Alt. 2a - 1500	60,000	13	12.4	3	0.10	15
		Alt. 2a - LD	395,600	7	13.3	1	0.18	12
	Landfill	Alt. 2b - ND	459,200	5	1.5	15	0.76	6
		Alt. 2b - 1500	386,500	8	2.1	12	0.69	7
		Alt. 2b - LD	585,200	4	12.6	2	0.89	5
Natural Gas Replacement	WWTP	Alt. 3 - ND	40,900	14	4.6	10	0.11	14
		Alt. 3 - 1500	78,300	11	3.4	11	0.13	13
		Alt. 3 - LD	252,200	10	1.8	14	0.20	10
Expanded Composting	Compost	Alt. 4	365,100	9	0.0	16	0.96	4

The results show that:

- Only Alternative 1b (landfill natural gas) has benefits that exceed the costs;
- The highest BCR (1.69) is Alternative 1b – Low-Diversion. This alternative ranks highest on total lifecycle CO_2e emission reductions, and when combined with the value of RIN credits results in the greatest economic benefits;
- All of the alternatives result in a net reduction in CO_2e over the next 30 years;

- All alternatives except for composting result in an EROEI of 1.0 or greater (incremental composting of food waste does not generate energy);
- Alternative 2a (WWTP Electricity Generation) – Low-Diversion ranks highest on EROEI;
- Alternative 1b – Low-Diversion is ranked 5th on EROEI; and
- Changing the value of the SCC was found to have no effect in ranking as the value influences all of the alternatives equally.

To aid in the comparison of the monetary and non-monetary metrics and provide insight from this Feasibility Study towards actions under 3.7 and 3.8, the results have been combined into a weighted score as shown below in Table ES-2. Each result was converted to an index (1 to 0) and were then weighted equally into a total score with a maximum value of 1.

Table ES-2: Indexed and Weighted Scores for each Alternative

Alternative Description	Location	Alternative	GHG Reduction	EROEI	BCR	Total Score	Rank
Pipeline Injection	WWTP	Alt. 1a - ND	0.01	0.17	0.04	0.23	13
		Alt. 1a - 1500	0.03	0.20	0.04	0.27	11
		Alt. 1a - LD	0.16	0.20	0.08	0.43	6
	Landfill	Alt. 1b - ND	0.29	0.19	0.32	0.80	3
		Alt. 1b - 1500	0.30	0.19	0.32	0.81	2
		Alt. 1b - LD	0.33	0.20	0.33	0.86	1
Electricity Generation	WWTP	Alt. 2a - ND	0.01	0.05	0.01	0.07	16
		Alt. 2a - 1500	0.02	0.31	0.02	0.35	7
		Alt. 2a - LD	0.14	0.33	0.04	0.51	5
	Landfill	Alt. 2b - ND	0.16	0.04	0.15	0.35	8
		Alt. 2b - 1500	0.14	0.05	0.14	0.33	9
		Alt. 2b - LD	0.21	0.32	0.18	0.70	4
Natural Gas Replacement	WWTP	Alt. 3 - ND	0.01	0.12	0.02	0.15	14
		Alt. 3 - 1500	0.03	0.08	0.02	0.14	15
		Alt. 3 - LD	0.14	0.05	0.04	0.23	12
Expanded Composting	Compost	Alt. 4	0.13	0.00	0.19	0.32	10

Based on the indexing and weighting exercise:

- Alternative 1b (landfill natural gas) – Low-Diversion has the highest score (0.86).
- Alternative 1b (landfill natural gas) – 1500 ton diversion is ranked second.
- Alternative 1b (landfill natural gas) – No-Diversion is ranked third.

If the City is instead focused on reductions that will be reflected in its municipal and community-scale GHG emission inventory, then evaluation should be narrowed to focus on Alternative 2, Electricity Generation, and Alternative 3, Natural Gas Replacement. While electricity generated at the WWTP or Landfill (2a and 2b, respectively) could very well be pushed to the power grid, contractual agreements with local utilities could allow the City to retain and retire RECs for GHG accounting purposes. Specifically, RECs could be applied to the City's Scope 2 market-based GHG inventory. Using RNG to displace natural gas use at the WWTP would result in lower

Scope 1 GHG emissions. Focused on these two alternatives, Alternative 2b – Low-Diversion is ranked highest (fourth overall), followed by Alternatives 2a – Low-Diversion and 2a – 1500. These alternatives are ranked 4, 5 and 7 overall.

Finally, biogas utilization alternatives can be combined together with others, and some can be incorporated as standalone projects (as shown in Table ES-3).

Table ES-3: Potential Biogas Utilization Alternatives Combinations

Weighted and Indexed Performance Indicators Total Score, inclusive of: *GHG Reduction, EROI, and BCR*				Landfill Location						
				Do Nothing	No Diversion		1500 ton/yr Diversion		Low Diversion	
					NG Pipeline Injection	Electricity Generation	NG Pipeline Injection	Electricity Generation	NG Pipeline Injection	Electricity Generation
					Alt 1b-ND	Alt 2b-ND	Alt 1b-1500	Alt 2b-1500	Alt 1b-LD	Alt 2b-LD
	Do Nothing			0	0.80	0.35	0.81	0.33	0.86	0.70
	No Diversion	NG Pipeline Injection	Alt 1a-ND	0.23	1.02	0.58				
		Electricity Generation	Alt 2a-ND	0.07	0.87	0.42				
		NG Replacement	Alt 3-ND	0.15	0.95	0.50				
	1500 ton/yr Diversion	NG Pipeline Injection	Alt 1a-1500	0.27			1.08	0.60		
		Electricity Generation	Alt 2a-1500	0.35			1.16	0.68		
		NG Replacement	Alt 3-1500	0.14			0.95	0.47		
	Low Diversion	NG Pipeline Injection	Alt 1a-LD	0.43					1.30	1.13
		Electricity Generation	Alt 2a-LD	0.51					1.37	1.21
		NG Replacement	Alt 3-LD	0.23					1.09	0.93

There are 18 unique possible combinations of alternatives, boxes in Table ES-3 with blue numbering indicate the individual alternative scenarios at either the Landfill or at the WWTP. The individual alternatives can be combined together, but must be done so following the same waste diversion scenario from the Landfill. Specifically, an alternative from No-Diversion scenario cannot be combined with an alternative from the Low-Diversion scenario. When combining the alternatives the scores from the Landfill and WWTP alternatives can be added together to identify the optimal combination of actions under each of the waste diversion scenarios. The highest scored individual alternatives are consistently Alternative 1b – NG Pipeline Injection (landfill alternatives for each of the No-Diversion, 1500 ton diversion, and Low-Diversion scenarios).

Identifying the optimal combination of actions may be approached as follows: select the highest scored alternative from the desired waste diversion scenario (shown to be from the Alternative 1b – NG Pipeline Injection landfill alternatives) then work down the column to the corresponding green shaded boxes. Select the highest scored, or desired, combination. Corresponding capital costs for each individual alternative are also additive when combined. For example, if choosing

from Alternative 1b – NG Pipeline Injection (at the Landfill, Total Score of 0.81), with 1500 ton diversion to the WWTP, work down the column (or "diversion lane") to the desired combination scenario. In this case, combining with Alternative 2a – Electricity Generation at the WWTP, results in a combined score of 1.16. As capital costs are also additive, consideration should be given to the seemingly minor weighted score differential. In the example of combined Alt 1b-1500 with Alt 2a-1500, there is an estimated $6.2M savings to select Alt 1b-1500 with Alt 1a-1500.

Path Forward

HDR recognizes that incremental food waste diversion is not an instantaneous process, but the SROI analysis provides an assessment of the resulting impact when achieved. This Report provides decision tools to support the City's further consideration and decision making.

Consequently, the City might consider the following path forward to further evaluate and implement the preferred alternative(s):

i. City decision on desired diversion scenario and methane utilization at the WWTP to narrow the field of alternatives. (0-6 months)
ii. Further technical analysis to develop organics management strategies to achieve a targeted diversion scenario and further evaluate life cycle costs of co-digestion (if desired) and biogas utilization to generate electricity or RNG. Consideration of impacts to planned digester rehab project. (3-6 months)
iii. Conceptual Design Development of the selected alternative(s), providing basis of design parameters and implementation planning. (3-6 months)
iv. Detailed Design Development. (TBD)
v. Bidding and Construction. (TBD)

It may be prudent for the City to complete items i) and ii) within the next 6-months for capital planning purposes.

1 Introduction

In December 2019, the City of Iowa City (City) selected HDR Engineering, Inc. (HDR) to perform a Methane Recovery Feasibility Study to address Action Items 3.7 and 3.8 included in the Iowa City Climate Action and Adaptation Plan (CAAP). The CAAP contains objectives for conducting a study that would determine the feasibility of methane generation, collection, processing, and potential re-use at the Iowa City Wastewater Treatment Plant (WWTP) and/or the Landfill and Recycling Center (Landfill). HDR used its Sustainable Return on Investment (SROI) process to measure the feasibility of the objectives.

This Feasibility Report evaluates alternatives for methane gas recovery and beneficial reuse of biogas at the City WWTP and/or Landfill as part of the City's CAAP objectives. This evaluation focuses on monetizing the benefits associated with the reuse of methane sourced from either the WWTP and/or the Landfill. The SROI analysis considers the triple bottom line (i.e., economic, environmental, and social) benefits of methane reuse. This study focuses on the economic and environmental impacts.

The analysis took into account:

- Estimated reductions in Greenhouse Gas (GHG) emissions and the associated social cost of carbon;
- Value of Renewable Identification Number (RIN) credits under the Renewable Fuel Standard Program (RFS);
- Value of electricity exported to the grid under net metering and buyback agreements with MidAmerican Energy Company and the Eastern Iowa Light and Power Cooperative;
- Value of avoided natural gas purchases;
- Capital investment and O&M costs of biogas reuse alternatives; and
- Energy Return on Investment (EROEI).

The results of this Study are intended to help the City assess the viability of alternatives with the greatest potential to reduce GHG emissions under CAAP Action Items 3.7 and 3.8. This Report details technical information on the feasibility analysis and summarizes the previous Technical Memorandums (TMs) that were completed by HDR leading up to the SROI analysis:

1. Evaluation of Existing Facilities TM
2. Wasteshed Analysis TM
3. Biogas Utilization Alternatives TM

2 Project Background

2.1 Climate Action and Adaptation Plan

In September of 2018, the City Council approved its Climate Action and Adaptation Plan. CAAP included specific actions to achieve GHG emissions targets. The plan's targets are in accordance with the Paris Agreement and include city-wide carbon emissions reductions of 25-28% over 2005

levels. On August 6th, 2019, the City passed Resolution 19-218 declaring a climate crisis and requesting accelerated action toward carbon emissions reductions in an effort to meet the Intergovernmental Panel on Climate Change (IPCC) target of limiting global warming to 1.5 Celsius.

CAAP identified 35 actions related to buildings, transportation, waste, adaptation, and sustainable lifestyle to help the City achieve its goals for reducing carbon emissions. Furthermore, these 35 actions were broken into 3 phases with phase 1 actions to be initiated by the end of 2020. Under waste actions 3.7 and 3.8 the City is looking to explore ways to recover and beneficially reuse methane from landfill and WWTP. The importance of these actions were reiterated in the Accelerating Iowa City's Climate Action Plan, published in April 2020. As noted in the CAAP:

> **Action Number 3.7: Take action on a feasibility study to efficiently capture and use methane from wastewater operations:**
>
> *"After water is used by residents, it flows into the wastewater system and then goes to the City's Wastewater Treatment Facility. While the City currently captures methane gas from the digesters used in the wastewater treatment process, only a portion of the methane is used to offset natural gas usage for the plant. To explore other options for further management of wastewater greenhouse gas (GHG) emissions, the City should conduct a study to determine the feasibility of using all captured methane to create renewable fuel or electricity that can be used to operate the facility, and take specific actions based on the results of this study."*
>
> **Action Number 3.8: Take action on a feasibility study on energy generation from landfill methane.**
>
> *"The methane produced by decomposition of organic waste in the Iowa City Landfill is currently being flared to transform it into carbon dioxide, which is a less potent GHG. The City has been considering methods to use the methane as a renewable energy source, and to further explore this opportunity, the City will conduct a feasibility study in FY2019 and take specific actions based on the results of this study."*

2.2 Feasibility Study

The objective of this Feasibility Study is to evaluate alternatives developed to support actions 3.7 and 3.8. To conduct this study, HDR applied its SROI framework to evaluate alternatives. The following sections of this report detail:

- The approach used.
- The alternatives considered.
- The economic analysis methods used to evaluate alternatives.
- A summary of the economic analysis results.
- Recommendations for waste actions 3.7 and 3.8.

2.2.1 SROI Background

SROI evaluates whether the public value of a project is sufficient to justify the money required to develop the project and which alternative provides the greatest financial and societal return relative to the project cost. SROI process is an enhanced form of benefit cost analysis (BCA) that involves a systematic comparison of the benefits and costs of projects in ways that communicate a project's triple-bottom line outcomes, (i.e. its full range of environmental, social and economic impacts). SROI originated from a commitment by HDR to develop a new generation of public decision support metrics for the Clinton Global Initiative (CGI) in 2007. SROI was developed with input from Columbia University's Graduate School of International Public Affairs and launched at the 2009 CGI annual meeting. Since then, the SROI process has been used by HDR to evaluate the monetary value of numerous sustainability programs and projects for water and wastewater infrastructure utilities around the country.

2.2.2 Methodology of SROI Process

The SROI process draws from standard economic BCA methods and the best available data to systematically calculate and compare the benefits and costs of project alternatives. The process addresses sustainability goals and outcomes from a triple bottom-line perspective, meaning the range of potential environmental, social, and economic impacts (see Figure 1). In this Feasibility Study, impacts are associated with the economic and environmental benefits related to the value of RIN credits to the City as well as the social cost of carbon associated with changes in GHG emissions. In addition, the EROEI and tons of GHG emissions are estimated as non-monetary metrics.

Figure 1: SROI Triple Bottom Line Accounting

The SROI process builds on best practices in benefit-cost and financial analysis methodologies, complemented by advanced risk analysis and stakeholder elicitation. Typically, the SROI process is implemented in four steps, which include:

1. **Develop the structure and logic diagrams (S&L's)**: Structure and logic diagrams are useful to display the understanding of how key variables within an analysis interact to influence the intermediate or final outputs being measured. These diagrams provide a

transparent view of the calculations being made in the analyses for key stakeholders and subject matter experts to review and understand the process better.

2. **Assign values to inputs**: Values are assigned to inputs based on logic established in the S&L's. In some instances, ranges for inputs are established to enable the analysis to capture how an input will impact the project with the potential variability of its value essentially simulating real world conditions.
3. **Develop consensus among stakeholders to validate inputs**: The S&L's and inputs are then presented to stakeholders for validation. This is a key step in the SROI process. Stakeholders and subject matter experts are consulted regarding the values used to understand their view on these inputs. This step is critical for getting stakeholder buy-in on the process and seeking out additional knowledge that may not have been captured previously.
4. **Evaluate impact on agency goals (e.g. cost, environmental impact, public perception, etc.), including simulation if applicable**: These inputs will then be added into the model structure detailed with the structure and logic diagrams to evaluate the agency goals, specifically the costs or environmental impact. The alternative that best meets these criteria will be the one that is the most desirable alternative.

3 Renewable Natural Gas as a Resource

Renewable Natural Gas (RNG) is biogas or landfill gas that has been treated or refined to natural gas (NG) quality. The resulting RNG can be used interchangeably with NG, but is considered renewable as it doesn't rely on petroleum and can therefore provide additional environmental attributes through federal and state programs.

3.1 Renewable Natural Gas - Environmental Attributes as Vehicle Fuel

3.1.1 EPA - Renewable Fuel Standard

The United States Congress created the Renewable Fuels Standard (RFS) through the Energy Policy Act of 2005 and revised the program with the Energy Independence and Security Act in 2007. The RFS is a renewable fuels program within the Clean Air Act which mandates that large fuel producers and blenders (Obligated Parties) must include within their fuel mix a growing portion of renewable fuels. The quotas required of the Obligated Parties are referred to as Renewable Volume Obligations (RVOs) and are established and tracked by the United States Environmental Protection Agency (EPA) through the use of renewable credits, also known as, Renewable Identification Numbers (RINs). The original program was designed to increase the RVOs until 2022 and then level off beyond that point unless Congress issued another amendment. The EPA can lower or raise the RVOs up to the maximum RVO quota set for 2022, but Congressional action would be required to eliminate the RFS program. The RFS program has pressure against it from the Oil and Gas Industry, but also has a strong support from the Corn Ethanol Industry, who represent half of the RIN market.

As the EPA's RFS, RVOs are developed by categorized RIN types based on their environmental benefit and the production pathway. These categories, D3 through D7, encompass lower value biofuels like corn-based ethanol (D6) up to high value biofuels like cellulosic biodiesel or ethanol (D3) (see Figure 2).

RNG produced from landfill gas is considered D3 cellulosic biofuel in the RFS. RNG produced from wastewater biogas production from anaerobic digestion or co-digestion is considered D3 cellulosic or D5 advanced biofuel depending on the feedstocks used to production. The biogas produced from the digestion of municipal biosolids will be considered D3 cellulosic and have the highest value. However, any biogas produced by the co-digestion of municipal solids with hauled in or high strength wastes will be considered D5 advanced, unless each individual feedstock has a 75% or higher cellulosic content.

Figure 2: EPA RFS Nested RIN Categories and Volumes

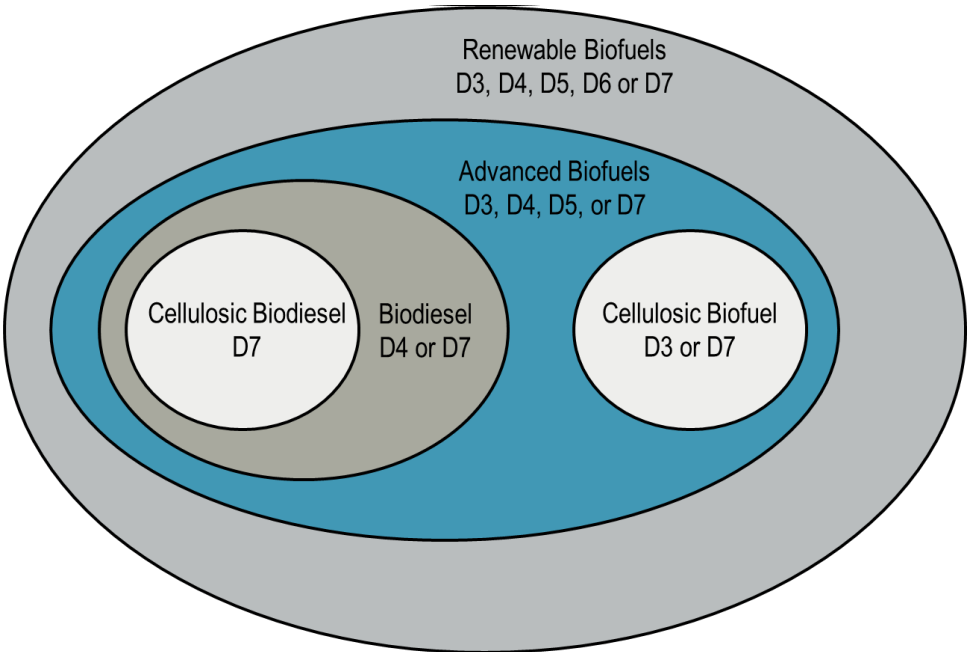
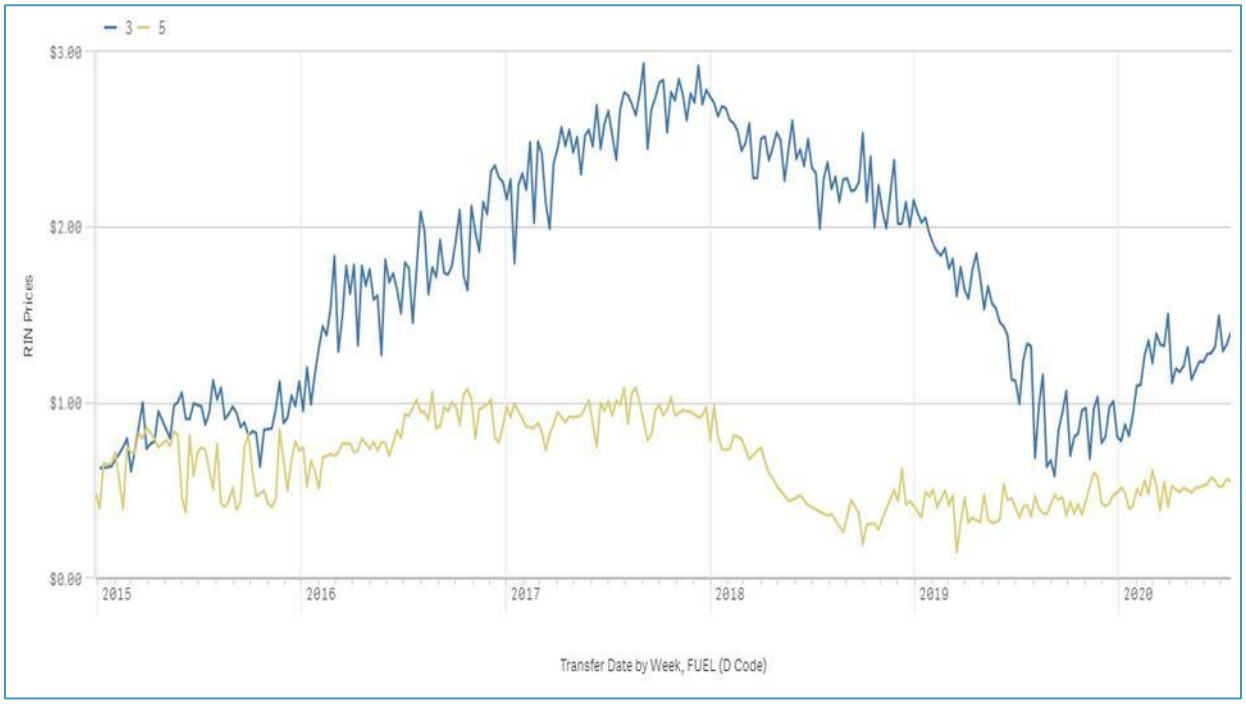


Figure 3 presents the historical RIN values as reported by the EPA from 2015 through August 2020.

Figure 3: Historical RIN values From the EPA from 2015 Through August 2020

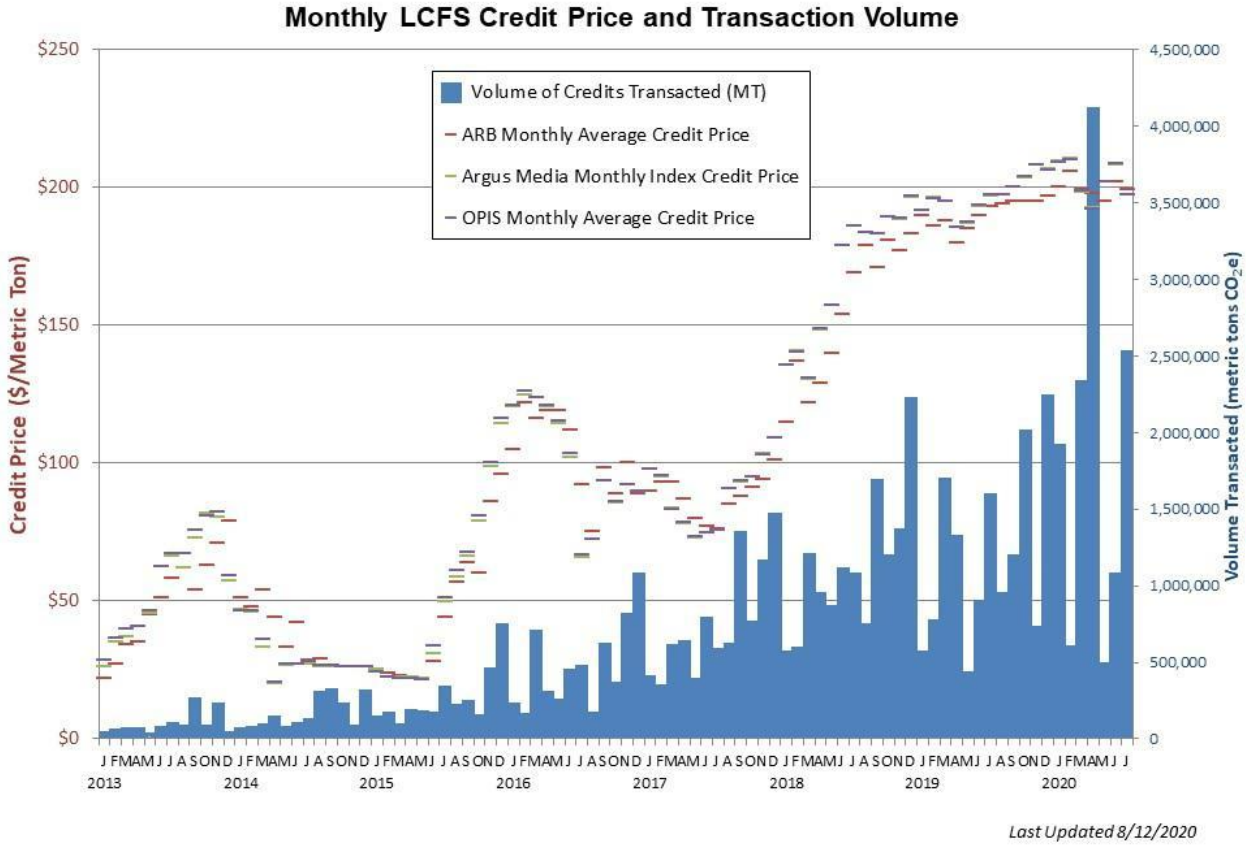


Source: https://www.epa.gov/fuels-registration-reporting-and-compliance-help/rin-trades-and-price-information

3.1.2 California Low Carbon Fuel Standard

In addition to RINs, carbon offset credits are also available through California's Low Carbon Fuel Standard (LCFS) program. The LCFS market has become a healthy market with more transactions and higher values throughout the last seven years (see Figure 4) and is not anticipated to end until 2032. LCFS credits can be obtained in addition to RIN credits as long as the renewable fuel is contracted for sale to an Obligated Party with end use in California.

Figure 4: California LCFS Market History



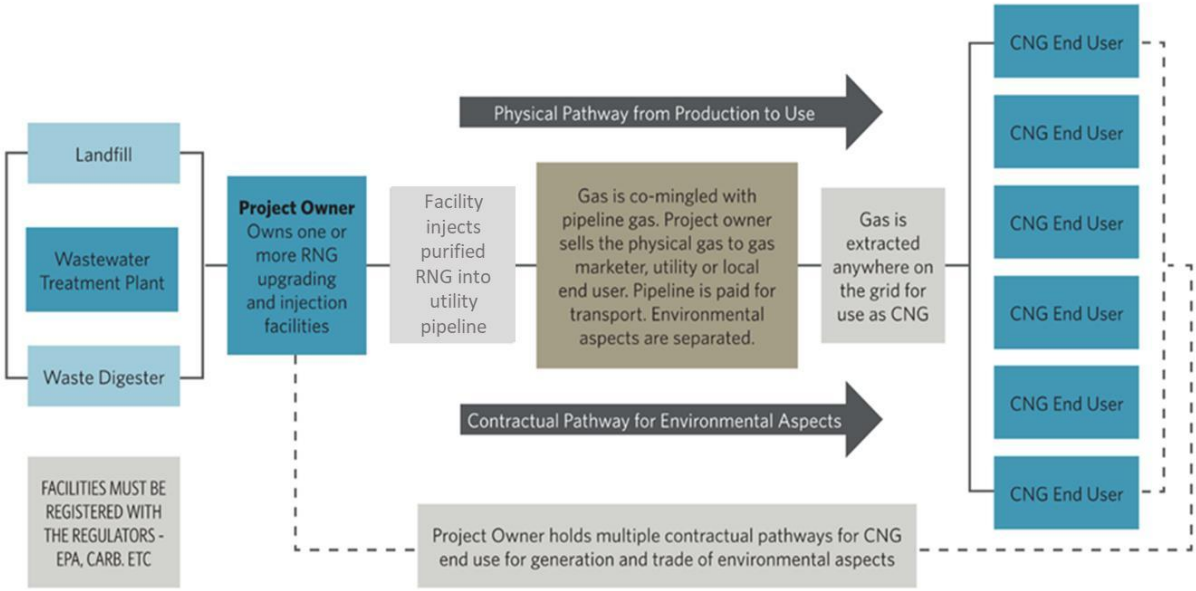
This chart tracks credit prices and transaction volumes over time. Monthly average credit prices reported by Argus Media and OPIS [used with permission] are shown along with CARB monthly average price.

3.1.3 Requirements and Pathways

A requirement to be aware of for both of these programs (RFS and LCFS) is that they are specifically renewable fuels for transportation programs. As such, the fuel must ultimately be used as a transportation fuel in order for the renewable attribute to be recognized. A renewable fuel producer is not required to explicitly find a transportation end user of the fuel it produces, however, at some point along the fuel supply pathway, it must be used as transportation fuel so that an Obligated Party can claim the RIN and/or the LCFS credit and meet its obligation with the EPA or with California.

The production and sale of RNG and environmental attributes like RINs and/or LCFS occurs in two pathways; the physical pathway and the contractual pathway for the attributes. The physical pathway is the sale of the RNG by the producer to end user of the gas via the natural gas grid. The contractual pathway for the attributes is separate and handled by third party which verifies that the RNG is truly renewable and markets the attributes to Obligated Parties. Figure 5 illustrates the two pathways of RNG and RIN/LCFS sales. It is important to note that the molecules of natural gas don't actually have to be used as vehicle fuel, but the physical pathway needs to be verified through the grid system.

Figure 5: PhysRNG Value Considerations



The value of RNG should take into account following:

1. The value of the RNG as natural gas based on the natural gas commodity market.
2. The value of environmental attributes obtained through the RFS (D3 or D5)
3. The value environmental attributes obtained through the LCFS.
4. The cost of compliance with the RFS and LCFS.
5. The cost of marketing the environmental attributes to Obligated Parties.

Items 1-3 should be considered as ranges (low, median, high) to account for the variability in future market values. The biogas revenues at the WWTP need to be divided into D3 and D5 categories. The biogas produced in the anaerobic digesters handling municipal biosolids will produce D3, but biogas produced at the co-digestion facility will be D5, but may be eligible for LCFS depending on the carbon intensity score. Items 4 and 5 are included to reflect the cost of bringing the gas to market within the environmental attribute programs. The RFS is highly regulated, so market RIN values are typically reduced by 15% and the LCFS values by 15-30% to account for the third part cost of compliance and marketing the environmental attributes to Obligated Parties. The third parties are either gas marketing companies or the Obligated Parties themselves, and are typically selected by a Request for Proposal (RFP) process. The resulting contractual arrangement specifies the City's share be based on either a fixed price or percentage of total revenue and the term of the agreement. The third party will qualify the RINs with EPA, qualify with California for LCFS credits, develop QA programs for certification, and administer the program. The City is then paid by the third party for both the natural gas commodity value and the associated renewable attributes based on a monthly or quarterly invoice.

4 Description of Project Alternatives

Three beneficial reuse alternatives were analyzed for current and future biogas generated at the WWTP and Landfill. For a complete and detailed assessment, please refer to the Biogas Utilization Alternatives Analysis Technical Memorandum previously provided by HDR, dated July 17, 2020. Recognizing synergy with another action in the City's CAAP, Action Item 3.2 Increase Composting of Organics, HDR also considered impacts of diverting incremental volumes of food waste from the Landfill to the existing WWTP, a new, dedicated anaerobic digester, and expanded composting operations. The following is a description of each alternative.

4.1 Alternative 1: Natural Gas Pipeline Injection

Biogas Utilization Alternative 1 assumes that the City purchases and operates equipment to condition the biogas to natural gas quality (RNG) for injection into the natural gas pipeline. To provide an interconnection point, the natural gas utility (MidAmerican Energy Company) would route a new pipeline from the existing natural gas distribution system to the City's property. The City would be required to reimburse the utility for the cost of the connecting pipe, and also pay an annual pipeline usage fee. This pipeline usage fee is dependent on the amount of RNG injected into the natural gas pipeline by the City. Assuming natural gas quality meets the RFS Program, the City would sell RIN credits and surrender any downstream GHG emissions reductions that would be realized by the Obligated Party purchasing the credits. Alternative 1 is applicable to both the WWTP and Landfill, presented as alternatives 1a and 1b, respectively.

4.2 Alternative 2: Electricity Generation

Biogas Utilization Alternative 2 assumes that biogas is conditioned and utilized in engine generators owned and operated by the City to produce renewable electricity. The electric power utility (MidAmerican Energy or Eastern Iowa Light & Power) would establish a connection to the grid, enabling the City to sell the renewable power. The City would be required to reimburse the electric utility for all system upgrades required to accommodate the connection. Under this alternative, HDR assumes that the City's contract with the electric power utility would allow the City to retain Renewable Energy Credits (RECs) to offset GHG emission associated with electricity use in their buildings and facilities. Alternative 2 is applicable to both the WWTP and Landfill, presented as alternatives 2a and 2b, respectively.

4.3 Alternative 3: WWTP Natural Gas Replacement

Biogas Utilization Alternative 3 involves conditioning biogas to natural gas quality with the intent of using the RNG in place of the natural gas at the WWTP. Biogas would be conditioned to natural gas quality by equipment owned and operated by the City to be installed at the WWTP. The WWTP RNG produced will exceed the amount of natural gas used at the plant. As such, the City would need to either: find a use for the excess RNG produced, flare the excess gas, or the City would only condition the amount of biogas needed and the excess biogas would be flared. For this analysis, it was assumed that RNG production would be capped at 62,848 standard cubic feet per day. Alternative 3 is only applicable to the WWTP as natural gas is not consumed at the landfill.

4.4 Alternative 4: Composting

Alternative 4 consists of diverting organic waste that would typically be placed in the landfill to a new or expanded composting facility. Because the existing composting operation is at capacity, this alternative assumes the City would utilize existing owned-land and purchase equipment to expand composting capacity. This alternative is only relevant for the Low-Diversion scenario, further described in the section below.

4.5 Organics Diversion Scenarios

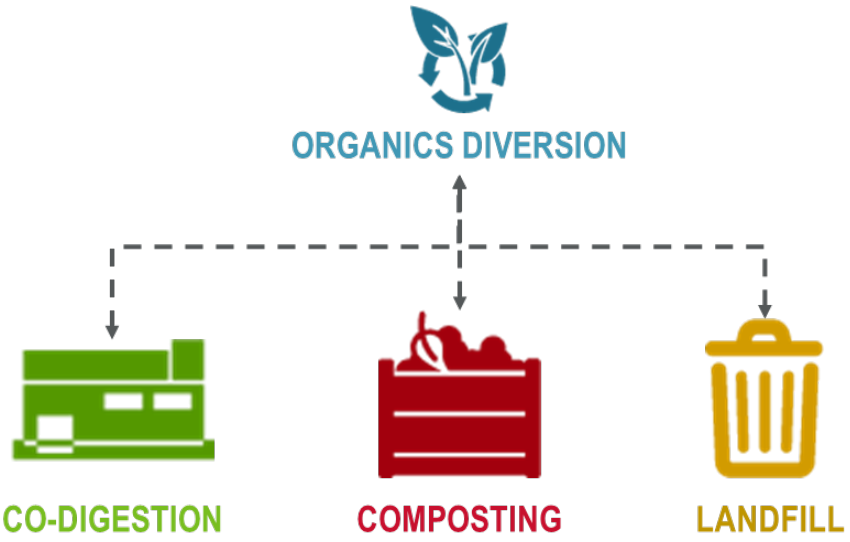
Recognizing the synergy with the City's goal to increase composting of organics, HDR evaluated the relative cost and GHG emissions impact for each of the four alternatives under three food waste diversion scenarios. HDR's previous technical analysis determined the impact on future biogas generation quantity when some of the City's organic matter is diverted from the Landfill for co-digestion or composting.

The three organics diversion scenarios include:

1) No Organics Diversion. The No Organics Diversion scenario assumes that all organics material is disposed of in the Landfill (i.e. current operation).
2) 1,500 tons. The 1,500 tons scenario assumes that an additional 1,500 tons of food waste material will be diverted from the Landfill to the existing WWTP anaerobic digester each year. This quantity represents the current available capacity in the WWTP anaerobic digester; therefore, no additional digester capacity is required for this diversion scenario. This scenario is not applicable to composting, as the existing facility is operating at capacity.
3) Low-Diversion. The Low-Diversion scenario assumes that 20% of organic material (7,960 tons/year) currently disposed of at the Landfill is diverted to new anaerobic digesters or an expanded composting facility. For GHG emissions modeling purposes, HDR assumed that the additional diverted organic material is entirely comprised of food waste. The required anaerobic digester volume required for the Low-Diversion scenario is 1.4 million gallons (MG).

For purposes of this study, HDR assumed that the new waste receiving station and standalone anaerobic digesters required to accept the additional diverted food waste would be located at the WWTP. A standalone digester facility for the diverted organic waste was assumed because the RIN credits for RNG produced in a municipal WWTP digester will have a higher value than those for RNG produced by a diverted waste digester. Additionally, the WWTP digester gas contains high levels of siloxanes. It is beneficial to keep the two sources of biogas separated until the siloxanes are removed from the WWTP biogas. Over the course of the Study development, discussion with City staff supported retaining digester capacity within the existing complex to support municipal biosolids. Therefore, for a planning level, Feasibility Study, an independent system to support new low-diversion digesters is proposed. Implementation would include independent operation, and not an expansion of the existing digester facility. However, as the plan is refined, a more detailed evaluation and conceptual design should be conducted to further determine the best approach for the City.

Figure 6: Organics Diversion



A summary of the alternatives and diversion scenarios selected for the SROI analysis are listed in Table 1.

Table 1: Summary of the Alternatives and Diversion Scenarios evaluated for Feasibility

Alternative Description		Facility Location	Scenario Name
Pipeline Injection (Alt. 1)	Sell RIN credits, & no additional organics diversion	WWTP	Alt. 1a - ND
		Landfill	Alt. 1b - ND
	Sell RIN credits, & 1,500 TPY organics diverted from landfill	WWTP	Alt. 1a - 1500 Div
		Landfill	Alt. 1b - 1500 Div
	New AD facility, sell RIN credits, & 7,960 TPY organics diverted from landfill	WWTP	Alt. 1a - LD
		Landfill	Alt. 1b - LD
Electricity Generation (Alt. 2)	No additional organics diversion	WWTP	Alt. 2a - ND
		Landfill	Alt. 2b - ND
	1,500 TPY organics diverted from landfill	WWTP	Alt. 2a - 1500 Div
		Landfill	Alt. 2b - 1500 Div
	7,960 TPY organics diverted from landfill	WWTP	Alt. 2a - LD
		Landfill	Alt. 2b - LD
Natural Gas Replacement (Alt. 3)	No additional organics diversion	WWTP	Alt. 3 - ND
	1,500 TPY organics diverted from landfill	WWTP	Alt. 3 - 1500 Div
	New AD facility, & 7,960 TPY organics diverted from landfill	WWTP	Alt. 3 - LD
Expanded Composting (Alt. 4)	7,960 TPY organics diverted from landfill	Compost	Alt. 4

Some of the alternatives listed in Table 1 can be constructed as standalone alternatives. Additionally the alternatives can be constructed together in various combinations provided the same waste diversion scenario is followed. For example, Alternative 1b – NG Pipeline Injection at the Landfill may be constructed at the Landfill with no improvements at the WWTP.

Alternatively, Alternative 1b could be selected for utilization of the biogas at the Landfill, with Alternative 2a (Electricity Generation) selected for biogas utilization at the WWTP.

A more detailed explanation and associated matrix table of possible combination scenarios is included later under Section 5.1.

4.5.1 Impacts to Existing Wastewater Treatment Plant

Implementation of anaerobic digestion for organics diversion can result in impacts to the existing WWTP. The diverted organics need to be incorporated into a mixture with a target feed total solids (TS) content of 6 percent. This requires the use of makeup water to create the mixture in a receiving station. Typically, the makeup water is a combination of digester recycle and WWTP effluent. The total water feed rate into the digester is estimated near 90,000 gallons per day, and the makeup water stream would be small.

A more important impact to the existing WWTP is the return stream from the diversion digester. After dewatering of the digested solids, some of the excess water must be returned to the plant as recycle. Digestion of organics results in the release of nutrients, nitrogen and phosphorus in the forms of ammonium and phosphate, respectively. After dewatering, the nutrients are divided between the solids and liquids residuals. A fraction of the nutrients would remain with the solids to their ultimate disposal (e.g. land application or landfilling). The remaining fraction is recycled with the liquid residuals to the WWTP. Recycled nutrients then consume part of the nitrification and nutrient removal capacities of the treatment facility. In addition, the carbon to nutrient ratio is skewed and biological nutrient removal becomes less favorable. This means that carbon addition may be needed to support biological nutrient removal. Further, liquid treatment capacity and cost must be reevaluated with potential increases to nutrient loading.

Organic waste nutrient content varies considerably. The nitrogen content can vary between 5 and 50 percent of the TS, and the phosphorus content can vary between 1 and 10 percent of the TS. This analysis used typical food waste values of roughly 10 percent for nitrogen content and 5 percent for phosphorus for the analysis. The result is an additional 150 to 200 lb-N/d nitrogen load and an additional 30 to 50 lb-P/d phosphorus load estimated for the WWTP for every ton/d of organics diversion. In all, every 1 ton/d of diverted wastes results in a recycle containing between 2 and 3 percent of the WWTP's nitrogen capacity. The Low-Diversion scenario is based on about 4 ton/d of organics diversion, which could use between 8 and 12 percent of the WWTP's TKN capacity[1].

4.6 Estimated Costs

A detailed opinion of probable costs and opinion of O&M costs was developed for the No-Diversion scenario for each alternative. The No-Diversion scenario costs (gas conditioning system and electricity generation equipment) were then extrapolated to estimate costs for the two diversion scenarios for each alternative. For the Low-Diversion scenario, costs were added for a new anaerobic digester and waste receiving station. The estimated biogas quantities for each

[1] Design TKN capacity of WWTP identified as 6,311 lb-N/d based on NPDES permit issued 05/01/2020

scenario as a basis for the extrapolation. Equipment proposals were also obtained for the No-Diversion scenario for each alternative.

Table 2 contains a summary of the capital and O&M costs for each alternative selected for the detailed SROI analysis.

Table 2: Biogas Utilization Alternatives Summary

Alternative	Scenario	Alternative Designation	Opinion of Probable Construction Costs	Opinion of Probable Annual O&M Costs
1a: WWTP NG Pipeline Injection	No Diversion	1A - ND	$8,600,000	$1,353,000
	1,500 Ton/Year	1A - 1500	$10,800,000	$1,815,000
	Low Diversion	1A - LD	$41,400,000	$3,112,000
1b: Landfill NG Pipeline Injection	No Diversion	1B - ND	$29,200,000	$2,292,000
	1,500 Ton/Year	1B - 1500	$29,000,000	$2,282,000
	Low Diversion	1B - LD	$28,000,000	$2,200,000
2a-2: WWTP Electricity Generation	No Diversion	2A - ND	$13,500,000	$1,067,000
	1,500 Ton/Year	2A - 1500	$17,000,000	$1,432,000
	Low Diversion	2A - LD	$50,000,000	$2,538,000
2b-2: Landfill Electricity Generation	No Diversion	2B - ND	$20,500,000	$1,288,000
	1,500 Ton/Year	2B - 1500	$20,300,000	$1,282,000
	Low Diversion	2B - LD	$19,600,000	$1,236,000
3: WWTP NG Replacement	No Diversion	3 - ND	$7,700,000	$867,000
	1,500 Ton/Year	3 - 1500	$9,700,000	$1,163,000
	Low Diversion	3 - LD	$39,800,000	$2,136,000
4: Composting	Low Diversion	4	$5,700,000	$495,000

4.7 Description of Impact Categories

The effect of an alternative differs across the individual impact categories (individual economic and environmental benefits and/or costs) and depends on the design of the project alternative, site conditions where the project is implemented, and characteristics in the community. Estimation of benefits and costs from a project depends on the degree to which linkages can be quantified between alternatives and a benefit or cost, and then available economic literature to value this change.

This section develops the general assumptions and inputs used in the SROI analysis framework and describes the impacts.

4.7.1 General Assumptions and Inputs

The SROI analysis measures benefits and costs throughout a 30-year period of analysis from 2021 to through the year 2050 representing the GHG emissions reduction goal year in the City's

CAAP. The methodology makes several important assumptions and seeks to avoid overestimation of benefits and underestimation of costs. Specifically:

- Input prices are inflated to 2019 dollars;
- The analysis period begins in 2021 and ends in 2050. It includes twenty-nine years of operations (2022-2050); and
- A constant 3 percent real discount rate is assumed throughout the period of analysis.

4.7.2 Impact Categories

Each of the evaluated impacts is discussed in detail in the following sections. The impacts are organized by their respective triple bottom line categorization (economic and environmental).

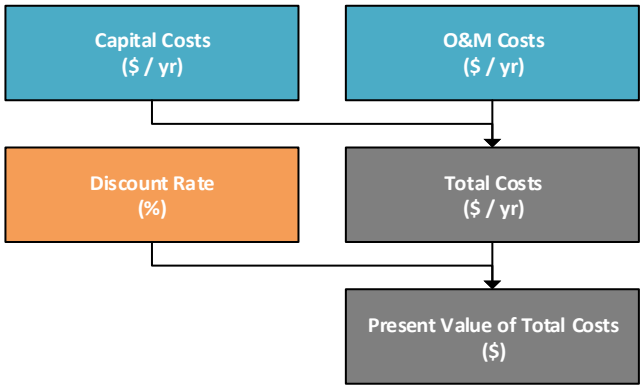
4.7.2.1 ECONOMIC IMPACTS

Economic benefits include impacts that are created by the project after deducting the cost of all inputs, including the cost of the capital expenditures (CAPEX) and annual operations and maintenance (O&M) costs (lifecycle costs of the project alternatives). Economic benefits include value of RIN credits to the City. Additionally a non-monetary measure of economic efficiency includes energy return on investment.

4.7.2.1.1 Lifecycle Costs

Lifecycle costs include CAPEX and annual O&M for each alternative. The costs are estimated as a 30 year life-cycle costs as shown below in the S&L diagram.

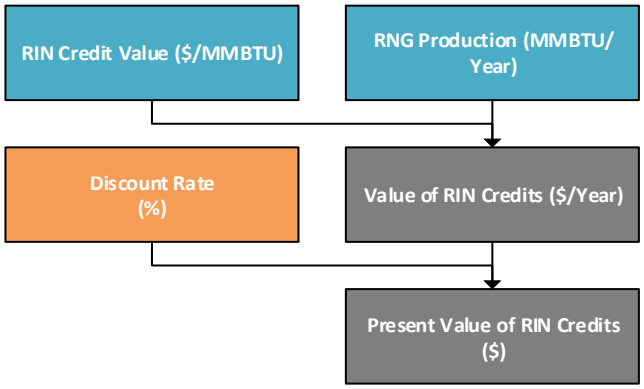
Figure 7: Lifecycle Cost Structure and Logic Diagram.



4.7.2.1.2 RIN Credit Benefits

RIN credits provide a potential unique revenue source to Alternative 1. RINs are the credits that the US Environmental Protection Agency (EPA) uses to track and enforce compliance with the renewable fuels mandates set by the federal RFS Program. The City may be able to generate and sell RIN credits to Obligated Parties by producing RNG from biogas and injecting it into the pipeline for blending with conventional, non-renewable natural gas. Figure 8 illustrates the value of RIN credits.

Figure 8: RIN Credit Value Structure and Logic Diagram.



The potential value of RIN credits beyond 2020 is shown below in Table 3. Based on this information and discussions between the City and HDR, the median D3 value ($16.18) was used in the SROI analysis for alternatives involving gas produced from the landfill. For alternatives located at the WWTP and food waste diversion scenarios the D5 value ($7.70) was used presuming the mix of a lesser quality gas.

Table 3: Value of RIN Credits

RIN and Carbon Market[2]	Units	Value			
		Most likely	Low	Median	High
Total for D3 + Commodity	$/MMBTU	$16.18	$8.20	$11.69	$25.15
Total for D5 + Commodity	$/MMBTU	$12.37	$5.71	$6.71	$9.70
Total for D5 + Commodity + LCFS	$/MMBTU	$7.70	$5.71	$11.69	$19.70

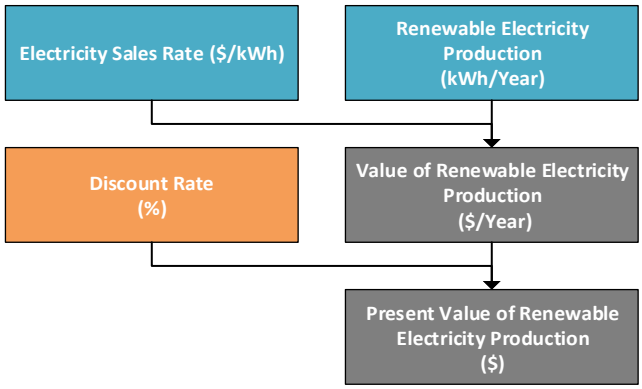
4.7.2.1.3 Renewable Electricity Production

Revenue from electricity sales are assumed to be captured from both net metering and negotiated buyback agreements with MidAmerican Energy Company and Eastern Iowa Light and Power Cooperative.

MidAmerican Energy Company (which supplies the electricity to the Iowa City Landfill) allows for net metering agreements for a facility nameplate generation capacity of up to 1 megawatt (MW) or 110% of its annual load. Credits from net metering agreements are paid out at the average locational marginal price (LMP) from the Midcontinent Independent System Operator (MISO) based on the generation profile of the resource. For energy produced beyond a nameplate capacity of 1 MW or 110% of its annual load, energy can be sold to MidAmerican Energy at a negotiated buyback rate. The Eastern Iowa Light and Power Cooperative allows for buyback agreements for facilities with a nameplate generation capacity exceeding 20 kilowatts (kW). Figure 9 illustrates the value of renewable electricity production.

[2] HDR is NOT providing a revenue projection or analysis of financial feasibility of alternatives. Such projections are highly dependent on open market commodity pricing, political volatility, and local, state, and federal programs and policies.

Figure 9: Renewable Electricity Production Value Structure and Logic Diagram



Electricity production was monetized under the assumptions shown in Table 4. The landfill is assumed to export 110% of its 2019 electricity usage at the net metered rate offered by MidAmerican Energy Company, and any excess generation is monetized at the negotiated buyback rate. The wastewater treatment plant receives the Eastern Iowa Light and Power Cooperative avoided cost rate for all of its electricity generation.

Table 4: Value of Renewable Electricity Production

Electricity Sales Assumptions	Units	Value
MidAmerican Energy Net Metering Rate	¢/kWh	2.6¢[3]
MidAmerican Energy Negotiated Buyback Rate	¢/kWh	2.6¢[4]
Eastern Iowa Light and Power Cooperative Avoided Cost Rate	¢/kWh	4.2¢[5]
2019 Iowa City Landfill Electricity Usage	kWh	278,882

4.7.2.1.4 Value of Avoided Natural Gas Purchases

The WWTP RNG produced will exceed the amount of natural gas used at the plant. As such, the City would need to either: find a use for the excess RNG produced, flare the excess gas, or the City would only condition the amount of biogas needed and the excess biogas would be flared. Production of RNG would prevent the facility from needing to purchase natural gas. For this analysis, it was assumed that RNG production would be capped at 62,848 standard cubic feet

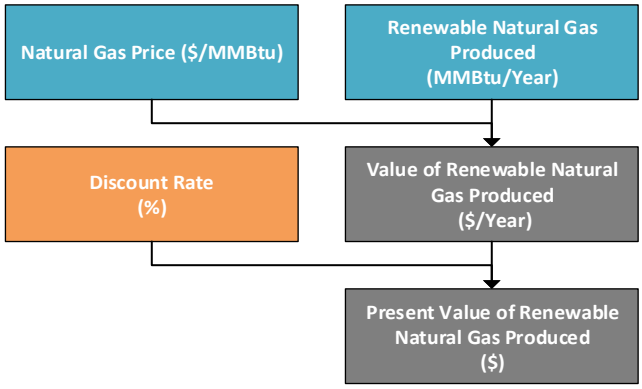
[3] The net metered rate is assumed to be a weighted average LMP based on 2019 hourly real-time LMP prices for the Illinois hub and the MISO load. Calculated based on data from Midcontinent Independent System Operator's market reports.
**********.misoenergy.org/markets-and-operations/real-time--market-data/market-reports/#nt=.
MISO historical load data was gathered from EnergyOnline from January 1, 2019 to December 31, 2019.
**********.energyonline.com/Data/GenericData.aspx?DataId=17.

[4] Negotiated buyback rate is assumed to be equivalent to the average LMP price calculated for the net metering rate.

[5] Weighted average calculation based on Eastern Iowa Light and Power Cooperative's posted avoided cost of generation during peak and off-peak hours.

per day and valued at the delivered cost of natural gas at the facility assumed to be **$3.16**[6] per MMBtu. The value stream is shown in Figure 10.

Figure 10: Renewable Natural Gas Value Structure and Logic Diagram



4.7.2.1.5 Energy return on energy investment

Energy return on energy investment is the ratio of the amount of usable energy delivered from a particular energy resource to the amount of energy used to obtain that energy resource as illustrated below.

$$EROEI = \frac{Eo}{E_i}$$

Where:

E_o = Energy output

E_i = Energy input

The resulting ratio demonstrates the relative energy inputs necessary to produce the energy output for each alternative. The higher the EROEI, the greater the amount of energy that is yielded for the amount of energy produced. EROEI was estimated for each alternative except for Alternative 4, because composting does not generate energy.

Energy output was based on the quantity of RNG produced or electricity generated. In addition to energy generated, HDR also factored in lifecycle energy use reduction using the USEPA Waste Reduction Model (WARM), which compares GHG emissions reductions and lifecycle energy savings from baseline and alternative waste management scenarios. HDR estimated change in lifecycle embodied energy by utilizing WARM to compare the baseline conditions to both 1,500 tons and Low-Diversion scenarios. Specifically, the output of the WARM model estimated the lifecycle energy use reduction by co-digesting or composting additional diverted food waste as compared to the baseline of landfilling this material. Because WARM is a lifecycle assessment tool, meaning impacts are estimated from cradle-to-grave, the estimated energy use reduction

[6] Calculated based on natural gas delivered and delivery charges from the wastewater treatment plant's bill for the month of October 2020.

occurs outside of the City's reporting boundary and would not be evident in annual GHG emissions inventories.

Direct energy input is based on the parasitic load of new equipment installed for the purposes of generating RNG or electricity, and does not include base load energy use required to operate the WWTP and Landfill Facilities based on current conditions. Specifically, direct energy input includes the parasitic load of the biogas conditioning equipment and electric generators. All energy output and input measures were converted into million British thermal units (MMBtu) to allow a relative comparison of alternatives. Table 5 provides details on each energy output and input value. The resulting EROEI's are presented in the results section of this report.

Table 5: Estimated Energy Inputs for Each Alternative

Alternative Description	Location	Alternative	Energy Input		Energy Output (Lifecycle Output + Lifecycle Energy Reduction)					EROEI
			kW/hr[1]	lifecycle (MMBTU)	RNG (scfm)[2]	kW-hr/day[1]	Lifecycle Output (MMBTU)	Lifecycle Energy Reduction (MMBTU)	Total Lifecycle Energy Output (MMBTU)	
Pipeline Injection	WWTP	Alt. 1a - ND	158	141,680	71	0	1,056,062	0	1,056,062	7.5
		Alt. 1a - 1500 Div	243	217,901	95	0	1,417,070	0	1,497,046	6.9
		Alt. 1a - LD	375	336,266	142	0	2,121,111	79,976	2,545,515	7.6
	Landfill	Alt. 1b - ND	1,145	1,026,733	541	0	8,096,474	424,404	8,096,474	7.9
		Alt. 1b - 1500 Div	1,145	1,026,733	536	0	8,026,070	0	8,106,045	7.9
		Alt. 1b - LD	1,145	1,026,733	515	0	7,710,000	79,976	8,134,404	7.9
Electricity Generation	WWTP	Alt. 2a - ND	305	273,497	0	10,915	407,816	424,404	407,816	1.5
		Alt. 2a - 1500 Div	353	316,539	0	14,644	547,143	0	627,118	2.0
		Alt. 2a - LD	650	582,862	0	21,921	819,033	79,976	1,243,437	2.1
	Landfill	Alt. 2b - ND	317	284,257	0	94,517	3,531,432	424,404	3,531,432	12.4
		Alt. 2b - 1500 Div	317	284,257	0	93,695	3,500,720	0	3,580,696	12.6
		Alt. 2b - LD	317	284,257	0	89,997	3,362,552	79,976	3,786,956	13.3
Natural Gas Replacement	WWTP	Alt. 3 - ND	158	141,680	71	0	653,776	424,404	653,776	4.6
		Alt. 3 - 1500 Div	243	217,901	95	0	653,776	0	733,752	3.4
		Alt. 3 - LD	650	582,862	142	0	653,776	79,976	1,078,180	1.8
Expanded Composting	Compost	Alt. 4	0	0	0	0	0	424,404	0	0.0

Notes:
1) The conversion from kw/hr to MMBTU is: kw/hr * 24 hours * 3,412.14 BTU per kW/hr * 365 days * 30 years divided by 1,000,000.
2) The conversion from scfm to MMBTU is: scfm * 1440 mins/day * 950 BTU per scfm natural gas * 365 days * 30 years divided by 1,000,000.

4.7.2.2 ENVIRONMENTAL IMPACTS

Environmental benefits include impacts that are valued based on the project's change in natural resource quality or quantity. The environmental included in this analysis include the social cost of carbon measured by changes in the emissions of carbon dioxide equivalents (CO_2e).

4.7.2.2.1 Social Cost of Carbon

GHG Emissions Impact Assessment: HDR understands that a key driver for decision-making is understanding the relative GHG emissions impact associated with each alternative and making progress towards the City's climate action goals. GHG emissions were estimated for each alternative included in the SROI analysis, and considered both direct and lifecycle impacts, as well as avoided emissions resulting from the beneficial reuse of biogas. Calculation methodologies align with best practices described in the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories **(**GPC**)** and Local Government Operations Protocol (LGOP) for GHG assessment. These considerations are described below and cumulative GHG emissions impacts for each alternative are presented in Table 6.

- Direct GHG emissions were based on the incremental emissions resulting from processes required to beneficially reuse biogas. Specifically, direct GHG emissions are based on the parasitic load of new equipment installed for the purposes of generating RNG or electricity, such as energy consumed by the biogas conditioning equipment and electric generators. It is important to note that direct emissions do not include base load energy use required to operate the WWTP and Landfill Facilities based on current conditions, rather, the Feasibility Study analyzes the incremental change from current operations. At the City's direction, HDR assumed that there would not be a material change in transportation-related GHG emissions associated with diverting food waste for the 1,500 tons and Low-Diversion scenarios. Lastly, it should be noted that GHG emissions associated with combustion of biogas/RNG is considered biogenic ($CO_2(b)$), and per the GPC, is to be reported separately outside of Scope 1, 2, and 3 GHG emission categories. Biogenic emissions are those related to the natural carbon cycle, as well as those resulting from the combustion, harvest, digestion, fermentation, decomposition or processing of biologically based materials.
- Lifecycle GHG emissions were estimated using the EPA WARM, which compares GHG emissions reductions and lifecycle energy savings from baseline and alternative waste management scenarios. HDR estimated change in lifecycle embodied carbon by utilizing WARM to compare the baseline conditions to both 1,500 tons and Low-Diversion scenarios. Specifically, the output of the WARM model estimated the lifecycle energy use reduction by co-digesting or composting additional diverted food waste as compared to the baseline of landfilling this material. Because WARM is a lifecycle assessment tool, meaning impacts are estimated from cradle-to-grave, the estimated GHG emissions reduction occurs outside of the City's reporting boundary and would not be evident in annual GHG emissions inventories.
- Avoided GHG emissions were estimated based on the beneficial reuse of biogas, including pipeline injection, electricity generation, and natural gas displacement, assuming:
    - Biogas injected into the natural gas pipeline would be utilized to generate and sell RIN credits, ultimately being used as a renewable fuel for mobile source

combustion. RNG is a market driver for commercial fleets to transition away from conventional diesel trucks to compressed natural gas (CNG)/RNG alternate fueled-vehicles. GHG emission reductions were estimated using a diesel fuel emissions factor published by the EPA.

- Biogas used to generate electricity would ultimately offset electricity generated by local electric power utilities (MidAmerican Energy or Eastern Iowa Light & Power). Emission factors were provided by the City. While MidAmerican Energy does have a public goal related to 100% of retail sales being served by renewable energy, this is not equivalent to a net zero carbon production goal. Absent of either electric utility having a publicly stated carbon emissions reduction goal, GHG emission reductions were estimated using the emission factor provided by the City, held constant for the study period.
- Biogas used as onsite fuel at the WWTP would displace natural gas on a 1:1 unit basis. GHG emission reductions were estimated using a natural gas emissions factor published by the EPA.

Table 6: Estimated GHG Emissions

Alternative Description	Location	Alternative	Change in Landfill GHG Inventory	Parasitic energy load	Change in biological treatment inventory	Beneficial reuse GHG benefit	Change in Net Embodied Carbon (EPA WARM)	Total Annual Change in CO_2e Metric Tons
Pipeline Injection	WWTP	Alt. 1a - ND	0	666	0	-2,017	0	-1,351
		Alt. 1a - 1500 Div	1,027	0	27	-2,707	-941	-2,594
		Alt. 1a - LD	1,585	0	144	-4,052	-4,996	-7,318
	Landfill	Alt. 1b - ND	0	4,840	0	-32,190	0	-27,350
		Alt. 1b - 1500 Div	0	4,840	0	-32,047	-941	-28,148
		Alt. 1b - LD	0	4,840	0	-30,903	-4,996	-31,059
Electricity Generation	WWTP	Alt. 2a - ND	0	1,289	0	-1,922	0	-633
		Alt. 2a - 1500 Div	1,492	0	27	-2,579	-941	-2,001
		Alt. 2a - LD	2,748	0	144	-3,861	-4,996	-5,965
	Landfill	Alt. 2b - ND	0	1,340	0	-16,647	0	-15,307
		Alt. 2b - 1500 Div	0	1,340	0	-13,282	-941	-12,884
		Alt. 2b - LD	0	1,340	0	-15,851	-4,996	-19,507
Natural Gas Replacement	WWTP	Alt. 3 - ND	0	666	0	-2,030	0	-1,363
		Alt. 3 - 1500 Div	0	1,027	27	-4,076	-941	-3,963
		Alt. 3 - LD	-7,221	144	2,748	-4,076	-4,996	-13,401
Expanded Composting	Compost	Alt. 4	-7,221	0	0	722	-5,670	-12,169

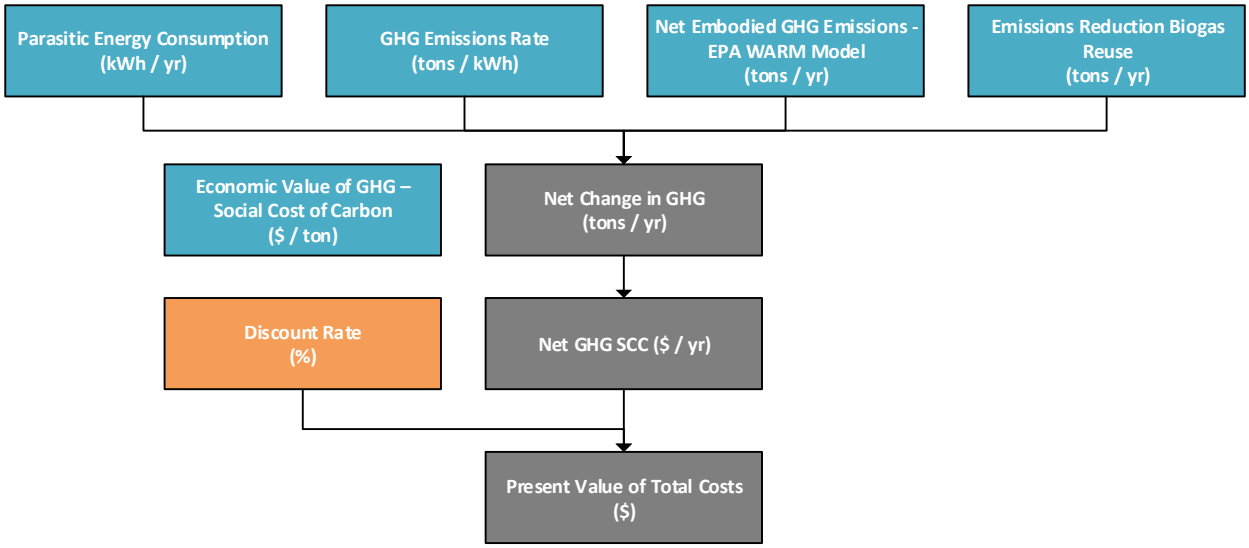
Value of GHG Emissions: Scientific studies in the United States and internationally have widely concluded that GHG emissions are closely linked with climate change, a condition that has been determined to lead to future economic impacts from more extreme weather events and damaging conditions on coasts. The impact is estimated from the change in energy production and net embodied carbon in each of the waste diversion scenarios. In alternatives of 1A and 1B (pipeline injection), RIN credits are counted as an economic benefit and the environmental attributes would therefore be sold to Obligated party who purchases the RIN credits. As such, the value of the social cost of carbon (SCC) is not counted for the associated changes in GHG emissions to avoid double counting.

GHG impacts were estimated using:

- EPA WARM model for the change in metric tons of CO_2e from embodied carbon in the waste stream;
- an electricity conversion factor (converts megawatt hours to tons of pollution for each emission type); and
- a cost of emission (monetizes the impact).

The logic for the estimating impacts of changes in GHG emissions is illustrated in Figure 11.

Figure 11: GHG Emissions Structure and Logic Diagram.



For CO_2e; the value from the Interagency Working Group on the Social Cost of Carbon (IWGSCC) was used in the analysis. This value is then escalated annually at 2% using rates derived from the Federal Interagency Working Group on Social Cost of Carbon. All values are in 2019 US dollars per ton.

Table 7: Social Costs of GHG Emissions

GHG Emissions	Unit	Value	Source
CO_2e	$/Ton	$46	IWGSCC (2013)

5 Summary Economic, and Environmental Impacts of Alternatives

The evaluation of economic and environmental impacts considered a time horizon or study period, which includes project development (construction and implementation) and 29 years of operation and benefit. This extends to 2050 and aligns with the planning horizon of the City's CAAP. Costs and benefits have been converted to present value using a 3% discount factor. Total benefits and costs are compared using a benefit to cost ratio (BCR), benefits divided by costs. BCR's exceeding 1.0 indicate that the benefits from the alternative exceed the costs of the investment over a 30 year period. Results are shown below in Table 8.

Consideration should be given to the implementation schedule of alternatives and potential for a phased approach. Revising the economic framework to account for a phasing of projects over 5-10 years would affect all of the alternatives equally and would not change the overall ranking or comparison of the alternatives. Furthermore, there is limited impact to the capital and O&M cost considerations as long as the period of study remains over 30-years. The more significant cost impacts are observed with a minimum delay of 8-10 years out of the study period. A number of implementation scenarios are possible, but the CIP planning impact is often similar from a planning perspective.

Table 8: Summary of Monetary Benefits and Costs ($ Millions, 2019)

Alternative Description	Location	Alternative	Total Cost	Total Social Cost of Carbon	Total Value for RIN Credit and Energy Revenues	Total Benefit	Benefit -Cost Ratio
Pipeline Injection	WWTP	Alt. 1a - ND	$35.92	$1.67	$5.48	$7.15	0.20
		Alt. 1a - 1500	$47.44	$3.21	$7.35	$10.56	0.22
		Alt. 1a - LD	$104.23	$18.01	$23.09	$41.10	0.39
	Landfill	Alt. 1b - ND	$75.47	$33.87	$88.14	$122.01	1.62
		Alt. 1b - 1500	$75.07	$34.86	$87.37	$122.23	1.63
		Alt. 1b - LD	$72.42	$38.46	$83.93	$122.39	1.69
Electricity Generation	WWTP	Alt. 2a - ND	$35.04	$0.78	$1.58	$1.91	0.05
		Alt. 2a - 1500	$45.91	$2.48	$2.71	$4.41	0.10
		Alt. 2a - LD	$101.24	$16.33	$2.77	$18.31	0.18
	Landfill	Alt. 2b - ND	$46.50	$18.96	$27.16	$35.23	0.76
		Alt. 2b - 1500	$46.18	$15.95	$26.91	$32.08	0.69
		Alt. 2b - LD	$44.55	$24.16	$25.75	$39.58	0.89
Natural Gas Replacement	WWTP	Alt. 3 - ND	$25.20	$1.69	$1.09	$2.78	0.11
		Alt. 3 - 1500	$33.18	$3.23	$0.93	$4.16	0.13
		Alt. 3 - LD	$82.92	$16.60	$0.15	$16.75	0.20
Expanded Composting	Compost	Alt. 4	$15.69	$15.07	$0.00	$15.07	0.96

The results show that only Alternative 1b (landfill natural gas) has benefits that exceed the costs. The highest BCR is Alternative 1b – Low-Diversion. This alternative ranks highest on total lifecycle CO_2e emission reductions, and when combined with the value of RIN credits results in the greatest economic benefits. However, the City should be aware that the CO_2e emission reduction when RINs are sold to an Obligated Party will occur outside of the City's municipal and community-scale GHG inventories. This alternative has the sixth highest cost of the 15 alternatives presented. The net result, of Alternative 1b, is a BCR of 1.69 dollars of benefit per dollar of cost invested.

A sensitivity test was conducted to test the impact of key monetary values (RIN credits and SCC values) on the ranking of the alternatives. Changing the value of the SCC was found to have no effect in ranking as the value influences all of the alternatives equally. Conversely, the RIN credit value only affects the BCR of pipeline injection alternative (Alternative 1) and would have an impact on alternative ranking. The sensitivity analysis showed that the realized RIN credit value would need to be below $6.00 per MMBTU, or 5% greater than the low value of D5 RIN credits shown Table 3 for the BCR ranking of alternatives to change.

Perhaps as important for consideration in CAAP are non-monetary considerations. The non-monetary metrics (EROEI and lifecycle change in CO_2e emissions) are shown in Table 9. Perhaps the most important measure related to CAAP action objectives is CO_2e reductions. All of the alternatives result in a net reduction in CO_2e over the next 30 years. Alternative 1b – Low-Diversion results in the greatest net reduction.

Table 9: Summary of Non-Monetary Impacts

Alternative Description	Location	Alternative	Lifecycle Change in CO_2e Emissions	Lifecycle EROEI
Pipeline Injection	WWTP	Alt. 1a - ND	40,500	6.9
		Alt. 1a - 1500	77,800	7.9
		Alt. 1a – LD	436,200	7.9
	Landfill	Alt. 1b - ND	820,500	7.5
		Alt. 1b - 1500	844,500	7.6
		Alt. 1b - LD	931,800	7.9
Electricity Generation	WWTP	Alt. 2a - ND	19,000	2.0
		Alt. 2a - 1500	60,000	12.4
		Alt. 2a - LD	395,600	13.3
	Landfill	Alt. 2b - ND	459,200	1.5
		Alt. 2b - 1500	386,500	2.1
		Alt. 2b - LD	585,200	12.6
Natural Gas Replacement	WWTP	Alt. 3 - ND	40,900	4.6
		Alt. 3 - 1500	78,300	3.4
		Alt. 3 - LD	252,200	1.8
Expanded Composting	Compost	Alt. 4	365,100	0.0

Finally, all alternatives, except for composting, result in an EROEI of 1.0 or greater. Incremental composting of food waste does not generate energy. Opposite of the economic and GHG measures, Alternative 2a (WWTP Electricity Generation) – Low-Diversion ranks highest on EROEI. Meanwhile Alt 1b – Low-Diversion is ranked 5th on EROEI.

The overall ranking of the alternatives for the monetary (BCR) and the two non-monetary results are shown below in Table 10.

Table 10: Summary and Ranking of Monetary and Non-Monetary Results

Alternative Description	Location	Alternative	GHG Reduction	GHG Rank	EROEI	EROEI Rank	BCR	BCR Rank
Pipeline Injection	WWTP	Alt. 1a - ND	40500	15	6.9	9	0.20	11
		Alt. 1a - 1500	77800	12	7.9	6	0.22	9
		Alt. 1a - LD	436200	6	7.9	4	0.39	8
	Landfill	Alt. 1b - ND	820500	3	7.5	8	1.62	3
		Alt. 1b - 1500	844500	2	7.6	7	1.63	2
		Alt. 1b - LD	931800	1	7.9	5	1.69	1
Electricity Generation	WWTP	Alt. 2a - ND	19000	16	2.0	13	0.05	16
		Alt. 2a - 1500	60000	13	12.4	3	0.10	15
		Alt. 2a - LD	395600	8	13.3	1	0.18	12
	Landfill	Alt. 2b - ND	459200	5	1.5	15	0.76	6
		Alt. 2b - 1500	386500	9	2.1	12	0.69	7
		Alt. 2b - LD	585200	4	12.6	2	0.89	5
Natural Gas Replacement	WWTP	Alt. 3 - ND	40900	14	4.6	10	0.11	14
		Alt. 3 - 1500	78300	11	3.4	11	0.13	13
		Alt. 3 - LD	402000	7	1.8	14	0.20	10
Expanded Composting	Compost	Alt. 4	365100	10	0.0	16	0.96	4

5.1 Findings and Insights

To make recommendations for actions under 3.7 and 3.8, the monetary and non-monetary results are combined into a weighted score as shown below in Table 11. Each result was converted to an index (1 to 0). The indexed results were then weighted equally into a total score with a maximum value of 1.

Table 11: Indexed and Weighted Scores for each Alternative

Alternative Description	Location	Alternative	GHG Reduction	EROEI	BCR	Total Score	Rank
Pipeline Injection	WWTP	Alt. 1a - ND	0.01	0.17	0.04	0.23	13
		Alt. 1a - 1500	0.03	0.20	0.04	0.27	11
		Alt. 1a - LD	0.16	0.20	0.08	0.43	6
	Landfill	Alt. 1b - ND	0.29	0.19	0.32	0.80	3
		Alt. 1b - 1500	0.30	0.19	0.32	0.81	2
		Alt. 1b - LD	0.33	0.20	0.33	0.86	1
Electricity Generation	WWTP	Alt. 2a - ND	0.01	0.05	0.01	0.07	16
		Alt. 2a - 1500	0.02	0.31	0.02	0.35	7
		Alt. 2a - LD	0.14	0.33	0.04	0.51	5
	Landfill	Alt. 2b - ND	0.16	0.04	0.15	0.35	8
		Alt. 2b - 1500	0.14	0.05	0.14	0.33	9
		Alt. 2b - LD	0.21	0.32	0.18	0.70	4
Natural Gas Replacement	WWTP	Alt. 3 - ND	0.01	0.12	0.02	0.15	14
		Alt. 3 - 1500	0.03	0.08	0.02	0.14	15
		Alt. 3 - LD	0.14	0.05	0.04	0.23	12
Expanded Composting	Compost	Alt. 4	0.13	0.00	0.19	0.32	10

As noted previously, the Alternative 1b-LD (Landfill RNG Pipeline Injection) – Low-Diversion has the highest BCR. It also has the highest GHG reduction over 30 years. This is driven by the assumption that biogas injected into the natural gas pipeline would be utilized to generate and sell RIN credits, ultimately being used as a renewable fuel for mobile source combustion. Further, RNG is a market driver for commercial fleets to transition away from conventional diesel trucks to compressed natural gas (CNG)/RNG alternate fueled-vehicles. However, the City should be aware that when RINs are sold to an Obligated Party, the CO_2e emission reduction will occur outside of the City's municipal and community-scale GHG inventories. Opposite of the economic and GHG impacts, Alternative 2a (WWTP Electricity Generation) – Low-Diversion ranks highest on EROEI. Meanwhile Alternative 1b – Low-Diversion is ranked 5th on EROEI.

Based on the indexing and weighting exercise, Alternative 1b (Landfill Natural Gas) – Low-Diversion has the highest score (0.86). Alternative 1b (landfill natural gas) – 1500 ton diversion is ranked second. Alternative 1b (landfill natural gas) – No-Diversion is ranked third. Again, CO_2e emission reduction associated with pipeline injection and used as a renewable fuel will occur outside of the City's municipal and community-scale GHG inventories.

If the City is instead focused on reductions that will be reflected in its municipal and community-scale GHG emission inventory, then evaluation should be narrowed to focus on Alternatives 2 (Electricity Generation) and 3 (Natural Gas Replacement). While electricity generated at the WWTP or Landfill (2a and 2b, respectively) could very well be pushed to the power grid, contractual agreements with local utilities could allow the City to retain and retire RECs for GHG accounting purposes. Specifically, RECs could be applied to the City's Scope 2 market-based GHG inventory. Using RNG to displace natural gas use at the WWTP would result in lower Scope 1 GHG emissions. Focused on these two alternatives, Alternative 2b – Low-Diversion is ranked highest (fourth overall), followed by Alternatives 2a – Low-Diversion and 2a – 1500. These alternatives are ranked 4, 5 and 7 overall.

If total GHG emissions reduction is the ultimately priority, Alternatives 1b (Landfill Pipeline Injection) offers the greatest potential, simply due to the volume of biogas generation and associated potential for renewable electricity generation.

Finally, biogas utilization alternatives can be combined together with others, and some can be incorporated as standalone projects (as shown in Table 12).

Table 12: Potential Biogas Utilization Alternatives Combinations

Weighted and Indexed Performance Indicators **Total Score, inclusive of:** ***GHG Reduction, EROI, and BCR***				**Landfill Location**						
				Do Nothing	No Diversion		1500 ton/yr Diversion		Low Diversion	
					NG Pipeline Injection	Electricity Generation	NG Pipeline Injection	Electricity Generation	NG Pipeline Injection	Electricity Generation
					Alt 1b-ND	Alt 2b-ND	Alt 1b-1500	Alt 2b-1500	Alt 1b-LD	Alt 2b-LD
WWTP Location	Do Nothing			0	0.80	0.35	0.81	0.33	0.86	0.70
	No Diversion	NG Pipeline Injection	Alt 1a-ND	0.23	1.02	0.58				
		Electricity Generation	Alt 2a-ND	0.07	0.87	0.42				
		NG Replacement	Alt 3-ND	0.15	0.95	0.50				
	1500 ton/yr Diversion	NG Pipeline Injection	Alt 1a-1500	0.27			1.08	0.60		
		Electricity Generation	Alt 2a-1500	0.35			1.16	0.68		
		NG Replacement	Alt 3-1500	0.14			0.95	0.47		
	Low Diversion	NG Pipeline Injection	Alt 1a-LD	0.43					1.30	1.13
		Electricity Generation	Alt 2a-LD	0.51					1.37	1.21
		NG Replacement	Alt 3-LD	0.23					1.09	0.93

There are 18 unique possible combinations of alternatives, Table 12 has been developed to more appropriately showcase combinations and the "diversion lanes" in which decisions would need to be maintained with a decision. Boxes with blue numbering indicate individual alternative scenarios

at either the Landfill or at the WWTP. The boxes are also color coded in a "heat map" format, to show the overall ranking of the individual scenarios.

The individual alternatives can be combined together, but must be done so following the same waste diversion scenario from the Landfill. When combining the alternatives the scores from the Landfill and WWTP alternatives can be added together to identify the best combination of actions under each of the waste diversion scenarios. From Table 11 above, the higher the score the better the alternative. The highest scored alternatives are: Alternative 1b – NG Pipeline Injection landfill alternatives for each of the No-Diversion, 1500 ton diversion, and Low-Diversion scenarios. Identifying the best combination of actions works as follows: select the highest scored alternative from the desired waste diversion scenario (shown to be from the Alternative 1b – NG Pipeline Injection landfill alternatives) then work down the column (or "diversion lane") to the desired combination scenario. In the case of combining with Alternative 2a – Electricity Generation at the WWTP, a resulting combined score of 1.16. As capital costs are also additive, consideration should be given to the seemingly minor weighted score differential. In the example of combined Alt 1b-1500 with Alt 2a-1500, there is an estimated $6.2M savings to select Alt 1b-1500 with Alt 1a-1500.

5.1.1 Path Forward

HDR recognizes that incremental food waste diversion is not an instantaneous process, but the SROI analysis provides an assessment of the resulting impact when achieved. This Report provides decision tools to support the City's further consideration and decision making.

Consequently, the City might consider the following path forward to further evaluate and implement the preferred alternative(s):

i. City decision on desired diversion scenario and methane utilization at the WWTP to narrow the field of alternatives. (0-6 months)
ii. Further technical analysis to develop organics management strategies to achieve a targeted diversion scenario and further evaluate life cycle costs of co-digestion (if desired) and biogas utilization to generate electricity or RNG. Consideration of impacts to planned digester rehab project. (3-6 months)
iii. Conceptual Design Development of the selected alternative(s), providing basis of design parameters and implementation planning. (3-6 months)
iv. Detailed Design Development. (TBD)
v. Bidding and Construction. (TBD)

It may be prudent for the City to complete items i) and ii) within the next 6-months for capital planning purposes.

6 References:

City of Iowa City (2018), Climate Action and Adaptation Plan, https://www.icgov.org/project/climate-action.

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U.S. Environmental Protection Agency (2019). Environmental Protection Agency Waste Reduction Model (WARM) version 15. https://www.epa.gov/warm/versions-waste-reduction-model-warm#15.

A

Appendix A

Low-Diversion Scenario Digester Costs

OPINION OF PROBABLE CONSTRUCTION COSTS

Low Diversion Scenario (20% Diversion) - New Anaerobic Digester Complex			
			Costs
Capital Cost	**Hauled Waste Receiving Station**		$2,960,000
	Anaerobic Digester (1.4 MG)		$18,325,000
	Sludge Dewatering and Storage		$4,990,000
	Total Adjusted Base Bid with Installation		**$26,300,000**
Annual O&M Cost	**General O&M - Parts, Labor, Electricity**	1.5% of capital subtotal	$394,500
	Annual O&M Costs		**$394,500**

B

Appendix B

Financial Proforma – Breakeven Analysis

Appendix B - Memo

Date:	Wednesday, December 23, 2020
Project:	CAAP Methane Recovery Feasibility Study (HDR #10203725)
To:	City of Iowa City (PM – Joseph Welter)
From:	HDR (PM – Morgan Mays; Marcella Thompson; Serguei Kouznetsov; Jeremy Cook)
Subject:	Financial Proforma - Breakeven Analysis

Building on the Sustainable Return on Investment (SROI) and the Energy Return on Energy Invested (EROEI) analysis performed by HDR, a high-level breakeven financial analysis was performed for each of the options identified in the Final Feasibility Report. The financial analysis examines the impact of cash flows to Iowa City (the City) to compare the revenues (inflows) and costs (outflows). The purpose of the analysis was to identify the length of time for each alternative to break-even. This memorandum outlines the cash flows evaluated, key assumptions, and the results of the analysis.

Key Assumptions

The financial analysis examined revenue streams for the various alternatives. For the pipeline injection alternatives, the revenue is derived from the Renewable Identification Number (RIN) credits under the Renewable Fuel Standard Program. For the electricity generation alternatives, the revenue is derived from electricity sales through an agreement with the utilities and Renewable Energy Credits (RECs). For natural gas replacement alternatives, revenue or rather savings are derived from avoided natural gas purchases.

Revenue from electricity sales are assumed to be captured from both net metering and negotiated buyback agreements with MidAmerican Energy Company and Eastern Iowa Light and Power Cooperative.

MidAmerican Energy Company (which supplies the electricity to the Iowa City Landfill) allows for net metering agreements for a facility nameplate generation capacity of up to 1 megawatt (MW). Credits from net metering agreements are paid out at the average locational marginal price (LMP) from the Midcontinent Independent System Operator (MISO) based on the generation profile of the resource. For energy produced beyond a nameplate capacity of 1 MW, energy can be sold to MidAmerican Energy at a negotiated buyback rate. The Eastern Iowa Light and Power Cooperative allows for buyback agreements for facilities with a nameplate generation capacity exceeding 20 kilowatts (kW). RECs are earned for each megawatt-hour (MWh) of electricity generated. For the purposes of this analysis, an average LMP of **2.6¢**[1] per kilowatt-hour (kWh) was calculated based on the 2019 LMP prices for the Illinois hub and the 2019

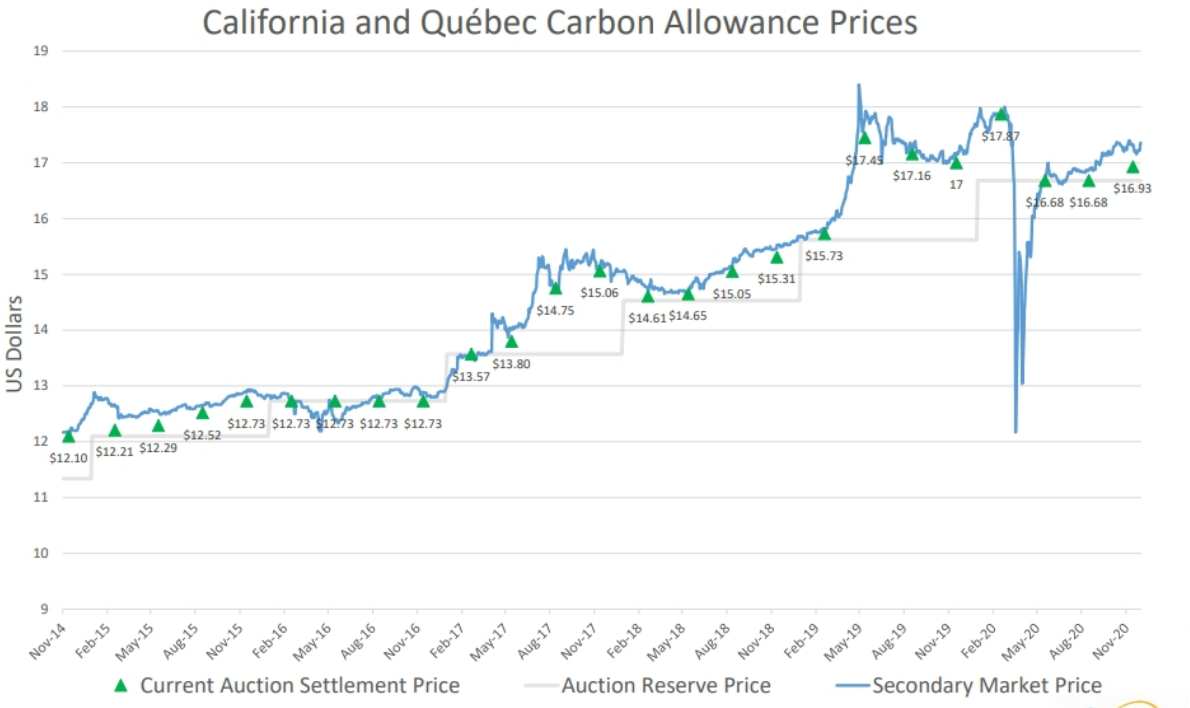
[1] Real time LMP prices gathered from Midcontinent Independent System Operator (MISO)'s historical LMPs for real-time markets from January 1, 2019 to December 31, 2019. **********.misoenergy.org/markets-and-operations/real-time--market-data/market-reports/#nt=.
MISO historical load data was gathered from EnergyOnline from January 1, 2019 to December 31, 2019. **********.energyonline.com/Data/GenericData.aspx?DataId=17.

MISO load. This was assumed to be the price paid per kWh for MidAmerican Energy's net metering agreements. It was also assumed that the negotiated buyback rate for electricity generation in excess of 1 MW was equivalent to the average LMP price of **2.6¢** per kWh. Eastern Iowa Light and Power Cooperative posts its avoided cost of generation during peak and off-peak hours online from which a weighted average rate of **4.2¢** per kWh was calculated for energy sales from the wastewater treatment plant.

Renewable energy credits were monetized at an average rate of **$17** per MWh based on the latest auction prices of $16.93 per MWh in and the approximate band of prices over the past couple of years (see figure below). The analysis assumed that prices would remain at that price for the full 30 years of the analysis.

Figure 1: Historical Auction Prices for Renewable Energy Credits[2]

Posted December 4, 2020



Notes:

1. California and Québec held their first joint auction in November 2014.
2. Current Auction Settlement Price is the price at which current vintage allowances sold at auction.
3. Auction Reserve Price is the minimum price at which allowances can be sold at auction.
4. Secondary Market Prices are a composite of commodity exchange futures contract prices for near month delivery and a survey of OTC brokered transactions for California Carbon Allowances. Secondary market prices are provided with permission of Argus Media Inc.
5. Secondary Market Price data drawn on December 4, 2020.

As mentioned in the main report, the WWTP RNG produced will exceed the amount of natural gas used at the plant. As such, the City would need to either: find a use for the excess RNG produced, flare the excess gas, or the City would only condition the amount of biogas needed

[2] California Air Resources Board. California and Quebec Carbon Allowance Prices, December 4, 2020. ********ww2.arb.ca.gov/sites/default/files/2020-09/carbonallowanceprices_0.pdf.

and the excess biogas would be flared. For this analysis, it was assumed that RNG production would be capped at 62,848 standard cubic feet per day and valued at the delivered cost of natural gas at the facility assumed to be **$3.16** per MMBtu.

Results

High level results of the financial analysis are presented in the tables below. Projects were assumed to be bonded at a 3% interest rate and the breakeven term represents the minimum financing term that would be needed for the project to break even financially. Many alternatives have a payback term that is longer than 30 years, making them infeasible without grant funding support.

Table 1: Lifecycle Financial Breakeven Analysis Results, Millions of 2019$

Alternative Description	Location	Alternative	Total Cost	Total Financial Benefit	Project NPV (3% bond rate)	Financial Breakeven Term
Pipeline Injection	WWTP	Alt. 1a - ND	$35.92	$5.48	-$30.44	N/A
		Alt. 1a - 1500 Div	$47.44	$7.35	-$40.10	N/A
		Alt. 1a - LD	$104.23	$23.09	-$81.14	N/A
	Landfill	Alt. 1b - ND	$75.47	$88.14	$12.67	17.9 years
		Alt. 1b - 1500 Div	$75.07	$87.37	$12.30	18.0 years
		Alt. 1b - LD	$72.42	$83.93	$11.52	18.2 years
Electricity Generation	WWTP	Alt. 2a - ND	$35.04	$1.58	-$33.47	N/A
		Alt. 2a - 1500 Div	$45.91	$2.71	-$43.21	N/A
		Alt. 2a - LD	$101.24	$2.77	-$98.47	N/A
	Landfill	Alt. 2b - ND	$46.50	$27.16	-$19.34	N/A
		Alt. 2b - 1500 Div	$46.18	$26.91	-$19.28	N/A
		Alt. 2b - LD	$44.55	$25.75	-$18.81	N/A
Natural Gas Replacement	WWTP	Alt. 3 - ND	$25.20	$1.09	-$24.11	N/A
		Alt. 3 - 1500 Div	$33.18	$0.93	-$32.25	N/A
		Alt. 3 - LD	$82.92	$0.15	-$82.77	N/A
Expanded Composting	Compost	Alt. 4	$15.69	$0.00	-$15.69	N/A

Table 2: Annual Financial Breakeven Analysis Results

Alternative Description	Location	Alternative	Annual Debt Service on Capital Costs	Annual Operating Costs	Annual Revenues/ Savings	Net Annual Financial Impact
Pipeline Injection	WWTP	Alt. 1a - ND	$0.44	$1.35	$0.27	-$1.52
		Alt. 1a - 1500 Div	$0.55	$1.82	$0.36	-$2.00
		Alt. 1a - LD	$2.11	$3.11	$1.14	-$4.08
	Landfill	Alt. 1b - ND	$1.49	$2.29	$4.37	$0.58
		Alt. 1b - 1500 Div	$1.48	$2.28	$4.33	$0.57
		Alt. 1b - LD	$1.43	$2.20	$4.16	$0.53
	WWTP	Alt. 2a - ND	$0.69	$1.07	$0.08	-$1.68

Alternative Description	Location	Alternative	Annual Debt Service on Capital Costs	Annual Operating Costs	Annual Revenues/ Savings	Net Annual Financial Impact
Electricity Generation		Alt. 2a - 1500 Div	$0.87	$1.43	$0.13	-$2.17
		Alt. 2a - LD	$2.55	$2.54	$0.14	-$4.95
	Landfill	Alt. 2b - ND	$1.05	$1.29	$1.35	-$0.99
		Alt. 2b - 1500 Div	$1.04	$1.04	$1.33	-$0.74
		Alt. 2b - LD	$1.00	$1.24	$1.28	-$0.96
Natural Gas Replacement	WWTP	Alt. 3 - ND	$0.39	$0.87	$0.05	-$1.21
		Alt. 3 - 1500 Div	$0.49	$1.16	$0.05	-$1.61
		Alt. 3 - LD	$2.03	$2.14	$0.01	-$4.16
Expanded Composting	Compost	Alt. 4	$0.29	$0.50	$0.00	-$0.79

Given that many of the alternatives do not generate enough financial benefits to break even in a reasonable time frame, the HDR team considered whether grant funding support could make the project feasible. The table below presents the minimum amount of grant funding required for each project to break even within specific time frames. Since grant funding is used to support up-front project capital costs, amounts above the initial capital costs are highlighted in red as not feasible. Amounts in green are feasible with the specified amount of grant funding.

Table 3: Grant Funding Support Necessary for Projects to Break Even

Alternative Description	Location	Alternative	Initial Project Capital Cost	Baseline Financial Breakeven Term	Grant Funding Support to Break Even within 30 Years
Pipeline Injection	WWTP	Alt. 1a - ND	$8.60	N/A	$30.44
		Alt. 1a - 1500 Div	$10.80	N/A	$40.10
		Alt. 1a - LD	$41.40	N/A	$81.14
	Landfill	Alt. 1b - ND	$29.20	17.9 years	$0
		Alt. 1b - 1500 Div	$29.00	18.0 years	$0
		Alt. 1b - LD	$28.00	18.2 years	$0
Electricity Generation	WWTP	Alt. 2a - ND	$13.50	N/A	$33.47
		Alt. 2a - 1500 Div	$17.00	N/A	$43.21
		Alt. 2a - LD	$50.00	N/A	$98.47
	Landfill	Alt. 2b - ND	$20.50	N/A	$19.34
		Alt. 2b - 1500 Div	$20.30	N/A	$19.28
		Alt. 2b - LD	$19.60	N/A	$18.81
Natural Gas Replacement	WWTP	Alt. 3 - ND	$7.70	N/A	$24.11
		Alt. 3 - 1500 Div	$9.70	N/A	$32.25
		Alt. 3 - LD	$39.80	N/A	$82.77
Expanded Composting	Compost	Alt. 4	$5.70	N/A	$15.69

In general, pipeline injection and electricity generation at the landfill are the only options that generate enough revenues to pay for the operating costs on an ongoing basis. Pipeline injection is feasible with bonding terms of about 18 years, while electricity generation would require around $19 million in grant funding support to be financially viable within 30 years. That said, the electricity generation revenues are currently limited by the net metering and buyback agreements in place. This analysis has assumed that MidAmerican Energy Company (which provides electricity to the Iowa City Landfill) will negotiate a buyback agreement similar to the LMP-based rates they offer under their net metering agreement. However, if the City were able to negotiate a higher rate, it could make the alternatives financially viable. Specifically, an electricity sales rate of **5.7¢** per kWh would make all three of the alternatives financially viable within the 30-year time frame.

Grant Funding

A few federal and state grant programs could potentially be leveraged to reduce the City's financial contribution and make the alternatives financially viable. The table below summarizes a few options based on literature review of the biggest programs which have had funding cycles within the past year.

Table 4: Grant Funding Opportunities

Program Administrator	Funding Program	Eligible Applicants	Eligibility Requirements	Funding
Federal Programs				
US Department of Energy Office of Energy Efficiency and Renewable Energy	Bioenergy Technologies Multi-Topic FOA	Individuals, entities, state or local governments, corporations, etc.	Varies based on year. FY2020 included area of Waste to Energy Strategies for the Bioeconomy, focusing on projects addressing topics such as advanced preprocessing of feedstocks, conversion of wet wastes to energy and products, and synergistic integration of algal biomass technologies with municipal wastewater treatment for greater energy efficiencies and lower costs. 20% cost share required.	Varies based on topic. Based on the FY20 grant application documentation, minimum award was $1,000,000 and maximum award for most topics was between $2,000,000 and $4,000,000.
US Department of Agriculture	Biorefinery, Renewable Chemical, and Biobased Product Manufacturing Assistance Program	Individuals, entities, state or local governments, corporations, institutions, public power entities, etc.	Must be for development and construction or retrofitting of a commercial scale biorefinery using an eligible technology for the production of advanced biofuels and biobased products. Majority of production must be an advanced biofuel.	Maximum loan guarantee of 80% of project costs or $250 million. Term length of the lesser of 20 years or the useful life of the project.
State Programs				
Iowa Energy Center	Iowa Energy Center Grant	Iowa businesses, colleges and universities, and private nonprofit agencies and foundations	Projects must provide benefit to Iowa ratepayers and aid in one of the key focus areas of the Iowa Energy Plan: 1) technology-based research and development, 2) energy workforce development, 3) support for rural and underserved areas, 4) biomass conversion, 5) natural gas expansion in underserved areas, 6) electric grid	Minimum award of $10,000, maximum award of $1,000,000.

Program Administrator	Funding Program	Eligible Applicants	Eligibility Requirements	Funding
			modernization, 7) alternative fuel vehicles.	
Iowa Energy Center	Alternate Energy Revolving Loan Program	Businesses, individuals, water and wastewater utilities, rural water districts and sanitary districts	Eligible technologies and resources include solar, wind, waste management, resource recovery, refuse-derived fuel, agricultural crops and residue, and wood burning, hydroelectric facility at a dam, energy storage, anerobic digestion, biogas, combined heat and power, wind repower. Facility must be in Iowa and be wholly owned by the borrower.	Minimum loan of $25,000, up to 50% of eligible project costs. Maximum loan of $1,000,000 per project. Loans offered at 0% interest.
Iowa Department of Natural Resources	Solid Waste Alternatives Program	Any unit of local government, public or private group, or individual	Projects to reduce the amount of solid waste generated and landfilled in Iowa. Funds can be used for waste reduction equipment and installation, recycling, collection, processing or hauling equipment, purchase and installation of recycled content products. 25% cash match required.	First $10,000 is eligible as a forgivable loan, next $50,000 is eligible as a zero-interest loan, and 3% loan on the remainder.

CITY OF IOWA CITY
MEMORANDUM

Date: December 28, 2020

To: Climate Action Commission

From: Ashley Monroe, Assistant City Manager

Re: Methane Feasibility Study Documents

At the January 4, 2021 Climate Action Commission meeting, HDR will be presenting the results of the Methane Feasibility Study conducted in 2019 and 2020. This study was conducted to meet the Climate Action and Adaptation Plan initiatives 3.7 and 3.8. (https://www8.iowa-city.org/weblink/0/edoc/1803121/Climate%20Action%20Plan.pdf). Two of the resulting reports, *Feasibility Report* and *Facility Evaluation* provide good overviews of the project and are provided for your reference in this packet.

The HDR team evaluated current and future biogas generation potential and identified alternatives for utilizing biogas at the Iowa City Wastewater Treatment Plant (WWTP) and/or the Landfill and Recycling Center (Landfill). HDR used its Sustainable Return on Investment (SROI) process to measure the feasibility of the objectives. The study was based on three categories for feasibility: net greenhouse gas emissions; net energy impact; and economics. Three alternatives were evaluated at each facility with three different scenarios for diversion of organic wastes from the Landfill. These study parameters led to seventy different combinations of alternatives and scenarios between the two facilities, of which, they will present an overview of the project and highlight top recommendations. HDR will present their findings and be available for questions in order to assist the Commission, City Council, staff, and other interested parties with any next steps.

If you have specific questions, Joseph Welter, Senior Civil Engineer, managed this project and has offered his contact information. Please feel free to email or call Joe at joe-welter@iowa-city.org and 319-356-5144.

Outreach Working Group, Meeting Agenda
Wednesday, Jan. 27, 2020, noon – 1 p.m.
Zoom Meeting Link:
https://zoom.us/j/97398387268?pwd=Mmo2a1A0T1E2MytqU0Zia2Uxa3FHZz09

Members:
Sarah Gardner, Matt Krieger, Madeleine Bradley, Grace Holbrook, Marcia Bollinger, Deb Schoelerman
Guests:
Bob Opplinger, Tom Banta, Audrey Wiedemeier, Liz Hubing, Cara Hamann

1. Welcome and Introductions

2. Updates

   - Ambassador program: *The next training session is set to start on Feb. 3 and run through March 24. This cohort was drawn from the waitlist of previous applicants. The application portal will reopen in March to recruit trainees for the third cohort, which is scheduled to begin training in April.*

   - Marketing RFP: *Negotiations are nearing completion with the preferred firm as to the scope of work and final contract, which will be brought before Council in February for approval. In the meantime, staff is compiling communications and marketing collateral for a comprehensive review as the first start of the project when it gets underway.*

3. Discussion of active transportation community outreach ideas presented by Bob Opplinger (see attached document): *Bob Opplinger began by giving highlights of the attached list noting that many programs are already in existance. Liz Hubing provided some details of the Bike Friendly Business program and suggested there might be a volunteer opportunity connected with it for the Climate Ambassadors. Audrey Wiedemeier discussed upcoming programming with the Bike Library, including a "Raise It Up" series of four family-friendly routes. The routes include 4-5 stops that are significant to the Black community in Iowa City. A self-guided audio tour narrated by Black community leaders will allow participants to learn more at each stop. The goal is to have 200 people per month participate in the rides. Weidemeier raised concerns she has had about putting together events meant for a crowd. Marcia Bollinger and Sarah Gardner shared conversations they had had with the Parks & Rec department on this topic, saying it plans are in the works for summer events like Party in the Parks, but they are being designed in a way to allow attendees to social distance. Opportunities for collaboration were discussed, including promoting the Raise It Up events in the Sustainability Newsletter. Gardner said she would share information with Wiedemeier about the Climate Action Grants as a potential funding opportunity for the program. Hubing said she would connect with Gardner to discuss a potential collaboration on the*

Bike Friendly Business program as well. Opplinger said he would send information on Bike to Work Month. Wiedemeier shared that the Bike Library has secured a new location at 1222 S. Gilbert Court and has plans for a celebration of the relocation later this month.

4. Other Items

Next Meeting Wed, 3/17

Active Transportation Community Outreach Ideas (from Bob Opplinger)

1. Create an active transportation advisory committee and/or hire an active transportation coordinator. This is long overdue. The advisory committee or coordinator would work with IC transit services, neighboring communities, and Johnson county as well as the MPO.
2. Promote more widely the Bike to Work Month activities. There will be a dozen or more events. The calendar is just being put together.
3. Work with the schools to promote Safe Routes to Schools. This is a nationally funded project to promote active transportation to schools. The Iowa Bike Coalition has a staff person dedicated to promoting this and will host their annual, virtual workshop for it on Thursday, January 28. (It's FREE.) The IC South District and the Bike Library were ramping up a biking version last spring. Garner school in NL has promoted this idea too and maybe Longfellow.
4. Help promote IC South Districts ambitious schedule of biking actives. Because of all the trails, ICSD want to become the biking mecca of IC.
5. Assuming live farmer's markets resumes, more actively promote Move Naturally to the Market. This promotion goes back to the Blue Zones Project and was hosted by BIC in May. People who biked or walked to the Saturday market received a $2 coupon for the market. (Vendors were reimbursed at the end of each market.) It was well received by vendors as well as patrons and attracted up to 250 people on a sunny Saturday.
6. Promote more widely, the League of American Bicyclists Bike Friendly Business initiative. This is a companion program with the Bike Friendly Community & Bike Friendly University programs. Our metro area has about a dozen BFBs. Tom Banta and I were able to persuade about 6-8 area business/worksites to apply. (It does not require everyone in the workplace to ride a bike to work.) IC Civic Center, Robert Lee Rec Center & Public Library collectively hold a silver-level designation, Johnson County offices a gold-level and we have one platinum-level business.
7. Develop a promotion that rewards bikers or walkers patronizing local businesses. There is a national program Bike Benefits (bb2.bicyclebenefits.org), that offers specified discounts, e.g. 10% off purchases, for patrons who bike to their business sporting the program's decal.
8. Learn to Bike classes. Work with BIC and IC rec services to set-up classes. We can teach an adult to ride a bike in 2-3 hours. NYC hosts clinics around town and annually teaches about 30K new bikers. Young kids take a little longer. We should have available soon a short pamphlet "Teaching your Child to Ride a Bike; A Guide for Parents and Caregivers."
9. Street Biking Classes. Street biking would take proficient riders further in offering them help to gain confidence using bike lanes and "safe streets" to commute.
10. Create a promotion that runs through the summer. For example, Iowa City Active Transportation Challenge. Beginning in May and running thru September create a challenge like the National Bike Challenge (https://www.lovetoride.net/usa). In its simplest form, a person who walks or bikes to work or on an errand instead by car would receive a credit. Accumulate 20 credits and receive a $10 gift card for area businesses. This is an ambitious idea. Some things to workout.
    a. The threshold for the number of points to receive a gift card. Twenty equals about one/week and the size of the reward
    b. How to record points. Is honesty an issue; considering the reward amount, I'd say no.
    c. How to underwrite expenses. Maybe offer only 500 cards and the number of gift cards an individual can receive, e.g. two. The biking community would offer financial support.

d. Soliciting cooperation with area businesses. These days I don't think that'd be hard.
e. Could you offer weekly super "raffle prizes" to people enrolled, e.g. a gift certificate to Film Scene.
f. Promotion

Building Working Group Report
For Climate Action Commission Feb. 1, 2021 packet

Residential Energy Data

The Building Working Group, including CAC members (Matt, Ben, Becky) and community volunteer member (Jeff), have talked with MidAmerican Energy contacts and/or discussed re getting residential energy data at the smallest level possible.

- Goal : *To understand potential areas to prioritize for energy efficiency and related improvement*.
- Create a map to show areas of high residential energy use and based on differences seen use that info for programming and outreach. Energy outreach programs are often most effective when done on a block by block or other small neighborhood scale versus one house here and one house there.
- When the city's Energy Analyst is on board, the BWG would like to move quickly to set up a meeting with that person and other city staff and move forward with requesting energy data and using it to support related climate actions.
- In particular, understanding residential energy data would help support these Accelerated Actions:
    - BE-1 Promote energy efficiency;
    - BE-2 Partner with stakeholders to promote green buildings and rehabilitation;
    - BE-3 re energy info in MLS listings
    - BI-1 re home energy assessments
    - BI-3 re neighborhood energy blitzes
    - BR-5 re rental energy efficiency
    - BPP-2 net-zero public housing
- Note: the data ideally should be made publicly available so others can do their own analysis, especially GIS-based.