Connaissance and *Savoir-Faire:* A *Chaîne Opératoire* Perspective on the Lithic Industries at the Iler Earthworks (AaHr-22), Essex County, Ontario

by

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Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Abstract

In a *chaîne opératoire* or 'operational sequence' conceptual framework, reduction technologies are recognized as an entangled, stepwise enactment of human knowledge (*connaissance*) and skill (*savoir-faire*). Through this model, as discussed in Chapter One, lithic assemblages may be situated within sets of Indigenous traditional knowledge marked by lifelong engagements between practitioners and their materials. In Chapter Two, this study adopts a coupling of the *chaîne opératoire* theory with an attribute-based analysis of extant primary and secondary sourced lithic materials recovered from the Late Woodland Iler Earthworks (AaHr-22) in Essex County, Ontario, in an effort to illuminate embedded stone economizing behaviours such as raw material acquisition and core reduction, as well as object manufacture, use, and discard.

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Chapter One

Of Body, Mind, and Matter: The *Chaîne Opératoire* as Situated Practice

1.1 Introduction

This component of my study demonstrates the potential for certain *chaînes opératoires* (operational sequences) to be aligned with systems of Indigenous/traditional knowledge (IK/TK). To perceive material through the lens of IK/TK is to engage with an epistemology that is intertwined with the lives of its past and present human cohabitants, and to understand cultural practices as not imposed upon the world but as emergent designs within a "material world transforming itself" (Ingold 1993:164). Such situated approaches, empathetic to Indigenous understandings of material, landscape, place, and being, allow for a more contextualized and nuanced understanding of established technical strategies (afforded by a *chaîne opératoire*), while arguing for an abandonment of the sharp separation of rule-based sciences from more reflexive understandings (Haraway 1998:589).

Theories of materiality reinforce this position: humans and things co-constitute each other through interconnected routes (Hodder 2011, 2012). Material industries interpreted as such challenge prior assumptions employed in the (re)construction of past systems of technological organization, and ultimately contribute to the ongoing understanding of the reciprocities between person and object: how materials become imbued with humanistic significance (Yellowhorn 2006).

1.2 Against Imposed Templates

As described by Leroi-Gourhan (1964), the basic principle on which a *chaîne opératoire* relies is an understanding of things within a sequence of technical actions, beginning (after its conception and prior contemplation) with the raw material and ending with the discard or ‘death’ of the finished object (Tixier et al. 1999) (see also Chapter 2). Furthermore, this method emphasizes another dimension—that of technological representations in the maker’s mind, a fundamental feature to consider in the understanding of technical tradition and action (Lemmonier 1992). However, while this application has merit in soliciting process-oriented perspectives on material, its analytical method still relies heavily on the classification of individual items according to prescribed theoretical categories. The significance of certain objects therefore risks being a typological re-construction only in the mind of the analyst, and potentially imposes mental templates on past peoples, what Bar-Yosef and Van Peer (2009:103) refer to as the “illusion of reading the minds of the knappers”.

Leroi-Gourhan’s approach to analysis holds that objects can be interpreted as a direct emanation or ‘secretion’ of distinctive behaviours—purposeful activities that exploit material properties, resulting in an object type indicative of a unique assemblage and the finalized product of a specific creation process. Such an approach emphasizes the notion that the shape of recovered objects (e.g., tools, flakes, and cores in lithic analysis) is one that makers originally sought to impose on their materials (Leroi-Gourhan 1964; see also Ingold 2013:39). To Tim Ingold (2013) however, such pre-established mental templates or ‘geometric intentions’ may never have existed at all. Material forms are not imposed upon but rather emerge from the multiple processes and specific techniques involved in their production. In contrast to the typically employed ‘construction kit view’ of materials—in which making is regarded as a succession of distinct, separate steps—the events that shape raw materials instead act as a continuum, an “ongoing current of skilled activity that is carried through from one piece to the next”. The process of making acts not as a building from discrete parts into a hierarchically organized totality, “but as a carrying on of the constant emergence of form” (Ingold 2013:43, 45).

This ‘formula’ for various making activities is transmitted across generations through processes of development. Humans are not born with prefigured representations of the material world, but are instead constituents of the surrounding environments (Ingold 2000:36-38). Human perception and actions are better understood as emergent processes of ‘enskilment’: learning is not a purely cognitive process but is rather “grounded in the contexts of practice, involvement and active personal engagement” with things disseminated through cultural bodies of information (e.g., traditional knowledge sets) (Pálsson 1994:920).

1.3 Defining Traditional Knowledge

There is no universally accepted definition of *traditional knowledge* (TK). Indeed, the word *traditional* in itself is ambiguous, often referring to ideas of cultural continuity and agency, transmitted in the form of social norms, attitudes, belief, materials, and conventions of behaviours. What descendent communities call ‘Knowledge of the Land’ is in turn defined as the understanding, however acquired, people have of one another (relations) and their environment (Berkes 1993; see also Leopold 1949). This situated, personal, and intimate Indigenous understanding of the ever-changing ‘natural’ milieu aligns with Ingold’s (2000) emergent processes of enskilment—that subsistence activities are forms of attentive ‘coping’ with the world that is intentionally “carried out by persons in an environment replete with other agentive powers of one kind and another” (Ingold 2000:59).

For the purposes of this research, Traditional or Indigenous knowledge refers to this transmission of cumulative bodies of knowledge, experience, epistemology, ontology, and material attributed to societies with historical continuity in resource use practices (Lassere and Ruddle 1982; Nicolas and Markey 2015). This contrasts with the often overly reductionist and synchronic 'Western World' view, wherein "notions of time, space, causality and classification are characterized, in part, as a series of binary oppositions" (Nicholas and Andrews 1997:5). Through TK/IK, the processes involved in object creation are seen as qualitative as opposed to quantitative, intuitive as opposed to purely rational, and moral as opposed to supposedly value free (Berkes 1993). Altered materials—obtained though co-operation with the surrounding environment—are ultimately considered as the combined result of body, mind, and matter. Situating operational sequences (by way of their interpreters) within such traditional forms of knowledge allows for a move beyond the concepts that underlie rigid typological approaches, and for a re-evaluation of the dynamic interactions between person and material (Chazan 2009).

1.4 Traditional Knowledge in Practice

1.4.1 Evidentiary Reasoning

Archaeological practices in Canada—deeply rooted as they are in 'Western' notions of positivism—have been to date largely dismissive of the so-called 'parochial' nature of Indigenous knowledge sets. Indeed, while it can be debated as to what exactly constituted 'archaeological knowledge', our adherence to explanations rooted in positivism has led to the marginalization of 'non-metric' perspectives, referring to Indigenous knowledge systems only in sentimental, romantic, and/or culturally subordinated terms (Beckford et al. 2010; Knudtson and Suzuki 2006). As stated by Hodder et al. (1995:241), this 'postmodern' condition is characterized as "fragmented, dislocated, [and] eclectically pillaging the past and other cultures without regard for traditional forms of authenticity". This can be contrasted with other epistemological approaches such as those of the Ojibway as revealed through A. Irving Hallowell's (1960) study of Ojibway ontology and belief practices. As Hallowell (1960) notes with regard to the animacy of seemingly inanimate things (e.g., stones), what matters to the Ojibway is experience—who, for example, has witnessed a stone offer medicine or move about on the floor. Standards of verification in this case revolve around personal accounts rather than an appeal to the scientific method, and it is these standards that can dislocate the empirical backbone of archeological knowledge.

With this in mind, can archaeologists work toward an understanding of Indigenous materials within an emergent and complex set of Indigenous socio-cultural designs? And how can we come to identify and interpret what can never be observed directly, namely the ontologies, actions, and associated material culture assemblages of past peoples (see Nicholas and Markey 2015)? While the interpretation of archaeological data has long relied on ethnographic/ethnohistoric sources to reveal (or provide proxies) for behavioural patterns in the archaeological record, what is often considered 'evidence' is still a matter for debate. As suggested by Hallowell's (1960) work, ignoring Indigenous knowledge sets may result in a biased and selective interpretation of material (and thereby its associated process of creation) that differs significantly from the interpretations of source communities, thus jeopardizing the integrity of archeologically derived evidence (Nicholas and Markey 2015:288; see also Denton 1997).

1.4.2 Human-Thing Entanglement

Building upon the *chaîne opératoire* framework, which seeks to interpret the full sequence of human activities involved in the creations of objects (e.g., lithic tools), as well and their respective roles within assemblages, may perhaps enable a move beyond the suggestion that production is governed by mental templates. If we consider that objects are not inert, but instead play a vibrant part in the ongoing understandings that people have of the world, we can then begin to rethink the relationship between traditional knowledge and technological organization (Jones 2015:335). This understanding of materials is reflected in Hallowell (1960) and the idea that things such as stones may be considered ‘alive’ by virtue of their positioning within fields of human experience. Their ‘liveliness’, in other words, is not a fixed state (or essence) but rather something that emerges relationally through the lives of persons (see also Ingold 2000:96-97).

Analyses of assemblages must therefore consider materials within the specific actions of their human counterparts. Fairlie and Barham (2017), for example, explore this in their study of the lithic *chaîne opératoire* and its potential for analyzing changes in task structuring strategies across human tool-making events. This approach, they argue, recognizes the body as “the interface between mind, materiality and society, where the gestures of the tool-maker are learned through activity” (Fairlie and Barham 2017:644). Such notions may be further explored through heterogeneous approaches to the understanding of human and material agencies and the intertwining processes through which they are transformed. Lithic materials may be seen as perpetually unfolding with their human participants and emergent through a “set of relationalities across time and space,” imbued with significance through creation processes, while having a direct formative effect on their makers (Edensor 2011:249; Gosden and Malafouris 2015:706).

1.5 Discussion: ‘Meeting Pasts Halfway’

In summary, to properly contextualize materials involved in Indigenous systems of technological organization we should recognize that individual objects are not inert but rather bound up in a set of complex relations. This would provide for more productive and inclusive analyses that engage both traditional knowledge and archeological expertise, thus challenging the limited self-reflexivity that has led to an invention of essentialized Indigenous identities, "rendered ahistorical, and devoid of subjectivities and dynamism" (Trofanenko 2006:309; see also Bell 2017). Indeed, as stated by Ingold (2000:96), taxonomic distinctions imposed upon materials are not often articulated by local Indigenous populations themselves but are rather "imposed by Western researches who brought with them their own 'conventional' understandings".

Dean Jacobs of the Bkejwanong (Walpole Island) First Nation is one that highlights this need to move away from the rigid analytical systems that often hinder the dissemination of IK/TK. "Aboriginal peoples" he (1994) states "bring skills and knowledge to the development process in particular. The juxtapositions of aboriginal knowledge and knowledge systems with mainstream European-based science is likely to enrich world views for all". Incorporating such contextualized understandings of traditional history and material stories—embodied in lands of social, cultural, and spiritual significance (see Basso 1996)—allows for the diversification of archaeological discourse in the interpretation of various material evidences (Jones 2015). Indeed, this 'meeting of pasts halfway' would provide descendent groups with the ability to "articulate nativist thought in the dialogue with the larger world [and] mitigate the impact of a modern world on cultural traditions" (Yellowhorn 2006:206-207). A combined, heterogeneous discourse surrounding pre-contact material would in turn facilitate public understandings of what constitutes Indigenous ways of being with the world, and how these have been manifested, interpreted, mediated, and entangled within material assemblages (Harrison 2013:6). Ultimately, this would testify to the ongoing assessment of material as a vital component integral to and generative of human behaviours (Hodder 2011, 2012).

1.6 Conclusion

Conceptualizing archaeological materials demands that we devise a variety of theoretical frameworks to more fully explore, comprehend, and appreciate 'traditional' perspectives in a rapidly changing world (Harrison 2013). Indigenous materials are not passive, static entities within assemblages, but reflective of dynamic relationships and emergent "negotiations, desires, and knowledges" (Bell 2017:245; Jones 2015). A situated *chaîne opératoire* analytical strategy ultimately contains the potential to be considered at this interface between human, material, and society. Indeed, it can be part of an empathetic and reflexive archaeology "based on the traditional understandings of social and cultural enablers of creation processes" and for the bridging of the problematic divide between standardized archaeological practice and Indigenous understandings of material culture (Fairlie and Barham 2017:644; Lauer and Aswani 2009).

Toward this end, I intend to publish my Chapter Two research findings in the *Midcontinental Journal of Archaeology* (MCJA) as it features many peer-reviewed papers on the archaeology of the region between the Appalachian Mountains and the Great Plains. This Journal has also become a key publication outlet for the dissemination of situated archaeological research in the in (western) lower Great Lakes.

Chapter Two

Connaissance and *Savoir-Faire*: A *Chaîne Opératoire* Perspective on the Lithic Industries at the Iler Earthworks (AaHr-22), Essex County, Ontario

2.1 Introduction

Analyses of lithic industries are little represented in the scholarship of the Late Woodland Western Basin Tradition of southern Ontario. Indeed, little systematic investigation of Late Woodland tool-making events in the area has occurred to date, thus relegating this field of inquiry and the broader study of Western Basin Tradition lifeways to the "far periphery of Ontario archaeology" (Murphy and Ferris 1990:191). Recent archaeological analyses in the Western Basin study area (e.g., Watts 2008, 2016, 2018), along with earlier studies (e.g., Lennox 1982, 1995), have, however, revealed a distinct technological industry during the Late Woodland throughout the southwestern-most corner of the province. In an effort to advance the study of this industry, this chapter details the lithic *chaîne opératoire* (operational sequence) and how its conceptual framework—focused on both the recognition of the overall technology, as well as the practical skills of the individual maker—informs lithic raw material procurement, tool production, and use during the Western Basin Late Woodland at the Iler Earthworks (AaHr-22) in Essex County, Ontario.

With regard to the tool production phase of the sequence, the lithic remains from Iler were classified using an attribute-based typological approach. This analysis, which involves tool, debitage, and core fragments, attempts to further understand the cultural landscapes of the western Lake Erie region and how Late Woodland Western Basin peoples interacted with their lithic materials. This analysis also seeks to illuminate what factors may have influenced Western Basin core reduction strategies, with an understanding that these activities would have been embedded within broader lifeways. This chapter proceeds by first describing the emergence of the *chaîne opératoire*, and what is entailed by its conceptual framework, before moving on to a discussion of Late Woodland Western Basin culture history. It then continues with an overview of the analytical methods applied to the tool and debitage assemblages from the Iler Earthworks before concluding with a discussion of the *chaîne opératoire* at Iler, and how we might work toward a more nuanced understanding of lithic industries in Ontario.

2.2 Origins of the *Chaîne Opératoire*

The study of lithic assemblages in both European and Americanist archaeologies has been largely dominated by *Typologie Morphologique* (morphological typology), a well-established way of analyzing materials which provides type-lists of formal retouched tools and associated debitage (see Boëda et al. 1990; Bordes 1953; Geneste 1985; Mauss 1973). François Bordes of the University of Bordeaux was its founder and leading advocate. His typological paradigm—a departure from the older and more evolutionary 'guide fossil' method in which stone tools served as 'interpretation-free cultural markers'—instead recognized 'synchronic variability' among object groups (Bordes 1953; Soressi and Geneste 2011:355). This, in time, led to the emergence of an approach that brought together "materials and tools, their actors and their actions within a technical time frame" (Delage 2017:158). The lithic *chaîne opératoire*, as this approach came to be known, built upon Bordes' typologies, and conceptualized reduction technologies as a suite of operations involving both mental operations and technical gestures (Perles 1987:23).

The concept was initially adapted for archaeological use by André Leroi-Gourhan in his seminal (1964) offering *Le Geste et Parole* (Gesture and Speech). In this work, Leroi-Gourhan envisioned all technical behaviours as being composed of systematic gestures from which the entire life history of an object—from conception to final discard—could be investigated (Ryan 2009:18). According to Leroi-Gourhan, *le geste* "functions as the link between the archaeologically visible technique and a group's social behavior" (1964, 1993:114). Incorporating this notion into material analysis allows the researcher to consider the *chaîne opératoire* as a "means to link people and their decision-making processes to the material culture remains contained in the archaeological record" with its theoretical framework acting as a grid for the observation of these techniques. When viewed with reference to both motion (gesture) and tool, these techniques form a chain that gives the operating series its shape (Leroi-Gourhan 1993:323). This, in turn, allows for the development of a more diachronic (i.e., spatial-temporal) understanding of human-altered materials (Delage 2017:160).

Perhaps more importantly, Leroi-Gourhan's approach further emphasizes the integration of mind with body during the act of making tools; materials, it can be argued, cannot be properly understood when separated from the underlying bodily techniques and agential intentions involved in their production (Dobres 2000; Tixier et al. 1999). Seen as a response to the increasing de-humanization of typological analyses, this 'anthropological reality' hidden within the archaeological record would become appealing to those scholars interested in describing and interpreting the variability observed in lithic industries according to culturally specific factors (Bar Yosef and Van Peer 2009:103-104; see also Delage 2017). This intellectual trend also triggered the development and establishment of lithic technological studies more in line with the 'anthropology of technology' (Lemonnier 1992).

A critical component of the *chaîne opératoire*, therefore, involves viewing the process of manufacture from the perspective of a person carrying out the action—that knowledge (*connaissance)* is enacted through the unique skills (*savoir-faire)* of the individual (Chazan 2009; Pelegrin 1986). Viewed through such a lens, the processes employed to make objects are cognitively disciplined: they are enacted in time based on personal expertise. Such series or 'sequences' of actions come about "because of interaction between experiences, which conditions the individual by processes of trial and error" (Leroi-Gourhan 1993:230). Lithic assemblages are recognized as the sum of these unique knowledge sets, established by way of lifelong engagements between practitioners and their materials.

2.3 The *Chaîne Opératoire* as an Analytical Strategy

2.3.1 Object Flow Model

The *chaîne opératoire* approach ultimately acts to chronologically process how raw materials are introduced into the technological cycle of production activities and transformed into culturally meaningful objects (Geneste 1985:77). The sequence is best represented by a basic object flow model (Figure 1) which divides the process into meaningful subsystems, namely: 1) the raw material procurement phase (through the distribution of available resources); 2) the tool's production (primary/secondary core reduction) within established technical strategies; and 3) its intended use-life (embedded in settlement-subsistence practices), maintenance, and eventual discard (Tixier et al. 1999). This form of analysis, as underscored by Sellet (1993), is also dependent on three major criteria: 1) it relies on the reproduction of procurement and manufacturing techniques to classify archaeological remains into meaningful units; 2) it incorporates all lithic materials present at a site, both 'end products' and debitage (flake products); and 3) it considers the often nonlinear order, or sequence, of production activities. Reconstructing the spatio-temporal organization of these various lithic economies is instrumental to understanding the intentions held by past makers (Pelegrin 1986; Tixier et al. 1999).

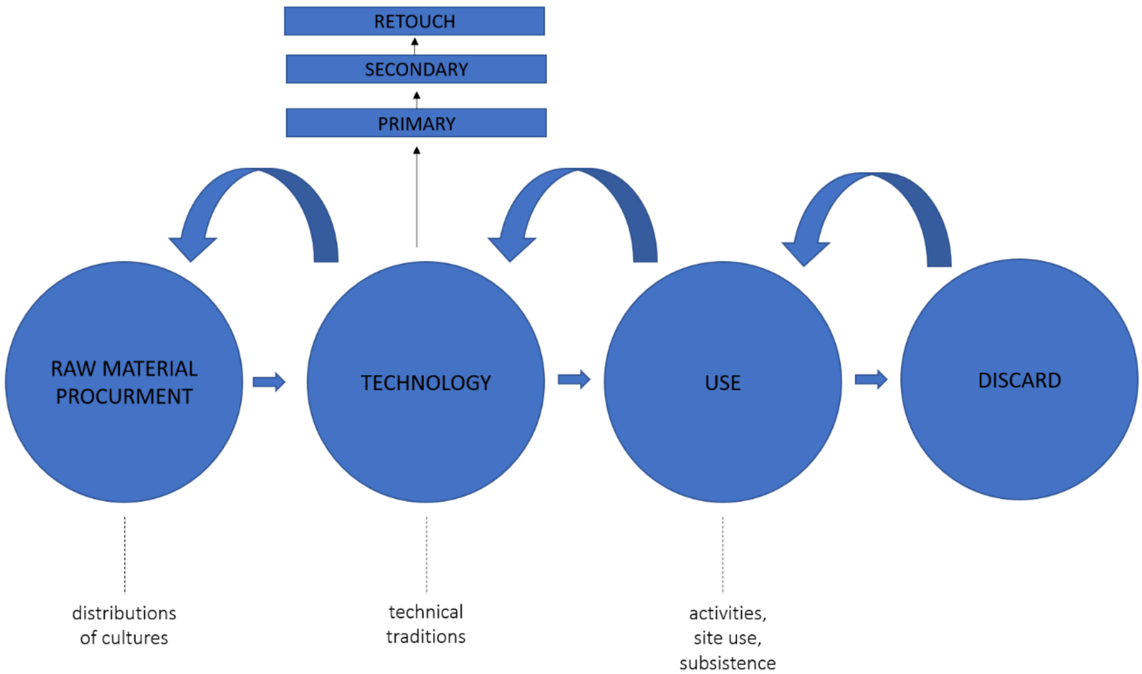

Figure 1: Chaîne opératoire: object flow model (modified from Tixier et al. 1999)

2.3.2 Observing Technical Strategies

While the analysis of finished tools and debitage is key to reconstructing past lifeways, a *chaîne opératoire* analytical strategy is not committed to the rigid identification of only one essential production technique. Its ultimate purpose is instead to recognize and describe the varying, and often re-visited, stages in a reduction sequence (Shott 2003:100-101). This is crucial when considering the fabrication of tools as a series of interrelated decisions: which materials can and should be used, alternatives to employ should one or more materials be unavailable, and the performance of the finalized tool given various circumstances. By identifying these choices and placing them along the *chaîne opératoire*, it become possible to discern which were based on cultural considerations, and which were based on unique environmental factors (Ryan 2009:32).

Understanding decision-making processes, particularly how they are impacted by cultural and environmental considerations, allows one to identify at what point in the sequence various elements acted to constrain or broaden the choices available to Western Basin peoples. The creation of stone tools ultimately involves a series of consistently employed strategies, traceable through a *chaîne opératoire* methodology, that considers the variables and regularities that result in a recognizable product.

2.4 The Late Woodland Western Basin Tradition

2.4.1 Developmental Sequence

The Western Basin refers to one of two archaeologically discernible cultural traditions of the Late Woodland period (ca. CE 600-1550) in the lower Great Lakes Region, with manifestations found throughout southeastern Michigan, northwestern Ohio, northeastern Indiana, and extreme southwestern Ontario (Ferris and Spence 1995; Fitting 1965; Murphy and Ferris 1990). Its developmental sequence—first established by James Fitting (1965) as "The Younge Tradition" in southeastern Michigan, and later modified for use in Ontario by Murphy and Ferris (1990)—consists of four phases: Riviere au Vase (ca. CE 600-800 or 900), Younge (ca. CE 900-1200), Springwells (ca. CE 1200-1400) and Wolf (ca. CE 1400-1600). These phases were initially based on ceramic trends at prominent multicomponent sites in southeastern Michigan, and later refined by researchers such as David Stothers, Neal Ferris, and Carl Murphy, based on additional analyses of changes in material culture and mortuary practices, as well as adjustments to various settlement and subsistence strategies (Watts 2008:11). While currently lacking radiocarbon dates, the Iler Earthworks clearly dates to the Springwells Phase based on ceramic design trends and the arrangement of settlement features.

Investigations into Western Basin subsistence-settlement patterns and socio-political organization have long been entangled with notions of 'ethnic affiliation'. Indeed, since the establishment of Fitting's (1965) sequence, researchers such as David Stothers (e.g., Stothers et al. 1994)—through the largely qualitative appraisal of Ontario Late Woodland materials—have regarded Western Basin groups to be an 'ethnic variant' of Iroquoian populations to the east. Such claims of Iroquoian affiliation have been refuted by Murphy and Ferris (1990:271-277) who argue that despite evidence of both cooperative and antagonistic interaction with adjacent Ontario Iroquoian groups (see discussion below on procurement), the Western Basin Tradition remains representative of a single, and distinct, cultural development. As stated by Watts (2008:13) this perspective (which will be adopted in this study) ultimately envisions material procurement, manufacture, and use within the region as "contributing forces in the production of social realties," conditioned by specific, yet diverse, cultural practices.

2.4.2 Springwells Settlement/Subsistence

Murphy and Ferris (1990:231) suggest that Western Basin groups inhabiting the ecologically diverse region of southwestern Ontario generally practiced mobile subsistence and settlement patterns, based on the seasonal availability and abundance of preferred plant and animal resources at known extraction locales. While largely adhering to this pattern, the Springwells Phase ushered in greater degrees of sedentism and inter-season coalescence, compared with the earlier Riviere au Vase and Younge Phases. However, with Springwells, settlements would begin to move toward more intensive occupations during the warmer months, and groups may have remained within, and operated from, a single location throughout the growing seasons (Murphy and Ferris 1990:245).

This trend toward greater degrees of sedentism is evidenced by the emergence of new site features, including palisades and multiple dwelling structures set among an array of numerous, large, and overlapping pit features (see e.g., Kenyon 1988; Lennox 1982; Lennox and Dodd 1991). While the dietary importance of maize cultigens and other domesticates is thought to increase during the Springwells Phase, a shift in warm weather site locations may reflect a preference for placing settlements (as is the case with Iler) in microenvironments replete with opportunities for hunting, fishing, and collecting (Foreman 2011:34; see also Watts et al. 2012).

Population aggregation and accelerated territorial retraction would continue through the succeeding Wolf Phase, and is possibly related to the appearance of earthworks (see discussion below on procurement). Indeed, in Essex County alone, several earthworked sites—often consisting of various circular/semicircular embankment features—have been reported along the east side of Sturgeon Creek, in several places along the north shore of Lake Erie between Point Pelee and Big Creek, and near the mouth of the Detroit River (Murphy and Ferris 1990; Watts 2018). As stated by Murphy and Ferris (1990:241; see also Knight and Ramsden 1972), while numerous earthen enclosures have been investigated, their exact function and season of use has been difficult to determine, in part due to the idiosyncratic depositional patterning of what is sparse cultural refuse (see also discussion below on discard).

2.4.3 Material Trends

As with prior phases in the sequence, Springwells is delineated primarily by changes in ceramic morphology, which are found across the Western Basin Tradition area of southwestern Ontario and southeastern Michigan (Fitting 1975; Krakker 1983; Murphy and Ferris 1990:209-218). Springwells vessels are marked by castellated collars, horizonal, oblique and cordmarked rim motifs, and elongated, cylindrical, and slightly constricting necks. These 'bag shaped' forms continue, with some morphological differences, into the succeeding Wolf Phase (Murphy and Ferris 1990:209). With regard to lithic assemblages, Springwells Phase sites in Ontario are represented by few, if any, complete bifaces, and instead feature more expedient utilized flake tools (e.g., spokeshaves and end-scrapers; see Figure 2). The majority of these tools were produced through the bipolar reduction of locally obtained secondary source chert nodules (e.g., Lennox 1982:19, 1995; Lennox and Molto 1995). Springwells projectile point styles would also continue the earlier pan-regional emphasis on Levanna point forms while moving toward the slightly narrower, isosceles-triangular Madison point (Kenyon 1988; Reid 1983a, 1983b). Side notched points have also been reported to occur at Springwells sites along the Thames River (Knight and Ramsden 1972).

Figure 2: Examples of Springwells Phase lithics from the E. C. Row site. 1. Spokeshave (denticulated, utilized lateral edge); 2. Biface mid-section; 3-6. Expended bipolar cores/nodules (from Lennox and Molto 1995)

2.5 The Iler Earthworks (AaHr-22)

The Iler Earthworks are found along a NE-SW trending ridge on the northern half of Lot 36, in the Township of Colchester South, Essex County, some 2 km north of the Lake Erie shoreline (see Figure 3). With regards to physiography, the site is situated on a small glacial outwash of Tuscola fine sandy loam, in a broad, largely flat region known as the Essex Clay Plain.

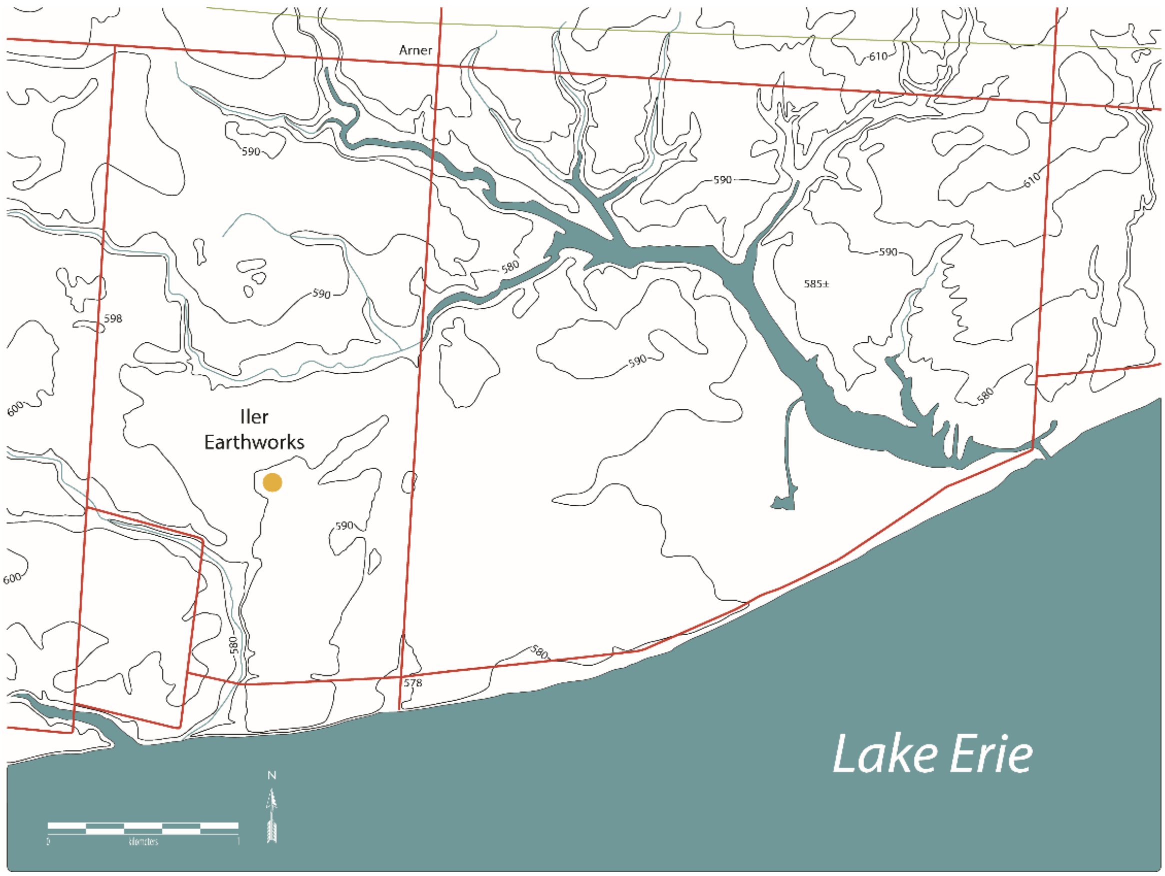

Figure 3: Location of the Iler Earthworks (drawing by C. Watts)

The earthen enclosure was first documented by local antiquarian John C. Bonham, who in 1944 produced a measured drawing of the site detailing a large semicircular berm and ditch opening to the east. These features—as suggested by aerial photography dating to the 1950s—may have at one time been elliptical in shape and partially destroyed during the clearing of parts of Lot 36 prior to 1944. The western portion of the embankment was leveled when the remaining woodlot was converted to agricultural production in the 1960s (Mr. Earl Iler, personal communication). This was completed prior to a surface collection of the site by Harry Bosveld of the Hiram-Walker (now Windsor Community) Museum in 1968, which recovered a “great deal of pottery, and a few pipe sherds as well as a single corner-notched projectile point” (Watts 2018). A small surface collection of “collared, cord-roughened” vessel rims was later recovered from the Iler Earthworks (Carey 1978; Reid 1981), possibly suggesting a late Springwells Phase occupation. However, it was not until Watts’ investigations of the neighbouring Cedar Creek Earthworks that the Iler Earthworks were formally surveyed and excavated. In 2015, he and his team conducted a magnetometer survey of roughly 1.2 ha of Lot 36, in an area corresponding to the location of the site as depicted by Bonham in 1944. Materials recovered from two test units placed atop prominent magnetic disruptions contained collared rim shreds and were deemed to be diagnostic of a Late Woodland Western Basin site dating to the late Springwells Phase.

The Iler site was formally excavated later that field season under the direction of Dr. Christopher Watts of the Department of Anthropology at the University of Waterloo. The 2015 season saw the excavation of one-metre units organized into five trenches (see Figure 4), one of which (Trench A) impacted the ditch feature within a metre of its location of the Bonham map. Artifacts recovered from these trenches included myriad lithic remains, including one formal tool, a Levanna projectile point, and portions of several bifaces. The total number one-metre square units placed across the site in 2015 was 116.

Figure 4: Plan view of the Iler Earthworks. The red squares denote one-metre units excavated in 2015. The area enclosed by the dashed yellow line marks the operation conducted in 2016 (drawing by C. Watts).

The 2016 season saw the mechanized removal of ploughzone soils to completely expose cultural features and the embankment ditch (Figure 4). Topsoils from a 210 m^2 area, immediately south of the trenches examined the previous year, were removed to reveal a number of pit features, particularly in the southeastern portion of this locale. Pit features were recorded, mapped, profiled, excavated, and screened (or set aside for flotation). Artifacts recovered from the screened fill from both field seasons were bagged with the necessary provenience information (unit, level, and feature designation) and assigned an accession number in the lab. The lithic materials recovered from both unit excavations in 2015 (n=466) and pit feature fills in 2016 (n=83) consist of primary, secondary (flakes), and tertiary (shatter) pieces of debitage, a small assortment of formal bifacial (n=7) and retouched/utilized flake tools (n=23), and cores (expended primary and secondary sourced nodules) at varying stages of reduction. Additional materials collected from pit features in 2018 (Figure 4, in the area enclosed by the dashed blue line) were not examined as part of this study.

2.6 Methodology

The methods employed in the analysis of Iler's lithic assemblage take into account the *chaîne opératoire* described above, including raw material procurement strategies and associated manufacturing processes, site configuration, tool function, environmental exploitation, and differential attrition rates of various artifact types (see Andrefsky 1994; Bamforth 1991; Kuhn 1991). These methods are used to reconstruct the various social processes that might impinge upon stone objects before their deposition in the archaeological record (Garvey 2015).

2.6.1 Analyzing Acquisition

Examining the multitude of factors involved in raw material acquisition is the first fundamental step in an understanding of the broader operational sequence, whether as a model for assessing anticipated manufacturing costs (i.e., the effort required to locate and utilize a chert source) or the amount of time involved in a particular core reduction activity (Odell 2015:159-160). Indeed, the makeup of raw materials should be an important consideration with regard to procurement patterning. Analyzing variations in material quality (e.g., isotropism, patination, and homogeneity) may gesture toward the structuring of Western Basin chert acquisition practices (Cotterell and Kamminga 1979; Garvey 2015; Whittaker 1994). In the southwestern Ontario study area (e.g., Essex County), locally obtained secondary materials—categorized here by their small, insular quality and heavily patinated cortical surfaces—tend to be manufactured into informal/expedient tool forms. Less abundant primary sourced materials—obtained through the travel to, and laborious quarrying of, distant surficial outcrops—require greater manufacturing efforts, resulting in an ideal template for further refitting (e.g., sharpening, hafting, and bifacial flaking) into formal tool types (Andrefsky 1994:31). This model ultimately considers the physical nature of accessible raw materials as crucial when inferring procurement trends (see Odell 2000:270) and was therefore implemented in the appraisal of strategies for raw material acquisition by Iler residents.

2.6.2 Analyzing the Reduction Sequence

Core reduction is a major component of the *chaîne opératoire* and focuses on the kinetic techniques applied to cores to produce ideal tool forms (see Shott 2003; Tixier et al. 1999). To analyze the reduction phase of the operational sequence, this study has elected to implement a macroscopic, attribute-based approach to lithics and microwear. In keeping with a *chaîne opératoire* analytical strategy, this understanding of the lithic reduction techniques employed at Iler may be sequentially ordered, and fractured pieces may be easily identified and placed into replicable typologies. The following outlines the analytical approaches to Iler: a) debitage; b) formal and utilized flake tools; and c) core assemblages.

a) Analytical Approaches to Debitage

Andrefsky's (1991, 2005) typologies for debitage (flake waste) were primarily used in the analysis of the Iler debitage assemblage in order to most accurately distinguish the stage of reduction, the intended tool type, and to discern between hard hammer and pressure (trimming) techniques. Various attributes of the Iler material were also assessed for their value in differentiating between reduction strategies and proportions of biface manufacture. These typologies assume that the Iler debitage was primarily the 'by-product' of manufacturing various objects that make up the Late Woodland Western Basin toolkit. The benefit of incorporating the approaches outlined below is ultimately the 'immediate behavioural inference' gained from the recognition of a single piece of debitage (Andrefsky 2005:114).

A frequently used approach in the analysis of lithic debitage, which is adopted here, is known as the 'triple cortex' typology. In this scheme, analysts classify debitage as either primary, secondary, or tertiary in nature based on the amount of cortical surface found on the dorsal side of the flake (Andrefsky 2005:114; Sullivan and Rozen 1985:764). In this study, it was important to adopt this approach given Iler's abundance of small yet often heavily cortexed chert pieces, frequently derived from secondary nodules. Additionally, the Sullivan and Rozen (1985) analytical method, which discriminates between the reduction of standardized cores and the bipolar reduction of secondary cobbles based on the crushing of the platform edge, together with a flattish fracture surface and a battered distal end (see Cotterell and Kamminga 1987) is also employed. As well, a 'technological' typology is also adopted when the physical characteristics of specific lithic objects are deemed sufficient to determine their place in the manufacturing process (e.g., biface trimming flakes) (Andrefsky 2005:118, 120). With these methods in mind, the following flake types are used in this study: primary flakes (whole and fragmented); secondary or biface trimming flakes (whole and fragmented); and chipping waste (shatter).

Another approach employed herein is the 'application load' typology. This is used to classify flakes according to their manufacturing technique (i.e., hard or soft hammer percussion and pressure flaking). As with the broader *chaîne opératoire* analytical strategy, this investigation of fracture mechanics is valuable when examining the more specific reduction sequence chronologically—from initial stages of hard hammer percussion, to soft hammer percussion during tool refinement, to finishing with pressure flaking (notching and sharpening). It is also useful when developing behavioural interpretations, such as changes in tool production preferences over time (Andrefsky 1994; Parry and Kelly 1987).

b) Analytical Approaches to Stone Tools

The formal tools from Iler are distinguished here by the presence of bifacial flaking. Bifaces are defined as tools with two sides that circumscribe the object and meet to form a single edge (Andrefsky 2005:77). While limited (n=7), the formal bifacial tools recovered from Iler were analyzed according to their specific modes and attributes (i.e., variations in form, size, proportions, and chipping characteristics) as well as, in the case of the complete projectile point, its blade, stem, notching, and base. In line with prominent lithic trends at other Springwells Phase sites in the area (e.g., Bruner Colasanti and E.C. Row; see Lennox 1982; Lennox and Molto 1995) many of the tools at Iler are made in an expedient fashion (n=23). These are detached flakes that display evidence of modification, either from intentional retouch of edges or from use wear along the margins (Cotterell and Kamminga 1987). The variability in the assemblage's flake tool morphology was examined with the following sources in mind:

1) The functional design of the maker in relation to specific task requirements;
2) The overall use life of the tool, along with its constant re-sharpening and re-configuration;
3) The size, quality, and abundance of raw materials.

However, the term 'utilized flake tool' is itself potentially problematic, as both function and morphological criteria are used to assign flakes to this category, and a purely macroscopic method used to distinguish utilized flake tools from debitage may at times prove inaccurate (Shen 1999). For the purposes of this study, therefore, the term utilized/retouched flake tool refers only to those lithic pieces which exhibit patterned use (i.e., edge-damage, edge-wear, and micro-wear) as determined by techniques of use-wear analysis (see e.g., Hayden and Kamminga 1979; Odell 1975; Odell and Odell-Vereecken 1980).

c) Analytical Approaches to Cores

The analysis of both bifaces and flake tools is best approached by considering the core on which it was produced. As stated above, knowing the origin of a flake—whether obtained from primary sourced, formalized cores types that have undergone several stages of preparation, or secondary nodules obtained opportunistically—can help explain prominent attributes that relate to tool function (Andrefsky 2005; Patterson 1983:304).

Very few expended primary sourced cores (as suggested by patterned flake scars and evidence of conchoidal fracture) were recovered at Iler. Indeed, the vast majority of the recovered debitage and expedient style flake tools in the assemblage appear to have been formed through the bipolar reduction of secondary sourced cores. As defined within Bordes' *Typologie Morphologique* as *les pièces esquillées*, (scaled or splintered pieces), bipolar objects are created when placed on an anvil and struck from above, thereby producing two opposing points of impact (see also Cotterell and Kamminga 1987; Kooyman 2000). This compressive force applied to a core nucleus results in the following definable attributes: twin ridged bulbs of percussion, profusion of step and hinge termination, as well as an irregular outline. Furthermore, the presence of thermal alteration may significantly affect material qualities (e.g., colour and the development of glassy/waxy lustre) as well as manufacturing profile (Domanski and Webb 1992; Jeske and Lurie 1993).

2.7 Attribute Analysis

With the above methods in place, it becomes possible to make sense of the entire lithic operational sequence at the Iler Earthworks**.** Between August of 2017 and June of 2018, I analyzed the lithic inventory (i.e., debitage, tool and core assemblages) recovered from this site in 2015 and 2016. All recovered materials were lightly washed using a toothbrush, air-dried, and then weighed before being examined with a 10x or 15x magnifying glass (hand lens) to determine use-wear. Each lithic piece was then classified based on the methods described above and with reference to terms contained in the Iler Earthworks Project Catalogue Taxonomy, based in large part on a classificatory scheme developed by David G. Smith (1997). The following categories were utilized: 1) Primary flakes, biface trimming flakes, and shatter; 2) projectile points; 3) assorted formal bifacial tools; 4) utilized and retouched flakes; and 5) cores and nodules. A copy of this code may be found in Appendix B.

Attribute analysis of the debitage suggests that certain object traits provide valuable information in identifying specific technologies employed at the Iler Earthworks. Flake and chipping waste from various reduction stages occur most frequently, with the overall debitage assemblage accounting for 93.6 percent (n=514) of the 549 lithic pieces recovered in 2015 and 2016. Though sparsely represented, there was still a number of whole or fragmentary tools recovered (n=30, 5.5%), many of which are expedient style utilized and retouched flakes. As well, a relatively small number of expended cores (n=2, 0.4%), and chert nodules, both whole and fragmentary (n=3, 0.5%), and likely acquired from local till plains, were also examined.

As with other Late Woodland Western Basin Tradition sites in the immediate vicinity (e.g., Bruner-Colasanti), the materials used in the production of lithic tools at the Iler Earthworks appear to consist mainly of cherts native to southern Ontario, including Onondaga, Selkirk, and Kettle Point. These cherts, while outcropping some distance away from Iler, were likely deposited in local till fields during the last Ice Age and picked up locally.

Table 1: Debitage: Primary and Secondary Flakes, and Shatter

Flake Types	**f (%)**
Primary Flakes	
Whole	97 (18.9%)
Fragmentary	153 (30%)
Subtotal	**250 (48.9%)**
Secondary/Biface Trimming Flakes	
Whole	62 (12.0%)
Fragmentary	68 (13.2%)
Subtotal	**130 (25.2%)**
Shatter	
Subtotal	**134 (26.1%)**
TOTAL	**514 (100%)**

Figure 5: Debitage: a-f. Primary flakes (whole/fragmentary); g-l. Biface trimming flakes (whole/fragmentary); m-q. Shatter

Table 1, above, provides the frequencies of the flake types represented in the Iler flake waste. Primary flakes were revealed to make up 48.9 percent (n=250) of the debitage assemblage (see, for example, Figure 5: a-f). As the initial stage in the reduction process, these flakes are generally the largest in size and are classified here by their pronounced bulb of percussion, visible striking platform, and feathered termination (when intact). Biface trimming or secondary flakes, (Figure 5: g-l) were also heavily represented (n=130, 25.2%). These flakes are produced through soft hammer percussion or pressure flaking and are often smaller and/or thinner as they reflect the perceived ‘final’ phases of the reduction sequence. Chipping waste or shatter, (Figure 5: m-q) (n=134, 26.1%) occurs when fracture planes are encountered in reducing a core. Instead of producing a classic flake style, portions will break off along pre-existing lines of weakness when encountered, creating blocky, amorphous chert fragments with no clear ventral or dorsal service, bulb of percussion, or termination.

Many of the primary and/or secondary flakes bear evidence of having been produced using the bipolar core technique. These flakes are often elongated, with crushed striking platforms and flakes scars on their dorsal surface parallel to their longitudinal axis. Bipolar flakes often display little cortical surface, as they are more often derived from the reduction of expended random cores rather than the initial reduction of chert nodules (see Shott 1999; see also Cotterell and Kamminga 1987; Kobayashi 1975).

Table 2 lists the identified biface and utilized flake types in Iler's limited tool assemblage. Bifaces (see Figure 6: a-e) comprise most of the very limited number of recovered formal lithic tools, approximately 1 percent (n=7) of the total lithic assemblage. These are organized by the reduction phase component of the operational sequence, with each form identified as a stage in the evolution of the tool, from raw-material blank to refined finished product. Of the identified bifacial tools, only one was recovered intact (Figure 6: a). This piece, which measures 22 mm in width, 33 mm in height, and 4 mm in thickness, is manufactured on Selkirk chert, with a straight to slightly convex lateral edge that conforms to the Levanna point type (Ritchie 1965:31). A paucity of formal tools is common to Springwells Phase sites, as suggested by Paul Lennox's (1982) report on the Bruner-Colasanti site which, like Iler, reports only one complete biface.

Table 2: Tools: Formal Tools and Utilized/Retouched Flakes

Tool Types	f (%)
Projectile Points	
Whole	1 (3.3%)
Tip	1 (3.3%)
Subtotal	**2 (6.6%)**
Bifacial Tools	
Tip	3 (10.0%)
Mid-Section	1 (3.3%)
Longitudinal Section	1 (3.3%)
Subtotal	**5 (16.6%)**
Utilized Flakes	
Whole	16 (53.3%)
Fragmentary	4 (13.3%)
Subtotal	**20 (66.6%)**
Retouched Flakes	
Whole	2 (6.6%)
Fragmentary	1 (3.3%)
Subtotal	**3 (10.0%)**
TOTAL	**30 (100%)**

The remaining fragmentary pieces include what resembles a tip fragment from a possible second Levanna point (Figure 6: b), as well as an unknown bifacial tool tip, and mid- and longitudinal sections (Figure 6: c-e) all made from Onondaga chert.

Twenty-three (4.1%) pieces of lithic debitage (classified here as utilized/retouched flakes) show evidence of modification (Figure 6: f-j), either from the intentional retouch of edges or from use-wear along margins. A continuous series of minute scars on one or both retouched flake faces denotes their potential scraping, cutting, and drilling functions respectively. One fragmented chert piece (Figure 6: f) has two retouched lateral edges, rounded through use, forming a point on the flake's distal end. The resulting wear pattern possibly indicates its use as a scraper. A second specimen (Figure 6: g) displays a series of flakes scars on its distal end, seemingly the result of pressure applied to its pointed tip, which Lennox (1982) suggests is

Figure 6: Tools: a-b. Projectile points (whole/tip); c-e. Bifaces (fragmentary); f-j. Utilized/retouched flakes (whole/fragmentary)

indicative of its use as a 'piercer/borer'. The fine alternate use retouch occurring on the lateral edges of many of the other utilized flakes, as well as the crushed edges on some of the larger pieces in the assemblage (Figure 6: h-j) suggests their use as chopping/cutting tools (see Lennox and Dodd 1991; Lennox and Molto 1995). Furthermore, many of the tools listed above bear some degree of thermal alteration.

Table 3 and Figure 7, below, illustrate the morphology and frequency of Iler's few lithic cores and cobbles. There are two (Figure 7: a,b) standard, multidirectional, hand rotated cores identified out of the five recovered. The remaining cores are small, modified, yet heavily patinated (round, waterworn) chert nodules (Figure 7: c,d). All of these cores, as with core assemblages from other Springwells sites such as E.C. Row and La Salle-Lucier, bear some evidence of bipolar reduction. The small size of these original pebbles, as well as their high incidence of patinated, heavily battered cortex, attests to their secondary source derivation (see discussion below on procurement).

Table 3: Lithic Cores: Expended Cores and Nodules (Bipolar)

Core Types	f (%)
Expended Cores	
Subtotal	**2 (40.0%)**
Nodules (Bipolar)	
Whole	1 (20.0%)
Fragmentary	2 (40.0%)
Subtotal	**3 (60.0%)**
TOTAL	**5 (100%)**

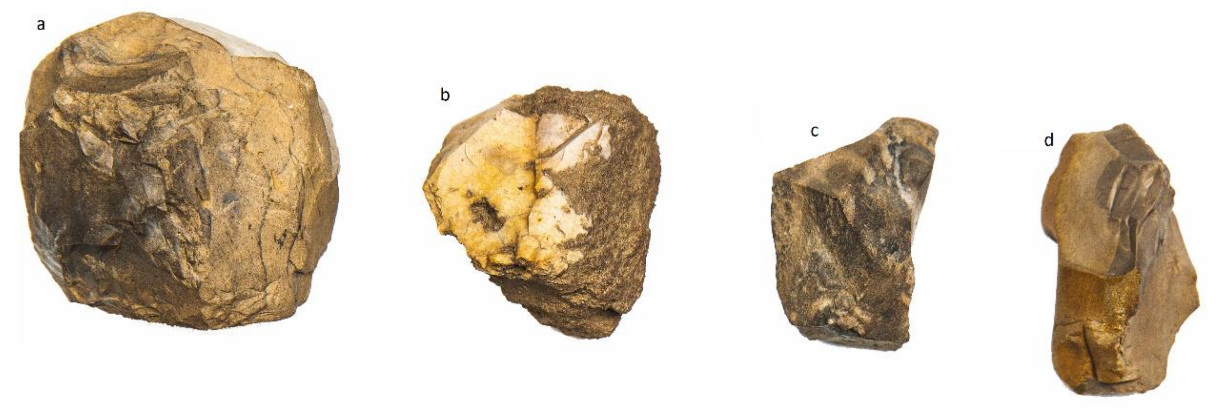

Figure 7: a-b. Cores (expended); c-d. Waterworn nodules

2.8 Discussion: A *Chaîne Opératoire* Perspective

By following the lithic *chaîne opératoire* object flow model, several notable patterns emerge in the analysis of lithic materials from the Iler Earthworks. As noted in Section 2.3.2, what we are after in this reconstruction are inferences regarding the decisions made about lithic procurement, manufacturing, and use based on cultural considerations and environmental factors. By emphasizing the social aspects of the Iler operational sequence, focus can then be directed to the underlying processes and negotiations that contributed to the creation of the lithic assemblage. Such choices are guided by personal and group knowledge and reflect the physical and cultural considerations in which the tool was acquired, produced, and used (Ryan 2009:442; see also Flenniken 1993).

2.8.1 Procurement

The following outlines the choices and decisions of Iler's inhabitants with respect to the procurement of lithic raw materials. This represents the first phase of the *chaîne opératoire* at Iler while speaking to issues of mobility, opportunism, and adaptation to local resource conditions. In the southwestern Ontario study area specifically, there is little in the way of primary chert sources due to a thick mantle of secondary glacial deposits. The closest sizeable and surficial material outcrops are found 180 km north of Iler at Kettle Point and nearly 250 km north and east of Iler with the Onondaga and Selkirk deposits (see Eley and Von Bitter 1989; Fox 1979; Janusas 1984). The chert sources in and around Essex County are mostly comprised of regularly occurring nodules, scattered in the till by glacial action, and left in a series of recessional moraines from south to north out of the Lake Erie basin (Luedtke 1976). The look and feel of secondary deposits are highly variable. Along the Lake Erie shoreline, large cobbles can be found of material virtually indistinguishable from the primary sourced Onondaga, in terms of material composition, yet the presence of cortical surface and evidence of wave action belie their secondary status. The high incidence of waterworn nodular cortex on recovered cores, as well as the proportionally small size of the associated debitage at Iler—as reflected in the lithic assemblages of contemporary Springwells sites in the study area (see e.g., Kenyon 1988; Lennox and Dodd 1991; Lennox 1995 and Molto 1996; Murphy 1987)—attests to the collection of chert from these local till sources. Indeed, the easy accessibility of workable materials in the local till suggests that the inhabitants of Iler may not have needed to visit or trade for materials from primary surface outcrops.

The use of secondary materials at the site is further evidenced by my purposeful handpicking of thoroughly patinated pieces of Onondaga chert from the nearby Lake Erie shoreline during the summer of 2018. Some of these pieces are depicted in Figure 8, below.

Figure 8: Heavily patinated and waterworn pieces of nodular Onondaga chert recovered from the Lake Erie shoreline (2km South of Iler)

These nodular cobbles—very similar in quality to the flake scarred cores excavated 2 km north in the fine sandy loam at Lot 36—would have provided ideal objective pieces for the production of the expedient style-tools prevalent in Iler Earthworks lithic assemblage. In adopting this procurement strategy, Iler’s occupants were however limited in their production trajectories (i.e., the reduction of primarily smaller pebbles for tools used in more expedient tasks). Yet, despite a thorough utilization of secondary chert sources, a number of formal bifacial tools (e.g., the Levanna point and fragmentary bifaces) were found at Iler, along with a number of utilized flakes too large to have been derived from local pebble sources, suggesting the acquisition of larger, primary sourced cores. In observing stage 1 of the *chaîne opératoire* object flow model (i.e., the distribution of material resources) one must take into consideration the interactions between and movements among local Late Woodland groups, preserved through artifacts present in the material record (Sellet 1993; Tixier et al. 1999). It is along these lines that scarce, nonlocal resources, often used in the fashioning of formal tools, may be acquired (Andrefsky 1994).

The scarcity of formal tools at Iler, however, suggests there may have been few options for exchange in the Western Basin region, possibly due to an emerging conflict between Late Woodland communities. As previously stated, it was the terminal end of the Springwells Phase that first saw the development of earthen enclosures in southwestern Ontario, at sites such as Parker and Iler in Ontario, and Graham-Vogt in Michigan (see Watts 2016). This phenomenon was possibly precipitated by the movement of Iroquoian peoples into the area, as evidenced by the presence of Iroquoian materials on Bkejwanong (Walpole Island) near Wallaceburg, as well as the appearance of more substantial and possibly fortified Iroquoian villages near what is now Chatham (Adams 1989; Foster 1990; Murphy 1988; Murphy and Ferris 1990). Hostilities between Western Basin and Ontario Iroquoian groups would have been of serious concern to both cultural traditions and may have acted as an impetus for site fortification. A trend toward isolationism, and population aggregations within fortified communities, could be seen as a direct response to the increased proximity of Ontario Iroquoian peoples in 'occupied areas' and may have engendered the settlement patterns seen among Western Basin Springwells and later Wolf Phase groups (Murphy and Ferris 1990:256). Indeed, an encroachment of Iroquoian 'frontier sites' may be another factor in the procurement patterns observed at Iler. It may be that it was simply too dangerous to frequently travel beyond what is now Essex County, to the north and east, where Onondaga, Selkirk, and Kettle Point quarry sites are found.

2.8.2 Production and Use

The next stage of the *chaîne opératoire* outlines how the lithic tools at Iler were formed, but were also changed and modified over the course of their use-lives. This refers not only to physical levels of analysis but also to scales at which past social action occurred and to which 'archaeological explanation' is therefore directed (Dobres and Hoffman 1994:213). As stated in Section 2.6.2, what this interpretation of the core reduction sequence ultimately hopes to illuminate are the potential uses of various tools (i.e., 'formal' bifaces or 'utilized' flakes) when faced with a variety of specific task requirements. In keeping with Stages 2 and 3 of the *chaîne opératoire* object flow model, the various technical traditions (e.g., the use of unstandardized, expedient core technology within a bipolar industry) present at the Iler Earthworks during the Late Woodland period may also be illuminated.

Prior investigations into Late Woodland lithic industries in southwestern Ontario have revealed few changes in formal biface use through time (see Fitting 1965; Murphy and Ferris 1990). Indeed, as indicated by Shott (1996), their frequent application as projectile points has remained a cultural constant throughout the Late Woodland Western Basin, being used almost exclusively in the hunting of larger game and, occasionally, in the pursuit of warfare among conflicting groups (see also Odell 2000). As stated above, the presence of few, formal bifaces at Iler hints at the possible reduction of large, primary sourced cores acquired through exchange networks or possible travel to distant quarry sites. Objects derived successfully from the reduction of such larger materials are regarded as tools only when they are manufactured according to particular yet recurrent design specifications, as reflected in archaeological typologies (Shen 1999:71).

The majority of tool types at Iler instead represent ‘utilized flakes’. As stated in the Methodology section, these expedient style tools are defined only with regards to their functional purpose, as evidenced by their varying patterns of use wear (i.e., alterations of edges and surfaces as a result of deliberate retouch). However, some use wear studies have revealed a multitude of flake types whose observed characteristics may not reflect their intended purpose (Odell 1981; Shen 1995, 1999). Flake tools of no morphologically distinguishable type may therefore have been used in expedient tasks (e.g., scraping, cutting, and drilling) associated with various hunting and gathering activities (see Foreman 2011; Watts et al. 2012). Many such pieces with demonstrable use-wear are present in Iler’s assemblage (see Figure 6) and many of its larger by-products of core reduction (i.e., primary, biface trimming flakes and shatter; see Figure 5) have the potential to be classified as ‘utilized’.

Such tools are often components of a bipolar industry. This reduction strategy—interpreted within a *chaîne opératoire* as both the action and resulting object—is perhaps the most efficient way to reduce small chert pieces, and is frequently implemented at sites where such secondary sourced raw materials (e.g., heavily patinated chert nodules; see Figures 7-8) are primarily accessible (Barham 1987; Crovetto et al. 1994). In sedentary contexts such as Iler, where mobility is constrained, flakes rather than finished bifaces may indeed have been a required choice for occasional tool use (Parry and Kelly 1987; Shott 1999:220). The overwhelming presence of utilized flakes at Iler may therefore account for the site’s lack of formal bifaces. Due to the ubiquity of secondary materials when compared with larger primary cores, as well as a proficiency in bipolar reduction, its inhabitants may have indeed ‘settled’ on, or perhaps even preferred, flake tools for expedient tasks.

Furthermore, when supply of lithic raw materials is low, depleted tools may be further reduced to produce a few more useful flakes (Goodyear 1993). This, in addition to the retouch of many formerly discarded cores and flake tools (and to some extent bifaces), many of which bear some evidence of thermal alteration as suggested by lustre, demonstrates a non-linear organization of reduction activities at the site (see Sellet 1999). Although constrained by technologies, the inhabitants of the Iler Earthworks possessed the necessary knowledge sets (*connaissance* and *savoir-faire*) required to derive as much use as possible from a limited amount of material. Indeed, this ability to incorporate alternative methods of reduction reflects a larger set of adaptive behaviours that populations use in their interaction with the surrounding environment (Goodyear 1993; Jeske and Lurie 1993:146).

2.8.3 Discard

This 'final' phase of the operational sequence refers to site patterning as suggested by discarded lithic materials. Unlike discard patterns present at other Western Basin settlements, where materials appear to have been purposefully deposited within selected storage pits in accordance with specific habitation activities or mortuary practices (see Fitting 1970:156; Greenman 1937), evidence from various Late Woodland earthworks (see e.g., Krakker 1983; Watts 2016), including Iler, suggests a generalized, non-purposeful treatment of discarded lithics, as given by their scattered depositional patterning. Despite this technological organization at Iler—the potential result of a combination between natural and cultural agencies (e.g., erosion over time into the semicircular embankment ditch and later agricultural disturbances)—it is entirely possible that much of Iler's lithic material may have instead been reserved for further application, as reflected above in the re-retting of expended objects. Here, it seems, is evidence of an exhaustive exploitation of all available resources.

In line with the so-called ‘final’ stage of the *chaîne opératoire* object flow model, wherein the concept of fixed, unchangeable categories may be challenged, such discarded materials are not viewed as end products of the reduction sequence but as part of a continuous cycle of use and re-use (Shott 1996, 2003). This analytical strategy ultimately considers material discard—the perceived last phase of use before deposition in the archaeological record—as a crucial consideration when inferring the overall technological strategies that in part comprise Late Woodland lifeways (see Bradbury and Carr 1999, 2014).

2.9 Conclusion

As both a conceptual device and methodological framework, the *chaîne opératoire* provides a way of understanding how lithic production is organized. With regard to the former, it serves to theorize how the manufacturing process would be viewed from the perspective of a tool maker, and how their knowledge (*connaissance)* comes to be enacted through unique skills (*savoir-faire*) born of ongoing engagements with materials. Concerning the latter, the *chaîne opératoire* allows the analyst to envision how raw materials are introduced into the technological cycle of production activities and transformed into culturally meaningful objects (Geneste 1985:77). The sequence, as noted earlier, can be divided into meaningful phases, including raw material procurement, tool production, and intended use-life, maintenance, and discard.

In implementing a *chaîne opératoire* analytical strategy to the Late Woodland Iler Earthworks lithic assemblage, we have been able to direct attention to the broader, embedded stone economizing behaviours that were woven into the very fabric of the Western Basin

(Springwells) cultural landscape. A total of 549 lithic objects were examined as part of this study, including principally flake and chipping waste from various reduction stages, along with whole or fragmentary tools, expended cores, and chert nodules likely acquired from local till plains or lacustrine/riverine environments. Various technological and function-based typological approaches to the Iler debitage and tool assemblages were employed in order to infer technical traditions at the site, revealing a largely secondary source, expedient-style lithic industry (i.e., the reduction of nodular cores to useable flakes) and the re-touch/re-fitting of formerly discarded flakes and tools. Such continued cycles of use and re-use may challenge potentially rigid taxonomies, and the so-called ‘death’ of discarded objects.

The analysis described above suggests that, rather than availing themselves of materials from primary sources, the inhabitants of Iler focused on an alternative procurement strategy—the collection of localized, secondary nodules. Furthermore, the paucity of formal, bifacial tools in the sample and ubiquity of utilized flakes hints at a somewhat circumscribed territorial range. Limited options for exchange, and/or a reluctance to travel to distant primary sources during the later Springwells Phase—the possible result of an emerging conflict between Ontario Western Basin, and westward-encroaching Iroquoian peoples—may have instigated the procurement patterns observed at Iler. Ultimately, the analysis and interpretation of the Iler Earthworks lithic assemblage contributes to the ongoing assessment of Western Basin Tradition lifeways, and the work needed to bring such fascinating practices into the broader ‘canon’ of Ontario archaeological research (Murphy and Ferris 1990).

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Appendix A: Summary Tables

Borden #: AaHr-22

Table A.1 Projectile Points and Bifacial tools

Unit	Trench	Level	Feature	Cat#	Articode	Description	#Pieces	Weight(g)
558-262	Trench C	A		015.230.2.1	BAA0001	Projectile Point - Whole	1	2.6
560-259	Trench C	A		015.251.2.1	BAA0002	Projectile Point - Tip	1	0.1
550-220	Trench F	C		016.214.2.1	BAZ0002	Bifacial Tool - Tip	1	11.3
563-269	Trench E	A		015.277.2.1	BAZ0002	Bifacial Tool - Tip	1	1.5
565-260	Trench D	A		015.278.2.1	BAZ0002	Bifacial Tool - Tip	1	1
561-260	Trench C	C	F1	015.264.2.1	BAZ0004	Bifacial Tool - Mid Section	1	0.4
561-262	Trench C	A		015.229.2.1	BAZ0016	Bifacial Tool - Longitudinal Section	1	0.4

Table A.2: Utilized/Retouched Flakes

Unit	Trench	Level	Feature	Cat#	Articode	Description	#Pieces	Weight(g)
559-263	Trench C	A	F1	015.236.2.1	BDA0001	Utilized Flakes - Whole	1	2.7
610-240	F1 Ditch	C	F1 Ditch	016.211.2.1	BDA0001	Utilized Flakes - Whole	1	3.1
550-265	Trench F	C	F3	016.201.2.1	BDA0001	Utilized Flakes - Whole	1	4.2
555-255	Trench F	C	F6	016.209.2.1	BDA0001	Utilized Flakes - Whole	1	1.1
560-254	Trench C	A		015.217.2.1	BDA0001	Utilized Flakes - Whole	1	0.6
560-261	Trench C	A		015.220.2.1	BDA0001	Utilized Flakes - Whole	1	0.3
561-261	Trench C	A		015.222.2.1	BDA0001	Utilized Flakes - Whole	1	1.8
560-256	Trench C	A		015.224.2.1	BDA0001	Utilized Flakes - Whole	1	0.6
560-259	Trench C	A		015.251.2.3	BDA0001	Utilized Flakes - Whole	1	1.6
560-262	Trench C	A		015.252.2.1	BDA0001	Utilized Flakes - Whole	1	0.9
561-258	Trench C	A		015.261.2.1	BDA0001	Utilized Flakes - Whole	1	0.2
577-240	Trench B	A		015.303.2.1	BDA0001	Utilized Flakes - Whole	1	1
577-270	Trench E	A		015.304.2.1	BDA0001	Utilized Flakes - Whole	1	2.9
579-260	Trench D	A		015.306.2.1	BDA0001	Utilized Flakes - Whole	1	3.1
580-224	Trench A	A		015.311.2.1	BDA0001	Utilized Flakes - Whole	1	0.4
580-234	Trench A	A		015.317.2.1	BDA0001	Utilized Flakes - Whole	1	3.3
555-265	Trench F	C	F14	016.207.2.2	BDA0002	Utilized Flakes - Fragmentary	1	0.8
561-262	Trench C	A		015.229.2.2	BDA0002	Utilized Flakes - Fragmentary	1	2.8
560-255	Trench C	A		015.218.2.1	BDA0002	Utilized Flakes - Fragmentary	1	0.2
560-256	Trench C	A		015.224.2.2	BDA0002	Utilized Flakes - Fragmentary	1	0.1
562-260	Trench D	C	F1	015.274.2.1	BDC0001	Retouched Flakes - Whole	1	16
570-240	Trench B	A		015.289.2.1	BDC0001	Retouched Flakes - Whole	1	0.4
576-269	Trench E	A		015.302.2.1	BDC0002	Retouched Flakes - Fragmentary	1	2.3

Table A.3: Nodules and Cores

Unit	Trench	Level	Feature	Cat#	Articode	Description	#Pieces	Weight(g)
555-265	Trench F	C	F14	016.207.2.1	BEA0001	Chert Nodule - Whole	1	65.5
550-225/545-225	Trench F	C	F12	016.203.2.1	BEA0002	Chert Nodule - Fragmentary	1	11.1
560-259	Trench C	A		015.251.2.2	BEA0002	Chert Nodule - Fragmentary	1	19.1
550-225/545-225	Trench F	C	F12	016.203.2.2	BEB0004	Core - Expended	1	2.6
568-269	Trench E	A		015.287.2.3	BEB0004	Core - Expended	1	14

Tables A.4: Primary Flakes

Unit	Trench	Level	Feature	Cat#	Articode	Description	#Pieces	Weight(g)
559-263	Trench C	A	F1	015.236.2.2	BEH0001	Primary Flakes - Whole	1	0.2
561-260	Trench C	C	F1	015.264.2.2	BEH0001	Primary Flakes - Whole	3	1
550-225/545-225	Trench F	C	F12	016.203.2.3	BEH0001	Primary Flakes - Whole	1	0.9
555-265	Trench F	C	F14	016.207.2.3	BEH0001	Primary Flakes - Whole	2	9.5
550-265	Trench F	C	F3	016.201.2.2	BEH0001	Primary Flakes - Whole	6	8
555-260	Trench F	C	F5	016.216.2.1	BEH0001	Primary Flakes - Whole	1	1.1
555-255	Trench F	C	F6	016.202.2.1	BEH0001	Primary Flakes - Whole	1	3.5
550-255	Trench F	C	F7	016.210.2.1	BEH0001	Primary Flakes - Whole	2	2.1
561-262	Trench C	A		015.229.2.3	BEH0001	Primary Flakes - Whole	2	1.8
560-255	Trench C	A		015.218.2.2	BEH0001	Primary Flakes - Whole	2	1.6
560-256	Trench C	A		015.224.2.3	BEH0001	Primary Flakes - Whole	4	4.3
568-260	Trench D	A		015.227.2.1	BEH0001	Primary Flakes - Whole	2	0.9
559-261	Trench C	A		015.235.2.1	BEH0001	Primary Flakes - Whole	2	1.5
559-262	Trench C	A		015.238.2.1	BEH0001	Primary Flakes - Whole	1	0.5
560-242	Trench C	A		015.240.2.1	BEH0001	Primary Flakes - Whole	1	2.1
560-243	Trench C	A		015.242.2.1	BEH0001	Primary Flakes - Whole	1	0.4
560-248	Trench C	A		015.246.2.1	BEH0001	Primary Flakes - Whole	1	0.4
560-259	Trench C	A		015.251.2.4	BEH0001	Primary Flakes - Whole	1	0.2
560-258	Trench C	A		015.254.2.1	BEH0001	Primary Flakes - Whole	2	2.2
560-264	Trench C	A		015.255.2.1	BEH0001	Primary Flakes - Whole	1	0.6
560-263	Trench C	A		015.256.2.1	BEH0001	Primary Flakes - Whole	2	2.8
560-267	Trench C	A		015.258.2.1	BEH0001	Primary Flakes - Whole	1	0.4
560-269	Trench C	A		015.259.2.1	BEH0001	Primary Flakes - Whole	2	1.1
561-258	Trench C	A		015.261.2.2	BEH0001	Primary Flakes - Whole	2	1.1
560-268	Trench C	A		015.262.2.1	BEH0001	Primary Flakes - Whole	1	1.4
561-260	Trench C	A		015.263.2.1	BEH0001	Primary Flakes - Whole	1	1.1
561-259	Trench C	A		015.265.2.1	BEH0001	Primary Flakes - Whole	2	0.8
561-259	Trench C	C		015.266.2.1	BEH0001	Primary Flakes - Whole	1	0.2
562-240	Trench B	A		015.269.2.1	BEH0001	Primary Flakes - Whole	1	0.6
561-263	Trench C	A		015.270.2.1	BEH0001	Primary Flakes - Whole	1	0.3
563-240	Trench B	A		015.273.2.1	BEH0001	Primary Flakes - Whole	1	0.6

564-240	Trench B	A		015.275.2.1	BEH0001	Primary Flakes - Whole	1	0.2
563-269	Trench E	A		015.277.2.2	BEH0001	Primary Flakes - Whole	1	0.2
565-260	Trench D	A		015.278.2.2	BEH0001	Primary Flakes - Whole	2	0.6
566-260	Trench D	A		015.282.2.1	BEH0001	Primary Flakes - Whole	1	0.6
567-260	Trench D	A		015.285.2.2	BEH0001	Primary Flakes - Whole	3	0.6
567-260	Trench D	A		015.286.2.1	BEH0001	Primary Flakes - Whole	1	0.4
568-269	Trench E	A		015.287.2.1	BEH0001	Primary Flakes - Whole	2	19.5
570-260	Trench D	A		015.288.2.1	BEH0001	Primary Flakes - Whole	3	1.4
569-260	Trench D	A		015.289.2.1	BEH0001	Primary Flakes - Whole	1	0.6
571-260	Trench D	A		015.291.2.1	BEH0001	Primary Flakes - Whole	2	1
573-240	Trench B	A		015.292.2.1	BEH0001	Primary Flakes - Whole	1	0.4
574-260	Trench D	A		015.294.2.1	BEH0001	Primary Flakes - Whole	1	0.5
573-269	Trench E	A		015.295.2.1	BEH0001	Primary Flakes - Whole	1	1.7
574-269	Trench E	A		015.297.2.1	BEH0001	Primary Flakes - Whole	1	0.6
575-240	Trench B	A		015.298.2.1	BEH0001	Primary Flakes - Whole	1	0.2
576-240	Trench B	A		015.299.2.1	BEH0001	Primary Flakes - Whole	1	0.1
576-260	Trench E	A		015.301.2.1	BEH0001	Primary Flakes - Whole	1	0.3
576-269	Trench E	A		015.302.2.2	BEH0001	Primary Flakes - Whole	1	1.9
577-260	Trench D	A		015.305.2.1	BEH0001	Primary Flakes - Whole	1	1.2
578-260	Trench E	A		015.310.2.1	BEH0001	Primary Flakes - Whole	1	1.6
580-216	Trench A	A		015.313.2.1	BEH0001	Primary Flakes - Whole	1	1.1
580-210	Trench A	A		015.315.2.1	BEH0001	Primary Flakes - Whole	1	0.9
580-234	Trench A	A		015.317.2.2	BEH0001	Primary Flakes - Whole	2	0.9
580-229	Trench A	A		015.318.2.1	BEH0001	Primary Flakes - Whole	1	0.9
580-230	Trench A	A		015.319.2.1	BEH0001	Primary Flakes - Whole	2	0.8
580-232	Trench A	A		015.320.2.1	BEH0001	Primary Flakes - Whole	4	2.4
580-236	Trench A	A		015.323.2.1	BEH0001	Primary Flakes - Whole	3	0.5
580-235	Trench A	A		015.326.2.1	BEH0001	Primary Flakes - Whole	4	4.2
559-260	Trench C	C	F1	015.233.2.1	BEH0002	Primary Flakes - Fragmentary	2	0.4
558-260	Trench C	C	F1	015.234.2.1	BEH0002	Primary Flakes - Fragmentary	1	0.7
559-261	Trench C	C	F1	015.237.2.1	BEH0002	Primary Flakes - Fragmentary	2	1.7
560-259	Trench C	C	F1	015.253.2.1	BEH0002	Primary Flakes - Fragmentary	1	0.8
560-265	Trench C	A	F1	015.257.2.1	BEH0002	Primary Flakes - Fragmentary	2	1.5
610-240	F1 Ditch	C	F1 Ditch	016.211.2.2	BEH0002	Primary Flakes - Fragmentary	1	1.3
605-230 (2m E)	F1 Ditch	C	F1 Ditch	016.215.3.2	BEH0002	Primary Flakes - Fragmentary	1	0.7
555-265	Trench F	C	F14	016.207.2.4	BEH0002	Primary Flakes - Fragmentary	3	2.5
550-265	Trench F	C	F3	016.201.2.3	BEH0002	Primary Flakes - Fragmentary	2	4.4
550-260	Trench F	C	F3	016.205.2.1	BEH0002	Primary Flakes - Fragmentary	1	1.4
555-260	Trench F	C	F5	016.216.2.2	BEH0002	Primary Flakes - Fragmentary	1	0.2
555-255	Trench F	C	F6	016.209.2.2	BEH0002	Primary Flakes - Fragmentary	1	0.5
550-255	Trench F	C	F7	016.210.2.2	BEH0002	Primary Flakes - Fragmentary	2	0.7
555-250	Trench F	C	F8	016.208.2.1	BEH0002	Primary Flakes - Fragmentary	2	0.9

555-250	Trench F	C	F8	016.212.2.1	BEH0002	Primary Flakes - Fragmentary	2	0.5
580-233	Trench A	A		015.324.2.1	BEH0002	Primary Flakes - Fragmentary	2	0.3
560-254	Trench C	A		015.217.2.2	BEH0002	Primary Flakes - Fragmentary	1	0.4
560-255	Trench C	A		015.218.2.3	BEH0002	Primary Flakes - Fragmentary	1	0.2
560-252	Trench C	A		015.219.2.1	BEH0002	Primary Flakes - Fragmentary	2	0.7
560-261	Trench C	A		015.220.2.2	BEH0002	Primary Flakes - Fragmentary	2	1.3
571-269	Trench E	A		015.221.2.1	BEH0002	Primary Flakes - Fragmentary	1	0.4
561-261	Trench C	A		015.222.2.2	BEH0002	Primary Flakes - Fragmentary	1	0.6
560-261	Trench C	C		015.223.2.1	BEH0002	Primary Flakes - Fragmentary	2	0.6
560-256	Trench C	A		015.224.2.4	BEH0002	Primary Flakes - Fragmentary	2	1.4
568-260	Trench D	A		015.227.2.2	BEH0002	Primary Flakes - Fragmentary	1	2.5
560-266	Trench C	A		015.228.2.1	BEH0002	Primary Flakes - Fragmentary	4	3.3
558-262	Trench C	A		015.230.2.2	BEH0002	Primary Flakes - Fragmentary	2	2.1
558-260	Trench C	A		015.231.2.1	BEH0002	Primary Flakes - Fragmentary	1	0.4
559-260	Trench C	A		015.232.2.1	BEH0002	Primary Flakes - Fragmentary	2	0.8
559-261	Trench C	A		015.235.2.2	BEH0002	Primary Flakes - Fragmentary	1	0.6
559-262	Trench C	A		015.238.2.2	BEH0002	Primary Flakes - Fragmentary	4	1
560-242	Trench C	A		015.240.2.2	BEH0002	Primary Flakes - Fragmentary	2	1.8
560-243	Trench C	A		015.242.2.2	BEH0002	Primary Flakes - Fragmentary	3	1.1
560-244	Trench C	A		015.244.2.1	BEH0002	Primary Flakes - Fragmentary	3	10.5
560-248	Trench C	A		015.246.2.2	BEH0002	Primary Flakes - Fragmentary	1	0.3
560-250	Trench C	A		015.248.2.1	BEH0002	Primary Flakes - Fragmentary	2	0.8
560-259	Trench C	A		015.251.2.5	BEH0002	Primary Flakes - Fragmentary	2	1.2
560-258	Trench C	A		015.254.2.2	BEH0002	Primary Flakes - Fragmentary	1	0.4
560-263	Trench C	A		015.256.2.2	BEH0002	Primary Flakes - Fragmentary	2	2.6
560-267	Trench C	A		015.258.2.2	BEH0002	Primary Flakes - Fragmentary	2	2.4
561-240	Trench B	A		015.260.2.1	BEH0002	Primary Flakes - Fragmentary	4	1.5
561-258	Trench C	A		015.261.2.3	BEH0002	Primary Flakes - Fragmentary	6	2.1
560-268	Trench C	A		015.262.2.2	BEH0002	Primary Flakes - Fragmentary	1	0.5
561-260	Trench C	A		015.263.2.2	BEH0002	Primary Flakes - Fragmentary	2	6.2
561-259	Trench C	A		015.265.2.2	BEH0002	Primary Flakes - Fragmentary	6	2.3
561-259	Trench C	C		015.266.2.2	BEH0002	Primary Flakes - Fragmentary	1	0.3
561-269	Trench E	A		015.267.2.1	BEH0002	Primary Flakes - Fragmentary	2	10.1
562-240	Trench B	A		015.269.2.2	BEH0002	Primary Flakes - Fragmentary	4	1.1
564-240	Trench B	A		015.275.2.2	BEH0002	Primary Flakes - Fragmentary	2	0.4
564-260	Trench D	A		015.276.2.1	BEH0002	Primary Flakes - Fragmentary	3	0.7
563-269	Trench E	A		015.277.2.3	BEH0002	Primary Flakes - Fragmentary	1	5.8
567-240	Trench B	A		015.280.2.1	BEH0002	Primary Flakes - Fragmentary	2	0.6
566-260	Trench D	A		015.282.2.2	BEH0002	Primary Flakes - Fragmentary	1	0.3
567-269	Trench E	A		015.283.2.1	BEH0002	Primary Flakes - Fragmentary	2	1.1
568-240	Trench B	A		015.284.2.2	BEH0002	Primary Flakes - Fragmentary	2	1
568-269	Trench E	A		015.287.2.2	BEH0002	Primary Flakes - Fragmentary	1	7
570-260	Trench D	A		015.288.2.2	BEH0002	Primary Flakes - Fragmentary	2	1.8

569-260	Trench D	A		015.289.2.2	BEH0002	Primary Flakes - Fragmentary	1	0.7
570-240	Trench B	A		015.289.2.2	BEH0002	Primary Flakes - Fragmentary	3	0.8
572-260	Trench D	A		015.290.2.1	BEH0002	Primary Flakes - Fragmentary	1	0.4
571-260	Trench D	A		015.291.2.2	BEH0002	Primary Flakes - Fragmentary	1	0.6
574-260	Trench D	A		015.294.2.2	BEH0002	Primary Flakes - Fragmentary	3	3.4
573-269	Trench E	A		015.295.2.2	BEH0002	Primary Flakes - Fragmentary	1	0.1
574-240	Trench B	A		015.296.2.1	BEH0002	Primary Flakes - Fragmentary	2	0.3
574-269	Trench E	A		015.297.2.2	BEH0002	Primary Flakes - Fragmentary	1	0.5
575-240	Trench B	A		015.298.2.2	BEH0002	Primary Flakes - Fragmentary	2	3.9
576-240	Trench B	A		015.299.2.2	BEH0002	Primary Flakes - Fragmentary	1	0.1
575-260	Trench D	A		015.300.2.1	BEH0002	Primary Flakes - Fragmentary	2	0.8
576-260	Trench E	A		015.301.2.2	BEH0002	Primary Flakes - Fragmentary	1	0.5
576-269	Trench E	A		015.302.2.3	BEH0002	Primary Flakes - Fragmentary	4	2.4
577-240	Trench B	A		015.303.2.2	BEH0002	Primary Flakes - Fragmentary	1	1.5
577-270	Trench E	A		015.304.2.2	BEH0002	Primary Flakes - Fragmentary	3	1.3
579-260	Trench D	A		015.306.2.2	BEH0002	Primary Flakes - Fragmentary	1	1.8
578-269	Trench E	A		015.307.2.1	BEH0002	Primary Flakes - Fragmentary	1	0.2
580-224	Trench A	A		015.311.2.2	BEH0002	Primary Flakes - Fragmentary	1	0.4
580-221	Trench A	A		015.312.2.1	BEH0002	Primary Flakes - Fragmentary	1	0.4
580-210	Trench A	A		015.315.2.2	BEH0002	Primary Flakes - Fragmentary	3	2
580-232	Trench A	A		015.320.2.2	BEH0002	Primary Flakes - Fragmentary	2	2.7
580-225	Trench A	A		015.322.2.1	BEH0002	Primary Flakes - Fragmentary	2	0.7
580-236	Trench A	A		015.323.2.2	BEH0002	Primary Flakes - Fragmentary	1	1
580-235	Trench A	A		015.326.2.2	BEH0002	Primary Flakes - Fragmentary	1	0.2

Table A.5 Biface Trimming Flakes

Unit	Trench	Level	Feature	Cat#	Articode	Description	#Pieces	Weight(g)
559-260	Trench C	C	F1	015.233.2.2	BEE0001	Biface Trimming Flakes - Whole	1	0.2
559-261	Trench C	C	F1	015.237.2.2	BEE0001	Biface Trimming Flakes - Whole	3	0.6
555-265	Trench F	C	F14	016.207.2.5	BEE0001	Biface Trimming Flakes - Whole	7	1.3
550-265	Trench F	C	F3	016.201.2.4	BEE0001	Biface Trimming Flakes - Whole	1	0.5
555-255	Trench F	C	F6	016.209.2.3	BEE0001	Biface Trimming Flakes - Whole	2	0.2
550-255	Trench F	C	F7	016.210.2.3	BEE0001	Biface Trimming Flakes - Whole	1	0.4
561-262	Trench C	A		015.229.2.4	BEE0001	Biface Trimming Flakes - Whole	2	0.4
555-265	Trench F	C		016.206.2.1	BEE0001	Biface Trimming Flakes - Whole	1	0.2
560-261	Trench C	A		015.220.2.3	BEE0001	Biface Trimming Flakes - Whole	1	0.2
571-269	Trench E	A		015.221.2.2	BEE0001	Biface Trimming Flakes - Whole	1	0.1
561-261	Trench C	A		015.222.2.3	BEE0001	Biface Trimming Flakes - Whole	1	0.2
560-261	Trench C	C		015.223.2.2	BEE0001	Biface Trimming Flakes - Whole	1	0.1

560-256	Trench C	A		015.224.2.5	BEE0001	Biface Trimming Flakes - Whole	1	0.1
560-266	Trench C	A		015.228.2.2	BEE0001	Biface Trimming Flakes - Whole	2	0.3
559-260	Trench C	A		015.232.2.2	BEE0001	Biface Trimming Flakes - Whole	1	0.1
559-262	Trench C	A		015.238.2.3	BEE0001	Biface Trimming Flakes - Whole	1	0.1
560-242	Trench C	A		015.240.2.3	BEE0001	Biface Trimming Flakes - Whole	1	0.1
560-243	Trench C	A		015.242.2.3	BEE0001	Biface Trimming Flakes - Whole	1	0.1
560-245	Trench C	A		015.243.2.2	BEE0001	Biface Trimming Flakes - Whole	1	0.1
560-248	Trench C	A		015.246.2.3	BEE0001	Biface Trimming Flakes - Whole	1	0.1
560-262	Trench C	A		015.252.2.2	BEE0001	Biface Trimming Flakes - Whole	1	0.1
561-240	Trench B	A		015.260.2.2	BEE0001	Biface Trimming Flakes - Whole	2	0.2
561-258	Trench C	A		015.261.2.4	BEE0001	Biface Trimming Flakes - Whole	1	0.1
561-260	Trench C	A		015.263.2.3	BEE0001	Biface Trimming Flakes - Whole	2	0.2
561-259	Trench C	C		015.266.2.3	BEE0001	Biface Trimming Flakes - Whole	1	0.1
561-264	Trench C	A		015.272.2.1	BEE0001	Biface Trimming Flakes - Whole	1	0.1
564-240	Trench B	A		015.275.2.3	BEE0001	Biface Trimming Flakes - Whole	1	0.2
564-260	Trench D	A		015.276.2.2	BEE0001	Biface Trimming Flakes - Whole	3	0.3
565-269	Trench E	A		015.279.2.1	BEE0001	Biface Trimming Flakes - Whole	1	0.1
567-240	Trench B	A		015.280.2.2	BEE0001	Biface Trimming Flakes - Whole	1	0.1
567-260	Trench D	A		015.285.2.3	BEE0001	Biface Trimming Flakes - Whole	1	0.1
573-260	Trench D	A		015.293.2.1	BEE0001	Biface Trimming Flakes - Whole	2	0.3
575-240	Trench B	A		015.298.2.3	BEE0001	Biface Trimming Flakes - Whole	1	0.1
576-269	Trench E	A		015.302.2.4	BEE0001	Biface Trimming Flakes - Whole	4	0.4
577-240	Trench B	A		015.303.2.3	BEE0001	Biface Trimming Flakes - Whole	1	0.1
577-270	Trench E	A		015.304.2.3	BEE0001	Biface Trimming Flakes - Whole	1	0.1
579-260	Trench D	A		015.306.2.3	BEE0001	Biface Trimming Flakes - Whole	1	0.4
580-234	Trench A	A		015.317.2.3	BEE0001	Biface Trimming Flakes - Whole	1	0.2
580-236	Trench A	A		015.323.2.3	BEE0001	Biface Trimming Flakes - Whole	2	0.2
580-235	Trench A	A		015.326.2.3	BEE0001	Biface Trimming Flakes - Whole	1	0.2
562-260	Trench D	A		015.271.2.1	BEE0001	Biface Trimming Flakes - Whole	2	0.6
559-263	Trench C	A	F1	015.236.2.3	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.1
559-261	Trench C	C	F1	015.237.2.3	BEE0002	Biface Trimming Flakes - Fragmentary	2	0.3
559-263	Trench C	C	F1	015.239.2.1	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.2
560-265	Trench C	A	F1	15.257.2.2	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.1
561-260	Trench C	C	F1	015.264.2.3	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.1
600-235	F1 Ditch	C	F13	016.215.2.1	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.3

555-265	Trench F	C	F14	016.207.2.6	BEE0002	Biface Trimming Flakes - Fragmentary	9	2.2
550-265	Trench F	C	F3	016.201.2.5	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.4
550-260	Trench F	C	F3	016.205.2.2	BEE0002	Biface Trimming Flakes - Fragmentary	6	1.7
555-255	Trench F	C	F6	016.209.2.4	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.1
550-255	Trench F	C	F9	016.204.2.1	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.1
555-265	Trench F	C		016.206.2.2	BEE0002	Biface Trimming Flakes - Fragmentary	2	0.3
560-261	Trench C	A		015.220.2.4	BEE0002	Biface Trimming Flakes - Fragmentary	2	0.2
561-261	Trench C	A		015.222.2.4	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.1
560-261	Trench C	C		015.223.2.3	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.2
560-256	Trench C	A		015.224.2.6	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.2
568-260	Trench D	A		015.227.2.3	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.2
560-266	Trench C	A		015.228.2.3	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.2
558-260	Trench C	A		015.231.2.2	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.1
559-261	Trench C	A		015.235.2.3	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.1
560-245	Trench C	A		015.243.2.3	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.3
560-244	Trench C	A		015.244.2.2	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.2
560-249	Trench C	A		015.247.2.1	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.1
560-251	Trench C	A		015.250.2.1	BEE0002	Biface Trimming Flakes - Fragmentary	2	0.2
560-262	Trench C	A		015.252.2.3	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.1
560-263	Trench C	A		015.256.2.3	BEE0002	Biface Trimming Flakes - Fragmentary	2	0.2
560-267	Trench C	A		015.258.2.3	BEE0002	Biface Trimming Flakes - Fragmentary	2	0.2
561-240	Trench B	A		015.260.2.3	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.1
561-258	Trench C	A		015.261.2.5	BEE0002	Biface Trimming Flakes - Fragmentary	2	0.3
561-260	Trench C	A		015.263.2.4	BEE0002	Biface Trimming Flakes - Fragmentary	2	0.3
561-259	Trench C	C		015.266.2.4	BEE0002	Biface Trimming Flakes - Fragmentary	2	0.1
561-263	Trench C	A		015.270.2.2	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.2
574-240	Trench B	A		015.269.2.2	BEE0002	Biface Trimming Flakes - Fragmentary	2	0.1
573-240	Trench B	A		015.292.2.2	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.1
575-240	Trench B	A		015.298.2.4	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.1
576-269	Trench E	A		015.302.2.5	BEE0002	Biface Trimming Flakes - Fragmentary	2	0.2
577-270	Trench E	A		015.304.2.4	BEE0002	Biface Trimming Flakes - Fragmentary	2	0.2
579-260	Trench D	A		015.306.2.4	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.1
580-234	Trench A	A		015.317.2.4	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.1
580-231	Trench A	A		015.321.2.1	BEE0002	Biface Trimming Flakes - Fragmentary	1	0.1
580-235	Trench A	A		015.326.2.4	BEE0002	Biface Trimming Flakes - Fragmentary	3	0.3

Table A.6: Chipping Waste (Shatter)

Unit	Trench	Level	Feature	Cat#	Articode	Description	#Pieces	Weight(g)
559-260	Trench C	C	F1	015.233.2.3	BFA0002	Chipping Waste - Shatter	1	0.3
559-261	Trench C	C	F1	015.237.2.4	BFA0002	Chipping Waste - Shatter	3	4.1
559-263	Trench C	C	F1	015.239.2.2	BFA0002	Chipping Waste - Shatter	1	0.9
561-260	Trench C	C	F1	015.264.2.4	BFA0002	Chipping Waste - Shatter	1	18.1
550-225/545-225	Trench F	C	F12	016.203.2.4	BFA0002	Chipping Waste - Shatter	1	3.6
555-265	Trench F	C	F14	016.207.2.7	BFA0002	Chipping Waste - Shatter	3	1
550-265	Trench F	C	F3	016.201.2.6	BFA0002	Chipping Waste - Shatter	7	13.6
550-255	Trench F	C	F9	016.204.2.2	BFA0002	Chipping Waste - Shatter	1	0.3
561-262	Trench C	A		015.229.2.5	BFA0002	Chipping Waste - Shatter	2	2.1
555-265	Trench F	C		016.206.2.3	BFA0002	Chipping Waste - Shatter	1	2.9
560-254	Trench C	A		015.217.2.3	BFA0002	Chipping Waste - Shatter	1	0.6
560-252	Trench C	A		015.219.2.2	BFA0002	Chipping Waste - Shatter	1	5.5
560-261	Trench C	A		015.220.2.5	BFA0002	Chipping Waste - Shatter	3	4.8
560-256	Trench C	A		015.224.2.7	BFA0002	Chipping Waste - Shatter	1	0.6
560-260	Trench C	C		015.225.2.1	BFA0002	Chipping Waste - Shatter	1	0.9
568-260	Trench D	A		015.227.2.4	BFA0002	Chipping Waste - Shatter	2	0.5
558-260	Trench C	A		015.231.2.3	BFA0002	Chipping Waste - Shatter	1	0.2
559-261	Trench C	A		015.235.2.4	BFA0002	Chipping Waste - Shatter	1	0.4
559-262	Trench C	A		015.238.2.4	BFA0002	Chipping Waste - Shatter	3	3.8
560-241	Trench C	A		015.241.2.1	BFA0002	Chipping Waste - Shatter	1	0.7
560-243	Trench C	A		015.242.2.4	BFA0002	Chipping Waste - Shatter	2	5.8
560-245	Trench C	A		015.243.2.4	BFA0002	Chipping Waste - Shatter	2	0.9
560-247	Trench C	A		015.245.2.1	BFA0002	Chipping Waste - Shatter	1	1.8
560-248	Trench C	A		015.246.2.4	BFA0002	Chipping Waste - Shatter	1	0.4
560-249	Trench C	A		015.247.2.2	BFA0002	Chipping Waste - Shatter	2	11
560-250	Trench C	A		015.248.2.2	BFA0002	Chipping Waste - Shatter	1	1.8
560-253	Trench C	A		015.249.2.1	BFA0002	Chipping Waste - Shatter	2	3.5
560-251	Trench C	A		015.250.2.2	BFA0002	Chipping Waste - Shatter	1	0.2
560-262	Trench C	A		015.252.2.4	BFA0002	Chipping Waste - Shatter	1	0.2
560-258	Trench C	A		015.254.2.3	BFA0002	Chipping Waste - Shatter	1	0.1
560-263	Trench C	A		015.256.2.4	BFA0002	Chipping Waste - Shatter	3	2.7
560-267	Trench C	A		015.258.2.4	BFA0002	Chipping Waste - Shatter	1	0.3
561-258	Trench C	A		015.261.2.6	BFA0002	Chipping Waste - Shatter	2	3.7
560-268	Trench C	A		015.262.2.3	BFA0002	Chipping Waste - Shatter	3	1.1
561-260	Trench C	A		015.263.2.5	BFA0002	Chipping Waste - Shatter	4	6.3
561-259	Trench C	A		015.265.2.3	BFA0002	Chipping Waste - Shatter	3	6.9
561-259	Trench C	C		015.266.2.5	BFA0002	Chipping Waste - Shatter	1	0.4
561-269	Trench E	A		015.267.2.2	BFA0002	Chipping Waste - Shatter	2	7.6
562-240	Trench B	A		015.269.2.3	BFA0002	Chipping Waste - Shatter	3	1.7
561-263	Trench C	A		015.270.2.3	BFA0002	Chipping Waste - Shatter	3	2

561-264	Trench C	A		015.272.2.2	BFA0002	Chipping Waste - Shatter	1	0.1
564-240	Trench B	A		015.275.2.4	BFA0002	Chipping Waste - Shatter	2	8.4
564-260	Trench D	A		015.276.2.3	BFA0002	Chipping Waste - Shatter	1	0.4
563-269	Trench E	A		015.277.2.4	BFA0002	Chipping Waste - Shatter	2	1.2
565-260	Trench D	A		015.278.2.3	BFA0002	Chipping Waste - Shatter	1	0.3
565-269	Trench E	A		015.279.2.2	BFA0002	Chipping Waste - Shatter	2	0.4
566-269	Trench E	A		015.281.2.1	BFA0002	Chipping Waste - Shatter	3	1.9
566-260	Trench D	A		015.282.2.3	BFA0002	Chipping Waste - Shatter	1	0.2
567-269	Trench E	A		015.283.2.2	BFA0002	Chipping Waste - Shatter	1	0.5
568-240	Trench B	A		015.284.2.3	BFA0002	Chipping Waste - Shatter	3	4.2
567-260	Trench D	A		015.285.2.4	BFA0002	Chipping Waste - Shatter	1	0.3
567-260	Trench D	A		015.286.2.2	BFA0002	Chipping Waste - Shatter	2	1.1
570-260	Trench D	A		015.288.2.3	BFA0002	Chipping Waste - Shatter	1	0.7
569-260	Trench D	A		015.289.2.3	BFA0002	Chipping Waste - Shatter	1	0.2
572-260	Trench D	A		015.290.2.2	BFA0002	Chipping Waste - Shatter	1	2.5
573-240	Trench B	A		015.292.2.3	BFA0002	Chipping Waste - Shatter	1	0.8
575-240	Trench B	A		015.298.2.5	BFA0002	Chipping Waste - Shatter	2	0.3
576-240	Trench B	A		015.299.2.3	BFA0002	Chipping Waste - Shatter	4	1.4
575-260	Trench D	A		015.300.2.2	BFA0002	Chipping Waste - Shatter	1	3.5
576-269	Trench E	A		015.302.2.6	BFA0002	Chipping Waste - Shatter	1	0.5
577-270	Trench E	A		015.304.2.5	BFA0002	Chipping Waste - Shatter	1	0.5
577-260	Trench D	A		015.305.2.2	BFA0002	Chipping Waste - Shatter	1	2.9
579-260	Trench D	A		015.306.2.5	BFA0002	Chipping Waste - Shatter	2	1
578-269	Trench E	A		015.307.2.2	BFA0002	Chipping Waste - Shatter	4	3
580-209	Trench A	A		015.308.2.1	BFA0002	Chipping Waste - Shatter	2	0.5
580-208	Trench A	A		015.309.2.1	BFA0002	Chipping Waste - Shatter	2	8
578-260	Trench E	A		015.310.2.2	BFA0002	Chipping Waste - Shatter	1	6.1
580-215	Trench A	A		015.314.2.1	BFA0002	Chipping Waste - Shatter	1	13.5
580-210	Trench A	A		015.315.2.3	BFA0002	Chipping Waste - Shatter	1	0.4
580-222	Trench A	A		015.316.2.1	BFA0002	Chipping Waste - Shatter	1	1.3
580-234	Trench A	A		015.317.2.5	BFA0002	Chipping Waste - Shatter	1	0.3
580-229	Trench A	A		015.318.2.2	BFA0002	Chipping Waste - Shatter	1	0.1
580-232	Trench A	A		015.320.2.3	BFA0002	Chipping Waste - Shatter	2	1.8
580-231	Trench A	A		015.321.2.2	BFA0002	Chipping Waste - Shatter	1	1.6
580-236	Trench A	A		015.323.2.4	BFA0002	Chipping Waste - Shatter	1	0.4
580-250	na (mag)	A		015.325.2.1	BFA0002	Chipping Waste - Shatter	3	10.5
560-260	Trench C	A		015.226.2.1	BFA0002	Chipping Waste - Shatter	2	12.2

Appendix B: Iler Earthworks Project Catalogue Taxonomy

Iler Earthworks Project Catalogue Taxonomy

LEVEL1	LEVEL1DESC	LEVEL2	LEVEL2DESC	LEVEL3	LEVEL3DESC	ARTICODE	DESCRIPTIO	
B	Chipped Stone	BA	Bifacial Tools	BAA	Projectile Point	BAA0001	Whole	CWM
B	Chipped Stone	BA	Bifacial Tools	BAA	Projectile Point	BAA0002	Tip	CWM
B	Chipped Stone	BA	Bifacial Tools	BAA	Projectile Point	BAA0004	Mid Section	CWM
B	Chipped Stone	BA	Bifacial Tools	BAA	Projectile Point	BAA0006	Tip+Mid Section	CWM
B	Chipped Stone	BA	Bifacial Tools	BAA	Projectile Point	BAA0008	Base	CWM
B	Chipped Stone	BA	Bifacial Tools	BAA	Projectile Point	BAA0012	Mid Section + Base	CWM
B	Chipped Stone	BA	Bifacial Tools	BAA	Projectile Point	BAA0016	Longitudinal Section	CWM
B	Chipped Stone	BA	Bifacial Tools	BAA	Projectile Point	BAA0022	Tip+LS+MS	CWM
B	Chipped Stone	BA	Bifacial Tools	BAB	Knife	BAB0001	Whole	CWM
B	Chipped Stone	BA	Bifacial Tools	BAB	Knife	BAB0002	Tip	CWM
B	Chipped Stone	BA	Bifacial Tools	BAB	Knife	BAB0004	Mid Section	CWM
B	Chipped Stone	BA	Bifacial Tools	BAB	Knife	BAB0008	Base	CWM
B	Chipped Stone	BA	Bifacial Tools	BAB	Knife	BAB0016	Longitudinal Section	CWM
B	Chipped Stone	BA	Bifacial Tools	BAZ	Bifacial Tool	BAZ0001	Whole	CWM
B	Chipped Stone	BA	Bifacial Tools	BAZ	Bifacial Tool	BAZ0002	Tip	CWM
B	Chipped Stone	BA	Bifacial Tools	BAZ	Bifacial Tool	BAZ0004	Mid Section	CWM
B	Chipped Stone	BA	Bifacial Tools	BAZ	Bifacial Tool	BAZ0008	Base	CWM
B	Chipped Stone	BA	Bifacial Tools	BAZ	Bifacial Tool	BAZ0016	Longitudinal Section	CWM
B	Chipped Stone	BB	General Chert Tools	BBA	Drill	BBA0001	Whole	CWM
B	Chipped Stone	BB	General Chert Tools	BBA	Drill	BBA0002	Tip	CWM
B	Chipped Stone	BB	General Chert Tools	BBA	Drill	BBA0004	Mid Section	CWM
B	Chipped Stone	BB	General Chert Tools	BBA	Drill	BBA0008	Base	CWM
B	Chipped Stone	BB	General Chert Tools	BBA	Drill	BBA0012	Mid Section + Base	CWM
B	Chipped Stone	BB	General Chert Tools	BBA	Drill	BBA0016	Longitudinal Section	CWM
B	Chipped Stone	BB	General Chert Tools	BBB	Scraper	BBB0001	Whole	CWM
B	Chipped Stone	BB	General Chert Tools	BBB	Scraper	BBB0002	Distal End	CWM
B	Chipped Stone	BB	General Chert Tools	BBB	Scraper	BBB0004	Mid Section	CWM
B	Chipped Stone	BB	General Chert Tools	BBB	Scraper	BBB0006	Distal End + Mid Section	CWM
B	Chipped Stone	BB	General Chert Tools	BBB	Scraper	BBB0008	Proximal End	CWM
B	Chipped Stone	BB	General Chert Tools	BBB	Scraper	BBB0016	Longitudinal Section	CWM
B	Chipped Stone	BB	General Chert Tools	BBC	Fish Hook	BBC0001	Whole	CWM
B	Chipped Stone	BB	General Chert Tools	BBC	Fish Hook	BBC0002	Fragmentary	CWM
B	Chipped Stone	BB	General Chert Tools	BBD	Spokeshave	BBD0001	Whole	CWM
B	Chipped Stone	BB	General Chert Tools	BBD	Spokeshave	BBD0002	Fragmentary	CWM
B	Chipped Stone	BB	General Chert Tools	BBE	Perforator	BBE0001	Whole	CWM
B	Chipped Stone	BB	General Chert Tools	BBE	Perforator	BBE0002	Fragmentary	CWM
B	Chipped Stone	BB	General Chert Tools	BBF	Graver	BBF0001	Whole	CWM
B	Chipped Stone	BB	General Chert Tools	BBF	Graver	BBF0002	Fragmentary	CWM
B	Chipped Stone	BB	General Chert Tools	BBG	Strike-a-Light	BBG0001	Whole	CWM
B	Chipped Stone	BB	General Chert Tools	BBG	Strike-a-Light	BBG0002	Fragmentary	CWM
B	Chipped Stone	BB	General Chert Tools	BBH	Burin	BBH0001	Whole	CWM
B	Chipped Stone	BB	General Chert Tools	BBH	Burin	BBH0002	Fragmentary	CWM
B	Chipped Stone	BB	General Chert Tools	BBZ	Miscellaneous	BBZ0001	Whole	CWM
B	Chipped Stone	BB	General Chert Tools	BBZ	Miscellaneous	BBZ0002	Fragmentary	CWM
B	Chipped Stone	BC	Unifacial Tools	BCA	Unifacial Point	BCA0001	Whole	CWM
B	Chipped Stone	BC	Unifacial Tools	BCA	Unifacial Point	BCA0002	Tip	CWM
B	Chipped Stone	BC	Unifacial Tools	BCA	Unifacial Point	BCA0004	Mid Section	CWM

Processing Legend: C=Count; W=Weigh; M=Mark; B=Bag; D=Discard

B	Chipped Stone	BC	Unifacial Tools	BCA	Unifacial Point	BCA0008	Base	CWM
B	Chipped Stone	BC	Unifacial Tools	BCA	Unifacial Point	BCA0016	Longitudinal Section	CWM
B	Chipped Stone	BC	Unifacial Tools	BCB	Unifacial Knife	BCB0001	Whole	CWM
B	Chipped Stone	BC	Unifacial Tools	BCB	Unifacial Knife	BCB0002	Tip	CWM
B	Chipped Stone	BC	Unifacial Tools	BCB	Unifacial Knife	BCB0004	Mid Section	CWM
B	Chipped Stone	BC	Unifacial Tools	BCB	Unifacial Knife	BCB0008	Base	CWM
B	Chipped Stone	BC	Unifacial Tools	BCB	Unifacial Knife	BCB0016	Longitudinal Section	CWM
B	Chipped Stone	BC	Unifacial Tools	BCZ	Unifacial Tool	BCZ0001	Whole	CWM
B	Chipped Stone	BC	Unifacial Tools	BCZ	Unifacial Tool	BCZ0002	Tip	CWM
B	Chipped Stone	BC	Unifacial Tools	BCZ	Unifacial Tool	BCZ0004	Mid Section	CWM
B	Chipped Stone	BC	Unifacial Tools	BCZ	Unifacial Tool	BCZ0008	Base	CWM
B	Chipped Stone	BC	Unifacial Tools	BCZ	Unifacial Tool	BCZ0016	Longitudinal Section	CWM
B	Chipped Stone	BD	"Informal" Tools	BDA	Utilized Flakes	BDA0001	Whole	CWB
B	Chipped Stone	BD	"Informal" Tools	BDA	Utilized Flakes	BDA0002	Fragmentary	CWB
B	Chipped Stone	BD	"Informal" Tools	BDB	Pieces Esquillees	BDB0001	Whole	CWB
B	Chipped Stone	BD	"Informal" Tools	BDB	Pieces Esquillees	BDB0002	Fragmentary	CWB
B	Chipped Stone	BD	"Informal" Tools	BDC	Retouched Flakes	BDC0001	Whole	CWM
B	Chipped Stone	BD	"Informal" Tools	BDC	Retouched Flakes	BDC0002	Fragmentary	CWM
B	Chipped Stone	BD	"Informal" Tools	BDD	Backed Blades	BDD0001	Whole	CWM
B	Chipped Stone	BD	"Informal" Tools	BDD	Backed Blades	BDD0002	Fragmentary	CWM
B	Chipped Stone	BE	Manufacturing	BE	Debitage	BE	Debitage	CWB
B	Chipped Stone	BE	Manufacturing	BEA	Chert Nodule	BEA0001	Whole	CWM
B	Chipped Stone	BE	Manufacturing	BEA	Chert Nodule	BEA0002	Fragmentary	CWM
B	Chipped Stone	BE	Manufacturing	BEB	Core	BEB0001	Intact	CWM
B	Chipped Stone	BE	Manufacturing	BEB	Core	BEB0002	Fragmentary	CWM
B	Chipped Stone	BE	Manufacturing	BEB	Core	BEB0004	Expended	CWM
B	Chipped Stone	BE	Manufacturing	BEC	Core Trimming Flakes	BEC0001	Whole	CWB
B	Chipped Stone	BE	Manufacturing	BEC	Core Trimming Flakes	BEC0002	Fragmentary	CWB
B	Chipped Stone	BE	Manufacturing	BED	Preform	BED0001	Whole	CWM
B	Chipped Stone	BE	Manufacturing	BED	Preform	BED0002	Fragmentary	CWM
B	Chipped Stone	BE	Manufacturing	BEE	Biface Trimming Flakes	BEE0001	Whole	CWB
B	Chipped Stone	BE	Manufacturing	BEE	Biface Trimming Flakes	BEE0002	Fragmentary	CWB
B	Chipped Stone	BE	Manufacturing	BEF	Miscellaneous Flakes	BEF0001	Whole	CWB
B	Chipped Stone	BE	Manufacturing	BEF	Miscellaneous Flakes	BEF0002	Fragmentary	CWB
B	Chipped Stone	BE	Manufacturing	BEG	Blades	BEG0001	Whole	CWB
B	Chipped Stone	BE	Manufacturing	BEG	Blades	BEG0002	Fragmentary	CWB
B	Chipped Stone	BE	Manufacturing	BEH	Primary Flakes	BEH0001	Whole	CWB
B	Chipped Stone	BE	Manufacturing	BEH	Primary Flakes	BEH0002	Fragmentary	CWB
B	Chipped Stone	BF	Waste	BFA	Chipping Waste	BFA0001	Chipping Detritus	CWB
B	Chipped Stone	BF	Waste	BFA	Chipping Waste	BFA0002	Shatter	CWB
B	Chipped Stone	BZ	Miscellaneous	BZA	Micro Burin	BZA0001	Whole	CWB
C	Ground Stone	CA	Celts	CAA	Stone Axe	CAA0001	Whole	CWM
C	Ground Stone	CA	Celts	CAA	Stone Axe	CAA0002	Fragmentary	CWM
C	Ground Stone	CA	Celts	CAB	Stone Adze	CAB0001	Whole	CWM
C	Ground Stone	CA	Celts	CAB	Stone Adze	CAB0002	Fragmentary	CWM
C	Ground Stone	CA	Celts	CAC	Stone Gouge	CAC0001	Whole	CWM
C	Ground Stone	CA	Celts	CAC	Stone Gouge	CAC0002	Fragmentary	CWM
C	Ground Stone	CA	Celts	CAD	Stone Wedge	CAD0001	Whole	CWM

Processing Legend: C=Count; W=Weigh; M=Mark; B=Bag; D=Discard

C	Ground Stone	CA	Celts	CAD	Stone Wedge	CAD0002	Fragmentary	CWM
C	Ground Stone	CA	Celts	CAE	Stone Pick	CAE0001	Whole	CWM
C	Ground Stone	CA	Celts	CAE	Stone Pick	CAE0002	Fragmentary	CWM
C	Ground Stone	CA	Celts	CAF	Chisel	CAF0001	Whole	CWM
C	Ground Stone	CA	Celts	CAF	Chisel	CAF0002	Fragmentary	CWM
C	Ground Stone	CA	Celts	CAG	Maul	CAG0001	Whole	CWM
C	Ground Stone	CA	Celts	CAG	Maul	CAG0002	Fragmentary	CWM
C	Ground Stone	CA	Celts	CAZ	Miscellaneous Celt	CAZ0001	Whole	CWM
C	Ground Stone	CA	Celts	CAZ	Miscellaneous Celt	CAZ0002	Fragmentary	CWM
C	Ground Stone	CB	Polished Objects	CBA	Gorget	CBA0001	Whole	CWM
C	Ground Stone	CB	Polished Objects	CBA	Gorget	CBA0002	Fragmentary	CWM
C	Ground Stone	CB	Polished Objects	CBB	Stone Pendant	CBB0001	Whole	CWM
C	Ground Stone	CB	Polished Objects	CBB	Stone Pendant	CBB0002	Fragmentary	CWM
C	Ground Stone	CB	Polished Objects	CBC	Stone Bead	CBC0001	Whole	CWM
C	Ground Stone	CB	Polished Objects	CBC	Stone Bead	CBC0002	Fragmentary	CWM
C	Ground Stone	CB	Polished Objects	CBD	Stone Disk	CBD0001	Whole	CWM
C	Ground Stone	CB	Polished Objects	CBD	Stone Disk	CBD0002	Fragmentary	CWM
C	Ground Stone	CB	Polished Objects	CBE	Stone Pipe	CBE0001	Whole	CWM
C	Ground Stone	CB	Polished Objects	CBE	Stone Pipe	CBE0002	Fragmentary	CWM
C	Ground Stone	CB	Polished Objects	CBF	Stone Knife	CBF0001	Whole	CWM
C	Ground Stone	CB	Polished Objects	CBF	Stone Knife	CBF0002	Fragmentary	CWM
C	Ground Stone	CB	Polished Objects	CBG	Bannerstone	CBG0001	Whole	CWM
C	Ground Stone	CB	Polished Objects	CBG	Bannerstone	CBG0002	Fragmentary	CWM
C	Ground Stone	CB	Polished Objects	CBH	Birdstone	CBH0001	Whole	CWM
C	Ground Stone	CB	Polished Objects	CBH	Birdstone	CBH0002	Fragmentary	CWM
C	Ground Stone	CB	Polished Objects	CBI	Boatstone	CBI0001	Whole	CWM
C	Ground Stone	CB	Polished Objects	CBI	Boatstone	CBI0002	Fragmentary	CWM
C	Ground Stone	CB	Polished Objects	CBJ	Bar Amulet	CBJ0001	Whole	CWM
C	Ground Stone	CB	Polished Objects	CBJ	Bar Amulet	CBJ0002	Fragmentary	CWM
C	Ground Stone	CB	Polished Objects	CBZ	Misc. Ground Stone	CBZ0001	Whole	CWM
C	Ground Stone	CB	Polished Objects	CBZ	Misc. Ground Stone	CBZ0002	Fragmentary	CWM
C	Ground Stone	CC	Manufacturing	CCA	Gr.Stone Preform	CCA0001	Whole	CWM
C	Ground Stone	CC	Manufacturing	CCA	Gr.Stone Preform	CCA0002	Fragmentary	CWM
C	Ground Stone	CC	Manufacturing	CCB	Waste	CCB0001	Non-Chert Chipping Detritus	CWB
C	Ground Stone	CC	Manufacturing	CCB	Waste	CCB0002	Non-Chert Shatter	CWB
D	Rough Stone	DA	Formal Tools	DAA	Hammerstone	DAA0001	Whole	CWM
D	Rough Stone	DA	Formal Tools	DAA	Hammerstone	DAA0002	Fragmentary	CWM
D	Rough Stone	DA	Formal Tools	DAB	Anvilstone	DAB0001	Whole	CWM
D	Rough Stone	DA	Formal Tools	DAB	Anvilstone	DAB0002	Fragmentary	CWM
D	Rough Stone	DA	Formal Tools	DAC	Hammer-Anvilstone	DAC0001	Whole	CWM
D	Rough Stone	DA	Formal Tools	DAC	Hammer-Anvilstone	DAC0002	Fragmentary	CWM
D	Rough Stone	DA	Formal Tools	DAD	Mano	DAD0001	Whole	CWM
D	Rough Stone	DA	Formal Tools	DAD	Mano	DAD0002	Fragmentary	CWM
D	Rough Stone	DA	Formal Tools	DAE	Metate	DAE0001	Whole	CWM
D	Rough Stone	DA	Formal Tools	DAE	Metate	DAE0002	Fragmentary	CWM
D	Rough Stone	DA	Formal Tools	DAF	Net Sinker	DAF0001	Whole	CWM
D	Rough Stone	DA	Formal Tools	DAF	Net Sinker	DAF0002	Fragmentary	CWM
D	Rough Stone	DA	Formal Tools	DAG	Mortar	DAG0001	Whole	CWM

Processing Legend: C=Count; W=Weigh; M=Mark; B=Bag; D=Discard

D	Rough Stone	DA	Formal Tools	DAG	Mortar	DAG0002	Fragmentary	CWM
D	Rough Stone	DA	Formal Tools	DAH	Pestle	DAH0001	Whole	CWM
D	Rough Stone	DA	Formal Tools	DAH	Pestle	DAH0002	Fragmentary	CWM
D	Rough Stone	DA	Formal Tools	DAI	Whetstone	DAI0001	Whole	CWM
D	Rough Stone	DA	Formal Tools	DAI	Whetstone	DAI0002	Fragmentary	CWM
D	Rough Stone	DA	Other	DAZ	Misc. Rough Stone	DAZ0001	Whole	CWM
D	Rough Stone	DA	Other	DAZ	Misc. Rough Stone	DAZ0002	Fragmentary	CWM
D	Rough Stone	DB	Informal Tools	DBA	Abrader	DBA0001	Whole	CWM
D	Rough Stone	DB	Informal Tools	DBA	Abrader	DBA0002	Fragmentary	CWM
D	Rough Stone	DB	Informal Tools	DBB	Rubbing Stone	DBB0001	Whole	CWM
D	Rough Stone	DB	Informal Tools	DBB	Rubbing Stone	DBB0002	Fragmentary	CWM
D	Rough Stone	DB	Informal Tools	DBC	Pieces of Red Ochre	DBC0001	Whole	CWB
D	Rough Stone	DB	Informal Tools	DBC	Pieces of Red Ochre	DBC0002	Fragmentary	CWB
D	Rough Stone	DB	Informal Tools	DBD	Pieces of Other Mineral	DBD0001	Whole	CWB
D	Rough Stone	DB	Informal Tools	DBD	Pieces of Other Mineral	DBD0002	Fragmentary	CWB
D	Rough Stone	DB	Informal Tools	DBZ	Misc. Informal Tools	DBZ0001	Complete	CWB
D	Rough Stone	DB	Informal Tools	DBZ	Misc. Informal Tools	DBZ0002	Fragmentary	CWB
D	Rough Stone	DC	Other	DCA	Fire Cracked Rock	DCA0001	Cobble	CWD

Processing Legend: C=Count; W=Weigh; M=Mark; B=Bag; D=Discard