TOWN OF CARRBORO
FACILITIES RENEWAL PROJECT

Town Hall // Century Center // Public Works

JSA ARCHITECTS

SUD ASSOCIATES, P.A.
CONSULTING ENGINEERS

JIM SPENCER ARCHITECTS, PA
109A Brewer Lane | PO Box 385
Carrboro, NC 27510
919.960.6680

April 27, 2021

Town of Carrboro Renewed Facilities Project Report Contents

JIM SPENCER ARCHITECTS, PA
109A Brewer Lane | PO Box 385
Carrboro, NC 27510
919.960.6680

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Town of Carrboro Renewed Facilities Project
Summary of Project Work and Recommendations

Project Background

Jim Spencer Architects, PA and Sud Associates, PA were hired by the Town of Carrboro to undertake a facilities renewal study in June of 2020. Our team has spent the last year documenting and studying three of the Town's existing facilities – Town Hall, the Century Center, and Public Works. We have met with staff members and a committee of representatives over twenty times and with Ben Schmadeke on multiple other occasions. The attached report includes information regarding both the existing and proposed conditions for these buildings/sites, as well as the energy analysis and preliminary recommendations regarding moving these facilities toward net zero. We hope that this report and the accompanying presentations on May 4 (architectural) and May 11 (energy systems) will assist the Council in making some general decisions about the future of their facilities. We ask that the Council receive this information and then provide feedback which our team will use to revise and present the final report after the summer break.

Project Process

The team has undergone the following steps in analyzing the Town of Carrboro facilities:

- Research Building History and Usage
- Perform Site Visits (JSA + Sud Associates)
- Document Existing Conditions (Plans + Photos)
- Create Existing Conditions Base Plans + Models
- Analyze Existing Conditions for Code and Life Safety (ADA, Fire and Exiting, Historical Character, Hazardous Materials, Program and Plan Efficiency, Sustainability)
- Coordinate with Energy Analysis
- Explore and Present Options for Defining and Using Net Zero Technologies

- Propose Programming and Building Renovations/Additions to address energy and other issues listed above
- Explore and Present Options for Defining and Using Net Zero Technologies
- Propose Programming and Building Renovations/Additions to address energy and other issues listed above (this work will be ongoing while Council considers net zero technologies and options, but Council feedback will inform final presentation.
- Present facilities renewal options to Staff and Town Council

Next Steps

- Prepare final reports based on feedback and input from Staff and Council
- Provide Construction Documents for Immediate Needs Projects (Windows, CC Chiller, etc. - These may also be influenced by decisions of Council on direction for the buildings' program and usage in the future)

Findings and Recommendations

Based on our work, we are attaching plan sets for each facility here (listed in the contents as Exhibits). We have included work on the Public Works facility in this report. However, due to the complexity of that site due to stormwater and other issues, public works has asked Sungate Engineers to assist in further site study to determine the best long-term solutions.

Plans for the proposed renovations and additions to the Century Center and Town Hall are attached. These plans are based on extensive feedback and collaboration with Town staff and other stakeholders. Please find below further information regarding each facility.

Town of Carrboro Town Hall

301 West Main Street
Carrboro, NC 27510

Primary Considerations:

A: Energy – Retrofit solutions to meet energy sustainability goals
B: Accessibility – Bring facility up to current accessibility standards
C: Life Safety – Fire and Life Safety analysis and recommendations
D: History – Preservation/return of historic character
E: Program – Current vs. Future Usage – short and long-term goals
F: Other – Hazardous Materials/Indoor Air Quality

Building Considerations Summaries

A: Energy & Sustainability Goals

See Sud Associates Energy Analysis and Recommendations
Note: Town Council is weighing in on Net-Zero energy metrics and boundaries for the proposed projects.
Proposals for renewed or replaced energy systems should incorporate this feedback as well as lessons learned from Town staff and facilities past and recent usage.

B: Accessibility

Accessibility is a primarily issue for the existing building. There is not full accessibility for many spaces in the building, due to lack of an elevator and proper clearances/space requirements. Most of the facilities, including restrooms and other public spaces, have deficiencies in accessibility. The basement and second level, both used extensively by the public, do not meet ANSI 117.1 or the ADA. More information will be provided in the proposed renovations/renewals phase, but priority must be given to both staff and public accessibility. This will include vertical circulation, as well as renovation and addition of toilet and other rooms.

C: Life Safety and Building Codes

The 1922 building would probably be categorized as a type III-B building under current building codes. This essentially means the exterior walls are masonry or non-combustible, and the interior structure and roof assemblies are of wood or other permitted materials.

The building is not sprinklered, but has a partial fire alarm system. Adding sprinklers to the building would be difficult, but would also protect a valuable town asset and provide enhanced life safety for its users. Exiting appears to meet existing codes generally, but could be upgraded slightly depending on future programming and accessibility improvements made.

D: Historic Character

"The materials, configuration and ornamentation of this building are typical of public schools built in the 1920s and 1930s. Built in 1922 as the Carrboro Graded School, this blocky two-story brick building with banks of large double-hung sash windows exhibits restrained ornamentation consisting primarily of shallow, stone-capped parapets and large recessed panels framed in narrow bands of corbelling. Naturally, decoration is concentrated at the main façade where box posts support a porch and a heavy molded and parapeted cornice resting on carved brackets marks

the recessed entrance. Flanking the porch, walls of solid brick are discretely ornamented with embedded squares of contrasting stone. It appears that a cornice, probably identical to the cornice above the entrance, originally accented the building's most prominent façades. According to local tradition, this school was erected on the site of a brick yard. One of the most well-known school figures was Mrs. Josie Sturdivant, who was principal until about 1947. After the present Carrboro Elementary School was built at the end of Ash Street in 1959, this building was converted into Carrboro Town Hall."

From *Carrboro, N.C. – An Architectural & Historical Inventory* by Claudia Roberts Brown, Burgess McSwain, and John Florin with photography by Jane Hamborsky

The building has obviously changed over many years, though the existing historic form is still extant. The restrained brickwork is still a feature of the building, but the interiors have largely been modified to meet office standards from the period of each renovation. One notable exception is the large former auditorium space on the upper level, which retains its wood floors and open trussed ceiling. This space is currently used for storage for the town's recreation and parks department.

Town Hall is obviously one of the most important buildings in Carrboro, and retaining its character as future modifications are made will be important. Strategies for energy conservation and generation on this site need to consider the building's aesthetic and character as well. The context and site itself have been modified greatly already, so the campus-like feel may allow modifications to be made with some subtlety but still achieve the Town's other goals.

E: Program – Current and Long-Term Usage and Goals

Current Use and Features

Town Hall has undergone renovations over the years which have affected its historic character some as well as its spaces and energy usage. The current use is largely administrative, though there is also assembly space (Council Chambers) and storage space. Original double-hung windows were replaced with aluminum windows (though in similar pattern and size). Original cornices and other wood features were largely removed, and a large porch and ramp added at the front entry.

Other reports regarding the structure and use of the building have been done, most notably in 1982 (Design Works), 1990 (LPA Group), and 2017 (Creech Associates). These reports noted Town Hall's lack of full accessibility, program use and existing structure and renovation potential.

The site itself is an approximately 3.96-acre lot which features a large open space which houses the Carrboro farmer's market pavilions, parking, and play space. On the opposite side of the site, Carrboro Fire Station #1 sits along with an enclosed service court containing electrical and telecommunications equipment.

A prominent site feature is the large historic American Elm tree in the front lawn. A truth plaque added to the building recently describes the town's history and goals for justice and equity in the future.

Future Program and Use

There is certain to be a ripple effect in the Town's space programming from the new 203 project. Earlier studies have anticipated much of recreation and parks program moving to the new building. This would not only free space at the Century Center, but also potentially move some things away from the Town Hall to allow for new programmed space. There is a lot of storage on the upper levels of town hall now, much of it planning and recreation and parks files and equipment. These spaces will be considered for other uses should the space become available. There is also significant space allotted to the existing shop and repair area to the west of the original town hall. This is valuable space, but could be considered for re-programming or use to solve other site and building issues.

In the end, the council and staff will need to make some decisions – both financial and planning – in order to decide how best to marry the Town's goals for energy use and optimal programming for their facilities. We will present some options for the proposed renovations in the next phase of this project.

Note: The 2020 pandemic has exposed issues surrounding use of office space and potential changes to work patterns. Consideration should be given to these issues and whether more flexible uses and systems should be used to minimize energy use and maximize building efficiencies.

Existing Uses and Space Allotment

TOC Government and Staff	12,414 SF
Administration	
Conference	558 SF
Lobby	165 SF
Offices	642 SF
Reception	167 SF
Storage	37 SF

Building Support	
Break Room	272 SF
Bathrooms (Public)	74 SF
Bathrooms (Staff)	287 SF
Copy	130 SF
Electrical	86 SF
Mechanical	732 SF
Shop/Shop Office	1,112 SF
Safe	117 SF
Town Council	
Council Chamber	1,021 SF
Mayor	162 SF
Town Manager	336 SF
Town Clerk	161 SF
Economic Development	421 SF
Finance	290 SF
Housing and Community Services	298 SF
Human Relations	
Basement Level Offices	105 SF
Main Level Offices	339 SF
Information Technology	
Offices	870 SF
Storage	68 SF
Planning, Zoning and Inspections	
Reception	125 SF
Planning Offices	1,332 SF
Copy	166 SF
Plan Room	202 SF
Inspections/Zoning Offices	734 SF
Storage	1,405 SF
Police Department	270 SF
Evidence Storage	270 SF
Recreation and Parks	2,877 SF
Basement Storage	915 SF

Upper Level Storage 1,962 SF

Proposed Uses and Space Allotment

TBD – see attached drawings for more information

F: Other: Hazardous Materials/Indoor Air Quality

The year 2020 has made focus on hazardous materials and indoor air quality much more common. Meetings with Town staff during the energy analysis have brought questions about the balance between energy efficiency and indoor environmental quality.

It is not known if the Town has undergone a building-wide hazardous materials study for Town Hall. It seems likely this was done during one of the earlier renovation projects, but may need to be revisited during the next project. We have not observed likely asbestos sources like pipe-wrap or older 9" vinyl tile, but the building should probably have an assessment for lead paint and other potential airborne hazardous materials if renovations are planned. Future mechanical systems and building materials should be carefully considered as well.

Town Hall – Summarized Recommendations

- Add full accessibility – new ADA toilet rooms, staff break rooms, and vertical circulation. This work should be highest priority.
- Add other life safety and property value improvements such as sprinklers, fire alarm, and security upgrades
- Renovate existing building to accommodate departmental needs once the 203 project is complete. The floor plans attached reflect a relative consensus among the building's staff. This renovation includes added additional space on the rear of the building, as well as internal program space modifications. The main big moves of the building's renovation are:
  1. Move council chambers to old auditorium
  2. Add ADA toilet rooms and new staff areas (break/locker rooms) downstairs
  3. Revise main level to accommodate more public interaction and give staff added security. Add new public toilets and information portals.
  4. Rework upstairs to allow for planning department expansion and move Town Manager, Clerk, Mayor and Council to upper level.
  5. Add all accessibility – elevators, hallways, breakout spaces
- Return building to closer to historic look, with new windows (full-height) and removing drop ceilings, etc. This would happen in conjunction with:

- Revised building's mechanical systems to move toward Net Zero. Go with all electric systems and perhaps add VRF systems to pinpoint space usage and maximize efficiency.
- Other additional site strategies might be implemented to gain additional energy efficiency – on or off-site solar (ideas of covering parking to reduce heat-island effect and add solar arrays), water capture or addition of other sustainable measures on the Commons
- Discuss future of this site as a whole – it may make sense to consider a rebuild of Fire Station 1. The station needs upgrades and better equal facilities and might be best to consider in conjunction with Town Hall project. Future use of the cell tower and the land/space it uses might also be considered.

Town of Carrboro Century Center

100 North Greensboro Street
Carrboro, NC 27510

Primary Considerations:

A: Energy – Retrofit solutions to meet energy sustainability goals
B: Accessibility – Bring facility up to current accessibility standards
C: Life Safety – Fire and Life Safety analysis and recommendations
D: History – Preservation/return of historic character
E: Program – Current vs. Future Usage – short and long-term goals
F: Other – Hazardous Materials/Indoor Air Quality

Building Considerations Summaries

A: Energy & Sustainability Goals

See Sud Associates Energy Analysis and Recommendations
Proposals for renewed or replaced energy systems should incorporate this feedback as well as lessons learned from Town staff and facilities past and recent usage.

B: Accessibility

Accessibility is not as critical for the Century Center as for Town Hall, but it must still be considered. Better access to the public spaces should be implemented. The current lift is remote and difficult to access. An elevator core into public space should be installed. Other renovations to spaces should incorporate good accessibility as well. Since clear and physical separation of the police and public areas is desired, clear circulation and access should be a priority in renovations. New kitchen and bathrooms facilities should also be fully accessible.

C: Life Safety and Building Codes

The original portion of the 1920's building would probably be categorized as a type III-B building under current building codes. It has load bearing brick walls and heavy timber or wood roof and floor structures. Later additions are fully non-combustible concrete frame with brick veneers.

The building was sprinklered in a previous renovation, but sprinkler and fire alarm would need to be reworked in some areas during renovation. Signage, exiting and dimensions of circulation should be assessed during renovations as well.

D: Historic Character

CARRBORO CENTURY CENTER (FORMER CARRBORO BAPTIST CHURCH)
HISTORIC INFORMATION
100 North Greensboro Street

"The history of the Carrboro Baptist Church dates to the turn of this century when Thomas F. Lloyd's Alberta Cotton Mill was in its first years of operation. As the adjacent small village of mill workers grew, Lloyd responded to the religious needs of the community by donating to the four denominations in Chapel Hill a lot on Weaver St., facing the mill. The Chapel Hill Presbyterians and Episcopalians, who did not want to build another church, quickly assigned their rights to the property to the Chapel Hill Baptists and Methodists, who erected the Union Chapel on the site in 1901 or 1902. According to the seventy-fifth anniversary publication of the Carrboro Baptist Church, this one-story frame building shared by the Methodists and Baptists initially measured twenty feet by thirty feet and was soon doubled in size. Nevertheless, sharing the building presented problems, and around 1910 the Methodists began to hold their services in the Carrboro Public School on W. Main St.

The first pastor to serve the Carrboro Baptists was the Rev. J.C. Hocutt, who conducted services at Union Chapel every fourth Sunday from 1902 to 1906. After the Methodists stopped using Union Chapel, the building became known as Union Baptist Church. In 1912 the church was renamed Venable Baptist Church in accordance with the new name of the town, and in 1914 it received its present name when the community changed its name to Carrboro. In 1921, plans for a new church building were begun after the Rev. J.B. Davis called for full-time services. The Baptists exchanged their property for the larger adjacent lot along N. Greensboro St. owned by the Durham Hosiery Mills. The congregation hired brick masons Toney and William Strayhorn who built the foundation and ground floor walls in 1921. Due to lack of funds, construction was suspended until 1924, when the

building was completed; the two building phases are reflected in the different shades of brick for the ground floor and the rest of the building.

The core of the building is a rectangular gable-roofed sanctuary supported by exterior buttresses to which a one-story hipped roofed wing is appended along the east elevation. On the main, west elevation, flat-roofed towers with recessed window planes topped with corbelling distinguish each corner; the southwest tower marking the major intersection of Main and Weaver streets is taller due to the addition of a belfry. Originally, the tower windows were larger, in the form of pointed arches. When this church was completed, Union Chapel was dismantled and its materials were used for the construction of McDuffie Baptist Church, named for one of Carrboro Baptist Church's well-known early ministers, on N.C. 86 north of Chapel Hill. During the 1960s, brick additions were made to Carrboro Baptist Church between the two towers and along the north elevation."

From *Carrboro, N.C. – An Architectural & Historical Inventory* by Claudia Roberts Brown, Burgess McSwain, and John Florin with photography by Jane Hamborsky

Current Use and Features

The Carrboro Century Center has undergone several renovations and additions over its history. The original structure is visible and mostly intact in its original church form on the south side of the site. 1960s additions which added classroom and other public spaces are still evident as well. The Town purchased the building from Carrboro Baptist Church in 1997. A major 1999 renovation modified the building into its primary current Town of Carrboro programs and uses. The main level north side is currently Town of Carrboro police department, along with portions of the bottom floor and other spaces. The bulk of the lowest level on the north is Town of Carrboro Recreation and Parks administrative space. Some of the lower level south side is also Rec and Parks, and the Carrboro Cybrary has occupied a large center area in the lower south portion of the building. The old auditorium is used as a multi-purpose assembly space. The town is able to use this space and its accessory spaces itself, as well as rent it to the public (in non-pandemic times).

JSA and Creech Associates have both done programming work for the Town to investigate the potential uses of the building assuming some or all of Recreation and Parks department's move to the new 203 building. (See separate reports on this). There is potential and expectation to expand the Town's police department into much of the building, while maintaining the building's ability to house a public assembly space. This may involve some additional accessibility and other upgrades.

The site itself is an approximately .7-acre lot with the building occupying the entirety of the western side (facing North Greensboro) of the site from south to north. There is a small parking lot and access drives connecting the property to East Main and East Weaver Streets. A small courtyard lies central between the northern additions and the old church building.

The northern portion of the site (facing East Weaver Street) contains the Carrboro Millennium fountain.

E: Program – Current and Long-Term Usage and Goals

Current Use and Features

The Century Center has undergone renovations over the years which have affected its historic character some as well as its spaces and energy usage. The current use includes the Carrboro Police department on the upper level, as well as the main administrative offices for the Town's Recreation and Parks department on the lower level. The former original church portion to the south contain Century Hall, a large assembly space, as well as ancillary spaces for the hall. Below the hall has been the Carrboro Cybrary space along with some classrooms, a kitchen and other storage and ancillary spaces.

Future Program and Use

There is certain to be a ripple effect in the Town's space programming from the new 203 project. Earlier studies have anticipated much of recreation and parks program moving to the new building. This would free space for expansion and reconfiguration of the Police department, which is in need of upgrades and large spaces for much of its program.

The town would like to maintain the flexibility and public use of the Century Hall. It is both a versatile space and a source of revenue for the Town. Upgrades to its ancillary spaces – a better catering kitchen, breakout rooms and toilets might improve the functionality and marketability. Accessibility and ease of use will be important.

Note: The 2020 pandemic has exposed issues surrounding use of office space and potential changes to work patterns. Consideration should be given to these issues and whether more flexible uses and systems should be used to minimize energy use and maximize building efficiencies.

Existing Uses and Space Allotment

TOC Police	4,561 SF
Administration	943 SF
Admin Assistant	95 SF
Captain	132 SF
Chief	152 SF
Conference	146 SF
Copy	114 SF
Reception (Records?)	208 SF
Waiting	96 SF
Building Support	1,184 SF
Ammo	58 SF
Bathroom	62 SF
Break Room	51 SF
Locker – Men	485 SF
Locker – Women	311 SF
Office Supplies	48 SF
Storage	169 SF
Community Services	303 SF
Community Police	96 SF
Community Service	93 SF
Lieutenant	114 SF
Criminal Investigations	1,177 SF
Booking	210 SF
Evidence	299 SF
Interview Rooms	182 SF
Investigators	486 SF
Field Operations	954 SF
Shift Supervisor	126 SF
Squad Room	289 SF
Training Room	539 SF

Proposed Space Allotment – Police Department

TOC Police	11,100 SF
Administration Total	2,880 SF
Reception/Waiting	502 SF
Private Interview Area	266 SF
Public Restroom	101 SF

Admin Assistant (2)	271 SF
Conference Room	511 SF
Captain	170 SF
Chief	189 SF
Assistant Chief	145 SF
Copy/Print	95 SF
Records	153 SF
Bathroom – Men's	153 SF
Bathroom – Women's	158 SF
Storage	166 SF
Building Support Total	3,298 SF
Ammo	65 SF
Bathrooms – Gender Neutral	207 SF
Bathroom – Prisoner	44 SF
Break Room	316 SF
Locker – Mens'	485 SF
Locker – Womens'	311 SF
Storage – Conditioned	681 SF
POPAT Storage	161 SF
Uniform & Equipment Storage	152 SF
K9 Equipment and CIU Equipment	216 SF
Mechanical	535 SF
Server	125 SF
Community Services Total	334 SF
Community Police	334 SF
Criminal Investigations Total	3,208 SF
Booking	352 SF
Evidence Storage	978 SF
Bulk Evidence Property Storage	77 SF
Evidence Blood Drying Room	120 SF
Evidence Processing	180 SF
Interview Rooms	294 SF
Latent Room	97 SF
Investigators	735 SF
Investigator Supervisor	153 SF
Investigators Storage	93 SF
Patrol Storage	129 SF
Field Operations Total	1,380 SF
Shift Supervisor/Sergeants	118 SF
Squad Room	303 SF
FATS Training, Control & Storage	959 SF

See drawings for revised Century Hall existing and proposed square footage totals

F: Other: Hazardous Materials/Indoor Air Quality

The year 2020 has made focus on hazardous materials and indoor air quality much more common. Meetings with Town staff during the energy analysis have brought questions about the balance between energy efficiency and indoor environmental quality.

It is not known if the Town has undergone a building-wide hazardous materials study for Century Center. It seems likely this was done during one of the earlier renovation projects, but may need to be revisited during the next project. We have not observed likely asbestos sources like pipe-wrap or older 9" vinyl tile, but the building should probably have an assessment for lead paint and other potential airborne hazardous materials if renovations are planned. Future mechanical systems and building materials should be carefully considered as well.

Century Center – Summarized Recommendations

- Replace existing chiller – Sud Associates will advise on more efficient system on May 11
- Renovate existing building after Recreation and Parks moves their primary function to the new 203 building. This project involves renovating existing interiors to expand police headquarters. We have worked several years with the former and current chiefs and staff to get a general plan together. The main goals of the plan would be to have better public access to central administration and reception, more security and safety for other police uses, bigger and better training rooms and break room and toilets, etc.
- Add extra support spaces for Century Hall to include renovated toilet rooms, more storage, a new and larger catering and teaching kitchen, and a lift for stage access.

Town of Carrboro Public Works

100 Public Works Drive
Carrboro, NC 27510

Primary Considerations:

A: Energy – Retrofit solutions to meet energy sustainability goals
B: Accessibility – Bring facility up to current accessibility standards
C: Life Safety – Fire and Life Safety analysis and recommendations
D: History – Preservation/return of historic character

E: Program – Current vs. Future Usage – short and long-term goals
F: Other – Hazardous Materials/Indoor Air Quality

Building Considerations Summaries

A: Energy & Sustainability Goals

See Sud Associates Energy Analysis and Recommendations
Proposals for renewed or replaced energy systems should incorporate this feedback as well as lessons learned from Town staff and facilities past and recent usage.

B: Accessibility

Accessibility is an issue for the existing administrative building. There is not full accessibility for many spaces in the building, due to lack of proper clearances/space requirements. Most of the facility's spaces, including restrooms and other public spaces, have deficiencies in accessibility. The second level is not accessible. More information will be provided in the proposed renovations/renewals phase, but priority must be given to both staff and public accessibility. This will include vertical circulation, as well as renovation and addition of toilet and other rooms.

C: Life Safety and Building Codes

The main administrative building would probably be categorized as a type II-B or III-B building under current building codes. The exterior walls are non-combustible, and the interior structure and roof assemblies are of wood or other permitted materials. The other buildings on site are a combination of V-B and III-B, but are primarily storage buildings.

The building is not sprinklered, but has a partial fire alarm system. Exiting appears to meet existing codes generally, but could be upgraded slightly depending on future programming and accessibility improvements made.

D: Historic Character

CARRBORO PUBLIC WORKS
HISTORIC INFORMATION
100 Public Works Drive

The Town of Carrboro bought this parcel for Public Works in about 1991 and the buildings are all from the 1990s and 2000s. Most are pre-engineered metal buildings, with a couple of masonry buildings and post and beam structures for storage.

The site itself is an approximately 2.944-acre lot with the building occupying 128,226 gross square feet of land to the southwest of the intersections of NC Highway 54 and Smith Level Road. Morgan Creek abuts the property on the south and causes flooding in extreme rain events. The floodplain does extend into the property and should be considered for future use.

E: Program – Current and Long-Term Usage and Goals

Current Use and Features

The current public works facility contains many different storage, maintenance and administrative uses. The Town's public works and storm water staffs both are housed in the existing building on the north of the site. Additionally, there are extra bays attached to this building which serves as a maintenance garage for town vehicles. The administrative portion of this building contains multiple offices, a break room, and conference facilities. It has a couple of non-accessible compliant toilet rooms and other ancillary spaces.

Other buildings on site include a sign shop, a gas depot, vehicle and material storage sheds. There are approximately 11 buildings on site in addition to the primary building. There are also material and vehicular storage areas (paved and unpaved) spread around the site.

Note: There have been recent stream reclamation projects done near the site, but the threat of flooding on the site (particularly the lower, south side) continues and should influence future use and renovations.

Future Program and Use

There is need for additional office space, due to the consolidation of the Town's stormwater staff on this site. The administrative building also needs accessibility upgrades for its toilet and other rooms. Relocation of the car wash area (and its discharge) is needed, along with new storage areas for town vehicles (newly acquired garage trucks for example).

There may be simple additions or re-allocations which could achieve the Town's goals on this site. However, there may be need to reconsider location of vehicular parking and future growth of staff.

In the end, the council and staff will need to make some decisions – both financial and planning – in order to decide how best to marry the Town's goals for energy use and optimal programming for their facilities. We will present some options for the proposed renovations in the next phase of this project.

Note: The 2020 pandemic has exposed issues surrounding use of office space and potential changes to work patterns. Consideration should be given to these issues and whether more flexible uses and systems should be used to minimize energy use and maximize building efficiencies.

Existing Uses and Space Allotment

Administration	
Director	160 SF
Administrative Assistant	243 SF
Landscape Supervisor	70 SF
Street Supervisor	63 SF
Solid Waste Supervisor	137 SF
Offices	553 SF
Copy	27 SF
Building Support	
Bathrooms	242 SF
Break Room	415 SF
Conference Room	309 SF
IT	23 SF
Mechanical	529 SF
Storage	1,336 SF
Tool Storage	184 SF
Shop	
Mechanic Bays	2,646 SF
Tool Storage	148 SF
Accessory Buildings	
Fleet Maintenance Storage	334 SF
Landscaping and Ground Storage	1,322 SF
Pumping Station	969 SF
Streets Storage	476 SF
Storage	1,573
Tire	193 SF
Vehicle Storage	3,146 SF
Wash Pit	67 SF

F: Other: Hazardous Materials/Indoor Air Quality

The year 2020 has made focus on hazardous materials and indoor air quality much more common. Meetings with Town staff during the energy analysis have brought questions about the balance between energy efficiency and indoor environmental quality.

It is not known if the Town has undergone a building-wide hazardous materials study for Public Works. The age of these buildings limits the likelihood of hazardous materials in the buildings. However, there are many issues on the site with runoff and building/landscaping/maintenance materials and car wash discharge. These should be addressed in renovation project. Future mechanical systems and building materials should be carefully considered as well.

Public Works – Summarized Recommendations

- As noted above, we have discussed the Public Works site and buildings with staff and various stakeholders. We have included drawings and backgrounds here, but Public Works staff have also asked Sungate Engineering to look at the site further (particularly with regard to its storm water and other environmental issues.
- Most notably, the existing building needs accessibility upgrades, particularly the locker and toilet rooms.
- There is immediate need for the gas tanks to be relocated above ground, and for the car wash to be covered.
- The is future need for more potential office space, but also for better vehicular circulation on site. We have recommended to Sungate that more pervious surface and directional drive aisles be considered to reduce the amount of paving and gravel on site. This would help with both the traffic patterns and with the storm water issues on site.
- Consolidation of the buildings and their use would greatly help on the limited amount of high ground available at 100 Public Works Drive. Therefore, it may make good long-term sense to construct new, more energy efficient buildings on site (a campus approach) vs. simply repairing/adding to existing buildings and using so many outbuildings.

Estimated Costs and Schedule

Estimated budgets are being developed and will be shared with the Council in June or after the summer break, depending on the feedback we get at our May 4 and May 11 meetings.

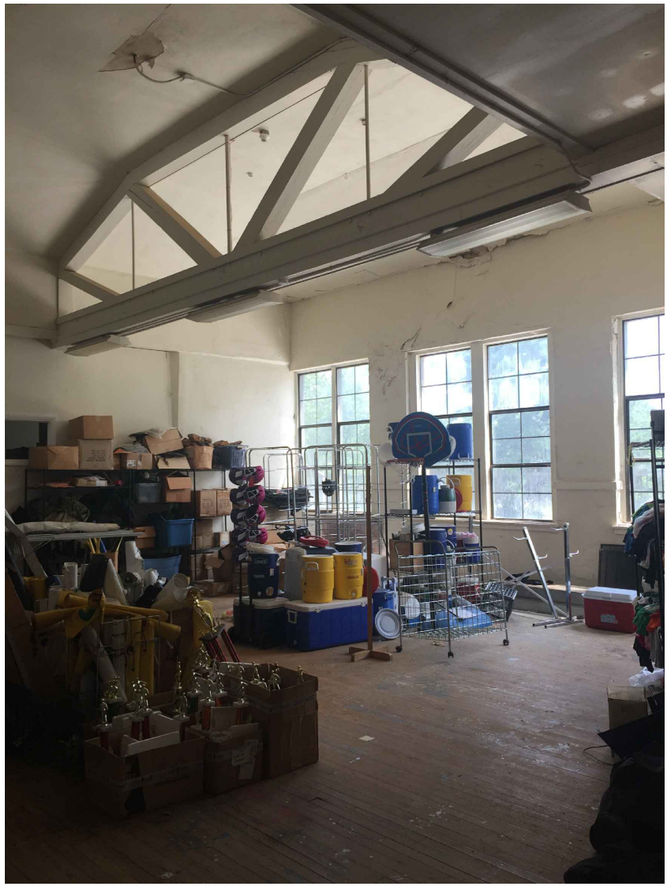
Priorities for the various work described is completely up to the Town staff and the Council. However, we recommend the Town Hall accessibility and other upgrades are prioritized.

Vintage Photo of Carrboro Graded School

photo: carrboro.com

Current Photo of Carrboro Town Hall

photo: david jessee



Carrboro Town Hall - Old Auditorium

photo: jsa

Carrboro Town Hall - Rear facade

photo: jsa

Carrboro Town Hall Southeast facade

photo: jsa

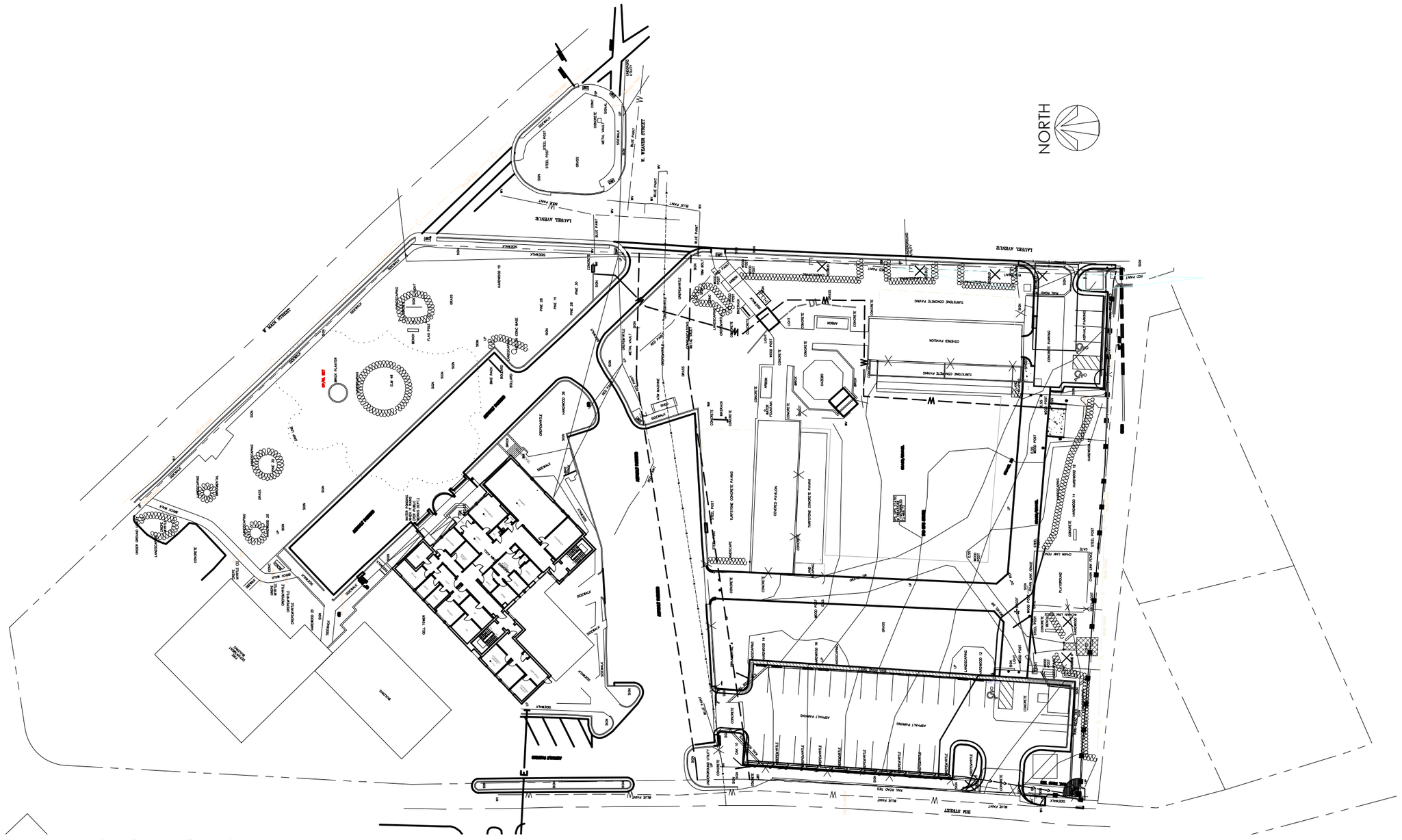
Jim Spencer Architects, PA
109-A Brewer Lane
Carrboro, NC 27510

jimspencerarchitects.com
919.960.6680

Town of Carrboro Renewed Facilities // Town Hall

Existing Conditions - Photographs // February 10, 2021

Town of Carrboro
301 West Main Street
Carrboro, NC 27510



1 / EC1 **Existing Conditions – Site Plan – Town Commons**
SCALE: 1" = 60'

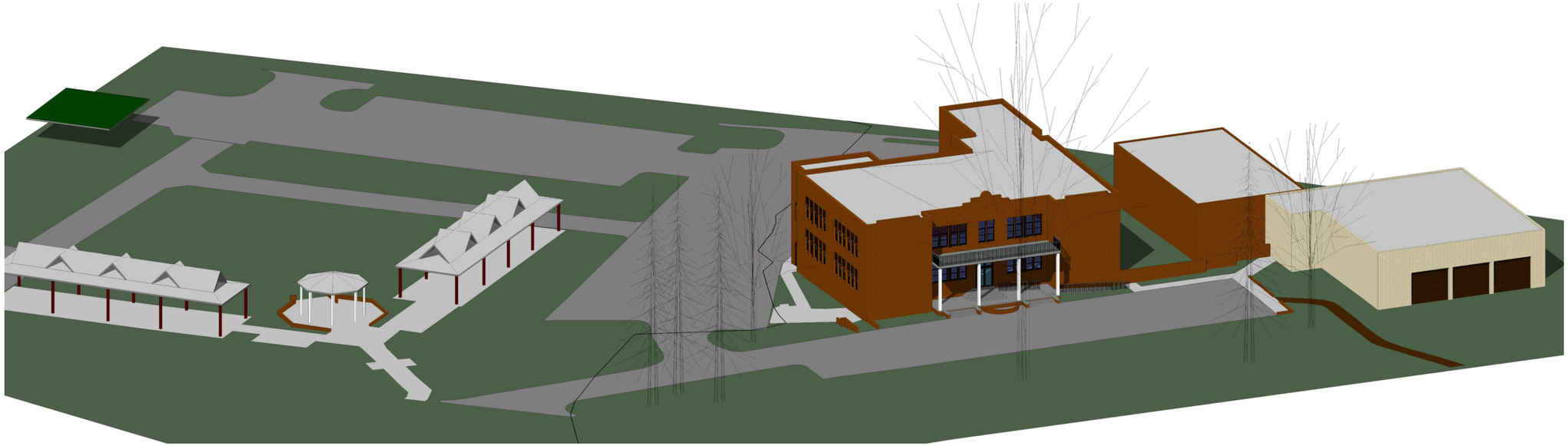
Jim Spencer Architects, PA
109-A Brewer Lane
Carrboro, NC 27510

jimspencerarchitects.com
919.960.6680

Town of Carrboro Renewed Facilities // Town Hall

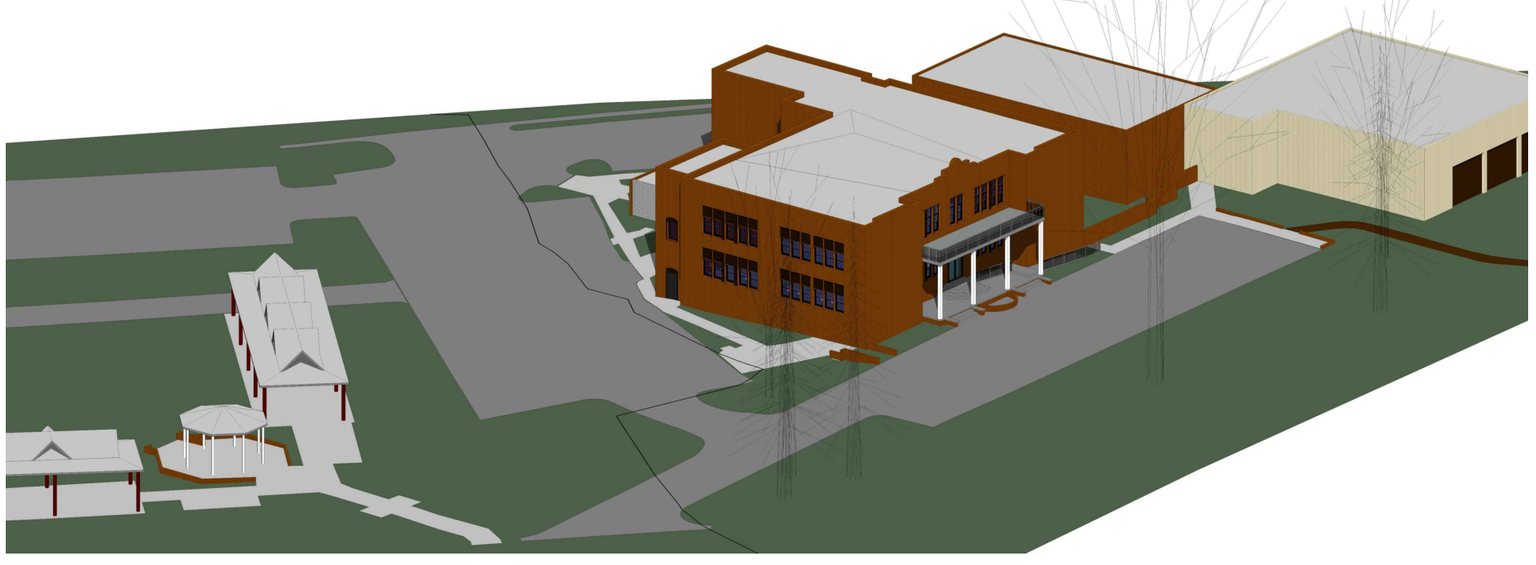
Existing Conditions - Site Plan // February 10, 2021

Town of Carrboro
301 West Main Street
Carrboro, NC 27510



Aerial View of Town Commons from the Northeast

Perspective View from Entry Drive to Town Hall



Aerial View of Town Commons from the Northeast

Jim Spencer Architects, PA
109-A Brewer Lane
Carrboro, NC 27510

jimspencerarchitects.com
919.960.6680

Town of Carrboro Renewed Facilities // Town Hall

Existing Conditions - Model Shots // March 10, 2021

Town of Carrboro
301 West Main Street
Carrboro, NC 27510

CARRBORO TOWN HALL
301 West Main Street

The materials, configuration and ornamentation of this building are typical of public schools built in the 1920s and 1930s. Built in 1922 as the Carrboro Graded School, this blocky two-story brick building with banks of large double-hung sash windows exhibits restrained ornamentation consisting primarily of shallow, stone-capped parapets and large recessed panels framed in narrow bands of corbelling. Naturally, decoration is concentrated at the main façade where box posts support a porch and a heavy molded and parapeted cornice resting on carved brackets marks the recessed entrance. Flanking the porch, walls of solid brick are discretely ornamented with embedded squares of contrasting stone. It appears that a cornice, probably identical to the cornice above the entrance, originally accented the building's most prominent façades. According to local tradition, this school was erected on the site of a brick yard. One of the most well-known school figures was Mrs. Josie Sturdivant, who was principal until about 1947. After the present Carrboro Elementary School was built at the end of Ash Street in 1959, this building was converted into Carrboro Town Hall.

From *Carrboro, N.C. – An Architectural & Historical Inventory* by Claudia Roberts Brown, Burgess McSwain, and John Florin with photography by Jane Hamborsky

Current Use and Features

Town Hall has undergone renovations over the years which have affected its historic character some as well as its spaces and energy usage. The current use is largely administrative, though there is also assembly space (Council Chambers) and storage space. Original double-hung windows were replaced with aluminum windows (though in similar pattern and size). Original cornices and other wood features were largely removed, and a large porch and ramp added at the front entry.

The site features a large open space which houses the Carrboro farmer's market pavilions, parking, and play space. On the opposite side of the site, Carrboro Fire Station #1 sits along with an enclosed service court containing electrical and telecommunications equipment.

A prominent site feature is the large historic American Elm tree in the front lawn. A truth plaque added to the building recently describes the town's history and goals for justice and equity in the future.

CARRBORO TOWN HALL
BUILDING FEATURES

A: Energy Systems

See energy analysis by Sud Associates attached

B: Building Code/Accessibility/Life Safety

The 1922 building would probably be categorized as a type III-B building under current building codes. This essentially means the exterior walls are masonry or non-combustible, and the interior structure and roof assemblies are of wood or other permitted materials.

The building is not sprinklered, but has a partial fire alarm system. Exiting appears to meet existing codes, but could be upgraded slightly depending on future programming.

Accessibility is a primarily issue for the existing building. There is not full accessibility for many spaces in the building, due to lack of an elevator and proper clearances/space requirements.

C: Historic Character

The building has obviously changed over many years, though the existing historic form is still extant. The restrained brickwork is still a feature of the building, but the interiors have largely been modified to meet office standards from the period of each renovation. One notable exception is the large former auditorium space on the upper level, which retains its wood floors and open trussed ceiling. This space is currently used for storage for the town's recreation and parks department.

D: Indoor Air Quality/Hazardous Materials

placeholder

E: Site Program – Short Term vs. Long Term programs

placeholder

Town of Carrboro Renewed Facilities Project

TOC Town Hall
301 West Main Street
Carrboro, NC 27510

Considerations

1) Retrofit solutions to meet energy sustainability goals
2) Solution to bring facility up to current accessibility standards
3) Fire and Life Safety analysis and recommendation
4) Preservation of historic character
5) Consolidation of storage
6) Other: Short term needs vs. long term goals

Existing Uses and Space Allotment

TOC Government and Staff	12,414 SF
Administration	
Conference	558 SF
Lobby	165 SF
Offices	642 SF
Reception	167 SF
Storage	37 SF
Building Support	
Break Room	272 SF
Bathrooms (Public)	74 SF
Bathrooms (Staff)	287 SF
Copy	130 SF
Electrical	86 SF
Mechanical	732 SF
Shop/Shop Office	1,112 SF
Safe	117 SF
Town Council	
Council Chamber	1,021 SF
Mayor	162 SF
Town Manager	336 SF
Town Clerk	161 SF
Economic Development	421 SF
Finance	290 SF
Housing and Community Services	298 SF
Human Relations	

Jim Spencer Architects, PA
109-A Brewer Lane
Carrboro, NC 27510

jimspencerarchitects.com
919.960.6680

Town of Carrboro
301 West Main Street
Carrboro, NC 27510

EXISTING BASEMENT LEVEL

PROPOSED BASEMENT LEVEL

SCALE : $\frac{1}{16}$" = 1'

LEGEND

- TOC Government & Staff
- Finance / Reception
- Information Technology
- Human Resources
- Community, Housing and Economic Development
- Planning
- Inspections / Zoning
- Public / Flex Space
- Staff Amenities
- Building Support
- Other
- PZI Storage

KEY IMPROVEMENTS

1. ENERGY EFFICIENCY/SYSTEMS
2. NEW ELEVATOR
3. NEW ADA BATHROOMS FOR PUBLIC USE DURING MARKET AND OTHER EVENTS AT TOWN COMMONS.
4. NEW ADDITION FOR STAFF BREAKROOM AND BATHROOMS.
5. INCREASED STORAGE FOR IT AND OTHER TOC GOVERNMENT/STAFF.
6. NEW SPRINKLER SYSTEM AND LIFE SAFETY IMPROVEMENTS.

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109-A Brewer Lane
Carrboro, NC 27510
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301 West Main Street
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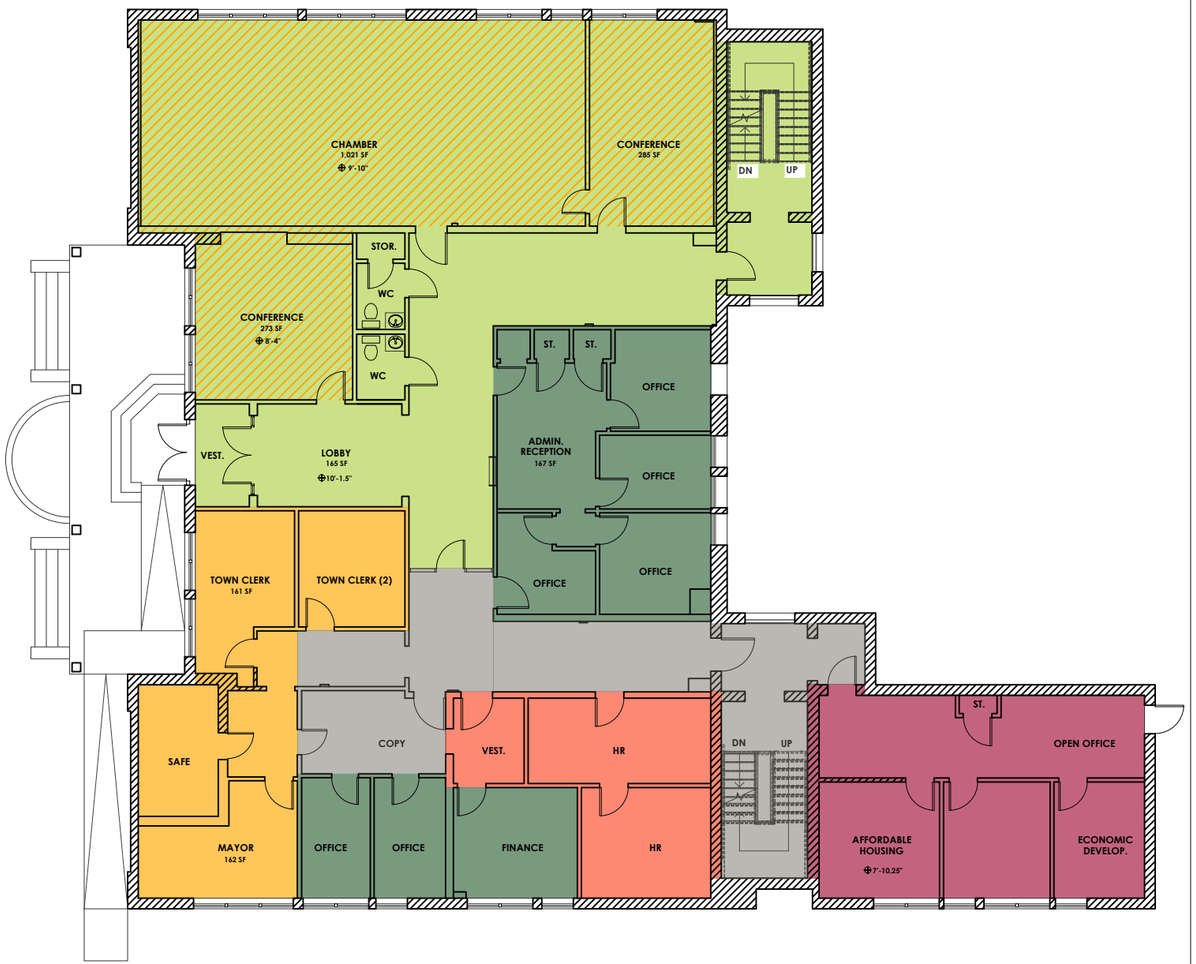


EXISTING MAIN LEVEL

PROPOSED MAIN LEVEL

SCALE : $\frac{1}{16}$" = 1'

LEGEND

- TOC Government & Staff
- Finance / Reception
- Information Technology
- Human Resources
- Community, Housing and Economic Development
- Planning
- Inspections / Zoning
- Public / Flex Space
- Staff Amenities
- Building Support
- Other
- PZI Storage

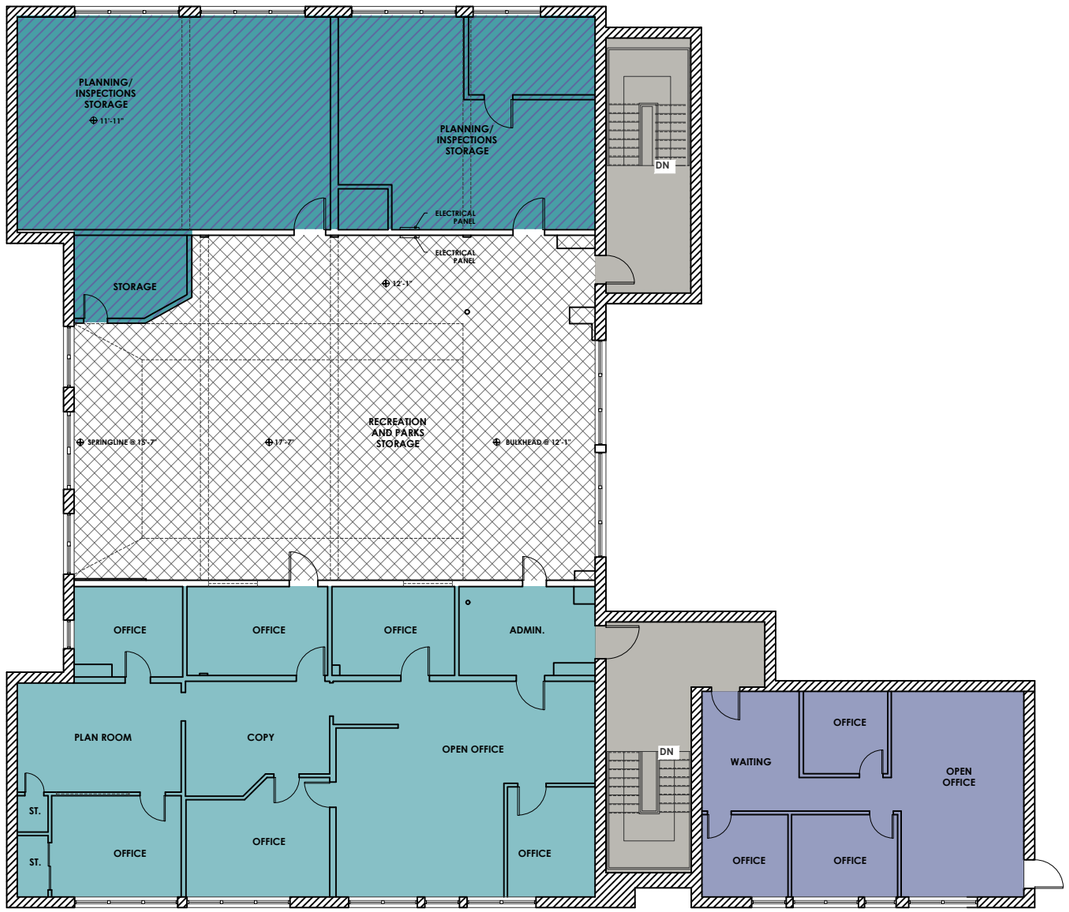
KEY IMPROVEMENTS

1. ENERGY EFFICIENCY/SYSTEMS
2. ADD NEW CORRIDOR AND ELEVATOR.
3. RENOVATE AND RECONFIGURE LOBBY TO INCORPORATE ADA RESTROOMS, ACCESS TO ELEVATOR AND INCREASE LOBBY/GALLERY SPACE.
4. RELOCATE COUNCIL CHAMBER AND REALLOCATE ROOM TO CONFERENCE/FLEX SPACE.
5. NEW ADDITION FOR STAFF OFFICES.
6. NEW SPRINKLER SYSTEM AND LIFE SAFETY IMPROVEMENTS.

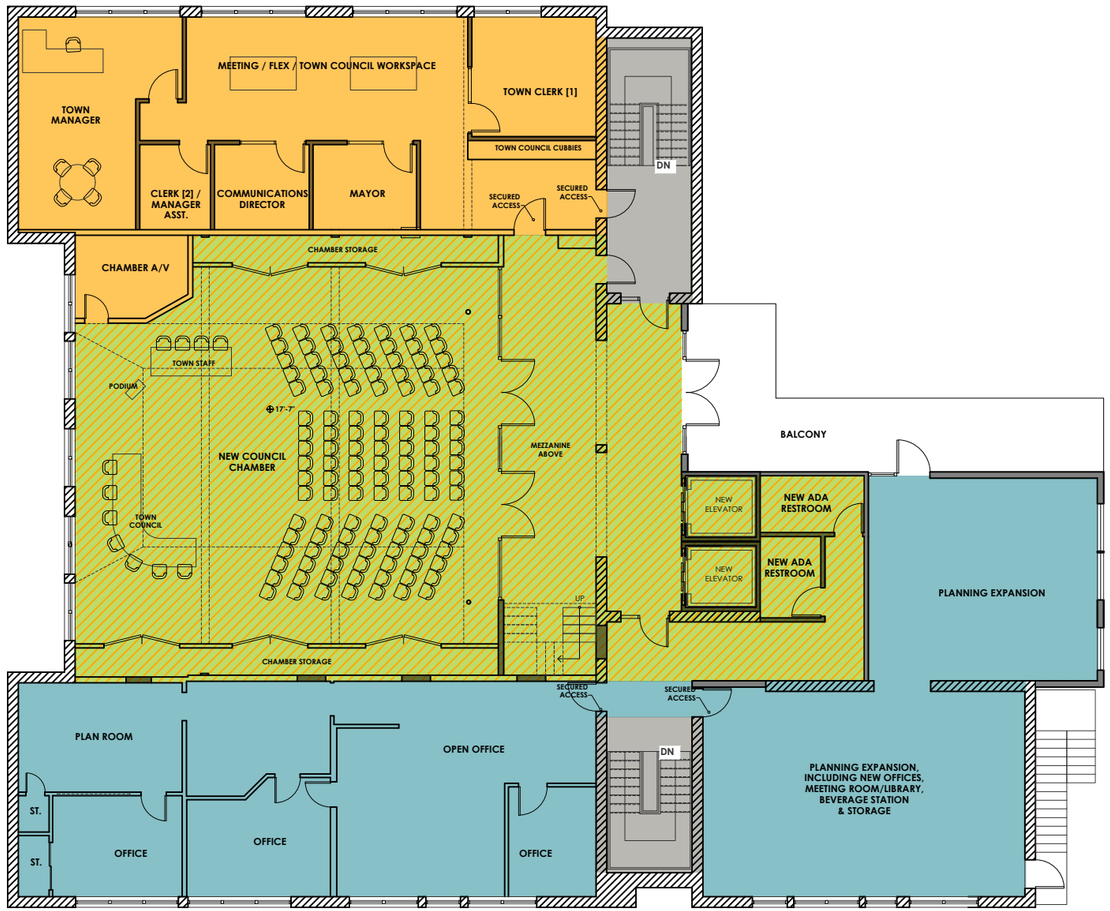
Jim Spencer Architects, PA
109-A Brewer Lane
Carrboro, NC 27510
jimspencerarchitects.com

Town of Carrboro Renewed Facilities // Town Hall // April 2021

Town of Carrboro
301 West Main Street
Carrboro, NC 27510



EXISTING UPPER LEVEL



PROPOSED UPPER LEVEL

SCALE : $\frac{1}{16}$" = 1'

LEGEND

- TOC Government & Staff
- Finance / Reception
- Information Technology
- Human Resources
- Community, Housing and Economic Development
- Planning
- Inspections / Zoning
- Public / Flex Space
- Staff Amenities
- Building Support
- Other
- PZI Storage

KEY IMPROVEMENTS

1. ENERGY EFFICIENCY/SYSTEMS
2. ADD NEW CORRIDOR AND ELEVATOR.
3. RENOVATE AUDITORIUM SPACE AND REALLOCATE TO COUNCIL CHAMBER.
4. RENOVATE EXISTING STORAGE SPACES AND REALLOCATE TO TOC GOVERNMENT & STAFF.
5. NEW ADDITION FOR PUBLIC RESTROOMS AND STAFF WELLNESS ROOM.
6. PLANNING EXPANSION
7. TOWN MANAGER OFFICE RELOCATION
8. NEW SPRINKLER SYSTEM AND LIFE SAFETY IMPROVEMENTS.

Jim Spencer Architects, PA
109-A Brewer Lane
Carrboro, NC 27510
jimspencerarchitects.com

Town of Carrboro
301 West Main Street
Carrboro, NC 27510

EXHIBIT A-1A

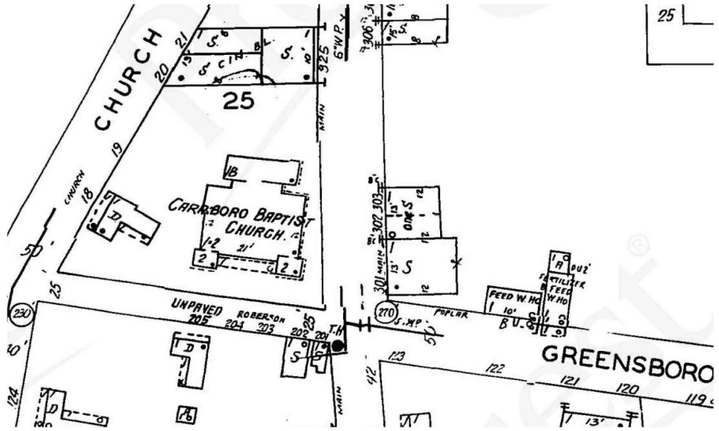
Town Hall Square Footage

	EXISTING	**PROPOSED**
TOC Government & Staff	2,856 sf	3,490 sf
Finance / Reception	1,084 sf	1,321 sf
Information Technology	1,678 sf	2,002 sf
Human Resources Offices	469 sf	612 sf
Community, Housing & Economic Development	801 sf	801 sf
Planning Offices	1,685 sf	2,717 sf
Inspections / Zoning Offices	875 sf	970 sf
Public / Flex Space	2,840 sf	7,450 sf
Staff Amenities	633 sf	1,502 sf
Recreation & Parks Storage	2,925 sf	218 sf
PZI Storage	?*	756 sf
HR Storage	?*	300 sf
Police Department Storage	278 sf	0
Other	1,835 sf (shop, unconditioned basement)	302 sf (unconditioned basement)

Notes:

- Proposed TOC Gov't & Staff square footage includes Meeting Room/Library, Town Council workspace, both of which can also be utilized by other departments as space for meetings, mobile workstations, plan reviews, large mailings.
- Flex space included in Public/Flex square footage will serve all departments for meeting space, mobile work stations, etc and will allow room for future expansion.
- Verify square footage of existing HR & PZI storage spaces.

EXHIBIT A-2



Sanborn Fire Map showing Carrboro Baptist Church

photo: openorangenc.org

Current Carrboro Century Center - Southwest Corner

photo: matt barrett

Vintage Photo of Carrboro Baptist Church

photo: openorangenc.org

Vintage Photo of Carrboro Baptist Church with 1960s Additions

photo: openorangenc.org

Current Carrboro Century Center - West Facade

photo: unknown

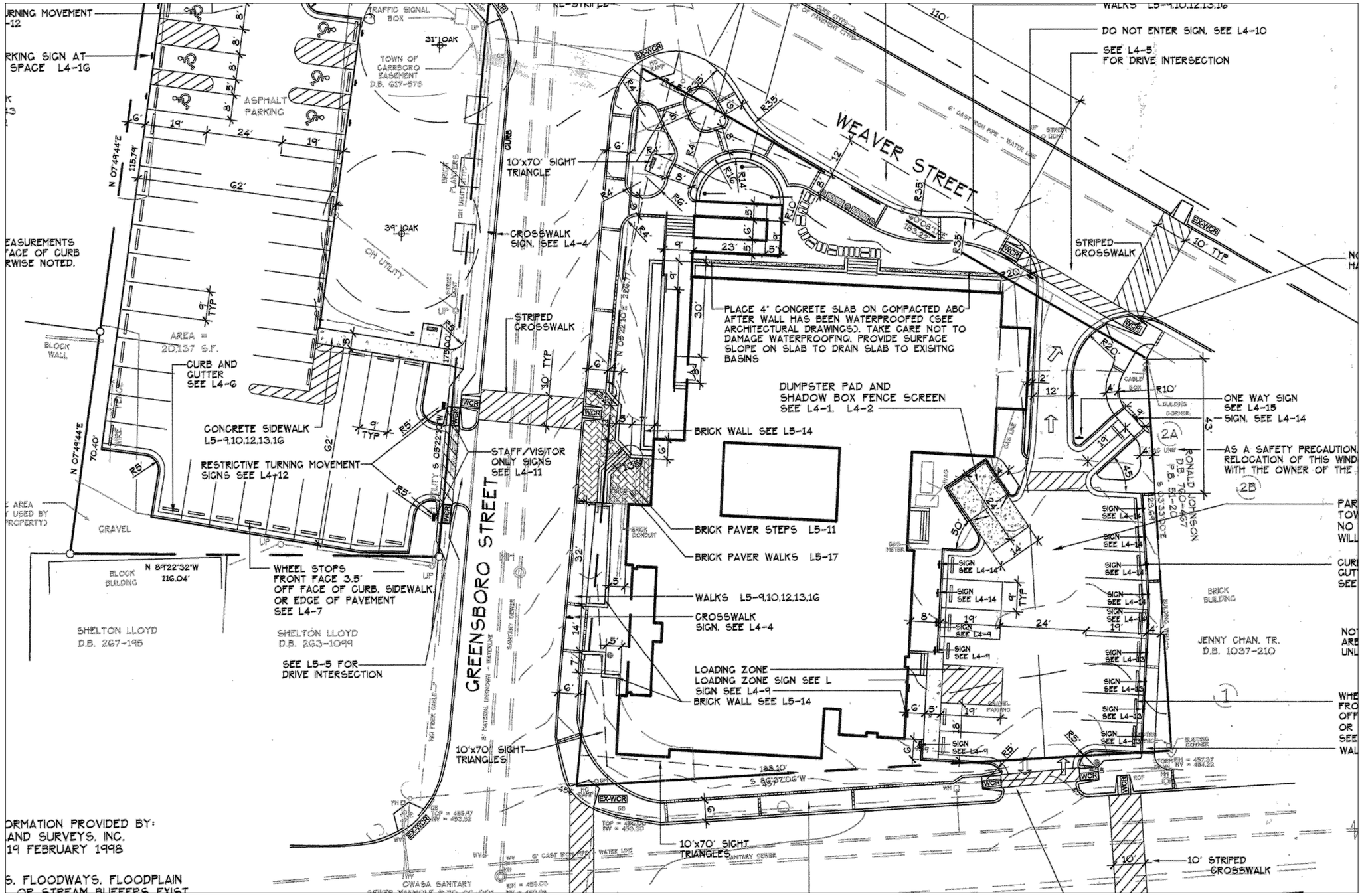
Jim Spencer Architects, PA
109-A Brewer Lane
Carrboro, NC 27510

jimspencerarchitects.com
919.960.6680

Town of Carrboro Renewed Facilities // Century Center

Existing Conditions - Photographs // February 2021

Town of Carrboro
301 West Main Street
Carrboro, NC 27510



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109-A Brewer Lane
Carrboro, NC 27510

jimspencerarchitects.com
919.960.6680

Town of Carrboro Renewed Facilities // Century Center

Existing Conditions - Site // February 2021

Town of Carrboro
301 West Main Street
Carrboro, NC 27510

1 / EC3 Existing Program – Lower Level
SCALE: 1/16" = 1'

Existing Space Allotment – Police Department

TOC Police	**4,561 SF**
Administration	943 SF
Admin Assistant	95 SF
Captain	132 SF
Chief	152 SF
Conference	146 SF
Copy	114 SF
Reception (Records?)	208 SF
Waiting	96 SF
Building Support	1,184 SF
Ammo	58 SF
Bathroom	62 SF
Break Room	51 SF
Locker – Mens'	485 SF
Locker – Womens'	311 SF
Office Supplies	48 SF
Storage	169 SF
Community Services	303 SF
Community Police	96 SF
Community Service	93 SF
Lieutenant	114 SF
Criminal Investigations	1,177 SF
Booking	210 SF
Evidence	299 SF
Interview Rooms	182 SF
Investigators	486 SF
Field Operations	954 SF
Shift Supervisor	126 SF
Squad Room	289 SF
Training Room	539 SF

Existing Space Allotment – Other

Century Hall	**5,683 SF**
Facilities	3,723 SF
Supporting Spaces	1,960 SF
Cybrary	**1,286 SF**
Recreation & Parks	**6,255 SF**
Administration	431 SF
Building Support	1,599 SF
Facilities	2,388 SF
Programs	1,837 SF

Jim Spencer Architects, PA
109-A Brewer Lane
Carrboro, NC 27510

jimspencerarchitects.com
919.960.6680

Town of Carrboro Renewed Facilities // Century Center

EC3 - Existing Program, Lower Level // February 2021

Carrboro Century Center
100 N Greensboro St.
Carrboro, NC 27510

919.918.7385

1 EC4 Existing Program – Upper Level
SCALE: 1/16" = 1'

Existing Space Allotment – Police Department

TOC Police	4,561 SF
Administration	943 SF
Admin Assistant	95 SF
Captain	132 SF
Chief	152 SF
Conference	146 SF
Copy	114 SF
Reception (Records?)	208 SF
Waiting	96 SF
Building Support	1,184 SF
Ammo	58 SF
Bathroom	62 SF
Break Room	51 SF
Locker – Mens'	485 SF
Locker – Womens'	311 SF
Office Supplies	48 SF
Storage	169 SF
Community Services	303 SF
Community Police	96 SF
Community Service	93 SF
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Criminal Investigations	1,177 SF
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Existing Space Allotment – Other

Century Hall	5,683 SF
Facilities	3,723 SF
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Administration	431 SF
Building Support	1,599 SF
Facilities	2,388 SF
Programs	1,837 SF

Jim Spencer Architects, PA
109-A Brewer Lane
Carrboro, NC 27510

jimspencerarchitects.com
919.960.6680

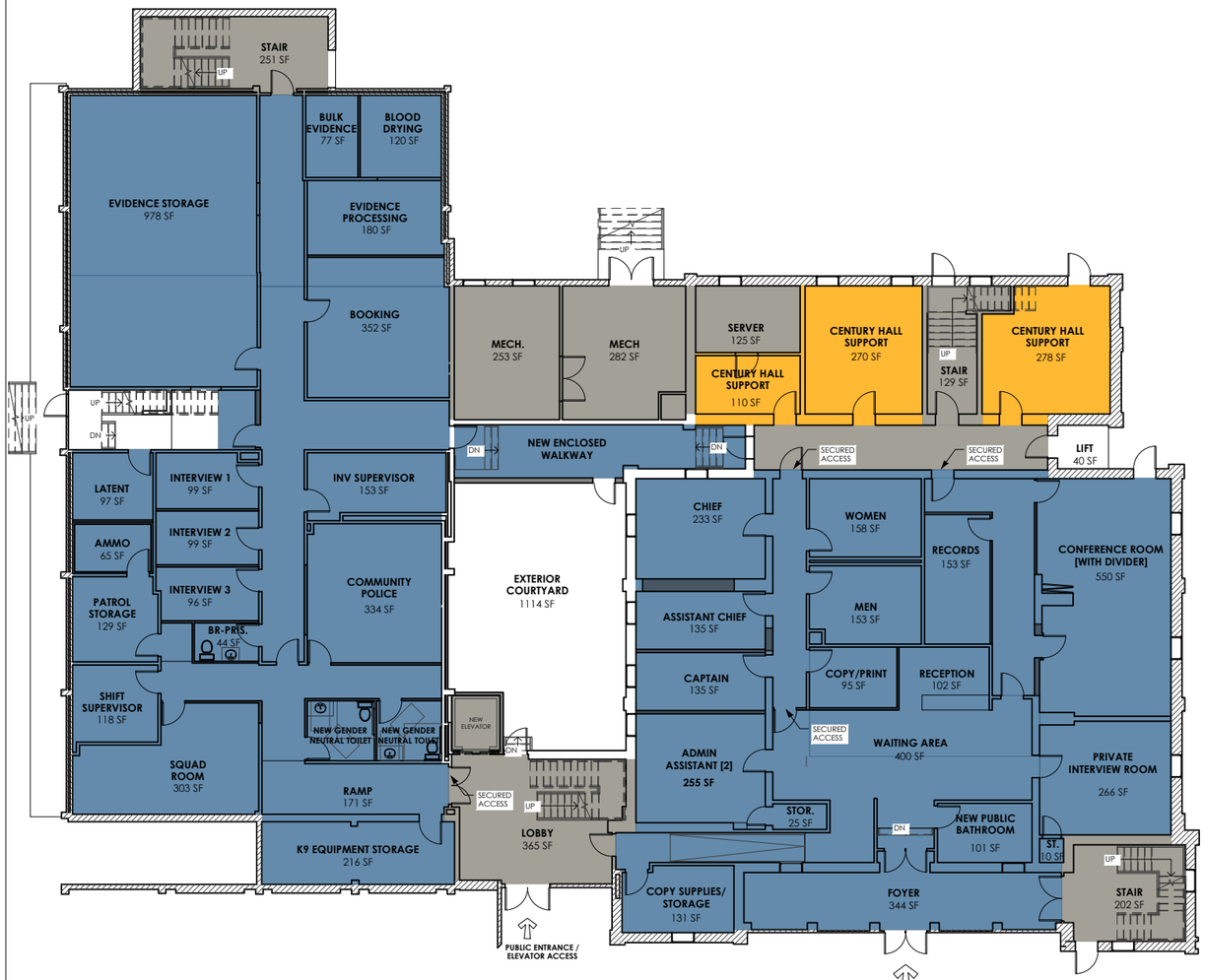
Town of Carrboro Renewed Facilities // Century Center

EC4 - Existing Program, Upper Level // February 2021

Carrboro Century Center
100 N Greensboro St.
Carrboro, NC 27510

919.918.7385

EXISTING LOWER LEVEL



PROPOSED LOWER LEVEL

SCALE = 1:20

LEGEND

- TOC Police Department
- Recreation & Parks
- Century Hall
- Cybrary

KEY IMPROVEMENTS

A. ENERGY
B. ACCESSIBILITY
   1. NEW ELEVATOR
   2. PUBLIC ENTRANCE ON GROUND FLOOR
C. PROGRAM IMPROVEMENTS

POLICE DEPARTMENT:
1. 6,539 NEW SF
2. IMPROVED CIRCULATION AND SECURITY
3. BETTER ACCESS FOR PUBLIC
4. IMPROVED FACILITIES, E.G. TRAINING, BREAK ROOM, LOCKER ROOMS, CONFERENCE ROOMS

CENTURY HALL:
1. NEW CATERING KITCHEN
2. 660 NEW SF FOR STORAGE AND OFFICE
3. IMPROVED BATHROOM FACILITIES

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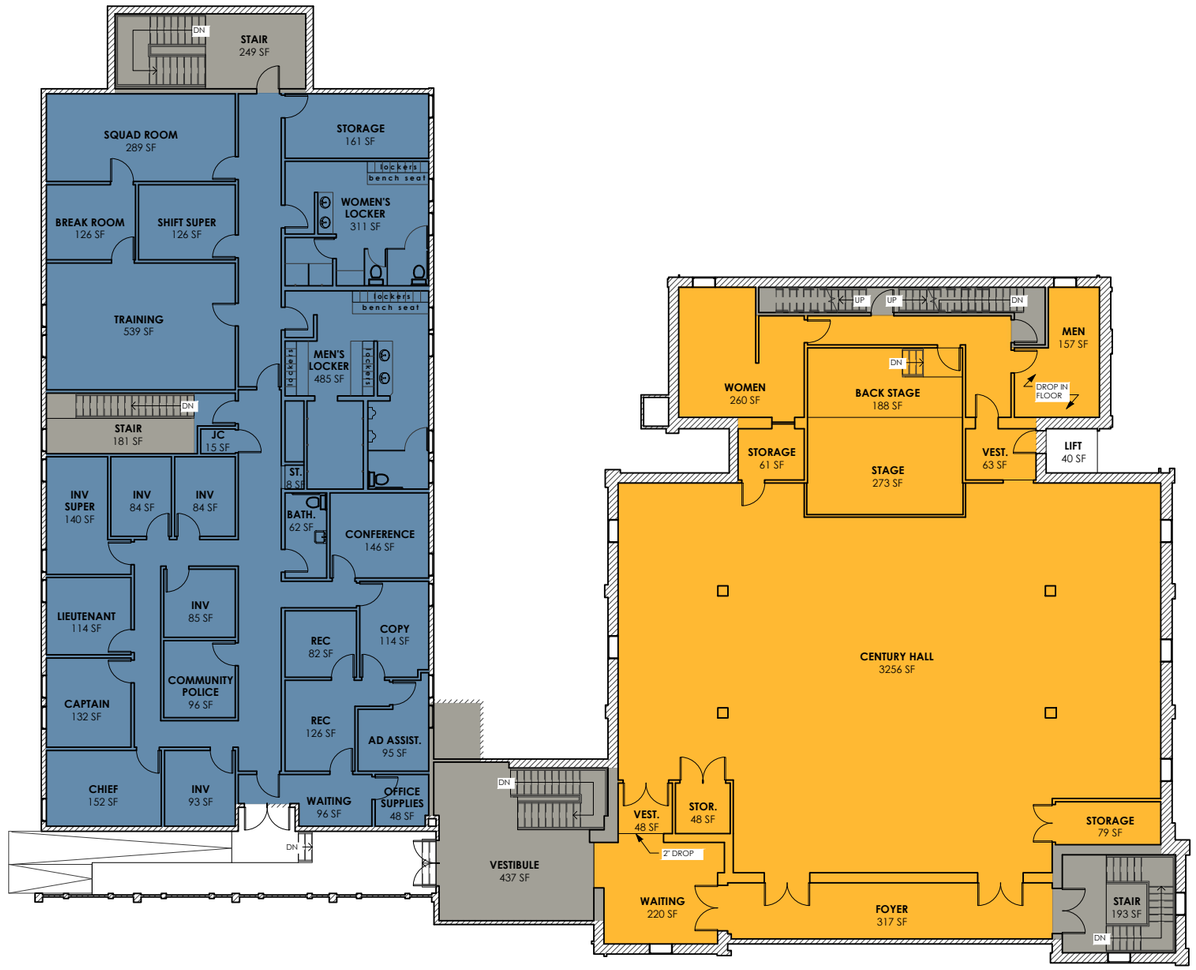
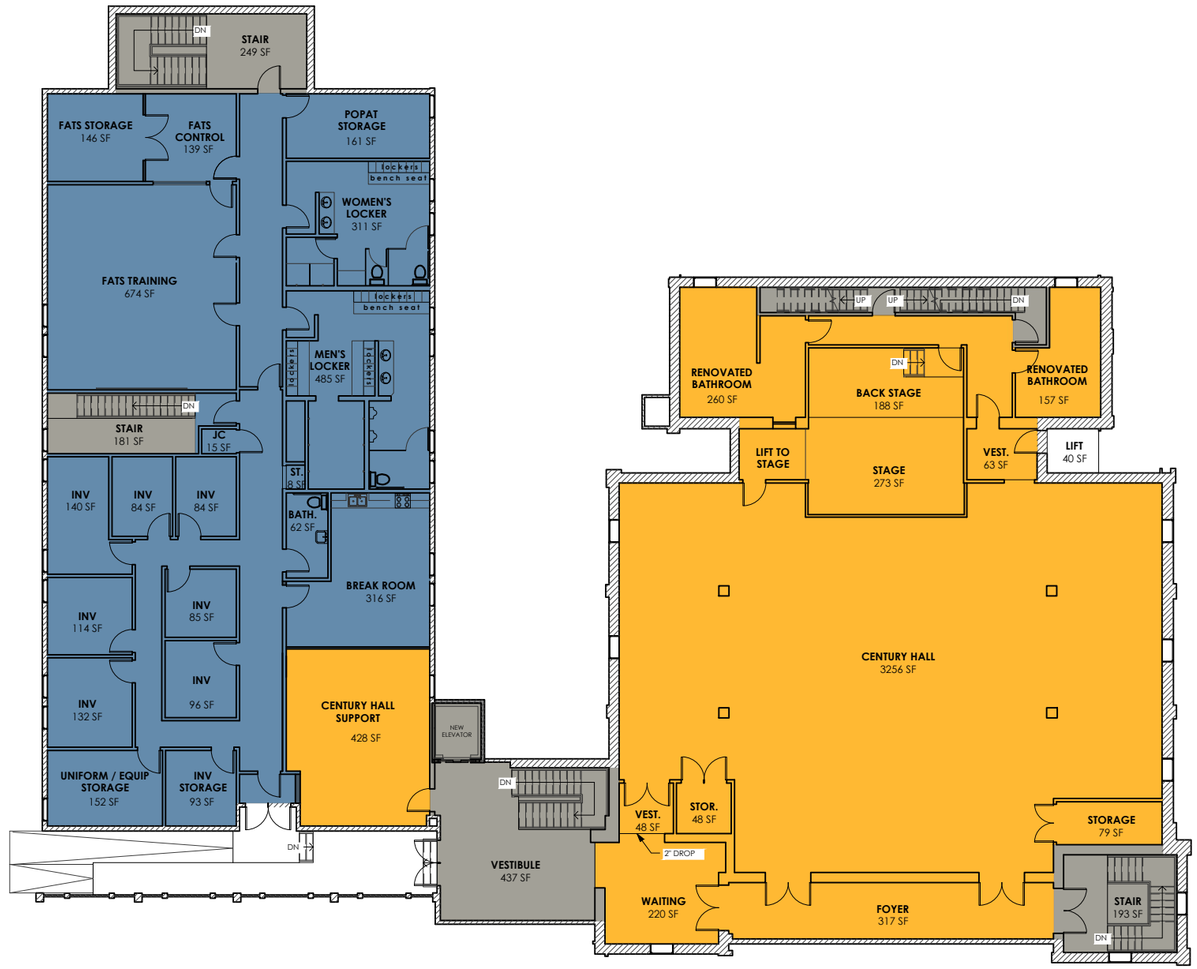
109-A Brewer Lane
Carrboro, NC 27510
jimspencerarchitects.com

Town of Carrboro Renewed Facilities // Century Center // April 2021

Carrboro Century Center
100 N Greensboro St.
Carrboro, NC 27510



EXISTING UPPER LEVEL



PROPOSED UPPER LEVEL

SCALE = 1:20

LEGEND

- TOC Police Department
- Recreation & Parks
- Century Hall
- Cybrary

KEY IMPROVEMENTS

A. ENERGY
B. ACCESSIBILITY
   1. NEW ELEVATOR
   2. PUBLIC ENTRANCE ON GROUND FLOOR
C. PROGRAM IMPROVEMENTS

POLICE DEPARTMENT:
1. 6,539 NEW SF
2. IMPROVED CIRCULATION AND SECURITY
3. BETTER ACCESS FOR PUBLIC
4. IMPROVED FACILITIES, E.G. TRAINING, BREAK ROOM, LOCKER ROOMS, CONFERENCE ROOMS

CENTURY HALL:
1. NEW CATERING KITCHEN
2. 660 NEW SF FOR STORAGE AND OFFICE
3. IMPROVED BATHROOM FACILITIES

Jim Spencer Architects, PA
109-A Brewer Lane
Carrboro, NC 27510
jimspencerarchitects.com

Carrboro Century Center
100 N Greensboro St.
Carrboro, NC 27510

BROADER CONSIDERATIONS:

A. Install Solar PV on current roof of Century Center addition. Add partial covering to parking area with Solar PV.

9,800 SF of PV = Approximately 98kW
Assuming 5 hrs/day = 178,850 kWh/year

B. Establish public - private partnership for Solar PV initiative. Install PV on roofs of Century Center and Carr Mlll Mall.

50,000 SF of PV = Approximately 500kW
Assuming 5 hrs/day = 912,500 kWh/year

C. Other town properties to consider:

- 300 E. Main Buildings and Parking Deck
- Proposed Building at 203 S. Greensboro
- Carrboro Plaza

SCALE = 1:60

SCALE = 1:60

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109-A Brewer Lane
Carrboro, NC 27510

jimspencerarchitects.com
919.960.6680

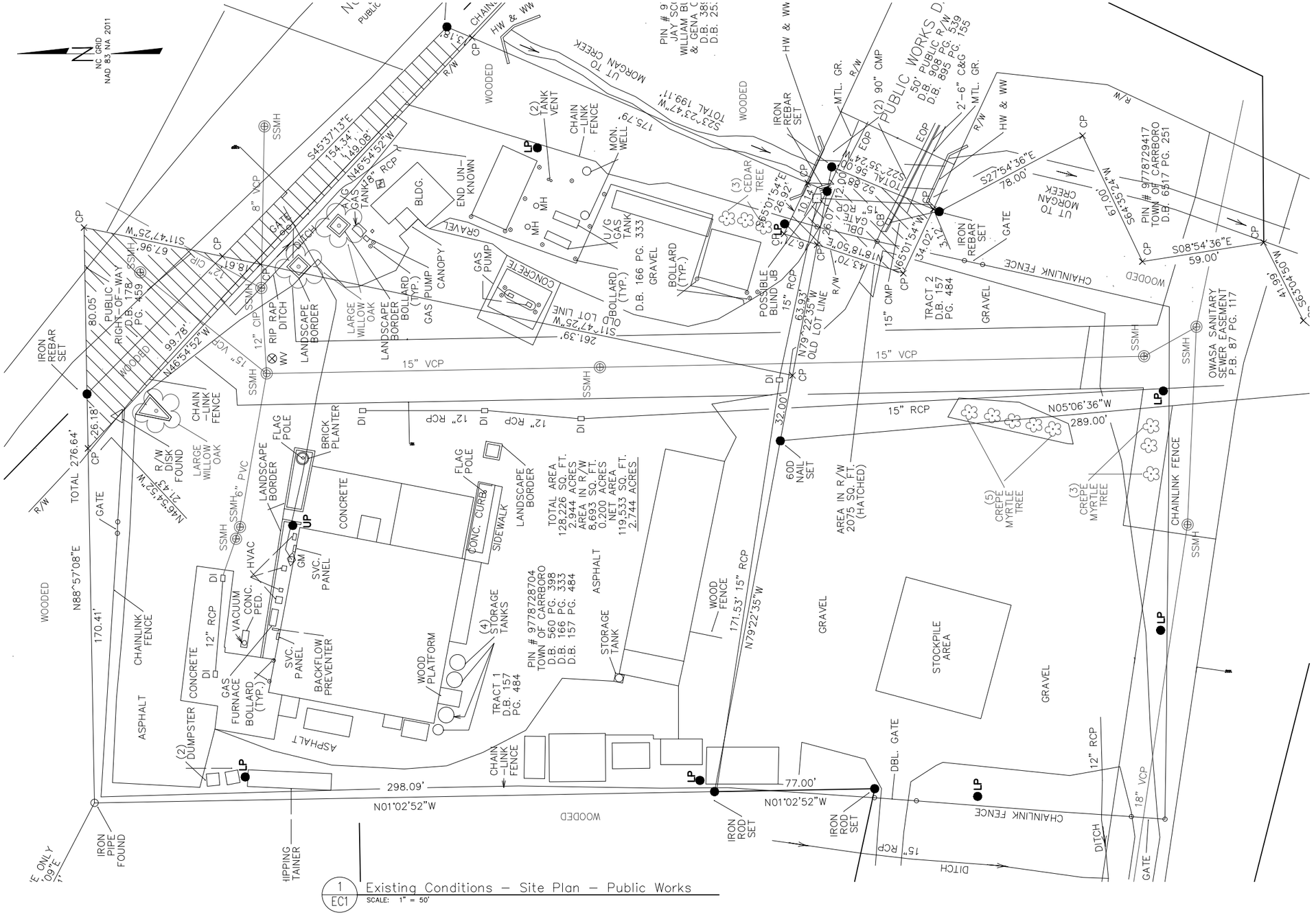
Town of Carrboro Renewed Facilities // Century Center

Broader Considerations // February 2021

Carrboro Century Center
100 N Greensboro St.
Carrboro, NC 27510

919.918.7385

EXHIBIT A-3



1 EC1 Existing Conditions – Site Plan – Public Works
SCALE: 1" = 50'

EXISTING CONDITIONS
O/A ZONING; 15' STREET SETBACK (ROW); 45' STREET SETBACK (CL); 15' BOUNDARY SETBACK
FLOOD ZONES - SEE MAPS
ISSUES TO RESOLVE: 1. VEHICULAR STORAGE AND CIRCULATION 2. LACK OF OFFICE SPACE/ACCESS. TOILETS 3. VEHICLE WASH AND DRAINAGE FROM IT 4. FLOODING/MOVE VEHICLES FROM LOW 5. PUBLIC VS. STAFF ACCESS
LONG TERM CONSIDERATIONS: 1. NEW OFFICE/STAFF SPACE, USE EXISTING BUILDING FOR MAINTENANCE 2. ENVIRONMENTAL ISSUES/TRAILHEAD 3. PLAN FOR NEW/ELECTRIC VEHICLES 4. OTHER

Jim Spencer Architects, PA
109-A Brewer Lane
Carrboro, NC 27510

jimspencerarchitects.com
919.960.6680

Town of Carrboro Renewed Facilities // Public Works

Existing Conditions - Site Plan // February 24, 2021

Carrboro Public Works
100 Public Works Drive
Carrboro, NC 27510

Carrboro Public Works - Administration/Repair Bays photo: jsa

Carrboro Public Works - View Toward Morgan Creek
photo: jsa

Carrboro Public Works - Vehicle Storage photo: jsa

Carrboro Public Works - Fuel Station photo: jsa

Carrboro Public Works - Sign Shop photo: jsa

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109-A Brewer Lane
Carrboro, NC 27510

jimspencerarchitects.com
919.960.6680

Town of Carrboro Renewed Facilities // Public Works

Existing Conditions - Photographs // February 24, 2021

Carrboro Public Works
100 Public Works Drive
Carrboro, NC 27510

1 Existing Conditions– Site Plan – Public Works
SCALE: 1" = 50'

Public Works & Stormwater Administrative

Storage

Maintenance / Vehicle Storage

Fuel

EXISTING CONDITIONS

O/A ZONING; 15' STREET SETBACK (ROW); 45' STREET SETBACK (CL); 15' BOUNDARY SETBACK

FLOOD ZONES - SEE MAPS

ISSUES TO RESOLVE:

1. VEHICULAR STORAGE AND CIRCULATION
2. LACK OF OFFICE SPACE/ACCESS. TOILETS
3. VEHICLE WASH AND DRAINAGE FROM IT
4. FLOODING/MOVE VEHICLES FROM LOW
5. PUBLIC VS. STAFF ACCESS

LONG TERM CONSIDERATIONS:

1. NEW OFFICE/STAFF SPACE, USE EXISTING BUILDING FOR MAINTENANCE
2. ENVIRONMENTAL ISSUES/TRAILHEAD
3. PLAN FOR NEW/ELECTRIC VEHICLES
4. OTHER

Jim Spencer Architects, PA
109-A Brewer Lane
Carrboro, NC 27510

jimspencerarchitects.com
919.960.6680

Town of Carrboro Renewed Facilities // Public Works

Existing Conditions - Site Plan // March 31, 2021

Carrboro Public Works
100 Public Works Drive
Carrboro, NC 27510

Public Works & Stormwater Administrative

Storage

Maintenance / Vehicle Storage

Fuel

1 RENOVATE EXISTING BUILDING, ADD ACCESSIBLE BATHROOMS.

2 ADD PUBLIC PARKING FOR FUTURE TRAILHEAD.

3 EXPAND POLE BARN TO ACCOMMODATE PW FLEET.

4 RELOCATE FUEL PUMP WITH ABOVE GROUND TANKS.

5 RELOCATE CAR WASH.

6A CONSOLIDATE STORAGE, SMALL EQUIPMENT AND TOOLS.

6B RELOCATE SALT, BRINERY, SAND, GRAVEL.

7 FUTURE ADMINISTRATIVE BUILDING.

1 Proposed Conditions– Site Plan – Public Works
SCALE: 1" = 50'

Jim Spencer Architects, PA
109-A Brewer Lane
Carrboro, NC 27510

jimspencerarchitects.com
919.960.6680

Town of Carrboro Renewed Facilities // Public Works

Proposed Conditions - Site Plan // March 29, 2021

Carrboro Public Works
100 Public Works Drive
Carrboro, NC 27510

Town of Carrboro
Town Hall Building; Century Center Building; Public Works Complex
Energy Modeling for Net Zero Energy Study

November 23, 2020

Background

The Town of Carrboro is considering options for renovating the Town Hall, Century Center, and the Public Works complex. The Town is seeking to develop a long-term renovation strategy while at the same time addressing immediate needs which have been identified by Town Staff. As part of the renovation effort, the Town would like to work towards the energy sustainability goals set forth in the Town's adopted Strategic Energy and Climate Action plan, which includes working toward net zero energy use.

Energy and water consumption models have been created for each of these facilities to inform decisions in the renovation planning and design process. These models are used to help understand how energy is consumed in each building, and where the most substantial opportunities for potential savings lie. They also provide valuable information in assessing the feasibility of modifying the buildings to achieve net zero carbon emissions. Further, the models create a benchmark for each building, establishing existing consumption characteristics and allowing a metric for assessing improvements.

Existing Systems

Town Hall

The Town Hall is a three-story building which houses office areas, a chamber room, a town server room, and a connected facilities maintenance shop. The exterior walls are uninsulated brick having mostly clear, double pane, operable windows. Most of the roof area is flat with recently installed rigid foam insulation above the deck.

The building is heated and cooled by 9 independent heat pump systems of varying ages. These systems are zoned to serve the basement offices, the server room, the chamber room, the north offices on the1st floor, the south offices on the 1st floor, the 2nd floor offices, the 1st floor of the west wing, the 2nd floor of the west wing, and the shop. None of these systems supply outdoor air for ventilation.

The lighting in the building is a mix of new LED fixtures, T-8 fluorescent fixtures, and T-12 fluorescent fixtures. The plug loads are mostly typical for office areas other than the facilities shop which sees typical shop usage. Hot water is provided by a tank-type electric water heater.

Century Center

Carrboro's Century Center is a two-story historic structure which houses office areas, community activity areas, a public computer resource area, a kitchen, and a large event hall. Part of the building serves the police department, which operates 24/7. Built in 1924, the Century Center has 18" thick uninsulated masonry walls with clear, double pane, operable windows. The roof is insulated at the attic floor by 9" of blown-in fiberglass insulation.

The building is conditioned by 3 variable air volume AHUs. Two of the AHUs utilize VAV boxes with hot water reheat, while the third AHU is a single-zone VAV unit serving the large event hall. Heating is provided by a 750 MBH natural gas-fired hot water boiler, and cooling is provided by a 70 ton air-cooled packaged chiller. The AHUs and chiller are controlled by a central control system, while the boiler operates on stand-alone controls.

The majority of the lighting throughout the building is T8 tube linear tube fluorescent fixtures. Most of the plug-in equipment is typical for an office building, though the computer resource area has a higher density of computers, and the all-electric kitchen contains heavy duty commercial cooking, refrigerating, and ice making equipment. Domestic hot water is provided by two tank-type natural gas-fired hot water heaters (75 gallon and 100 gallon).

Public Works

The public works complex is collection of buildings including office areas, an auto shop, sign shop, vehicle, equipment, and materials storage areas, a fuel station, and a carwash station. The primary energy consuming building is a 6,100 square foot pre-engineered metal building with an additional 2,400 square feet of unconditioned loft storage and mechanical space. This building houses public works administration offices, a small server room, and the fleet maintenance shop.

The office areas are divided into 3 separate HVAC zones, each of which is conditioned by a natural gas furnace with split system A/C. The shop area is conditioned by a 156 MBH natural gas unit heater. The sign shop utilizes a small heat pump window unit.

Lighting is provided by a mix of LED and fluorescent fixtures. The miscellaneous electrical loads in the complex are significant and highly variable in usage. Other than standard office equipment, these include air compressors, auto lifts, car vacuums, fuel pumps, garage doors, and various shop equipment. Domestic hot water is provided by natural gas-fired instantaneous water heaters.

Historical Utility Consumption

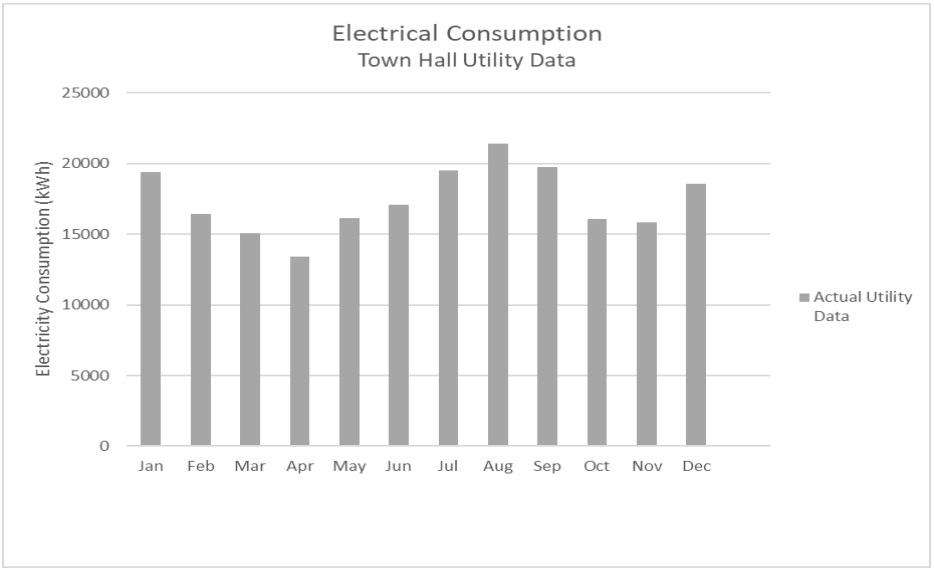
An analysis of the historical utility data was performed as a first step in creating energy and water consumption models of the facilities. 12 months for electricity, natural gas, and water utility data were obtained for the analyses. The data used were from the 2019 calendar year to eliminate any effect from the 2020 COVID-19 pandemic shutdowns. Usage by each facility was analyzed separately.

Town Hall

The town hall does not use natural gas, as all heating, water heating, and cooking use electricity.

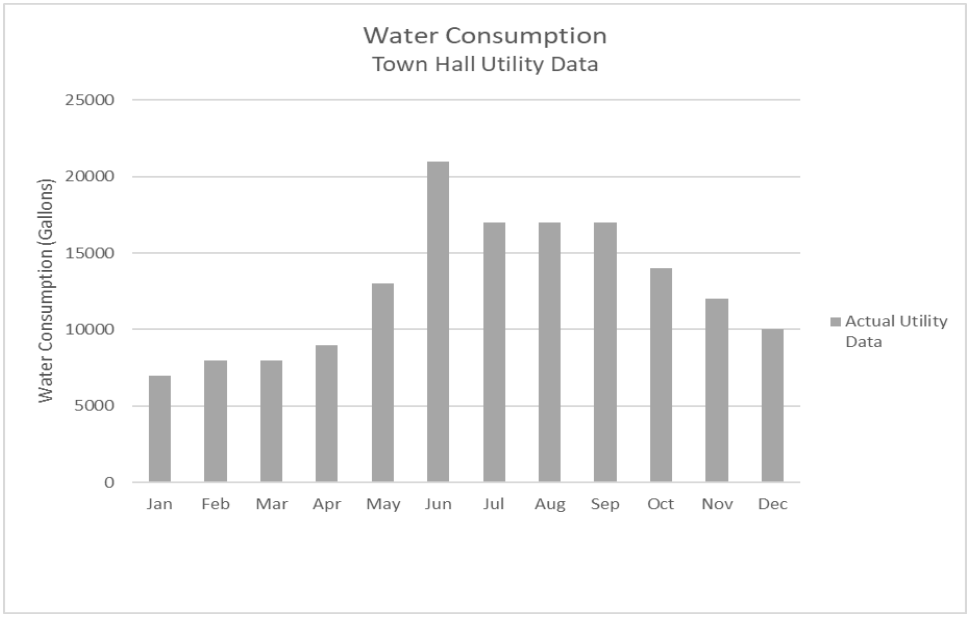
Electricity

The building is served by three separate electric meters. One meter serves the majority of the building, one meter serves the shop, and the server room is served from the meter serving Fire Station 1. Onsite power readings, in conjunction with Fire Station 1 utility data, allowed the annual energy consumption of the server room (servers plus HVAC) to be estimated and extracted from the Fire Station data. This estimate was added to the data from the main building meter and the shop meter to obtain a monthly set of consumption data for the entire building. This combined usage is presented below.



Water

A single water meter serves the building. Data from this meter are presented below.

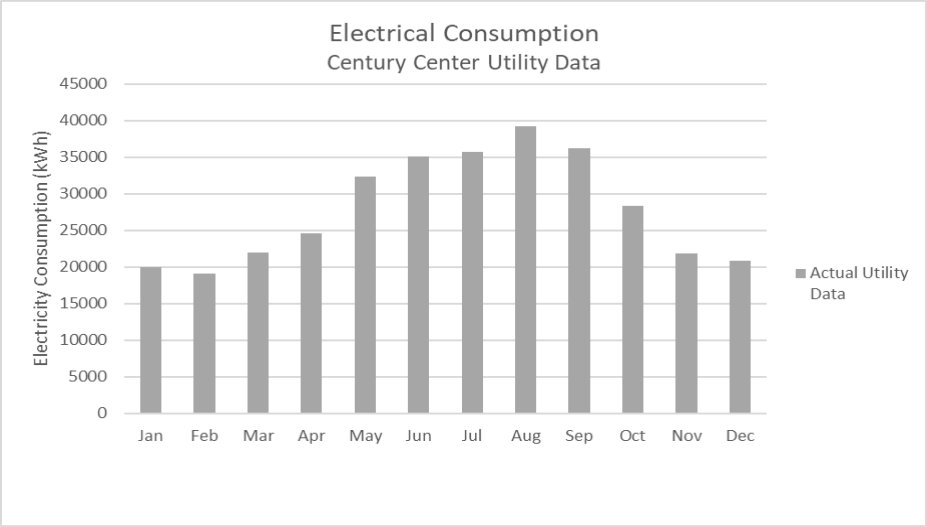


Century Center

The Century Center uses electricity, natural gas, and water.

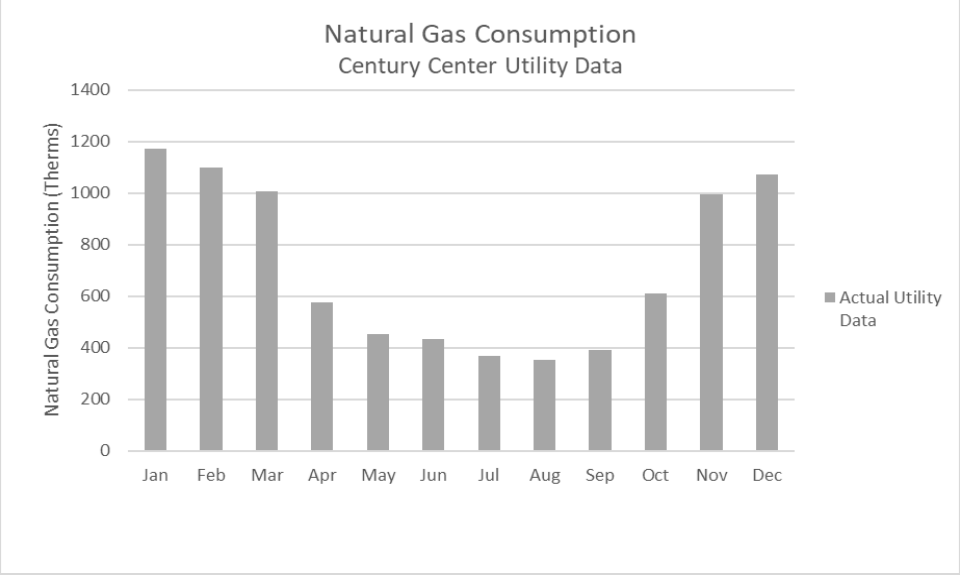
Electricity

A single electric service entrance serves the entire building. Data from this meter are presented below.



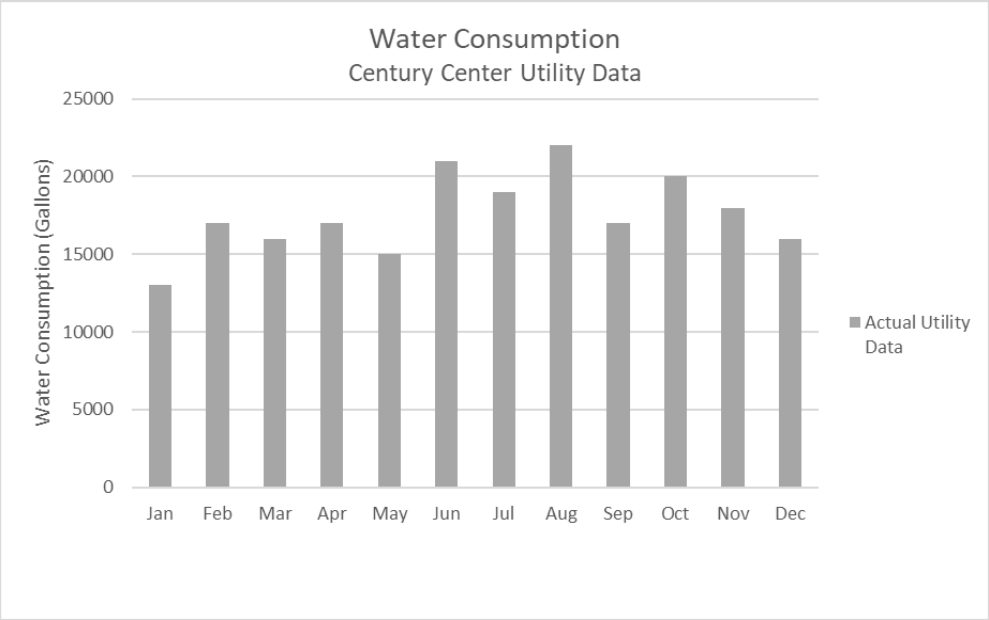
Natural Gas

A single natural gas service entrance serves the entire building. Data from this meter are presented below.



Water

A single water service entrance serves the entire building. Data from this meter are presented below.

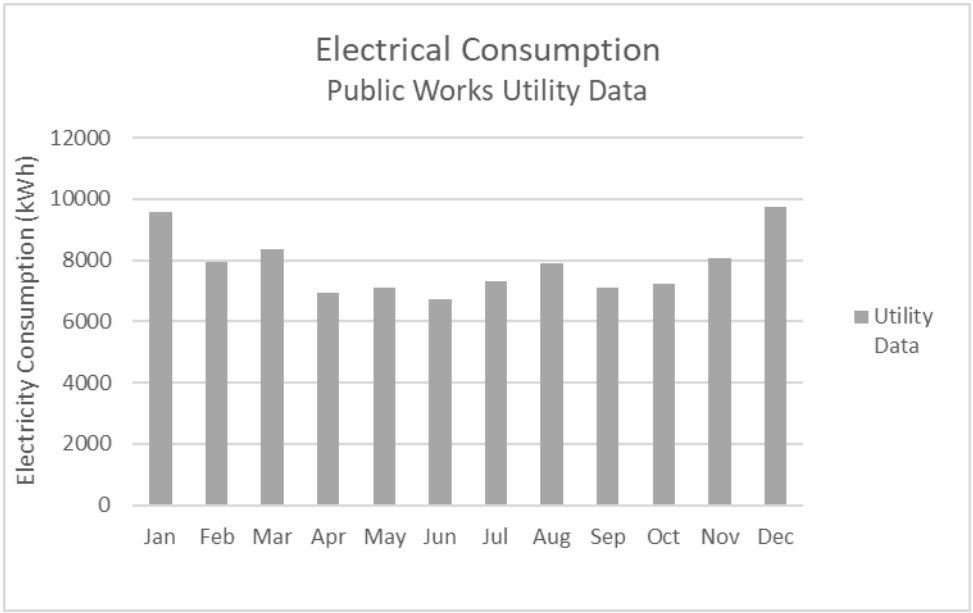


Public Works

The Public Works complex utilizes electricity, natural gas, and water.

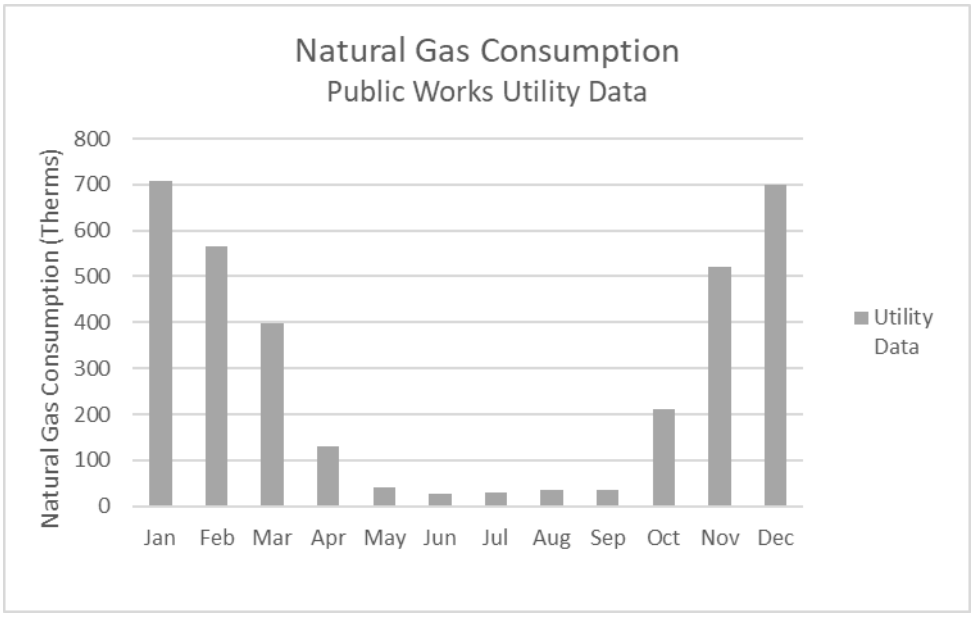
Electricity

Public Works is served by three electric service entrances. One meter currently has no load connected to it, one meter serves the server room and its A/C unit, and one meter serves the rest of the complex. The data presented below show the combined metered usage for the complex.



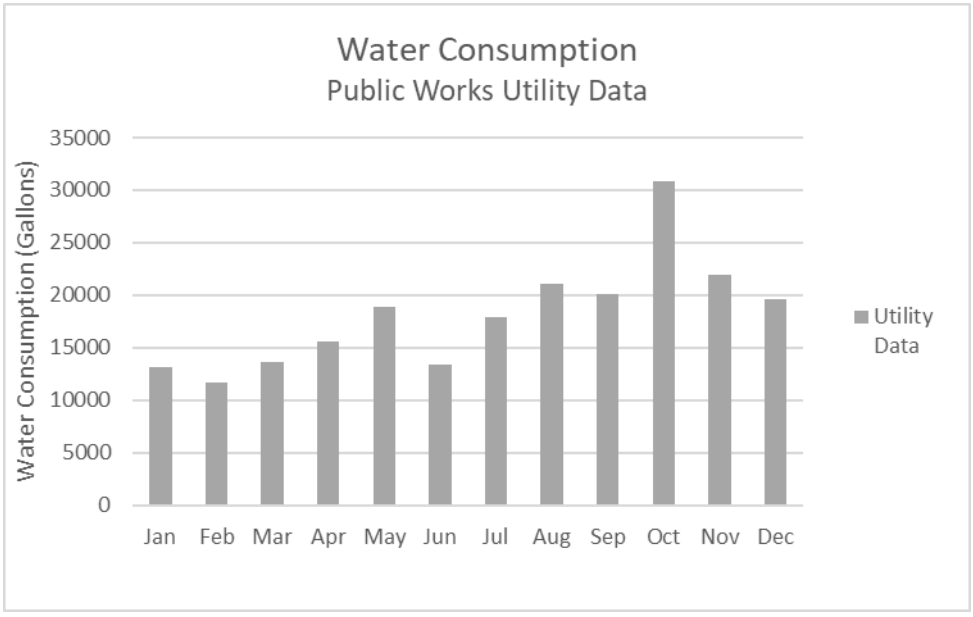
Natural Gas

Two natural gas meters serve the facility. One meter serves the generator and the instantaneous hot water heaters, and one meter serves the rest of the facility. The combined usage is shown below.



Water

A single water service serves the entire complex. Data from this meter are presented below.



Simulation Methodology

Energy and water consumption simulations were created for each building. The energy models for the Century Center and the Town Hall were generated using the Trane TRACE software. TRACE uses a comprehensive set of environmental and building characteristics to simulate the energy consumption

for the entire building each hour of a full typical year. TRACE excels at simulating the complex interactions among various end uses, schedules, and control strategies as are found at the Century Center and Town Hall.

Due to the nature of the Public Works complex, in-house spreadsheet tools were used in lieu of TRACE to simulate annual energy usage. The usage of this facility is highly dependent on inconsistent variables such as the amount of time garage doors are open, frequency of shop equipment use, frequency and duration of car washes, etc. This type of facility is best modeled using versatile, transparent, independent calculations in conjunction with known historical utility data. Through this approach a more reliable and understandable breakdown of how the facility uses energy can be obtained.

Hourly energy simulations require detailed weather data for the specific location of the buildings. TMY3 (Typical Meteorological Year) weather files for the Durham area were utilized for the Carrboro models. Building inputs include the constructions of the walls, windows, roofs, and floor systems, HVAC equipment and control strategies, room-by-room lighting systems, plug-in equipment, and occupancy, domestic hot water systems, and schedules of usage for occupants and each energy end use. The values utilized in the Carrboro models were obtained via building drawings, site visits, measurements, and conversations with Carrboro staff.

Water models are generally much less complex than energy simulations. These are usually analyzed on an annual basis, as hourly calculations would provide little additional value to understanding the facility. In-house spreadsheet tools were used for these models. The primary inputs for these models are occupancy types, general occupancy schedules, and the various water-using fixture data.

Energy and Water Model Results and Calibration

Each energy and water model was calibrated to match the historical utility consumption to within an acceptable error tolerance based on industry standard practice. The Carrboro energy models were calibrated such that the modeled electricity and natural gas consumption is within 10% of the actual consumption for each month of the year, and within 5% of the total annual consumption. The water models were calibrated to within 5% of the annual consumption.

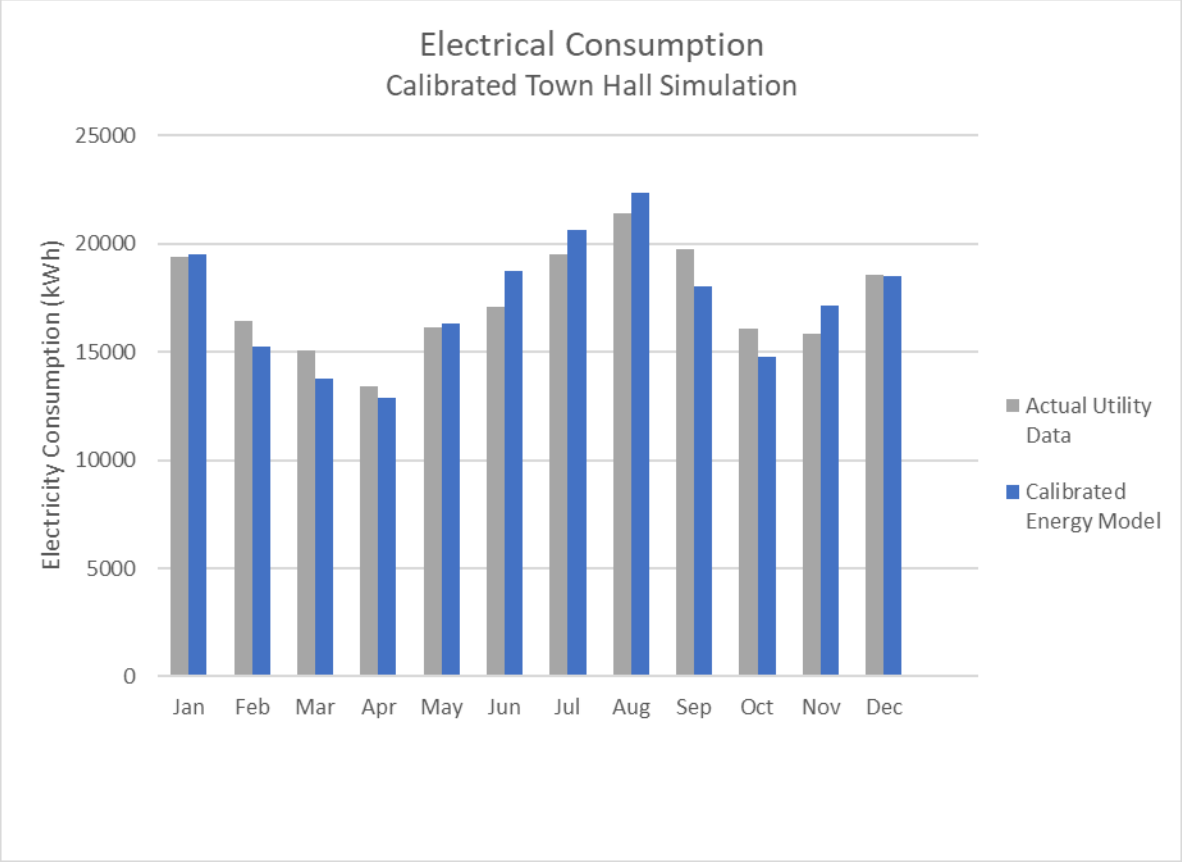
Town Hall

The energy consumption results for the Town Hall are presented below, along with its energy use intensity.

Town Hall Energy Consumption Profile		
End Use	**Energy Consumption (kBTU/yr)**	**Percent of Total**
Heating	83,044	11.7%
Cooling	169,247	23.9%
Fans/Pumps	99,651	14.1%
Lighting	119,697	16.9%
DHW	9,687	1.4%
Plug Loads / Other	228,125	32.2%
Total	709,451	100%
Conditioned Area (sf)	12,235	
Energy Use Intensity (kBTU/sf/yr	57.99	

The calibrated results for the Town Hall building are presented below. A breakdown of the energy model results is provided in Appendix I.

Electricity (Town Hall)



Town Hall Electricity Consumption (kWh)			
Month	**Actual Utility Data**	**Calibrated Model**	**% Error**
Jan	19376	19511	1%
Feb	16401	15249	-7%
Mar	15073	13769	-9%
Apr	13404	12849	-4%
May	16112	16328	1%
Jun	17091	18748	10%
Jul	19536	20641	6%
Aug	21386	22342	4%
Sep	19764	18056	-9%
Oct	16086	14755	-8%
Nov	15835	17120	8%
Dec	18583	18499	0%
Total	**208646**	**207867**	0%

Water (Town Hall)

Town Hall Water Consumption (gal)			
Period	Actual Utility Data	Calibrated Model	% Error
Annual	155734	155731	0%

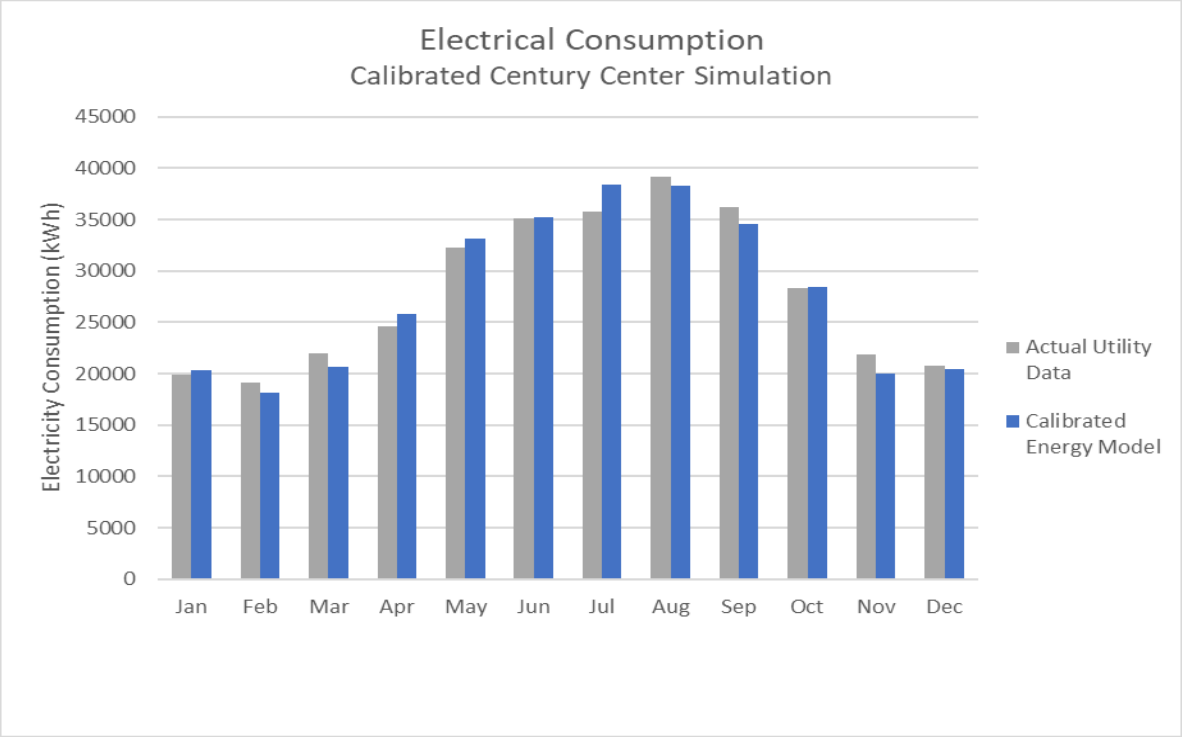
Century Center

The energy consumption results for the Century Center are presented below, along with its energy use intensity.

Century Center Energy Consumption Profile		
End Use	Energy Consumption (kBTU/yr)	Percent of Total
Heating	848,026	42.7%
Cooling	224,216	11.3%
Fans/Pumps	548,968	27.6%
Lighting	203,910	10.3%
DHW	13,420	0.7%
Plug Loads / Other	147,747	7.4%
Total	1,986,287	100%
Conditioned Area (sf)	19,912	
Energy Use Intensity (kBTU/sf/yr	99.75	

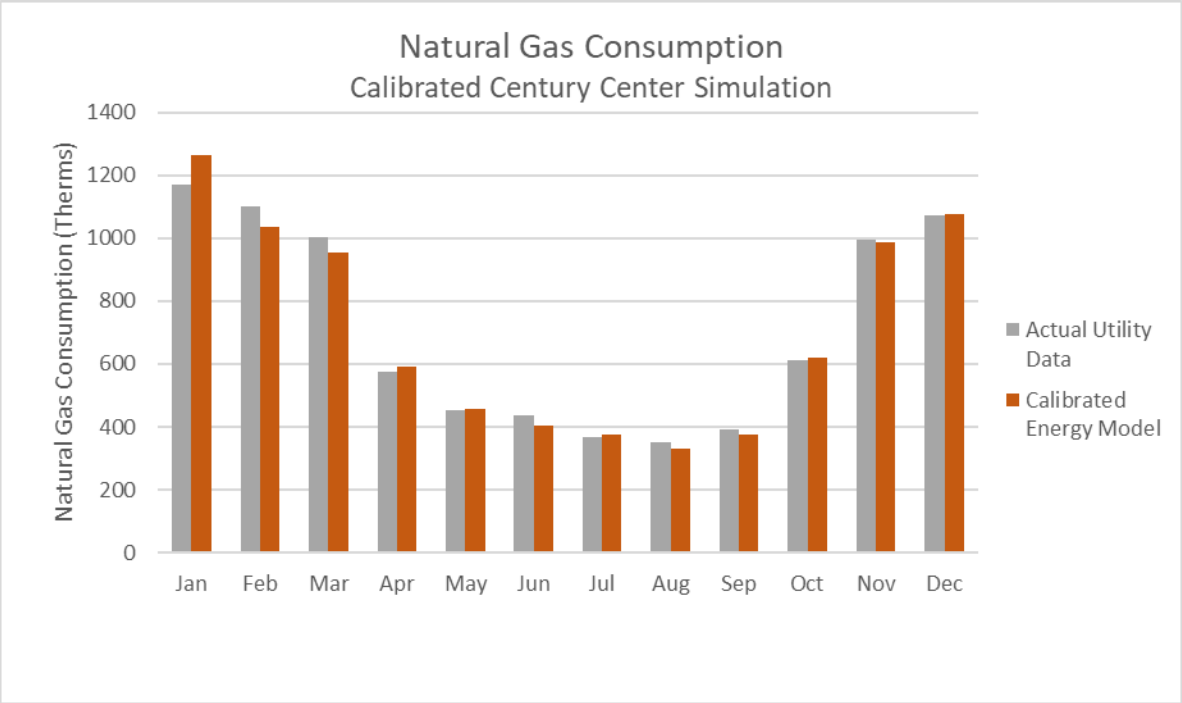
The calibrated results for the Century Center are presented below. A breakdown of the energy model results is provided in Appendix II

Electricity (Century Center)



Century Center Electricity Consumption (kWh)			
Month	**Actual Utility Data**	**Calibrated Model**	**% Error**
Jan	19932	20377	2%
Feb	19082	18203	-5%
Mar	21936	20665	-6%
Apr	24586	25760	5%
May	32315	33172	3%
Jun	35082	35268	1%
Jul	35727	38364	7%
Aug	39209	38241	-2%
Sep	36198	34531	-5%
Oct	28286	28423	0%
Nov	21833	19996	-8%
Dec	20796	20465	-2%
Total	**334982**	**333463**	**0%**

Natural Gas (Century Center)



Century Center Natural Gas Consumption (therms)			
Month	**Actual Utility Data**	**Calibrated Model**	**% Error**
Jan	1170	1263	8%
Feb	1100	1035	-6%
Mar	1005	955	-5%
Apr	574	592	3%
May	451	458	2%
Jun	435	406	-7%
Jul	366	377	3%
Aug	351	331	-6%
Sep	390	377	-3%
Oct	611	622	2%
Nov	995	987	-1%
Dec	1073	1078	0%
Total	**8522**	**8482**	**0%**

Water (Century Center)

Century Center Water Consumption (gal)			
Period	**Actual Utility Data**	**Calibrated Model**	**% Error**
Annual	219416	219264	0%

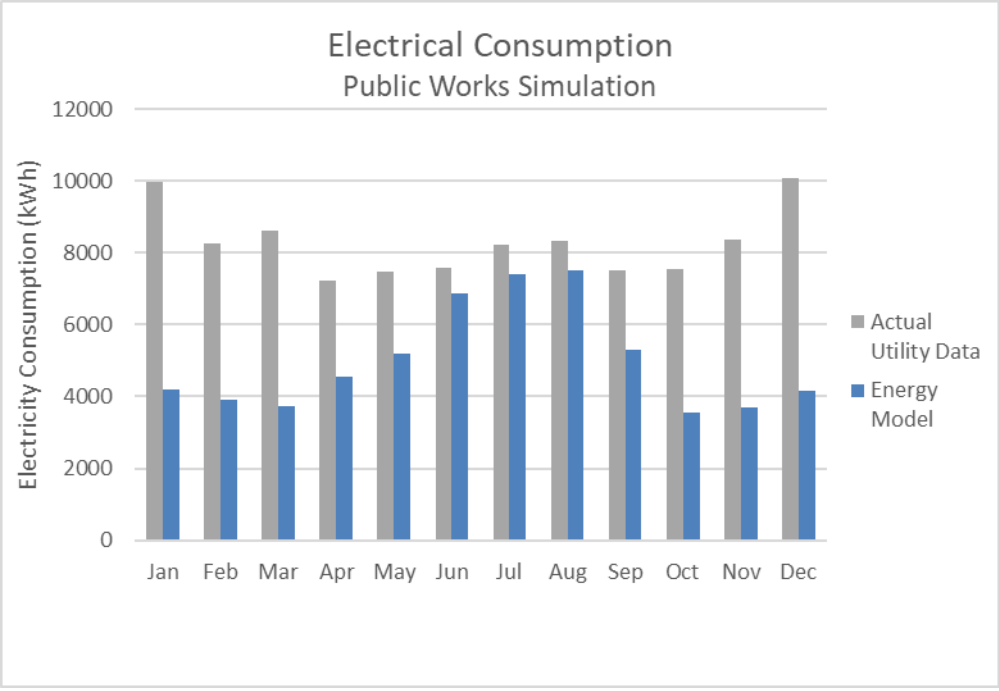
Public Works

The energy consumption results for the Town Hall are presented below, along with its energy use intensity.

Public Works Energy Consumption Profile		
End Use	**Energy Consumption (kBTU/yr)**	**Percent of Total**
Heating	306,672	44.3%
Cooling	62,858	9.1%
Fans	36,683	5.3%
Lighting	54,922	7.9%
DHW/Carwash/Generator	30,900	4.5%
Office Equipment	15,861	2.3%
Server	15,040	2.2%
Air Compressor	24,088	3.5%
Shop/Site Equipment	11,495	1.7%
Currently Unaccounted	133,601	19.3%
Total	692,120	100%
Conditioned Area (sf)	6,300	
Energy Use Intensity (kBTU/sf/yr	109.9	

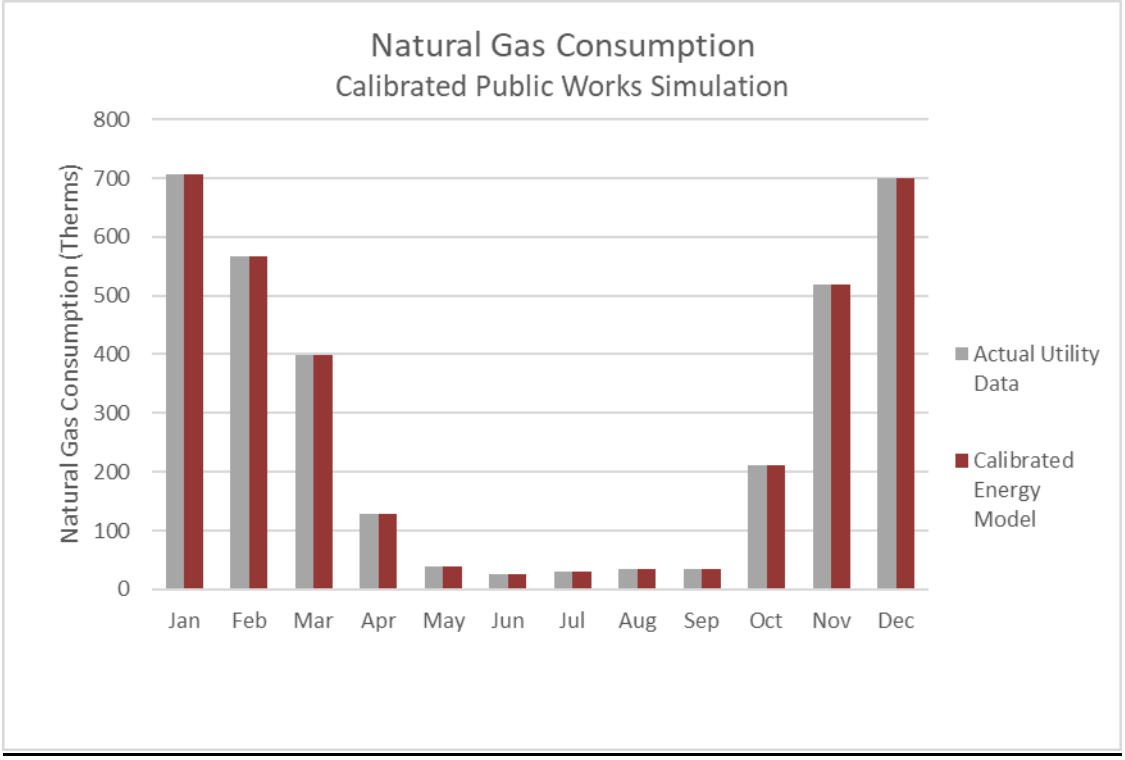
Note that the model is unable to account for a large percentage of the electrical consumption in the facility. This is shown in the table above as “Currently Unaccounted”, and in the electricity chart and table below as the percent error between the model and the utility data. The tables below show the energy model results as compared to the utility data. See Appendix III for a breakdown of modeled end uses.

Electricity (Public Works Complex)



Public Works Electricity Consumption (kWh)			
Month	**Actual Utility Data**	**Calibrated Model**	**% Error**
Jan	9965	4193	58%
Feb	8277	3919	53%
Mar	8606	3726	57%
Apr	7229	4549	37%
May	7472	5190	31%
Jun	7600	6868	10%
Jul	8231	7419	10%
Aug	8330	7522	10%
Sep	7511	5288	30%
Oct	7553	3535	53%
Nov	8355	3710	56%
Dec	10079	4143	59%
Total	**99208**	**60063**	**39%**

Natural Gas (Public Works Complex)



Public Works Natural Gas Consumption (therms)			
Month	**Actual Utility Data**	**Calibrated Model**	**% Error**
Jan	707	707	0%
Feb	566	566	0%
Mar	399	399	0%
Apr	129	129	0%
May	40	40	0%
Jun	26	26	0%
Jul	31	31	0%
Aug	35	35	0%
Sep	35	35	0%
Oct	210	210	0%
Nov	520	520	0%
Dec	699	699	0%
Total	**3397**	**3397**	**0%**

Water (Public Works Complex)

Public Works Water Consumption (Gallons)			
Period	Actual Utility Data	Calibrated Model	% Error
Annual	217948	216000	1%

Conclusions

The creation of energy models allows a better understanding of how resources are used within a facility, and can offer insight as to what opportunities there may be to save energy and water. These results will be used to guide design decisions moving forward in the process of upgrading these three facilities. The energy and water simulations for the Century Center and the Town Hall reconcile cleanly with the utility data. The natural gas and water models for the Public Works facility also match the utility data. Currently, however, there are unknown factors resulting in discrepancies between simulations and utility data for the electricity consumption at Public Works. This should be further investigated, as the large discrepancy could point to energy saving opportunities.

Appendix I

TRACE Energy Consumption Summary (Town Hall)

ENERGY CONSUMPTION SUMMARY

By Sud Associates, P.A.

	Elect Cons. (kWh)	% of Total Building Energy	Total Building Energy (kBtu/yr)	Total Source Energy* (kBtu/yr)
Alternative 1				
Primary heating				
Primary heating	24,332	11.7 %	83,044	249,156
Other Htg Accessories		0.0 %	0	0
Heating Subtotal	**24,332**	**11.7** %	**83,044**	**249,156**
Primary cooling				
Cooling Compressor	39,897	19.2 %	136,167	408,541
Tower/Cond Fans	4,758	2.3 %	16,239	48,721
Condenser Pump		0.0 %	0	0
Other Clg Accessories	4,935	2.4 %	16,842	50,530
Cooling Subtotal....	**49,589**	**23.9** %	**169,247**	**507,792**
Auxiliary				
Supply Fans	29,198	14.1 %	99,651	298,984
Pumps		0.0 %	0	0
Stand-alone Base Utilities	2,838	1.4 %	9,687	29,064
Aux Subtotal....	32,036	15.4 %	109,338	328,048
Lighting				
Lighting	35,071	16.9 %	119,697	359,128
Receptacle				
Receptacles	66,840	32.2 %	228,125	684,443
Cogeneration				
Cogeneration		0.0 %	0	0
Totals				
Totals**	**207,867**	**100.0** %	**709,451**	**2,128,567**

* Note: Resource Utilization factors are included in the Total Source Energy value .

** Note: This report can display a maximum of 7 utilities. If additional utilities are used, they will be included in the total.

Appendix II

TRACE Energy Consumption Summary (Century Center)

ENERGY CONSUMPTION SUMMARY

By Sud Associates, P.A.

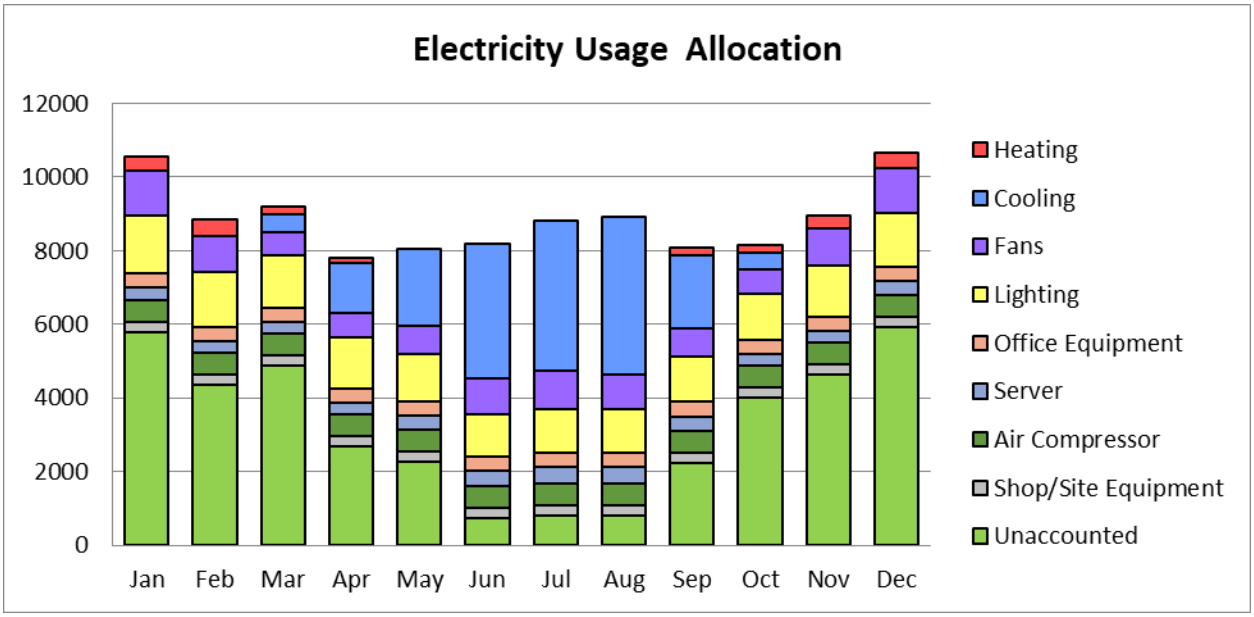
	Elect Cons. (kWh)	Gas Cons. (kBtu)	Water Cons. (1000 gals)	% of Total Building Energy	Total Building Energy (kBtu/yr)	Total Source Energy* (kBtu/yr)
Alternative 1						
Primary heating						
Primary heating		833,181		42.0 %	833,181	877,032
Other Htg Accessories	4,350		27	0.8 %	14,845	44,539
Heating Subtotal	**4,350**	**833,181**	**27**	**42.7** %	**848,026**	**921,571**
Primary cooling						
Cooling Compressor	58,800			10.1 %	200,685	602,115
Tower/Cond Fans	6,315			1.1 %	21,553	64,667
Condenser Pump				0.0 %	0	0
Other Clg Accessories	580			0.1 %	1,978	5,934
Cooling Subtotal....	**65,695**			**11.3** %	**224,216**	**672,716**
Auxiliary						
Supply Fans	72,367			12.4 %	246,990	741,045
Pumps	73,385			12.6 %	250,463	751,463
Stand-alone Base Utilities	14,632	14,997		3.3 %	64,935	165,615
Aux Subtotal....	160,384	14,997		28.3 %	562,388	1,658,123
Lighting						
Lighting	59,745			10.3 %	203,910	611,791
Receptacle						
Receptacles	43,290			7.4 %	147,747	443,287
Cogeneration						
Cogeneration				0.0 %	0	0
Totals						
Totals**	**333,463**	**848,178**	**27**	**100.0** %	**1,986,287**	**4,307,489**

* Note: Resource Utilization factors are included in the Total Source Energy value .

** Note: This report can display a maximum of 7 utilities. If additional utilities are used, they will be included in the total.

Appendix III

Energy Consumption Summary Charts (Public Works)



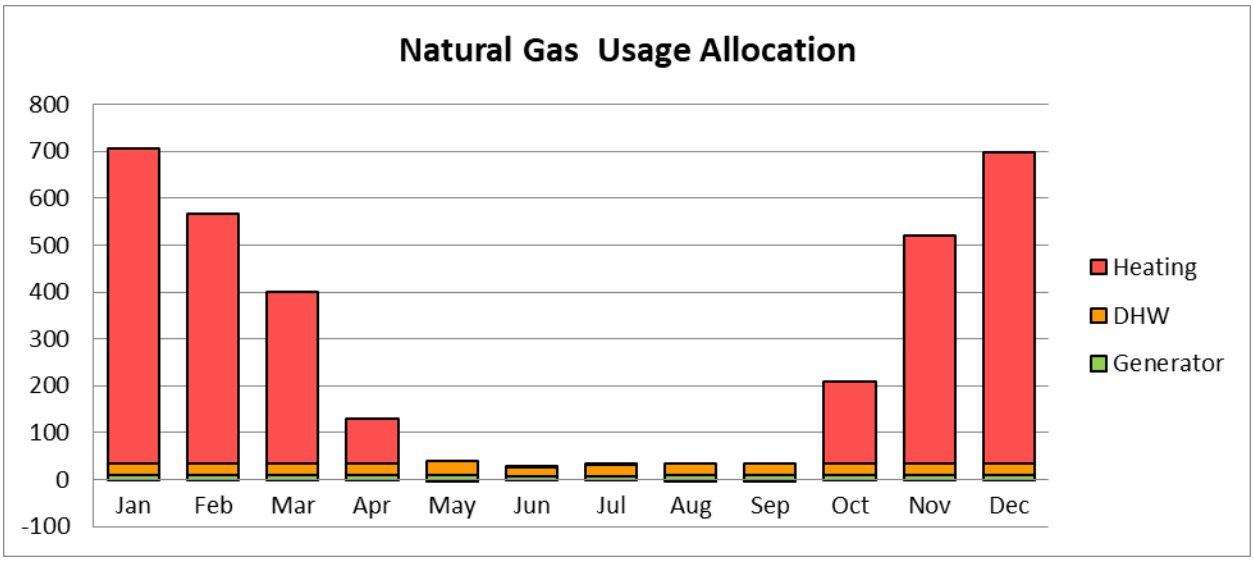


EXHIBIT E-2

Town of Carrboro
Town Hall Building; Century Center Building; Public Works Complex
Defining Net Zero Metrics and Boundaries

November 13, 2020

DRAFT REPORT

Background

The Town of Carrboro is considering options for renovating the Town Hall, Century Center, and the Public Works complex. The Town is seeking to develop a long-term renovation strategy while at the same time addressing immediate needs which have been identified by Town Staff. As part of the renovation effort, the Town would like to work towards the energy sustainability goals set forth in the Town's adopted Strategic Energy and Climate Action plan, which includes working toward net zero energy use.

A first step in the process of achieving a net zero energy building is to define the term "net zero" and to establish the criteria for a net zero energy building. This is more than an exercise in semantics, as the definition and criteria chosen can have significant effects on design decisions and project costs.

Defining "Net Zero"

The basic idea of a net zero energy building is that, over the course of a year, it has completely offset its energy usage by renewable energy production. Beyond this general concept, there is no single, universally accepted definition for a net zero energy building. The exact definition used for any given project is a choice made by the building owners and project team based on motivations, priorities, budget, building and site characteristics, and other constraints. The US DOE and the National Renewable Energy Laboratory (NREL) have developed a clear framework and guidance to aid owners and designers in choosing the defining criteria for their specific project.

In short, there are two decisions to be made: what metric will be used to evaluate the building's performance (i.e. net zero what?), and what is the boundary within which renewable energy may be generated? Each of these questions is addressed below.

Defining the Metric

NREL has presented 4 options for defining the metric by which a net zero building can be evaluated: Site energy consumption, source energy consumption, greenhouse gas (GHG) emissions, and energy cost.

Option 1: Net Zero Site Energy: A net zero site energy building will offset the energy it uses on site with renewable energy. The energy consumed is seen directly on the building's utility bills. Some owners see net zero site energy as an attractive metric primarily because it is easy to understand and its calculation does not depend on complex factors outside the boundary of the building. This metric steers designers away from natural gas as a heat or domestic hot water fuel in favor of heat pumps or even electric resistance heating. Solar hot water is often a more attractive renewable energy source than photovoltaics under this metric.

Option 2: Net Zero Source Energy: The source energy metric considers the source of the energy used in the building. For instance, the source energy metric would account not for the electricity used in the building, but for the coal used at the power plant to produce the electricity used in the building. This metric is favored by owners whose primary motivation is to conserve the Earth's fossil-based energy sources and to reduce the environmental damage associated with the extraction of these fuels. Using this approach largely levels the field when comparing natural gas heating versus electric heat pumps.

Option 3: Net Zero GHG Emissions: This metric is based on the GHG emissions associated with the energy used in the building rather than the energy itself. For instance, the GHG emissions metric would account not for the electricity used in the building, but rather for the airborne pollution generated by the power plant as it produces the electricity used in the building. A net zero GHG building might also be called a "carbon neutral" building. Net zero GHG emissions is chosen by owners whose primary motivation is to mitigate climate change. This metric favors the use of natural gas over electricity use, and places high value on producing renewable electricity (e.g. photovoltaic panels).

Option 4: Net Zero Energy Cost: A net zero energy cost building will offset the building's energy cost over the course of a year with renewable energy sold to the grid or other users. This metric is perhaps the simplest to understand, but it may not fit with the Town's Climate Action Plan. The most attractive systems and fuel types under this metric are variable, depending on the comparative market rates of the different fuels.

Defining the Boundary

Any net zero building will require renewable energy either to power the building directly or (more likely) to offset the building's consumption of non-renewable energy. Where this renewable energy can be generated in order to count towards this offset is determined by the building owners and project team. NREL has presented 4 options, in order of decreasing constraint: building footprint generation, building site generation, imported renewables, and purchased generation.

Option A: Building Footprint Generation: This option applies the constraint that all renewable energy must be generated within the footprint of the building itself. A common example of this would be PV panels installed on the building's roof.

Option B: Building Site Generation: Renewable energy may be generated anywhere within the property lines of the net zero building. Under this option, for example, a building may have PV panels on its roof as well as on the ground or on an on-site parking canopy.

Option C: Imported Renewables: Under this option, renewable energy may be imported from off-site and used on-site. A typical example would be biomass or biofuels used for heating. This option simply expands options for renewable generation, it does not exclude the possibility that some energy may still be generated on the building or the building site.

Option D: Purchased Generation: This option allows renewable energy to be generated by others and purchased by the building. This is often done in the form of Renewable Energy Credits (RECs). In this case the renewable energy itself is not necessarily used in the building, but the offsets created by the renewable energy are purchased and claimed by the building owners. Under this option, each of the previous three options may be included in the total mix of generation possibilities.

EXHIBIT E-3

BUILDING ENERGY ANALYSIS
TOWN OF CARRBORO

Town Hall
Century Center
Public Works

Presented to Town Council, 12/1/2020

JSA ARCHITECTS

SUD ASSOCIATES, P.A.
CONSULTING ENGINEERS

PROCESS

- Study Facility Documents
- Analyze Utility Data
- Perform Site Visits
- Research Building Use and Schedules
- Research Building Equipment
- Create Energy Simulations
- Create Water Usage Spreadsheet Models
- Calibrate Energy Simulations and Water Models

JSA ARCHITECTS

SUD ASSOCIATES, P.A.
CONSULTING ENGINEERS

TOWN HALL

JSA ARCHITECTS

SUD ASSOCIATES, P.A.
CONSULTING ENGINEERS

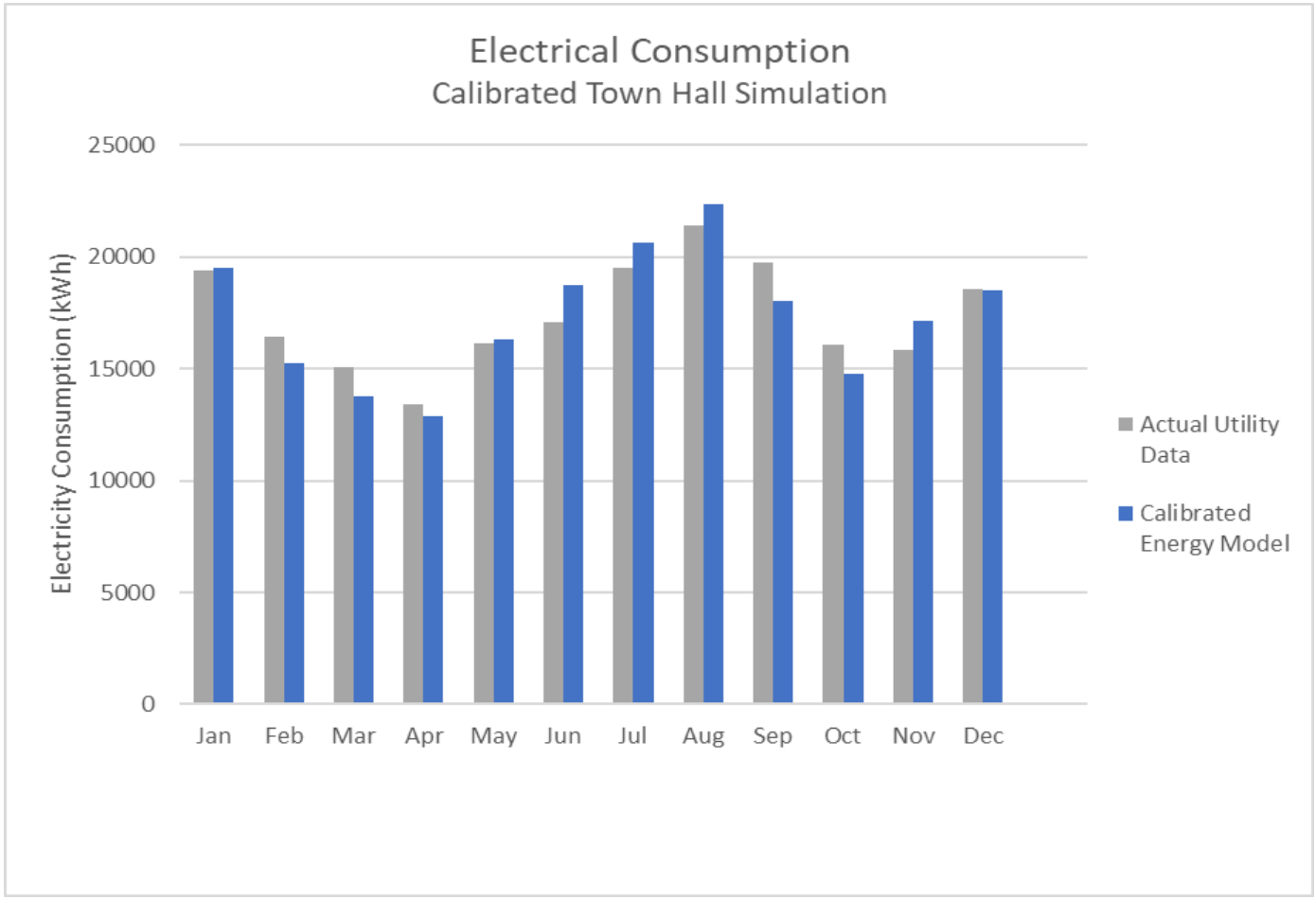
SIMULATED ENERGY SUMMARY

Town Hall Energy Consumption Profile		
End Use	Energy Consumption (kBTU/yr)	Percent of Total
Heating	83,044	11.7%
Cooling	169,247	23.9%
Fans/Pumps	99,651	14.1%
Lighting	119,697	16.9%
DHW	9,687	1.4%
Plug Loads / Other	228,125	32.2%
Total	709,451	100%
Conditioned Area (sf)	12,235	
Energy Use Intensity (kBTU/sf/yr	57.99	

JSA ARCHITECTS

SUD ASSOCIATES, P.A.
CONSULTING ENGINEERS

ELECTRICITY



JSA ARCHITECTS

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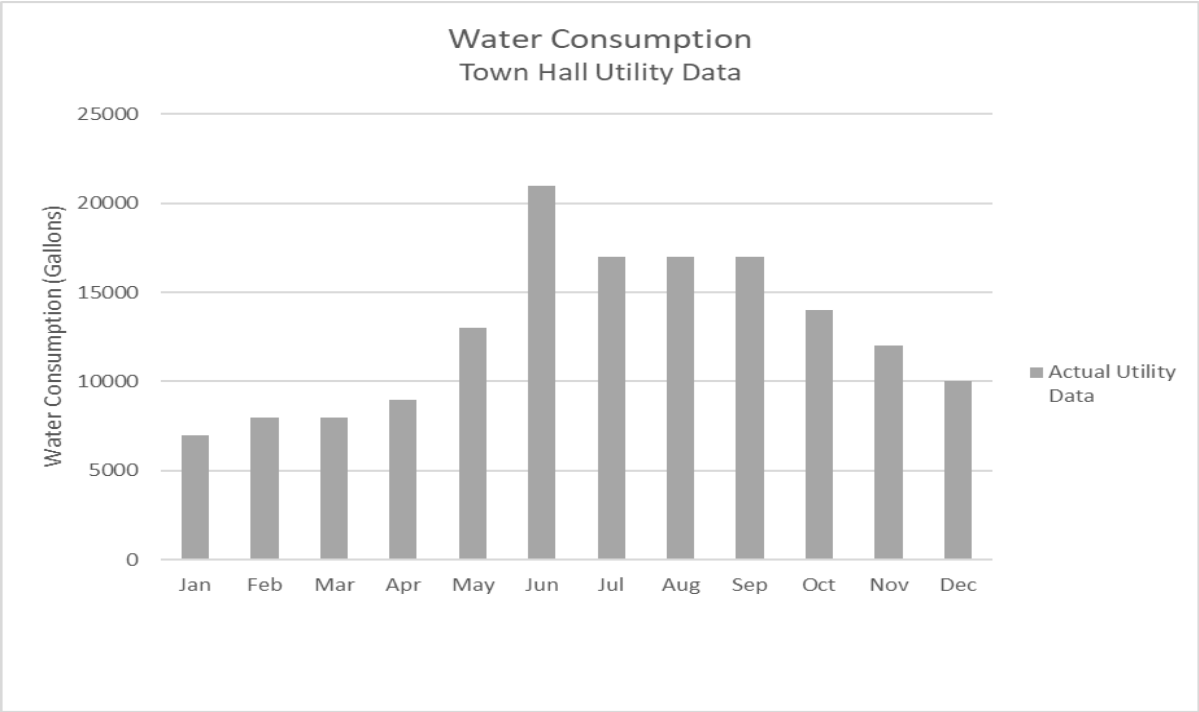
WATER



Town Hall Water Consumption (gal)			
	Actual Utility Data	Calibrated Model	% Error
Annual	155734	155731	0%

JSA ARCHITECTS

SUD ASSOCIATES, P.A.
CONSULTING ENGINEERS

CENTURY CENTER

JSA ARCHITECTS

SUD ASSOCIATES, P.A.
CONSULTING ENGINEERS

SIMULATED ENERGY SUMMARY

Century Center Energy Consumption Profile		
End Use	Energy Consumption (kBTU/yr)	Percent of Total
Heating	848,026	42.7%
Cooling	224,216	11.3%
Fans/Pumps	548,968	27.6%
Lighting	203,910	10.3%
DHW	13,420	0.7%
Plug Loads / Other	147,747	7.4%
Total	1,986,287	100%
Conditioned Area (sf)	19,912	
Energy Use Intensity (kBTU/sf/yr	99.75	

JSA ARCHITECTS

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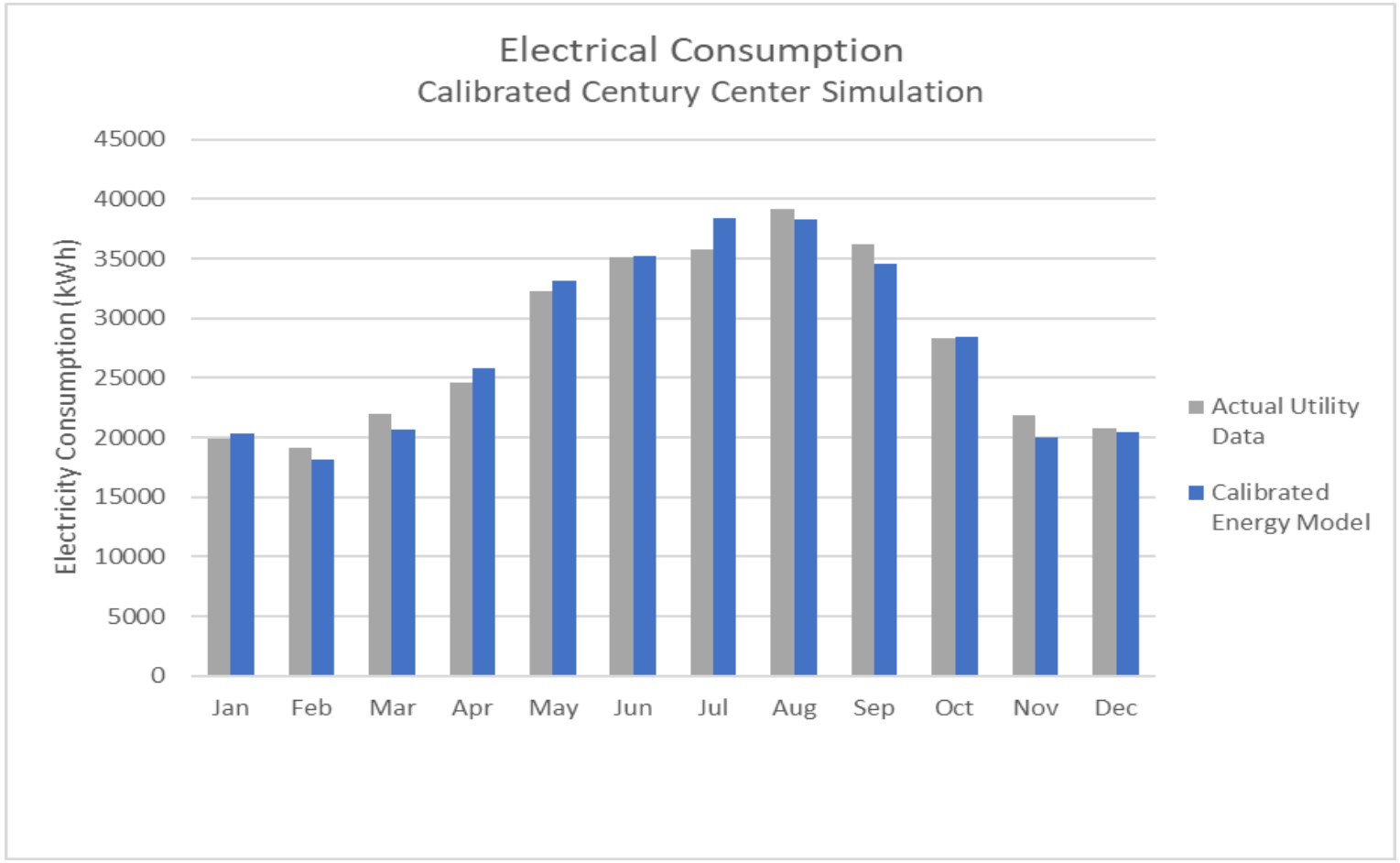
ELECTRICITY



JSA ARCHITECTS

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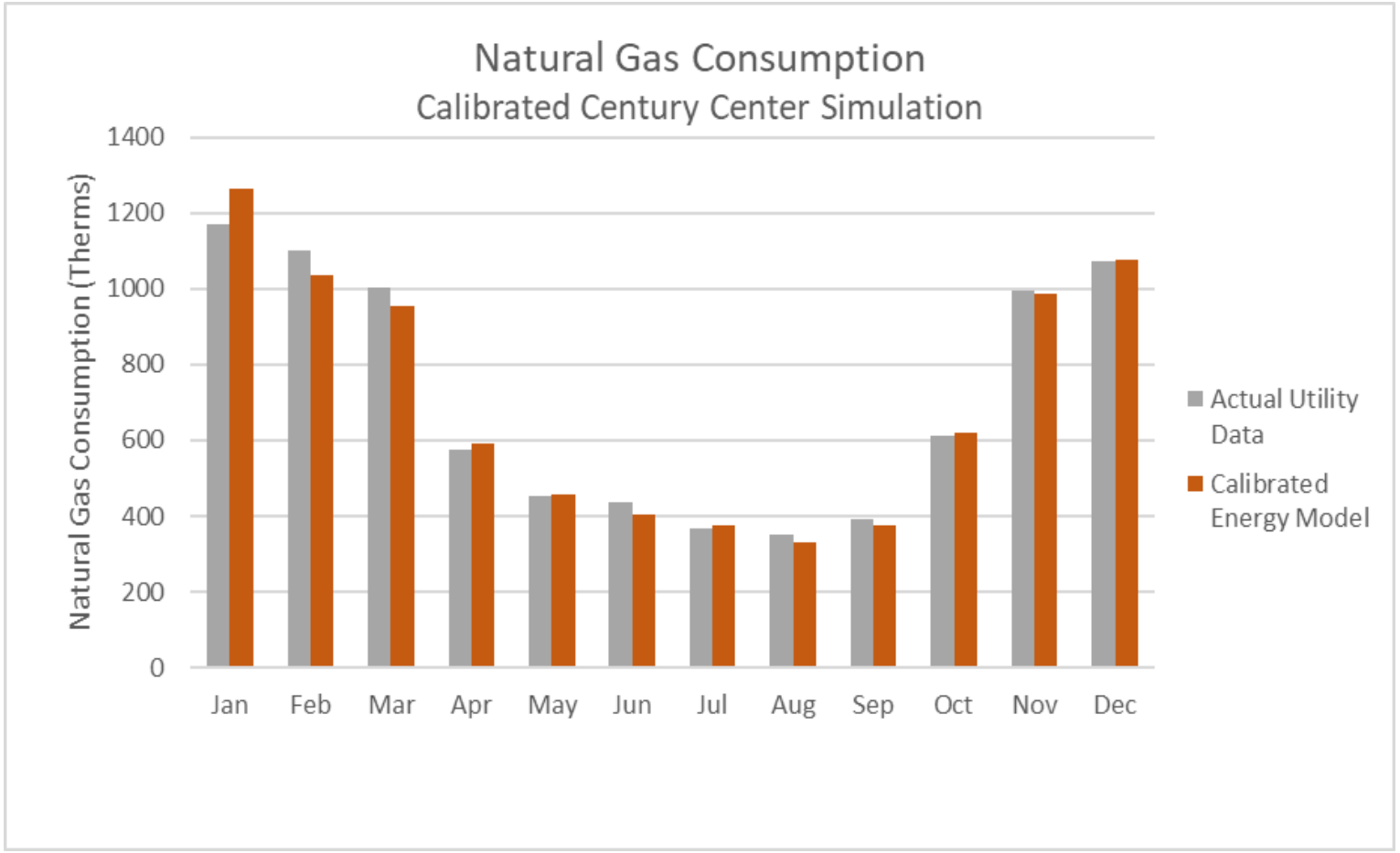
NATURAL GAS



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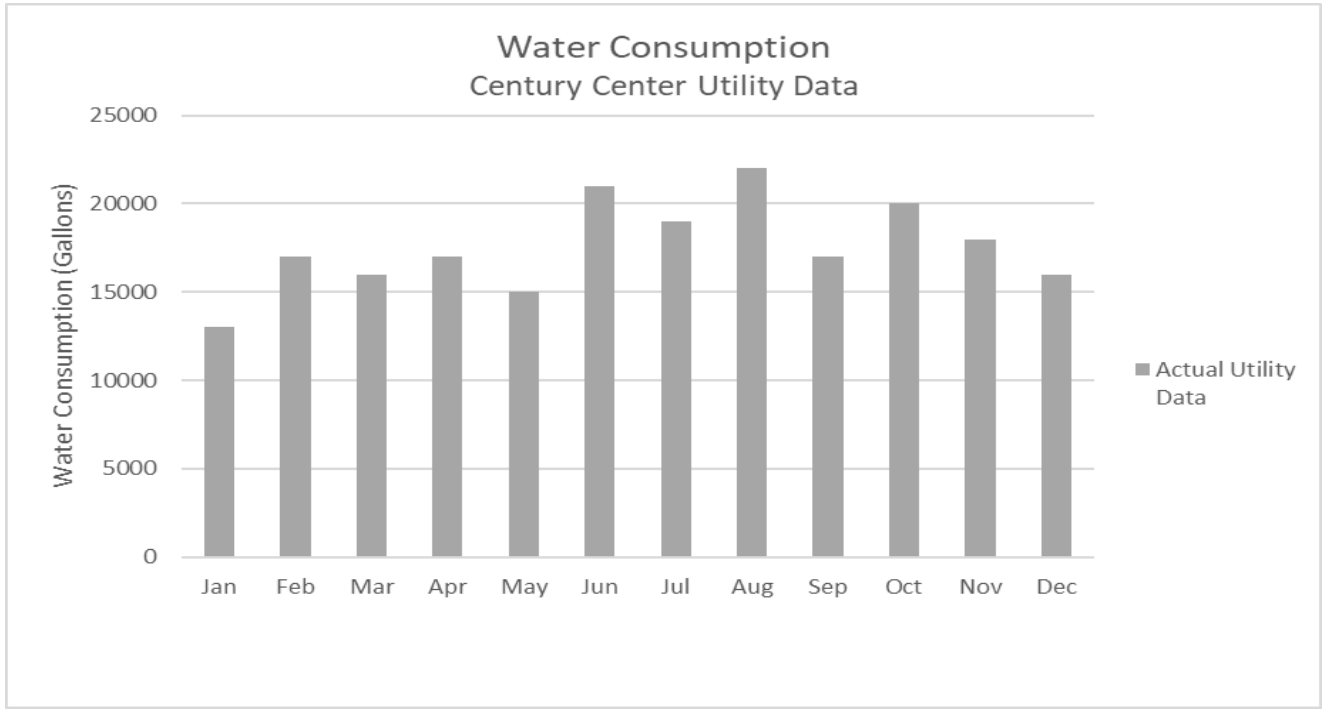
WATER



Century Center Water Consumption (gal)			
	Actual Utility Data	Calibrated Model	% Error
Annual	219416	219264	0%

JSA ARCHITECTS

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CONSULTING ENGINEERS

PUBLIC WORKS

JSA ARCHITECTS

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CONSULTING ENGINEERS

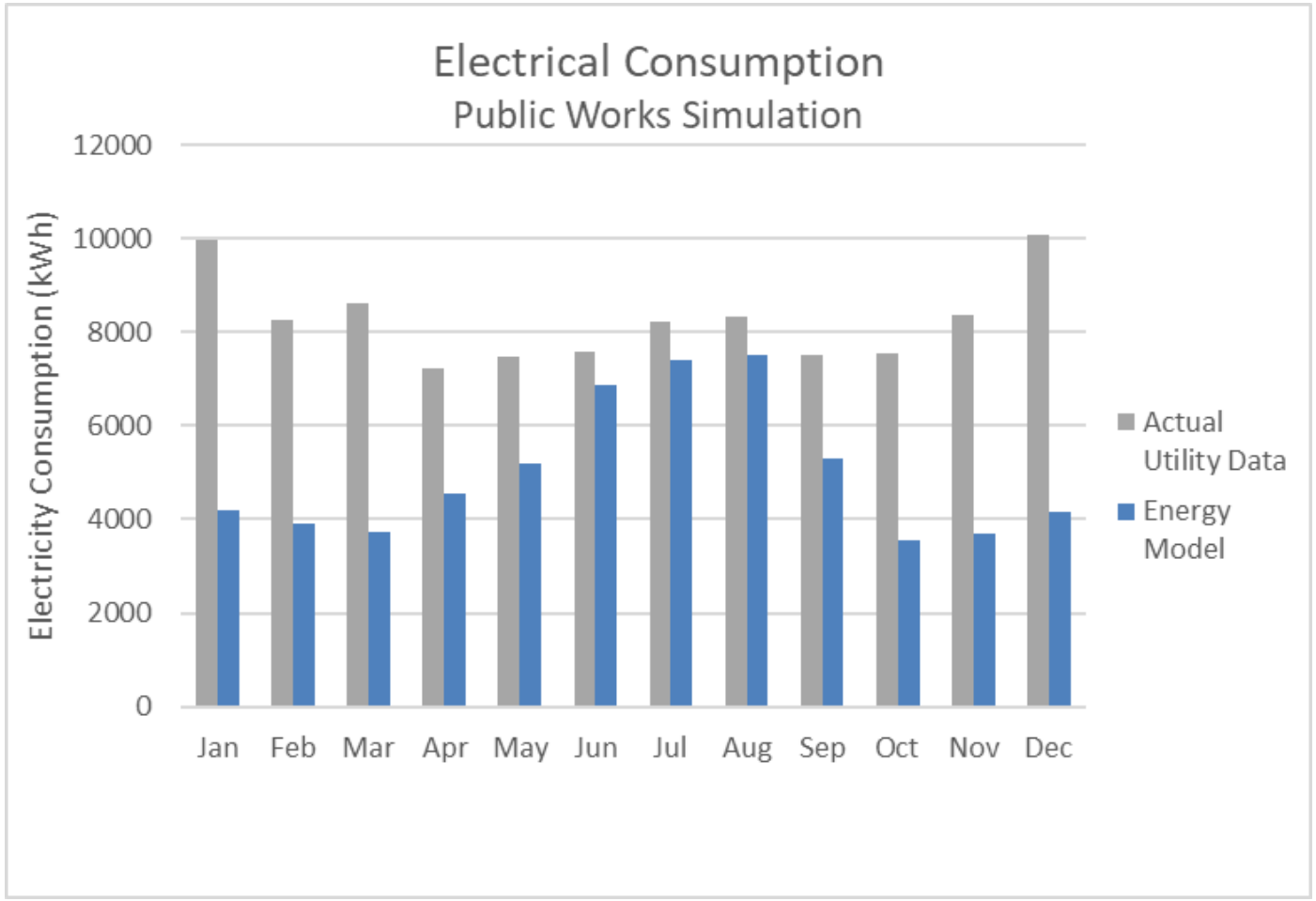
SIMULATED ENERGY SUMMARY

Public Works Energy Consumption Profile		
End Use	Energy Consumption (kBTU/yr)	Percent of Total
Heating	306,672	44.3%
Cooling	62,858	9.1%
Fans	36,683	5.3%
Lighting	54,922	7.9%
DHW/Carwash/Generator	30,900	4.5%
Office Equipment	15,861	2.3%
Server	15,040	2.2%
Air Compressor	24,088	3.5%
Shop/Site Equipment	11,495	1.7%
Currently Unaccounted	133,601	19.3%
Total	692,120	100%
Conditioned Area (sf)	6,300	
Energy Use Intensity (kBTU/sf/yr	109.9	

JSA ARCHITECTS

SUD ASSOCIATES, P.A.
CONSULTING ENGINEERS

ELECTRICITY



JSA ARCHITECTS

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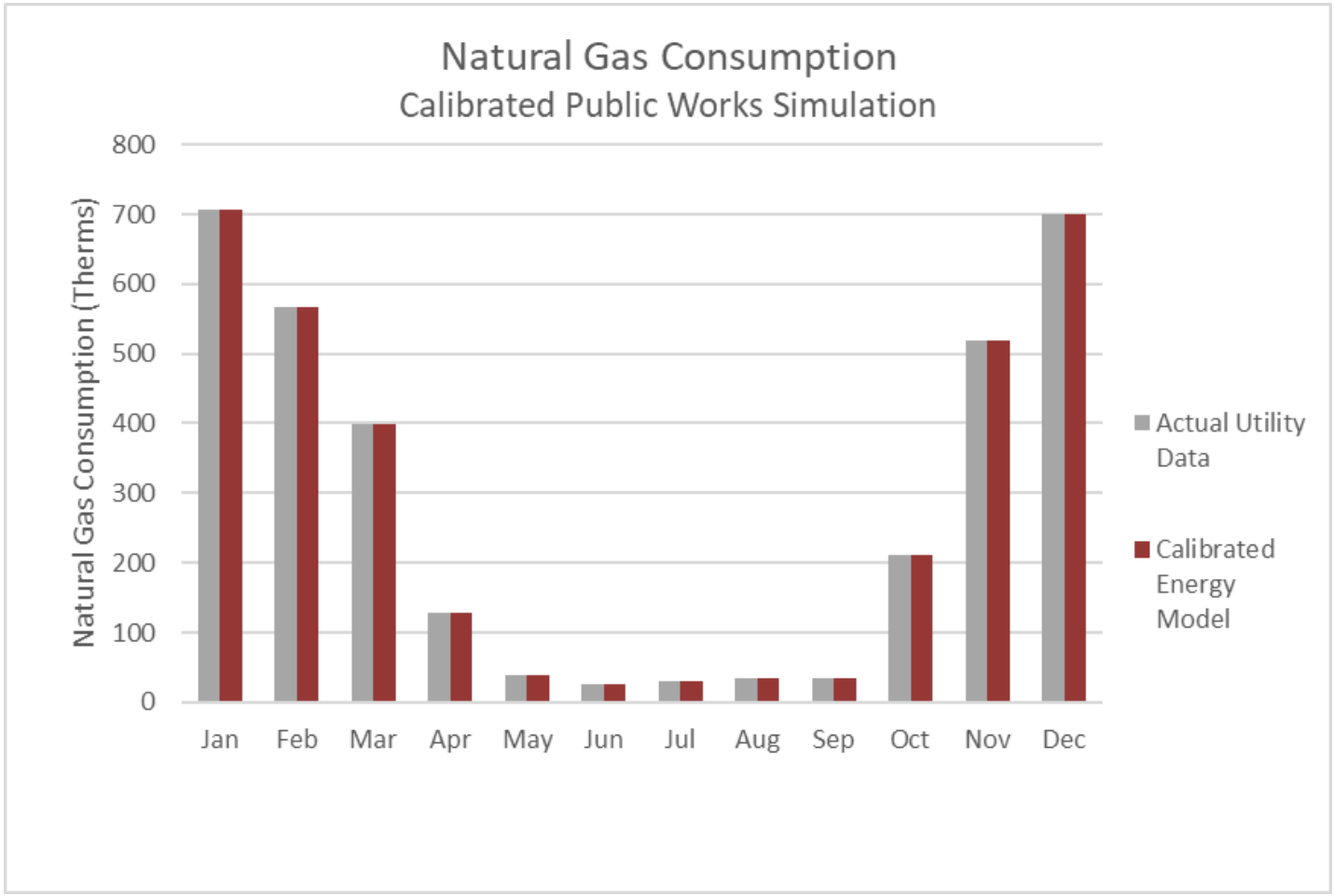
NATURAL GAS



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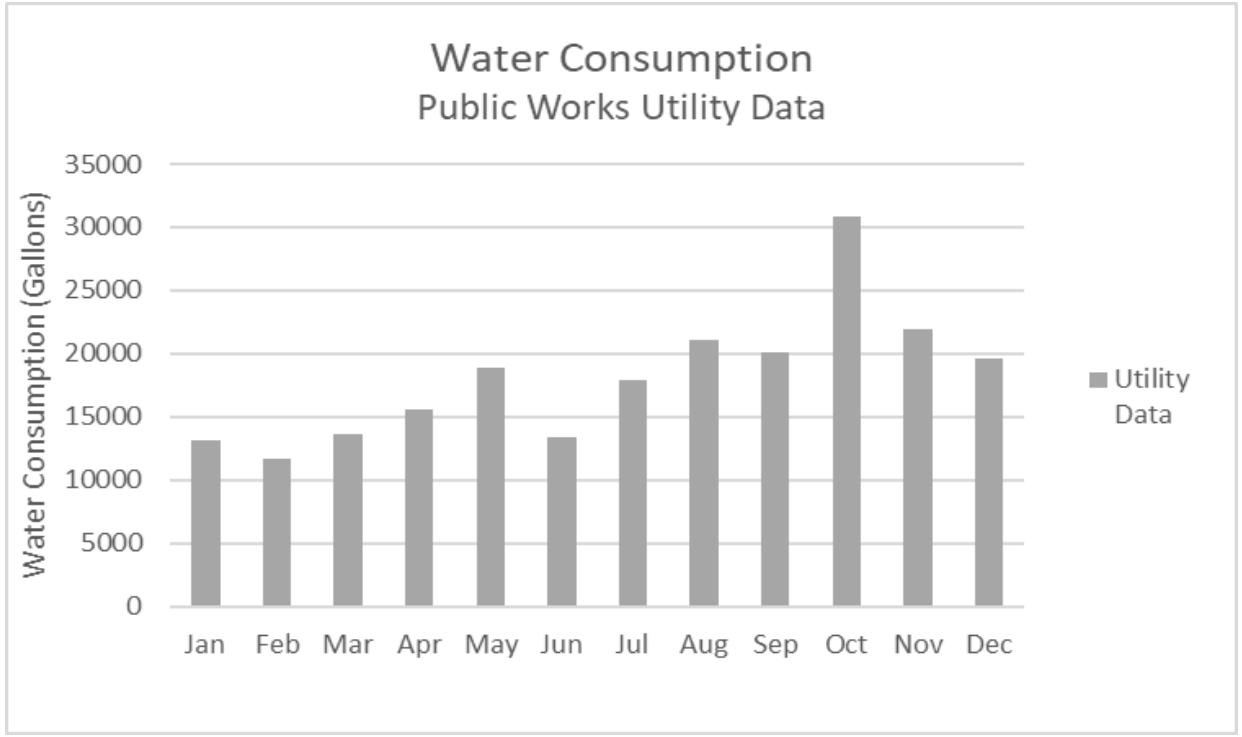
WATER



Public Works Water Consumption (Gallons)			
Period	Actual Utility Data	Calibrated Model	% Error
Annual	217948	216000	1%

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DEFINING NET ZERO
TOWN OF CARRBORO

Town Hall

Century Center

Public Works

JSA ARCHITECTS

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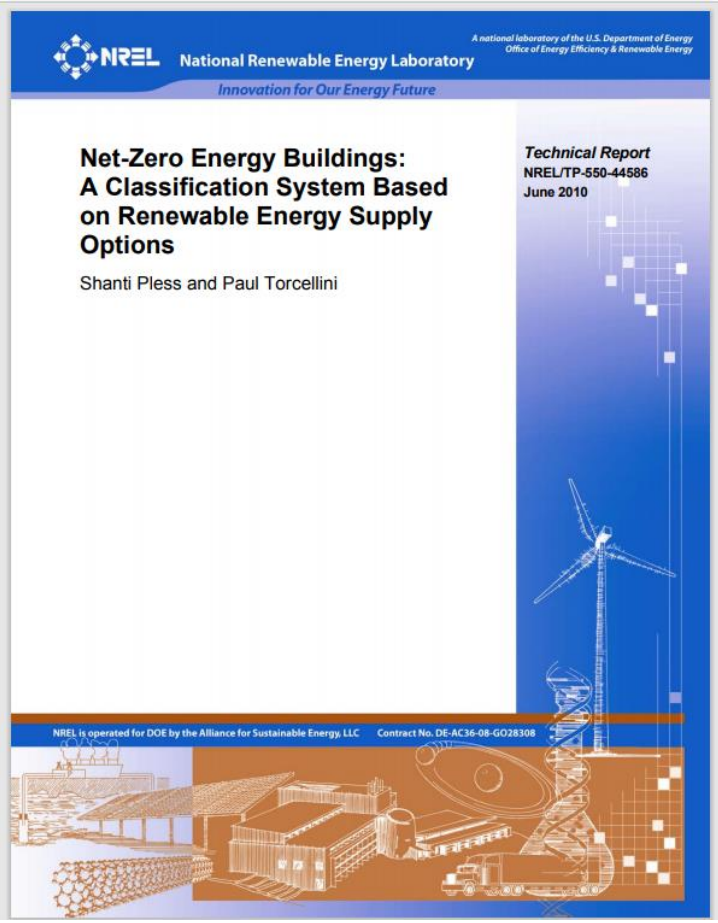
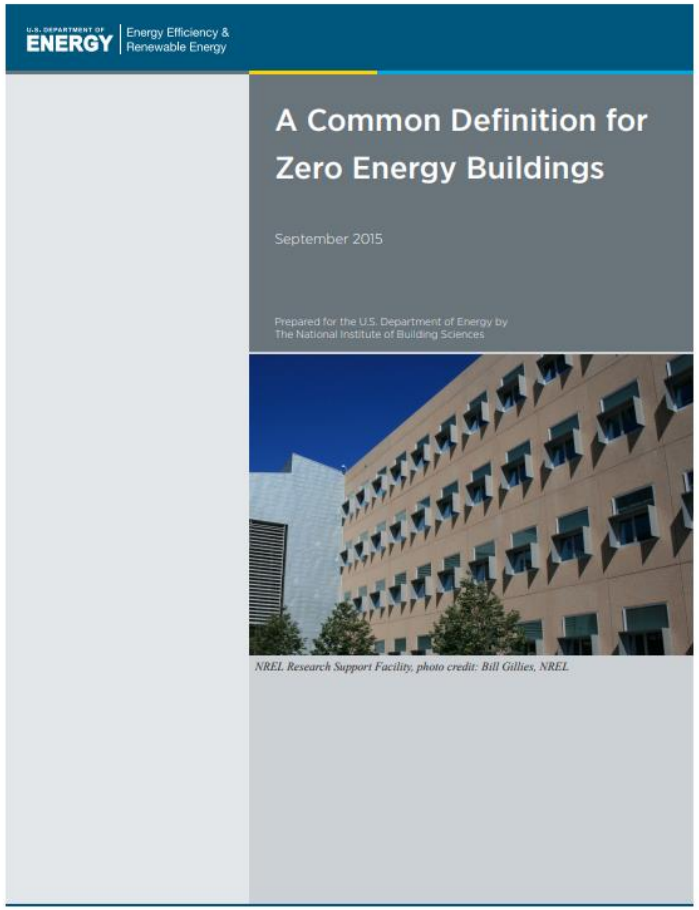
DEFINING “NET-ZERO”





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DEFINING THE METRIC

- Net-Zero…

- Option 1: Site Energy
  - Energy usage as seen on utility bills offset by renewables
- Option 2: Source Energy
  - Considers inefficiencies introduced by power plants and transmission
- Option 3: Greenhouse Gas Emissions
  - Focuses on atmospheric pollutants rather than fossil fuels themselves
- Option 4: Energy Cost
  - Based on utility costs. May not apply to the Climate Action Plan

JSA ARCHITECTS

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DEFINING THE BOUNDARY

- Renewable Energy is Generated…

- Option A: Within the Building Footprint
  - e.g. solar panels on the building's roof
- Option B: Within the Property Boundary
  - e.g. panels on the building's roof and on a separate parking canopy
- Option C: Off Site
  - Imported to site, e.g. wood chips shipped to the site for building heat
  - Generated off site, e.g. PV panels on Town-owned Property
- Option D: By Others (RECs)
  - Carbon offsets can be purchased to supplement other strategies

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IMPLICATIONS

- Option 1: Net-Zero Site Energy
  - Favors using electricity over natural gas
- Option 2: Net-Zero Source Energy
  - Natural gas vs electricity comparison requires analysis
- Option 3: Net-Zero GHG Emissions
  - Favors using natural gas over electricity
- Option 4: Net-Zero Energy Cost
  - Natural gas vs electricity comparison requires analysis

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NEXT STEPS

- Settle on Net Zero Definition
- Design Building Improvements
  - Must first meet basic safety, health, and comfort needs
  - Incorporate changes in space usage
  - Preserve historic quality
  - Pursue efficiency upgrades toward the Net Zero goal
    - Minimize energy consumption
    - Provide the balance with renewable generation

QUESTIONS?

EXHIBIT E-4

Attachment A

A RESOLUTION FOR ADOPTING A NET ZERO DEFINITION FOR THE TOWN OF CARRBORO BUILDINGS

WHEREAS, the Town Council received a Net Zero Buildings report and presentation at the December 1, 2020 Town Council Meeting by the Town's consultant, Sud Associates, P.A., and subsequently discussed the Net Zero Buildings metric and boundary options presented; and

WHEREAS, the Environmental Advisory Board (EAB) received the same presentation on January 11, 2021 and have submitted the attached hereto comments; and

WHEREAS, the Town Council and the EAB are in agreement with which Net Zero Buildings definition to adopt for the Town of Carrboro; and

WHEREAS, the Town Council and the EAB agree that the approach to any Net Zero Buildings project will be to first conserve as much as possible through energy efficiency measures, then to make up the balance through renewable energy generation; and

NOW, THEREFORE, BE IT RESOLVED by the Carrboro Town Council that the following Net Zero Buildings definition be adopted for the Town of Carrboro:

Net Zero Buildings shall be evaluated using greenhouse gas emissions (GHG) as the accounting metric. Renewable energy can be generated off-site to offset GHG emissions from non-renewable energy consumption.

This definition conforms to Option 3C of the attached report.

This the 19th day of February in 2021.

TOWN OF CARRBORO

Environmental Advisory Board

301 West Main Street, Carrboro, North Carolina 27510

RECOMMENDATION

January 11, 2020

Net Zero Discussion

Motion was made by Echart and seconded by Brandon that the EAB recommends:

Defining Net Zero

- Option 3: Greenhouse Gas Emissions
- The Town will need timely and defensible data to back up greenhouse gas emissions calculations
    - Search for more granular data (Duke Energy vs. NREL)
    - Published emissions data can be out-of-date so the Town will need to make some assumptions
        - Need to capture life cycle emissions from the production and transportation of the energy, especially natural gas

Defining the Boundary

- Option C: Off Site
- Develop solar energy anywhere on the grid, provided that it is owned by the Town
- Does not need to be Town property or within Town boundaries
- Look into Town parks, covered parking lots
- At some point the Town may need to examine creative yet feasible opportunities
    - Community solar
    - Buy a stake in a larger operation in another location; invest in solar farms
- The entire Carrboro community is a system, the location of the renewables is not as important
- However, on-site solar will minimize distribution losses

<u>Additional Comments</u>

Energy Sources

- The EAB recommends not locking the Town into natural gas usage
    - If the Town relies on electrification, it has more control and flexibility
- The makeup of the Town's energy sources is a moving target
    - The Town will need to take future trends into account

RECs

- Some EAB members are skeptical of RECs due to the fact that some renewable projects may already be in place and would not represent new emissions reductions

Overall

- The Town needs to work towards a goal of reducing fossil fuel use
- The Town should first pursue maximizing the energy efficiency of its buildings
- Next, the energy usage of the buildings must be offset completely by renewables in order for the Town to reach its goals of 80% reduction of 2010 greenhouse gas emissions levels by 2030
- The building analysis is a great first step towards evaluating all municipal energy usage and ultimately, the community's energy usage

VOTE:

AYES: (5) Kaufman, Turner, Brandon, Schalkoff, Echart

ABSENT/EXCUSED: (1) Blanco

NOES: (0)

ABSTENTIONS: (0)

Laura Janoway 1-11-21

For Tim Turner, Chair (Date)

Town of Carrboro
Town Hall Building; Century Center Building; Public Works Complex
Defining Net Zero Metrics and Boundaries

November 23, 2020

Background

The Town of Carrboro is considering options for renovating the Town Hall, Century Center, and the Public Works complex. The Town is seeking to develop a long-term renovation strategy while at the same time addressing immediate needs which have been identified by Town Staff. As part of the renovation effort, the Town would like to work towards the energy sustainability goals set forth in the Town's adopted Strategic Energy and Climate Action plan, which includes working toward net zero energy use.

A first step in the process of achieving a net zero energy building is to define the term "net zero" and to establish the criteria for a net zero energy building. This is more than an exercise in semantics, as the definition and criteria chosen can have significant effects on design decisions and project costs. Regardless of the definition chosen, the general approach to achieving net zero is to first conserve as much energy as is feasible, then use renewable energy to offset the remaining usage.

Defining "Net Zero"

The basic idea of a net zero energy building is that, over the course of a year, it has completely offset its energy usage by renewable energy production. Beyond this general concept, there is no single, universally accepted definition for a net zero energy building. The exact definition used for any given project is a choice made by the building owners and project team based on motivations, priorities, budget, building and site characteristics, and other constraints. The US DOE and the National Renewable Energy Laboratory (NREL) have developed a clear framework and guidance to aid owners and designers in choosing the defining criteria for their specific project.

In short, there are two decisions to be made: what metric will be used to evaluate the building's performance (i.e. net zero what?), and what is the boundary within which renewable energy may be generated? Each of these questions is addressed below.

Defining the Metric

NREL has presented 4 options for defining the metric by which a net zero building can be evaluated: Site energy consumption, source energy consumption, greenhouse gas (GHG) emissions, and energy cost.

Option 1: Net Zero Site Energy: A net zero site energy building will offset the energy it uses on site with renewable energy. The energy consumed is seen directly on the building's utility bills. Some owners see net zero site energy as an attractive metric primarily because it is easy to understand and its calculation does not depend on complex factors outside the boundary of the building. This metric steers designers away from natural gas as a heat or domestic hot water fuel in favor of heat pumps or even electric resistance heating.

Solar hot water is often a more attractive renewable energy source than photovoltaics under this metric.

Option 2: Net Zero Source Energy: The source energy metric considers the source of the energy used in the building. For instance, the source energy metric would account not for the electricity used in the building, but for the coal used at the power plant to produce the electricity used in the building. This metric is favored by owners whose primary motivation is to conserve the Earth's fossil-based energy sources and to reduce the environmental damage associated with the extraction of these fuels. Using this approach largely levels the field when comparing natural gas heating versus electric heat pumps.

Option 3: Net Zero GHG Emissions: This metric is based on the GHG emissions associated with the energy used in the building rather than the energy itself. For instance, the GHG emissions metric would account not for the electricity used in the building, but rather for the airborne pollution generated by the power plant as it produces the electricity used in the building. A net zero GHG building might also be called a "carbon neutral" building. Net zero GHG emissions is chosen by owners whose primary motivation is to mitigate climate change. This metric favors the use of natural gas over electricity use, and places high value on producing renewable electricity (e.g. photovoltaic panels).

Option 4: Net Zero Energy Cost: A net zero energy cost building will offset the building's energy cost over the course of a year with renewable energy sold to the grid or other users. This metric is perhaps the simplest to understand, but it may not fit with the Town's Climate Action Plan. The most attractive systems and fuel types under this metric are variable, depending on the comparative market rates of the different fuels.

Defining the Boundary

Any net zero building will require renewable energy either to power the building directly or (more likely) to offset the building's consumption of non-renewable energy. Where this renewable energy can be generated in order to count towards this offset is determined by the building owners and project team. NREL has presented 4 options, in order of decreasing constraint: building footprint generation, building site generation, imported renewables, and purchased generation.

Option A: Building Footprint Generation: This option applies the constraint that all renewable energy must be generated within the footprint of the building itself. A common example of this would be PV panels installed on the building's roof.

Option B: Building Site Generation: Renewable energy may be generated anywhere within the property lines of the net zero building. Under this option, for example, a building may have PV panels on its roof as well as on the ground or on an on-site parking canopy.

Option C: Off Site Renewables: Under this option, renewable energy may be imported from off-site and used on-site. A typical example would be biomass or biofuels used for heating. While not explicitly stated by NREL, it is our opinion that renewable energy generated by a system owned by the building owner and located on land which is owned by the building owner (though not on the building site) would qualify under Option C. An example would be PV panels located on a Town-owned park. This option simply expands options for renewable generation, it does not exclude the possibility that some energy may still be generated on the building or the building site.

Option D: Purchased Generation: This option allows renewable energy to be generated by others and

purchased by the building. This is often done in the form of Renewable Energy Credits (RECs). In this case the renewable energy itself is not necessarily used in the building, but the offsets created by the renewable energy are purchased and claimed by the building owners. Under this option, each of the previous three options may be included in the total mix of generation possibilities.

EXHIBIT E-5

HVAC UPGRADE CONCEPTS
TOWN OF CARRBORO

Town Hall

Century Center

Public Works

JSA ARCHITECTS

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CONSULTING ENGINEERS

CENTURY CENTER

- Keep existing system types (HW, CHW)
  - Allows reuse of existing piping and ducting
  - Boiler is new, highly efficient
  - HW and CHW enables flexibility, effectiveness, and efficiency
  - Use of natural gas boiler does not aid goal of electrification
- Improve Operation
  - Apply strategies to save natural gas and electricity
  - Address extended hours areas separately
- Equipment upgrades
  - E.G. Replace chiller w/ heat recovery chiller
    - Aids goal of electrification by displacing some gas heat with electrical “waste heat”

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TOWN HALL

- Complete redesign of systems
  - Electricity based systems
  - Consider new occupancy types and schedules
  - State of the art efficiency in equipment and strategies
  - VRF AHUs w/ VAV boxes one possible option

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CONSULTING ENGINEERS

PUBLIC WORKS

- Focus first on system operation
  - Make the most of existing systems
- Upgrade equipment as appropriate
  - Select system types tailored to space needs
  - Continue goal of electrification
  - State of the art efficiency in equipment for new spaces

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