

Naples' Refuge Duality: Volcanic Evacuation and Aid Through Superstition and Pragmatics

by

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Dalhousie University is located in Mi'kmaq'i,
the ancestral and unceded territory of the Mi'kmaq.
We are all Treaty people.

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Abstract

Naples, the third largest city in Italy is known for its rich history, its interplay with volcanic activity, and its sense of superstition. Built on Neopolitan yellow tuff pyroclastic rock, the region's geology has fostered unique qualities for the area, from fertile soil to historical storytelling. The region is known for the tourist attraction of Pompeii, a Roman town destroyed in 79AD by a volcanic eruption, framed more as an archeological wonder than a cautionary tale. The pervasive sense of superstition among Neopolitans creates a nature-culture divergency that obscures the residents' views on volcanic risk. Through three architectural interventions, this thesis redirects attention to the geological cultures and ecologies of the region's past, present and future by creating spaces designed for education, cultural celebration and evacuation. This thesis investigates how architecture can catalyze cultural reorientations against the challenges of our planet's collapsing ecologies.

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Chapter 1: Introduction

De-Constructing Naples Volcanic Identity

Naples is situated between Mount Vesuvius, the Campi Flegrei super volcano, and volcanic activity within the bay. The metropolis is vulnerable to its surrounding volcanic activity and earthquakes and has an increased risk of flooding from rising sea levels (Alberico, Petrosino and Lirer 2011, 1057). Currently, Naples does not have a place of refuge for its three million residents, and an evacuation plan has yet to be implemented. When a volcanic eruption occurs, Naples will require a place for residents to seek refuge or a safe place for a mass evacuation. A place of refuge between these volcanic hot spots is essential in providing quick access for evacuation and aid.

Naples's leading source of protection comes from widespread belief in different matters of superstition and religious rituals. It continues to be a defining way of maintaining an impression of security for Naples residents. Amongst the beliefs, the cornicello charms, often worn as a charm on the body, in the home or vehicle as a form of protection from bad omens and the annual San Gennaro blood liquefaction ceremony held at The Cathedral of Naples all ensure good luck and protection to the residents of Naples (Jallon and Napolitano 2021, 79). Furthermore, volcanic activity has become a source of tourism in Naples; the volcanic disaster of Pompeii, which covered the entire Roman city and other adjacent communities in approximately six meters of ash and pumice in 79 A.D, has been celebrated for its archeological achievement rather than as a place of education to prevent a future disaster of a greater magnitude. This thesis investigates the possibility of creating a place of



Figure 1: Naples high density housing in relation to Mt. Vesuvius (Oversnap 2018)

refuge in Naples that will protect its people, their culture and history through education, amplification of cultural work and evacuation. The architectural integrations of this thesis aims to turn the attention of the public to the ground through the ecological, cultural and economic significance of Naples' geology.

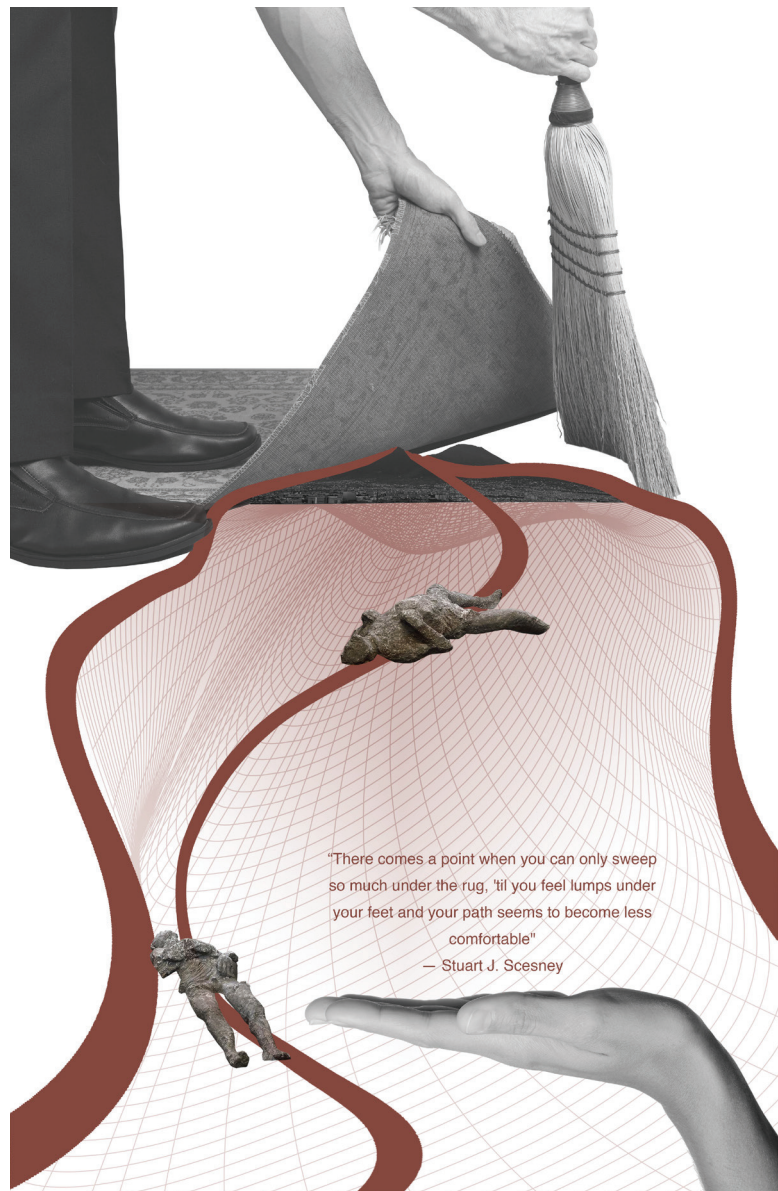


Figure 2: Translation of the cultural mindset of Naples Residents



Figure 3: Superstitious horned hands symbolism



Figure 4: Cornicello (Italian Horn)



Figure 5: The blood of San Gennaro

The Value of Superstition

Southern Italy's cultural connection to superstitious beliefs has been prevalent for thousands of years, and residents of Naples still believe in and implement various superstitions in their daily lives. In exploring the duality between the region's superstitious symbols and annual religious rituals against their surrounding volcanism, these cultural beliefs help in understanding the residents of Naples and their connection to their land (Jallon and Napolitano 2021, 78).

Good omens for Italians often refer to pouring wine and touching iron to drive away evil premonitions and ensure foreboding joy and prosperity. In cases of evil and danger, Italians often switch their rings from their left hand to their right as a symbolic way of touching iron when they do not have access to iron directly. Evil or danger might be perceived when the topic of death is discussed or when people possess the 'evil eye.' The 'evil eye' refers to that person seeing someone else with sinful intentions or jealousy that could potentially cause harm (Marrocco 2011). While spilling wine is a good omen, spilling oil is believed to cause misfortune (Rini 1929, 85).

In the southern regions of Italy, Italians also believe in the importance of thresholds, and entering a space incorrectly can directly affect the luck of an individual. Upon approaching a building and passing into its entrance to ensure good omens in a space, it is believed that an individual must enter the threshold with its right foot; failing to do so is considered to be an evil omen that could create a significant risk of misfortune for that individual (Rini 1929, 86). This thesis reinterprets cultural beliefs, symbols, and superstitious practices (such as the 'correct' way of passing

through thresholds or touching iron) to inform the project's design strategies. Superstitions are used as a design tool where through materiality and spatial design, one can create more culturally relevant places of communication, education and evacuation for Naples residents. This design method will provide a space that welcomes Neapolitans' cultural beliefs while establishing places that includes and softens the conversation regarding potential volcanic eruptions in the region.

A Volcanic Monument

Mount Vesuvius has become a cultural landmark for Naples and continues to be praised by residents as a monument to the city. The historic volcano known for its volcanic eruption in 79 A.D that destroyed the Ancient Roman town of Pompeii has become a pivotal part of Naples tourism for decades. The ruins, discovered in 1599 by architect Domenico Fontana, have become one of the most significant archeological achievements in history (Rowland 2014, 1). Despite many attempts at educating the residents on their volcanic history and the existing risks of living in such proximity to Mount Vesuvius and the Campi Flegrei region, residents continue to view Mount Vesuvius primarily as an object of regional pride, a towering geological landmark and a source of tourist revenue for the region.

Communities situated directly on the Campi Flegrei supervolcano have the luxury of rich crops. The croplands in the region come from tephra rock deposits from previous eruptions that have weathered into soils, allowing for the breakdown of various minerals (iron, magnesium and potassium) to be introduced into the soil composition naturally (Bosher and Chmutina 2017, 160). Residents in

this region experience sinkholes, ground uplift and high sulphur levels, which cause an increase in health risks and threatens existing architecture that have not been reinforced to accommodate sudden geological shifts (Heiken 2013, 31). Even with these dangers, residents believe the benefits outweigh the risks. The cultural norm of stifling the resounding issue of volcanic eruptions has been a societal norm to ensure people's composure through life. However, there's a pressing need to introduce education that fosters a dual understanding of both cultural heritage and ecological dynamics, particularly for the locals who rely on and thrive in the volcanic landscape.



Figure 6: Collage exploring the cultural duality of Naples and its volcanic landscape

Chapter 2: Superstition and Physical Measures

Cultural Duality



Figure 7: Portrait of Pulcinella

The foundation of duality plays a vital role in understanding the amplified relationship between culture and nature in southern Italy (Jallon and Napolitano 2021, 59). Citizens of Naples and surrounding Campania rely heavily on their relationship to the volcanic landscape to provide them with rich agricultural goods that have become pivotal ingredients in cultural staples in the region. Grapes for variations of wines, deviations of tomatoes, peppers, eggplants, fresh herbs and lemon trees all capitalize on the rich volcanic soil of Campania and all contribute to classic cultural dishes and drinks for the citizens of Naples (limoncello, neapolitan pizza, ragù, to name a few) (Rogers 2022). This thesis looks to understand and appreciate the complexity of the duality between the cultural significance and appreciation of the land. It also addresses the many geological risks the land provides to the locals who choose to live directly on the volcanic landscapes and adjacent to it. While Naples provides a unique perspective on the duality between the nature and culture, it is crucial to understand that, unlike many western cultures, Naples does not fully perceive its relationship to its landscape through what philosopher and anthropologist Bruno Latour calls the nature-culture dichotomist lens (Latour 1993, 7). Historically, Naples has possessed numerous cultural beliefs and traditions in relation to its precarious topography, which signifies that Neapolitans were and still are profoundly culturally bonded to their natural environment. Paradoxically, there is exceptionally little cognition of the palpable risks

associated. However, the region's citizens need to heighten their attention to the surrounding geological risk rather than continuing to ignore it and lessen their anxieties by relying solely on superstition and religious rituals, hindering their ability to effectively address the surrounding ecological phenomena they are exposed to. Latour stresses the concept of interconnectedness and hybridity of nature and culture by considering new technologies, materialities and chains of practices. This approach provides a framework for how this thesis's architectural integration can connect culture and nature rather than dichotomize the two (Latour 1993, 11-12).

Cultural dualism between Naples culture and nature is referenced into the city's architecture, providing an explanation for the strengthened relationship locals have between their metropolis and the landscape. The duality exemplifies itself in the hidden devices; public gardens and parks, cloisters, communal public stairs and landings all amplify the city center in virtually every era, constructing heightened public spaces (Jallon and Napolitano 2021, 56). These architectural integrations reflecting the city's topographical changes provide unique moments and viewpoints that provide clear views towards Vesuvius and the mountainous hills of Campania, providing a constant reminder of the surrounding volcanic topography. By embracing the region's natural and cultural characteristics, this thesis envisions additional strategic viewpoints, an education center, and an evacuation pier in the Villa Comunale di Napoli to exemplify attributes from the prosperous existing metropolitan areas while furthermore paying homage to the superstitious beliefs to augment the connection of Naples's citizens to their volcanic landscape.



Figure 8: Portrait of Hercules

Greek Volcanic Mythology

The stories and myths concerning Naples's volcanic activity can be traced back to Greek mythology. During Virgil's poetic documentation of the Campi Flegrei region during the first century BCE, he acknowledged the volcanic region's connection towards a burial place within the underworld related to a Greek god mythological war. Greek colonists of Naples believed the Campi Flegrei region was the location of the tomb of some giants that were defeated by Hercules on behalf of Zeus (Italia.It 2023). The legend emphasizes that the war occurred due to the giant's plan to usurp the king of the gods. Zeus assigned Hercules to punish the Giants for their recklessness. Campi Flegrei derives from this legend, defining the word *Flego* to mean "I burn" in Greek (Italia. It 2023). This myth provides a vivid depiction of volcanism during that period. It signifies the long-standing cultural fantasy around the supervolcano, retold through stories about war and destruction. The story brings a parallel of the destructive magnitude of war and the destructive power of the volcanic landscape.

Naples Landscape Allegories

Southern Italy's sense of superstition and storytelling has been ingrained into the Neapolitan's cultural identity for centuries. Complex legends and magical beliefs have been told over many generations, some stories directly correlating to volcanic landmarks, allowing for a spiritual connection to the volcanic landscapes through storytelling. Beyond belief in religion and sacrilegious rituals, there is a cultural significance to an irrational belief in magic that is still prevalent today. Italian vernacular magic exists as neither a religion nor a formal method of practice; rather, it thrives

as an intricate social fabric woven into the lives of Italians across generations. For most Italians, the cultural embrace of witchcraft beliefs has profoundly shaped behaviors, fostering symbolic systems of protection and storytelling, as noted by Magliocco (2007).



Figure 9: Portrait of Virgil

Virgil (70-19 BC), was a Roman poet who was known for his ties to sorcery and, historically for placing magical eggs into the foundations supporting the fortifications of the city, earning him the reputation as a protector of Neopolis (now Napoli). His poetry illustrates a deep-rooted connection to the Campi Flegrei landscape and the underworld (Jallon and Napolitano 2021, 79). The underworld references the tectonic activity below the Neapolitan tuff where Naples is situated. Virgil's visit to the Campi Flegrei region sets the scene through his depiction of poetic storytelling, allowing us to envision the topographically unique site as the ancient underworld. His accurate depiction of the Campi Flegrei landscape provides a sense of realism that can still be sensed when visiting the region (Smiley 1948, 99). Virgil's depiction of his time in the Campi Flegrei documents the massive craters and deadly vapours emitting from the volcanic exhalation of the region, deeming in his words the Lago d'Averno crater to be the gate of Hell (Smiley 1948, 100). The relationality between storytelling and landscape shows respect towards the volcanism surrounding the area while providing a story that can capture the attention of residents over many generations (Jallon and Napolitano 2021, 79).



Figure 10: Portrait of San Gennaro

Religious Ritual

The notion of religious ritual as a form of protection from the natural environment is a pivotal historical attribute in the region, and residents in Naples continue to partake in annual rituals to ensure their safety from potential volcanic disasters (Jallon and Napolitano 2021, 78). The Roman Catholic tradition of San Gennaro's blood liquefaction ceremony on Saint Feasts Day dates back over 240 years. Gennaro (third century) was a local Christian bishop in Naples and was known for miraculously surviving completely unscathed when anti-Christian Emperor Diocletian tortured Gennaro by throwing him into an active furnace (Rowland 2014, 25). Shortly following this miracle, like many other Christians during the Roman empire, he was forced to partake in Roman gladiatorial combat, where he involuntary had to be subject to animals and man-to-man combat. Throughout this period of battle, he remained once again unscathed; however, at last, his miracles ran out, and he was beheaded. During the time Gennaro was beheaded, a brave bishop was successful in catching a small portion of Gennaro's blood (Rowland 2014, 26). Gennaro continues to be celebrated for his miracles, and the small amount of blood is still blessed and worshiped to protect the citizens of Naples. The relic holding San Gennaro's blood is displayed at Naples Cathedral annually for visitors to admire. Residents of the southern Italian capital have regarded it as a form of awareness of the surrounding volcanic hazards and protection from war, famine and disease. They view the liquified blood as a miracle that will provide them with a year of safety for their city (Heiken 2013, 23). The ritual occurs three times a year: the first Saturday in May, the 19th of September (Saint Feast Day) and the 16th of December (the

day of Vesuvius's eruption in 1631). The ceremony consists of a solemn procession of the bust of San Gennaro and the religious relic of San Gennaro's blood from the Cathedral of Naples to the Basilica of Santa Chiara in Piazza del Gesù. While there are multiple ceremonies throughout the year, the liquefaction is an auspicious sign for the whole year and only occurs on Saint Feast's Day (Perrotta n.d.). In 2020, the blood failed to liquify on Saint Feast Day, signalling a bad omen, which also coincided with the global pandemic (Wanted in Rome 2023b).

Building on Unpredictable Grounds

Naples's geology is situated in multiple volcanic regions, allowing for an increased risk of earthquakes and sinkholes due to the volcanic activity shallow in the earth's crust. These three volcanic regions are Mt. Vesuvius, Campi Flegrei and the Bay of Naples (see figure 11) (Alberico, Petrosino and Lirer 2011, 1057). Earthquakes, sinkholes and ground uplift have all been consistent natural factors in the Naples region and continue to be an ongoing problem regardless of a volcanic eruption on the horizon. The Neapolitan pyroclastic tuff on which the city is situated is very porous, and due to tectonic shifting from volcanic activity under the earth's surface, Naples experiences these natural factors quite frequently (Heiken 2013, 29). In addition to these natural processes, there is an increased risk of flooding due to climate change. Flood events are relatively frequent due to the city's geomorphological onset, surrounded by pyroclastic uplifted hills (Alberico, Petrosino and Lirer 2011, 1057). The pyroclastic sediment is soft, and water can easily flow down these hills towards the sea, flooding the densely populated region. With rising sea levels becoming an ongoing issue due to climate change (see appendix A), there is another risk

of flooding from the hillside and the waterfront. It is critical to consider an architectural integration that is resilient to volcanic activity, resist ground instability, earthquakes, and flooding.

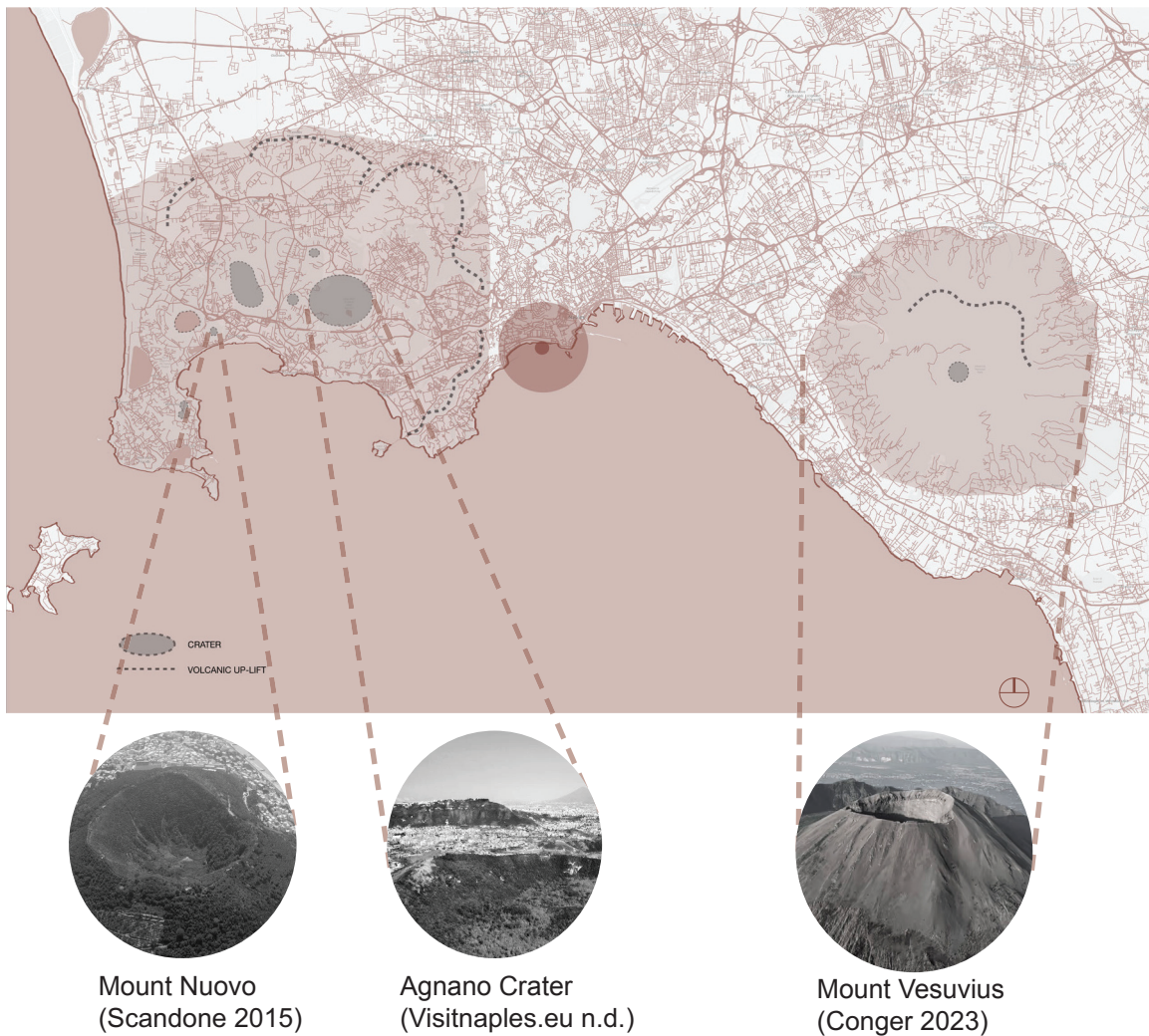
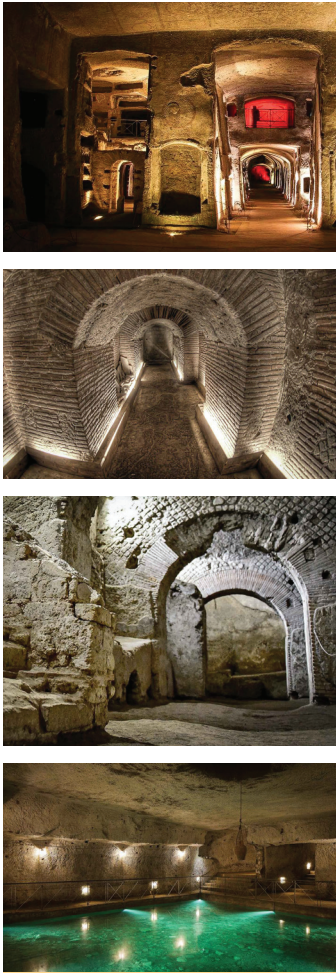


Figure 11: Volcanic regions surrounding Naples
(Map Source: ArcGIS 2023)

Naples Underground

In the last decades of the first century B.C., Romans designed and constructed an aqueduct underground in Naples that branched out towards Pompeii and other small Roman villages. The creation of the underground aqueduct was an extension of the previous Greek infrastructure (Ferrari, Lamagna and Rognoni 2019, 94). The aqueduct was built underground due to the lack of freshwater lakes in the region. The Campi Flegrei and volcanic land provided thermal salt springs, but freshwater was essential and vital for the growing population in the area. The 105 kilometer Roman aqueduct was the longest aqueduct of that time and the only one designed to service several cities. Due to the long periods of topographic raising and lowering of the land due to variations of magmatic chambers in the Campi Flegrei, structural collapse of portions of the aqueduct was inevitable (Ferrari, Lamagna and Rognoni 2019, 94-95). As a result of the constant changes from the magmatic chambers and seismic shifting from the surrounding volcanic activity, the underground is unsafe and risky to human life due to its unexpected behaviour. While portions of the aqueduct have been reinforced and used as a source of revenue from tourism, the central tunnel system remains vulnerable to further collapse. These cavities and aqueduct branches underground undermines the structural integrity of buildings due to the interaction of the flowing water and materials that constitute the aqueduct cavity (Cennamo, Maurizio and Concetta 2017, 190). Sinkholes and ground collapse resulting from surface instability frequently causes buildings to gradual deteriorate and the eventual collapse of buildings above. However, building assembly is also often to blame due to structural deficiencies, increasing the risk of ground



Figures 12-15: Views of Naples underground (LeisureItaly 2018)

surface failure due to poor building construction (Cennamo, Maurizio and Concetta 2017, 198-99). From these lessons of underground construction and structure failure, it is critical to avoid building above the historical aqueduct.

Earthquake Resistance

In Italy, most buildings have been deemed flawed in seismic capacity, causing a heightened risk of collapse in the circumstance of a large-magnitude earthquake (Manfredi and Masi 2018, 1). In the 1980s, Italy saw an increase in residential housing due to demand and affordability; however, almost 80% of these homes built across the country, including Naples (primarily in the Campi Flegrei region), have been deemed structurally unfit to seismic risk. A few of these projects now require retrofit adjustments to aid in their structural deficiencies. The majority still remain at risk of collapse in the event of a high-magnitude earthquake. (Manfredi and Masi 2018, 1). My proposed resilient architecture accommodates high risk seismic performances at the building's foundations.

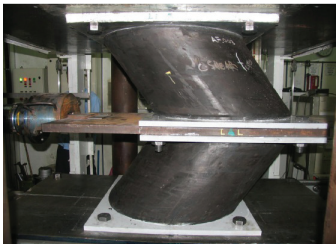


Figure 16: Base Isolation testing
(TechStar n.d.)

Base isolation systems perform as an approach to seismic protection that involves isolating the structure (superstructure) from the base (foundation), significantly reducing energy transfer from earthquake tremors (Seismic Resilience n.d.). The base isolation design allows for designed bearings between the foundation slab and the superstructure, removing the rigid and inflexible horizontal connection to the ground. In the case of a seismic event, horizontal ground acceleration of the seismic activity will be reduced as it is transferred through the vertical bearings, preventing damage to the building structure. The base isolation comprises flexible rubber pads, allowing quick

lateral force resistance and helping to protect the structure above the isolation plane of the building (Seismic Resilience n.d.). Base isolation foundations are ideal for low-middle-rise projects and can easily be retrofitted for existing buildings. This thesis proposes an architectural intervention including base isolation systems at the foundation. Since the building material could be conventional masonry reinforced with steel, these details could become a model for best practices for Naples's retrofit building construction against seismic events.

Japanese Volcanic Architecture

Due to extensive earthquakes and the Neopolitan pyroclastic yellow tuffs porosity, Naples's landscape does not allow for safe underground places of refuge. Lessons from Naples's comprehensive history of underground excavation for Roman aqueducts and its heightened risk of collapse due to earthquakes have proven that the architectural integration for this place of refuge and education must be resilient above the earth's surface (Cennamo, Maurizio and Concetta 2017, 190). To achieve this, a sloped roof with a structural building assembly that can accommodate the weight of pyroclastic remnants are implemented in this thesis's design strategy.

Over the last decade, Japanese architects and engineers have honed resilient architectural strategies that can withstand volcanic activity through the structural enhancement of steel-sloped roofing and concrete building assembly. A recent exploration in Japan following the 2018 Mt. Kusatsu-Shirane eruption highlighted the need to strengthen buildings to ensure that any evacuation facilities in high-risk areas could withstand volcanic debris. The case study documented how the existing wood assembly roofs



Figure 17-18: Engineered volcanic roofs on refuge facilities (Yamada et al. 2020)



Figure 19-20: Volcanic soil cement bricks (Frearson 2023)

typical to the Japanese region could not withstand the weight of pyroclastic debris. Researchers added unprocessed steel plates to the roof's exterior layer to strengthen them. Following extensive testing of impact test data and weight absorption, the unprocessed steel proved to be excellent at absorbing energy from impacts due to its high flexibility and exceptional corrosion resistance (Yamada et al. 2020, 1). This type of roof assembly has successfully been introduced to community mountain huts as a places of refuge for hikers exploring more high-risk volcanic regions in Japan. In addition to steel roofing assemblies, reinforced concrete has been the primary building material that ensures the highest level of strength for volcanic disasters (Yamada et al. 2020, 2). This thesis will introduce steel plates to its roofing assembly, influenced by the roofing analysis of these Japanese researchers, as referenced in this case study.

A housing project in Tokyo in 2013 by Aray Architects incorporated volcanic soil into their concrete, creating a unique way of introducing volcanism into their building materiality (Frearson 2023). The concrete creates a natural cooling of the building through passive house principles and aids in natural fireproofing, humidity conditioning, and thermal storage throughout the home (Frearson 2023). This example provides a strategy for designing masonry bricks with volcanism and its rich soils that are heavily celebrated by Naples residents rather than simply constructing an architecture to be resilient from volcanism.

Chapter 3: Ruin and Landscape

Disaster as Tourism



Figure 21: Hiking
to Vesuvius crater

(NaplesPompeii n.d.)

Naples capitalizes on its landscape to offer tourists a remarkable experience of the city's volcanic surroundings. While Roman ruin towns destroyed by volcanic eruption continue to be a prevalent source of revenue for the city, there has been expanding tourism for the volcanic activity itself. Tourists have the chance to encounter Mount Vesuvius right up to the stratovolcano's crater edge. The hike up the 1281-meter-high volcano provides the opportunity to maximize the volcanic experience (NaplesPompeii n.d.). Since 1995, Vesuvius has become a national park, and visitors can experience walking entirely around the mouth of the crater while potentially seeing smoke coming from the volcanic cavity in close proximity to the crater's edge (NaplesPompeii n.d.). Naples continues to heavily mystify its past history of volcanic disasters and instead introduces more dangerous tourist attractions directly correlated to active volcanic activity. Instead of educating tourists and locals about the dangers of volcanic activity to comprehend past catastrophic volcanic events, the city and its major attractions romanticize the volcanic experience.

Pompeii

The 79 A.D. volcanic eruption of Mount Vesuvius buried the ancient Roman town of Pompeii in volcanic ash, instituting one of the most well-preserved Roman ruins in history. The eruption happened so quickly that the residents of Pompeii had no time to escape, and the majority of those who perished suffocated in their homes and beds or in the main gathering squares of the city. From a model analysis of the eruption, results estimate that Vesuvius's gases, ash, and volcanic particles would have engulfed the city for between 10 and 20 minutes (Tondo 2021). The ruins of Pompeii are some of the most famous ruins in the world, and millions visit the sites annually to take in the 44-hectare archeological excavation (Rowland 2014, 1). The ruins of Pompeii were first discovered near the end of the 16th century by the architect Domenico Fontana, though excavation did not begin until 1738 (Jashemski 2023). Pompeii and Herculaneum's current primary education and attraction are associated with archaeological achievements rather than as a place of education on the volcanic eruptions. Each site lacks a history of past measures for Roman residents' safety and evacuation. Currently, Pompeii allows for educational visits to the ruins for schools to explore the ancient town. These educational visits consist of exploring the ruins and seeing the archaeological findings on the site (Pompeii n.d.). The education celebrates the archeological achievement of uncovering a Roman city frozen in time, a well-preserved archive of the past, rather than as a place of education to help imagine the scale, speed, and power of the magnitude of the geological event if it were to occur again. This thesis thus argues that such a compelling story of a catastrophic event has yet to better inform Napolitans' attitudes towards

their surrounding volcanic landscape. The education program of my architectural integration must establish a relationship between the past volcanic eruptions, ruins, and strategies of prevention to ensure that it will capture residents' and tourists' interest.



Figure 22: Collage exploring duality between ruin and tourism.



Figure 23: Tours of active sulfur vents (Ischia Guided Tour 2023)

Active Volcano Tours

With the growing attention paid to hiking along Mount Vesuvius's crater to catch a glimpse of volcanic activity, there has also been an increased interest in the Campi Flegrei region. The supervolcano, composed of 38 volcanos, provides tourists with a different experience of Naples's volcanic activity (Campi Flegrei Active 2023). The Campi Flegrei promotes "nature" tours, allowing tourists to bike or walk Monte Nuovo, the youngest volcano in Europe, to see and experience the volcanic ground uplift and views of the massive surrounding supervolcano (Campi Flegrei Active 2023). Private tours to the Campi Flegrei Volcanic fields provide excursions that allow tourists to experience craters, volcanic lakes, caves, hot gas, fumaroles, and earthquakes in the area (Ischia Guided Tour 2023). The Campi Flegrei region provides tours of the active sulphur fields and lets people experience a close relationship to the active volcanism. Allowing people to explore active volcanic sites comes with risk. In 2017, a family of three were killed after toxic chemical contamination of the sulphur caused them to fall into a crater (Giuffrida 2017). It is clear that volcanic activity is quite mesmerizing and captivating; nonetheless, volcanism is extremely dangerous and unpredictable, and to help diminish the potential risk, a site for education would be critical in challenging this dangerous fixation.



Figure 24: Agnano crater
(Visitnaples.eu n.d.)



Figure 25: Active sulfur
vents (Ischia Guided Tour
2023)

Campi Flegrei

The Campi Flegrei supervolcano (see figure 26) comprises 38 volcanos, smouldering fumaroles, ground uplift and sinkholes, and overlapping craters. It is estimated that over the past 12,000 years, the supervolcano has erupted sixty-five times (Jallon and Napolitano 2021, 29-30). Currently, half a million residents of Naples live in the Campi Flegrei region, and there has yet to be an evacuation plan specifically for this high-risk area in the event of a volcanic eruption. The communities living in the Campi Flegrei are at a heightened risk due to the volcanic activity being directly underneath them. Consequently regional authorities must devise an evacuation plan to benefit these communities and increase evacuation efficiency. In the event of another eruption, the supervolcano will destroy the city of Naples due to its proximity and the north-eastern wind flow blowing ash and debris directly towards the city (Alberico, Petrosino and Lirer 2011, 1058). Since the region is along the coast, which limits the relocation by land routes, the proposed evacuation infrastructure that this thesis suggests will support the Campi Flegrei communities with a quick and efficient evacuation from the supervolcano region.

Agriculture vs. Risk of Life

While the area is unique for its geological terrain, it is also rich in history and home to Italy's oldest Greek settlement. The Campi Flegrei region has some of the most fertile crops in the Campania region. The rich soils have developed on the previous lava flows or from accumulations of air-borne volcanic sediment. The easily worked soils in relation to the region's mild climate allow for an excellent agricultural resource superior to those of other areas of Italy (Unger

1953, 508). The dirt and temperature allow crops to excel throughout the year, causing multiple harvesting months for farmers depending on the specific crop type. Yields varying from fruits, vegetables, herbs, and vineyards paint the volcanic hillsides (Rogers 2022). Due to the region's rich soils, communities build homes and harvest crops up to the crater line.

Caldera Formation

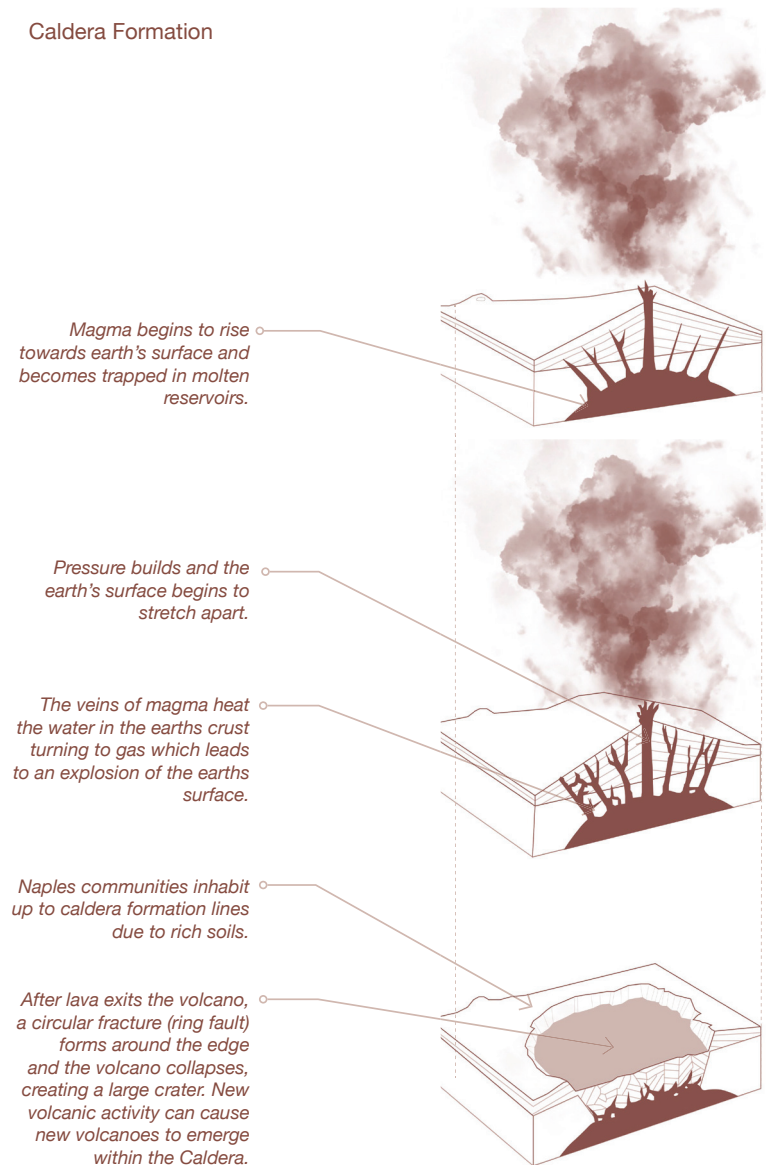


Figure 26: Supervolcano caldera formation diagram (Information Reference: Robinson 2011)

These communities have benefited from the landscape when it comes to producing goods for generations. However, they continue to live in a red high-risk zone that could wipe out their entire community in the event of a volcanic eruption (Jallon and Napolitano 2021, 31). Residents have experienced multiple health issues in the area due to the high hydrogen sulphide levels. Eye irritation and shortness of breath are all health risks that come from living in close proximity to active volcanism. In addition to the hydrogen sulphide, 350-1500 tonnes of carbon dioxide are released from the area daily (Heiken 2013, 31-32). The tension that comes from volcanic activity is a fascinating and complex relationship as it is both life-giving and life-taking. While residents of the region insist on living near and directly on volcanic activity, they believe that they will go through life reaping the land's riches rather than being a casualty from it.

Ground Uplift and Sinkholes

Ground surface instability and deformation are significant risks in the Campi Flegrei area. While the city has historically been carved out and built on Neopolitan pyroclastic yellow tuff, the ground constantly adapts to the tectonic shifts from the volcanism, making it extremely dangerous to attempt to introduce a place of refuge underground (Jallon and



Figure 27: Sink hole formation in Naples (Borghese, Mortensen and Picheta 2021)

Napolitano 2021, 31). Sulfer vents and an underground cave system below the old city in Naples's downtown core have increased the risk of collapsing due to earthquakes in the area, strengthening the argument that bunkers cannot be resilient in the Neopolitan landscape (Jallon and Napolitano 2021, 86). Since the 1538 eruption of the Campi Flegrei, the entire region has been gently sinking as magma begins to push the earth's crust upwards. Moreover, the area has seen a 4-meter topographic uplift since the 1950s. As the uplifting continues, the strain on the crust will cause the ground to break, which can result in sinkholes or massive cracks on the surface (Giuffrida 2017). In the 1980s, an influx of residents moved to the region to access cheaper homes. These buildings were expeditiously and poorly built and are vulnerable to the daily micro seismic stresses the region has been experiencing, creating an additional risk for the large community (Giuffrida 2017).

Naples Impending Doom

Near the end of the summer of 2023, the Campi Flegrei began to show signs of the supervolcano waking up. The supervolcano, spanning 12-15 kilometres across, is the largest active caldera in Europe and has been slowly restless since the 1950s. However, more than 2,500 earthquakes have trembled since August 2023, showing a drastic increase in volcanic activity (Olds 2023). Naples has primarily encompassed its "Evacuation Plan" surrounding Vesuvius, perhaps due to its strong presence in the landscape. However, the more considerable risk to the city is the Campi Flegrei region, which currently has no concrete plan to evacuate residents safely. With half a million residents living directly above the supervolcano and

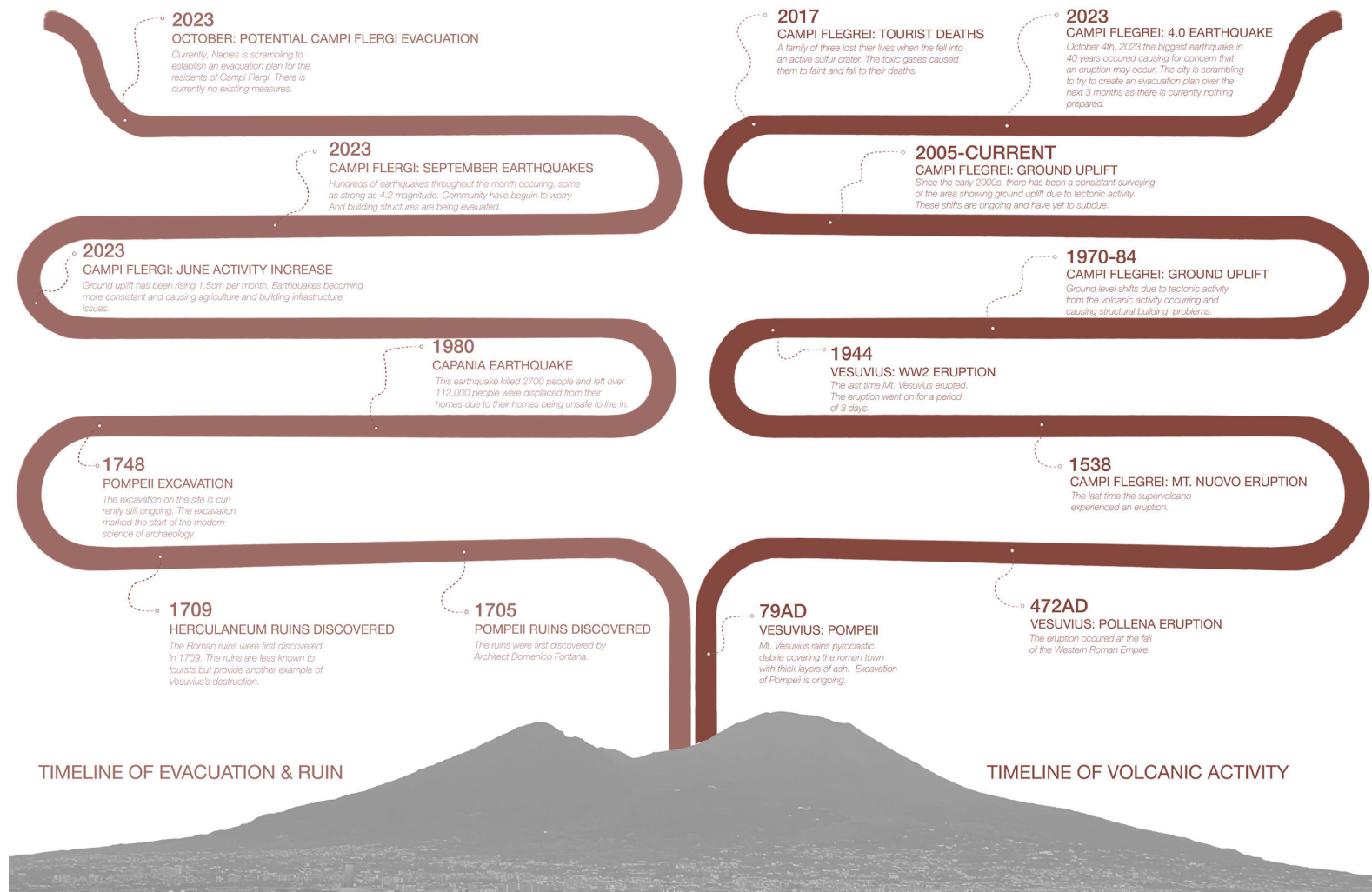


Figure 28: Timeline of volcanic activity and evacuation and ruin (Data collection: Carlino 2021)

800,000 living in close proximity to it, there are too many people to evacuate by car, which would cause a gridlock, and no alternative measures have been taken (Olds 2023).

On October 4th, 2023, a 4.2 magnitude earthquake hit the Campi Flegrei region, making it the biggest earthquake in decades. The city had no premeditated plan to implement or evacuate the area if there was an eruption (Wanted in Rome 2023a). Residents have begun to show signs of worry due to the recent increase in seismic activity, but the city has yet to begin to prepare a future evacuation. According to the volcanologists' previous analysis of seismic events and the supervolcanos history, there is no indication that there will be an eruption anytime in the future. Since the beginning of December of 2023, seismic tremours have begun to decrease, but scientists project this decline may be short-lived based on previous regional monitoring. These new fractures from the pressure from underground magma will start to heal and eventually close, causing an increase in pressure and seismic activity to begin again (Perrone 2023).

Where is the Education?

In 2013, the Italian Department of Justice proposed a survey of four communities in close proximity to volcanic activity. From this survey, merely 1% of residents were anxious about living in such proximity to high-risk geological areas. People were more concerned about trash piling up and failing infrastructure. This is an example of how volcanic risk is not a prevalent fear in Neopolitan society (Heiken 2013, 30). However, these surveys unveiled a heightened level of awareness among the younger population. The younger generation has lightly grasped the understanding of volcanic risk, which is essential to consider when

discussing future evacuation methods. Over 80% of residents are unaware that an evacuation plan currently exists (Heiken 2013, 30). Citizens of Naples need a place that can provide them with a clear education regarding the volcanic activity surrounding them. Such education has the potential to strengthen their understanding of the interconnected relationship between their cultural identity and the geological risk of their surroundings. Superstitions and religious rituals, although significant cultural practices, will prove inadequate in safeguarding Neapolitans in the face of a volcanic circumstance. Therefore, it is crucial to view Vesuvius not merely as a fixed monument but as a force of nature, requiring farsighted measures to protect the citizens of Naples. The proposed architectural intervention must capitalize on the younger generations to introduce volcanic awareness. To achieve a practical approach that can not only draw the attention of the younger population but also attract adults and elderly generations who are more set in their ways, storytelling will be the primary method of educating the public. The storytelling will borrow cultural figureheads discussed in Chapter 2 and their connection to the Campania landscape. This strategy will work within older generations' cultural beliefs while also captivating their interest to foster education towards volcanic risk. This thesis will also strengthen the education towards Pompeii as a cautionary tale of impending volcanic eruptions by utilizing Pompeii as a city of the dead and the site of refuge as a city for the living.

Chapter 4: A Tale of Two Cities

Twin Cities

This thesis explores two strategic sites that establish a relationship between the past, present and future of volcanic eruptions. The first site is the Roman town of Pompeii, which I refer to as “The City of the Dead”, a place of ruin and destruction from 79 AD. This city shows the outcome of a population unaware of the risks of their surroundings, their unpreparedness, and their fate as victims of the region’s volcanic landscape. The City of the Dead architecturally integrates education about volcanic risk with the human fascination for death and the effect of destruction. The second site, which I call “The City of the Living”, refers to Naples, a city with a pervasive sense of superstition and a nature-culture division. This city represents the present and the future. It probes the way in which architecture can serve as a catalyst for cultural reorientations amidst the challenges of the region’s collapsing ecologies. The City of the Living introduces a place of education, celebration, and refuge for its residents. Both cities are linked by direct views of Mount Vesuvius, a volcanic monument that reminds us of the volcanic devastation from the surrounding volcanic landscape. These views will unite the primary architectural intervention of a cultural center and evacuation in The City of the Living to the intervention of a Roman Watchtower in The City of the Dead.

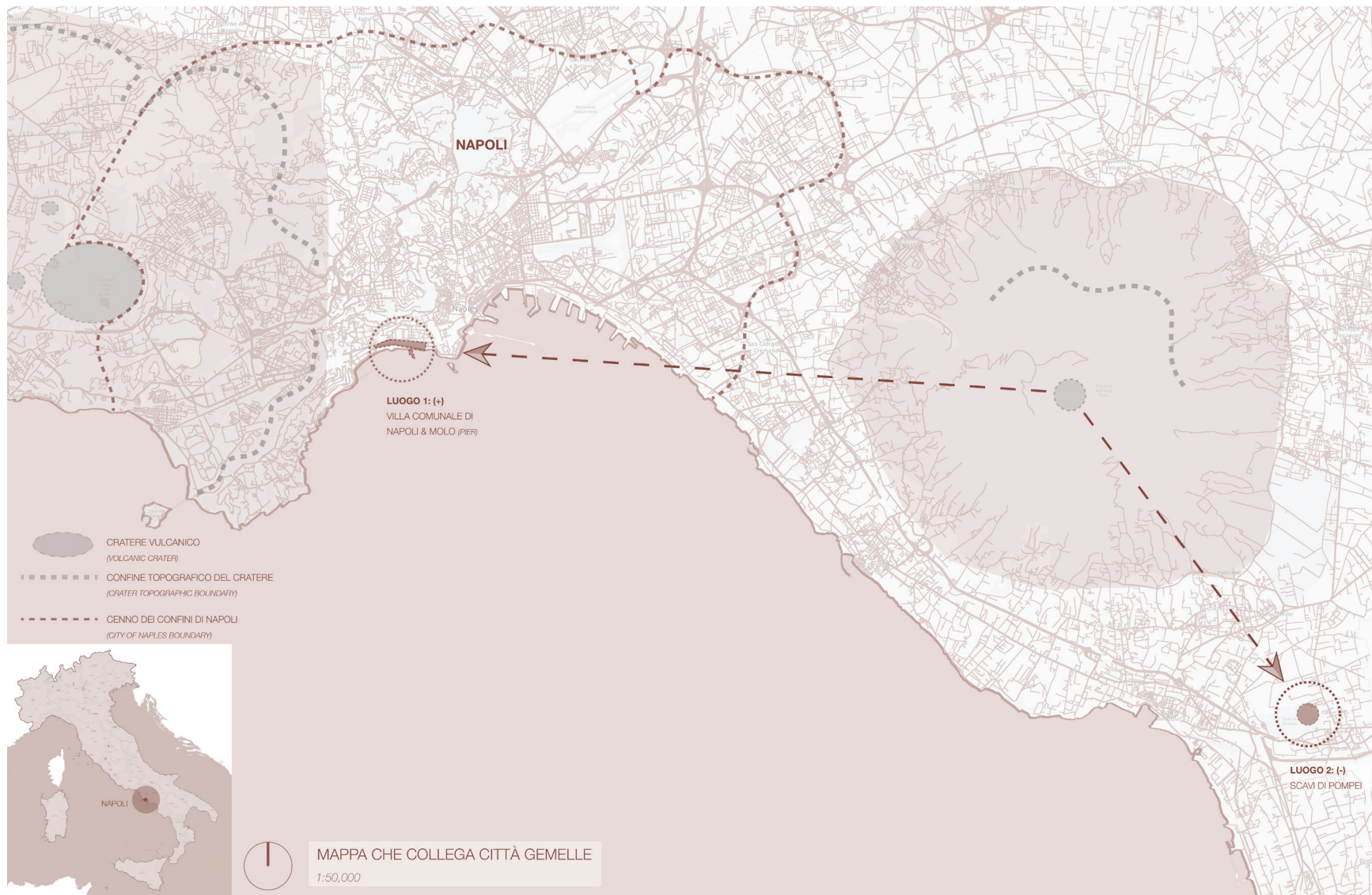


Figure 29: Diagrammatic site map documenting both cities and their link to Vesuvius. (Map Source: ArcGIS 2023)

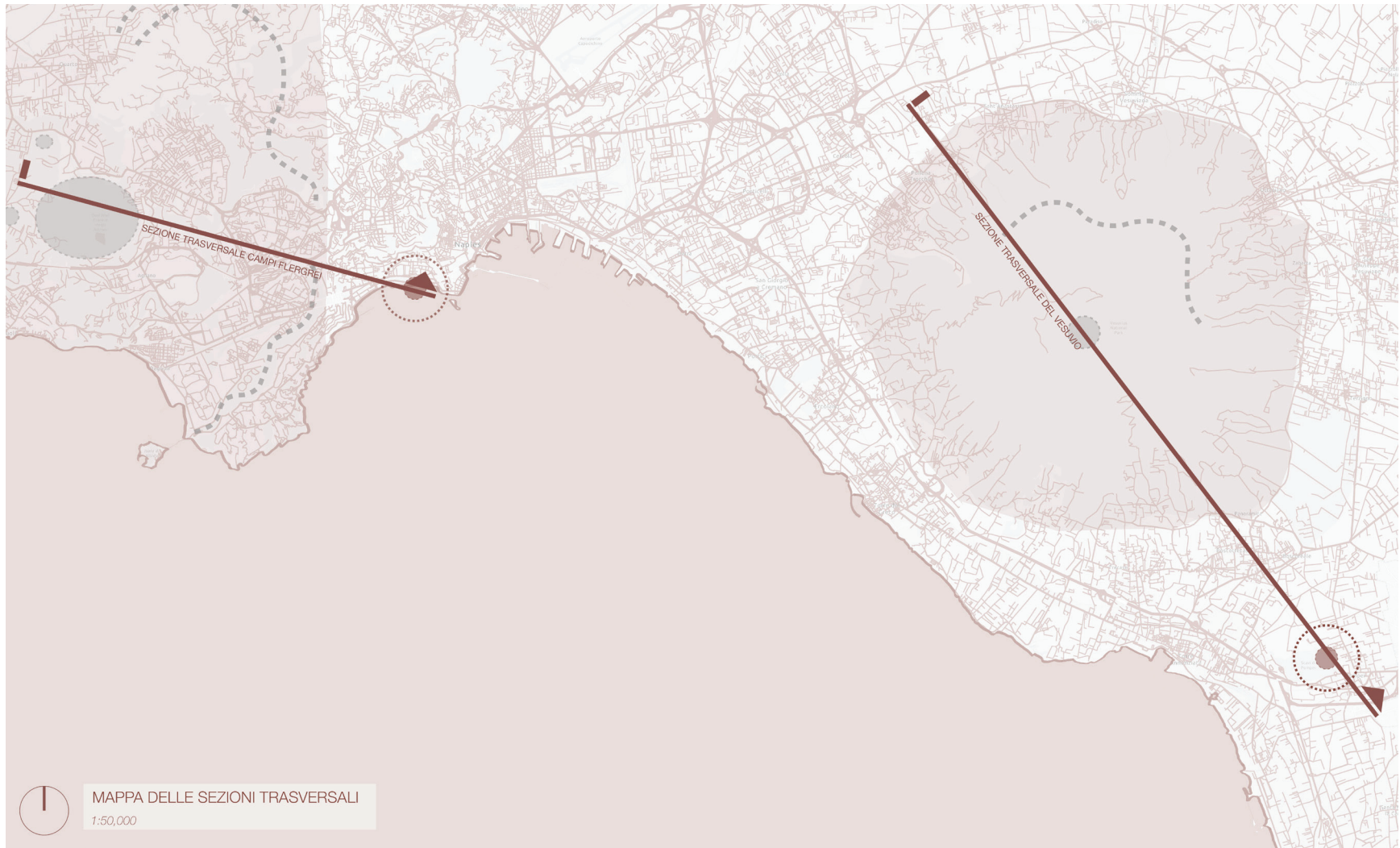


Figure 30: Diagrammatic site map indicating the cross-sections into city of the living (left) and the city of the dead (right) in relation to their volcanic landscape
(Map Source: ArcGIS 2023)

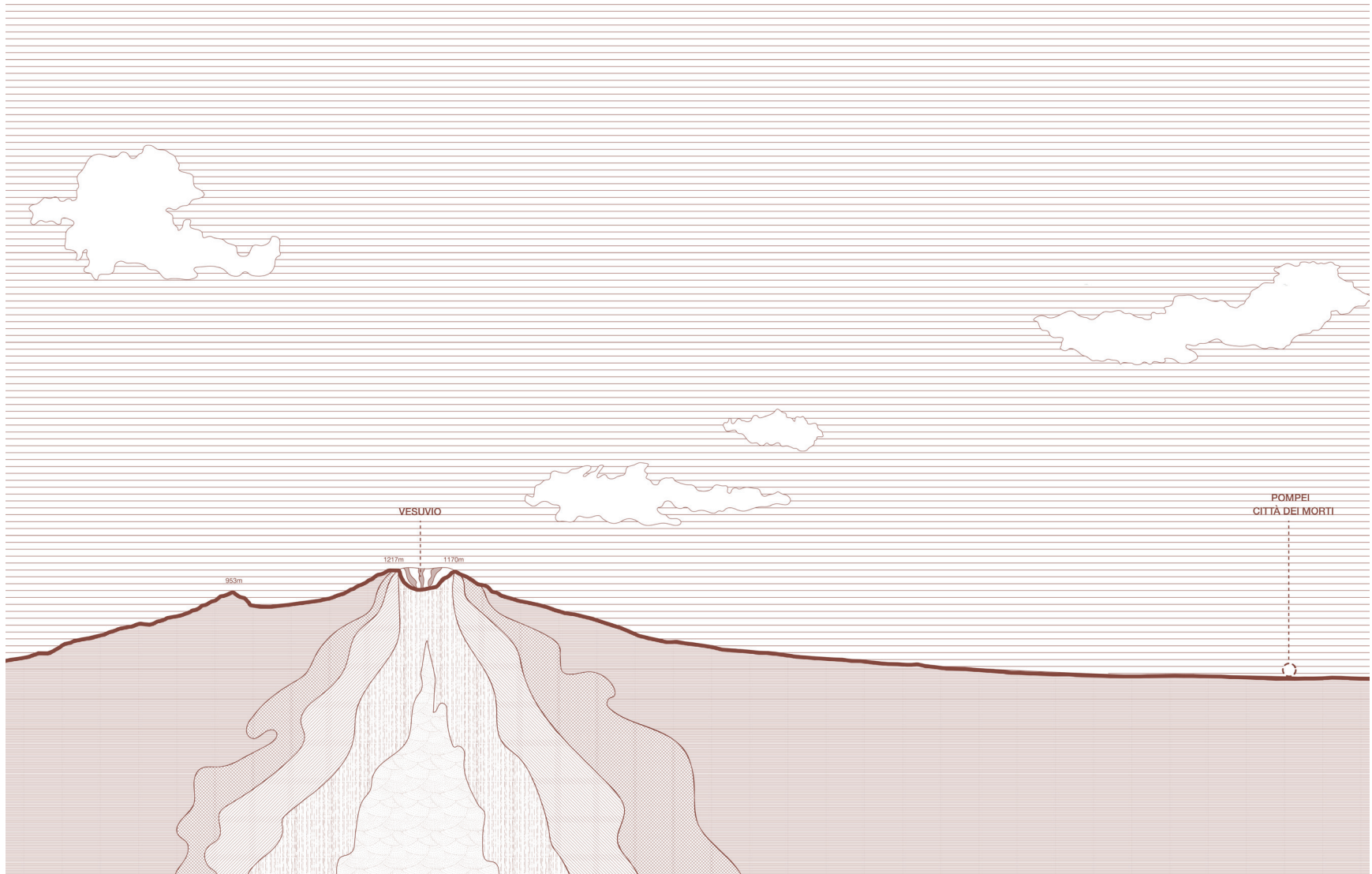


Figure 31: Cross-section of Vesuvius (1:20,000) (Elevation date source: ArcGIS 2023)

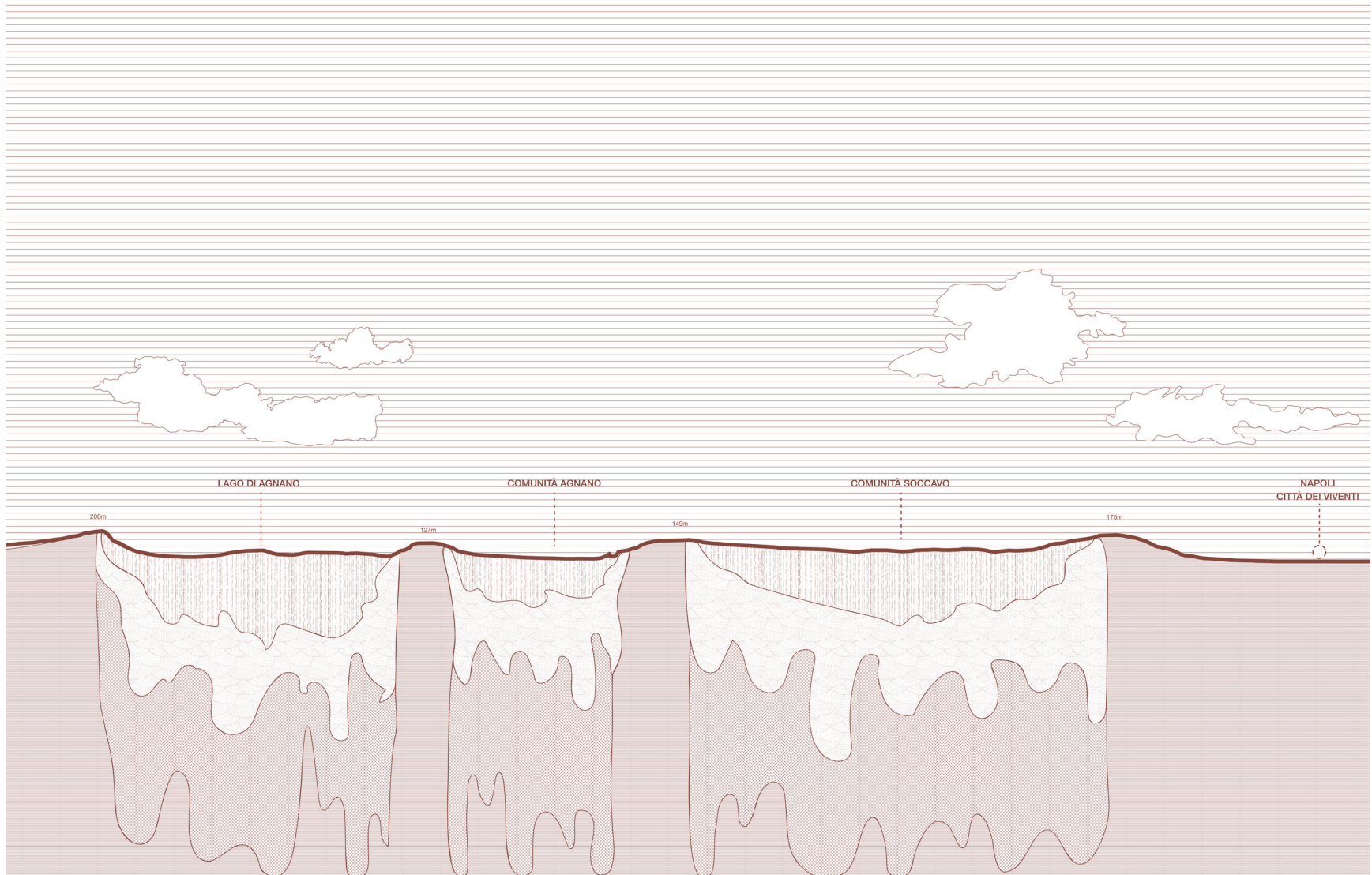


Figure 32: Cross-section of the Campi Flegrei supervolcano. (1:20,000) (Elevation date source: ArcGIS 2023)

City of the Living

Along Naples' waterfront is The Villa Comunale Di Napoli, a one-kilometer urban park built in 1780 encompassing Europe's oldest aquarium and a Darwin museum. Within the park are monuments depicting Hercules and additional Greek and Roman figureheads, intriguing fountains made with volcanic tuft as well as a temple of Virgil (Flora Planner n.d.) (see Appendix B). The park supplies an ideal location for a place of education and cultural celebration that can become an extension of the existing educational spaces within the park's urban fabric. The adjacent northern building to the site is the Casina Pompeiana, constructed in 1870 as a permanent exhibition space for artwork curated by painter F. Maldarelli that showcased views of Pompeii. While the building transferred ownership to the Municipality of Naples in 1997 and is no longer serving this purpose, it hints at a connection between Pompeii to the Villa Comunale di Napoli which this thesis proposes (Commune Napoli n.d.a).

The park also provides an opportunity to create an extension towards the seascape by introducing a pier that will accommodate a place of evacuation in the event of a volcanic circumstance. The Villa Comunale Di Napoli is linked to multiple transit stops along the northern edge of the park's length (see figure 34), allowing residents to access the site directly by private vehicle or public transit, thus making this site convenient for visitors and for residents in the event that they need to evacuate. The site is in close proximity to the Campi Flegrei region and the downtown core, allowing for rapid access to aid in the event of an eruption.

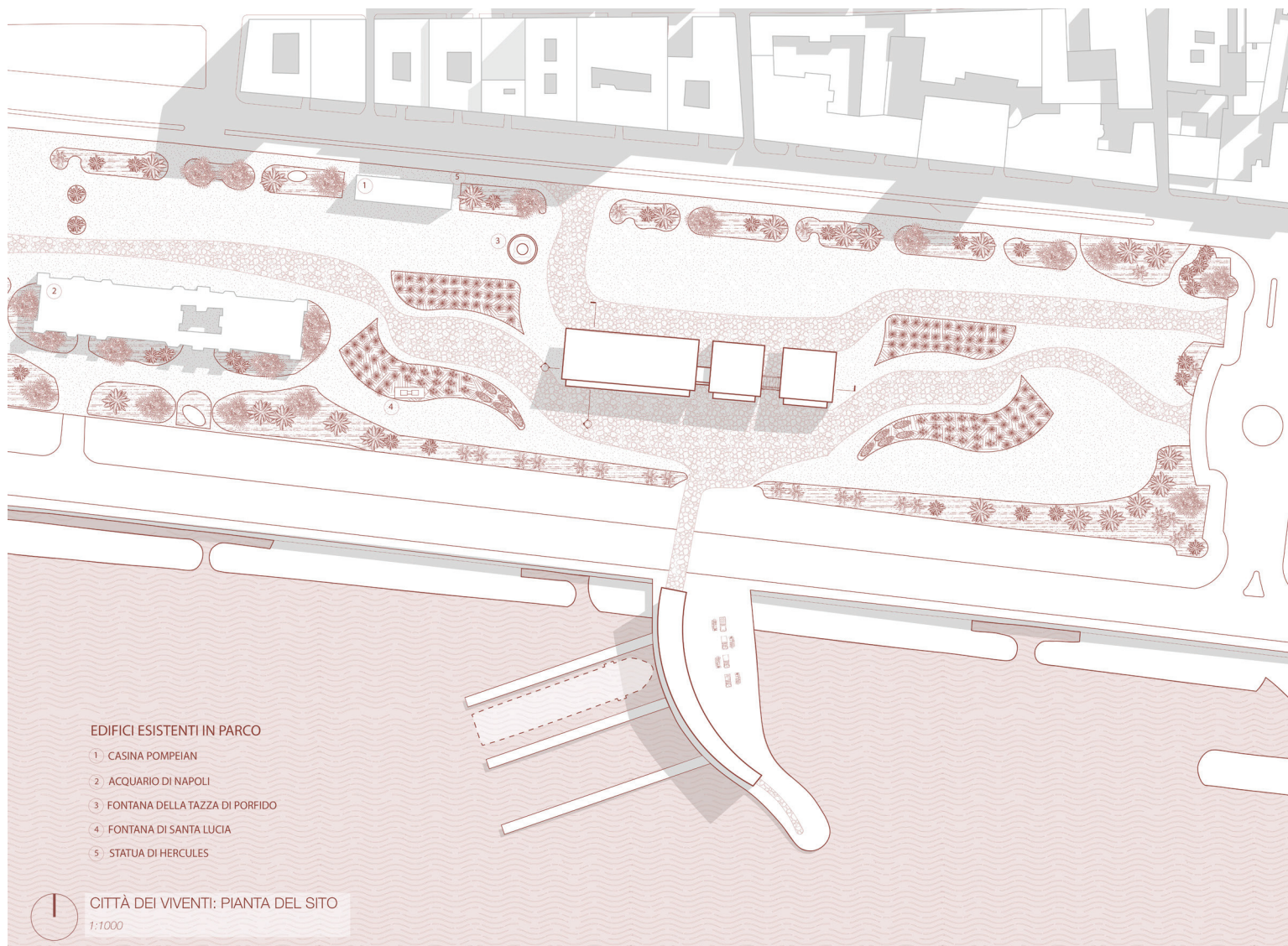


Figure 33: City of The Living site plan

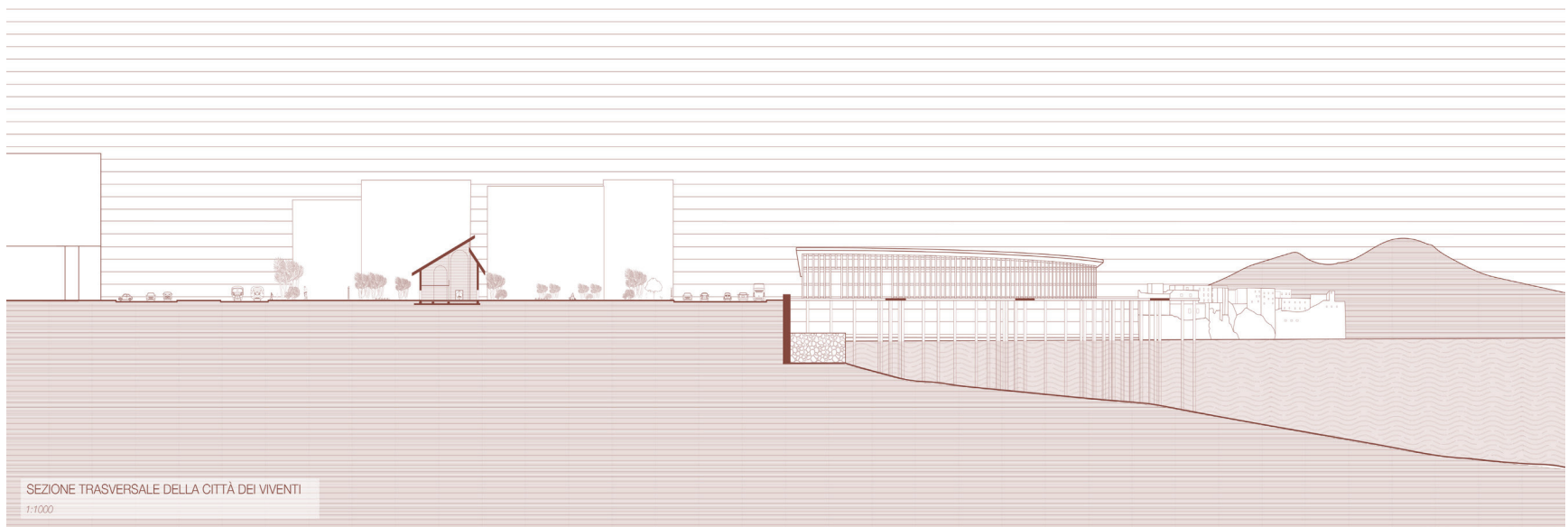


Figure 34: City of the Living site cross-section

The education and cultural spaces provide visitors of the park with a unique building designed for its resiliency and strength against potential volcanic risk. The architecture's exterior shows the dramatic slopes and strength of the building's roof, built to protect the building from volcanic debris and ash. The building's walls are composed of volcanic soil concrete, and their assembly creates a dramatic width that provides faith that the thick concrete walls will comfortably support the roof. The building's interior creates a sense of comfort and softness. Curved arches line the interior of the building, referencing a connection to Naples's arched underground tunnels. Ensuring the interior feels welcoming and familiar to residents visiting the education and cultural spaces is essential in reducing residents' anxieties or sense of fear of the topic of a volcanic disaster. The building is divided into three volumes, each with a specific purpose. However, the three spaces challenge a cultural-nature dualism where the volcanic landscape's geological attributes complement the volcanic regions' cultural storytelling. The west portion of the building is an education space. The first level provides hands-on interactive exhibits where residents can familiarize themselves with their surrounding volcanic landscape. A mezzanine level explores four cultural figureheads, Hercules, Virgil, San Gennaro and Pulcinella and their stories where Naples culture and volcanic activity intersect (figure 37). The mezzanine provides an observable flow of the cultural stories to the geology below.

The second section, in the centermost part of the building, houses a cultural archive attached to the education space that celebrates Naples's cultural identity. The archive's main attraction is a cantilevered vault that hangs between arches and can only be accessed in the event of an evacuation

(figure 36). The vault has an opaque exterior, creating a dramatic sense of mystery regarding what cultural goods are retained within. The third and final space, at the eastern edge of the building, is a winery. The winery poses as a good omen for visitors and provides a sense of comfort in a place designed for disaster. The winery holds and serves wines harvested from the volcanic soils of Campania, allowing visitors to appreciate and reap the unique wines from the region's volcanic soils. To complement the winery is an urban garden. The garden strictly grows and harvests vegetables grown in Campania's volcanic soils. This urban garden provides a visual and physical connection to the agricultural gains from the rich volcanic soils that the residents risk their lives to live in close proximity to. The urban garden stands in contrast with how the park's vegetation has historically been designed by Royal gardeners and botanists in the 18th and 19th centuries where tropical and sub-tropical species were introduced to the site (Commune Napoli n.d.b).

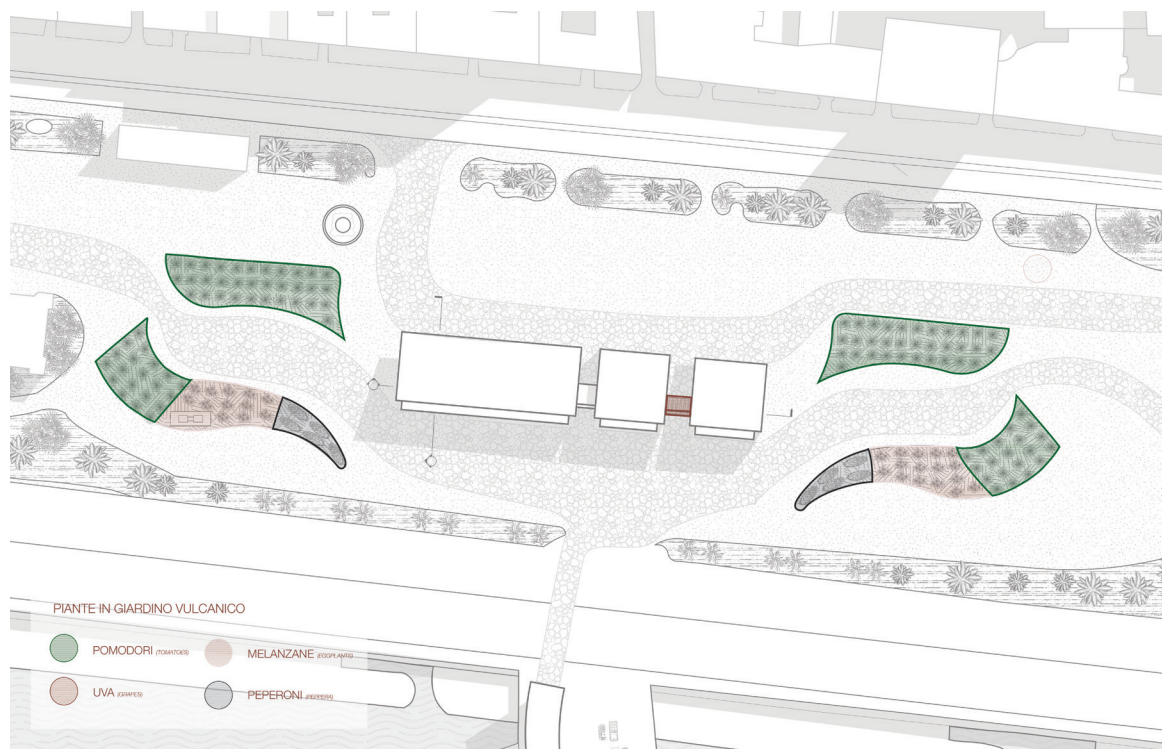


Figure 35: Volcanic urban garden diagram

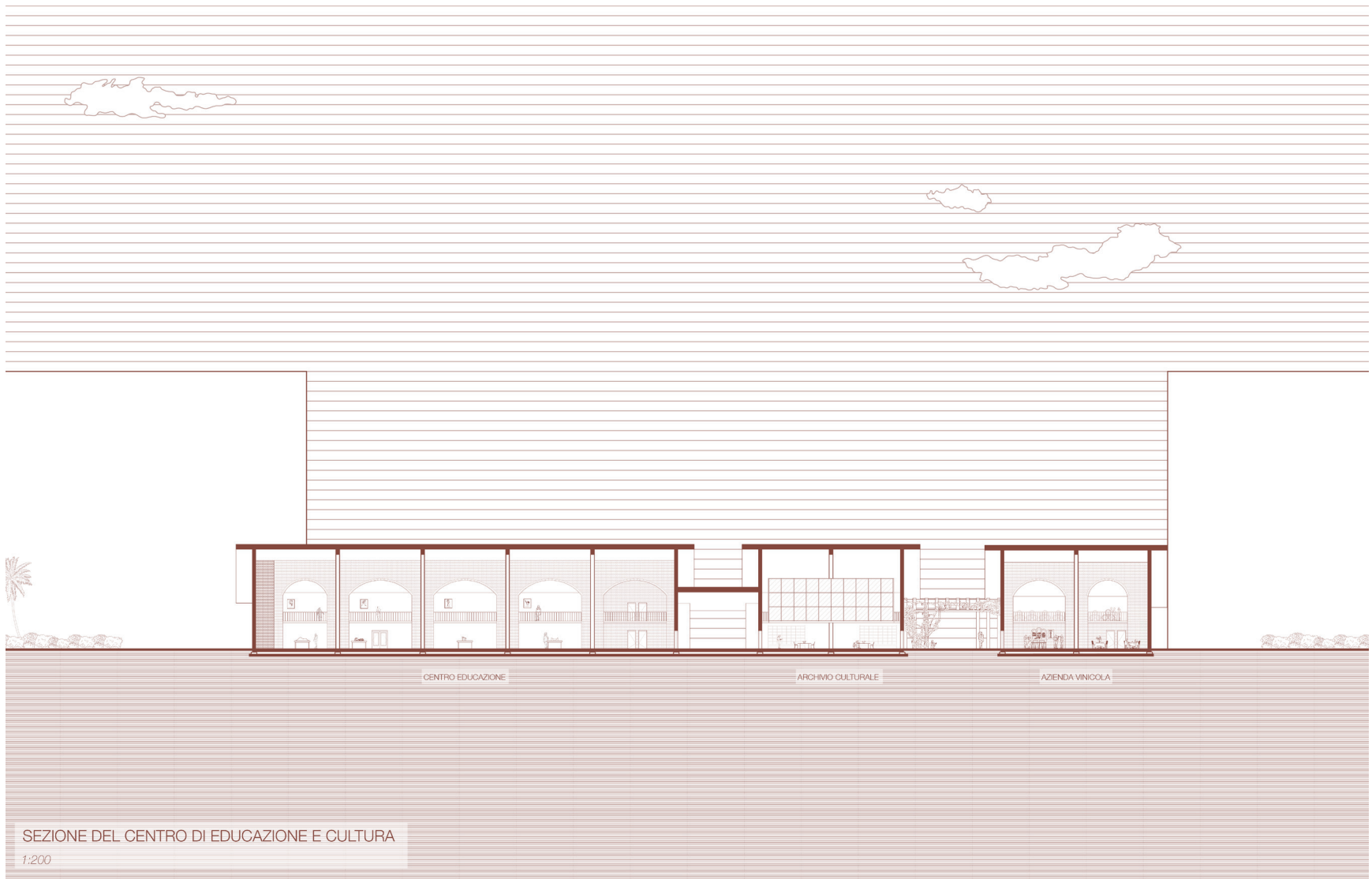


Figure 36: Center for Education and Culture building section

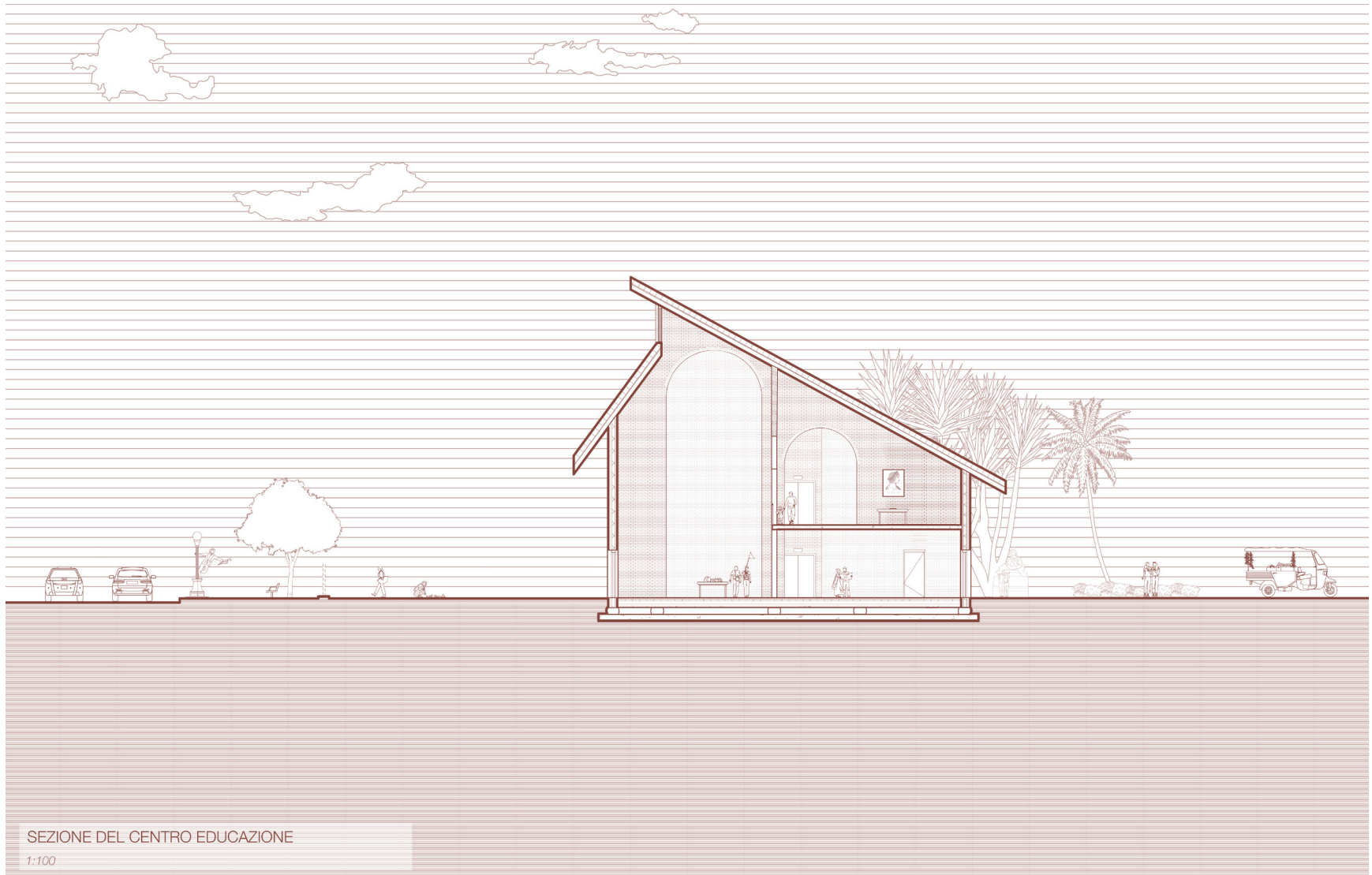


Figure 37: Education Center building section

Evacuation Network By Sea

Naples is one of the principal seaports in Italy for imports and exports and is one of the largest cruise ports in the country. European ferry lines come to the port throughout the day, providing quick access for residents and visitors to come and go from Naples. Utilizing the existing sea traffic routes to incorporate into the design schematics of my thesis is essential as it provides a quick way to evacuate residents in high-risk volcanic areas. Currently, 80% of residents in Naples are unaware that there is a basic framework of an emergency evacuation plan in the event of a volcanic disaster. The method provides residents with a two-week notice once geologists have determined that a volcanic eruption is projected to occur. Residents' current only way of evacuation is by vehicle via main highways and trains (Heiken 2013, 30). Over three million people trying to evacuate by Vespa/car could create a gridlock of traffic downtown due to the extremely narrow roads, making this unorderly evacuation nearly impossible to execute safely (Heiken 2013, 23). Assuming the past eruptions are a reasonable guide for determining the time for evacuation, this thesis will follow the existing two-week period for evacuation into the design methodology. Evacuation by sea in the region dates back to the Roman town of Herculaneum, which Vesuvius also obliterated during the same period as Pompeii. Survivors from this coastal Roman town could seek refuge and evacuation from the sea (Mage 2019). This thesis will re-introduce Neapolitans to their past evacuation history dating back to the Roman period and create a best practice to create a more efficient evacuation plan than the current insufficient system that will be able to vacate residents effectively out of the city.

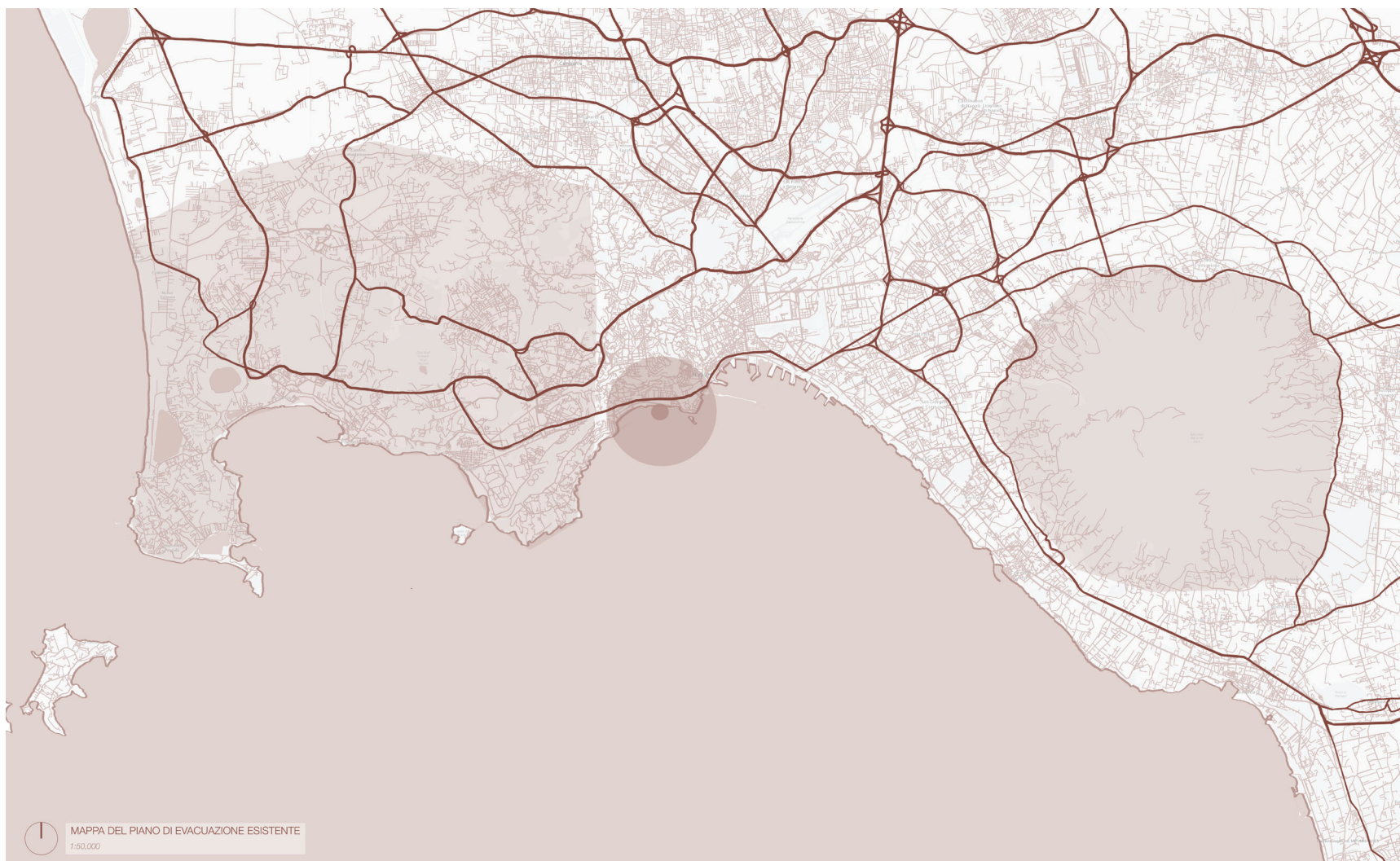


Figure 38: Map showing existing methods of evacuation i.e. Highway routes (Map Source: ArcGIS 2023)

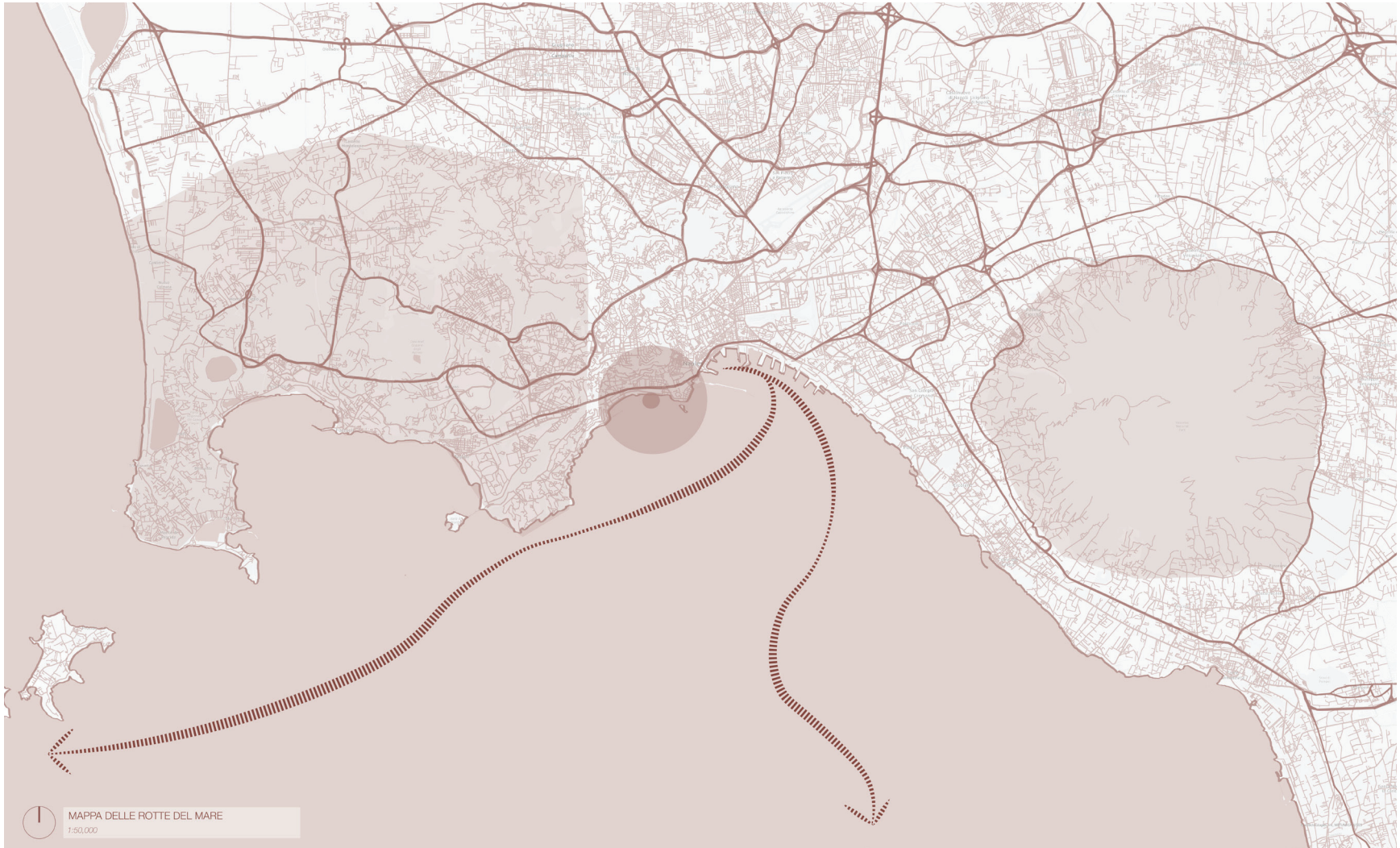


Figure 39: Map documenting the two main sea routes into the port of Naples. (Map Source: ArcGIS 2023)

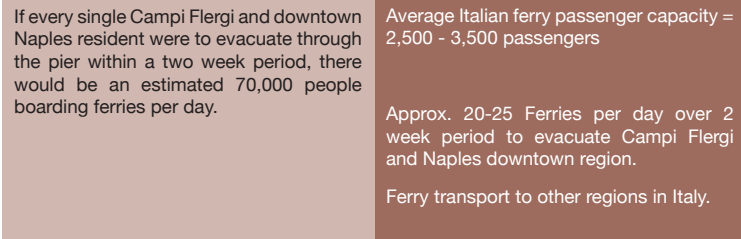


Figure 40: Ferry capacity statistics (European Parliament 2016)

Place of Evacuation

Presenting a place of evacuation along Naples waterfront supplies an efficient location for residents to evacuate from the city to other regions within the country or the European Union through existing ferry lines. A pier creates an extension of the education and cultural celebration spaces in The Villa Comunale Di Napoli and revitalizes the connection between the park and the seascape. Introducing superstition as a design tool of the pier, the dock is shaped to resemble a cornicello charm as a form of a good omen and a celebration of the superstitious beliefs of the Neapolitans. The pier's shape was essential in ensuring that residents could seek refuge in a space that respects and encourages their spiritual superstition while also being a form of resilient architecture.

The dock comprises two programs; the primary is a sheltered pavilion for residents to seek refuge while waiting for ship embarkment, and the secondary is a flexible space for the community. This flexible space can be utilized for a farmers market depending on seasonal harvests and as a place for the community to celebrate the ceremonies for San Gennaro in May, September, and December.

The place of evacuation is designed as a long pavilion that follows the curvature of the pier. The pavilion roof consists of the same assembly as the architectural intervention in

The Villa Comunale Di Napoli, complementing the same architectural language. When there is no volcanic risk, the pavilion will provide a place of refuge from the sun, allowing visitors to enjoy the views of Vesuvius and the seascape without being in the sweltering sunshine. When there is a volcanic risk, the pavilion can accommodate a place of refuge as people embark onto ferries to evacuate from the city within a two-week evacuation period.



Figure 41: Collage exploring place of evacuation site



Figure 42: Collage of embarkment and evacuation

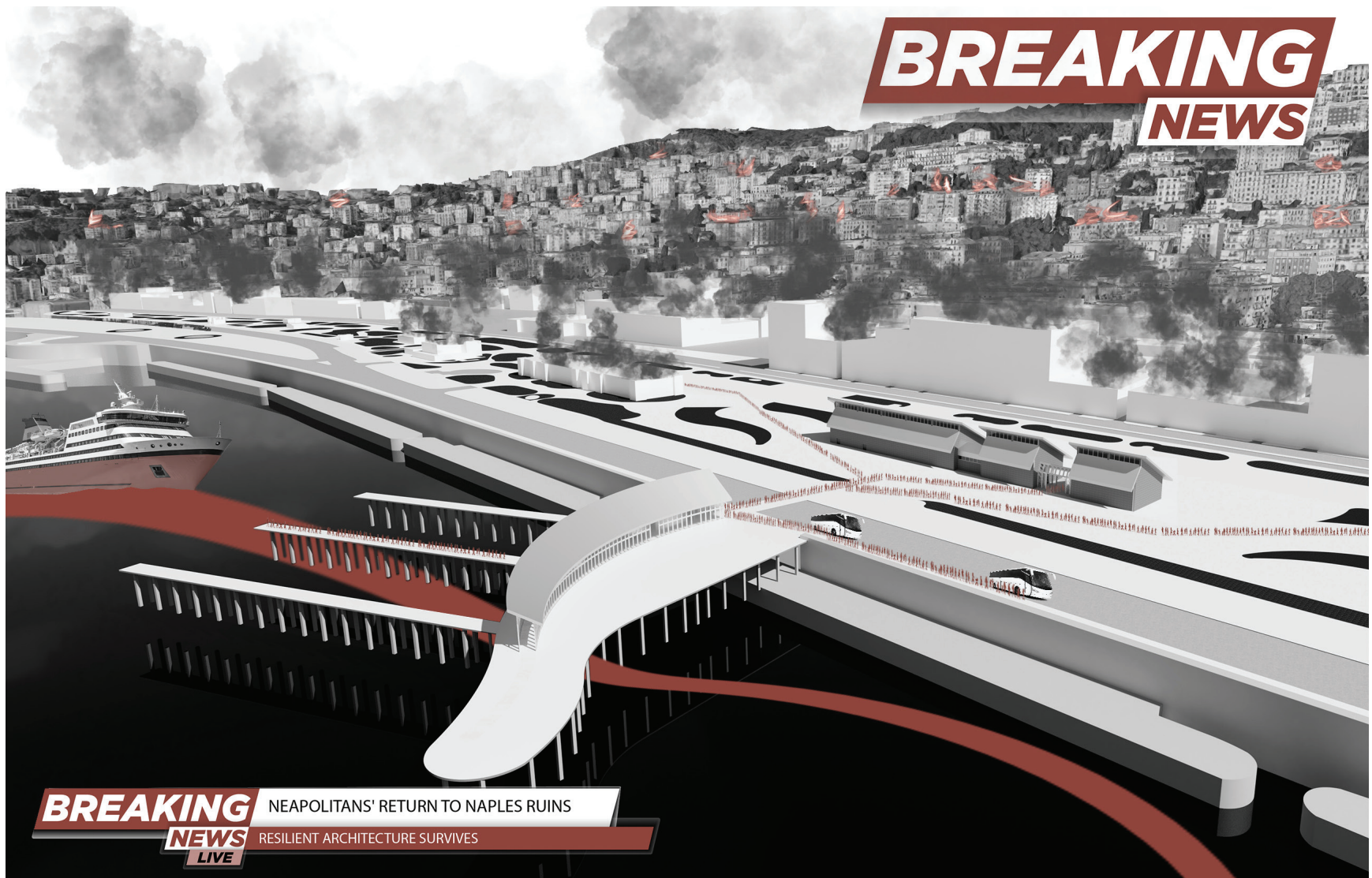


Figure 43: Return to Naples, the future City of the Dead

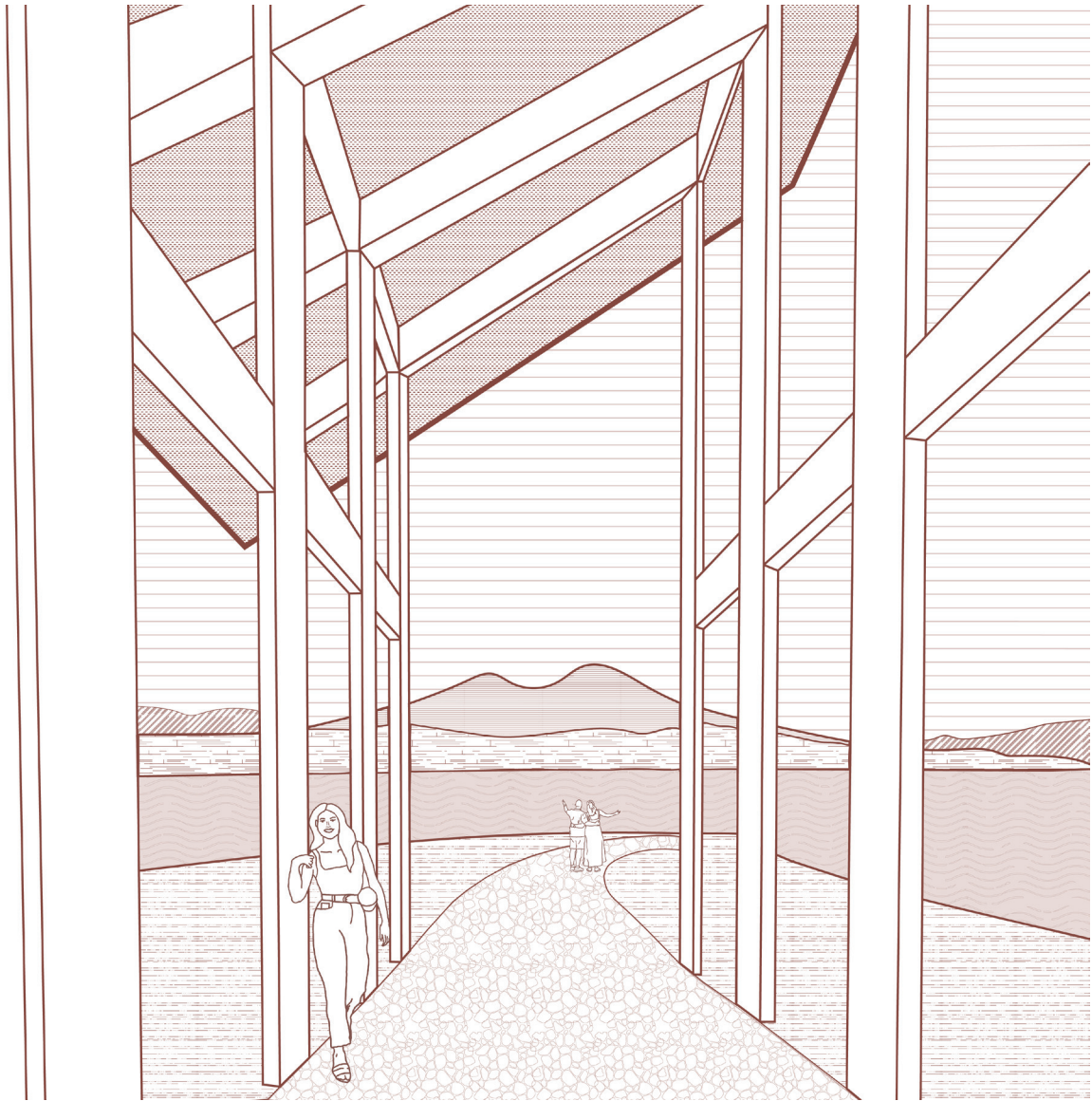


Figure 44: View of Vesuvius from evacuation pier

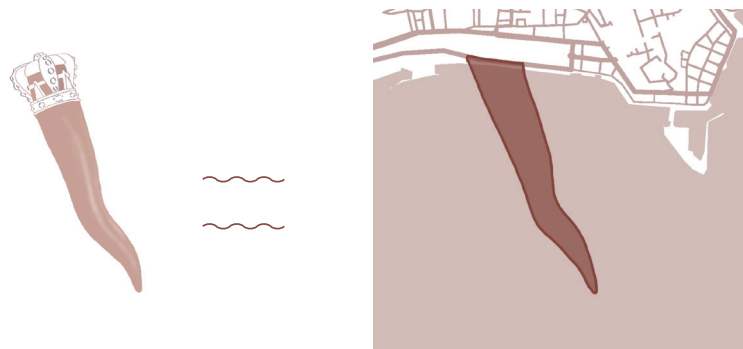


Figure 45: Superstition pragmatic diagram

City of the Dead

The Roman town of Pompeii and modern-day Naples are like twins; one is the negative, and one is the positive. While this thesis suggests framing Naples as the City of the Living, Pompeii acts as a metaphor for death, thus showing how the region's volcanic landscape can be both life and death-giving. With this understanding in mind, an architectural intervention in Pompeii was essential in achieving this relationship. The architectural precedent inspiring the intervention in the City of Death is the Roman watchtower, drawing influence from the Roman period and the surrounding ruins of Pompeii. The proposed watchtower is situated within an existing grass-covered region previously excavated by archeologists. It is currently utilized as a picnic gathering space on the outer edge of the ruins with a direct view of Vesuvius. It overlooks the ruins of Pompeii's Amphitheatre as an observatory for visitors to experience the ruins of the old Roman city from above with 360-degree views. The exterior balcony of the watchtower is 5.8 meters above ground (19 feet), representing the height of ash and debris that covered the city of Pompeii during the 79 A.D. eruption (Jashemski 2023). The watchtower provides a place where the architecture helps visitors witness the remains of the catastrophic event, understand its scale and magnitude, and see how the city is regarded for its archeological wonder. Nevertheless, it also inspires the idea of seeing Pompeii as a cautionary tale of a town that did not understand the deathly impacts of its surrounding volcanic landscape.

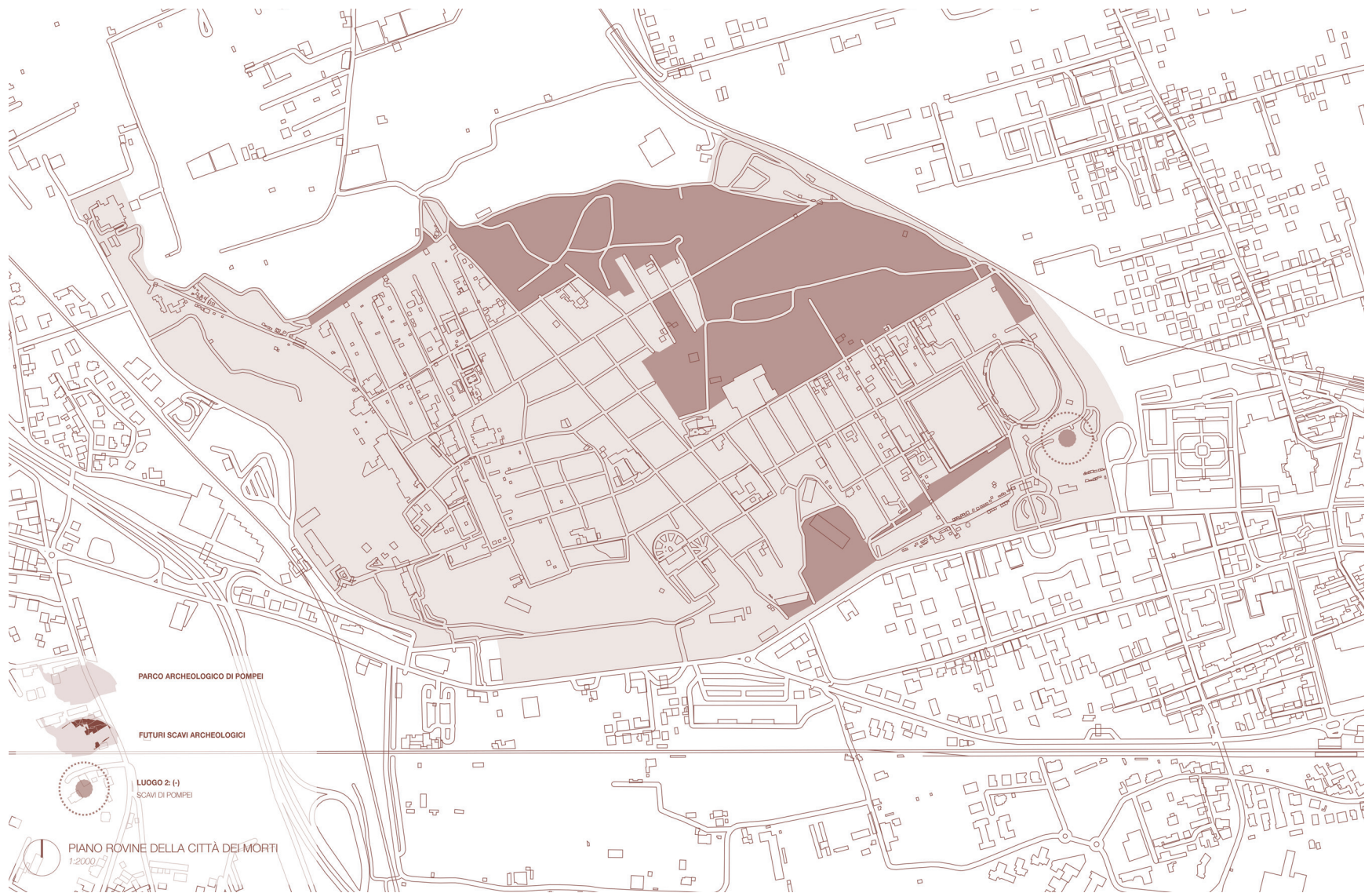


Figure 46: Pompeii archaeological site (Data Collection: Pompeii n.d.)

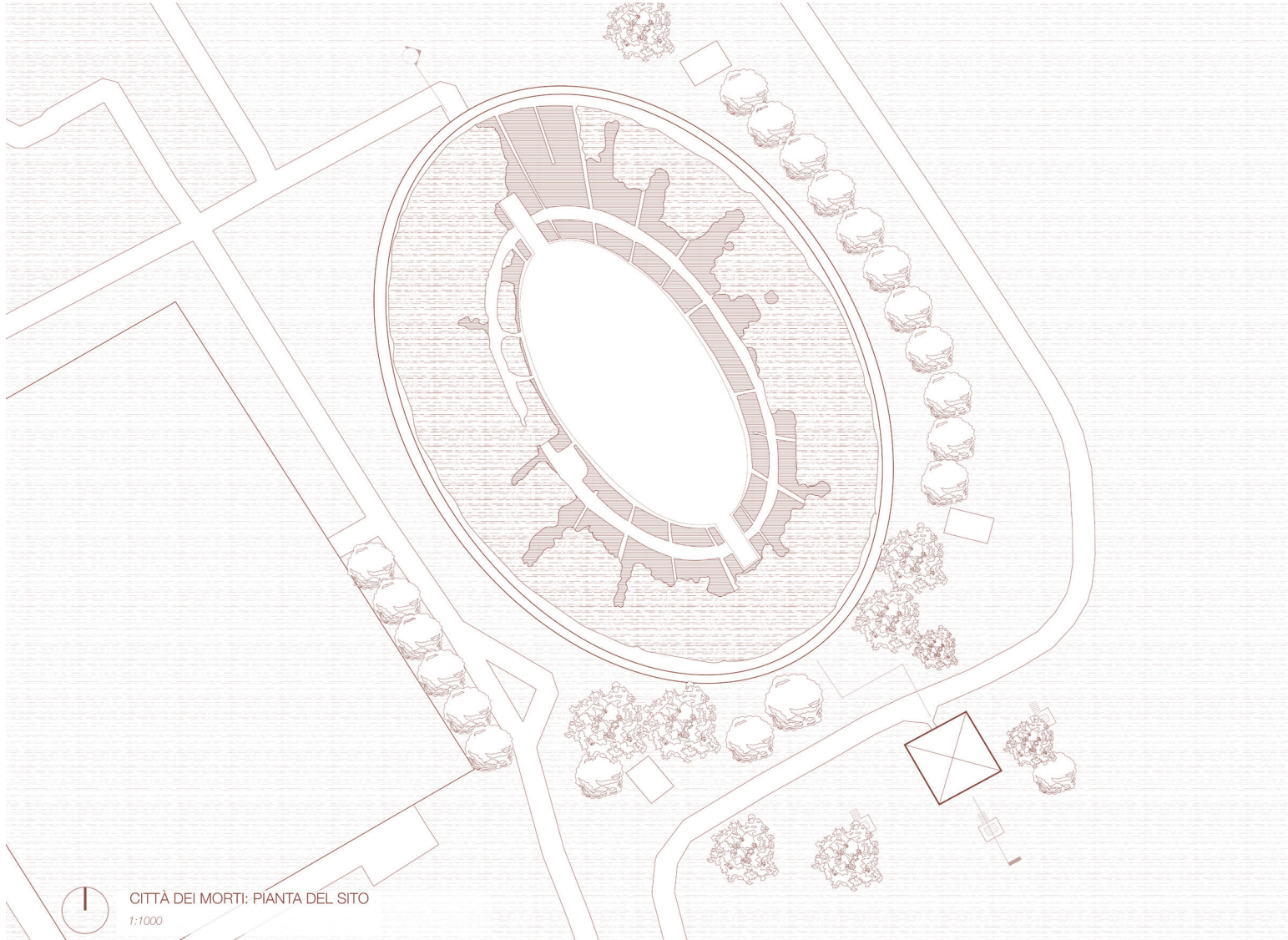


Figure 47: City of The Dead site plan

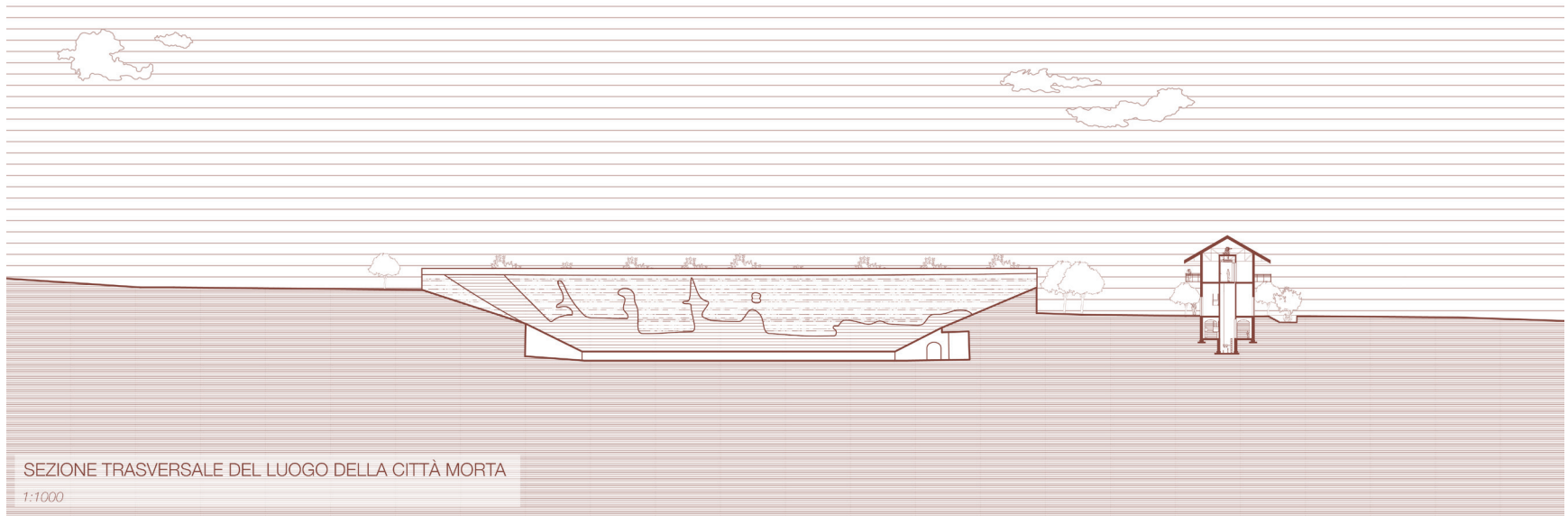
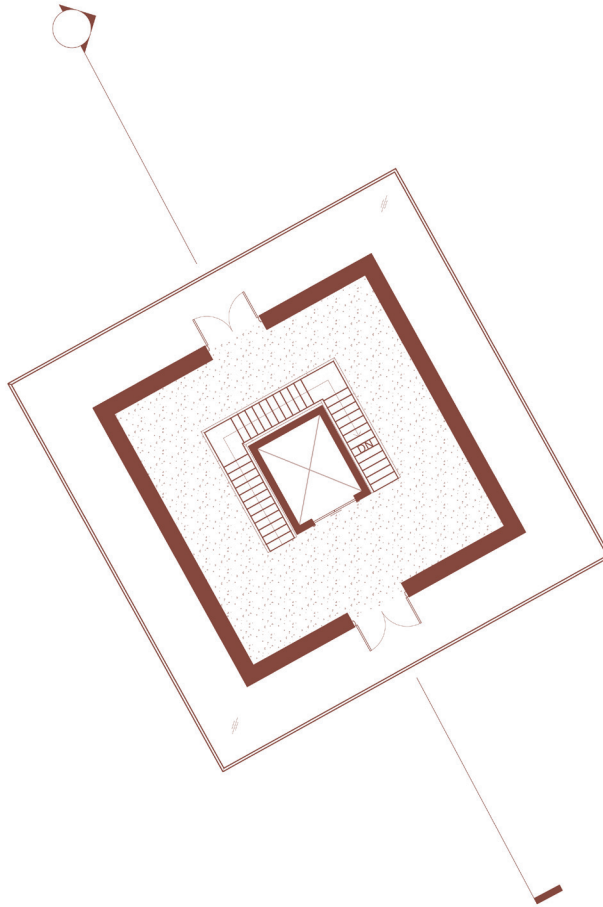


Figure 48: City of The Dead site cross-section



LIVELLO DI OSSERVAZIONE
1:100

Figure 49: Watchtower observation level

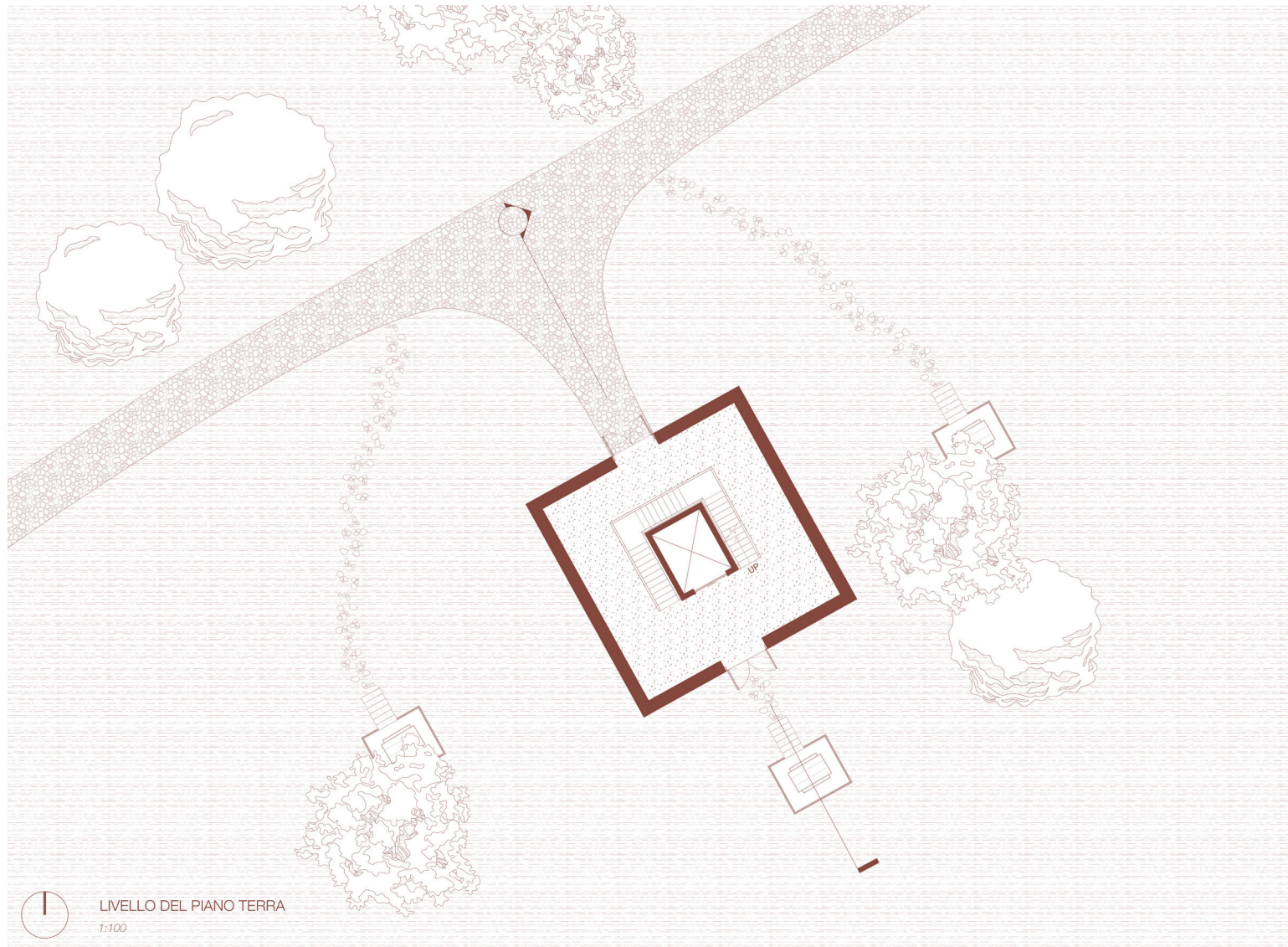


Figure 50: Watchtower ground floor level

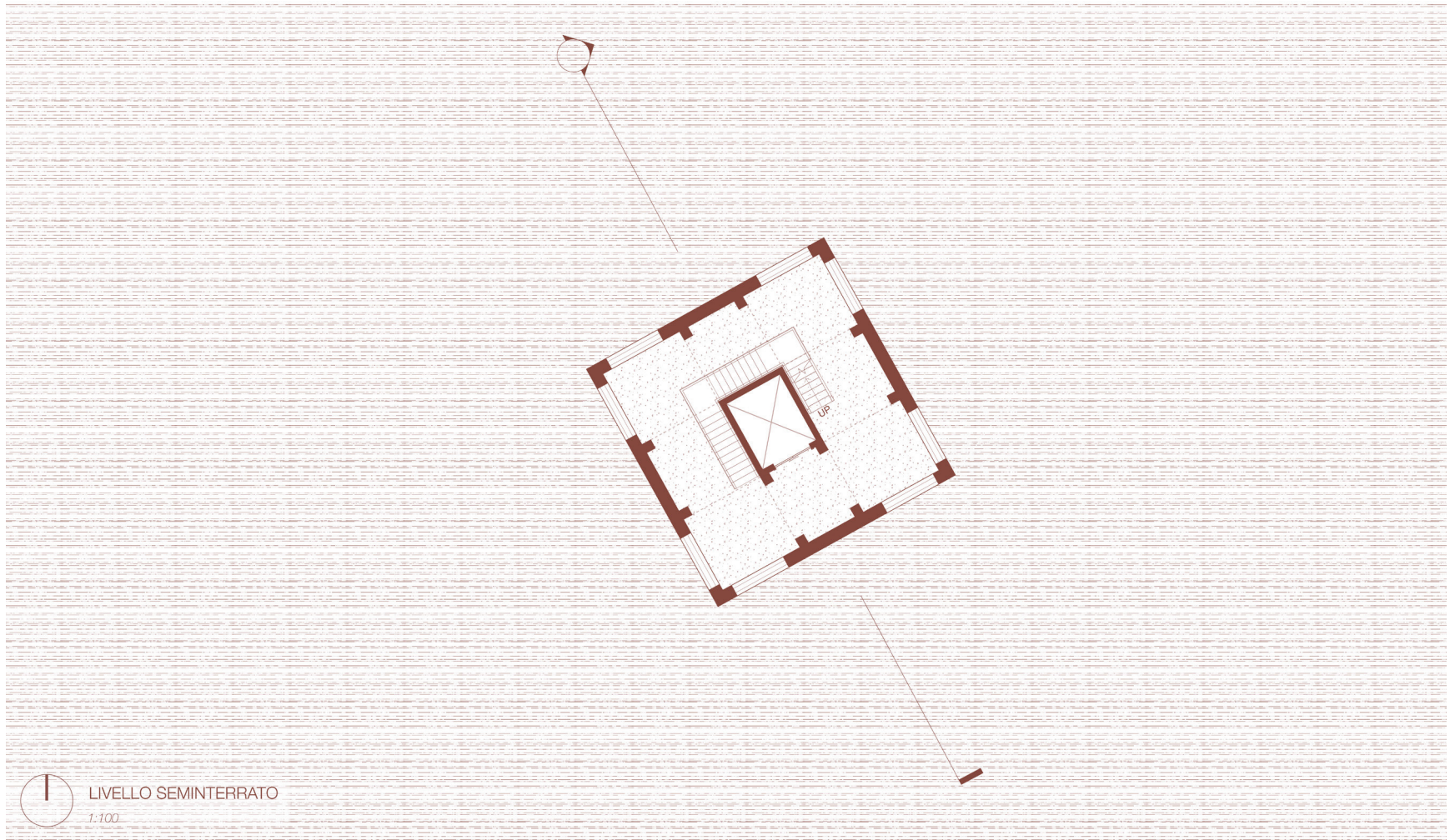


Figure 51: Watchtower basement level

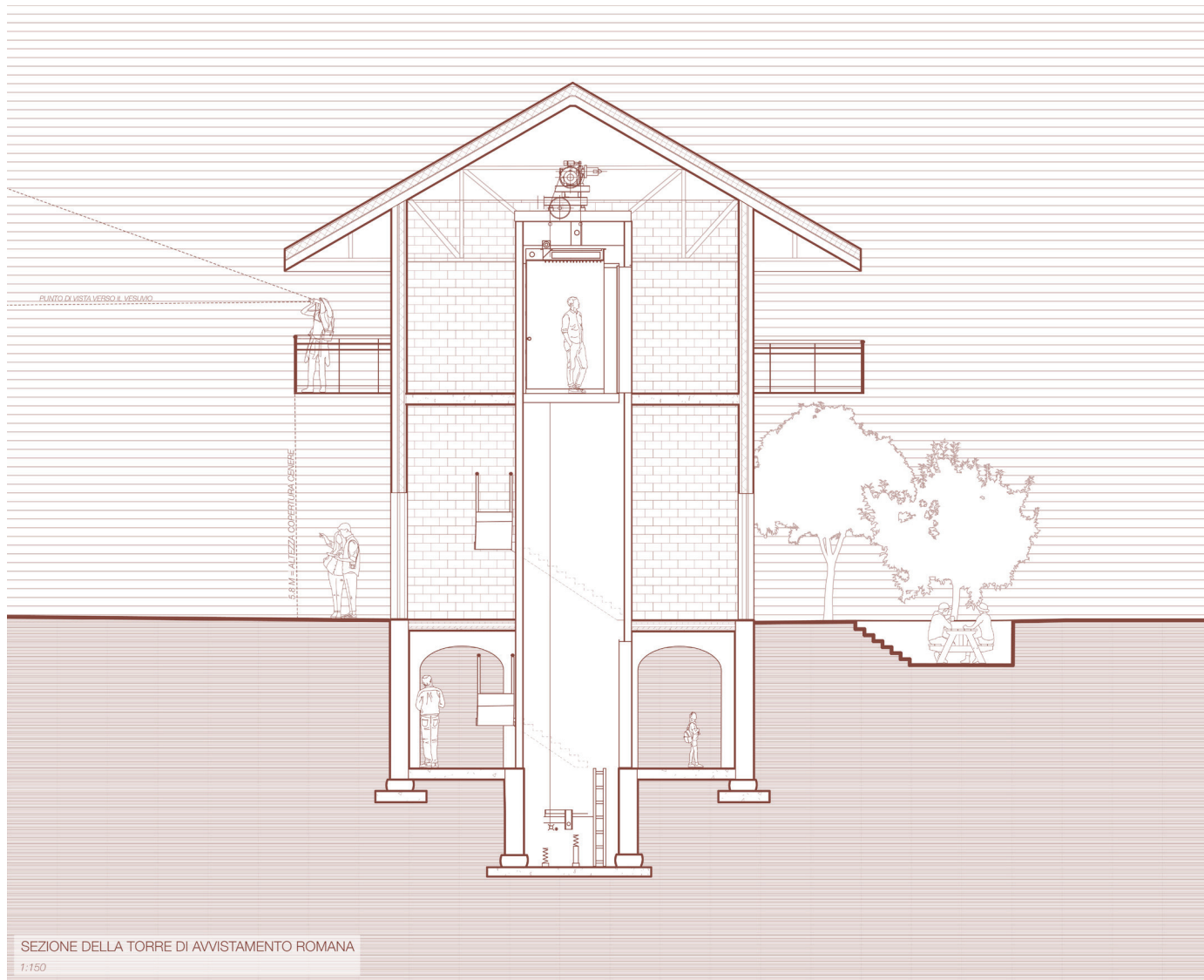


Figure 52: Watchtower building section

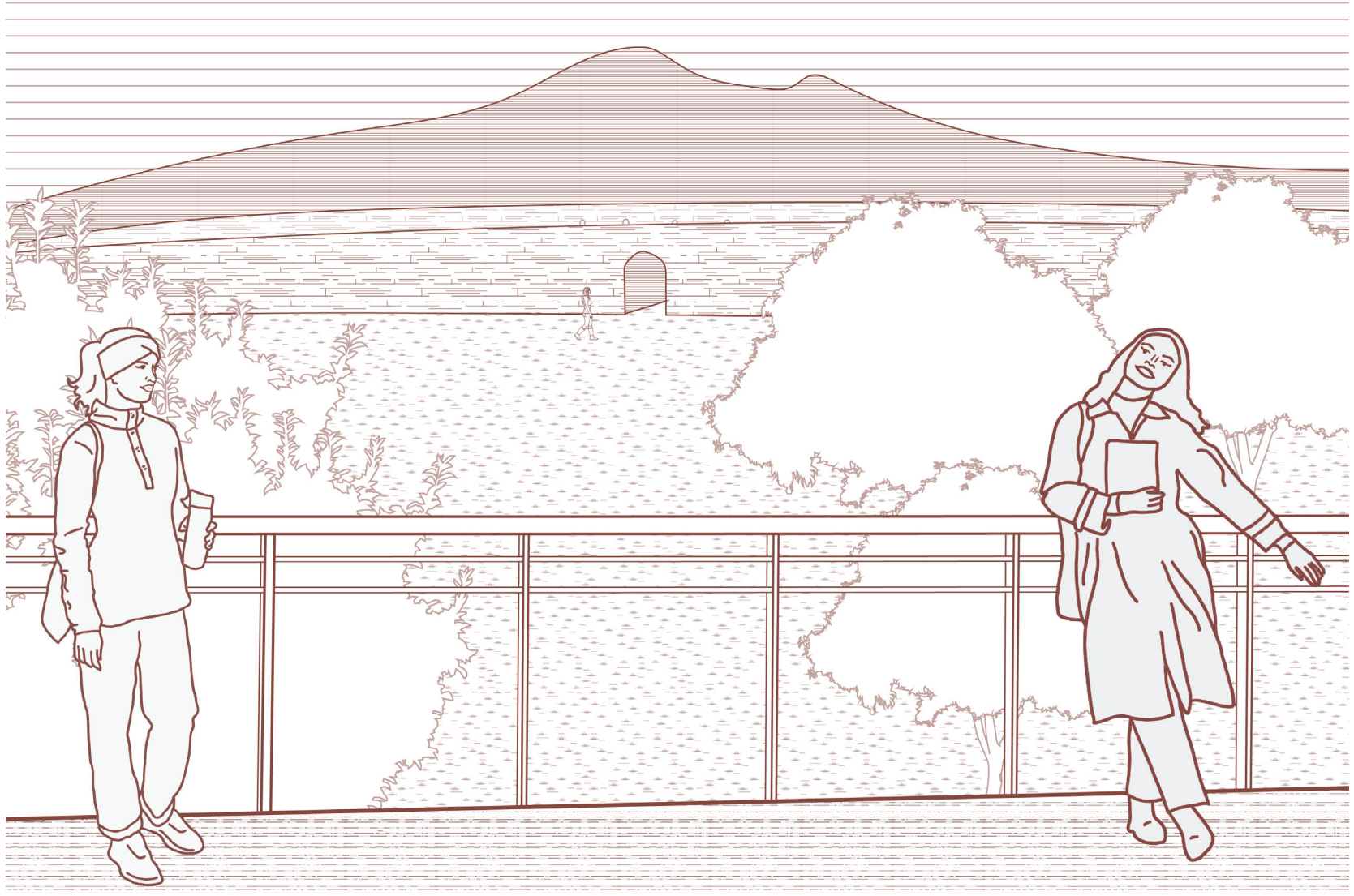


Figure 53: View of Vesuvius from Pompeii Intervention

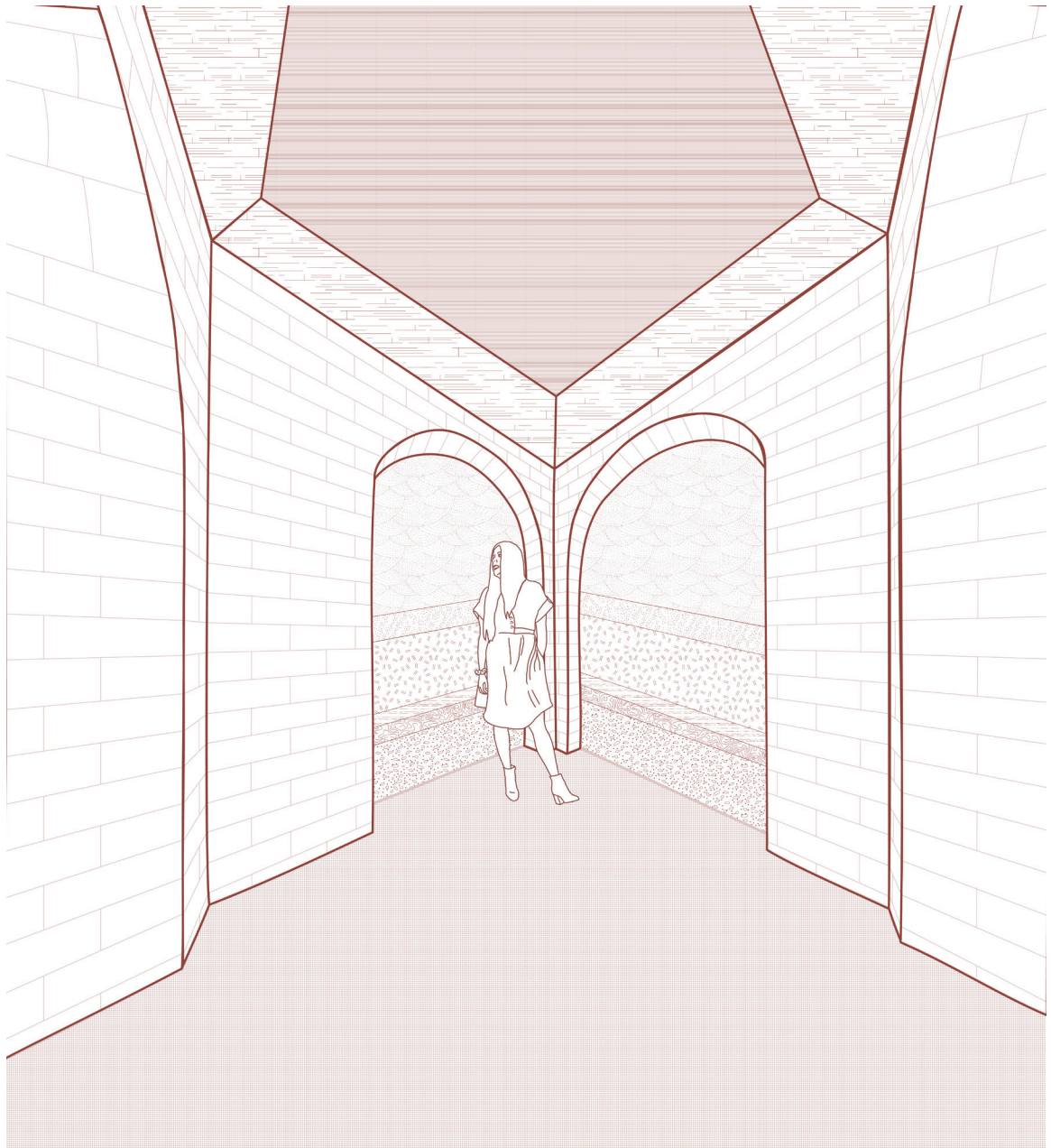


Figure 54: View of watchtower underground

A Cautionary Tale

This thesis aims to view Pompeii not just as an archeological achievement but as a cautionary tale that can be utilized as a form of educating the watchtower's visitors on the destruction that occurred from the Vesuvius eruption of 79 A.D. While the observation level references the ash and debris build-up of the destruction above ground, the architectural intervention also aids in educating about expressing the geological compression of the volcanic event. The lower level of the watchtower brings visitors below ground to educate them on the geological layering of the soils of the site that have been weighing down the old town and its people. The basement level provides a visual glimpse of the soil layering through a series of arched viewports, creating windows that allow visitors a clear view of the volcanic soils. The lower level of the watchtower was designed with influences from the Naples underground, creating an environment of low-arched ceilings, causing one to feel a sense of compression in the space. The sight of the soil and the feeling of compression provides a geological experience through the architecture that will help Neapolitans understand the emergence and importance of the surrounding volcanic landscape and its destructive power. The architecture of the watchtower plays into the story of Pompeii as a cautionary tale. It signifies the sense of destruction and devastation that can be directly viewed from the glass observation balcony and from below ground, where the feeling of being swallowed up by compression creates a sensory experience.

Chapter 5: Designing for Disaster

Duality in Architecture

This thesis strives to design resilient architecture that will continue utilizing the volcanic landscape's dual nature and cultural features through materiality and structural assembly. To achieve this goal, key design decisions of each architectural intervention are drawn from the case studies referenced in Chapter 2. This thesis introduces volcanic ash soils into the concrete mixture for building construction, a strategy inspired by the 2013 residential project in Tokyo from Aray Architects. Just like the Tokyo project, the buildings designed in this thesis anticipate the use of volcanic cement, poured into bricks. Exposed brick walls, reminiscent of past Neapolitan's vernacular finishes, make both the interior and exterior of the watchtower. To ensure structural integrity, steel reinforcement is embedded within the cavity between the interior and exterior layers of brick. This wall assembly provides a high-energy efficient natural heating and cooling system while resisting seismic stress. The spaces between the volcanic bricks create an insulating layer to decrease the thermal load from the exterior heat (Frearson 2023). Introducing volcanic soils into the architectural materiality allows for an appreciation of the surrounding volcanic landscape and building programs. According to architect Asei Suzuki "The volcanic cement has many attributes in other geological features like fireproof, adiabaticity, humidity conditioning, thermal storage, and lightness." (Frearson 2023).

To complement the volcanic concrete bricks, ensuring the roofing assemblies of the resilient architecture is vital to ensure the buildings can withstand the weight of ash, volcanic debris and projectiles from a potential volcanic eruption. Each piece of resilient architecture in this thesis introduces unprocessed steel plates to the exterior layer of the roofs due to their excellent impact energy and weight absorption, as well as their high flexibility and overall corrosion resistance (Yamada et al. 2020, 1).

While these wall and roof assemblies aid in creating resiliency against geological shifts in the volcanic landscape, it is essential to also design for the geological changes below the earth's surface. Base isolation systems complement the footing of each column to limit potential seismic forces for all of the proposed concrete brick and steel building construction (Seismic Resilience n.d.). The base isolation also allows for designed bearings between the foundation slab and the superstructure, releasing the rigid and inflexible horizontal connection to the ground. If seismic activity were to occur, horizontal ground acceleration of the seismic event would be reduced through the vertical bearings, preventing damage to the building structure (Seismic Resilience n.d.). By ensuring that the architectural intervention is designed with a heightened level of attention to the geological unpredictability of the region, the architectural expression instills a sense of confidence in the building's ability to endure and thrive amidst the volcanic activity.

Pier Adaptability

The pier of the place of evacuation and community flex space must also be resilient against potential seismic activity as well as rising sea levels. The pier's height meets the level of the existing seawall and streetscape, designing a seamless transition from the sidewalk to the pier. The pier's height provides a clear and comfortable height offset from the existing sea level and comfortably accommodates projected sea level rise events. In addition to the existing sea wall, a series of breakwater infrastructures along the seascape assist in potential storm surges and sea level rise. Nonetheless, in the event of more drastic events, additional infrastructure must be introduced to ensure the dock can remain resilient. Following the same practice of base isolation, the piers columns absorb seismic shockwaves from the Bay of Naples seafloor. It is essential to design the pier with climate change in mind in addition to the surrounding natural risks. While the surrounding volcanism, earthquakes, and potential flooding from the hills threaten the proposed dock, rising sea levels can be unpredictable and must also be considered in the design process to provide complete confidence that the architectural integration will be as resilient as possible.

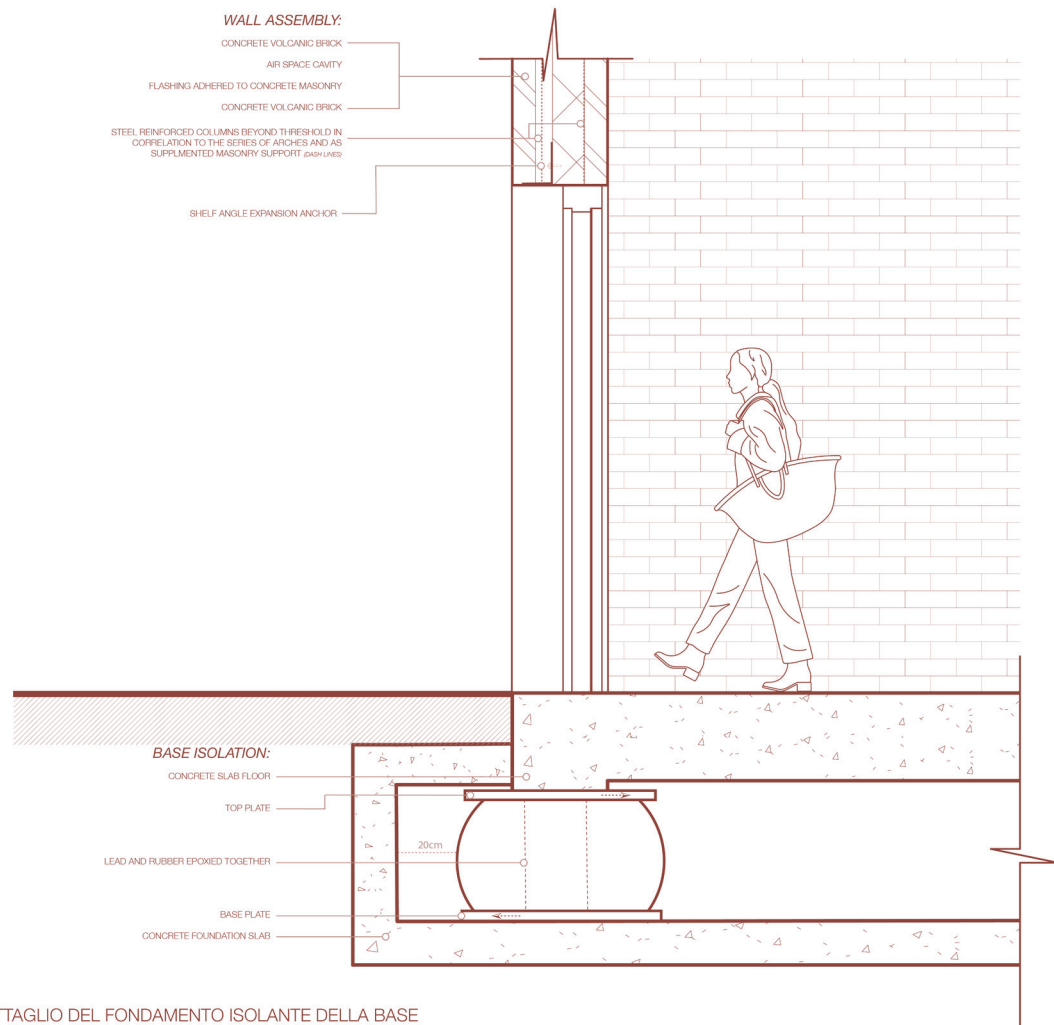


Figure 55: Base Isolation footing detail at door threshold

Biformity of Refuge and Ruin

In addition to linking the Twin Cities in this thesis with views of Vesuvius, The City of the Living provides the prospect of forming an association with the past Roman towns of Pompeii and Herculaneum through the implementation of mosaics. Both Roman ruins are admirably praised in Naples for their archaeological history and preservation, and their mosaics provide an opportunity to understand the lifestyle



Figure 56: Pompeii house of the Great Fountain

(Mage 2019)



Figure 57: Pompeii mosaic reflecting pool

(Mage 2019)



Figure 58: Herculaneum wall mosaic (Mage 2019)

and culture of the people who once inhabited these Roman towns (Mage 2019). The education and cultural celebration spaces within The Villa Comunale Di Napoli will be linked to a series of mosaic pathways that begin at the park's main access points in close proximity to the architectural intervention. The mosaic path will also enhance the design objective of connecting the architectural intervention in The Villa Comunale Di Napoli to the place of evacuation pier. The pier furnishes an opportunity to bridge a connection to past volcanic tragedies with a place of refuge that can respect and educate residents and tourists on the duality of the current site of evacuation and the impact of the disasters of the past. In complementing the unique and well-preserved mosaics from both Roman towns, the pier will also execute ancient Roman water fountains, delivering a sense of duality between the beauty of past disaster ruins and the current evacuation pier. The Roman fountains provide a resource for clean drinking water for visitors of the dock for daily life and in the event of an evacuation.

Education Through Storytelling

This thesis utilizes storytelling as a design tool to provide a space that welcomes and supports Neapolitan's cultural beliefs of superstition and ritual while providing an opportunity to educate about the scientific geological composition of their surrounding volcanic landscape. This method provides a sense of comfort while also softening the conversation regarding potential volcanic eruptions that, in the past, have led to stress and tragedy. The education center is oriented toward a younger audience as they have shown to spark more interest and concern regarding the volcanic activity in the city rather than adult and senior generations (Heiken 2013, 30). Yet the lessons told throughout the education

center will be via superstitious, Roman, Greek and religious characters who all tell stories of their experiences with Vesuvius or the Campi Flegrei region while implementing geological science and attributes that all ages can connect with. The education center is laid out in two large spaces, creating a cultural-nature dualism that complements and intertwines the volcanic landscapes' geological attributes and cultural storytelling.

The ground floor level provides a hands-on interactive exhibit where visitors can familiarize themselves with their surrounding volcanic landscape by touching volcanic rocks and understanding the different attributes between Vesuvius and the Campi Flegrei supervolcano. The mezzanine level explores the cultural connection of the volcanic lands through their history and stories. The education center focuses on four cultural figureheads: Hercules, Virgil, San Gennaro, and Pulcinella, as well as their direct stories of Naples culture and volcanic activity. While reading each character's stories and their experiences in the volcanic region, visitors can observe and make connections between the stories and the geological exhibit below.

In connecting The City of the Living to The City of the Dead, the education center will complement and work alongside the existing Pompeii archaeological educational visits and the Vesuvius Observatory geologists to extend the region's educational framework. The architectural integration of the Roman watchtower is a continuing connection to the education center. Yet, it explores the sense of destruction and devastation that can be directly viewed from the glass observation balcony and below ground with a sensory experience of compression.

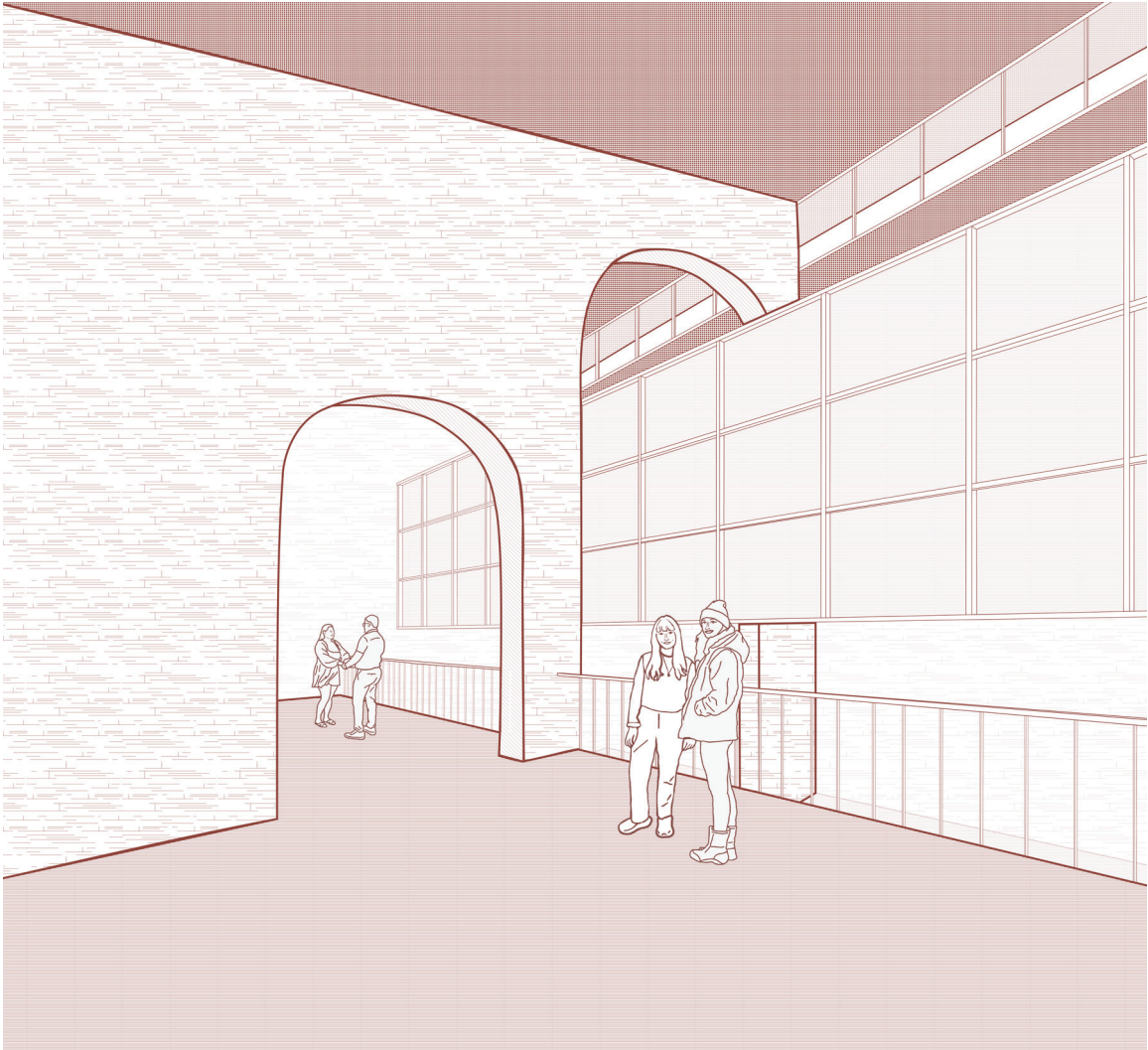


Figure 59: View of archive's Interior and overhead culture vault

Refuge for Culture

The City of the Living is not solely a place for Neapolitans to grow their understanding of the duality between their existing cultural beliefs and superstitions to their volcanic landscape but also an archive of their culture. In connection with the education center, the architectural intervention within The Villa Comunale Di Napoli provides a space that celebrates Naples's cultural identity and beliefs by introducing a cultural archive. The archive provides an extension of the education center by allowing students and professionals

to access specific cultural documentation and goods. The archive's main architectural attraction is an elevated vault that hangs between the structural arches of the archive and can only be accessed in the event of a volcanic evacuation. Within the vault is storage for natural and cultural qualities of the region consisting of regional agricultural seeds, soils, spices, recipes, and additional symbols that make Naples a unique place. For the typical visitor to the archive, the vault provides a sense of mystery regarding what's stored within as the exterior is opaque, creating a sense of drama regarding which cultural and natural artifacts are stored within. This vault is also rather poetic as a geological layer of Naples and foreseeing a future Pompeii. In the event of an eruption, the cultural artifacts within the vault can quickly be transferred to a ferry and transported alongside residents, or it can become part of the geological layering of the city, for future generations to uncover. Unlike citizens of Pompeii, residents of Naples could bring physical and cultural ties with them if their homes and lands are destroyed.

The final cultural celebration space within The Villa Comunale Di Napoli is a winery adjacent to the cultural archive. The spilling of wine represents a good omen for people and is a sign of good luck (Rini 1929, 85). In understanding this superstitious belief, the winery will provide a place of comfort in an architectural intervention designed for disaster. When there is no volcanic risk, visitors can simply enjoy the wines of Campania's rich volcanic soils and savour traditional meals of the region as a place of cultural pride. Visitors of the winery can also explore scaling grape vines growing around the building's exposed structural assembly that connects the archive and the winery. This threshold shows a duality between the heavy steel structure and the fertile grapes

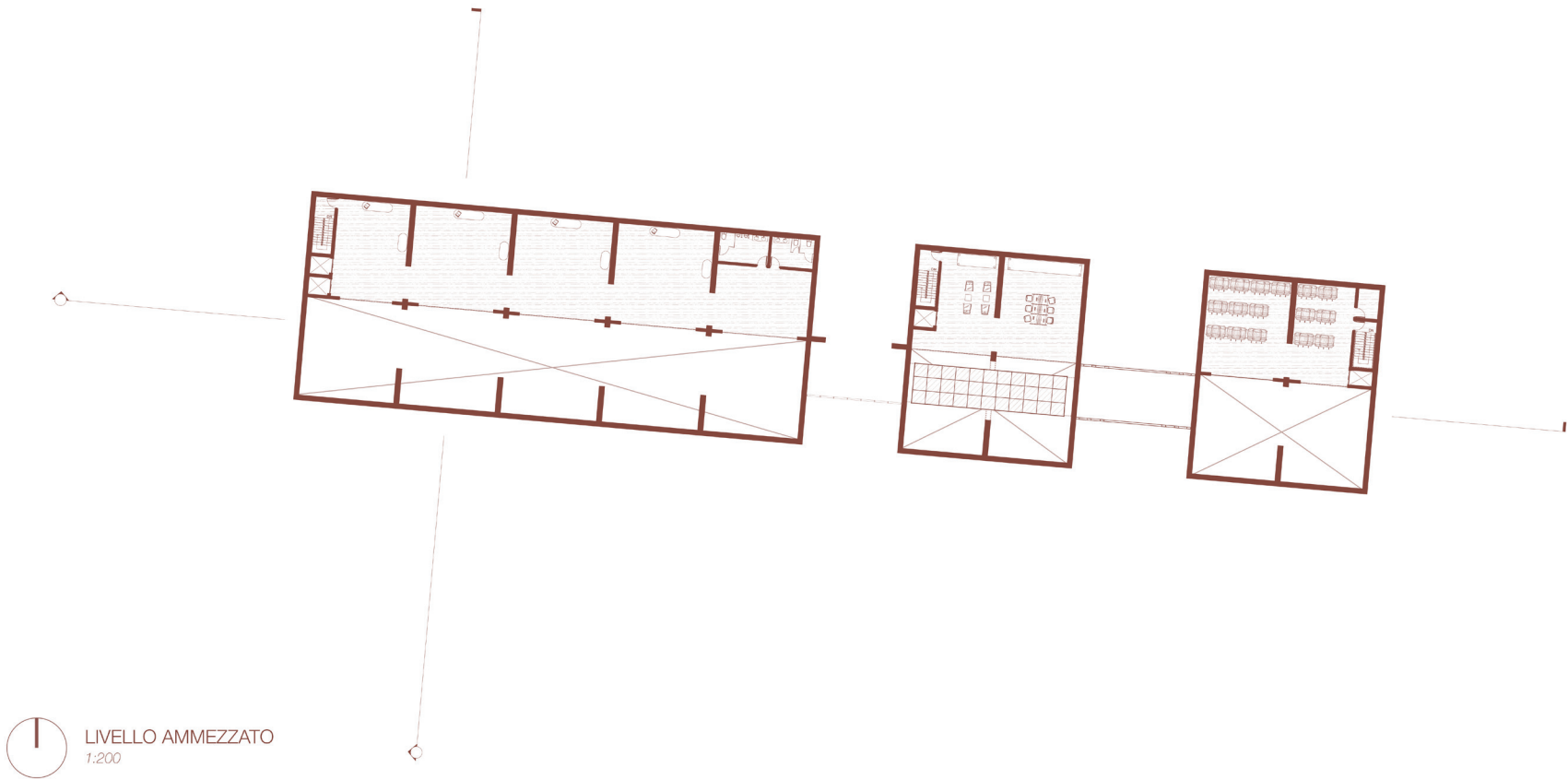


Figure 60: City of Living mezzanine floor plan

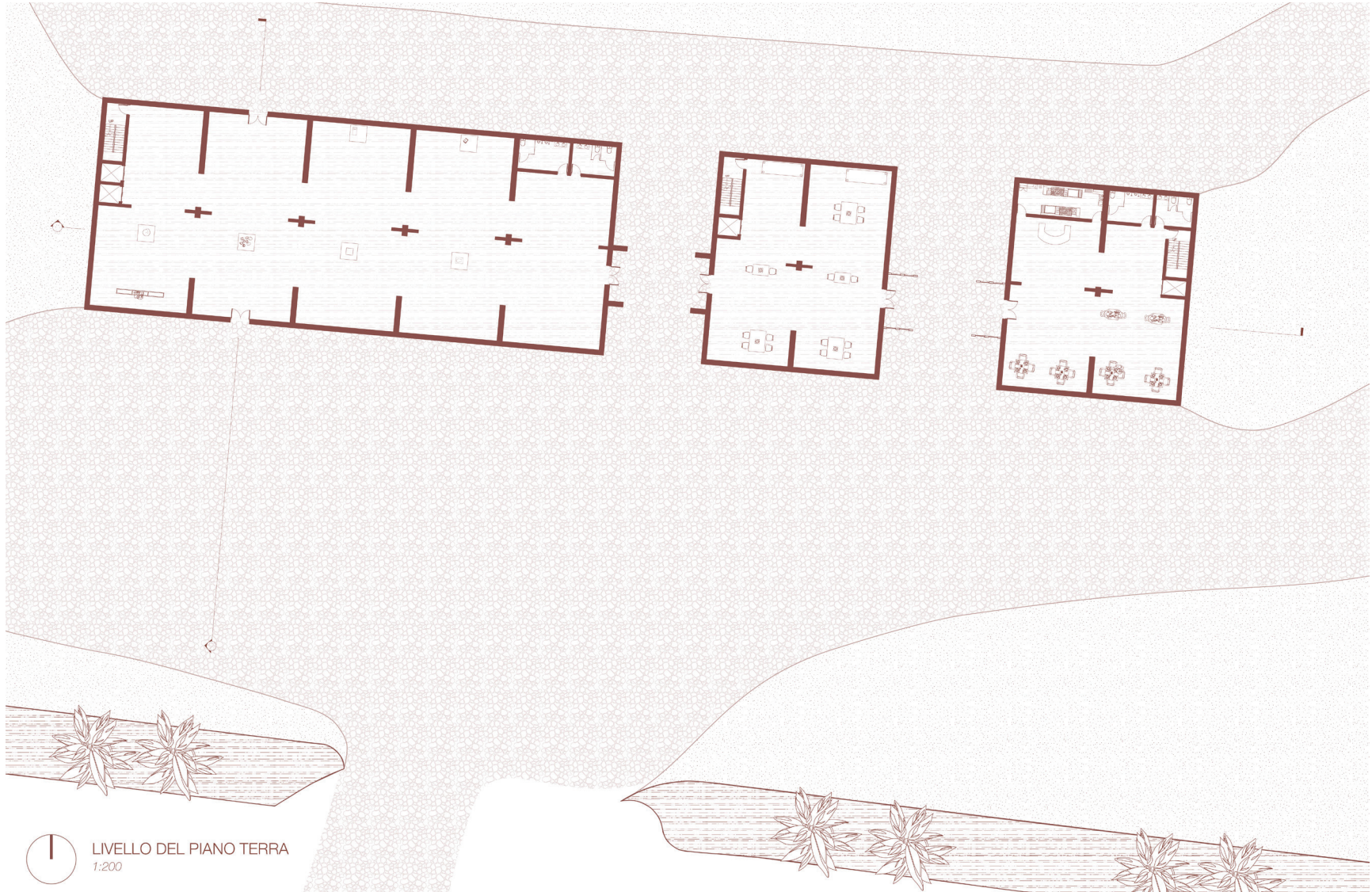


Figure 61: City of Living ground floor plan

growing from the volcanic soil. In addition to the grape vines, agriculture is also celebrated by the introduction of an urban garden. The garden strictly grows and harvests vegetables and grapes that are grown in the volcanic soils of the Campania region. This urban garden delivers a close and personal connection to the region's agricultural gains that the residents risk their lives to live in close proximity to.

Modern Architectural Integration

The city of Naples is no stranger to a more modernist approach to building design and has embraced the duality between its traditional architecture and modern design integration. Naples has embraced its contemporary renewal within its urban fabric (Jallon and Napolitano 2021, 99). Modern architecture in Naples has produced its own adaptability and interpretation of its relationship between function and architectural language, permitting a revised urban fabric and launching the city into a new historical-cultural dimension (Jallon and Napolitano 2021, 99). The architectural integration in The Villa Comunale Di Napoli complements the traditional architecture of the adjacent Naples Aquarium and the modernist architecture of the Darwin Dohrm Museum. This thesis incorporates a contemporary design through the building's exterior style and materially while celebrating a more vernacular interior design that celebrates the Roman arches of the Naples underground. Naples is an ideal city to introduce a contemporary architectural approach due to the city's constant evolution, adaptation and expansion.

A Sense of Comfort

Designing a place of education and evacuation for a population of people who rely on their superstitious beliefs and rituals as a primary method of protection can be a difficult task. The architecture has to be resilient while still creating an environment with a sense of familiarity and comfort for those who visit the space. This level of comfort gives Neapolitans a sense of safety while they explore the geological immersive exhibitions and storytelling. To achieve this mission of creating a place of reassurance and familiarity, this thesis aligns the resilient architecture of the education and cultural celebration spaces to have an interior that symbolizes the Naples underground. While the architectural intervention's exterior is large and dominant in its resiliency, the interior is composed of soft curved arches. The sense of superstition can be seen throughout the building with references to touching iron along the mezzanine guardrail and the spilling of wine from the winery. These superstitious beliefs are folded into design strategies and architectural decisions that reference and respect the history of Naples's Roman underground infrastructure while also celebrating superstitious beliefs that have stood the test of time, creating a level of comfort for visitors. At the same time, they explore the education and cultural celebration spaces while feeling relaxed and comfortable.

Chapter 6: Conclusion

Through the creation of three architectural interventions, this thesis explores how Neapolitans can redirect their attention to the geological cultures and ecologies of their surrounding volcanic landscape through the lens of past, present, and future. By envisioning the creation of a place of education, cultural celebration, refuge and evacuation that can complement the existing beliefs of superstition and ritual, this thesis has provided multiple architectural interventions that relate and educate residents and visitors on past and future volcanic disasters. Through the method of storytelling, this works against a cultural-nature division by culturally connecting to the volcanic regions while also softening the conversation on the risk of living adjacent to and above volcanic activity.

This thesis has probed the methods in which architecture can operate as a catalyst for cultural reorientations amidst the challenges of our earth's collapsing ecologies. Through the architectural design of the interventions in both Twin Cities, they create their own form of education on architectural resilience against seismic activity and volcanic risk. Using methods and symbolism from the region's superstitious beliefs and religious rituals, the design outcomes ensure a sense of duality between the cultural ways of protection and the resilient architecture itself. The exterior of the architectural interventions in The City of The Living shows the strength and resilience of the building's assembly with its thick walls and overhanging roofs. At the same time, the interior provides a sense of comfort and familiarity through

its design, which references the Naples underground. The softness of the interior creates a more comfortable space for visitors and residents to feel safe and not overwhelmed by the geological exhibition.

This thesis serves as a blueprint for anticipating and navigating the climate crisis. It goes past fortifying out collective resilience to precarious circumstances; it furthermore illuminates pathways for facilitating communal practices of mutual support, celebrating abundance, and entertaining in nuanced discussions. This thesis revives historical insights and resolution relevant to navigating catastrophic events. By opening up this discussion, we can collectively embark on a voyage towards architectural practices that are not only innovative and sustainable but also extremely attuned to the complex interplay between culture, environment and society.

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Appendix A: Map of Sea Level Rise



Figure 62: Diagrammatic site map documenting sea level rise risk.
(Map Source: ArcGIS 2023)

Appendix B: Site Diagram of Figurehead Influences

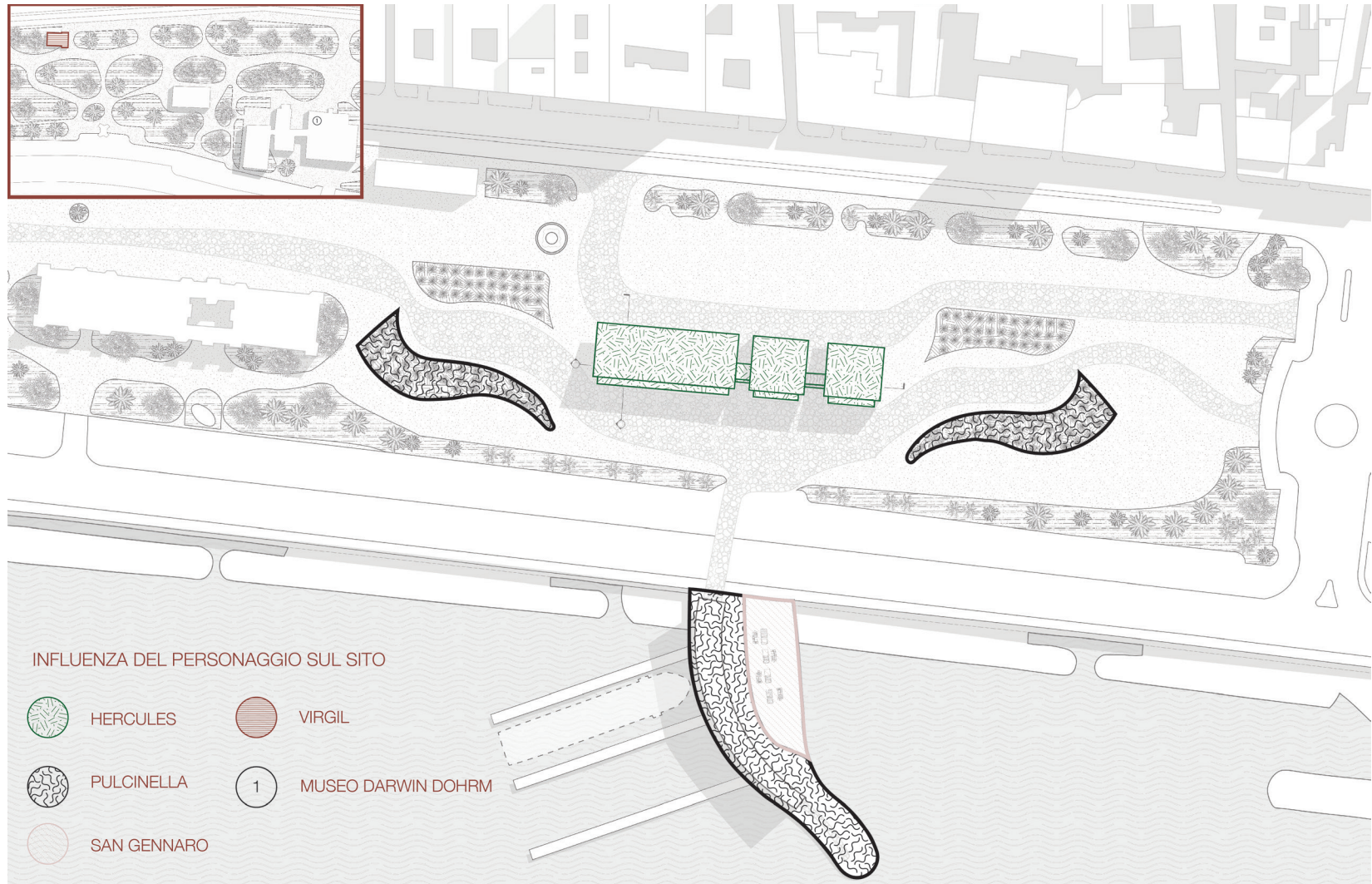


Figure 63: Diagrammatic site map documenting figurehead influences in Villa Comunale di Napoli park