AN APPLIED ANTHROPOLOGY OF ELECTRONIC WASTE IN CENTRAL AUSTRALIA

by

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Dedicated to the town of Alice Springs/Mparntwe

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ABSTRACT

As an applied anthropology study of electronic waste (e-waste) in the remote town of Alice Springs, this dissertation chronicles how e-waste is understood and managed in the arid interior of Australia. What is electronic waste? 'Electronic' refers to the presence and movement of electricity throughout an object so that it may perform some expected function. Waste, however, defies simple definition. Waste usually refers to something that has been discarded due to being unwanted or unusable.

This dissertation traces and tracks the boundaries of e-waste in Central Australia using ethnographic methods, anthropological theories of waste, and digital garbology. Digital garbology, a synthesis of digital anthropology and garbology, helps to identify and recommend strategies for confronting uneven, and often unjust, distributions of e-waste. Rather than focusing solely on discarded consumer electronics, this dissertation takes a critical look into the different types of waste emerging from the production, use, maintenance, and discard of electronics.

Over the course of thirteen months of fieldwork in Alice Springs, it became clear that the label e-waste is not consistently applied to discarded electronics. E-waste is often discarded in out-of-sight locations such as landfills, recycling centers, and illegal dumping grounds. Before being discarded, however, unused electronics are often stored inside homes, sheds, and other living spaces. Rather than simply focusing on electronic objects that have already been thrown away, this dissertation explores how and why some electronics seem to resist being labeled as e-waste.

Why Alice Springs? The management of e-waste in Australia has focused on the recovery of valuable metals from the recycling of televisions, computers, and mobile phones at the expense of other discarded electronics such as solar panels and household appliances. And yet, the closest e-waste recycling facility to Alice Springs is over 1,500 kilometres (900 miles) away in Adelaide, South Australia. The remoteness of Alice Springs reduces the ecological benefits of recycling. However, it also creates room to discuss the viability of alternative e-waste management strategies such as reuse and repair.

CHAPTER 1. AN INTRODUCTION TO ELECTRONIC WASTE AND ALICE SPRINGS

1.1 Introduction

Over the last six years, I have committed myself to using the same laptop to research and write this dissertation. It has traveled with me across the planet several times and has connected to various plugs and power plants, Wi-Fi points and data centers, and electrical accessories such as headphones and audio recording equipment. All things digital are tremendously interconnected. This laptop in particular has been showing more and more signs of wear. I recently replaced a small micro-screw that had fallen out and caused the case of my laptop to crack open every time I lifted my screen lid. For months, this daily occurrence reminded me to add compressed air to my shopping list so I could remove some of the dust that had been accumulating inside my machine. Powering my computer on in a new place frequently causes my logon screen to turn black or blue for what feels like hours but is in reality likely to be less than ten minutes. In the past, I was overwhelmed with an involuntary sense of panic and dread that I would lose all of my work. Now, I simply set my laptop down and pour myself some more coffee while I wait for it to load at its own pace. I am able to relax because I have learned to trust the various digital backups I have created using secure online storage services like the Purdue University Research Repository (PURR). The death of this laptop does not mean that this draft will disappear into the black abys of a perpetual loading screen. Thinking *with* this laptop shows how electronic devices are entangled with the things that I value like time, accessibility, and connectivity. It is no wonder that when faced with the question ‘what is electronic waste’, many of my interlocutors associated the term with things like ‘wasting time on the internet’ rather than dead laptops and broken televisions. Furthermore, it becomes increasingly clear that digital objects such as this dissertation do not reside in any individual electronic device. I now wonder about the waste that is created by the redundant copies of this dissertation I have simultaneously saved in different locations across local hard-drives and network servers housed across the United States. Is this waste also electronic waste? In what ways does it matter if electronic waste means different things to different people? These ongoing musings inspired the essential question and focal point underlying this dissertation: what is electronic waste?

1.2 Research Question 1: What is Electronic Waste?

This unassuming, and yet, deceptively vital question frames how my interlocutors[1] understand and react to electronic waste (e-waste). 'Electronic' refers to the presence and movement of electricity throughout an object so that it may perform some expected function. Waste, however, defies simple definition. Waste usually refers to something that has been discarded due to being unwanted or unusable. And yet, one person's waste may be reclaimable by someone else who has the foresight and interest to derive value from that very object. When electronic things break down, their component parts move through homes, repair centers, transfer stations, states and territories and international boundaries where they accrue different values and meanings (Cross and Murray 2018).

Not all discarded electronics are initially wasted, yet all eventually generate waste and pollutants. In addition to the breakdown of electronic devices, waste is produced by the manufacturing of electronics, the ongoing maintenance of data centers, the development of communications infrastructure, and more. Even waste-eliminating strategies such as recycling and repair produce remainders in the forms of emissions, spent parts, and toxic residues (Gabrys 2011; Lepawsky 2018). Not only is waste inevitable but is also a fulcrum for understanding the values held by those who discarded it and those who labor with waste on our behalf (Thompson 2017[1979]); Gabrys 2011:149).

In a broad sense, the term e-waste refers to any equipment that at one time depended "on electric currents or electromagnetic fields in order to work properly, including equipment for the generation, transfer, and measurement of current" (Babu et al. 2007:308), are deemed obsolete by the user of the equipment, and/or are discarded (ABS 2013; Commonwealth of Australia 2014; Electronics TakeBack Coalition 2014; Environment Protection and Heritage Council 2010a:359). Waste management experts readily understand e-waste as a rapidly growing by-product of the mass production, consumption, and discard of electronic devices and services. For example, televisions, computers, mobile phones, white goods (e.g. large electrical appliances such as refrigerators, washing machines, and dryers, typically white in color), home entertainment and stereo systems, toys, toasters, kettles and almost any household or office

[1] The term 'interlocutor' has been selected to indicate the intellectual collaboration between myself and individuals who continue to share their knowledge, experience, and emotions with me in order to contextualize and disentangle the social lives of people and things in Central Australia.

object with circuitry, electrical components, or a battery supply can eventually become e-waste. In addition to these products, discarded circuit boards, plastic casings, cathode-ray tubes, activated glass, and lead capacitors and other components also makeup the e-waste stream (Babu et al. 2007:308; Pérez-Belis et al. 2014:17). The dominant strategy for handling the e-waste stream is focused on value recovery, the recovery of rare earth metals and recyclable materials. As household appliances are increasingly designed or retrofitted with electronic components and Wi-Fi connectivity, it has become difficult to disassemble these appliances for recycling and to then decipher what *is* and *is not* e-waste.

Contrary to popular notions of the digital as an incorporeal cloud, the digital is not necessarily synonymous with immaterial or non-physical. Rather, as Miller and Horst (2012) argue, digital worlds are neither more nor less material than the worlds that preceded them. E-waste is also undeniably entangled with the waste produced by digital systems. The production and ongoing maintenance of social media platforms, media streaming services, data storage repositories, and online search engines generate e-waste in the form of spent hardware and pollutants (e.g. tailings from mining or toxic leachate from landfills with e-waste) associated with the manufacturing, recycling, and eventual discard of data center equipment. In other words, the conventional device-focused definition of e-waste obscures other types of waste entangled with the ongoing consumption of digital services. Anthropological theories of waste, discussed in chapter two, encourage a more fluid definition of e-waste that leverages the various understandings of e-waste that I encountered during my twelve months of ethnographic research in Alice Springs and beyond.

1.3 Alice Springs/Mparntwe, Northern Territory

Those who travel to Alice Springs are instantly bombarded by an array of iron rich reds strewn across the surface of the earth, giving the town and surrounding region its moniker ‘the Red Centre’. In the late nineteenth century the South Australian government commissioned the construction of a 3200 km telegraph line running from Adelaide in South Australia, through the arid interior of Australia, and northwards to Darwin where it was connected with the rest of the world via an underwater copper cable (Figure 1.1). In the 1870s, a group of white settlers occupied Alice Springs and constructed a central node of Australia’s unprecedented Overland

Telegraph Line. The location of Alice Springs was chosen for its geographic centrality and proximity to an underground aquifer (hence the name ‘Springs’).

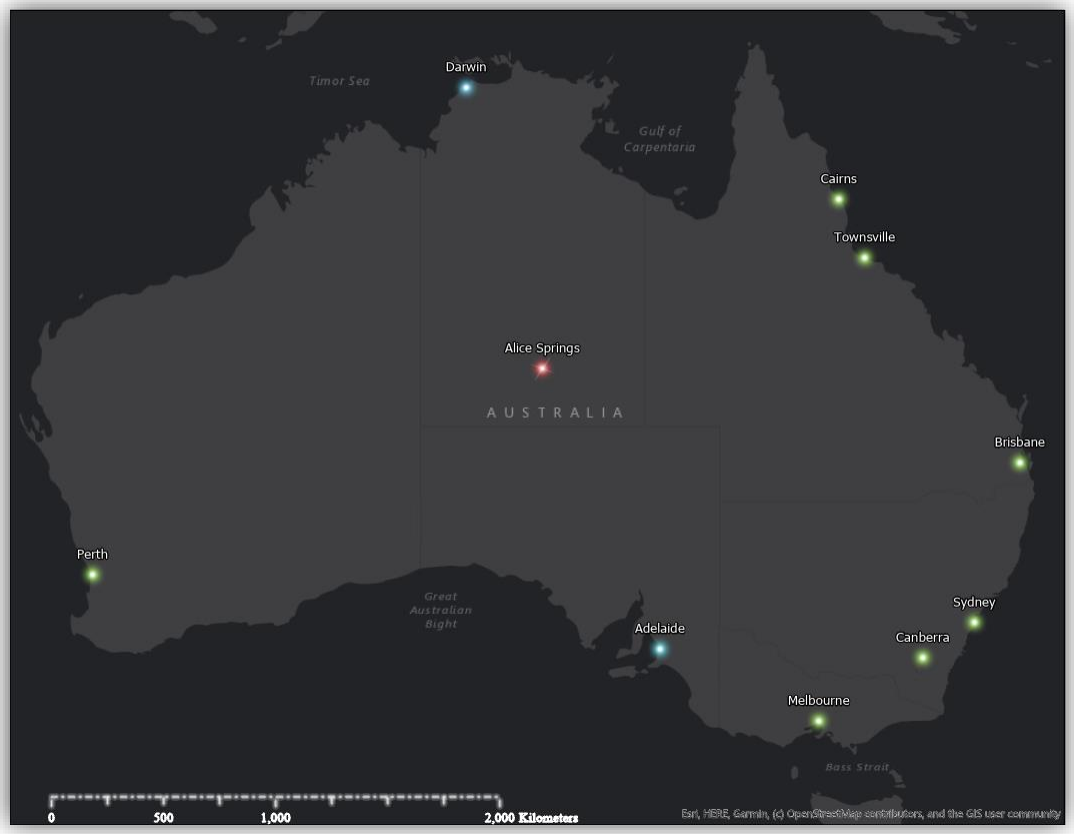


Figure 1.1: Map of Australia Showing the Location of Alice Springs (Figure by author)

The Overland Telegraph line was a narrow corridor through the heart of Australia in 1872 and the Alice Springs station was merely a tiny island of white settlers in Aboriginal land (Traynor 2016:75). By the end of the nineteenth century, European missionaries had also settled relatively nearby in Hermannsberg, about 130 kilometers to the west. Over the next fifty years the town slowly grew as the Australian government leased land to settlers for mining and cattle stations. However, the town experienced significant growth following the completion of the Ghan railroad in 1929 and the construction of a military base for US and Australian army personnel during World War II (Ottosson 2014).

Alice Springs has a population of approximately 25,000 people, the majority of whom are of Australian, British, or Irish Ancestry (ABS 2016). However, around thirty languages other

than English are spoken by residents of various ethnic and Aboriginal heritage (Ottosson 2014). Within the town's population, 18.6% identify as Aboriginal or Torres Strait Islander people, most of whom are of Arrente ancestry (Ottosson 2014).

Nestled within the MacDonnell Ranges, the dual history of Mparntwe/ Alice Springs is unavoidably linked to settler colonization, the development of communications infrastructure in the form of the Overland Telegraph (OT) Line, and the ramifications of earlier anthropological research and missionary work. Settler colonialism is a territorial project focusing on the acquisition of land (Wolfe 2006; Simpson 2014:19). Prior to and since the 1870s, Alice Springs and the surrounding area was called Mparntwe by the Arrente People. The Central Arrernte people are the Traditional Owners of Mparntwe/Alice Springs (ASTC 2017). According to the Aboriginal Land Rights (Northern Territory) Act 1976, Traditional Ownership of the land, including the right to use traditional methods to forage on traditional lands, is granted by the Australian government to the descendants of a particular region if they are able to demonstrate that they "have common spiritual affiliations to a site on the land, being affiliations that place the group under a primary spiritual responsibility for that site and for the land" (Northern Territory of Australia 1976)[2]. Archaeological evidence suggests that Central Australia has been occupied by Aboriginal people for more than 35,000 years (Smith et al. 1997).

The contentious history of settlers, missionaries, and researchers undoubtedly shapes and has shaped the socio-political landscape of Central Australia. The colonial settlement of Alice Springs impacted Aboriginal people and the surrounding ecology of the MacDonnell Ranges. For example, the Regional Waste Management Facility (RWMF), vernacularly called 'the landfill' or 'the tip', is precariously located in the vicinity of Aboriginal sacred sites. The growth of communications infrastructure, the construction of telecom towers, and the introduction of power generators and solar panels into remote communities has further shaped relationships between Aboriginal and non-Aboriginal Australia. Digital technologies and infrastructure have extended the reach and presence of the Australian government to these once inaccessible, distant places.

[2] The meaning of Traditional Owner, however, varies across the States and Territories of Australia. David Edelman (2009) provides a more nuanced exploration of the meaning of this term and its implications for Aboriginal Land Rights.

Alice Springs is geographically remote, located 1500 kilometers (900 miles) away from the nearest metropolitan areas and even further away from facilities where electronic devices are designed, assembled, and shipped to Australia. Today, Alice Springs serves as a significant infrastructural hub for waste management, health care, and the provisioning of government services across all of Central Australia. The remoteness, diverse population, and prominence of Alice Springs as an infrastructural node in the Australian Outback make it an intriguing field site for investigating the boundaries of e-waste management in Australia. Unlike the significantly larger cities of Adelaide and Darwin, Alice Springs does not have its own recycling infrastructure for processing e-waste. Residents and businesses of Alice Springs discard approximately 28 metric tons of e-waste for collection and recycling per year at the Regional Waste Management Facility (Personal Communication with Alice Springs Town Council). The closest e-waste recycling and resource recovery centers to Alice Springs are over 1,500 kilometers away in Adelaide, South Australia. And yet, Central Australians have been accumulating e-waste, empty bottles, and many other kinds of rubbish since the construction of the Overland Telegraph Line.

1.3.1 Waste Management in Alice Springs

Trekking around the ranges, hills, and sand dunes of Central Australia today, one might spot the rusted iron of discarded automobiles, the husks of cathode-ray-televisions and household appliances, and the remains of other machinery melding with the distinctively red soils. For locals, these degrading objects are part of the scenery – not out of place, but an expected and sometimes entertaining attribute of the desert landscape. Did they consider it to be e-waste? Over time, I learned that there are many more ways to understand e-waste than typical definitions allow. Exploring this multiplicity of understandings and ways people ascribe value and meaning to discarded objects is key to unraveling the e-waste problem.

In Alice Springs, the history, meaning, and consequences of electronic objects are intimately linked. The electric current running though the telegraph wires in the 1870s was generated by batteries (Traynor 2016:71). In 1871, Benjamin Clarke carefully escorted between 120 and 150 glass batteries called Meidinger cells. Meidinger cells stood about 25cm tall and produced 1.08 volts, just a little bit more than the small AA batteries we use today (Traynor 2016:71). The subsequent and chronic maintenance of Meidinger cells are an early example of e-

waste being generated in Central Australia. These cells were constantly cleaned by the telegraph station's operators and lineman who also regularly replaced the copper sulphate crystals (Traynor 2016). Ultimately, however, these cells would have been discarded by the OT operators, generating the first e-waste in Central Australia.

Where would this waste have ended up in these early days? There were no landfills in Alice Springs in the 1870s. Much of the discards produced by the Alice Springs telegraph station would have either been refashioned into something else or tossed and buried nearby. Although the historical record is relatively vague, historical archaeology tell us that early settlers most likely discarded non-degradable waste on their own properties. For example, historical archaeologist Kate Holmes has documented glass bottle dumps dispersed around private properties (1988). Unfortunately, there is a sparse archaeological coverage regarding the fate of discards during the early settlement of Alice Springs.

In the late nineteenth and early twentieth centuries, residents of Alice Springs sporadically received supply shipments. Consumer goods became rapidly available in Central Australia following the completion of the Ghan railway and Stuart Highway. In the 1930s the town's population grew significantly, as did the amount of waste generated. Consumer and discard practices in Alice Springs continued to shift in the latter half of the twentieth century. The Ghan made it possible for glass bottles to move readily and cheaply interstate. Infrastructural developments in communication, mining, and Indigenous services infrastructure ballooned the town's population. More people and more consumables led to more waste. By the late 1970s, more waste had led to the development of a centralized landfill, replacing the individual bottle dumps and fire pits (Holmes 1988). Over the course of the twentieth century landfills across Australia transformed from open dumps, where families could openly scavenge, to gated resource recovery centers tasked with mitigating the unpleasant and dangerous aspects of mass waste.

1.3.2 The Emergence of Mass Waste

What is mass waste? It is not simply waste that has amassed (Reno 2014). According to Reno, waste matter is best understood "not as anthropocentric but as semi-biotic: a sign of the form of life to which it once belonged" (2014:3). As mass waste becomes more concentrated and contaminating, public images of waste become more focused on the spread of pollution rather

than the generation of life. Mass waste mixes together waste from many people in a way that causes discards to lose their indexical connection to the being(s) that generated them and become anonymous (Reno 2014:17). Garbology, discussed in chapter three, investigates the links between those who waste and the waste itself by systematically sampling and analyzing mass waste alongside a range of ethnographic methods (Rathje 2001; Sosna 2016; Brunclíková 2016).

Mass waste arguably emerges in Alice Springs simultaneously with a broader national shift towards a consumer society. Daniel Miller defines consumer society as one where "commodities are increasingly used to express the core values of that society but also become the principal form through which people come to see, recognize and understand these values" (2012:40). Wasted objects, things that have been ascribed zero or negative value (Sosna and Brunclíková 2016:5), tend not to feature within the core values of a consumer society. Although, human settlements have long included waste management and infrastructure such as sewers, waste collectors, and dumps, the scale of waste production as well as the reuse of waste materials often took place within public view. More recently, the modernization of waste management infrastructure and politics maintains the anonymity of mass waste. This concealment obscures issues of ownership and responsibility, evades effective resource recovery, and wedges apart those who labor in waste from those who discard it. As a result, many who speak of 'waste' have a tendency to conflate the term with the peculiar history of mass waste (Reno 2014).

Landfills and incinerators play a prominent role in amassing waste away from the populations who generated it. Prior to the appearance of sanitary landfills, Australians likely either burned their garbage or buried it on the outskirts of town (e.g. Holmes 1988; Brown 2012). Modern landfills are engineered to remove, or at least mitigate, waste from the influence of other life forms (micro-organisms, insects, and vermin) and forms of life (scavengers and scrap dealers):

> "The development of the sanitary landfill, or closed tip, in the early 20th century was meant not only to protect people from unpleasant odors and sights, but also to cover waste so that flies and other vermin could not access it, precisely to interrupt the unruly semi-biotic participation of waste deposits in behavioral environments" (Reno 2014:17-18).

The inception of sanitary landfills stems from "controlled tipping" in Great Britain in the 1920s, a response to cities that were "dumping wastes between houses and covering the piles with street sweepings"(Melosi 2002:27). In the United States, sanitary landfills became the predominant

means of disposal following the preparation of a manual by the Sanitary Engineering Division of the American Society of Civil Engineers in the 1950s (Melosi 2002:24). Their definition of sanitary landfill stresses the confinement of refuse to the smallest practical area of land, its reduction to the smallest practical volume, and the frequent burying or sealing of the refuse using layers of earth (Melosi 2002:24). Sanitary landfilling also became a universal method for waste disposal in Australia throughout the twentieth century.

According to data collected by Geoscience Australia (2017), there are nearly 2000 waste management and resource recovery sites across Australia with about 100 listed in the Northern Territory (Figure 1.2).

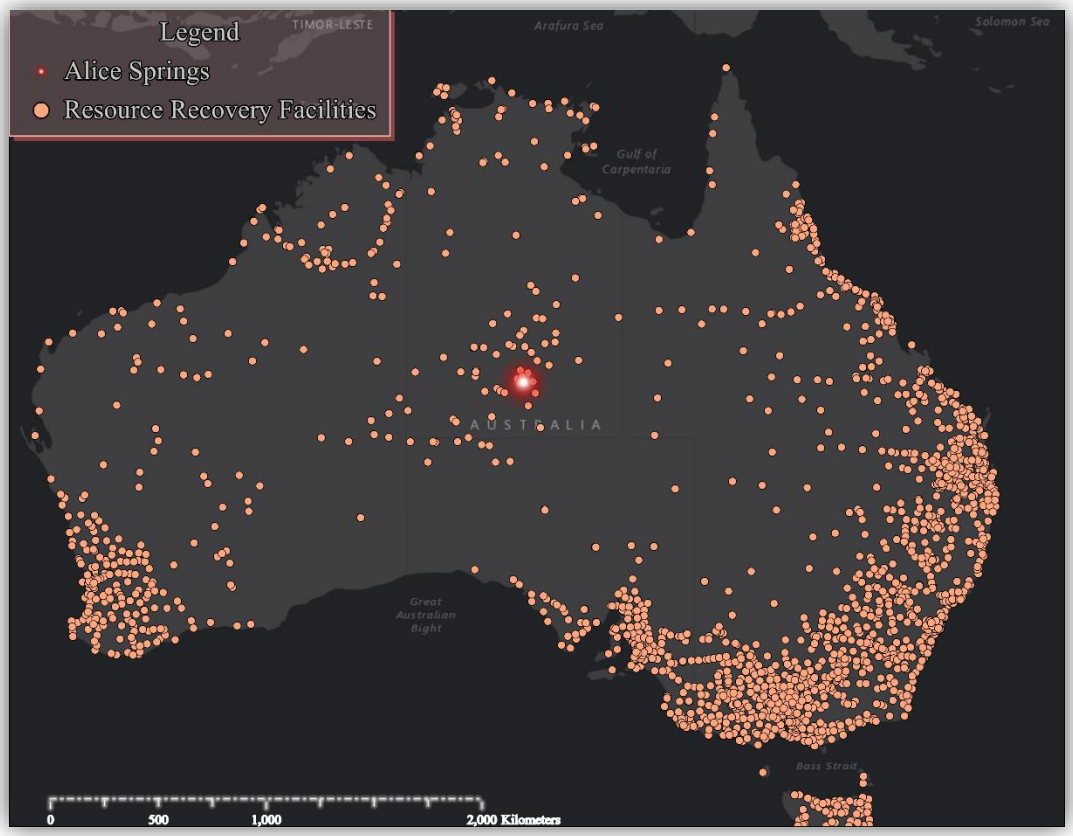


Figure 1.2: The Distribution of Resource Recovery Centers across Australia (Figure by Author)

Despite recyclables being collected in Alice Springs, there is an important distinction to make between recycling collection points and recycling centers. Although opportunities exist all over Australia for the collection of televisions, computers, mobile phones, cartridges, and batteries,

these items must be transported great distances across regional and remote Australia to be recycled and reprocessed. The distance between Alice Springs and the nearest reprocessing center is approximately 1500 kilometres. Once processed into smaller components and materials, it is then common for many of these materials to be sent overseas for further recycling and reprocessing.

1.3.3 An Anthropological Study of Waste and Place in Alice Springs

In the 1870s, Atherreyurre (a-tuh-ree-oo-ra), a sacred waterhole belonging to the local Arrernte people, was occupied by Euro-Australian[3] settlers. The Telegraph Station these settlers built has since become a key historical site symbolizing the origins of modern international telecommunications infrastructure in Australia (Traynor 2016:58). The town of Mparntwe/Alice Springs is uniquely positioned as both geographically separate from the metropolitan centers of Australia and as a central infrastructural hub for the sparsely populated Australian outback. Alice Springs and the surrounding country has also become a tourist destination representing "a kind of ongoing frontier and iconic 'outback' space that anchors powerful sentiments of Anglo-Australian settler forms of belonging on the Australian continent" (Ottosson 2014:120). Anglo-Australian settlers brought with them a steadily increasing flow of waste materials that were not biodegradable. Because settler colonial waste management strategies are designed for forgetting (Hird 2013; Rose 2003), the presence and littering of rubbish in Alice Springs and the surrounding area challenges us to engage an ontology of remembering (Hird 2013). When an individual sends their waste away to a landfill or incinerator located outside of the community, that waste has been moved out-of-sight, making it easier for individuals to dismiss the consequences of their discard activities. And yet, the presence of waste or litter in a public place often results in feelings of disgust and even anger towards the perceived perpetrator.

Aboriginal cosmology, however, relegates waste differently as a vital sign linking country and people:

> "The remains of people's action in country tell an implicit story of knowledgeable action: these people knew where they were, they knew how to get the food that is there in the country. The country responded to their presence by providing for them,

[3] The term 'Euro-Australia' is used throughout this dissertation to denote the effects of Non-Aboriginal Australians occupying Central Australia. However, it is important to recognize that many of the residents of Alice Springs from its initial occupation in the 1870s through to the present have come from all corners of the world. For example, the neighborhood of Sadadeen in Alice Springs is named after an Afghan cameleer. Cameleers and their camels enabled Euro-Australian settlers to travel and construct the telegraph line across the arid interior of Australia.

> and the remains are evidence of the reciprocity between country and people" (Bird Rose 2003:62)

Rubbish encountered along the foot paths, riverbeds, and in the bush and scrub around Alice Springs are an active reminder that the geospatial boundaries of Alice Springs also overlay Mparntwe, the name for the area used by the Arrente Traditional Owners. Discarded automobiles, shattered glass, and litter carried by the wind are indeed a point of contention for non-Aboriginal residents of Alice Springs (Ottosson 2016). Ethnographer Åse Ottosson (2016) provides a detailed and empathetic description of how many non-aboriginal residents misconstrue the presence of rubbish as anti-social behavior.

Anthropological studies of e-waste have predominantly focused on the massive accumulations of e-waste in densely populated areas of China (Kirby and Lora-Wainwright 2015), Ghana (Akese and Little 2018), Kenya (Cross and Murray 2018), and India (Reddy 2015). My research in Central Australia represents a departure from these studies because it attends to the different ways e-waste is understood and managed in a very remote community. I performed thirteen months of ethnographic research that took me to landfills, secondhand shops, Central Australian homes, Repair Cafés, community meetings, social media pages, government offices, and non-governmental organizations (NGO's) – all while exploring the bush and scrub of Alice Springs.

The social history and demographics of Alice Springs make it a unique case study for exploring the social and ecological conditions that generate e-waste in Australia, where that waste tends to accumulate, and what can be done to better manage e-waste. Although concentrations of e-waste in Central Australia are not inherently higher than in more populated places, Alice Springs is an infrastructural hub for the Australian Commonwealth to divvy out resources and healthcare services to the whole of Central Australia, is home to a joint Australian and American military base, and serves as a gateway for mining and fracking operations in the region. Each of these operations generate various forms of e-waste such as discarded hardware from government and healthcare offices, and the vast consumption of digital resources at the military installation.

The continual development of communication, government, and energy infrastructure means that the management of e-waste in remote communities is an important issue that is only going to become more pressing in the future. Interstate transport is required for the processing of

e-waste into recyclable products and is both ecologically and economically costly. The landfilling or burying of e-waste in Central Australia has a direct and adverse impact on the region's desert ecology. Without adequate management and planning, the region is vulnerable to the negative impacts of e-waste. The Australian Commonwealth, through a series of policies and regulations, determines how e-waste ought to be managed in the Northern Territory.

1.4 Research Question 2: How effective is the Australian government at managing e-waste?

The Australian government's emphasis on recycling has a tendency to preclude repair and reuse as a viable means to alleviate the challenges of e-waste. This emphasis is apparent in the lack of metrics and incentives for reuse and repair in the National Television and Computer Recycling Scheme (NTCRS) as well as MobileMusters (Commonwealth of Australia 2014; MobileMusters 2014). Furthermore, efforts to recycle e-waste are often limited to televisions, computers, and mobile phones. This regulatory boundary pushes other types of e-waste outside the purview of environmental and social responsibility. Chapter two adopts rubbish theory to better articulate the potential harms and benefits of excluding non-regulated discarded electronics from e-waste management (Thompson 2017). Chapter three describes how I applied ethnographic participant observation, interviews, and digital archaeology to illuminate what happens to e-waste that falls outside of Australia's e-waste management schemes.

Early in my fieldwork I became curious about the extent to which the regulators and policy makers in metropolitan cities affect the framing and management of e-waste in Central Australia. In many ways, e-waste is a comparatively young waste stream. The conditions, standards, regulations, and processing techniques that inform e-waste infrastructure remain essentially in flux. In particular, I became interested in the presence of discarded solar panels and other types of e-waste that I encountered in the homes of Central Australians, at the RWMF, and while dawdling around the outskirts of the town. I conducted participant observation at a range of community meetings addressing environmental, economic, and social issues in Alice Springs. At each of these meetings, the efforts of environmental activists to transform the town's energy infrastructure seemed disconnected from the waste produced by such transformations. These meetings are written about in more detail in chapter seven. The critiques of Australia's e-waste related policies and regulations in this dissertation move past the oft-cited critiques of NTCRS

and MobileMuster recycling and resource recovery metrics. Instead, the critiques are evaluated alongside the socio-ecological concerns of my interlocutors in Alice Springs.

By privileging recycling and material recovery, the Australian commonwealth frustrates the ability of skilled and imaginative repairers to extend the useful lives of electronics. Furthermore, the NTCRS and MobileMusters, by limiting which types of e-waste will be regulated, has consequentially pushed other types of e-waste outside the purview of environmental and waste activism in Australia. For example, in chapter six I critique the relative visibility of e-waste littered around the outskirts of the town. Given that this dissertation is an applied anthropology of e-waste in Central Australia, I actively tried to address some of these issues in the field by helping to organize Repair Cafés and by educating residents, government employees, and waste management professionals via public presentations throughout my fieldwork.

Political ecology, discussed in chapter two, was particularly useful in helping me to better understand how e-waste is framed in specific ways by the Australian government. More specifically, it is a helpful theoretical framework for parsing out whose definition or conceptualization of e-waste is likely to be realized in terms of public and private understandings of e-waste. Throughout this dissertation I critique how discarded electronics are often framed as either a waste or resource and the consequences of framing discarded electronics in this way.

1.4.1 Framing the Management of Electronic Waste within Australia

Over thirty years ago, discarded electronics were viewed as a relatively untapped source of recoverable resources as opposed to a post-consumption waste management problem (Lepawsky 2018:2). Lepawsky rightly points out that the two realities of discarded electronics as ‘scrap’, a potential source of recoverable resources, or as ‘waste’, are not mutually exclusive (Lepawsky 2018:3). Rather, the framing of discarded electronics as one or the other “underscores the normative effects built into any conception of what discarded electronics are and how they ought to be managed” (Lepawsky 2018:3). Furthermore, framing discarded electronics as e-waste may have the unintended effect of relegating specific solutions thinkable while simultaneously rendering others as unimaginable let alone actionable (Lepawsky 2018:6).

In Australia, the NTCRS limits the types of e-waste regulated by the government to televisions, computers, and related accessories (Commonwealth of Australia 2014). The NTCRS

is the largest producer responsibility scheme in Australian history. It was established under the Australian Government's Product Stewardship Act 2011 which "provides a framework for managing the environmental, health, and safety impacts of products, including impacts associated with the disposal of products" (Commonwealth of Australia 2014:6). The COAG (Council of Australian Governments) organized the NTCRS in response to the scope of the e-waste problem and the desire of industry, community, and state and territory governments for a national approach to e-waste recycling.

The NTCRS was designed through a collaborative process beginning in 2009 which involved a total of "130 submissions from a broad range of stakeholders including television and computer manufacturers, industry associations, state and territory governments, local governments, environmental organizations, and individuals" (Commonwealth of Australia 2014:9). The Australian Government organized a national effort to facilitate discussions with local government (360 councils representing 84% of Australia's population), recyclers, and charities (Commonwealth of Australia 2014:9). A survey of local councils across Australia was undertaken to determine their current level of understanding and action on e-waste (Davis and Herat 2008, 2010). The results identified access to reprocessing facilities and the public's limited awareness of e-waste related issues as key barriers to the collection and treatment of e-waste (Davis and Herat 2010:2).

Since beginning operations in May 2012, the scheme has led to the recycling of over 10,000 metric tons of e-waste (Commonwealth of Australia 2014:4). Despite Australia defining e-waste broadly as "waste electrical and electronic equipment that is dependent on electric currents or electromagnetic fields in order to function" (ABS 2013), electronics industry members are only required to fund the collection and recycling of a certain proportion of TVs and computers disposed of in Australia each year. The Scheme began at 35%, by weight, of the TVs and Computers imported into Australia each year and is scheduled to incrementally be raised to 80% where it will level off in about ten years. These increased recycling targets are intended to ensure that hazardous materials such as lead, mercury, and brominated flame retardants are diverted from landfills and that reusable materials such as precious and other metals, plastics, and glass are recovered (Commonwealth of Australia 2014:7).

E-waste that is not included under the scheme's recycling targets are under the jurisdiction and stewardship of state and territory governments. The operational review of the

scheme notes that in cases where "alternative options are not made available at the jurisdictional level, there is a [serious] risk of increased illegal dumping and other adverse environmental outcomes" (Commonwealth of Australia 2014:6). In addition to retaining responsibility for e-waste outside of the scheme targets, state, territory, and local governments are responsible for regulating e-waste recyclers to ensure that environmental and work health and safety performances are satisfactory.

Despite the success of the NTCRS, the consultations conducted by this operational review revealed that the public demand for e-waste recycling was greater than the collection targets set for the early stages of the NTCRS (Commonwealth of Australia 2014:12). This resulted in a stop-start roll-out of scheme services, unstable market conditions for the recycling sector, and jeopardized the provisioning of social benefits to social and disability employers and employees within the e-waste sector (Commonwealth of Australia 2014:12). These issues were also addressed and elaborated upon in a subsequent review by Morris and Metternicht (2016), who found that the current legislative framework does not sufficiently address the rate and types of e-waste generated in Australia, facilitate adequate public engagement and accessibility to services, realize recycling and material recovery targets, or contain sufficient auditing and compliance measures (Morris and Metternicht 2016:218).

As of 2018, e-waste legislation only pertains to discarded electronics covered by the NTCRS and MobileMusters (2014), a parallel scheme for collecting and recycling mobile phones. Most interpretations of the effectiveness of e-waste management in Australia rely primarily on tons of e-waste diverted from landfill and materials recovered for remanufacturing as metrics (e.g. Morris and Metternicht 2016). While the diversion of e-waste from landfill is indeed important, this dissertation is also concerned with the recyclability, repairability, and reusability of electronics in Central Australia.

The views of waste management experts, the electronics manufacturing industry, local government, and environmental governmental and non-governmental organizations are all present in the schemes Operational Review (Commonwealth of Australia 2014). However, the development and deployment of the NTCRS engages in particular forms of erasure (Dourish and Bell 2012:95), that render aspects of e-waste, and those who manage it outside of the scheme, largely invisible. While analyses of e-waste management in Australia integrate the perspectives of co-regulatory arrangements and the 31 domestic e-waste recycling facilities (e.g. Morris and

Metternicht 2016; Dias et al. 2018), the perspectives of Australian households, hacktivists, and small businesses engaged in repair and reuse have essentially been ignored[4].

With the exception of recycling, little has been done to mitigate the 'weighty geographies of electronics' (Lepawsky 2018) in Australia. The increasing complexity and heterogeneity of materials in electronics manufacturing has led to an unequal distribution of social and ecological harm as waste from the extraction of raw materials and discard of digital devices filters and settles across the globe. Although this dissertation is based in Alice Springs, the transport to and consumption of digital devices in Alice Springs are but one link within the global electronics commodity chain. Chapter six explores how e-waste experts understand and respond to the logistical challenges and opportunities of managing e-waste in remote and sparsely populated areas of Australia such as Alice Springs in relation to Australia's more densely populated cities (e.g. Adelaide, Brisbane, Melbourne, Perth, and Sydney).

1.5 Research Question 3: How are the multi-scalar dimensions of e-waste experienced, understood, and contested by Central Australians?

The feeling of 'remoteness' pulses in and out of daily life in Alice Springs as residents occasionally need to purchase items from interstate, wait an extended amount of time for an important parcel in the mail, or come to terms with truncated options for recycling and repair (See chapters four and five). Those who travel to Alice Springs are rewarded with a landscape colored various shades of red from the iron rich geology. As mentioned, Alice Springs is approximately 1500 kilometers (900 miles) from metropolitan Australia and even further away from the mines, factories, and shipping containers where electronic devices are fabricated, imported, and at times exported. The "Tyranny of Distance" and experiences of remoteness shape the way e-waste is experienced, understood, and managed in Central Australia. The concept, popularized by conservative historian Geoffrey Blainey (2001 [1966]), refers to the dynamic role geographic distance has played in shaping the history of Australia. In the third and most recent edition of **THE TYRANNY OF DISTANCE**, Blainey states that "distance is tamed but far from dead" (2001:373). Chapter six illustrates how in many ways this concept is still indeed true for Alice Springs.

[4] I use the term hacktivists to refer to individuals seeking to challenge the designed obsolescence of electronics via creative reuse and repair strategies (Delgado and Callén 2017).

Distance has always been embedded in the production, consumption, and discard of electronics. For example, while reflecting on her Fulbright fieldwork in Australia, Allaine Cerwonka recounted her informants being especially excited by the prospects of mobile phones in the mid-1990s because it helped them to mitigate their anxieties associated with distance (Cerwonka and Malkki 2008:86; Blainey 2001:354). Although, electronics transform the Australian experience of distance, especially in remote communities, their circuitry tells a different story. The taming of distance in Australia reinforces neoliberal notions of globalization and development while externalizing environment and social justice issues associated with e-waste. Disassembling a mobile phone or a laptop reveals components that have been sourced from across the globe. The consumption of electronics in Alice Springs links Central Australians with the waste generated by the manufacturing of electronic devices as well as the burdens of managing e-waste.

Distance and remoteness temper how e-waste is seen, experienced, and managed in Alice Springs. In chapter six, the consequences of e-waste are rendered as somewhere else's problem for Central Australians. What makes a place remote? More specifically, how is Alice Springs experienced as a remote place? Central Australia is geographically and politically remote from the center of Australian power in Canberra. To what extent is Central Australia "remote" to and for those who live there now and those who have lived there for many generations? These questions highlight the relationality of remoteness. For my interlocutors living in Alice Springs – those who have recently migrated from major Australian cities, who were born and raised in town, or have lived in the region for countless generations, Central Australia is not necessarily "remote". Indeed, in terms of waste and recycling, my interlocutors routinely argued that opposite. Together, my interlocutors and I took stock of the sheer distance tractor trailers filled with tons of discarded televisions and computer stacks needed to travel in order to be recycled. But throughout my fieldwork, it also became increasingly clear that Alice Springs is, in many ways, a vibrant center of both Aboriginal and non-Aboriginal culture in Australia. The town and surrounding region are punctuated by culturally significant sites associated with the Dreaming as well as historical outposts, national parks, and more that have become undeniably iconic of Outback Australia.

Nevertheless, the political remoteness of Central Australia from the Commonwealth Government based in Canberra has put the region at risk of becoming a dumping ground for

interstate and international hazardous waste. With a relatively small and sparse population, the majority land around Alice Springs and the Northern Territory (NT) is viewed as low-value except for mining and waste storage. This point is critical because Alice Springs is located in the Northern Territory (NT). Due to its status as a Territory, and not as a state, the NT has a limited ability to prevent mining, fracking, and other environmentally damaging activities. Given its low sparse population, the region also has limited representation in federal politics and parliament. Furthermore, as a Territory, the Commonwealth of Australia can override decisions made by the NT government.

Ironically, the perceived remoteness and pristine quality of these landscapes feature predominantly in the narratives the Australian Outback as an invaluable marker of Australian identity. In response, low population, low land value, and the limited power of the NT government have led to a conservation of Aboriginal lands and culture unique to Australia. However, even national heritage sites in the NT such as Kakadu are not immune from the aversive effects of mining (Perdan 2011). Despite romanticizing Uluru, the Great Barrier Reef, and other national parks in Australia, these areas and the many species that inhabit them are chronically under threat from mining and resource extraction, international shipping lanes, tourism, and hazardous waste disposal.

This susceptibility, however, is a source of contention for environmental activists in Alice Springs and chapter seven takes a closer look into how hazardous waste facilities are being contested in Central Australia. In particular, Central Australia routinely attracts activist from across Australia to protest waste storage facilities, fracking, and more. Many of these activists became key interlocutors and close friends since beginning my fieldwork in 2017. Chapter seven addresses the broader legacy of waste colonialism in Central Australia by taking critiques of technocapital sacrifice zones (Suarez-Villa 2009) into consideration. As described throughout this dissertation, waste is often externalized across the production, consumption, and discard of electronic devices and digital services. While chapter six discusses how distance and remoteness sever awareness of this waste and the true consequences of digital and electronic consumption (thus making e-waste somewhere else's problem), chapter seven deals with the threat of Central Australia becoming "somewhere else", or rather, a technocapital sacrifice zone for storing the hazardous remainders of mining, manufacturing, and nuclear energy (Suarez-Villa 2009).

These ongoing ecological threats are nested within the aforementioned settler colonial history of Alice Springs and the surrounding region which has had a lasting and ongoing effect on Aboriginal and Non-Aboriginal people living in Central Australia. These effects are intimately tied to the wider infrastructural project of 'taming of distance' (Blainey 2001[1966]) initiated by efforts such as the Overland Telegraph. Consequentially, the wasting and ruination of physical, social, and cultural landscapes in Central Australia became noise in Euro-Australian narratives of progress. Furthermore, socio-ecological impacts are too often muffled in discourse surrounding new infrastructural projects focused on digital communications and renewable energy. In particular, this dissertation situates e-waste, especially discarded electronics linked to the aforementioned efforts to 'tame distance', in Central Australia as a byproduct of the region's settler colonial past and present.

1.6 Learning to Waste Well

This dissertation reconfigures how anthropologists and waste management experts come to frame some discarded electronics as e-waste and draws attention to the potential consequences of failing to recognize other types of e-waste. The question "what is electronic waste" is ethnographically explored in relation to the role(s) electronic devices and e-waste play in the lives of Central Australians. It delves into the interstitial stages of discarded electronics being stored in households, locally repaired, or brought to the RWMF to be landfilled, recycled, or resold for reuse in the secondhand shop. The emergence of social media and digital marketplaces are also considered as important nodes for understanding the social lives of e-waste. Now, more than ever, greater attention to the true costs of our digital lives is needed to ensure that the places, peoples, and things which make our modern way of life possible are not reduced to mere externalities.

As mentioned earlier, digital infrastructures are far from immaterial. The data centers that store emails, selfies, field notes, films and television series, and much more produce waste and consume a multitude of resources from rare earth metals to human labor. These particular forms of mass wastage and mass consumption often take place out of sight and out of mind. These costs are essentially invisible to Central Australians. As a remote town and major infrastructure hub, Alice Springs is a significant site for assessing Australia's management of e-waste. Furthermore, establishing an understanding of the challenges involved with the implementation of a recycling collection schemes in places as remote as Alice Springs will likely provide

important insights for how to better handle e-waste in other regional and remote communities around the globe.

As of 2020, a significant amount of e-waste is being and has already been discarded. The garbage will invariably keep coming as more people all over the world consume digital content and electronic hardware. Waste is essentially unavoidable. However, it is critical that we learn how to waste well. To waste well is to elevate the status of working with waste by drawing attention to its vital role in maintaining and providing health and safety for human settlements, fostering the efficient consumption and reuse of materials, and providing the means to recycle that which cannot be reused (Lynch 1990). The chapters that follow serve to critically consider and develop new strategies for wasting e-waste well in Alice Springs.

CHAPTER 2. THEORIZING ELECTRONIC WASTE

2.1 Introduction

When electronic things break down, their component parts move through homes, repair centers, transfer stations, states and territories and international boundaries where they accrue different values and meanings (Cross and Murray 2018). The relationships between people and discards are explored by anthropologists (Nagle 2013; Zahara and Hird 2013; Reno 2016b; Millar 2018; Nguyen 2019), archaeologists (Sosna 2016; Brunclíková 2016; Haak 2016), and garbologists (Rathje 2001; Tani and Rathje 1995; Schiffer et al. 1981) who methodically 'paddle around in the rubbish they seek to understand' (Thompson 2017[1979]). The anthropological body of work on discards spans landfills, attics and basements, recycling centers, repair shops, curbsides, archaeological middens, bottle dumps, and even auto-mobile graveyards. Researching discards, however, requires a theoretical approach that can trace what discarded objects mean to different people as they move across time and space.

Behavioral archaeology is "the study of material objects regardless of time or space in order to describe and explain human behavior" (Reid et al. 1975:864). The life history framework, as employed by behavioral archaeology, is a useful means to trace how artifacts, including electronic devices and digital software, interact with people, other objects, and infrastructure throughout time and space. The life history framework reminds us that all objects, including consumer electronics and the devices that power digital services, "begin as a raw materials" (Schiffer 2011:23). Materials are extracted from the earth, manufactured and assembled into electronic devices, transported and exchanged, used and reused, repaired and maintained, and eventually discarded or abandoned (Schiffer 2011:23; Figure 2.1). While there are indeed observable patterns in the movement of these materials from place to place, the life history framework enables the researcher to traces the movement of individual electronic devices, as well as their object biographies (Kopytoff 1986; Joy 2009), across domestic, digital, and public spaces as they interact with objects, infrastructural nodes, and people (Figure 2.2).

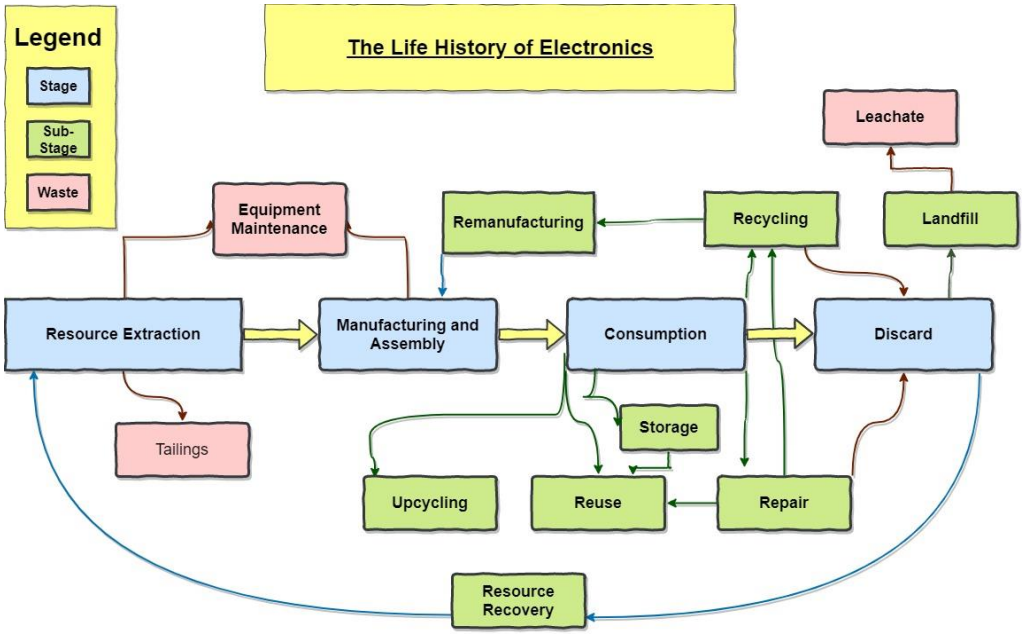


Figure 2.1: The Life History of Electronics (Figure by author)

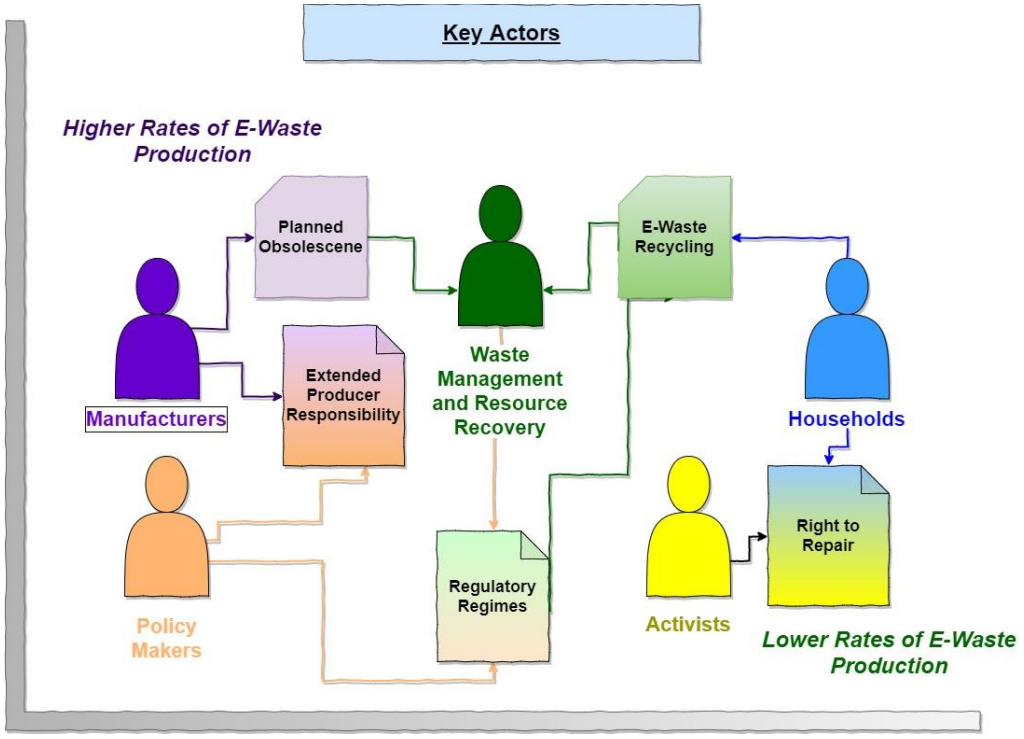


Figure 2.2: Key Actors Affecting the Life History of Electronics (Figure by author)

2.1.1 The Life History of Digital Objects

The first time I asked the question "What is electronic waste?" aloud was as researcher on the Purdue Electronic Life Histories Project (Cooper et al. 2016). From 2014 to 2016, we surveyed and interviewed residents of Tippecanoe County, Indiana, students at Purdue University, and e-waste recyclers in the region. I was surprised by the overwhelming numbers of students and residents who believed that the term "e-waste" refers to the amount of time they have "wasted online" checking emails, streaming media, and using social media. By contrast, the e-waste recyclers we spoke with had a much more visceral relationship with e-waste. During a visit to an e-waste recycling center up the road from my old apartment I was impressed to see employees using magnets to wrangle together loose screws and pieces of metal as they speedily disassembled household electronics. The responses I received from residents and students was certainly at odds with what I was told counted as "e-waste."

Integrating insights from digital anthropology allowed me to expand the life history of electronics to include the life history of digital objects. Miller and Horst define the digital as "all that which can be ultimately reduced to binary code but which produces a further proliferation of particularity and difference" (2012:3). The digital lives in and depends upon material objects such as processors, capacitors, hard disc drives, and punch cards. Digital objects and the digital worlds they enable are therefore neither more nor less material than the worlds that preceded them.

And yet, digital media is often perceived as immaterial because of a growing disconnect from the wires, power sources, and data centers that enable digital worlds. Fichter and Hintermann define a data center as "a room or building where the central information technology (IT), including the server and the infrastructure needed for its operation, of one or more organizations is installed" (2014:847). Although the literature pertaining towards the amount of e-waste generated by data centers is sparse, Tozer et al. acknowledge that the disposal of sulphidic tailings, a waste product from the manufacturing of IT components, "results in intensive land use and, if not disposed of responsibly, can leach into surrounding water and soil" (2016:106). The issue here is that these tailings are not unique to the IT equipment used in data centers. Rather, what is problematically absent is a true assessment of the amount of equipment consumed and eventually discarded by data centers each year. In their study on the amount of materials used in German data centers in 2008, Fichter and Hintermann found that data centers contained about 110,300 metric tons of material including IT equipment, power infrastructure, racks and containment, and cooling and air

conditioning. In 2020, online services and cloud computing have become even more ubiquitous, with more individuals and organizations depending upon data centers for the storage of their data. A vast network of cables, generators, and hardware connects and powers all of our devices, consuming and wasting enormous amounts of materials and energy on our behalf. A staggering amount of pollution and harm remain buried beneath techno-utopian narratives focusing on the potential of the digital to enhance our lives. For example, Peter Little's (2014) ethnography of IBM's birthplace in Endicott, New York is a nuanced exploration of how toxic substance exposure, corporate deindustrialization, and toxic mitigation are socially experienced, articulated, and made meaningful by the residents IBM has since abandoned.

The life history of digital objects is a crucial yet understudied aspect of e-waste scholarship. E-waste emanates from both the hyper consumption of electronic devices such as mobile phones, televisions, and SMART household appliances as well as digital services such as social media, streaming services, online data storage, and cryptocurrency. Recognizing these additional forms of e-waste, however, makes assessing how Australia manages its e-waste an even more vexing question than simply asking "how much e-waste does Australia generate and recycle each year?

2.1.2 Managing Waste from the Life History of Electronics in Australia

The mechanisms that enable the performance of digital worlds as immaterial are often overlooked. In reality, digital worlds are powered by elaborate infrastructures. The movement of digital data from one device to another connects people, places, and other objects across the globe. But what of the waste produced by the manufacturing and discard of electrical equipment? Dourish and Bell draw ethnographic attention to the process by which infrastructural standards are developed and deployed, how infrastructures are maintained, the constraints infrastructure imposes, and the forms of erasure in which they engage (2012:95). In particular, I am interested in how digital infrastructure erases e-waste from the experience of Central Australians. The widespread misbelief that digital data is somehow immaterial, which is critically contested by digital anthropologists, perpetuates a myth of dematerialization, thus masking the actual pollution emanating from the streaming of online media, digital communications, and economic activity. For example, Mayers et al. (2014) observed that the distribution of videogames on Blu-ray discs resulted in lower greenhouse gas emission than online alternatives (See Velásquez et al. 2010 for a similar example regarding on- and offline movie rentals).

As digital services increasingly replace brick and mortar stores, a mass of e-waste is hiding in the shadows. It is important to note that digital services undoubtedly have many other benefits. For example, affordances in the design of Netflix coinciding with social activism has led an increase in the amount of programming with audio description and other accessibility features (Ellis 2015). I do not renounce the benefits and the generative aspects of social media for many people around the world (e.g. Miller et al. 2016). However, the proliferation of digital services and the distribution of e-waste, pollutants, and other residues shed by digital infrastructures should not and cannot be ignored.

2.1.3 The Materiality of Waste

The concept of materiality promotes the significance of the material qualities of the environment as they are perceived, used, and symbolized while also emphasizing how material properties are enrolled in the life projects of humans (Jones 2004; Miller 2005a,b). Materiality signals the ways in which objects and humans are mutually constitutive of each other (Miller 2005a). In **ENTANGLED**, Ian Hodder (2012) describes these interrelationships as entanglements or dependencies. He asserts that human dependence or reliance on things is enabling and productive. However, as humans become involved in various dependencies, their ability to develop as societies or individuals become constricted (Hodder 2012:18-19). Humans may become dependent upon any combination of physical, economic, social, and/or psychological conditions. They are not inherent in the things themselves but are tied to the interactions between human and things. It is these interactions that are being constrained or limited. Unequal power relations often constrain and limit interactions between people, things and other people. When the livelihood of each group is caught in dependency on the other, as in the master-slave relationship, the dependency is co-constraining (Hodder 2012:18-19).

The life history framework is a plausible way for taking seriously the material qualities of e-waste while still appreciating its relational qualities as an index of other human and non-human interrelationships (Skibo and Schiffer 2008; Schiffer 2011). The standardization of technologies, infrastructure, and modes of consumption generate a set of dependencies which constrain and limit interactions between people and the electronics they are consuming and discarding. For example, the standardization of sanitary landfills effectively bifurcated the interactions between people and their discards once they are picked up from the curbside.

Reno differentiates between two categories of waste in order to account for the materiality and sociality of waste: correlational waste and ontological waste (2016b). Correlational waste refers to objects that humans no longer want (Reno 2016b). Correlational waste has been consciously rejected, stored, and/or deposited by individuals or groups "based on specific sets of aesthetic criteria that are invented and applied by people in a particular time and place" (Reno 2016b: 17). Waste in this sense can be usefully understood in conversation with "matter out of place" (Douglas 2005). In Douglas' structural classification, waste is a byproduct of any human assessment of worth and meaning. It is therefore socially constructed rather than an actual characteristic of things in the world, although the characteristics of the thing may feature into the assessment. For example, Europeans have separated cemeteries from landfills because "the former are places where we prove the transcendent value of ourselves and the people we love while the latter are places we cast off things of little use and even less meaning for us" (Reno 2016b:18).

Correlational waste differs from ontological waste which "is expended or lost not as a result of a contingent, all-too-human-decision, but as part of the process of form maintenance more broadly" (Reno 2016b:19). All organisms must expend waste, usually in the form of effluent, exhaled gases, or other unnecessary molecules (Reno 2016b). "Waste in this latter sense is linked to entropy, the thermodynamic tendency for arrangements of matter to fall back into an equilibrium state and lose stability" (Reno 2016:19). Ontological wasting is purposeful, though non-intentional, and is a necessary ingredient for life via continued self-repair and self-maintenance (Reno 2016:20). By contrast, the slow degradation and weathering of e-waste (e.g. the deterioration of a Samsung TV discussed in chapter six) releases ingredients harmful to life.

Reno classifies e-waste as a type of correlational waste that mirrors the social formations of capitalist modernity (2016b:21). The management (or mismanagement) of correlational waste has consequences for the afterlives of e-waste. In particular, materials released from the disposal and processing of e-waste effects the ability of ecosystems to utilize ontological waste. When consigned to landfills and open-air recycling operations, heavy metals and inorganic compounds from e-waste mingle with humans and bacteria. Understanding how e-waste is managed reveals what people think things are worth because: "What you throw away makes other things appear more important, by comparison" (Reno 2016b:18). This insight echoes Thompsons' (2017) theorizing of rubbish.

2.2 Theorizing E-Waste as Rubbish

Michael Thompson's *Rubbish Theory* (2017[1979]) provides an important anthropological starting point for making sense of e-waste. Thompson's theoretical framework classifies objects using a threefold typology: durable, transient, and rubbish. As time passes, durable objects increase in value while transient objects degrade or lose value (Thompson 2017). Durable and transient objects exist within a 'region of fixed assumptions' in which their relative value is determined by powerful social actors. Only transient objects, those which are gradually declining in value and in expected life-span, may slide across into a third covert category called 'rubbish' (Thompson 2017:27). Rubbish are objects that have been discarded, disregarded, or ejected from our regimes of value upon reaching zero or negative value. Thompson (2017) surmises that rubbished objects, upon being classified as obsolete and valueless, can then be transformed into a durable object, giving examples of antique furniture and Stevengraphs. A key emphasis is on the ability of socially marginalized people to transform rubbish into something of value, a point that has become a fulcrum for more recent ethnographies of waste (e.g. Millar 2018; Nguyen 2019).

The key to Rubbish Theory is its focus on the relationships between the region of flexibility and the region of fixed assumptions (Thompson 2017:82). In tracing how objects move across these boundaries, rubbish theory seeks to explain the dynamic relationship between our world view and our actions. Thompson suggests that "once we have latched on to one way of seeing things, we are also latched on to not seeing things in other ways" (2017:140). Human systems are reliant upon the existence of monstrous rubbish (Thompson 2017; Adams 1994). When an electronic object is ejected to the fringes of society, it has entered what Thompson describes as a 'region of flexibility' (2017:26). Within the region of flexibility, innovative and creative social actions may augment, to some extent, or otherwise re-determine the perceived value of the discarded object outside of the dominant spheres of influence (Thompson 2017:26). At this stage in the social life of an electronic object, its materiality interacts with a range of individuals, policies, and ecologies (Appadurai 1986).

E-waste, such as mobile phones, televisions, and computers are readily collected, recycled, and remanufactured into new devices. This is the predominant way of "seeing" or measuring e-waste in Australia. There are, however, many devices that are repaired and reused

as secondhand electronics and even more that are stored in households, stockpiled or discarded at landfills, or illegally dumped outdoors.

Rubbish theory contains a useful concept for luring monsters, or externalities, back into the life history. Many anthropologists, archaeologists, sociologists, and semioticians have converged on the idea that externalities like waste, rubbish, and trash are, at least in part, inevitable byproducts of human classification (Thompson 2017; Douglas 2005[1966]; Gabrys 2011). However, the absence of waste from technological narratives in the digital age has led to the formation of monsters (Thompson 2017). Thompson (2017) draws attention to the exclusion of 'monsters', externalities located outside the social ordering and classifying of things. Monsters are unclassified objects that have become disregarded and vilified because they confront the arbitrary nature of classification systems.

E-waste is also an anthropogenic monster (described in the following section). The regulation of e-waste has led to some of it being classified for the sake of recycling and resource recovery. For the e-waste falling outside of these classificatory schemes, if left unchecked, can silently wreak havoc on human and non-human bodies, introducing toxic and persistent heavy metals and inorganic compounds into its surroundings (Thompson 2017:140; Sepúlveda et al. 2010). Exposure to toxins from e-waste recycling adversely effects mental and physical health, neurodevelopment, thyroid function, cellular expression and function, and is associated with adverse neonatal outcomes, changes in temperament and behavior, and decreased lung function (Grant et al. 2013). Thompson cautions that, at its worst, the exclusion of monsters from classificatory systems is "intolerant, puritanical, and repressive" while "at its best, reveals a dubious prettifying intent that leads to the pretence that things are tidier than they really are" (2017:138). If left unchecked or ignored, monsters have the potential to wreak havoc on people and the planet.

2.2.1 Anthropocenic Monsters

More recently, Swanson et al. (2017) have sought to draw out monsters (see also Haraway 1992) and ghosts in a collection of multidisciplinary pieces highlighting cross-species entanglement (2017). For Swanson et al. (2017:M2), there are two types of monsters. First, there are those that consists of chimeric entanglements held together in fragile coordination or symbiosis which they assert is essential to life on earth. This view takes into account the integral

role monsters play in ecological systems due to material interdependence. Eukaryotic life and coral reefs are monsters because they are made of mismatched parts hanging together in fragile coordination. In this sense, they suggest that humans are also monsters because they cannot live without other species such as intestinal bacteria. Second, there are anthropogenic monsters ushered in by modern human activities that disrupt symbiosis and lead to decline and death. Modern industrial campaigns seek to exterminate monsters using sterilization, sanitization, and quarantining premised on human classifications of dirt, pollution, and the unclean (Reno 2016b:54-55; Douglas 2002). However, the very same technologies that were erected to eliminate anathema ultimately unleashed new monstrosities such as virulent pathogens and spreading toxins (Swanson et al. 2017:M4).

Externalized forms of waste and pollution emanating from the life history of electronics poses a cross-species predicament. For example, halogenated organic pollutants have been found to bioaccumulate in fish serum near e-waste processing sites in South China (Zeng et al. 2014). Rather than remaining within processing sites, heavy metals and toxic chemicals are carried by air, dust, wastewater, and sediment. Those living near e-waste processing, incineration, and recycling sites in South China were found to have higher concentrations of harmful dioxins and furans in a study on human hair (Luksemburg et al. 2002; Sepúlveda et al. 2010). Furthermore, heavy metal and other organic pollutants like polybrominated diphenyl ether (PCBE) are found in leachate from landfills with e-waste in arid parts of Australia (Kiddie et al. 2014).

E-waste is a compelling example of the Anthropocene because it both results from and contributes to anthropogenic modifications of the geologic fabric of the Earth. The geology of Central Australia is entangled with the mining of rare earth metals and the disposal of hazardous materials. For example, in the following fieldwork excerpt I describe a conversation I had with a close friend of mine who I met during my fieldwork in Alice Springs. At the time, he had just returned from working in a remote part of Central Australia:

> "It is July 2019 and I am catching up with Jason[5] who recently returned from a camping trip with a group of geologists employed by an Australian mining company. Although the geologists he chatted with self-identified as politically progressive, Jason was surprised to hear the group's stance on mining and fracking in Central Australia. The geologists asserted that resource extraction in the region is unavoidable because Australia needs the resources to continue growing. In my friend's recollection, the geologists were seemingly unconcerned with the

[5] This is a pseudonym.

> perceived necessity and potential consequences of growth. Together, my friend and I worry that the perspective of development and growth as desirable and even natural or inevitable, in some sense, remain prevalent in Australia".

This particular type of growth, however, is dependent upon the ongoing extraction of rare earth metals, an increase in energy consumption, and the discard of waste and pollutants from mining, manufacturing, and other industrial processes. How then, do we begin to make sense of all the waste that will be generated during these processes?

In the late 1970s, Thompson (2017) cautioned scholars to open their eyes to monsters and find a way to incorporate them into our worldviews before the toll of ignoring them is too great. The term "monster" is useful for illuminating: 1) discarded electronics that are not being managed and regulated as e-waste within Australia and 2) the full breadth of physical waste entangled with the life history of electronics (Gabrys 2011; Little 2014; and Lepawsky 2018). Illuminating e-waste in this way is an example of monster conservation, an activity which requires an in-depth analysis of the very monsters that have been cast outside classificatory schemes and thus left largely unaddressed. It is also a tracing activity; a way to see relations by illuminating the connection between Man's conquest and the monsters this conquest has produced (Swanson et al. 2017:M8). The reincorporation of monsters into existing systems, however, is a daunting task that requires significant of sums of time, energy, and money (Adams 1994:67).

2.2.2 Towards Monster Conservation

Semiotician Walter R. Adams (1994) defines trash by stating what it is not: things that conserve autopoiesis ─ the ability of a social organism or system to maintain and renew itself by regulating its composition and conserving its boundaries ─ are not trash. This anti-definition essentially states that all things which threaten autopoiesis are trash. Trash threatens our boundaries in a variety of ways such as releasing foul odors, overfilling designated spaces such as landfills, or exposing our bodies to toxic substances. According to Adams (1994), the manner that people deal with trash depends on the severity of the threat it presents to our boundaries. Reflecting on these manners alongside insights from rubbish theory may reveal possible pathways for monster conservation.

During the first stage, trash is externalized as ‘noise’, external phenomena that do not conform to a systems internal logic, in order to form and maintain social structures and conservative systems. However, this noise occasionally becomes impossible to suppress (Adams 1994). Trash or rubbish may become visible as a result of a confrontation between a world view and one or more natural limits (Thompson 2017). Thompson reminds us that the survival of a world view or any system “can only be ensured by eliminating, rejecting, or ignoring… intrusive and dangerous elements” (2017:100). Therefore, during the second stage people resolve the social conflicts arising from awareness of trash through the development of rituals. During these rituals people work to decipher whether or not the external phenomenon (trash) should be rendered as taboo (bad) or be transformed into something sacred (good). Take for example the diversion of lead-based paints from the waste stream. In this case, lead-based paint becomes trash after a report is issued on the danger it poses to human health. The paint is then diverted from household storage spaces and the municipal waste stream where it is now rendered as taboo and polluting. Instead, specialized disposal facilities are developed to divert the paint and then transform it into something ‘good’ such as recyclable lead batteries.

Rubbish theory predicts that objects of zero or negative value, in this case lead paint, can be reclaimed in the region of flexibility and converted into something valuable. When this happens, the world view or system is modified to render rubbish as an object value. Thus, rubbish theory provides another key insight. Without the possibility of rubbish, a self-perpetuating system would be unable to change (Thompson 2017:27). Through the development of these rituals, trash becomes a part of the culture in a sense but predominantly remains as an ephemeral part of culture (Adams 1994:66).

However, relegating the ritualization of trash disposal primarily to the waste management sector is not a sustainable solution in and of itself. Trash will continue to threaten our system boundaries until it becomes an integral part of everyone’s worldview. For example, China’s recent stoppage on taking recyclable materials from overseas is making it more difficult for Australians to ignore waste (Walker 2018). The final step outlined by Adams (1994) requires that the external phenomenon (in our case e-waste) becomes an integral part of the system. Nearly twenty five years ago, Adams cautioned that we can no longer ignore that landfills are full, they are closing, and can no longer accept additional refuse (1994:66-67).

In order to avoid making the same mistake of relegating trash-monsters as external to our world view, we must expand our frame of reference (Adams 1994; Artigiani 1994) regarding narratives of technological change and the role of the waste management sector in reacting to these changes. Changing perceptions of waste "requires an inclusion of phenomena that traditionally had been considered as externalities" (Adams 1994:81). Thompson suggests that such a synthesis, which he calls 'monster conservation', "allows us to tolerate the monsters that undoubtedly exist in our world and, at the same time, would prevent us from ending up knee-deep in them" (2017:139). However, activities which result in the conservation of monsters are often messy, uncomfortable, and energy intensive (Thompson 2017). Nevertheless, there is an inherent need to better understand how e-waste is talked about and understood by powerful actors in government and industry.

2.3 Assessing E-Waste as a Socioenvironmental Conflict

The international Basel Convention, adopted on March 22nd 1989, regulates the transboundary movement of hazardous waste and their disposal with the intent of protecting 'developing' countries from being exploited. The inclusion of e-waste, however, is controversial because it staves the flow of potentially reusable electronics and affects the livelihoods of e-waste recyclers. The Basel Convention has since become a multiscalar network indexing the relationships and power differentials of various peoples involved in the life history of electronics (Lepawsky and McNabb 2010; Lepawsky 2015, Kirby and Lora-Wainwright 2014; Nordbrand 2009; Pickren 2014; Pucket and Smith 2002; Puckett et al. 2016; Reddy 2015; Widmer et al. 2005). The dominant narrative of the Basel Convention is that waste from rich 'developed' countries is being dumped to poorer 'developing' countries. This emphasis on the transboundary movement of waste from areas of privilege and affluence to areas with lower economic status and influence is a typical example of waste colonialism in action (Liboiron 2018b).

Waste colonialism is generally understood as the domination of one group in their homeland by another's group via the dumping of waste and pollution (Liboiron 2018b). In regards to e-waste, regulatory loopholes and unchecked infrastructure perpetuate waste colonialism (Kirby and Lora-Wainwright 2014). Chapter seven applies the critical lens of waste colonialism to the case of hazardous waste disposal in Central Australia.

The movement of e-waste is indeed complicated. A strong narrative of 'developed nations' dumping their e-waste on 'developing' nations tends to frame the e-waste problem (Lepawsky 2018). However, the trade of e-waste from rich 'developed' nations to poor 'developing' nations is modest comparted to the flow of e-waste within these regions (Lepawsky 2014:4). Geographer Joshua Lepawsky has demonstrated a counter flow of e-waste from the Global South to the Global North (e.g. Lepawsky and McNabb 2010; Lepawsky 2014; Lepawsky 2015). Also, Kahhat and Williams' (2009) found that Peru is a net exporter of printed circuit boards to Germany and China thus bucking the developed to developing mantra.

As mentioned earlier, the definition of what materials count as waste is a contentious issue. In particular, e-waste is difficult to manage because of inconsistent definitions across political and economic scales, making e-waste problematic to track and quantitatively measure across international boundaries. Despite these challenges, the performance measures by which organizations can be judged to be in compliance with the Basel Convention are significantly influenced by the imperative of making sure those measures are auditable (Power 2000). It is perhaps through this process of making them auditable, that the organization actually blinds itself to the full range of positive and negative outcomes associated with performances, whether they be financial, environmental, medical, social, or some other categorized performance (Power 2000).

The commodification of recyclable materials in e-waste is a key mechanism for ensuring the auditability of the Basel Convention as well as the NTCRS in Australia. Thus, international organizations calling for the total prohibition of e-waste exports under the Basel Convention often promote recycling as a primary mode of material recovery. The Basel Convention seeks to dually control who is exposed to the potential harm of e-waste recycling, and thus who has access to the economic gains of e-waste recycling. Critics of this approach argue that an overemphasis on recycling damages the effectiveness of regulatory frameworks intended to ensure environmental benefits from repairing, reusing, refurbishing electronics or even transforming it into something else (Pickren 2014; Lepawsky 2014; 2015).

2.3.1 The Socioenvironmental Conflict of E-Waste

The transboundary movement of e-waste is a socioenvironmental conflict. The concept of conflict in anthropology goes beyond political and economic struggles, incorporating

cosmological, ritual, identity and moral elements that are not always clearly perceived or sought out from other disciplinary perspectives (Little 2007; see also Mitchell 2002; Reno 2016b; Little 2014; Carse 2012; and Wolfe and Schweitzer 1996). Little defines socioenvironmental conflicts as "a complex set of struggles amongst social groups stemming from their different modes of ecological inter-relationship" (2007:6). Ethnographic research on socioenvironmental conflicts puts the researcher at the center of the conflict rather than the center of a particular social group. This allows the anthropologist to identify the diverse social actors and environmental resources involved in the conflict; analyze how the actors interact with each other and with their biophysical and social environment; and survey each group's claims and their respective shares of formal and informal power (Little 2007:7).

Little asserts that an anthropological perspective can help "detect latent conflicts that are not yet politically manifest in the formal public sphere because the social groups involved are politically marginalized or 'invisible' to the State" (2007:6). The ability to detect latent conflicts is particularly important in Alice Springs where social and ecological concerns are often edged out from national discourse. For example, in chapter seven I detail the emergence of a socioenvironmental conflict concerning a dual mine and hazardous waste storage facility to be constructed on Aboriginal lands near Alice Springs. The proposed facility highlights the conflicting perspectives concerning the uncertainty, complexity, and biophysical constraints of storing hazardous waste (Dietz et al. 2003:1907).

In addition to heterogeneity, tonnage, and toxicity; the persistence of heavy metals and inorganic chemicals in human and ecological bodies remain an important environmental justice concern. For example, e-waste may contain and release hazardous materials such as lead, chromium, mercury, polyvinyl chloride plastics (PVCs), and brominated-flame retardants (BFRs). These substances pose major occupational and environmental health hazards during stages of production and disposal despite remaining invisible at the point of consumption (Pickren 2014:113). The toxic burdens of e-waste are disproportionality born by marginalized populations who risk exposure to these dangerous substances in order to gain access to a volatile scrap metal market (Song and Li 2014; Chen et al. 2010; Chen et al. 2012; Xu et. al 2012; Xu et al. 2014; Grant et al. 2013; Sepúlveda et al. 2010).

Reddy's (2015:171) ethnography of informal e-waste recyclers in Bangalore's IT sector draws attention to the marginalization of Bangalore's Muslim community who have been

recycling e-waste since the 1980s. In 2004 the Indo-German-Swiss E-Waste Initiative (IGS) intervened and sought to centralize and sanitize the recycling of e-waste in a manner described by Reddy as ‘‘Bourgeois environmentalism’’ (2015:168). Rather than certifying and training the cities Muslim population to meet their mission of sustainable e-waste recycling, the IGS gave preferential treatment to a newly authorized e-waste recycling company. The IGS response is illustrative of the dominant e-waste narrative, which generally conflates all informal e-waste recyclers into a singular category characterized by a failure to implement health and safety precautions (ETBC 2014; Reddy 2015.

2.3.2 Discard Studies and the Productive Afterlife of Waste

Mary Douglas famously argued that waste, dirt, and pollution are the product of social classifications which render certain objects, people, and ideas as external to or outside of the realm of social relations (2005[1966]). Discards, waste, trash, and rubbish are used interchangeably throughout this dissertation. These terms often carry with them a colloquial connotation of being disorderly, dirty, disgusting, or polluting (Douglas 2005; McMullen et al. 2019). Furthermore, exposure to objects classified in this manner has a tendency to forge an association between waste laborers, lowliness, and destitution (Nguyen 2019:50). When possible, I utilize the word discard because I find it to be relatively neutral and relevant to Thompson’s assertion that rubbish inhabits a region of flexibility. Larsen, in his ethnography of a secondhand shop in San Francisco, demonstrates a similar preference for the term discard because it refers “to objects that are considered rubbish as well as objects that are considered valuable but have been discarded by their previous owner anyway” (2018:10).

Nonetheless, theorizing waste or discards as “matter out of place” has been critiqued for its preoccupation “with projecting social value onto and investing power into objects” at the expense of ignoring environmental pollution resulting from the materiality and toxicity of waste (Liboiron 2016:7; Reno 2015). Reno suggests that we eschew, at least partially, the social constructionist view of waste as an arbitrator of disorder and order (2014). In the last decade, critical scholars under the interdisciplinary banner of discard studies have moved away from this view, instead focusing on the various ways humans and nonhumans are increasingly dependent upon and affected by waste matter.

For cultural criminologist Jeff Ferrell, the discarded objects he encounters in Fort Worth, Texas are signs of life rather than unwanted dirt:

> "A lot gets lost in the empire of scrounge - people's lives, for instance… An Outgrown shirt, an old tool, a garbage bag filled with toys, a door discarded as part of a remodeling project - all are residues of decisions made, of lives moved on, of opportunities taken and not taken… With disconcerting regularity my scrounging uncovered high school and college diplomas, marriage certificates, achievement awards, family photos and photo albums, sports trophies, baby keepsakes, college annuals, and other detritus of human endeavor come loose from its place within personal and family history. While my discovery of such life fragments now discarded amid everyday trash carried for me a constant sense of poignancy, if not tragedy, the precise nature of the problem of course remained at issue. Did a discarded family photo album denote a death in the family, a sudden relocation, a family falling apart? Did a discarded high school diploma or college annual suggest an existential breaking point in someone's life, their death - or simply an overcrowded closet"? (Ferrell 2006:87)

Similar records may also be encountered while sieving through discarded electronics, especially if the data on the device is intact. In this way, e-waste can be envisioned as a sign of life (Reno 2014), rather than simply matter out of place (Douglas 2005).

Discard studies differs from conventional research on waste management strategies and policies in two important ways. First, it seeks to reframe waste and pollution "as the material externalities of complex systems" by critiquing "industrialization, capitalism, and global economies as engines of waste" and focusing on the scale, toxicity, longevity, and heterogeneity of mass waste (Liboiron 2018a). Discard studies is also concerned with the productive afterlife of waste (Reno 2015). This is the effect of waste matter on "local and global political disputes, liberal and illiberal forms of governance, competing assessments of economic and moral value, and concerns about environmental pollution and crisis" (Reno 2015:558). The life history framework, discussed earlier, is an effective way to render the externalities of resource extraction, electronics manufacturing, and digital infrastructures and potential afterlives of e-waste visible to policy makers, waste management experts, and activists in Alice Springs.

2.3.3 The Geology of Media

At the turn of the twenty-first century, Crutzen (2002) inspired a wide range of scholars to formally recognize the Anthropocene as the current geologic epoch of world history described in terms of the unprecedented human modification of the global environment. The utilization and

popularization of the term ‘Anthropocene’ is a salient indicator of the emergent need to investigate the social construction of waste (Högberg 2016) and the multitude of challenges associated with the management of toxic materials emanating from the life history of discarded electronics. Although a myriad of designations has been used in place of or alongside the term Anthropocene, such as Capitalocene (Moore 2017, 2018), Chthulucene (Haraway 2015, 2016), and Anthrobscene (Parikka 2014). Each of these terms index the massive changes human practices, technologies, and existence have had on ecological systems (Parikka 2015). And yet, each of them “differ in terms of scale, rate/speed, synchronicity, and complexity” (Haraway 2015:159). Rather than using these terms to connote a geologic epoch or era, Haraway suggests they may be better used to describe geologic boundary events, such as the K-Pg boundary between the Cretaceous and Paleogene (2015:160).

I assert that the Anthropocene demarcates a historical tipping point in which humanity’s exploitation of resources, relationships with each other, and impact on ecologies are no longer sustainable. For example, the energy required to maintain digital infrastructures and the online culture it supports, the planned obsolesce of consumer products, and wasteful practices across the life history of electronics immediately impair humanities ability to protect current generations let alone preserve the planet for our children and future generations (Parikka 2014:6).

Anthropocenic wastes such as nuclear waste, plastic, space debris, and other industrial materials are toxic, heterogeneous, and massive (Grays-Cosgrove et al. 2015; MacBride 2011). This waste, including e-waste, threatens “to disrupt all orderings, all plans, all impacts’, on a planetary scale, from ocean acidification to the survival of the human species,” affecting the geologic makeup of the Earth (Liboiron 2016:4). For media archaeologist Jussi Parikka, the earth itself is a recording device, a media containing geologic information. Therefore, geologic surveys are:

> “sites of transformation where the earth becomes an object of systemized knowledge and the knowledge thus created of the earth's resources is mobilized toward technological production, governmental geopolitics, and increasingly a global survey of the minerals of earth" (Parikka 2014:4).

E-waste reveals the unsustainable and self-destructive speeds of contemporary capitalism on the Earth (Taffel 2016:347).

Media archaeology investigates the submerged and obfuscated realities of e-waste, including the discards that arise from communications infrastructure. By rendering e-waste as a problem that will be with us for a long time, media archaeology draws vital attention to the different strategies employed by people living in places where Anthropocenic wastes sieve and settle. Political ecology, on the other hand, is an equally powerful framework used to identify and expose how issues of environmental justice are intimately related to social justice and moral concerns characteristic of the Anthropocene. While media archaeology forges a more dynamic understanding of e-waste stratified across various temporalities, political ecology is instrumental in achieving an understanding of e-waste across geographic, social, political, and economic boundaries.

As an extension of Anthropocene, Parikka employs the term ‘Anthrobscene’ to remind the reader of "the unsustainable, politically dubious, and ethically suspicious practices that maintain our technological culture and its corporate networks" (2014:6). The blurring of corporate network with governmental institutions is arguably evident in Australia’s National Television and Computer Recycling Scheme (NTCRS) which is managed by a collective of representatives from the electronics manufacturing and importation industry. Furthermore, Morris and Metternicht, in their review of the NTCRS, found a lack of transparency in how the management of the NTCRS that undermines public, local and state government, and industry confidence and trust (2016:229). In addition to the regulatory efforts to manage e-waste in Australia, waste management infrastructure itself provides a vital window into the geology of media.

2.4 The Mismanagement of E-Waste

The device oriented definition of e-waste considers e-waste as originating from electronic devices. This definition, however, can inadvertently lead to the mismanagement of e-waste because it fails to represent the full breadth of potential waste pollutants, debris, and residues generated by the production of electronic devices (Gabrys 2011; Little 2014; Lepawsky 2018). Exposure to waste, pollutants, and harm can happen at many phases in the biography of an electronic object (Kopytoff 1986). From the beginning, resource extraction produces tailings with dangerous heavy metals and radioactive materials. The subsequent transport and manufacturing of electronic devices produces airborne pollutants, carbon emissions, and toxic

residues. And even the recycling of consumer electronic devices produces waste and emissions. Rather than focusing solely on waste resulting from the discard of electronic devices, taking all of forms of waste into consideration serves to reorient the gaze of social scientists, policy makers, and waste management and resource recovery experts towards the wider socio-ecological ramifications of e-wasting.

Ultimately, the recycling of electronic devices produces waste, either in the form of emissions from the recycling process or unrecyclable pieces of plastic, and this waste will one day be discarded in one place or another. Once discarded, the harmful materials within e-waste are seldom "cleaned up" and endure in geologic time, making their management an exercise in shifting materials from one space to another rather than eliminating the harm altogether (Gray-Cosgrove, Liboiron, and Lepawsky 2015:2). In fact, the archaeological record has ample evidence of materials, including hazardous materials such as lead, having a lasting and significant effect on their respective landscapes (Manteca et al. 2017; Martínez-García et al. 2005; Pyatt et al. 2000). Even if the wasting of electronics ceased today, the unknowable consequences of e-waste already disposed in landfills around the world necessitate long-term management strategies (Hird 2013).

Policy makers, waste management experts, and the electronics industry play a vital role in determining how e-waste is conceptualized and understood by the general public. E-waste, as it is defined within the realm of waste management (e.g. Babu et al. 2007) is positioned as a rapidly growing waste stream composed of many different materials that vary in terms of economic value, toxicity, and recyclability. For example, although rare earth metals, heavy metals, and plastics are recyclable, synthetic chemicals used to stop electronics from catching fire often are not. Furthermore, recyclable materials vary in terms of toxicity. Heavy metals such as lead and mercury are much more dangerous to handle than are rare earth metals such as gold and silver. The recyclability of plastics varies by type of plastic but is also drastically affected by the ebb and flow of global trade.

Managing this vast and heterogeneous waste stream is a global challenge with no easy solutions. Despite the seemingly ubiquitous global uptake of digital devices, inequalities remain pervasive in the less visible domain of what happens after a device has been discarded. Although some individuals and corporations' benefit from e-waste recycling, those working with or living near the waste and pollutants from the electronics industry can be subject to disproportionate

harm. To tackle e-waste requires careful attention to how and why e-waste is generated, managed, and even understood. It necessitates engagement with policy makers, experts, and communities around the world to ask how they conceptualize e-waste and what ramifications these definitions pose. These questions compel an applied anthropology concerned with both outlining the true costs of electronics and strategies for mitigating these costs.

2.5 Reappraising the Challenge of Electronic Waste

This dissertation integrates behavioral archaeology's life history approach with rubbish theory and political ecology to adjudicate the effectiveness of the Australian government's strategies for managing e-waste. The life history of electronics is inextricably entangled with socio-ecological processes and environmental conflicts are the life history of electronics (Neumann 2005:5). Disagreement and misunderstanding make it difficult to conjure viable alternatives to socioenvironmental conflicts. The language, concepts, and frameworks used in discard studies (e.g. the productive afterlives of waste) and media archaeology (e.g. the materiality of digital waste) enable anthropologists to make sense of competing understandings of e-waste and the emergence of socioenvironmental conflicts associated with the making and management of e-waste (e.g. Akese and Little 2018; Kirby and Lora-Wainwright 2015). For example, Akese and Little applied a critical environmental justice framework to develop a situated and nuanced analysis of e-waste in Ghana. Kirby and Lora-Wainwright (2015), on the other hand, draw attention to asymmetries of power in the development of e-waste policies, economies, and infrastructure in Asia. Chapters five, six, and seven incorporate elements of political ecology to address the constantly shifting and complex ways in which humans come to 'know, access, and struggle' over environmental and socio-technological issues across multiple geo-political scales and networks of power (Robbins 2011; Carse 2012).

E-waste can be distinguished from other forms of waste by scales of heterogeneity, toxicity, tonnage, and persistence (MacBride 2012; Gray-Cosgrove, Liboiron, and Lepawsky 2015). E-waste is heterogeneous both inside, in the sense of being made of many different materials, and outside because e-waste refers to a large swathe of objects with very different material makeups and life histories. Each electronic device contains a heterogeneous array of materials, many of which are toxic at various points of contact with humans and the environment (Sepúlveda et al. 2010). The sheer tonnages of e-waste, including hazardous materials ejected

from the manufacturing and transportation of electronic devices, already discarded in landfills are particularly difficult to quantify.

Different actors in the global trade of e-waste define this category according to their own set of standards and regulatory regimes. A discarded iPhone in Alice Springs is defined as e-waste by MobileMusters (2014), a voluntary mobile recycling scheme in Australia. And yet, the same mobile phone may find new life in a repair shop in Uganda (Houston et al. 2016). Under what circumstances, then, can someone's e-waste become someone else's e-treasure? Does the possibility of value recovery override the potential risk of mismanaging discarded electronics?

2.6 Tracking the Afterlives of E-Waste in Alice Springs

The construction of the Overland Telegraph line in the 1870s did not merely result in the earliest forms of e-waste in Central Australia. The settlers introduced European cattle, rabbits, and other invasive species to the region, fundamentally altering the ability of humans to live and waste well (Lynch 1990) in Central Australia. The irony of waste management in Alice Springs, an issue I address more thoroughly in chapter six, is as follows. In an effort to make waste easier to control and more legible to engineers, states and corporations, waste management regimes have disproportionally put the lives and livelihoods of others at risk (Reno 2014:19)! According to Reno, however, it does not take much to make waste, even mass waste, more life-like (2014:20). Economic activity is 'ongoing' and does not stop at a familiar point of final consumption (Gregson et al. 2010; Lepawsky and Mather 2011). In other words, and as predicated by Rubbish Theory (Thompson 2017), the designation of e-waste is not an end point in the life history of electronics. Rather, the category of rubbish is a fulcrum point leading to the various afterlives of e-waste (Gregson et al. 2010:853).

Chapter four highlights the ongoing social lives of discarded electronics by demonstrating the potential of e-waste to generate value. For example, e-waste salvaged from the Regional Waste Management Facility by a retired resident, living in relative isolation, has helped him to maintain his social life in Alice Springs. As discussed in chapter five, electronics repairers and hacktivists in Alice Springs often cannibalize the components and materials of dead machines in order to fix or build devices (Harper 1987, Houston 2017, Barendregt 2012). In Bangladesh, gold extracted from e-waste from North America is transformed into gold bars or jewelry for a wedding ceremony (Lepawsky and Mather 2011). Fumes from lead-soldered circuit

boards or plastic covered wires become air-borne, water-borne, and-blood borne toxins while scrap metal becomes ornate gate locks and household implements (Lepawsky and Mather 2011). In the future, urban mining of landfills will help to lessen the burdens of mining by recovering materials, biogas, and energy from landfills containing e-waste, generating new socio-ecological possibilities (Zhu 2014).

For Reno, waste should be regarded as a temporary set of things in between forms of life (2014:20). This notion of waste dovetails nicely with Michael Thompson's understanding of rubbish as existing within a region of flexibility (2017 [1979]). The interstitial qualities of waste are also highlighted by scholars seeking to understand the possible afterlives of e-waste (e.g. Lepawsky and Mather 2011; Hertz and Parikka 2012; Cross and Murray 2018). Reimaging waste management as a strategy for extending the life histories of electronics fosters an environmental politics that acknowledges and even celebrates laborers who provide the invaluable service of transforming waste into resources. However, the modernization of waste management infrastructure makes it exceedingly difficult for individuals to encounter e-waste let alone imagine new ways to scrounge value from e-waste.

Early in my fieldwork, I became interested in the question of if and how particular kinds of electronic objects ever cease to be waste. I quickly found that focusing on the use and discard of electronics left out an integral moment in the life history of electronics, reuse and repair. During fieldwork I expanded my frame of reference from 'e-waste' to 'discarded electronics' because the term e-waste excluded activities that were actively reducing or staving off electronics falling into the category of waste. Instead, I came to understand that the two realities of discarded electronics as a scrap (potential source of resources) or as waste to be managed are not mutually exclusive (Lepawsky 2018:3).

The framing of discarded electronics as waste, and policies which privilege recycling over reuse and repair, haven proven to be problematic for the management of discarded electronics in remote parts of Australia where unwanted electronic devices, microchips, and other electrical components would have to travel over 1500 km to the nearest recycling and processing centers. Distance has indeed emerged as a very lively and vital aspect of life in Alice Springs, and Australia more generally, throughout the thirteen months of ethnographic fieldwork I conducted between 2016 and 2018.

When electronics are collected for recycling, they are transported long distance to one of a very small number of places capable of processing the heterogeneous assemblage of materials found in most electronic devices (Lepawsky 2018:89). The recycling of electronics takes place entirely out-of-sight (and out-of-mind), away from the residents of Alice Springs. Although not necessarily a regular occurrence, residents living in Australia's capital cities have options to tour e-waste recycling facilities and gain a deeper understanding of the labor and effort involved in the dismantling and processing of electronic devices. However, the destruction of this equipment, the energy inputs, and the waste outputs in the form of emissions are neither visible nor audible to the resident dropping off a television or computer at a collection point, especially in Alice Springs (Lepawsky 2018).

Discovering challenges and opportunities pertaining towards the repairability and reusability of electronics was a key outcome of these research activities. Chapters five addresses the need to engage with repair and reuse as a vital area of inquiry. Reflecting on the past and present of discarded electronics in Central Australia enables a better understanding of how policies and regulations in exacerbate or alleviate challenges related to e-waste management in Australia. In particular, I draw attention to the marginality of repair and reuse in Central Australia as a key area for investigating alternatives to e-waste recycling.

In chapter six I investigate the roles of distance, remoteness, and waste management infrastructure in masking the prevalence of e-waste in Central Australia. Building on the critiques developed in previous chapters, *Somewhere Else's Problem* problematizes the collection of e-waste in Central Australia to be sent elsewhere for recycling and instead considers local alternatives for managing discarded electronics in Alice Springs. Chapters six and seven both explore how anthropological theory is mobilized in this dissertation to render the issues surrounding e-waste more visible to my interlocutors.

2.6.1 The Throwaway Society

Attention to the afterlives of e-waste supports Gregson et al's critique that the throwaway society thesis is a seductive oversimplification (2007:683). The throwaway society thesis suggests that households are indiscriminately throwing things away faster and faster in order to make room for the hyper consumption of even more disposable products (Gregson et al. 2007; Cooper 2005). Both Högberg (2016:63) and Crocker (2016:11-12) reference Victor Lebow's

(1955:3) remarkably candid statement about the interrelationships between consumerism, needs, and the economy:

> "Our enormously productive economy demands that we make consumption our way of life, that we convert the buying and use of goods into rituals, that we seek our spiritual satisfactions, our ego satisfaction, in consumption. The measure of social status, of social acceptance, of prestige, is now to be found in our consumptive patterns. The very meaning and significance of our lives today are expressed in consumptive terms… we need things consumed, burned up, worn out, replaced, and discarded at an ever-increasing pace" (Lebow 1955:3)

The ever-increasing pace of things being worn down, replaced, and discarded is a key component of this quote. In citing it, Högberg (2016) and Crocker (2016) convey that contemporary consumer culture is a radically different way of living in so far that it produces waste to a degree that is incomparable with previous periods of human history. Not everything, however, is worn down, replaced, or discarded at the same rates.

The sweeping narrative of a throwaway society is a potent example of critics failing to form a nuanced and empirical understanding how waste and discards are encountered by individuals, communities, and societies around the world. Daniel Miller argues that the "single main problem with conventional writing about consumption is that it seems to consists largely of authors who wish to claim that they are deep by trying to show how everyone else is shallow" (2012:107). Heeding these critiques, I understand the act of discarding as "a spatially, socially and economically differentiated process, one that can be anticipated to connect in myriad ways to the making of social relations, identities, and distinction" (Gregson 2007:683). These processes, however, must be situated within the unprecedented tonnages, toxicity, and heterogeneity of waste produced by contemporary consumer societies (Gray-Cosgrove et al. 2015, Högberg 2016, and Crocker 2016). While it is important to render the consequences of e-waste visible and meaningful to my interlocutors, throughout this dissertation I also humanize the consumption and discard of electronics by documenting the role these objects play for my interlocutors in Alice Springs.

Chapter four, for example, illustrates how the emotional comfort elicited by a sewing machine or the physical comfort of an air conditioning unit can influence decisions to store electronic devices that are no longer in use instead of discarding to a landfill or recycling center (Miller 2008). Chapter five illuminates how some residents of Alice Springs cope with the exacerbated costs of moving new electronics, especially household appliances, to and from

Central Australia. During my fieldwork, I collected and analyzed a social media dataset to better understand the variety of secondhand electronics being circulated in Alice Springs as well as why some were recirculated while others were discarded. I was surprised to find that some users were posting to indicate that they had lost or found an electronic device. Furthermore, others had been using the page to track down or advertise reliable repair services for damaged electronics. This dataset tells a different story than the conventional assessments of reuse and repair that tend to focus on more general narratives of reuse as a conflict of interest for multi-national corporations. For example, Ylä-Mella et al. (2015) draw attention to the dismay of companies whose brand is rooted in the chronic marketing of high-tech fashion devices. From their perspective, the gains they would obtain by improving their environmental image through the support of reuse legislation are contentious because they would also likely reduce sales volumes of new equipment in parallel with the increased cost of collecting e-waste (Ylä-Mella et al. 2015). And yet, careful documentation of reuse in Central Australia, reinforces the need to part with reductionist frames, such as the throwaway society (Gregson et al. 2007). Blanket assumptions like this obfuscate the actual strategies being implemented by people who aim to live and waste better within their socio-ecological domains (Lynch 1990).

2.7 Conclusion

Monster conservation is a vital tracing activity meant to pull externalities, which are by definition outside the purview of most discourse, back into consideration (Swanson et al. 2017:M8). This chapter assembles theoretical insights from behavioral archaeology and rubbish theory to perform monster conservation by expanding what is or could be meant by the term e-waste. Rubbish theory is employed to consider the flexibility of waste as a category. By definition, rubbish is flexible because it exists outside dominant value regimes. This flexibility allows waste to become a means for the accumulation of wealth outside sanctioned conduits.

Behavioral archaeology and the life history of electronics enables us to see monsters or externalities that, if left unaddressed, may have harmful consequences (Thompson 2017). Waste ethnographies highlight the potential of waste to generate income and opportunities for marginalized people who may otherwise have limited access to financial resources and the ability to purchase commodities (e.g. Nguyen 2019; Millar 2018; Reddy 2015). Discard studies is also employed to better understand e-waste as a sign of life and potential rather than unwanted

dirt. This is picked up again in chapter four's exploration of the social lives of discarded electronics. While each chapter works to illuminate different types and aspects of e-waste, the focal point of these consequences is explored in chapter seven. In the next chapter, I describe the methods I used to trace the edges and boundaries of e-waste in Australia.

CHAPTER 3. A DIGITAL GARBOLOGY OF ELECTRONIC WASTE

3.1 Introduction

In the months leading up to graduate school, I had been routinely inspecting wooded corridors along highways in the Mid-Atlantic of the US as an Archaeological Technician for a cultural resource management firm. Although I was alarmed by the sheer quantities of plastic, metal, and paper debris I encountered by roads and streams, my training in anthropology had taught me to interrogate rubbish as having a distinctly archaeological signature. While searching for programs that united my interest in archaeology and garbage, I serendipitously discovered a listing on the American Anthropological Association website for a PhD research position focusing on e-waste as part of an interdisciplinary effort to design sustainable interventions alongside engineers, toxicologists, and political scientists. By the time I arrived at Purdue University in the autumn of 2014, I was determined to learn as much as I could about e-waste by reading scholarly journal articles and waste management reports. I thought that that the term e-waste specifically referred to waste electrical equipment or electronic devices (Babu et al. 2007). I was excited, focused, and determined to discover how to reduce e-waste and prevent it from harming others! However, unlike my previous research on food remains from seventeenth century European settlement sites in the Gambia (Singer 2013), this time I would be able to ask people about their waste.

As my first semester drew to an end, my supervisor and I sat down to plot out my research questions, the methods I would employ, and the field sites where I would investigate these questions. I was eager to begin asking people what they do with e-waste, why they did this, and what concerns or hopes they harbored regarding the future of their e-waste. Imagine my surprise, having carefully thought up a myriad of questions and frameworks for interpreting answers to those questions, when the first replies I received from my interviewees were: "Wait…What is electronic waste? Do you mean all the junk mail spammers keep sending me? Oh wait, sorry. Do you mean, like, the amount of time I spend on the internet? Ugh, social media can be such a waste of time." Surely, I thought, this is just a misunderstanding. Yet moments like these permeated across all five years of my research and are likely to continue well into the future.

What at first seemed like a misunderstanding, however, became a key moment of realization. Perhaps, I thought, all of these things, the junk emails, the wasted time online, the broken laptops and household appliances, perhaps all of them *are* e-waste. Over time, I adapted and devised a new strategy: to research both online and offline field sites; to develop a more nuanced understanding of waste that is capable of making sense of digital waste; and to arm myself with a theoretical framework that is flexible enough to synthesize the disparate types of data I sought to collect. From roadside ditches to the depths of social media forums, I set out to uncover archaeological signatures of the digital age by asking the question: what is electronic waste?

3.2 Towards a Digital Garbology of E-Waste

In order to address this question, I applied ethnographic and archaeological methodologies informed by anthropological theories of waste (as discussed in chapter two) to conduct a digital garbology of e-waste. Although the specific term "digital garbology" is first used by Gabrys (2011) in her sociological study of e-waste, my use of the term is derived from a combination of the late William Rathje's garbage project (1984, 2001) and recent developments in digital anthropology (e.g. Horst and Miller 2012; Pink et al 2016). If garbology investigates the physical and material characteristics of waste and landfills as they move across and within social, political, and ecological landscapes, then digital garbology accounts for an expansive array of sites where electronic waste expands, sifts, and settles (Rathje and Murphy 2001; Brunclíková 2016; Gabrys 2011).

3.2.1 Garbology

Given its archaeological and anthropological origins, garbology is holistic in its approach to analyzing refuse, incorporating ethnographic methods and anthropological theory. Although garbology has its roots in behavioral archaeology, garbological studies tend to have a practical emphasis on household discards in trash bins, landfills, and dumpsters. In the 1970s, archaeologists radically reimagined archaeological sites to include landfills, household waste bins, and litter. Archaeology proved to be a powerful tool for analyzing household patterns of consumption via their discards. For example, in a US case study Tani and Rathje (1995)

discovered that the rate of dry-cell batteries discarded by households nearly doubled between 1975 and 1995. They argued that the analysis of refuse from US households is essential to a comprehensive picture of battery purchase, use, and discard (Tani and Rathje 1995:101). Their sample consisted of data from nearly 4,000 household garbage pickups, which were then aggregated by census tract and collection period (Tani and Rathje 1995:87-88). The aggregated data was analyzed for socioeconomic variables such as income, age, and ethnicity. Higher-income households were found to consume (and discard) more dry-cell batteries. Additionally, age composition played an important role in determining dry-cell battery use. Garbologists quickly recognized that open-ended interviews about the purchase and use of battery-operated devices, as well as about the purchase and discard of batteries themselves, would add considerable depth to the findings they generated from their aggregated database. When used in isolation, garbage archaeology is far from realizing its potential value. There must be strong collaborations between archaeologists, cultural anthropologists, policy makers, demographers, and even marketers.

The late William Rathje, founder of the Garbage Project at the University of Arizona, was inspired by Webb et al.'s (1966) call for triangulating data using multiple methods. Following Webb et al (1966), Rathje argued that neither interviews, surveys of participants, nor observations of participants are sufficient, either by themselves or in combination in accounting for human behaviors such as reuse and discard (2001). Instead, he advocated for the additional analysis of material trace measures in order to most adequately describe, analyze, and understand the ways social systems both behave and evolve (Rathje 2001:61). Garbologists, now armed with an array of questionnaires, interview schedules, and surveys, contribute to our understanding of discarded objects as an indicator of our cultural and material metabolism; the rate in which we consume objects and symbols to maintain our physical and social forms (Brunclíková 2016; Rathje 2011; Schiffer et al. 1981; Sosna 2016). However, questionnaires and interviews are merely one facet of what can be gained from an ethnographic approach to garbage. Brunclíková (2016) and Sosna (2016) draw more deeply upon participant observation in their investigations to interpret the everyday routines and rhythms of consumption and recycling practices in households and landfills.

3.2.2 Ethnographies of E-Waste

In the past decade, anthropologists, sociologists, and geographers have made progress documenting the complexities of e-waste. These studies are developing alongside health and environmental assessments of e-waste recycling (e.g. Sepúlveda et al 2010; Song and Li 2014; Grant et al. 2013). Anthropological work on the topic of e-waste tends to be oriented towards the sites and places where discarded electronics aggregate to be recycled or landfilled (e.g. Reddy 2015; Kirby and Lora-Wainright 2015; Akese and Little 2018). Ethnographers spend ample time with laborers to better understand the conditions and consequences of working with e-waste in countries such as China (Kirby and Lora-Wainright 2015; Kirby 2019), Ghana (Little and Lucier 2017); Kenya (Cross and Murray 2018), and India (Reddy 2015). In some cases, although less common, ethnographers have also focused on the storage and stockpiling of unused electronics (Kennedy and Wilken 2016; McMullen et al. 2019). Rather than relying on surveys and biological data, each of these ethnographers also used their bodies and senses as a research instrument to highlight the crucial labor performed by sanitation workers, waste haulers, recyclers, and others who interact with mass waste on a regular basis.

Although not specific to e-waste studies, garbologists have increasingly integrated archaeological and ethnographic methods to make contributions to policy, public perceptions, and behavioral interventions concerning consumption, discard, recycling, and reuse (Rathje 1978, 2001, and 2011; Schiffer et al. 1981; Adams 1984; Tani and Rathje 1995; Brunclíková 2016; Sosna 2016). Today, a range of discard studies rooted in anthropology, archaeology, and geography challenge the many garbage myths associated with electronics such as the popular belief that digital media is somehow immaterial and erroneous assumptions about the global flow of discarded electronics (Gabrys 2011; Parikka 2011; Pickren 2014; Lepawsky and Mather 2011; Taffel 2015; Little and Lucier 2017; Lepawsky 2018). And yet, e-waste remains an onerous and practical challenge for waste management professionals, environmental activists, and individuals involved in the reuse, repair, and resale of secondhand electronics around the world.

3.2.3 Digital Ethnography

In 2016, a group of scholars from the Digital Ethnography Research Centre at RMIT (Royal Melbourne Institute of Technology) described key principles of digital ethnography that

are of direct relevance to digital garbology (Pink et al. 2016). Decentering the digital is a key strategy digital ethnographers employ to learn more about the stories, relationships, and other types of meaning people attribute to electronic devices and digital media. Rather than analyzing the technological affordances of a particular device or digital platform, digital ethnographers are concerned with the ways in which digital media is entangled with other activities, technologies, objects, feelings, and experiences (Pink et al. 2016:10). Digital ethnography has an integral role to play in understanding how electronic devise become e-waste, what these devices mean to householders, recyclers, and waste management experts, as well as the many ways electronic devices overlap and intertwine with other personal experiences and object life histories.

Ethnography, in addition to garbological methods such as excavation and waste audits, is a vital tool that enables anthropologists to triangulate the complex relationships between human behavior, values, and waste. Therefore, digital garbology has much to gain from the standard ethnographic toolkit (multiple methods, induction, semi-structured interviews and participant observation). The digital aspect of digital garbology, however, is informed by the cutting edge principles of digital ethnography. Digital ethnography is a recalibration of ethnographic methods that considers the affordances and consequences of conducting research on and with digital technologies. Digital ethnography adds a central feature to digital garbology; namely, the ability to follow the behaviors and values associated with e-waste across digital *and* non-digital places.

The question of where an anthropologist conducts their fieldwork has been fundamentally impacted by globalization throughout the twentieth century and the proliferation of social media technologies at the start of the twenty-first century. Electronic devices and the infrastructure behind digital communications and media enable anthropologists to radically alter how and where they conduct research, share results, and manage relationships and data outside of the field. Digital garbologists must employ a wide range of methodologies rooted in garbology, ethnography, and even GIS (geographic information systems) to engage with the various sites, people, and activities invoked by the life history of electronics.

3.2.4 The Anthropology of Infrastructure: Affective Experiences of Places and Things

Infrastructure affects how waste matter is experienced by pushing it further out of sight and out of mind. The anthropology of infrastructure draws attention to the multiscalar movement of waste from one place to another and the points at which the life history of e-waste becomes

difficult to imagine or visualize. Larkin (2013:328) describes infrastructures as built networks with physical and material forms that facilitate the possibility of exchange through the trafficking of goods, ideas, waste, power, people and finance.

> "As physical form they shape the nature of the networks, the speed and direction of its movements, and its vulnerability to break down. They comprise the architecture for circulation, literally providing the undergirding of modern societies, and they generate the ambient environment of everyday life" (Larkin 2013:328).

A network of infrastructures moves discarded electronics vast distances across Australia to be processed for resource recovery, especially considering the vast distances e-waste must travel from Alice Springs to be processed elsewhere. Larkins' synthesis on the anthropology of infrastructure stresses that a systems analysis of infrastructure demands a shift in ethnographic focus towards government centers far from where the actual roads, sewage systems, and landfills are constructed (2013:28). In the methodological discussion that follows, I focus on what happens to discarded electronics as they move between households, waste management facilities, secondhand shops, and national or international boundaries.

3.3 Methodological Overview

Traditionally ethnographers do extended fieldwork — which typically lasts at least one year — while living in a population in order to encounter a broad range of contexts, build rapport, and ask better questions (Bernard 2011; Miller 2017; Miller et al. 2016). Ten months of ethnographic research in Alice Springs and three months of preliminary research in Adelaide, South Australia were conducted between 2016 and 2018. Over the course of my fieldwork I collected data and triangulated my findings using participant observation, semi-structured interviews, and digital archaeology.

3.3.1 Participant Observation

Participant observation is a humanistic and scientific method capable of producing both experiential knowledge and positivistic knowledge. This method "puts you where the action is" and can be used to collect narratives or numbers (Bernard 2011:344). In this particular case, I conducted participant observation in Alice Springs in order to understand what e-waste means to

my interlocutors, how it is being managed, and how the challenges of e-waste shape and are shaped by remoteness, development, and sustainability in Alice Springs.

When I moved to Alice Springs on January 14th 2017, I immediately began familiarizing myself with the surrounding community, local resources, and the town's waste management infrastructure. It takes time to understand the various ways that people "learn to stand, sit, move, modulate our voices, and perform - the day-to-day practice of living in a culture" (Musante 2014:252). Participant observation differs from observation in that the ethnographer is engaged in the very activities being studied. While observation helps you to record and note explicit aspects of culture, participation is key to uncovering the tacit aspects of culture, the meaning of behaviors and activities, and the significance of particular forms of social organization.

I attended many meetings of an Environmental Non-Government-Organization (E-NGO) and the bi-monthly Environmental Advisory Committee meetings at the Alice Springs Town Council. These meetings allowed me to register which environmental issues were important to activists, local government, and the various communities of Alice Springs. I simultaneously sieved through the archival record (at the Special Collections office at the Alice Springs Public Library, and online via local council pages as well as federal, state, and territory government databases such as the NT EPA and www.ntlis.nt.gov.au) to learn more about how these concerns have changed throughout the history of the town. In particular, archival research helped me to make sense of the local bylaws and history of environmental attitudes towards waste, reuse, and ecological resources in Alice Springs.

Ethnographic participant observation also necessitates a bit of dawdling. Dawdling in Alice Springs made it possible for me to see and interact with people and things much more often than other forms of travel. Ferrell's (2006) use of the word 'dawdle' reflects the idea of 'wasting time' as a generative and effective means to move amongst the empire of scrounge. In his fieldwork, the empire of scrounge generally referred to the collection of people, discarded items, scrap yards, secondhand shops, curbside, sheds, and dumpsters where rubbish was transformed into something valuable. In addition to slowing down to find garbage, I also spent many hours 'wasting time' by riding my bike through the town, into the MacDonnell ranges, and to social gatherings, some planned and some spontaneous.

Participant observation enabled me to observe the everyday and explicit waste disposal practices of residents living in Alice Springs as well as the tacit meaning behind decisions to

reuse or discard electronics and the regulatory regimes to manage and organize e-waste. Using this method, I traced the movement of discarded electronics from a variety of starting points, especially those that are considered as 'peripheral' or 'subsidiary' to the dominant e-waste narrative (Star and Griesemer 1989:396). Ten months of participant observation were performed in Alice Springs (in addition to three months of preliminary participant observation in Adelaide) at a range of sites where the reuse and deposition of electronics took place: waste management sites (Regional Waste Management Facility, transfer stations, and e-waste collection events), domestic sites (houses, curbside waste, and neighborhoods), secondhand/reuse sites (social media; thrift/opportunity shops; yard and lawn sales; and farmers markets), and repair spaces (electronics repair shops, and Repair Cafés). Reuse activities include secondary use, recycling, lateral cycling, curation, and inheritance (Schiffer et al. 1981:68; Schiffer 2011:123). Depositional activities may include landfilling, loss, abandonment, illegal dumping, and other forms of discard (Schiffer 2011:123).

Over one hundred hours of participant observation were conducted at the Regional Waste Management Facility (RWMF) between July and December 2017. An additional eight hours per week were spent analyzing the circulation of secondhand electronics in Alice Springs via social media and visits to secondhand shops. On average about ten hours a week were spent working with a Waste Activist Collective (WAC) to organize events and preparing resources for reducing waste generated across the life history of electronics, plastics, and other consumables. Much of the rest of my time in Alice Springs was spent conducting semi-structured interviews and positioning myself in public places such as the Alice Springs Public Library, the Todd Mall, or the pub where I could write up field notes or chat with my interlocutors. In the case of the RWMF, I obtained additional permission from the Alice Springs Town Council to officially volunteer. This process delayed my ability to conduct fieldwork at the RWMF until July 2017.

Volunteering at the RWMF was an integral fieldwork experience that allowed me to observe and affect the outcomes of electronics discarded by members of the public and small businesses in Alice Springs. When electronics came to the transfer station, I was able to follow them from the back of a Ute[6] to the e-waste collection bin, dumpster, scrap metal bin, and secondhand shop, all of which were located on the premises of the RWMF. These spaces were

[6] Ute is an Australia term short for utility vehicle that typically refers to a passenger car or truck with a built-in open cargo tray in the back. It roughly corresponds to the phrase pickup truck in the US.

selected in order to observe a range of sites in which households can reuse and dispose of their e-waste, interact with e-waste experts, and learn about opportunities to manage their e-waste in Alice Springs. The majority of these spaces are publicly accessible and for those that are not, permission was sought out by the primary resident or site manager. In addition to spending time in these places making observations and having informal conversations, I also utilized the same waste management, repair, and reuse services as residents of Alice Springs and participated in community conversations concerning waste and environmental issues at the Alice Springs Town Council, NGO meetings, and public events. While my experiences volunteering at the RWMF are discussed in chapter four, analysis informed by the participant observation I conducted in Alice Springs is featured throughout the entire dissertation.

The extended duration ethnographers spend in their field setting enables them to better sense and capture the events that precede and follow activities of interest (Becker and Geer 1957). For example, during my fieldwork I volunteered to help collect e-waste at the regional waste management facility on the first Saturday of every month. This field setting made it possible to interact with members of the public who have decided to drop their electronics off as e-waste. Participant observations made in other locations such as homes, offices, and recycling centers told me more about what happened prior to and following a discarded electronic becoming e-waste. While participant observation helps expose the researcher to these moments, semi-structured interviews enable interlocutors to provide their own explanations (Becker and Geer 1957; Jerolmack and Khan 2014).

3.3.2 Semi-Structured Interviews

Semi-structured interviews were conducted with a range of Australian e-waste experts, members of the public at e-waste collection events, and households in Alice Springs. Separate interview schedules were utilized for each of these three primary groups. Over the course of my fieldwork, a total of 75 semi-structured interviews have been conducted, 39 of these with e-waste experts in Adelaide and Alice Springs (Table 3.1). The qualifier ‘e-waste experts’ generally refers to individuals who work with discarded electronics and waste related issues or come into contact with discarded electronics on a regular basis.

In reality, I found that most of my interlocutors were at least e-waste experts when it came to their own possessions and all of my interlocutors contributed valuable insights across the

entire life history of electronics. The local residents that I interviewed each shared unique stories that illuminate interstitial moments in the object biographies of electronics. Twenty-four public interviews were conducted on e-waste collection days at the regional waste management facility (RWMF) in Alice Springs. An additional 12 semi-structured interviews titled Junk Drawer interviews were conducted with households in Alice Springs. On average, however, residents were less knowledgeable about the specific policies, regulations, and waste management practices pertaining to their discarded electronics.

The semi-structured interviews with e-waste experts, households, and members of the public are discussed below in more detail. Each of these interviews have made unique and insightful contributions to other areas of my research allowing me to triangulate a deeper understanding of how e-waste is made and understood in Alice Springs. For example, the junk drawer interviews combined with my own auto-ethnographic experiences have provided me with deeper insights into the ways in which stored electronics embody experiences of family life, distance, and anchored mobilities (Williams et al. 2008) in Alice Springs. These interviews investigate how definitions and conceptualizations of e-waste compare within and between e-waste experts and members of the public.

Table 3.1: Semi-Structured Interviews (Table by author)

Category	Count
Academia	2
Electronics Recycling and Repair	6
Household: Junk Drawer Project	12
Information and Communication Technology (ICT)	5
Local Government	6
Non-governmental-organization (NGO)	5
Public: E-Waste Collection Day	24
State and Territory Government	7
Waste Management Professionals	8
Total	**75**

Interviewing E-Waste Experts

In order to formulate a deeper understanding of how discarded electronics are managed after they have been discarded by residents, I spoke with a range of individuals involved in the

social lives of discarded electronics including environmental and waste education specialists in local government, representatives from state and territory organizations such as the Environmental Protection Authority (EPA), local government employees in the Northern Territory and South Australia, waste and resource recovery specialist employees and consultants, nongovernmental organizations (NGO) organizations involved with waste and environmental activism, information communication technology (ICT) specialists in remote Australia, e-waste recyclers, as well as reuse and repair experts at local repair shops, do-it-yourself organizations, and makers-spaces.

In many ways, everyone, including households, contain pieces of expert knowledge that pertains to the life history of e-waste and reflects their specific relationships with discarded electronics and e-waste infrastructure. There are, however, a range of experts in technology, academia, government, and waste management who play an active role in defining the norms of e-waste management in Australia. E-waste experts in this regard may be involved in a range of activities including the development of policy and regulations, measurement and auditing techniques, and public engagement campaigns. Within the category of e-waste expert, it is important to note that people have different relationships to the subject matter. E-waste experts, playing a key role in the management of e-waste infrastructure, are located within and outside of Alice Springs. They include a range of personnel such as waste management consultants based in Adelaide and waste management employees in Alice Springs, academics, local, state, and territory government employees, nongovernmental organizations, e-waste recyclers, and electronic repair technicians.

However, there are limitations to this investigation of e-waste experts in Australia. Geographic and funding constraints necessitated that some of these interviews be conducted over the phone or via web communications. When possible, however, the interview was conducted face-to-face. Furthermore, e-waste 'experts' were sampled through a blend of snowball sampling and respondent-driven sampling (RDS). My interview respondents in government and industry helped me to recruit their colleagues who were involved in e-waste management across Australia (Bernard 2011:147-151). This approach may have narrowed the perspectives I was obtaining from e-waste experts. In order to broaden the perspectives being shared with me, data generated from semi-structured interviews were triangulated with participant observation at local and national conferences, town council meetings, and other public events focused on the

management of e-waste. The resulting analysis provided a deeper understanding of how e-waste experts define and bound the category of e-waste, revealing why some electronics may be resistant to being classified as e-waste. The expert interviews conducted during my fieldwork are featured throughout this entire dissertation.

The Junk Drawer Project: Object Biographies

Surveys on household e-waste in countries such as the United States (Saphores et al. 2009) reveal that a significant portion of e-waste remains stored in basements, attics, outdoor sheds, and other domestic living spaces. These studies put into question community accessibility, availability, and awareness of e-waste infrastructure. Rather than assuming that people are unaware of their options to reduce, reuse, or recycle e-waste, the junk drawer project used semi-structured interviews centered on object biographies (Kopytoff 1986) to provide a richer context for the life history of e-waste in domestic settings. This iterative interview navigates the meaning of e-waste *with* the interlocutor. The discussion centers on the electronic objects themselves in order to reveal why my interlocutors make decisions to store electronics they are no longer using, what these objects mean to them, and if they would classify these objects as waste.

The junk drawer research activity originated with the Purdue Electronic Life Histories Project (ELHP) and was initially designed by Dr. Shannon McMullen at Purdue University (McMullen et al. 2019). As a graduate researcher with the ELHP, I helped to pilot and implement the Junk Drawer interview protocol in the United States (McMullen et al. 2019) before adopting it to explore the life history of electronics in Central Australia. In addition to semi-structured interviews, the junk drawer procedures I adopted are inspired by photovoice, a participatory method in which interlocutors are entrusted with the means to document what they deem to be significant (Wang and Burris 1997). For this particular research activity, I asked the interviewee to guide which objects were photographed and discussed. The junk drawer collection of photographs and interviews illustrate the range of electronic devices that are stored at home and the reasons for storing these electronics.

For the purpose of this ethnography, the term “junk drawer” refers to an actual drawer, cabinet, storage bin, and any other kind of container or location where electronics that are no longer in use are kept. The locational context of the junk drawer is a key aspect of its relevance to the question of where and how electronics are being shuffled out of a person’s viewshed.

Photos of electronic devices are taken to record the devices, the junk drawer, as well as the context of the junk drawer. A semi-structured interview accompanies these photos to further contextualize the presence and meaning of e-waste in the homes of Central Australians. These interviews included a range of questions concerning the places electronics are being stored and the devices themselves:

- Could you explain how these objects came to be stored in this location?
- Could you identify and tell us about some of the electronic devices we see?
    - Are any of the objects still functional?
- Have there been any past repairs or refurbishments?
- Do you have intentions for repair or refurbishing?
    - Who will do the repair/refurbish?
- Are any of these devices being considered for a different purpose than the one it was intended for?
    - For example:
        - Will you collect spare parts from the device?
        - Have you thought of repurposing parts for an art, design, or craft project?
        - As a children's toy?
- Do you have any future plans regarding these objects?
    - E.g. (selling, disposing, recycling, or storing)
- What do you estimate the value of this object was at the time of purchase?
- Does it have any non-monetary value or usefulness? [storage device; replacement parts; memento]
- If you were to include this device in a time capsule, what would it to convey to future generations?
    - What will they believe the devices purpose was?
    - Will they still consider it to be valuable?

Chapter four provides an in-depth analysis of the junk drawer dataset and how stored electronics map onto the personal narratives of my interlocutors in Alice Springs. The junk drawer research activity serves to strengthen our understanding of why electronics are stored even after they are declared technologically obsolete or no longer able to perform their original functions. The entangled life histories of people and their electronic objects helped to reveal if

and how particular kinds of electronic objects cease to be waste or avoid becoming waste in the first place.

Public Interviews on E-Waste Collection Day

As mentioned above, an additional twenty four interviews were conducted with members of the public utilizing the RWMF's monthly e-waste collection service. On the first Saturday of each month during my fieldwork, the Alice Springs Town Council allowed residents to drop off televisions, computers, and computer accessories for no fee. This e-waste was collected and set aside to be picked up by a road train [7]and transported interstate for recycling under the National Television and Computer Recycling Scheme (NTCRS). These interviews were relatively brief and usually lasted between three and five minutes. After obtaining informed consent, I asked members of the public a series of exploratory questions to learn more about their personal history with the electronics they were discarding, their experiences repairing, recycling, or discarded electronics in Alice Springs, and their personal knowledge of risks, challenges, and opportunities related to e-waste. These data are not explicitly addressed in this dissertation, with a minor exception in chapter four, but instead became a significant means to triangulate my observations and analysis between residents of Alice Springs and e-waste experts.

3.3.3 The Story of Our Electronics: A Qualitative WebGIS

Integrating GIS and ethnography allowed me to better map the social, spatial, and temporal dimensions of various places, individuals, and institutions associated with the life history of electronics in Central Australia. Data generated from ethnographic observations can be stored and analyzed using a qualitative geographic information systems (QGIS). Cope and Elwood (2009:172-3) describe QGIS as body of methods and practices which incorporate reflexivity upon the processes, products, and politics of any research and a multifaceted engagement with GIS as a technology for storing and representing spatial information, as social and political practice, and as a socially constituted approach for knowing and making knowledge.

[7] 'Road train' is a commonly used term in Outback Australia to describe a freighter truck with two or more trailers or semi-trailers.

During preliminary fieldwork, I designed and tested a mobile GIS application that I called 'Ethnographic Collector' to securely collect qualitative data during participant observation. The geodatabase used in this application is securely located in Purdue's GIS Library and can also leverage tools such as geo-coding which can be used to map out the names of local resources (i.e. repair shops, recyclers, secondhand markets, etc.) identified during participant observation and semi-structured interviews. These geospatial tools also aided in the development of an interactive online presentation which combined maps of waste and recycling infrastructure with multi-media and preliminary ethnographic findings (discussed in more detail below). While a traditional GIS is optimized for the collection of spatial and quantitative data, a QGIS was developed for this dissertation in order to enable the coding of conventional GIS data with ethnographic observations derived from text, images, audio, video, web resources and other types of media that can be spatially mapped.

The QGIS utilizes an enterprise geodatabase designed in ArcGIS 10.3 for Desktop to compile and store data on a secure server hosted by the GIS Service at the Purdue University Libraries. Publishing the geodatabase to a server makes feature services accessible on ArcGIS Online (www.arcgis.com) via an organizational account. These feature services are then published as a Web Map on ArcGIS Online, which in turn makes them accessible via the 'Collector for ArcGIS' iOS application. A Web Map titled 'Ethnographic Collector' was created for this ethnography. My Ethnographic Collector enabled me to record spatial data while making ethnographic observations by either using the GPS chip in my field equipment or by manually placing a point using ArcGIS for Desktop or ArcGIS online. In addition to recording spatial points, I recorded text based observations and multi-media attachments (photographs and videos) to create a visual record of what I was observing in the field. These observations were primarily focused on the spaces where I encountered discarded electronics, waste, and attended key events with my interlocutors.

In addition to the ethnographic collector, I also published two complementary web applications, a story map and a GeoForm, on ArcGIS Online to help visualize the life history of discarded objects in Australia. In particular, I designed the Story of Electronics WebGIS as an interactive educational resource for residents of Alice Springs. I developed and launched 'The Story of Our Electronics' in order to help community members learn about the life history of electronics by critically considering their own local consumption, reuse, and discard behaviors.

An ArcGIS Online Story Map is a relatively easy to use application for making web maps that can incorporate various types of visual media such as YouTube videos, websites, and slides. This story map enables participants to collaborate in the investigation of their relationships with others, their electronics, and e-waste infrastructure. Story maps integrate more conventional GIS maps with multi-media in order to visualize place-based narratives. I was able to leverage my understanding of publishing web maps on ArcGIS online to create a series of maps with data provided by the National Waste Management database (e.g. Figure 1.2), Alice Springs Town Council, and my own ethnographic research.

Throughout 2017, I consulted with my interlocutors to enhance the relevance and quality of this presentation. A GeoForm (an online questionnaire), asking questions similar to the Junk Drawer semi-structured interviews, was built into this interactive presentation. The Story of Our Electronics resulted in the collection of eleven additional data points containing text, images, and a general sense of where electronics are being stored in Alice Springs and what happens once they are stored. Participants were recruited through convenience sampling (Bernard 2011:146), at the 2017 desertSMART EcoFair, at the NTCRS e-waste collection event on the first Saturday of every month, and via social media distributed on various Facebook pages. These samples reflect a significant degree of self-selection bias as individuals who have an interest in e-waste and sustainability and were more inclined to participate in these research activities. These responses provided an extra opportunity to learn about the life history of electronics from people who may not have been as comfortable letting me into their homes to conduct an interview.

Wang and Burris (1997:374) note that photovoice and, by extension, the Story of Our Electronics WebGIS are themselves political acts because they document community realities and discuss community change (e.g. Cook 2014). While I am entirely grateful for the participants who contributed their personal experiences reusing and discarding e-waste, it is possible these narratives will occupy gray spaces in terms of safety standards, litter and illegal dumping bans, intellectual property laws, and terms of agreement. All reasonable steps have been taken to ensure the confidentiality of participants in the Story Map and all other research activities. Analysis of this dataset is featured within the Junk Drawer section of chapter four.

3.3.4 Field Notes

As Emerson et al. (1995:40) note, the timing of writing up field-notes becomes increasingly critical the longer an ethnographer spends in the field. “Notes composed several days after observation tend to be summarized and stripped of rich, nuanced detail (Emerson et al. 1995:40). Field-notes were written as soon as possible following both online and offline research activities. In particular, field-notes regarding the life history of electronics via social media were derived from my own participation and interactions with social media users as well as field jottings from informal conversations with and observations of the residents who use these platforms to reuse and discard electronic equipment in Alice Springs. Field notes were taken while conducting participant observation as well as the moments leading up and following semi-structured interviews. These field notes document how Central Australians work, or at times fail to work, in tandem with each other, governments, and businesses to manage their consumption of electronics and the resulting production of e-waste.

3.3.5 Digital Archaeology of Secondhand Circuits

This dissertation takes into consideration the physical characteristics of electronics — and the materials and infrastructures which power electronics — by measuring the various types of electronics circulating in Alice Springs (Rathje 2001:63). Garbologists use participant observation, semi-structured interviews, and surveys in tandem archaeological methods to understand and triangulate discard behaviors (Rathje 2001, 2011; Webb et al. 1966). Although archaeological methods are useful for locating and measuring the scale of e-waste in Alice Springs, they are unable to adequately describe the conditions surrounding why some objects are discarded in landfills while others are stored, reused, or discarded elsewhere. Taking a lesson from the garbological investigations of the 1970s and 1980s, chapter five of this dissertation blurs the boundaries between archaeology and ethnography by integrating an archaeological survey of secondhand electronics in Alice Springs with ethnographic methods. Chapter five considers data collected from participant observation and semi-structured interviews alongside a database I curated to document the circulation of secondhand electronics via social media in Alice Springs

During my fieldwork in Alice Springs, I also observed residents using social media to scale their interactions with other people, places, and things in a culturally consistent manner. In particular, I found that residents utilized social media to buy, trade, and sell secondhand electronics online. Social media also supplemented social networks aimed at locating individuals engaged in hobby repairs as well as local repair businesses. However, residents were not using social media in isolation from other strategies such as yard and lawn sales, secondhand shops, and lateral exchanges between friends and family members.

I spent approximately eight hours per week extracting and analyzing social media data between May 1st and December 31st 2017. The data was collected from a public reuse/resale Facebook group with the intention of tracking the types of secondhand electronic objects circulating online in Alice Springs. These data were collected using NCapture, an online data capture tool, which was then imported into NVivo 11,a Qualitative Data Analysis Software (QDAS) for initial coding (discussed in more detail below). Daily datasets were stitched together as a singular dataset in NVivo 11, coded, and then exported to a Microsoft Excel spreadsheet for additional analysis. In total, I collected 9,240 Facebook posts from a page where residents of Alice Springs could buy, sell, trade, or giveaway a range of objects. 1,976 of these posts described a secondhand electronic such as a mobile phone or refrigerator being bought, sold, swapped, or given away for free. A detailed explanation of how these posts were extracted, coded, and analyzed and can be found in chapter five.

3.3.6 Thematic Coding

Grounded theory guided the analysis of qualitative data in this dissertation. As a mode of analysis, grounded theory emerges from the data itself. Coding is an integral part of grounded theory and ethnographic analysis. Coding is based on the practitioners' recognition of themes and patterns within the data. The aim to build a theoretical explanation by specifying phenomena in terms of the conditions that give rise to them, how they are expressed through action and interaction, the consequences that result from them, and variations of these qualifiers (Corbin 1990). The data collected in this dissertation are derived from many sources. All of the ethnographic data collected via participant observation, archival research, semi-structured interviews, QGIS, and the analysis of social media data were thematically coded using NVivo 11. Coding is an iterative process, beginning with an initial code book based on key terms and

concepts identified in e-waste and other academic literature. Additional codes were created, added, and modified within the codebook during the subsequent analysis of field notes, preliminary finds, and interview data.

3.3.7 Anonymity

Many of the names of organizations and individuals in this dissertation have been altered for the purpose of preserving the identities and privacy of my interlocutors. When possible, I have also adjusted identifying details about my interlocutors. However due to the remote setting of this ethnographic fieldwork, it may be possible for the reader to infer that a particular passage corresponds to someone they know. The following excerpt regarding anonymity when conducting ethnographic research on social media comes from the Why We Post project led by Daniel Miller and is worth quoting in full:

> "In the current age of Google and online searching it is entirely possible for a reader to find out the real name of our field sites, even though we would not confirm that identification; but clearly the only reason for anonymity is the protection of informants, so we cannot see why anyone would do this for other than malicious reasons. In any case we have introduced additional levels of anonymity at the personal level. The more we believe the actual information published could potentially cause harm to an individual, the more stringent we have been in our anonymization. This includes both our concerns and those of our Informants" (Miller et al. 2016:40).

In Miller's individual contribution to the **WHY WE POST** project he goes on to request that readers collaborate with him in trying to preserve anonymity (2016: viii). Throughout this dissertation I have taken all reasonable measures to introduce additional levels of anonymity past the personal level. However, Alice Springs has a relatively small and charismatic population making it difficult to ensure anonymity of organizations and businesses. While some ethnographers researching waste have come up with alternative pseudonyms for the towns, places, and landfills they have researched, I have made a conscious decision to identify Alice Springs/Mparntwe as the central hub of my fieldwork. Alice Springs is a strikingly unique, storied, and beautiful remote town located in the Red Centre of Australia. The insights generated by this ethnography would be significantly muddled if I were to omit the vibrant history, culture, and geography of Alice Springs. I echo Miller and his colleagues' request to help me preserve the anonymity of my interlocutors.

3.3.8 Data Management and Confidentiality

As a researcher and member of the community in Alice Springs both on and offline, there is an active power dynamic between myself and those being researched. In order to ethically navigate this relationship, the proposed research requires informed consent. Written and signed consent forms have been developed as part of an Institutional Review Board (IRB) application with Purdue's Human Research Protection Program (approved in March 2017) for semi-structured interviews, including the Junk Drawer research activity, with e-waste experts, households, and members of the community. Oral consent was requested from community members at public events such as e-waste collection events. A script for these interactions was also submitted to the Purdue IRB.

All physical records collected for this dissertation have been securely stored under lock and key while digital records are stored securely via the Purdue University Research Repository (PURR). This collection includes field notes, transcripts, consent forms, and any information that could be used to identify project participants. Data collected via the Story Map and WebGIS has been safely stored via Purdue's secure server housed in the GIS Library. These data layers contain multi-media, spatial, and descriptive information. Examples of data include people's experiences at particular stores, recycling facilities, transfer stations, and other nodes of e-waste related activities.

The informed consent procedure notifies subjects that the information they have elected to share with me is treated as confidential. The results of the investigation have been compiled to ensure that individual positions are unlikely to be identifiable. Written consent was obtained via a request that participants consent before beginning an interview with exception of public event interviews conducted during participant observation. Public interview participants were recruited using a short script which explained the project. They were then informed about the nature of the project and the data I was seeking to collect. If they agreed to participate in the interview, I continued with a brief explanation of informed consent and began the interview. I offered each participant a paper copy of the informed consent document.

In order to ensure that the social media users were aware of my intentions as a researcher, I utilized a separate researcher profile on Facebook with a detailed description of the research procedures. Murthy cautions digital ethnographers to critically assess the power relations of online and cyber stealth research: "Though the internet projects an air of neutrality, it is a space

of power relations (2008:840).” My contact information was provided on the publicly accessible researcher profile I created to allow for social media uses to request that their personal, group, or event pages not be recorded or observed. To ensure that social media data collected using NCapture was kept confidential, the data has been stripped of names, pictures, and any other information that could personally identify an individual without their consent personal identifiers such as names and profile pictures. Per the description of my research procedures on my researcher profile, I have notified my interlocutors that, at any point in time, a social media user could make a request for any data and information pertaining to their social media posts to be removed from the project records.

In the case of the Story Map and online questionnaire, an online consent form was utilized. Each participant contributing data to the Story of Our Electronics WebGIS was first required to read and electronically sign an informed consent waiver. The story map is designed to preclude personal identifiers that could link informal reuse and deposition practices to specific households. This story map will help to significantly improve our understanding of the conditions in which these grey areas are actually navigated by households. In concordance with the IRB application, the risks associated with this study are no greater than an individual would encounter in daily life or during the performance of routine physical or psychological exams or tests. However, although participatory methodologies, such as the Story Map and Junk Drawer research activities, strive to address material and status inequalities, it is still possible that broader class stratification may be amplified (Murthy 2008). The potential risks to the participant were explicitly described in the informed consent process.

3.3.9 Limitations

In all observational studies there is an impact from the observer’s point of view on the observed, how it is observed, and how it is recorded (Musante 2014:272). The ethnographer's positionality as an individual with gender, race, class affiliation, and other characteristics will have an effect on the specific ways in which a person will approach a research project, experience the research setting, be experienced by participants, and the expectations and perceptions he or she will bring (Musante 2014:272). Bernard (2011:350) notes that the amount of time you spend conducting fieldwork affects your access to and what you can learn from interactions with people and the events you attend. Traditional anthropological research takes a

year or more because it can take that long to settle in, learn a new language, gain rapport, and be in a position for asking good questions so as to get good answers (Bernard 2011:349). When ethnographers build a deep relationship to their field site and rapport with their informants, over the span of decades, they eventually get data about social change that is simply not possible to get in any other way (Bernard 2011:350-351). I have spent more than a year building relationships and rapport with my interlocutors in Alice Springs from February to December 2017 and in August 2018. Between field seasons, I maintained contact with my interlocutors, especially regarding developments in Australia's response to China initiating a new era in which they will no longer accept foreign rubbish (Walker 2018).

Although Aboriginal Australians were present in my research via participant observation at the RWMF, at community meetings, and public life in Alice Springs, they were not the subject of individual interviews. During my time in the community, I was unable to build sufficient rapport with Aboriginal organizations that would have enabled me to ethically engage with Aboriginal people residing in town camps (see Ottosson 2014) and remote communities. This history of anthropological research and Aboriginal people in Central Australia is complex (Traynor 2016). Although I was able to address the research questions outlined in this dissertation, it would have been a fuller and different story if I had been able to access and learn from the Aboriginal community living in spaces such as the town camps. Much more research is needed to understand the experiences, meaning, and understandings of e-waste for Aboriginal residents of Alice Springs. These possibilities are considered further in the future research section at the conclusion of this dissertation.

In addition to the limitations of the researcher, limitations may occur in semi-structured interviews when interviewees cannot or will not discuss a certain topic (Becker and Geer 1957:30). In regards to e-waste, technology and infrastructure, Daniel Miller's concept of the humility of things (Miller 1987) may reduce or distort the ability of households to discuss their reuse and discard activities: "the more effective the digital technology, the more we tend to lose our consciousness of the digital as a material and mechanical process, evidenced in the degree to which we become almost violently aware of such background mechanics only when they break down and fail us" (Miller and Horst 2012:25). Moreover, differences in perception and positionality will affect how an interviewee responds to interview questions. Becker and Geer (1975:31-32) argue that participant observation helps to identify systematic distortions in

interview data by checking descriptions against observed behaviors and events. Musante (2014:261) asserts that the tacit understandings gained during participant observation provide a deeper insight and understanding of behavior of those sampled in the study.

While semi-structured interviews give the ethnographer a verbal account of an informant's sentiment, participant observation situates their account in relation to actions and interactions observed throughout the fieldwork (Jerolmack and Khan 2014:7). Participant observation has its own limitations such as accessibility, the positionality of the researcher, and the variability in the amount of time it takes to establish significant rapport. I suspect that my positionality as an male researcher from the United States, in his mid-twenties, and with a middle class and Jewish upbringing all had an effect on the specific ways in which I experienced the research setting, how I was experienced and perceived by my interlocutors, and the expectations and biases I held heading into the field (Musante 2014:272).

Furthermore, as an ethnography centering its focus on e-waste, material traces are an especially critical component of the proposed research (Rathje 2001:69). Therefore, in addition to participant observation at e-waste collection, disposal, repair, and recycling facilities; the junk drawer and story of our electronics research activities accounts for the direct recording and analysis of e-waste. However, a limitation in this study is the issue of sampling. I did not procure a statistically random sample of the population in Alice Springs using participant observation, semi-structured interviews, or the Story Map activity. This places certain limits on the generalizability and transferability of results generated by my research. However, in ethnography, a random sample is not essential. Rather, I purposefully sampled Australian e-waste experts and residents in Alice Springs. The limited transferability of findings from the proposed ethnographic research was partially mitigated by triangulating data and findings generated from a quantitative measurement of e-waste produced through a random sample of households (EC Sustainable 2015) and key interviews with e-waste experts.

3.4 Applying Anthropology to Study Electronic Waste

As an applied anthropologist, I aim to foster a more sustainable relationship with the waste produced by the digital technologies my interlocutors and I consume on a daily basis. Therefore, I have made an effort throughout this dissertation to transform ethnographic findings and anthropological insights into recommendations and strategies related to the management of e-

waste. Throughout my fieldwork, I also met with local politicians, waste management experts, and environmental activists in Alice Springs and Adelaide to discuss my anthropological interpretation of e-waste related issues in Central Australia. Presenting my preliminary findings throughout and following my fieldwork gave me additional opportunities to discuss what I was finding with my interlocutors. Over the course of my fieldwork, I presented preliminary findings to the town's Environmental Advisory Committee, K-12 students in Alice Springs at the 2017 and 2018 DesertSMART EcoFair, to my collaborators at the WAC, and to the general public during a National Recycling Week event held at the Alice Springs Town Council. An overarching purpose of these presentations was to illuminate the relative invisibility of issues related to e-waste from the vantage point of Central Australia.

As a temporary resident of Alice Springs, I set out to help collect, or at least draw attention to, e-waste littered around the town and the surrounding bush[8]. I also made an effort to recycle, reuse, and maintain my own electronic devices. For example: in order to keep my laptop running I routinely used compressed air to mitigate the buildup of dust and dirt, a prevalent issue for electronics in Central Australia. Although I was not a member of the Alice Springs Town Council Environment Advisory Committee (EAC), I regularly attended their bi-monthly meetings and presented preliminary findings regarding the variety of discarded electronics actually being wasted and reused in Alice Springs.

3.4.1 Tracing the Boundaries of Electronic Waste

I traced and tracked the boundaries of e-waste in Central Australia by using ethnographic participant observation, semi-structured interviews, the analysis of archival records and policy reviews, and the digital excavation of a social media dataset. Building upon three months of preliminary ethnographic research in Adelaide, one of Australia's metropolitan centers for e-waste management, I conducted ten months of participant observation in Alice Springs. Although modern landfills and garbage dumps have garnered attention from anthropologists and archaeologists (Reno 2016b, Sosna 2016, and Rathje 2001), I focused on the movement of e-waste and discarded electronics across domestic sites (e.g. households, curbside waste bins), sites

[8] The term "bush" colloquially refers to an outdoor area located in the Australian wilderness. Graeme Davidson (1978) provides a historical account considering the mythological development of "the Bush" with a capital B in the nineteenth century in Australia.

of electronics reuse (e.g. secondhand shops, yard or lawn sales, and online forums), sites of electronics repair (e.g. repair shops and Repair Cafés), and conventional waste management sites (e.g. the landfill, transfer station, and e-waste collection events). This allowed me to register how the interactions of different people, institutions, and waste materials shape the life history of electronics.

While living in Alice Springs, I routinely visited the homes of my interlocutors, rode around town on my push bike, and observed what types of waste residents left on the curbside or discarded at the regional waste management facility. Anthropological work on the topic of e-waste, in particular, also tends to be oriented towards the sites and places where discarded electronics aggregate to be recycled or landfilled (e.g. Reddy 2015; Kirby and Lora-Wainright 2015; Akese and Little 2018). In response, a series of twelve semi-structured interviews focused on junk drawers (McMullen et al. 2019)[9] were conducted in the homes of Central Australians living in Alice Springs. The junk drawer interviews focused on the phenomena of household material culture between the stages of storage and discard, asking my interlocutors to reflect on how electronics ended up in their homes, the meaning these objects have, and what they may do with them in the future (McMullen et al. 2019). These domestic field sites document discarded electronics at "a stage during which value is negotiated and troubled" (McMullen et al. 2019:2). Chapter four reflects on the myriad of ways my interlocutors navigate their current relationships and future plans to manage the discarded electronics that have accumulated in their households. Together, these interviews highlight how discarded electronics come to be repurposed, reused, recycled, and discarded or simply stored by residents in Alice Springs.

3.4.2 Applied Anthropology and Everyday Activism

Anthropologists such as Pink (2012) and Miller (1998) have demonstrated that choices to consume commercial goods, energy, and other resources must be studied within their own cultural logics and with attention to the relationships that emerge through these choices. Participant observation is a suitable method for investigating e-waste at the intersection of everyday life, consumption, and activism. Sarah Pink views everyday life as a "context of human

[9] Prior to conducting fieldwork for this dissertation, I helped organize and conduct fieldwork with the Electronic Life Histories Project at Purdue University. The junk drawer component of my fieldwork is derived from a set of interviews discussed in McMullen et al. (2019).

relativity, innovation and change, and a site where processes towards a sustainable future might be initiated and nurtured" (2012:5). She notes a tendency for studies of everyday life and activism to be conducted in isolation from each other (2012:4).

Studies of everyday life tend to focus on mundane, routine, hidden or unnoticed activities and behaviors. By contrast, studies of activism are often linked to the public, explicitly, explosive, and sometimes even glamorous elements of political life. Pink asserts that this dichotomy is unsuitable as the growth of activist movements with sustainability agendas increasingly include ordinary people working in tandem with each other, governments and businesses (2012:4-5). She argues that sites for activist practices are just likely to be found in everyday life as they are to be found in the global political arena (Pink 2012). Although the practices and places differ, discarding the previous dichotomy is necessary if we are to track how continuities form between the sites and practices of activism and everyday life, especially with the emergence of social media web platforms (Pink 2012:5). By considering everyday life and activism together, researchers can better understand how environmental activism implicates both policy and everyday life practices as sites of resistance (Pink 2012; Barendregt 2012; Pfaffenberger 1992).

Social media also proved to be an important site of everyday activism. Social media, despite relying on the consumption and discard of electronics, both aids my interlocutors in extending the useful lives of electronics by trading, selling, or gifting objects and has been enlisted as an instrument for conducting digital ethnography (Pink et al. 2016). It also served as a place for residents of the town to air out concerns about illegal dumping, to facilitate the exchange of secondhand electronics, and to organize as environmental and social activists. I also worked alongside my interlocutors to develop strategies for extending the useful lives of electronic devices as a way to reduce the amount and frequency of e-waste generated in Alice Springs.

In April 2017, I became a co-founder of a WAC (waste activist collective). This position granted me particular insights into the rhythms, obstacles, and potential of repair and reuse to foster a more sustainable relationship with electronics in Central Australia. Our weekly meetings culminated in the WAC organizing the first ever Repair Café, to our knowledge, in Alice Springs. At this event, we recruited a number of electronic tinkerers, a test and tagger, seamstresses, carpenters, and a few other volunteers to provide free repairs and advice to members of the Alice Springs community. Our objective was to encourage the residents of Alice

Springs to repair and reuse clothing, electrical appliances, wooden objects, toys, and dull knives rather than tossing them out and purchasing new ones. My role in WAC helped me to form deeper relationships with interlocutors and to directly disrupt the discard of electronics in Central Australia. After two months of planning and recruiting volunteers with WAC, the first Repair Café was held on the morning of 22 July 2017 at the E-NGO. All thirty five attendees who brought an item to the Repair Café and submitted a feedback form left with advice on how to repair their item (n=12 items) and many had their items repaired on site (n=37 items). These experiences are discussed in more detail in chapter five alongside an analysis of data collected from interviews with hackers, repairers, and activists.

Applying anthropology as a waste activist in Alice Springs exposed me to ethnographically insightful moments throughout my fieldwork. In particular, I began to understand my own daily activities as an auto-ethnography. I began to write field notes focused on my own reuse and discard activities as an avenue towards social and environmental activism. On one hand, I learned to focus on the discard, reuse, and repair of electronics as indicative of my interlocutor's values, rather than the monetary value of the object itself. Focusing on their values was instrumental in learning which repair and reuse interventions were most salient. By documenting my experiences recovering discarded mobile phones, computer components, and other wasted electronic objects for recycling and reuse, I was able to track how this research was affecting my own values and behavior. Overall, this enabled me to develop a tacit knowledge of e-waste infrastructure in Central Australia as well as the barriers impeding access to more sustainable outcomes for e-waste. These barriers became increasingly apparent while volunteering at the RWMF and co-organizing the Repair Café with the WAC.

Attention to the use of social media by local NGO's, the Alice Springs Town Council, and social justice/environmental activists revealed a bigger sense of community around issues such as consumption, waste, and reuse in Alice Springs than I expected. In these online forums, waste was not merely out of sight nor out of mind. Leveraging social media, I collaborated with my WAC interlocutors to share everyday strategies for reducing consumer waste, to share local events regarding the ecological and economic future of Alice Springs, and to recruit volunteers and residents for an inaugural Repair Café. I also recruited interlocutors who were interested in discussing their experiences of waste management in Alice Springs over the past seventy years.

The momentum gained by our initial endeavors led to a second Repair Café in April 2018 as well as a waste audit of a local farmers market. Despite returning to the US from January-August 2018, I was still able to contribute to the WAC's social media page and maintain a dialog with my interlocutors concerning waste related developments in Alice Springs. In summary, digital garbology allows us to rethink e-waste by providing deeper insights into the limitations of and opportunities for waste management in Central Australia through the eyes of waste management experts and local residents of Alice Springs.

3.5 Rethinking E-Waste

Rethinking the definition of e-waste involves integrating established understandings of the term as it is used by waste management experts and policy makers with new and critical concepts developed from ethnographic fieldwork and anthropological theory. As I learned more about e-waste through digital garbology and the lens of behavioral archaeology and political ecology, I found the predominant definition of e-waste to be worrisome. Attention to the life history of electronics revealed a more complex assemblage of waste bound to the production of electronic devices and digital services. I also became more attuned to the non-linear trajectories e-waste can follow as households store, discard, acquire, and even restore e-waste. Figure 3.1 depicts the most frequent words coded as "Electronic Resources and Waste" in my field notes and interview transcripts and illustrates the many possible afterlives of e-waste. For example, words such as 'become', 'change', 'repair', and 'fix' appear alongside 'recycle', dump', and 'dispose'.

Figure 3.1: The most frequent words coded as “Electronic Resources and Waste” in the shape of Australia. This word cloud was generated using NVivo and ArcGIS Pro (Figure by author).

A cursory review of Australia’s official e-waste management strategies revealed that only computers, televisions, mobile phones, and related accessories were being diverted from landfill and that recycling, a process that produces its own waste and residues, was the primary alternative (Commonwealth of Australia 2014; MobileMuster’s 2014). Using behavioral archaeology’s life history framework, I began to explore the movement of e-waste around Alice Springs. Rather than privileging landfilling and recycling, the life history framework considers a spectrum of depositional and reuse activities. Depositional activities include landfilling but can also refer to the loss, abandonment, storing, or illegal dumping of an electronic device. In addition to depositional activities, the life history of electronics also includes reuse activities

such as secondary use, recycling, lateral cycling, curation, and inheritance (Schiffer et al. 1981:68; Schiffer 2011:123).

The act of deciding to discard, reuse, recycle, or repair an electronic device is a social practice affected by the materiality of that object and the values of the person making the decision (Högberg 2016; Reno 2016b). These social practices reveal what people think things are worth. According to Reno, "what you throw away makes other things appear more important, by comparison" (2016a:18). While the vocabulary of depositional and reuse activities are useful for illuminating the different pathways a discarded electronic device may follow, rebooting e-waste requires additional considerations. In particular, there are pollutants and externalities ejected from each stage of the life history of electronics. For example, in a hybrid economic and environment life cycle assessment of laptops, Deng et al. found that the manufacturing stage, rather than use or discard, accounts for the most energy consumption and emits the most carbon emissions (2011:1205).

The lens of political ecology alerted me to the uneven exposure to potential harms associated with working with or living near e-waste. A significant amount of waste matter is generated by the mining, manufacturing, recycling, and disposal of electronics. This waste matter is not merely produced by electronic devices but also by microchips, and other electrical components found in energy, digital, and many other forms of infrastructure. And yet, e-waste discourse mostly reflects the management of discarded electronic devices and not the massive amount of waste produced by the cumulative life history of electronics. This particular framing of e-waste as a waste management issue, rather than an infrastructural issue, "highlights the epistemological and political commitments involved in selecting what one sees as infrastructural (and thus casual) and what one leaves out" (Larkin 2013:330). Repair and reuse are too often "left out" of e-waste management schemes and policies across the globe. So too are the plethora of electronic devices and components associated with the development of renewable energy infrastructure that will be discarded in years to come.

Despite the absence of electronics repair and reuse from e-waste regulatory regimes, these activities do indeed take place, challenging the prevailing nomenclature of a throwaway society (Gregson et al. 2007). In the vein of Daniel Miller's '**A THEORY OF SHOPPING**' (1998), the decisions to discard, reuse, and recycle material culture in Alice Springs are just as embedded within nuanced experiences of place, belonging, and love as they are entangled with the valid

critiques of hyper consumption. Furthermore, China's recent stoppage on taking recyclable materials from overseas has made it more difficult for Australians to ignore what happens to the waste they produce domestically (Walker 2018). Many Australians are now becoming familiarized with domestic e-waste recycling due to the emergence of the *'War on Waste'*, a documentary series from the Australian Broadcast Corporation (ABC) hosted by Craig Reucassel.

The time to rethink what we know about e-waste and what we intend to do about it is now. Colloquial descriptions of e-waste, whether as spam messages or notions of wasted time browsing the many chasms of the World Wide Web, should not be dismissed merely because they do not adhere to the strict sense of solid waste applied in the domains of waste policy and regulations. Digital waste, in the form of junk emails and deleted digital files is indeed a type of e-waste. E-waste is and must be a flexible category capable of discussing discarded hardware, digital waste such as junk emails, 'wasted time', and the expenditures required to keep people and their smart appliances connected. While this applied anthropology of e-waste helps to contextualize the scale and management of e-waste in Australia, more importantly, it helps to situate the life history of discarded electronics within experiences of care and belonging.

3.6 Conclusion: Arrivals and Departures

Alice Springs is a place defined by movement as residents arrive and depart in an ongoing cycle of employment contracts, working holidays, research funding, and intrepid adventurers. This constant flow of people, ideas, material culture, and ideologies helps foster a unique sense of outback urbanism. As an ethnographer, my sense of place and belonging in Alice Springs is inseparable from the experiences of arriving and departing, sometimes to take a short trip to Adelaide or Melbourne while other times to return to the United States without a definite date scheduled for my return.

This coming and going proved to be a salient experience to my interlocutors as well. In particular, I was struck by the empathy and encouragement I received from my interlocutors upon returning to the US in January 2018 when they saw how difficult it was for me to leave Alice Springs. I was frequently reminded of how common it is for people who temporarily moved to Alice Springs from other parts of the world to end up returning for large swathes of time later in their lives. Many of the 'going away' conversations I participated in or witnessed

contained jokes about how likely the person leaving will return within three months. I frequently encountered individuals from across Australia, Europe, and the Americas who experienced a constant urge to return to Alice Springs. Not unlike the foreigners who settle in the Red Centre, during my fieldwork I noticed that a great deal of electronics do not leave Central Australia and are instead kept in sheds, buried in the town landfill, or lost to the surrounding bush.

CHAPTER 4. THE SOCIAL LIFE OF DISCARDED ELECTRONICS

> "In April 1924, Fred Prince decided he needed a break from the work that was taking its toll on him… He could see a great future in central Australia and intended retiring there. They packed up their household belongings, including his cherished piano, and arranged for them to be stored with friends in town. Their horses, goats, and the various family pets were left at the telegraph station… Within a few days of arriving in Adelaide he was admitted to hospital where he struggled for two weeks to recover from the stress of the previous eight years" (Traynor 2016:263).

For over a century, people have traveled to the Red Centre of Australia from all over the world. From the 1870s until the early twentieth century, telegraph station operators and their families traveled long distances between Alice Springs and Adelaide in harsh and arid conditions. Like Fred Prince, many people who leave Alice Springs, including myself, also arrange for our belongings to be stored with friends and family. I too could see a great future in Central Australia. I have also come to understand that leaving belongings with friends is less about the distance being traveled and more about maintaining closeness to your social life and those who remain in the Red Centre.

On a blazing hot December afternoon at the end of 2017 and my first bout of fieldwork, the spirited pub manager named Leo[10] dismissed my goodbye, insisting he would see me again when I inevitably returned. Over the course of fieldwork, I became close friends with Leo and many of my interlocutors. I kept attempting to say goodbye to them and make arrangements for the things I would not be taking back with me to the United States. I stowed my music recording equipment and Martin Backpacker guitar with the local musician I had been jamming with for the past few months. The bicycle I had used for my daily commutes was left with my good friend and handyman Morris[11]. Throughout my fieldwork I had come to see the entrusting of objects to friends, not as merely a regular occurrence, but also as an activity that generates an affective experience of place and belonging, especially for transient individuals who are between jobs and international visas while staying in Alice Springs. In my own experience, having friends hold onto these objects for me imbued the objects with the power to anchor me during my subsequent moves interstate and overseas (Williams et al. 2008).

[10] This is a pseudonym.
[11] This is a pseudonym.

Leo was right to register the tentativeness of my farewell. I returned to Alice Springs seven months later on July 31st 2018. I felt the solar warmth hug my skin the very moment my sneakers touched the bitumen (asphalt). Mere minutes later, my dear friend Jason[12] arrives with his Ute, parks by the side of the road, and walks over to me with a contagious grin on his face. Over the next twenty-four hours this cheery contagion spread to Leo and Morris. That afternoon, while drinking a beer with Morris, I was pleased to discover my bike was put to good use by a visiting Argentinian couple while I was away. The couple soon stopped by to drop off the bike, joined us for a welcome back pale ale, and then invited us over for a dinner party. Like Fred Prince, I too returned home to recover from the rigors of an extended period of fieldwork with a yearning to return. The pushbike I left behind with Morris last January maintained and even generated new social connections in Alice Springs, enhancing my sense of belonging in Central Australia.

4.1 The Social Life of Discarded Electronics

Communication technology has been a vital aspect of life in Alice Springs since the Overland Telegraph (OT) first passed through the MacDonnell Ranges in the 1870s. Whether in the era of the OT or the contemporary era of communications via social media and the National Broadband Network (NBN), the movement of people and things generates experiences of place and belonging in Alice Springs. These movements also produce discarded electronics. Using the term 'discarded electronics' instead of 'electronic waste', allows me to address those objects that have been disregarded, unused, or stored out of view. This important distinction is a direct response to the unease my interlocutors conveyed when I classified the storage of their unused electronics in their homes as e-waste. Rather than simply focusing on electronic objects that have been thrown away or discarded, I have become interested in the following question: How and why do some electronic objects seem to resist being socially classified as e-waste, even after they cease to be used? In order to answer this question, this chapter begins by pulling stored electronics out of their respective closets and junk drawers. The junk drawer project, explained in more detail below, explores how stored electronics are valued and the role(s) they play in the development and maintenance of social relationships and values in Alice Springs.

[12] This is a pseudonym.

In a recent study conducted by my ELHP colleagues in Indiana, household electronics evoked a sense of identification, joy, and social connection (McMullen et al. 2019:2). This is in stark contrast to the predominant association of waste with affective and sensorial dimensions such as disgust, disorder, and abjection that are featured in more macro-level discussions of waste (e.g. Douglas 2002). Despite their status as unused or stored, a range of discarded electronics in Alice Springs were able to maintain value by evoking social connections and values. For example, as described earlier in this introduction, it is common for my interlocutors to leave their stored electronics and other things behind while traveling interstate and overseas.

Leaving objects behind creates a material and social anchor connecting individuals back to Alice Springs. For some, storing these objects with friends helps to reflect their communal and ecological values by reducing the amount of waste and energy produced by endless waves of consumption. In this way, the valuation of electronic objects in the homes of Alice Springs can become particularly complex. Furthermore, this chapter draws attention to the dynamic valuation of electronic objects occupying the interstitial spaces between recycling, reuse, and discard at the Regional Waste Management Facility (RWMF). The movement of discarded electronics ─ and the social actors who come into contact with discarded electronics ─ is traced as they transition from the micro-scale of the household to the macro-scale of waste and resource recovery.

The social life (Appadurai 1986) of discarded electronics in Central Australia reaches across households, secondhand shops, and waste storage facilities and includes both people (e.g. residents, laborers, policy makers, and waste management experts) and things (e.g. discarded electronics, storage containers and drawers, and e-waste collection containers). Although my pushbike, digital recording equipment, and steel toed boots were temporarily accommodated by my friends, many other discarded objects enter into the town's RWMF. When discarded electronics are stored, laterally recycled, or buried under the red earth, they enshrine the relationality of permanent and temporary residents of Alice Springs.

Landfilling makes a socio-ecological imprint by physically altering the landscape and leaving an impression of the collective consumption practices and values of Alice Springs. And yet, the RWMF also provides opportunities for residents to forge social connections with others in the community through salvaging and reselling materials that come into the landfill. While the deliberate separation of discards at the landfill reinforces the perception of waste as something unwanted, impure, potentially offensive, and dangerous, as 'matter out of place' (cf. Douglas

2005), the transfer station and secondhand shop provide a pathway for rubbish (Thompson 2017) to be re-valued by someone else. While secondhand shops are vibrant examples of rubbish theory (Thompson 2017) in action, this chapter begins by exploring how the rubbishing of stored electronics, a range of transient objects that have declined in economic value over time, reflect the values of residents in Alice Springs.

4.2 The Junk Drawer Project

Contemporary consumer culture is a radically different way of living than previous periods of human history because it produces an incomparably vast and heterogeneous waste stream (Högberg 2016; Crocker 2016). Anthropologists specializing in waste emphasize connections between the social practices of consumption and disposal (Högberg 2016; Reno 2016b). The junk draw project takes place directly between these two activities, documenting the conditions in which electronics are stored, discarded, and in some cases, salvaged prior to becoming waste.

E-waste is often discarded in areas that are out-of-sight for most Australians such as landfills, recycling centers, and illegal or illicit dumping grounds. Moreover, a great deal of e-waste resulting from the materiality of computers, finance, games, design, museum catalogs, and more flies under the radar for the general public. Before being discarded, however, unused electronics are often stored inside homes and sheds. A general lack of awareness regarding e-waste, where it comes from, and what happens to it is can be understood as an issue of framing. This issue is addressed in Daniel Miller's concept 'the humility of things' (1987). That is, the less aware we are of how objects frame our everyday behaviors and experiences, the more they ensure normative behaviors and relationships without being open to challenge (Miller 1987:85-108, 2005:5). The humility of things, inspired by Bourdieu's concept of habitus (1977), is the subtle ability of things to reinforce social norms such as gender, class, and power. Discarded electronics are able to avoid our attention more than food waste and other debris because they neither visibly break down, nor do they release detectable odors. Nevertheless, these objects hold the potential to record social meaning and personal narratives.

Electronic objects have contradictory implications for social and environmental issues. On one hand, digital media can remove sources of waste. Information can circulate without compact disks and books. The high carbon footprint of long-haul business-class flights can be replaced by video or webcam conferencing. Individuals with disabilities are aided in watching

films, television shows, or documentaries by audio descriptions and other accessibility features (Ellis 2014, 2015). On the other hand, digital media inherently produces e-waste. USB sticks are lost at the bottoms of drawers, backpacks, or conference tote bags. MP3 players are replaced by newer mobile phones connected to media streaming services hosted by sophisticated data centers. These data centers require physical storage space for redundant backup copies, energy for cooling, and the chronic replacement of failing electrical equipment. Households cycle through computers, televisions, digital photo frames, and kitchen appliances with LED screens and Wi-Fi connectivity. As discussed throughout this dissertation, e-waste contains heterogeneous and, at times, toxic, materials that are difficult to dispose (Sepúlveda et al. 2010). But what role do these objects play in the lives of residents in Alice Springs? Only in understanding what these objects *mean* to the residents of Alice Springs can we properly assess *how* and *why* these objects are being discarded.

This iteration of the junk drawer project (derived from McMullen et al. 2019) traces the social lives of discarded electronics at the microscale of households in Alice Springs. Prior to discard for recycling or landfill, household e-waste is often stored in basements, attics, sheds, and other domestic living spaces (Saphores et al. 2009). In 2017, I interviewed twelve of my interlocutors regarding the electronic objects stored in their junk drawers. The term "junk drawer" is employed to account for any drawer, cabinet, storage bin, or any other kind of container or location where electronics are stored. The analysis of these interviews was also informed by participant observation conducted during thirteen months of ethnographic fieldwork in Australia.

The junk drawer interviews focused specifically upon stored electronic devices that have not been used in the last six months and were conducted with residents of Alice Springs. Our dialogue centered on how and why my interlocutors made the decision to store their unused electronics and what they intend to do with these devices in the future. In addition to asking questions about these devices, photos were taken to provide a visual record of where different types of devices were stored by my interlocutors. The locational context of the junk drawer illuminates the humility of discarded electronics, or rather, the ability of these objects to remain hidden within everyday domestic and private spaces. While the storage of electronics in the junk drawer likely enables normative behaviors of consumption and hoarding, bringing these hibernating devices (Wilson et al. 2017) into the view challenged my interlocutors to not only

consider why they have held onto them in the first place, but also what these devices might mean to them and others in the future.

During my fieldwork I also designed the Story of Our Electronics WebMap as an interactive educational resource for residents of Alice Springs (see chapter three). Prior to launching the WebMap I received feedback on earlier incarnations from a few of my key interlocutors in order to enhance the relevance and quality of this presentation. A GeoForm (an online questionnaire), asking questions similar to the Junk Drawer semi-structured interviews described later in this chapter, was also built into this interactive presentation. The Story of Our Electronics resulted in the collection of eleven additional data points containing text, images, and a general sense of where electronics are being stored in Alice Springs and what happens once they are stored.

4.2.1 Key Findings

The junk drawer project highlights the various ways my interlocutors continue to live with electronic objects that are no longer in use. Despite being focused on a particular moment in time and space (the junk drawer), each of the object biographies (Kopytoff 1986) captured in this research activity illustrate stories of movement, transformation, incompleteness, and return (Hetherington 2004). Together the junk drawer project and the Story of Electronics recorded object biographies for a range of electronics including computer, tablets, mobile phones, MP3 players, televisions, USB flash drives, musical instruments, household appliances, videogame consoles, UHF radios, power tools and more (See Table 4.1). The junk drawer project illuminates the activities and decisions that immediately precede and follow the discard of electronics such as storage, scrounging, and tinkering.

In many ways, the term junk drawer is implemented here as a euphemism. A significant number of my interlocutors had so many electronic devices in storage that they took up whole rooms, garages, yards, and storage vans! These junk drawer interviews complicate understandings of consumerism by demonstrating how ‘sticky objects’ (Ahmed 2010) or ‘evocative objects’ (Turkle 2007) bond strongly to our bodies, our homes, and our emotions, underscoring the importance of thought and feeling in our relationships to things. The junk drawer project strengthens our understanding of how and why electronic objects are discarded, reused, or stored. Rather than reducing discarded electronics to a material stockpile or confirming the throwaway thesis (Gregson et al. 2007), the following narratives illuminate the

value of unused electronic objects to my interlocutors in Alice Springs (Table 4.1). The table below summarizes key findings from these narratives and is followed by a deeper consideration of how the value of things and values of people become entangled in the object biographies of unused household electronics in Alice Springs.

Table 4.1: Key Findings from the Junk Drawer Project (Table by author)

Narrative	Themes	Technologies
Personal Computers	• Kinship and Social Relations • Vitality of Discarded Electronics • Region of Flexibility	Desktop computers, Laptops, Keyboards, Modems, Printers, LED Televisions, Cathode Ray Televisions
Junk Vans	• Planned Obsolesce • Subverting Consumerism	Automobiles, Mobile Phones, Xbox, Televisions, Microwaves
Lateral Cycling	• Storage and Stockpiling • Social Connections • Personal Data	DVD and Blu-Ray Players, iPad Tablet, Kogan television and Remote Control, HDMI cables, USB Car Chargers, RCA cables
Incomplete Projects	• Reuse and Repair • Secondhand • Opportunistic Consumption	Laptops, RAM Sticks, USB Chargers, Power Supplies
Time Capsules	• Consumption and Daily Routines • Value of Devices versus Data • Stockpiling and Repairability	Mp3 player, Laptops, Tablets, Desktop Computers, Videogame Consoles, Mobile Phones
The Comfort of Things	• Regulating Loneliness • Storage of Data • Evocative Objects	Sewing Machine, Xbox, Air Conditioning Unit, Mobile Phones, Music Equipment, External Hard Drives

Personal Computer

Jay[13] is a resident retiree that I met on an e-waste collection day at the transfer station in the winter of 2017. Unlike other residents, he had come to scrounge electronics for his personal computer collection. For much of his life, Jay garnered expertise in electronic hardware

[13] This is a pseudonym.

manufacturing as a scientist in Australia and the United States. Following e-waste collection day, I was able to stay in contact with Jay. Our subsequent junk drawer interview effortlessly became a life history of Jay. As an elder retiree, he struggles with depression. During our first meeting, he explained to me that much of his time is spent at home with little motivation to leave. While recording the following excerpt, however, I began to understand the vital and very personal role discarded electronics have in Jay's daily life.

> "Well, this is a keyboard [points to the cardboard box concealing a keyboard next to the kitchen table] on a laptop I picked up. And the reason… I have a friend which has got a whole… the reason is that I go to the tip is to get rid of his stuff. He's decluttering but he's got stuff from like World War II… Oscilloscopes and real heavy duty things. And he just works on them or fiddles with them and either takes the nuts and bolts out when he wants a capacitor or whatever he takes out and puts it aside.
>
> But he's reached the point now, he's much older than me, and he's saying I've gotta move these massive heavy printers that are… you know the old bulb printers and so… that's why I'm doing it because he's a friend of mine and he's very old. He can't move stuff so I go over there and sometimes load the car up and go and dump it for him. But anything I see that is very new or whatever, I'll take it because it's… people just come up and say "oh these work but I've changed my, I've got an LED TV now and I got rid of this older one". Particularly, now with the move from the cathode ray monitors you know they were dogs of things".

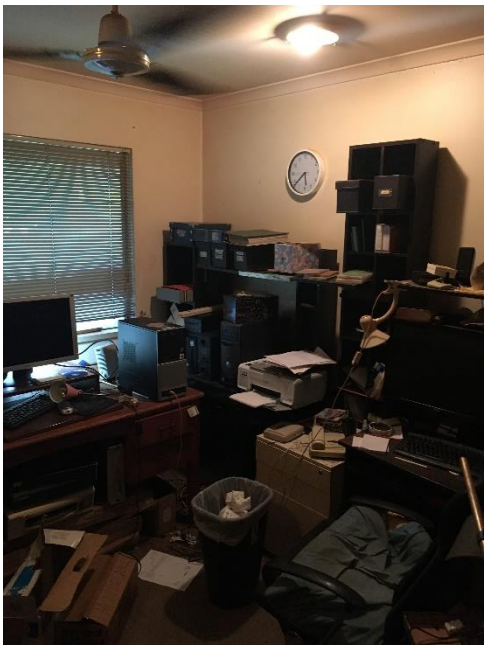


Figure 4.1: Salvaged personal computers in office (Photo by author, October 2017)

These trips and social exchanges have become an important pathway for Jay to locate materials to scavenge and to generate vitality. By moving discarded electronics from his friends' home to the transfer station, Jay transforms his daily routines and combats his depression.

The transfer station is a liminal place where discarded objects enter into a region of flexibility. The act of reclaiming these objects, however, does not merely produce value for those objects. The liminality of the transfer station reminiscent of Millar's interpretation of Jardim Gramacho "as a place of burial that was simultaneously… a source of sustenance" (2018:63). Millar (2018) uses the term 'vital liminality' to describe the experience of waste pickers laboring at the dump because it indexes the generative and high-stake aspects of this labor. Jay applies his decades of electronic expertise to reclaim discarded electronics from the transfer station, returning them to a domestic location (Figure 4.1). By doing this, he generates new life for these devices as well as himself. However, this labor is relatively high stakes for Jay, whose depression and retirement have left him with sparse opportunities for socializing with others.

For Jay, the computers that he collects from the transfer station cease to be e-waste and instead return to the category of personal computers. In the 1960s, personal computers were heralded as a transformative social technology capable promoting decentralization, ecological balance, and social harmony (Pfaffenberger 1988:41). And yet, as this dissertation points out, the proliferation of computer technologies has led to ecological imbalances and social inequalities caused by the uneven distribution of e-waste and pollutant associated with the life history of electronics. The production of e-waste is generally exacerbated by the ability of computer manufacturer's to leverage designed obsolescence and anti-repair policies that reduce the ability of individuals to repair their personal computers and electronics (Delgado and Callén 2017; Grinvald and Tur-Sinai 2019). These actions, however, cause once valuable computers to become transient objects, reducing in value over time until they become rubbish, an object existing in-between positive and negative value (Thompson 2017). Ironically, the rubbishing of these computers makes it possible for Jay, with his expertise in electronics hardware, to realize the transformative powers of computers.

By diverting rubbished computers from the transfer station, Jay severs their connection to the centralized management of e-waste, promotes a positive ecological outcomes by refusing to consume new devices, and fosters a meaningful sense of social harmony for himself and the others. In other words, scrounging provides a pathway for the personalization of computers that

had been disowned and depersonalized by their former owners. Furthermore, Jays' motivation for scrounging electronics at the transfer station enabled him to build and maintain social ties that would otherwise be difficult for him to achieve due to his retirement and depression.

The Junk Van

Kevin[14] is a town council employee in his fifties who was living in a major metropolitan city prior to moving to Alice Springs. When he first moved to Central Australia, he elected to live in a caravan before moving into his current house about a year and half ago. "I'm a bit of an accumulator," he says:

> "I don't buy much new, but I go to lots of lawn sales. I'm a bit of a scavenger and a dumpster diver. I find things, get things cheap, and accumulate stuff… The more storage space I have, the more I fill it up with things. So occasionally I have lawn sales to get rid of things but most of the time I just accumulate and collect"

Kevin also takes additional measures to expand his storage space. Outside of his home is a stationary 'storage van' which is filled to brim with secondhand items that he has collected (Figure 4.2). I ask Kevin about the last time he drove the van. He responds by telling me "no… It's a shed. I bought it as a shed". His backyard contains an additional trailer filled with more items and multiple cars. Three and a half to be specific. He has one half of a Honda.

The backyard camper trailer is occasionally used by visiting guests but more often contains additional things. "My old TV, I think, is in there, another TV I found that costs $5, an old microwave that's broken. It needs throwing away". Kevin holds onto the microwave and other broken items because he believes he can fix things, straddling the boarder of hoarding and salvaging. Throughout our interview he stresses his commitment to keeping things going for longer instead of creating waste through the consumption of new things:

> "So, it's an interesting world because when I was young, younger, we grew up on a farm. My parents don't throw much away. But things were difficult to get. Clothes were expensive. There wasn't stuff like there is. It's only in the last thirty years, say, that there's an explosion of stuff, waste, consumer society, and throwing away society. I don't really like it. I really don't like planned obsolesce even though I take advantage of it. But most of the things I have are old. My car there is 1967 and that's 1992. 1974 for this one. So I like to keep things going past their usual life if I can".

[14] This is pseudonym.

Figure 4.2: Photo of Kevin's Storage Van. For active scavengers, a junk drawer does always not suffice. (Photo by author, Novemeber 2017)

Kevin's opportunistic scavenging of discarded objects challenges the idea that discards are merely an end-point of consumption. Discarded objects continue to move from one place to another. At each step, the value of discarded objects is renegotiated and discarded objects can be transformed into something useable and valuable. In the following excerpt, Keven details how the secondhand mobile phones he scavenges from MobileMuster bins are collected, evaluated, put to use, and eventually returned for e-waste recycling:

> "Well I grabbed some phones that weren't mine and thought these are useful to me. I took some of them apart to see how they worked. And then thought 'I don't want to become a hoarder'. So I don't want to keep things that are completely useless to me even though I still have a lot of those things. So just last week I put some of the mobile phones into the MobileMuster which we have at work. Which is very handy. I think some of them originally came out of there anyways. When I've had phone problems, I look for temporary phones that [I] might be able to use while my phone's damaged or broken. I think I grabbed a whole lot and then they sit around and then they went back to where they came from (laughs)".

Kevin has curated an extensive collection of electronics, automobiles, and other items. To an outsider, his home and yard appear as a chaotic and disorderly hoard, albeit at a smaller scale

than the RWMF. Rather than burying discards semi-permanently in the ground, they cluster in his mobile storage van, trailers, and throughout his house and yard. His mobile phones subvert the recycling efforts of MobileMusters (2014), extending the uselife of undead electronics. Although his scrounging "interrupts the dreamlike, phantasmic ways in which subjects and objects ordinarily relate to each other within consumer capitalism" (Reno 2016a:102), his attempts to subvert consumerism fundamentally relies on and benefits from capitalist cycles of production, consumption, and discard.

Lateral Cycling

Consumerism requires the discarding of the 'old' to make way for the 'new' (Crocker 2016:6). However, sometimes the 'new' may be a different place rather than a different device. Furthermore, the manner in which we discard something 'old' varies from person to person and from place to place. Throughout my fieldwork it became common to encounter discarded electronics moving from one place to another with or without the person(s) who purchased the device. As mentioned above, Jay would often help his older friends discard electronics on e-waste collection day but was equally inclined to reclaim materials so long as he had an idea of how he might use the device. The lateral cycling of objects from one home to another, circumventing secondhand shops altogether, was a common feature across the junk drawer interviews. In my own experience I have also laterally cycled discarded electronics in Alice Springs.

Early in my fieldwork, Tracy[15] had a spare external DVD player for her MacBook laptop. I told her I was happy to find a new home for it. About one year later I gave the DVD player to my colleague with a MacBook in Cairns. While this device, which was rather small and portable, traveled significant distances with me in my luggage, discarded electronics are just as likely to remain behind in Alice Springs. An elder and semi-retired couple describe the electronics left behind by their friend, a local dentist:

> "…We had a friend who is a local dentist. When he left town he left a lot of his electronic stuff with us. We haven't used a lot of it. And in fact, on Friday I've got a friend coming into town who's a principal of a school out (in a remote community) and he's pretty good with electronics…He knows the value of a lot of this electronic

[15] This is a pseudonym. Tracy is a key interlocutor and fellow waste activist in Alice Springs (see chapters five and eight).

> stuff so I'm gonna get him to have a look at it and tell us whether it's any good or whether it can be thrown out or recycled or what. So yeah, he gave us a couple radios, a couple printers, gave us a computer monitor which we've actually given away"

At the beginning of this chapter, I reflected on Fred Prince arranging for his belongings to be stowed with friends after eight years of living in Alice Springs. In the twenty-first century, individuals can vacate Central Australia much more rapidly. There are also increased pressures for my interlocutors that moved for work to leave Central Australia. There is a flow of employees in and out of Central Australia matching the rhythms of various government contract cycles, temporary work visas, and contract work. Throughout my fieldwork I was often told things such as: "Yeah, that's from a friend. Some people leave town. One lady left me a heap of stuff when she left in a hurry". Electronics also move between residents of Alice Springs[16] or interstate family members and kin.

Susan[17] is a regular attendee at events and meetings organized by a local environmental NGO. At one of these meetings she asked me what she should do with an iPad she obtained but never used. I recommended finding a new home for it rather than recycling, as I explained the importance of preserving embodied energy. During the interview, conducted a few months later Susan and her husband informed me that the tablet was mailed as a present to her brother. Per our conversation, she made sure to wipe the device of personal data.

> "Yes, a present to my brother. Um. I'm so thrilled. I'm so thrilled because he's a software engineer and he flattered me by saying 'yes, I could use that'. So I went "oh it must be worth something'. I uh… what's the word? I cleared it out which was good because I'd never done that to anything. Put it in the mail. It arrived. Found a new home. I haven't verified that he's using it. I know that when you go into his house it's just electronics everywhere. So it could easily get lost. But I just feel relieved it's now his responsibility".

By sending the device to her brother, Susan acknowledges that she has deferred her responsibility regarding the device's end-of-life.

Kim[18], another Alice Springs Town Council employee, laterally cycled a Kogan TV that she no longer wanted after her dog had destroyed the remote:

> "It used to be taped [to the TV]… But when my old dog was a puppy she kept jumping on the TV it was taped to… And then, I think she was a bit stressed because

[16] The movement of electronics between residents in Alice Springs is discussed in more detail in chapter five.
[17] This is a pseudonym.
[18] This is a pseudonym.

> I was moving house and I think she was a bit worried she wouldn't come with me… this was a barn when I moved in here…And I'm like 'dammit, you haven't eaten anything in such a long time'. But yes, so dog-struction".

The Kogan was re-gifted to a friend in Alice Springs who installed it outside by his hot tub spa. Prior to giving the TV to her friend, Kim tried a number of universal remotes to no avail. Ultimately, she was able to find friends to take the universal remotes off of her hands and was happy that they were not "completely wasted".

About a year before I started my fieldwork, a major electronics retailer closed shop in Alice Springs. Michael[19] and I met following a public presentation I had given to the community of Alice Springs. During our junk drawer interview, he gave me an hour long tour of his house, his tinkering space, and his electronic stockpiles. In the following excerpt, Michael explains how he purchased a stockpile of HDMI cables with the goal of helping people transition to the correct technology:

> "So when the [electronics store] closed down in town, they were selling on clearance like really cheap. Things like HDMI cables, those little cigarette plug USB chargers… Yeah, so I sort of stocked up because I often go to people's places and they've still got RCA cables connecting their TVs to their Blu-ray DVD players and I just, you know, replace them for them. But I've got a bunch of in stock which don't, you know, don't get used until they're actually needed".

It became clear that these stockpiles contain many electronics that have not been used in the last six months. Although Michael may find some use for them in the future, for now, however, they signify incomplete projects.

Incomplete Projects: Future Plans, Repairs, and Recycling

A small portion of my interlocutors, including Michael, have illustrated a desire to repair and tinker. In addition to Michael, two of the volunteers I worked with at the E-NGO's Repair Café tinker with electronics in order to extend their working lives. Regardless of the state of their projects, all three of these interlocutors have future plans to find new homes for a range of devices and accessories. The following narratives extend our understanding of why individuals may be reluctant to relinquish ownership of a device (Ylä-Mella et al. 2015:381).While Michael

[19] This is pseudonym.

is particularly interested in involving his family in future repairs and projects, Geoffrey[20] has made an effort to refurbish and provide laptops that he acquired for free to older residents of Alice Springs (Figure 4.3):

> "So the beautiful thing about these older generation laptops is that they're built in such a way that user serviceability is still actually quite a doable thing without having to be rocket science or a brain surgeon. So the fact that I've got this significant redundancy of laptops is kind of neat because, yeah, if a key falls off a keyboard then hey, four screws and a small screwdriver and it's out. …Equally having RAM that's not soldered to the motherboard. You know that you can buy a box of RAM sticks off of eBay to get things up to a point that they are every bit as fast as you would need for general day to day computing out of something that's twelve years old".

Figure 4.3: Geoffrey's Stockpile of Laptops (Photo by author, October 2017)

Choosing to keep these laptops running helps to conserve the embodied energy of each device, reducing the need to consume new devices. While Geoffrey has no qualms about his stockpile of laptops and components, Michael is more conflicted regarding the electronics he has accumulated:

> "Well, I've got a scanner at work now. So we probably could get rid of it but what's gonna happen to it. Like, that's my other issue. Yeah, my other issue is… Yeah, I'd like to see it being used somewhere else. Like some of the plug packs and USB

[20] This is a pseudonym.

> chargers and stuff. But some of the plug packs and stuff I have are probably non-switch mode power supplies which are less efficient. So you don't know whether it's better to just recycle it and people buy a new efficient product or to actually reuse it. So that's a bit of a dilemma for me as well. Am I actually doing the environment and community a service or a disservice by keeping old products in use"?

My interlocutors, including Michael, generally convey that they would like to "do the right thing" with their e-waste. However, as Michael points out, the so-called "right thing" remains difficult to discern, especially when venturing deeper into the life history of electronics. Michael's question identifies a key limitation within the research design of this dissertation, the challenge of assessing the net gains and losses of replacing one technology with another. Admittedly, I emphasize narratives of reuse and repair as a corrective alternative to life cycle assessments (LCA), which tend to treat activities outside the purview of manufacturers as noise. Although, I discuss this in more detail later, it is worth noting here that LCA studies are critiqued for being product and service oriented and lacking attention to human behavior (Gutowski 2018).

While Michael and other tinkerers tend to stockpile discarded and unused electronics, some individuals were more inclined to utilize recycling services. However, individuals who choose to recycle electronics in Alice Springs often waited until they had enough stock to make the trip worthwhile:

> "**Respondent**: Well look, I can just show you a bit of stuff I've got out here (in his shed). I've got two boxes of electrical cables and stuff that…
>
> **Interviewer**: Do you just collect these from different housing projects that you've worked on?
>
> **Respondent**: Yeah. Yeah, I think that that cable came from the community but it's not the sized cable that's used much these days. But I take that around to the metal recycling place.
>
> **Interviewer**: How often do you take them over?
>
> **Respondent**: Oh, probably every three or four months. I've got another box of leads here. I don't know what to do with these. There's a lot of this type of fitting that… I think next time I go to the recyclers I'll take those in too".

During my volunteering at the RWMF e-waste collection day, I rarely saw repeat residents with the exception of Jay. This pattern reinforces the observation that my interlocutors were pragmatic

about how often they would recycle their electronics. Michael plans to recycle computer parts in the future but is again concerned about sorting out what should be recycled and how to recycle it:

> "Main reason would be because I haven't had time to go through it and work out what should be recycled and how to recycle it. Because I mean like TVs and stuff I know how to get rid of but the smaller stuff like this, I'm not sure what I can do with them here in Alice Springs. And yeah, I prefer to reuse things rather than recycle when I can, and repair. I have a friend for a while in his signature had about eight R's. Reduce, Reuse, Repair, Repurpose, Re… um… Yeah. About seven or eight of them".

The decision to recycle, repair, or reuse electronics is essentially an incomplete project. From the vantage point of Alice Springs, I see the dominant waste management paradigm of e-waste recycling loosen its grip on my interlocutors as they in turn grapple with the possibilities of alternative reuse and discard practices.

Time Capsules

I asked my interlocutors to imagine what their electronic objects may convey to future generations who encountered the objects after being buried in a time capsule for a thousand years. The discarded electronics discussed in the Story of Our Electronics responses included an mp3 player, three laptops, one tablet, two personal computers, a collection of videogame consoles, and three mobile phones. One respondent explained that although they were unable to think of a device important and meaningful to them, they found "the information and experience that is transmitted" to be important "rather than the device itself".

The majority of online respondents suggested that the devices would convey insights into their daily routines. For some this meant study habits, including hours of staring at screens while for others it meant access to their individual taste in music and art. The remaining respondents each believed their e-waste would convey a dependence on electronic devices, a reluctance to let go of outdated equipment, and "exemplify the thin end of the wedge, of when electronics infiltrated our lives". Another respondent specified that they would want to include an explanatory note to convey that they did not take their present resource wealth for granted. During the Junk Drawer Project, the responses tended to be more elaborate, likely because I was able to ask follow up questions to my interlocutors. These responses covered an interest in the

evolution of electronics, the nostalgic value of older technologies and experiences with older forms of media, and the sentimental value of digital data.

Many of my interlocutors suggested that electronic devices are already in the process of becoming historical reference points. For example: after showing me his junk van and backyard, Kevin joked about a character from the television show Portlandia who sought after a Nokia brick phone to become a key piece in their early 2000's museum exhibit. During my interview with Michael, I extended this question to the assemblage of electronics and components he has collected since moving to Australia. During this exchange, Michael considers whether or not his collection provides evidence of hording or an individual who is unhappy with the status quo of rapid consumption and discard:

> "**Interviewer**: If an archaeologist were to come across this home and it had been left untouched for a thousand years, what would this home convey to future generations and archaeologists?
>
> **Respondent**: Probably more than anything it would convey a hoarder. Someone who couldn't let go of stuff that was probably of little value. But I would hope that it would convey someone who… yeah I guess someone who wasn't happy with the status quo. And who was, if not trying to do something, wishing they could do something about it".

Michael is initially concerned that future researchers might assume he was a hoarder based on the sheer size of his collection. This assumption is at odds with his values because it fails to convey how this assemblage can be employed to reuse and repair electronics:

> "…Because I've pulled apart things from all over the place and all kinds of things. And kept various parts. I didn't show you my boxes of screws and stuff but I keep tiny little screws out of appliances that I take apart. When I do throw things out, I try and take them apart. See if there's anything that I might be able to use in a project and keep that".

These repairs require that Michael stockpile materials from older objects, which he describes as legacy objects. Upon closer inspection, he believes that his possession of these legacy objects might reveal his interest in fixing and tinkering with electronics as a hobby:

> "…If they could date it well enough they might think that a lot of the stuff was fairly old or legacy. Even though it's only five, ten, fifteen years old, it's still well out of date in terms of actual usage of what people use now. A lot of it. If my tools were in with it, they'd probably know or be able to work out that I was an electronics technician or fixing things and tinkering and stuff which they may find curious. Obviously not in a commercial capacity but more in a hobby slash environmental concern way".

Michael's initial assessment of hoarding quickly gives way to a more nuanced understanding of *why* he has held onto all of these objects and *what* a deeper investigation of these objects may tell future archaeologists looking to understand the relationships individuals had with their electronic tools and devices.

Michael believes that his collection has the potential to create positive environmental and social impacts. For example, he has utilized many of the legacy devices and components he has collected to help a local church maintain its' aging audio and visual equipment and has a sophisticated understanding of how his collection can be utilized for a range of other repairs. Recalling these activities to me helped Michael to self-validate why he has collected so many objects and that his collection is not necessarily wasteful.

The Comfort of Things

Högberg argues that in a culture of consumption, "to consume becomes a way to be, a way to live" (2016:63). The culture of consumption is deeply dependent upon an acceleration in the disposal of goods in order to generate "real and created needs" that will in turn be satisfied by increasing consumption (Högberg 2016:63). While the anthropology of consumption demonstrates the roles of shopping in fostering relationships of care (Miller 1998 and 2008) or as a strategy for 'making ends meet' (Dake and Thompson 1999; Martin 1993), these ethnographies often push waste to the curb.

There is an unfortunate tendency for critics of consumerism to assume that mass waste is simply a by-product of a "throw-away society" that merely values consumption as an indicator of social position and care (Gregson et al. 2007). And yet, the junk drawer interviews referenced above demonstrate the comfort of holding onto things by looking beyond the functionality of these objects and considering how they index the intimate connections between people and other things (Miller 2008; Beer 2012). During the staggering hot summer afternoons in Alice Springs, Kevin finds a great deal of comfort in his Xbox and air-conditioning units: In particular, he has held onto a number of these objects which were important to him when he first came to live in Central Australia:

> *"…My Xbox. It's been very good. I was quite lonely when I first came to town and I isolated myself, almost on purpose, living out of town. And so… I played*

a lot of Xbox. And it was good. I mean it kills time, especially over summer when it's very hot. My air conditioning units' very very important to me in summer. When I was in the caravan it was very very hot. So I had two or three different air conditioners going. So they were important.

Having grown up outside of Central Australia and with relatives living overseas, Kevin relies on his mobile phone to connect him to his loved ones and the wider world:

"… The phone, the phone is. I like having a connection, if I want it, to the world and to my family. To stop being lonely, you know? So the phone is important…You know, I've been asking people. Which would be the worst [to lose], your keys or your phone?"

The connectivity of the phone helps to reduce Kevin's experience of loneliness and isolation. When I asked Kevin about the responses he has received to his query, he explained to me that most people, including himself, agree that losing your phone is worse than your keys. Rather than emphasizing the phones ability to reduce loneliness, Kevin and his peers are deeply worried about the personal data stored on their devices. If someone found his phone, he worries that they could easily gain control over his life because he does not have a lock on it. Similar too many Australians, Kevin owns multiple phones (MobileMusters 2014). His accessibility to secondhand phones means that the one phone is unlikely to produce additional loneliness.

Furthermore, Kevin is not only interested in reducing his loneliness. Throughout the interview he distinctly expresses his aim to regulate the level of isolation he is experiencing. For example, in addition to living outside of town in his caravan before moving into Alice, he prefers to use his musical equipment alone:

"…on the opposite to being lonely, when I'm happy I'm playing music. Either my own music or playing records and mixing. So I really like my turn tables and my mixer and my records."

The responses I curated from the Junk Drawer and the Story of Electronics are striking in that each of them reveals how the story of discarded electronics is simultaneously a story of us. The personal data stored on electronic devices was identified as key issue throughout the Junk Drawer project because it possesses something of the individual who used that device. To quote

Marcel Mauss, even after e-waste "has been abandoned by the giver, it still possesses something of him" (1925:11-12). In a pilot study on USB devices entering the e-waste stream, Kennedy and Wilkin hint at the tensions between the materiality of the USB devices, — as being affordable, capacious, and disposable — and the immateriality of the devices 'precious' data (2016: 11). By focusing on why participants were reluctant to dispose of faulty or little-used USB devices, Kennedy and Wilkin (2016) sought to understand what aspects of the devices matter to their participants. It is worth noting that the Junk Drawer and Story of Our Electronics projects did not focus on USB devices and instead focused on the devices my interlocutors already found to be meaningful.

The ability of discarded electronics to hold archives of music, photos, games, software, and personal information is important to my interlocutors (Beer 2012:366). For example, while speaking to me about an external hard disc drive (HDD) in his closet, Michael admits to having lost track of what exactly data is archived on the device. In particular, he wishes he had more time to sieve through the photos. Losing the photos, laments Michael, would be fairly upsetting. Similar sentiments were expressed by Kevin regarding a photo of a cactus flowering over Christmas following a flood stored on one of his older mobile phones. In many cases, the moments these photos archive cannot be easily recaptured as people and their children age, the internal memory of devices decay, or whole landscapes and ecologies change.

And yet, for some of my interlocutors much more is at stake than the mere archiving or potential loss of data. While showing me around her home, Kim drew attention to a sewing machine that was gifted to her by her mother. In the following excerpt, Kim retells the trying circumstances that brought her mother and this particular sewing machine to Alice Springs:

> "The sewing machine was a slightly stressful time. My mom had been in Alice Springs visiting and her father passed away. And then I flew to, and mom knew that I wanted sewing machine for a long time. And then I went to New South Wales for the funeral. My parents are in Sydney but he wasn't. And we were shopping the day after and she decided to get me an early Christmas/birthday present. My birthday and Christmas are the same thing for me, they're like five days apart. So a birthday-Christmas present. We combine the words. Birthday-Christmas. No pause. And yeah. I think in my head it would be like a failure if I gave it way which is a bit ridiculous".

Although Kim has not used this sewing machine for the purpose of sewing clothing, the Birthday-Christmas gift has become an 'evocative object'; a provocation to think about Kim's father's death and a companion to her emotional life (Turkle 2007; Turley 2012). As mentioned

earlier in this dissertation, digital media is not necessarily synonymous with the immaterial or non-physical. Although the sewing machine is used here as a key example of an 'evocative object', it stands to reason that digital photos or other archived materials can also provoke thought and act as emotional companions. Each of these objects have a relative physical presence. Both Kim and Kevin were able to think with the sewing machine and photos stored on an old mobile machine and expressed discomfort at the idea of giving away or loosing those objects. And yet, there is a general tendency for people to lose track of what content is actually archived on their devices, as is the case with Michael's HDD described above. In summary, while the junk drawer project achieves its objective of mapping out active connections between people and things, it also reveals moments of suspended connection with digital media.

4.2.2 Storing, Scrounging, and Tinkering with Electronics

All of my interlocutors had stored electronics in their households and some of them routinely scavenged discarded, secondhand, and discounted electronic devices while others engaged in tinkering. Scrounging activities, also called scavenging and salvaging by my interlocutors, interrupt "established routes of material preservation, purchase, and disposal" and are often discouraged by government regulators, corporations, and waste management professionals (Reno 2016a:99). The NTCRS, in particular, emphasizes a particular route or material preservation involving the purchase of an electronic device followed by its disposal to an e-waste collection point, recycling at a certified facility, and reincorporation into the electronics manufacturing industry where the cycle can begin anew. And yet, Jay and others were able to routinely collect discarded electronics, bring them home, and tinker with them in order to get them running again.

In addition to being stored as a keepsake, discarded objects, depending on their materiality and the ability of individual agents to salvage those objects, may be remade into something useful and valuable. The variability in these processes and activities are precisely why, as Högberg (2016:63) asserts, it is a crucial time to understand waste as social practice. A significant segment of my interlocutors shared a common reluctance to jettison unused electronic devices that hold sentimental or ideological value. Susan and Kim laterally cycled objects in order to prevent their electronics from becoming waste while also fostering social connections with their kin. The scrounging of computers at the transfer station contributed to a sense of

sentimental value for Jay. This value, however, is not located within memories of those particular devices but in the social connections that are maintained by recovering them from the transfer station and the sense of worth he gained from being able to apply his knowledge of electronic hardware.

Economic gain is not a significant motivation for the scrounging of e-waste and reusable components from the transfer station, clearance sections, and elsewhere in the community. Although, it is worth pointing out that scrounging is facilitated by individuals being able to freely or cheaply acquire e-waste. Instead of economic gain, the motivations of Kevin, Geoffrey, and Michael are reminiscent of the phone phreakers of the mid-twentieth century who sought to seize the international phone system for themselves, appropriating its power without permission, deriving a sense of ecstasy, and all while trying to improve the very system they were hacking (Pfaffenberger 1988:39).

Kevin opportunistically accrues his massive collection of secondhand objects to protest planned obsolescence. However, he is keenly aware that his scrounging activities are only made possible by the discards of consumerism. He derives satisfaction from his ability to consume things that he wants while also demonstrating alternative ways to consume electronics. Geoffrey held onto and refurbished laptops so that he could help older members of the community access digital resources and Michael collected legacy components to help a local church maintain its audiovisual equipment. These activities demonstrate that scrounging and tinkering are a means to appropriate the materiality of discarded electronics. By appropriating the technological benefits of these technologies, my interlocutors are able to create a sense of fulfillment while also aiding their ability to subvert the norms of mass consumption and discard. The remainder of this chapter contextualizes the social practices leading up to and immediately following the discard of electronics at the regional waste management facility in Alice Springs.

4.3 Ethnography at the Regional Waste Management Facility

Volunteering at the regional waste management facility (RWMF) was an integral fieldwork experience that allowed me to observe and affect the outcomes of electronics discarded by members of the public and small businesses in Alice Springs. When electronics came to the transfer station, I was able to follow them from their truck to the e-waste collection bin, dumpster, scrap metal bin, and secondhand shop, all of which were located on the premises

of the RWMF. These spaces were selected in order to observe a range of sites in which households can reuse and dispose of their e-waste, interact with e-waste experts, and learn about opportunities to better manage e-waste in Alice Springs. The majority of these spaces are publicly accessible and for those that are not, permission was sought out by the primary resident or site manager. In addition to spending time in these places making observations and having informal conversations, I also utilized the same waste management, repair, and reuse services as residents of Alice Springs and participated in community conversations concerning waste and environmental issues at the Alice Springs Town Council, NGO meetings, and public events.

Participant observation at the RWMF also included volunteering at the Transfer Station and salvaging materials for the secondhand "tip shop" near the face of the landfill. Here I worked side by side with the bottom crew, employees who work at the transfer station, in the management offices, the weighbridge, and the tip shop. Occasionally, I would find myself on the landfill, salvaging materials for the tip shop. Those who worked atop the landfill moving and burying waste were known as the top crew. I was also surprised to find myself scavenging for materials alongside a variety of non-humans including dingoes and birds atop the landfill (Figure 4.4). The presence of these animals is an important reminder that there is no barrier between fauna and the refuse produced by Alice Springs.

Informal conversations with individuals at a local music shop, an electronics repair shop, and with a Tag and Testing contractor helped me to make sense of Australia's risk and liability norms and expectations. Our discussions regarding public liability led me to avoid some issues with the organization of a Repair Café I co-organized with my interlocutor Tracy (discussed in more detail in chapter five) by recruiting the Tag and Tester to ensure that the electronics being repaired at the event would not be dangerous to take home and thus reducing the risk and liability of the E-NGO who hosted the event. These interactions, however, also circled back to affect my volunteering at the RWMF, especially the 'tip shop' located at the front of the facility.

Early on in my fieldwork I learned that any electronic object brought to the tip shop had to be tested and tagged prior to being sold. However, there was only one employee at the RWMF tip shop who was certified to test and tag. Seemingly, the lack of time and personnel to process these secondhand goods led to a number of functional and potentially resalable electronic devices being discarded to landfill. These devices were usually sent to landfill because they fell outside the narrow categories of e-waste covered by the NTCRS. Furthermore, as mentioned

earlier in this dissertation, the Northern Territory has not banned e-waste from landfill whereas the states of South Australia and Victoria have implemented a ban.

Figure 4.4 Documenting the presence of non-humans at the landfill (Photo by author, August 2017)

4.3.1 From the Ghan to the Landfill

Consumer goods became rapidly available in the interior of Australia following the completion of the Ghan and Stuart Highway. This caused consumer and discard practices in Alice Springs to shift in the latter half of the twentieth century. Glass bottles could more readily and cheaply move interstate. Infrastructural developments in communication, mining, and indigenous services infrastructure ballooned the town's population. In short, more people and more consumables led to more waste. A significant increase in the amount of waste generated by Alice Springs led to the construction of a centralized landfill meant to replace the individual bottle dumps and fire pits documented by historical archaeologist Kate Holmes (1988). Over the course of the twentieth century, sanitary landfills became a widespread trend in industrial consumer societies (Rathje and Murphy 2001). Open dumps in Australia, where a family could bring their children and openly scavenge, were gradually replaced by regulated and gated resource recovery centers tasked with mitigating the unpleasant aspects of mass waste.

In September 2017, I asked residents on a social media forum to share with me their earliest experiences of discarding rubbish in Alice Springs. The following responses are typical examples of residents salvaging for materials on the tip face, a practice which is now prohibited by the managers of the RWMF, due to liability concerns:

> "In the 60's and 70's a trip to the tip was great fun! We only took accumulated bits and pieces. But generally brought back more than we took. The general kitchen waste didn't seem to be dumped in the same area as bits n pieces so we could have a lovely scavenge. Dad always found a wonderful assortment of 'things' he thought he'd 'need'…"

> "In the 70 / 80's it was simply referred to as the supermarket ... as mentioned you could pick up all sorts of stuff before they started bringing in restrictions on scavenging. Yanks would dump all of their stuff that they couldn't sell or take back with them to the US. A lot of people would take away more stuff than they dump...lol. Back then there was a mountain of old car bodies & what we would refer to now as hard rubbish. It was like a maze where you could wander around for hours picking up bits and pieces…"

These responses highlights the relative ease and ubiquity of scavenging at the landfill prior to the facility being gated in the 1990s. Prior to this change, many residents recalled freely driving onto the area of the current landfill and dumping their rubbish onto the tip face. During my fieldwork at the RWMF, residents often explained to me that the landfill has grown significantly over the last two decades. The following section takes a deeper look at the manner and context in which residents and RWMF employees work to bury and, at times, salvage resources at the landfill.

4.3.2 Working with Waste in Alice Springs

While waste labor is readily interpreted as indispensable for maintaining urban lives and development, individuals performing this labor are often viewed as polluters of social and moral order (Nguyen 2019:52; Nagle 2013; Reno 2016b). A critical assessment of contemporary waste management strategies illuminates how those who work with waste are exposed to disproportionate physical harms and social stigmas. For example, in a chapter aptly titled *'Ghostly and Fleshly Lines'*, anthropologist Joshua O. Reno provides ethnographic evidence of the social divisions that arise as humans distance ourselves from mass waste (2016b). While crossing into the United States through Michigan, waste haulers from Canada were marked, like their cargo, as a social bad, "something that ought to go somewhere else to be dealt with by someone else", by residents living near a landfill receiving hazardous waste (Reno 2016b:208).

Unlike the hazardous cargo being hauled into Michigan from Canada, e-waste in Alice Springs is brought to the RWMF by residents where it is either discarded into the landfill, set aside for e-waste interstate recycling, or diverted to the secondhand shop.

RWMF employees I volunteered with understood that they work in a relatively dangerous environment. For example, we were occasionally instructed to shatter the glass on a large solar panel in order to extract non-ferrous metals and set them aside for a local scrapper. With each strike, glass sherds rained down from the panel, some careening off into the air. We were careful to minimize the spread of glass[21]. In general, personal protective equipment (PPE) was provided and required to be worn for these types of tasks. Proper tools and safety conditions, such as proper ventilation, mitigates some of the risks associated with e-waste processing and recycling such as unnecessary injuries, anemia, high blood pressure, respiratory illness, reproductive damage, and even organ failure (Conrad 2011:352). The processing of e-waste and other potentially hazardous materials at the Alice Springs RWMF does not include e-waste recycling and takes place outdoors in an open-air environment.

Nonetheless, working with e-waste at RWMF poses other risks. While volunteering on e-waste collection days, the e-waste containers were routinely overfilled. Free e-waste collection days for the public occurred on the first Saturday of every month. Given that these events occurred on weekends, the transfer station usually had no more than one employee. When the e-waste containers are overfilled, there is a chance that the television sets and monitors will be crushed from the sheer weight of devices above or below them. On more than one occasion I noticed shattered glass from a cathode ray tube (CRT) television set covering the ground beneath the container. When electronics are stacked over the container wall, they may slide and fall onto the ground or a human. While I never witnessed the latter, I frequently found myself preventing devices from falling out of the container. In the following field note I reflect on the perspective of Morris, a local tradesperson, who regularly utilizes the transfer station to discard demolition debris from work around Alice Springs. In this example, Morris was dissatisfied with his experience at the weighbridge and shared some recommendations for making the transfer station more accessible:

[21] This solar panel salvaging activity occurred a number of times throughout my fieldwork and is discussed in more detail in chapter seven. It is import to note, however, that all employees, including myself, were required to conduct a risk assessment at the start of every workday at the Regional Waste Management Facility. This helped to ensure that we were following all reasonable precautions to protect ourselves and others dropping off waste at the Transfer Station.

When Things Do Not Work

This afternoon Morris got off work around 3:30 to grab a beer and invited me to come along and drop off the trailer he had borrowed for the day to his mate. On the way home we stopped by the tavern for a beer. Soaking in the sun out front of the tavern, we started to chat about his afternoon. Earlier today Morris had gone to the tip and was aggravated when an employee at the weighbridge falsely accused him of bringing in hazardous paint waste without declaring it. The employee walked around the back of his trailer to audit his load. I could tell that he was frustrated by the experience but explained to him that I had witnessed a lot of people illicitly bringing in waste to the transfer station and tip face. Morris volleyed back stating that even if that happens, it was the employees' attitude that rubbed him the wrong way. There was no apology issued to Morris after he was incorrectly accused. After I shared some of my experiences volunteering at the RMWF, our conversation shifted towards his critique of the transfer station itself. As he began to share his opinion, I reached into my pocket and took my phone out to signal to him that I would like to record his complaint so I could incorporate it into my recommendations for the ASTC. He consented to the recording transcribed below:

> "The problem is, with the transfer station here, is the bins are too high off the ground. And if you back your trailer up to it, you have to shovel every piece of rubbish out of your trailer, into the bin. Instead of if it was four hundred millimeters lower, you could just back your trailer up and push your rubbish off into the bin and drive away. Jobs done.
>
> And now all they need to do, because they fucked up the original planning of the transfer station, is build a ramp in those bays so that you back your trailer up onto a higher section. And then you can get the same effect.
>
> And you can still have your boom gates for safety, which are there anyways, which are just in the way at the moment because they're at the same height as the bin. The only reason to have them there is [for] when the bin's not there. But you can still have them there for general use. And then as you back your trailer in, you can move the gate, back up, and push the rubbish off and you're done. It would be so much easier".

In addition to the inconvenience for residents discarding their rubbish and recyclables at the transfer station, I noticed that the current setup results in a lot of green debris, plastics, and paper being blown away by gusts of wind. Building ramps, as Morris suggests, could help reduce rubbish being blown out of the transfer station, make the transfer station more accessible and safe for residents of Alice Springs, and reduce the amount of time employees spend cleaning up

after residents at the transfer station which could be replaced by productive salvaging tasks such as extracting copper from washing machines.

On the way home from the pub we continued to chat about the hours of the transfer station. For contractors like himself, it is very difficult to get to the tip when it closes at four in the afternoon. On more than one occasion, he has had to argue with the weighbridge to leave the gate open until 4:00pm rather than closing early at 3:50pm. Furthermore, in the mornings the gate does not open until 8:00am, making it difficult for him to drop his load off before starting work for the day. Lastly, he found the line between householder and contractor waste is problematic. When he is taking yard waste and dropping off household rubbish at the tip, he feels he should not be charged the contractor rates. Although these added expenses are passed on to his clients, he does not like the idea of treating household rubbish as contractor or industrial waste.

The multi-million dollar redesign of the transfer station at the RWMF is, in some ways, an imposition of design dumped on the community. In this case, the design was imposed without sufficient regard for the knowledge, preferences and lifestyles of the people, such as Morris and other tradesmen and women, who help make these places viable (Amin 2014:154).

4.3.3 Rediscovering Value: The Salvation of Rubbish

The term resource recovery is often limited to material recovery in the sense that e-waste contains valuable metals that can be reprocessed into new commodities. For example, the NTCRS Operation Review solely focuses on recycling and material recovery from e-waste (Commonwealth of Australia 2014). And yet, the ethnographic fieldwork I conducted in Alice Springs has reoriented what I understand to be recoverable resources as well as resources that are in need of recovery. Dawdling around Alice Springs on my bicycle and volunteering at the RWMF exposed me to heterogeneous rubbish that has been unceremoniously discarded and ejected by the town. By rubbish, as mentioned in previous chapters, I refer to Thompson's (2017) category of objects that have fallen into a region of flexibility where their perceived value remains in flux. I came to experience the RWMF, colloquially known as the tip, as an assemblage of rubbished places, persons, and things. While the designation "tip" specifically refers to the landfill, located at the RWMF, it also encompasses the transfer station, the location

where refuse is literally tipped out into sorted containers. The Rediscovery Centre, a secondhand shop located at the RWMF, is therefore referred to as the tip shop by my interlocutors.

The laborers working at the transfer station, tip, and tip shop provide salvation for refuse; a second chance for rubbished objects to be rendered as valuable to a potential customer. On days when the store was less busy, my co-worker at the tip shop Jamie[22] and I would go to the tip face to salvage materials for the shop. Workers amongst the tip shop joking attributed the discovery of sought out materials and objects to the "Tip Gods". Although said in jest, the finding and salvaging of materials was often seen by my co-workers as an important tasks and community service. The labor of working with discards, however, is often placed into simultaneous and contradictory value frameworks that praise workers for salvaging resources and wealth from discards and, at the same time, relegate these activities as disgusting, non-skilled, and undesirable (Nguyen 2019).

I gained firsthand experience in the potential of disgust that approximates salvaging discards while volunteering to salvage materials with my co-workers. At the end of a warm August afternoon, two of the RWMF employees and myself rode over to a recently deposited demolition pile on top of the tip. We were hunting a collection of bathtubs that the top crew had noticed earlier that day. One of the employees explained to me that the tubs could be sold as repurposed garden beds for about thirty dollars each. By the end of the day I was exhausted, a bit dehydrated, and slightly overwhelmed by the fierce stench of the tip face cooking in the sun. I failed to notice the large puddle of brownish water that had accumulated the base of the tub I was about to pick up. When I went to move the tub onto the back of the trailer, the water spilled out of the tub and onto my torso. The stench of the water immediately triggered disgust and a bout of dry heaving. Despite the momentary discomfort I experienced, I gained satisfaction the following week when I returned to the tip shop to find out that the tubs had indeed been sold.

Many of the town residents I spoke with during my fieldwork viewed salvaging operations like this in a positive light. On several occasions, I documented artists, builders, and other creative residents benefiting from affordable access to the bricks, pallets, bathtubs, and more that we salvaged from the tip face. These members of the community benefited from others, including myself, exposing our bodies to unknown substances, smells, and stresses.

[22] This is a pseudonym.

As mentioned earlier, in addition to volunteering at the transfer station I also spent a significant amount of time working in the Rediscovery Centre, the RWMF's secondhand shop more commonly known as the tip shop[23]. Throughout my fieldwork I came to understand the speed of consumption in a new light. It would seem that things left the tip shop just as rapidly as they entered the transfer station. Throughout the day, residents of Alice Springs pulled their vehicles alongside the shop and unloaded everything from tools, doors, and plywood to children's toys, books, bicycles, and more.

Drawing on Appadurai (1986), Douglas (2005), and Thompson (2017), Larsen (2018) notes that discards in secondhand shops undergo a categorical transformation from dirt, an object of non-value, into a cultural commodity. The ability of an object to undergo this transformation is dynamically bound to material and social conditions. In other words, what is or is not salvaged has just as much to do with the general state of the object as it does whether or not it is imagined to be desirable. These valuations occur each time an item is donated, assessed, resold, recycled, or discarded and immediately involve residents and RWMF employees from the tip shop, weighbridge, transfer station, landfill crew, and management office. While Larsen highlights the importance of discarded objects being in good condition, desirable, and in demand, the tip shop had additional concerns related to liability and a limited capacity.

On a few occasions I found a number of resalable electronics either sent away for recycling or within the landfill. I was particularly surprised by the number of functioning printers I saw discarded on a regular basis. Electronic items such as kitchen appliances, musical equipment, and monitors may have been resalable but there were not enough staff members certified in testing and tagging to be able to bring these items into the shop (Figure 4.5). At the time of my fieldwork, the tip shop only had one individual certified to test and tag electronics. This meant that even working, desirable, and in demand electronics were usually sent to landfill or recycling, leading to potentially valuable things falling through the gaps (Larsen 2018:2). For the first month of my fieldwork, the sole test and tagger was out of town leading to even more recoverable electronics being discarded. Many piles of recoverable discards were often sent to landfill due to a limited capacity for scavenging, processing, and stockpiling materials. Nevertheless, the men and women I worked with at the RWMF worked tirelessly and creatively

[23] Chapter three contains a detailed description of this dissertation's methodology.

to salvage construction materials, bathtubs, rugs and carpets, toys, and tools from the transfer station and the open face of the landfill.

Figure 4.5: Backlog of Electronics waiting to be tested and tagged (Photo by author, November 2017)

Over the course of my fieldwork it became clear that the tip shop was considered an exciting and valuable space by my interlocutors. However, the current iteration of the tip shop is managed by the Alice Springs Town Council and is often critiqued by frequent customers for having a less desirable selection than its predecessor the Bower Bird shop. For example, in the following quote Jay nostalgically remembers his trips to the Bower Bird:

> "[I] used to go the tip [before] and it was just undeniably magic. You could buy very good stuff. I haven't seen anything similar come here in the last ten years that they used to have before…You'd just go down and they'd have it really spread out and you'd go through it and you know, you'd pick up a little set of lights like those lights in the corner [of the living room] for $2. And there's nothing like that anymore".

Unfortunately, to my knowledge, there are no accessible records of what was sold at the Bower Bird that would indicate the extent to which this critique is valid. Nevertheless, I regularly encountered a number of local artists, crafters, travelers, builders, and tinkerers frequenting the shop. For example, during my fieldwork I met a local artist who collaborated with school

children to construct sheep out of recycled materials and installed them out front of the rediscovery center (Figure 4.6). Across town, many of my interlocutors even collected wooden pallets from the transfer station to build bed frames.

Figure 4.6: Recycled Sheep on a Rubbish Heap (Photo by author, July 2017)

Employees in the current iteration of the tip shop determine what is and is not e-waste, interpreting the resale value of electronic objects:

> "What we do if people drop off electrical stuff, we test and tag it. So we then resell it. So if someone tells us 'oh, this is still working. I've got this mixer', then we test and tag it and then we sell it. We, of course… try to avoid things like toasters because first of all there would have been a problem when someone passed it on and its ten years old. And then, I mean you can buy for $10 a toaster. So we try and avoid those things that can cause electrical shocks or things".

The risk of an electronic object causing an injury leads to liability concerns for management at the RWMF, affecting the decisions employees make to accept or reject electronics. These concerns, as my interlocutor indicates in the following quote, have a cost:

> "…We reduce the risk as much as possible. And it's also a service. So we don't fix things because we don't have the capacity. But we test and tag things that work, people tell us. There's a market for televisions if they work. People do buy televisions if we get one in good condition. Yeah, electrical goods is a problem because there's licensing, risk, and those sort of things involved. So if you don't

have a person with the right background… and it's… I mean the modern world is regulated".

And yet, both employees and customers alike have articulated that the regulations built to reduce risk and liability are severely hindering the means to recycle and reuse resources that come through the RWMF:

> "On another night I had a discussion about, it was funny, there's a guy from Austria that came here a week or two ago. We'd go and look at a mulch and you sort of talk to him about recycling… And he said 'it's so over regulated. There's so many forms to fill in to do some recycling that it prohibits it'. And that's yeah… And I think we need it in Australia but it can go to the extreme in terms of recycling".

The tips unique spatial position at the edge of the town as well as the towns' relative isolation from the metropolitan centers of Australia fosters a region of flexibility where rubbished electronics can be salvaged by thrifty individuals such as Jay, discussed earlier in this chapter.

4.3.4 A Grey Space for Hard Waste: Scrounging for Friends

A typical e-waste collection day at the transfer station begins with a resident arriving at the front gate of the facility. When given a green traffic signal, the resident pulls up to the weighbridge and describes the waste they intend to drop off to an employee behind a glass window. The resident then drives up the ramp to the transfer station where they pull alongside a large red walk-in-container (Figure 4.7). On most days, the sky remains cloudless as the blazing hot sun blares indiscriminately over us, the bitumen, and the e-waste container.

Every few minutes a new resident arrives, sometimes alone and more often as a family. I place my field notebook on the ledge of the bin before offering some assistance moving their e-waste into the container. Twenty-four individuals consented to public interviews regarding their stories of recycled and repaired electronics and general knowledge of e-waste. I usually take this opportunity to help inform residents about which types of e-waste are allowed to be placed in the bin. Most often, they would thank me and go on their way, sometimes discarding other recyclables into the cardboard or green waste containers.

The e-waste is then transported to blue crates provided by TechCollect, an official recycler under the National Television and Computer Recycling Scheme (NTCRS) until they are collected (Figure 4.8). On one occasion, however, a resident scrounger flipped the script by swapping out his unwanted e-waste for previously discarded electronics. Jay, the retiree

mentioned earlier in this chapter, came to drop off e-waste on behalf of an immobile friend with the secondary purpose of picking through the mounting pile of computer desktops, laptops, cords and cables, televisions, printers, and keyboards. He later confirmed that many of these items were indeed still functioning. It was not until later that learned how he transformed these discarded electronics from somewhere else's problem to a storehouse of reusable parts and social relations.

Figure 4.7: Waste Collection Container (Photo by author, October 2017)

Figure 4.8: E-Waste Storage at the back of the landfill (Photo by author, July 2017)

4.4 To Ban or Not To Ban?

Throughout the twentieth century waste disposal shifted from an open-ended, distributed, and multispecies enterprise, to a rational, centralized, and technologically sophisticated landfill (Reno 2016b:13). As new industrial chemicals are manufactured at a rate significantly faster than toxicologists can study and policy makers can regulate, it is exceedingly difficult to assess the risk these materials pose to human and environmental health. And yet, a range of materials in e-waste are known to adversely impact human health. The recovery of the rare earth elements from recycled e-waste also poses the risk of leaving substantial traces of harmful contaminants in human bodies and the environment (Sepúlveda et al., 2010). For example, e-waste may contain and release hazardous materials such as lead, chromium, mercury, polyvinyl chloride plastics (PVCs), and brominated-flame retardants (BFRs). Exposure to toxins from e-waste recycling adversely affects mental and physical health, neurodevelopment, thyroid function, cellular expression and function, and is associated with adverse neonatal outcomes, changes in temperament and behavior, and decreased lung function (Grant et al., 2013). Rather than remaining within processing sites, heavy metals and toxic chemicals are carried by air, dust,

wastewater, and sediment. The sheer tonnages of e-waste, including hazardous materials ejected from the manufacturing and transportation of electronic devices already discarded in landfills, are particularly difficult to quantify.

At present, landfill bans are a significant point of contention for waste management and resource recovery experts across Australia. Landfill bans are often envisioned as a powerful tool for reducing e-waste in Australia. In a written submission to the operational review of the NTCRS (Commonwealth of Australia 2014), the South Australian Minister of Sustainability, Environment, and Conservation contends that the landfill ban on e-waste not only supports the NTCRS by ensuring a supply of products for recycling, but also increases community awareness and behavior for the responsible disposal of e-waste. However, ethnographic research has highlighted a growing concern that landfill bans and recycling schemes can unintentionally result in the stockpiling of recoverable materials and an increase in illegal dumping. Given that the Northern Territory has not yet banned e-waste from going to landfill, the following examples include evidence from my preliminary fieldwork in South Australia (SA), the first Australian state to ban e-waste to landfill.

As of September 2013, whitegoods such as washing machines and refrigerators as well as all other e-waste were banned from direct landfill disposal across all of SA under the Environment Protection (Waste to Resources) Policy 2010. However, the following interview excerpt with an e-waste expert reveals that stockpiling may have increased following the ban in SA and the implementation of the NTCRS:

> "It opens up a Pandora's Box of issues because it… While the intent is good, when you get an oversupply in stockpiles it creates ethnical environmental dilemmas for government decision makers and policy makers. What do we do now?"

He worries that large stockpiles may cause contamination issues. Furthermore, he argues that the growth of stockpiles is attributed to low collection targets set by the NTCRS. This issue was echoed by a range of stakeholders in local councils and e-waste recycling businesses who provided feedback via the Operational Review of the NTCRS (Commonwealth of Australia 2014). He then goes on to provide two suggestions for the reduction of e-waste stockpiles: a significant increase in the targets of the NTCRS and new legislation supporting reuse strategies. In the following excerpt, however, his interpretation of reuse seems to be focused on the reuse of materials rather than the reuse of electronic devices.

> "… It's also important to have a target that says, 'X percentage of that must be used back in the electronics industry or something else within the metals industry', um, you know that sort of thing. So much of the copper should be reused."

Although reuse strategies are the subject of chapter five, it is worth noting that critics of the NTCRS are increasingly drawing attention to the e-waste that the Australian government has failed to manage.

In the words of a waste management consultant I spoke with at a crowded pub near Adelaide's central business district, although "they've banned e-waste in landfill, that doesn't mean no e-waste is going to landfill". How can we be sure? During my preliminary fieldwork in South Australia, it became increasingly apparent that the recent landfill ban cannot guarantee that e-waste is being diverted. Furthermore, prior to this ban an unknown amount of e-waste has already accumulated in South Australia landfills. Although the exact contributions of heavy metals and inorganic compounds to leachate from e-waste are also unknown, there is evidence to suggest that these contaminants are present in leachates across South Australia (Kiddie et al. 2014). If e-waste is affecting leachate in South Australia, it is more than likely that heavy metals and other contaminants will also be present in Northern Territory (NT) landfills. Avoiding the contamination of leachate via e-waste was cited by many of my interlocutors as a central impetus for rolling out the NTCRS.

Informed by my ethnographic curiosity, I constructed a GIS using the EPA's activity license database[24] to assess which South Australian landfills have plans to monitor the amounts of e-waste in closed landfills as well as present and future e-waste contaminating active landfills. The following table summarizes that only five out of 23 landfills within 60 kilometers of Adelaide have a license that mandates the monitoring of e-waste. When placed in a GIS (Figure 4.9), it is revealed that the locations of these licensed landfills are near the McLaren Vale and Barossa Valley winery regions outside of metropolitan Adelaide. By contrast, landfills located near the poorer socio-economic suburbs north of Adelaide have not specific requirements for managing e-waste according to their EPA license.

[24]See http://www.epa.sa.gov.au/data_and_publications/environmental_authorisations_licences/search-licenses

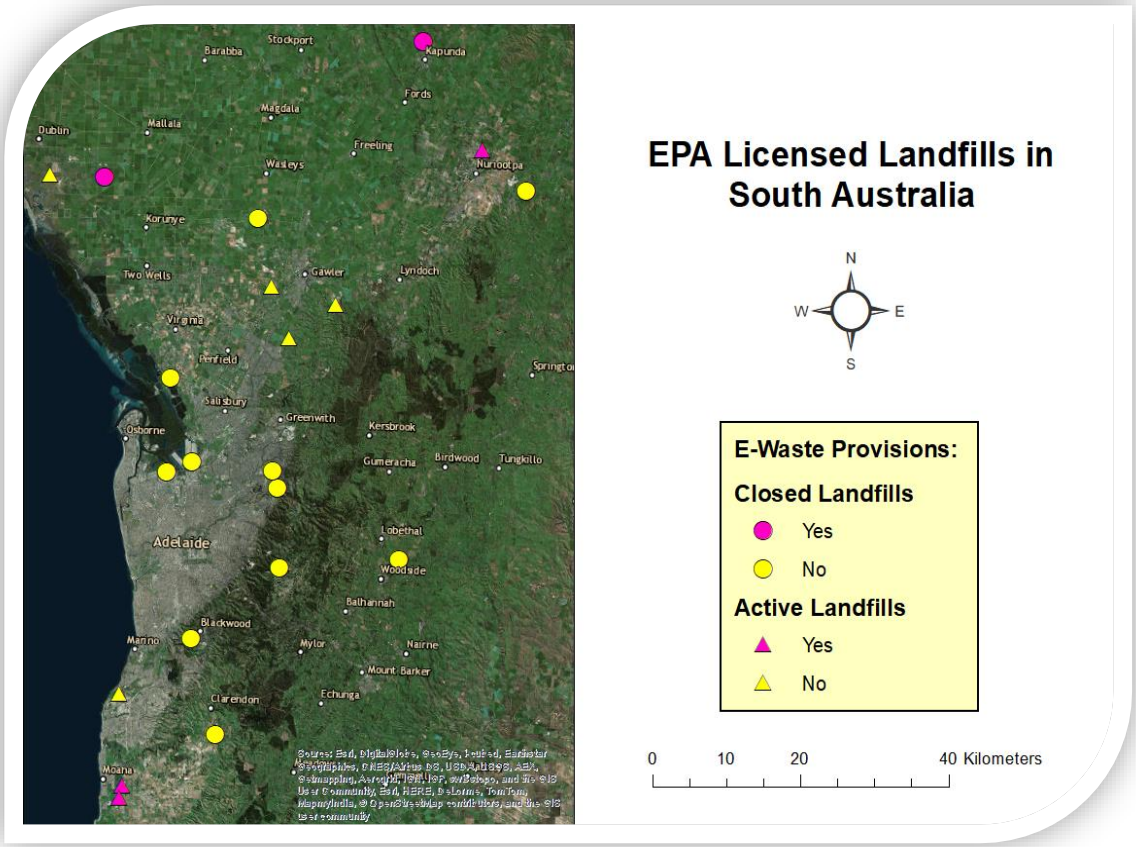


Figure 4.9: A GIS of Landfills with and without Provisions for Managing E-Waste (Figure by author, August 2016)

Additional research is needed to clarify the extent to which e-waste is being managed in landfills across Australia. However, the preliminary fieldwork I conducted in Adelaide led me to asking my waste management interlocutors in Alice Springs about their perspectives on landfill bans in the Northern Territory (NT). In the following interview except, my interlocutor at the RWMF in Alice Springs explains why a landfill ban in the NT may not be effective:

> "E-waste… Well if we did where would it go? So, yeah. I wouldn't ban it because it'd end up in some bush. Um there's apparently sites that people have dropped things off because they come here and they go 'I'm not paying $65 to get rid of a fridge' so they go and they… and then you go in your mind, okay, actually sometimes I write down the rego[25] and say look to the rangers 'keep an eye out for this guy floating about, he's got a fridge'. But yeah, we have to do all we can in

[25] "Rego" is Aussie slang for registration.

> that respect… Yes, we'll take it. Yeah, if we ban it, it'd just end up in the landfill or in the bush".

Indeed, during a ride along with an Alice Springs town ranger we came across a mass stockpile of abandoned white goods just outside of a foreclosed metal scrapyard at the edge of the town (Figure 4.10). The rangers suggested that the white goods were dumped in order to avoid paying fees at the RWMF.

Figure 4.10: Abandoned white goods outside a foreclosed metal scrapyard in Alice Springs (Photo by author, 2017)

Another RMWF employee similarly believes that a landfill ban would not work in Alice Springs:

> "We would just end up with it anyway. I would rather them bring it in here and we can control it then rather than just get it in the skips, get it in the bins, get it with the commercial rubbish, you know. To me, I think that it would be easier if someone came here and said take this, I know we know exactly what to do with that. Rather than run over with a compactor and think 'oh god, there's nothing to do with that because it's been run over'! Everything's all squished out of it. So yeah, no. I don't think a ban… because… yeah. On a tangent, we were gonna try and ban chemicals. We'd get them anyway. They'd be hidden and we wouldn't know. So yeah. So I don't think a ban would work. It's an education thing. At least if you sat there with fifty people or a hundred people that allows the feedback. Straightaway you can say 'we can't take this because, we don't want that because, this is what we're gonna do'. And then people can start firing back ideas to you. And then you've got an

> opportunity to answer them or take them on board and say, 'well I've never thought of that but we'll put some thought into that'".

This quote draws direct attention to one of the key differences between the efforts to manage e-waste in Alice Springs compared to South Australia. As of December 2018, the town council does not employee an individual with the sole task of educating residents on the sustainable management of waste and recyclables in Alice Springs. This responsibility belongs to the town's lone environmental officer, a part time employee who is also tasked with a wide range of tasks such as auditing and reporting on the status of the RMWF, solar installations, and a myriad of other environmental issues. Many of the councils I interviewed in South Australia, however, also employee waste and recycling education officers to educate residents on landfill bans, recycling opportunities, and other means to reduce waste contamination and illegal dumping.

My fieldwork in both Adelaide and Alice Springs has illuminated the messy possibilities of a landfill ban. On one hand, if there is a lack of public education, a landfill ban may result in worse forms of contamination. Illegally dumped e-waste and white goods can already be found around the fringes of Alice Springs. My interlocutors strongly believe that this type of dumping is exacerbated by the costs of disposing these materials at the RWMF with the exception of free televisions and computers drop-offs on the first Saturday of each month. Furthermore, they worry that a landfill ban will lead to some residents misusing the transfer station. On the other hand, even in South Australia where the landfill ban has been rolled out alongside educational support from governmental organizations such as Green Industries South Australia (GISA), formally known as Zero Waste South Australia, it is unclear whether e-waste is being diverted from landfill.

Electronic objects foster communication, accessibility, and more. And yet, the very same objects can have potentially monstrous consequences when buried beneath the earth. Within the landfill, toxic leachate and unknown combinations of solids, liquids, and gasses concentrate in close proximity to humans and non-humans, water sources, and ecologies. Without proper regulatory and behavioral recourse, landfill bans alone do little to accommodate and mitigate or stave the disposal of mass waste across the Earth. Furthermore, a legislative landfill ban on e-waste cannot ensure that harmful materials will not accumulate elsewhere.

4.4.1 Disorder and Ambiguity

Rubbished objects and people accumulate at the margins of infrastructure where they perpetrate disorder and ambiguity. For example, illegal dumping activities are the scourge of councils and residents seeking to foster a clean and orderly environment. For many of the residents in Alice Springs, the appearance of litter in shared public spaces is the epitome of dirt and disorder. These residents often attribute blame and hold responsible the perpetrators by voicing their disgust on social media forums and even posting documentary evidence such as addressed letters. The legal responsibility for managing illegally dumped waste, however, becomes increasingly difficult to trace when the discarded waste and those are discarded it are veiled in ambiguity.

South Australian councils were invited by the state organization Green Industries SA (GISA)[26] to participate in the Zero Waste Environmental User System (ZEUS), a web-based system for recording, monitoring, and analyzing waste and recycling data across the state including instances of illegal dumping (GISA 2017). On a rainy afternoon in Adelaide's CBD, Jessica[27] explained to me that individuals involved in the illegal dumping of rubbish are usually "some dodgy person in a truck who's picked stuff up and never gone anywhere near a licensed facility". She goes on to differentiate illegal dumping associated with the execution of the NTCRS. In South Australia, co-regulators are meant to keep track of discarded electronics collected for recycling under the NTCRS.

> "Now again it's actually really the co-regulatory arrangements job to see that that is happening because they are responsible for producing annual reports on performance back for both their liable parties and the Australian government. Right so they should have a sense of what these facilities having. Before the review, that wasn't happening because stuff was being referred to as recycled when, uh interstate there was some bad illegal dumping instances from facilities".

The waste management regimes have a limited ability to render waste as orderly. However, when the co-regulators lose track of discarded electronics and later encounter illegally dumped e-waste they are not construed as "dodgy" in the same sense as the defiant individual, described by

[26] Prior to the start of my preliminary fieldwork in 2016, GISA was known by my interlocutors and the as known as Zero Waste South Australia (ZWSA). In 2017, the organization was renamed to indicate an expansion of its focus from waste to other issues related to the sustainable usage of energy, water, and other resources. This shift also mandated an increase in attention to industrial and corporate sustainability in South Australia (ZWSA 2015).
[27] This is a pseudonym

Jessica, refusing to utilize licensed waste management facilities. The question of responsibility for e-waste mismanaged by the NTCRS co-regulators remains ambiguous.

4.5 Lost in the Earth: The Destruction of Embodied Energy

Materials recycling alongside the harvesting of energy via biogas and incineration at landfills (Cherubini et al. 2009) are useful reclamation strategies. And yet, these activities do not completely mitigate massive energy expenditures and waste arising from earlier stages in the life cycle of electronics. Alongside the significant efforts my colleagues made to salvage reusable materials at the RWMF, I also witnessed the trashing and destruction of many resources. For example, in their hybrid economic LCA, Deng et al. (2011) demonstrate that manufacturing accounts for 62-70% of the total energy inputs in the life cycle of laptop computers. The discard of laptops, even for recycling, as well as larger household appliances, inevitability results in the loss of embodied energy. The embodied energy of electronics refers to the total energy required in the creation of electronic equipment, including the energy used to assemble the equipment and that energy required to extract and manufacture the materials or components (adopted from Crowther 1999). The following interview except comes from a waste management expert in Alice Springs and speaks to the destruction of embodied energy from waste discarded at landfills.

> "One of the massive things in Alice Springs is, Alice Springs 2017 by the way, is we don't have recycling bins. We chuck [it away], throw it in the bin. And of course we're the end of that. And the end of that is a mess. You know, in the sense that we don't know what's gonna come in each and every single day. And it's hard to know where to put it and for now, it's all into the landfill. When it comes in a bin, it goes into a compactor, the compactor goes up into the landfill. There's not much more we can do about it".

The recyclable materials (glass, metal, cardboard, and e-waste) that I encountered were stockpiled for extended periods at the tip until someone else would collect them for further processing or the materials would become consigned to the landfill. Once deposited, the compactor renders the materials unsalvageable:

> "When it comes out the other end it's already ruined, whatever it was. Um so I think they used to have a curbside collection thing here when I first moved to Alice Springs… But I haven't seen it. Like you know, chuck out day. Chuck out your TV or whaaaaaaat-ever it might be and then council would go around and collect it all,

> bring it here [claps hands], and we'll go through it and what's really junk goes to the tip. If what doesn't, we sell in the shop."

The embodied energy of electronics that enter the tip shop, however, is temporarily preserved through reuse. In turn, this reduces the demand for cheap and new electronics in Alice Springs.

Towards the latter half of my fieldwork I came across Chuck[28], a local metal scrapper who got in touch with me using social media. When Chuck and I first spoke on the phone, he explained his interest in starting up an e-waste recycling business in Alice Springs. A friend of Chuck's in New Zealand had recently had success opening his own e-waste recycling business. Chuck shared with me that he and his friend both felt that e-waste recycling was due to become a "new age gold mining'. Having spent a significant time in remote communities, he contends that e-waste is "just everywhere. Literally, it's just everywhere! They are throwing away smashed phones and iPads, tube and LED TVs, and more".

Due to the limited and sparse population of Central Australia, the viability of e-waste recycling cannot rely upon a consistently large and predictable waste stream. Even if domestic e-waste stored in Central Australian homes was made available for local recycling, the quantitative reality is that the stores of e-waste in Alice Springs are likely too small to warrant the transport of recovered materials to interstate and international manufacturing facilities. As I argue in the following chapters five and six, I believe there is more potential for value recovery in the repair and reuse of electronics within Alice Springs rather than recycling. If, however, recyclers are able to use low-cost energy, then this would likely enable the recovery of materials from e-waste that are otherwise expensive to transport to Alice Springs. Micro-factories for the recycling and re-manufacturing of electronics are one possible workaround to this issue because they enhance the ability of innovative individuals to design more sustainable and resilient solutions to e-waste locally in Alice Springs (Sahajwalla and Gaikwad 2018).

4.6 Recommendation: Embracing the Generative Aspects of E-Waste

E-waste legislation in Australia privileges recycling as the predominant mode of resource recovery (Commonwealth of Australia 2014; Morris and Metternicht 2016). Furthermore, recycling approaches to resource recovery almost exclusively focus upon material recovery

[28] This is a pseudonym.

without a sophisticated consideration of the recovery of social resources ranging from labor to experiences of place and belonging. For example, Golev and Corder (2016) conducted a pilot study with the aim of taking stock of mobile phones currently kept in storage in Australia. This study frames the stock of mobile phones as a recoverable material. The authors define 'in-use stocks' as "the material in electronic products, and indeed all metals in society, whether active or dormant and not yet disposed of" and assert that information on these stocks is important so the investments into recovery operations can be properly informed (Golev and Corder 2016:2). Golev and Corder (2016) provide two useful recommendations from which I will build upon in this section: 1) to implement a better collection and recycling system to capture the metals and resources from Australian mobile phones and 2) the facilitation and wider enabling of mobile phone reuse to mitigate the shortening lifespan of these devices. These recommendations call on manufacturers and recyclers to mitigate the environmental impacts of electronics over their product life cycles. However, the recovery of resources from e-waste need not only be concerned with the recovery of valuable metals and the mitigation of environmental harm across the produce life cycle.

Although the following excerpt comes from a South Australian e-waste expert, it speaks to the duality of labor as both a social good and a key challenge for resource recovery across Australia. In particular, my interlocutor considers the costs of a mechanized approach to e-waste alongside manual disassembly:

> "The more mechanized approach has less employment than manual disassembly. Manual disassembly, and certainly with our economy, helps with jobs. And that's an important consideration here in South Australia. And you know, it's difficult, there's a price point there… Its labor cost that are the highest costs associated with some of this industry in terms of manual disassembly".

As my interlocutor continues, he draws attention to the challenge of paying for e-waste labor and the opportunities to involve social enterprise organizations in the creation of jobs for disadvantaged sectors of the community:

> "There has been, in the e-waste disassembly sector… a lot of social enterprise organizations that are using socially disadvantaged sectors of the community [to process] e-waste. So you know that's not to say they're not getting paid. You know their paid at a normal wage. But there are some benefits that they, for example I think they get some subsidies from the Australian government to do that. So it means in a lot of ways it's a subsidized work force.

He then continues to make an argument that manual disassembly, if not subsidized, would then put the labor cost out of the price market because e-waste recyclers would have to charge a fee to customers dropping off their e-waste. This concerns him because he believes it may result in e-waste ending up in landfill despite the South Australian landfill ban:

> "If you were to go to Victoria or New South Wales, you'll find a lot of the stuff just goes to landfill because it's cheaper. And so waste tends to follow the line of less economic resistance and labor costs are a, unfortunately are a part of that. And it's a bit of a catch twenty-two because we really need the jobs and yet [labor] is one of the highest part of the e-waste manual disassembly costs".

The economics of recycling e-waste within Australia, particularly the high cost of labor, cannot solely support resource recovery efforts. My interlocutor highlights the efforts of social enterprises who have sought out government subsidies to support the e-waste disassembly sector in South Australia. During my fieldwork, the management of e-waste was mostly limited to collection under the NTCRS and MobileMusters with the exception of household appliances and solar panels that were occasionally dismantled at the transfer station by the bottom crew. After being collected at one of a few drop-off locations, e-waste is then typically sent to a metropolitan recycling center to be processed, disassembled, and likely shipped internationally to be reprocessed into a usable commodity. However, the most significant aspect of this excerpt contains a moral dimension concerning the recovery of social and material resources from e-waste.

As argued above, there is a lot more at stake than simply the recovery of rare earth metals and the mitigation of environmental harm caused by mining, extraction, and manufacturing. The processing of e-waste locally within Australia requires a commitment to fellow Australians. In particular, valuing the work, knowledge, and benefits of processing e-waste locally, first for reuse and then for recycling, is only economically feasible if it is subsidized by the Australian government. Currently, the NTRCRS provides a means to transport specific types of e-waste from Alice Springs to major metropolitan centers. From a Central Australian perspective, however, the environmental and economic benefits of transporting e-waste over 1,500 kilometers are marginal at best. The recommendations outlined in this chapter assume that both the landfilling of e-waste and rapid consumer cycles are ecologically damaging and morally precarious. In order for the e-waste stream to become smaller and safer, it is vital that designers and engineers continue to identify find ways to minimize the amount of material used in

products, extend the useful life of products, and minimize the volume of toxic substances used in products. (Rathje and Murphy 2001:214). Subsidizing local reuse and recycling of e-waste within Australia, especially in remote Australia, could generate many jobs centered on social and material resource recovery.

4.7 Conclusion

There is a growing tendency for Australians and Americans to wall themselves off from disorder and the entropic breakdown of materials, relationships, and memories. This tendency is likely related to a significant change in the design and operation of landfills over the last few decades. In the mid-twentieth century landfills, were often open to family weekend scavenging excursions. Over the last several decades, gates have been erected around most landfills and entrance is more strictly regulated. Although the Alice Springs tip shop provides a public window into what residents discard, the early days of the landfill allowed residents to develop a much more intimate understanding of what gets thrown away, how things degrade, and whether or not an object is salvageable. Contemporary waste management facilities have exacted the ultimate means of forgetting by placing tons of waste out-of-sight and out-of-mind for most people. And yet, the practice of thrifting and salvaging items from the Tip Shop is evidence that many are continually choosing not to forget about discards. Furthermore, the junk drawer project illustrates a plethora of reasons why people hold onto electronics and the various steps people take to slow down the movement of electronics into the category of e-waste.

The time to appreciate and learn from the social life of discarded electronics is now. This ethnography provides evidence for a more nuanced explanation of how people and things are entangled in Central Australia. Throughout my fieldwork I encountered a proliferation of discarded electronics that are not merely waste at the end-point of consumption. Participant observation at the regional waste management facility outlines the need to reconsider regulatory barriers to resource recovery. When regulations and risk prevention reduce our ability to recover resources, they consequentially expose vulnerable populations around the world to continued exploitation. "Source reduction is to garbage what preventive medicine is to health- a means of avoiding trouble before it happens" (Rathje and Murphy 2001:14). Furthermore, while the minimization of e-waste in Alice Springs should be an immediate objective, there is still a great need for solutions aimed at handling the e-waste that has already entered the waste stream.

CHAPTER 5. NO TIME TO WASTE! HACKTIVISM AS ARCHAEOLOGY

> "In the three or so million years of humankind, we have never had more reason than we have today to try to understand our relation to our artifacts - what we manufacture, use, and discard - and how our artifacts both mirror and shape our actions and attitudes". (Rathje 1984: 9)

I have just returned from one last ride on my push bike to watch the summer sun begin its descent over the West MacDonnell Ranges. All of my belongings are packed and most of our furniture has been sold using a buy, sell, swap, and give group on Facebook. I sat on my living room floor soaking my eyes in the purples and blacks of the vibrantly depicted Seven Sisters Dreaming (Johnson 2011), emotionally and physically exhausted from clearing out the home I had cobbled together and occupied over the past year[29]. After a few minutes, my trance is broken by a droplet of condensation onto my pretzel crossed legs. The droplet had fallen from the Red Centre Devil Lager clasped by left hand. The beer, released just a few days ago, is billed as a bush tucker[30] brew featuring quandong fruit (native peach) from Central Australia. I would later from a conversation with a local brewer, who was gearing up to help open the first local brewery in Alice Springs since the early twentieth century, that this particular quandong lager was not actually brewed in Central Australia.

"Hold on now", I thought to myself. "What on red earth does beer have to do with e-waste in Alice Springs? Is old mate[31] going on another one of his pub rambles"? As it turns out, the early days of brewing in Australia are useful in helping to rethink strategies for locally reusing and recovering resources. For example, glass bottles tended to find their way back to breweries where they would be refilled, a practice still championed by contemporary home brewers in Central Australia. In a historical archaeology of bottle dumps around Alice Springs, bottles dating from 1910 to the 1950s were recovered southeast of the town in the foothills of the MacDonnell ranges (Holmes 1988). Archaeologist Kate Holmes concluded these bottles reflect the change from largely imported bottles up to about World War I, to the locally made variety (1988):

[29] See Alma Nungarrayi Granites' extraordinary illustration of the Jukurrpa in Hinkson (2014:142).
[30] The phrase 'bush tucker' refers to edible fruits, nuts, seeds and leaves that come from plants native to Australia.
[31] A colloquial Australian term used to refer to someone you do not personally know but whose identity can be deduced from a particular context. For example, when your friend notices a stranger spilling his beer as he walks across to his table at the pub, she may look in his direction and say aloud to you that 'old mate is having a bit of trouble'.

> "During the Depression there was a shortage of bottles, and some of the older greens were reintroduced, which may explain why some are present at Cramer's Farm. Another difficulty when attempting to date rubbish deposition from bottles is that a major aim of the bottle co-operatives was to re-use bottles. While it is unlikely that bottles in the Northern Territory were sent back to South Australia to be refilled, it is not known how old bottles may have been on arrival in the Territory, and how much local re-use was possible" (Holmes 1988:13).

Historical accounts of brewing in Alice Springs indicate that bottles might have been reused as early as the 1890s when Wesley Turton began brewing beer (Traynor 2016:142). The largest and most successful manufacturer of glass bottles in Australia when the telegraph station was built were most likely the Melbourne Glass Bottle Works Company, established in 1872 (Holmes 1988:11). They went on to gradually absorb a number of other factories and formed the Australian Glass Manufacturers (AGM) Company in December 1915.

Travel to and from Alice Springs was quite the ordeal between 1872 and 1915. The nearest train station was located over 700 kilometers south of the town. The Ghan reached Alice Springs on the newly completed railway for the first time in 1929. Prior to the railway and the Australian army's construction of Stuart Highway in the 1940s (Traynor 2016:259), most of the discards in Alice Springs would have either been reused or buried on individual lots. Although the Alice Springs Town Council (ASTC) would go on to recycle glass in roads and foot paths, the key point is that there is a precedent for Central Australians reusing and recycling locally so long as local industry can utilize the material.

5.1 No Time to Waste

Throughout my fieldwork in Alice Springs, I became attuned to the movement of secondhand electronics between individuals and households in Australia via social media, yard sales, and secondhand shops. Leveraging digital ethnography and archeology, I set out to record the circuits of reuse in Alice Springs. For the purposes of this chapter, reuse is understood as a process which occurs when an object, after some period of use, undergoes a change in the user (a person or social unit) or the activity of use (Schiffer et al. 1981:68). Reuse therefore includes the transference of secondhand electronic devices which have by definition undergone a change in user. Although secondhand channels typically do not involve market transactions, a digital archaeology of social media makes it possible to reveal patterns in the types of electronics

circulating and potential explanations for why some electronics cease to become waste. Furthermore, reuse may be regarded as a substitution of new things with those that have already been used by someone else or for something else (Lane et al. 2009), reducing waste which may otherwise be generated along the life history of electronics.

There is no time to waste. This chapter urgently draws our attention toward the heterogeneity, tonnage, toxicity, and persistence of electronic waste (e-waste) generated by the manufacture, use, and discard of electronic devices and digital infrastructure. The e-waste stream is a dynamic assemblage of ecologically persistent materials originating from discarded electronics and a wide range of waste products, such as lead and sulfuric acid, emanating from the mining of rare earth metals. The recycling and landfilling of e-waste expose humans living or working nearby to a devastating array of risks, physical illnesses, and social stigmas. The precarious qualities of this waste stream, as well as waste itself, are unevenly distributed across the places and people entangled in electronics manufacturing, consumption, and discard (Lepawsky 2018; Gabrys 2011; Parikka 2015).

Despite the vast quantity of waste arising in resource extraction and manufacturing (Lepawsky 2018:132-153), efforts to mitigate e-waste in Australia have been predominantly focused on postconsumer recycling supported by the National Television and Computer Recycling Scheme (NTCRS) and MobileMusters. Although the Australian Bureau of Statistics (ABS) broadly defines e-waste as "waste electrical and electronic equipment that is dependent on electric currents or electromagnetic fields in order to function" (2013), legislation is focused specifically on discarded televisions, computers, and mobile phones. However, other electronic devices may also become e-waste, including white goods (e.g. fridges, washing machines, dryers, etc.), home entertainment and stereo systems, toys, toasters, kettles and almost any household or business item with circuitry or electrical components (Babu et al. 2007:308; Pérez-Belis et al. 2014:17). Within e-waste there is also a useful distinction between 'end-of-life' electronics, which are discarded because they no longer work, and 'end-of-use' electronics, which are discarded because they are no longer being used (Ylä-Mella et. al 2015). Significantly absent from the critiques (Morris and Metternicht 2016) and reviews (Commonwealth of Australia 2014) of Australia's e-waste regulations and infrastructure are considerations supporting the repair and reuse of electronic devices that are still useable (for an exception see Lane et al. 2009).

While this chapter is titled ‘No Time to Waste!’ as a call to acknowledge the relationship consumers have to waste arising from the production, transportation, use, reuse and discard of electronics, it is also a call to reformat our relationship with time. The discarding of the 'old' to make way for the 'new' is a key characteristic of contemporary consumer societies (Crocker 2016: 6). In *Someone Else’s Problem*, Crocker (2016) rejects the idea that individuals *alone* are responsible for the environmental and social consequences of consumerism. Rather, there is a double-deception in which *both* the consumer and producer actively obscure and ignore the consequences of their consumption. The commodification of time has become an arbitrator of those activities considered to be wasteful and those found to be valuable. Later in this chapter I argue that Repair Cafés, a community event in which volunteers work alongside residents to repair household items, disrupt the common-held belief that time is money and that there is no time to waste. For some, “the idea of ‘time-saving’ can lead us to devalue or discount those more important, social and creative activities that take time but seem to have no monetary value” (Crocker 2016:171). My interlocutor’s decisions to repair, reuse, store, sell, or purchase an electronic device are indeed impinged by the time and resources each activity would take to complete.

In the case of Alice Springs, time-saving may lead to people consuming cheaply made products from supermarkets and superstores as well as utilizing ecologically costly forms of online shopping without taking the time to consider the consequences. With cheapness, however, comes uncertainty of an object’s quality and the socio-ecological circumstances in which that object was produced, consumed, and discarded (Fioratta 2019:88). Despite the relative ease of consuming cheap electronics in Alice Springs, I encountered many instances of individuals seeking to replace or repair their electronics by harnessing tight social networks of lawn sales and secondhand shops at times augmented by the utilization of social media. In tending to the strategies people use to keep electronics in circulation, this chapter diverges from studies within the domains of waste management (Li et al. 2009; Kiddie et al. 2014), ecology (Leung et al. 2008; Sepúlveda et al. 2010), and human health (Grant et al 2013; Liu et al. 2014; Liulin et al. 2011; Song and Li 2014, 2015; Zhao et al. 2010), which have predominantly focused on the effects of e-waste after it has already been discarded.

Instead, this chapter investigates the repair and reuse of electronics as a means for reducing the rate of waste production resulting from the mining of virgin materials by curbing

demand for new devices. Despite their best efforts, Australian product stewardship schemes do little to confront the full breadth of waste generated across the life history of electronics, nor do they address the full range of discarded electronics entering Australian landfills. Nevertheless, activities facilitating the reuse and recycling of non-regulated e-waste do exist in Central Australia. The primary purpose of this chapter is to establish a baseline understanding of what happens to the electronics in Alice Springs that are not entering landfill nor being transported significant distances to recycling and processing centers across Australia and Oceania.

5.1.1 Archaeologies of Waste

The waste stream generated across the life history of electronics entangles the technology we consume on a daily basis with deep time (Parikka 2015). The life history of electronics is deep both in the sense of materials mined from the Earth and the persistent durability of these materials upon being discarded. Whereas archaeology conventionally focuses on the past through the remnants people have left behind, this chapter defines archaeology as "a discipline that studies relationships between people and things in all times and all places" (Skibo and Schiffer 2008:6). This definition, derived from behavioral archaeology, encourages the application of archaeological methods and theories to the study of contemporary material objects circulating in ongoing culture systems (Reid, Schiffer, and Rathje 1975:866). Furthermore, this definition of archaeology integrates the present and future as viable arenas capable of shaping and being shaped by archaeological discourse. This of course requires an extension of archaeological considerations into an ethnographic present where activities such as the discard, reuse, repair, and circulation of secondhand electronics are underway.

The methodological approach implemented in this chapter is derived from the existing work of archaeologists in the United States and Europe whose have focused primarily upon contemporary refuse as a measure of human consumption. These archaeologists, or garbologists, quickly discovered that archaeological methods alone cannot adequately describe the conditions surrounding why some objects are discarded in landfills while others are stored, reused, or discarded elsewhere. Garbological investigations in the 1970s and 80s blurred disciplinary boundaries by integrating archaeological surveying, sampling, and cataloging with ethnographic methods. Archaeologists, now armed with an array of questionnaires and interview schedules, contribute to our understanding of discarded objects as an indicator of our cultural and material

metabolism, the rate in which we consume objects and symbols to maintain our physical and social forms (Brunclíková 2016; Sosna 2016; Schiffer et al. 1981). However, questionnaires and interviews are merely one facet of what can be gained from an ethnographic approach to garbage. The biases and limitations of garbage sorting differ from the biases associated with the use of informants, each of which produces a separate reality of discards (Rathje 1984:12). Research on garbage itself is therefore most useful when made in conjunction with what we can learn alongside our interlocutors. For example, archaeologists Brunclíková (2016) and Sosna (2016) have made an effort to draw more deeply upon ethnographic observations in their investigations of the everyday routines and rhythms of consumption and recycling practices in households and landfills.

This chapter extends the integration of archaeological and ethnographic methods in two ways. First, ethnographic and archaeological analyses are applied to the reuse of secondhand electronics in Alice Springs. Data collected using participant observation and semi-structured interviews is coupled with the analysis of a database documenting the circulation of secondhand electronics via Social Media in Alice Springs. The digital archaeology of secondhand electronics in Alice Springs reveals the actual diversity of electronics being reused outside the limited purview of Australia's e-waste management regime. This data also draws attention to the diversity of electronics which will inevitably still be discarded at some point in the future. Secondly, I consider the reflexive and applied dimensions of ethnographic practice as an integral facet of twenty-first century garbology by reflecting on my role as a waste activist in Alice Springs and the productive possibilities of hacktivism as a means to subvert the norms of consumption embedded within the life history of electronics. Here I use the phrase 'hacktivism' to refer to the creative reuse and repair strategies implemented by individuals seeking to challenge the designed obsolescence of electronic devices rather than using it describe a dimly lit room full of software coders hacking into government or corporate data systems (Delgado and Callén 2017).

5.1.2 Recyclability in Central Australia

In 1989, a journalist for the Centralian Advocate called on residents of Alice Springs to reconfigure their attitudes towards waste:

> "Australia's indifference to waste is colored by its abundance of "raw materials" and its small population. But as resources and their economic value start to dwindle, we are going to have to reassess our attitudes to waste. It's already happening but is it fast enough"? (Richards 1989)

Despite a significant amount of ecologically-minded residents changing their attitudes towards waste in Central Australia, the tyranny of distance (Blainey 2001[1966]) remains. Throughout my fieldwork, an overwhelming number of residents expressed frustration with the lack of recycling options in Alice Springs. At the time of Richards' report, nearly three decades ago, the Alice Springs Town Council (ASTC) choose not to utilize funds from rate payers to organize a curbside recycling service. Today, however, the ASTC manages the Regional Waste Management Facility (RWMF) consisting of a landfill, transfer station, and secondhand shop. Volunteering at the RWMF in 2017 illuminated the potent challenge distance presents for the recycling of plastics, cardboard, glass, and e-waste in Alice Springs. In 2018, these challenges were exacerbated by China's ban on imported plastic waste (Walker 2018). This led to the town council indefinitely postponing their plans to organize curbside recycling in Alice Springs.

Waste management experts in Central Australia are acutely aware of the costs of disposing rubbish in the RWMF and transporting recyclable resources. Alice Springs is centrally located 1500km inside of Adelaide and Darwin (See Figure 1.1), making it ecologically expensive to move products, people, and waste back and forth. The ecological costs of transporting discarded electronics from Alice Springs is further exacerbated by the long-distance transport recycled electronics must undertake if they are to reach one of the very small number of smelters on the planet capable of handling electronics as part of their inputs (Lepawsky 2018:89). In fact, a life-cycle-assessment (LCA) conducted by Barba-Gutiérrez, Adenso-Diaz, and Hoop (2008:487-488) suggests that the negative environmental impact of transporting discarded electronics (this case study analyzed a washing machine, refrigerator, a TV set and a personal computer) by road for 500km cancels out any of the positive impacts on greenhouse gas (GHG) emissions gained by recycling. Discarded electronics originating in Alice Springs have to travel three times this distance if they are going to be recycled and processed at the nearest recycling facility in Adelaide, even further if they are going to reach a viable smelter. During an informal chat with a waste and recycling educator in the Adelaide Hills of South Australia, she explained that metal recyclers only want e-waste if it contains easily accessible and high-value metals. She explains that recyclers have been known to call her up and say they are 'no longer

taking this or that'. She attributes this to a higher ratio of plastics to metals in electronic devices than in the past.

Distance plays a significant role in the proliferation of waste and pollution emitting across the life history of electronics. The more things travel into, out of, and at times around or under Alice Springs, the more difficult it is to link those things to the production of waste and consumption of ecological resources. Although Alice Springs, an infrastructural hub for the vast and remote interior of Central Australia, has the organizational capacity to collect discarded electronics to be sent interstate, this chapter challenges the general desirability of recycling. The recyclability of electronics is both materially and logistically limited. Although televisions and computers may be lighter and sleeker than their earlier incarnations, the sheer number of devices as well as the ability of recyclers to access valuable materials within them remains a vexing challenge. During an interview with a waste management expert in Alice Springs, my interlocutor asserted that Australia's bias towards recycling is, in part, due to its reliance on a material exports market and the lack of an in-between industrial layer that would adequately facilitative remanufacturing and reuse at a large scale. This chapter, however, investigates the potential of localized repair and reuse within Alice Springs as viable alternatives to the recycling and landfilling of e-waste.

5.2 Towards an Applied Archaeology Investigation of E-Waste

In the past decade, anthropologists, sociologists, and geographers have begun to document the complexities of e-waste, helping to challenge garbage myths emerging around the de-materialization of digital objects and the global flow of discarded electronics (Gabrys 2011; Parikka 2011; Pickren 2014; Lepawsky and Mather 2011; Taffel 2015; Little and Lucier 2017; Lepawsky 2018). However, e-waste remains an onerous challenge for waste management professionals and activists in Central Australia. In order to map out these challenges, this chapter incorporates garbology, ethnography, and hacktivism to conduct an applied archaeology "in and of the present" (Harrison 2011:141).

By tracking garbage, rubbish, detritus, trash, and waste across homes, businesses, and landfills, garbologists can aptly describe the transience of objects, the interrelations of objects and people, and the enduring materiality of those objects after their initial discard (Gabrys 2011:16). From its inception, garbology has made contributions to both archaeology and the

realm of waste management. The Garbage Project, conceived by the late William Rathje, was designed to demonstrate the utility of archaeological methods and theories for achieving a better understanding of contemporary issues. Over three decades Rathje and others have conducted work in a range of locations including Tucson, Phoenix, New Orleans, Milwaukee, Marin County (California), Mexico City, and Sydney, Australia. At least fifteen landfills in the US and Canada were excavated during the course of the Garbage Project (Tani and Rathje 1995). Rather than relying on self-reported behavior or self-perceptions, Rathje and his colleagues relied upon garbage as a key measure of purchasing, consumption, and discard behaviors (Tani and Rathje 1995). By investigating the interaction of artifacts, actions, and attitudes, garbology is well suited for evaluating our current conditions, anticipating change, and helping to design, plan, and make policy decisions with fewer unexpected side effects (Rathje 1984:10).

The Garbage Project is inherently an applied archaeology investigation tasked with exploring "the potential contributions of refuse research by providing valuable data to as many researchers and policy planners in as many areas of interest as possible" (Rathje 1984:12). More than thirty years of garbology have produced a number of general policy and behavioral suggestions which extend archaeological analysis into the domains of policy and waste management. Garbology proved useful as a means to support waste minimization programs, to measure diet and nutrition, to evaluate levels of household participation in recycling programs; to identify household-level sources of hazardous wastes; to cross-validate census counts, and to provide base data for the design of new "environmentally friendly" packages" (Rathje 2001:63). However, Rathje and Murphy (2001) insightfully point out that there are no silver bullets to handling garbage. Because of this, we must be willing to pay for its disposal and management as a public service. They suggest that we may only be able to make small incremental changes in household behavior. Overall, the Garbage Project provided a means to more reasonably assess the risks associated with garbage and the ability to educate the next generation about these risks without relying on myths (Rathje and Murphy 2001).

Jennifer Gabrys (2011) begins to document the scale and complexity of e-waste in her book titled **DIGITAL RUBBISH THEORY: A NATURAL HISTORY OF ELECTRONICS**. Although the garbology of electronics may have an obvious reference points in landfills, Gabrys (2011) illustrates how electronic debris also expand, sift, and settle in an array of other places— from superfund sites in the United States to recycling and processing centers, telecom towers, and

internet access points. The interactions of electronics, media, landscapes, and waste requires the expansion of garbology to sites that investigate new residual ecologies. My reading of Gabrys' framework elicits an informative connection between a distinctively electronic version of garbology and the recent emergence of digital ethnography as a methodological entry point for answering the following interrelated questions: What is wasted along the life cycle of electronics? How and where does this waste circulate?

5.3 Digital Ethnography: Tracking Discarded Electronics

Throughout my preliminary research in South Australia it became increasingly apparent that social media plays a vital role in the circulation of secondhand electronics in Australia. More than five thousand people in Alice Springs, at least 20% of the town's population, are currently using buy, sell, and trade pages on Facebook to help move their electronic devices amongst other objects. In order to understand how discarded electronics are circulating in Alice Springs, this chapter adopts five key principles for conducting digital ethnography (Pink et al. 2016).

The first principle of **multiplicity** implies that there are many ways to engage with the digital (Pink et al. 2016:8). For example, digital technologies require attention to the materiality of infrastructures which disseminate digital media, various theoretical frameworks for understanding the 'digital' (Horst and Miller 2012), and the variable interests of different research partners, stakeholders, and participants. Ethnographers must become attune to the impact of these infrastructures on both research participants and the researchers themselves. Secondly, **non-digital-centric-ness** refers to the decentering of the digital in digital ethnography. This principle is rooted in media studies and media anthropology. Pink et al. (2016:10) assert that this decentering helps us acknowledge the ways in which media is entangled with other activities, technologies, materialities, feelings, and experiences. Within the context of studying the movement of secondhand electronics, it is vital to recognize that social media does not exist in isolation from the non-digital. The digital must be understood as *part of* something wider. Third, **openness** refers to digital ethnography as a research method that not bounded. Rather than being a unit of activity with a beginning or end, it is processual. Reflecting on the sharing and collaboration that occurs in open source projects and creative commons, Pink et al. (2016:12) view digital ethnography as a collaborative and participatory process in which researchers and participants produce knowledge collaboratively via their digital interaction. Fourth, **reflexivity**

goes beyond the simple idea of 'bias' and engages with the subjectivity of the research encounter. Digital ethnographers might reflectively engage with questions about how we produce knowledge and our relationships with the digital (Pink et al. 2016:12-13). Lastly, **unorthodox** means that digital ethnography requires attention to alternative forms of communicating including imagery, digital media such as websites, and interactive media that goes beyond the 'broadcast' model of dissemination. Unorthodox approaches enable new forms of continuity between fieldwork, enhanced means of collaboration and dialog with research participants, and new possibilities for the dissemination of ethnographic findings (Pink et al. 2016:14). Each of these principles of digital ethnography inform the possibilities of hacktivism, reuse and repair activities aimed at confronting designed obsolesce, as an experimental and applied archaeology of the digital.

5.3.1 Social Media and the Reusability of Electronics

When describing social media, especially as it applies to the circulation of secondhand objects, it is important to establish what differentiates it from other forms of media. Rather than defining social media as individual platforms with particular affordance, Miller understands social media to be a 'scalable sociality' (2016:3). Whereas previous forms of media facilitated either a dyadic conversation or public broadcast, the boundaries of social media are much more permeable, allowing for a more nuanced range from private to public and from small to large groups. Social media platforms are, by this definition, scalable. In **SOCIAL MEDIA IN AN ENGLISH VILLAGE**, Miller (2016) provides ethnographic evidence that demonstrates the ways in which social media complicates the normative separation of the public and private spheres while also becoming a vital tool, in part due to its scalability, for the reification of this division in a culturally consistent manner. In summary, Miller argues that new modes of visualizing and broadcasting people's private lives on social media threaten to create embarrassing and anxious situations for residents of the English Village where Miller conducted his fieldwork (2016:187). As a scalable sociality, Miller observed the villagers using social media to reify what he deems to be a characteristically English buffer between the private and public spheres. Social media creates situations for residents of Alice Springs to scale their interactions with people, places and things in a culturally consistent manner. While this social buffer proved culturally salient in the

English Village, attention to the circulation of secondhand objects in Alice Springs reflects and reifies experiences of remoteness and place-making in the Outback of Central Australia.

In the case of Central Australia, it is clear that the reuse of electronics is not only scalable across digital platforms, but also brick and mortar secondhand shops, lawn sales, and informal agreements between individuals as they travel to and from Alice Springs throughout various seasonal, funding, and employment cycles. In other words, the circulation of secondhand objects in Alice Springs is a translocal experience that brings together specific assortments of people, places, and things both online and offline. McFarlane (2009) uses 'translocal' to indicate a blurring of the local and global at the confluence of social movements. In order to better understand the role of social media in the circulation of secondhand electronics, I collected and sieved through 9,240 Facebook posts from a 'buy, sell, swap (or trade), and give' (BSSG) page used predominantly by residents of Alice Springs. These posts were often written in tandem with the other nodes of secondhand activity mentioned above.

5.4 Digital Archaeology Methods

As part of my broader ethnographic research in Alice Springs, I began by collecting data once a week from a public reuse/resale Facebook group with the intention of tracking the types of secondhand electronic objects circulating online in Alice Springs. I spent approximately eight hours per week extracting and analyzing data between May 1st and December 31st 2017. This data was collected using NCapture, an online data capture tool, which was then imported into NVivo 11, a Qualitative Data Analysis Software (QDAS) to create a continuous database of posts indicating the movement of secondhand electronics. In order to ensure that users of this public Facebook were aware of my intentions as a researcher, I designed a separate researcher profile on Facebook with a detailed description of my research procedures. Murthy (2008:840) cautions scholars who conduct research *with* the Internet to critically consider the Internet as a space which is also imbued with particular power relations. Therefore, the design of digital archaeology projects should critically address the power relations between the researchers and those being studied to ensure that all preventions are taken to maximize the prevention of harm. To ensure that the social media data I collected using NCapture is kept confidential, personal identifiers such as names and profile pictures were not curated. I made clear on my researcher profile that per the request of an online user, I would forgo and delete any observation or record.

I also ensured online users that data can and would be removed from my records per their request at any point during or following the study. All personal identifiers were cleaned and deleted from the data.

From May 1st to August 25th 2017, data was collected once a week and then stitched together as a singular dataset in NVivo 11. However, during the data collection period I encountered an unexpected obstacle. On August 25th, 2017 I noticed that the Facebook API (Application programming interface), which had previously allowed me to collect the whole dataset each time I ran NCapture, was now only enabling me to collect the most recent one hundred posts. Upon reaching out to QSR International, the makers of NVIVO and NCapture, it was determined that Facebook, which determines how many posts you can collect, permanently reduced the amount of posts that could be collected using NCapture. This limitation on data collection caused me to reevaluate how often I collected data, switching from one per week to every other day, and likely resulted in an insignificant loss of data during the week of August 25th.

Eden (2017) also collected and analyzed social media posts in her case study of a Freecycle group in the United Kingdom. For this case study 1,355 posts were collected using participant observation online, but there is no mention of how these posts were recorded. It is unclear if Eden manually transcribed each post from the page she observed sometime during her fieldwork (2017:266). Nevertheless, Eden (2017) encounters and codes for four basic types of Freecycle posts which highlight the circularity of Freecycling: 'Offer', 'Taken', 'Wanted', and 'Received'. Eden (2017) bridges together the literature on prosumption, the reintegration of production and consumption (Ritzer and Jurgenson 2010), and the literal expressions of Freecycler's to illustrate how Freecycling collectively produces, changes, and reproduces the moral ordering of objects, how objects are valued, and the various paths these objects follow. Unlike Eden's (2017) Freecycle Case Study, this chapter hones in on the circulation of secondhand electronics in Alice Springs and treats the dataset of secondhand electronics as a digital archaeological catalog.

5.4.1 Designing a Typology for Secondhand Electronics

Although the Facebook page I analyzed included a wide variety of secondhand items, the primary focus of this study was to assess and categorize the secondhand electronics being circulated in Alice Springs. I employed a dual classification approach to make aspects of my

analysis comparable and to also keep my analysis open to the actual variety of secondhand electronics that I encountered. I elected to use the European Union's WEEE Directive Classification scheme, which consists of 10 categories (Table 5.1) in order to compare the circulation of electronics via social media with those being recycled or landfilled in the Australia, the United States, and the European Union.

Table 5.1: Ten Categories of the European Union's WEEE Directive (Table by author)

WEEE Classification	Description
1.	**Large Household Appliances:** Example: Refrigerators, Washing Machines, Air Conditioning Units)
2.	**Small Household Appliances:** Examples: Coffee Makers, Toaster Ovens, Electric Kettles; Other Kitchen Appliances; and Vacuum Cleaners
3.	**IT and Telecommunications Equipment:** Example: Mobile Phones, Laptops and Tablets; Printers, Personal Computers, Computer Servers
4.	**Consumer Equipment:** Example: Televisions, Radios, and Musical Instruments
5.	**Lighting Equipment:** Example: Lamps, Globes/Light Bulbs, and Compact Fluorescent Tubes
6.	**Electrical and electronic tools:** Example: Power Tools and Sewing Machines
7.	**Toys, leisure and sports equipment**: Example**:** Videogame Consoles, Remote Control Toys, Fitness Equipment
8.	**Medical devices:** Example: Dialysis Machines, Medical Freezers, and Cardiology Equipment
9.	**Monitoring and Control Equipment:** Example: Thermostats, Smoke Detectors, and Digital Scales
10.	**Automatic Dispensers**: Example: Money Dispensers, Vending Machines; Cash Registers, and Hot Drink Dispensers

Although the EU classification scheme is extensive, it does not incorporate all existing and possible electronically imbued objects that have been or may be discarded. Items that did not meet any of these categories but were still considered to be secondhand electronics or interrelated to electronic devices and infrastructure, were given an 'unspecified' designation. Furthermore, the aggregate groupings within the EU classification scheme were designed for tracking mass quantities of e-waste at the costs of identifying qualitative differences between types of e-waste. Due to the analytical limitations of the WEEE classification scheme, I opted to also create my own types and subtype categories for the analysis in order to make sense of the particular electronics being circulated in Alice Springs (see Figure 5.2). The coding of types and subtypes was an iterative process with codes being readjusted multiple times and new codes being added weekly. I also came to learn more about the types of secondhand electronics being exchanged while conducting ethnographic fieldwork at a local secondhand shop.

5.4.2 Describing the Data

In total ***9,240 Facebook Posts*** from a public Central Australian buy, sell, swap, and give webpage were coded in Nvivo11 and then extracted for analysis in Microsoft Excel. Of these posts, a sum of 1,976 secondhand electronics was recorded (Table 5.2). **Table 5.2** refers to the total sum and the total count of electronics that were coded as 'buy', 'sell', 'swap' or 'give'. The *sum* refers to the total number of electronics of one type listed in each post. The *count* refers to 1 post. The count is likely to be more useful when comparing across categories such as lights, DVDs, and videogames because these items were more often listed as bundles or multiple entries per post while other categories such as refrigerators, mobile phones, and power tools were not. It would therefore be inappropriate to use the Total Sum when comparing multiple categories. Although I coded for CDs, DVDs, Blu-ray Discs, Videogame disc and cartridges, and Vinyl records, I have decided to analyze these separately from the main collection. These items have a parent code titled 'Unspecified_Discs and Cartridges' which makes them easy to filter out when necessary (See Figure 5:3). The codes 'buy', 'sell', 'swap', 'and 'give' refer to the post as it was written from the perspective of the poster. For example, if someone wrote "WTB (want-to-buy) an iPhone 6s with 64gb of memory", this post would be coded as 'Buy'. However if that post were to be written as "iPhone 6s with 64gb of memory for sale. Selling due to upgrade", then the post would be coded as "sell".

Table 5.2: Total Secondhand Electronics by Sum and Count (Table by author)

	Buy	Sell	Swap	Give	Total
Sum	145	1,770	8	55	**1,976**
Count	142	1,481	8	51	**1,669**

Figure 5.1 shows that about as many large and small household appliances (WEEE categories 1 and 2) are being circulated as televisions, computers, and mobile phones (categories 3 and 4). However, size and weight of the large and small household appliances is typically larger than most televisions, computers, and mobile phones. The reuse of these appliances therefore is an important consideration for the volume of WEEE being diverted from landfill. Throughout my fieldwork, key personnel at the Town Council and the Regional Waste Management Facility (RWMF) emphasized the importance of reducing the volume of waste entering landfill. **Figure 5.2** visualizes the type of electronics that were coded based on observations in the field as well as patterns in the social media dataset collected between May 1st and December 31st 2017. This dataset is much more expressive than the WEEE categories in **Figure 5.1**.

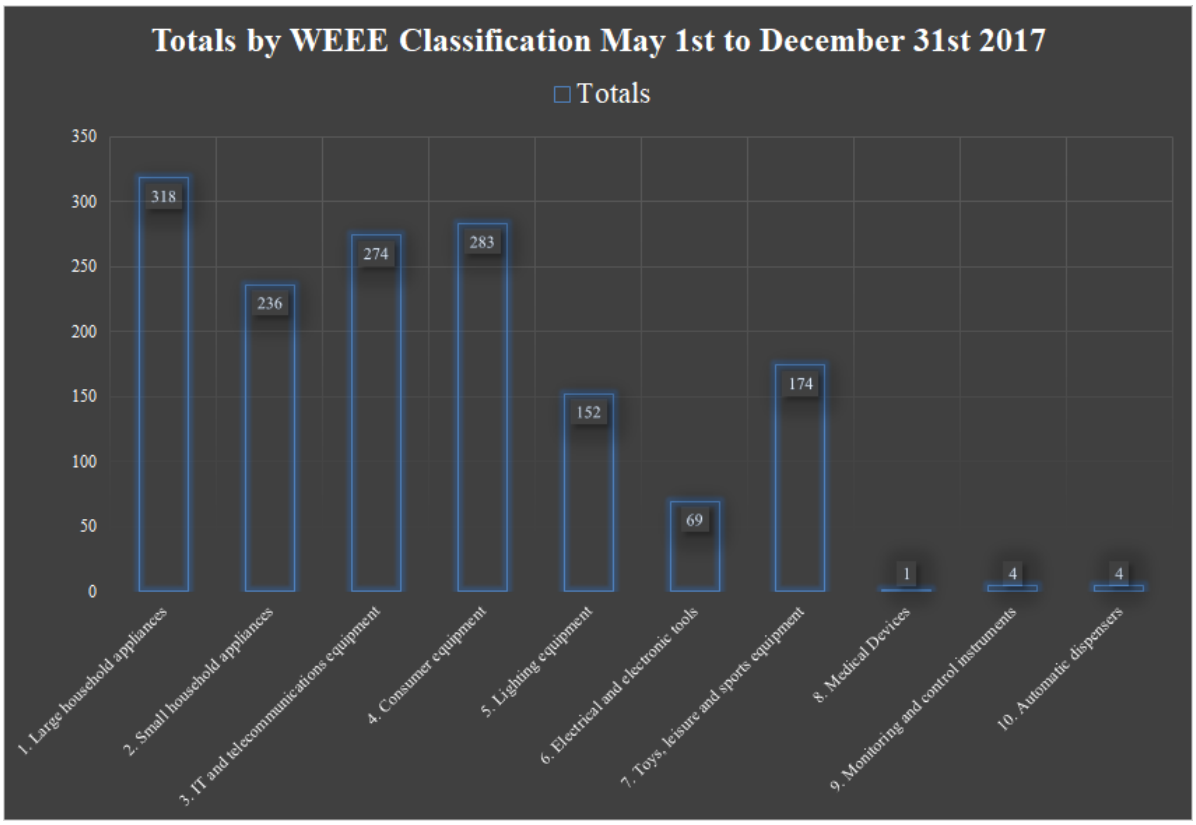
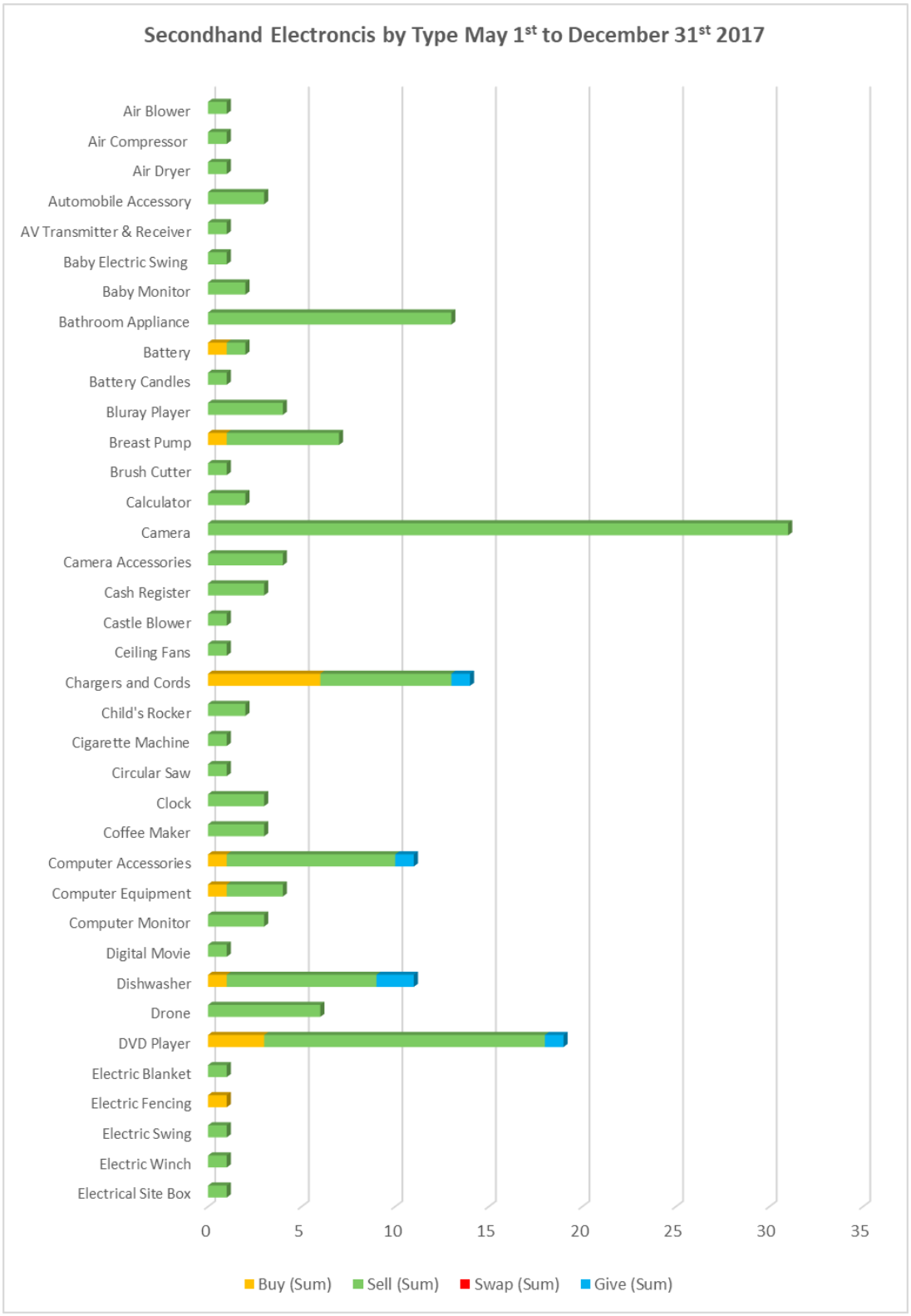
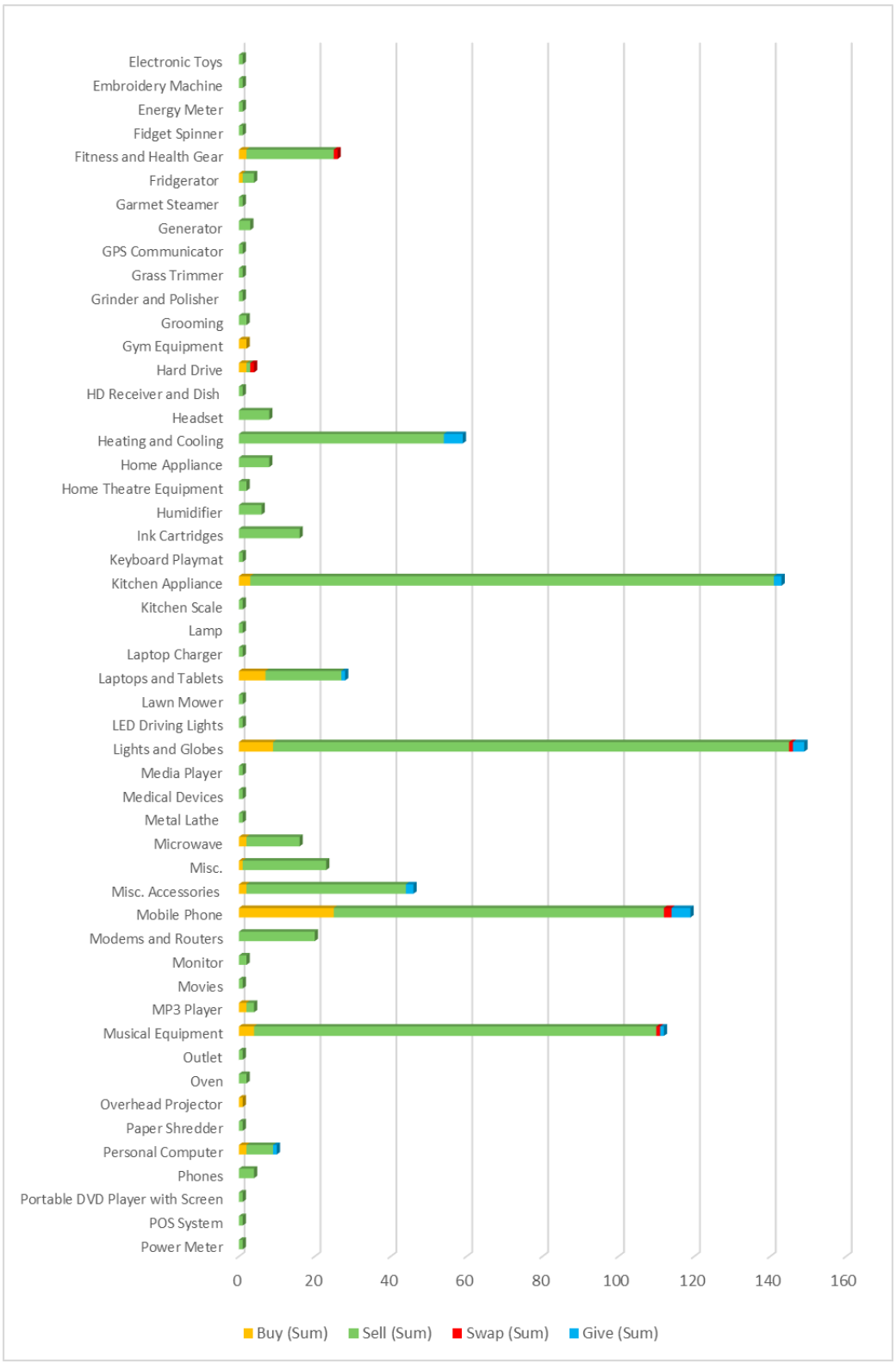


Figure 5.1: Totals by WEEE Classification May 1st to December 31st 2017 (Figure by author)


Secondhand Electroncis by Type May 1st to December 31st 2017
Air Blower
Air Compressor
Air Dryer
Automobile Accessory
AV Transmitter & Receiver
Baby Electric Swing
Baby Monitor
Bathroom Appliance
Battery
Battery Candles
Bluray Player
Breast Pump
Brush Cutter
Calculator
Camera
Camera Accessories
Cash Register
Castle Blower
Ceiling Fans
Chargers and Cords
Child's Rocker
Cigarette Machine
Circular Saw
Clock
Coffee Maker
Computer Accessories
Computer Equipment
Computer Monitor
Digital Movie
Dishwasher
Drone
DVD Player
Electric Blanket
Electric Fencing
Electric Swing
Electric Winch
Electrical Site Box
0
5
10
15
20
25
30
35
Buy (Sum)
Sell (Sum)
Swap (Sum)
Give (Sum)


Electronic Toys
Embroidery Machine
Energy Meter
Fidget Spinner
Fitness and Health Gear
Fridgerator
Garmet Steamer
Generator
GPS Communicator
Grass Trimmer
Grinder and Polisher
Grooming
Gym Equipment
Hard Drive
HD Receiver and Dish
Headset
Heating and Cooling
Home Appliance
Home Theatre Equipment
Humidifier
Ink Cartridges
Keyboard Playmat
Kitchen Appliance
Kitchen Scale
Lamp
Laptop Charger
Laptops and Tablets
Lawn Mower
LED Driving Lights
Lights and Globes
Media Player
Medical Devices
Metal Lathe
Microwave
Misc.
Misc. Accessories
Mobile Phone
Modems and Routers
Monitor
Movies
MP3 Player
Musical Equipment
Outlet
Oven
Overhead Projector
Paper Shredder
Personal Computer
Phones
Portable DVD Player with Screen
POS System
Power Meter
0
20
40
60
80
100
120
140
160
Buy (Sum)
Sell (Sum)
Swap (Sum)
Give (Sum)

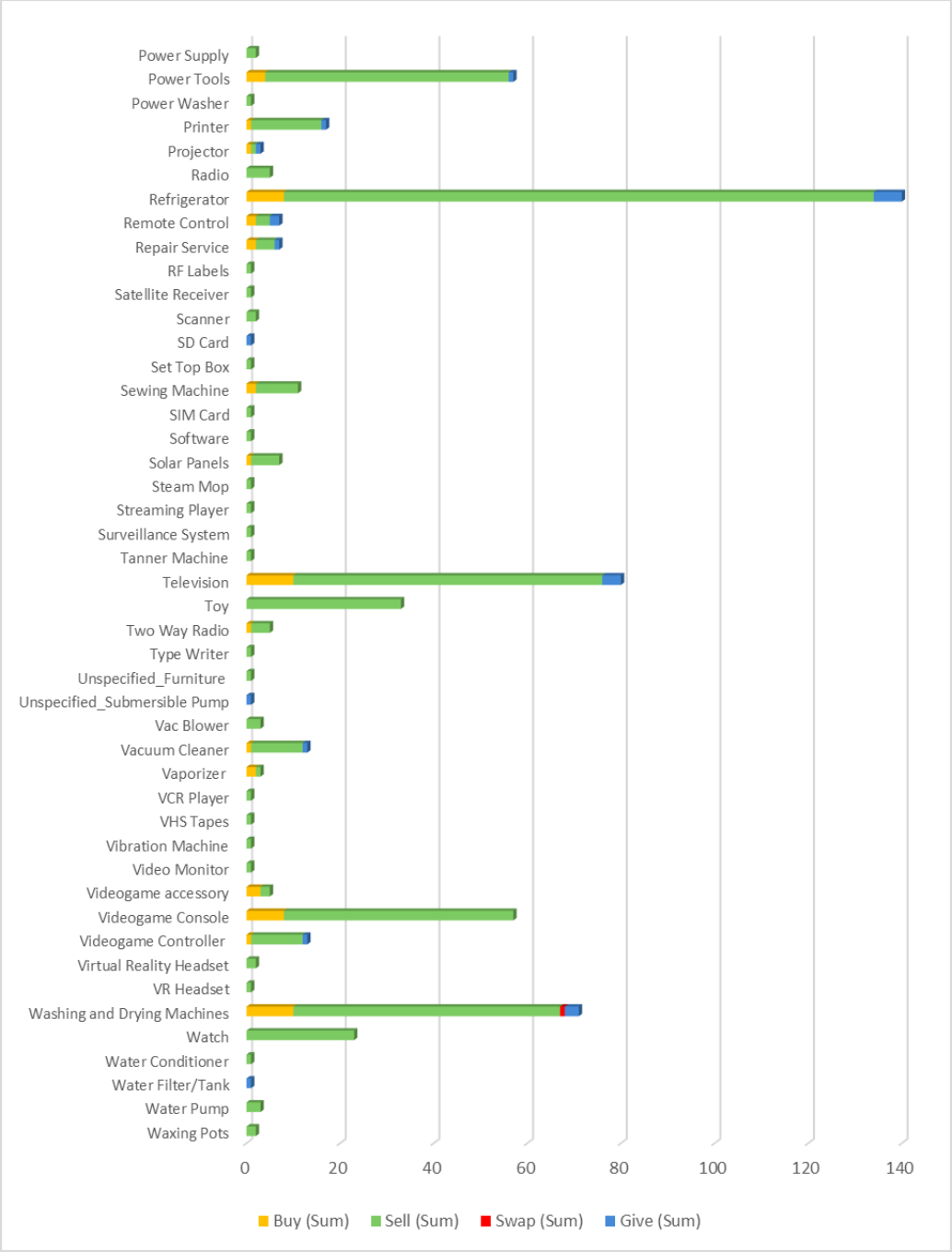


Figure 5.2: Secondhand Electronics by Type May 1st to December 31st 2017 (Figure by author)

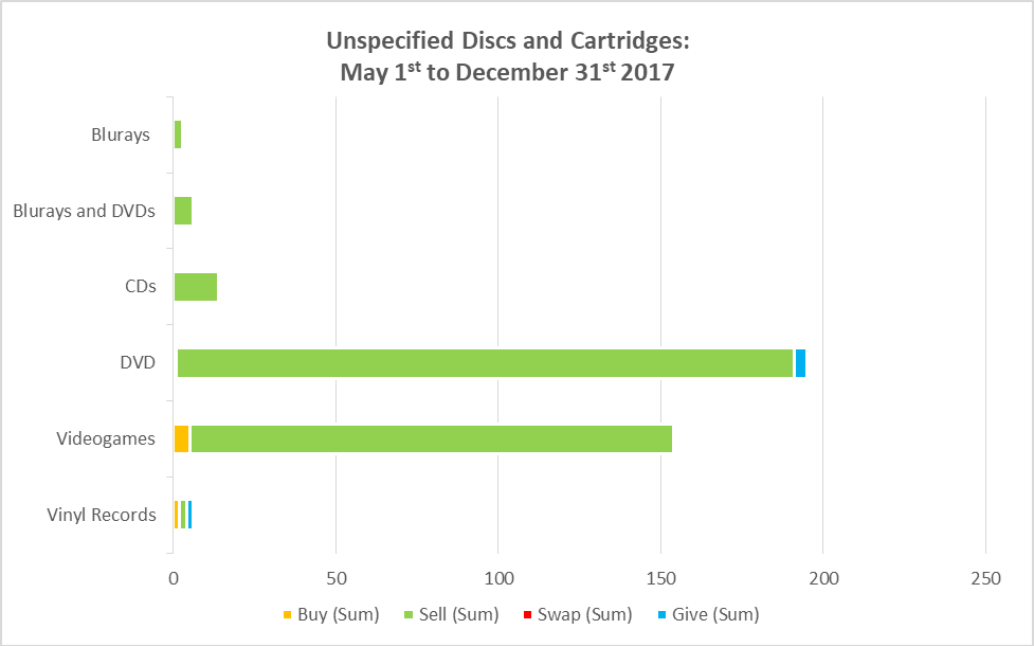


Figure 5.3: Unspecified Discs and Cartridges May 1st to December 31st 2017 (Figure by author)

5.4.3 Key Findings

European scholars have identified a number of general barriers to reuse ranging from the availability of good-quality equipment to regulations, standards, and product design which actively interfere with an individual's ability to repair and reuse equipment (Kissling et al. 2013). And yet, reuse arising from the circulation of secondhand electronics in Alice Springs extends the lifespan of electronic devices; thus reducing the consumption of new devices and the material and energy inputs that these new devices would require. Throughout my fieldwork I encountered significant amounts of large household appliances being swapped, as evident in the social media data (Figures 5:1 and 5:2) and scavenged across town. While e-waste policies in Australia target a portion of IT and telecommunications equipment and consumer electronics and information (WEEE Categories 3 and 4), a significant number of large and small household appliances (WEEE Categories 1 and 2) are circulating in Alice Springs. Category 1 and 2 electronics should be of key consideration as Australia expands its product stewardship of electronics. Furthermore, product stewardship can better support the repair and reuse of these items by supporting existing pathways for reuse.

While coding via WEEE categories is a useful method for identifying broader discard patterns, these aggregated classifications mask the heterogeneity of electronics moving between households in Alice Springs. In addition to conventional types of e-waste like mobile phones, televisions, and computers, **Figure 5.2** documents everything from electric breast pumps and fish tanks to power tools, musical instruments, and solar panels. **Figure 5.3** merely begins to document the physical residues of media which would otherwise not exist in Alice Springs without the appropriate hardware for reading these discs and cartridges. Although Alice Springs does not have a VHS or DVD rental store, the tip shop also routinely sells secondhand films and videogames from the 1990s and early 2000s.

Why do people discard functional electronics?

As a particular form of discard involving items that are often still functional, investigating reuse offers some explanations for why people choose to discard functional electronics. However, simply coding for the numbers of secondhand electronics being bought, sold, given away, or traded does not account for the reasons why these activities are taken place. During the process of preliminary coding, I began to notice that my dataset contained descriptions of the electronics being circulated as well as why some electronics were being sold. In other words, this dataset provides a window into the logic of why electronics are moving around in Alice Springs. Additional coding of the dataset was conducted to compile a list of reasons why people claim to be selling their electronic devices (**Figure 5.4**). In addition to reasons listed in each respective post, ethnographic fieldwork throughout 2017 helped provide opportunities for gaining deeper insights into why some secondhand devices are being circulated online. In order to triangulate these claims, these data can then be related to ethnographic data collected using participant observation and semi-structured interviews in the households of Alice Springs.

The social media data indicates that people tend to buy more electronics and electronic appliances than they use on a regular basis. While the majority of reasons items were being sold were due to the seller having upgraded from an older model to a more recent model (n=55), an additional 39 posts suggests that the movement of people within Alice Springs, interstate, and internationally has a significant impact on useable electronic devices entering secondhand circulation. Others were selling on behalf of someone else, or because they had mistakenly purchased the wrong device.

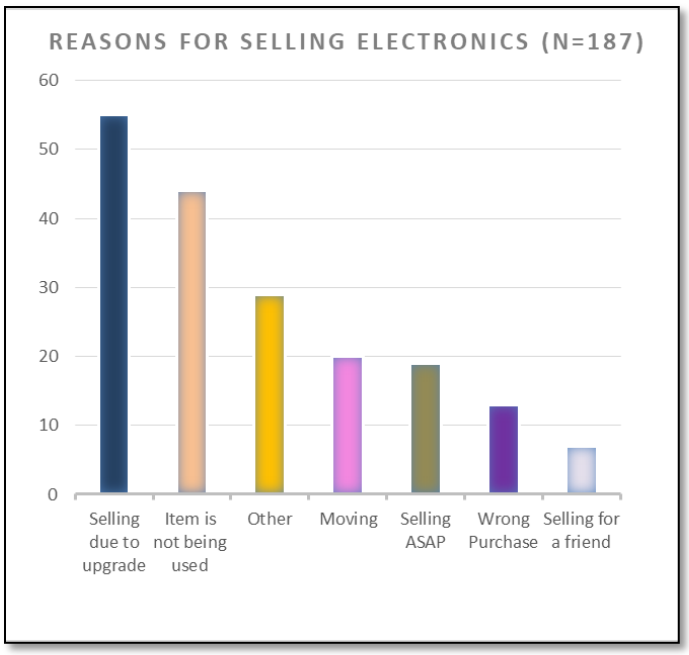


Figure 5.4: Reasons for Selling Electronics (n=187) May 1st to December 31st 2017 (Figure by author)

I also learned about discarded devices that were still in working order during public interviews conducted during e-waste collection events at the RWMF. A total of 24 public interviews were conducted across three separate occasions in August, October, and November 2017. For example, while dropping off a printer at the transfer station, a retired Firefighter explained to me that he was "just trying to downsize and sort things out". Although he was no longer using the printer, the retired firefighter confessed that the printer was still functional and could indeed be used by somebody else. Similar explanations were repeated for the printers, televisions, and computers that were dropped off during the collection events. In addition to downsizing ─ and in agreement with the social media dataset ─ moving from one house to another was also cited as a common reason for people using the e-waste collection service. Furthermore, this list provides a baseline for investigating why people might choose to discard electronics for secondhand circulation.

The Reusability of Discarded Electronics

The secondhand circulation of these electronics prevents a wide range of non-NTCRS covered devices from ending up in landfill. During an interview with a waste management expert at the RWMF, I asked about what happens to vacuum cleaners and microwaves that find their way into the transfer station. The replied I received describes the semi-ultimate fate of these items:

> **"**Well unfortunately they're sent to landfill. If we capture them before they go in, we'll take… like the microwave will go to the metal pile. But usually vacuum cleaners, hair dryers, pedestal fans, um yeah, anything other than computers, TVs, printers, usually goes in landfill**.** There's no… and that's for a host of reasons. We don't have people here to pull the little motors out and things like that. If we did, we would. But yeah, they just got to landfill".

While my interlocutor draws attention to a lack of labor resources available at the RWMF, I also became aware of other reasons why these items are landfilled during ethnographic fieldwork. Aside from larger items like microwaves and washing machines, small household appliances are much more likely to be discarded into rubbish bins or thrown directly into general household waste dumpsters at the transfer station. Residents are often told that these items are not accepted at the secondhand shop, usually because the shop lacks the capacity to test and tag, the formal regulatory process for ensuring the safety for electrical equipment in Australia. The shop keeper explains that the Alice Springs Town Council is liable if they sell a secondhand electronic that causes damage to someone's health or property:

> "Yeah so basically I sell what I know will sell, i.e. TVs which is pretty much it. I keep all the cords for computers. Don't really sell computers… there's way too many going-ons with the computer. So if I do test a computer, I just give it to them for five bucks and say look 'you can pull it apart yourself if you want to. It might work, it might not. But all I can tell you is it's not gonna go pop and bang, wiz, in your bedroom'. So I… I'm paranoid because I was electrocuted years ago and I just don't like doing it all".

It is clear that the shop keeper is concerned about the liability that someone being harmed by a faulty electronic presents. As an additional precaution, staff at the transfer station are instructed to cut the wires and cables off of televisions in order to mitigate trespassers from coming into the RWMF and steeling electronics or other things at night. Later in our interview he draws attention back towards liability as a key difference between the secondhand shop at the RMWF and other secondhand shops around Alice Springs:

> "And for me, I'd rather not sell it and throw it in the bin. Unfortunately, [if] someone goes home and it goes pop, bang, wiz, [they can] sue the council. Because it's a… it's not like an op shop[32] in that respect".

For these same reasons, resalable computers and televisions are also rarely brought into the secondhand shop at the RWMF. There are, of course, exceptions. On one occasion, a Samsung tablet was brought into the shop while I was working behind the counter with Courtney[33]. Whenever a device like this came along, the RWMF employees had the option to barter with the shop keeper. Furthermore, the shop also kept a wish list for its employees and regular customers. Except for these rare occasions, which I witnessed twice during my hundred hours of participant observation, the majority of electronics end up being sent for recycling, if they are covered by the NTCRS, or sent straight to landfill. In the next quote, the shop keeper describes the type of electronics he prefers to keep at the shop:

> "I prefer to have old things in the sense of like old arty things. Like you know, old TVs, you've seen them. Like old vacuum cleaners down there and things like that. And that would be more so to put in the shop somewhere rather than sell. I think, there's a very old TV there. There's an extremely old record player there. Not for sale they're just purely to art the place up to make it look a little bit more authentic".

He then stresses that the resale of electronics does not produce a significant income for the shop:

> "It's not really an income base. It's more if there is an income it's more [for the scrapper] than the shop… You wouldn't be able to sell it for any more than a couple of dollars because you get a brand new toaster from Kmart for five bucks or six dollars and sixty cents, something stupid like that. So there's no resell value in it at all".

In each of these quotes it becomes clearer that the reusability of discarded electronics at the RWMF is limited by issues of liability and economic viability. Due to the cheapness of newly available electronic appliances from stores such as Kmart, my interlocutor believes that the secondhand shop cannot afford to spend time certifying that toasters, kettles, and hair dryers are safe for use. Despite these obstacles, however, the social media dataset, described earlier in this section, documents a powerful alternative for residents of Alice Springs to circulate their secondhand electronics.

[32] "Op shop" is short for opportunity shop. This is analogous to a thrift store in the United States.
[33] This is a pseudonym.

5.4.4 Limitations

One major drawback to this approach is the lack of data concerning the actual weight and volume of each item. Future studies may consider approximating an average weight or value, which corresponds with particular types of e-waste. Furthermore, this dataset is by no means exhaustive in regards to the circulation of secondhand electronics in Alice Springs. Electronics circulate through a variety of pathways both online via eBay and other webpages and offline at secondhand shops, lawn sales, and amongst friends and family. Lastly, it is unclear from the dataset which items were successfully sold and circulated. Additional research may look into the outcomes of a random sample of posts generated during the study period to gain even deeper insights into the object biographies of those electronics. A more in-depth understanding of electronic devices that have been stored by residents of Alice Springs, some of which were acquired through secondhand circuits, can also be found in chapter four.

5.5 Hacktivism and the Politics of Repair and Reuse

The social media dataset analyzed above highlights existing alternatives to the recycling and discarding of electronics in Alice Springs. These reuse activities help residents of Alice Springs continue to extract value from costly devices that would otherwise be wasted. This section shifts from an analysis of secondhand circuits towards the role of repair and hacking in extending the useful lives of electronics in Alice Springs. Delgado and Callén (2017:181) argue that hacking resembles a move from a politics of representation to a politics of demonstration. In their view, hackers cope with precariousness by disrupting and reconfiguring their relationships with state, technology, biology, and material culture. Delgado and Callén assert that hacks are tangible demonstrations, which show how things could 'be done otherwise' (Delgado and Callén 2017:189).

Delgado and Callén (2017) conducted ethnographic fieldwork with Obsoletos, a small-scale hacker and maker initiative based in Madrid, Spain. Obsoletos understand e-waste as a harmful and hidden material effect of the promises of progress and innovation associated with electronics and the information and knowledge society. Rather than simply viewing it as an environmental and medical issue, they also contend that a throw-away society, in tandem with constant software updating and accelerating escalation of hardware replacements, "aggravates

the digital divide by making it more difficult and expensive for many people to participate and keep up with the information society" Delgado and Callén (2017:185). Their primary aim, then, is to make the problems of e-waste visible rather than solving the problem in its entirety.

The dialogue amongst international DIY/hacker communities pulls into focus the precariousness and obsolescence of electronics as a consequence of design, manufacturing, consumption and disposal (Delgado and Callén 2017:188). Although hacktivist collectives like Obsoletos do not necessarily identify themselves as political activists, they encourage others to participate and change their perspective by skilling-up as a means to disrupt the normative flows of production, consumption, and discard. Within the Hacktivist ethos is an emphasis on sharing and sustaining knowledge openly both online and during hacker meetups. Those who access electronic repair forums and tutorials tend to also aid in their development, sharing information on what tools and techniques were useful in their repair efforts.

During my visits to an electronics repair shop in Alice Springs, Barry[34] explained to me that he repeatedly utilizes electronic repair forums. Barry spoke with excitement anytime he was showing me a shortcut he had learned from one of those forums. When I asked Barry about the experiences which led to him becoming an electronics repairer, he reached over to turn down the shop radio which was blasting Queen's bohemian rhapsody. I was surprised to learn that he had previously worked in a range of other professions while working as a repairer part time. He considers himself 'very very lucky' he was able to complete his apprenticeship in electronics with a very good company and 'superb tradesmen' as a teenager in the early 1980s. Having traveled to Alice Springs later in the life, he is one of a handful of businesses that repair consumer electronics in the town. These shops, however, are not the only places where electronics are repaired. Throughout my fieldwork, I encountered a number of individuals who repair electronics for themselves and their friends as a hobby and service.

However, there is a central paradox within e-waste hacking arising from a dependency on overproduction and obsolesce in order to access electronics that inevitably produce waste, albeit perhaps less that would be produced otherwise (Delgado and Callén 2017:190). In other words, these hackers are picking up on a key insight ethnographers of waste repeatedly encounter: garbage inevitably keeps coming (Nagel 2013; Reno 2016b; Millar 2018; Larsen 2018).

[34] Barry is a pseudonym

> "At our hackerspace we're kind of riding the wave [of] electronics becoming a lot more accessible and easy…Because you know you have little modules that do a lot of the thinking for you. You don't have to obsess over every little component. As far as your average person off the street being able to repair stuff, I don't think that would be getting any easier, unfortunately. Although in some cases, you know if the power supply on something is blown, buying a new one, there's a lot of things you can buy, but in a way you're just creating more e-waste. You know, replacing hardware…"

This dependency on a continued cycle of obsolesce is very problematic and has been indirectly addressed in the quotes above and below by an interlocutor working out of a Hackerspace in South Australia. In a crowded arcade in the Central Business District of Adelaide, the hacker explains why he finds the scale of obsolete e-waste entering recycling facilities, landfills, and household storage to be mind-blowing:

> "… Well seeing the inside of an e-waste processor was definitely an eye-opener. I really hadn't factored in just how much… just how massive and voluminous the e-waste stream was until I saw that. I probably went from thinking there was something that could actually be achieved by reuse and things like that to suddenly just going 'there's just too much, I give up'. It kind of reminds me of like, I was collecting music and then Napster happened, and I just said 'I give up'! There's too much music, you know? There's just too much stuff.
>
> So now it's no longer, you know, 'gotta catch them all' it's kind of like bathe in the firehose kind of thing. So that's the impression that I got from seeing that. So, yeah. It just suddenly went from being something that I thought might be kind of manageable to something that like, just, so, it's not, yeah. You would need to deal with it at such an early stage, really at the production level. There's no way in which our… Yeah, I don't know. I don't want to harp on too much on the same [thing], but yeah, my personal experience of e-waste was having my mind blown…"

Although they appreciate how hacking can help them and others to think more critically about e-waste, they do not see hacking as a viable solution to e-waste. Nor do they advocate for hacking as a political protest in the manner articulated by (Delgado and Callén 2017). For them it is a hobby which gives them great pride and joy, not a form of activism. This is perhaps an important distinction between my interlocutor's conception of activism and the ethnographic literature on activism in everyday life (e.g. Pink 2012) which may still consider hacking activities as evidence for activism. As Delgado and Callén (2017:191) conclude, visibility is enhanced through practices of sharing and collective circulation. They suggest that hacks are themselves tangible demonstrations of alternative relationships with technology, information, and each other. From the perspective of my interlocutors engaged in hacking, Delgado and Callén (2017) may seem

overly optimistic about hacking as a 'politics of demonstration'. For example, the Adelaide based hacker describes his understanding of the barriers and potential impacts of recovering electronics from the waste stream:

> "…Yeah, often when anything like that comes along it's always a little bit of a regulation magnet. Like, you see these British shows, like was it Junk Yard Wars or whatever? Strap Heap Challenge? I think they're basically the same thing. Where they're basically in the middle of this junk yard and they have to build various mechanical things.
>
> You know that's crazy from an Occupational Health and Safety (OH&S) standpoint. But the problem is doing the exact same thing even just with e-waste… Yeah it's all gonna be probably about the details of getting someone who is actually allowed to walk out onto the factory floor and pull stuff out the bins and so on. That's a lot more complicated than you would imagine…
>
> So normally the thing they [e-waste recyclers] prefer is that we just [say] 'it looks a bit like this. If you find one can you throw it in a box'? And then one day they give us a box all of those bits. Which actually a lot of the people disassembling stuff are pretty familiar with the stuff they're disassembling. They're not just like, you know monkeys hacking it into pieces. So it's not really such a bad way to go.
>
> Um, so yeah. It would be, in terms of something that would have a good impact, if it was that people could go through all this waste and pull out bits and make something useful out of it, that'd be kind of nice. But again all of these things are just like the psychological, you know, raising awareness. Actual impact on e-waste would probably be relatively small. And you can do events to make it apparent to people how much e-waste is produced. But yeah I sometimes think that people don't need their spirits to be crushed anymore. So that's why I kind of like things like economic solutions…"

Access to stores of e-waste in Alice Springs is considerably less due to a lower volume of discarded electronics and smaller population. However, during my fieldwork I encountered a few individuals attempting to recover electronics from e-waste collection points. For example, Kevin, and Jay, both discussed in chapter four, recovered discarded mobile phones from the MobileMusters bin at the Alice Springs Town Council and personal computers the NTCRS collection containers at the RWMF.

Social inequalities consign differential access to the materials and resources required for adjusting the value of a discarded object (Thompson 2017:25). In order to increase the value of a discarded mobile phone, one must have access to the resources and knowledge for disassembling device, acquiring spare parts, reassembling the device, or remaking the materials salvaged from

the mobile phone into something entirely different such as jewelry (Lepawsky and Mather 2011), a GPS beacon, or a paper weight. In order to recoup the most value from selling a salvaged or repaired object, one might need to be licensed electronics repairer. Asa Doron's ethnography of mobile phone repairers in North India reveals that, in practice, electronics repairers tend to move in-between dominant spheres of influence (2012). She routinely interviewed repairers who have worked for large IT companies and have had their own independent market stalls. Furthermore, the classification of discards at a secondhand shop can also reify social tensions. For example, Larsen (2018) describes the discomfort of customers directed to the foreign language section of the secondhand shop when looking to purchase a book written in Spanish in a San Franciscan neighborhood where Spanish is predominantly spoken (2018:11).

The increase of poor quality household appliances sold at major retailers has also become a source of frustration for many of my interlocutors who nostalgically recall the days when an electric kettle was 'built to last' a lifetime. And yet, the affordability and accessibility of these electronics have made modern technologies and conveniences available for people in a lower economic brackets (Fioratta 2019; Horst and Taylor 2014; Williams et al. 2008). Affordability is thus a key tension in dialogue surrounding e-waste and the repair of discarded electronics for people living in Central Australia.

Throughout my fieldwork in Australia my interlocutors and I have oscillated back and forth regarding the value of disrupting the flow of e-waste at the local level. Lucas[35] and I would challenge each other to consider if increasing visibility of the e-waste is enough to disrupt or if massive regulatory reform is required. Although the (in)visibility of e-waste is the subject of the next chapter, it is worth mentioning that my interlocutors understand that there are no silver bullets for e-waste. Simply increasing the visibility of electronics is not likely to have a direct impact on the scale of waste being generated across the life history of electronics. While local councils can support hackerspaces and efforts to reuse electronics, the benefits of hacktivism can be significantly enhanced by multi-scalar policies concerning the design, repairability, and durability of electronics. Nevertheless, hacktivism provides useful alternatives for those wishing to disrupt and impact the flow of e-waste. The remainder of this section addresses the collective efforts of waste activists and electronics repair volunteers to make e-waste visible by hacking,

[35] Lucas is a pseudonym

extending the working life of household electronics, and reducing the amount of electronic devices being consumed and disposed of in Alice Springs.

5.5.1 Organizing the Inaugural Repair Café in Alice Springs

As a member and co-founder of a WAC[36] (the waste activist collective) in Alice Springs, I gained particular insights into the rhythms, obstacles, and potential of repair and reuse for fostering a more sustainable relationship with electronics in Central Australia. Tracy and I met during my first week living in Alice Springs. I had reached out to the local E-NGO (environmental non-governmental-organization) to learn more about their work with local businesses, the town council, and surrounding communities to protect and conserve ecological resources in Central Australia. Tracy and I very quickly registered our similar interests in waste, recycling, and community engagement and began recruiting like-minded individuals to join us and form a collective of waste activist. Weekly meetings were held, beginning in April 2017, to determine how the collective can:

- Influence local policy around curbside recycling and organic collection, waste reduction and reuse.
- Increase the community's awareness and involvement on waste issues, through events and media.
- Go beyond rubbish. To promote efficient living in all areas of life, including:
    - The sustainable and responsible use of natural resources (e.g. water and energy)
    - The utilization of human labor and creativity to reduce the environmental burdens of waste and pollution

These meetings culminated in WAC organizing the first ever Repair Café in Alice Springs. In the months leading up to the Repair Café, Tracy and I recruited a number of electronic tinkerers, a test and tagger, seamstresses, carpenters, and a few other volunteers to provide free repairs and advice to members of the Alice Springs community. Our objective was to encourage the

[36] WAC is a pseudonym

residents of Alice Springs to repair and reuse clothing, electrical appliances, wooden objects, toys, and dull knives rather than tossing them out and purchasing new ones. My role in WAC helped me to form deeper relationships with interlocutors such as Tracy and apply my research and theoretical perspectives to directly disrupt the discard of electronics in Central Australia.

The Repair Café was held on the morning of 22 July 2017 at the E-NGO. Throughout the morning, I primarily focused on facilitating volunteers stationed at the electrical area of the Repair Café. I also recorded notes on the various things people brought with them to be repaired. While mulling over the supplies with Barry, I learned that he had been asking people what they do with their broken or unwanted TVs. Barry explained that his peers were more than likely to throw their unwanted electronics in their council provided rubbish bins so long as they could fit. He then transitioned and cautioned us to temper our expectations regarding what is repairable because electronics requiring more than soldering were probably unfixable at the Repair Café. A few minutes' later two more of our electrical volunteers arrived to help repair electronics throughout the morning.

Despite these limitations, all thirty five attendees who brought an item to the Repair Café and submitted a feedback form left with advice on how to repair their item (n=12) and many had their items repaired on site (n=37). Each attendee was issued a data collection form upon entering the Repair Café. These data were then digitized in order to learn more about what items were repaired, individual repair experiences, and participant feedback. We saw a variety of electrical appliances come into the Repair Café including a vacuum, a solar powered light, lamps, a vintage radio, a chainsaw, a coffee machine, and an air compressor (**Figure 5.5)**

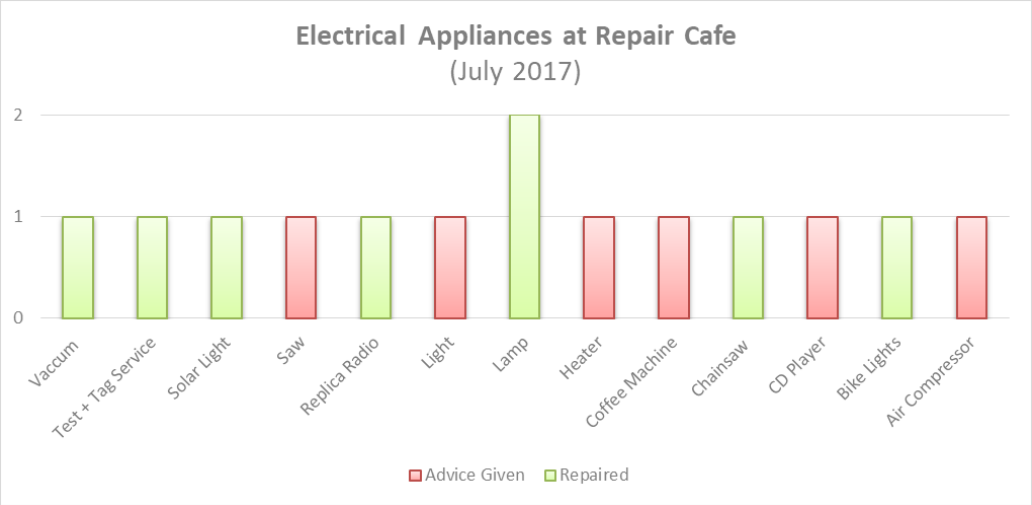


Figure 5.5: Various Electrical Appliances Assessed by Volunteers at the Repair Café (Figure by author, July 2017)

None of these items are covered under the National Television Recycling and Computer Scheme (NTRCS) and therefore would not have been collected for e-waste recycling if they were brought to the RWMF on an e-waste collection day. Furthermore, because each of these items required various levels of repair, it is likely that they would not have been salvaged at a secondhand shop. One of the key volunteers we had at the electrical appliance station was a local Test and Tag contractor. In Australia, the Test and Tag industry ensures that workplaces are safe by testing electrical equipment. This allowed us to ensure that any of the electronics repaired by our volunteers would meet the necessary standard (AS/NZS 3760[37]:2010).

During the event, a friend of mine had brought clothing to be repaired at our sewing station. While Wally[38] was waiting, he stopped by the electronic appliances section and was surprised to learn we had a volunteer Test and Tagger on-site. Although he considered running home to get his newly acquired secondhand equipment that he intended to use at his Farmers Market stand, he ultimately decided not to and to just use the sewing repair section of the Repair Café. This highlights tag and testing as an important point of intervention for possibly extending the life expectancy of electrical appliances in Alice Springs. Offering test and tagging alongside repair services reduces uncertainty about the safety of secondhand electronics and may better facilitate the maintenance or reuse of electrical appliances in Alice Springs.

[37] See https://www.testandtagtraining.com.au/as-nzs-3760
[38] Wally is a pseudonym

5.6 The Repairability of Electronics in Central Australia

This Repair Café and a series of interviews with local electronics repairers draw attention to some of the geographic, economic, and social contours of repairability in Central Australia. By repairability, I refer to the ability of individuals to access the knowledge and materials to restore the functionality of their electronic devices. Repair, however, can be achieved through various means involving the replacement of dysfunctional components or the reworking and manipulation of materials to restore the functionality of that object. Some repairs are more or less durable than others. All repairs produce, at the very least, some waste in the form of scrap materials or waste externalized from the supply chains of spare parts. Furthermore, repair activities do not merely result in the functionality of an object being restored, "but also enliven the landscape of things, building forms of meaning and attachment that help thicken human relationships to technology (Houston et al. 2016:2).

As a hobbyist repairer, Jack[39] is concerned with the broader market forces and logistics of repairability in Alice Springs, arguing that household appliances, even the 'good ones' are not being built for repair:

> "…it's hard to buy a good kettle then. I don't know where you go. Maybe if you go... Maybe Harvey Norman's got good kettles. But you know you tend to think, again being cynical, I often think the good kettles are just pretty much the same as the bad kettles except their rebadged and rebranded. You know? I don't know if you can actually buy a kettle that lasts 30 years now… and has a replaceable element. Because it's all about spare parts. I mean if you're going to manufacturer electronics that are repairable, it's about manufacturing spare parts. And that's why you can't change your model every year because, you know obviously, if you change your model the spare parts aren't going to fit anymore. So um, it's just, you know, it's all just… The entire paradigm of the market is based around constant change, which is the single most antagonistic thing towards any kind of sustainability".

The knowledge required to repair electronic appliances is at odds with the very design of the electronics. Furthermore, this quote highlights the reliance upon a particular type of repair: the replacement of faulty parts with new or salvaged parts. Each act of repair, whether it relies upon replacement or restoration brings together other landscapes, materials, technologies, and knowledge. In the section that follows, I draw upon an ethnography of repair in the North

[39] Jack is a pseudonym

Country region of New York, USA for a complementary perspective on the different ways that repair thickens the relationships between Central Australians and discarded electronics.

5.6.1 From Practical to Rationalized Repair

In order to make sense of the skills required to conduct repair in remote Australia, it is useful to reflect on ethnographies of repair situated in similarly remote locales. Sociologist Douglas Harper's ethnography on rural life in northern New York provides an in-depth examination of the skills and knowledge of Willie, a mechanic and engineer proven to be indispensable to his neighbors. Similar to Alice Springs, the tyranny of distance (Blainey 2001) features into social life in the North Country region of New York State. Although North Country is about 150 miles away from the nearest airport in Syracuse, the mountains surrounding the region form a largely impregnable barrier in the winter. Harper found that “the isolation and the absence of” suburban American culture formed a basis of life for Willie and his neighbors (Harper 1987:4). In addition to distance, poverty was a fundamental reality of the North Country in the 1980s.

Dissuaded by the argument necessity is the mother of invention, Harper contends that "the difficulties posed by geography and material limitations are not always, even for people with Willie's skills, the basis for creativity and growth' (Harper 1987:4). Willie’s management of time, energy, and social relationships affected the manner in which he operated his shop and went out of his way to help others in his community. In this way, the labor of repair is not merely concerned with the restoration of an object to some earlier state of functionality. The materiality of objects being repaired is inherently “unstable and unsettled, changing at different speeds and intensities, and across varying registers” (Houston 2017”4). The labor of repair therefore encapsulates a process of differentiation which requires the repairer to be knowledgeable of and connect to a range of individuals, organizations, and infrastructures (Houston 2017:4).

A graveyard of Saab vehicles was located adjacent to Willie’s shop. Shepherded by Willie, discarded Saab bodies slowly gave up their parts, moving piece by piece toward a state of final uselessness. Repairers often cannibalize the components and materials of *dead* machines (Harper 1987, Houston 2017, Barendregt 2012). Although Willie was dedicated to making the most out of stored or used parts to keep his shop going, both Willie and Harper understood that waste is ultimately inevitability. During my fieldwork, I too encountered the unsalvageable

remainders of repair and scraping. On summer afternoons, I often escaped the punishing sunlight by pulling apart washing machines under the transfer stations outdoor shelters. Each endeavor produces valuable materials pieces of copper, eventually sold to a local metal scrapper and plastic components and tubing tossed into the landfill. Like e-waste, the residues of automobile repair and washing machine scrapping “are not inert matter but make new kinds of problematic entanglement” (Houston 2017:4). These entanglements are most often consigned to the domain of waste management.

The history of knowledge and practices encompassing waste management has developed alongside a Weberian rationalization of work and labor. Harper (1987) details the rationalization of automobile work from the vantage point of the 1980s, a time when the labor of repairing and maintaining automobiles began to shift away from individuals having a broad material knowledge of their own vehicles towards a service-based system of certified technicians working alongside computers to routinize repairs and maintenance. Harper ethnographically documents the vestiges of an older way of relating to discarded materials via reuse and repair that is worth revisiting in other rural and remote contexts such as Central Australia.

In North Country, Harper encountered the marginal continuation of practical labor (Harper 1987:20) at the nexus of a significant historical change. The shifting relationships between knowledge and labor required for repairing and maintaining everyday material culture from automobiles to farming equipment and household heating systems. Harper theorizes these shifts as an emergence of a Weberian Rationalization which he defines as “the process through which social organization becomes more systematized as the division of labor becomes more elaborate” (Harper 1987:21). Consequentially, the worker becomes an even smaller cog in an expanding organization. As the specialization of each worker increases, the working knowledge of individual participants in the growing organization decreases (Harper 1987:21). "The mind called forth by a rationalized society also becomes more objective, which means that solutions to problems are more definable and predictable" (Harper 1987:23). In other words, the more rationalized a society becomes, the more difficult it is for individuals to cope with 'uncomfortable knowledge' (Thompson 2008).

The emergence of rationalized repair in the 1980s (Harper 1987:22-24) led to "deskilling" in an area of work where one would expect to find old forms of method and consciousness. Harper suggested as repair becomes rationalized, it becomes more objective and less "intuitive"

(1987). Rationalized repair is more inductive than deductive in that it deals more with specific components of a machine that are defective than with the overall integration, or tuning, of its components. This can lead to failures due to the rationalized repairer ceasing to consider how attending to a defective component will affect the entire system or machine.

One key distinction Harper gives to identify rationalized repairmen is that they are trained in schools and certified by earning degrees. The formal education of the repairmen makes their skills legible (Scott 1998) to the state, to their company, and their customers. In this way the rationalized repairer becomes ensnared in state-backed norms and policies which favor the replacement of faulty components with new ones rather than simply making use of the materials around them. In an increasingly rationalized world, the customers trust shifts from the individual repairer to his or her quasi-professional status. Consequentially, Harper cautions "as the small shop gives way to the large garage and the family business gives way to the corporation, this parent-to-child, years-long apprenticeship will disappear as a form of learning in society" (Harper 1987:23). Overall, the rationalization of repair leads to a reduction in consumer choice as the price of repair increases dramatically and the ability to salvage used materials is reduced.

Concurrent with my fieldwork, the right to repair became a contentious issue unifying consumers, makers, and hackers who seek to extend the working life of their electronic devices. In April 2018, a US federal appeals court sentenced an e-waste recycler who had built a sizable business out of recycling e-waste to federal prison for fifteen months. The court ruled that he had infringed $700,000 on the Microsoft Corporation by making "restore discs" to extend computers' lives[40] (Washington Post 2018). The possibilities of repair and reuse are truncated by rigid intellectual property (IP) laws and regulatory regimes such as the NTCRS which privilege recycling. Furthermore, the rationalization of repair has led to an extensive deskilling of repair laborers (Harper 1987). Rather than repairing the faulty electrical component in a device, an electronic repair technician is increasingly expected to simply replace the faulty component with a new one, creating a new stream of smaller e-waste consisting of discarded components. The prevalence of computerized monitoring systems in automobiles also produces e-waste and reduces the need for repair technicians to gain an in-depth and holistic understanding of how to repair broken automobile parts, instead replacing them with new ones (Harper 1987).

[40] Accessed online: Electronics-recycling innovator is going to prison for trying to extend computers' lives

5.6.2 Rationalized Repair and Waste Management in Alice Springs

Harper's ethnography is immediately relevant to anyone attempting to make sense of the management of discarded electronics in Alice Springs, a place where the cost of moving materials in and out of a tight social networks of tradies[41], artists, and scrappers demonstrates the value of practical labor in the twenty-first century. For example, during my most recent stay in Alice Springs with Morris, a local tradesperson, he shared a story with me about a group of plumbers who had traveled all the way from Perth on a contract. At the end of their project, the plumbers had a significant amount of copper piping leftover and asked Morris where they should take the copper in order to avoid taking it with them back to Western Australia. Morris was sure to point them towards one of the local scrappers who we both knew accepted dirty and clean copper (see Ferrell 2006). The scrap produced by the contracted plumbers provided raw material for the practical labor of scrapping copper, on one hand, and of maintaining the social ties between Morris and the scrapper, on the other. Even my experiences at the RWMF, a place that by all means was expected to be a hub of rationalized labor, proved to be extremely porous as scrappers, artists, and creative residents are consistently re-imagining what can be done with discarded materials.

This ethnography tracks the practical labor already performed by people maintaining and repairing electronics or by simply recovering value from those electronics being discarded in Alice Springs. When I spoke to Barry about his experiences borrowing components and parts from broken electronics to perform repairs, he told me that he "recycles all the time" while pointing to a dismantled television on the table behind us:

> "The screen's been smashed. Somebody threw a beer bottle at it. So, I'm raiding the boards out of it and then, you know, if another one of those TV comes and the boards not available or something. It's always better to stockpile the boards".

Barry goes onto specify that the repair is for a local rental business who wants things fixed cheaply. His strategy for keeping costs down is to supply them with a second-hand replacement:

> "Because theoretically electronic components don't wear… A transistor should last a million years or more, in theory, because they simply don't wear… So, a second-hand board should be as good as a new board… This board would have been four hundred bucks. Here's one for fifty bucks. And it saved buying a new board".

[41] The term 'tradies' is an Australian abbreviation referring to a tradesperson (e.g. carpenter, electrician, or painter).

Barry's shop and his participation in the Repair Café, discussed earlier in this chapter, are a striking example of practical knowledge in action. Building upon his own practical knowledge of electronics with digital resources such as social media and online forums, Barry applies his ever-growing knowledge of the materials within electronics to the needs of local businesses and residents. Supporting practical labor is necessary in order for my interlocutors to reduce the amount of materials going to landfill; to regain control over how their time, energy, and social relationships are managed; and ultimately to design a more sustainable strategy for addressing e-waste.

In summary, repairability does not simply encompass the material affordances of discarded electronics, but also prompts the "organizational contexts for repair, configurations of knowledge, embodied skills, and access to tools within "repair worlds" (Houston et al. 2016:8)". For example, the South Australian hacktivists described earlier in this chapter were not certain if their efforts to repair electronic devices made a dent in Australia's growing e-waste stream. They saw their actions more as a hobby and a means to empower themselves. In contrast, the co-organizers, volunteers, and residents who planned and attended the Repair Café in Alice Springs often left with a rekindled optimism seeded in both their ability to keep their possessions working longer and the communal resources they discovered.

5.7 Conclusion: Reformatting Time with Discarded Electronics

Waste, detritus, and externalities produced across the life history of electronics are often obscured from and ignored by consumers. In particular, narratives surrounding the de-materialization and 'greening' of digital technologies obscure how waste and other consequences arise "ubiquitously but unevenly at all points in the production, transport, and use of such items, not merely when they're thrown away" (Lepawsky 2018:9). International organizations calling for the total prohibition of e-waste exports under the Basel Convention often promote recycling as a primary mode of material recovery. Critics of this approach argue that an overemphasis on recycling damages the effectiveness of regulatory frameworks intended to ensure environmental benefits from repairing, reusing, and refurbishing equipment (Pickren 2014; Lepawsky 2014, 2015). Ethnographically tracing the repairability and reusability of e-waste in Central Australia show how creative strategies can be employed to increase the capacity of Alice Springs, and possibly other remote towns, to manage the growing assemblage of discarded electronics across

Central Australia. And yet, improvements in the management of e-waste in Alice Springs are not possible without engaging the town's residents, businesses, and local government. Understanding how e-waste is experienced, understood, and contested by Central Australians is crucial.

The reuse of secondhand goods via social media and community events such as Repair Cafés help to disrupt the flow of e-waste by extending the product lifespan for household electronics. And yet, neither of these alternatives oblige us to consider *how* consumer goods conceal "the negative effects of our everyday seemingly necessary but convenient actions" (Crocker 2016:6). While it is worthwhile to fix and maintain electrical appliances rather than purchase new ones, it is perhaps even more worthwhile to question whether or not we need to use particular electrical appliances in the first place. There is a dire need to recast that which may seem convenient upon first glance as inconvenient for the sustainability and resiliency of our communities. As Rathje and his colleagues discovered during their thirty years of garbological research, there are no silver bullets for managing waste (Rathje and Murphy 2001). As discussed elsewhere in this dissertation, we cannot simply recycle our way out of the e-waste problem. Furthermore, repair and reuse alone will do little to mitigate e-waste without the proper support of policy makers, activists, and product designers. The next chapter considers the role of distance in shaping ideas of how to manage e-waste in Australia. Distance also has a significant effect on the repairability of discarded electronics in Alice Springs. For example, high transport costs and long wait times impinge on the ability of repairers to provide an affordable and timely service to residents and local businesses.

Whereas recycling helps to alleviate the material burden of mass waste arising from the discard of electronics, it does little to stave the rolling tide of resource extraction, energy consumption, and mass waste produced at earlier stages in the life history of electronics. Reuse and repair, in most cases, helps to extend the lifespan of electronic devices, to preserve the embodied energy of a product, and lessen the demand for the consumption of virgin materials. Again, it is crucial to recognize that none of these activities are completely waste free. Nevertheless, repair and reuse have the potential to slow rates of consumption and the generation of e-waste.

CHAPTER 6. SOMEWHERE ELSE'S PROBLEM? THE IN(VISIBILITY) OF ELECTRONIC WASTE

6.1 Introduction

Distance muddies perceptions of the valuable and toxic qualities of e-waste (electronic waste), enabling a sense of e-waste as being 'somewhere else's problem'. This chapter examines the role(s) of waste in the construction of digital futures alongside shared experiences of distance and dis(connection) in remote Australia. Inseparable from these experiences are the histories and politics of communications infrastructure and waste management in Central Australia. Shared experiences of distance and remoteness regulate the (in)visibility of e-waste in Alice Springs, Northern Territory, Australia. For the purposes of this chapter, the term (in)visibility is employed to reflect the relative visibility of e-waste in Central Australia as a key topic of ethnographic inquiry. Thirteen months of ethnographic research at the margins of Australian e-waste infrastructure reveal an urgent need for policy experts to rethink their approaches to resource recovery and waste management.

Alice Springs was at the center of Australia's astonishing effort to reduce the time required for communications to be sent back and forth between Europe and Australia. The OT passed through the MacDonnell Ranges in the early 1870s, eventually leading to the development of a town that came to be known as Alice Springs. Over the next decades, the town experienced slow growth until 1929 when the town's population swelled after becoming the end station for the Ghan railway and then again when it became a base for Australian and US army personnel during World War II (Ottosson 2014). Alice Springs now serves as a significant infrastructural hub for waste management, health care, and the provisioning of government services across all of Central Australia. Unlike the significantly larger cities of Adelaide and Darwin, Alice Springs does not have its own recycling infrastructure for processing e-waste. As mentioned earlier in this dissertation, the nearest e-waste recycling and resource recovery centers are over 1,500 kilometers away in Adelaide, South Australia.

I was first alerted to the issue of distance during an interview with a South Australian waste and recycling educator at a regional council outside of Adelaide. In the following quote, she explains why distance and small population sizes are key challenges for local government outside of major metropolitan zones:

> "That's the thing. Distance. And you're moving a lot of air. That applies for all types of recoverables and recyclables. So that's a big issue. The second thing is [when] the population is fairly small [and the tonnages are] quite small compared to what it probably needs to be [profitable]".

From her point of view, the sheer distance e-waste must travel from regional and remote places to recycling facilities in Adelaide, where it will be disassembled and processed for recycling, is further exacerbated by the region's sparse population.

Due to the limited viability of transporting discarded electronics from Central Australia for recycling (Barba Gutiérrez, Adenso-Diaz, and Hoop 2008:487-488), I looked into barriers for repairing and reusing electronics in Alice Springs. After closing up his shop for the day, a local repairman shared his concerns with me regarding the future of electronics repair and reuse in Alice Springs:

> "[The] challenge is to have… here in Alice Springs, is to have somebody who can do that work. Um, we have one or two or three people who are currently doing that work. Probably half a dozen people are currently doing that work. And they're absolutely working five, six, seven days a week as it is. So, it's just the, we need more repairer people.

I then asked him why, if there is plenty of work to go around, he thought there are few people working in electronics repair?

> "Well it's a fairly specialist work. And not only that, they've gotta keep a fair bit of spares, if you like, or that sort of thing. And getting spares or equipment to Alice Springs is quite, quite expensive. So, a $2 part can end up costing you $10 with $7 or $8 freight on it. So that is a major problem we've got here.

The distance spare parts must travel is a logistical and economic hurdle for the few electronic repairers located in Alice Springs. While the geographic distance from Alice Springs to Adelaide is an unavoidable constant, the amount of materials entering landfill is alterable. An Alice Springs based waste management expert encapsulates this in the following interview excerpt:

> "Ah mate… like I said…We're not gonna get any closer to any other town. We're always going to be the fifteen and the sixteen hundred kilometers away from our first major town that's on the coast. So, I don't know, again I think it's a cop-out because… I mean, we do cardboard bailing. And yes, if we bailed all our cardboard, we would end up with a mountain of stockpiled cardboard but it doesn't matter. The distance is going to be the same. You know, we can have a big pile of metal down and there and wait, wait, wait until the guys can come up and bail it. It's still the same transport cost. No matter, next year's not going to be any cheaper. So yeah… and I mean. We just can't keep putting it in the ground. Otherwise we're

> running out of space. This town's not big enough to have to look after this landfill when it's closed without a revenue. It just, it won't happen. Something's gotta give".

The location of Alice Springs makes it a significant place for examining how geographic distance and limited e-waste infrastructure condition the life history of discarded electronics and how, if possible, discarded electronic cease to be waste. The life history model employed in this chapter can be understood as an ''archaeological eco-biography" of electronics portraying the historical trajectories of environmental movements and choices made by individuals or households (Hardesty 2009:69). The central objective of this chapter is to ethnographically describe the life history of electronics in Alice Springs within a distinctively Central Australian geopolitical, social, and behavioral context. By exploring the life history of e-waste at the margins of e-waste policy and infrastructure in Australia, I aim to illuminate the vital need for designing interventions that reduce waste across the entire life history of electronics, rather than exclusively at the point of household discard.

6.2 Technology and Distance

Throughout my fieldwork, I have encountered the theme of distance as a key aspect of Australia's settler history and ethnographic present. In their forum *Remote and Edgy: New takes on old anthropological themes*, Harms et al. (2014) draw upon Ardener (2012[1987]) to refocus the term 'remote' from those places which are rarely visited to the margins and edges of society. This Ardenerian inspired category of remoteness provides an anthropological lens capable of discerning the contingencies, relations, and distributions of power that permeate waste management discourse in Central Australia. In what ways are remoteness "contingent and relational --- and inexorably co-implicated with power" (Harms et al. 2014:371) from the viewshed of Alice Springs?

The tyranny of distance, a concept popularized by conservative historian Geoffrey Blainey (2001 [1966]), features predominantly in the minds of many Euro-Australians including waste management professionals. This concept refers to the dynamic role geographic distance has played in shaping the history of Australia. In the third and most recent edition of *The Tyranny of Distance*, Blainey states "distance is tamed but far from dead" (2001:373). Distance has indeed emerged as a very lively and vital aspect of life in Alice Springs throughout the

thirteen months of ethnographic fieldwork I conducted between 2016 and 2018. And yet, I insist that we take Blainey's statement one step further by acknowledging the following:

1. Advents in communications and transportation technologies are not killing distance; rather, distance continues to animate, permeate, and shape the lives of residents in Alice Springs.
2. Geographic distance does not inherently equal remoteness.

Shared experiences of distance generate a sense of place, feelings of belonging, moments of healing and self-reflection, and a means to regulate social and material relationships.

Although the trip from South Australia to Alice Springs in 1899 was long and perilous, Doris Blackwell, daughter of Stationmaster Thomas Bradshaw, recalled that those at the telegraph station had been in closer proximity to the news of the world than anyone living in Adelaide, Brisbane, Melbourne, or Sydney:

> "Every word of worlds news — the end of the Boer War, the death of Queen Victoria, the San Francisco earthquake, the winner of the Derby — passed through Alice Springs telegraph station on its way from Darwin, where the international cable came ashore, to Adelaide" (Blackwell and Lockwood 2010[1965]:72).

The telegraph and railways of the nineteenth and twentieth centuries provided an unprecedented rapid transmission of communications and transportation to Central Australia (Traynor 2016:6-7). And yet, despite the continued evolution of transport, in the forms of air travel and the paving of roads, and communications technology, such as the mobile phone and the internet, distance still figures predominantly into how Australians relate to one another.

The fabrication of distance as a potent descriptor of life in Central Australia begins with the construction of a telegraph station at Alice Springs in the early 1870s. Today, the topic of distance continues to persist in discussions regarding limited mobile coverage and broadband internet connections in very remote towns (Kennedy et al. 2016, Stillman et al. 2010). In 2009 the Australian federal government funded the construction of the National Broadband Network (NBN) for the cost of 44 billion AUD. The implications of access to high speed broadband in regional and remote places were explored by Kennedy et al. (2016:194). Their analysis built upon Stillman and colleagues (2010) study on the way communication shapes the experience, meaning, and significance of places. Kennedy et al. (2016:204) argue that connectedness and distinction feature heavily into the socially, technically, economically, and geographically varied Australian landscape. Although the NBN did not feature predominantly in conversations with my

interlocutors in Alice Springs, over time I became attuned to a shared ethos of remoteness unique to Central Australia. In a series of interviews with regional and rural interlocutors, Kennedy et al. (2016:210) found that connection to high-speed broadband (HSB) enabled people to regulate isolation and connectivity in their own terms.

Throughout the history of Alice Springs, it is useful to consider how access to developments in information and communications technology are shaping and also shaped by experiences of place and the desire to regulate particular types of isolation and connectivity. Alice Springs came into being as an infrastructural in-between: "a node in others' networks, both built in and left out" (Johnson 2019:1). With the completion of the OT line, Alice Springs became an instrumental node connecting Australia to the rest of the world. As Johnson points out, "infrastructural in-betweens complicate the persistent aspiration of communicative connectivity" by challenging the assumption that enhanced connectivity is inherently good (2019:12). The telegraph significantly reduced the amount of time it took for Europeans to monitor and communicate with the Australian government. And yet, as Johnson (2019) reveals in her ethnography of data centers in Iceland, the imperial legacies of communication technologies do not necessarily put a "death to distance" (Cairncross 2001) nor do they alleviate the marginality of those living alongside an infrastructural in-between.

Despite living alongside an international clearinghouse for digital data, residents of Reykjanes suffer from the municipal debt crisis in Iceland, lag behind in education and employment, and the area is still seen by other Icelanders as a place to pass through (Johnson 2019:9). Although there are some similarities between the imperial legacies in Reykjanes and Alice Springs, the effects of distance in Central Australia are exacerbated by 1500 kilometers of arid terrain between Alice Springs and metropolitan Adelaide and Darwin. Even as a node in someone else's network, residents of Alice Springs are very much affected by distance. For example, the waste management experts I worked with at the Regional Waste Management Facility (RWMF) are keenly aware that Alice Springs is "not gonna get any closer to any other town". In other words, the costs of transporting materials, labor, and other resources to and from Alice Springs are going to be felt by the town's residents.

While this section hints at the capacity of information communications technologies as a tool for regulating distance and remoteness, I have yet to fully address the waste produced by the rapid development of these technologies in Central Australia. In the following sections, however,

I take a deeper look into the shared ethos of remoteness I encountered in Central Australia through the lens of e-waste and digital accessibility.

6.2.1 The Tyranny of Distance: A Northern Territory Perspective on Waste

The National Waste Report 2010 found the effects of distance and a lack of resources to be a daunting obstacle in the Northern Territory (NT). In 2010 there were no facilities in NT to recycle aluminum, glass, plastic or any other recyclables, all of which are transported interstate for treatment at considerable cost. For example, in 2006-07, 181,000 metric tons of waste were generated in the NT of which 17% was recycled and 83% was disposed to landfill (Environment Protection and Heritage Council 2010b:139). However, in recent years the RWMF in Alice Springs has recycled and processed the glass from wine and spirit bottles. The 2006-7 figures also revealed that the average waste generated per person in NT was significantly below the national average (Environment Protection and Heritage Council 2010b:139). Furthermore, only 47% of the NT population have access to curbside recycling facilities (Environment Protection and Heritage Council 2010b:130).

The environmental impacts of long-distance transportation are also associated with the tyranny of distance in the National Waste Report 2010 (Environment Protection and Heritage Council 2010a:12). The following excerpt from the NT Environmental Protection Authority (EPA) reflects the pervasiveness of the tyranny of distance and is worth quoting in full:

> "There is generally very limited waste infrastructure or access to markets for recyclables, and the recruitment and ongoing retention of staff is a challenge. The vast distances and poor road conditions between towns restricts opportunity to separate and transport recyclable and hazardous wastes to appropriate facilities. Landfills are generally designed below minimum standards for environmental protection yet may be the only disposal option provided. Very few, if any, regional councils can afford the cost of relocating or redesigning existing landfills to a level that can achieve assured environmental protection or costs of providing waste management services. The selection of suitable land to develop for landfill can be impeded by the need for landowner consent, and the complexities with identifying appropriate custodians of the land" (NT EPA 2015:6).

Extrapolating this grim outlook for the sophistication of landfills across the Northern Territory to e-waste means that the burying, burning, and leaching of heavy metals and inorganic compounds is a legitimate concern that cannot be simply alleviated through recycling or disposal. As a limited exception, the ASTC (Alice Springs Town Council) has made significant upgrades to

their RWMF via the construction of a transfer station and secondhand shop. Although this transfer station makes it possible to capture recyclables from the waste stream, a number of my interlocutors who frequent the RWMF remain concerned about the economic costs and unassured about the ability of the transfer station to protect the environment from harmful waste.

The reality of e-waste and other types of waste negatively effecting community health needs to be evaluated in these remote communities as appliances and other types of e-waste get dumped alongside hazardous household waste. Even furniture, with brominated flame retardants and other chemicals could pose a major invisible threat to these communities. On an uncharacteristically cloudy afternoon I was riding my pushbike across town to conduct an interview when I noticed a black cloud of smoke rising from the vicinity of the RMWF about five kilometers away (Figure 6.1). Despite the modernization of the Alice Springs RWMF compared to less sophisticated remote landfills, prolifically hot and dry afternoons continue to pose fire risks.

Figure 6.1: View of black smoke rising from a burning mattress pile at the Regional Waste Management Facility from the corner of Todd Street and Stott Terrace (Photo by author).

Nevertheless, in a public report, written as a roadmap for the Alice Springs Town Council by Desert Knowledge Australia, future imaginaries of the Alice Springs RWMF position it as a model for resource recovery and waste management in remote and isolated locations:

> "By 2033, Alice Springs is recognized as a model for resource recovery and waste management in remote and isolated locations with at least 50% of general waste being recycled and 100% of food and garden waste produced by the town being

> composted or mulched for local re-use. Residents are actively reducing their waste through recycling and the Alice Springs Regional Waste Management Facility provides a world's best practice model for innovative resource recovery in a constrained remote/regional setting. We will look back and be amazed…" (McClean and McHenry 2014:20).

In the same report, McClean and McHenry stress the longstanding importance of replacing imported consumables with local production as a key strategy for reinvigorating the economic growth of nations and more recently cities…:

> "For a town like Alice Springs, bringing together resource recovery and import replacement, [led] by an import replacement strategy, could provide innovative ways forward in developing and expanding the local economy" (2014:20).

From this perspective, the question of e-waste shifts from how to recycle discarded to electronics to the questions of an imaginary focused on resource recovery and import replacement might become a reality in Alice Springs and what types of waste may be produced through an emphasis on local production.

These recommendations tend to fall on deaf ears at the regulatory level which has predominantly emphasized recycling as the primary means of resource recovery in Australia. When I returned from Alice Springs at the start of 2018, there were plans for a council ran curbside recycling service to begin in July 2018. Despite the lack of curbside recycling, a range of recyclables were still collected at the RWMF transfer station and Rediscovery Centre. In 2016, it was reported that the average Alice Springs household generated 17.6 (±4.4) kg of waste per week, with almost half (46%) of this waste recyclable and a further 33% compostable (O'Leary 2016: xv). Household waste audits demonstrated the environmental costs and benefits of implementing a curbside recycling service in Alice Springs and found that such a system could prevent around 3,400 metric tons of waste per year from ending up in landfill (O'Leary 2016).

O'Leary (2016:13-14) insightfully draws attention to the environmental and economic importance of developing local markets for recyclable materials as a strategy for mitigating the tyranny of distance. This became even more necessary when the Chinese government announced that they would no longer being accepting the bulk of recyclables from Australia (Walker 2018). This announcement shook the waste management sector throughout the first half of 2018. The following field note documenting my dialogue with two interlocutors reflects what I learned during follow-up fieldwork in 2018:

> Today is the 3rd of August, my first Friday back in Alice Springs since last January. After having coffee with a friend in Todd Mall, I rode over to the Olive Pink Botanical Gardens, climbed the hill to get a full view of Alice Springs, and had a thought provoking lunch with Tracy and Lucas at the cafe. Interest in waste has persisted both locally with efforts made to encourage the council to collect green waste and nationally with the second season of the War on Waste airing on the Australian Broadcast Corporation network. In response to the China ban on accepting rubbish, curbside recycling in Alice Springs has been moved to the back burner. Initially, the council had planned to implement a curbside recycling service beginning in July 2018. Rather than stalling momentum, Tracy and others helped to push the collection of green waste to be composted at the RWMF and sold to local farmers. Either way, there are no plans to begin curbside recycling or the green waste program until the next business year beginning in July 2019.

While the recent China ban creates distance between Australia and Asia, the importance of developing local solutions for recyclable materials is not foreign to Australian waste practitioners and local government. For example, consider the following interview excerpt detailing one perspective on localized resource recovery in South Australia:

> "Um, when you look at some of the systems overseas, you know part of the problem here is how spread out our population is. You know they've got some great ideas in Europe where you don't have to pay to take stuff to the landfill and it's supported… to the transfer station for drop-off recycling point. And you know you put this here, put that there, put that there… um you know it's within a very short distance of everybody's, wherever you live. I know that's not practical here but surely we could come across some sort of compromise.
>
> You know, in the rural area there's been funding for social enterprise for diversion at landfills. So um, [in one rural area] they have, through the social enterprise scheme, they have a group that is involved with people with social or mental disabilities. So, when you take something to landfill whether it's that fridge or the electronic items, a cupboard or whatever, they'll get diverted. Electronic items that can be reused are all tested, tagged, and then available for sale at a discounted price.
>
> So, we don't have that, again it's that distance and the practicality of applying it here but I think that as our council… cause lots of massive growth down south… as that growth extends past that location I think the practicality of something like that would increase. But in the meantime, you know we are, our local landfill is setting up a massive facility to do a lot of that diversion themselves".

Although my interlocutor is reflecting upon rural areas in South Australia, it is worth noting that there is indeed precedence for the NT taking inspiration from its southern neighbor. More than thirty years after SA introduced its Container Deposit Legislation (CDL), the NT implemented their own Container Deposit Scheme (CDS). But the importance of this quote has a

much deeper implication. My interlocutor begins by explaining the drop-off process but moves on to discuss the role social enterprises are playing in diversion at landfills. Diversion refers to the process of separating out valuable recyclables and reusable items from the waste stream, an activity that not only reduces the amount of waste going to landfill but actively increases the revenue of councils and landfill operators.

From the perspective of Alice Springs, however, it is important to understand how both Central Australian labor, possibly in the form of social enterprises, and renewable energy will enable the NT become resilient and less dependent on transporting their rubbish and low value recyclables upwards of 1500 kilometers. On one hand, rendering Central Australia as a remote and distant location may have the unintended consequences of limiting access to curbside recycling infrastructure; or labeling the region as Australia's '*somewhere else'* for environmentally and socially destructive industries. On the other hand, shared experiences of remoteness in Central Australia may hold the key to unlocking innovative and resilient solutions to e-waste.

Doris Blackwell emphatically concludes her retelling of life in Central Australia by reiterating that she was brought up and educated in "Alice…on the line" (Blackwell and Lockwood 2010:204). Over the course of the next century and despite rapid technological developments in communications and digital infrastructure, Alice Springs continues to be simultaneously experienced by its residents as central and remote. In the sections that follow, I consider the intersections of life and waste 'on the line' in Alice Springs.

6.3 Rubbish in the Distance, Rubbish in the Shadows

Shared experiences of distance and remoteness also have implications for waste outside of the RWMF. During one of many conversations with Lucas, he noted that Alice Springs and the surrounding area is commonly described in terms of its remoteness as 'waste land', 'barren', and 'desert'. Lucas worries that this peripheral status and understanding of Central Australia has left the area vulnerable to nuclear waste, fracking, and other environmentally and socially destructive industries. The history of Alice Springs is deeply entrenched with technological breakthroughs in communications infrastructure. Do these technologies and infrastructures open the back gate for destructive industries to ravage Central Australia? Rather than focusing exclusively on the

transformative properties of digital connectivity, I am interested in unraveling the infrastructural foundations for communications in Central Australia.

The remainder of this section considers both the generative and shadowy qualities of remoteness and e-waste in Central Australia. Sasha Newell's contribution to the Remote and Edgy forum (Harms et al. 2014) draws parallels between the importance of shadows in the social construction of both remoteness and rubbish, a category theorized by Michael Thompson (2017, 2003) to describe objects which slip out and then back into categories of social value. Just as Ferrell's (2006) empire of scrounge exists at the edges of urban life in Fort Worth, Texas, so too does the district of Treichville in the city of Abidjan (Harms et al. 2014). The following quote by Newell captures the capacity of remoteness to emerge within the very crevices of centralized structures and is worth quoting in full:

> "Some people (outlaws, for example) seek out remote spaces to profit from invisibility, while others are wedged into them by socioeconomic forces beyond their control. Thus, residual and disorderly social material collects in the interstices, in the shadows cast by semiotic walls too ideologically important to allow for visible anomaly. Perhaps every urban edge has a remote side, a space of relative semiotic freedom contained by unforgiving boundaries. Thus, the event-richness, singularity, and individual self-definition of remote zones may be the product of the very ordering principles that try to shut out such variation. In the shadows cast by the searchlights of the panopticon, the edges between things are harder to see" (Harms et al. 2014:367).

Adhering to a similar logic, Ferrell's (2006) auto-ethnographic account of scrounging in Fort Worth demonstrates how the central forces of urban consumerism foster an empire of scrounge at the margins of urban life. As discussed earlier in this dissertation, rubbished things (objects, ideas, and even people) provide an alternative pathway towards social categories of value (Thompson 2017). And yet, scroungers are dependent upon consumer discards as a material basis for generating an alternative means of self-definition. In this sense, the subversive actions of scroungers and their position at the margins of urban life are conditional upon the social creation of waste and the places at the edge or margins of social life where this waste tends to accumulate. Anthropological reflections on remoteness provides an avenue for assessing of how places such as curbside and dumpsters, sheds and attics, yards and parks, or landfills are socially fitted, and at times retrofitted, for handling rubbish.

A common feature of these places is that they often exist at the nexus of consumer capitalism and the empire of scrounge. Paradoxically, the shadowy and remote places where

scroungers and salvager's encounter rubbish arise from the efforts of powerful actors to develop and profit from rapid cycles of mass production, consumption, and discard. In this sense, the remoteness of a particular place may be better understood as the shadowy context in which things slip into the category of rubbish rather than a place which is simply geographically far away from an urban center. On the other side of the same coin, it is easier for objects to slip into the category of rubbish in remote places. An underlying purpose of this dissertation, then, is to lend context to the remote and shadowy places in which electronics are rubbished. This requires a multi-scalar approach to remoteness and rubbish. In other words, what is required is a political ecology of e-waste (Pickren 2014) attuned to the situational remoteness of electronics in a junk drawer, a landfill, a town, a region, and a country.

6.3.1 A Porous Ethos of Remoteness

Following the writing of geographer Jeff Malpas, I have come to understand "place" as a bounded but open and contested site: a complex product of competing discourses, ever-shifting social relations, and internal (as well as external) events and influences" (1999:39). Descriptions of the ever-shifting social relations, events, and influences shaping experiences of place in Alice Springs are littered throughout this dissertation. The social construction of distance has played an instrumental role in the settler colonial colonization of Australia. The modern outcomes of settler colonialism, however, are inseparable from the early colony's desire to connect itself externally to Europe and the rest of the world via the Overland Telegraph line. Therefore, the use of communications technology to regulate isolation and connectivity is truly at the core of Central Australia's settler colonial history and present.

As an anthropological archaeologist, I have a keen interest in the role these technologies have played in how my interlocutors develop notions of place and belonging in Alice Springs. Appadurai (1996:179) points out that residence in itself is not enough to transform a space into a known place; residence is not enough to produce and maintain a sense of place. Rather, 'place-making' involves the design and building of house, roads, and other physical features as well as particular forms of attachment to the built environment and the people using it (Ottosson 2014:121). In *To Know One's Place: Belonging and Differentiation in Alice Springs*, anthropologist Åse Ottosson asserts that a sense of belonging is crafted through place-specific acts of self-identification, and identification by others (Ottosson 2014:122). In my own

ethnographic research, I have found that residents of Alice Springs craft a sense of belonging by creating social boundaries around the specific places in which types of rubbish are permissible.

Attention to 'rubbishing' in Alice Springs has illuminated how experiences of place and belonging are porous, slowly bubbling through the veneer of everyday life in the Red Centre. For Ottosson (2016) and her interlocutors, 'rubbishing' refers to the narrative of anti-social behaviors such as drunken violence, noise, and littering in shared public areas and properties. Throughout my time in Alice Springs I have encountered both conservative folks who seek to correct behaviors by banning and penalizing perpetrators and progressively minded folks with a desire to breathe life into the deeper historical and cultural events which have caused the broader Alice Springs community a great deal of discomfort. I too, have experienced involuntary pangs of anger while riding my bike over countless shreds of shattered glass. On a cold winter night in June, I attended a spoken word open mic at the local theatre overlooking the dry Todd riverbed. I recall a local poet drawing connections between the shards of glass as emblematic of the mistreatment of indigenous Australians for generations. Rather than the glass 'rubbishing' the town, this poet brought to bear the existing inequalities and lack of empathy surrounding generations of Aboriginal dispossession.

E-waste, on the other hand, is relatively inconspicuous to most residents of Alice Springs. E-waste becomes physically and visibly separated from residents who discard their devices for e-waste collection at the RWMF (Figure 6.2) or electronic retailers with take-back containers (Figure 6.3). On a few occasions, I found that dawdling around town on my bike provided opportunities to encounter e-waste in places where it did not 'belong'. Only by slowing down, was I able to defy the 'tyranny of the ordinary':

> "In an urban environment increasingly subject to close surveillance and legal control, I found myself salvaging surprise and adventure as surely as a consumer discards. The tyranny of the ordinary, the tight circuitry of the city's legal and spatial control, fell away as the process of scrounging reversed everyday meanings and transformed ordinary situations into extraordinary events" (Ferrell 2008:139-140).

Figure 6.2: E-Waste Collection Day at the Tip (Photo by author)

Figure 6.3: MobileMuster Bin at the Rediscovery Centre (Photo by author)

During my fieldwork, I rarely scrounged the e-waste I encountered at the margins of the town's legal and spatial control. And I often did encounter e-waste quite literally at the geographic edge of Alice Springs. Witnessing discarded automobiles, car radios, televisions, mobile phones, and other forms of e-waste in the bush became an ordinary experience for myself and my interlocutors as we hiked and drove around the MacDonnell Ranges. The following fieldwork excerpt illustrates the messy boundary between Council and Crown Land and the even messier boundaries of responsibility over litter and dumped e-waste in the NT.

"E-Waste Watch" on Undooyla Road

On August 16th, 2017 I rode east of the town and into the well-traveled mountain bike and hiking trails of Undooyla hill. Around 11:15am, I noticed a sun-tanned man with a neon yellow safety/visibility vest picking up litter along the side to Stott Terrace. I cycled up the hill and decided to take the first right onto an unsealed dirt road across from the painted over 'Crown Land' sign I had snapped a photo of a few months back (Figure 6.4). Face down and on the ground to my right, about 50 metres away from Undooyla road, was a Samsung plasma TV (Figure 6.5) with a shattered display. At first I had difficulty connecting to my Ethnographic Collector, a web-based application on my phone that I used to collect qualitative, visual, and geospatial data. I was at the edge of cellular range so instead I took my time jotting down fieldnotes, taking photos, and recording a mental image of where I believed I was on the map.

Figure 6.4: Crown Land sign post located at the top of Undooyla hill (Photo by author, May 22 2017)

As I continued on, a white car with two Aboriginal men passed me suggesting that a town camp may be located a little further down the path. I decided not to venture further so as to not interrupt the camp without permission. When I got back down Undooyla hill, I called my contact at the ASTC and asked her what I was supposed to do now that I had found e-waste out in the bush. She asked me to clarify where it was and then told me she would ask an ASTC Ranger what he thought. She reported back that he said it was likely just within his jurisdiction so he would go

check it out. I asked her to keep me updated but did not hear anything over the coming days. Nearly three months later I decided to ride back to the same spot and found the same Samsung TV laying on the ground! I noticed that the different layers of the screen were now spread across the ground (Figure 6.6). Although the naked eye cannot register the release of heavy metals and inorganics into the red earth around it, the disintegration of the TV screen challenges the idea that electronics tend not to breakdown.

Figure 6.5: Samsung Plasma TV Illegally Dumped (In-Situ) on the Boundary of Council and Crown Land (Photo by author, August 17 2017))

Figure 6.6: Samsung Plasma TV Illegally Dumped (In-Situ) on the Boundary of Council and Crown Land (Photo by author, October 10th 2017)

In addition to this Samsung TV, my interlocutors and I have found a variety of other discarded objects throughout Crown Land. While the majority of these objects looked as if they were discarded because they were broken or unusable, I did not expect to encounter a sink during a walk with Jason on Undooyla hill (Figure 6.7). To our amusement, this sink achieved comedic irony. On top of the sink is a lone toothbrush in a glass jar. While a sink is conventionally utilized to clean hands, teeth, dishes, and other 'dirty' objects, this sink is itself 'matter out of place' (Douglas 2002), polluting the serene outback landscape. The intended meaning of the placement of this sink and toothbrush on top of the hill is unclear. And yet, whoever placed this sink here would most likely have been aware of its comedic juxtaposition. Although this cleverly discarded sink is not an electronic object, its placement on Undooyla hill is significantly at the boundary of Council land, managed by the ASTC, and Crown land, managed by the NT.

Figure 6.7: Unexpected Sink encountered during walks and bike rides along Undooyla hill, on the eastern boundaries of Alice Springs (August 7th 2017, Photo by author).

The discovery of discarded objects at the boundaries of Crown and Council land led to me ask more questions of waste management experts in Alice Springs about responsibility and jurisdiction. In particular, I wanted to know what happens to e-waste illegally or illicitly discarded in places such as Undooyla hill. A waste management expert I interviewed in Alice Springs explains the jurisdictional differences between Crown and Council land:

> *"On Crown Land, which is not Council Land, they've got contractors picking up those things and they do pay for it. It's a cost to them because… they're responsible and they've got ownership of the Crown Land. So that's where you will notice it… It's not major. It's a minor problem".*

I later learned that contractors work for the Australian Commonwealth government, as the Northern Territory is under federal jurisdiction. Crown land is also owned by the Commonwealth while council land is owned and managed by the ASTC. During an Environment Advisory Committee meeting the town council CEO confirmed approximately 74% of the land in the municipality of Alice Springs is Crown Land. In an extended sense, therefore, the responsibility of paying the bill to collect discarded objects on Crown Land, including some e-waste dumped within Alice Springs, and ensuing landfill levy's falls upon the whole of Australia.

A shared ethos of remoteness unique to Alice Springs seems to be at odds with the pervasive ethos of disposability encountered in many consumer societies. According to Machado-Borges' (2017) analysis of waste and middle-class-ness in Brazil, an ethos of disposability signifies the ability of consumer cultures to constitute "waste as ethically insignificant" (Hawkins 2006:29). Although residents believed waste should be disposed of and taken out of sight, they were uninterested in what happened to waste after disposal (Machado-Borges 2017:312)". However, this raises the question of what happens when waste is disposed of in the *wrong* place (Figure 6.8). Even on the peripheral edge of town in Alice Springs, residents are sensitive to maintaining the boundaries and edges of the town in order to secure and preserve the ecological amenities of the surrounding bush and scrub. I thought back to a field note I had recorded a month earlier describing how social media was employed to mitigate waste being discarded in inappropriate places:

> This afternoon while observing the online Alice Springs Community Forum, I came across a post with a picture and thread in which a member of the community was shaming someone for dumping their rubbish in the bush. I have chosen to exclude

some of the photos and comments in order to preserve anonymity. However, the original post had a photo which contained the address, first initial, and last name of the individual who likely dumped the rubbish. The conversation following the post continued to shame the individual. There were a few comments about the illegality of dumping the rubbish and contacting the police.

17 July 2017

Figure 6.8: Photo of Illegally Dumped Household Waste posted on an Open Community Facebook Page (Figure by author, July 17th 2017)

Concerns pertaining towards the preservation of ecological amenities in Central Australia can also be found in the archival record. For example, in a letter to the editor from the Oodnadatta Progress Association (Figure 6.9), rubbish is allegedly linked back to residents of Alice Springs by the absence of container deposit markings in 1987 (Greenwood 1987). So while communications technology, such as mobile phones, social media, and the Centralian Advocate, can help mitigate anxieties associated with distance, they can also be employed to help keep the town and its rubbish from spreading outward, negotiating how and where rubbish should be discarded.

RUBBISH LEFT BY VISITORS

Sir,—Our association has become very concerned at the amount of rubbish being left by visitors at Dalhousie Springs in the Witjira National Park.

As yet there are no permanent NPWS staff at Witjira so it is imperative that visitors take their rubbish with them.

After all, if there was room to take containers in, there should be room to take them out again.

Rubbish buried or left behind in garbage bags is soon scattered by dingoes, hawks and crows.

Dalhousie has become an increasingly popular spot with Alice Springs people and some of the rubbish picked up recently is identifiably of Territory origin, such as non-deposit drink cans.

Please, Territorians, take care when next you visit the Springs to leave it squeaky clean, ready for the next visitors.

Robin Greenwood,
Secretary,
Oodnadatta Progress Association.

Figure 6.9: The Oodnadatta Progress Association draws attention to the rubbishing of park lands over the South Australian border (Greenwood 1987).

6.4 Recommendations: Confronting the (In)Visibility of Electronic Waste

At the time of writing this chapter in August 2018, the Basel Action Network (BAN) released a follow-up to their e-Transparency report which flagged a number of e-waste recyclers illegally exporting e-waste from the US (Puckett et al. 2016). This time around, Palmer et al. (2018) have flagged Australian e-waste recyclers registered under the National Television and Computer Recycling Schemes for illegal export. While these reports highlight the power of GPS technology in making illegal and illicit trade networks visible to the public, it remains unclear how much e-waste is being exported in this manner and what happens to e-waste and the people who process it upon leaving Australia. As discussed earlier, the transboundary movement of e-waste has been a key point of focus for geographer Josh Lepawsky (2014, 2015, 2018). This scholarship is complimented by researchers who have sought to characterize the afterlives of exported e-waste (e.g. Lepawsky and Mather 2011; Hertz and Parikka 2012; Kirby and Lora-Wainright 2014; Reddy 2015; Akese and Little 2018; Cross and Murray 2018). For the majority

of my interlocutors in Alice Spring, with the exception of those who tinker with discarded electronics (see chapter four), the possible afterlives of e-waste are obfuscated by waste management and recycling infrastructure.

Anthropologists and archaeologists theorize material objects as frames that tell us what is appropriate and inappropriate in a particular society (Miller 1987, 2005, and 2010; Bourdieu 1977). Even when stored in junk drawers, attics, and basements, e-waste is relatively inconspicuous. As discussed in chapter four, the more an invisible an object has become, the more power it has to reinforce societal norms. Social anthropologist Daniel Miller dubbed this phenomenon 'the humility of things' (Miller 1987:85-108, 2005:5). In Australia, public awareness of the mass waste generated by the Australian public and private sectors is generally limited except for the occasional exposé (e.g. War on Waste, ABC Four Corners), or annual acknowledgments such as National Recycling Week activities.

However, if encountered in a public space rather than a private or domestic space, garbage becomes more visible and upsetting. This idea was repeatedly observed on community related social media pages where people have 'called out' others for dumping their waste in public places. Of course there are exceptions, and a number of the people I spoke with are actively doing their best to extend the lifespan of their electronic devices and challenge the tsunamis of waste produced by mass consumption (see chapter four).

While reducing, reusing, and recycling are absolutely preferable to indiscriminate mass wasting, waste remains an inevitable by-product generated at all stages of the life history of electronics including repair, reuse, and recycling (Little 2014; Lepawsky 2018). The humility of e-waste makes it exceedingly difficult, however, for individuals to visualize and come to terms with the waste and residues of these activities. What is needed, then, is a road map for visualizing e-waste in Central Australia.

6.4.1 A Road map for Visualizing E-Waste

As discussed earlier in this chapter, discarded electronics at the margins of waste management discourse are difficult to see and know. As Lepawsky (2018) and others (e.g., Gray-Cosgrove et al. 2015; Little 2014) have articulated, e-waste and hazardous waste are indeterminate categories loaded with inherent ambiguities making it difficult to count or even locate all of the waste produced in the manufacture, use, and discard of electronics. However,

from the perspective of those e-waste experts I interviewed, the amount of waste being generated across the life history of electronics is not entirely indiscernible. They acknowledge waste generated by the consumption of resources for production and transportation. Furthermore, they are aware that recycling itself also produces waste which will need to go somewhere. My interlocutors are mostly in agreement that we cannot simply recycle our way out of this problem. So why then, do the political actors in Australia continue on the path which privileges postconsumer recycling and the destruction of discarded electronics? What would it look like if policy makers, industry, and individuals focused upon reducing waste through the design of products, services, and infrastructure? Confronting the (in)visibility of e-waste in Australia requires regulatory approaches that take into account local opportunities for e-waste and resource recovery.

6.4.2 Reframe Local Opportunities for E-Waste and Resource Recovery

Large electronic appliances such as televisions, washing machines, refrigerators, and computer towers are primarily discarded at the RWMF in Alice Springs. While a small number of retailers offered to collect televisions and computers, the majority of discard activities take place at the transfer station on the first Saturday of each month. Frequently, I would hear my interlocutors request that the ASTC be more involved in setting up and managing e-waste recycling. For example, a local electronics repairer expressed his concerns regarding the ASTC charging for e-waste collection as well as his interest in the repair shop becoming a drop-off point for e-waste:

> "Town council really should be a lot more involved in setting up a recycling. Because at the moment, the town council here, as far as I know, they are a [Tech-Collect point]. And I've been led to believe that the Tech Collect is free for [e-waste]. There's just a freight they've gotta get down. So, I don't understand the council's charges and why they only have the one free day. So, I'm still waiting for an answer for that one too. I don't think I'll get an answer for it. So, if it all goes well with the Tech Collect one, then I can advertise the fact that we can then collect electronic waste. Because they provide you with a storage bin and they collect it once a month, I think it is. It just goes back on a truck. So, it'd be good if it happens".

While providing more nodes for the collection of e-waste is an easy step forward, this system still relies upon costly forms of transportation to relocate e-waste for recycling in Australia and overseas. Perhaps it is more sustainable and beneficial for the town of Alice

Springs to invest in local recycling opportunities? When asked about opportunities for recovering resources from e-waste locally in Alice Springs, rather than elsewhere, one interlocutor worries about the cost but draws attention to recycling already happening in town:

> "Um and people are trying. We've got the cash for containers, that's more of a government thing than a locally owner thing. But you've got Alice Waste Disposal, they're doing those fake tread tyres… things like that. And you've got that Recycle Bill, he'll supply the bin as long as you put your ten cent returnable containers in there. He'll pick it up for free, he'll clean the bin for free. So yeah, people are trying"

Another interlocutor suggests that the costs of recycling can be overcome by enhancements in technology:

> "Well I think that the scale of implementable technologies always creates a downward pressure on implementation in the sense that the cost for implementing processes is improved as technology improves. And the scale and cost of that equipment descends. So… We're already seeing, in the say six years I've lived in Alice Springs, the town has gone from almost zero recycling, a very kind of old school approach to bottles, to having a much more participatory recycling process. And you've seen a couple of micro-enterprises emerge of people participating in recycling. But not so much e-waste. I think that there's potentially room with understanding for someone to create a small business around managing that process".

In terms of e-waste, he argues, a key obstacle will be coordinating transport and designing a business model that includes "a certain level of disassembly". He then draws attention to two opportunities unique to Alice Springs:

> "One thing that's a little bit untapped is the idea that Central Australia is actually massively energy rich in the sense that solar energy is high yield here. And apart from the cost of… the setup cost, after that, high energy processes can actually be relatively low cost here. So, the idea of being able to recycle plastics through high heat processes. There's actually real potential to do things like that here. But there's relatively high setup costs. And all the technologies have to be imported. This sort of thing. So, there's room for an escalation of small scale industrial enterprise in a town that is relatively rich in energy because that massively offsets the cost of transport if you can value-add to the recycling process here".

While distance proves to be a significant obstacle for the recycling of e-waste in Australia, numerous interlocutors have suggested that focusing resource recovery on local production will render many of these concerns moot. Furthermore, my interlocutors understand that simply placing blame on either consumers or manufacturers is not a viable mechanism of change.

Public awareness of waste related issues in Australia has increased since the airing of the *War on Waste* television series by the Australian Broadcast Corporation (ABC) in 2017. During an interview with the Craig Reucassel, the host of the show, a representative from a major Australian supermarket blamed the consumers for producing food waste by choosing not to purchase non-aesthetically pleasing yet perfectly safe and nutritious produce. This type of argument suggests that an insatiable appetite for new, chic, and cutting-edge technology is at the heart of consumerism and the waste problem, including e-waste. The extent to which this appetite is the source of the problem raises important questions of the responsibility and accountability of consumers. This blame game, however, does little to reveal waste generated along the life history of electronics.

6.5 The Generative Aspects of Remoteness and Marginality

In likening remoteness to rubbish, Newell shifts the discourse from distance to a lack connectivity (Harms et al. 2014:367). A similar shift has occurred in Australian research concerning the role of information communication technology (ICT) in affecting experiences of distance and remoteness (Stillman et al. 2010). Rather than focusing solely on the affordances of ICT to mitigate distance, Stillman and his colleagues identified five salient themes which enable their interlocutors to scale the manner in which they utilize ICT: distance and proximity; work and leisure; connection and disconnection; technology access and exclusion; comfort and anxiety (2010:4). Together these themes cast light on the shadows of rural life and move a rigid conceptualization of remote living. A central tenant of globalization is the collapse of space and time enabled by new modes of transport and communications (Guest 2013). Stillman et al. (2010:9) conclude that access to these technologies may paradoxically reinforce the sense for people living in rural and remote places that the concentration of people and events are "elsewhere" thereby exacerbating experiences of isolation.

By focusing on e-waste, however, this dissertation engages with experiences of isolation and remoteness in Central Australia in relation to the margins of digital connectivity. The marginality of Alice Springs, characterized by its disconnection from the centers of recycling and manufacturing in Australia, may actually enhance the town's ability to reframe local opportunities for resource recovery. Future fieldwork should investigate the potential of digital

connectivity to help link up recoverable resources with skilled and creative individuals interested in local reuse, repair, and recycling across Central Australia.

6.6 Conclusion

In conclusion, this chapter outlines the potential of remoteness to affect how Central Australians understand, or are unable to understand, e-waste as a consequence of their desire to reduce distance, as was the case with mobile phones in the 1990s. As a remote town and major infrastructure hub, Alice Springs is a significant site for assessing the social, material and political manifestations of the tyranny of distance in the minds of Australians. The challenges and realities of managing e-waste in Alice Springs speak to the broader geopolitical canvas of remote and regional waste management in Australia and abroad.

Often hidden in plain sight within our homes, sheds, junk drawers, landfills, and outdoor amenities, e-waste remains largely invisible and absent from the thoughts of many Australians. In order to render e-waste and the web of issues associated with it visible, waste management professionals and policy makers must reorient their limited focus on e-waste as a solid waste with an understanding of the role(s) discarded electronics play in the lives of Central Australians. Only by understanding why and how different people decide to stop using, to discard, or to store their electronic devices can adequate interventions be designed to avoid and reduce e-waste.

Although Central Australians generate e-waste in their homes and via their digital consumption, people generally do not regularly see, think, or worry about it. The humility of things (Miller 1987) frames what types of discard activities are visible and invisible in Central Australia. The tyranny of distance creates a veil around Central Australia making it difficult for residents to see and experience the actual consequences of their consumption. For most, the socio-ecological costs of consumer electronics, digital infrastructure, and renewable energy in Alice Springs remain hidden from view. Digital anthropologists concerned with connectivity have a lot to gain by incorporating waste into their analyses. This chapter has highlighted an urgent need for waste management professionals and policy makers to more seriously engage with the social, behavioral, and political dimensions of e-waste. The (in)visibility of e-waste in Central Australia plays a vital role in determining the extent to which interventions can successfully avoid, reduce, reuse, and recycle e-waste in Australia and overseas.

CHAPTER 7. LOCATING ELECTRONIC WASTE IN THE ANTHROPOCENE

7.1 Introduction

In 1859, Sir Richard MacDonnell, the governor of South Australia, first advocated for an Overland Telegraph route traveling from Darwin to Adelaide rather than along the coastline. MacDonnell believed that the Overland Telegraph would provide an enormous boost to the SA economy and stimulate development of the huge expanse of 'unsettled' country lying between its existing outposts in the Flinders Ranges and the north coast. Just over a decade later, the laying of a submarine cable to Northern Australia (a duplicate cable was laid in 1878 after the first cable failed over twenty times in its first five years of usage) and an Overland Telegraph line to Adelaide revolutionized connectivity between Australia and Europe. However, the intrusion of European settlers at Atherreyurre (a-tuh-ree-oo-ra), a water hole named Alice Springs by the settlers, and the ecological disruption that followed mark the beginning of the Anthropocene in Central Australia.

Alice Springs is deeply affected by transformations in communications and renewable energy technologies. Currently, Alice Springs is experiencing an unprecedented increase in renewable energy technologies. Although this is praiseworthy, because it displaces the monstrosities of fossil fuel, dangerous materials and pollutants such as heavy metals and industrial chemicals remain externalized from renewable energy discourse. Whether acknowledged or not, these monstrous entities persist and pollute during the manufacturing of components and devices used to facilitate renewable energy and communications infrastructure. Despite the inevitable discard of end-point devices such as solar PV panels, waste from renewable energy infrastructure is alarmingly absent from both Australia's e-waste management schemes and environmental discourse in Alice Springs.

This chapter locates electronic waste (e-waste) within the precarious political ecology of the Anthropocene. Media archaeologists, such as Jussi Parikka (2014, 2015) and Sy Taffel (2015, 2016), draw attention to the entanglements of media with plastic and e-waste, human bodies, and ecologies in the Anthropocene. As an amalgam derived from 'Anthropocene' and 'obscene', the term Anthrobscene is a critique of the unsustainable consumption, politically dubious activities, and ethically suspicious behaviors affecting ecological systems (Parikka 2014;

2015). Informed by these various conceptualizations of the Anthropocene, this chapter explores how my interlocutors experience, react to, and, at times, fail to acknowledge the proliferation of waste emanating from the life history of electronics.

This purpose of this chapter is to perform monster conservation (Thompson 2017). Monster conservation is a tracing activity; a way to see relations by illuminating the connection between humankind's conquest and the monsters this conquest has produced (Swanson et al. 2017: M8). In a more practical sense, this chapter brings to light facets of the e-waste problem that are often avoided by environmental activists, policy makers, and waste management experts. Monster conservation requires an in-depth analysis of the very monsters that have been cast outside classificatory schemes and thus left largely unaddressed.

The first half of this chapter contextualizes the emergence of Anthropocenic wastes in Central Australia (Gray-Cosgrove et al. 2015). These wastes, including e-waste, plastic waste, nuclear waste, and orbital waste, share in common a relatively recent origin and the potential to adversely affect the wellbeing of humans and nonhumans across the longue dureé (Stephen 2016). The origins and consequences of Anthropocenic waste are outlined using media archaeology in tandem with political ecology and the anthropology of infrastructure. Together, these approaches illuminate how asymmetries of power along the life history of electronics are entangled with the settler colonial history of Central Australia. Settler colonialism focuses on the forceful and hegemonic acquisition of land and territory rather than labor (Wolfe 2006; Simpson 2014:19).

The latter half of this chapter renders technocapital sacrifice zones (Suarez-Villa 2009) as a continuation of settler colonialism (Wolfe 2006) in Central Australia. A technocapital sacrifice zone is an area that has been wasted, ruined, or exploited for the profit of powerful technological institutions or corporations (Little 2017; Suarez-Villa 2009). The forceful acquisition of land that gave way to the Overland Telegraph line across Australia's Arid interior has culminated in the formation of technocapital sacrifice zones in Central Australia. This section draws primarily upon ethnographic evidence collected during semi-structured interviews with e-waste experts, participant observation at community meetings hosted by a local environmental non-governmental-organization (E-NGO), and archival documentation of anti-nuclear waste campaigns in the Northern Territory.

7.2 Ethnographic Encounters with Solar Monsters

Discarded televisions, computers, and mobile phones are the primary targets of Australia's efforts to mitigate e-waste. Non-regulated and recognized forms of e-waste, however, are still discarded and trashed on a regular basis. These electronic objects prove too tricky and energy consuming ─ requiring both material resources and human labor ─ to adequately incorporate within value systems. Solar panels are often heralded as a beacon of hope. A rooftop installation contains the promise of renewable and endless energy. Despite this promise of a more sustainable and resilient future, solar panels are not immune to ruination. They too are weathered by the heat, the dust, and the aridity of Central Australia. Who, then, is charged with paying attention to and taking responsibility for the management of solar waste in Central Australia? At first glance, the answer appears to be nobody.

Shortly after arriving in town, I met Lucas, a young environmental activist who had recently relocated to Alice Springs from a metropolitan city. We agreed to meet in the late afternoon at one of the pubs lining Todd Mall in Alice's Central Business District. I arrived first and sat on a wooden stool facing the footpath to watch pedestrians scramble past. He arrived shortly after and we both enjoyed the last warmth of the sun before it set over the West MacDonnell Ranges. Our discussion trekked across hazardous waste dumps, e-waste, and eventually towards the future of solar energy in Alice Springs. During this moment we bonded over our shared enthusiasm for the aspirations of Alice Springs as a Solar City. In particular, we both enthusiastically conferred around the notion of a boundless economic future for Alice Springs fueled by renewable solar energy. Together we imagined and anticipated how renewable energy may figure into the development of high tech solutions to twenty first century challenges such as energy, the processing of dangerous waste, and the ever increasing demands on the information technology and communications sector.

This sense of excitement and awe for the solar future of Alice Springs was continually encountered with other environmental activists throughout my fieldwork, especially while attending regional economic development meetings and regular updates from a local group of solar energy activists. Overtime, however, the pangs of excitement were gradually replaced with a sense of uncertainty. It became increasingly apparent that the conjuring of solar powered futures was inadvertently producing shadowy monsters. Forty years ago, Michael Thompson cautioned that dubious prettifying "leads to the pretence that things are tidier than they really

are" (2017[1979]:138). Similar to the precarious effects of industrial campaigns discussed by Swanson and her colleagues, renewable energy campaigns seeking to sterilize and cleanup energy-grids, if left unchecked, will also generate virulent and toxin-spreading monsters (Swanson et al. 2017:M4).

The life history framework (Schiffer 2011) is useful for mapping the dynamic assemblages of people, things, and activities that enable a particular object, in this case a solar panel, to arrive in Alice Springs. In particular, the life history of electronics sobered me to the absence(s) of e-waste from discourses outside the immediate domain of waste management in Australia. While not unique to Alice Springs, these absences are especially concerning considering the commitment of the town's environmental activists to renewable energy and ecologically progressive policies. The most poignant example of e-waste related monster exclusion in my fieldwork came in the form of solar waste.

Although the useful lives of solar PV panels is estimated to be 25 to 40 years (Aman et al. 2015:1196), I regularly encountered discarded solar equipment, or solar waste, at the Regional Waste Management Facility (RWMF) and a nearby scrap yard in Alice Springs. As Cross and Murray (2018) argue, the term "solar waste" is indeed problematic because it designates a diverse range of materials, component parts, metals and plastics into an apparently uniform category. It is worth noting that the majority of discarded solar equipment I encountered in these settings were likely concentrating solar power (CSP) rather than photovoltaic (PV) panels. CSP technologies produce electricity by concentrating energy from sunlight in order to heat some medium housed within the panel (Aman et al. 2015:1193). I suspect that many the PV panels installed in Alice Springs over the last decade will reach the end of their use life over the course of the next decade. Indeed, one- to eight million metric tons of decommissioned solar PV's are estimated to join Australia's e-waste stream over the coming decades (Mahmoudi et al. 2019).

I became attuned to this particular type of e-waste while conducting participant observation at the town landfill. One afternoon, I headed up the landfill with a woman employed at the landfill's secondhand shop. Our objective was to salvage a pile of carpets and bring them to the shop where they could be sold. After we collected the first few roles of carpet, we headed over to the steel and metal scrap pile (Figure 7.1). Nestled within the steel scrap were refrigerators, washing machines, a microwave oven, and solar panel equipment (Figure 7.2)! We

were searching for pieces of non-ferrous metal, such as copper and aluminium, to salvage and sell to a local scrapper. The wind whistled through the giant pile of metal scrap. We used a steel pipe to break open the glass cover a solar powered water heater and then threw it onto the back of the truck.

Figure 7.1: Steel piled up at the Alice Springs Landfill (Photo by author, August 2017)

Figure 7.2: Discarded solar equipment at the Alice Springs Landfill (Photo by author, August 2017)

Over the course of my fieldwork I encountered discarded solar panels at landfills, secondhand shops, metal recyclers, throughout the town, and at various ranger stations without 100 kilometres of Alice Springs. While installed, these objects are considered a vital part of the town's sustainable future. At least twenty percent of the town council's major facilities utilize solar energy (ASTC 2017). Despite the prevalence of solar technology, few of my interlocutors have engaged with the possibility of these electronics entering the waste stream. Having observed solar panels in transit to one of the metal scrappers in town, I decided to ask him if and how he managed discarded solar panels. After a week of negotiating a time to meet, I visited his work yard on a searing hot summer afternoon. His workers continued to pound, saw, and drill away at discarded pieces of non-ferrous metal. At first, I was firmly told that he refused to take solar panels "because they're relatively worthless except for a little bit of aluminum… it's not worth me pulling it apart. So no, I don't touch it. I've got to make a living. I can't afford smashing them apart". I then asked what he thought was the best course of action for someone looking to discard a solar panel. He replied: "the best place for them is at the dump".

Throughout my fieldwork I had noticed that this scrapper did in fact take a number of solar panels after they had been partially dismantled by laborers, including myself, at the RWMF:

> At the end of an abnormally rainy and cloudy October afternoon, I helped to break open the glass of a set of Solahart J series panels that had been accumulating in the scrapers bin over the last week. The manager at the recovery center and I held them over the steel dumpster bin. He used his other hand to swing a hammer at the glass so it would shatter and fall into the dumpster. We then dangled the panel upside down and over the bin to ensure most of the glass did not end up on the pavement.

This vignette points towards a tendency for e-waste in Central Australia to be loosely or under-regulated. Having participated in the shattering of multiple solar panels, I became increasingly concerned with the regularity in which shattered glass from various types of e-waste is encountered by laborers at waste recovery centers. However, I was also surprised to notice the relative lack of awareness concerning the presence of solar waste during interviews with e-waste experts and environmental activists. Solar panels were rarely mentioned as a concern during our interviews (n=75). When I choose to bring solar waste to my interlocutor's attention, it was

typically regarded as a *future* waste stream to be dealt with at the end of their anticipated product lifespan in about twenty-five years[42].

Instead, my interlocutors were more concerned with the potential benefits of solar equipment as a renewable form of energy in comparison with the socio-ecological consequences of fossil fuel. This omission led me to familiarizing myself with the life cycle of solar equipment. In 2009, the Silicon Valley Toxics Coalition (SVTC 2009) released a report titled "Toward A Just and Sustainable Solar Energy Industry" to promote human health and advances in social and environmental justice. Although the SVTC believes solar energy will play an essential role in addressing global warming and revitalizing the economy through the creation of "green jobs", the authors of this report critique the win-win narrative of solar energy. They illuminate the oft-ignored underbelly of solar energy; namely the potential environmental and health costs of the rapid uptake of solar energy alternatives.

During a question and answer session at a community meeting organized by SolarFutures[43], on ways to develop a publicly owned solar infrastructure in Alice Springs, an elder technology professional that I will call Rory[44] was concerned with the poor carbon footprint of solar panels. One of the presenters responded in disagreement, claiming that there is a three to four-year carbon pay off period. As he continued, I wondered to myself about how this pay-off period is determined. A narrow focus on carbon dioxide or greenhouse gas emissions pushes the people and ecologies that suffers in order to produce solar equipment and manage solar waste into the shadows.

Another member of the audience asked about the use of tritium batteries and improving the flexibility of solar infrastructure to respond to rapid changes in battery technologies. As batteries' prices continue to come down, the affordability and accessibility renewable energy increases. This raised another question. What does it mean for these prices to go down? I found myself becoming more apprehensive towards the increase in solar panel uptake in Alice Springs. While the renewable energy activists in town were quick to point to the economic and ecological benefits of replacing their current fossil fuel based infrastructure with solar power, discourse

[42] This estimate of twenty-five years is also quoted by scholars (e.g. Aman et al. 2015; Xu et al. 2018). I am not certain where it has originated but given my fieldwork I am suspicious of its accuracy and even more concerned with its ability to cast solar panel waste as a problem to be dealt with somewhere and some-when else.
[43] This is a pseudonym and not the actual name of the activist group who organized the meeting.
[44] This is a pseudonym.

concerning solar waste and the negative socio-ecological effects of solar equipment production is absent. For example, after the meeting I found an online petition written by SolarFutures. There was no mention of the need to responsibly manage solar waste in Alice Springs and minimize the harm caused to people involved in the manufacture solar PVs and the processing of solar waste. As mentioned above, the waste management and environmental experts I interviewed tended to believe that solar equipment will not become an issue for at least two more decades.

There are of course some important exceptions. During the meeting Rory brought up a counterpoint. Instead of producing more electricity, "we should be focused on consuming less of it"! After the meeting, Lucas and I shared that we both felt that Rory had basically read our minds. In response, the speaker seemed to conflate energy efficiency with a sheer reduction of energy usage. This narrative was similar to one presented at another meeting that Lucas and I both attended focusing on regional economic development.

In emphasizing solar waste, we can begin to see how zero waste and renewable energy narratives paradoxically rely upon the unsustainable consumption of resources as well as a disparate exposure to the pollution and adverse health effects associated with the processing of solar waste. Given the presence of microelectronics and the incorporation of highly toxic materials like lead, brominated flame retardants, cadmium, arsenic, and nickel in their manufacturing, discarded solar equipment is indeed a form of e-waste (SVTC 2009:19; Aman et al. 2015:1197; Mulvaney 2013:231; Xu et al. 2018; Mahmoudi et al. 2019). Over the last decade experts on the life cycle of solar energy equipment have called for the implementation of precautionary plans and extended producer responsibility (EPR) for the management of solar waste (Aman et al. 2015:1197; SVTC 2009).

As I have repeatedly stressed to my interlocutors in Alice Springs, I do not intend to disparage the clear environmental benefits of moving away from fossil fuels and towards renewable solar, wind, and water-based alternatives. For example, several life cycle analyses of solar PV panels containing cadmium (Cd) confirmed that the cumulative flow of Cd into the environment were significantly higher in coal burning power plants (Mulvaney 2013:233). However, there is an absence of research examining how cadmium use in PV manufacturing may affect the health of workers and nearby communities (Mulvaney 2013:233). Furthermore, Mulvaney draws attention to a series of environmental justice issues that have been largely externalized from renewable energy discourse including the damaging and destruction of Native

American cultural resources near Blythe, California and the disproportionate burdens of solar energy futures on particularly threatened and endangered species like the desert tortoises and Mojave kit foxes (2013:235-236). This proliferation of environmental justice issues suggests that a failure to treat and prepare for the influx of solar e-waste in Alice Springs may result in a failure to design for an environmentally and socially just future.

Unlike the European Union, which places solar waste under the Waste Electrical and Electronic Equipment (WEEE) directive, the Commonwealth of Australia has no regulations prohibiting the landfilling of solar PVs. A significant absence of policy engagement with e-waste in the Northern Territory, especially those discarded electronic objects that fall outside of the NTCRS (NT EPA 2015; Commonwealth of Australia 2014), is indeed troubling. A clear plan to manage the influx of waste solar PV panels is conspicuously missing from the Northern Territory's Waste Management and Pollution Control Regulations (Northern Territory of Australia 2014) and a report issued to the Alice Springs Town Council titled "RoadMap to a desertSMART Town 2013-18: A Vision for a Sustainable Resilient Alice Springs" (McClean and McHenry 2014). Although McClean and McHenry stress the importance of reducing waste through resource recovery and replacing imported goods with Central Australian goods, their report does not come to terms with the impending influx of solar waste (2014:20). This externalization of solar waste, both financially and symbolically, conceals the damage of solar monsters beneath the veneer of a pseudo-clean and precarious future for renewable energy in Central Australia.

7.2.1 The Materiality and Aesthetics of Infrastructure

A complex web of infrastructure underlays communication networks, energy grids, and the manufacturing and discard of electronics. For Larkin (2013), infrastructures are simultaneously things with their own material, symbolic, and ideological properties and also, the relationship between things. Infrastructure is matter that enables the movement of other matter (Larkin 2013:329). Infrastructures are objects, including landscapes and 'natural resources', that create the grounds on which other objects operate, and when they do so they operate as systems (Larkin 2013; Carse 2012). The technological characteristics of infrastructure congeal to generate the ambient conditions of everyday life such as temperature, speed, and fluorescence and particular aesthetic experiences of place (Larkin 2013:336). The ambient experiences of

infrastructure create “a sensing of modernity, a process by which the body, as much as the mind, apprehends what it is to be modern, mutable, and progressive” (Larkin 2013:337). The aesthetic dimensions of infrastructure allow for materials such as iron, mud, concrete, fiber optic cables, and plastic to stand for an era and bring about a sensory apprehension of existence (Larkin 2013:338). In Alice Springs, the aesthetic and material dimensions of infrastructure have shifted from the days of the Overland Telegraph to the contemporary digital era of mobile communications and high-speed-broadband.

Despite technological transformations, infrastructural projects in Central Australia are aesthetically encased by the iron rich red dirt, lending a sense of deep continuity. The serene beauty of the red soil, the rolling MacDonnell ranges, and the sandy riverbed of the Todd remain a constant in Alice Springs. It is common for individuals who have lived in Alice Springs to reminisce about feeling awestruck the moment they pass through the gap in the ranges. The extraordinary view through the gap or from atop Anzac Hill, Mount Gillen, and the Undooyla hills underlay experiences of place and belonging in Alice Springs, the co-mingling of humans and other living beings, and developmental infrastructure projects such as the recent construction of an entire housing development powered by solar panels. Slivers of infrastructure, including a footpath, road, train track, and powerlines flow through this gap parallel to the ancient Todd River. This new solar powered housing project is located opposite the town on the other side of the gap. Although the ongoing development of renewable energy in Alice Springs is intimately entangled by the politics and aesthetics of infrastructure, discussions pertaining towards the development of this infrastructure in Alice Springs rarely consider the destructive legacy of settler colonialism and the true breadth of waste produced by solar waste.

7.3 Electronic Waste and Settler Colonialism

An early encounter showcasing the destructive capacities of media on indigenous ways of life in Central Australia is documented in Stuart Traynor’s comprehensive history of the Alice Springs Telegraph Station (2016:87). According to Traynor, in 1873:

> “The Arrernte watched these hard-hooved animals trample the banks of their creeks and foul the water in a way that soft-footed native wildlife had never done. These strange animals, with their voracious appetite, were also having a profound impact on the food and medicinal plants they relied on”… It is no wonder skirmishes

> occurred in the years that followed as Arrernte tried to assert their rights to land and protect their sacred places" (2016:87).

The reader is tempted to question whether or not the phrase 'strange animals' refers to the livestock or the European descendent intruders whose appetite for land and conquest has put Central Australia's cultural and ecological future at great risk. During my fieldwork I frequently rode the narrow footpath through the gap (Ntaripe), a sacred place to the Arrente People located between the East and West MacDonnell Ranges (Traynor 2016:138). Although, volunteering at the regional waste management facility alerted me to Ntaripe and other sacred places, there is still much more to learn regarding the intersections of waste and sacred places in Alice Springs.

The life history of discarded electronics and the afterlife (Reno 2016b) of e-waste in Alice Springs remain entangled with the vestiges of settler colonialism and are greatly influenced by contemporary forms of technocapitalism. As mentioned earlier in this dissertation, the first residues of e-waste arrived in Central Australia with the settlers who constructed the Overland Telegraph. Although it is unlikely that the spent Meidinger cell batteries were malignant, discarded batteries are not the only waste that emerged at the time. Settler colonialism is a territorial project focusing on the acquisition of land and territory rather than acquisition or creation of labor (Wolfe 2006; Simpson 2014:19). In order to enable the settlers to permanently colonize a place, settler colonialism operates to eliminate indigenous peoples and indigenous ways of life from desired territories (Wolfe 2006:388; Simpson 2014). The settler colonial project seeks to remove indigenous bodies, souls, culture, and forms of difference from the land (Simpson 2014). In other words, "settler colonialism destroys to replace" (Wolfe 2006:388) using a range of techniques such as occupation, treaties, forceful elimination, containment, assimilation, notions of 'natal' rights, and presumptions of just occupancy which create and sustain these forms of dispossession (Simpson 2014:21).

The Overland Telegraph line was a narrow corridor through the heart of Australia in 1872 and the Alice Springs station was merely a tiny island of white settlers in Aboriginal land (Traynor 2016:75). Strategically located in the heart of the continent, the Alice Springs Telegraph Station assumed a greater prominence than any other on the OT line, except the terminus at Port Darwin, and became the supply depot for the lonely outposts to the north (Traynor 2016:67). Around two hundred Arrente People lived in the area surrounding the telegraph station in the 1870s. Historical accounts suggests the local Arrente People were

remarkably tolerant of white settlers squatting at Atherreyurre (pronounced a-tuh-ree-oo-ra). Atherreyurre is the Arrente name for the water hole, which came to be known as Alice Springs, named after the wife of Charles Todd, a key figure in the construction of the OT line. The newly built station was a fortress with gun ports so men could fire on any would-be attackers, although this was never necessary (Traynor 2016).

The settlers did not ask permission to settle next to one of the Arrente People's most reliable sources of water and a spot where Aboriginal people traditionally gathered to exchange goods and prepare for ceremonies (Traynor 2016). Anthropologist Theodore GH Strehlow briefly describes the socio-ecological impact of settler colonialism in the region:

> "The introduction of cattle, sheep, and rabbits, and the consequent destruction of the natural vegetation cover, have turned many of the best portions of the Centre into dust bowls. In drought times the eaten-out native game reserves are littered with carcasses of dead cattle" (Strehlow 1965:145).

As the availability of indigenous fauna decreased, the spearing of cattle became a pressure point over the coming decades. Violence towards Aboriginal people became normalized in the region as the settlers began to police their newly acquired estates (Traynor 2016). Today, the violence towards Aboriginal people continues, albeit in different ways. For example, in a piece written for the Conversation, archaeologist Claire Smith (2017) draws attention to the material culture of racism in the Northern Territory. The settler colonial critique helps to make sense of the slow violence afflicting Aboriginal landscapes in Central Australia. Settler colonialism ushered in a new era of waste and socio-ecological relationships in Central Australia.

When Euro-Australians colonized Central Australia, they classified the arid lands as largely uninhabited and ripe with opportunity. The challenges of locating a suitable path for the OT line and then moving supplies up and down the line fostered the "appearance of isolation and its reality of dispossessed poverty" (Wilmsen 1989:157). Today, places such as Alice Springs are officially designated as remote or regional by the Australian government. Mparntwe, the name given to the area by the Arrernte people, however, was not isolated or impoverished in the eyes of the Aboriginal inhabitants who have lived in and rendered these places livable for millennia. In **DARK EMU**, Australian Indigenous writer Bruce Pascoe illuminates the deep history of Aboriginal ecological knowledge concealed by European settlers over the past two centuries:

> "In the excision of unpalatable parts of our history, the illegal occupation of land and the slaughter of the occupants, for instance, we have lost elements we never

> knew existed. Those elements — like the crops, houses, irrigation systems and fisheries — may hold keys to future prosperity" (Pascoe 2014:154).

What else has been lost or, at the very least, is on the line due to the culturally and ecologically destructive outcomes of settler projects in Colonial Australia?

In Alice Springs, a number of organizations have sprung up to incorporate indigenous perspectives and concerns into the technological and economic future of Central Australia. During my fieldwork in 2017, I conducted participant observation at regional and remote community development meetings focused on imagining the future of renewable energy enterprises in Alice Springs. These meetings spanned topics such as the digital and technological future of Alice as well as concerns regarding the future of fracking and the burying of hazardous waste in the Northern Territory.

The present political climate of the NT regarding development, waste, and indigenous land rights is disturbing. In the previous section, I drew attention to solar monsters lurking in the shadows of e-waste and renewable energy discourse. I argue that acceptance of and engagement with the inevitability of waste is a necessary path towards conducting our very own monster conservation (Thompson 2017). Reflecting on Pascoe's (2014) DARK EMU illuminates how the rubbishing of discarded consumer goods in Australia is entangled with the rubbishing of deep indigenous history and ecological knowledge.

The overlaying of differential infrastructure onto Aboriginal land by the Australian government is part of the wider project of settler colonialism that can be observed across the country. In summary, infrastructure is understood as a sociotechnical assemblage consisting of both humans and non-humans (Amin 2014:138). Differences and divisions are inscribed in the workings of infrastructure. For example, the socio-spatial decisions of providers to connect power, water, sewage, or internet to people around remote Australia. Amin (2014:139) argues that rendering these differences and divisions visible reveals imbalances. Focusing on the recent history and ethnographic present of waste, in particular e-waste, in Alice Springs illuminates how the development of communication and digital infrastructure in Australia is derived from violent forms of value. That is, the valuation of Alice Springs as a central infrastructural hub for remote Australia is inherently entangled with ongoing settler colonial forms of violence.

7.3.1 No-dafone; Opt-us-out

The absence of waste is not only a feature of renewable energy discourse but is also evident in discourse concerning the development of communications infrastructure in Australia. For example, e-waste is not mentioned in a report reviewing the impact of Australia's National Broadband Network[45] (NBN), a recent initiative to connect all Australian's to reliable high-speed internet (Reede 2011). Despite not explicitly dealing with e-waste, Baden Eunson's (2012) paper "NEW MEDIA: BIOHAZARD? MAGICAL THINKING? REFRAMING THE DEBATE" provides a unique and notable exception. Eunson (2012) problematizes the exclusion of perceived and actual biomedical impacts of new media in Australia, especially concerning the impact of electromagnetic radiation from mobile phones and telecom towers. In the following field note, I describe a similar conflict that I encountered during preliminary fieldwork conducted in the Adelaide Hills region of South Australia (SA).

> This morning I woke up at 5:30 AM to shower and get ready to catch the bus to a small town in the Adelaide Hills about 10 miles away from my home in Adelaide's CBD. I logged into Facebook to check for updates from the Vodaphone Telecom tower protestors and noticed that Katie had sent me a message saying she was awake and was willing to take me over to the protest around 7 AM. I accepted the ride and enjoyed a French press coffee while I continued to gleam over Facebook for more details. I noticed a comment was posted last night saying that a politician from the Greens and another from the Liberals were supposed to show up along with a reporter from ABC radio. About an hour later we arrived to an assemblage of residents with signs and slogans reading: 'This town won't back down, Vodafrown!!

This quote was also found on a Facebook post that I recorded prior to heading to the community breakfast. **Figure 7.3** is a demonstration showing the height of the proposed telecom tower and its likelihood of disrupting the town's visual aesthetic, which is understood to be an amenity by the protesters. When I returned to my house to write up my notes later in the day I noticed that more photos had been posted to the Facebook page from different areas around town showing how visible this tower would be from a multiple points of view.

[45] The National Broadband Network (NBN) is a multi-billion dollar infrastructural project funded by the Australian Government (Reede 2011:23).

Figure 7.3: Activist demonstration showing the height of the proposed telecom tower (Photo by author, June 2016)

One of the first people I spoke with at the protest was a middle-aged man who immediately pinned me as an American. He then told me he had previously lived in Illinois for about a decade. According to him, this site is one of seven proposed sites by Vodafone. He believed that the property owner was to be compensated $30,000 AUD to have the tower built. Katie suggested that the property might actually be owned by the same people who own the nearby railway that was visible through the sparse winter trees.

Many families came with their young children and an older couple brought their dog along with them. Everyone prepared themselves a coffee from the large communal French Press and a breakfast roll with egg, grilled onions, and sauce. With warm jumpers and a hot meal in our stomachs, the group began to share their concerns with each other. Katie and I found ourselves chatting with a local council member who was elected in 2014. We learned that he also had a research background from the same university where Katie had previous worked. Despite a

significant post-development application push-back by the community, he felt that the consultation process could have probably been done a little bit better. This sentiment was echoed by Travis[46], one of the main organizers, who informed us about an upcoming private appointment he made with Environment, Resources and Development (ERD) Court to voice his concerns. One of the issues identified during this informal discussion involved the limitation of one community representative speaking on their behalf and trouble finding an expert witness. The individual that the ERD had recommended is a current employee of Telstra, a competing Telecom company, and therefore holds a conflict of interest. A woman in the group expressed her frustrations about not being able to find anyone who is powerful and knowledgeable in this type of conflict. However, the community members around her continued trying find alternatives despite a shared frustration.

One of the interesting moments in this gathering was a discussion concerning how the group framed their opposition. Rather than their initial concerns regarding the biomedical ramifications of electromagnetic radiation from the Telecom Tower, the group reframed their refusal using the legal language and discourse of amenities. Some parents in the communities had been concerned that children in the nearby primary school were going to be exposed to radiation forty hours a week. Adapting to court constraints, however, the community activists found that they could only leverage certain arguments such as the destruction of communal amenities to formally challenge the building of the tower. They shared with me and Katie that the original Vodafone development application was initially refused on these grounds so the community wished to double down.

Later in the morning I was able to have a chat with the local artist who painted and brought a painting with him to protest the Vodafone tower. Over the last several years he has collected landscape paintings that depict a European style landscape in Australia. However, he is critical of these original paintings because they replicate the myth of Terra Nullius, ignoring Aboriginal presence and the disruption settler society has caused. In response, he juxtaposes new images and text over the old colonial landscapes in order to highlight ongoing social and environmental justice issues (Figure 7.4). This protest is characteristic of a broader tension between infrastructural development and settler colonialism in Australia.

[46] This is a pseudonym.

Figure 7.4: Western style landscape in Australia painted over by an Adelaide based artist with anti-telecom art and slogan (Photo by author, June 2016)

7.4 A Micropolitical Ecology of Technological Sacrifice Zones

A New South Wales (NSW) based mining company currently intends to construct a hazardous waste dump in a remote community located in the vicinity of Alice Springs. This mining company has proposed to develop a dual mine and waste storage facility approximately 120 km south of Alice Springs. If approved, building and development will begin immediately and will last about four years. According to the companies Environmental Impact Statement (EIS), they project the mine's lifespan to be about 500 years with the waste being stored for geologic time. The proposed mine is a key example of settler colonialism, in that it will likely destroy vital cultural and ecological resources, instead replacing them with pollution and waste. This particular form of settler domination via waste and pollution is also known as waste colonialism (Liboiron 2018b). These settler and waste colonial activities, which are

fundamentally linked to the development of communications and energy infrastructure in Australia, alter the very geology and ecology of Central Australia.

Intimately tied with the production of e-waste and other hazardous wastes are the questions of where these wastes end up and who or what is sacrificed in the process. These categorizing moments highlight the competing epistemological and political commitments of governments, multi-national corporations, and Central Australians (Larkin 2013:330). Categorizing moments occur in national politics, such as in the development of the NTCRS, and also within the micropolitical decisions made by households, small businesses, or NGO's to negotiate or tolerate the effects of decisions made by the Northern Territory or Commonwealth of Australia. A micropolitical ecology of e-waste in Alice Springs must be tuned "into situated, intersubjective, and micro-level processes of contentious negotiation and tolerance" (Little 2017:3).

The e-waste generated in Alice Springs is deeply entangled with technocapitalism via waste and resource recovery, recycling, and transportation infrastructures. By techno-capitalism, I refer to Suarez-Villa's emphasis on corporate power and its' exploitation of technological creativity (2009:3). This section is significantly inspired by Peter Little's micropolitical ecology and ethnography of technocapital sacrifice zones in Endicott, New York, the birthplace of IBM (2014; 2017). In addition to illuminating IBM's legacy of hazards and stigmas in Endicott, Little draws attention to the affective experiences of those who been left behind or sacrificed by IBM. The ethnographic record is rife with examples of the precarious legacies of powerful actors such as the US military (Turner 1997; Johnson 2019).

Rather than employing the term "technocapital sacrifice zone" to exclusively describe disadvantaged communities and disproportionally contaminated landscapes, Little contends that they are social and micropolitical zones made up of interconnected narratives, affects, discriminations and consequences (2017:2). Drawing on Wendy Brown's reminder that the term sacrifice indexes "the life-giving powers of the sacred", Little's reconceptualization of technocapital sacrifice zones importantly registers the possibility of a continuum of responses to economic and corporate sacrifice (2015:214). Within a community of technological neglect, Little documents contamination narratives and narratives of endurance, survival, and life, "offering a critical –reinterpretation of the nature and the social production of sacrifice itself" (2017:4). Armed with Little's micropolitical ecology framework, the remainder of this chapter hones in on the issue of technological sacrifice zones in Central Australia.

As outlined in chapter two, rethinking e-waste to include the full breadth of pollutants and residues expelled across the life history of electronics is a cumbersome and energy-intensive endeavor. Although they are not the primary focus of this dissertation, the consequences of technocapitalism in Central Australia are inseparable from my analysis of e-waste in Alice Springs because they involve the mass wastage of hazardous materials inextricably linked to the development, maintenance, and wastage of digital and energy infrastructures. Furthermore, the environmental non-governmental-organization (E-NGO) that I collaborated with throughout my research is and has been deeply concerned with preventing the development of nuclear and hazardous waste storage facilities in Central Australia.

7.4.1 Central Australia in the Age of the Anthropocene

In recent history, multiple sites across Central Australian have been proposed as dumping grounds for national and international hazardous waste (De Lorenzo 2012). The rendering of these sites as being in the "middle of nowhere" is particularly unsettling for Aboriginal and non-Aboriginals living throughout Central Australia (De Lorenzo 2012:63). Although the region is large and sparsely population with geologically stable areas, an arid climate suitable for hazardous waste storage, and little chance of glaciation (Taylor 2006), rendering Central Australia as being "nowhere" is a gross misrepresentation.

Advocates for the construction of storage facilities for international hazardous waste in Australia aspire to isolate materials that pose global dangers by proposing a shared responsibility for the best choice of technology and procedures (Taylor 2006:879). Anti-storage advocates, however, stress the fallibility of containment strategies due to the plethora of pathways for hazardous materials to escape over long periods of time (Cowan and Evans 2010). From a waste management and policy perspective, the questionable geologic suitability of Central Australia is also at odds with political and social concerns pertaining towards Aboriginal land rights and environmental protection. The National Radioactive Waste Management Bill 2010, which targets the disposal of Australia's current and future radioactive waste on traditional Aboriginal lands, has been critiqued for targeting Aboriginal communities, failing to provide informed consent, and ignoring the best-practices for the management of radioactive waste (Cowan and Evans 2010). Furthermore, many Australians harbor a prevailing skepticism towards the ability of

storage methods to provide the necessary isolation and security of hazardous materials over geologic time (Taylor 2006:879).

This skepticism can be extended more broadly from concerns focused on the impacts of hazardous waste and disasters on a sparse human population to the ways non-humans in Central Australia are affected by Anthropocenic wastes. After all, humans are "a serious hazard, or threat, or risk to other species and planetary ecosystems and our impact in the Anthropocene might mark a significant disaster in the history of the more-than-human" (Dominey-Howes 2018). Hazardous waste such as heavy metals and inorganic compounds are produced across the entire life history of electronics and many of them are bioavailable, meaning they have a tendency to bond with the molecules of living organisms (Luo et al. 2011; Sepúlveda et al. 2010).

Another consequence of concentrating on remote or central areas is the failure to deal with the issue of waste generation in the first place. Waste arising from the development of communications infrastructure and mining in Alice Springs is intimately tied to the town's inception. From the OT in the nineteenth century to the NBN in the twenty-first century, e-wastes in the form of spent batteries, copper wires, end-of-life modems and routers, and discarded computers have been increasing in quantity and complexity. Today, refuse arising from the ongoing development of infrastructure in Alice Springs and hazardous waste threaten surrounding communities in Central Australia.

7.4.2 Enacting and Contesting Technocapital Sacrifice Zones in Central Australia

How are technocapital sacrifice zones enacted and contested in Central Australia? This question is derived from my third research question addressing how my interlocutors in Alice Springs experience, understand, and, at times, contest multiscalar dimensions of e-waste. Whereas previous chapters have highlighted the invisibility of e-waste produced within Alice Springs, this chapter explores how my interlocutors register the threat of hazardous waste storage operations, including e-waste and nuclear waste, in Central Australia. In November 2017 I attended a community meeting informing concerned residents and Traditional Owners of Central Australia about the region's future as a sacrifice zone for hazardous waste. More than thirty Traditional Owners, Aboriginal people awarded certain rights and responsibilities in relation to a tract of land in agreement with the Australian government, travelled to attend the public meeting

and were joined by concerned "residents from the Alice Springs community. The following concerns were summarized by the E-NGO, published online, and are paraphrased in order to protect the identities of my interlocutors:

- A united belief that the region should not be a sacrifice zone for hazardous waste from across Australia.
- A lack of transparency around native title negotiations and what the company is promising the community.
    - Some members of the community claim they were not informed of the storage of hazardous waste for geological time.
- The native title claimants are concerned that the project will interfere with their cultural rights such as hunting and the ability to teach and grow with the next generations.
- The lack of a sufficient regulatory framework and no long-term monitoring plan for the project.

Prior to the meeting, I met with Lucas at the E-NGO to help him run over his presentation and then we rode together to the Alice Springs Town Council. When we arrived, Lucas received a call from the translator they had hired who notified him that they could no longer attend the community meeting. Fortunately, one of the Traditional Owners present at the meeting volunteered to translate the presentations given by Lucas and his colleagues. The presentations began with the ritualized script of acknowledging the Aboriginal custodians of the land and their ancestors, past, present, and future. The indigenous makeup of the room made this script more relevant than usual. I noticed a small collective of others from the E-NGO and residents I had interviewed about e-waste spread throughout the audience.

The director of the E-NGO begins by summarizing their history of involvement in environmental campaigns such as the anti-nuclear and anti-fracking movements. Lucas followed up with his presentation summarizing the lengthy EIS document submitted by the mining company for review by the NT EPA. Lucas was followed by Mary[47], a young indigenous scholar who spoke from her perspective of having family from the area affected by the potentially hazardous waste storage facility. Her presentation stressed the community's right and ability to speak on their own behalf. The purpose of this community meeting, she says, is to "bring

[47] This is a pseudonym

together the knowledge in the room, find the gaps in knowledge, and make a plan to fill the gaps".

The presenters drew attention to the absence of a national Australian policy or plan for managing hazardous waste. Another key concern was the likelihood of transport accidents and spills. According to the presenters, the mining companies plan is for stockpiled waste to be kept above ground for four years until enough of earth has been mined. One of the audience members drew attention to the security issue associated with leaving these materials out in the open. They are proposing that the facility will take up to 400,000 metrics tons of waste per year which roughly equates to 105 containers or 35 trucks each day. There are concerns that this hazardous waste could compromise the organic certification of a nearby farm. There is also the cultural impact of it as a "sacrifice zone", as a stigmatized zone where people and places do not matter. The proposed site is merely twenty kilometers from the sacred Finke River. The sacrificing of such areas threatens to erode the means to protect sacred places under the auspices of regional economic development.

Lucas confirmed that the mining company "has contractual relationships to accept waste" and that these contracts are commercial in confidence, meaning that the details of what type of waste will be deposited are not required to be accessible to the public. Both Lucas and I took issue with this lack of transparency. Following the meeting we discussed how human rights and the health of the earth should outweigh the profits and gate keeping of intellectual properties. During his presentation he also shared that the waste acceptance criteria is a "voluntary guideline rather than a legal requirement". Ultimately there is significant uncertainty with how this waste will be regulated. Especially since there are exemptions for mining under the Northern Territories Water Act and Waste Management & Pollution Control Act. It is also unclear whether or not the NT EPA has enough capacity to monitor and watch over the site because it is unprecedented in scale. There are also examples of similar hazardous waste storage operations outside Australia leaking nuclear waste (Warren 2017).

The EIS indicates that two hundred workers will be housed on site at accommodation facilities also known as *man camps*. These camps will be located near the waste storage facility. Approximately six percent of the jobs are reserved for indigenous people from anywhere in Australia. The company has promised money for sports facilities and funding for rangers in the vicinity of the mine and waste storage facility. Members of the community present at the

meeting, however, fear negative social impacts from the 'man camps' including increased crime, drugs, and gambling on behalf of the fly-in and fly-out workers.

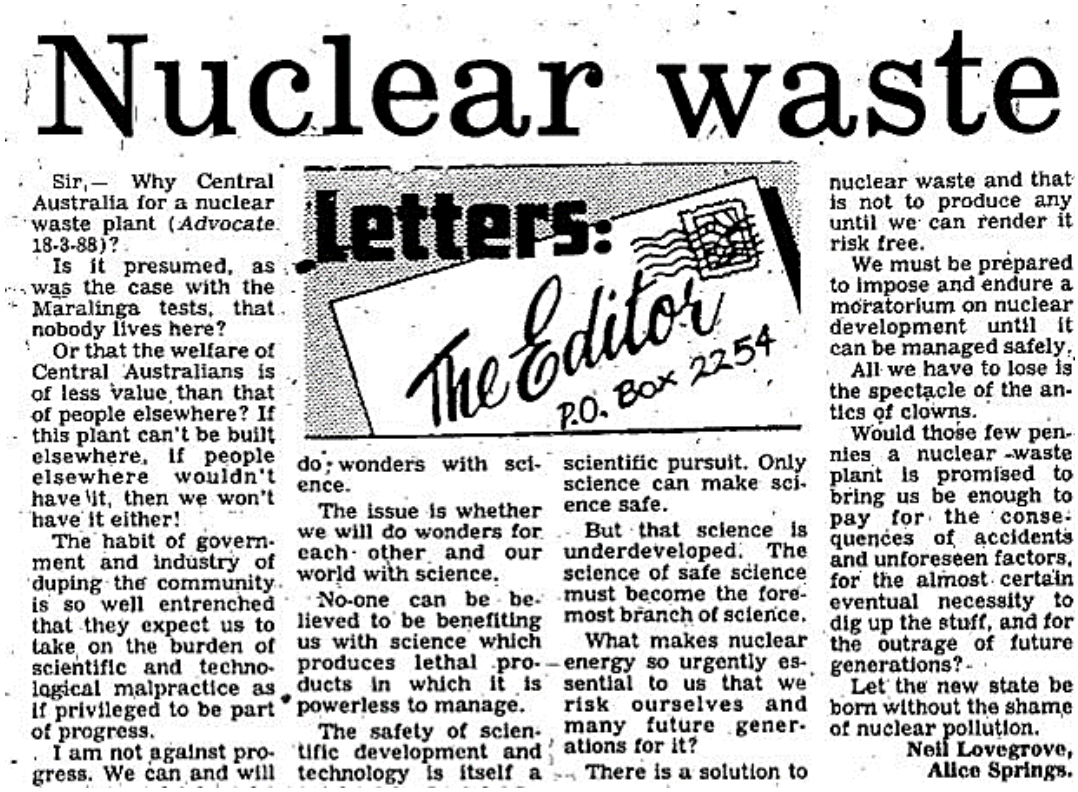
In summary, the arrangements discussed in this meeting are emblematic of technocapital sacrifice zones in that a destructive industry is building on existing inequalities and dependencies to exploit Central Australia for the sake of profit (Suarez-Villa 2009:3-4). Furthermore, these activities build upon nearly one hundred fifty years of settler colonialism in Central Australia. Despite these threats, a growing number of activists have become established in Alice Springs and routinely organize against exploitive activities in region.

"The Territory is not a Sacrifice Zone, it's our Home"

Prior to the presentations, I had a brief exchange with one of my interlocutors with whom I had interacted with at several past E-NGO events. As an audience member, she played the role of devil's advocate, critiquing the not-in-my-backyard (NIMBY) perspective. After all, she reckons, the hazardous waste "has got to go somewhere". Over the last fifty years, Australia has benefitted from mining and exporting nearly 30% of the world's reserves of high-quality Uranium ore (Holland 2002; Taylor 2006). Proponents of hazardous waste storage in Australia assert that the sparse population, geologically stable areas, political stability, and arid climate make it an ideal choice for the establishment of an international repository (Taylor 2006:879). Taylor (2006:880) suggests that because Australia both produces uranium and has the physical characteristics needed for a high level waste disposal site, there is an ethical, political, economic, and strategic argument for creating a secure international nuclear storage center. And yet, there is a prevailing skepticism regarding storage methods and the long-term effects of burying nuclear waste underground. Taylor believes that this skepticism is misplaced and that the technology to safely and responsibly store the world's nuclear waste has "reached a level of maturity and reliability" (2006:880). However, as Cowan and Evans argue, containment strategies are always fallible, especially those that purport to diligently contain waste for "thousands of years in places out of site and mind to the voting population" (2010:27). The very conditions that make Australia attractive for hazardous waste storage, its aridity, remoteness, and sparse population, also casts uncertainty regarding the risks of managing these containment facilities if anything were to go wrong across large swathes of geologic time. Furthermore, throughout my fieldwork

it became increasingly apparent that Central Australians are often on the wrong end of corporations vacating the region and leaving behind illegal dumps of rubbish in their wake.

For more than forty years, the issue of nuclear waste storage has been controversial in Alice Springs. Take for example a letter to the editor of the Centralian Advocate written in 1988 (Figure 7.5). Neil Lovegrove, the author of the letter, asks "why Central Australia for a nuclear waste plant"? For Mr. Lovegrove, the proposal of nuclear waste in Central Australia renders the welfare of Central Australians as less valuable than the welfare of people elsewhere. Hazardous waste can and, in some cases, does escape confinement via natural processes (e.g. hydrological and geomorphological); human error during transport, storage, and re-handling incidents; or even intentional interventions such as criminal and terrorist activities (Cowan and Evans 2010:27; Dennis 2005:799; Turner 1997; Fredrickson et al. 2004).



Nuclear waste

Sir,— Why Central Australia for a nuclear waste plant (*Advocate* 18-3-88)?

Is it presumed, as was the case with the Maralinga tests, that nobody lives here?

Or that the welfare of Central Australians is of less value than that of people elsewhere? If this plant can't be built elsewhere, if people elsewhere wouldn't have it, then we won't have it either!

The habit of government and industry of duping the community is so well entrenched that they expect us to take on the burden of scientific and technological malpractice as if privileged to be part of progress.

I am not against progress. We can and will do wonders with science.

Letters: The Editor P.O. Box 2254

The issue is whether we will do wonders for each other and our world with science.

No-one can be believed to be benefiting us with science which produces lethal products in which it is powerless to manage.

The safety of scientific development and technology is itself a scientific pursuit. Only science can make science safe.

But that science is underdeveloped. The science of safe science must become the foremost branch of science.

What makes nuclear energy so urgently essential to us that we risk ourselves and many future generations for it?

There is a solution to nuclear waste and that is not to produce any until we can render it risk free.

We must be prepared to impose and endure a moratorium on nuclear development until it can be managed safely.

All we have to lose is the spectacle of the antics of clowns.

Would those few pennies a nuclear waste plant is promised to bring us be enough to pay for the consequences of accidents and unforeseen factors, for the almost certain eventual necessity to dig up the stuff, and for the outrage of future generations?

Let the new state be born without the shame of nuclear pollution.

Neil Lovegrove,
Alice Springs.

Figure 7.5: A Letter to the Editor published in the Centralian Advocate on March 30th 1988 (Lovegrove 1988[48])

[48] Access to the Centralian Advocate Archives provided by the Alice Springs Public Library.

Anti-waste proponents are often accused of NIMBYism (not-in-my-backyard-ism), as having a narrow focus on the waste without appreciation for the wider social and political realities involved (Reno 2016a:209). However, Mr. Lovegrove conveys a nuanced perspective acknowledging the potential economic benefits of waste disposal while even permitting the possibility of nuclear waste storage in Central Australia if it can be safely and responsibly managed. He concludes with a proclamation to "let the new state be born without the shame of nuclear pollution". While there is little doubt that technical sophistication of waste containment strategies has increased since the 1980s (Taylor 2006), the contestation of environmentally damaging activities has continued through to the present and become increasingly entangled with Aboriginal land rights. For example, in July 2005 the federal government in Canberra announced that a new Radioactive Waste Management Facility would be located at one of three sites in the Northern Territory where it wielded greater political clout (Nagtzaam 2014:247). As discussed earlier, the siting of these facilities in Central Australia has a disproportionate impact on Aboriginal Australians. Eventually a tract of land near the community of Muckaty Station was nominated. However, in 2012 a coalition of Aboriginal traditional owners of the land contested the sites nomination arguing that that they had not been properly consulted and causing the government to reopen Australia-wide applications for potential sites (Nagtzaam 2014).

As I write this dissertation, Lucas and his colleagues at the E-NGO continue to advocate for a precautionary approach to mining, fracking, and hazardous waste (including nuclear waste) disposal in Central Australia. As recently as May 2019, my interlocutors at the E-NGO continue to contest the notion that nobody lives in remote Central Australia, declaring that "the Territory is not a sacrifice zone, it's our home". This quote speaks to the resolution of Central Australians to protect their home from the adverse risks of ecologically devastating activities.

Although e-waste is not an explicit or visible concern to many of my interlocutors, the life history of electronics is indeed entangled with the wider consequences of promoting renewable and nuclear energy alternatives, the hazardous waste these transitions will produce, and the formation of policies and regulations concerning the mining and extraction of raw materials for electronics manufacturing. While previous chapters have highlighted the invisibility of e-waste, the next section considers the potential for techno-capitalist institutions to obfuscate and divert attention away from alternative e-waste prevention and management strategies.

7.4.3 The Co-Optation of Green Schemes in Australia

Co-optation is a powerful tool implemented by techno-capitalist institutions to enable the continued exploitation of people, resources, and ecosystems. This tool, while not unique to techno-capitalism, is in a colloquial sense akin to 'green washing'. The term is generally defined by Little and Lucier "as a movement's gaining access or acceptance by the target institutions but without achieving any new advantages in terms of their political agenda" (2017:206). For example, when the NTCRS was enacted in 2011 it indulged public campaigns to mandate extended producer responsibility for e-waste in Australia. However, the following interview excerpt with an e-waste expert in Adelaide showcases the co-optation of the NTCRS by manufacturers who sought to reduce regulatory burdens on themselves by placing the onus on consumers and regional councils:

> "I always will come back to who's really paying. [It] is the consumer that's really paying. But where is the cost burden more noticeable? If you're paying, again the figures are in that operational review, that if you're paying less than 30 cents extra for your computer when it's funding through that level, then personally I question whether anyone's gonna be second guessing their decision to buy a computer. Whereas when you have a small regional council who has uh you know $50,000 worth of e-waste to get rid of — and when I say small I mean tiny — that's actually, if you did that as a percentage cost it might be 20% of their budget as opposed to the — whatever quarter of nothing percent. So yeah it's around where the burden falls."

Here the avoidance and reduction of e-waste takes a back seat to the interests of manufacturers who have found a way to continue profiting from e-waste despite the recycling quotas mandated by the scheme. Furthermore, stakeholder submissions to the NTCRS operational review in 2014 revealed significant stress on local councils who received inadequate support for collecting e-waste due to limited e-waste recycling and material recovery quotas under the scheme (Morris and Metternicht 2016:228).

Wide scale co-optation is also visible from the vantage point of Central Australia where fracking is always leaking into the concerns and purview of the environmental, Indigenous, and mining sectors. Fracking involves the injection of liquid at high pressure underground in order to extract oil or gas by forcing open existing fissures. The following quote comes from Jay, an interlocutor now in his seventies, who I interviewed during a public e-waste collection day at the RWMF (See chapter four). Reared in Australia, Jay has been employed around the globe for

decades. However, his cynical view on 'fracking' is decidedly different from the majority of my interlocutors who derive their critique of fracking predominantly as environmental activists:

> "You know, and it's been proven like in Japan, these guys are making so much. They can make oil and whatever out of bloody plastics. I mean the amount… you know, we've been growing algae to make fuel and the bloody fuel we've got with the… you know we had the boom on ethanol and that's died. Don't see anything on ethanol anymore (laughs). So I'm very pessimistic about… because the control of all of these things is by the big corporations and the fuel lobby or whatever you want to call it, the petroleum industries have got so much clout and we won't… I don't necessarily think that [it's] the coal that they want to keep going with, though I can see why… but Australia has got so much natural gas under the ground."

Jay's pessimism is concerned with the ability of 'big corporations' to easily move from exploiting one economic resource to another without designing more efficient and sustainable ways to harness the resources they have already exploited. He is particularly disheartened despite the technology for recycling plastics into oil and utilizing ethanol is being jettisoned so that petroleum industries can continue to make profits. In the remaining excerpt, Jay suggests that he does not fundamentally disagree with fracking but instead is concerned that Australian consumers are being mistreated or short-changed:

> "And you hear 'oh we're not gonna frack anything, we're not gonna develop anymore fracking sites' and everyone said, "No more fracking"! You know? I keep thinking, fracking's been going on since about 1948, you know? And they're all worried about it getting into the water table. Yes, maybe it will, but the majority that they're bringing out of the ground and they're now selling over in Australia should be raking the dollars in! Well they are, they're raking the dollars in and the poor old consumers in Australia are paying and can't get enough gas (laughs)!"

In this last segment of the quote, Jay drives in the point that despite the risk to the water table, the major fracking companies are 'raking the dollars in' while the 'poor old consumers in Australia', who he indicates are paying for the tracking one way or another, are not truly benefiting. Despite insisting that he does not identify as a "greenie", Jay is largely concerned with the outcome of large corporations gaining access and profiting from environmental resources. Rather than "green-washing" fracking, which would indeed be a difficult task, it would seem that these companies are co-opting individuals and organizations concerned with the economic development of Australia. With these concerns in mind, the following section considers how applied anthropology and activism can be leveraged for better waste outcomes in Alice Springs.

7.5 Recommendation: The Role of Transparency and Education in Precautionary Approaches to Anthropogenic Waste

The effects of Anthropocenic wastes including plastics, orbital debris, and radioactive wastes are likely to outlive the human species (Gray-Cosgrove et al. 2015). E-waste, which contains plastics and other environmentally persistent materials is also found in orbital debris, solar panels, and any system utilizing electrical equipment (such as for monitoring, distribution power, digital communications, etc.). E-waste produced during the Anthropocene will indeed become part of the geologic makeup of the Earth, entering the Longue Dureé of the planets geo-history. As the effects of globalization reach remote communities, their representatives are resolute in reminding politicians in capital cities that they "will not do for dumping harmful garbage, because people live there" (Turner 1997:108). So, what, then, can anthropologists and activists do to positively shape the legacy of waste humanity has left behind? They can make a substantial commitment to collect data regarding the contents and effects of waste on humans and non-humans, advocate for a proliferation of precautionary principles across all levels of governance, and wide-scale community education informed by these data and principles.

The rate of industrial chemicals and materials used each year has far outpaced humanities capacity to assess their capacity for harm (Lepawsky 2018; Hird 2013). In regards to the potential impacts of hazardous waste, there are fundamental limits to what we can know about the effects of these materials on living organisms. While theoretically this characteristic uncertainty has led to these materials becoming monsters (Thompson 2017; Swanson et al. 2017), in practice it means that waste audits and toxicology studies have a decisively limited ability to prevent harm. Transparent communication of these limitations is often foregone in waste audits and environmental impact statements.

In Alice Springs, environmental activists are already attuned to the potential threats of disposing hazardous materials into Central Australia. Together, anthropologists and activists can and should continue to demand transparency from multi-national corporations proposing to extract resources or deposit waste and other harmful materials. There need to be a more robust set of requirements for the consultation these corporations are required to conduct with communities affected by their potential activities. For example, Environmental Impact Statements addressed to the Environmental Protection Authority are written in English. And yet, the language used in these reports is highly inaccessible to a public audience let alone to affected

individuals who speak English as a second language. Greater transparency is therefore needed in regards to both the collection of data and the information and analysis provided in consultations.

A deeper look into the formation of sacrifice zones and their implications for humans and non-humans, or "more-than-humans", demonstrates a further need to rearticulate how e-waste is managed in a manner that respects all forms of life, especially those in regional and remote areas of Australia (Dominey-Howes 2018; Rickards and Kearnes 2016:4). Dominey-Howes (2018), citing Rickards and Kearnes (2016:4), uses the term "more-than-humans" to refer to 1) "all other non-human species—that is plants and animals" and 2) the assemblage of species, processes, and objects that make up ecological and physical environments (Dominey-Howes 2018:3). In the case of Central Australia, "more-than-humans" includes the total assemblage of organisms (such as the threatened black-footed wallaby and central rock rat), entities, and objects affected by anthropogenic activities (e.g. fracking, mining, and hazardous waste storage). Unfortunately, the Anthropocene is already marked by the erasure of "more-than-humans" across the planet (Moore 2016). And yet, there is much to learn from "the vestiges and signs of past ways of life" that remain into the present (Gan et al. 2017:G1).

This chapter highlights how reactionary policies can lead to the off-loading of nuclear waste onto vulnerable populations around the globe (e.g. Turner 1997) and how affected communities respond to these threats. Although nuclear waste has been successfully contested in some instances (e.g. Nagtzaam 2014), the production of anthropogenic waste is practically unavoidable. It is impossible to forecast each of the detrimental effects connected with the lodging of hazardous and ecologically persistent waste into the Earth. It is no longer enough to react to the extant threat of anthropogenic waste. Rather, a preventative or precautionary approach is needed in order to slow the rate of new industrial chemicals and waste being produced. The NTCRS, and its emphasis on manufacturers funding's recycling, illustrates the current extent of precautionary principles applied to the management of e-waste in Australia. As critiqued earlier in this dissertation, this scheme does little to the slow the rates of ecological exploitation across the life history of electronics. Instead, regulatory support is needed to encourage the reduction of materials being consumed and wasted in the life history of electronics as well as the reuse and repair of electronic devices and components.

An extremely important, yet underfunded and undervalued, facet of the precautionary approach is the role of waste and recycling educators in helping residents, local businesses, and

local government to understand their roles in reducing Anthropogenic wastes by reducing the rates of their consumption, choosing more-sustainable alternatives to plastics and other materials, and contesting large-scale industrial waste with grass-roots activist campaigns. This means expanding the coverage of waste and recycling education to address the complex impacts of decisions made by consumers further up the supply chain rather than simply instructing them on which bin to place waste materials.

7.6 Conclusion

In conclusion, the experiences and understandings of Anthropogenic waste (e.g. e-waste, nuclear waste, and other hazardous materials) for environmental activists in Alice Springs, are shaped by the Central Australia's designation as a remote place. Distance and remoteness can sever awareness of waste arising from digital and electronic consumption, making this waste somewhere else's problem. This chapter, however, considers the threat of Central Australia becoming "somewhere else" in relation to the world's hazardous waste. The interactions of this remote designation with global pressures has led activists to see waste in a manner that elicits a response. Despite global pressures to create a sacrifice zone in the Northern Territory, activists continue to organize, connect, and rally against chronic corporate incursions. Activists routinely volunteer and sacrifice their labor to safeguard Central Australia. In order to aid these efforts, polices and regulations guided by the precautionary approach are needed. A substantial increase in data collection and sharing as well as educational outreach concerning the effects of long-term hazardous waste storage on humans and more-than humans living in Central Australia must also ensue.

CHAPTER 8. APPLYING ANTHROPOLOGY TO ELECTRONIC WASTE MANAGEMENT IN CENTRAL AUSTRALIA

> "Any recycled product is a collection of numerous pieces with multiple past lives and is the work of untold people whose labor often goes unseen" (Millar 2018: ix).

8.1 Introduction

Electronic waste (e-waste) remains a vexing issue because of the massive amounts of waste generated by resource extraction, manufacturing, and the transport of raw materials across the globe. Moreover, electronics play a vital role in connecting residents of Alice Springs to the rest of Australia and overseas. In other words, e-waste is not merely a problem of post-consumer waste. This dissertation has taken an unconventional look at e-waste by looking deeper into the history of waste generated by communications and infrastructural development in the Australian outback and taking a critical stance on the inevitable role e-waste has in the future of seemingly 'green', 'clean', and 'renewable' energy technologies. E-waste is both a material residue and marker of the energy required to maintain our digital culture, the planned obsolesce of consumer products, and the wasteful practices employed in both private and public sectors. The global e-waste stream is undeniably accelerating alongside rates of digital consumption. The proliferation of e-waste and its relative invisibility immediately impairs our collective ability to protect current generations from harm, let alone preserve the planet for our children and future generations (Parikka 2014:6).

Whether you elect to utilize the term anthropocene or another like anthrobscene, both index a historical tipping point in which humanities exploitation of resources, relationships with each other, and impact on ecologies are no longer sustainable. Focusing on e-waste has enabled me to illuminate the submerged realities of digital and renewable energy infrastructure and development in Central Australia. This concluding chapter seeks to both reiterate the key findings of this dissertation and serve as a jumping on point for scholars and activists looking to foster ethical, ecologically sustainable, and environmentally just outcomes for the life history of electronics. Together, these findings and recommendations address the sociality and materiality of waste, the role of distance in rendering a place pollutable, and the power of infrastructure to

gloss over the uneven realities of waste and pollution produced across the entire life history of electronic devices and digital infrastructures.

Across the preceding chapters, I sought to deconstruct the arbitrary barriers separating the social, ecological, and political realities of e-waste and piece them together using a mixed qualitative approach rooted in ethnographic methods and anthropological theory. However, one of the greatest strengths of anthropology is its affinity for borrowing and contributing to other scholarly disciplines and non-academic domains. Therefore, I have also made use of the growing body of research in the multidisciplinary assemblage of scholars focused on discard studies.

Rather than focusing solely on waste and trash, discard studies examines the wider systems, structures, and cultures of waste and wasting (Liboiron 2018a). Inspired by their interdisciplinary efforts, I questioned the premises and assumptions of "what seems natural, normal, logical, and inevitable" about waste by considering "the wider systems that allow things to seem natural, normal, logical, and inevitable in the first place" (Liboiron 2018a). This concluding chapter serves to synthesize and apply the theoretical and practical applications of this dissertation by outlining how the recommendations made in each of the previous chapters may be complimented by additional activism and research. It is my hope that these recommendations spark additional discourse concerning the social and cultural dimensions of waste and resource recovery, environmental policy, and renewable energy.

8.2 Seeing and Living with E-Waste

Throughout this dissertation, I have employed anthropological theory and ethnographic analysis to fortify my definition of e-waste as interlinked with discarded electronics. In **REASSEMBLING RUBBISH: WORLDING ELECTRONIC WASTE**, Lepawsky (2018) draws attention to a shift from discarded electronics being framed as scrap, a potential source of recoverable resources, in the 1960s to a problem of post-consumption waste and its management since the 2000s. While these two realities are not mutually exclusive in Australia, these frames "underscore the normative effects built into any conception of what discarded electronics are and how they ought to be managed" (Lepawsky 2018:3). Media representations of waste, and e-waste in particular, are allegorical in the sense that they index visions of how the world ought to be (Lepawsky 2018:3). The social life of discarded electronics raises fundamental ethical questions about which actions (recycling, reuse, landfilling, etc.) are good and right (Lepawsky 2018).

Furthermore, the ethnographic work of Millar (2018), Reno (2016b), and Nagle (2013) illuminate how the normative framing of waste as a problem and polluting agent masks the productive and generative aspects of living with, working with, and caring for waste. In other words, the worlding or framing of e-waste matters because it effects the relative visibility of e-waste and causes recycling to become the dominant solution supported by the Australian government at the expense of alternatives focused on repair and reuse.

There are a number of barriers that make it difficult to truly see and experience e-waste in Central Australia. I have identified three vantage points from where e-waste is most obscured. Beginning in the homes of my interlocutors, the junk drawer project identified a wide range of electronic devices that have not been used in the last six months being stored in drawers, sheds, junk vans, on living room tables, and in just about every room of the houses I visited (See chapter four). While some of these devices were kept for sentimental reasons or as repair stocks, many of my interlocutors either were acutely unaware of how much they had accumulated or did not know what to do with unused electronics in their possession. These household electronics are more invisible then other types of waste because they do not tend to release foul odors nor deteriorate into something rotten and unsightly.

Once a household or small business decides to discard their e-waste for recycling, so long as it is a television or computer, they are invited to discard their unwanted electronics for free at the Regional Waste Management Facility (RWMF) on the first Saturday of each month. During my fieldwork I conducted over one hundred hours of intensive participant observation at the RWMF, including several e-waste collection days. E-waste is collected in open air containers, often filled above the suggested threshold, and then discarded electronics are placed further out of public view at the far side of the landfill. Usually fifteen to twenty containers are stacked and stored until the NTCRS affiliated TechCollect loads them onto a road train and transports the discarded electronics for recycling at a metropolitan location approximately 1500 kilometers away or more.

The devices and equipment people once spent a significant amount of money on are then taken far out of sight and more easily out of mind. Just as consumers are alienated from the means of production, so too are they alienated from means and the realities of resource recovery, including the waste generated by the transportation and processing of their discarded electronics.

8.2.1 Is Electronic Waste Somewhere Else's Problem?

> "Western landfills are sites of forgetting made possible through legislative decision, regulative decree, risk models, community accession, and engineering practice" (Hird 2013:106).

Distance is inevitability embedded within the circulation of electronics and is therefore an implicit aspect of e-waste. This becomes especially apparent when one dismantles a laptop or desktop computer. These devices bring together components from all around the globe. The lithium ion battery docked inside this laptop was manufactured in Korea, processed further in China by a company with headquarters in Thailand, and designed in compliance with European regulations that are managed by an office in Germany. While an in-depth analysis of a particular electronic device is not the immediate objective of this dissertation, it is useful to consider just how difficult it is to decipher who is responsibility for the waste produced across the life history of electronics.

Geographic, infrastructural, and regulatory distance separates individuals, businesses, and organizations from the waste produced on account of their digital consumption and discard behaviors. In Alice Springs, the RWMF is visibly tucked away south of the West MacDonnell Ranges a few kilometers outside of the town. The fence surrounding the facility regulates the people and waste allowed into the transfer station and landfill as well as the recoverable materials which are allowed out of the landfill. This deliberate separation reinforces the perception of waste as something unwanted, impure, potentially offensive, and dangerous, as 'matter out of place' (cf. Douglas 2005). However, rubbish at the RWMF can and does generate meaningful connections between people and other places in Alice Springs and across Australia. Many of the friends and acquaintances I made throughout my fieldwork in Alice Springs routinely shopped for salvaged bikes, construction materials, and other miscellaneous items at the Rediscovery Centre, a secondhand store located at the interface of the transfer station and the landfill at the RWMF. These connections are discussed in further detail within chapter four.

During my time volunteering at the RWMF, I encountered a greater variety of things entering the ground than I could have ever hoped to record in adequate detail. After three decades of sieving through municipal garbage around the world, Rathje and his colleagues generated many garbage revelations. For example, they identified hazardous chemicals from pesticides, cleaners, cleansers, drain openers, waxes, paints, swimming pool chemicals, and more

discarded in the household refuse stream. Ironically, chemicals meant to clean the home were polluting ground water as many of the landfills they were being discarded into are situated near low-lying areas (Rathje 1984). The same can be said of sophisticated digital monitoring technologies and renewable energy infrastructure aimed at 'cleaning' up the world.

The disposal of e-waste to landfill generates a higher concentration of toxicity than in landfills without e-waste (Kiddee et al. 2013b; Spalvins et al. 2008). And yet, these discards have found and continue to find their way into the RWMF. Historically, landfills were not designed to receive e-waste and many do not have appropriate lines or barriers to prevent the leakage of leachates that are particularly risky (Kiddee et al. 2014:2). Even when e-waste is relegated as somewhere or "someone else's problem" (Crocker 2016), they continue to threaten all forms of life via toxic landfill leachate. Part of the problem is that these pollutants and toxins, having blended with other forms of hazardous waste in a landfill, are exceedingly difficult to classify and reintegrate into social, environmental, and political discourse (Thompson 2017; Swanson et al. 2017). Illuminating the various afterlives of e-waste in Alice Springs, however, reinforces that e-waste is indeed everyone's (i.e. a global) problem.

8.2.2 The Shadow of a Solar City

Throughout my fieldwork, I was alarmed to discover that my interlocutors had a tendency to push certain forms of waste outside of renewable energy and economic development discourse (see chapter seven). When placed within the logics of an economic growth paradigm, the narrative of a sustainable solar infrastructure in Central Australia only works if waste and exploitation from the life cycle of solar panels is bracketed off. I elaborated upon this concern more deeply in chapter seven of this dissertation. However, while attending a presentation regarding the future of Solar Energy in Alice Springs in October 2017, it became increasingly apparent to me that the extended time frame or use-life of solar equipment creates distance from the people and environments impacted by the manufacturing, transportation, and inevitable discard of these technologies possible. When the issue of solar waste is either deferred or goes completely unaddressed, the social, political, and geographic distance not only makes solar waste somewhere else's problem, but also some a shadowy monster waiting to wreak havoc at some other time in the future.

As mentioned in chapter seven, the question of carbon footprints as linked to the production of solar panels was not a major concern, with one exception, of the environmental activists I encountered in Alice Springs. At first, the speakers at the SolarFutures meeting were reluctant to humor Rory's question but eventually responded that the carbon footprint is typically paid off over the first 3.3 to 4 years of use. There are of course many questions regarding this 'pay back' period and whether or not it incorporates those people and places that suffer from the extraction of raw materials and the contract manufacturing of this equipment (Mulvaney 2013:231). The discussion then shifted towards tritium batteries and a need to build flexibility into the solar infrastructure in order to respond to rapid changes in battery technologies. Particularly, it was mentioned that batteries prices continue to come down. This is in some ways a red flag. As prices for renewable energy go down, I suspect that the externalization of waste and exploitation of labor elsewhere may increase. One possible explanation for the pervasive absence of solar waste is the general difficulty of counting or measuring e-waste. As mentioned in chapter six, the labels of e-waste and hazardous waste are both loaded with inherent ambiguities making it difficult to count or even locate all of the waste produced in the manufacture, use, and discard of electronics (Lepawsky 2018; Gray-Cosgrove et al. 2015).

8.3 Embracing Everyday Activism as Ethnographic Fieldwork

An overarching objective of this dissertation has been to document the everyday activities which result in the discard of electronics. However, rather than focusing solely upon the discard of electronics to landfill or for recycling, I also engaged with the repair and reuse of discarded electronics via participant observation, semi-structured interviews, and various digital methods such as the Story of Our Electronics and the digital archaeology of secondhand electronics (see chapters three, four, and five). These research activities intersected with my involvement in the founding of a Waste Activist Collective (WAC) in Alice Spring. In addition to organizing the first Repair Café in Alice Springs, the WAC maintained a social media page of our own sharing tips with other residents on how to reduce our waste by reusing and recycling what we could on one hand, and making better decisions on how to consume produce, meats, and other things on the other. Despite these everyday examples of 'waste' activism, my interlocutors and I did not always reduce our waste as much as possible. Even during my fieldwork, my friends and I regularly experienced anxiety trying to rationalize buying non-durable electronic products from

major retailers. I often wondered why or why not people may choose to buy cheap and unrepairable electronics as opposed to more durable ones, if at all. I addressed this very question many times via my own consumption and discard habits while living in Alice Springs. One explanation that seemed to be salient to both myself and my interlocutors involves time.

Given the amount of time it can take to ship electronic devices interstate to Alice Springs, sometimes the convenience of grabbing an electronic appliance from Kmart or Target seems unavoidable. Also, it takes time to repair and or maintain electronics. Parts or components often need to be shipped interstate for a repair and the few repairers I interviewed in Alice Springs always seemed to have quite the backlog of items. It also takes time for consumers to learn how to manage their e-waste effectively and for e-waste to be transported from one physical location to another. Relating time to space, Crocker suggests that "time is not simply a movement of divisible, substitutable objects that can be 'lost' or 'saved', or substituted for money" but rather "a fourth dimension of our experience of space" (Crocker 2016:183). The chronic and rapid uptake of electronic devices as well as the dependence upon the conveniences they bestow are symptomatic of time-scarcity: the "delusive creation of an urge to consume what we imagine we need for some personal benefit" (Crocker 2016:183). The consumption of disposable and replaceable objects has become entangled in a logic of 'time-saving' versus 'time wasting' which in turn may lead us to devalue social and creative activities that require time but may not have monetary value in and of themselves (Crocker 2016:171). Rather than seeking to eliminate all waste from our daily lives, my waste activist interlocutors and I focused on helping residents to think more carefully about what they consume and how they discard it.

In my field notes, environmental activists have spoken about the negative effect stores such as Kmart, Woolworths, and Coles have had on the production of waste in Alice Springs. They typically frame it in terms of people being willing to buy from these stores because it is often cheaper and more convenient. In reality, quality things, including parts for electronics repair, take a significant amount of time to arrive in Alice Springs. Moreover, these things tend to incur additional shipping costs. Chapter six of this dissertation delved into the deeply entrenched role and ongoing challenge of distance in Australia. Another way to look at consumption in Central Australia, especially for those residents who shop at supermarkets and major retailers, is to locate these activities within a broader desire to collapse geographical distances, enabling residents to relate to other Australians via consumption.

While living in Alice Springs in 2017, the Australian Broadcast Corporation aired a limited series titled “War on Waste”. This series drew waste issues into national discourse. The war on waste sparked dialogue concerning broader consumer trends and values in Central Australia. Australia-wide it drove behavioral change focused on reusable bags, advocated for a ban on plastic straws, and addressed contamination issues in household recycling. In August 2018, a second series of War on Waste addressed the production of e-waste in Australia. The episode featured a tour of the e-waste produced by a ‘typical’ Australian household and featured a collaboration with the Basal Action Network’s (BAN) e-transparency project to audit e-waste recyclers (Palmer et al. 2018). War on Waste fits neatly within dominant international discourse which frames e-waste as a problem solvable by better recycling, this series was not representative of the situations, concerns, and types of e-waste that I encountered during my fieldwork.

8.3.1 Towards Scalable Consumption

The transitory population of Alice Springs often utilized social media to rapidly sell or trade things as they moved out of town. What they could not discard via the secondhand market usually ended up at the transfer station. Televisions and computers mostly arrived on the first Saturday of the month which was the designated e-waste collection day. A component of time features again in the second-hand circulation of electronics in Alice Springs that provides a means for people to counteract their desire to consume new, unaffordable, and hard to obtain objects. In some cases, residents who limit their consumption to major national retailers may not actually acquire what they want as quickly. Rather than placing retail consumption in a binary with local counter movements such as Food for Alice, they should be understood as a ‘scalable sociality’ (Miller et al. 2016) of sorts. That is people in Alice Springs are scaling their consumption to signal their connection to the town as well as broader national trends.

The scalability of consumption in Alice Springs involves a certain level of translocal and temporal negotiation. By translocal, I draw upon McFarlane’s (2009) use of them term to indicate a blurring of the local and global at the confluence of social movements. It is important to recognize that many of the objects circulating locally via social media, secondhand shops, or lawn sales have their origin elsewhere in Australia and oversea. This is especially true for

consumer electronics, household appliances, and solar photovoltaic panels. Much of the produce grown locally and restaurants in Alice Springs rely on imported seeds, foods, and equipment.

As a settler outpost in the heart of Aboriginal Australia, Alice Springs has relied upon translocal consumption since the construction of the Overland Telegraph Station. The accumulation of material culture and mass waste in Alice Springs tells an ongoing story about the translocal movement of people, things, and ideas in Central Australia. And yet, scaling consumption may still be invoked as a tool of everyday activism. On a daily basis, my interlocutors make choices which result in some type of waste being produced along the life history of electronics. One particular avenue of activism that I have embarked on as an applied anthropologist is to render e-waste visible to my interlocutors. A prerequisite to this task involved answering this dissertation's primary research question: what is e-waste?

8.4 Recommendations: Advocacy in Local Politics

Throughout this dissertation, I have argued for a reorientation within waste management professionals and policy makers from a limited focus on solid waste towards a deeper understanding of the social, cultural and ecological impacts of waste produced by the life history of electronics. Additionally, experts should account for the full breadth of perspectives and values communities, activists, businesses, and organizations regarding the management of e-waste. This means expanding consultation arrangements to independent repair businesses, hacktivists, and makerspaces. This recommendation emerged from my second research question concerning the effectiveness of the Australian government in managing e-waste.

My approach to answering this question differs drastically from previous assessments of Australia's e-waste related policies and regulations (Commonwealth of Australia 2014; Morris and Metternicht 2016; Dias et al. 2018). As an ethnographer, I have investigated the life history of electronics by using my body as instrument; taking into account my own positionality and experience as a consumer of electronics. I am by no means separate from my interlocutors in this manner. I too make decisions about what electronics and digital subscriptions to consume and how to handle my share of the waste from these decisions. In addition to measuring the amount of e-waste moving from one place to another, ethnographers collect and analyze narratives, documentation, and testimonies from multiple standpoints to account for social anxieties and feelings such as comfort, discomfort, fatigue, and frustration. By tacking back and forth between

those who have power and those who do not, ethnographers are better positioned to amplify the voices of those who are marginalized and issues that are too often externalized or silenced. Ethnographers value and seek out collective wisdom, participation, and understanding by talking with people and participating in everyday life alongside our interlocutors. For this reason, I believe town councils across Australia should seriously consider employing anthropologists in residence or at the very least a waste and recycling officer. I encourage environmental and social activists to speak to their town councils about sustaining a commitment to programs such as Repair Cafés and educational tours of waste facilities for both children and adults.

This section summarizes the recommendations I have made throughout this dissertation. In particular, ethnographic research plays an important role in enhancing existing perspectives on the successes and limitations of current e-waste management practices and policies in Australia. The following three recommendations speak to the roles I intend to carve out following fieldwork as a publicly engaged anthropologist in Central Australia:

a) Coming to Terms with the Amount and Diversity of Discarded Electronics
b) Enhancing Capacity to Reuse and Repair in Alice Springs
c) Funding a Waste and Recycling Education Officer in Alice Springs

8.4.1 Coming to Terms with the Amount and Diversity of Discarded Electronics

This dissertation sheds light on the true diversity of electronics being discarded in Alice Springs and some of the interactions these discarded electronics have with various places, people, and activities. I discussed solar panels at the RWMF, trashed televisions on Crown Land, junk drawer electronics, and a comprehensive list of secondhand electronics exchanged via social media. On June 5th, 2017, I gave a presentation to the Environmental Advisory Committee (EAC) in Alice Springs regarding my preliminary research findings. In particular, I took a deeper look into the digital archaeology of secondhand electronics in Alice Springs. At the end of my presentation I was only granted a short time for questions. However, one question stuck with me. For more times than I can count, I've been asked the question 'Why Alice Springs'? 'Why Australia'?

That evening was the first time I got the sense that the question was being asked because the person did not believe it was worth anyone's time to focus on e-waste in Alice Springs. In my presentation, I intentionally skipped through talking about e-waste as a global issue and tried

to home in on specific issues relevant to Alice Springs, in particular, and, more generally, Australia. Working with data I had, I juxtaposed the categories of Waste Electrical and Electronic Equipment (WEEE) used in the European Union with the actual electronics I encountered being discarded for recycling or reuse during my fieldwork. At the very least, I felt I was able to land my point that there is indeed e-waste currently uncovered by the NTRCS moving around Central Australia. Chapter six considers why e-waste may be difficult to envision as a Central Australia, let alone, Australian issue. On one hand, the humility of things posits that the more invisible an object is the more power that object has to reinforce the norms and boundaries of our society (Miller 1987). The ability of e-waste to accumulate and move across Australia without very little attention is evidence of its relative invisibility compared to other types of waste or waste in other places.

So, what does it mean to come to terms with the actual diversity and amount of discarded electronics circulating in Central Australia? In my digital archaeology exploration of secondhand electronics (chapter five), I used two typologies to evaluate the breadth and diversity of electronics in Alice Springs. First, I used EU's WEEE classification scheme which is comparably extensive to the US and Australia. And yet, I quickly found that the WEEE classification scheme does not usefully render all existing and possible electronically imbued objects that have been or may be discarded. Although coding via WEEE categories was useful for identifying broader discard patterns in Australia and overseas, these aggregate classifications mask the heterogeneity of electronics moving between households in Alice Springs. In addition to conventional types of e-waste like mobile phones, televisions, and computers, I also encountered everything from electric breast pumps and fish tanks to power tools, musical instruments, and solar panels. Due to the analytical limitations of the WEEE classification scheme, I created additional categories for the types and subtypes of e-waste I encountered in my investigation of the social media data I collected between May and December 2017 (see Figure 5.2). These codes were also informed by the participant observation I conducted at a local secondhand shop.

While efforts to recycle televisions, computers, and mobile phones in Australia have been at least partially successful, this research discovered a significant amount of large household appliances circulating secondhand markets in Alice Springs, as evident in the social media data (Figures 5:1 and 5:2), and scavenged across town. Coming to terms with the prevalence of large

and small household appliances in Alice Springs confronts a key limitation of Australia's e-waste management regime. The electronics that makeup categories 1 and 2 of the European Union's WEEE classification scheme should be of key consideration as Australia expands its product stewardship of electronics. However, rather than focusing on the recycling of these items, product stewardship should better support the repair and reuse of these items by supporting existing pathways for reuse.

8.4.2 Enhancing Capacity to Reuse and Repair in Alice Springs

There is an important distinction to make between recycling collection points and recycling centers. Although opportunities exist all over Australia for the collection of televisions, computers, mobile phones, cartridges, and batteries, these items must be transported great distances across regional and remote Australia to be recycled. Once processed into smaller components and materials, it is common for many of these materials to be sent overseas for further recycling and reprocessing. At present, the ability to recycle electronics within Australia is mostly limited to major metropolitan and urban centers. While reflecting on an interview I conducted with two Hackers in South Australia, I assessed repair and reuse activities as a politics of demonstration ((Delgado and Callén 2017). My interlocutors were concerned that their efforts alone may make little impact in the sheer amount of e-waste being produced (see chapter five). Indeed, all electronic devices and the components within them will eventually become e-waste.

While recycling e-waste reduces the amount of material sent to landfill and to some extend the amount of waste associated with the mining and extraction of materials from the Earth, even the most technologically sophisticated modes of recycling produce waste products and emissions. Furthermore, legislation mandating the recycling of e-waste in Australia is currently extended to computers, televisions, and mobile phones (Commonwealth of Australia 2015; MobileMusters 2014). Recycling is not a silver bullet for reducing the burdens of e-waste. If we cannot rely on recycling, what about repair and reuse?

Transporting e-waste from Central Australia to Adelaide and beyond for recycling does not combat the cycle of obsolesce inherent in today's hyper consumption of electronic devices and services. It is therefore recommended that residents, politicians, and activists in Alice Springs co-design new means to enhance their capacity for electronics reuse and repair. As discussed throughout this dissertation, reuse and repair extend the useful lives of our electronic

devices and reduce the rates in which waste is produced during the extraction of new materials and manufacturing of new devices. Furthermore, the reuse of computers provides more employment opportunities at a rate of 296 jobs per every 10,000 tons of materials disposed of for recycling each year (ETBC 2014). Reuse is already supported in Alice Springs by the consumption of secondhand electronics (see chapter five). Employment opportunities are also created by support for the repair and upcycling of electronics into objects of equal or higher quality and value[49]. There are also a growing number of digitally accessible do-it-yourself guides for repurposing or upcycling your electronic waste into art, garden beds, musical instruments, jewelry, and other interesting objects.

The ASTC and Northern Territory government can take a meaningful step forward by supporting Repair Cafés, such as the one I co-organized with my interlocutors, and other efforts to reuse electronics. For example, the RWMF already salvages select electronics devices from landfill for resale at the Rediscovery Centre. During my time volunteering at the RWMF it became clear that a number of reusable electronics, however, were discarded because there were not enough certified in the tagging and testing of electronics (see chapter four). Perhaps the ASTC might consider skilling up and certifying all of their employees with test and tagging. In summary, I assert that making repair and reuse a more viable option may in turn encourage Central Australians to purchase electronics that are more repairable rather than disposable, thus curbing the cycle of obsolescence.

8.4.3 Funding a Waste and Recycling Education Officer in Alice Springs

Enhancing the capacity of repair and reuse also necessitates that the town council rethink how it engages householders, small businesses, and other local experts with a vested interest in the ecological, social, and economic wellbeing of Alice Springs. Increasing the visibility of the e-waste through community education coupled with regulatory reform and economic support for these educational campaigns are vital. In order to achieve this level of community education, it is recommended that the Alice Springs Town Council (ASTC) either hire a full-time waste and recycling educator officer or officially recruit a local NGO to perform this service. If created, this position could also go a long way towards educating renewable energy activists on the best

[49] While reuse is the restoration of a product to its original quality or value, upcycling involves the restoration of an electronic device into a product of higher quality or value than the original.

course of action for managing their solar waste in the near future. Additional ethnographic research could be performed in tandem with efforts to educate the public about waste and recycling issues in Central Australia.

It is also important that this position is paid rather than volunteer. Although not the subject of prior chapters, volunteer fatigue was mentioned and demonstrated by many of my activist's interlocutors throughout my fieldwork in 2017. In the words of my interlocutor Tracy, 'waste goes beyond rubbish', it's about energy, it's about water, and efficiency. Sitting in the warm winter sun, Tracy and I discussed how she was filling a bit overwhelmed by our efforts to maintain the Waste Activist Collective (WAC) (see chapter five). I explained that waste is also about people and ensuring that people are not being exploited or negatively affected by waste. One unattended side effect of our waste activism was volunteer fatigue. In evaluating the success of the Repair Café, Tracy questioned what contributions it made to her environmental non-governmental-organization (NGO) and the amount of work hours she had put into the event. She explains to me that she is frustrated that the government has decided not to internally fund environmental programs and is stead outsourcing to NGOs who in turn call upon volunteers. This is when she first alluded to the idea of 'volunteer fatigue' and its prevalence in Alice Springs.

Although Tracy was compensated for her efforts to organize the Repair Café, she believes that the WAC needs to be strategic about its use of voice and energy so as to not exploit volunteers. In fact, the majority of my WAC interlocutors who volunteered for the Repair Café are frequent volunteers across a wide range of activities and events in Alice Springs. Despite having to produce a budget, Tracy lamented that my time and the time of other volunteers were not costed into the Repair Café budget. Ultimately, she views the breakdown of funds and support for volunteers as a devolution of responsibility. Tracy critiques this devolution of responsibility as "drawing on people that give to society because they're not under the pump to fulltime employment".

In some cases, the health of my interlocutors was adversely affected by working overtime, burning out, and becoming sick. Merely creating a waste and recycling educator may not alleviate the systemic issue of volunteer fatigue in Alice Springs. With the continued support of local activists and applied anthropological research, however, it may build momentum for the WAC and other concerned residents to procure more funding and support for the volunteers of

Alice Springs. One additional means to value the work of volunteers in Alice Springs would be to arrange for a deeper relationship between these activities and Charles Darwin University (CDU), the only university with a campus in Alice Springs.

A few days after my conversation with Tracy, I caught up with Lucas for an afternoon Pirate Life Pale Ale at the pub. At the heart of our conversation was how to get the NT government and others in power to stop undervaluing qualitative and de-colonized research methodologies. I shared a lot of my ideas with him about the importance of creating a connection between local council and CDU through service learning projects that integrate the coursework of students at CDU with the needs of the community, no matter the discipline. Lucas was concerned, rightfully I think, with the absence of policy and funding to encourage service-learning projects. This led to us talking about Tracy's idea of 'volunteer fatigue' in terms of advocating for this type of change. Together we theorized that providing volunteers with university credit, acknowledgement of their work from town council, and support in accessing funding and grants, may really help to create a more amendable environment for volunteers in Alice Springs.

Based on my findings, I also recommended that any retailer selling electronics, or any goods for that manner, should be mandated to have a waste management education policy that teaches their employees how to reduce, reuse, and recycle packaging, products, and other materials that flow through the store. Any consumer walking into the store should be able to ask what they can do about their waste. Yes, some items have a warranty and will be dealt with within the store, but not every item has a warranty and it should be clear to the consumer what will happen to items regardless of whether they have warranty or not. The retailers need to be able to demand higher standards of sustainability from manufacturers and companies further up the supply chain. However, if it means using big data, monitoring, and 'smarter' technology to accomplish these means, than those pieces of equipment and the human labor going into this monitoring cannot be taken for granted either. The waste management of smart technology must set the highest standard for reuse, recycling, and repair! Certainly, powerful companies like Facebook, Microsoft, Apple, and Intel should be active stewards in the management of waste resulting from their own equipment and technologies.

Lastly, consistency was deemed an important community engagement issue during preliminary research with waste and recycling education officers in South Australia. Here my

interlocutors explained that consistent accessibility to resources such as waste and recycling education, e-waste collection events, and illegal dumping monitoring tools have played a vital role in South Australian overall effort to manage e-waste. In 2016, the changeover from Zero Waste South Australia (ZWSA) to the Office of Green Industries SA (GISA) affected the consistency of educational resources across local councils. Inequalities in resources between local councils were marked as a potential issue as GISA lessens its support for e-waste collection events and organizing educational campaigns. Prior to becoming GISA, ZWSA helped to establish a consistent protocol and marketing scheme for a curbside bin tagging campaign aimed at reducing the contamination of rubbish, recycling, and green waste and organics bins.

GISA had also provided the Zero Waste Environment User System (ZEUS) as a tool for local councils to manage data on illegal dumping, municipal solid waste (MSW), and many other things. Each participating council has access to their own dashboards where they can upload and analyze data. Data from these reports can be used to help councils manage and assess the expenses associated with the cleanup of illegal dumping as well as measuring the successful implementation of waste and recycling education programmes. This issue of consistency as well as data and resource sharing between town councils and state organizations is indeed relevant to Alice Springs. Despite these growing pains, South Australia provides a useful example for how Alice Springs Town Council might make the most of more opportunities for community engagement.

8.4.4 Additional Alternatives for Managing Electronic Waste in Central Australia

While the recommendations detailed above emphasize reuse and repair in Alice Springs, many of my interlocutors shared ideas with me regarding ways to enhance the recycling of e-waste in Australia. Incentivization, servitization, and subsidization were three ongoing suggestions from e-waste experts and scholars across South Australia and the Northern Territory. Incentivization usually refers to Container-Deposit style legislation which involves an additional fee placed on the purchase of new electronic devices that is reimbursed by an e-waste collector if the customer brings it to a designated collection point. While container deposit legislation has existed in South Australia since the 1970s and the Northern Territory over the last decade, the logistics and costs of recycling electronics are vastly different than glass and aluminum containers.

Servitization models already exist for a range of computers, printers, copy machines, and other electronics. Essentially, in taking away responsibility from individuals, servitization can streamline the repair and maintenance of heavy-duty machines. Advocates of servitization argue that centralizing our consumption of electronic devices will reduce less waste than individual ownership. While these seems increasingly applicable for items such as printers, the argument becomes less convincing for end-point devices like mobile phones, tablets, cloud computers connected to data centers. Servitization of this variety would require much more transparency than is currently afforded in order to accurately assess the amounts of energy consumed and waste produced by these data centers.

Lastly, subsidization was recommended as a means to enhance the economic viability of recycling within Australia rather than exporting materials overseas. Due to the high value of labor in Australia and long distances between cities, the costs of transporting and recycling electronics is significant. Although the NTCRS provides some support for the recycling of e-waste in Australia, additional subsidization may bolster a diverse workforce capable of maintaining, repairing, and recycling electronics. In the case of Alice Springs, this may mean subsidizing the certification of employees at the RWMF in tag and testing. More broadly, it may mean finding innovative ways to pair individuals with disabilities with post-industrial employees to safely and effectively process e-waste within Australia. These types of activities are already taking place via funding from social enterprises in South Australia. It is therefore worth considering how this may look in Central Australia.

8.5 Future Research: Tracking the Afterlives of E-Waste

In additional to advocacy and activism, future research is needed to trace how the afterlives of electronic waste intersect with the lives of Australians. I have identified three primary areas for future research based on the findings of this dissertation: an ethnographic study of discards in Aboriginal communities, the life history of solar waste, and a digital garbology of Australian landfills. Each of these require ongoing attention to settler colonialism and racialized landscapes of waste and discards.

8.5.1 An Ethnographic Study of Discards in Aboriginal Communities

In Central Australia, distance is believed to have created forms of isolation that have protected aspects of the traditional Aboriginal way of life (e.g. Bardsley and Wisemen 2016). Blainey also suggests that distance and isolation have caused the outback, including Central Australia, to escape or defy economic development (Blainey 2001:371). Although the tourism and hospitality industry in Alice Springs have grown over the past century, the extent to which populations within Alice Springs are economically disadvantaged may reveal the reality of race relations between Aboriginal and non-Aboriginal members of the community. Waste colonialism provides a useful lens for revealing the fraught and tenuous history of discarding hazardous, nuclear, and other troublesome forms of waste on Aboriginal Country in Central Australia. For example, anthropologists and historians have traced the ruination of sacred and vital water holes during the nineteenth century to the discard of cattle carcasses and excrement (Traynor 2016; Strehlow 1965).

The town of Alice Springs began as a non-indigenous settlement near the telegraph station in 1870 before expanding onto the lands of the Mparntwe, Antulye, and Irlpme Arrente groups (Ottosson 2014:119). As of 2011, 18.6% of Alice Springs' population identify as Aboriginal and about 19% are from overseas. About 1000 Aboriginal members of the community in Alice Springs live in town camps (Ottosson 2014:123-124). Town camps are houses and dwellings leased through Aboriginal housing associations. Settler colonialism in Central Australia has significant social, material, and economic consequences for those living in the town camps of Alice Springs. The continued settler colonial presence in Alice Springs and the surrounding country has contributed to its identity as a tourist destination which represents "a kind of ongoing frontier and iconic 'outback' space that anchors powerful sentiments of Anglo-Australian settler forms of belonging on the Australian continent" (Ottosson 2014:120).

Since the 1980s, a mushrooming of indigenous services and activist organizations has occurred alongside Aboriginal land rights legislation and a national policy on indigenous self-determination (Ottosson 2014:120). These organizations and activists, including the Aboriginal housing association and Central Lands Council, will be consulted if I am to initiate future fieldwork in Alice Springs. Additionally, it is my intention to consult with the community to devise an appropriate way for including this segment of the population in the Junk Drawer and Online Story Map research activities discussed in chapter six.

In the current day, discussions regarding the inevitable expansion or relocation of the RWMF, the disposal of hazardous waste to the South, and the on-going threat of waste and pollution from mining and fracking in the territory continue to inspire activism and scholarship centered on a critique of waste colonialism. Chapter seven took a deeper look into the effects of settler colonialism in the region and how this history has led to its susceptibility as a technocapitalist sacrifice zone.

In any case, an ethnography of reuse and deposition strategies across Alice Springs must be attuned to the perceived and experienced social, material, and political realities of settler and waste colonialism. Although the reuse and deposition of e-waste in town camps was of relevance to this ethnography, I elected to postpone conducting interviews and participant observation with the town camps. During my fieldwork, I worked to establish rapport with my interlocutors in Central Australia. I will continue to carefully navigate the social and political complexities of fieldwork in Town Camps in future fieldwork. Future ethnography must iteratively take into consideration the question of who has power to manage e-waste and who does not?

The value of this fieldwork is its ability to reengage with topic of litter and rubbish through an ontology of remembering (Hird 2013). As discussed earlier in this dissertation, contemporary waste management strategies are designed for forgetting (Hird 2013; Rose 2003). Landfills, and incinerators cast waste away from oneself and burying it out-of-sight-out-of-mind. Aboriginal cosmology, however, relegates waste as a vital sign linking country and people (Rose 2003:62): Rubbish encountered along the foot paths, river beds, and Crown Land around Alice Springs are an active reminder that the geospatial boundaries of Alice Springs also overlay Mparntwe, the name for the area used by the Arrente Traditional Owners. Discarded automobiles, shattered glass, and litter carried by the wind are often misconstrued as anti-social behavior by non-Aboriginal residents of Alice Springs (Ottosson 2016). By enlisting an ontology of remembering, residents of Alice Springs/Mparntwe may begin to better see how their waste and discard activities tie them to places within and outside of the town.

8.5.2 A Life History of Solar Waste

A life history of solar waste is needed to help make the waste produced by renewable energy infrastructure more legible to my interlocutors. Rather than simply counting the amount of solar waste produced by residents and organizations in Alice Springs, a life history

perspective takes into account the social and ecological activities that facilitate everything from the extraction of raw materials which are then altered and assembled; transportation, consumption, maintenance, and discard (Schiffer 2011).

Although some resources already exist to guide residents looking to purchase renewable energy technologies, such as the Silicon Valley Toxics Coalition Solar Scorecards (Mulvaney 2013:236), additional research is needed to keep up with changes in the technologies being introduced to Central Australia. Chapter seven scrutinized the exclusion of solar waste from 'Clean Energy' narratives with the goal of reorienting waste management experts towards a more accurate assessment of the challenges and opportunities associated with e-waste. I argued that this enable the waste management sector to take a more proactive role in securing a more sustainable relationship with technology, waste, and those places and people who may bear the burden of solar waste. Furthermore, and ideally, an applied anthropology of solar waste conducted *with* renewable energy activists can better tie together social and environmental concerns in Central Australia, bringing together technical expertise with cultural sensitivity.

8.5.3 A Digital Garbology of Australian Landfills

Digital garbologists implementing GIS (geographic information systems) can track waste produced across the life history of electronics in time and space, addressing a need to understand how e-waste can be managed or even prevented in some cases. By leveraging the locations of landfills, recycling centers, repair shops, and more, GIS can be used to help determine or predict which locations are most likely to be affected adversely by ground waste contamination and other issues associated with hazardous waste disposal and the life history of electronics.

Preliminary research in Adelaide, South Australia (see chapter four) suggested that landfill bans provide, at their best, a partial solution to the rapid influx of discarded electronics entering the waste stream and, at their worst, lead to a false sense of content as legacy (closed) landfills already contain significant amounts of e-waste related materials and non-compliant individuals may be illegally dumping e-waste to avoid landfill levies and fees.

Although a national geodatabase of waste management facilities exists (Geoscience Australia 2017), more research is needed to understand how e-waste is being managed, if at all, at these facilities. Furthermore, this database can be used to determine which locations are most likely adversely affected by ground waste contamination and other issues associated with

hazardous waste disposal. For example, remote sensing techniques have been successfully employed to identify landscapes effected by hazardous wastes (Slonecker et al. 2010). An important caveat, however, is the difficulty of associating these hazardous waste signature with e-waste (e.g. Kiddie et al. 2013).

Waste audits and garbological surveys can be used to estimate the amount of e-waste in landfills (Rathje et al. 1992) and these distributions can be analyzed and mapped out in a GIS. This would be particularly useful for landfills that no longer accept e-waste but may have in the past. Furthermore, establishing a baseline understanding for rates of e-waste contamination in Australian landfills is necessary for future researchers to be able to evaluate the actual effectiveness of landfill bans. Future research using GIS and remote sensing can systematically sample communities affected by hazardous waste. Paired with ethnographic methods, digital garbologists can provide deeper insights into how people are affected by their proximity to hazardous waste and what strategies they are already using to cope with or contest polluting activities.

8.6 Conclusion

Despite the emergence of e-waste scholarship in the early twenty first century, the best path forward for managing e-waste has been obscured by incomprehensive definitions, incomplete regulatory measures, and a general lack of resources. The roots of e-waste as a by-product of technological developments runs much deeper than the last several decades. In Central Australia, the Overland Telegraph line relied upon Meidinger Cell batteries and the tremendously long insulated copper wires to connect Europe to Australia. These technologies were not perfect. Some failed and needed to be replaced. Some produced waste as a byproduct of routine maintenance.

As we look to the future, it is clear that the discarded electronics buried in our landfills is here to stay. Furthermore, hazardous waste linked to the mining and extraction of rare-earth metals and the massive amounts of energy consumed on a daily basis threaten Central Australia for geologic time. According to the Australian Bureau of Statistics, nearly "75% of the 3 million computers bought in Australia every year will end up in landfill" (2013). Discarded computers, televisions, mobile phones are responsible for approximately 70% of the toxic chemicals such as lead, cadmium and mercury found in the leachate collected from Australian landfills (ABS

2013). Exposure to these chemicals has been shown to have a devastating effect on ecosystems and human health. Over time these heavy metals and other inorganic compounds are able to migrate away from our landfills and into ground water and eventually the food we consume. E-waste also contains valuable metals including gold that can be recovered through recycling. According to the Electronics TakeBack Coalition (ETBC), just one tonne of mobile phones contains $15,000 USD of precious metals such as silver, gold, palladium, and copper (ETBC 2014). While recycling is an effective way to keep electronic waste out the landfill, the most effective way to reduce your electronic waste is through the reuse and repurposing of your electronic devices!

This dissertation has mapped out the current terrain of e-waste management and discourse in Central Australia, drawing attentions to aspects of e-waste hidden within the contours of digital infrastructures, renewable energy technologies, and the very recycling of e-waste itself. Although I have emphasized the vital significance of keeping our electronics running for longer, I have been careful to avoid asserting one particular strategy for 'un'-making electronic waste. As I have argued throughout this dissertation, waste, including e-waste, is inevitable. In response, I have expanded my understanding of e-waste to include any waste produced across the life history of an electronic object or digital service. Although my fieldwork was rooted in the materiality of discarded electronics found in Alice Springs, it became increasingly apparent that the emergence of e-waste in Alice Springs is intimately linked to past and present cultural histories and technologies. As the linchpin of Australian-European communications in the nineteenth century and a shining example of a solar city in the twenty-first century, the socio-ecological footprint of Alice Springs has always been significant.

There is still much work to be done. As an applied anthropologist, it important that the critiques and recommendations contained within this dissertation reach decision makers at the Alice Springs Town Council and Northern Territory government. I invite these decision makers to consider the true breadth e-waste in Alice Springs as they develop new waste management, climate action, and renewable energy plans and strategies over the coming decade. Following my fieldwork, I will continue to collaborate with the Waste Activist Collective to develop official recommendations for the management of e-waste at the Regional Waste Management Facility, secure funding for additional Repair Cafés, and continue to give public presentations to environmental activists, local residents, and waste management experts. Learning to live more

sustainably with electronics is a lifelong endeavor. In this way the conclusion of this dissertation marks both an ending and a new beginning.

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Zero Waste South Australia. 2015. Establishment of Green Industries SA: South Australia. The Place Where People and Business Thrive. Zero Waste South Australia, The Government of South Australia.

Zhao, Gaofeng, Huaidong Zhou, and Zijian Wang. 2010. "Concentrations of selected heavy metals in food from four e-waste disassembly localities and daily intake by local residents." *Journal of Environmental Science and Health Part A* 45 (7):824-835.

Zhu, Xuan. 2014. "GIS and urban mining." *Resources* 3 (1):235-247.

VITA

Gideon Singer

Applied Anthropologist and GIS Specialist

gasinger@smcm.edu

Education

Purdue University *Doctor of Philosophy in Anthropology* 2016-2020

Masters of Science in Anthropology 2014-2016

- Dissertation: *"An Applied Anthropology of Electronic Waste in Central Australia."*
- Research Interests: Applied Anthropology, Environmental Anthropology, Electronic Waste, Garbology, Political Ecology, Geographic Information Systems, Sustainability
- Advisor: Dr. H. Kory Cooper

St. Mary's College of Maryland 2009-2013

Bachelor of Arts in Anthropology, cum laude

- Honors Thesis: "*Zooarchaeological Analysis of the Atlantic Trade and European Settlement in the Gambia, West Africa."*

Awards and Grants

2014 –2016; 2018	National Science Foundation Integrative Graduate Education and Research Traineeship in Sustainable Electronics
2017	Australian-American Fulbright Postgraduate Scholarship

Current Research

Gideon's research focuses on the management of electronic waste in Australia and the United States. As a Fulbright postgraduate scholar, Gideon applied utilized ethnographic methods, archival analysis, and geographic information systems (GIS) to investigate the role of reuse, repair, and recycling as response to the rapid increase of e-waste and to design community-based resources to help reduce the negative consequences of e-waste. During his time in Alice Springs, Gideon created educational resources and interactive presentations using ArcGIS Online to visualize consumption and discard practices in Central Australia. While this project directly contributes to anthropological theory concerning waste and discard studies, it also provided opportunities to directly engage with the community of Alice Springs. For example, Gideon helped to organize Alice Springs' first Repair Café with the Think More Use Less Collective and volunteered to teach about the life history of electronics and rubbish at the 2017 and 2018 Desert

EcoFair. This project is the cornerstone of Gideon's PhD dissertation being conducted at Purdue University with his advisor Dr. H. Kory Cooper.

Skills and Abilities

- Accomplished cross-cultural researcher with experience designing and performing qualitative research using ethnographic methods and quantitative analysis of survey, archaeological, and geo-spatial data
- Skilled geographic information systems analyst with experience using spatial and geostatistical analyst, performing multi-criteria suitability assessments, geodatabase management, python scripting, Georeferencing and digitizing maps, and building web applications on ArcGIS Online
- Conducts interdisciplinary research with engineers, environmental and social scientists, and product designers in Australia, India, and the United States
- Proficient in Microsoft Word, Excel, Access, PowerPoint, Outlook, ESRI's ArcGIS, NVIVO, SPSS, Qualtrics, and Social Media data analysis tools such as NCapture

Employment History

2019- **GIS Specialist** at Datastory Consulting, Baltimore, MD

- Designs custom Story Maps with Web Maps and multimedia content for clients in the public and private sector using ArcGIS Pro and ArcGIS Online.
- Performs site suitability assessments, drive time analysis, and other geostatistical analyses using Business Analyst for ArcGIS
- Curates feature class, shapefile, and table data from open data portals, premium data services, and clients in a server environment to create robust infographics and reports
- Creates python scripts using Arcpy to automate and perform geospatial analysis and data management

2018 **Adjunct Lecturer of Cultural Anthropology** at Howard Community College, Columbia, MD

- Trained college students in ethnography and key concepts in anthropological theory
- Utilized multimedia, current events, and digital content to keep course fresh and engaging
- Mentored students to develop an empathetic and critical understanding of cross-cultural issues ranging from socio-economic inequality to climate change

- Administered exams, long term assignments, grades and feedback in an adult classroom environment

2016 **Teaching Assistant** for ANTH 20400 at Purdue University,
West Lafayette, Indiana

- Taught introductory concepts in human evolution and biological anthropology
- Designed laboratory exercises and evaluated student performance

2013-2014 **Archaeological Technician** at HDR INC., RK&K INC., and STANTEC
Washington D.C.; Baltimore, MD: Laurel, MD

- Surveyed the archaeological record with shovel test pits, GPS data collection, surface collections, and phase II and III excavation units
- Conducted phase I, II and III archaeological surveys in Maryland, Delaware, Virginia, and New Jersey
- Researched archaeological and architectural reports at State Historic Preservation offices and archives
- Curated and documented archaeological data in Microsoft Excel and ArcGIS
- Coauthored site reports for two archaeological surveys in Delaware for HDR Inc.
- Utilized mobile GIS technology to record archaeological and geologic field data
- Mapped archaeological features and soil maps using ESRI ArcGIS Server

2012 **Fauna Analyst** at THE KENT HALL ANTHROPOLOGY LAB,
St. Mary's City, MD

- Responsible for the curation and analysis of fauna remains recovered by Professor Gijanto as part of the Gambia Peace program (2006 through the present).
- Recorded artifact provenience and conducted zooarchaeological analysis of the Berefet 2010 collection from The Gambia, West Africa
- Constructed a Microsoft Access Database for entering and querying attributes and provenience of fauna and other artifacts
- Performed a preliminary spatial analysis using interpolation techniques in a geographic information system
- Authored a senior honors thesis entitled 'Zooarchaeological Analysis of the Atlantic Trade and European Settlement in the Gambia, West Africa'

Publications and Presentations

Peer Reviewed Publications

Singer, Gideon: "A Digital Ethnography of E-Waste: Engaging with Consumption, Recycling, and Reuse in Tippecanoe County, Indiana". *Unmaking Waste 2015 conference proceedings*. Adelaide, SA: Zero Waste SA Research Centre for Sustainable Design and Behaviour, 2015. https://www.unmakingwaste.org/

Peer Reviewed Publications "Forthcoming"

Singer, Gideon: "Time to Reboot: An Applied Anthropology of Electronic Waste in Central Australia". *Unmaking Waste 2018 conference proceedings*. Adelaide, South Australia.

Peer Reviewed Publications "Under Review"

Singer, Gideon: "Digital Garbology." *Oxford Research Encyclopedia of Anthropology*. 2020.

Edited Works

Singer, Gideon; Chiveralls, Keri; Thompson, Kirrilly; and Harold Kory Cooper. "Waste, Space, and Place". *Sustainability*. 10(4):1207.

https://www.mdpi.com/journal/Sustainability/special_issues/Waste_Space_and_Place

Archaeological Reports

2014 Phase I Archaeological Survey for HISP NCC, SR 71, Old Porter Road to SR 7, Red Lion, New Castle County, Delaware. Report prepared for Delaware Department of Transportation by James G. Parker and Gideon Singer.

2014 Phase I Archaeological Survey for HISP US 9 and SR 5 Intersection Improvements, Harbeson, Sussex County, Delaware. Report prepared for Delaware Department of Transportation by James G. Parker and Gideon Singer.

2013 Zooarchaeological Analysis of the Atlantic Trade and European Settlement in the Gambia, West Africa. Honors Senior Thesis prepared for the Department of Anthropology at St. Mary's College of Maryland by Gideon Singer.

2011 Berefet Faunal Report. Prepared for the Kent Hall Laboratory at St. Mary's College of Maryland by Gideon Singer and Aryel Rigano.

Conference Presentations

Singer, Gideon: "Somewhere Else's Problem: The (In)Visibility of Electronic Waste in Central Australia". American Anthropological Association, San Jose, California. November 2018.

Singer, Gideon: "Time to Reboot: An Applied Anthropology of Electronic Waste in Central Australia". Unmaking Waste in Adelaide, South Australia. September 2018.

Singer, Gideon: "The Life History of Electronic Waste in Indiana: Cultural Theory, Households, and Discard." Society for Applied Anthropology in Vancouver, British Columbia. March 2016.

Singer, Gideon: "The Purdue Electronic Life Histories Project a Preliminary Ethnographic Investigation of Indiana's E Waste Landscape." Dimensions of Political Ecology in Lexington, Kentucky. February 2016.

Singer, Gideon: "Ethnographic Collector: Adapting ArcGIS Online for Pilot Ethnographic Fieldwork in Australia and the United States". GIS Day at Purdue University in West Lafayette, Indiana. November 2015.

Jaskolski, Mark, Singer, Gideon, Roth, Madeline and Platt, Sarah: "Cremona Estate: A Historical and Archaeological Preliminary Site Assessment." Annual Middle Atlantic Archaeological Conference, Virginia Beach, VA. March 2013.

Guest Lectures

Singer, Gideon: "An Applied Anthropology of Electronic Waste in Central Australia". University of North Texas. November 15 2019.

Poster Presentations

Singer, Gideon: "Time to Reboot: An Ethnography of Electronic Waste Management and Practices in Central Australia" at Australian-American Fulbright Commission Orientation; Parliament House, Canberra, ACT, Australia. March 2017

Singer, Gideon: "The Electronic Waste Landscape WebGIS Project: Assessing Spatial and Cultural Phenomena within an Integrated Framework". Society for Applied Anthropology in Pittsburgh, PA. March 2015.

Lenik, Stephen, and Singer, Gideon: "The Geneva Heritage Project: Archaeology and Community Engagement." Society for Historical Archaeology Conference in Baltimore, MD. January 2012.

Non-Academic Presentations

Singer, Gideon: "From Middens to E-Waste: A Journey from SMCM to Australia." World Anthropology Day, St. Mary's College of Maryland. February 2018.

Singer, Gideon: "Somewhere Else's Problem: The (In)Visibility of Electronic Waste in Central Australia" at Alice Springs Town Council, Northern Territory, Australia. November 2017.

Interactive Online Publications

Singer, Gideon: "The Story of Our Electronics". ArcGIS Online. 2020. <https://storymaps.arcgis.com/stories/f3d0c271ebed41da92db1137b5591ddb>

Click Here to Explore "The Story of Our Electronics Interactive Presentation"

Volunteer and Academic Service

2018 **Guest Lecturer** for Purdue University MSE 597: Global Design for Sustainability. November 29th 2018.

2017-2018 **Member and Volunteer** of the Arid Lands Environment Centre (http://www.alec.org.au)

2017-2018 **Co-founder and Organizer** at Think More Use Less Collective (https://www.facebook.com/TMULC/)

2017 **Volunteer** at the Regional Waste Management Facility and Rediscovery Centre in Alice Springs, Northern Territory, Australia

2015-2016 **Graduate Student Representative on an Applied Anthropology Faculty Search Committee** at Purdue University.

Helped to identify, organize, interview, and analyze candidates for a faculty position in the department of anthropology at Purdue University.

2015-2016 **GIS Day Committee Member** at Purdue University.

Worked with the GIS Library and committee members to plan and organize GIS Day activities at Purdue University.

2015 **China-Australia Round Table Delegate** at Unmaking Waste Conference at the University of South Australia.
Contributed anthropological perspectives to an interdisciplinary round table discussion of sustainability, circular economies, and design.

2013 **Teaching Assistant** at St. Mary's College of Maryland
Assisted lecture and field research in "Anthropological Research Methods."

2012-2013 **President of the Anthropology Club** at St. Mary's College of Maryland
Organized and assisted in campus events and community outreach.

2011 **Research Assistant** in the Tropical Archaeology Research Laboratory at James Cook University, Australia

Workshops and Additional Training

Aug 2016 Do It Yourself GeoApps Online MOOC by ESRI and Udemy

May 2016 Why We Post: the Anthropology of Social Media MOOC by University College London and FutureLearn.

June 2015 NSF IGERT for Sustainable Electronics International Internship in India.

May 2015 Common Cause – Working with values & frames. Pre-Conference Workshop at Unmaking Waste in Adelaide, South Australia.

April 2015 Social Network Analysis with R Workshop. Association for American Geographers.

Dec 2014 NAPA Workshop: The Design Process: Thinking, Tools, Methods, and Models. American Anthropological Association Conference in Washington D.C.

Dec 2014 Constructing Spatial Ethnographic Research Design. American Anthropological Association Conference in Washington D.C.

Nov 2014 Going Places with Spatial Analysis MOOC by ESRI and Udemy

SOFTWARE AND OTHER TECHNOLOGICAL COMPENTENCIES

- Microsoft Office: Word, PowerPoint, Excel, Access, OneNote
- Qualtrics
- NVivo11 and NCapture WebAPI
- ArcGIS: ArcPro, ArcMap, ArcCatologue, ArcGIS Online, and ArcGIS Collector

- IDRISI Selva (Remotely Sensed Image Processing)
- Audio Recording and Editing Software: Reaper; WavePad Sound Editor
- Web and Application Design using JavaScript and HTML 5

Archaeological Field Schools and Laboratory Experience

2012-2013 Cremona Estate and De La Brooke Estate Phase I Surveys in Mechanicsville Maryland conducted by St. Mary's College of Maryland.

2012 Analysis of historical artifacts from the Addison Plantation in Prince Georges County Maryland as part of the Archaeological Practicum course at St. Mary's College of Maryland.

2011 Rock Art Field School in Laura, Australia conducted by James Cook University, Cairns, Australia.

2011 Geneva Heritage Project in Grand Bay, Dominica conducted by St. Mary's College of Maryland.

2010-2013 Analysis of Faunal Remains from the Gambia, West Africa in the Kent Hall Laboratory at St. Mary's College of Maryland.

2010 Barton Site Field School in Western Maryland conducted by Towson University.

Academic and Professional Society Affiliation

2014-2020 Society for Applied Anthropology

2017-2020 Australian Anthropological Society

2014-2019 American Anthropological Association

2014-2016 Association of American Geographers