

THESIS

‘WE COULDN’T EVEN PASS A RESOLUTION
STRONGLY CONDEMNING SOMETHING’:
DECISION-MAKING AND PROCEDURAL INJUSTICE AT ROCKY FLATS

Submitted by

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ABSTRACT

‘WE COULDN’T EVEN PASS A RESOLUTION STRONGLY CONDEMNING SOMETHING’: DECISION-MAKING AND PROCEDURAL INJUSTICE AT ROCKY FLATS

Over the course of the Rocky Flat’s Nuclear Plant’s operation, multiple incidents led to radioactive contamination in the surrounding environment. In 1996, state agencies agreed on a \$7.3 billion remediation of the site, which was completed in 2005. On September 15, 2018, the periphery of the site was opened to the public as a Wildlife Refuge, in the center remains a space overseen by the Department of Energy. Despite remediation efforts, public opposition for both the Wildlife Refuge and the proposed roadway construction adjacent to the site remains due to concern with increased health risk for local communities. Given the history of contamination and community health response, Rocky Flats is an example of warranted environmental and procedural justice concerns. Literature indicates that procedural justice and environmental justice requires both access to information and public participation in decision-making. To examine these two elements at Rocky Flats, fifteen face-to-face interviews, participant observation of public meetings, and archival analysis was conducted. Findings indicate that Rocky Flats remains a site of environmental and procedural injustice due to the requirement of technical knowledge for public deliberation, and development of the Wildlife Refuge and the roadway despite clear public opposition. This thesis aims to contribute to environmental and procedural justice literature by examining public opposition in a post-remedial setting.

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CHAPTER I: INTRODUCTION

The Rocky Flats Nuclear Weapons Plant operated from 1952 to 1989 as a plutonium trigger facility for nuclear weapons production during the Cold War. During this period, there was intensive national security surrounding nuclear production in fear of information being relayed back to the USSR. While this may have been justified in the time period of operation, secrecy often expanded to practices that put local communities at risk. Some examples of this include the radiation exposure of miners on the Colorado Plateau, the release of radioactive waste into local water ways at Hanford, and the testing of nuclear bombs in New Mexico (Dawson & Madsen 2007; Brown 2013; Kuletz 1998). Researchers at these locations saw evidence of increased health risks for local communities, but were barred from exposing this information to the public (Brown 2013; Malin 2015). Instead, nuclear communities have had to determine issues impacting locals by sourcing collective information about public health experiences from one another, which then led to questions over nuclear production practices that once occurred at these sites.

Rocky Flats is situated within this nuclear history. This facility's purpose was to produce nuclear triggers with the plutonium available from the Hanford and Savannah River sites (New York Times 1978). The facility was owned by the Atomic Energy Commission (AEC) (which was subsequently split into the Department of Energy (DOE) and Nuclear Regulatory Commission (NRC)) and operated over the years by Dow Chemical (1951-1974), Rockwell International (1975-1986), EG&G (1990-1994), and remediated by Kaiser-Hill (1994-2005), (Buffer 2002; Iversen 2012). During its operation, there were many hazardous practices that released radioactive particles into the local environment. The most concerning incidents include

two fires onsite, improperly stored waste containers, and discharges into local waterways (Iversen 2012). Local community members were unaware of what was being produced at Rocky Flats – let alone the on-going contamination and leaks – because of intensive secrecy. For example, many people living near the facility assumed that the site was responsible for producing cleaning products, rather than manipulating high grade nuclear material for nuclear bombs (Iversen 2012). After a Department of Energy employee received an accidental dose of radiation the primary facility for plutonium operations, building 771, was requested to halt action until safety problems were remedied (McKinley & Balkany 2004). In 1989, the FBI raided the Rocky Flats facility after determining that building 771 continued operations illegally (McKinley & Balkany 2004).

Since 1970, there have been ongoing studies to determine contamination risk for local communities. Health outcomes in the communities have been contested among area residents, independent researchers, and government agencies. In 1970, Martell and Poet found offsite plutonium deposits up to 400 times that of background levels (Moore 2012). In 1974, Dr. Carl Johnson, the Director of the Jefferson County Health Department and a researcher, began to question the health impacts from the release of radioactive particulate into the environment. After collecting samples, he found plutonium concentrations ten to four times greater than those of Martell and Poet (Moore 2012). In 1975, Johnson found high rates of lung cancer and leukemia deaths in local census tracts (Johnson 1977). The DOE, in 1987, contested these findings by determining that rates of cancer were higher near the urban core of Denver, which was then disputed by Johnson (Crump et al. 1987; Moore 2012). In 1989, Johnson was met with opposition from realtors on the Board of Health who forced his resignation (Moore 2012; Iversen 2012). Today, this history is important because as residents become aware of the facility through

personal health experiences, they begin to question whether their local environment caused their failing health. The legacy of secrecy surrounding Rocky Flats has outspoken residents remaining suspicious of evidence produced by government agencies that indicate the safety of the landscape.

Due to the history of keeping critical information about risk from communities potentially living in danger, local advocacy groups feel that the land surrounding Rocky Flats constitutes continuing and significant health risks to surrounding communities and especially to people who may visit the former site or its boundary zone. These advocacy groups are: Rocky Flats Right to Know (RFR2K), the Environmental Information Network (EIN), and Rocky Flats Downwinders. I have focused on researching these groups for this thesis, given their important roles in demanding procedural equity for members of the public. Today, the DOE and the Fish and Wildlife Services (FWS) attest that soil samples indicate remediation efforts are not needed for the boundary zone to be safe for public recreation (USDOE 2006). The cost of cleaning up the land was estimated at \$36 billion, however the DOE, the Environmental Protection Agency (EPA), the Colorado Department of Public Health and Environment (CDPHE), Congress, and EG&G agreed to impose a limit of \$7.3 billion for clean up, by removing subsurface remediation from the equation (Abelson 2006). Additionally, the construction of a \$1,657,563 roadway, the Jefferson Parkway, is expected in the coming years. Advocacy leaders are concerned that the construction of this roadway will elevate radioactive dust into their community.

On September 15, 2018, the Wildlife Refuge opened for public recreation. The Rocky Flats Wildlife Refuge is divided into two zones. The Central Operable Unit is a 1,309 acre zone in the center of the refuge under the management of the DOE. This is where the facility once operated, and the remediation of the site occurred. The peripheral area is a 4,883 acre area

around the Central Operable Unit that has been opened up to the public for recreation, and is under the jurisdiction of the Fish and Wildlife Services. Through a human health and ecological risk assessment led by the DOE, it was determined that the periphery zone did not require any remediation requirements (USDOE 2006). The DOE determined this by collecting operating records of Rocky Flats, interviews conducted with those who had knowledge of Rocky Flats Operations, and soil and sediment data. Human health outcomes were estimated within a lifetime cancer risk of one in a million for a refuge visitor (USDOE 2006; CDPHE 2018). Advocacy leaders are concerned with this decision because no long-term cohort health study has been conducted, and attest that the health experiences of local communities do not reflect this estimation.

Rocky Flats Right to Know was organized by two grandmothers concerned with the access children would have to the Rocky Flats Wildlife Refuge and the lack of signage explaining the history and potential risk of the site to the public. Because the Wildlife Refuge was not included in the remediation of the site they believe that local populations will face health risks when accessing this site. Children ages zero to fourteen have been found especially susceptible after internalized exposure of ionizing radiation (Busby & Fucic 2006). As children are more likely to play in the soil, this group believes that there is an increased likelihood of children ingesting or inhaling residual radioactive particulate. As of April 27, 2018, one of the major accomplishments of this group was banning field trips for children to the Wildlife Refuge across Jefferson County, Adams County District 12, the Denver Public School Board, the Boulder Valley School District, and St. Vrain Valley School District. All of these school areas have agreed not to use the Wildlife Refuge out of caution for children's health and safety (The Nation Report, Oct 10, 2017). In addition to concern over community exposure, this group would

also like the community to be notified of the site's history and the residual contamination that remains in the environment. Without signage and communication about the history, residents, especially those who are new to the community, will remain unaware of the health risks which may exist. RFR2K are concerned that health risk will be exacerbated with future development. In extension, this group coordinates monthly community meetings about Rocky Flats to raise awareness over health risk, environmental exposure, and development in the community.

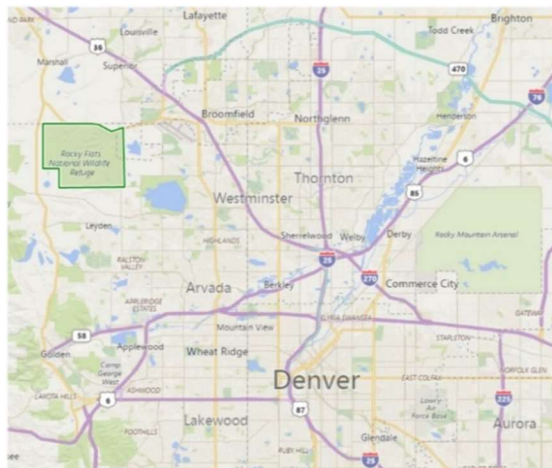


Figure 1: The Rocky Flats Wildlife Refuge boundary zone including the COP

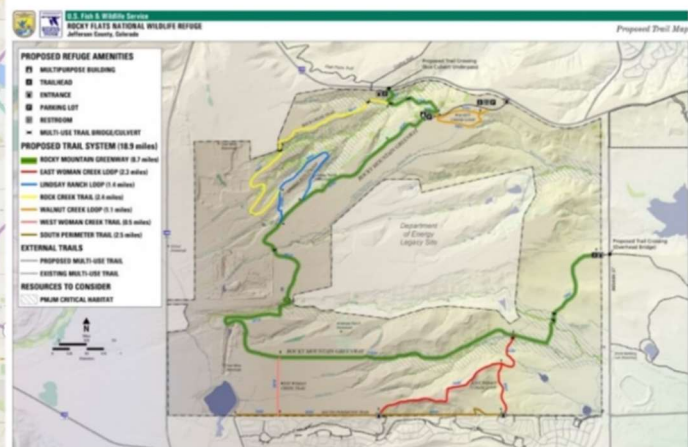


Figure 2: The proposed trail development on the peripheral refuge area

A second community group demanding environmental and procedural equity around the former Rocky Flats site is the Environmental Information Network. This group has been involved in exposing issues with Rocky Flats for decades. One of their first actions was reading the Mary Walker memo, which details talking points about Rocky Flats between the DOE and the EPA, on a local radio station. The Mary Walker memo states, “We have serious contamination, and we have extremely limited environmental and waste characterization data for a site of this complexity... Much of the good press we have gotten... has taken attention away from just how really bad the site is” (The Ambushed Grand Jury 2014). By exposing this and informing the public, the FBI was forced to act by raiding the facility. This group has also worked to produce community-based knowledge of contamination at Rocky Flats. One example

of this is through monitoring the environment with Geiger counters to see levels of radioactivity during a grass fire on the boundary zone. They found rates reaching heights of 19,999 counts per minute. This is a very high reading, as this group previously established background levels at eight to fifteen counts per minute for the site. EIN believes that this grassland fire was used as a method to expedite 'clean-up', by burning up the contamination to make space available for home development. To their knowledge, there have been no health studies examining the effects from this burn (EIN 2015).

The final major group concerned with the Rocky Flats contamination are the Rocky Flats Downwinders. The Rocky Flats Downwinders was founded in 2015 by two concerned residents, one who grew up in the area and one who entered the area without knowledge of the site. Both of these founders have seen and experienced extensive personal or communal negative health outcomes they associate with Rocky Flats. They are a non-profit organization hoping to bring awareness to the history of Rocky Flats. Overall their goal is to educate the community and medical professionals of the potential adverse health effects from living in proximity to the site. They also are adamant that the downwinders of the community receive supportive services, medical monitoring, and inclusion under the Radiation Exposure Compensation Act (RECA), which to date has only supported residents who were employed by the plant during operation. One of the major goals of this group is to expose health outcomes in surrounding communities. To do this they have teamed up with Metropolitan State University to distribute and analyse health surveys from local communities. Through convenience sampling, preliminary findings indicate that rare cancers were found in 48.8 percent of 1,745 cases of those who lived in the area between 1952 and 1992 (Jensen n.d.).

All of these groups have been active in informing the local community to environmental contamination in the landscape and/or continue to engage in public meetings to inform local residents of health risks and demand environmental and health justice for their community. Advocacy groups have two main spaces to convey environmental and health concerns of the site to public officials: the Stewardship Council and the Jefferson Public Parkway Highway Authority (JPPHA). The Stewardship Council was created to provide local oversight over residual contamination, to ensure that local government and community interests are met, and to maintain ongoing education of contamination management for future generations. Finally, the council has a commitment to address all other issues regarding Rocky Flats, as determined by the board. What this means is that while the advocacy groups introduced above are concerned over health issues, the opening of the refuge, and development in the community, the board of this council is able to determine if this should be considered an issue. The Board of Directors consists of elected representatives from ten local communities, each community has one director and one to two alternates. In addition, there is group representation from the League of Women Voters, the Rocky Flats Cold War Museum, the Rocky Flats Homesteaders, and a single resident representative.

The Jefferson Public Parkway Highway Authority has seven directors, one of whom also sits on the Stewardship Council. This group was formed in order to see the completion of the beltway around the Denver metropolitan area. The only portion of this road missing is a twenty mile stretch that presses up against the Rocky Flats boundary zone. Advocacy leaders are concerned about development in the community because they feel that it will re-suspend radioactive particulate into the atmosphere, where it will be inhaled by local and unsuspecting

residents. This thesis will focus on this group because they are focused on following through with a roadway that advocacy leaders are adamantly opposed to.

At the Stewardship Council meetings, the DOE and the CDPHE present to the board and the public. Recall that the DOE (formerly the AEC) has historically overseen the site and continues to be responsible for monitoring the Central Operable Unit, where the Rocky Flats facility once was. The CDPHE is responsible for monitoring and determining health risk to local communities from residual contamination. In 1998, they conducted a study of community health outcomes by evaluating cancer incidents in communities from 1980 to 1989 using the state cancer registry. They found no significant incidents of cancer in the majority of statistical regional areas, when compared to the population of the Denver metropolitan area. Four of ten research statistical areas were found to have statistically significant cancer ratios. Two of these regions remained significant for lung cancer after the inclusion of 1990 to 1995 data, however these incidents were attributed to smoking after examination of respondent smoking history. In 2016, the CDPHE updated the study using data from 1990 to 2014. Lung cancer was elevated in four communities, colorectal cancer was elevated in two communities, and esophagus cancer was elevated in one community, however, the CDPHE attributed all of these increased incidents to smoking histories. In 2017, the CDPHE, in response to the public, conducted an analysis using the same methods for incidents of thyroid and rare cancers, using 1990-2014 data. In this study they found one region to have increased incidents of pancreatic cancer but attributed smoking, alcohol and obesity likely causes. Advocacy leaders feel that this research does not represent community health experiences because it does not consider those who were diagnosed after moving away from the community, and demand a cohort study be conducted. Their major concerns relate to issues of environmental and procedural inequity.

Environmental justice activists and scholars focus on the disproportionate placement of toxic sites in underprivileged areas and the lack of space for authentic participation by these community members in determining zoning and land use around contaminated or polluting sites. Environmental injustice occurs through the inequitable distribution of environmental bads like air, soil, and water pollution, and a lack of participatory decision-making power for local populations (Schlosberg 2007). Procedural justice is necessary for environmental justice because residents of contaminated communities gain autonomy and self-determination over potential environmental risks (Lake 1996).

The historical events that have led to contamination of the environment and the ongoing concerns of health risk for the community appear to constitute an incident of environmental and procedural injustice. Rocky Flats was first sited in a working-class community where residents were unaware of environmental and health risks associated with nuclear development, due in part to the secrecy surrounding nuclear production. Academics have long examined the proximity of exposure in toxic communities through a snapshot of health incidences. To capture the legacy of risk that many communities endure, Szasz & Meuser (1997) insist environmental injustices must be examined through a historical understanding of the site. Today, advocacy groups seek to have health outcomes from this history recognized by government agencies. Their concerns and demand for participation in decision-making over the site indicate ongoing procedural injustice. Procedural justice in the environmental justice literature, is the pursuit of meaningful involvement and decision-making for communities over the risks that come with development in local landscapes.

In the context of Rocky Flats, where community residents' access to information, opportunities to participate in decision-making, and exposure to contaminants have been

questioned by affected parties, my study aims to investigate aspects of procedural equity in relation to contemporary development around the Rocky Flats site. In particular, I ask the following research questions:

- 1) How has scientific, technical, and other related information about Rocky Flats' contamination and clean up been presented for lay people of the community, by the CDPHE and other agencies?
- 2) How do community activists and community groups working on Rocky Flats issues perceive their opportunities for, or barriers to, authentic participation in related land use decisions?

In order to answer these questions, I have collected data utilizing three methods: archival analysis, fifteen face-to-face interviews, and participant observation, described in detail in Chapter 3. Two meetings from both the Stewardship Council and the JPPHA occurred over a five-month data collection period. Including RFR2K meetings, nine public meetings were attended and observed for this thesis. The three community advocacy groups and three public meeting spaces were selected for this study because they allow the best source of how procedural justice or injustice is occurring at the site today. This is important because Rocky Flats is a facility that was sited at a time when communities could not consent to the risks associated with nuclear facilities. As these communities have lacked agency over their environment since the inception of the facility, government agencies, and boards filled with elected officials, operate within a historical context that has led residents to question the safety of their environment, and the role that institutions have played in obscuring risk communication. Through these questions this thesis aims to contribute to environmental justice literature by examining community opposition in a space that has officially been considered remediated.

CHAPTER II: LITERATURE REVIEW

Introduction

Prior to the 1980s, environmental initiatives took on a predominantly white, middle class, male perspective of land conservation outside of lived local spaces (Taylor 2009). For example, in 1992, the cumulative budgets of environmental organizations dedicated only eight percent to toxic waste management, with the majority of the eight percent going to wildlife preservation initiatives (Taylor 2009). Many communities across the U.S. continue to deal with decades of environmental health issues from toxic contamination, pollution, and waste disposal. Due to large environmental organizations ignoring the concerns of local communities living in contaminated spaces across the nation, grassroots organizations have formed to tackle these environmental issues affecting their communities (Taylor 2009). Through local experiences, communities have determined that environmental inequities often occur by the unequal distribution of harm; in particular, harmful facilities or waste dumps are sited in neighbourhoods predominantly inhabited by racial minorities and lower income populations (Mohai, Pellow, Roberts 2009). These skewed distributive practices occur due to political influence in the decision-making process for facility siting (Roberts & Toffolon-Weiss 2001). Community leaders quickly realise that they must actively engage in the decision-making processes to protect their communities. Residents organize to have their concerns seriously recognized by policymakers. Therefore, as environmental and health outcomes are recognized by policymakers, faith in the institutions can be restored (Fischer 2000).

A framework of environmental justice, and procedural justice in particular, is needed to understand the conflict arising between community advocacy groups and institutional

organizations around Rocky Flats. While institutional representatives maintain that the site has been cleaned up and is ready for development, community members have reservations about increased risk and lack trust in governmental institutions after decades of deceit following nuclear development after World War Two. Therefore, the only way to resolve this conflict is for policymakers to enhance local residents' voices and meaningfully consider their perspectives in how the local landscape should be developed.

Below, I first discuss the impacts of nuclear development on communities across the U.S. and then at the Rocky Flats facility in particular. The concerns of these communities are rooted in health experiences; therefore, it is critical to delve into environmental health and epidemiological studies to understand these experiences. Finally, this literature review will explore the history and literature of environmental justice in order to analyse the environmental injustice of Rocky Flats.

Nuclear Distributive and Procedural Injustice

The nuclear fuel production cycle in the US has a legacy of distributive injustices, whereby toxic facilities have been sited without local communities being aware of the health risks associated with nuclear facilities. In order to contextualize the experiences of current residents near Rocky Flats, I first review the historical legacy of nuclear production, including the resulting distributive and procedural injustices that have plagued these communities.

In Colorado, instances of injustice have occurred at all phases of nuclear development. For example, 92 percent of US western uranium mines were within the four corners area, with 1,276 of these mines in Colorado, which has led to these areas taking on an inequitable distribution of environmental and health risks (Dawson & Madsen 2007). In the 1950s and 1960s, the majority of American uranium ore was produced in Colorado and Utah until the 1970s

and 1980s, when New Mexico and Wyoming became the prominent sources for uranium mining (Makhijani et al. 1995).

Uranium mining has had a devastating environmental and health impact on local mining communities; however, facility leaders often would not disclose the health risks to mine laborers and local communities (Malin 2015, Dawson & Madsen 2007). Researchers have studied uranium exposure and have found: that there is a greater cancer risk at lower levels of cumulative radiation than higher levels, health outcomes take approximately twenty years to develop, and smoking does not explain the relationship between lung cancer and radiation exposure (Dawson & Madsen 2007). Additionally, several studies report uranium miners have developed non-malignant respiratory disease, lung cancer, pneumoconiosis, tuberculosis, chronic obstructive respiratory disease, emphysema, benign and unspecified tumors, and disease of blood and blood forming organs (Holaday et al. 1952; Roscoe 1997; Dawson & Madsen 2007). Importantly, health risks were also experienced by the rest of the community as workers brought uranium dust back home with them on their clothing (Malin 2015).

The impacts of nuclear development have been hidden from many communities across the US, resulting in distributive and procedural injustice. For instance, health outcomes were kept from residents in Nevada, a state that has had one hundred atmospheric and nine hundred underground nuclear detonations alone (Boutte 2002; Makhijani et al. 1995). The AEC carried out the tests in Nevada despite being aware of the health outcomes they were causing downwind communities, such as leukemia, malignant tumors, genetic defects, cataracts, obesity, impaired fertility, and shortened life spans (Fradkin 1989). As with workers' access to information, downwind communities were not informed about these health risks. When researchers attempted to follow up on the outcomes of nuclear fallout on local communities, the AEC prevented public

release of the information for years. For example, a 1961 report indicating increased leukemia rates in southwestern Utah after exposure to fallout, was obstructed by the AEC until 1978 due to concern that the results would create public opposition to nuclear testing (Ball 1986).

Nuclear communities are treated as sacrifice zones once the land has been thoroughly contaminated. Kuletz (1998) examines the nuclear contamination left over from nuclear development during the Cold War and the Indigenous communities of Western Shoshone, Southern Paiute, and Owens Valley Paiute who condemn its existence. New Mexico has been left with thousands of nuclear mines and mills, two proposed waste sites to store all of the US's nuclear waste, other unofficial nuclear waste sites, secret testing sites, and the home to the largest nuclear accident in the nation (Kuletz 1998). Historically there were more than 928 above- and below-ground nuclear testing detonations in this state, which contaminated the homes and communities of local residents who have become known as 'downwinders' (Kuletz 1998). While Indigenous populations provided experiential evidence of increased cancer rates among their communities, scientists delegitimized these claims by producing contrary scientific evidence (Kuletz 1998). For example, the Indian Health Services (a division of the U.S Department of Health and Social Services) reported that there was no evidence of health risk to the area and no need for future studies, despite research which indicated increased rates of miscarriages at two times the average, in addition to infant deaths, genetic abnormalities, and learning disabilities among local populations (Kuletz 1998). Additionally, a study conducted by the March of Dimes Birth Defects Foundation (MDBDF) was unable to demonstrate statistical significance due to a limited sample size, putting small Indigenous populations who experience wide ranging health outcomes at a clear disadvantage for scientific legitimation (Kuletz 1998; Shields et al. 1992).

Contaminated communities often come against scientific boundaries when attempting to show significance due to small population size from wide ranging health outcomes.

The Radiation Exposure Compensation Act was created in 1990, and amended in 2000, to provide financial compensation to uranium miners, atomic downwinders, and nuclear test participants (Dawson & Madsen 2007). While the creation of an act was invariably a positive course of action, stringent criteria including: proof of exposure risk, geographic boundaries, and only being accessible to specific positions within the uranium extraction industry, left many excluded from compensation (Dawson & Madsen 2007; Brugge & Goble 2003). In 2000, amendments removed many restrictions but introduced new restrictions including: the requirement of forty working months or one year of mine employment, and the exclusion of workers employed after 1971 (Dawson & Madsen 2007). While some downwind communities in Arizona, South Dakota, and Utah are eligible for compensation, geographical boundaries exclude communities within Idaho, Colorado, northwest New Mexico, Iowa, western Montana, and upstate New York despite also being at risk of high fallout doses (Dawson & Madsen 2007). Community advocacy groups mobilizing around the Rocky Flats plant who identify as downwinders also remain excluded from RECA in part, due to these geographic restrictions.

After excavation, uranium was sent to many nuclear facilities for various kinds of processing. The Hanford nuclear production facility in Washington was one such facility, and it specialized in the processing of nuclear weapons. At Hanford, run by DuPont, there was also a legacy of secrecy, pollution, and procedural injustice. To retain and ensure loyal workers for the projects of the nuclear industrial complex, communities were built with the intention of being attractive places for nuclear families to settle (Brown 2013). Due to the national security protocol at the time, the Hanford site, operated by federal, corporate, and scientific elite, was able to

conceal from the public their dumping of radioactive contamination into the surrounding landscape (Brown 2013). A federal, corporate, and scientific elite are people whose positions privileged them to access of environmental and health risk information that the lay public was not made aware of and held decision-making power over the site. A declassified memo from the AEC exposes how elites justified the contamination of landscapes around nuclear sites, referring to these populations as, “low-use segment[s] of the population” (Gallagher 1993). In part, radioactive release was due to the removal of irradiated uranium rods from cooling tanks after five weeks, as opposed to the required three months, in order to expedite production time at the cost of environmental and health risks (Brown 2013). When legal disputes did arise, DuPont and the Army Corps had a secret deal with the Department of Labour (DOL) which allowed lawsuits to be brought to a tribunal headed by the contractor and the federal government instead of civil court. In this way, knowledge and power were retained by the federal government, corporate, and a scientific elite, to ensure the perpetuation of nuclear development, at the expense of the citizens, who Cold War rhetoric was said to protect.

The releases from the plant were shown to have serious consequences for the residents surrounding the facility; however, these findings were also shrouded in secrecy. For example, scientists fed local sheep uranium pellets to test for health impacts and found that the sheep experienced weakness, disorientation, difficulty moving, ulcers, and stillbirths, but the results were kept classified (Brown 2013). Despite these results, when local residents became concerned through their own experiences, the researcher told the court that the sheep were not exposed to high enough radiation levels and then published articles directly contradicting these earlier findings. When residents tracked cancer and heart disease cases on a map, this methodological approach was later disputed in court by experts (Brown 2013).

Methodological approaches used to confirm the health outcomes of contaminated communities often do not have the required statistical power due to small sample size. For instance, Indigenous communities have had their health greatly impacted by the nuclear contamination at Hanford. In the 1980s, three Indigenous communities were designated as affected communities and, in 1989, a clean up agreement was negotiated between the DOE, the EPA, and the State of Washington. Indigenous communities were left out of the agreement proceedings but were included on the Hanford Advisory Board which provided them budgetary oversight (Liebow 2007). In 1990, nine Indigenous groups were subcontracted in the clean up of their local environment so that the remediation effort would reflect their perspective (Liebow 2007). Once individuals of the Indigenous groups learned the required skills for risk exposure modeling, they discovered that due to the necessity of statistical models to be representative of a general population, statistical modeling would not be feasible to establish conclusively that Hanford was the reason for the thyroid disease among community members (Liebow 2007). When the Agency for Toxic Substances and Disease Registry (ATSDR) later tried to include Indigenous groups in another study, the agency was ultimately dependant on the DOE for funding, and the restrictions of this funding prevented the creation of a medical monitoring program for these communities (Liebow 2007).

At every stage of the nuclear development process there has been a legacy of secrecy, contamination, and contestation of health research when communities or scientists attempt to advocate for environmental justice. The procedural injustice of siting nuclear operations without community knowledge of environment and health risk has resulted in an inequitable distribution of these risks on nuclear communities. The historical and contemporary community experiences in Rocky Flats continue to highlight this pattern.

Rocky Flats

Rocky Flats was a Cold War era plutonium trigger plant constructed sixteen miles northwest of Denver, Colorado's urban center. Today, community development encroaches upon the site's buffer zone established to protect residents from exposure to radioactive particulate. While many residents once worked at the facility, it was viewed as an enigma to the broader community. For example, Iversen (2012) observes that residents were unsure what the facility created, many assuming the product to be cleaning supplies.

From 1952 to 1989, Rocky Flats manufactured more than seventy thousand plutonium triggers (Iversen 2012), worth nearly \$4 million apiece (Herbert 2008). The facility was owned by the AEC, but over its lifetime it has been operated by Dow Chemical, Rockwell International, EG&G, and cleaned up by Kaiser-Hill (Iversen 2012). Scientists have found plutonium as one of the most toxic human made elements, where even a minute amount of plutonium particulate in a human's body is enough to cause the development of cancer (Moore 2012). For instance, plutonium-239 was studied in the lungs of an ape and the study concluded that while the alpha rays from the particles do not travel very far in the body, they can penetrate more than 10,000 surrounding cells (Del Tredici 1987). This conclusion is particularly salient given that plutonium-239 and plutonium-240 have been estimated to have a half life of 24,000 years and 6,537 years respectively, meaning that not only will particles emit radiation within the body over a lifetime, these radioactive particles will also remain in the environment much longer than we can imagine (Iversen 2012; Grogan et al. 2000). Though energy absorption is dependent on the rate of particulate transformations that occur and the rate of energy that is released from these transformations, a single particle of plutonium can attach to internal organs and continuously expose surrounding tissue (Iversen 2012; Grogan et al. 2000). One potential consequence is the

development of cancer, which can take years or even decades to manifest (Iversen 2012; Grogan et al. 2000). Because of this, community members are still concerned about incidents that led to residential exposure decades ago.

Two major fires occurred over the course of Rocky Flat's operation, in 1957 and 1969 (Schneider Feb 15, 1990). The 1969 fire caught the attention of Ed Martell, a radiochemist for the National Center for Atmospheric Research (Moore 2012). When Rocky Flats officials declined to conduct an off-site soil sampling, Martell and Poet conducted this research themselves (Moore 2012). Through their soil sampling they found that multiple locations east of the facility had plutonium deposits within the top .39 inch of soil, which were 400 times background radiation levels (Moore 2012). Martell met with AEC, Rocky Flats, and Colorado Department of Health (CDH) officials to present the findings, but was told that the contamination did not come from the 1969 fire and that, instead, it was more probable that this contamination came from leaking drums of plutonium waste or the first fire in 1957 (Moore 2012). This meeting was the first time that the public or the state government became aware of the 1957 fire and the leaking radioactive waste on site (Moore 2012). In 1957, a fire in building 771 destroyed many filters meant to prevent plutonium from escaping into the environment, and although a dose estimate has been conducted, little data exists to confirm how much radioactivity the community was exposed to (CDPHE n.d.). Dr. Krey, an AEC scientist, soon confirmed Martell's findings, indicating that plutonium contamination had been widely distributed off-site and into the Denver Metro (Krey 1976). However, these samples mixed both surface and subsurface soils and while this study could indicate the release of contamination from Rocky Flats, scientists were unable to determine surface contamination from this method (Moore 2012). An additional issue with this study is the small sample size, as there were only twenty-five

samples collected over a large spatial area, of which, only fifteen had plutonium deposits (Moore 2012).

With evidence of soil contamination, the CDH set contaminated soil standards to 0.2 disintegrations per minute per gram of soil (dpm/g) (Cleere 1973; CSBH 1973). However, this conservative standard was quickly expanded to 2.0 dpm/g, and regulations preventing residential, commercial, and industrial uses were removed (Cleere 1973; CSBH 1973). Soil in these new construction projects would now only need to be plowed below the surface soil (CSBH 1973). In later sampling, the CDH took soil samples however, importantly, they mixed the samples that they collected, which led to diluted results that were only able to show an average distribution of plutonium in the soil (Love 1994).

As in other cases of nuclear contamination and intensive national security, health studies conducted on the public health risks of contamination remained highly politicized and controversial. Conflicting studies show how contested claims of contamination and illness related to Rocky Flats have been ongoing for decades. In 1974, Carl Johnson, the Director of the Health Department of Jefferson County, was asked if housing development should be permitted in the area and felt it necessary to examine the risk of development (Johnson & Holland 1985). To do this he collected dust samples from twenty-five locations around the facility and found that plutonium contamination was ten to forty times greater than what Martell and Poet had previously found (Moore 2012). He argued that sampling dust was more accurate to determine the actual health hazard present in the environment since larger soil samples would not be inhalable. The CDH brought in a retired DOE scientist to dispute the method, but the scientist ended up agreeing with Johnson that his dust sampling method would be much more cautious

than the CDH's soil sampling method. Consequently, Colorado officials chose to ignore this second opinion (Morgan 1976).

In a later study, Johnson took 72 dust samples up to 18 miles away from the facility and found evidence of non-uniform distribution with some samples 17 times higher than background radiation (Moore 2012). At some of these locations, the samples indicated sources of Cesium and Strontium-90, elements found in the event of a nuclear fission criticality, which is an uncontrolled nuclear fission event that spews radioactive material into the surrounding environment (Moore 2012; Iversen 2012). In response, the Jefferson County Board of Health, mostly consisting of realtors, voted for Johnson to resign (Moore 2012). In 1981, Johnson was dismissed from the Jefferson County Board of Health with the election of a representative of the Homebuilders' Association to the County Commissioners (Iverson 2012).

In an additional study, Johnson compared 1975 census tracts' rates of leukemia and lung cancer deaths certificates and found that contaminated tracts had greater rates of these deaths. (Johnson 1977). In opposition, the DOE brought in Dr. Crump to replicate and refute Johnson's findings (Moore 2012). Crump found that cancer incidences were highest in the urban core of Denver, rather than the northwestern outskirts near Rocky Flats (Crump et al. 1987). Johnson, however, disputed these findings; he claimed that Crump's methodological approach considered the state capital as the source of radiation and diluted the rates of cancer in the Rocky Flats area by including the City of Boulder (Moore 2012). Despite this, a housing lawsuit occurring at the time over contaminated land and health risk ruled in favour of a \$9 million settlement and acknowledged the danger of contaminated land (Johnson n.d; Moore 2012). However, when the issue of health was brought up in court, the experts for the plaintiffs, including Johnson, were not allowed to speak and the CDH used Crump's study to claim that there was no evidence of health

risk at Rocky Flats (Johnson 1985; Moore 2012). While health is the ultimate reason people are concerned over purchasing contaminated households, the health claim was dismissed despite the housing settlement, which effectively acknowledged a health concern for the area as houses remain on a contaminated environment.

Residents in Colorado have also experienced systematic dismissal of their environmental and health concerns. Activists and other members of the public have had to fight for any transparency about Rocky Flats throughout its operation. In 1988, a Sierra Club Citizens' lawsuit shut down building 771 after an inspector from the DOE and two workers were exposed to plutonium (Iversen 2012; McKinley & Balkany 2004). The FBI raided the Rocky Flats facility for breaking this lawsuit after observing midnight incineration of contaminated material and radioactive runoff from the spray fields going into Woman Creek which feeds into Standley Lake, a nearby drinking water source for local communities (Iversen 2012).

A Grand Jury composed of citizens was gathered to decide how to charge people with the environmental crimes that had occurred at the site. The Department of Justice (DOJ) looked to settle the case instead of going to trial, fined the Rockwell Corporation \$18.5 million, and agreed that there was no offsite harm (McKinley & Balkany 2004). Rockwell's demands for settlement included the following: no indictment of any individuals only the corporation, no Grand Jury report, no debarment, no charges for liability, and a statement that there had not been midnight burning (McKinley & Balkany 2004). Rather than go through with this decision, the Grand Jury produced a report asking that top officials of Rockwell and the DOJ be charged as criminals for their leadership that placed the community at risk. Instead of following through with the Grand Jury's decision, the judge publicly denounced the Grand Jury by announcing to the public that they had failed in their duty (McKinley & Balkany 2004). Young (2000) describes that

democracy requires, that all members of society be included equally, and have equal opportunity to influence decision-making outcomes. Yet, the Grand Jury, representing the will of the people, was ignored by those in power of our judiciary system and their report was sealed from the public (Mckinley & Balkany 2004).

A member of the Grand Jury decided that the public should be informed about the cover ups that were occurring through the court proceedings and released the Grand Jury report, which discussed their conclusions and the justification of targeting top governmental and corporate officials (Mckinley & Balkany 2004). The court system responded to this action by placing the Grand Jury under investigation; if any members shared more information with the public about the proceedings of the court case, they could be sentenced to 20 years in jail for breaking their oath of silence (Mckinley & Balkany 2004). After the company was fined, the public was given the impression that justice had been served. With the Grand Jury unable to speak out in relation to the information they had witnessed about the incredible amount of contamination at the facility, the state to moved forward with cleaning up the site in a cost and time effective manner by turning the area into a green space.

While the DOE estimated that cleanup of the facility would cost \$36 billion, Kaiser Hill was awarded the project with a budget of just \$7.3 billion (Satterfeild & Levin 2007). Therefore, the soil would be cleaned up as best it could be, within the strict parameters of a significantly reduced budget. For example, surface soil of three feet in depth would be cleaned to fifty pico curies of plutonium per gram of soil (pCi/g), while soils between three and six feet were restricted to 1,000 pCi/g, and no limit was set below six feet (Satterfeild & Levin 2007). Satterfeild & Levin (2007) places these levels into context by highlighting that the Nevada Test Site had cleanup standards set at 200 pCi/g and the cleanup of the Livermore Laboratory in

California was set at ten pCi/g. The next paragraph will examine how citizens concerns of these cleanup standards have historically been regarded by government agencies.

Cameron & Lavine (2006) report the impeccable remediation at Rocky Flats obtained through the efforts of innovation and managerial practices. This perspective has been disputed through an ethnographic research of the clean up process. Satterfeild & Levin (2007) contend that while public participation was a part of the clean up process, it soon became replaced with a discourse of risk communication by professionals. To interrogate this, they conducted field observations over an eighteen-month period and interviewed 25 people involved with the process. These interviewees included the following: representatives of local governments, the Citizens Advisory Board, the DOE, EPA, CDPHE, and Kaiser-Hill, local journalists, and local activists (Satterfeild & Levin 2007). The authors highlight that despite citizens developing technical expertise, this knowledge failed to bring resolution to the remediation process, and instead created more conflict (Satterfeild & Levin 2007). Conflict occurred because while the community participated, the agencies and contractors came into discussions of remediation with pre-decided fiscal and temporal limitations (Satterfeild & Levin 2007). Where the community wanted the contaminated soil cleaned up to the fullest extent possible, the agencies decided to clean up the land to the best possible standards within a budget. This decision remains an additional source of conflict, layered atop sediments of deceit and secrecy since 1952.

The Fish and Wild Life Services, which have been given management responsibilities over the wildlife designation of the land, describe Wildlife Refuge creation as important for restoring and preserving native ecosystems (FWS 2018). Highly contaminated landscapes are often remediated as wildlife sanctuaries because the cleanup standards are less restrictive in comparison to the standards required for residential or commercial development (Havlick 2007).

In this way, contaminating military practices are presented as compatible with the greening of landscapes (Havlick 2007). The benefits include the streamlining of military base closures, the creation of new spaces for recreation, scientific study, education for the public, and the increase of animal population within the habitat reserves (Havlick 2007). While the greening of space under the management of the FWS is often a good thing, what is not considered are the budgetary constraints, which in turn result in a limitation of public access to the sites (Havlick 2007). For example, while Rocky Flats is being remediated into a Wildlife Refuge, there will continue to be a Central Operable Unit closed off to the public and monitored by the DOE (DOI 2018). The authors conclude that failure to highlight the ways that the military retain control over ‘remediated’ spaces will result in the assumption that military conversion is a process of demilitarization and the conflation of military objectives as environmental conservation (Havlick 2007). Nearly twenty-four military installations have been reclassified as wildlife sanctuaries since 1988 in the US (Havlick 2007). While these lands are some of the most contaminated spaces, they are also the most biodiverse federally-controlled lands (Havlick 2007).

The prior examples show that there have been many instances of people speaking out about the contamination at Rocky Flats, only to be silenced through the use of governmental, corporate, or medial institutional power. Beginning with intensive national security, residents were unaware of the purpose of the facility from the beginning of its operation. Once news came out about the contamination around the facility, researchers who had tried to make community members aware of the risk were fired or discredited. After the FBI raids, a Grand Jury was selected in order to provide the image of community participation in the political process; however, the judge went against the actions that the Grand Jury report requested, once again silencing citizens in order to protect corporate and governmental elites. These events indicate

clear procedural inequality in the decision-making process for communities living with the burden of Rocky Flats. In all of these instances, both trust and fairness have been breached by governmental agencies and institutions. Therefore, they are responsible of correcting these errors by providing the communities around Rocky Flats participation and self-determination for what will occur in the future.

Due to these past actions by the government, community advocacy groups are concerned with the health risk that the plant presents to the community. While the government argues that the site has been cleaned up and that there is no statistical significance of increased cancers, residents are wary of these claims due to the legacy of secrecy surrounding the site. These tensions are magnified as development projects continue in the area despite the pleas of local community groups.

In recent years, housing development has increased around Rocky Flats, with the neighborhood of Candelas encroaching on the property line of the former facility's buffer land, which was established to provide the community a small amount of protection from contamination. Additionally, as of September 15, 2018, the Rocky Flats Wildlife Refuge is open for public recreation. Finally, the last leg of the ring road around the Denver metropolitan area is being constructed directly adjacent to the boundary area (JC July 25, 2017). The overall expenses for this highway are \$1,657,563 and is scheduled for construction in the fall of 2022 (JPPHA Oct 13, 2017; JC July 25, 2017). The completion of this roadway is estimated to bring a \$1.2 billion net economic and fiscal benefit increase to Jefferson County, as well as net fiscal benefits of \$25.8 million (JCEDC Oct 2017). The net fiscal benefits are calculated upon the assumption that the completion of the Jefferson Parkway will result in a 16% increase of non-residential businesses being constructed on the local landscape (JPPHA Oct 2017). This indicates that the

plan for the community is to develop residential and non-residential buildings in the area and to keep the land that was once used to construct nuclear triggers as a recreation space. Provided that community advocacy groups have the difficult position of voicing their concerns against powerful interest groups, what barriers do these groups experience in becoming part of the decision-making process for their community? The following section examines how health experiences are often a platform used by communities to voice opposing perspectives to elite decision-making practices.

Environmental Health, Contested Illness, and Health Social Movements

Health social movements challenge mainstream medical power, policy, and professional authority. Brown et al. (2004) describes that health social movements can be understood in the following three ways: seeking access to health care services; drawing attention to social inequalities of gender, race, class, and sexuality that exacerbate health inequalities by restricting affordable access to healthcare; and disrupting how disease, illness experience, disability and contested illnesses are operationalized in our society. This final category is what Brown argues embodied health movements challenge. Activists within embodied health movements frame their critiques of systemic issues through their own health experiences (Brown et al. 2004). Embodied health movements have three characteristics, namely: the biological body is central to the social movement; activists challenge how medicine and science define lived health experiences; and activists collaborate with scientists to pursue research, funding, treatment, and prevention (Brown et al. 2012). While the movement is motivated and legitimated through personal health experiences, the community base that composes the movement may not all have the health issues, but perceived risk is enough to start social action (Brown et al. 2004). Community

members surrounding Rocky Flats have seen loved ones experience a variety of health issues and many perceive contamination as the cause of these experiences.

Brown & Zavestoski (2004) expand on health social movement research by examining the relationships these movements have with science. Many articles discuss how science has become delegitimized through the use of scientific findings as a tool to suppress dissent (Ong and Glantz 2001, Rosenstock and Lee 2002, Greer and Steinzor 2002). Health science movements, especially embodied health movements, often critique scientific findings that do not align with their lived experience. Paradoxically, in order to legitimize their lived experiences, they are required to produce scientific knowledge that enhances their ability to advocate for policy change (Brown & Zavestoski 2004). Brown (1992) describes one aspect of popular epidemiology through toxic waste activism. Popular epidemiology is often the method used in order for a community to fight for recognition of their health experiences. Typically, embodied health movements organize by first experiencing the health issue on an individual basis and then come together after discovering others with similar experiences in the community (Brown 1992; Brown et al. 2004). After hypothesizing the cause as something out of the ordinary, lay people engage with government officials and scientific experts about their experiences and encourage government agencies to conduct a scientific study (Brown 1992). The governmental study often finds no association between contaminants and health effects. Finally, community groups bring in their own experts, who then find support for local health experiences and challenge governmental findings (Brown 1992). Community groups around Rocky Flats rally around a combination of health issues either experienced personally or by loved ones and produce science that the institutional elite reject in favour of their own findings.

Cable et al. (2008) expand on contested illnesses by showing that illnesses are an outcome of risk societies, especially through the guise of national security and the nuclear industrial complex. Cable et al. (2008) describe how nuclear production has left radioactive and toxic by-products, unbeknownst to the communities built above these soils. Health problems have become so common within communities that they are regarded by researchers as ‘environmental illnesses’; common symptoms include the following: multiple chemical sensitivities, immune system deficiencies, tremors, chronic fatigue, memory loss, unexplained rashes, chronic headaches, tumors, and depression. When researchers debate the effect of the environment on human health, citizens face the consequences by not being able to access vital health services, welfare, and worker compensation (Brown et al. 2004). Contested illnesses tend to serve in the interests of corporations, government, and medial authorities (Cable et al. 2008). Corporate authorities are advantaged by contesting illnesses, as this allows them to continue production for profit and preserve economic hegemony (Cable et al. 2008). Similarly, state interests benefit in contesting illnesses by retaining the power and wealth that come with the production of nuclear weapons on a global field (Cable et al. 2008). Finally, physicians benefit by protecting their work contracts within the corporate and state institutions challenging the illnesses (Cable et al. 2008).

The politically embodied nature of contested illnesses can be seen through the experiences of Downwinders around the Hanford site who advocated for health studies to be conducted. Nussbaum et al. (2004) detail many of the same steps that Brown (1992) highlighted. Frustrated downwinders organized, educated, and conducted their own health surveys that were in turn dismissed by governmental agencies (Nussbaum et al. 2004). Institutional elites did not respond until the Freedom of Information Act forced the DOE to release documents describing

accidental or deliberate releases of radioactivity into the local environment (Nussbaum et al. 2004). The health research funding was provided to the DOE, the same institution responsible for the previous disinformation campaign nullifying local residents' experiences (Nussbaum et al. 2004). Unsurprisingly, the health study conducted by the DOE found no significant rates of health issues for citizens to be concerned about (Nussbaum et al. 2004). Governmental agencies also created citizen advisory committees; however, the Downwinders soon found that the meetings served to dissipate anger over their own marginalization (Nussbaum et al. 2004). Public meetings such as these act as opportunities for public relations rather than public involvement (Nussbaum et al. 2004). To legitimize their experiences community advocacy groups who identified as Downwinders met with physicians who empathized with their experiences and created and distributed a health survey (Nussbaum et al. 2004). This health survey found elevated occurrences of hyperthyroidism and excess stillbirths for Downwinders (Nussbaum et al. 2004). Thyroid, central nervous, and female reproductive cancers were also significant (Nussbaum et al. 2004).

In the United States, research examining health outcomes related to nuclear production has often concluded that health outcomes cannot be pinpointed to a given industry. The Agency for Toxic Substances and Disease Registry (2006) found that cancer rates in Monticello, Utah, a uranium mining town, were lower than the remainder of Utah. There are many problems with this study, ranging from Monticello's small population size, cancer diagnosis not represented outside the state, and the lack of cancer analysis prior to 1973. In Rocky Flats something similar is happening where housing is being advertised as an attractive place to live (Hendee 2017). As a result, epidemiological studies of Rocky Flats will encounter many of the same issues other nuclear health studies have experienced including the loss of people to study due to health

outcomes, migration out of the area as people who become sick become aware of the risk, and migration into the area due to the attractive location.

In 1998, the CDPHE conducted a study comparing the rates of cancer, including esophagus, stomach, colon and rectum, liver, lung, bone, leukemia, lymphoma, and brain cancer, between communities around Rocky Flats and those of the Denver metropolitan area (CDPHE 1998). Four of ten statistical regions had elevated ratios of cancer. The CDPHE used 1990 to 1995 data to follow up these elevated ratios and found that only two remained significant for lung cancer, which they attributed to smoking after examining the smoking histories of individuals. In 2016, the study was updated using 1990 to 2014 data. Again, lung cancer was elevated in four communities, colorectal cancer was elevated in two communities, and esophagus cancer was elevated in one community, however, the CDPHE attributed all of these increased incidents to smoking histories. In 2017, the CDPHE conducted an analysis of thyroid and rare cancers due to public backlash. They found one region to have elevated pancreatic cancer but attributed smoking, alcohol and obesity as the likely cause. The CDPHE recommend that citizens adopt a healthy lifestyle avoiding tobacco, alcohol consumption, sun exposure, to take up running, and to watch their diet instead (CDPHE 2017). Community advocacy groups are working to refute these conclusions with their own community-based health studies.

Health risks that workers have experienced as a result of exposure to contamination has led to compensation through RECA. The health outcomes that communities with nuclear histories experience are contested by elites, which compound health and environmental injustices. The following section will discuss four forms of injustice that are widely discussed in the environmental justice literature. Recognition of lived health outcomes and participation in the

process of deciding what should be done with local landscapes are two methods to restore community trust in institutions after decades of deceit.

Environmental Justice

Love Canal has been considered one of the seminal events of the anti-toxic movements (Gibbs 2014). Love Canal is a community that was situated on Hooker Chemical's (now known as Occidental Chemical) toxic dumping land, where an estimated 22,000 tons of toxic waste was dumped (Fletcher 2003). These chemicals rose through the surface soils and leached into households after a large snowfall in 1978 (Fletcher 2003). Community members and, in particular, women advocated for the government to take action (Newman 2001). The government evacuated 239 families out of the area, but 700 were told that they did not qualify for evacuation and reimbursement because they were not at sufficient risk (Newman n.d). The residents who were left behind produced their own citizen science; Gibbs and others, for example, constructed a community health survey with the guidance of Dr. Paigen, labeled disease groups on a map, and found illnesses clustered along swales (Gibbs 2014). Despite showing evidence of negative health effects, these diseases have been difficult to wholly attribute to the contamination at Love Canal. Some authors, for example, found no evidence of increased rates of cancer or mortality in the area (Janerich et al. 1981; Gensburg et al. 2009). Clark Heath Jr. (1983) criticizes these findings because the nature of observing rare cancers requires a small population size that is easy to be indistinguishable when compared to the general population. Today, this event is considered the beginning of the environmental health movement because of the coordination it has spurred between activists and researchers – and because it led to the legislation that introduced the Superfund.

The contamination of Warren County in 1978 is another foundational event for the formation of environmental justice activism, through its analysis of environmental racism, or unequal environmental risk distribution based upon racial inequalities. The Ward Transformer Company hired people to illegally dump PCBs along rural roads and left the State of North Carolina responsible for cleaning up the contamination (McGurty, 1997; Szasz & Meuser 1997). Rather than transporting the soil to a pre-approved hazardous waste landfill in Alabama, the state government decided to save money by opening a new waste landfill in Warren County. African American activists in the county argued that the siting of the landfill was due to racial discrimination by government agencies and allied themselves with civil rights leader, Reverend Benjamin Chavis.

Under public pressure, the US General Accounting Office (GAO) studied landfills for four communities in the southern United States and found that three of the four communities were predominantly black (UCC 1987). Just a few years later, Chavis convinced the United Church of Christ (UCC) to fund two studies examining the relationship between toxic waste facility locations and racial composition of surrounding communities (McGurty 1997; Szasz & Meuser 1997). They found race be the most significant variable in relation to hazardous waste siting and, in the communities with these sitings, the average minority population was 24 percent more than those without (UCC 1987). While they acknowledge that socioeconomic status plays a role in relation to hazardous waste siting, they still found race as the most significant indicator of the siting of waste facilities, demonstrating an instance of inequitable distribution of environmental bads across the country (UCC 1987).

While they found race as the largest predictor of their study, vulnerability due to class cannot be ignored. Since the 1990s, researchers have been debating whether class could be the

original predictor of environmental inequality, then followed by race (Mohai, Pellow, & Roberts 2009). Class and race can both be shown as the largest predictor for environmental inequality based upon how a researcher samples the model. For example, while the UCC used zip codes and found race as the largest predictor, Anderton et al. (1994) used census tracts and instead found class as the predictor of facility siting. This debate is important because if environmental bads are distributed to communities of colour due to racist zoning procedures, the solution would be to change zoning procedures to reflect a more race-equal distribution. If the problem is due to class-based decision-making, where the siting of facilities results in diminishing neighbourhood values, which in turn results in the neighbourhood becoming more financially accessible to lower income people, policy makers would be drawn towards integrating neighbourhoods to reflect a variety of income brackets (Been 1995; Pastor, Sadd, & Hipp 2001).

Class is important in how a neighbourhood is able to resist contaminating industries. Faber and Krieg (2002) discuss how households with a median average income of less than forty thousand dollars in Massachusetts live next to roughly three times the industrial waste sites as high median income earners above sixty-five thousand dollars. Mohai and Saha (2005) show how community economic power to prevent facilities from being sited nearby, especially in context of the Not in My Backyard (NIMBY) movement after Love Canal, led to the unequal distribution of environmental risk. They find through a 50-year longitudinal analysis of siting in Michigan that facilities were located in economically able neighbourhoods in the pre-NIMBY era and this pattern shifted once the NIMBY movement took hold. Socioeconomic status has been shown as a vital predictor of the unequal distribution of environmental risks and hazards. Bullard (1990) expands on this and finds that communities with the economic power to resist toxic facilities and waste sites are those of which that have pre-existing social capital in the form

of education, income, and contain fewer people of colour. If pre-existing social capital is what determines a community's ability to fight off toxic siting, this places communities with low voter turn out, home ownership, and wealth at a disadvantage for toxic sitings (Mohai, Pellow, & Roberts 2009).

This debate indicated to environmental justice scholars that environmental injustice required methodologies that allowed for historical and longitudinal analyses of the formation of communities facing environmental injustice, as a single moment does not capture legacies of risk that communities endure (Szasz & Meuser 1997). Hersh (1995) examined the history of steel production in Pittsburgh. The origin of the facility siting was based on geological abundance of coal which was used to make coke for fuel. Hersh (1995) found that African Americans were not only offered the most hazardous jobs, but inner-city communities of colour also faced disproportional contamination as the transformation of transportation infrastructure aided in the creation of white pristine suburban communities.

Hurley (1995) found something similar to Hersh in his analysis of Gary, Indiana, a major production site for US Steel. Similarly, the siting of the facility was due to the geographic allocation of resources. Again, African Americans lived farther away from the place of employment until whites purchased suburban communities with the destruction of railways, which transformed inner city communities into communities of colour. What Hurley found in his analysis, however, was that African Americans experienced the same environmental risks across class lines, while these same environmental bads were experienced differently across class lines of white people. This is due to lower income whites being unable to move out into suburban areas and higher income African Americans being barred from these same white suburban communities due to discrimination. In this way, environmental priorities became constructed

along class experiences. Higher income neighbourhoods, in-line with upper class environmentalism, tried to retain pristine green spaces for their backyards and escape the polluted cityscape (Hurley 1995). The working class, on the other hand, were concerned with their dilapidated environment within the city and the working conditions at the local US Steel factory.

With the historical similarity of these two cases, Szasz & Meuser (1997) call for environmental justice academics to conduct more historical analyses, as proximity of exposure to a toxic substance at a single moment does not capture the legacy of risk that many communities endure. Roberts & Toffolon-Weiss (2001), for example, use Molotch and Logan's (1987) concept of the city as a growth machine, whereby a city's elite manipulate the shaping of the city to their interests. Roberts & Toffolon-Weiss examine multiple case studies in the Louisiana chemical corridor: 1) the proposed uranium and PVC plants at the time, which directly impacted lower income rural black residents, 2) the oil field waste pits in Gran Bois which implicate Houma Indian and Cajun locals, 3) the agricultural street landfill which affects lower and middle class black citizens. Through these multiple case studies in Louisiana's chemical corridor, they were able to show that business and government elites prioritize private interests over public and environmental wellbeing. In regard to Rocky Flats, elites have also shaped the community for decades and continue to do so with the construction of the Wildlife Refuge, home development, and the Jefferson Parkway on the border of the boundary zone, despite the opposition of community advocacy groups.

Procedural Equity

Distributive injustice, mentioned in the previous section, is largely influenced by who holds decision-making power in and over a community. For this reason, it is also important to

examine instances of environmental injustice as a *process* through a lens of procedural justice. Policies enacted by officials contribute greatly to how and where environmental bads are distributed. Many instances of environmental injustice have lasting consequences on the lives of people, which cannot be undone. For this reason, procedural justice advocates demand more meaningful and authentic roles for community members, advocates, and other parties in making policy and land-use decisions.

One crucial aspect of risk's distribution across society is who has the decision-making power to define and then accept these risks. For example, in many of the cases already discussed, citizens were not in charge of the adoption of risky technologies that were placed in their communities. Lake (1996) expands on this by discussing solutions to distributive injustice. The solution to distributive injustice has often been conceptualized as simply the equitable distribution of environmental bads. Lake (1996) argues that this position treats the symptoms of environmental risk rather than addressing the underlying issue of procedural injustice, which allows for the inequitable distribution of risk to occur. He emphasizes that instead of distributing risk across communities that may or may not want industrial development there, it is a much more democratic process to expand the understanding of justice to include self-determination and individual autonomy (Lake 1996; Hunold & Young 1998). In this way, communities should not only be included in the decision-making process for distribution, but also be able to participate in the production and adoption of these risks.

The theoretical basis of procedural justice in the environmental justice literature comes from Shrader-Frechette's conception of *participative justice*. She argues distributive injustice is an outcome of unequal access to goods (often money) that can be transformed into accessing other goods like ecologically pristine spaces or decision-making power. To challenge this, she

proposes a model of scientific proceduralism that allows for community input in the decision-making process of facility siting. In particular, she argues that citizens and environmental stakeholders should have the same decision-making power as experts, the right to consent, due process, and compensation for health issues (Shrader-Frechette 2002).

Scientific, technocratic means are used to analyze issues surrounding and the siting of facilities or the risks associated with such sitings. However, these methods and data sets are often not comprehensible to lay populations. Shrader-Frechette continues to develop the road map to participative justice by outlining the ten strategies that polluters use to mislead the public. These tactics include: special interests' unduly influencing federal regulators, using advisors with conflicts of interest, committing white-collar crimes, manipulating the media through PR and advertising, promoting polluter self-policing, and using campaign contributions and lobbying to thwart regulators (Shrader-Frechette 2007). Therefore, participatory justice is necessary to ensure procedural justice.

Inequitable distribution of risk and exclusion from decision-making processes are historically tied to nuclear development. For instance, teenagers within the Navajo Nation have had rates of cancer 17 times the national average, due to a legacy of uranium mining that lead to contamination of well water (Pasternak & Brugge 2007). Another example is the Shoshone in Nevada, who have experienced not only nuclear testing, highlighted at the beginning of the chapter, but also, Yucca Mountain within this territory has been selected as the repository for the nation's radioactive waste. Similarly, those surrounding Rocky Flats have had an unequal nuclear burden placed on their communities and bodies. Inequitable distribution is not a natural process, but arises through political process; therefore, it is important to examine whose interests are met through decision-making processes and who is omitted from this process.

Those who are excluded from the process face recognitional barriers erected by those who have access to decision-making apparatus. Schlosberg (2007) specifies that activists often try to frame issues of equity and recognition through community environmental identity. In the case of Rocky Flats, the construction of the Wildlife Refuge is a misrecognition and dismissal of the concerns these residents have over their health and environmental wellbeing. At every stage of the production, deconstruction, and eventual remediation of the Rocky Flats site, the public has not been in control over their local landscape. Therefore, recognition is a prerequisite to Shrader-Frechette's understanding of participatory justice.

Schlosberg (2007) builds upon this conception of participatory justice by constructing a framework for procedural justice. Environmental justice groups often feel that the inequitable distribution of bads that occur in their community are due to lack of oversight and participatory decision-making (Schlosberg 2007). Rather than being told that the communities' interests will be taken care of by mainstream environmental groups or governmental agencies, communities would like consultation, discuss the issue from a variety of perspectives, and partner in decision-making (Schlosberg 2007). Procedural justice, in this case, is constructed out of three central aspects. First, community groups must be provided access to information about the risks in connection to the nature of the contamination in the community (Schlosberg 2007). While elites may argue that members of the lay public are not qualified to make decisions regarding technical problems, community members feel they should have access to all of the information that other decision-makers have (Schlosberg 2007). Second, affected citizens and stakeholders want to be part of the political process and have a voice in deciding environmental policymaking (Schlosberg 2007). Finally, community-based participatory research, especially in regard to popular epidemiology, has been integral for communities to obtain environmental justice. In this

way, participation goes beyond consent as a research participant and instead is a partnership between community and the elite, with community members driving the projects (Schlosberg 2007).

Ottinger (2012) expands on this by explaining that information regarding the risks of industrial projects may not be understood when state, corporate, and civil actors make permitting and other decisions. Due to this uncertainty, they conclude that opportunities to consent must be upheld as new information regarding the risk of the industry comes to the surface. If, for example, a process was to cause more harm than originally estimated, the company or industry should be responsible for finding a solution or decommissioning the plant in which they had invested (Ottinger 2012). This is significant because under the current model, industries are able to externalize the harms and costs of the industry while collecting all of the benefits in profit. For example, the various corporate operators at Rocky Flats have been provided a small legal fee in comparison to the environmental damages, and potential health risks they have placed surrounding communities in.

Scholars of procedural justice debate the concept of trust or fairness as the most central component to achieving procedural justice. Some assert that trust is the foundation of procedural justice, while others argue that perceptions of fairness are the foundation. Kickul, Gundry and Posig (2005) found that trust mediated perceptions of fairness in regard to procedural justice. In this way, trust and fairness are likely both equally fundamental to procedural justice. Many articles describe the importance of fairness for community access to information, decision-making opportunities, and facility siting input (Walker 2010a; Hampton 1999; Hunold and Young 1998; Lake 1996). Hunold and Young (1998) call for a process of communicative democracy, which relies on a foundation of citizen participation that ensures all needs and

perspectives are accounted for. For this to occur, procedural conditions including inclusiveness, consultation over time, equal resources, and access to information, and shared and authoritative decision-making for the public, must be maintained (Hunold and Young 1998). Access to information can be a difficult situation to navigate when there is a power imbalance between corporate and governmental actors. In this situation, the authors suggest that either consultation with researchers which the public trusts or counter studies by these same researchers should be commissioned by facility developers or government bodies (Hunold and Young 1998).

Additionally, while scientific results are often touted as clear evidence of a particular viewpoint, the creation of additional scientific knowledge recognizes that information creation is politically embodied (Walker 2010b; Hunold and Young 1998), reemphasising that citizens should have the final say of what happens in their community. For Rocky Flats, instead of upholding the scientific knowledge that was produced by Ed Martell and Carl Johnson, two researchers trusted by the community, governmental agencies moved to discredit and overpower them with institutional and corporate power.

Within the environmental justice literature, Fischer (2000) discusses the importance of community trust in governmental institutions for accepting research outcomes. Fischer (2000) details how public trust is better considered as a reflexive process in our understanding of the risk we are placed in and to what extent experts aim to obscure their responsibility in this risk. As citizens come to lose trust in expert systems, they take into consideration this lack of trust when calculating risks (Fischer 2000). The community of Rocky Flats has lost trust in governmental and corporate experts and, to regain this trust after decades of deceit, they require decision-making power to shape the community they live in.

Schlosberg (2007) emphasises the importance of community capabilities. These community capabilities include the ability for a community to sustain itself, retain its culture, and generally live a fulfilling life. Things that impact community capabilities include globalization, environmental contamination, and food insecurity (Schlosberg 2007). Environmental justice issues are felt not only by individuals, but also by communities, as shown through inequitable distribution of environmental harms and barriers to public participation in the policy process. In the case of Rocky Flats, recognition is needed to shine a spotlight on the legacy of detrimental health outcomes and governmental action that have subjugated the agency of the community, both of which have served to interfere with community capabilities. The importance of recognition after a community goes through devastating circumstances can be lent from disaster literature. Kai Erikson (1976) describes how the root of collective trauma is often due to retreat from the victims without regret or apology from those responsible for disaster.

Restorative justice has been theorised with the aim to acknowledge and understand the impact actions have had on victims, including the wider community (Sharpe 1998). The restorative justice process aims to empower all who were involved in the injustice, outside of expert influence (Kenny & Leonard 2014). For the communities who have been impacted by decades of injustice surrounding the Rocky Flats facility, the empowerment of their viewpoints, without the need to legitimize their perspectives through governmental scientific bodies, would empower them and allow them to be recognized as true participatory members in the procedural process. In turn, community influence over the decision-making process in the remediation of their local landscapes would restore trust in governmental systems.

Intensive national security led to communities around Rocky Flats taking on the health and environmental burden of radioactive contamination that became part of their landscape,

without their knowledge or agreement. Public participation efforts in the past resulted in conflict due to agencies and contractors coming into discussions of remediation with pre-decided fiscal and temporal limitations (Satterfeild & Levin 2007). As development projects in the area are in the process of being given clearance to begin construction, how are community advocacy groups being presented relevant information and being included in these decisions? The following section will detail how these questions will be answered.

CHAPTER III: METHODS

Introduction

This research project utilizes primarily qualitative and community-based methods. Berg & Lune (2012) emphasize that qualitative methods allow for an analysis of social meanings, beyond what quantitative methods can offer. While qualitative methods reveal deeper social meanings, each method presents a particular perspective of society (Berg & Lune 2012). For this reason, this research used methodological triangulation in order to investigate the barriers that community advocacy groups at Rocky Flats face and validated the findings from a variety of avenues (Berg & Lune 2012). My methods include: fifteen in-depth interviews, archival analysis of CDPHE documents, and participant observation. While distributive injustice can be analysed through quantitative methods, both procedural injustice and recognition can be understood more in-depth through the lived experiences of people.

This project relied on a community-driven method of social research. A community-driven approach allows for the broadening of knowledge among all partners, whereby community members witness scientific research methods, and researchers learn community perspectives (Colquhoun, Geary, & Goodman 2013). This method is important to partake in when examining communities with a history of contamination and health impacts because often these communities have also experienced a history of scientific silencing by federal, corporate, and medical elites.

Community members living near Rocky Flats have expressed feeling disempowered and excluded from decision-making processes that have helped structure the safety and landscape of their community for decades. For this reason, I began the research process from the community

perspective by attending community events. This had the additional benefit of gaining entry into the field through observation at these events, understanding a group's argot, and built rapport with key leaders of community advocacy groups (Berg & Lune 2012). The social dynamics of nuclear communities had a large learning curve, in part because of the language I was required to learn to understand the struggles that community members face. Interestingly, this shows the level of knowledge community members have acquired to engage the social and environmental contexts they are living in. Community advocacy groups have become experts in their own right in their pursuits to become decision-makers over their own landscape. While there are leaders within the community, the lay public does not have this knowledge; therefore, it is important to understand what information is presented to the public from government experts. As such, an archival analysis of documents accessible from the CDPHE website will be conducted. On the CDPHE website, information available to the public include, community dose estimations, the cancer registry studies, and a history of the site. Finally, where participant observation and archival document analysis provide a general understanding of the social landscape surrounding this issue, in-depth interviews with community leaders and organizational representatives sharpen the focus of the dynamics surrounding this socio-environmental issue. Together, the triangulation of these qualitative methods allowed for a deeper understanding of the issue than a quantitative approach could provide.

As I showed in the previous chapter, a foundational question of environmental health is who has the decision-making power to decide what constitutes a community health issue. Embodied health movements face barriers of legitimation and advocate based on their personal and communal health experiences. In a similar vein, environmental justice questions how to ensure that all population are protected from disproportionate health or environmental outcomes and can

participate in related decision making. Barriers to environmental justice have been highlighted through how risk is allocated. Specifically, the disproportionate placement of toxic sites in underprivileged areas and the lack of space for authentic participation by these community members in determining zoning and land use around contaminated or polluting sites. In this way environmental health and environmental justice rely on access to participation in decision-making. Procedural justice is at the core of environmental justice and health movement literature and questions how communities are meaningfully involved in this decision-making. Schlosberg (2007) indicates that in order for communities affected by environmental injustices and health outcomes to become part of the decision-making process, they require: access to information, a seat at the table for decision-making, and collaborative research based on the needs of and led by affected communities.

Based on the foundational concerns of environmental justice, health, and procedural justice literatures, my research questions are:

- 1) How has scientific, technical, and other related information about Rocky Flats' contamination and clean up been presented for lay people of the community, by the CDPHE and other agencies?
- 2) How do community activists and community groups working on Rocky Flats issues perceive their opportunities for, or barriers to, authentic participation in related land use decisions?

By asking these questions, this thesis will help answer questions posed by the environmental justice, health, and procedural justice literatures regarding how to better ensure that populations are protected from environmental injustices and health outcomes, and how communities are included to ensure that their experiences are recognized in environmental and health decision-making. To align with these major concerns posed in the literature, I have focused on public inclusion in decision-making and access to information which procedural justice and the

foundation of environmental justice and the legitimization of embodied health movements rely. Access to information and decision-making are also uniquely important in a nuclear context, as many communities could not participate due to intensive secrecy. Remediation and development of post-nuclear industrial complexes provides an opportunity for members of the public to have agency over their health and environmental landscape not seen since the Cold War.

In-depth Interviews

Schlosberg (2007) contends that grassroots social movements tend to organize through a network of supports. Additionally, Creswell (2013) states that three considerations that should go into a sample are: the sampling strategy, who should be selected as a participant, and the size of the sample that will be studied. For my study, fifteen participants were interviewed using a network sampling process. These participants consisted of people in leadership roles pertaining to Rocky Flats. There are multiple leaders within the community, and positions are divided along lines of acceptable risk at the Wildlife Refuge. Specifically, there are resident-driven community advocacy groups against public access and development in and around the site. On the other hand there are institutional leaders, conveying the safety of the Rocky Flats Wildlife Refuge to local residents. Given this project's focus on contested illness and access to transparent information about environmental health risks, I sampled from the network of citizens that have mobilized around these issues in relation to Rocky Flats. The interviews lasted approximately an hour and were recorded using a digital app for voice recording and files transfer. Face-to-face interviews were prioritized because they have generally been regarded to provide better quality data, as visual cues help enhance the meaning being conveyed (Fielding & Thomas 2008). Sweet (2002) however, disputes this, as they found telephone interviews to provide data that was not

noticeably different. Due to this, face-to-face interviews will be prioritized, however, telephone interviews will be used when it is the most convenient option for the participant.

The sample of interviewees consisted of residents belonging to three community advocacy groups in the region around Arvada and Westminster, Colorado including: Rocky Flats Downwinders, Rocky Flats Right to Know, and the Environmental Information Network.

Rocky Flats Right to Know is the group that currently presents the most information to the community about the history of Rocky Flats. As explained in the introduction, they have people directly involved with past and current events dealing with contamination at the facility, talking to the public, and taking questions from the community. The leadership of this group is mainly concerned with the access children would have to the Rocky Flats Wildlife Refuge, the lack of signage explaining the history, and potential risk of the site to the public. As of April 27, 2018, one of the major accomplishments of this group was banning field trips for children to the Wildlife Refuge across Jefferson County, Adams County District 12, the Denver Public School Board, the Boulder Valley School District, and St. Vrain Valley School District. In addition to concern over community exposure, this group would also like community notification of the site's history and the residual contamination that remains in the environment. Without signage and communication about the history, residents, especially those who are new to the community, will remain unaware of the health risks which may exist, and increase with future development.

The Environmental Information Network has conducted citizen science through monitoring the contamination levels during grassland fires, which they believe helped make room for home development. This group has the longest history in the area, existing before the FBI raids that closed the facility in 1989. As indicated in the introduction, one of their first actions that informed a large amount of the community was the reading of the Mary Walker

memo to the public, which encouraged the FBI to raid the facility. They were also able to aid the FBI by uncovering documents describing the magnitude of discharges from the facility into the local environment from the DOE repository in Fort Collins. In addition to uncovering information, this group has worked to produce community-based knowledge of contamination at Rocky Flats. One example of this is through monitoring the environment with Geiger counters to see levels of radioactivity during a grass fire on the boundary zone. They found rates reaching heights of 19,999 counts per minute, which is a very high reading, as this group previously established background levels at eight to fifteen counts per minute for the site. To their knowledge, there have been no health studies examining the effects from this burn (EIN 2015).

Finally, the Rocky Flats Downwinders is a non-profit organization interested in bringing health risk information to the people living around the buffer zone and to the medical professionals that analyse their symptoms. Ultimately, they would like for the public facing health problems to receive medical services and compensation for their illnesses and loss of quality of life. One of the major goals of this group is to expose health outcomes in surrounding communities. Through collaboration with Metropolitan State University for a convenience sample, preliminary findings suggest that rare cancers were found in 48.8 percent of 1,745 cases of those who lived in the area between 1952 and 1992.

For all three groups, their concerns can be met only by being included in the procedural processes related to land use around the former Rocky Flats site. In turn, I examined the experiences of people in these groups, as they are representative of local concerned residents. Of them, I have asked: how have they been included in the decision-making process for the shape and development of their community? As a prerequisite to procedural justice, have their concerns been substantively recognized by institutional actors?

In order to understand which groups have the decision-making power to shape the local landscape, I interviewed institutional leaders overseeing the issue. This leadership consists of: CDPHE representatives, The Rocky Flats Stewardship Council, and the Jefferson Parkway Public Highway Authority. These representatives were chosen because they provide the best perspectives as key stakeholders in the remediation and development of the land. These groups believe that the land has been cleaned up and should be open to development of housing or roadways.

In Colorado, the lead oversight body for a superfund site is either the EPA or the CDPHE. For Rocky Flats, the CDPHE has taken on this oversight role. They serve as a body that monitors the remediation of the site conducted by the DOE. In 1998, and 2016 they conducted a cancer study of the site, and in 2017, they updated the study to include rates of thyroid and rare cancer for the community. Across these studies they found statistical regions with elevated cancer incidents and attributed these occurrences to smoking histories. As an oversight body, they have a large influence over how the landscape is developed.

The Rocky Flats Stewardship Council was formed in 2006 to give local government and community oversight of the remediated Rocky Flats site. The Stewardship Council consists of ten elected officials of local governments, representatives of the League of Women Voters, the Rocky Flats Cold War Museum, the Rocky Flats Homesteaders, and a single resident representative. The mission of the Stewardship Council is to ensure local government and community interests are met in regard to stewardship of residual contamination, track issues of the health consequences for former site employees, and maintain and educate the public of ongoing and future needs of the site. Additionally, the council has a commitment to address all other issues regarding Rocky Flats, as determined by the board.

Finally, the Jefferson Parkway Public Highway Authority was formed in 2003, when the communities of Arvada, Broomfield, and Jefferson County came together to complete the Beltway toll road, a \$1,657,563 ring road surrounding the entirety of the Denver metro area. The only portion of this road missing is a twenty mile stretch that presses up against the Rocky Flats boundary zone.

Together these institutional organizations have a large stake in the future of the community. Therefore, in this context, I was curious about the following: What steps are being taken to include residents in the decision-making process, and when they are included, are the community advocacy groups seen as decision-makers towards the development of their landscape?

Potential participants were contacted through email. Often, these emails were preceded with a meeting in-person through the participant observation process where I developed rapport with participants. Interviews were conducted wherever the participant felt comfortable, and often these locations were their home or a nearby café. All respondents consented to having their interview recorded. Recordings were stored on Dr. Malin's password-protected work computer. The participants were asked 13 questions, as this project is part of a larger oral history study.¹ Questions can be found in the appendix section of this thesis and focused on the personal history of the participant in the area, their experiences with health issues, their experience with the documents on the CDPHE site, and their feelings on inclusion in the decision-making process for the community. These questions helped determine if the participants felt that there has been procedural justice in the handling of Rocky Flats.

¹This research is a subset of Dr. Malin's Rocky Flats Oral History project

These interviews were recorded and held on Dr. Malin's computer. Groenewald (2004) suggests that researchers record each interview on a separate file and then assign each file with an interview code. These interviews were titled with the participants' name, however in the analysis process these names were changed to protect the identity of the participants.

Hammersley & Traianou (2012) suggests that the goal a researcher should have for the anonymity of their participants is to make them non-identifiable to those who should not have access to participants' personal information. Interviews were transcribed and then analysed by coding for common themes that emerged from participant statements.

Lofland et al. (2006) describe the process of coding qualitative data first as open coding, followed by focused coding. As such, a first pass of open coding looking for general themes that emerge was conducted, followed by an additional round of coding searching for in-depth themes. Through this process a common narrative arose across the interviews for analysis.

Archival Document Analysis

Supporting these in-depth interviews was an archival analysis of the documents about Rocky Flats contamination provided to the public on the CDPHE's website. Archival document analysis was useful for this study because it provided an understanding of what information the community has been provided and what technical specializations are needed to understand this information. When I searched for information about the Rocky Flats site, the first reliable source that appears in a Google search is for the EPA. On the EPA site, a citizen concerned with site documents will be redirected to the CDPHE site. Here, citizens will access documents that governmental institutions regard as transparent and useful to lay public.

These documents include: The Executive Summary and Evaluation of Thyroid and all Rare Cancers around Rocky Flats, the Resource Conservation and Recovery Act Facility

Investigation/ Remedial Investigation Report (Final RFI/RI Operable Unit 3), CDPHE's Cancer Registry study from 1998 and the updated version from 2016. The executive summary is a 19-page document showing the results of the supplemental study done from 1990 to 2014 of rates of thyroid cancer and all rare cancers. This document provides a background of where and how the data was collected, and tables depicting the reported rates of thyroid and rare cancers. The Final RFI/RI Operable Unit 3 is a 552-page document that concludes that no remedial effort was required in the communities off-site from Rocky Flats. As local development is a concern for community advocacy groups, especially the Jefferson Parkway, local residents would pursue this document in order to understand risks associated with development.

The CDPHE's Cancer Registry study from 1998 is a 105-page document and is a summary of Colorado Central Cancer Registry's report of cancers rates in the areas surrounding Rocky Flats and the larger metropolitan Denver area. This document includes how the data was collected, and the tables of expected and observed rates of cancer. The updated version contains data from 1990 to 2014 and contains similar information and formatting to its predecessor. Analysing these documents will help determine what information the public has access to, and how accessible and useful this information is for making informed decisions about environmental risks and public health.

To analyse a collection of documents, Bowen (2009) suggest that a first pass should be done to find the meaningful and relevant passages of the text. Similarly, Corbin and Strauss (2008) call for a researcher to demonstrate their ability to extract pertinent information and distinguish it from irrelevant information when conducting an archival document analysis. Once this has been accomplished, thematic elements of the text should be uncovered through a coding scheme (Bowen 2009). Bowen (2009) argues that archival document analysis is more than lifting

words from the document; instead researchers should be examining the intended meaning of the document.

Finau (2000) describes the difficulties in disseminating health risks from professionals to citizens, one of the foundational requirements being that both communicator and receiver must agree on a direction they deem beneficial. The authors pose the following questions: Who needs a message? What, why, and when is the message needed? How is the message transmitted? Who is the messenger? This perspective depicts a one-way relationship with elite institutions and information sought by affected people. However, through an environmental justice perspective, the knowledgeable are often those living with the health consequences themselves. Gillard et al. (2012) describe how their inclusion of community member perspectives allowed for findings that would have otherwise been missed. How have CDPHE documents brought in community perspectives and participation in the production of knowledge? Keohane, Lane, Oppenheimer (2014) argue the five principals for scientific communication are honesty, precision, audience relevance, process transparency, and specification of uncertainty about conclusions. How have the documents achieved these five principles? To discover this, the documents will be coded looking for these five themes and instances where community perspectives were brought in. In order to determine the precision of the documents, the methods used will be analysed. While examining the documents, I asked: Is there anything or anyone excluded from these methods? Audience relevance was examined by determining how useful the information presented is for the purposes of lay people. Process transparency for the documents was determined by examining how these articles explain their data collection process. Specificity about the uncertainty of conclusions was examined through how the documents explain what is missing from the analysis. Finally, honesty was determined through the combination of all of the above.

Participant observation

I utilized participant observation by attending monthly meetings, participating in various community and organizational activities, and spending time in affected communities. Participant observation was conducted in public or quasi-public settings. These settings included: observing known contaminated locations within the community for signage and publicly available risk information, public meetings held at Trinity Presbyterian Church facilitated by Rocky Flats Right to Know (but often attended by members of the other groups), Stewardship Council meetings that concern oversight of the environment, and the public meetings concerning the construction of the Jefferson Parkway Public Highway.

As these are public spaces, I did not have difficulty accessing them. For example, one community event that I participated in with the Rocky Flats Downwinders was the Race for Sarcoma. This race was held in the in the Greenwood Village community by the Sarcoma Foundation of America. The Rocky Flats Downwinders participated because they saw the parallels between rare cancer development due to radionuclide exposure in their own community and the lived experiences of those living with this rare cancer, whether it was due proximity to Rocky Flats or not. At this event, I was able to meet two of the organizers for the Rocky Flats Downwinders and introduce myself. Harrison, MacGibbon, & Morton (2001) discuss the importance of reciprocity as an action to not only gain access to research settings, but also a method of trust building. As conveyed in the literature review, an era of intensive national security has left sacrificed communities with a loss of trust in scientific and governmental institutions. While a five kilometer run is a very small gesture of solidarity, it helped raise money for Sarcoma research and let me build rapport with community members.

Additionally, I have developed ties with Rocky Flats Right to Know. Over the course of the last semester, I have attended community meetings hosted by this local awareness and advocacy group. These meetings often have covered a variety of perspectives by other community advocacy groups. For example, one meeting allowed community members to engage with the FBI officer who was in charge of raiding the facility in 1989, and ask questions about the risk that the facility poses. Due to his silencing requirement by the court system, he was unable to openly answer many of these questions, which brings into question the federal government's commitment to transparency about this issue with the citizens of this country. Other meetings have presented information by the EIN who were monitoring rates of air pollution during the burning of the grasslands within Rocky Flats' boundary.

Creswell (2013) suggests that some of the first steps a researcher should engage in for participant observation is selecting and entering the site, and then, identifying who or what should be observed. The sites that were observed were the Jefferson Parkway Public Highway Authority (JPPHA) and the Stewardship Council meetings, which allowed for an examination of interactions between citizen groups and those in positions of authority over construction issues pertaining to Rocky Flats. Additionally, I attended Rocky Flats Right to Know (RFR2K) meetings, to examine how these community advocacy groups mobilized when presented with institutional and community barriers. These meetings also indicated how information is used and interpreted by the community groups. How were their conclusions different from those presented in the archival documents? At these meetings I plan on being a present observer, the community advocacy groups that I was with engaged with city council members and shared their concerns. At the site, Lofland et al. (2006) express that it is fairly common for researchers to feel inundated with information. In order to resolve this issue in the field, I took notes about what was said at

the meetings, who the speakers were, and the emotions that were conveyed throughout interactions. I took pictures of public meeting spaces in order to analyse place, which was especially helpful for describing the setting in the findings. Pollner and Emerson (1983) reveal that one of the major difficulties that researchers have in the field are the various responsibilities a researcher should be aware of: involvement and withdrawal, along with participation and detachment. The meetings were set up where a speaker disseminated information and community members responded with questions of their own. As there are ties to these groups through a separate project, it was also important to retain distance for a non-biased analysis of these community groups and the barriers they encountered. Two meetings each, for JPPAH and the Stewardship Council, occurred over a five-month data collection period. In addition, RFR2K hold monthly community meetings where they, and other speakers, presented information about the site to residents. Five of these meetings were attended in order to examine how this information aligns with the information that was presented by agencies overseeing this issue. Including the RFR2K meetings, nine public meetings were attended and observed for this thesis.

During and after the meetings, I wrote up my field notes. Lofland et al. (2006) detail that field notes should consist of a chronological log of the ongoing of the setting, attempt to capture raw behaviors, direct quotations when possible, and analytic ideas as they arise from the researcher. Some codes that emerged from observing public meeting were “dismissal of concern” and “difficulty understanding research”. Interviews were transcribed and then analysed by coding for common themes emerging from participant statements. Some of the codes to emerge from interviews with participants were “community knowledge of site”, “public involvement”, and “risk normalization”.

Conclusion

The data gathered through the triangulation of in-depth interviews, archival data analysis, and participant observation answered how information related to the clean up has been presented for lay people of the community, whether this information was useful for the needs of community members, and how community groups perceived their opportunities or barrier to, and participation in land-use decisions. As a site with a legacy of nuclear production that has become integrated into the Denver metropolitan area, community advocacy groups face unique challenges opposing the perspectives of governmental agencies, local governing bodies, and development corporations.

CHAPTER IV: FINDINGS AND ANALYSIS

Introduction

Three main themes emerged from the fifteen interviews collected, the meetings attended, and through the analysis of archival documents. These themes include: 1) *Contested Illness in Affected Communities*, 2) *Barriers to Procedural Justice*, and 3) *Current Development and Inaccessible Information*. The themes that emerged from the data helped answer my research questions:

- 1) How has scientific, technical, and other related information about Rocky Flats' contamination and clean up been presented for lay people of the community, by the CDPHE and other agencies?
- 2) How do community activists and community groups working on Rocky Flats issues perceive their opportunities for, or barriers to, authentic participation in related land use decisions?

The first overarching theme of *Contested Illness in Affected Communities* details how advocacy leaders contested illness at Rocky Flats through personalized health experiences in the community. Within this theme, emerged the subtheme of *Health Experiences Ignored for Profit*. Advocacy leaders understood that the decision to award homeowners compensation for contamination in the area while ignoring health outcomes helped increase profit for local home development and governments.

The second overarching theme is *Barriers to Procedural Justice*. Barriers for concerned residents to achieve procedural justice, and ultimately environmental justice over their contaminated landscape, were enacted in three main ways: *Institutional Barriers*, *Inaccessible Information*, and *Dismissal of Public Concern*. Institutional barriers were erected through the physical space of public meetings that limited public participation and through agency dismissal of residents' illnesses as natural environmental illness. Additionally, information collected by

agencies was presented at a comprehension level above both Stewardship Council members and residents in attendance, which resulted in a reliance on their expertise for decision-making. Due to these barriers towards procedural justice, both advocacy leaders and residents in attendance demanded more access to decision-making power over the future of Rocky Flats.

The third overarching theme is *Current Development and Inaccessible Information*. This theme examines how advocacy leaders and board members understood community awareness of this issue. Within this theme, there are two sub themes: *Community Information - Notification for Residents* and *Home Purchase as Consent*. Advocacy leaders understood that the community needed more notification of the site's history but board members perceived that avenues already existed to gain this knowledge. Due to this, board members also understood continued home development and home purchase in the area as community acceptance of a contaminated landscape.

Contested Illness in Affected Communities

The contestation of health impacts related to nuclear exposure around Rocky Flats exists within the nuclear history of the nation. Other nuclear communities in the nation have shown that nuclear development has a wide breadth of negative health outcomes on local communities (Fradkin 1989; Kuletz 1998). Research has also indicated that due to sample size, contaminated communities often have difficulty proving health outcomes when compared to larger populations (Kuletz 1998). While health outcomes associated with environmental contamination are difficult to prove, residents rely on personalized health experiences to advocate for environmental and health justice.

Over the course of my interviews, leaders often described how instances of community health issues provided evidence for the legacies of environmental and health injustices that

remain after the clean up period at the site. Community leaders saw that their experiences were not recognized by agencies entrusted with protecting community health. The disputes that were explored in this theme are reminiscent of Brown et al. (2004) where personalized health experiences provided communities a platform to critique systemic barriers to health justice. Another similarity to Brown's et al. (2004) work is that while community activism is legitimated through embodied health experiences, not all members of the movement are required to have health issues, instead residents congregate over the perceived risk of the environment. This is an important aspect of community activism at Rocky Flats because nuclear contamination, especially constant low-level exposure to radiation, is not entirely understood by scientists. Residents came to advocate against the opening of the Wildlife Refuge and development in the community, by pointing to a variety of negative health outcomes they understood as a result of exposure to radioactive particulate.

Lay advocacy leaders in the community disputed the claim that there were no increased incidents of negative health outcomes in their community in two ways. First, they looked at their own health experiences, and those of others in the community, and attributed these health outcomes to the legacy of contamination at Rocky Flats. Ellie* for example illustrates these community-wide patterns. Ellie's first husband died of cancer when he was 47. She described to me the toll that her family has gone through, finally attributing these experiences to the residual contamination at Rocky Flats. She stated, "...seeing him go through that horrendous fight with cancer really made me aware of all the people who are impacted by Rocky Flats in my own neighborhood." The heightened awareness of community health experiences after personalized negative health experiences reflects how Brown et al. (2004) conceptualize the formation of embodied health movements. Heightened awareness of communal health outcomes were

reflected by all advocacy leaders I interviewed, who then attributed their personalized health experiences and those of other community members to the communal legacies of Rocky Flats.

Personalized health experiences became collective, as people recognized these outcomes across their networks and nearby communities. This caused leaders to question why action wasn't being taken to protect their community from environmental health risk. Victoria* detailed to me after discovering a tumor on her ovary, how she explored environmental causes for her health experiences. After reaching out to others in the community, she found that they were also experiencing health impacts. She explained:

...after then discovering that Rocky Flats is a nuclear weapons facility in Arvada, I went into Facebook and I found people that I went to school [with]... they were both sick. The first had stage four thyroid cancer, and his whole family, actually, had thyroid cancer... I also contacted another woman who had... some kind of ovarian cancer... and asked both them if they thought Rocky Flats had something to do with them being sick... they both thought that it did, and I was like, well what the hell, why isn't anything being done!

Through her personalized health experience, Victoria discovered the Rocky Flats facility in her community. Additionally, she discovered after speaking to friends that others in her community were also sick, some with entire families experiencing the same type of cancer. Like other advocacy leaders, these people came together to question environmental health risk that the community was experiencing, and why there was not anything being done to address these health outcomes. In this way, health advocacy in communities around Rocky Flats are following the process of becoming an embodied health movement as described by Brown et al. (2004). Leaders both feel that community health experiences provide a platform for systemic critique of why there is a lack of action to protect their community, which in turn, legitimizes their advocacy to demand that action be taken.

While advocacy leaders understood the health experiences in their community as evidence of environmental outcomes from the facility, they felt forced to produce scientific knowledge to prove this. This speaks to the experience of embodied health movements that critique scientific findings, and are then, required to legitimize their movement through scientific knowledge (Brown & Zavestoski 2004). The need to provide technical data to convey their experiences in a meaningful way was found across all interviews with advocacy leaders, who also felt frustrated that the data they had produced by surveying the community had not been considered statistically significant. For instance, Emma* a founder of RFR2K who attends every public meeting, described how the environment impacts her community but felt that they could not prove it to decision-makers. She stated, “My best friend who was on the tracks and was in all these demonstrations... she just died of a very aggressive cancer and she was healthy, and I mean, they ate really well, they were active, so who knows, I mean you can't prove anything.” Emma’s statement exemplifies how environmental illnesses disempower affected communities. Advocacy leaders maintain that radioactivity released during operations of Rocky Flats is the cause of a diversity of health issues in the community. However, scientifically, they understand that the prevalence of contamination in our environment makes it difficult to pinpoint one cause of health outcomes in a community. Cable et al. (2008) emphasise how health problems have become so common in nuclear communities that they are often regarded as ‘environmental illnesses’. Due to the widespread presence of illness in contaminated communities, governmental studies often find no increased rates of health outcomes (Brown 1992; Nussbaum et al. 2004). In this way, environmental illnesses work in favour of governmental and corporate bodies who operated nuclear facilities and disempower nuclear communities left with environmental and health outcomes decades later.

Across my interviews with advocacy leaders, they felt that the CDPHE cancer study was not representative of health experiences in their community. To show this, they dissected the methods that found no increased cancer rates in their community to that of the rest of the Denver metropolitan area. Hannah* highlighted the major concern that advocacy leaders had with the study, as she stated, “It’s only a study right now at this specific time. Where we’re talking sixty years. Even for my family I wouldn’t be a part of that study right now because we don’t live there... our family, and so many others deserve to be included in that. It’s not extensive enough.” Representing patterns seen across my interviews, Hannah also specified two problems with the study that advocacy leaders agreed with: 1) The study did not follow people who moved out of the area, and therefore 2) a longitudinal cohort study should have been conducted to represent the lived experience of members of the public. The frustration that advocacy leaders voiced about sampling techniques can be further explained through a privileging of the biomedical model, and an unwillingness to conduct an examination of the issue through an environmental health analysis. This division is illustrated through the reluctance to conduct sampling beyond snapshots of community illness. An environmental health analysis requires that the environment be considered as a source of community health outcomes. In order to properly analyse environmental health outcomes, a longitudinal sampling strategy should be conducted of those who have lived in the local environment to accurately and thoroughly determine the impacts on local populations.

Advocacy leaders understood the exclusion of those who have moved away as a method of obscuring the health experiences of members of the public. Sarah* who has advocated against the contamination and perceived health outcomes in her community for decades, described how agencies conduct studies. She emphasized that this is, “...the Orwellian way of approaching a

study, you figure out what you want at the end, and you figure out how to make it work that way.” While not all advocacy leaders understood the CDPHE’s cancer risk study as purposefully targeting the reality that the agency wanted, all leaders understood the methods used to not be representative of residents’ lived experiences and an obscuring of community health realities. The failure to include residents who have moved out of communities surrounding Rocky Flats depicts a failure of Schlosberg’s (2007) third principal for procedural justice. Schlosberg’s third principal requires that community-based participatory research of environmental health outcomes are conducted in contaminated communities. This is important, especially considering the secrecy that has historically surrounded the site, because it allows for research to be interpreted through the understanding and experiences of local populations. Had researchers conducted health studies in collaboration with concerned and affected members of the public, transitory populations would have been impossible to exclude. For instance, it was not uncommon for participants to recall those in the neighbourhood who had been impacted by cancer or other health outcomes they attributed to the contamination of their local environment. Health researchers could have pulled on local population’s social networks to locate and determine the health outcomes of those who have moved away from the community. Advocacy leaders experienced contested illnesses when the health experiences witnessed in their community are ignored or dismissed, and their critique of statistical studies conducted by government agencies are not recognized as important indicators that more health research is needed.

In my review of the CDPHE cancer study, I also noticed that excluding participants that moved out of the area or into other communities may have obscured results that could represent residential experiences. Conducting archival analysis of this study also made me consider the

size of regional statistical areas examined. For example, large areas in the study were examined. While outcomes in these areas should be examined for contamination, due to the fires for instance, this model can also dilute statistical findings. Further, in many interviews with advocacy leaders, people highlighted concern for residents near Indiana Avenue, where most of the off-site soil contamination is officially acknowledged to exist, and where construction of the Jefferson Parkway has been proposed. Advocacy leaders singled this area out for both cancer experiences and the infertility of residents. Gabe* for example described, “My son, his wife... all of his wife's family that lived on the downside of Rocky Flats, the downwinders close to Indiana, all of the males are sterile, [and] all [of] the females can't have children.” Not all advocacy leaders specified fertility as the most pertinent issue for residents living off of Indiana, but all were concerned about health issues down this avenue. For instance, Victoria who noticed high occurrences of health issues down this avenue when reaching out to community members, stated: “I'm getting affidavits for people that lived on Indiana, that have like really sick families or rare illnesses and stuff... in my mind I have a lot of stories... a lot were on Indiana, Indiana came up a lot for me.” In her pursuit to collect histories of people that were experiencing negative health outcomes in the community, Victoria received many emails from those connected to Indiana Avenue. This further highlights a failure to conduct a health study with the input of affected residents. In my interviews, advocacy leaders were not only concerned with health outcomes in the communities around Rocky Flats, which were partially analyzed by the CDPHE study, they were also concerned about the health impact on populations down Indiana Avenue, a small region that would be obscured using the large statistical regions of the CDPHE study. The experiences of concerned residents have important implications for contesting illness in nuclear communities. Research produced by government institutions of health outcomes in nuclear

communities often find no association with local environment and community health (Brown 1992; Nussbaum et al. 2004). This research is supported by one statistical method being utilized by the CDPHE to determine the safety of the landscape, when a variety of sampling strategies should be used to thoroughly determine the safety of the environment. This is important because the results of one statistical method is being prioritized over the experiences of local members of the public. The burden of evidence becomes placed on communities who were not able to consent to a nuclear facility being placed in their environment.

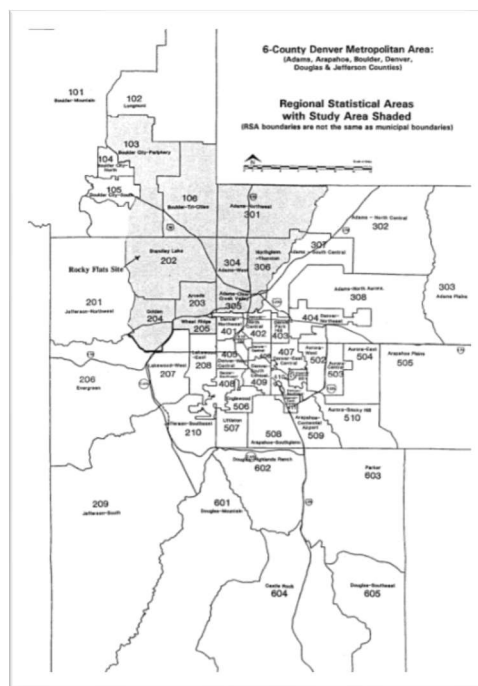


Figure 3: Statistical Regional Zones of the CDPHE 1998 Cancer Registry Study

The understanding of community health outcomes by lay advocacy leaders reflected the formation of an embodied health movement emboldened through personalized experience and perceived environmental risk. The experiences of advocacy leaders also reflect counter evidence provided by governmental agencies, a common experience for nuclear and contested communities. Following the production of models that show non-significance for community health risk, residents felt forced in conducting research to legitimize their experiences, which was then dismissed by government. The experiences of advocacy leaders echo those of other

nuclear communities, who also find that small population sizes when observing rare cancers become indistinguishable when compared to the general population. This theme depicts the intersections of environmental health, environmental justice, and procedural justice literatures in post-nuclear decision-making. Leaders formed advocacy groups out of concern for local health due to the surrounding environment, this embodied health movement was triggered after experiencing health outcomes and seeing the health outcomes of others in the community. The health studies that have been conducted by the CDPHE thus far do not reflect the experiences of local advocacy leaders. These leaders understand that the methods used could obscure potential health realities in the community and highlight two ways this could have occurred. First, affected residents have likely moved out of the area and second, the statistical regions may obscure smaller areas around Indiana Avenue that had the greatest level of contamination. The environmental justice literature has grappled with the depiction of outcomes through sampling and Szasz & Meuser (1997) suggest that historical analyses should be conducted to have a more accurate understanding of environmental and health outcomes on a community. This suggestion has been echoed by advocacy leaders who call for a longitudinal health study to be conducted of those who have lived in the area. The failure to follow through with sampling requests by concerned and affected members of the public indicates a failure to enact Schlosberg's (2007) third principal for procedural justice, collaborative research. Below, I examine sub-themes that emerged in relation to contested illness.

Health Experiences Ignored for Profit

Discrediting the health experiences of residents within contaminated communities tends to serve the interest of government and corporate authorities (Cable et al. 2008). This adds to the narrative of contested illness at Rocky Flats given the history of public health figures being

removed from office due to strong homebuilders' corporate influence (Iversen 2012). By contesting health and environmental issues corporation are able to continue to produce wealth and government retains the power and wealth that follows the production of nuclear weapons. Rocky Flats is a landscape that has officially been remediated and the Wildlife Refuge has been opened to the public, however, the DOE retains control over the Central Operable Unit, a restricted zone on site. Havlick (2007) contends that transitioning militarized landscapes into ecological wildlife refuges serves to 'green' military initiatives. Advocacy leaders conveyed that development in the area was motivated though the profits that could be shared by housing developers and local governments alike and recognized that this was only possible by dismissing environmental health claims in the area.

All advocacy leaders I interviewed understood the profits that would be made through developing the surrounding area, and they expressed that these had been prioritized over health concerns of members of the public. They understood this to be evident in two ways. First, advocacy leaders saw the 2016 conclusion of a \$375 million class action lawsuit against Rockwell and Dow Chemical that compensated homeowners for loss of value for contaminated property, while throwing out health concerns, showed the prioritization of housing in the area. Second, by ignoring health issues in the area, housing development has been able to expand and profit. Hannah for example, drew on the results of the lawsuit when discussing compensation for the impacts of residual contamination, emphasizing that the lawsuit compensated homeowners for the residual contamination in the area. She stated, "That was a part of the same lawsuit... cause it's really sickening when you think about that, that we'll pay people because they lost money on their house but all these people that, you know, lost children or spouses or parents to cancer, there's nothing". While concerns about local contamination were founded on health

issues, residents experiencing health impacts were not provided compensation through this lawsuit. Throwing out health claims in the Rockwell Lawsuit is only possible because of the findings of the CDPHE studies. As mentioned in the previous section, these studies rely on a single sampling strategy to determine the safety of the landscape. Cable et al. (2008) emphasizes that contesting illness serves the interests of government and corporate authorities. This is reflected in the conflict surrounding Rocky Flats as the decision to provide compensation for land while disregarding health, allows housing and roadway development in the community, in addition to the transition of the Rocky Flats boundary area into a Wildlife Refuge.

Advocacy leaders were against all development near the site because they perceived thought that development would cause re-suspension of radioactive dust in the air, where local residents may inhale it. All advocacy leaders were concerned about financial influence over development in the area, especially as development would transition the environment from contaminated wide-open land, to a contaminated landscape hidden under housing. For instance, Sarah emphasized:

So really what is at issue here, Travis, is there is big money at stake [and] they don't want to write it off because they want to keep selling it... to develop every little bit they can... and look at that now, it's wall-to-wall, it's unconscionable what they've done, it should've been left a no man's land.

She described the decision to develop the area with housing as financially motivated, an unethical choice when so many in their community are experiencing health outcomes they associate with radioactive contamination in the environment. All leaders understood housing development in the community as financially motivated, often at the expense of health concerns in the community. In order for communities who have been impacted by environmental contamination and health outcomes to experience justice, they must be provided a lead role in the decision-making for the local landscape (Schlosberg 2007). Across my interviews with advocacy

leaders, they emphasised that there should not be any development in the area, especially without more health studies being conducted on population who had lived in the area. The decision to develop the area while community advocacy groups have voiced for development to stop highlights how members of the public are not adequately included in the decision-making process for the future of the area.

Ultimately, advocacy leaders understood that there were two sides surrounding Rocky Flats issues – those who wanted to profit, and those who were concerned about health outcomes. As local governments and corporations chose to develop local housing stocks without further exploration of the potential health outcomes for local communities, advocacy leaders saw local government and developers as profit-driven. Gabe for example, insisted:

There's two sides of the fence, you know, there's the money end of it, here you take five hundred thousand dollar homes and over a million-dollar homes out here in Candelas, and that's a lot of revenue for Jefferson County, and that's what they capitalized on...but the health issues, and, you know, the future generations of young people... coming up with disease.

Across interviews with advocacy leaders, local governments and development companies were described as profit-driven rather than concerned about the public's health outcomes. Community advocacy leaders, on the other hand, saw not only past and current health issues as outcomes of contamination in the environment, but also expressed sustained concern for people moving in and for future generations unknowingly exposed to dust from development. Profit driven decision-making is one reason that environmental and health justice is only obtainable through procedural justice. The decision to continue to develop the landscape despite public opposition indicates a failure of Schlosberg's (2007) second principal for procedural justice, a seat at the table for decision-making. This was shown as advocacy leaders consistently attended and voiced their concerns at public meetings over the Rocky Flats site and the Jefferson Parkway, however

government officials have decided to move forward with development in the area in spite of these disputes. With clear opposition to development in the area, Rocky Flats remains a site of environmental and political injustice as members of the public have historically and continue to be excluded from participation in the decision-making process over their local landscape.

Community advocacy leaders' concerns for development in the area as profit-driven were also shown across meetings for the Jefferson Parkway. While community advocacy leaders were concerned about health risk, topics in these meetings generally adhered to technical aspects related to the revenue that would be expected from the completion of this project. For example, meeting discussions covered what the toll rate for the proposed roadway should be provided the expected annual one percent growth rate of home development in the area. Additionally, it was estimated that the opening of this ring road would produce an initial \$60 million in revenue with an estimated \$46 million increase by the year 2040. During one of these meetings Ellie requested that public money be spent on health studies, to which she received the response that money was being spent on studies. Ellie responded, "You are conducting studies on how much money you will make, but not on health studies." The economic topics covered at public meetings instead of the focus on health, exemplifies advocacy leader's understanding of the prioritization of profit over health in the community. This interaction emphasizes that the concerns of members of the public are not defining the agendas or outcomes of public meetings. While community leaders continue to advocate for development in the area to be halted and for more health studies to be conducted, public meetings for Jefferson County's Public Parkway continue to focus on the prosperity that completion of the roadway may bring to the area. Community advocacy leaders have clearly voiced their opposition to development in the area at public meetings, however

development continues, indicating that members of the public are not part of the decision-making process for the future of the community.

Contested health issues in environmental contaminated communities must be understood within a historical context (Szasz & Meuser 1997). Historically, concerned public health figures studying health issues at Rocky Flats have been removed from office through the influence of home developers (Iversen 2012). While not directly referencing this history, advocacy leaders understand that development would bring large amount of profit to developers and local governments. They saw profits from development being prioritized over health risk in the area and felt that money would be better served for further health studies. Additionally, development served a double purpose of obscuring a contaminated landscape covered in housing and road development. This also reflected a lack of environmental and health recognition by those in positions of power, as advocacy leaders understood their health outcomes as due to residual contamination, often referring to themselves or others near development initiatives as Downwinders. Continuing development despite clear opposition by members of the public and conducting studies that are not aligned with the concerns of members of the public indicates a failure of two of Schlosberg's (2007) principals for procedural justice, a seat at the table for decision-making, and public collaborative research.

Analysis of Contested Illness in Affected Communities

Advocacy leaders contest illnesses that people connect with environmental exposures to Rocky Flats, first through personalized health experiences and then community-wide health experiences. Embodied health experiences form the foundation of advocacy leaders' understanding and concern for local environmental contamination. Some of the advocacy leaders aim to contradict knowledge produced by the CDPHE with their own research to help legitimize

their claims. In the meantime, advocacy leaders saw decisions to award homeowners and to continue developing the land as significant dismissals of health concerns in the name of profit. Many of the health issues surrounding Rocky Flats today can be understood through the health literature of contaminated communities. For example, while embodied health experiences provide a platform to critique scientific knowledge, these groups are still expected to engage in the production of scientific knowledge in order to legitimize their experiences (Brown & Zavestoski 2004). This is difficult for those experiencing health issues at Rocky Flats because exposure to radioactive particulate may manifest as a variety of health outcomes, which results in small sample sizes. The major recommendation to residents of these communities, after results from the CDPHE Cancer Registry Study, found no significant rates of cancer was to practice a healthy lifestyle, however, this too is difficult for local community leaders if they understood their health outcomes to not be due to personalized decision-making, but rather, an outcome of environmental exposure. Exercise outside would be a conscious action to expose oneself to environmental risk, especially as local development sends residual contamination into the air.

Advocacy leaders face multiple barriers towards becoming authentic participants in land use decisions around Rocky Flats. The burden of proof for community health outcomes has been placed on members of the public due to CDPHE assurance that the environment is safe. Safety was determined using a single health sampling strategy. The sampling method that the CDPHE studies utilize privileges the biomedical model over an environmental health analysis of the area. The CDPHE studies sample large statistical areas surrounding Rocky Flats, and while this is a sampling strategy that should be conducted, a thorough examination of environmental health outcomes cannot only be conducted using a single sampling method. As advocacy leaders have echoed, an environmental health analysis would allow for a thorough examination of community

health impacts. This strategy would include a longitudinal health analysis of those who have lived in the community, including those who have moved away. A focused examination of those down Indiana Avenue which is officially regarded as the most contaminated offsite area should also be required. As decision-making at Rocky Flats has historically excluded the public, these two research strategies must include a community-based approach to collection, execution, and analysis of research in order to empower public decision-making over the landscape. Conducting research in this manner would fulfil Schlosberg's third requirement for procedural justice, community-based participatory research. While this is important for community empowerment, another requirement for procedural justice through Schlosberg is a seat at the table for decision making, specifically, public decision-making leading the way for the future of the site.

Members of the public have clearly voiced their discomfort with development around the site at public meetings, including construction of the Wildlife Refuge, the Jefferson Parkway, and housing. For procedural and ultimately environmental justice to be reached for the site, these development initiatives must be halted until the public decides to continue once research has been conducted in a manner the public is satisfied with. The reluctance to conduct environment and health research that the public is satisfied with indicates how contesting illness serves in the interest of government and corporate authorities (Cable et al. 2008). The development of the Jefferson Parkway and housing close to the Rocky Flats site served to increase profits for governmental and corporate bodies. Additionally, the transition of a historically contaminated landscape serves to 'green' military initiatives (Havlick 2007). When considering the contested health issue surrounding the site, the transition of this space against the request of members of the public also serves to obscure environmental health claims.

Barriers to Procedural Justice

Decision-makers have a large influence on how risk is defined and accepted after or during the recognition of environmental injustice. Lake (1996) presents community self-determination and individual autonomy as methods for addressing the distributive injustices of environmental bads. Ideally, he says, residents should be able to set decision-making agendas for how environmental risks in their community will be addressed.

Schlosberg (2007) expands on this by providing three central aspects to procedural justice. First, access to information is required for residents to make educated decisions. Second, affected residents should have a voice in deciding environmental policy-making. Finally, residents should be involved in research concerning their community. All of these should be driven by residential perspectives. Shrader-Frechette (2007) outlines strategies that are used to mislead the public, the most relevant in this case being the promotion of polluter self-policing. The legacy of Rocky Flats begins with non-consensual founding and secrecy surrounding environmental risk. These two aspects emphasize the importance of residential decision-making over their own landscape, regardless of agency perceptions of environmental remediation. Three themes indicating procedural injustice emerged from interviews with advocacy leaders and board members: *Institutional Barriers*, *Inaccessible Information*, and *Dismissal of Public Concern*.

Institutional Barriers

Institutional barriers at the site are mainly shown through participant observation and statements made by residents during Stewardship Council meetings. Additionally, in my interviews, advocacy leaders observed that these spaces are not accessible or welcoming to the public. When members of the public bring up their concerns to agency representatives, they are regularly dismissed and told that health outcomes are from natural causes or individualized

behaviors and decisions. Institutional barriers preventing the access to residential decision-making for the site were mainly witnessed through participant observation at the Stewardship Council. The two avenues most available for public deliberation and decision-making over the Rocky Flats environment are the Rocky Flats Stewardship Council and the Jefferson Parkway Public Highway Authority meetings. The scheduling of the Stewardship Council meetings, which began at 8 am and were always held on a weekday, made it difficult for those with children, full-time jobs, or other constraints to attend the meetings and participate. Despite the council's mission to uphold community interests over the site, they already excluded attendees, due to these tough time constraints. The meeting room itself was mostly taken up by a table that wrapped around two thirds of the room and was occupied by approximately thirteen members of the Council. The last third of the room held approximately fifty seats for residents, who were concerned about this issue, as well as refreshments for all attendees. While every meeting I attended had these seats filled, there remained a large open space in the middle of the room. Those who were unable to find a seat were left standing, and a few who are unable to find standing room were left sitting on the ground towards the middle of the room. From the organization of the space, it seems clear that these meetings were prioritized as a discussion between members of the board, with the observation of a few community members allowed.



Figure 4: The Rocky Flats Stewardship Council and Residents

Community advocates I interviewed observed the same limitations about the space and the ways it excluded members of the public from feeling welcome to speak. For example, in my interview with Victoria, she noted:

...the Stewardship Council... they're supposed to be very, like, you know, open to the public and stuff, well, why [are] their meetings in the middle of the fricken day? Anyone who has a job cannot attend... they're open to the public but... how do we even know about them? It's like they act like it's out there [to] people, like, who is it out to? Not citizens who live here because they don't want people to know about Rocky Flats... If [residents] know about the Stewardship Council, then people find out about Rocky Flats...

Schlosberg (2007) describes that procedural justice requires affected communities to have access to information, a seat at the table for decision-making, and collaborative research based on the needs and led by affected communities. Additionally, these requirements need to be community led initiatives. Access to the site of public deliberation is prevented in two ways, which are vital for achieving procedural justice, namely: access to information and community self-determination. Local residents were not notified of meetings associated with the site in effective ways, and therefore, were excluded from the decision-making process.

Ultimately these barriers helped diminish the space for members of the public to share their perspectives in meaningful ways – and definitely kept those concerns from driving meeting agendas. When members of the public brought up issues that were important to them in the meetings, such as contested illness outcomes, they were often dismissed. For instance, in regard to the community's concern over cancer incidences, representatives of the CDPHE told the audience that cancer is a result of thousands of mutations per day and undergoing this process is normal for our bodies. Additionally, the representative normalized the risk of cancer through the use of botulinum in Botox, in order to argue that small doses of some compounds are not dangerous. Finally, I observed the representatives encourage community members to test their

homes for radon exposure, as it is the number one cause of cancer, next to smoking. Following this, representatives passed out coupons for home radon testing while stating, “If you care about radiation exposure, get your home tested.”

The normalization and naturalization of cancer risk served as a dismissal of residential concerns of cancer occurrences being due to human decision-making from the Rocky Flats plant site. When the public aimed to participate in environmental decision-making, agency representatives dismissed their concerns as environmental outcomes. This action reflects how common health problems in contaminated communities are often regarded as ‘environmental illnesses’ (Cable et al. 2008). By dismissing residential health concerns as environmental, decision-makers are able to retain power over the direction of what environmental action will be taken. For Rocky Flats this means that no more health studies are required for the transition of the landscape into a Wildlife Refuge despite public request for more community-based research on health outcomes to be conducted.

Advocacy leaders understood these comments to not only be a dismissal of community concerns, but also a failure of institutions to protect residents from contaminants. Oliver* a resident who works as a software architect with education in mathematics and computer science, and who knows “How to read... how to do research, and... know[s] right from wrong” reminded the CDPHE that their mission is to protect and improve the health of Colorado’s people and the quality of its environment. He observed, “That in taking the flippant and cavalier attitude with respect to Rocky Flats, evidenced in CDPHE’s briefing to you today, CDPHE is failing in that mission, most negligently.” Residents and advocacy leaders did not feel that agencies are addressing their concerns. This issue could be resolved using Schlosberg’s (2007) third

recommendation for procedural justice: residents should be driving research through community based participatory practices.

Ultimately, residents would like to set the agenda and be included in decision-making during meetings, but feel they are barred because they do not have the expertise that agencies and Stewardship Council members retain. Residents, however, have watched their loved ones be impacted over decades from what they perceive as outcomes of residual contamination from Rocky Flats. They feel they are experts in their own right from these lived experiences. At the end of a meeting, a local mother of a child with a rare cancer stated, “I find the way this issue is discussed in the commentary and in council dehumanizing, it should be led by the people who can have their lives destroyed by this issue... people can die if you dismiss human stories.” This resident, like advocacy leaders and others at the meetings, understood that their experiences were not driving the research, conversation, or decision-making surrounding environmental and health issues at Rocky Flats.

In my interviews with advocacy leaders, public involvement in the decision-making process was at best used as a form of public relations, and at worst, non-existent. Despite this, across all my interviews with advocacy leaders, they observed that they should be involved in the decision-making process for the future of Rocky Flats. For example, Victoria observed “I think when you are doing construction or if you're considering doing construction in the area, you should connect with organizations that help people who are claiming to be impacted by the contamination.” Victoria like all other advocacy leaders I interviewed, believe that they should be involved in the decision-making process because they have first hand experience with contamination in the area. Community advocacy leaders rely on their personalized health experiences to demand environmental justice for their community. Brown (1992) discusses when

concerned lay people hypothesize that something out of the ordinary is occurring in their community, they encourage government agencies to conduct a study of their health impacts. Often the study finds that there is no association between contaminants and health effects (Brown 1992). Specifically, research focusing on nuclear communities have found no association between environment contamination and human health when conducted by the DOE (Nussbaum et al. 2004). Following this, nuclear communities have been required to distribute their own surveys and conduct their own analysis to prove the association of negative health outcomes and their contaminated environment (Nussbaum et al. 2004). This pattern that Brown describes is occurring at Rocky Flats and can be dissected through an environmental and procedural justice lens. Advocacy leaders have been asking for more studies to be conducted before development of the landscape occurs. They have been able to point out major flaws in the health studies that have been conducted by government institutions thus far and feel that they should be included in community decision-making for the future. Environmental risk was placed on the community without the possibility of consent, now members of the public would like to be a driving force for decisions over the future of the site.

The call for more community involvement in the decision-making process reflects the literature in two ways. First, the foundation of procedural justice requires that the public are experts in their own right, and are entitled to the right to consent, and due process over issues of environmental injustice (Shrader-Frechette 2007). Advocacy leaders and residents at public meetings are voicing their concerns loud and clear, and yet, are dismissed by decision-makers and government agencies. Second, Schlosberg (2007), specifies that for procedural justice to occur, affected residents must have a voice in deciding the future of their community. Nussbaum et al. (2004) in addition, critiques public meetings that serve to dissipate public anger, as they are

just a form of public relations rather than substantive action towards environmental justice. Public meetings dealing with the issue of Rocky Flats do not follow through or consider the requests of members of the public and serve as public relations rather than genuine public participation in the decision-making process. Due to this, Rocky Flats remains a site of environmental and procedural injustice.

Statements made during public meetings and those of advocacy leaders in interviews indicate that public meetings are not being regarded as spaces for public involvement. When residents demand more action be taken in order to gauge their health risk, agencies direct the audience towards natural environmental causes rather than further exploring the potential influence of the facility's residual contamination on community health outcomes. Community illness are dismissed through natural environmental causes and public meetings serve as a method of public relations by attempting to direct residents' anger elsewhere. Both advocacy leaders and residents in attendance demand more access to decision-making over the future of Rocky Flats.

The barriers that community advocacy leaders around the Rocky Flats site face reflect the literature on procedural justice in contaminated communities. Achieving procedural justice in nuclear communities is important because community decision-making over environmental and health risk has not historically been available to members of the public, instead these communities have been disenfranchised as environmental and health risks have been placed on their communities without their consent. One requirement for procedural justice is access to active participation in the decision-making process (Schlosberg 2007). Members of the public face barriers to becoming active participants in two ways. First, the use of space for Stewardship Council meetings is not set up in a way to facilitate discussion with members of the public.

Members of the public are treated as if they are attending to observe the meeting rather than as active participants in the decision-making process. Second, community advocacy leaders have been clear that they want development in the area to stop until more health studies have been conducted to thoroughly determine the health impacts on the community. *Participative justice*, a foundation of procedural justice, requires that members of the public have the same decision-making power as experts, the right to consent, due process, and compensation for health issues (Shrader-Frechette 2002).

Few if any, of these requirements are being met because community concerns remain ignored. As development in the community continues despite these requests, public meetings serve as public relation attempts, rather than opportunities for the public to actively engage with decision-making over their environment (Nussbaum et al. 2004). Furthermore, the interactions between concerned members of the public and elected officials in these spaces highlights how the dismissal of public involvement severs as a form of environmental misrecognition. Members of the public voiced how the CDPHE mission to protect and improve the health of Colorado's people is failing because they are dismissing lived experiences in the community. This reinforces that members of the public are not active participants in decision-making or research of the site and reflects the importance of recognition as a prerequisite to *participative justice*. This reiterates that rather than being told that community interests will be taken care of, member of the public want consultation, have the issue discussed from a variety of perspectives, and be active partners in the decision-making process (Schlosberg 2007).

Inaccessible Information and Agency Power

Access to useful information is a prerequisite for procedural justice because it allows residents to fully participate in the decision-making process. This theme explores how

information regarding Rocky Flats is obscured though the technical knowledge that is required to comprehend what is happening in the environment. Both advocacy leaders and Stewardship Council members indicate that this knowledge is above their comprehension. As agency data is prioritized in decision-making at the site, this shows that by presenting information in this manner government agencies retain power of the direction of environmental and health actions at Rocky Flats.

Throughout my public meeting attendance, it became apparent that the information being presented was highly technical and not adequately translated to be useful for, or transparent to, members of the public. For example, across presentations at the Stewardship Council, the DOE, and CDPHE detailed how soil sampling was historically collected, how today sampling is done by observing contamination in wells on site, and how information like risk assessment and effective dose were calculated. While I observed the looks of confusion in the room during these meetings, statements made by participants emphasised the difficulty that all present had in understanding the technical data. I overheard the presider of the meeting speak to a colleague and say, “This presentation is a classic example of you know it too well,” while gesturing with one hand above his head. This gesture and statement imply that the speaker’s comprehension of the material was beyond the comprehension level of the board, and especially the public audience.

This perspective was further affirmed when Logan*, an elected official on the board whose many accomplishments include holding a doctorate in veterinary medicine, being chief of prevention operations in the Air Force, and also as Director of health in the Jefferson County Department of Public Health, told me that, “If I was a lay person I would be mad because that presentation was way up here. I had a hard time wrapping my head around it and I’m not a lay

person, I was in the air force.” In this statement, Logan empathized with the lay public in understanding the information presented by the CDPHE representatives. These statements were made by members of the board, who have specialized knowledge in their own right. Despite this knowledge, Stewardship Council members still indicated how difficult understanding the data presented by agencies was for them and indicated that they would not expect the lay public to understand. Access to information is important for the lay public to participate fully in decision-making for the site, if residents, and even decision-makers were unable to understand the material that agencies are presenting decision-making power is being held by agencies overseeing the site. This is also important provided the historical context of Rocky Flats, as government agencies have held and continue to hold powerful influence in the direction that environmental and health action takes. Access to information is integral for procedural justice because without this, communities remain reliant on government and corporate authority rather than as social actors with agency over the environment and health of their landscape and community. Members of the public who come to meeting are required to trust that the information being presented to them is accurate and considerate of their concerns.

Due to intensive secrecy surrounding the operations of the nuclear facility, community trust in governmental decision-making over issues surrounding Rocky Flats has been breached. Additionally, research conducted by the CDPHE, an institution that community advocacy leaders do not trust, is privileged over the research conducted by scientists that community advocacy leaders do trust. While scientific results are shown as clear evidence for the safety of the site, the dismissal of research that community members trust and the reluctance to conduct further research on community health to relieve community concerns displays how information creation is politically embodied (Hunold and Young 1998). As citizens lose trust in expert systems, they

take into consideration this lack of trust when evaluating risk (Fischer 2000). Access to information is important because it is the first step towards rebuilding community trust in experts and becoming a public with agency over their landscape.

Stewardship Council members who were unable to understand the information presented by government agencies recognized the difficulty that they and the lay public were having and asked for more comprehensive information. For example, Barbara* an elected official that occupied a place on both the Stewardship Council and the JPPHA meetings, questioned the effectiveness of the CDPHE's presentation. She asked the CDPHE representative, "I don't know if this is out of line to ask this, but I'm just going to give a little bit of advice: when we're dealing with that data and giving that data to the public, could we make it more public friendly?... Because if you gave this to them their head would spin around." After this statement another board member added, "Like ours are!" While Stewardship Council members are not understanding the information being presented to them and recognize that the lay public will likely be unable to understand as well, one important aspect of this statement is the uncertainty around the power that elected officials have in asking for more comprehensive data for the lay public. This indicates that agenda-setting power for meetings is held by government agencies and not Stewardship Council members – or other members of the public impacted by Rocky Flats.

This is important in relation to the public's access to information because if government agencies are the ones setting the meeting's agenda, they are also able to decide the level of knowledge and expertise at which they will be presenting and thus have power over the situation that is difficult to counter for laypeople. For example, The CDPHE representative responded, "Appreciate that advice, but this is a different level of presentation for this group...". The

CDPHE representative acknowledged that the presentation was not meant for concerned residents and was instead meant for scientists overseeing residual contamination at Rocky Flats. While they followed this statement by indicating that they would be open to feedback about their presentations, this still did not address an important aspect of information access – collaborative research. Collaborative research is one of Schlosberg's (2007) requirements for procedural justice. Production of collaborative information would be an effective way to aid in providing access to information. For example, if research on health impacts in the community was conducted with collaboration from members of the public – from data collection to data analysis and interpretation – the data would be presented in a way that emphasized public understanding because throughout this process information would have to be continuously scaled to the comprehension level of the lay public. This would make public meetings about Rocky Flats a much more accessible experience for members of the public as it would not only increase public understanding of how research conclusions have been arrived at but also, be a much more inclusive space for members of the public to participate in the decision-making process. The production of knowledge for the site without public involvement ensured that decision-making power was retained by those who produce and convey research, namely government agencies.

The retention of decision-making power by government agencies though the production of inaccessible knowledge was shown across interviews with advocacy leaders. All advocacy leaders discussed the inaccessibility of data produced by government agencies, the most common insight being the use of jargon in articles, especially for measurements meant to convey the radioactivity of soil. For example, Sarah noted:

Somebody who doesn't know all of that, they're going to look at that and go... what does this mean?... It says, zero point zero one zero zero PCI slash G, what does that mean? You know, so they don't have a reference point... [and] they don't have the critical thinking skills and the knowledge base to challenge it.

Sarah indicated that lay residents who are concerned about the impacts of residual contamination in their environment are barred from challenging the data produced by government agencies because technical knowledge is required to do so. The jargon used in agency research remains a barrier for community access to information and access to participatory decision-making. Public access to information is crucial for environmental and public health because it enhances a community's capability to consider risks from a range of perspectives.

Historically, environmental and health risks have been placed on nuclear communities without their consent. Across nuclear communities there has also historically been an effort to obscure information about the health and environmental impacts of nuclear initiatives (Brown 2013; Dawson & Madsen 2007; Ball 1986). Due to longstanding intensive secrecy surrounding nuclear weapons development and environmental health outcomes, communities have lost trust in expert institutions. Rather than being told that community interests will be taken care of by experts, especially governmental bodies who have lost this trust, a community should have the capability to determine what is an acceptable risk for their community (Schlosberg 2007). Access to information is important not only for organizations like the CDPHE and DOE to regain community trust but also to ensure that communities are reaching conclusion after considering all perspectives available to them. Jargon used in agency publications creates a barrier on a community's capability to make decisions without relying on agency experts to direct them.

When residents do attempt to challenge the data through scientific research rather than their own personal experiences, government agencies have actively produced counter narratives rather than working with concerned residents towards environmental and health justice. Advocacy leaders conveyed across interviews that they felt barred from participating at public

meetings, one reason for this may be because information surrounding Rocky Flats has not been produced in a collaborative manner. For example, Hannah stated, “We can inform citizens, but jeez there’s so much contradictory information that, you know, [it] seems like when we publicize something... it comes back like ‘oh no, no, no, use this study, it *is* safe!’” Hannah indicated that every time advocacy leaders try to engage on a scientific field, they are countered rather than collaborated with. The use of highly technical knowledge in scientific articles produced by governmental agencies requires the public to accept their findings on the basis of status. Rather than collaborate with members of the public to produce scientific knowledge that is comprehensive, the CDPHE produces information that relies on existing, registry-based data and is thus not the sort of community-driven health study that the community has requested repeatedly. Without collaboration, community members with concerns of health and environmental safety will continue to distrust information produced by governmental agencies. This presents a barrier to procedural justice, failing Schlosberg’s (2007) third principal, research collaboration.

In fact, across my interviews the only thing that both Stewardship Council members and advocacy leaders agreed on was the role of information production that is retained by government agencies, and the power that comes with this role. For example, Elisa* who is a Stewardship Council board member, described this relationship to me. She stated:

...the hard thing about the Stewardship Council is, you know, I don't think a lot of people understand its role, it has zero authority, it has zero control... you know we could even pass a resolution strongly condemning something and it wouldn't matter...the Stewardship Council also has to keep a pretty good relationship with the DOE and the CDPHE because they're our source of information.

Across interviews with advocacy leaders and board members, both groups presented the Stewardship Council having limited knowledge over the issues and instead rely on the expertise

of the government agencies presenting the data. While this could be thought of as an institutional barrier, it strongly illustrates the inaccessibility of information within the context of the interaction between the public, Stewardship Council members, and government agencies shown above. Information remains inaccessible for advocacy leaders, concerned residents, and board members because responsibility for data gathering and presentation is retained by governmental agencies.

This fails all three of (Schlosberg 2007) requirements for procedural justice. This process disempowers the public because it makes them unable to make decisions over the future of the community themselves and instead requires Stewardship Council members and members of the public to rely on expert knowledge of the site. While expert knowledge is important, in the historical context of nuclear weapons development, experts have hidden information detailing environmental and health risks from communities. (Brown 2013; Dawson & Madsen 2007; Ball 1986). Members of the public want access in deciding the future of their community. Inaccessible information provided the foundation to disempowerment of the public for public meetings because Stewardship Council members feel that they must maintain a good relationship with government agencies as they are the source of risk information. Agenda making power over public meetings, and decision-making power over the site therefore remains maintained by government agencies who are predominantly responsible for placing environmental and health risk on the local community. While members of the public have been clear that they would like development in the area to stop until more health research is conducted, this request is able to be ignored because governmental agencies continue to hold power over the site.

The responsibility for collecting and presenting data is important because it shows another way that procedural justice is not being met through the inaccessibility of information.

While advocacy leaders work to produce their own information to help justify their health claims, agencies counter these claims through their own reports, which in effect, results in these agencies being the only source of information seriously considered. Rather than collaborate with concerned residents to produce more health data, agencies produce knowledge that requires all to rely on their expertise as a single source of information. In addition, the DOE funds both the CDPHE and the Stewardship Council for oversight of Rocky Flats. While this is presented as an instance of the polluters pays principle on the CDPHE website, the website also ascribes DOE responsibility for ongoing surveillance of groundwater treatment, sampling the groundwater well network, sampling surface water, monitoring two landfills, and other environmental monitoring on site. The environmental justice principle of ‘polluter pays’ is being used to reinforce and continue environmental injustice by promoting polluter self-policing and control over the future direction of the site.

Information collected and presented by agencies to the board and the public is difficult to understand and therefore causes those in attendance to rely on agency expertise. Community advocacy groups have been involved in issues surrounding Rocky Flats for decades. In this time, there could have been many collaborative health studies produced in order to identify if residents have cause to worry about residual contamination in their landscape. Instead, agencies produce contradictory information as a method of silencing community concerns. Two important aspects of procedural justice are highlighted in this theme. Shrader-Frechette (2007) identifies the many tactics that polluters use to mislead the public, including: special interests’ unduly influencing federal regulators, using advisors with conflicts of interest, committing white-collar crimes, manipulating the media through PR, and promoting polluter self-policing. The promotion of polluter self-policing is the most relevant for the Rocky Flats site. While the CDPHE presents

DOE funding as aligning with the ‘polluter pays’ principle, this is a misrepresentation of an environmental justice principle as the DOE continues to be the source of information for issues onsite. In this way, information creation is politically embodied (Hunold and Young 1998). Procedural justice for communities impacted by environmental injustice requires access to information, but this can be difficult when there is a power imbalance between government agencies and the public. Hunold and Young (1998) suggest that independent research and independent consultation by community trusted researchers should be pursued as a solution to this.

Dismissal of public concern

Over the course of my interviews and time at public meetings, I witnessed public concern being repeatedly dismissed by board members. Dismissal of public concern occurred in three ways: hostile meetings that lead to dismissal, dismissal of risk, and the dismissal of concerned residents themselves. The dismissal of the public is another way that procedural injustice is enacted over issues surrounding Rocky Flats. By dismissing the perspectives of concerned residents, board members and agency representatives are actively preventing a resolution of the Rocky Flats legacy that is determined by affected communities. The dismissal of public concerns violates the requirement for procedural justice of community access to decision-making and self-determination (Schlosberg 2007; Lake 1996).

During one public meeting I attended, a lawyer representing members of the public, demonstrated the ‘alternative perspectives’ of community members to the Stewardship Council. While there was only one occurrence of this, this instance was important because it indicated how experts who try to support members of the public are demeaned by members of the Stewardship Council and government agencies when members of the public are able to direct the

meeting agenda. In this meeting a local lawyer who went back to school in order to bring local communities around Rocky Flats health justice, presented on a variety of public concerns ranging from the legacy of secrecy surrounding the site, to the risks that have been associated with plutonium. I witnessed the lawyer being heckled by a representative. As the lawyer was concluding her presentation she insisted that, “My goal here is to talk about the things that are unique to the alternative viewpoint... that while the math and the modeling is all very impressive, if you are the one affected by the wrong side of that math, or your family... all the math in the world isn’t going to be a comfort.” This statement was met with a mimicking jeer from a representative near me in the back who stated, “My goal is to find new clients.” The largest concern that residents had were the health outcomes that they associated with Rocky Flats, and while the lawyer was trying to convey this to the board, a representative of a government agency dismissed this as a moment of opportunism.

What this exchange portrays, beyond dismissal of community members’ concerns, is the value of recognition of community environmental health experiences for environmental and procedural justice. Brown (1992) describes a major barrier that embodied health movements face is the affirmation of community health experiences through government funded studies. One of the reasons for this is that there are benefits to governmental authorities in dismissing community experiences (Cable et al. 2008). Governmental institutions benefit in dismissing community health claims in the short term through expansion of development projects in the community, and in the long term by distancing themselves from community health outcomes and risk associated with nuclear production. Community advocacy leaders often try to frame issues of equity and recognition through community environmental identity (Schlosberg 2007). The main identity that those who believe their health issues have been caused by radioactivity left from facility

operations are Downwinders. Concerned members of the public chose this lawyer to speak on their behalf at a Stewardship Council meeting to present their perspective of the issue. Hunold and Young (1998) discuss how communicative democracy can be difficult when there is a power imbalance barring access to information. One proposed solution is that consultation and communication occurs through trusted researchers. The dismissal of this community trusted lawyer serves as a method to not recognize community environmental and health concerns. This is important for procedural justice and ultimately environmental justice because it shows how without recognition, concerned members of the public cannot become active participants in decision-making.

Across my interviews, advocacy leaders reported experiencing dismissal of their perspectives at public meetings through a range of hostile actions, including lying to the community, being treated like enemies, being forced out of meetings, and presenting social media statements to the board. Overall, rather than cooperate with concerned residents in a manner that satisfies their concerns, advocacy leaders understood that the board and agencies routinely discarded their concerns. For example, Chloe* when discussing the CDPHE mission statement to enhance community power over their environment, stated:

If you can't demean the message demean the messenger... That whole group many of which were former PhD scientists, chemists, biologist, etc., who did work under contract... are just being routinely discarded and demeaned and what not, and as out of touch [for] not wanting to accept the current science.

Members of the public understand that researchers who have raised alarm over environmental health risks are being dismissed. Rather than collaborate in effective ways with local scientists and members of the public, my interviewees felt dismissed by government officials. As the opening of the refuge is being pushed through despite clear opposition from advocacy groups at public meetings, public meetings remain spaces of procedural injustice due to the failure to

achieve Schlosberg's (2007) second and third requirement of procedural justice, a seat at the table for decision-making and collaborative research. One of the methods that Hunold and Young (1998) suggest to address a power imbalance over access to information is that consultation with and research through community trusted researchers should be prioritized. Rather than dismissing researchers that concerned members of the public trust, further research that the community requests could be facilitated through a partnership of trusted researchers, government researchers, and members of the public. By doing so research would be conducted in collaboration with members of the public, members of the public would have first hand access to information produced through the research, and members of the public would be able to fully participate in the decision-making process.

Board members' dismissal of public concern also occurred when they connected the perceived hazards of living in a community with residual contamination, to every day risks we are required to accept. These hazards ranged from individualized action like smoking to the risk of crossing the street. Ultimately, this perspective dismissed both the role that government has had in contaminating the local landscape in the first place and the requirement to remedy environmental and health issues in a way that affected communities see fit. For example, Logan observed:

The issue to me on Rocky Flats is more emotional than factual... Some people are going to walk across the street, there's a lady there in the wheelchair and they're pushing her across the street, and there's a probability that a meteor could hit em, or a car could hit them all and kill them... We take risks and we assume them [and] that's rational.

Logan presented the risk from natural disasters to crossing the street, akin to that of the environmental risks in the community. Across interviews with board members, this habit of dismissing residential concern was repeated. While this viewpoint dismissed residential concern

and government's responsibility for causing this issue in the first place, it also upholds researchers' data over residential health experiences.

The dismissal of community perceptions of environmental and health risks result in additional barriers to environmental and procedural justice. Rather than working with concerned residents to transition the environment into a space that the community understands as safe, government agencies decide what should be considered safe, while ignoring those who do not feel represented by environmental and health standards. Specifically, perceptions of risk diverged between Stewardship Council members and community advocacy leaders along the lines of distinct risk perceptions. While there are inevitable risks that one must accept in a lifetime, the perspective that risks associated from Rocky Flats – facility operations, the development of nearby housing, roadways, the opening of the Wildlife Refuge, and the rejection of community-based health research – are inevitable, indicates a dismissal of the social factors that concerned members of the public are fighting against to safeguard against risk.

Environmental and health risks have been placed on nuclear communities across the nation without their consent due to intensive secrecy during the Cold War (Brown 2013; Kuletz 1998; Ball 1986). Regarding risk in nuclear production as an inevitability is a method to distance governmental bodies from responsibility of this risk. Fischer (2000) regards public trust to be a reflexive process as members of the public consider what extent experts aim to obscure their responsibility from risk. This exemplifies the importance of public access to participation in the decision-making over their landscape for environmental and health justice. Current decision-makers see risk associated with Rocky Flats as an inevitability and rather than take precautions, this is used to justify development of the Wildlife Refuge, roadways, and housing. Thus,

community advocacy groups face a significant barrier in their concerns influencing and included in the decision-making process.

In addition to dismissing residential health experiences in favour of agency models, Stewardship Council members dismissed those concerned as a small group of residents who were unwilling to become informed or change their mind. For instance, Elisa told me:

I think you have people that don't have the patience or the interest to delve into such a difficult topic and they want a really really simple answer, and I don't think you're ever going to be able to provide that in a situation like this, and so, part of me thinks that, the public that wants a simple answer is not really who we need to be talking to, it's the public that truly wants to be educated and informed.

Elisa indicated that the concerns residents have over residual contamination in their community is borne out of an unwillingness to become informed. This perspective of advocacy leaders and concerned residents was held across interviews with board members. By viewing concerned residents in this manner, board members, the majority of which are elected officials, are able to dismiss concerned residents as an uncooperative small subset of the population who are not worth engaging with in decision-making for the site. It also privileges knowledge produced by agencies over the knowledge of those who have experienced health issues in the community. Advocacy leaders have described how the methods used in existing studies could overlook local health outcomes, and request that more health studies be conducted as a precaution to health risks that development may compound. Rather than unwillingness to become informed, advocacy leaders are unwilling to allow the decisions made by developers and government officials to place their communities at risk again. The characterization of concerned members of the public as unwilling to become informed highlights how information creation is politically embodied (Hunold and Young 1998). Concerned members of the public are hesitant to adopt information from institutions that originally placed their community at risk, even indirectly This hesitation is

founded in distrust for government agencies from this original decision and is exacerbated when requests from concerned members of the public are dismissed (Fischer 2000). The dismissal of concerned members of the public from decision-making for not wanting to adopt the view of government agencies indicates a clear barrier to opportunities of authentic participation for concerned members of the public. This indicates a failure of Schlosberg's (2007) second principle for procedural justice because community members should be able to participate in the decision-making process without being required to come to the same conclusions as government officials.

The dismissal of public concern over the environmental and health issues they attribute to the site indicates ongoing procedural injustice by decision-makers in the community. This occurred in three ways: hostile meetings that lead to dismissal, dismissal of risk, and the dismissal of concerned residents themselves. The dismissal of concerned residents in this manner also reflects historical instances of dismissing concerned residents following the completion of the Grand Jury trial in 1992. Dismissal of concerned residents has been ongoing for decades as decisions are made at the site. Without the inclusion of residents in the decision-making process board members and governmental agencies reproduce procedural injustice, and ultimately a misrecognition of community interests as the landscape is transformed into something they are adamantly opposed to. One of the reasons why this is important is because community trust in government agencies has been lost through land use decision-making from which members of the public were excluded previously. Fischer (2000) describes public trust as a reflexive process as they take into account what extent experts aim to obscure their responsibility from risk. For instance, Stewardship Council members distanced themselves from responsibility over risk by conceptualizing risk as inevitable. While concerned members of the public request that

development halt in the community until more health studies are conducted as a precaution to risk, the way that Stewardship Council members understand risk serves as a method to dismiss public concern over risk. When a lawyer and scientists trusted by the community try to convey and validate the concerns of community members in public meetings they are dismissed as well.

Cable et al. (2008) emphasize how government benefits in contesting illness. Two ways that government could benefit by contesting illness at Rocky Flats is through expansion of development projects in the short term and distancing themselves from community health outcomes and risk associated with nuclear production in the long term. Despite being unwilling to take the concerns and requests of members of the public seriously, Stewardship Council members consider concerned members of the public as unwilling to become informed. Concerned members of the public cannot be active participants in land use decision-making when their concerns are dismissed in these ways.

Analysis of Barriers to Procedural Justice

Barriers for concerned residents to achieve procedural justice, and ultimately environmental justice over their contaminated landscape were enacted in three main ways: *Institutional Barriers, Inaccessible Information, and Dismissal of Public Concern*. Institutional barriers are enacted by the physical space that limits public participation at meetings and agencies dismissal of resident illness as natural environmental illness. The dismissal of community concerns in this manner reflects Cable's et al. (2008) observation in how common health problems in contaminated communities are often regarded as 'environmental illnesses'. Dismissal in this manner at public meetings serves to direct residential concern elsewhere as a form of public relations rather than substantive action towards environmental justice (Nussbaum et al. 2004). As public meetings serve as a form of public relations rather than a forum for

genuine public participation, these meetings fail Schlosberg's (2007) second principal, a seat at the table for decision-making. Additionally, information collected by the DOE is presented both above the comprehension level of the board and residents in the community, and used as a method of dismissing concerned residents. Therefore, information presented to the public cannot stand up to Schlosberg's (2007) first principal, access to information, since the information presented is not useful when people consider risks and made health-related decisions. While the CDPHE presents funding by the DOE as enactment of the 'polluter pays' principal, the DOE retains active monitoring and sampling of the site. This is important because government agencies are also highly influential over the direction that decision-makers choose to take. Rather than being an instance of 'polluter pays', this relationship better serves as a form of polluter self-policing (Shrader-Frechette 2007). Due to the large power imbalance between concerned residents and governmental agencies the information produced by these agencies remains politically embodied (Hunold and Young 1998). These relationships remain historically embodied as concerned residents continue to be dismissed after decades of advocacy (Szasz & Meuser 1997). Despite, or due to, these barriers towards procedural justice, both advocacy leaders and residents in attendance demand more access to decision-making over the future of Rocky Flats. The perspectives and experiences shared with me from public officials and community advocacy leaders highlight the barriers that concerned members of the public face in becoming authentic participants in decision-making over land use decisions for Rocky Flats. While public officials consider risk in the area inevitable, community advocacy leaders call for more research to be conducted on the health outcomes to the community as a precaution to environmental health risk. Despite a community trusted parties trying to convey community concerns to the Stewardship Council and representatives of government agencies, these trusted

people are dismissed and concerned members of the public are characterized as unwilling to become informed. This characterization, the level that information is presented at, and an unwillingness to pursue the requests that concerned members of the public have made show the underlying mentality of what the presentation of information should mean for lay people in the community. Particularly, that the perspectives of government researchers and officials should be adopted by the community despite government agencies creating the issue in the first place, and because of this, members of the public cannot be considered active participants in decision-making. Dismissing social factors in the creation of environmental risk serves to naturalize the local landscape. Ultimately, the naturalization of risk from military spaces benefits government and corporate authorities over the interests of members of the public, and aids in both the dismissal of a thorough health examination of the community (Cable et al. 2008; Havlick 2007).

Current Development and Inaccessible Information

Both board members and advocacy leaders discussed whether there was the need to inform the local community of the Rocky Flats history. On this topic, these two groups mainly presented opposing perspectives. Board members felt that if residents wanted to be notified of information regarding Rocky Flats, they had the ability to access this information through the internet. Additionally, board members saw housing development and the purchase of these homes in the area as an indication of residents' acceptance of environmental contamination. Advocacy leaders on the other hand conveyed that community knowledge of Rocky Flats was not pervasive.

Community Information - Notification for Residents

One of the main concerns expressed by advocacy leaders across my interviews was that those who live in the area and those who wish to live in the area are not being adequately

informed of the sites history and the contamination that remains in the environment. They understand the lack of signage in the area as a method of obscuring this history from both of these populations.

In order to have an engaged public around issues regarding environmental and health injustice, there must be access to information as to what has occurred at sites of environmental injustice. In interviews with advocacy leaders, they conveyed their concern over the signage at the site. The residual contamination at the site is invisible to the human eye, but the social issue of public decision-making over a contaminated site is in part caused by the lack of signage, another form of invisibility. For instance, Ellie detailed:

A huge problem [is] people don't even know about it, like, look at Microsoft Bing Maps, and Zillo doesn't even talk about Rocky Flats, and there's no signage, and just complete denial. Arvada is the biggest denial area. Arvada because that's Candelas... I think [the] biggest battle [Emma] and I have tackled is that people have the right to know that there's still contamination in there and it can cause health problems... the city of Arvada is lying by not putting signage.

Advocacy leaders as a whole understood that the lack of signage in the area was a tactic to keep the history from the public consciousness. Ellie argued an informed public requires both physical and digital notice of the events that transpired at Rocky Flats. Furthermore, advocacy leaders would like notice of the residual contamination in the area and notice that there may be potential health problems associated with it. During my time observing the meetings for community advocacy groups, there was often a reminder to report a mistake to Bing Maps about the naming of the land for their service. Currently both Bing and Google Maps label the land historically belonging to the facility as the Rocky Flats National Wildlife Refuge.

While advocacy leaders requested signage on the land so that residents may become informed about the legacy of Rocky Flats, this request was dismissed by elected officials. Chloe is an elected official that supports advocacy leaders' desires – an exception compared to other

elected officials – was exasperated at the decision to deny signage for the public by her peers on the Stewardship Council, and other decision-makers. She stated, “We allowed... all of this unconscionable stuff... but don't make it worse by pretending it never happened... hiding it and calling it... the National Wildlife Refuge, and when the state legislature two or three times had legislation in front of it to have to put signage out there, they voted it down.” While this perspective was an exception to other perspectives on the board, it did reflect the perspective of advocacy leaders and indicated that providing the opportunity to acknowledge the history of the site, as per concerned residents wants, elected officials chose not to present the history to the public. Thus far public officials have consciously decided to obscure the history of Rocky Flats from members of the public by voting down opportunities to provide signage in the area. Preventing the public from access to information about their environment in this manner indicates a failure of Schlosberg's (2007) first principal for procedural justice. Community advocacy leaders have been requesting signage so that members of the public can be informed about the Rocky Flats site. However, when elected officials had the opportunity to ensure that these requests were met, they chose to deny them. Shrader-Frechette (2002) argues for active participation to occur, citizens and environmental stakeholders should have the same decision-making power as experts, the right to consent, and due process. Members of the public do not have the same decision-making power as experts because their requests are ignored. As mentioned in the first theme of this thesis, one of the major concerns that community advocacy leaders have is that newer residents have no knowledge of the landscape's history. The history of secrecy associated with nuclear production at Rocky Flats provides an additional barrier for knowledge of Rocky Flats in the community as well. Rather than enable community decision-

making over the landscape by ensuring that knowledge of Rocky Flats is prevalent in the community, elected officials voted to impede public knowledge and decision-making.

While advocacy leaders indicated the need for signage in the community, most of the Stewardship Council members I interviewed denied this need. Each one observed their view that that concerned residents could obtain any information that they required through the internet. For example, Barbara expressed:

You can Google that and look up what it was... those kinds of things should be a factor in your decision-making, but I don't know that we can put everywhere, a sign, everywhere in this county, at every golf course and at every lake... I think you can talk to people in the area and ask them.

Stewardship Council members predominantly understood that community members could access information about Rocky Flats through the internet, however, this perspective assumed that residents have enough information to pursue online examination of the history of the site. Barbara suggested that people talk to their neighbours to gain information about the site but this ignored that residents are unaware of the history of the site, and the residual contamination that remains, until they experience health outcomes. While the mandate of the Stewardship Council is to ensure that the community retains knowledge of the history of Rocky Flats, and the residual contamination in the environment, Stewardship Council members ascribe the fulfillment of this mission to the internet.

While my interviews with board members indicated that notification for the public was achievable through online access, advocacy leaders as a whole did not believe that there was adequate awareness in the community. This position was echoed by Olivia* a Stewardship Council member, who was again an exception to the majority. Olivia's unique position as an elected official who interacts with many constituents provided insight that advocacy leaders may not have. She stated, in regards to community awareness of the site, "No, I don't think so, and I

just base that on conversations that I have with a lot of people, talking as an elected official, and a representative of our people, I mean there are a few who are keyed in, but the overwhelming majority don't have any idea.” As discussed previously, advocacy leaders indicated that they were unaware of the legacy of Rocky Flats, and the residual contamination that remains in their community, until they experienced health outcomes.

Across my interviews with advocacy leaders, they indicated that they felt that the majority of the community was unaware of the issues associated with Rocky Flats, which Olivia supported. While the majority of board members felt that residents were being provided adequate notification of the site’s history through the internet, this assumption seems unlikely. The quotations provided indicate that a few Stewardship Council members support community advocacy groups and believe that members of the public are not adequately informed about the issues and risks surrounding Rocky Flats. Community advocacy leaders request more signage so that members of the public can make informed decisions for the future of the community. Community advocacy groups and a minority of Council members have acknowledged that the public has been uninformed for decision-making in their community thus far. This is important because without an informed public there cannot be access to active participation and consent over land use decisions for the site. Rocky Flats is a site of environmental injustice largely due to the intensive secrecy during operation of the facility (Schlosberg 2007). Procedural justice is a pre-requisite to achieving environmental justice, especially given this history, because it enables community agency over their environment (Lake 1996). An uninformed public indicates that procedural justice over the site is not occurring in two ways, a lack of public access to information therefore cannot lead to active public participation in decision-making (Schlosberg 2007).

On September 15, 2018, the Rocky Flats Wildlife Refuge opened to the public for recreation. Signage has now been placed at the entrance. While the sign covers a lot of detail about the site, there are two things missing for the sign to indicate agency action towards procedural justice. First, the sign does not include what contamination was found offsite. Instead it only specifies that no remediation was required. This aspect of the clean up and transformation of the site requires affected communities to continue to rely on agency expertise in determining their safety. Second, the transformation of the site has moved forward despite the protest of community advocacy groups. While the site may officially be considered low risk to local populations, it remains a site of procedural injustice because the voices of concerned residents were left out of the decision-making process. Those who are left out of the process come against recognitional barriers from those with decision-making power. Local residents have framed environmental issues at Rocky Flats as community health issues. Concerned residents who have experienced health outcomes identify as downwinders on both a local, and global scale. The forced opening of the Wildlife Refuge, despite concerned residents' protest at community meetings, is a form of environmental misrecognition and a dismissal of local health experiences. Rather than allow communities agency over their local landscape, governments retain decision-making power over community risk, and therefore reproduce the original non-consensual act of facility placement with the refuge placement. While providing signage will initiate the provision of useful information for the community and allow more informed participation, signage has only now been included after major decisions for the environment have been enacted. Additionally, community advocacy leaders are not only concerned about the Wildlife Refuge, but also about contamination offsite. Signage has not been placed in surrounding communities. The combination of a lack of signage and the refusal to adhere to the requests of members of the

public who were engaged at meetings indicates a failure of Schlosberg's (2007) first and second requirements for procedural justice.

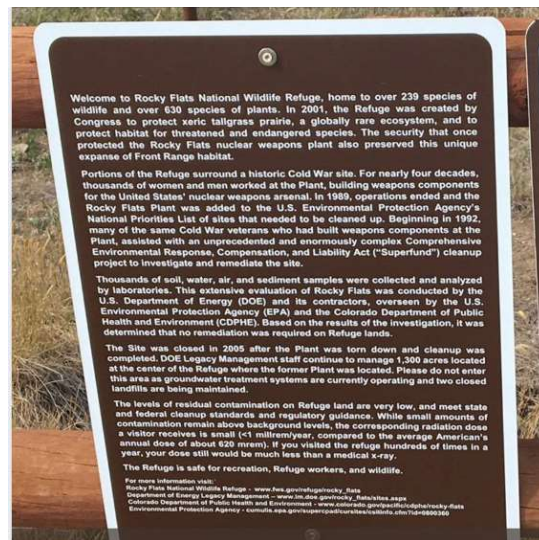


Figure 5: Signage on the Rocky Flats Wildlife Refuge

This is particularly important in the context of nuclear environmental injustice because of the legacy of community disempowerment that has occurred due to intensive secrecy. On both a national and local level nuclear production during the cold war without notice to members of the public of environmental and health risks associated with operations (Iversen 2012; Brown 2013; McKinley & Balkany 2004; Fradink 1989; Ball 1986). Remediation efforts in these communities should aim to correct past mistakes. To realize environmental justice for the site, procedural justice is needed so that members of the public have agency over the environments that they are living in, and what risks they choose to adopt (Lake 1996).

While signage at the Wildlife Refuge is a beginning to public notification, it comes after many major decisions for the site have been made. Signage on the site relies on local residents physically accessing the site, and while this is a beginning, it is far from encouraging knowledge about the site's history in local communities' consciousness. Both the opening of the Wildlife Refuge and the lack of signage offsite are in opposition to community advocacy leaders request. Those who benefit most from denial of this request are government authorities who can both say

that this will help profit enter local areas as the environment looks like an attractive place to live and portray that issues surrounding Rocky Flats have been resolved. Additionally, this is an appealing resolution for developers in the area who can now say that homeowners will have a Wildlife Refuge in their backyard. The following section will examine how portrayal of the landscape and homeownership influenced understanding of community acceptance of risk.

Home Purchase as Consent

As previously discussed, residents do not become aware of the site until they or loved ones are impacted by health experiences. This also indicates that community knowledge of the site is not as pronounced as board members believe, as shown in the previous section. Despite this, across interviews with board members they convey home development in the area, and the purchase of these homes, as community acceptance of environmental risk. For example, Harold* a member of the board through the Rocky Flats Homesteaders, a group of the plant's retired workers, stated:

Adjacent to the property out there to the refuge, the Wildlife Refuge... those are not inexpensive homes... so consequently the thought of being downwind from a nuclear weapons plant which, is gone now, did not seem to deter them whatsoever as far as buying and, you know, now living.

Harold like other board members, connected the price of a household to the acceptance of potential risk in the area, through the assumption that prospective residents were knowledgeable of the history of Rocky Flats. Community knowledge of the history of Rocky Flats cannot be interpreted through home purchase, even for expensive homes. As described in the previous section, elected officials have chosen to not place signage in local communities and online markers like Google maps have changed the space's name Rocky Flats National Wildlife Refuge. The legacy of secrecy at Rocky Flats already posed a barrier to community knowledge of the site and for people moving into the area, it is unlikely that they are making home purchase

decisions with notification of environmental contamination and health experiences of local community members. To discover if local community members were knowledgeable of the history of Rocky Flats and residual contamination that has been left in the environment before home purchase, a survey would be a valuable instrument for elected officials to determine if home purchase can be attributed to consent. While advocacy leaders are not asking for this type of research, this shows how more research of the community is needed before the space can achieve environmental justice. Denying people's requests for more signage and research in the community benefits government and corporate authority, by obscuring the past and increasing development in the future (Cable et al. 2008). Following through on decision-making on the assumption that community knowledge of the site is represented through home purchase indicates that members of the public are not active participants in the decision-making process for the site, representing a failure of Schlosberg's (2007) second requirement for procedural justice, a seat at the table for decision-making as members of the public cannot be active participants, or consent to decision-making based purely on home purchase.

While advocacy leaders were concerned about people moving into the area without full knowledge of environmental contamination, the majority of board members understood home purchases in local communities to represent acceptance of environmental risk. For example, Barbara described:

I went to see what they were doing, you know, and took a tour of the area, and when I saw the housing development and where it was at, at the edge, I was like, 'wow that's interesting, obviously some people don't think there's anything wrong with it because they're awfully close.'

The Stewardship Council has the responsibility of ensuring that the community continues to retain knowledge of the site's history. However, the opposite is occurring, and board members are using housing development as a reflection of community knowledge and acceptance. This

reaffirms that members of the public are not active participants in the decision-making process. If community members were active participants, Stewardship Council members would point to the involvement of the public in decision-making rather than assuming through home purchase the consent of the public.

A more just process would be to ensure that community requests are implemented through collaboration. For example, community advocacy leaders have requested that more signage and more health studies be conducted before the opening of the Wildlife Refuge. In order to accomplish all three requirements of procedural justice elected officials could work with concerned members of the public to decide where and what should be placed on signs. Additionally, more research could be conducted on health outcomes in the community, and those who have moved away or died could be included in the study by cooperating with members of the public to determine the history of their social networks. In the meantime, development projects should be put on hold, and the Wildlife Refuge closed until the results of more health studies, and a survey of community knowledge and consent is conducted.

Similar to the reliance on the internet to convey the history of Rocky Flats and the residual contamination in the area to local residents, across interviews with board members, responsibility for notifying people of the history was placed on realtors selling the households. Only one of the elected officials that I interviewed indicated that she did not believe that this was happening. Olivia expressed:

Even homes that are even more proximately located, I don't think that there's any obligation on anyone to notify, I don't know who is obligated, and I'd be curious in the housing development, just south of Rocky Flats, whether they're notifying homeowners of the risks.

Olivia indicated that there should be notification of the environmental risks in the area, but is unsure if there is any obligation to do so. While the majority of officials understood that

residents are aware and able to access information pertaining to environmental risk in the area, there was little obligation to ensure this was occurring, despite the mandate of the Stewardship Council to do so. Officials dismissed the necessity of informing the community of the landscape's history and the residual contamination left behind, while also placing the responsibility for accessing this information on residents. In addition to this, the perceived acceptance of residents' comfort in the area is affirmed through home development, with the assumption that home developers are duly notifying costumers of the potential risk. These two perspectives reinforce one another into placing responsibility on everyone, except for the government, who continues to hold responsibility over site.

Access to useful information is integral for procedural justice, but decision-makers are not collaborating with community advocacy leaders to ensure that members of the public are properly informed. One test to confirm that the public is informed is how engaged and accepted members of the public are in the decision-making process since access to information is a pre-requisite to public participation. Advocacy leaders indicate both exclusion of the public in the decision-making process and that many in the community remain uninformed, re-emphasising the site as a space of procedural injustice. To realize environmental justice, underlying issues of procedural injustice must be addressed (Lake 1996). Rather than work with concerned members of the public to ensure that communities and prospective residents are informed about the history of the site, Stewardship Council place the responsibility of informing prospective residents on home developers, whose profit margin would likely be impacted by doing so. By shirking responsibility of ensuring an informed public on to developers, both local governments and developers increase revenue, and benefit through the loss of knowledge of the plant site as new people move in (Cable et al. 2008).

Candelas is the newest and closest community built adjacent to the Rocky Flats Wildlife Refuge. In order to distinguish how the landscape is presented to prospective homeowners, I examined the presentation of the site for the community of Candelas. The community brochure, available on the Candelas website, described the local environment as a “land in mint condition.” The brochure drew upon the history of homesteaders in the 1800s to present the landscape as fairly untouched, and in doing so, it ignored the history of how the Wildlife Refuge came to be. The presentation of the history in this way ignores the history of Rocky Flats and fails to notify prospective residents to the residual contamination in the area. Additionally, obscuring the history in this manner serves the interests of corporations and government in a similar fashion to contesting local illnesses. Finally, the presentation of the history to prospective homeowners in this manner prevents community access to information about Rocky Flats, because it makes the history of nuclear operations and contamination of surrounding environment invisible. Prospective homeowners cannot make informed decisions about whether to live in the area without this knowledge.

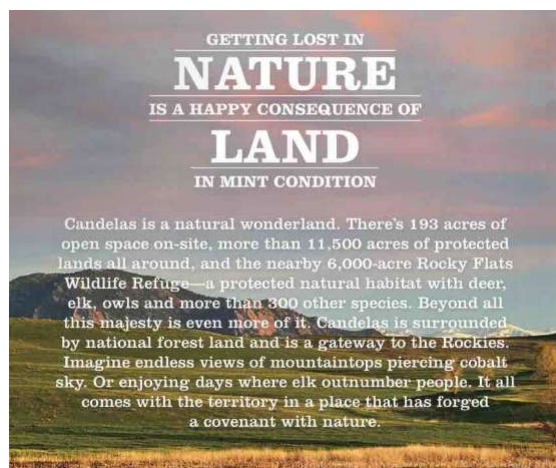


Figure 6: Community brochure available from <https://www.candelaslife.com/Community-Brochure/Candelas-Community-Brochure.html#p=3>

The Stewardship Council has the mandate to ensure that knowledge of the history of Rocky Flats and the residual contamination in the landscape is well known. However, board

members place responsibility for doing so on realtors, and assume that prospective homeowners are entering the community with the required knowledge to make educated decisions. Due to this assumption, board members see home purchase as acceptance of environmental risk. Advocacy leaders attest that knowledge in the community is not as pronounced as board members believe. Through the examination of how the new and nearby community of Candelas, is being presented to prospective residents, it appears unlikely that these new residents are being informed of the local history and remaining contamination. The placement of the responsibility to inform prospective residents on developers and the subsequent erasure of this history serves the interests of both local corporations and governments (Cable et al. 2008). Through this action, those who identify as environmental downwinders are misrecognised. Restorative justice is accomplished through the acknowledgement of how environmental injustice histories have impacted local communities (Sharpe 1998). Agencies, corporation, and board members have instead chosen to obscure these experiences, which in turn, results in a continuation of injustice for local residents. Residents and advocacy leaders have reason to distrust decision-makers over the future of the site because of the ways that experts have obscured their responsibility in conveying the risk of the site (Fisher 2000).

Analysis of Current Development and Inaccessible Information

Advocacy leaders observe that residents are unaware of the history of Rocky Flats until they or loved ones experience health outcomes and search for answers. While the Stewardship Council has the mission to retain knowledge of Rocky Flats in the community, this body ascribed this responsibility onto other outlets, including home developers, and the internet. The placement of signage at the site is a beginning for community notification, but requires that residents access the site to become notified. Prospective residents are being presented with a history that erases

Rocky Flats' remaining contamination, and the identities of Downwinders who understand their health outcomes to be due to plant operations. Without this knowledge prospective residents cannot make informed decisions to live in the area. While signage onsite may help notify residents, the question remains: Are prospective homeowners becoming aware through this medium before home purchase? The shirking of risk notification responsibility onto developers, and the subsequent erasure of history, serves the interest of local corporations and governments. While government agencies will understand the clean up of Rocky Flats, and the opening of the refuge as a success, advocacy leaders will understand these developments as a barring of community agency, and continuation of denial and injustice that have occurred for decades.

Conclusion

My research of Rocky Flats set out to determine how scientific information has been presented to lay people of surrounding communities, and how members of the public perceive their opportunities for, or barriers to, authentic participation in related land use decisions. Examination of how information about Rocky Flats and what opportunities members of the public have in becoming active participants in decision-making for their community tie directly into how environmental justice literature has conceptualized the requirements necessary for procedural justice. Procedural justice is important to achieve environmental justice of a site because often members of the public have not been able to determine what environmental and health risks they take on as a community (Lake 1996). Nuclear development in particular, has a history of purposefully obscuring environmental and health risks of operations from surrounding communities (Malin 2015; Brown 2013; Dawson & Madsen 2007; Kuletz 1998; Fradkin 1989; Ball 1986). Operations of Rocky Flats leading to contamination of the local environment was also kept from the public due to intensive secrecy (Iversen 2012; Moore 2012; McKinley &

Balkany 2004). In order for resolution of environmental injustice in post-nuclear communities to be achieved, especially because of legacies of intensive secrecy, decision-making must be performed in a procedurally just manner. Three requirements for procedural justice are access for members of the public to useful information, active participation in decision-making, and collaborative research (Schlosberg 2007).

Through methodological triangulation of fifteen in-depth interviews, attending nine public meetings, and document analysis I examined whether procedural justice for member of the public is being achieved for environmental justice over the site. Three major themes emerged from data collection, 1) *Contested Illness in Affected Communities*, 2) *Barriers to Procedural Justice*, and 3) *Current Development and Inaccessible Information*.

By capturing the theme of *Contested Illness in Affected Communities*, my findings show that health experiences of members of the public are not being supported through access to useful information, active participation in decision-making, and collaborative research. Those who experience health issues in local communities reflected Brown et al.'s (2004) research on embodied health movements. Locals who experienced health outcomes, also conveyed a heightened awareness of surrounding negative community health experiences and attributed these outcomes to legacies of Rocky Flats. Community advocacy leaders felt both forced to legitimate community health experiences through science, and found their experiences contested through agency research. Community advocacy leaders maintained that Rocky Flats is the cause of the diversity of health issues in the community but understood that a prevalence of contamination in our environment makes it difficult to pinpoint one cause of health outcomes in a community. This exemplifies how the commonality of illness in nuclear communities come to be regarded as 'environmental illness' (Cable et al. 2008). While community advocacy groups

are pursuing examination of health outcomes in their community through scientific means, they also critique government studies that found no elevated health outcomes in many statistical regions, and individualized blame for those that were. Community advocacy leaders highlighted how CDPHE health studies did not follow those who have moved away from the area, and instead of conducting multiple snapshots a longitudinal cohort study would be more effective in determining community health outcomes. Additionally, community advocacy leaders were particularly concerned with health outcomes of those who lived down Indiana Avenue, officially recognized as where the majority of offsite contamination resides, which the large statistical regions in CDPHE studies would have obscured.

An effective and procedurally just manner of exploring community health would be to have research driven through community participation (Schlosberg 2007). Analysis of those who have moved away could be included through community social networks. Advocacy leaders understand agency reluctance to further examine community health through a variety of methods betrays the benefit that government and corporate authorities have in contesting illness (Cable et al. 2008). The first major theme contributed towards both of my research questions. Advocacy leaders request more studies to be conducted on health outcomes for their community, instead government research individualises health by suggesting that people community members live a healthy lifestyle. Community advocacy leaders face barriers in access to information and access to decision-making as health research through a variety of methods is not being conducted.

The second main theme indicated that community advocacy groups face many *barriers to procedural justice* over their environment. Through interviews with advocacy leaders, they spoke to me about the importance that development in the area halts until more community health research is conducted so that members of the public can judge the environment's safety.

While community advocacy leaders made these requests known at public meetings for the Stewardship Council and the Jefferson Parkway Public Highway Authority, multiple barriers prevented their concerns from driving these meetings. Upon entry into Stewardship Council meetings the first barrier experienced by concerned members of the public is the time that these meetings occur and the space itself. Meetings are at a time not easily accessible by those with full-time jobs, children, or other constraints, and the space emphasizes board deliberation rather than equal access to participation with members of the public.

One of the foundations to procedural justice is participative justice and requires that members of the public have the same decision-making power as experts, the right to consent, due process, and compensation for health issues (Shrader-Frechette 2002). Rather than being active participants in decision-making for the site, members of the public recognized that meetings served as public relations (Nussbaum et al. 2004). Members of the public want to be actively engaged in the decision-making process rather than being told they are taken care of (Nussbaum et al. 2004). In order to become active participant, members of the public must have access to useful information to make informed decisions from (Schlosberg 2007). Presentation of information at Stewardship Council meetings however were above the comprehension level of board members and members of the public in attendance. Clear presentation of nuclear concepts is important because historically, environmental and health risks from nuclear initiatives have been hidden and placed on nuclear communities without their consent (Brown 2013; Dawson & Madsen 2007; Ball 1986). Due to this history, advocacy leaders do not trust agency researchers and consider this loss of trust when evaluating risk (Fischer 2000).

One way to effectively rebuild community trust in government agencies would be to collaborate with members of the public through the entire health research process. Instead of

collaborating with those concerned with health in the community, government agencies counter the research that advocacy leaders pursue on public health. Further, the Stewardship Council relies on the information that government agencies who are tied to government agencies who first created this issue. The environmental justice principle of 'polluter pays' is being used to reinforce and continue environmental injustice by promoting polluter self-policing and control over the future direction of the site (Shrader-Frechette 2007). The control that government agencies hold over the production and presentation of information at Rocky Flats show that the creation of information is politically embodied (Hunold and Young 1998).

Due to this power imbalance, community trusted researchers should be integrated in the creation and dissemination of research (Hunold and Young 1998). Instead of government bodies and agencies collaborating with community trusted experts, advocacy leaders conveyed that experts they trusted were dismissed and demeaned. The barriers that members of the public faced in acquiring useful information and conveying their concerns indicates that decision-making for the future of Rocky Flats remains procedurally unjust (Schlosberg 2007). A foundational reason that concerned residents are coming up against these barriers when advocating for justice could be the difference in risk perception between elected officials and advocacy leaders. Elected officials view risk associated with the landscape as inevitable while concerned members of the public wish to halt development as a precaution to environmental risk. Dismissing social factors in the creation of environmental risk serves to naturalize the local landscape. Ultimately, the greening of military spaces serves in the interest of governmental and corporate authorities, shown through the final main theme of this research (Cable et al. 2008; Havlick 2007).

The final main theme that emerged from this research was how inaccessible information supports community development projects, to the detriment of community advocacy leader

request. Community advocacy leaders are concerned that without signage, information of environmental and health risk in the community will not be well known in the community, especially as new residents move into the area. Access to information on risk is important, especially for a post-nuclear community, because this information has historically been hidden from members of the public during operation (Iversen 2012; Brown 2013; McKinley & Balkany 2004; Fradink 1989; Ball 1986). However, elected officials turned down having signage in surrounding communities because they believed that members of the public could become informed through the internet. Community advocacy leaders are critical of this because without signage, or digital markers on Google maps informing residents that the site was once used for plutonium operations this already sparse knowledge will disappear from community consciousness. This concern is reinforced by a few Stewardship Council members who conveyed that the general public is not informed of the history of Rocky Flats. Additionally, Stewardship Council members are unsure if residents are being notified of this history when purchasing homes.

While this would be better known through a survey of the community, upon examination of how new communities are presented to the public online, the history of Rocky Flats is completely erased from the narrative. Due to a combination of lack of signage in the community, and lack of digital markers online including presentation of the area by community developers, the history of nuclear operations and contamination of surrounding environment is being erased. Prospective residents are presented with a history that both erases Rocky Flats' remaining contamination, and the experiences of those who attribute their health outcomes to this contamination. Those who benefit most from the erasure of this history are government and corporate authorities because the landscape appears like an attractive place to live and will help

profit enter the area (Cable et al. 2008). This is an appealing resolution to both government and corporate authorities who can now say that the greening of a military space results in homeowners having a Wildlife Refuge in their backyard (Havlick 2007). For those who understand their health issues to be due to facility operations this is a misrecognition of their environmental identity as Downwinders (Schlosberg 2007). Recognition of how nuclear development has impacted members of the public is foundational to environmental justice of post-nuclear communities because health risks have historically been hidden from members of the public. The final main theme details how community advocacy leader's who have requested more public information about the history and risk of the site face barriers in achieving this access to information because they also do not have access to active participation in the decision-making process.

From the three main themes that emerged from my examination of procedural justice at Rocky Flats, I was able to answer my research questions. These questions focused on foundational requirements to procedural justice, namely how scientific information has been presented to lay people of surrounding communities, and how members of the public perceive their opportunities for, or barriers to, authentic participation in related land use decisions. These questions were derived from (Schlosberg 2007) requirements for procedural justice: access to information, active participation in decision-making for the site, and community collaboration through research. Through my interviews, document analysis, and attendance of public meetings, these methods have indicated that none of these requirements are being met. The following chapter will discuss my research questions in further detail.

CHAPTER V: DISCUSSION

The issues surrounding Rocky Flats are enveloped in the history and secrecy of nuclear development in the nation. The prevention of a community's ability to choose for themselves whether to take on the associated risks of nuclear development results in an inequitable distribution of environmental and health risks and a dismissal of procedural equity. Over time, members of the public have become more aware of nuclear development as they experience negative health outcomes. The intensive national secrecy pertaining to nuclear development during the Cold War has kept reports which indicates health risks to labourers and residents near nuclear production sites from local communities (Dawson & Madsen 2007).

Secrecy surrounding health impacts from nuclear development have been seen at every phase of the nuclear production cycle. In Utah, for instance, a report indicating an increase in leukemia rates after exposure to fallout in 1961 was obstructed by the AEC until 1978 for fear of public opposition to nuclear testing (Ball 1986). In Washington, when studies indicated increased negative health consequences from Hanford radioactive waste releases, these were kept secret, and contrary articles were published to ensure this secrecy (Brown 2013). Over time, declassified documents have shown that elites during this period considered local residents around nuclear production facilities as, "low-use segment[s] of the population" (Gallagher 1993). In New Mexico, local communities provided experiential accounts of increased cancer rates in their communities but faced scientific opposition due to their small population size (Kuletz 1998). At every stage of the nuclear production cycle there have been active efforts to ensure national intensive secrecy and prevent community self-determination over their local landscape.

Rocky Flats is situated within this national legacy of intensive secrecy around nuclear issues. From 1952 to 1989, Rocky Flats manufactured more than seventy thousand plutonium triggers (Iversen 2012). Over the course of its operation, there have been many instances of negligence that have led to community exposure to radioactive contaminants. These events include two fires that led to airborne contaminants escaping the site and improper storage of radioactive drums that leaked into the soil (Moore 2012). Over decades, studies produced by researchers examining health impacts of local residents have been contested by governmental agencies like the CDPHE and the DOE (Johnson 1977, Moore 2012). Moreover, when clean up standards were set for the local landscape, Satterfeild & Levin (2007) observed that public participation in the clean up process was replaced by risk communication from professionals. Rocky Flats is also situated in the practice of greening military environments to wildlife refuges and residential recreation spaces. Havlick (2007) highlights how the failure to examine how the military retains control over ‘remediated’ spaces results in the conflation of military objectives as environmental conservation. At this time the periphery of Rocky Flats has been transformed into a Wildlife Refuge, and there is the Central Operable Unit in the middle of the site that will remain closed off to the public.

Sustained in this nuclear history, it is important to examine how communities realize environmental and particularly procedural justice by being included in the decision-making processes about land use in their local landscape. Using Schlosberg’s (2007) requirements for procedural justice, I was able to analyze fifteen in-depth interviews, nine public meetings, examine three relevant documents. Schlosberg (2007) describes that procedural justice requires affected communities to have access to information, a seat at the table for decision-making, and collaborative research based on the needs and led by affected communities. From these

requirements two research questions became central in exploring this issue, which I examine below. First, I asked:

- 1) How has scientific, technical, and other related information about Rocky Flats' contamination and clean up of Rocky Flats been presented for lay people of the community, by the CDPHE and other agencies?

Environmental justice requires that affected residents are provided autonomy and self-determination over their local landscape in order to take on risk in a manner that they see fit. In order to achieve this, procedural justice requires public access to decision-making processes and spaces Schlosberg (2007) conceptualizes the first requirement for procedural justice as public access to information. Over the course of my interviews and observations, I was able to determine how information related to Rocky Flats was presented to lay people in the community. Through archival analysis, participant observation, and statements made during public meetings, it appears clear that the elevated ways in which scientific information is presented means it is not useful, effective, or ultimately even meant for the lay public – or even decision-makers on the Stewardship Council. The requirement that members of the public have deeply specialized technical expertise and knowledge to comprehend the information produced by government agencies in turn allows agencies to retain community reliance on their expertise for decision-making. In addition, while the CDPHE presents DOE sampling and monitoring over the site as a way of ensuring that the ‘polluter pays’ after environmental injustice, the continued reliance on their data is more akin to polluter self-policing (Shrader-Frechette 2002). While the expertise of government researchers is undoubtedly useful, their power to define what is considered risk is a significant barrier to environmental justice in the community (Lake 1996). For nuclear communities especially, who have experienced decades of intensive secrecy about community

risk, self-determination over their environment is necessary for procedural and ultimately environmental justice (Lake 1996).

Moving forward with development, despite the health concerns of advocacy leaders, leads to the second way that information, or lack thereof, is presented to the community. Because advocacy leaders do not see the research that has been conducted as reflective of community experiences, they would like to see signage informing residents of the potential danger in the area. In my interviews with the Stewardship Council members, signage in the area was dismissed because they perceived that there were other avenues that community members could become informed about the issues. This perspective dismisses the experiences that advocacy leaders have had to become knowledgeable about the site. Advocacy leaders only came to know about the site's history after, they, or loved ones in the community, experienced negative health outcomes. These individualized health experiences, heightened advocacy leaders' concerns to the health experiences of many in the community, and in pursuit of an answer, they uncovered the legacy of secrecy surrounding Rocky Flats. This process of becoming knowledgeable about community health risks through personal health experiences, which then transitions towards requests for health action, reflects research on public epidemiology and the formation of embodied health movements (Brown 1992; Brown et al. 2004). While there is now signage at the site, there is no signage in the community like advocacy leaders have requested, and questions remain over if prospective residents are being informed about the history of Rocky Flats and the residual contamination that is in the environment. The Stewardship Council has a mandate to ensure that residents are informed about this history but shirk this responsibility onto developers and the internet. Again, where more research could be conducted to examine if homeowners are informing prospective and new residents of the history of Rocky Flats. Stewardship Council

members were unable to confirm if developers were informing prospective residents of the history of Rocky Flats and an examination developer portrayal of the area online indicates that they likely are not. The shirking of responsibility for informing community of this history and the erasure of this history from the portrayal of Rocky Flats work in the benefit of governmental and corporate authorities through the increase of revenue from being an attractive community (Cable et al. 2008).

Both the presentation of information at public meetings and the difficulty that advocacy members have had towards implementing signage in the area indicate a failure of Schlosberg's (2007) first requirement for procedural justice, public access to information. Reflecting on the barriers that community members face in accessing information pertaining to Rocky Flats is required to settle environmental justice issues through communicative democracy. Hunold and Young (1998) describe communicative democracy as a process where all perspectives are accounted for through citizen participation. Basic requirements for communicative democracy are community inclusiveness, consultation over time, equal resources, and access to information, in addition to, shared and authoritative decision-making for the public. The findings indicate the access to information has been a difficulty of local communities due to a power imbalance between government actors and residents. Hunold and Young (1998) suggest that in order to mediate a situation like this, consultations between residents and researchers, which are trusted by the local community, should result in a collaborative analysis of local issues.

Access to useful information and collaborative research is especially important for post-nuclear contaminated communities. Nuclear development has a history of purposefully obscuring environmental and health risks of operations from surrounding communities (Malin 2015; Brown 2013; Dawson & Madsen 2007; Kuletz 1998; Fradkin 1989; Ball 1986). Environmental and

health risks associated with Rocky Flats through radioactive operations is included in the nation's history of intensive secrecy during nuclear development (Iversen 2012; Moore 2012; McKinley & Balkany 2004). Thus far, nuclear communities have been disenfranchised as nuclear operations have contaminated their local communities, placing these populations at risk without their consent. This is why access to useful information and collaborative research is important for those in nuclear communities, so that they may take an active role in decision-making for their community.

Schlosberg (2007) reiterates the importance of collaboration for procedural justice, especially in regards to collaborative research. While access to information in the community is important for procedural justice in and of itself, collaborative research could be an effective way to both engage and inform residents in a comprehensive manner. One of the major concerns of community advocacy groups is that there has not been longitudinal research of health outcomes in the community. Collaborative research could fulfill this concern by drawing on community networks in order to find the histories and health outcomes of those who have moved away from the community. Engaging with community members at all stages of the research process would also be an effective method to ensure that information is presented in a way that is comprehensive to the lay public.

To answer my first research question of how the scientific, technical, and other related information about Rocky Flats' contamination and clean up has been presented for lay people of the community, it is clear that the information has not been presented in a manner that is useful to support members of the public to evaluate risk and make informed decisions about public health. Instead, information presented at Stewardship Council meetings was above the comprehension level of board members and members of the public. Additionally, CDPHE

determined the health safety of the site using snapshots of community health rather than a longitudinal cohort study that community advocacy leaders have been requesting. This indicates a significant barrier for access to information because the Wildlife Refuge has opened to the public using this limited data rather than fulfilling public request. Community advocacy leaders have also been requesting information offsite so that residents can be aware of the contamination in their environment. Rather than supporting this request, elected officials have chosen to not have signage offsite because they believe that this information can be found online. Finding this information online becomes difficult when digital markers and local developers erase the history of Rocky Flats. Therefore, information has *not* been presented to enable community self-determination over the landscape; rather it has been presented in a manner to ensure the continued reliance on government authority for land use decisions. Due to continued procedural injustice of access to information about the site, it cannot be considered a site of environmental justice. Conducting collaborative health research that community advocacy leaders have requested could be a beginning point to achieving procedural justice.

To this point, the CDPHE would attest that there was a citizens' environmental sampling committee that found results similar to other governmental agencies soil findings in 1996. Two factors need to be considered here. First, advocacy leaders are concerned about the health outcomes of their neighbours and while a soil study is a good place to start, there needs to be continuing institutional commitment in producing data and research led by local residents. Second, Fisher (2000) describes how community trust in institutions is highly influential towards community risk perception, where by, loss of trust in agencies is taken into consideration when calculating risk. As the legacy of Rocky Flats has been enshrouded in secrecy and continues to be obscured, the first steps to reinvigorating community trust and therefore residential

acceptance of risk would be to allow community perspectives to drive the decision-making process over this landscape.

This leads into my second research question:

- 2) How do community activists and community groups working on Rocky Flats issues perceive their opportunities for, or barriers to, authentic participation in related land use decisions?

This second research question is derived from Schlosberg's (2007) second principal for procedural justice, public access to decision-making. Rocky Flats advocacy leaders understand decision-making meetings over the site are hostile environments to community perspectives. Advocacy leaders perceive the opening of the Wildlife Refuge and development of the Jefferson Parkway as risky for the community because they understand negative health experiences are inevitable outcomes of the landscape's contaminated history. They would like to halt the opening of the Wildlife Refuge until they can be shown that residual contamination has not had a lasting impact on their community. When I spoke to advocacy leaders about their experiences at public meetings they conveyed that they did not feel that the spaces were welcoming and rather, experienced hostility at these meetings.

Through participant observation, I was able to witness how Schlosberg's second requirement for procedural justice was not being met. To ensure their meaningful participation, communities would like consultation, to discuss options from a variety of perspectives, and partner as authentic participants in decision-making (Schlosberg 2007). While both the Stewardship Council and the CDPHE have missions to increase and enhance community power and understanding, these missions cannot be realized without advocacy leaders driving meeting agendas. Meetings that did not have advocacy leaders setting the agenda led to resident perspectives being dismissed. During public comment periods, community members expressed

the health concerns in the area and the desire for more research to be conducted, and for these reasons, why opening of the site should be postponed. Meeting agendas, on the other hand, focused on presenting soil sampling, estimated revenue from future projects, and discussing the myths associated with the site.

While the CDPHE Cancer Registry study was conducted to determine if these estimates reflect real health outcomes in the community, advocacy leaders point out important flaws in the method of this study. The major flaw that they distinguish is that it does not capture health incidents of those who have been diagnosed after moving outside of the studied area. Without research that adequately captures the health experiences of those who have lived in the community, officials and agencies will continue to face opposition to planned development in the area. This study has been presented to residents as the gold standard for health research. Rather than alleviate residents' health concerns, conceptualizing the study in this manner serves to dismiss the methodological critiques of advocacy leaders, and dismiss health experiences in the community.

Following through with community request is foundational for environmental justice, especially for post-nuclear communities. This is because intensive secrecy resulted in nuclear operations creating environmental and health risk in surrounding communities, without consent. In order for nuclear communities to achieve environmental justice, they must have access to information, be active participants in decision-making, and collaborative research must be conducted (Schlosberg 2007). Conducting these three requirements would dismantle the authority that governmental and corporate entities hold over the site (Cable et al. 2008). This is because members of the public would hold the same decision-making power as experts which enables their ability to consent to future decision-making of the site (Shrader-Frechette 2002).

The refusal to follow through with the request of concerned members of the public however, reproduces the procedural and environmental injustices created with placement and operation of the site. The implementation of the Wildlife Refuge, and development projects like the Jefferson Parkway in the face of clear opposition from members of the public exemplify that members of the public do not have an active role in decision-making for the site. Rather, when concerned members of the public attended public meetings to participate in decision-making for the site, these meetings were used by government agencies as opportunities for public relations (Nussbaum et al. 2004).

Dismissal of residents occurred in three ways, hostile meetings, which led to dismissal, dismissal of risk, and the dismissal of concerned residents themselves. When a local lawyer presented community understandings that they associate with Rocky Flats, the atmosphere turned tense. Affected residents want to be part of the political process and have a voice in decision-making (Schlosberg 2007). Additionally, residents would like further research conducted by trusted agencies or researchers (Hunold and Young 1998). Rather than invite trusted researchers and professionals to collaborate on studies and policy that is reflective of community concern, advocacy leaders conveyed that these trusted people are dismissed and demeaned. Advocacy leaders do not trust agency researchers, and this loss of trust is compounded when the voices of trusted professionals are excluded from examination of environmental and health risk. One underlying reason for the reluctance of Stewardship Council members to request more health research is a perception of risk as an inevitability compared to community advocacy leaders who would like precautions taken to environmental and health risk. Considering the risk in the area as inevitable, serves to undermine community concern while also upholding the status-quo of governmental and corporate authority over the landscape. In these interviews, the dismissal of

concerned residents was justified because community members who attended meetings were seen as a small segment of the population, and a population unwilling to change their mind. Understanding this perspective is important because through the characterisation of concerned residents, Stewardship Council members are able to create a narrative where development is the only acceptable direction to go. Both government and corporate authorities benefit in this narrative through the revenue that would come with development of roadways and the Wildlife Refuge that presents the area as an attractive place to live (Cable et al. 2008). This exemplifies how the creation of information, whereby agency research and development narratives are privileged despite comprehensive critique of agency research methods and precautionary understanding of risk is a politically embodied process (Hunold and Young 1998).

To answer my second research question of how community advocacy leaders, perceive their opportunity for authentic participation in land use decision-making, they understand that there are more barriers than opportunities in becoming active participants for decision-making. Community advocacy leaders have been clear that they would like precautionary action taken to address their concerns over health risk stemming from Rocky Flats environmental contamination. Community advocacy leaders have two major requests that should be adhered to achieve environmental justice. First, they are concerned that a single method examining community health has been used to determine the safety of the landscape and request that more health research be conducted before allowing members of the public to access the Wildlife Refuge. Second, they have requested more signage in the area for members of the public to be able to make informed decisions about the environmental and health risk they place themselves in. Community advocacy leaders faced barriers to becoming active participants in the decision-making process by both the set up of the meeting space and the demeaning of trusted

professional. Stewardship Council spaces were organized in a manner that emphasised deliberation between board members with members of the public as observers rather than as active participants. Community advocacy leaders also conveyed that the concerns raised by community trusted researchers are dismissed, and I saw an instance of this when a trusted professional presented the concerns of community advocacy leaders to the Stewardship Council. One reason that community concerns are being dismissed is due to the perception of risk as inevitable among the Stewardship Council. The conclusion that risk is inevitable and therefore development should continue both dismisses the concern that members of the public hold over health risk in the area and the social factors that have led to radioactivity being released into the environment. These barriers prevent concerned members of the public from becoming active participants for decision-making in their community, and work to the benefit of government and corporate authorities who will see an increase of revenue. Due to the lack of access to active participation for members of the public for the site, land use decision-making cannot be considered a procedurally just process for Rocky Flats.

This research study pulled from the literature on nuclear distributive and procedural injustice, environmental health, environmental justice, and procedural equity. The distribution risk associated with radioactive contamination from nuclear operations across the nation has occurred through intensive secrecy that could not allow for community consent (Brown 2013; Dawson & Madsen 2007; Kuletz 1998; Fradkin 1989; Ball 1986). Environmental and health risks associated with Rocky Flats through radioactive operations is included in the nation's history of intensive secrecy during nuclear development (Iversen 2012; Moore 2012; McKinley & Balkany 2004). Due to the secrecy of environmental risk in the community, concerned members of the public discovered environmental and health risk in a way that reflects the

formation of embodied health movements through popular epidemiology (Brown 1992; Brown et al. 2004). Community advocacy groups followed this process by first experiencing health risk individually, which brought individuals to notice sickness in their neighborhood, and allowed them to come together to question why more wasn't being done to protect community health. To protect community health advocacy leaders request that the Wildlife Refuge remains closed until more health studies are conducted, and that more signage be placed in surrounding communities so that current and prospective residents can make informed decisions on health risk. The Stewardship Council has not followed through with either of these requests which has led to a failure of both access to information and access to active participation in decision-making (Schlosberg 2007). Access to information is important so that members of the public may have full self-determination in the future of their community (Lake 1996). Procedural justice is especially important for post-nuclear communities because of the legacy of secrecy that has followed nuclear production and allowed for non-consensual environmental and health risk in these communities. Rocky Flats remains a site of environmental and procedural injustice because development continues against the request of concerned members of the public.

Final Thoughts

Contemporary issues surrounding Rocky Flats are embodied in the legacy of secrecy of sites across the nation. As nuclear residents try to take control over their local environments and community health, government agencies must question how they intend to aid affected communities in achieving environmental and health justice.

The first overarching theme, *Contested Illness in Affected Communities*, examined how community advocacy leaders understand local health experiences. Community advocacy leaders understand that health outcomes experienced by members of the public are a direct result of

radioactive contamination in their environment left over from operations at Rocky Flats. This theme relates to my research question because community health is foundationally what community advocacy leaders are concerned about. The perspectives and experiences of community advocacy leaders around Rocky Flats echoes the “Nuclear and Procedural Injustice”, “Environmental Justice”, and the “Environmental Health and Epidemiology” literatures as advocacy leaders of embodied health movements are required to legitimize their experiences through science, but have difficulty showing statistical significance due to the breadth of potential health outcomes which results in small sample sizes. The transformation of community concern into embodied health movements reflects the formation of politicised collective illness identity in order to advocate for action on community health outcomes (Brown et al. 2004). Without affected communities being able to prove health experiences as statistically significant, government agencies, specifically the CDPHE, normalize health experiences as ‘environmental illness’ or dismiss data that indicates significance through smoking histories (Cable et al. 2008). Post-nuclear communities often have difficulty showing statistical significance due to a wide variety of health outcomes reducing sample size (Kuletz 1998; Shields et al. 1992). Dismissal of community health as an outcome of ‘environmental illness’ indicated how Stewardship Council members connect health to the inevitability of risk. Considering negative health outcomes as inevitable while also rejecting further health studies before opening the Wildlife Refuge to the public is mostly to the benefit of developers, government, and corporate authorities, who may receive increased revenue through an erasure of health risk history at Rocky Flats (Cable et al. 2008).

The second overarching theme, *Barriers to Procedural Justice*, found that governmental agencies retain influence over decision-making for the site by presenting information above the

comprehension level of members of the public and members of the Stewardship Council, many of whom are elected officials. This finding contributes to the literature on “Procedural Equity” by showing how government agencies are manipulating the ‘polluter pays’ principal, and the inaccessibility of information both through knowledge production and dissemination as a means to influence decision-making for the site. One of the foundations to procedural justice is based on Shrader-Frechette’s (2002) description of participative justice which requires that member of the public have the same decision-making power as experts, the right to consent, due process, and compensation for health issues. Community advocacy leaders have requested that more health studies be conducted before opening the Wildlife Refuge and for there to be more signage in local communities about risk associated with Rocky Flats. Government agencies and Stewardship Council members have moved forward with opening the site up to the public, and refusal to place more signage in the community.

As previously discussed, the normalization of risk, combined with a refusal to pursue a variety of methods to examine community health indicates that the creation of information at Rocky Flats is politically embodied (Hunold and Young 1998). When a power imbalance occurs, Hunold and Young (1998) suggest that trusted researcher should conduct research and convey information. However, trusted professionals and researchers have been dismissed and demeaned at Stewardship Council meetings however. The second overarching theme *Barriers to Procedural Justice* contributed to both research questions as community advocacy leaders have access to agency health information regarding the site but are barred from accessing more health information that they request through more health studies. Additionally, their requests for more signage in the community so that current and prospective residents can make informed decisions continue to be dismissed. For these reasons access to information and access to active

participation to decision-making in the community for members of the public face significant barriers.

Finally, the overarching theme of *Current Development and Inaccessible Information* echoes “Environmental Justice” and “Procedural Equity” literature, as development of the Wildlife Refuge and the shirking of responsibility to notify residents of residual contamination both obscure the history of the site and the experiences of those who identify as Downwinders. My findings indicate that rather than improving or enhancing the spaces for community participation for making decisions related to local landscapes, government officials and agencies are driving the decisions over the future of the site. Without health and environmental justice being at the forefront of future planning and development, officials and agencies should expect sustained opposition to any planned development project in the area for years to come. This theme mainly addressed my first research question focusing on access to information for members of the public. Access to useful information is important for environmental justice in post-nuclear communities because nuclear projects have often been operating in a manner that contributed to environmental and health risk without the knowledge of surrounding communities (Iversen 2012; Brown 2013; McKinley & Balkany 2004; Fradink 1989; Ball 1986). The rejection of signage informing residents of Rocky Flats history, and the erasure of this history through digital markers like Google maps and developer presentation of landscape results in a significant barrier to accessing information for current and prospective homeowners. Iversen (2012) highlights that intensive secrecy has kept local populations in the dark about the history of the site and the remaining contamination in the environment. Stewardship Council members indicated that they are unsure if members of the public are being notified of this history when purchasing a home which is compatible with how community

advocacy leaders highlighted how members of the public become informed of the issue only after first experiencing negative health outcomes. The erasure of this history through development initiatives indicated that the presentation of information to the public is done in a manner that benefits governmental and corporate authorities at the expense of community advocacy leaders in determining health outcomes for their community (Cable et al. 2008). These benefits include added revenue and the justification of military initiatives through the greening of these landscapes (Havlick 2007). Those who identify as Downwinders see the greening of Rocky Flats as a misrecognition of environmental identity because they understand that more needs to be done to examine health of the public before the Wildlife Refuge can be opened in an environmentally just manner.

Contributions, Limitations, and Suggestions for Future Research

This thesis contributes to the environmental justice literature by examining community opposition in a space that has officially been considered remediated. Due to the intensive national secrecy that occurred during the Cold War, and the health outcomes that have occurred through the environmental contamination of nuclear community landscapes, it is imperative that perspectives of residents drive the decision-making of future site initiatives. One limitation with this work is that not all residential perspectives are included in its analysis, only those who are most engaged. While it is shown through the perspectives of community advocacy leaders that there is not widespread local knowledge of the site, this can only truly be understood by surveying the rest of the community. Future research should aim to capture the whole of community knowledge of Rocky Flats.

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APPENDIX

Rocky Flats Environmental Health Oral History Interview Guide 2017

- 1) Please tell me about your personal history/background?
 - a. When and where were you born?
 - b. Where were you raised?
 - c. What was your childhood home like?
 - d. What have been some defining experiences since leaving home?
 - e. Occupation(s)? Children? Spouses?
 - i. (ask probing and conversational questions in this direction...)
- 2) Did your family live or own land near Rocky Flats?
 - a. Did you know about the facility?
 - b. What stories did people tell about it?
- 3) IF they have long-term history in area: What were your specific experiences with or recollections of your town/Arvada?
 - a. Rocky Flats?
 - b. How did you first become aware of the facility?
- 4) IF they are newer to the area (moved since facility's closure): How did you become aware of the Rocky Flats facility?
 - a. What have your specific experiences been in relation to the site?
- 5) How has Rocky Flats affected your daily life?
 - a. Particularly your quality of life?

- 6) How has your physical health been affected, if at all?
 - a. Have your family members been affected as well?
 - b. Neighbors?
 - c. Others?
- 7) How has your emotional or psychological well-being been affected, if at all?
 - a. Have your family members been affected as well?
 - b. Neighbors?
 - c. Others?
- 8) IF appropriate: How have you been involved in community organizing or activism related to Rocky Flats?
 - a. Ask related questions about nature, duration, and motivation for activism.
- 9) Do you think that the public can easily access information about Rocky Flats?
 - a. Have you been able to find out what you want to know?
 - b. Have you examined the documents provided on the CDPHE and DOE sites?
 - i. Do you feel that if the average citizen were to read them they would understand what they say?
 - c. What have you found? (if relevant)
- 10) In what ways, if any, have you or community members been included in deciding what is to be done with Rocky Flats?
 - a. In what ways would you like to be included
 - b. The CDPHE's of Health Equity's Mission statement is to: "Build partnerships to mobilize community power and transform systems to advance health equity and

environmental justice” Do you feel like this has been achieved and if not, how can this be achieved?

- 11) What is your knowledge of health studies about RF?
 - a. What do you think about them?
 - b. Denial of past studies’ findings, such as Carl Johnson’s?
 - c. Current CDPHE study?
- 12) What would justice look like for you in this situation, given your experiences with RF?
 - a. If appropriate: Do you wish you had more knowledge about health impacts?
 - b. If appropriate: Do you think that citizens should have a right to know about the site’s history?
 - c. Other questions, as appropriate.
- 13) Are there any other questions we should ask? Observations or experiences you’d like to share about RF?

Questions for Developers, Jefferson Parkway Officials, and Stewardship Council members

- 1) Please tell me about your personal history/background?
 - a. When and where were you born?
 - b. Where were you raised?
 - c. Occupation(s)? Children? Spouses?
 - i. (ask probing and conversational questions in this direction...)
- 2) Can you tell me what you know about the history of Rocky Flats?
- 3) How has the public responded to development in the area?

- 4) From your perspective as [role here], how would you describe residents' concerns about remaining environmental risks of land around the former Rocky Flats site?
 - a. [Probe for developers: Have construction workers or others expressed concerns about their health or safety working on the site?]
- 5) In what ways, if any, have you seen community members included in making decisions about how to develop the land surrounding the former Rocky Flats site?
- 6) In what ways, if any, have you seen them notified of the site's history?
- 7) Would you feel comfortable living in the area?

LIST OF ABBREVIATIONS

Agency for Toxic Substances and Disease Registry (ATSDR)

Atomic Energy Commission (AEC)

Colorado Department of Health (CDH)

Colorado Department of Public Health and Environment (CDPHE)

Department of Energy (DOE)

Department of Justice (DOJ)

Department of Labour (DOL)

Disintegrations per minute per gram of soil (dpm/g)

Fish and Wildlife Services (FWS)

Environmental Information Network (EIN)

Environmental Protection Agency (EPA)

Federal Bureau of Investigation (FBI)

Jefferson Public Parkway Highway Authority (JPPHA)

March of Dimes Birth Defects Foundation (MDBDF)

Nuclear Regulatory Commission (NRC)

Pico curies of plutonium per gram of soil (pCi/g)

Radiation Exposure Compensation Act (RECA)

Rocky Flats Downwinders

Rocky Flats Right to Know (RFR2K)

The Rocky Flats Stewardship Council

US General Accounting Office (GAO)