

# North Dakota State University

## Graduate School

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**Title**

DESIGNING FOR SHARED SPACES: AN APPROACH TO ENHANCING ANIMAL WELFARE AND FOSTER HUMAN-ANIMAL CONNECTIONS THROUGH COMPASSIONATE DESIGN

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**DESIGNING FOR SHARED SPACES: AN APPROACH TO ENHANCING ANIMAL  
WELFARE AND FOSTER HUMAN-ANIMAL CONNECTIONS THROUGH  
COMPASSIONATE DESIGN**

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## **ABSTRACT**

The provided research conveys the problems being faced in animal shelters that were influenced by COVID-19 and how it impacted the overcrowding rates driven by the rise in pet relinquishment numbers and lack of social response by humans. Due to the lack of proper awareness and standards for shelters, animal welfare is not being observed, causing placement in inhumane environments, triggering severe stress, and causing mental/physical deterioration. Animal welfare is suffering because of the lack of human response for animal life. These situations that are impacting animal well-being have greatly increased because people are less willing to connect to animals and shelters. The building proposal being presented is for a properly configured animal shelter that is designed to promote healthy and stimulating living spaces for cats and dogs, offers proper spaces for shelter employees to perform daily operations, and spaces designated for human-animal interaction that provide benefits to the welfare of both groups.

## **ACKNOWLEDGEMENTS**

I would like to acknowledge all the people that were willing to allow me to interview them and provide critical information that displayed the positive and negative elements of their shelter facility.

## **DEDICATION**

I want to dedicate my project to my cat, Charlie-Johnson, who was my inspiration for wanting to undertake this topic. He's been the best emotionally supportive roommate since my sophomore year by involuntarily attending all my virtual classes during the events of COVID-19 and has gotten to experience all my up-and-downs throughout the years as I worked to achieve my degree.

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**LIST OF ABBREVIATIONS**

- S.F. .... Square Footage
- AAI .....Animal-Assisted Intervention
- AAT .....Animal-Assisted Therapy
- ASPCA.....American Society for the Prevention of Cruelty to  
Animals
- C4C .....Capacity for Care
- HAR .....Human-Animal Relationship

# **1. INTRODUCTION**

Over the years people have become more aware of the importance of animals and their welfare, but there is a lack of focus on properly designed animal housing that offers a calm experience for animals. There are an estimated 27 million puppies and kittens born each day in the United States and 6.3 million companion animals enter shelters every year causing overcrowding, lack of service space, and unwanted euthanizing due to the facilities not having proper housing and resources for the animals being brought in (Mitchell, 2022). Current studies have shown that in recent years, largely impacted by COVID-19, there have been an overwhelming increase in shelters not having proper funding and resources needed to provide a humane environment for its residents. The research documented in this thesis focuses on animal welfare and how space design can impact the overall well-being of animals. The collection of research provides an understanding of how animal shelters have been designed in the past and how they have poorly adapted to the contemporary needs of a safe space for animals. By studying animal welfare, it is presented in this thesis that the well-being of animals is greatly impacted by a human-animal relationship; proving that by incorporating a community resource center both human and animal welfare can have a positive impact.

## **1.1. Problem Statement**

Animal shelter related research and statistics are often observed as a blackhole due to the lack of historical data presented throughout history (Reese, 2018). Shelters have faced the struggle of overcrowding dating back to the first documented case of animal sheltering. As the popularity of shelters has increased so has overcrowding, primarily influenced by recent events such as COVID-19 and owners being faced with personal challenges (Carroll et al., 2022). The increase in relinquishment numbers are predicted to continue to grow and it is predicted that the

number of animals being relinquished are three to five times higher when adopted post-pandemic (Carroll et al., 2022). Therefore, there needs to be a new understanding of how contemporary care facilities are not adequate to provide animals' needs.

Animal housing has historically been designed without consideration for the animal's well-being. There has been a gap in the societal understanding of the difference between animal control and animal welfare. Animal welfare is defined by the American Veterinary Medical Association as, "An animal is in a good state of welfare if (as indicated by scientific evidence) it is healthy, comfortable, well-nourished, safe, able to express innate behavior, and if it is not suffering from unpleasant states such as pain, fear, and distress" (*Animal Welfare*, 2022). The United States has historically acted under the ideals of animal control by simply working to remove animals from streets and place them in confinement until adopted, rehomed, or euthanized as opposed to the definition of animal welfare (Reese, 2018). There is a call for research regarding what is needed to provide the proper care and offer the best environment for dogs and cats when housed in shelters around the Midwest. Historically animals have been housed in inhumane scenarios, as shown in Figures 1 and 2, that have led to a shift in shelter care, but there are still missing links to how animal housing can affect animal behavior and can benefit animal adoption rates. There is evidence presented by Wagner et al., in Figure 3 that show more contemporary housing that meets minimal cat housing sizing but presents uncomfortable and inhumane scenarios for the animals (Wagner et al., 2018). These minimums are leaving negative emotional and health consequences to animals, preventing them from having the ability to be adopted (*Animal Shelter Housing*, 2019). This thesis project will discover the influences of overcrowding that are impacting shelters in the United States and how current shelter design standards don't provide for the additional needs of animals housed in shelters.



Figure 1.

*Example of a dog placed in a kennel too small for its size.*



*Curated By: (Grablick, 2023)*

Figure 2.

*In a warehouse at the Oglethorpe Street campus, dogs are being stored in crates due to overcrowding.*



*Curated By: (Grablick, 2023)*

Figure 3.

(a) A cage with a main compartment (76 cm [30 in] high) and two overly small additional compartments (each 38 cm [15 in] high). (b) A litter box located under a 38 cm (15 in) high shelf. The litter box is too small and the shelf impedes normal posturing.



*Curated By: (Wagner et al., 2018)*

Animal shelters are not only designed for the housing of animals but there also needs to be a proper understanding of how the human-animal relationship plays a role in the animal welfare at the shelters. The increase of issues in an animal healthcare center has become a growing topic in society, but there is a lack of engagement between people and the animals

within these shelters. Animal shelters are primarily influenced by human involvement. The caretakers, volunteers, and community all provide a vital role in a shelter's success. Therefore, there needs to be a proper understanding of how the incorporation of people in a shelter design can provide benefits to the shelter and animal adoption rates.

### **1.2. Objective**

The proposed project will use gathered information from related sources on how animal housing can be designed to make a positive impact on animal welfare and implement new shelter facility designs that include a community center which could be used for human-animal interactions and educational programs. The building will offer a desirable environment that promotes healthy and emotional benefits for the animals in addition to offering properly distinguished spaces for the people and employees to complete their daily responsibilities. The animal housing units will be designed with housing cages that provide each animal with the correct amount of mobility room and include additional stimulating spaces. When developing a functional animal shelter that meets these needs, a community center integrated in the building provides an opportunity for community engagement and gives an opportunity for the public to engage with the facility.

## **2. BACKGROUND**

Animal shelters have become a growing concern for society as people understand the large impact animals have on human life. People understand the importance of animal well-being and how animals deserve fair treatment. New studies and research presented in this thesis have been conducted to bring awareness to the way animal captivity needs to be updated.

Architectural change needs to be made to shelter design expectations to provide stress reducing housing for animals and adequate facilities for staff members.

## **2.1. Animals' Place in History**

Animals have been an important part in human lives from the beginning of time and left marks on history by displaying power and a strong connection to humans. Animal shelters and animal protection laws were developed around three centuries ago in regard to animal welfare, but throughout history the development and changes regarding animal welfare have been minimal but influential (Irvine, 2015). Culture and people are a main influence in what happens to animals, especially when influenced by society's response to animal rights. It is important to understand how animals have achieved protection through laws and how the rise in animal associations have played a role in the way humans have been able to develop connections and an understanding on why animal welfare connects to human emotions as well.

### **2.1.1. Importance of Animal Protection Laws**

Animal protection laws were originally established in the eighteenth century due to the evolution of distress from seeing people inflict brutality on animals in communal areas. During the Victorian era, the movement of animal protection encouraged the government to take actions that would reduce the distance seen between humans and other species. The first leader in protecting animals against cruelty was influenced by Henry Bergh, a native to New York City, NY. On one of Bergh's work-related trips, he ventured to Europe where he was appalled by the level of animal cruelty he had seen amongst his travels. After making his final destination to London, Bergh would become acquainted with Richard Martin, who established the Martin's Act in 1822. The Martin's Act would become the first largely recognized animal protection act that protects animals against cruelty (Coleman, 1924)[pg. 29, 36]. Figure 4 displays the first trial of Bill Burns who was the first person convicted under the Martin's Act. Henry Bergh would return to America and dedicate his life to developing animal protection laws in America under the

guidance of Martin. Bergh was later credited with establishing the American Society of the Prevention of Cruelty to Animals (ASPCA) in 1866 and is perceived as the first animal protection society in the United States (Horecka & Neal, 2022). The ASPCA paved the way for anticruelty legislation in the United States but was underrepresented. The ASPCA was designed to help protect animals, but the organization would establish city pounds that collected strays to be killed or would supply animals for vivisection without repercussions which actually led to a rise in reported animal killings (Irvine, 2015).

Figure 4.

*A painting of the trial of Bill Burns, the world's first known conviction for animal cruelty under the 1822 Martin's Act.*



*Curated By: ("Cruel Treatment of Cattle Act 1822," 2023)*

### **2.1.2. Origin of Animal Sheltering**

Despite the efforts through legal development, people began to oppose their government and soon took direct action to prevent the killing of animals. Animal shelters would soon emerge through the actions of independent efforts as an act against the brutality of city pounds. The first act of animal sheltering is documented in 1858 by two women in Philadelphia, PA, who had the original goal of providing homes, helping people find lost animals, and protect animals from being killed (Irvine, 2015). The shelter worked with high success, but they fell into overcrowding issues pushing them to have to resort to killing animals. The discovery of using a lethal dose of chloroform would become the standard humane way of killing unwanted animals until gas chambers were designed using carbon monoxide shortly after. Figure 5 shows a gas chamber that was used in shelters in Utah until 2014. The two women, Elizabeth Morris and Annie Waln, would become the leading example of sheltering by creating the Morris Refuge Association for Homeless and Suffering Animals. In addition, Caroline Earle White formed a women's branch of the Pennsylvania ASPCA. The women's branch would establish the first official animal shelter facility leading a social change that demanded the spread of shelters in the United States (Irvine, 2015).

Figure 5.

*A gas chamber used in a Utah shelter until 2014.*



*Curated By: (Jaskot, 2017)*

### **2.1.3. Animals & People**

Humans and animals have always had a strong relationship throughout history. Dating between 12,000 and 9,000 B.C., humans have been domesticating animals. Humans originally domesticated animals to keep livestock for food, but the discovery of dog domestication in Iraq and cat domestication in Cyprus were discovered at least 12,000 years ago. The first evidence of Animal Assisted Interventions (AAI) was recorded at the Quaker York Retreat in England, where rabbits and poultry were used in a therapeutic setting in 1792 (Fine et al., 2019). Animal stress studies have been conducted as models for human stress studies since the year



1926 (Horecka & Neal, 2022). Boris Levinson was the first person to define the treatment method of Pet Therapy after discovering that one of his patients was more willing to verbalize during treatment after an accidental interaction with Levinson's dog during their session (Fine et al., 2019). AAI had originated in the therapeutic community as a form of social experimentation. While originally conducting an experiment on stress seen in dogs in the 1970s, Samuel Corson and Elizabeth O'Leary Corson discovered that when other patients and staff would interact with dogs, people were more open to communicate. A relationship between human and animal was observed through interactions leading to a breakthrough moment in the field of AAI (Fine et al., 2019). Figures 6 and 7 show examples on how animal assisted treatments are given to people in need of AAI and AAT.

Figure 6.

*Online dog-assisted reading program.*



*Curated By: (Animal Assisted Intervention (AAI), 2022)*

Figure 7.

*Therapy dog interacting with a child in AAT.*



*Curated By: (Animal Assisted Intervention (AAI), 2022)*

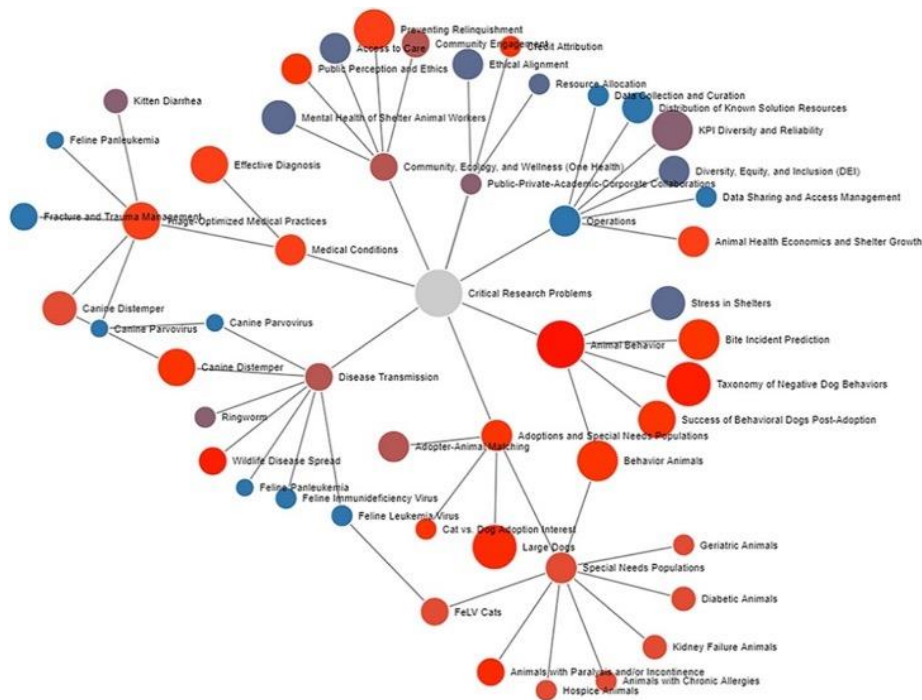
## **2.2. Challenges Within Animal Shelters**

Horeka provides Figure 8 as an overview of all the places of concern that arise within animal shelters and related animal welfare practices. The Animal Behavior node is observed as one of the biggest areas represented. In addition to the relation animal behavior has to the current critical research problems, this thesis will discuss issues that touch on how this different research problem plays an important role in how a properly designed animal shelter connects to solutions for these concerns through the research and understanding of animal well-being. The research presented in this thesis will address a majority of these concerns and apply them to departments that directly address their connection to animal behavior and how human-animal relationships

compare to each other (Horecka & Neal, 2022). The figure provides a strong example of how much animals rely on human involvement to achieve better care.

Figure 8.

*The number of problems being faced in related animal welfare professions. Each problem is identified with a node using color to represent difficulty and size defining the impact a solution will provide.*



*Curated By: (Horecka & Neal, 2022)*

### 2.2.1. Population

Shelters are expected to run at an 80% occupancy rate and have an animal turnaround rate of a two week average (*Facility Design, Shelter Animal Housing and Shelter Population Management, 2015*). There are two main reasons overpopulation happens in animal shelters. The

first reason is due to the lack of population control from animals being able to reproduce. The second reason is due to owners abandoning their pets when they feel they can no longer care for or want their pet (Mitchell, 2022). Before the effects of COVID-19, the population of animals entering shelters each year averaged 7 million within the United States alone. It was reported that nearly half of those animals, particularly cats, would be euthanized solely due to the lack of space for shelters to house the animals (Turner et al., 2012). COVID-19 left an impact on population numbers due to the unexpected lack of spay-neuter resources to help control population numbers. The pandemic caused 63.16% of shelters to reduce or stop performing spay-neuter surgeries and shelters were able to release animals for adoption not requiring spay-neutering (Gunter et al., 2022).

#### ***2.2.1.1. Overcrowding***

Overcrowding in animal shelters ascended drastically after World War II as the pet population started to grow exponentially (Irvine, 2015). Overpopulation has become a growing crisis seen across the globe in the pet community which is causing undue stress on animal shelters and causing the rates of unwanted euthanasia to increase (Mitchell, 2022). Due to the advancement of veterinary medicine, there has been an increasing animal lifespan. This affects the reproduction rate of animals in addition to the popularity of large-scale commercial breeding and grows the demand for household pets (Mitchell, 2022). Implementing spay/neuter strategies such as a capture and release program helps control the animal population and reduce euthanasia rates (Turner et al., 2012). Animal shelters have the main goal of trying to save as many animals as possible and get the animals adopted as quickly and easily as possible. Due to new technologies and human awareness of the unethical euthanasia methods taken in the past to help control animal populations, overcrowding in shelters is becoming a rapidly growing concern in

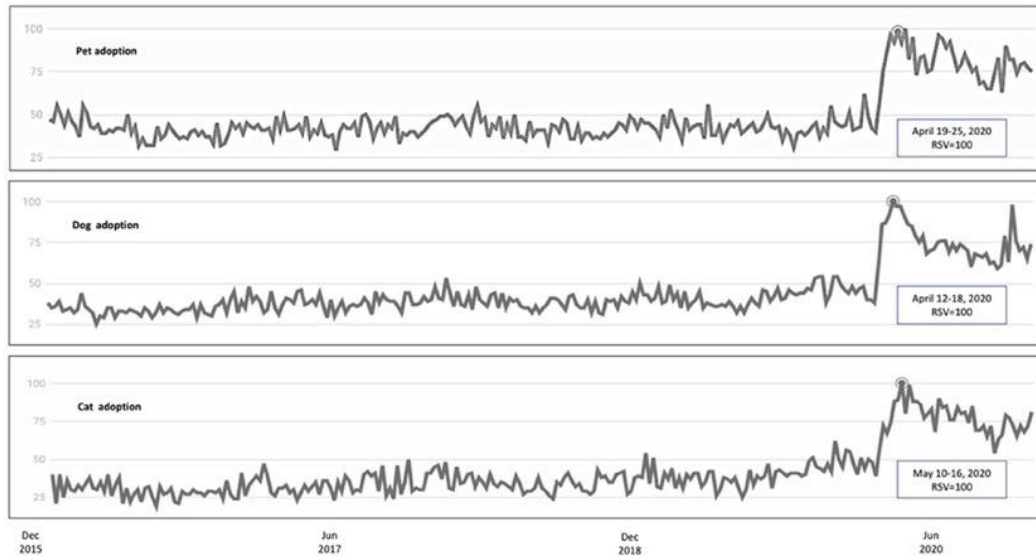
the world of ethical animal housing (Horecka & Neal, 2022). Overcrowding reduces animal welfare because there is less control over the space animals can go within the facility. Animal breeds that don't mix well are placed next to each other causing stress on the animals. The lack of proper animal housing increases the spread of disease and infections (Turner et al., 2012). Having properly populated shelters increases the number of animals getting adopted. Studies show when a shelter reduces their cat adoption population by 40% the number of potential adopters that actually left with a cat doubled (Wagner et al., 2018). By limiting the number of cats being presented made the potential adopters feel like they could connect more with the cats they could see and find one that was more preferable to their desired personality (Wagner et al., 2018)

#### ***2.2.1.2. Animal Relinquishment***

One of the most influential impacts on animal housing efforts in more recent years is due to the COVID-19 pandemic that had an impact on human-animal relationships all around the globe (Gibbs, 2022). April 2020 marked the peak of animal adoption seen globally during the pandemic, increasing 250% compared to the adoption rate of past years before the pandemic (Ho et al., 2021). A study conducted in 2020 shows that 58.6% of households in Madison, WI, own cats or dogs (Hawes, Hupe, et al., 2022). People during COVID-19 were focused to adapt to a new lifestyle impacted by the global lockdown and shifting to a work from home regimen. The demand for animal adoptions increased due to animal welfare organizations becoming more prominent and people wanting to have a companion at home while in lockdown along with using dogs to go for walks as a form of physical activity (Hoffman et al., 2021).

Figure 9.

*The pet adoption rates over a five-year span (December 2015-December 2020) to display the drastic increase in adopt rates during the pandemic.*



*Curated By: (Ho et al., 2021).*

Before the pandemic, an average of 324,500 animals were being relinquished to animal shelters due to family disruptions, economic issues, or other minor factors (Reese, 2018). Hoffman et. al. reported that 17% of dogs and 26% of animals that were acquired during COVID-19 have been relinquished back into shelters or rescue homes (Hoffman et al., 2021). An interview conducted with Ashlynn Cluchey, in connection with the Cheboygan County Humane Society located in Michigan, gives insight to the negative influences currently being witnessed in regard to animal relinquishment after COVID-19 (Lybrink et al., 2022). Cluchey approaches the topic going into the crushing idealization that regardless to how much the people at the shelters encourage dogs to receive proper training after adoption or they teach people how important it is to socialize their animals; people do not take the time to properly interact with their animal. The

number of animals that are reentering shelters due to being poorly socialized and have behavioral issues is growing exponentially from animals that were obtained during COVID-19 (Lybrink et al., 2022).

The overpopulation problem present in shelters largely connects to irresponsible breeders and depraved animal ownership. Before the current effects of COVID-19, the United States and United Kingdom were the largest contributors to the animal relinquishment numbers (Carroll et al., 2022). In the Midwest, 47.4% of animals relinquished were in ownership of their pet for less than a year (Carroll et al., 2022). Over 50% of the recorded pets were housed for less than two weeks before being given back to a shelter (Carroll et al., 2022). The average age of animals being relinquished is 1.96 years (Shore et al., 2003) The most common reason for cat relinquishment was due to the owner moving and the main reason for dogs was due to behavioral reasons. (Shore et al., 2003). Another popular reason recorded for animal relinquishment was due to the animal being given as a gift (Carroll et al., 2022) Animals that were acquired through a planned adoption or where discovered as strays were at a decreased risk of relinquishment compared to animals that were classified as a gift (Carroll et al., 2022).

### ***2.2.1.3. Euthanasia***

There are challenges to understanding how some shelters struggle with determining when saving animals from euthanasia becomes more of a priority over the quality of life for the animals (Turner et al., 2012). In Canada and North America, it is estimated that 40% to 50% of the animal population that enters an animal shelter will be euthanized. Cats are more likely to be euthanized over dogs. Laura Reese's presented research shows dog euthanasia has higher rates when in municipal shelters that present higher rates of strays and owner surrenders (Reese, 2022). Shelters that advertise as running a no-kill operation will deny entry for animals that are

older than a certain age, show signs of possible illness, or display unsound temperament and behavior. Most of these animals end up getting euthanized because they have a higher likelihood of not getting adopted (Turner et al., 2012). Animals that end up being euthanized tend to be selected, excluding medical concerns, by the history of the animal itself such as age, medical concerns, or behavior, but others can be chosen due to breed. Mixed breed dogs and dogs related to breed stereotypes are more likely to be killed (Reese, 2018) The number of shelters that no longer hire full time veterinary staff to perform euthanasia has drastically reduced, but the attention to how shelters handle euthanasia is important to observe. Shelters that provide a private space or provide euthanasia procedures off site to prevent animal care attendants from being exposed to seeing euthanasia procedures have a lower staff replacement rate (Turner et al., 2012). Euthanasia is not something that can be completely prevented but it should be handled with proper care. Animals with the disadvantage of having to be euthanized still need to be offered compassionate, humane, and quality medical care to provide them with dignity in their death, therefore proper personnel training and education is needed to provide proper welfare for all animals within a shelter's care (Turner et al., 2012).

### **2.2.2. Shelter Design & Animal Housing**

Shelters and veterinary services provide medical care to animals, but the issue faced with overcrowding has caused shelters to house animals in locations and cages that tend to cause a stressful environment for the animals. Shelters are supposed to follow the management model of Capacity for Care (C4C) which provides the minimal housing size needed for animals based on optimal shelter populations. Single sided housing is one of the most prevalent housing options used for dog and cat housing. Single side housing prevents animals from being comfortable within their space and can lead to emotional distress by having to perform tasks such as eating



and reliving themselves in the space where they are supposed to sleep (Wagner et al., 2018). Animals are placed in housing environments that cannot be properly sanitized or are being shared with another animal species increasing disease transmission rates (Turner et al., 2012). Animals placed in inadequate housing for a prolonged period of time has shown to significantly impact animal mental health. Housing expectations needed for different animals of different ages need to be observed and housed differently. Kittens brought into shelters are less likely to be in housing for a long period of time but require housing having more sterilization and can possibly hold an entire litter at once. Adult cats are more likely to be placed in housing units more equipped for long term housing (Wagner et al., 2018). Housing and care for animals needs to be altered if animals spend over two weeks housed in shelters and will need more attention to make sure they don't become emotionally or physically affected due to the long term captivity (*Facility Design, Shelter Animal Housing and Shelter Population Management*, 2015). Cats are infamous for showing emotional distress in subtle mannerisms that can be easily missed when they are not being properly observed (Wagner et al., 2018).

#### ***2.2.2.1. Healthy Shelter Design***

A proper layout that includes the concerns for an employee's needs should provide the healthiest and most comfortable living experience for the animals. It is vital to have animal housing that is built for the animals well-being (Schlaffer & Bonacci, 2003). Animals are able to be comfortable and healthy when housed in units that cater to the species' needs and are able to have opportunities to engage in stimulating activities (Turner et al., 2012). Allowing animals to engage with people and get outside of their housing units is vital to preventing animal deterioration when in a shelter. Providing human-animal interactions in a shelter increases animal outcome positively. Approximately 45% of people say they are more likely to adopt an

animal when they get to see them outside of cages (*Let's Make Cities as Pet-Friendly as Possible*, 2019). It is important that shelters provide opportunities for animals to exercise and engage with other animals and people to provide them with psychological benefits for their physical and mental well-being (Turner et al., 2012). When animals get the opportunity to live in an atmosphere that promotes comfort, it reduces euthanasia rates. Animals that present healthier tendencies by displaying relaxed and outgoing behaviors increase their rate of adoption and are adopted quicker (Turner et al., 2012; Wagner et al., 2018). Proper housing reduces disease transmission and makes proper cleaning procedures easier for employees. Turner et al. and Wagner et al. mention that communal interaction within shelters can actually provide health benefits as compared to shelters that limit animal interactions (Turner et al., 2012; Wagner et al., 2018). Shelters will work with potential adopters to make sure the animal is healthy before releasing it for adoption. It is important when housing animals that their living space is designed specifically for their needs and to feel safe so the animal is happy and healthy.

#### ***2.2.2.2. Species Specific Housing***

Housing designs for dogs and cats have similar features that affect the well-being of the animals in resident. A few defined needs for animal housing include proper ventilation, access to natural lighting, daily human interaction, easily cleaned surfaces, a quiet environment, and offering stimulating elements within the space. All areas of animal housing need to incorporate these key elements, but understanding the correct way of applying these needs can be situational based on the animal species, age, length of stay, and medical conditions. Animals are more comfortable and healthy when placed in shelters that are designed to provide a setting that resembles a home environment as compared to the standard institutional building design (*Design Concepts*, n.d.).

Enclosure design is the key factor to being able to properly apply the necessary features to make sure that each animal is comfortable within their unit. The design of double compartment housing is the most universally applied form of comfortable housing for dogs and cats to reside (*Animal Shelter Housing*, 2019). Double compartment housing requires there to be a clean side for an animal to perform basic living activities such as eating and sleeping, and a side that the animal can use as a bathroom (*Animal Shelter Housing*, 2019; *Facility Design, Shelter Animal Housing and Shelter Population Management*, 2015). Providing opportunities for the animal to make their own choices within their unit encourages the feeling of comfort in the enclosure. By incorporating different surface textures, enriching temperature varying elements, and offering different vertical levels for movement also provide positive emotional effects. Simple design changes such as having raised beds, and elevated food stations increase the usable floor space for the animal (*Facility Design, Shelter Animal Housing and Shelter Population Management*, 2015). Including additional applications to specialty designed housing units for animals with medical needs should be applied as well. The article, “Study Confirms Statewide Veterinary Shortage,” Directly comments:

About 10% of housing designated for this purpose is a good rule of thumb. With good husbandry one would not expect more than about this proportion of the population to be sick at any one time. An exception would be for shelters that specialize in transferring from high disease risk shelters or otherwise accept an unusual number of animals requiring treatment.

Therefore, animal isolation needs to be 10% of housing within a facility and ensure that they are the same size as housing units throughout the shelter to provide a less stressful change in environment (“Facility Design and Animal Housing,” 2015).

#### 2.2.2.2.1. Dogs

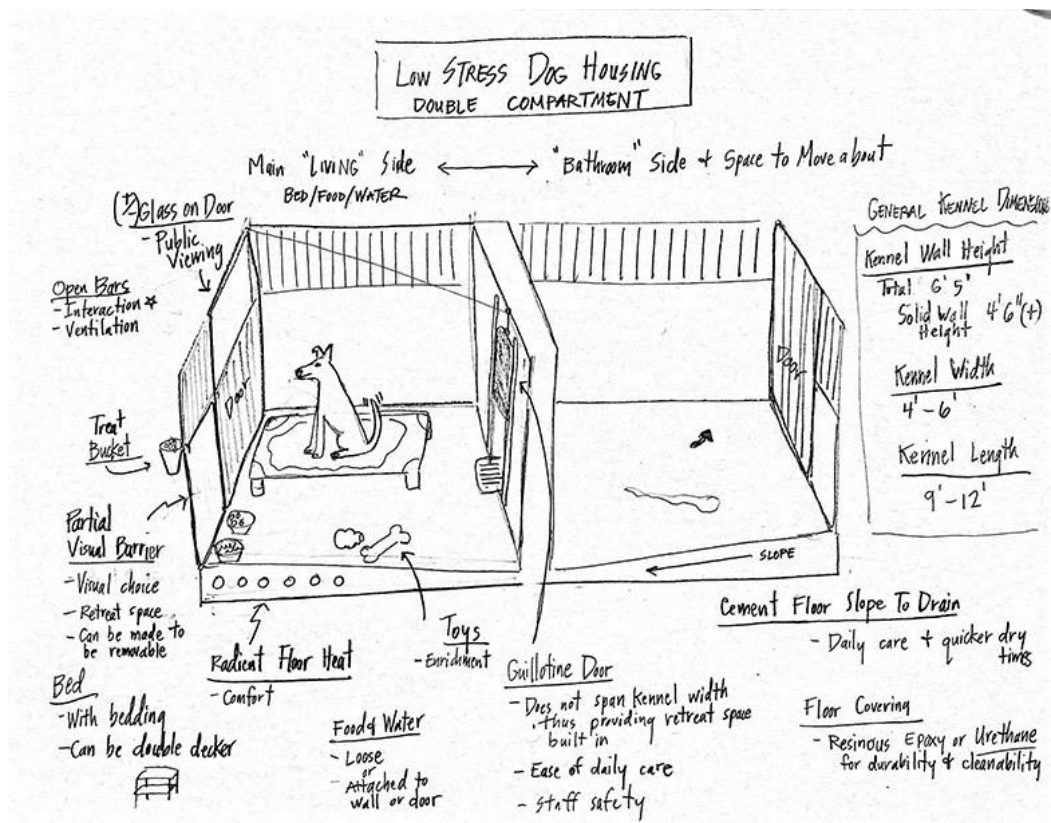
Dog housing is commonly overlooked in animal shelters. The United States currently has some of the smallest and the least amount of regulations for dog housing (*Animal Shelter Housing*, 2019). Design factors such as using double pane glass instead of laminated glass to reduce the noise levels from barking, placing housing units so they aren't directly facing each other across a hallway, and providing vent holes for dogs to sniff people before entering their units can make dogs have less stress when in captivity (Schlaffer & Bonacci, 2003). When dogs get placed in single compartment housing, they have higher level of stress which can impact behavior and mental health. Dogs are harder to house due to the variety of sizes and breeds; therefore, housing units should be double compartment kennels and cages or individual rooms. Housing spaces should always be designed to ensure each dog can freely move around without touching the walls of the enclosure (*Animal Shelter Housing*, 2019) Shelter dogs often suffer from happy tail, which is the term used when dogs tails become bruised and bleed due to the constant impact of hitting the walls of their enclosure (*Animal Shelter Housing*, 2019).

A dog's double compartment housing should be a minimum of 4' W and 10' L with a partition. This is the minimum size and unit size should vary to accommodate all breed sizes (*Facility Design, Shelter Animal Housing and Shelter Population Management*, 2015). Double compartment design can be customized by incorporating outdoor spaces for dogs in place of double compartment housing (*Animal Shelter Housing*, 2019). Providing access to a larger dog run gives the dogs the ability to improve their well-being by getting outdoors and exercising outside of their housing unit. Outside runs provide benefits to dogs of all sizes and breeds. The designated space can also encourage a dog's sociability and encourages human-animal relationship when volunteers and staff play with the dogs. Studies show there is no effect on

adoption increase depending on the exposure of different enrichment activities including playing with toys, walking, obedience training or petting, but the overall chance of adoption increased and change the perception of adoptability (Perry et al., 2020).

Figure 10.

Example of an ideal layout for dog kennel housing noting key features needed within a horizontal double compartment housing unit to ensure a comfortable living environment.



Curated By: (Facility Design, Shelter Animal Housing and Shelter Population Management, 2015).

#### 2.2.2.2.2. Cats

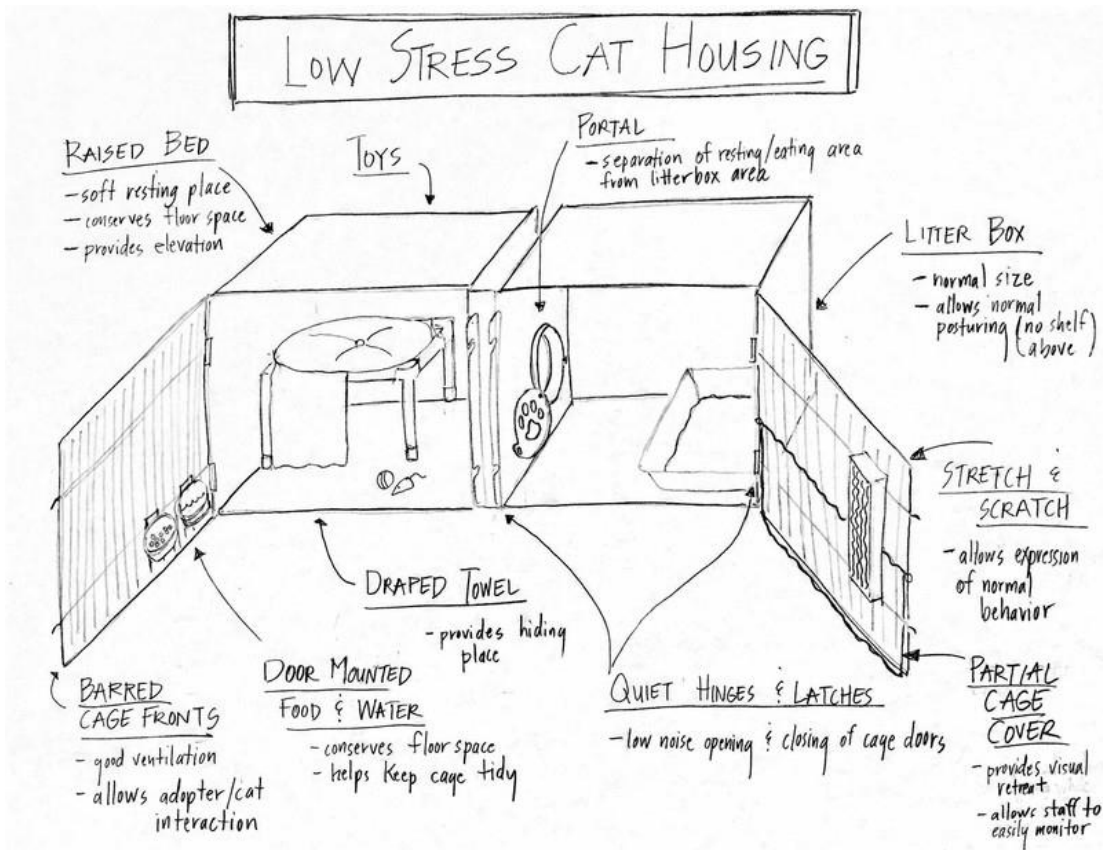
Humane double compartment housing for cats is stated to be a side that provides bedding, toys, and food on one side and a litter box on the additional side (*Facility Design, Shelter Animal Housing and Shelter Population Management*, 2015). The C4C model which entailed doubling housing sizes from 5.8 S.F. to 11 S.F. was implemented in three Canadian shelters in 2014 and 2015 and there were positive results across all concerning areas of the study at each location. The percentage of disease transmission was less, there was a decrease in veterinary costs, cat adoption rates rose, and the overall number of animals euthanized was reduced (Wagner et al., 2018). Using housing dimensions of 30” W by 28” L by 26-30” H per compartment are ideal for cats to be able to move around on the floor and vertically and have features that allow to move and customize units when needed for specific requests. The material of caging is usually stainless steel but can vary with use of fiberglass or laminated wood core (*Facility Design, Shelter Animal Housing and Shelter Population Management*, 2015).

Cats are natural predators which needs to be factored into how their housing is designed. Cats like to be located at eye level to humans and they need privacy spaces in addition to elevated places to rest and watch their surrounding environment (Wagner et al., 2018). Including places to hide such as hiding boxes in addition to providing levels within the unit encourage climbing and mobility opportunities for the cat to stay active and happy within their enclosure. Observing cat behavior is vital to ensuring happy behavior within their living space. Cats that are found sleeping in their litter box or display behaviors such as a decrease in grooming, anorexia, and other symptoms of possible sickness can be signs of stress on the cat (*Facility Design, Shelter Animal Housing and Shelter Population Management*, 2015). Figures 11 and 12 display two different examples of how proper cat housing units should be designed and laid out to ensure

comfortable living situations for the cat. Elements vital for observation include the use of raised bedding, providing toys and scratching posts, and making sure the litter boxes are properly placed.

Figure 11.

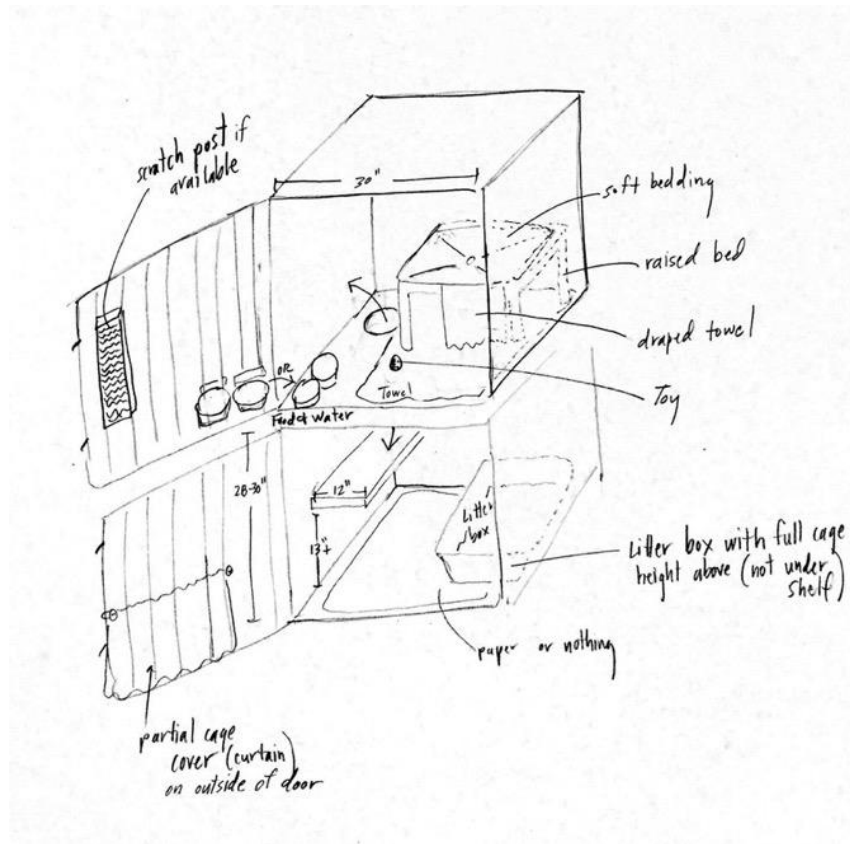
Example of an ideal layout for cat housing noting key features needed within a horizontal double compartment housing unit to ensure a comfortable living environment.



Curated By: (Facility Design, Shelter Animal Housing and Shelter Population Management, 2015)

Figure 12.

*Example of an ideal layout for cat housing noting key features needed within a vertical double compartment housing unit to ensure a comfortable living environment.*



*Curated By: (Facility Design, Shelter Animal Housing and Shelter Population Management, 2015)*

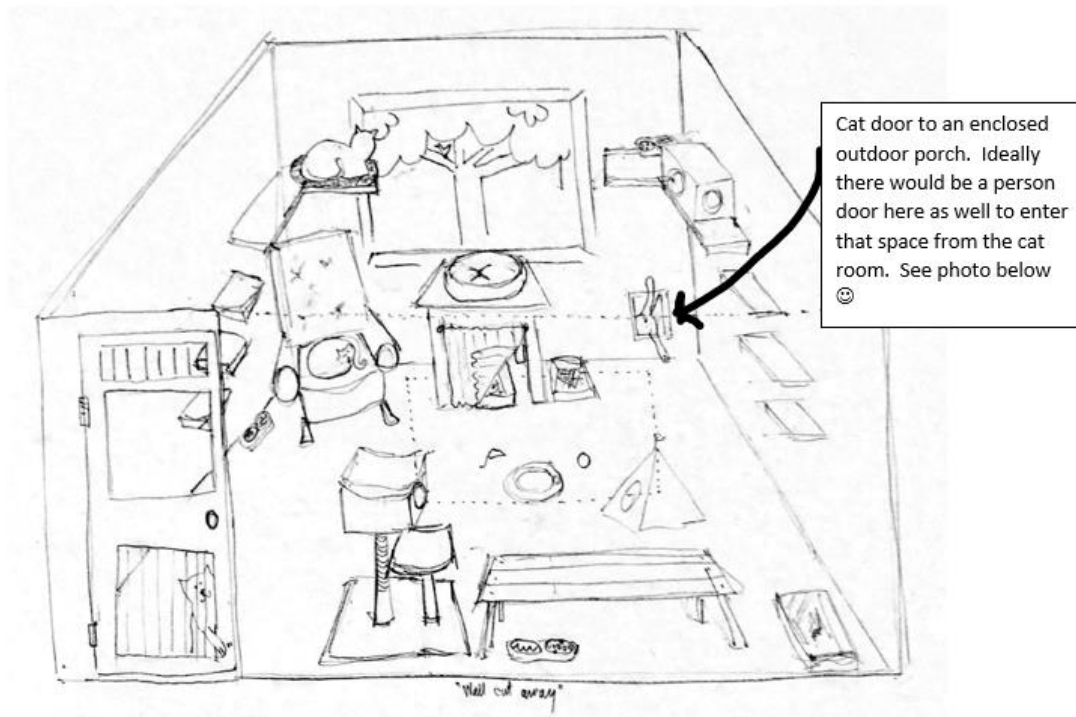
Providing group housing for cats is beneficial for shelters to have because there are flexible housing options for different groups of cats. Group housing is a critical option when confined groups of cats are brought into shelters from households or in hoarding cases. Group housing is usually designed to house small groups consisting of four to six animals. When calculating the correct room size for needed floor space, 18 S.F. per cat, is drastically larger than



compartment housing units (Wagner et al., 2018). Cats that have the opportunity to be housed in a group setting are often viewed to be healthier and more comfortable. Having a large room for movement encourages decision making and allows the animal to control the environment. Large rooms are more likely to be spot cleaned rather than the usual whole pen disinfection. In addition, daily human interactions increase immunoglobulin and reduce the risk of disease transmission. A study has proven that the volume of pathogen shedding is less likely to be spread with casual daily contact (Wagner et al., 2018).

Figure 13.

*Example of an ideal layout for cat housing noting key features needed within a group housing unit to ensure a comfortable living environment with access to outside.*



*Image by: (Facility Design, Shelter Animal Housing and Shelter Population Management, 2015; Wagner)*

In addition to housing quarters within a shelter, cats need additional space to be given opportunities to participate in stimulating activities. Having spaces that encourage stimulating events such as having windows, televisions, toys, and volunteer playmate time encourages positive welfare (*Facility Design, Shelter Animal Housing and Shelter Population Management*, 2015). Daily interactions with humans impact cat demeanor and can improve their sociability (Wagner et al., 2018). Catio is a frequent modification done to shelters today to allow cats the opportunity to have an outdoor space. Catio is a low cost addition for shelters that provide cats the opportunity to choose their environment while being socialized and are mentally stimulated (*Facility Design, Shelter Animal Housing and Shelter Population Management*, 2015) Cats strongly prefer to engage in human social interactions rather than playing with toys alone (Wagner et al., 2018). Wagner et al., and additional researchers have provided results showing cats that are more exposed to public housing enclosures are given more meaningful enrichment and have positive social behavior. Allowing cats to be outside of cages provides them with enrichment that encourages positive behavior with humans and cats and can help potential adoptions by allowing people to see more of the cat's personality (Wagner et al., 2018).

Figure 14.

*Example of an outdoor catio design that allows cats to move freely and have access to move from indoor to outdoor easily.*



*Curated By: (Facility Design, Shelter Animal Housing and Shelter Population Management, 2015; Wagner et al., 2018)*

## **2.3. Human-Animal Relationships**

### **2.3.1. Animal Shelter Community**

Animal shelters are built on the system and policies made by humans for animals and impacting the environment they are being housed in, which can leave an impact on the community within a city. By incorporating the public to make them aware of needs and services to provide humane shelters can make a change that impacts the community and city programs and policies leading to a more positively designed system for welfare needs. By working to improve the lives around us provides a better understanding on the impact of current policies and

systems being conducted around the animal shelter system and can lead to building better animal housing capacity within a city while decreasing negative human and animal health related outcomes (Hawes, Flynn, et al., 2022). By incorporating human touch and social efforts within the programs at a shelter can make a greater impact towards positive welfare. The need for community resources and human input leaves a long-term effect on an organization. There are barriers set for social change among the humane community and awareness should be brought to the attention of the public for change that affects all members of the public (Hawes, Flynn, et al., 2022).

#### **2.3.1.1. Funding**

Animal shelter funding plays a significant role in the welfare and euthanizing of animals. Animal shelters that have been faced with high numbers from relinquishment rates and overcrowding are now becoming weighed down due to the underlying pressure of not having enough money or funding to care for all the animals being housed in the facility (Bissell, 2022). There are reports of an increase of animal hoarders now posing as running an animal rescue operation to get more money from people (Turner et al., 2012). Public (animal controls) and private (humane societies) funding are the main forms of funding for animal shelters, but private shelters still run as nonprofits and are allowed to choose if they want to operate as an open or limited intake facility, limiting the animals being taken in (Reese, 2018). Private funding has more of an influence from the city or county that influences the amount of money shelters receive (Goselin et al., n.d.; Reese, 2018). The rates of relinquishment are presented as higher in nonprofit shelters, but on the other hand, they have a higher adoption rate (Reese, 2022). The save rate in HSHV or HSLC is nearly 30% higher than in DACC according to Figure 15

Figure 15.

*A comparison of three different animal shelter and rescue facilities in Michigan during 2016.*

**Table 1.1 Nature of the Three Shelters**

	<b>DACC</b>	<b>HSHV</b>	<b>HSLC</b>
Organizational structure	Division of Health Department	Nonprofit with county contract	Nonprofit
Intake status	Open intake-Detroit	Open intake-county	Limited intake
Service area	City of Detroit	Washtenaw County	Livingston County
Transfer status	Out only	Receives primarily from out of state (puppies)	Receives from instate
2016 Animal intake	2605	5183	796
2016 Save rate	60%	95%	99%
Revenue <sup>a</sup>	\$2,100,000	\$6,652,848	\$1,060,516 <sup>b</sup>
Age of facility	86	07	13
Age of organization	89	120	46
Ancillary organizations	Friends of DACC	External board	External board
Staff size	14/survey 22/current	100	42
Veterinary clinic	Internal only	Internal and external	Internal and external

<sup>a</sup>HSHV, 2016 available on website, HSLC 2015 from Charity Navigator, DACC 2016 from city budget.  
<sup>b</sup>Revenue for 2015 for the HSLC is substantially higher than in previous years when its total budget was around \$400,000 or less. Significant increases in contributions and in investment income increased the 2015 revenue figures. In all years prior to 2015 the shelter was operating at a loss, with 2015 being the only year with a modest profit.

*Curated By: (Reese, 2018)*

Animal shelters that receive funding still can't get enough money to cover the actual cost it takes to run a shelter. Shelters that work with animal control or other welfare services can combine their revenue from contracts and fundraising to gain a larger budget (Reese, 2022). A large portion of the animals that enter a shelter have medical or behavior issues that need to be medically addressed which costs money (Goselin et al., n.d.). The current economic issues that were first seen due to the impacts from COVID-19 are being seen across animal shelters. People have become less willing to donate or give resources to animal shelters out of fear of their own concerns regarding money. Local community funding is the main source of income for animal shelters and they rely heavily on their ability to advertise in order to get donations of food and

supplies so that funding can go towards lifesaving procedures. Shelters tend to have to perform humane euthanasia when they are unable to afford medical treatments, but euthanasia still costs the shelter money; therefore, it is better to try to get more animals adopted as opposed to euthanizing them (Goselin et al., n.d.).

### ***2.3.1.2. Staffing***

Staffing within animal shelters plays a large role in how animal welfare is achieved within a facility. The average ratio of animals to staff in shelters is 691:1 (Goselin et al., n.d.). Staffing needs depicted in NACA include formulas to determine proper staffing needs, but the services only include the work of basic cleaning and feeding and doesn't estimate the time needed beyond these tasks including laundry, dishes, enrichment time, and humane education aren't calculated in (Reese, 2018). The staff within shelters make sure that animal shelters get the proper cleaning, but when time is limited for certain activities, proper techniques and ethical practices tend to get ignored. Staff should be able to allow for a minimum of 15 minutes per animal per day for proper cleaning and feeding (Turner et al., 2012). Shelters that have low staffing numbers have limited positions such as veterinary technicians, director of developments, general and operation managers, and animal control workers, otherwise any additional support is provided by volunteers. Shelters that are faced with overcrowding of animals are also faced with lack of employee and volunteer support causing the ethical time needed to care for the animal to be neglected. The lack of staffing is especially seen when additional time is required from staff for medical procedures and therapy because these medical techniques require training and proper knowledge. There is a critical need for more training time and funds to educate people on how to perform these procedures.

### ***2.3.1.3. Fostering***

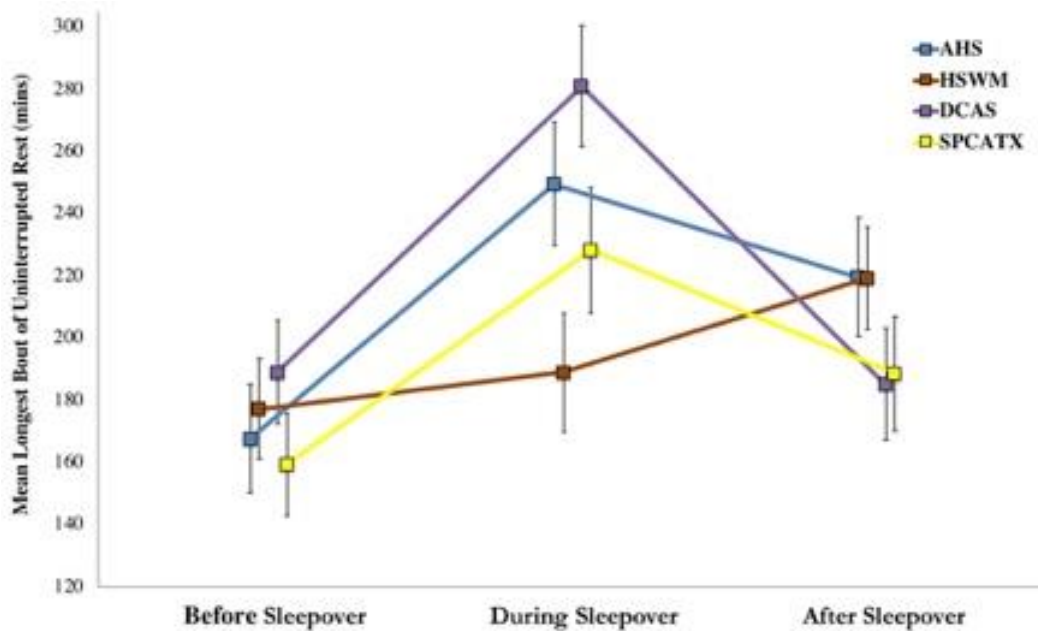
Providing foster care for animals leaves a great impact on shelter population rates in addition to providing animals a less confined housing environment compared to being placed in a shelter. A shelter's use of foster programs has proven to provide animals with a living situation that provides a positive impact on animal well-being (Ackerman et al., 2023). People who participate in foster programs participate as members because they like the idea of being able to save lives or are defined as animal lovers, but the lack of communication shelters provide to local communities is observed as a missing link to the community response relating to community involvement and fostering. Shelters that provide more communication and offer marketing materials that help people understand the foster care experience can increase individual participation (Ackerman et al., 2023). The most common reason for animal fostering is from animal centered motives, but people have identified to participate in said programs for self-orientated or child-centered motives. The general motive people have for participating in a foster program can place a light on how much animal fostering can add personal or family related benefits while being able to provide positive welfare for an animal when participating in a foster program (Ackerman et al., 2023; De Maeyer et al., 2014). Both parties are able to gain benefits on a mental, physical, or educational level.

Foster programs have been providing benefits to animal welfare since they were established, encouraging a focus on giving animals a better housing experience before getting adopted. The risk of disease spreading is minimal when an animal is directly placed in a foster home due to being exposed to less animals (Ackerman et al., 2023). The person and animal that participate in a foster relationship are able to experience mental health benefits due to the ability to provide a better care environment (Ackerman et al., 2023). The studies provided show how

animals have been able to gain benefits through the use of shelter foster programs. This reduces the development of behavioral and socio-cognitive decline that is observed in animals that are housed in shelters for a prolonged period of time (Ackerman et al., 2023). The act of being housed in a shelter environment can be a stressor for animals causing behavior issues and impact the animal's adoption rate (Gunter et al., 2019). Lisa Gunter conducted a study of how dogs face a sleep deficit in shelters which can correlate to the animal's stress levels (Gunter et al., 2019). Evidence from the study depicted in Figure 16 shows there are positive impacts on rest rates after being able to sleep in a home environment (Gunter et al., 2022).

Figure 16.

*Graph represents the rest rates after dogs were exposed to home environments.*



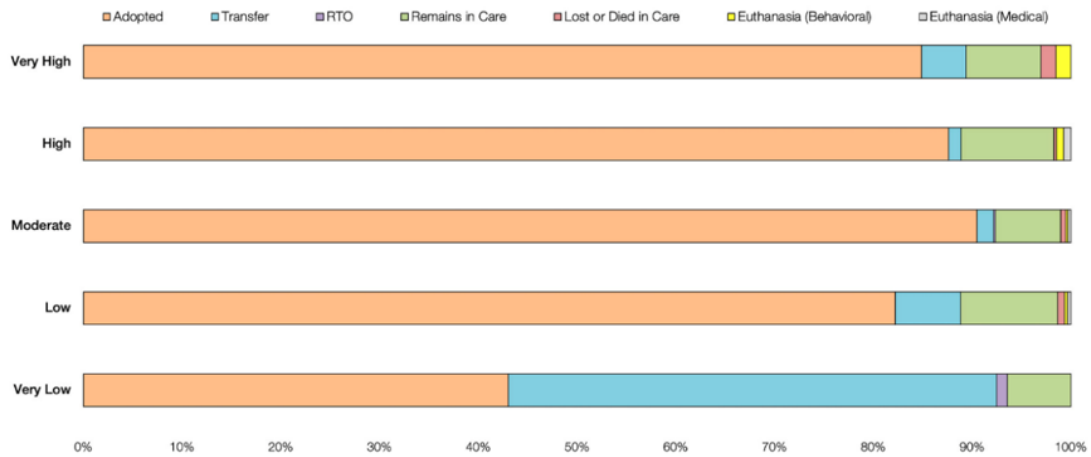
*Curated By: (Gunter et al., 2022)*



Lisa Gunter conducted a study that researched how animal fostering numbers have been affected due to COVID-19 in the year 2020. The number of foster members increased during this period. Over three quarters of the shelters that participated in the study were private, non-profit shelters which had a 93% positive outcome rate (Gunter et al., 2022). It is evident COVID-19 boosted the fostering numbers for participating shelters by 39.60%, increasing the rate of fostered animals being adopted significantly. The evidence from this study shows how people are willing to participate in fostering programs, increasing the adoption rate at shelters if given the proper amount of popularity within a local community.

Figure 17.

*Graph displays the impact animal fostering has on animal behavior increasing adoption rates.*



*Curated By: (Gunter et al., 2022)*

#### **2.3.1.4. Community Relations**

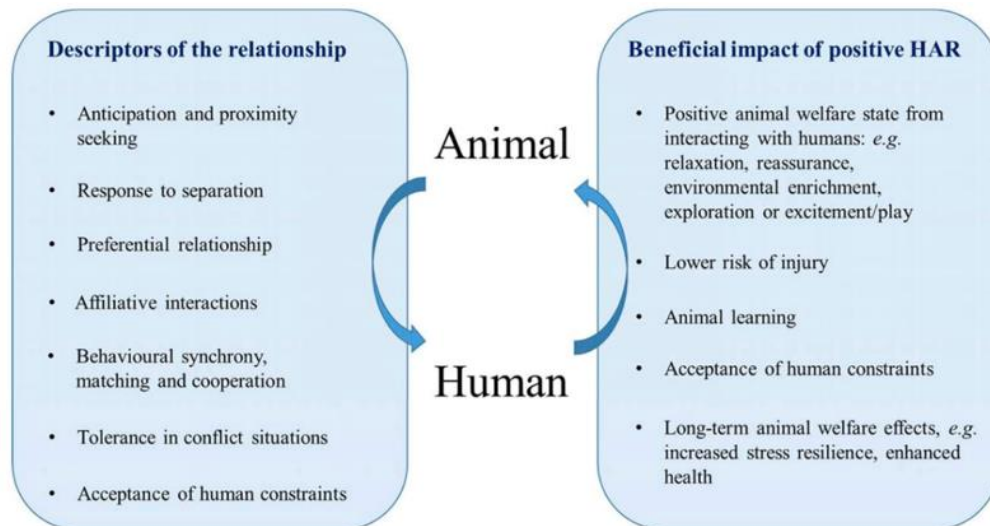
Shelters are responsible for providing humane education to the local public. Shelters should provide services that incorporate educational aids such as going to schools, clinics, nursing homes, etc. to provide information on the importance of humane animal care. Shelter involvement at local events is one of the most effective ways to bring community awareness to the needs of the animals and shelter while promoting animals for adoption. An increase of community humane education can leave a positive impact on intake numbers through encouragement of animal retention and encourages spay-neuter procedures, reducing litter populations (Reese, 2018).

#### **2.3.2. Human-Animal Relationships**

Today we are able to identify that human-animal relationships can leave positive impacts on both members' welfare, making it prevalent to understand that by incorporating an environment that encourages healthy human interactions with animals will gain emotional benefits (Oosthuizen et al., 2023). Hawes, Flynn, et al., 2022 makes the statement, "animal shelters that align their programming with best practices in community outreach while providing opportunities to practice responsible petkeeping support the community in exploring the impacts human activities have on animal and environmental welfare, both positive and negative" (Hawes, Flynn, et al., 2022) concluding how important the human-animal relationship should be observed in order to understand how both groups can impact the well-being of the other. In fact, people who own a companion animal are associated with decreased deterioration in mental health and are less likely to have an increase in feelings of loneliness (Ratschen et al., 2020).

Figure 18.

*Represents the key descriptions of positive factors influenced by human-animal relationship.*



*Curated By: (Rault et al., 2020)*

### **2.3.2.1. Animals helping Human Welfare**

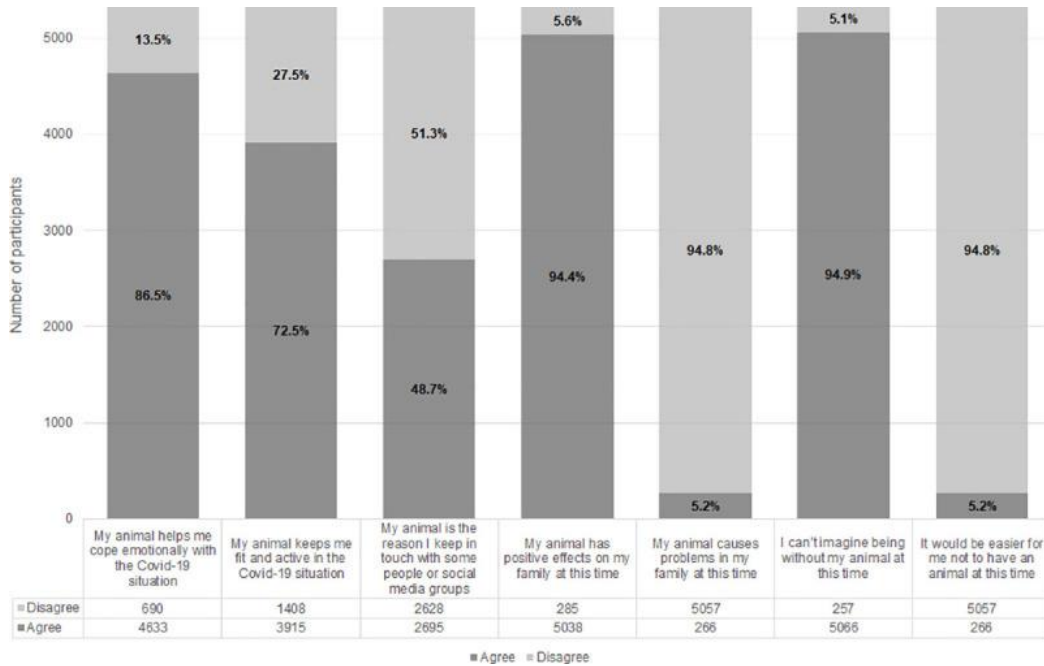
It has become evident in research that humans who have a bond with animals have better health. Animals encourage physical and mental benefits to humans. Animals are able to read emotions, respond to nonverbal cues, and offer comfort (Robb-Dover, 2022). Animals provide companionship to humans by showing an interest in similar activities and encourage social support and social interactions. Dogs have particularly shown to improve human activity levels through exercise by the benefits of taking a dog on a walk. The human-animal bond impacts areas within the human body causing physical changes to immune systems, blood pressure, and causes positive chemical changes in the brain that impact people faced with anxiety, depression, and stress (Oosthuizen et al., 2023; Robb-Dover, 2022). Brooks et al., provides an analysis proving that 60% of the subjects in the study place their animal as an identified central influence

to mental health management. The study provided results on how people who had issues with human-human relationships would place more of a trust on a human-animal relationship. Caring for a pet provides a source of validation and humans were able to use their pet to engage in social engagement. Having a pet provides people with a sense of control when they have to care for a pet, establishing security and routine which develops a relationship that impacts cognitive and physical benefits (Brooks et al., 2016).

Karl Oosthuizen's research analyzed the work being done by The Royal Society for The Prevention of Cruelty to Animals New South Wales (RSPCA NSW) which provides community programs, one which provides short term housing for companion animals with owners who are undergoing a crisis situation. Oosthuizen's study demonstrates the value of a human-animal bond especially when people are faced with crisis situations because the animal was able to boost mental health and be a companion for coping while under stress. Having an animal to talk to provided people with a sense of being mentally grounded and were willing to listen to the person when they felt like no one else would provide mental strength (Oosthuizen et al., 2023).

Figure 19.

Graph displays if people agreed or disagreed to statements regarding personal issues and how their animal influenced behavior.



Curated By: (Ratschen et al., 2020)

### 2.3.2.2. Animal Assisted Services

Animal Assisted Therapy (AAT) has been around for over 200 years and has gained popularity in more recent years. The use of AAT and Animal Assisted Activities (AAA) have been researched to prove that animals make large strides in encouraging emotional changes in people faced with mental illnesses. People are more willing to interact with animals because they provide a judgement free companion and offer unconditional affection when needed and when a bond is developed a reaction response of relaxation engages (Robb-Dover, 2022). AAT and AAA interventions can impact different people groups.

A Bert et al., research study concluded by eight resource references that the animal interventions, using dogs, for inpatient children showed evidence of decreased reported pain levels and increased psychological benefits. Animals leave a strong impact on children especially in the field of education and development. The aid of animals for kids with disabilities, sensory processing challenges, and anxiety are often encouraged to spend time with an animal to help them feel grounded. Incorporating a dog into a therapy session for kids with learning disabilities can increase learning enjoyment. By reading to a dog or encouraging basic memory skills by taking care of a pet are great ways animals can be incorporated into educational practices (Reese, 2018). Children that work with therapists will encourage animal involvement as a form of treatment (Arky, 2023) A study provided from Stasi et al., determined that AAT has similar results in different age groups such as the elderly. AAT is an effective adjunctive treatment for the elderly. In the study, elders were able to interact with cats for one hour a day over the course of six weeks. The interactions with the cats promoted social happiness within the nursing home. The study displayed no significant changes in medical related responses beside a reduction in blood pressure and improved depressive symptoms that are commonly seen in people placed in nursing homes during their end of life. The cats were able to provide comfort and actually made the subjects' mood more positive in the anticipation to see the animals (Stasi et al., 2004).

### **2.3.3. Gap Identification**

The research previously cited suggests there are important relationships between an animal's welfare and the spaces within a shelter. The historical efforts put forth in attempts to protect animals and develop an understanding of the emotional benefits of a human-animal partnership is lacking. It is evident there has not been a large amount of research and proper analysis conducted to better understand how animal shelters can incorporate different techniques

that invite social involvement into shelters to bring a stronger awareness to the issues. These issues seen in shelters and by incorporating the community, humans and animals can gain benefits to their well-being that go beyond the concerns of proper shelter layout and animal housing. It is important to uncover the missing areas of research that go beyond the singular concerns regarding the physical health of animals, but also identifies emotional effects because they play a vital role in influencing adoption rates and reducing euthanasia.

The lack of consistent and reliable data being recorded regarding overpopulation rates make it hard to get a proper assessment of the overarching issues being seen in the acclaimed frontline responders, animal shelters (Reese, 2018). This mean that there needs to be more research conducted on how shelters are struggling to provide proper housing for animals and identify what is causing people to act the way they do regarding animal relinquishment and abandonment with the intent to find ways to prevent it. People have reduced their generosity and animal shelters are suffering because there has been a decrease in community funding. Building an understanding of how shelters depend on community and with new, updated building facilities can incorporate healthy living situations, offer services to reduce population of animals while implementing social spaces to draw in community through events and programs can increase adoption rates and lower intake numbers. The integration of social spaces being incorporated need to be observed on how community engagement can benefit the animals and shelter needs.

#### **2.4. Project Type**

As the population of animals entering shelters grows at an increasing rate, it is evident that current housing is not adequate for the demand and shelters are unable to get the support from the community they need. The main design for a shelter should be focused on providing a building that provides security and comfort to all animals being housed. An animal shelter is an

animal care and control center that should be designed with the intent to be easily accessed by the community. Animal shelters and rescues are currently running on the strength of the people within their own community to provide the support needed, especially when it comes to the common goal of saving as many lives as possible. Hudson, WI, doesn't provide an animal shelter and all animals that are recovered from the city pound are sent to a neighboring community. This arrangement leaves local shelters in a state of distress from lack of space and proper supplies. The overall construction of the building is designed to provide for all areas associated with animal shelter functions related to welfare and services of healthcare. New animal shelters have implemented design strategies that are incorporating new housing layouts that encourage positive effects on animal welfare. Existing shelters have even been working to provide better housing or cost-efficient additions to their buildings to provide for animal needs being seen in specific locations. Implementing better social engagement encourages the community to be more involved in a shelter providing positive impacts on funding and fostering.

## **2.5. Project Issues**

This thesis is focused on how animal shelters can implement design strategies relating to building design and animal housing that is designed to provide animals with a safe and comfortable place to be housed when in a facility. It is evident shelters rely primarily on social and community engagement to gain proper funding and support to give the animals being housed the best environment. Shelter designs are primarily designed for animals' restrictive and prolonged housing needs. Even with new studies regarding animal housing, if shelters were able to get more community involvement, there would be several benefits for humans and the animals. By incorporating a community enrichment center space within a shelter people will be able to interact with animals, gain education on proper care, teach children the importance of



animal care, and draw in more awareness of the needs presented in the demanding world of animal welfare facilities.

### **3. METHODOLOGY**

This thesis paper will be conducting research through a cross sectional study of three forms of data collection. The collection of data needed for analysis will be done through research, interviews, and case studies. A site located in Hudson, WI, will be where the development of an animal shelter will be designed with the intent of having comfortable animal housing and proper resources for employees in addition to a community center. The development of this facility will be inspired by the designs of the Michigan Animal Rescue League, Santa Clara Animal Services Center, and the Blacktown Animal Rehoming Center.

#### **3.1. Approach**

##### **3.1.1. Data Collection**

Research will be conducted from scholarly articles and journal entries that will provide a proper background on the historical impact of animal shelters and how new spatial problems are arising affecting animal welfare within the living situations in shelters today. An analysis will be done to identify the common reasons and related themes that led to the rise of overcrowding and how current social issues such as Coronavirus has impacted these numbers. After identifying common causes, the common themes will identify how newly designed facilities need to incorporate new standards that encourage healthy living situations for the animals throughout different subdivisions.

The second form of data collection will be done using a series of interviews with local animal shelters to gain a direct understanding of challenges that pertain to the current area of study. An interview will be conducted with a shelter that neighbors the city of the proposed site

location. An additional interview will be conducted at a shelter in the Midwest that is currently undergoing design strategies to meet increasing needs and space demands at the shelter.

Lastly case studies will be analyzed to identify common themes seen throughout the current architectural field pertaining to animal housing. The information collected will be used to form a proper understanding of how current information obtained from research is being used in current designs and where there are gaps between research and current applications in the design field. Case studies will also be presented to demonstrate how community engagement can be integrated into animal welfare facilities.

### **3.1.2. Analysis**

The construct of this paper is developed through the use of data collection from books and online articles. Each source was read and given a thorough analysis to find relative information pertaining to the topic. In addition to written work, an examination of animal shelters that have implemented new humane housing design strategies to learn how research can be applied to the building proposal was completed. A series of interviews with local animal shelters were conducted to provide more of a current and personal interpretation to the issues being seen in shelter design as more of a personal implementation to better design. The written document applies beneficial information including fact-based discoveries and statistics to display how overcrowding in animal shelters are limiting the ability to provide animals being housed with proper medical resources and applicable housing that encourages emotional benefits for animals in order to allow animals the best prospect for being adopted. Through the use of the collected research and given feedback from shelter workers, the development of a layout will take into account the different defined needs of a shelter and how to provide a layout that encourages a stress-free environment for animals and the humans that will have contact with

them. The design goal will focus on providing for the needs of staff while assuring the animals have proper resources such as double compartment cages, social spaces, toys, and additional features that will increase an overall happiness within the shelter.

### **3.1.3. Conclusion**

The research concludes that proper calculations need to be done when designing a new animal shelter to predict capacity rates through given sources. The shelter should be easily adaptable to the fluctuating number of housed animals at a given time, especially as numbers continue to increase. Offering a design that can be flexible and encourages easy transitions for staff members to offer the best care is a key requirement. The design of an animal shelter should be designed for comfort for both humans and animals. Staff need separate, easily manageable spaces for back of house care in addition to having the space for medical equipment. Dog and cat housing should be located on separate sides of the building with easy access for the staff to work but encourage visitors and volunteers to be able to see and interact with the animals. Stimulating spaces should be provided in each animal's housing quarters that applies to their personal needs. Dogs should have the opportunity to interact with people and other dogs through outdoor access and indoor spaces while cats should be given large windows and rooms such as an outdoor patio or a playroom with stimulating and social benefits. The social and communal benefits given through different programming and human learning processes increase welfare for humans and animals. Incorporating a space for communal outreach for relationship building, although still needing more studies, can lead to mental and physical benefits for more positive well-being.

### **3.2. The City of Hudson, WI**

The city of Hudson is located on the western side of the state of Wisconsin in St. Croix County. The city is home to over 16,000 residents and is rapidly growing with a population

density of 2,138 per square mile (*Hudson, Wisconsin Population 2023*, 2023; *People in Hudson, WI*, 2023). Since 2000 the city has expanded by 58%, becoming one of the fastest growing cities in Wisconsin (*Hudson Quick Facts*, 2023). Hudson is only a short drive from booming cities such as St. Paul, MN, and Eau Claire, WI. The city was developed along the St. Croix River, which is the division between Minnesota and Wisconsin, and the Willow River. The city of Hudson is an active city consisting of retail and commercial spaces and includes an active downtown area that encourages community interaction along the river front. Hudson includes a range of parks and outdoor activity spaces welcoming to people and animals that incorporate water activities such as boating and fishing (*People in Hudson, WI*, 2023).

Louis Massey and Peter Bouchea settled in Hudson in 1840. The city was originally called Willow River named after the northern waterway. In the 1850's to 1860's the city began to gain settlers and the mayor, Almon Day Gray, renamed the city "Hudson" because the town reminded him of the Hudson River in his hometown in New York (*History of Hudson*, 2023). Interstate 94 was built to replace the original toll bridge in 1951 (*History of Hudson*, 2023; *Old I-94 Bridge at Twilight*, 2003). The St. Croix River, located along the western edge of the city, was given its name meaning, "holy cross" because of the peninsula formed by the St. Croix River and the Mississippi River. The St. Croix River became a popular path for trading during the city's development. The establishment of a trading post in 1793 encouraged trading with the native tribes of the Dakota and Ojibwa (Zarling, 2011). The county became a land consisting primarily of farmers and the lumber industry boosted the Hudson area and by the end of the 1800's the county turned to the dairy industry establishing 21 cheese factories and creameries in total by 1895 (*History of Hudson*, 2023; Zarling, 2011).

Figure 20.

*Logging on the Hudson Waterfront, n.d.*



*Curated By: (Zarling, 2011)*

Figure 21.

*Old eastbound bridge built in 1951 and westbound addition completed in 1971. Image taken in 1977.*



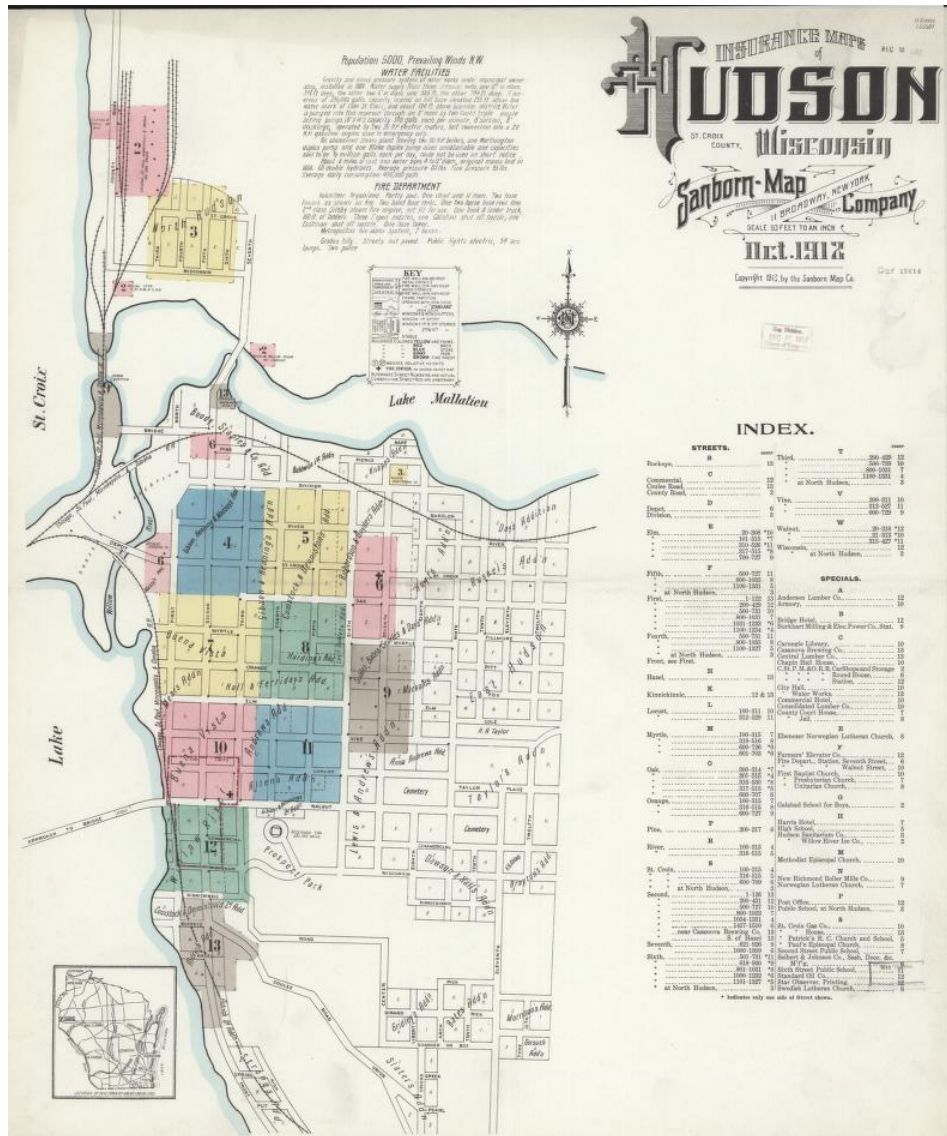
*Curated By:(Old I-94 Bridge at Twilight, 2003)*

Figure 22 displays the original Sanborn map of Hudson from 1912. The image doesn't provide direct information to the proposed site but gives context of the surrounding area (*Sanborn Fire Insurance Map from Hudson, St. Croix County, Wisconsin., n.d.*). Figures 23-26 provide aerial images of the city progressing throughout time to the present day. Figure 27

displays the most current map of the City of Hudson which includes the proposed site providing context to the surrounding area schools, parks, and other resources in the city (Hudson, WI, 2023).

Figure 22.

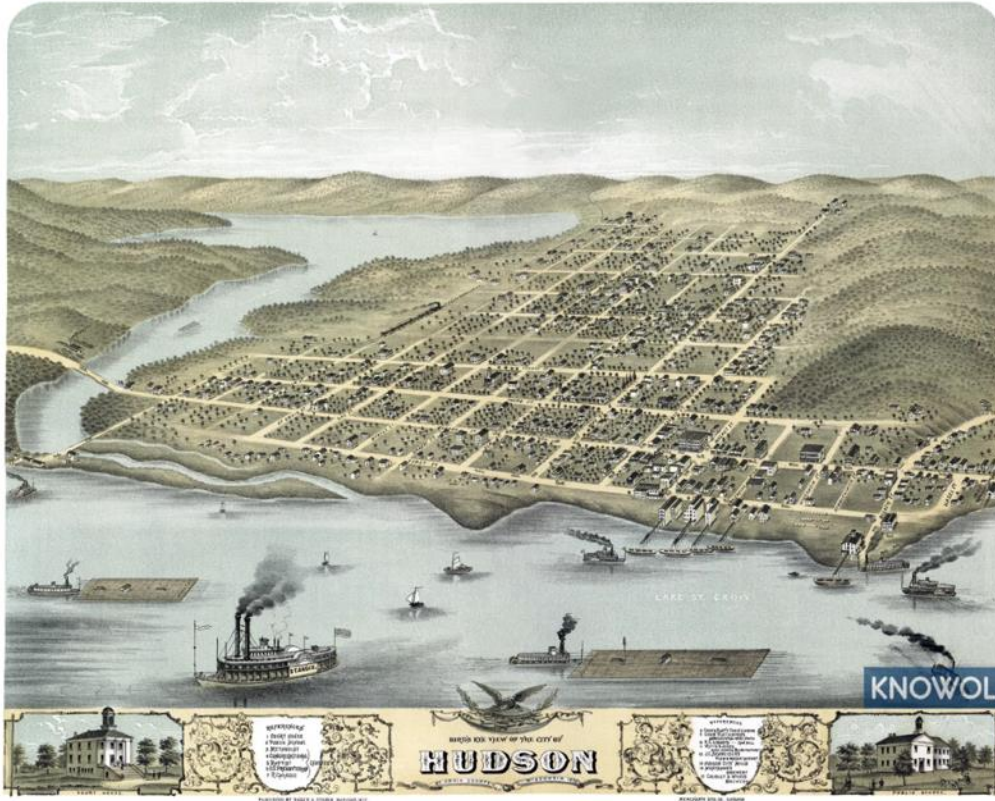
Sanborn Fire Insurance Map of Hudson, St. Croix County, Wisconsin in 1912.



Curated By: (Sanborn Fire Insurance Map from Hudson, St. Croix County, Wisconsin., n.d.)

Figure 23.

*Map of Hudson in 1870 from a bird's eye view.*



*Curated By: (Beautifully Restored Map of Hudson, WI from 1870, 2016)*



Figure 24.

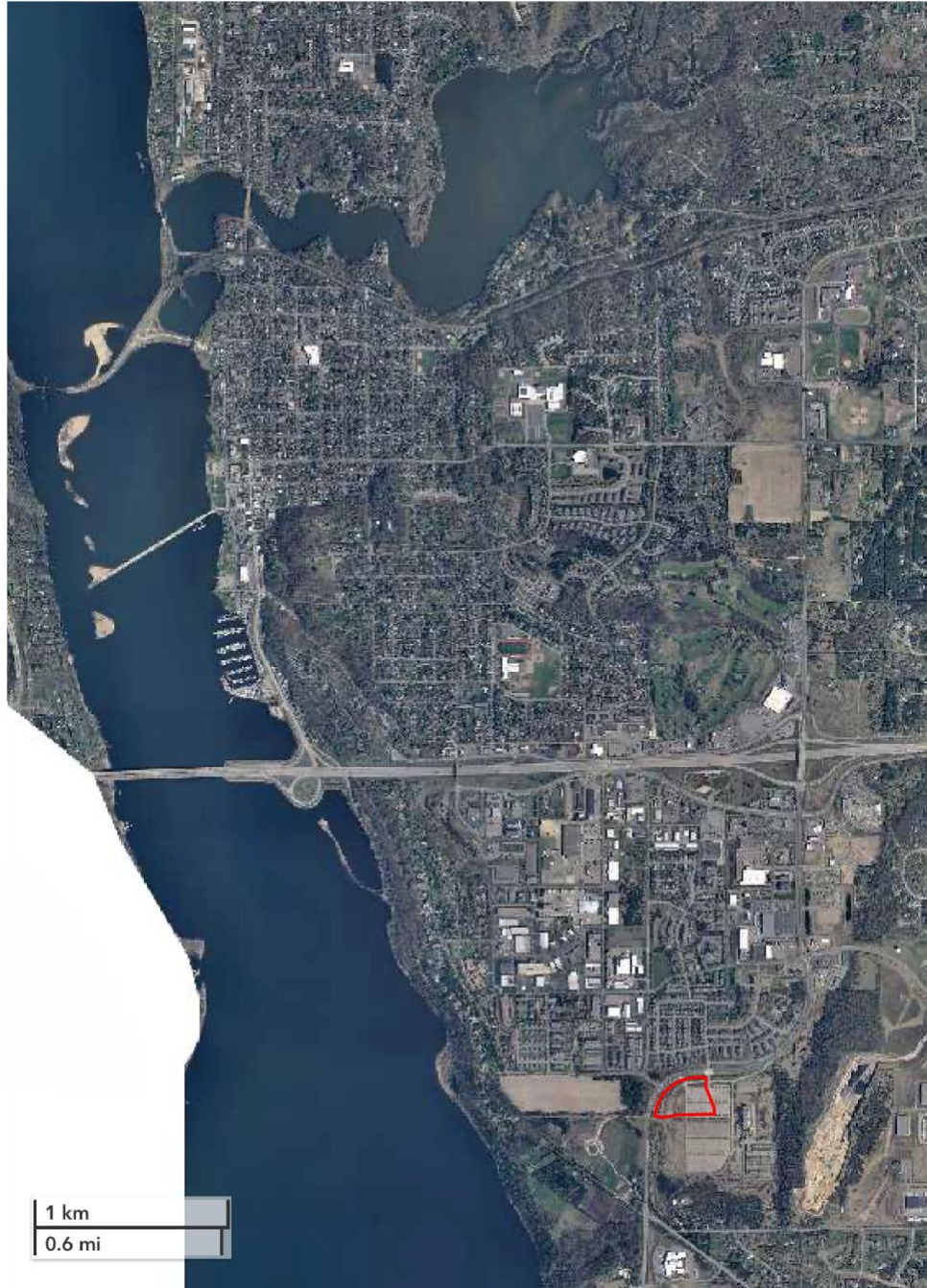
*Aerial map of the City of Hudson in 1992.*



*Curated By: (GIS Map, 2024)*

Figure 25.

*Aerial map of the City of Hudson in 2010*



*Curated By: (GIS Map, 2024)*

Figure 26.

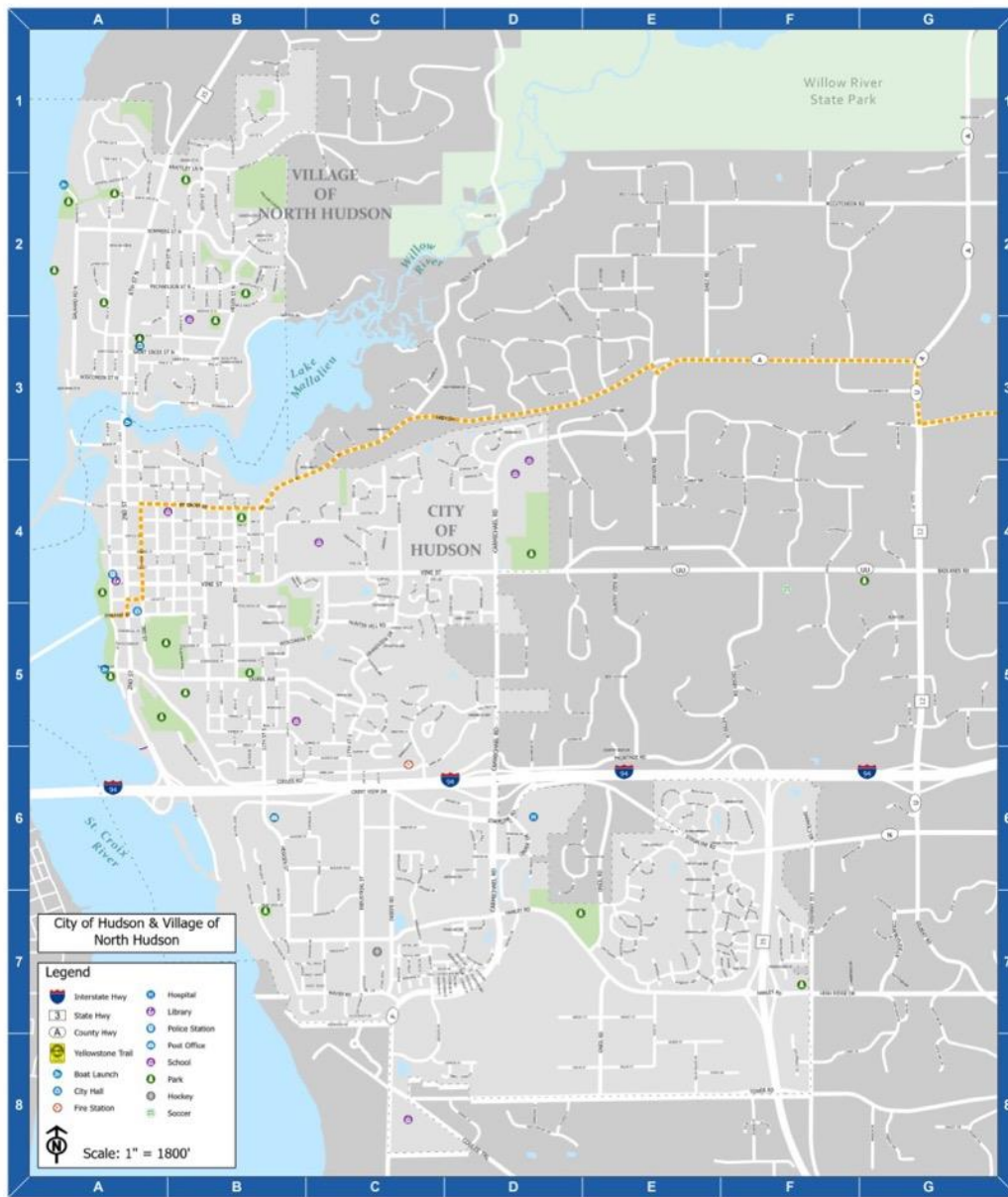
*Aerial map of the City of Hudson in 2022*



*Curated By: (GIS Map, 2024)*

Figure 27.

*Current Aerial map of the City of Hudson.*

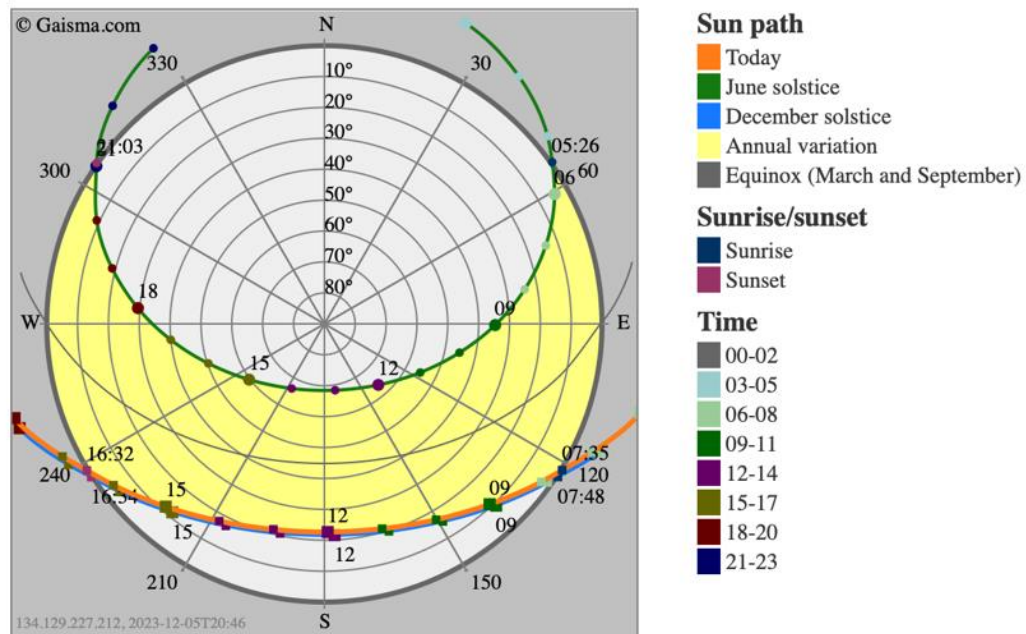


*Curated By: (Hudson, WI, 2023)*

Hudson, WI, has a continental climate with warm summers reaching an average of 85 degrees Fahrenheit and cold winters going as cold as -10 degrees Fahrenheit. The city receives between two to four inches of rain per month with snowfall reaching over 40 inches in a given year (*Climate in Hudson, WI, n.d.*). Figure 28 shows the heat index representing July and August as being the most comfortable months in the city. The humidity levels in Hudson represented in Figure 30 are comfortable compared to other city averages peaking in the warmer months (*Climate in Hudson, WI, n.d.*).

Figure 28.

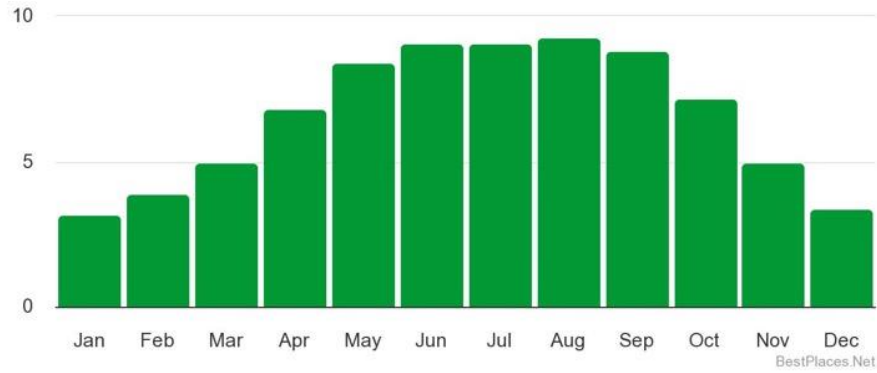
*Sun path diagram of Minneapolis, MN.*



*Curated By: (Minneapolis, Minnesota, n.d.)*

Figure 29.

*A visual comfort index in the city of Hudson displaying July and August as the most comfortable months to be in the city.*



*Curated By: (Climate in Hudson, WI, n.d.)*

Figure 30.

*The humidity percentage in Hudson displaying July as the most humid month during an average year.*



*Curated By: (Climate in Hudson, WI, n.d.)*

### **3.3. The City of Hudson's need for an Animal Shelter**

Hudson is a rapidly growing city and is constantly changing because it is located so close to St. Paul and Minneapolis, MN, making it an even more desirable city for people. The city has recently been expanding its retail and commercial sectors downtown and along I-94, the interstate that runs through the center of the city. Hudson was picked for the project site because the western Wisconsin area is severely lacking animal rescue locations. Animal shelters that have to cover a larger regional area makes the facility's goal attainment unmanageable (Reese, 2018). The city was picked because of the growing human population and its surrounding farmland leaves animals vulnerable when captured without having a convenient location to be placed. Local issues of farmers hoarding unvaccinated animals and not spay/neutering their animals on their land increase animal population numbers and often leaves large groups of animals coming into shelters at a time. The lack of responsible ownership and resources to encourage proper animal care in this area, addressed in the interview conducted with Colleen O'Shaughnessy who works at an animal rescue in New Richmond, WI, could benefit from implementing more social outreach to make people aware of these issues and lead people of the community to act (C. O'Shaughnessy, personal communication, November 4, 2023). The lack of animal welfare facilities in the area also leaves a gap in providing the community with the ability to engage with animal shelters. People are also more apt to go out on their own to find possible breeders and not look at shelters for future companion animals for their family homes. Hudson's own animal warden transports all its captured animals across the St. Croix River into Woodbury, MN, to the Animal Humane Society.

Figure 31.

*Map displaying the City of Hudson animal warden (A) and the Animal Humane Society in Woodbury (B.)*

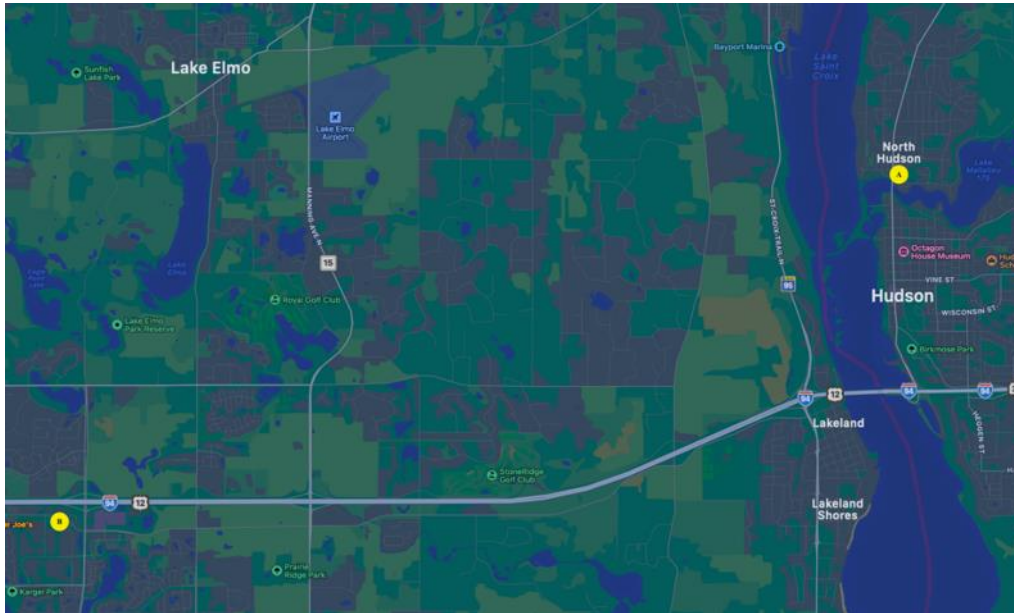
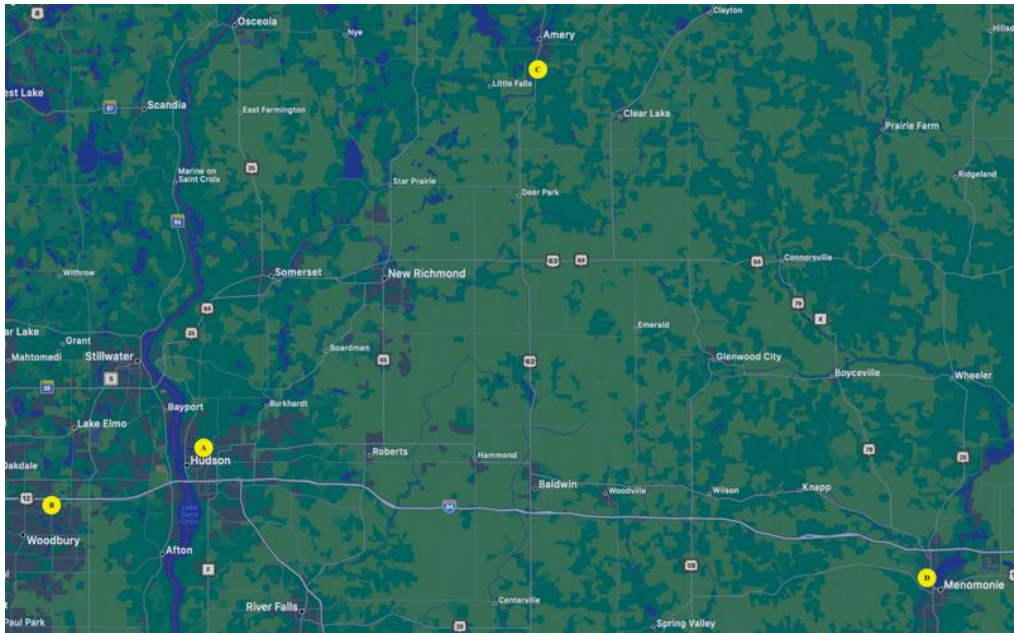




Figure 32.

Map displays the location of the nearest animal shelters in Wisconsin in relation to Hudson's animal warden (A) and Arnell Memorial Humane Society located in Amery, WI, (C) and Dunn County Humane Society in Menomonie, WI (D).



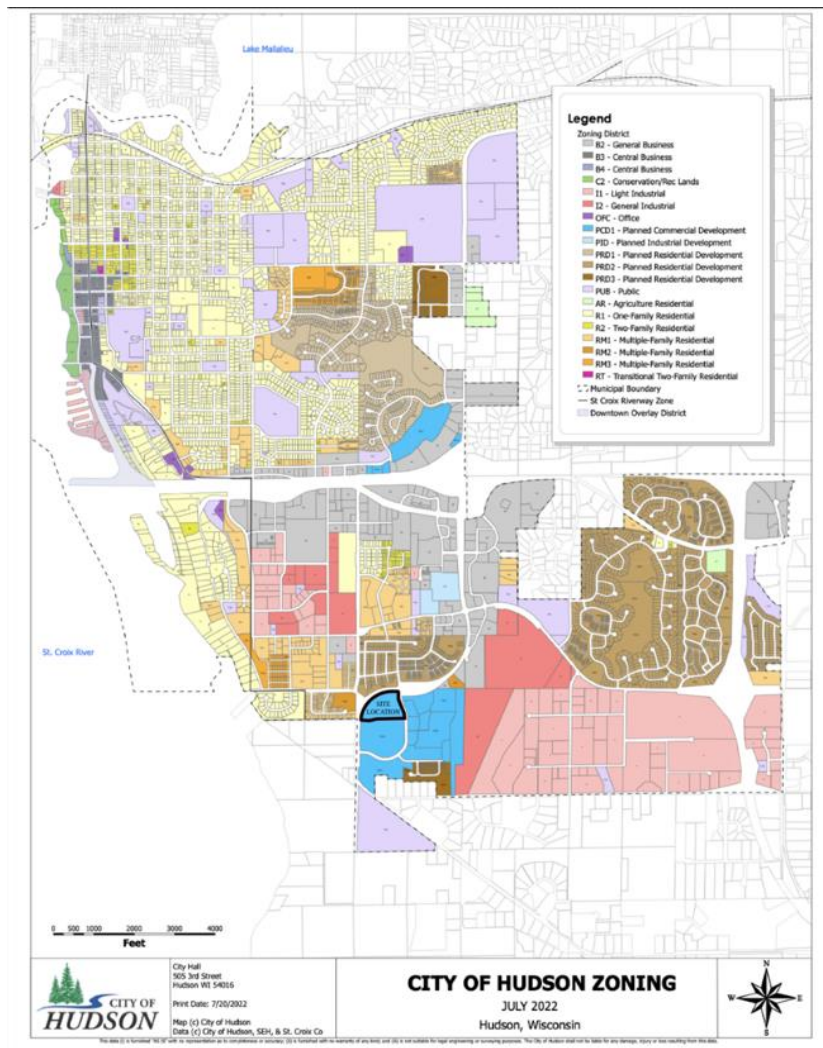
### 3.4. Specific Site

The site, 2202–2240 Carmichael Rd, Hudson, WI, 54016, is located within a 10-minute drive from the Hudson animal warden office and is just outside the center of the city. The location is optimal in size providing 12.693 acres (552,925 S.F.) and is in the PCD1 - Planned Commercial Development zoning district. A PCD1 is defined by the City of Hudson as, “A planned commercial district is a pre-planned development of business establishments usually characterized by central management, integrated architectural design of buildings, integrated landscaping, joint or common use of parking and other similar facilities and includes harmonious selection and efficient distribution of business types.” The site is located in close proximity to

residential zones to encourage community involvement. Its location is also easily accessible from educational centers such as schools, universities, and daycares making it more acceptable to a proper circulation of community engagement. Figure 33 displays where all schools and parks are located within the city.

Figure 33.

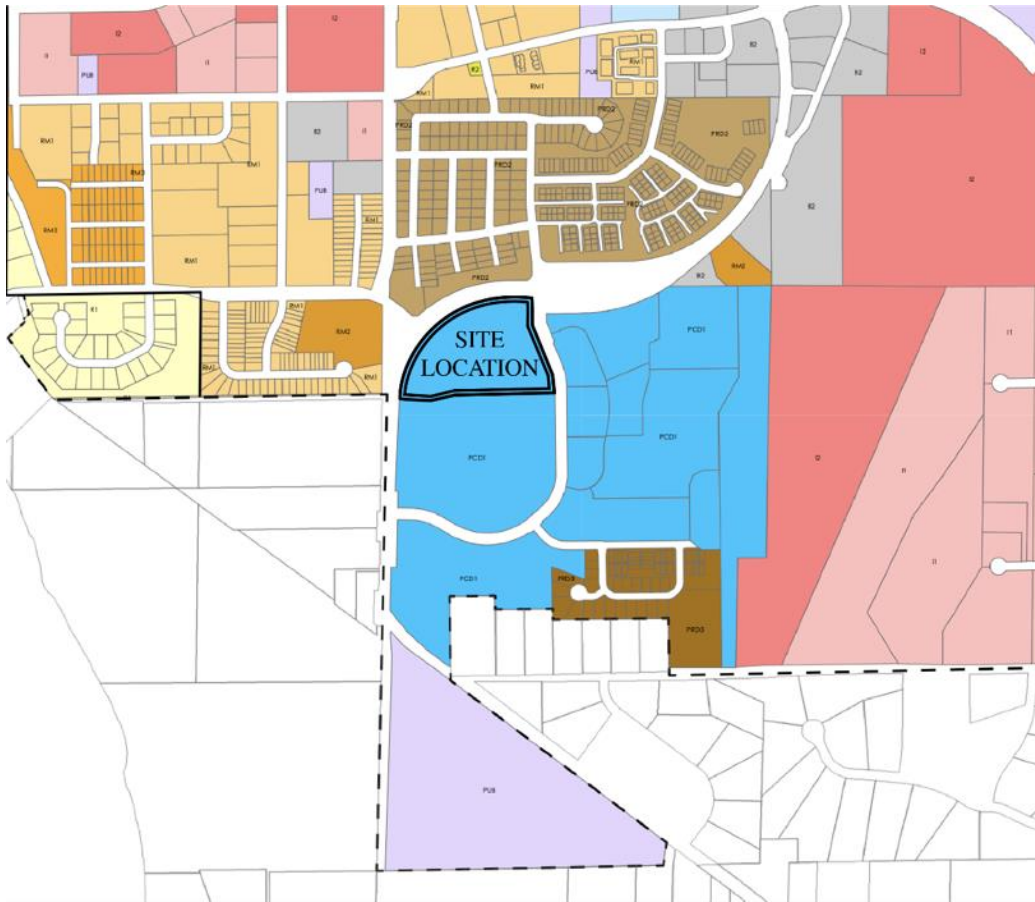
*City of Hudson Zoning map with legend.*



*Curated By: (Zoning, n.d.)*

Figure 34.

*Map of City of Hudson zoning near project site.*



*Curated By: (Zoning, n.d.)*

Figure 36 is a map of lower Hudson that includes the site in the year 1992 displaying the St. Croix Meadows Dog Track that was built in 1991. The dog track closed in 2001 and the site remained vacant for 17 years until 2018 where the 130-acre site would become a \$200 million dollar development project (Klecker, 2018). The site currently sits undeveloped surrounded by new housing developments and a Phillips-Medisize corporate building located to the south side of the site shown in

Figure 39. Figure 38 gives a look at the development proposal of the area that was presented for the site in 2018 encouraging more walkable areas and increasing public interests in the area.

Figure 35.

*Undated photo depicts the 131-acre former St. Croix Meadows dog track site in Hudson.*



*Curated By: (Rupnow, 2018)*

Figure 36.

*Aerial image of site in 1992.*



*Curated By: (GIS Map, 2024)*

Figure 37.

*Aerial image of site in 2010.*



*Curated By: (GIS Map, 2024).*

Figure 38.

*Conceptual design of a proposed development at the former St. Croix Meadows Dog Track site in Hudson. 2018.*



*Curated By: (Rupnow, 2018)*

Figure 39.

*Aerial image of site in 2023.*

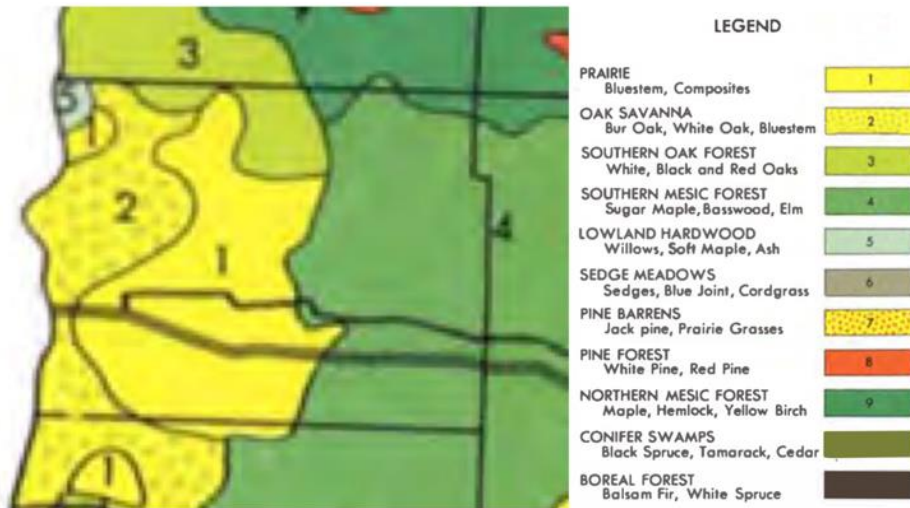


*Curated By: (GIS Map, 2024)*

The site was reestablished after the demolition of the St. Croix Meadows Dog Track leaving the land flat and undeveloped presently beside a gravel parking zone and marked entrances for future development. The site has no large trees or shrubbery and consists of prairie vegetation. The site consists of mostly sand with sandy soil surface deposits and is located in the lower Willow River watershed. There is a water retention pond located on the southeast corner of the site that is victim to fluctuating water levels (*St. Croix County Comprehensive Plan, 2012*). The county consists of 85% upland and due to the site's high elevation in the city there is minimal risk to flash flooding, storm water erosion, or water runoff issues affecting a structure built on the site (*St. Croix County Comprehensive Plan, 2012*).

Figure 40.

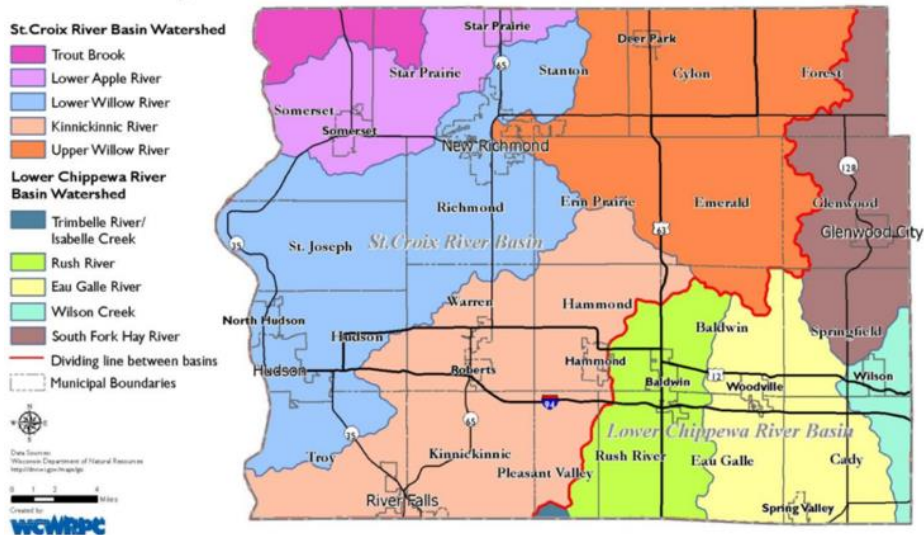
1965 vegetation map of St. Croix County.



Curated By:(Cottam & Loucks, n.d.)

Figure 41.

St. Croix River Basin Watersheds for Hudson and surrounding areas.

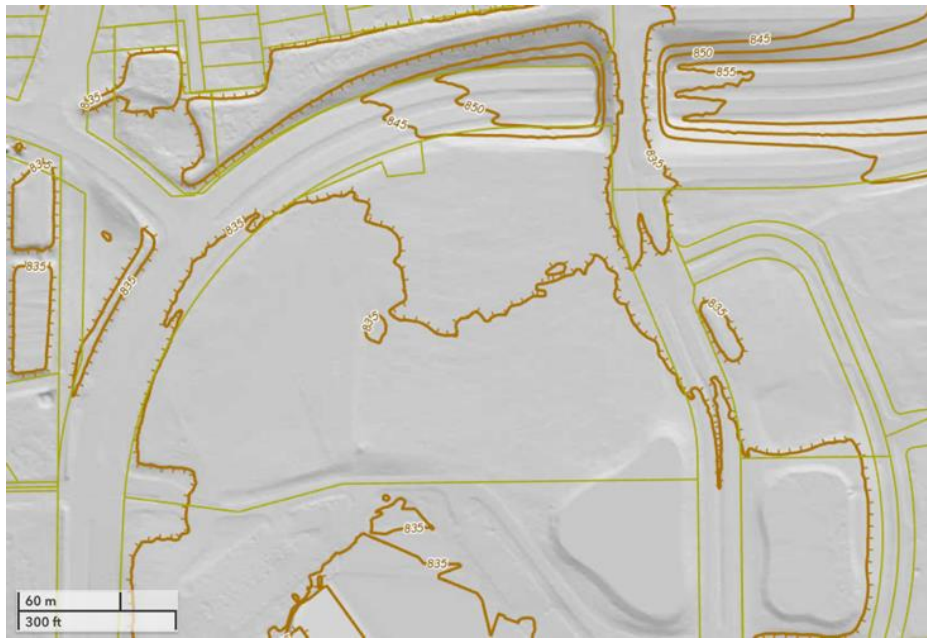


Curated By: (St. Croix County Comprehensive Plan, 2012)



Figure 42.

*Hillside and contour map of site. 2022.*



*Curated By: (GIS Map, 2024)*

Figure 43.

*View on site looking northwest.*



Figure 44.

*View on site looking southeast.*



Figure 45.

*View on site looking east.*



### 3.5. Other Inquires

Table 1.

*Overview of interview locations.*

Project Name	Location	Year	Square Footage	Number of Levels	Animal Capacity
Homeward Animal Shelter	Fargo, North Dakota	1990	2,300 S.F.	1	45-50 Total in Shelter
Gregory's Gift of Home	New Richmond, Wisconsin	2004	4,000 S.F.	1	200+ Cats. 15+ Dogs

#### 3.5.1. Homeward Shelter

Heather Clyde is the Operations Director at Homeward Animal Shelter, located in Fargo, ND, since 2005. Heather provided information regarding the current shelter arrangement and how the shelter is coping with the struggles similar to the topic of this dissertation. Homeward has between 200 and 250 cats in their care; 45 to 50 are in the shelter building at a time with the remaining located in foster homes. The building is 2,300 S.F. and there is about 1,300 S.F. across the street used for office and storage space. There are 18 single side dog kennels shown in Figure 46 with metal doors and 17 double compartment cages located in the cat ward of the shelter, with additional single side housing. Figure 47 shows the cat housing units located in the cat room. Due to the number of cats being housed the portals of the double compartments are closed to provide more available units. The double compartments are only kept open for cats that have social issues and don't do well with human interaction. These cats are usually placed into foster

care quicker to open up more housing and get the cat to be more comfortable in an environment outside of a cage. The dog kennels are roughly 6' by 7' and each kennel has raised beds and they provide blankets and toys. Clyde illustrates how the dogs are usually seen to be happy in their kennels at Homeward as compared to being in the city pound by explaining, “they usually are happy to go in there because at the pound they get nothing and they get a metal bowl for their water and a paper tray for their food and no blankets, no bed, no nothing.”

Figure 46.

*Dog housing units in the dog ward.*



Figure 47.

*Cat housing in the cat ward.*



Clyde alleges the shelter outgrew its building about five to ten years after it was built in 1990. The original design didn't have any housing for cats, consisting of three times as many intakes at the shelter compared to dogs. Medical or surgical space is not provided within the shelter because of the drastic need for housing rooms. The shelter converted the rooms that were originally intended for medical procedures and examinations into spaces for kittens and a sick ward. Figure 48 shows how cat units have been converted with plexiglass and placed in the original grooming room to separate the sick animals from the healthy ones. This change in space use limits the ability to properly give animals the disease control and vaccines needed when they first enter the shelter. Without having a space to properly keep potentially infected animals puts

all other animals at risk. The shelter building doesn't have adequate ventilation impacting the spread of disease and the housing of dogs and cats are not properly spaced. There is a noticeable increase in stress levels due to the noise and lack of separation between animals causing over stimulation. Figure 49 and 50 demonstrates how the staff office is organized to have additional cat housing that is used specifically for new cat intake which are housed in temporary single side cages and Figure 51 demonstrates a dog in a separate office away from the cat housing.

Figure 48.

*Converted housing units for sick cats placed next to the grooming tub.*



Figure 49.

*The staff performing daily operations with cat housing within their workspace.*



Figure 50.

*Additional cages for new intake cats in the staff workspace.*

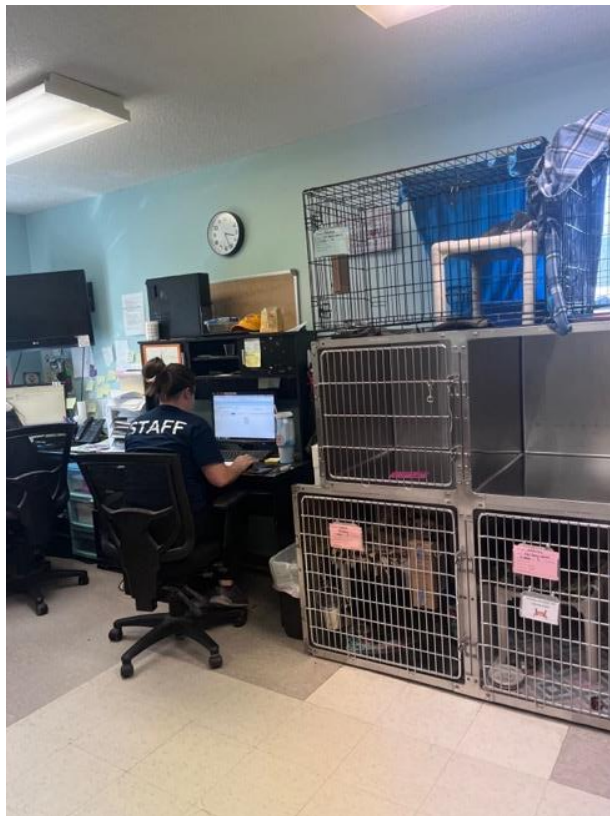
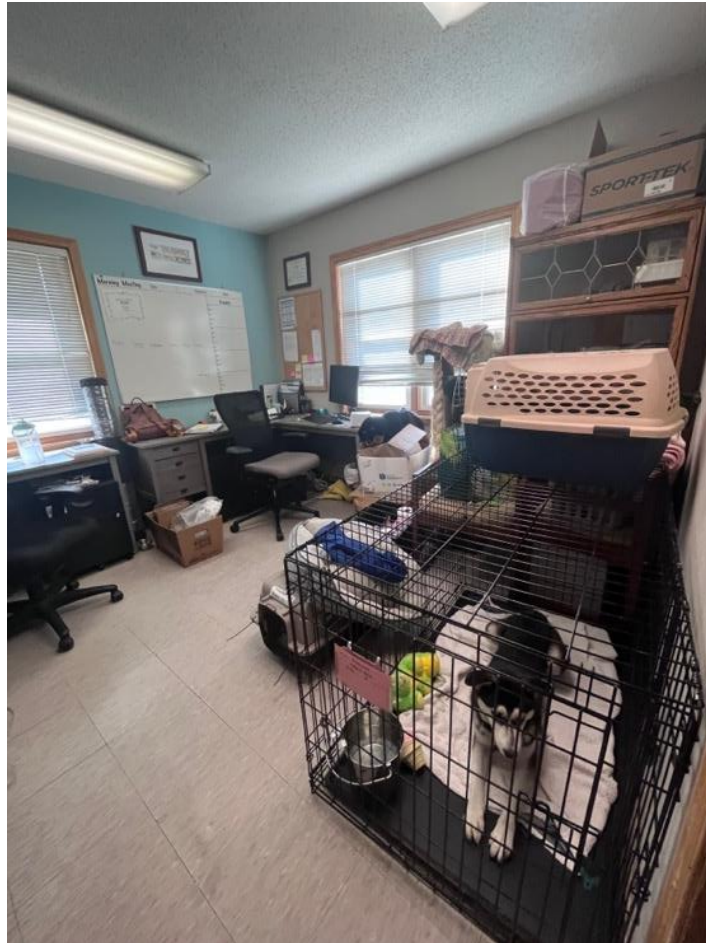


Figure 51.

*Dog housing placed in a shared office space.*



Clyde said that during COVID-19, in 2020, the shelter witnessed an increase in animals being adopted. They had empty cages and struggled to have enough animals for the demand of people looking to adopt. In 2021 they witnessed those same animals being brought back from people going back to work, behavior issues due to socialization concerns, or people didn't have the time to care for them anymore and the numbers keep increasing as the economy continues to decline. Homeward has been implementing no adoption fees just to get animals out of the buildings to make room for more new intakes which has been increasing their adoption rate with



the addition to having more online resources to find an animal being housed in a foster home. The shelter has been reaching out to the local college, North Dakota State University, to try and get more college students to foster animals and provides animals for therapeutic purposes when asked by the university. The shelter uses social media platforms and has done television interviews to bring awareness to the needs and issues such as the recent spread of kennel cough in the area and need for additional supplies. The shelter also has volunteers that come to help with the animals. The aid from volunteer work really encourages the animals to get social interactions and reduce stress by getting to taken on walks or getting to play with each other in interactive activities.

The less than ideal setup at Homeward was explained to not only display a stressful environment for the pets but also for the employees and volunteers. By having animals in workspaces making noise and interrupting conversations and phone calls Clyde explains is very distracting. Having a good separation between work and the animal care is important to assure that a comfortable environment is present for everyone in the facility. During the interview with Clyde, she provided some personal insight to what she feels would be beneficial to building a new shelter that focuses on improving animal well-being. Clyde describes an ideal layout for cat housing as, “the cats would be in like pods almost, and they have a room behind their kennels where a volunteer can be in there with those individual cats hanging out with them.” This design would allow visitors to see and look at all the animals without touching them on a plexiglass side, reducing the spread of disease, while volunteers can socialize and do what they need to in the room behind. Clyde also talked about the use of catios and her opinion that catios are a waste of space because they are hard to utilize in the midwestern weather being cold for 6 months out of the year and having a room that is climate controlled would be more beneficial in the location

of the shelter. The dogs would also gain better access to the outdoors and have more of a comfortable dog run that doesn't injure their paws like their current cement one, but is easy to clean for the employees (H. Clyde, personal communication, October 4, 2023).

### **3.5.2. Gregory's Gift of Hope (GGOH)**

Colleen O'Shaughnessy is the founder and Volunteer Director at Gregory's Gift of Hope located in New Richmond, WI. GGOH, opening as a rescue in 2004, is a non-profit, no-kill organization on 5.8 acres and currently sits as a 4,000 S.F. facility. O'Shaughnessy explains how she operates as a 100% no-kill rescue that only euthanizes if they are severely ill and it is in the animal's best interest. The building started off housing only 50 cats with around only 80 as an average five years ago, but during COVID-19 they reached a max of 256 and now is sitting at an average of 200 cats. GGOH started with 8 rooms for cats and dogs all in one building, but as shown in Figure 52 and Figure 53 the original small dog runs were turned into cat rooms because of the lack of space and the dogs were moved to an additional barn space which provides them with more room. There are only 8 kennel spaces for dogs with a few additional for forever dogs and they provide a large outdoor dog run.

Figure 52.

*View A of Indoor dog run converted into cat rooms.*



Figure 53.

*View B of Indoor dog run converted into cat rooms.*



O’Shaughnessy describes the way they shelter their animals by saying, “It’s like a daycare center and they’re out and about.” GGOH is set up differently than a traditional shelter, encouraging animals to move freely by allowing them to move around in a specific room or freely around the common areas depending on the cat’s needs. Due to GGOH being a rescue, they take in animals with medical issues and do all that they can to save the animal from being

euthanized. This requires a large portion of the animals being housed to be in the shelter for most or possibly all of their life due to their physical needs and restraints. The facility is set up in a series of rooms that each work with a specific need for a cat. Most cats in the building have some form of medical issue and because a lot of the cats being housed are not likely to be adopted, O'Shaughnessy believes that the cats shouldn't have to spend all their days locked inside a cage. O'Shaughnessy encourages this set up as she feels it helps encourage adoptions because cats are able to develop a personality and people are able to come and spend as much time as they want meeting cats and finding which one fits their needs. The facility keeps all their cats inhouse rather than foster just to maintain their system and set up. They have 20 dependable volunteers at a given time always helping and working to make sure all the cats get what they need. O'Shaughnessy and a few other employees are medically trained for medical procedures, so they end up doing more of the medical work while volunteers work with the cleaning and socializing.

Figure 54. *View from the entrance into the cat filled lobby.*



O'Shaughnessy spent a good time of the interview explaining how the new call for funding they have done on social media and through public resources has increased interest from more people who aren't local. O'Shaughnessy comments on GGOH's attempts and getting funding:

What's really strange, though, is that just in the last couple of weeks we've had all these like champs and everybody starting to say, Oh, we want to do this. And I'm like, we've been here almost 20 years and the city has never been supportive. We have more support from Minnesota people and people from other states than we do from our own community.

She mentioned her connection to working with mental health and that it is important to her that people who adopt are able to care for themselves before getting an animal because it creates this circle of inhumane care. She stands firm that animals need emotional support too, therefore people who use emotional support should find a safe and common way to get emotional support that benefits the person and animal without putting the animal at risk. O'Shaughnessy said that she tried to get programs at GGOH that were for kids and people to learn about how to care for and learn the responsibilities of taking care of animals, and they would have reading groups where kids could read with the animals, but ended up not having enough funding to continue it. She still encourages groups to come and help such as the local Girl Scouts and they will bring animals to daycares, middle schools, etc. in the area to encourage the kids to understand and connect with the animals. They even encourage groups of people with disabilities come into GGOH and they would connect with the cats that had disabilities that matched their own. O'Shaughnessy said she loves it when people just come to visit because it gets the community

involved and they can see what it's really like inside their facility and they are able to learn so much regarding animal care.

The overall building works in a communal set up which allows most cats to roam freely unless they have a specific need. They provide a room with special flooring and housing needs for cats who had their legs amputated or have more severe medical concerns. Figure 55 shows how one of the rooms in GGOH was converted to meet the needs of paralyzed cats so they can easily move around the room freely. Cats that are in cages are new intakes that are being acclimated or are getting medication where they need to be separated for a few weeks. O'Shaughnessy explained that they will use plastic for highly contagious animals, but the facility doesn't come across a lot of diseases that they feel worried about. The common respiratory infections are so common and hard to control she feels that letting the cats be interactive with each other rather than caging them from the potential of getting sick helps build up their immune system and encourages less sickness. GGOH still ensures they do all the mandatory cleaning procedures and provides medication for all pets and constantly move things around to make sure nothing gets missed. One of the biggest concerns brought up by O'Shaughnessy is that they have an ICU space that is in the same room as the laundry and feeding room and the combined space tends to get overwhelming, especially because cats are able to get in and interrupt the work being done by employees. Figure 56 shows the ICU unit and Figures 57 and 58 display the combined space used for ICU units, laundry, and feeding. She would want a small room for the three ICU units then another room for the medicinal work separated from the feeding and laundry rooms. The cost of being able to expand the standard barn and even fix their catio to be built as a more stable structure for the cats are things they are hoping they would be able to improve if given the right amount of funding. The need to build more rooms would allow there to be a space designed

specifically for employees and volunteers while providing two or three more individualized rooms for groups of cat needs (C. O'Shaughnessy, personal communication, November 4, 2023).

Figure 55.

*Cat room converted for paralyzed cats and others with disabilities.*

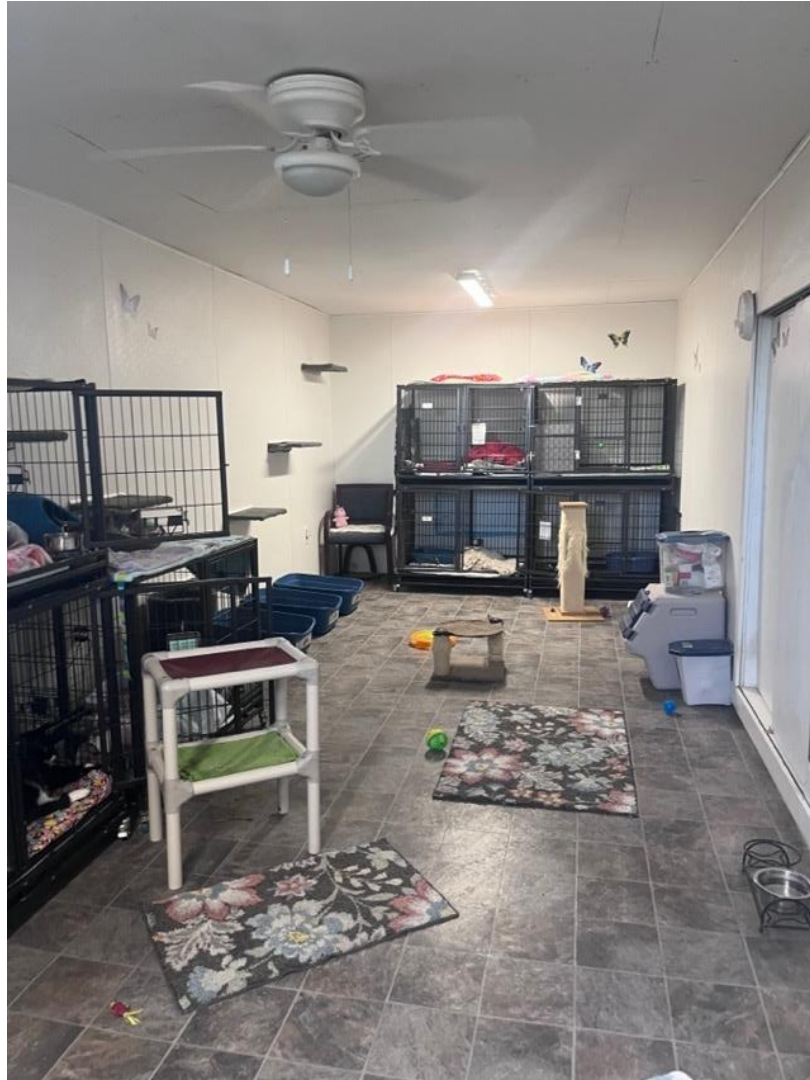




Figure 56.

*Kittens in one of the three ICU units in the laundry/feeding room.*



Figure 57.

*Cats occupying the laundry/feeding room.*



Figure 58.

*Storage and feeding station in the laundry/feeding room.*



### 3.6. Case Studies

Table 2.

*Comparison of case studies.*

Project Name	Location	Year	Square Footage	Number of Levels	Animal Capacity
Michigan Animal Rescue League	Pontiac, Michigan	2020	15,260 S.F.	1	125-175 TOTAL
The Santa Clara Animal Services Center	San Martin, California	2021	36,264 S.F.	2	54 Dogs 90 Cats. + Others
Blacktown Animal Rehoming Center	Blacktown, Australia	2023	66,521 S.F.	1	135 Dogs 230 Cats

#### 3.6.1. Michigan Animal Rescue League (MARL)

MARL was built in Pontiac, Michigan, designed by PLY+ Architecture firm in 2020. The architect built MARL with the goal of achieving a new level of shelter design that would enhance animal wellness and ensure the proper environment was built for the animals in the care of the facility. The original building was 5,000 S.F. and built in 1953. The new facility is nearly three times larger sitting at 15,260 S.F. The new facility now has over 1,200 animals coming in and finding new homes each year. Between 125-175 animals are cared for at MARL daily (*Michigan Animal Rescue League (MARL)*, 2023). The firm underwent a series of studies to identify what practices were needed to encourage the best architectural elements and spatial organizations that would influence the welfare of the cats and dogs in the shelter. The building is

placed on an uneven site which allows for a lower level for employee use. The building is set back from the busy road and includes separate parking zones for employees and guests. The guest parking is located away from the building with a central walk to the lobby space of the building. The site has walkways amongst the green spaces, lined with trees and shrubbery leaving open spaces for dog runs and outdoor stimulating activity space for the animals (Pintos, 2022).

Figure 59.

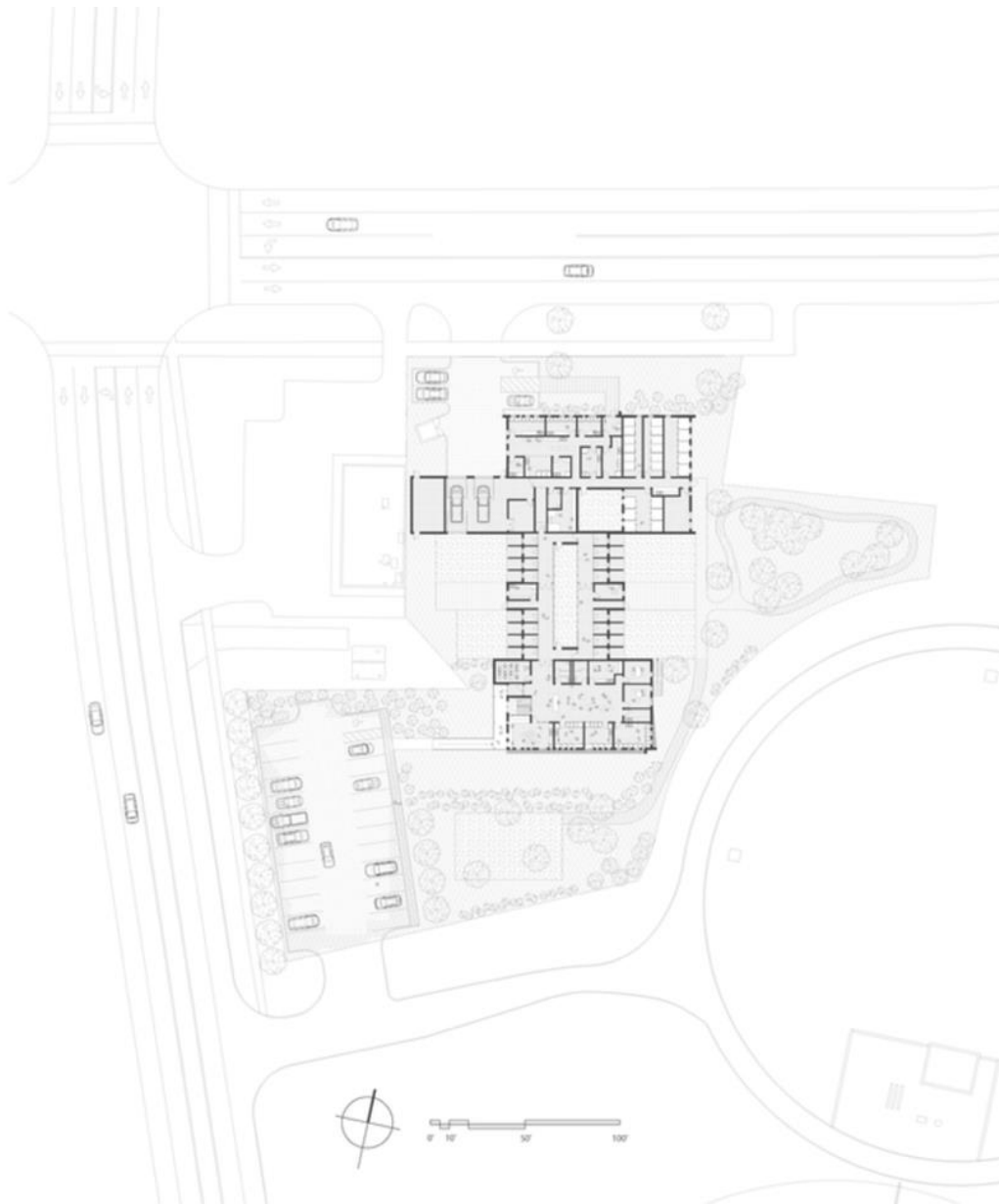
*Exterior view of the MARL building.*



*Curated By: (A Different Breed of Shelter, 2023)*

Figure 60.

*MARL Site Plan.*



*Curated By: (A Different Breed of Shelter, 2023)*

Figure 61.

MARL Floor Plan.



Curated By: (A Different Breed of Shelter, 2023)

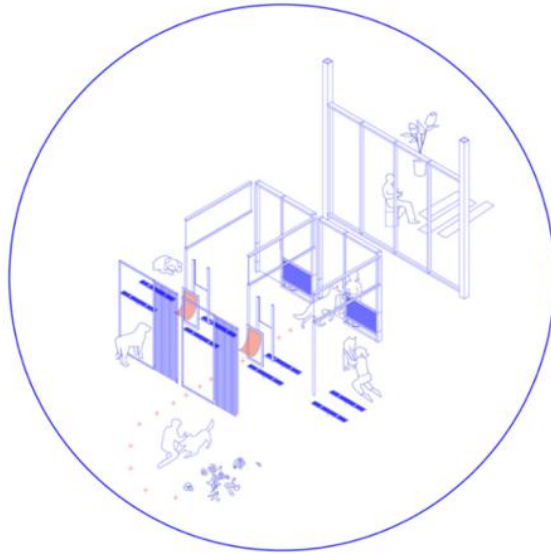
MARL's new facility was designed to provide quality care during the wait for animals to get adopted. They believe the quality of care and housing needs impacted the future given to an animal. They accept all animals including those that are old or sick and only euthanize when an issue compromises the animal's quality of life. The animals get social time everyday and they provide enrichment programs to minimize stress and keep them healthy. They make sure they understand each animal's behavior and make sure the potential adopter is aware of all quirks of the animal's personality to ensure they find the right match (*A Different Breed of Shelter*, 2023).

The shelter is a great example of how animal shelter designs in the midwest can be designed to allow for animals, dogs in particular, to have housing that provides effective and healthy housing. The architects at PLY+ designed the building with design objectives that would positively impact animal well-being. The design allows natural light to infiltrate the facility giving access to all animals using courtyards placed in the center and around the exterior of the buildings. The building uses color theory to provide a bright interior that brings attention to the importance of animal wellness. The housing neighborhoods are separated into four zones to help with acoustics and noise levels (Pintos, 2022). The custom designed cat housing units provide the animals with freedom of choice by allowing easy movement and offering free roaming spaces with different levels for perching, wooden ledges, and sunlit napping spaces. Dogs got the same level of attention when designing for their needs by having easy access to outside and spaces providing stimulating activities.



Figure 62.

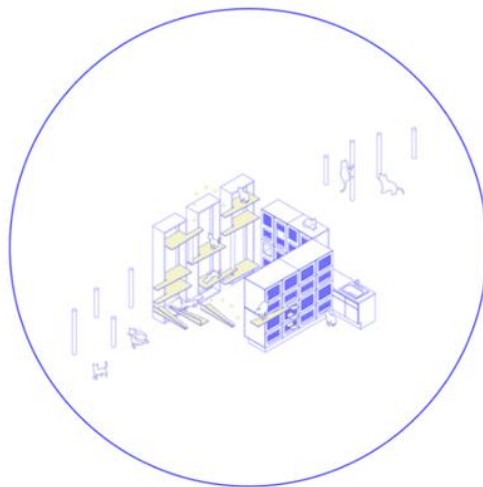
*Illustration of the dog kennel layout at MARL.*



*Curated By: (A Different Breed of Shelter, 2023)*

Figure 63.

*Illustration of a cat room layout at MARL.*



*Curated By: (A Different Breed of Shelter, 2023)*

Figure 64.

*Cat room with new innovative housing units and social space at MARL.*



*Curated By: (A Different Breed of Shelter, 2023)*

Figure 65.

*Example of a socialization room at MARL.*



*Curated By: (A Different Breed of Shelter, 2023)*

In conclusion, this case study of MARL gives a look into how new shelter designs can be built focusing on the comfort of the animals being housed. The up-close look at how they incorporate spaces within the housing units to allow animals to be individually housed while being able to socialize with volunteers gives them the ability to develop a personality in a stress-free space while staying active and healthy. The building design portrays a good example of how to provide the needed spaces for care while separating dogs from cats to limit the stress between the animals and their unique needs. The facility is a great example to observe how to incorporate outdoor and indoor spaces that meet the needs and environmental conditions of the Midwest, connecting to the Hudson, WI, proposed building site.

### **3.6.2. The Santa Clara Animal Services Center (SCASC)**

The Santa Clara Animal Services Center is located in San Martin, CA. The 36,264 S.F. facility was completed in 2021 on eight acres (*County of Santa Clara Animal Services Center, 2023*). The building was designed to reflect the surrounding environment of the Santa Cruz mountains (*Santa Clara Animal Services Center, 2022*). The design of the facility has the capacity for 54 dogs and 90 cats with additional space for other animals. The focus is on places of value for specific animal needs such as having open air play areas that connect to the dog housing (*Santa Clara Animal Services Center, 2022*). The center has been operating as a public no-kill facility at a 90% live-release rate since 2015. The Santa Clara Animal Services Center takes in all animals of all sizes including livestock and wildlife. The center prides itself on its desire to save all animal lives regardless to where they come from (*County of Santa Clara Animal Services Center, 2023*).

Figure 66.

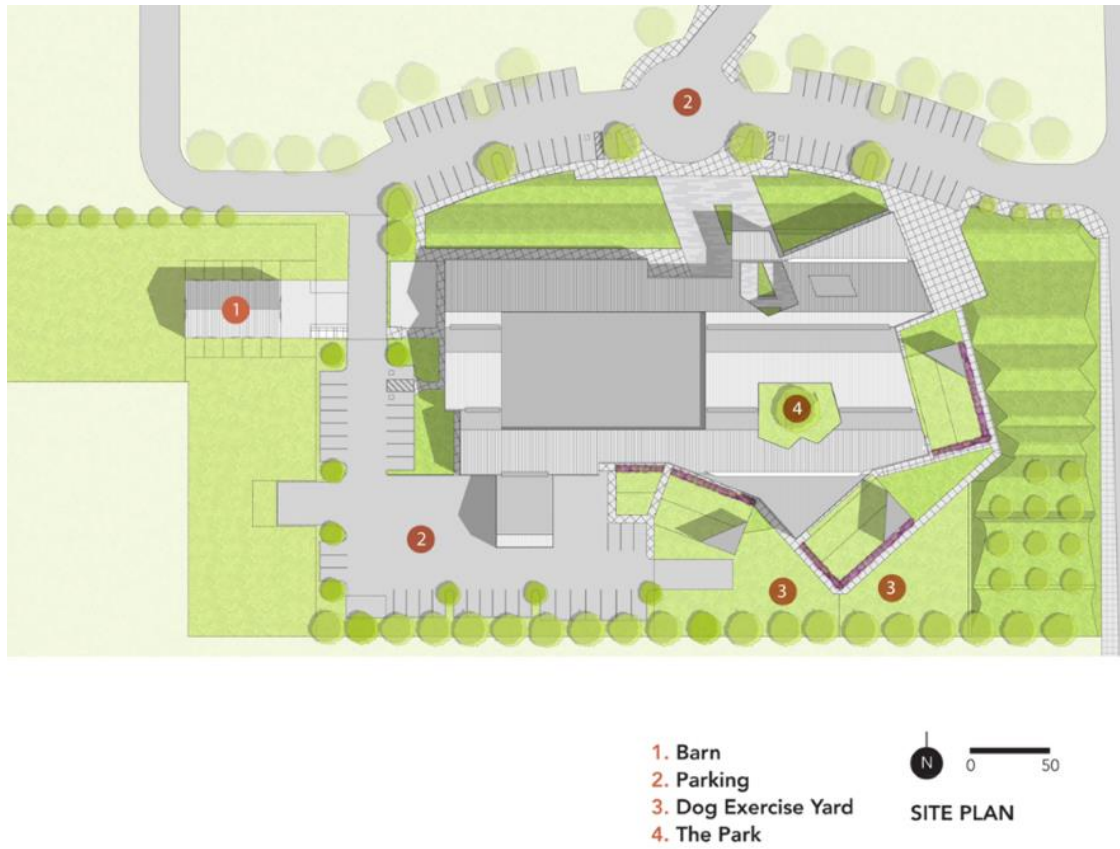
*Exterior view of SCASC.*



*Curated By: (Santa Clara Animal Services Center, 2022)*

Figure 67.

*SCASC Site Plan.*



*Curated By:* (Santa Clara Animal Services Center, 2022)

Figure 68.

*SCASC Floor Plan.*



*Curated By: (Santa Clara Animal Services Center, 2022)*

The architect, Dreyfuss + Blackford had staff tour other local shelters to gain an idea of how they wanted to redesign the SCASC. The architect implemented more welcoming features to allow people to see animals outside of cages. The firm implemented solutions to issues being seen such as dogs at the end of kennel hallways not being seen so they designed a courtyard loop for dog housing to encourage all the dogs to get looked at and can display their personalities in a courtyard environment instead of a cage. The dog cages even have an open vented lower half of their kennel doors with plexiglass on the upper half. Cats are housed in free roaming spaces to

display their personalities. The use of glass in the facility was another necessary feature because as people approach the building from the parking lot and when walking around inside you can see the animals playing and having fun. The site has a large partition of the lot made up of parking space on the north and west side of the building with a smaller exercise yard to the southeast of the building in addition to the courtyards within the building (Hettinger, 2023).

Santa Clara Animal Services Center currently takes in 5,000 animals each year. The center is designed to provide adequate clinical space to care for animals with medical needs which is located on the north side of the building next to the staff and volunteer populated spaces. There are two surgery suites that allow veterinarians to provide free, same day spay/neutering. The cats and dogs are located on separate sides of the building allowing each housing zone to have exterior access and natural lighting. Each animal zone has specific design elements encouraging animal welfare such as social spaces and rooms for acclimation. The dog housing is designed to circumference an open courtyard that is separate from yard space for exercise (Hettinger, 2023). In addition to the standard requirements for an animal shelter, the facility incorporates a community center located off the main shelter zones. This space is equipped for 150 occupants to participate in animal specific community events. They are able to host humane educational events and pet care trainings. The community space has been a great community resource. People have requested to use the space for purposes outside of animal care related events which draws people into SCASC, increasing public awareness.

Figure 69.

*View of the dog housing in SCASC.*



*Curated By: (Santa Clara Animal Services Center, 2022)*

Figure 70.

*View of the cat housing in SCASC.*



*Curated By: (Santa Clara Animal Services Center, 2022)*



Figure 71.

*View of the Community Center in SCASC.*



*Curated By: (Santa Clara Animal Services Center, 2022)*

In conclusion, the new design has increased the animal welfare characteristics by lowering stress levels and allowing animals the opportunity to be more free-roaming. This concept encourages animal personalities and increases human interest in specific animals. The building encourages human-animal interactions while making sure the animals have proper housing kennels. The staff quarters are spacious and provide rooms for individual needs with enough space for medical suites. The site provides adequate space for parking for visitors and employees while still providing outdoor space designed specifically for the well-being of dogs.

The community center is adaptable and can provide a space for all possible needs, programs, and events while being adaptable for each event's needs.

### **3.6.3. Blacktown Animal Rehoming Center (BARC)**

The Blacktown Animal Rehoming Center (BARC) is located in Blacktown, Australia, designed by Sam Crawford Architects. The project was completed in 2023 at a final square footage of 66,521 S.F. The center is designed to house up to 380 dogs and cats with an average capacity of 135 dogs and 230 cats. The facility has a unique design concept. The facility is constructed of multiple buildings that provide the needs for one intended use. The layout was designed to provide thermal, visual, and aural comfort in addition to reducing levels of stress. Each building is linked with walkways that have overhead coverings. The buildings are designed to allow all the animals to have a connection to the outdoors (Abdel, 2023).

Figure 72.

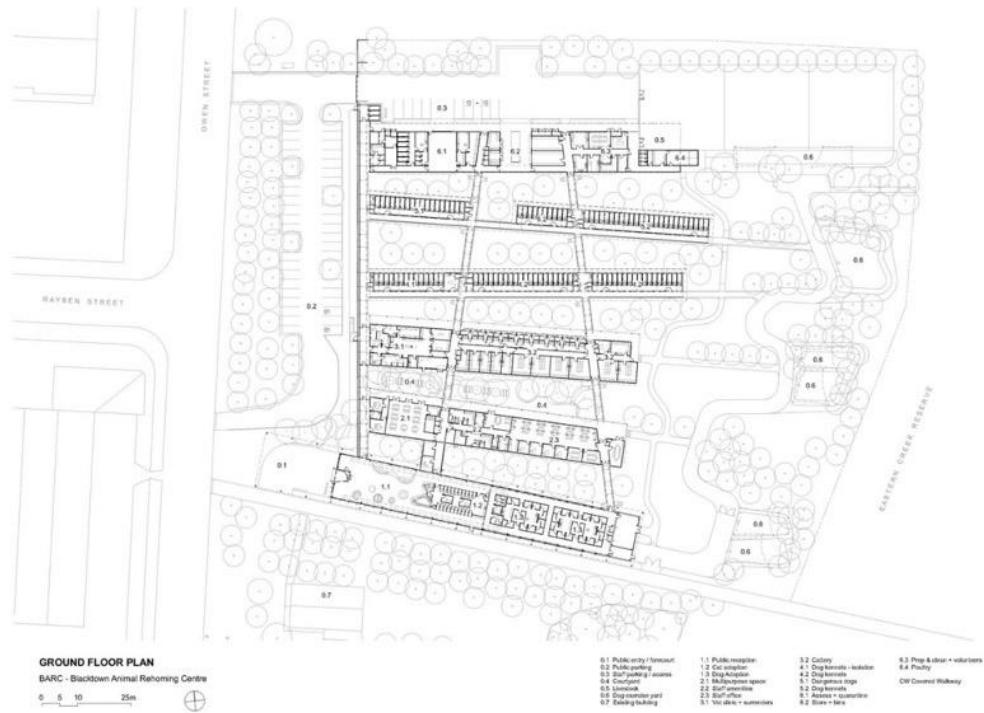
*Exterior view of BARC.*



*Curated By: (Abdel, 2023)*

Figure 73.

*BARC Site Plan and Floor Plan.*



*Curated By: (Abdel, 2023)*

The center uses a blend of color and natural features to draw in adopters. The architect commented on the design intent stating:

Maximizing the connection with nature is such an important part of the design. For the animals obviously, but also as relief for staff compassion-fatigue, and to balance the necessary hard surfaces required for hygiene and durability. It also de-institutionalizes the spaces and makes them feel more welcoming.

This approach displays how the architect wanted to make sure that both the animals and humans that enter the facility are happy and healthy when in the center. The dog housing units are designed at a scale that allows the dogs to see nature and reduces stress through stimulation or

lay behind shades to block out the stimulation when desired. The access to the outdoors also provides staff with the ability to alleviate stress from being indoors all day (Abdel, 2023).

The entire facility is built with highly durable materials to protect against cleaning chemicals and environmental elements while providing proper ventilations and thermal comfort connected to BARC climate. The site is filled with green spaces littered with trees and greenery. The center sit in the middle of the site with the parking and entrance located on the west side of the buildings. The staff parking is located on the north side which connects to the staff and volunteer spaces. The site has a civic space at the entrance for a welcoming feel as guests enter and has a functional area to host educational events to engage the community. The multipurpose facility focuses on a strong community center to gain support through educational events and programs to teach the community about pre-adoption needs and animal trainings to maximize adoption rates at BARC. The building also provides a veterinary hospital within and a cattery. The site pays homage to the native plant and bird species in the art by integrating it into the bold color scheme that is implemented throughout the buildings. The center also implements sustainable features such as solar panels, passive thermal comfort through proper ventilation needs, and water retention services which help better the land and community they are working with (Abdel, 2023).

Figure 74.

*BARC lobby and community space.*



*Curated By: (Abdel, 2023)*

Figure 75.

*View of the dog housing in BARC.*



*Curated By: (Abdel, 2023)*

Figure 76.

*View of the cat housing in BARC.*



*Curated By: (Abdel, 2023)*

In conclusion, the idea of having separate buildings for each department within the proposed shelter is not the best idea for the proposed site due to the harsh winter weather, but the way this shelter focuses on the connection to the environment and uses visual stimulation to increase animal well-being encourages more of a connection to how shelters can implement strategies to getting animals the stimulation they need. By separating the spaces and animals can reduce the spread of germs and limit the visual and aural issues presented from a confined facility housing different animals. The buildings' use of materials and suitable features really demonstrate the use of environmental features that should be observed as inspiration for the proposed building.

### **3.7 Detailed Space**

The proposed animal shelter in Hudson, WI, will be designed using an estimated 30,000 – 40,000 S.F. with a large landscape layout that will be an extension of the building’s design. The building will be designed to provide housing for the calculated needs of Hudson, WI, and the surrounding areas. The proposed animal shelter will incorporate spaces that include a lobby, medical clinic, quarantine room, staff room, volunteer room, feeding room, storage closets/rooms, restrooms, cat housing, dog housing, outdoor play area, indoor stimulating rooms, social rooms, adoption rooms, community rooms, office space, and an intake room. The building will be located in the center of the site with public parking located next to the road on the west side. The facility orientation will run parallel to the road direction to the west with each user sector being strategically placed to address user needs.



Table 3.

*Proposed building program demonstrating the estimated range of space sizing.*

Space Name	Number of Units	Square Footage	Calculated Square Footage
Lobby	1	4000	4000
Visualization Rooms	2	230	460
Guest Bathroom	2	250	500
Admin	1	1200	1200
Mechanical	1	570	570
Storage Bay	1	440	440
Additional Animals	1	400	400
Private Office	4	200	800
Volunteer Space	1	150	150
Staff Break Room	1	500	500
Private Bathroom	2	70	140
Care Clinic	1	1600	1600
Laundry	2	300	600
Kitchen	2	350	700
Total Storage	N/A	1500	1500
<b>Dogs:</b>			
Indoor Small Unit	10	30	300
Indoor Large Unit	28	40	1,120
Critical Care	1	250	250
Puppy Nursery	1	400	400
Intake Room	1	400	400
Real Life Room	1	350	350
Adoption Room	1	350	350
Large Dog Run	1	1900	1900
Small Dog Run	1	960	960
Grooming	1	200	200
Training Room	1	550	550
<b>Cats:</b>			
Cat Rooms	5	250	1,250
Long Term Care	1	300	300
Critical Care	1	250	250
Kitten Nursery	1	250	250
Intake Room	1	250	250
Stimulation Room	1	450	450
Adoption Room	1	350	250
<b>Community Spaces:</b>			
Community Center	1	3250	3,250
Breakout Rooms	2	200	400
Cat Cafe	1	600	600
Cat Greenspace	1	700	700
<b>TOTAL INDOOR:</b>			<b>28,290</b>
Circulation	25%	28,290	7,073
<b>TOTAL OVERALL:</b>			<b>35,363</b>

## **4. RESULTS AND CONCLUSION**

After the completion of my conducted research, a project program was developed for an animal shelter in Hudson, WI. The shelter would be designed with the intention to provide humane housing units for cats and dogs and incorporate different forms of public spaces that get different users to engage on the site to encourage human-animal interactions.

### **4.1. Final Project Description**

The final proposed project is called Hudson Heart. Hudson Heart is a community integrated animal shelter that stands at just over 38,000 square feet in size. The building is equipped to provide humane housing for stray animals captured in the city of Hudson and in surrounding towns. The shelter is designed to provide healthy housing units to roughly 50 dogs and 100 cats with additional spaces that provide humane group housing options outside of the use of individual cages. The shelter utilizes unique spaces inside that encourages the animals in the shelter to develop healthy habits and express their personalities to help them find the perfect adoption partners. The integration of public access outdoor spaces in addition to the interior lounge and event spaces are designed to provide the shelter with more opportunities to develop a stronger presence in the local community. The overall design of the shelter had the goal of developing a safe space for the animals being housed in the shelter while developing new ways for shelters to foster human-animal connections within the facility. Researched design elements are incorporated throughout the building and site, using already existing design expectations for animal shelters while incorporating unique ways of implementing new design concepts.

## **4.2. Project Objectives**

The completion of the proposed community integrated shelter demonstrates solutions to four key goals that were developed from the research conducted during this study. The use of public interaction on site, developing a desirable layout for staff and animals, the value of spaces for public use that encourage human-animal interactions, and the vital development of humane housing units that focus on the animal's welfare and ease of care.

### **4.2.1. Public Site Access**

One main goal that was concentrated on for the project was utilizing a location that has enough space to encourage the public to come and engage with the site. By offering publicly accessible outdoor spaces on the site, people would be more apt to participate in the shelter's events and be aware of funding needs. The use of public, dog friendly, parks on the south side of Hudson was needed. Therefore, by building a space where people felt comfortable and safe near their home would encourage users to get outside and not only benefit their animal's wellbeing, but also get the benefits for their own health.

The building was placed at the center of the site to allow a walking path to encompass the entire site. The walking paths on the site encourage people to engage their animals in physical activity. The site includes dog parks on the north side of the site to encourage dogs to exert in physical activity and engage in social interactions. The site also incorporates water features such as a dog puddle, similar to a children's splashpad, that allows dogs to play in shallow water and interact with water fountains to provide mental stimulation. The pond that currently resides on the south end of the site would also get refashioned to allow dogs to go swimming to help dogs learn swimming skills and aid in joint and muscle development. All these resources would be

open to the public to encourage people in the nearby communities to get their dogs the physical and social benefits improving their well-being.

#### **4.2.2. Program Layout**

Another goal of the project was to develop a good layout of the overall shelter that makes pathfinding easy and each sector is uniquely designed to meet the needs of each user. With the major concerns regarding the influence of different species causing stress on each other and the drastic variation in behavioral needs, it is important to develop an appropriate layout that makes daily tasks stress-free for staff, while assuring a comfortable environment for the animals within their sectors.

The entrance to the main shelter and the community center are located on the west side of the building directly off the parking lot. All public amenities are located at the front of the building to limit controlled access to certain areas and ensure there is a safe boundary between public guests and the back of house activities. The building has all administration and employee facilities located at the center of the shelter acting as a division between the cat and dog facilities. There is a private administration area for staff with private office spaces. The center of the shelter provides the space for a full-service clinic where certified staff can conduct medical procedures such as spay/neuter surgeries or minor operations when needed to reduce the cost of animal transportation to clinics when animals are in need of medical service. The clinic has attached quarantine spaces for dogs and cats to allow for easy treatment and reduce the spread of diseases. The design provides a staff entrance on the east side of the building, opposite from the public access, which gives employees and volunteers easy access to their work and lounge spaces. Other spaces at the back of the house includes a large storage space for supply deliveries and donations to be easily unloaded and stored in the facility.

The cat housing is located on the north side of the building to give them more visual stimulation from people on the site, other animals, and cars on the street. The cat sector consists of five standard housing rooms that can hold the recommended number of 12 cats in each. There are additional private spaces for kittens, new cat intake, and long-term cat housing. Both the cat and dog sectors include adoption rooms, laundry rooms, and kitchens to keep staff production confined to one sector when completing their daily tasks. The cat zone utilizes additional space for the use of a stimulation room while the dog side provides additional storage and a large grooming station. The dog housing is on the south of the building to give the dogs plenty of natural light and provides more warmth during the winter climate. All kennels are located on the exterior walls consisting of four housing rows that vary in size to accommodate different sizes and breeds. The dog housing is strategically laid out to reduce noise levels as compared to standard face-to-face dog kenneling and encourages potential adopters to walk the full length of kennels to provide fair adoption opportunities to all dogs. There is a private space for puppies and new intakes and the shelter offers additional spaces such as dog runs, training rooms, and a real life room as resources for proper development and providing humane care practices.

#### **4.2.3. Lighting Influence**

With the project placing a strong focus on welfare and encouraging healthy living, the project has the goal of concentrating on providing the most comfortable environment within the shelter without interfering with daily operations. The design of the building emphasizes the use of natural light to improve mood and behavior, especially when faced with the cold, winter climate present in the Midwest region.

Through the use of clerestory windows, my building provides daylight into all major sectors within the core of the building as a way to encourage positive experiences for human and

animals within the shelter. Using clerestory windows there is less visual stimulation in specific areas of the shelter while providing the benefits of sunlight exposure such as improving attention, increase physiological alertness, improving performance on cognitive tasks, and reducing sleepiness in the humans and animals.

#### **4.2.4. Community Involvement Opportunities**

One of the most vital goals of the design is to get the community involved with animal shelters to help the public understand the social impacts animals and people have on each other. As developed in the conducted research, by giving opportunities for human-animal interactions there are strong emotional benefits to both member's well-being, therefore the design provides spaces in the building and on the site that encourages all different groups of people to be able to engage with the shelter's animals to help develop relationships and build positive emotional and behavioral benefits.

In addition to the public outdoor spaces, there are two key areas in the animal shelter that are designed to get the public engaged with the animals at the shelter. The community center is designed to be functional for a variety of different uses and offers two breakout rooms for more small group needs. The community center can be used for the shelter to host events such as fundraisers, educational classes, behavioral development events, and courses that utilize AAI and AAT. The community center is equipped with access to an outdoor greenspace for hosting dog training lessons. In addition to the community center, there is a cat cafe room located just off of the lobby which allows the public to come and interact with the cats at the shelter. The cafe connects to a cat green space where cats can be placed in a social setting and get visual stimulation for their surroundings.

#### **4.2.5. Individual Units**

The most crucial element for my project focuses on the animal's welfare, therefore my final goal addresses the need to design proper individual units for the animals that promotes safe and happy living while in confinement. My goal was to develop housing units that include key features that complete an overall comfortable living space based on what is best for their well-being.

Looking first at proper cat housing units that prioritize cat's welfare, you can see how double compartment housing provides a properly sized space for cats to have imputable floor space and offers separation between living and relief spaces. The unit provides private litter box space which making cleaning easier for staff. The doors of the kennel are made specifically to make daily tasks such as cleaning and feeding easy for employees while encouraging healthy behavior patterns in the cats that aid in personality development. Similar to cat housing, the dog kennels in the facility are designed as double compartment housing. The dog kennel design includes an interior space that uses back of kennel drainage for easy cleaning as well as have radiant floor heating to provide the dogs comfort in the colder climates in addition to offering raised bedding to keep dogs relaxed and provide comfort. The outdoor portion of each housing unit has controlled access from the use of a guillotine door and uses synthetic turf that makes kennel cleaning easy for staff. The kennels provide elements such as above kennel windows, visual controlled fencing, and raised observation windows to limit overstimulation in dogs from their surroundings. The doors are specially designed to be closed on the bottom to limit dogs from coming in contact with people or other animals that pass by preventing diseases from being transmitted but has an open-air access on the upper portion.

The building design also pays close attention to the materials used within, especially in the design of individual housing units. Proper sanitation in animal shelters is key to providing a healthy living environment for the animals that is why the materials within the shelter are selected to provide ease of cleaning for staff, are safe for animal use, and are durable against harsh cleaning products. The facility uses materials that encourage a safe living space for the animals and provides a comfortable working environment for the staff. A few examples of materials used in the project include porcelain tile, PVC wall paneling, fiberglass reinforced plastic, powder coated steel, seamless epoxy flooring, aluminum, and specialty products such as artificial dog turf.

All of these objectives were used as the fundamental building blocks to help develop an animal shelter that meets the needs of the staff and animals using the shelter. These objectives were selected from the collection of research to determine what are the leading influences that need improvements in shelter designs and what changes can be implemented by architects to make the living spaces for the animals leave positive results on welfare in addition to bring awareness to the shelters need for community engagement.



### 4.3. Project Design and Documentation

Figure 77.

*Site Plan.*

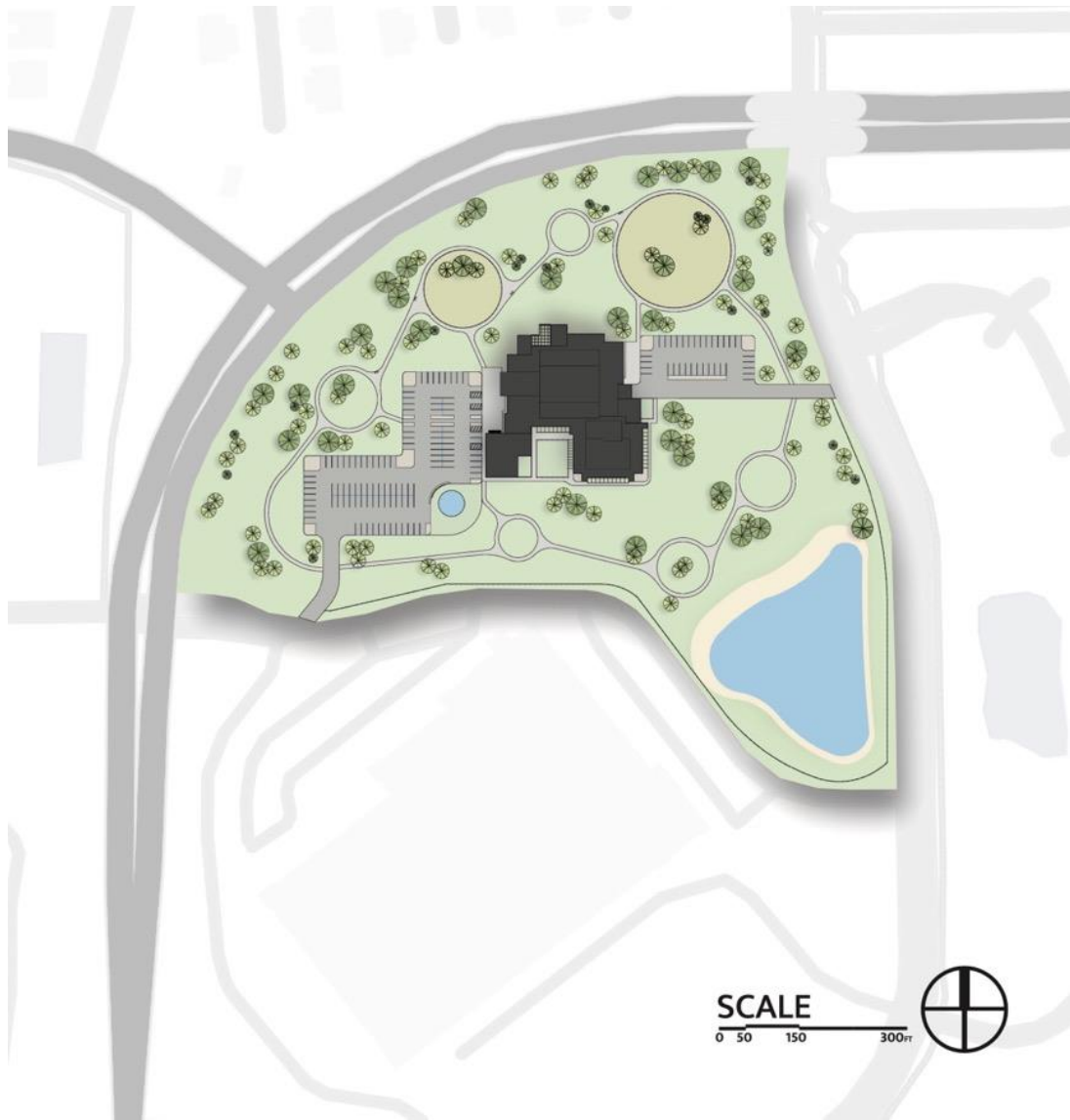


Figure 78.

*Demographic of site representing key outdoor spaces.*

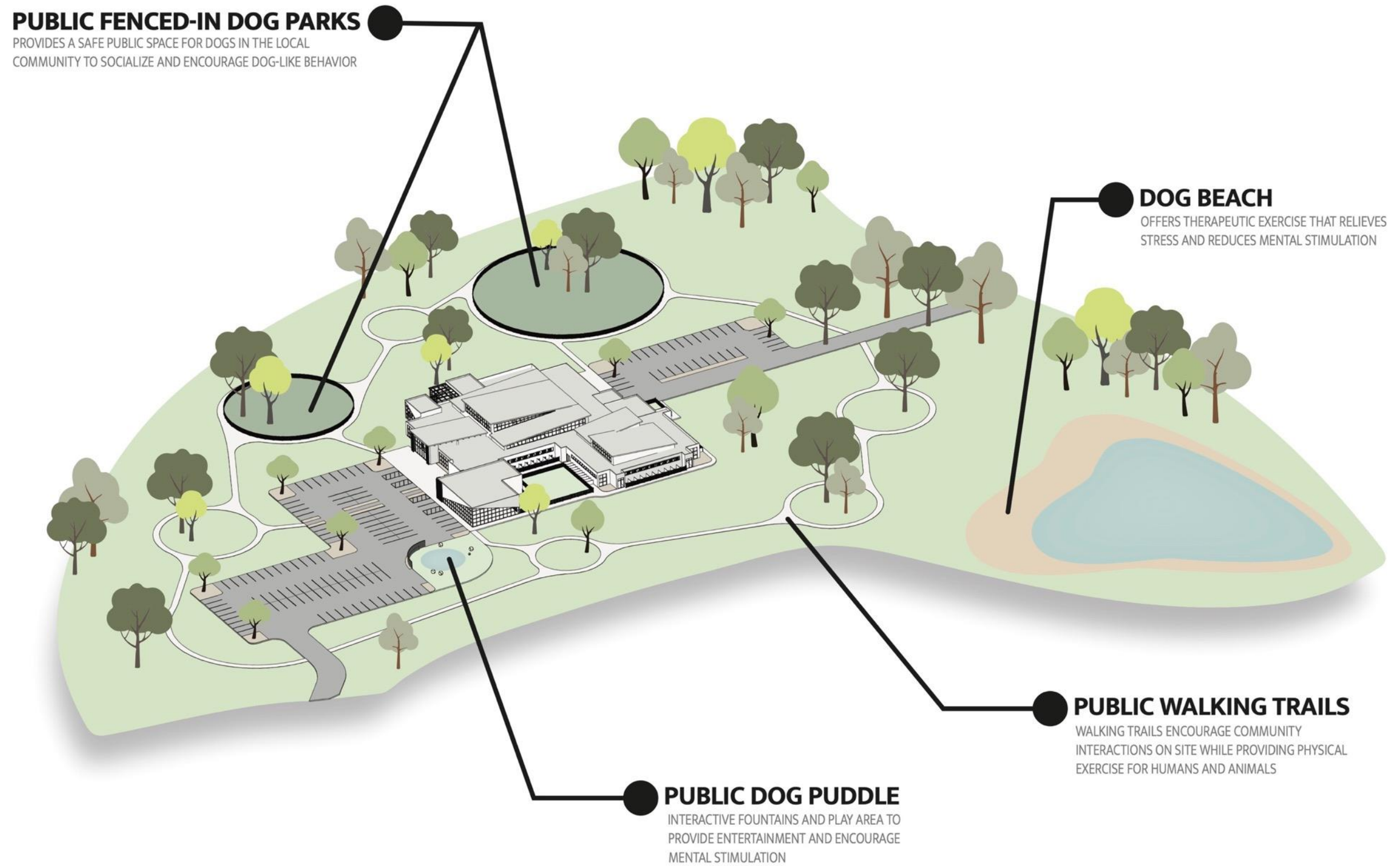


Figure 79.  
Floor Plan.

## KEY

- |                           |                                |
|---------------------------|--------------------------------|
| <b>A</b> LOBBY            | <b>S</b> TRAINING ROOM         |
| <b>B</b> ADMIN            | <b>T</b> PUPPY ROOM            |
| <b>C</b> CLINIC           | <b>U</b> DOG INTAKE ROOM       |
| <b>D</b> OFFICE           | <b>V</b> VISUALIZATION ROOM    |
| <b>E</b> STORAGE          | <b>W</b> CAT INTAKE ROOM       |
| <b>F</b> CAT QUARANTINE   | <b>X</b> KITTEN ROOM           |
| <b>G</b> DOG QUARANTINE   | <b>Y</b> CAT HOUSING           |
| <b>H</b> RESTROOM         | <b>Z</b> LONG TERM CAT HOUSING |
| <b>I</b> VOLUNTEER LOUNGE | <b>AA</b> COMMUNITY CENTER     |
| <b>J</b> STAFF LOUNGE     | <b>AB</b> BREAKOUT ROOM        |
| <b>K</b> MECHANICAL       | <b>AC</b> CAT CAFE             |
| <b>L</b> KITCHEN          | <b>AD</b> CAT GREEN SPACE      |
| <b>M</b> LAUNDRY          |                                |
| <b>N</b> ADOPTION ROOM    |                                |
| <b>O</b> STIMULATION ROOM |                                |
| <b>P</b> GROOMING         |                                |
| <b>Q</b> REAL LIFE ROOM   |                                |
| <b>R</b> DOG RUN          |                                |

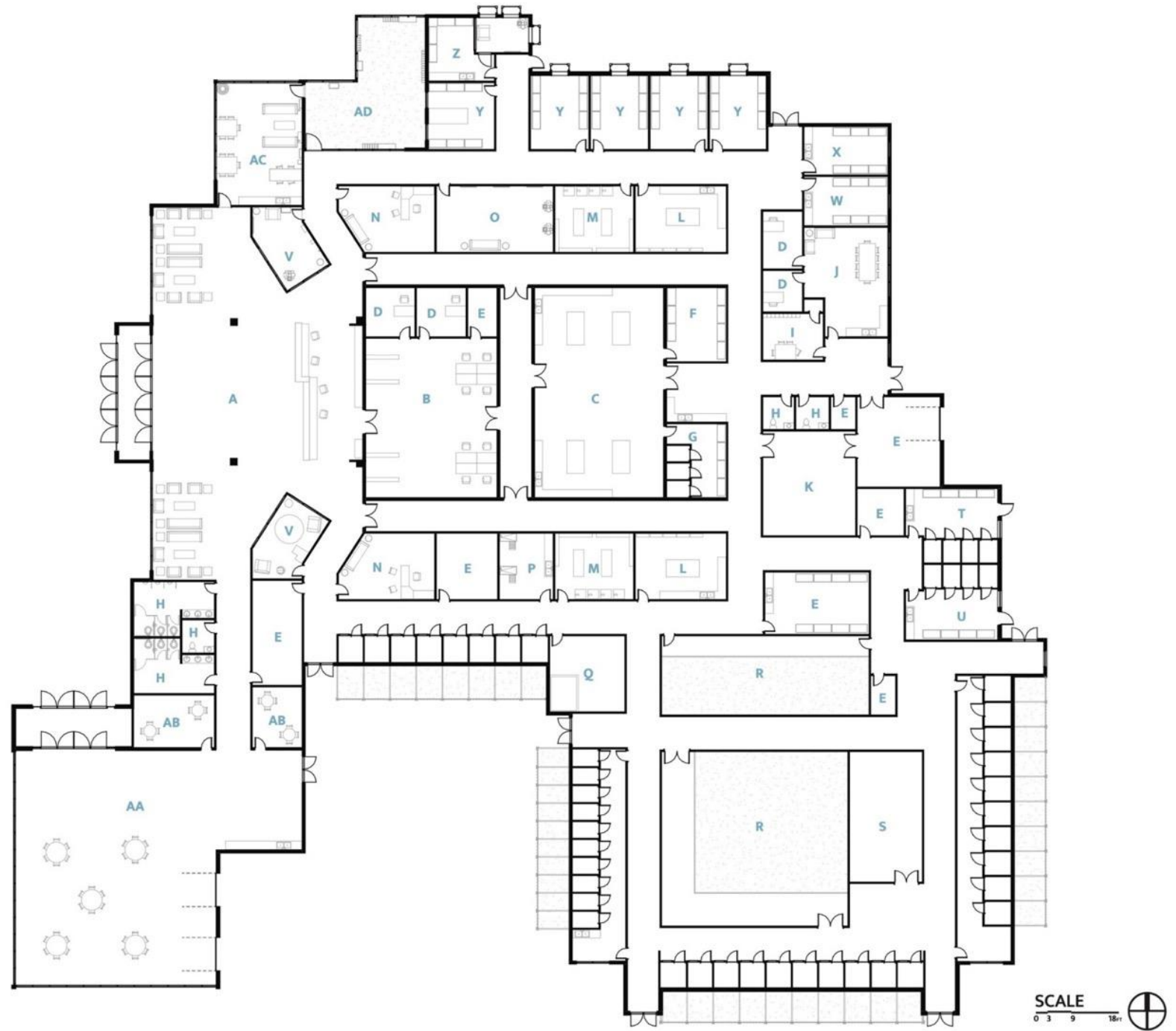


Figure 80.

Demographic highlighting key design features implemented throughout the building.

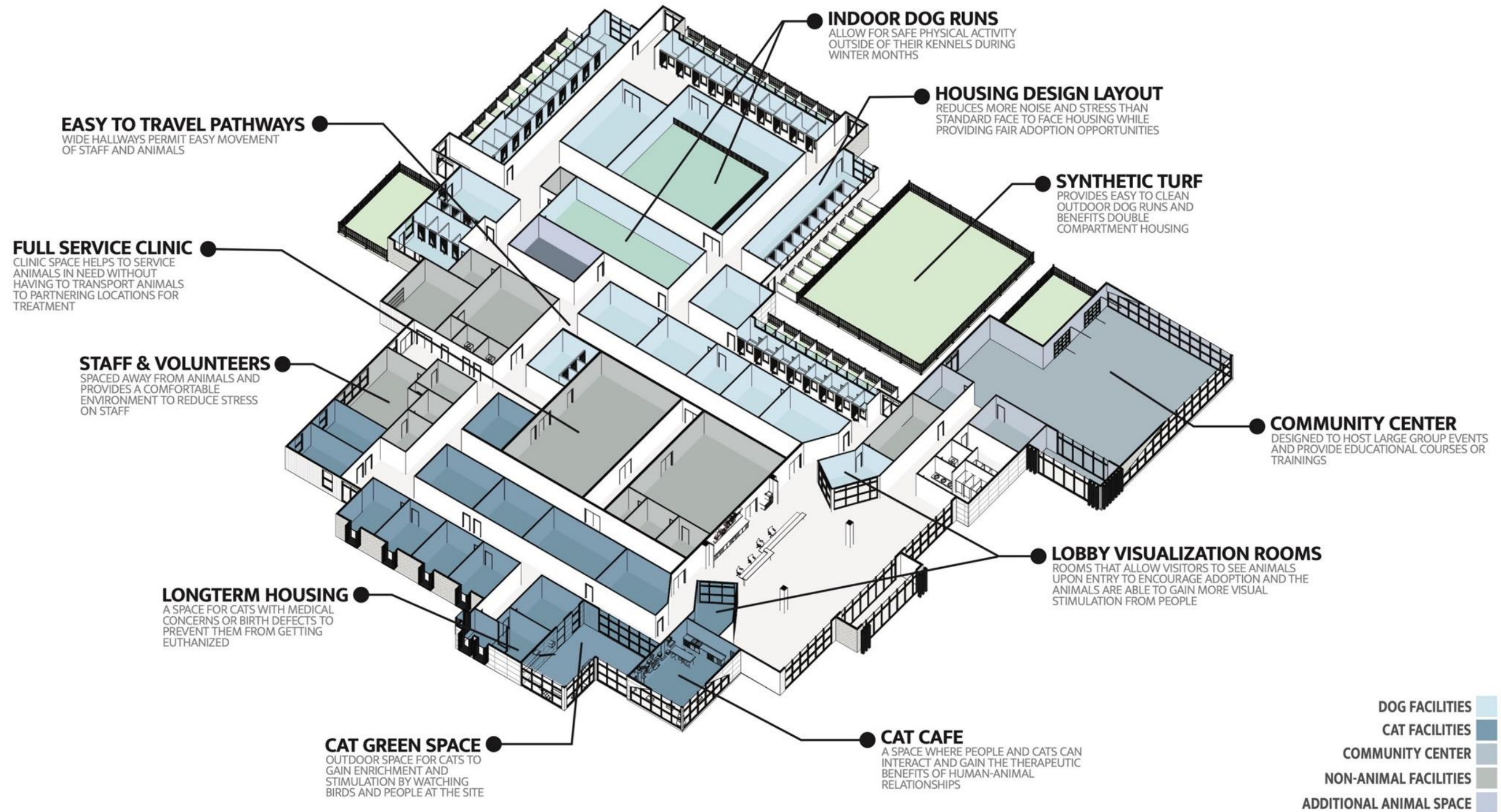


Figure 81.

*Elevations*

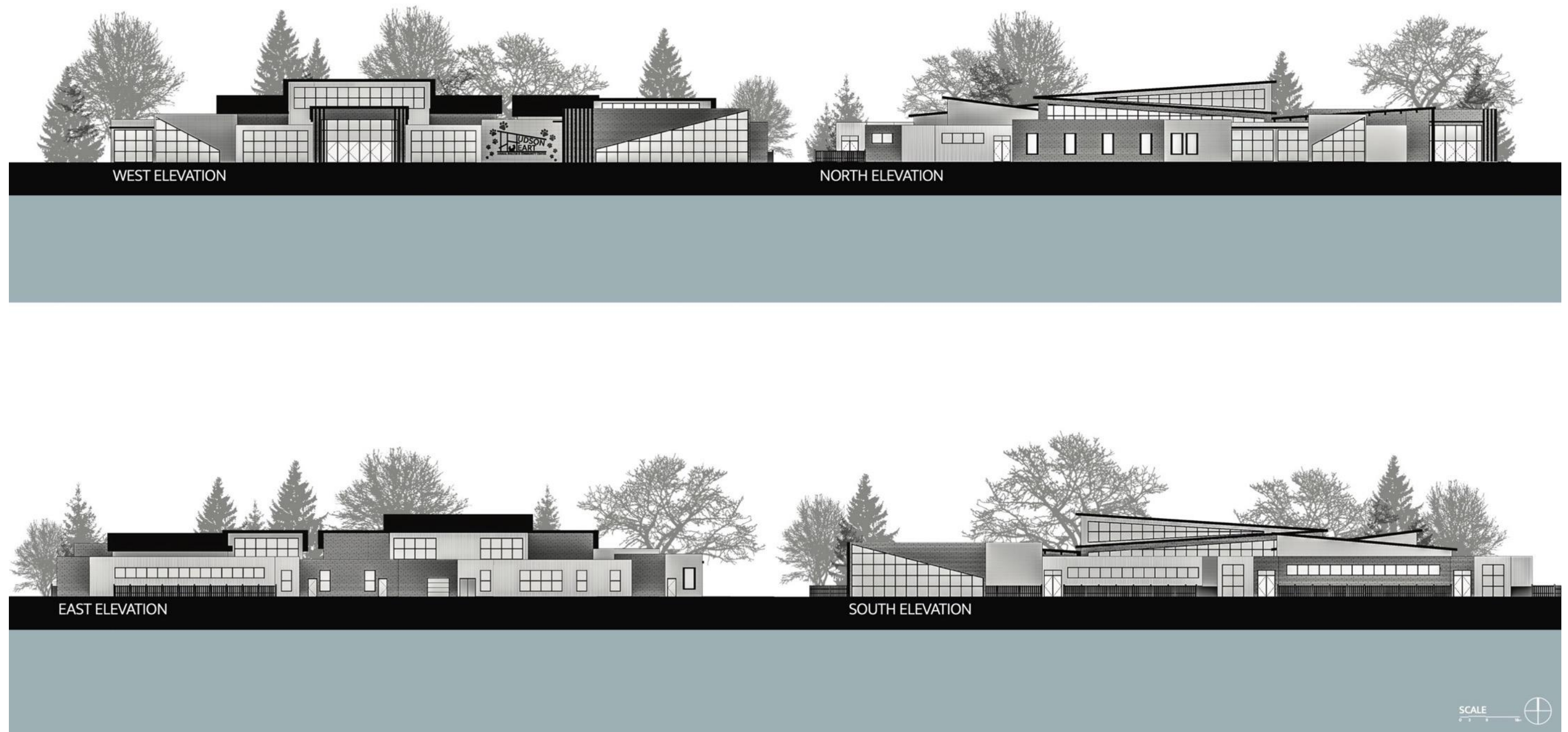


Figure 82.

*Section cut demonstrating how light enters into core spaces within the building.*

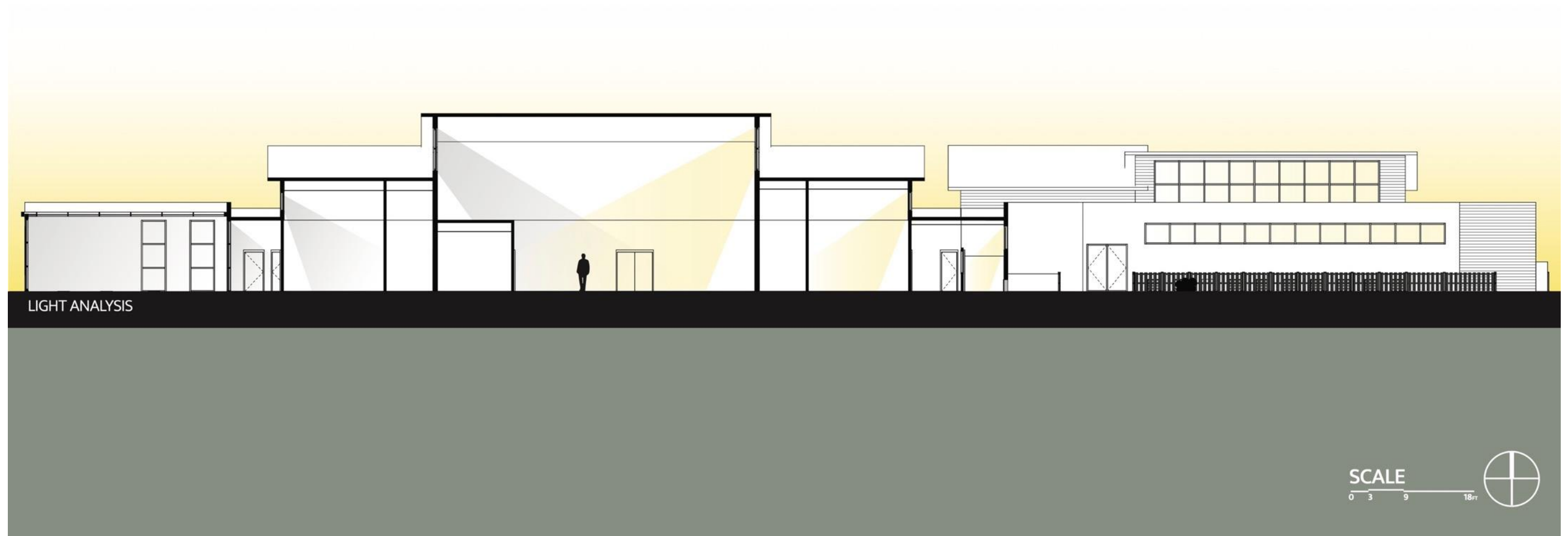


Figure 83.

Design example of a cat housing unit with callouts to key design features that promote healthy living.

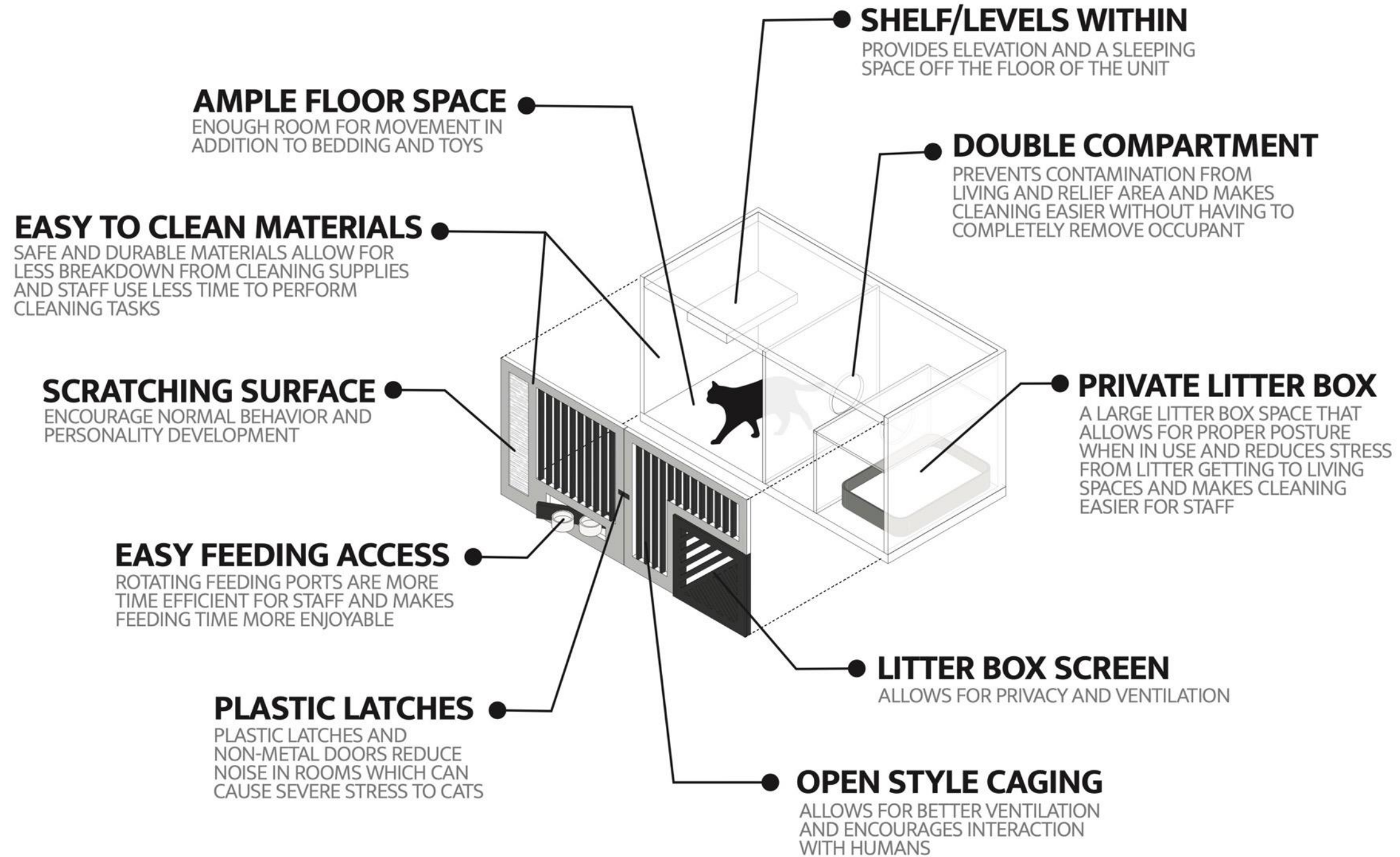


Figure 84.

Design example of a dog housing unit with callouts to key design features that promote healthy living.

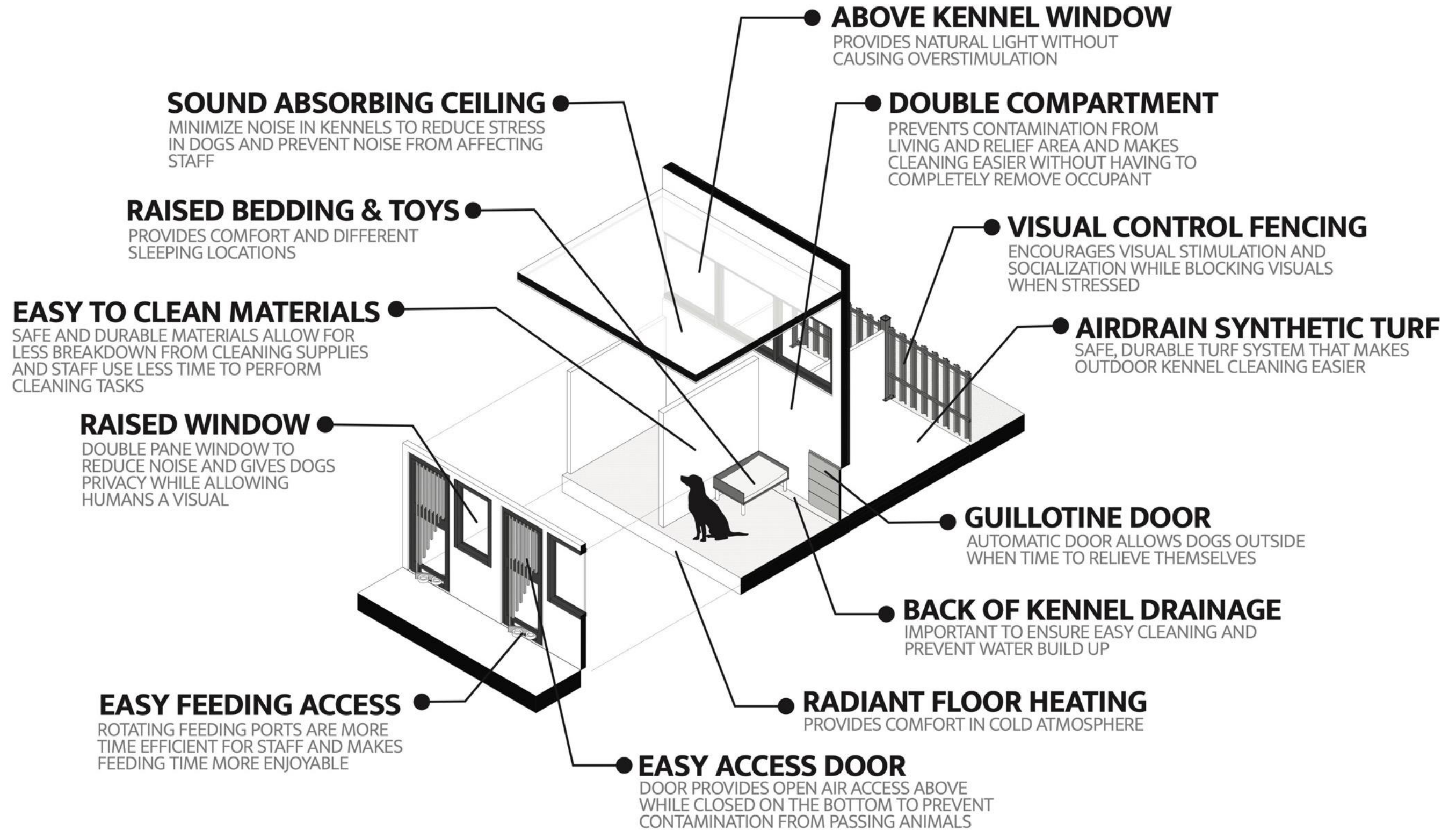




Figure 85.

*Rendering of Hudson Heart's front entrance.*



Figure 86.

*Rendering of the lobby space.*



Figure 87.

*Rendering depicting the dog puddle located on the site.*



Figure 88.

*Rendering depicting the dog parks located on the site.*



Figure 89.

*Rendering of the cat cafe.*



Figure 90.

*Rendering of the cat green space.*



Figure 91.

*Rendering of dog housing units.*



Figure 92.

Final project presentation boards





#### **4.4. Conclusions**

In conclusion, the research conducted and implemented in the proposed solution are conducted to help demonstrate a collection of potential design strategies that can be implemented in new animal shelter designs to encourage more architectural interest in designing for animal welfare. It is important that as architectural projects that involve animals get implemented, there is a regard for the animals being considered users in spaces. Although the animals can't directly convey their needs, it is important to understand behavior and mannerisms within the users to develop a thorough project that embraces compassionate design. The concept of providing more public, community integration within animal shelter design is done to foster the benefits of human-animal connections as a solution to fundamental issues causing concerns in shelters in operation today.

The design of the proposed building does not guarantee how the overall funding and social outreach will be provided therefore there is still the issue of the shelter being able to gain enough support in sectors outside of their building especially in encouraging fostering and volunteer work that are vital to a shelters success. There is still a plethora of challenges that the proposed solution does not address that should be developed further in continued research. There are more statistics and research that could be developed on how to specialize the use of community involvement in shelters and how shelters can properly convey their needs today. As more studies develop regarding economic crises and lack of social movements in regard to animal care, there needs to be a focus on the overall fluctuation of support being given to shelters from people using online platforms compared to the people local to the shelters.

More studies regarding emotional distress and cognitive deterioration in animals needs to be developed to conduct a more thorough understanding of what changes humans, as caretakers

of animals, can implement to assure that animals are being handled in a humane way. As new studies unfold regarding the physiological effects regarding animal welfare develop changes need to be addressed in shelters.

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## **SPECIAL APPENDIX**

### **2nd year**

- Fall:** 2020 Charlott Grueb  
Land Artist Studio  
Moorhead, MN  
Row Club Boathouse  
Minneapolis, MN
- Spring:** 2021 Emily Gou  
The Finley Dwelling  
Dwelling Studio– Cripple Creek, CO  
Faculty Living Center  
Downtown Mixed-Use – Fargo, ND

### **3rd year**

- Fall:** 2021 Emily Gou  
Fargo-Moorhead Arts District  
Fine Arts and Cultural Center – Fargo, ND  
Lime Light  
Child Care Center – Fargo, ND
- Spring:** 2022 Ron Ramsey  
Native American Culture Center  
Cultural Center, Fargo, ND  
Eagle’s View  
F-M Honor Guard Fargo National Cemetery – Fargo, ND

**4nd year**

**Fall:** 2022 Bakr Aly Ahmed

The Zirconia - Capstone

Mixed-Use Mid-Rise– Washington, DC

**Spring:** 2023 Bakr Aly Ahmed

Blissful Acres

Marvin Window Competition – Argusville, ND

Downtown West Fargo

Downtown Revitalization– West Fargo, ND