

Perforated Encroachment:

a critical re-imagining of subdivision neighbourhoods
in the desert landscape of Apache Junction, Arizona.

by

Rhiannon Heavens

A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Architecture (M.Arch)

The Faculty of Graduate Studies
Laurentian University
Sudbury, Ontario, Canada

© Rhiannon Heavens, 2021

THESIS DEFENCE COMMITTEE/COMITÉ DE SOUTENANCE DE THÈSE
Laurentian University/Université Laurentienne
Faculty of Graduate Studies/Faculté des études supérieures

Title of Thesis	Perforated Encroachment: A critical re-imagining of subdivision neighbourhoods in the desert landscape of Apache Junction, Arizona	
Titre de la thèse		
Name of Candidate Nom du candidat	Heavens, Rhiannon	
Degree Diplôme	Master of Architecture (M.Arch)	
Department/Program: Département/Programme	Architecture	Date of Defence: 12 April 2021 Date de la soutenance

APPROVED/APPROUVÉ

Thesis Examiners/Examineurs de thèse:

Prof. Patrick Harrop
(Thesis Advisor/Directeur(trice) de thèse)

Prof. Shannon Bassett
(Thesis Second Reader/Deuxième lecteur(trice) de thèse)

Prof. Michaele Pride
(External Examiner/Examineur(trice) externe)

Approved for the Faculty of Graduate Studies
Tammy Eger, PhD
Vice-President Research
Vice-rectrice à la recherche
Laurentian University / Université Laurentienne

ACCESSIBILITY CLAUSE AND PERMISSION TO USE

I, **Rhiannon Heavens**, hereby grant to Laurentian University and/or its agents the non-exclusive license to archive and make accessible my thesis, dissertation, or project report in whole or in part in all forms of media, now or for the duration of my copyright ownership. I retain all other ownership rights to the copyright of the thesis, dissertation or project report. I also reserve the right to use in future works (such as articles or books) all or part of this thesis, dissertation, or project report. I further agree that permission for copying of this thesis in any manner, in whole or in part, for scholarly purposes may be granted by the professor or professors who supervised my thesis work or, in their absence, by the Head of the Department in which my thesis work was done. It is understood that any copying or publication or use of this thesis or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that this copy is being made available in this form by the authority of the copyright owner solely for the purpose of private study and research and may not be copied or reproduced except as permitted by the copyright laws without written authority from the copyright owner.

Table of Contents

	FGS page	III
	Table of Contents	IV-V
	Abstract	VI-VII
	Acknowledgments	VIII-IX
	List of Figures	X-XV
Part 1	Introduction	1
Part 2	Where did the suburbs go wrong?	2
	2.1 Postwar development	3
	2.2 C.I.A.M. and Broadacre city	3
	2.3 Levittown and Maryvale	4-5
	2.4 Synopsis	6-9
Part 3	Building a Toolkit	10
	3.1 Building the toolkit	11
	3.2 Broadacre City	12
	3.3 Arcosanti	13
	3.4 Arcosanti and Broadacre city	13
	3.5 Green Urbanism	14
	3.6 Taliesin West	15
	3.7 Case Study House No.8	16
	3.8 Building and Planning Toolkits	17
Part 4	Place	18
	4.1 Site Introduction	19
	4.2 Site analysis	20-23
	4.3 History	24-25
	4.4 Present	26-33
	4.5 Site Interpretation	34-37
	4.6 Perforated Encroachment	38-39
Part 5	Final Design	40
	5.1 Design Overview	41
	5.2 Aesthetic Influences	42-43
	5.3 Materials and light	44-45
	5.4 Shade screens	46-47
	5.5 Structure	48
	5.6 The Desert	49
	5.7 Townhouse	50-53
	5.8 Single Family home	54-57
	5.9 Apartment	58-65
	5.10 Cluster	66-78
	5.11 Community Plan	79-83
	5.12 Adjacent Plots	84
	5.13 Phoenix Connection	85-87
Part 6	Conclusion	88-91
	Bibliography	92-93

Abstract

The suburbs have been developed to operate as machines of mass-production and 'functionalism' through the division of zones, uniform tracts of housing, and isolated office parks and strip malls. This system separates us from one another, from amenities and from landscape within detached zones of residential areas. We must drive to box stores for groceries, serving thousands of people from different areas. We must drive long distances and sit in traffic to get to work. We do not know our neighbours, we value privacy over human connection and without the proper civic framework, we lack a sense of community.

This system that glorifies the usage of the automobile has left us divided. The urban form of the past provided the potential for collective action and for connections among people of different economic and social classes.¹ Many people are unaware of the radical shift that took place from the generations of strong urban planning that came before World War II, because the cities and suburbs of today are all that we have known.² With the onset of climate change, the numerous social revolutions and shifts in our demographics and new technology, we must rethink not only how we develop our neighbourhoods, but how we live.

Today's renters and home buyers primarily choose between living within the city or in the suburbs. Both options have not been congruent with our economic, social, and environmental needs for some time. Suburban sprawl, however, carries a more damaging effect due to the amount of carbon emitted from daily travel. An alternative form of suburban development is necessary to combat the effects of climate change and respond to the needs of our evolved society.

**Modernism | Retro Futurism | Suburb
Sustainable | Community | Desert**

¹ Philip Langdon, *A Better Place to Live: Reshaping the American Suburb* (Boston, MASS: University of Massachusetts Press, 1994), <https://web-b-ebshost-com.libweb.laurentian.ca/ehost/ebookviewer/ebook/bmxlYmtfXzEzODc1X19BT-g2?sid=bf0299b6-8282-49c6-90f5-8e85d5ba75c9@pdc-v-sess-mgr05&vid=0&format=EB&rid=1>.

² Peter Calthorpe, *Urbanism in the Age of Climate Change* (Washington, DC: Island Press, 2012), <https://link-springer-com.libweb.laurentian.ca/book/10.5822%2F978-1-61091-005-7>.



Acknowledgments

I would like to thank my family and friends for their support over the past six years. A special thank you to my peers and friends at school. We got through this wild ride together. I will look back on all the late nights in studio, the chisel injuries and model disasters with great fondness.

Thank you to my father who raised me to see the value in hard work and in realizing my potential. Another special thank you to my older sister Robin, who has always been my greatest supporter and the strongest female role model in my life. You both inspire me to be my best self.

Thank you to my Thesis advisor Patrick Harrop. I feel so lucky that I had you guiding me through this challenging final year. I greatly appreciated your positivity, humour and support. Thank you to my second reader Shannon Bassett. It is always a pleasure to work with you. Lastly, I'd like to thank the MSoA. Thank you for adapting our learning style this year due to COVID-19 to ensure that our studies were uninterrupted. Thank you for six wonderful years of learning.

List of Figures

Abstract Image

Heavens, Rhiannon “Photograph flying into Phoenix”, December 2020

Figure 1

Heavens, Rhiannon “Zoning division diagram”, November 2020

Figure 2

Heavens, Rhiannon “Disconnect between people diagram”, November 2020

Figure 3

Heavens, Rhiannon “Erasure of landscape and local identity diagram”, November 2020

Figure 4

Heavens, Rhiannon “Dense cities vs suburban sprawl diagram”, November 2020

Figure 5

Heavens, Rhiannon “Unsustainable design disconnected from informed societal context diagram”, November 2020

Figure 6

“Congrès Internationaux D’Architecture Moderne,” *Wikipedia*, October 17, 2020, https://en.wikipedia.org/wiki/Congr%C3%A8s_Internationaux_d%27Architecture_Moderne.

Figure 7

Eric Mumford, *The CIAM Discourse on Urbanism 1928-1960* (Cambridge, MA: MIT Press, 2002).

Figure 8

Heavens, Rhiannon “C.I.A.M. 4 Functions diagram”, November 2020

Figure 9

American Public Media, “The G.I. Bill and Roosevelt’s Economic Bill of Rights,” *American RadioWorks*, accessed December 5, 2020, <http://americanradioworks.publicradio.org/features/americanream/a1.html>.

Figure 10

“Levittown, Pa.: Building the Suburban Dream,” *The State museum of Pennsylvania*, accessed December 5, 2020, <http://statemuseumpa.org/levittown/one/b.html>.

Figure 11

Kate Kershner, “Why Do Cookie-Cutter Neighborhoods Exist?,” *HowStuffWorks* (HowStuffWorks, May 2, 2012), <https://home.howstuffworks.com/home-improvement/construction/planning/why-cookie-cutter-neighborhoods-exist.htm>.

Figure 12

Jon Talton, “Phoenix 101: Maryvale Begins,” *Rogue Columnist*, 2017, https://www.roguecolumnist.com/rogue_columnist/2017/05/phoenix-101-maryvale.html.

Figure 13

“Google Maps Apache Junction.” *Google Maps*, 2020. <https://www.google.com/maps/place/Apache+Junction,+AZ,+USA/@33.4002553,-111.6006681,12z/data=!3m1!4b1!4m5!3m4!1s0x872bb6f168df69c1:0x702c0500cea34b0!8m2!3d33.4150485!4d-111.5495777>.

Figure 14

Heavens, Rhiannon “Precedent Gems”, November 2020

Figure 15

“Reading Broadacre,” *Frank Lloyd Wright Foundation*, October 1, 2018, <https://franklloydwright.org/reading-broadacre/>.

Figure 16

Heavens, Rhiannon “Broadacre city toolkit icons”, November 2020

Figure 17

Heavens, Rhiannon “Broadacre city land perforation diagram”, November 2020

Figure 18

Hasta, “Frank Lloyd Wright and Broadacre City,” *HASTA*, March 14, 2018, <http://www.hasta-standrews.com/features/2018/3/14/frank-lloyd-wright-and-broadacre-city>.

Figure 19

“5 Things to Know about Arcosanti, Arizona,” *Furthermore from Equinox*, accessed December 1, 2020, <https://furthermore.equinox.com/articles/2019/05/form-festival-arcosanti>.

Figure 20

Heavens, Rhiannon “Arcosanti toolkit icons”, November 2020

Figure 21

Heavens, Rhiannon “Arcosanti land perforation diagram”, November 2020

Figure 22

Heavens, Rhiannon “Arcosanti and Broadacre city tools”, November 2020

Figure 23

Heavens, Rhiannon “Green Urbanism diagram”, November 2020

Figure 24

Heavens, Rhiannon “Taliesin West Photograph”, August 2019

Figure 25

Heavens, Rhiannon “Taliesin West toolkit”, November 2020

Figure 26

Heavens, Rhiannon “Taliesin West land perforation diagram”, November 2020

Figure 27

Heavens, Rhiannon “Taliesin West analysis diagram”, November 2020

Figure 28

Heavens, Rhiannon “Photograph of the Case Study House no.8”, September 2019

Figure 29

Heavens, Rhiannon “Case study house no.8 toolkit icons”, November 2020

Figure 30

Heavens, Rhiannon “Case study house no.8 land perforation diagram”, November 2020

Figure 31

Heavens, Rhiannon “Case study house no.8 Modulation Diagram”, November 2020

Figure 32

Heavens, Rhiannon “Case study house no.8 site analysis Diagram”, November 2020

Figure 33

Heavens, Rhiannon “Building Toolkit”, November 2020

Figure 34

Heavens, Rhiannon “Planning Toolkit”, November 2020

Figure 35

“Maps: Data Basin,” Maps | Data Basin, accessed November 15, 2020, https://databasin.org/maps/new?fbclid=IwAR-ONARDh8C2oW1-zXMFA-uJyqLLzLAsg6-DyP45Uuflbr6T_zcpUJ1nhrOU.
Heavens, Rhiannon “AJ Location”, Nov 2020

Figure 36

“Maps: Data Basin,” Maps | Data Basin, accessed November 15, 2020, https://databasin.org/maps/new?fbclid=IwAR-ONARDh8C2oW1-zXMFA-uJyqLLzLAsg6-DyP45Uuflbr6T_zcpUJ1nhrOU.
Heavens, Rhiannon “AJ Public transit”, Nov 2020

Figure 37

“Maps: Data Basin,” Maps | Data Basin, accessed November 15, 2020, https://databasin.org/maps/new?fbclid=IwAR-ONARDh8C2oW1-zXMFA-uJyqLLzLAsg6-DyP45Uuflbr6T_zcpUJ1nhrOU.
Heavens, Rhiannon “AJ mapping”, Nov 2020

Figure 38

Heavens, Rhiannon “site washes, vegetation and roads/paths”, November 2020

Figure 39

Heavens, Rhiannon “Overall site analysis”, November 2020

Figure 40

Heavens, Rhiannon “Site Photo”, June 2017

Figure 41

Klokkan Technologies, “Maps of Apache Junction,” *Old Maps Online*, accessed October 13, 2020, https://www.oldmapsonline.org/en/Apache_Junction,_Arizona.

Figure 42

Klokkan Technologies, “Maps of Apache Junction,” *Old Maps Online*, accessed October 13, 2020, https://www.oldmapsonline.org/en/Apache_Junction,_Arizona.

Figure 43

Bob Vint, “Southwest Housing Traditions: Design Materials Performance,” *HUD User*, 2005, https://www.huduser.gov/Publications/pdf/SouthwestHousing/SW_Housing_Traditions.

Figure 44

Bob Vint, “Southwest Housing Traditions: Design Materials Performance,” *HUD User*, 2005, https://www.huduser.gov/Publications/pdf/SouthwestHousing/SW_Housing_Traditions.

Figure 45

Bob Vint, “Southwest Housing Traditions: Design Materials Performance,” *HUD User*, 2005, https://www.huduser.gov/Publications/pdf/SouthwestHousing/SW_Housing_Traditions.

Figure 46

Bob Vint, “Southwest Housing Traditions: Design Materials Performance,” *HUD User*, 2005, https://www.huduser.gov/Publications/pdf/SouthwestHousing/SW_Housing_Traditions.

Figure 47

Heavens, Rhiannon “scorched desert photograph”, August 2015

Figure 48

Heavens, Rhiannon “Green desert photograph”, December 2014

Figure 49

Gene Hanson, “Cactus”, *Gene Hanson Photography*, accessed December 5, 2020, <http://www.genehanson.com/photography/cactus.htm>.

Figure 50

Peter Rudegear. “The Future of Housing Rises in Phoenix.” *The Wall Street Journal*, June 19, 2019. <https://www.wsj.com/articles/the-future-of-housing-rises-in-phoenix-11560957036>.

Figure 51

“Idaho & Old West Hwy for Sale,” *Loop net*, accessed November 23, 2020, <https://www.loopnet.com/Listing/Idaho-Rd-Old-West-Hwy-Apache-Junction-AZ/16002079/>.

Figure 52

“Monsoon Pounds Phoenix, Flooding Washes & Bringing ‘Nickel-Sized’ Hail,” *AZ Family*, accessed November 1, 2020, https://www.azfamily.com/news/monsoon-pounds-phoenix-flooding-washes-bringing-nickel-sized-hail/article_45df-cfc3-62e0-5de2-81bf-113daba31eca.html.

Figure 53

James Carr, “Evacuations Lifted, SR 88 Reopens after 2 Apache Junction Brush Fires,” *The Arizona Republic*, May 8, 2020, <https://www.azcentral.com/story/news/local/arizona-wildfires/2020/05/07/apache-junction-police-brush-fire-forces-residential-evacuations/3092550001/>.

Figure 54

Heavens, Rhiannon “Site Photos”, January 2021

Figure 55

Heavens, Rhiannon “Site Photos”, January 2021

Figure 56

Kopp, Jeff “site drone photo facing East” January 2021

Figure 57

Kopp, Jeff “site drone photo facing North” January 2021

Figure 58

Kopp, Jeff “site drone photo facing North-East” January 2021

Figure 59

Kopp, Jeff “site drone photo facing West” January 2021

Figure 60

Kopp, Jeff “site drone photo facing South” January 2021

Figure 61

Kopp, Jeff “site drone photo ground texture” January 2021

Figure 62

Kopp, Jeff “site drone photo facing South-East” January 2021

Figure 63

Kopp, Jeff “site drone photo ground texture” January 2021

Figure 64

“Google Maps Apache Junction.” *Google Maps*, 2020. <https://www.google.com/maps/place/Apache+Junction,+AZ,+USA/@33.4002553,-111.6006681,12z/data=!3m1!4b1!4m5!3m4!1s0x872bb6f168df69c1:0x702c0500cea34b0!8m2!3d33.4150485!4d-111.5495777>.

Figure 65

“Google Maps Apache Junction.” *Google Maps*, 2020. <https://www.google.com/maps/place/Apache+Junction,+AZ,+USA/@33.4002553,-111.6006681,12z/data=!3m1!4b1!4m5!3m4!1s0x872bb6f168df69c1:0x702c0500cea34b0!8m2!3d33.4150485!4d-111.5495777>.

Figure 66

“Google Maps Apache Junction.” *Google Maps*, 2020. <https://www.google.com/maps/place/Apache+Junction,+AZ,+USA/@33.4002553,-111.6006681,12z/data=!3m1!4b1!4m5!3m4!1s0x872bb6f168df69c1:0x702c0500cea34b0!8m2!3d33.4150485!4d-111.5495777>.

Figure 67

“Google Maps Apache Junction.” *Google Maps*, 2020. <https://www.google.com/maps/place/Apache+Junction,+AZ,+USA/@33.4002553,-111.6006681,12z/data=!3m1!4b1!4m5!3m4!1s0x872bb6f168df69c1:0x702c0500cea34b0!8m2!3d33.4150485!4d-111.5495777>.

Figure 68

Heavens, Rhiannon “site abstraction”, November 2020

Figure 69

Heavens, Rhiannon “Superstition Mountain range model”, October 2020

Figure 70

Heavens, Rhiannon “Site model exaggerated 4x vertically”, October 2020

Figure 71

Heavens, Rhiannon “Land perforation model”, December 2020

Figure 72

“Google Maps Apache Junction.” *Google Maps*, 2020. <https://www.google.com/maps/place/Apache+Junction,+AZ,+USA/@33.4002553,-111.6006681,12z/data=!3m1!4b1!4m5!3m4!1s0x872bb6f168df69c1:0x702c0500cea34b0!8m2!3d33.4150485!4d-111.5495777>.

Figure 73

Heavens, Rhiannon “Design focus diagram”, January 2021

Figure 74

Rocor. “Richard Neutra.” *Flickr*. July 4, 2012. <https://www.flickr.com/photos/rocor/7504287456>.

Figure 75

Bruder, Will. “ASU Turrell SkySpace.” *Will Bruder Architects*, April 21, 2016. <https://willbruderarchitects.com/project/asu-turrell-skyspace/>.

Figure 76

“Perforated Metal Mesh Sheet .” *Made in china*. Accessed April 28, 2021. <https://wymetalmesh.en.made-in-china.com/product/hvfQcAbEqeYL/China-Small-Hole-0-8mm-Hole-Diameter-1-6mm-Pitch-Hastelloy-Perforated-Metal-Mesh-Sheet-Screen-for-Filter.html>.

Figure 77

“Solar Panel 002 on CC0 Textures.” *CC0 Textures - Public Domain PBR Materials*. Accessed April 28, 2021. <https://cc0textures.com/view?id=SolarPanel002>.

Figure 78

“Concrete Texture.” *Pinterest*, January 13, 2021. <https://www.pinterest.ca/pin/505951339380310275/>.

Figure 79

“Combed: Stucco Texture, Stucco Finishes, Plaster Texture.” *Pinterest*. Accessed April 28, 2021. <https://www.pinterest.ca/pin/403705554066923412/>.

Figure 80

Heavens, Rhiannon “ground floor lighting”, December 2020

Figure 81

Heavens, Rhiannon “ground floor lighting”, December 2020

Figure 82

Heavens, Rhiannon “window shading screen”, March 2021

Figure 83

Heavens, Rhiannon “balcony steel framing”, March 2021

Figure 84

Heavens, Rhiannon “balcony perforated steel panels”, March 2021

Figure 85

Heavens, Rhiannon “apartment walkway steel framing”, March 2021

Figure 86

Heavens, Rhiannon “apartment walkway perforated steel panels”, March 2021

Figure 87

Heavens, Rhiannon “fixed panels connection bracket”, March 2021

Figure 88

Heavens, Rhiannon “Typical housing structure diagram”, March 2021

Figure 89

Kopp, Jeff “site drone photo” January 2021

Figure 90

Heavens, Rhiannon “townhouse floorplan”, April 2021

Figure 91

Heavens, Rhiannon “townhouse interior rendering”, March 2021

Figure 92

Heavens, Rhiannon “Townhouse section”, March 2021

Figure 93

Heavens, Rhiannon “townhouse day perspective I”, March 2021

Figure 94

Heavens, Rhiannon “townhouse day perspective II”, March 2021

Figure 95

Heavens, Rhiannon “townhouse night perspective I”, March 2021

Figure 96

Heavens, Rhiannon “townhouse night perspective II”, March 2021

Figure 97

Heavens, Rhiannon “townhouse balcony rendering”, March 2021

Figure 98

Heavens, Rhiannon “townhouse section II”, March 2021

Figure 99

Heavens, Rhiannon “single-family home floorplans”, March 2021

Figure 100

Heavens, Rhiannon “interior rendering of office/den”, March 2021

Figure 101

Heavens, Rhiannon “single-family home section I”, March 2021

Figure 102

Heavens, Rhiannon “SFH daytime perspective I”, March 2021

Figure 103

Heavens, Rhiannon “SFH daytime perspective II”, March 2021

Figure 104

Heavens, Rhiannon “SFH night perspective I”, March 2021

Figure 105

Heavens, Rhiannon “SFH night perspective II”, March 2021

Figure 106

Heavens, Rhiannon “SFH Terrace rendering”, March 2021

Figure 107

Heavens, Rhiannon “SFH section II”,
March 2021

Figure 108

Heavens, Rhiannon “Apartment roof rendering”,
March 2021

Figure 109

Heavens, Rhiannon “apartment floorplans”,
March 2021

Figure 110

Heavens, Rhiannon “apartment section I”,
March 2021

Figure 111

Heavens, Rhiannon “apartment daytime perspective”,
March 2021

Figure 112

Heavens, Rhiannon “apartment section II”,
March 2021

Figure 113

Heavens, Rhiannon “apartment night perspective I”,
March 2021

Figure 114

Heavens, Rhiannon “apartment walkway rendering”,
March 2021

Figure 115

Heavens, Rhiannon “apartment daytime perspective”,
March 2021

Figure 116

Heavens, Rhiannon “apartment roof rendering”,
March 2021

Figure 117

Heavens, Rhiannon “apartment night perspective II”,
March 2021

Figure 118

Heavens, Rhiannon “apartment roof rendering”,
March 2021

Figure 119

Heavens, Rhiannon “cluster axonometric diagram”,
March 2021

Figure 120

Heavens, Rhiannon “cluster sustainability axonometric
diagram”, March 2021

Figure 121

Heavens, Rhiannon “cluster elevation I”, March 2021

Figure 122

Heavens, Rhiannon “cluster elevation III”,
March 2021

Figure 123

Heavens, Rhiannon “cluster elevation II”,
March 2021

Figure 124

Heavens, Rhiannon “cluster elevation IV”,
March 2021

Figure 125

Heavens, Rhiannon “typical site section”,
March 2021

Figure 126

Heavens, Rhiannon “typical residential site plan”,
March 2021

Figure 127

Heavens, Rhiannon “cluster rendering”,
March 2021

Figure 128

Heavens, Rhiannon “cluster daytime rendering I”,
March 2021

Figure 129

Heavens, Rhiannon “cluster night rendering I”,
March 2021

Figure 130

Heavens, Rhiannon “cluster daytime rendering II”,
March 2021

Figure 131

Heavens, Rhiannon “cluster night rendering II”,
March 2021

Figure 132

Heavens, Rhiannon “cluster sun study June 20 9am”,
March 2021

Figure 133

Heavens, Rhiannon “cluster sun study Dec 21 9am”,
March 2021

Figure 134

Heavens, Rhiannon “cluster sun study June 20 12pm”,
March 2021

Figure 135

Heavens, Rhiannon “cluster sun study Dec 21 12pm”, March
2021

Figure 136

Heavens, Rhiannon “cluster sun study June 20 3pm”, March
2021

Figure 137

Heavens, Rhiannon “cluster sun study Dec 21 3pm”,
March 2021

Figure 138

Heavens, Rhiannon “cluster sun study June 20 6pm”,
March 2021

Figure 139

Heavens, Rhiannon “cluster sun study Dec 21 6pm,
March 2021

Figure 140

Heavens, Rhiannon “community organization diagram”,
March 2021

Figure 141

Heavens, Rhiannon “community site plan”,
March 2021

Figure 142

Heavens, Rhiannon “community axonometric”,
March 2021

Figure 143

Heavens, Rhiannon “connection to empty adjacent plots
diagram”, March 2021

Figure 144

Heavens, Rhiannon “connection to Phoenix diagram”,
March 2021

Figure 145

Heavens, Rhiannon “Housing rendering”,
March 2021

Part 1

Introduction

Part 1 | Introduction

Today's suburbs are defined by the division of zones, uniform tracts of housing, and isolated office parks and strip malls. This system designed around the automobile has left us divided from one another, and from any sense of place or natural landscape. We cannot continue on the unsustainable path of suburban sprawl. Climate change must redirect our settlement patterns and architecture. This thesis develops an alternative planning strategy for the suburbs that is more in tune with our social and ecological needs, while preserving the local character of place. An architecture that enhances these goals perforates the planning strategy.

Part 2 attempts to understand 'where the suburbs went wrong'. We have inherited an urban planning model previously conceived within a postwar societal context. Tracing back the influences that shaped the suburbs allows us to understand the value of past motivations. These past motivations are re-adjusted to suit today's societal context looking towards the future.

Part 3 examines planning and building case studies from the past. Positive aspects drawn from these studies translate into a kit of parts for the design of the Thesis project. Planning precedents include; Broadacre city, Arcosanti and Peter Calthorpe's Green urbanism. Building precedents include; Taliesin West and the Case Study House No.8.

Part 4 investigates the nature of place. This thesis project is sited in the Sonoran desert landscape in Apache Junction, Arizona. Literal site analysis looks at the past and present conditions of the area, the analysis of the site itself, and presents site photos. The site interpretation translates natural site conditions towards an appropriate design response.

Part 5 summarizes the lessons learned from the research, critiques and iterative design into a final Thesis project.

Part 6 concludes the Thesis.

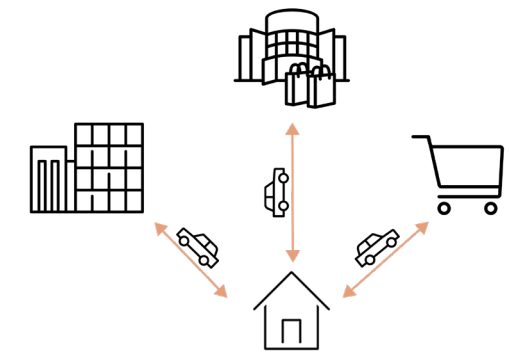


Fig. 1 Zoning division diagram

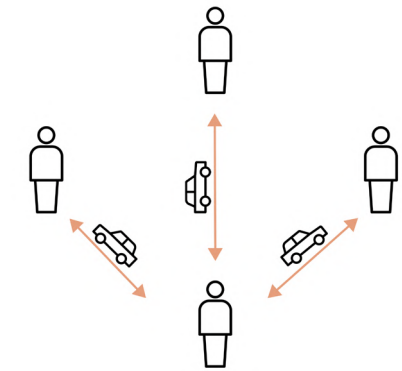


Fig. 2 Disconnect between people diagram



Fig. 3 Erasure of landscape and local identity diagram



Fig. 4 Dense cities vs suburban sprawl diagram



Fig. 5 Unsustainable design disconnected from informed societal context diagram

Part 2

Where did the suburbs go wrong?

Part 2.1 | Postwar development

Before looking ahead, it's important to trace back the influences that have shaped the suburbs we know today. America transitioned from the great depression, to World War II, and further on to an era of unprecedented wealth. This boom after WWII, along with new technological advances brought about an age of mass-production, standardization and specialization. The celebration of the automobile prompted the creation of interstate highways, subdivisions and shopping malls. This led many people to abandon cities. The national identity revolved around 'the American Dream' and the optimism in suburban life.³

Part 2.2 | C.I.A.M. and Broadacre City

The model of suburban sprawl we have inherited was largely influenced by two notable sources; Broadacre city and the C.I.A.M. group. Frank Lloyd Wright's 'Broadacre City' was focused on decentralization, democracy and the individual. Wright aimed to free individuals from the 'sham' he called the city.⁴ Broadacre city is examined in Part 3 as it originally carried good intentions. The 'Congrès Internationaux d'Architecture Moderne' (C.I.A.M.), also played a role with their development of a template for city living. C.I.A.M. held notable members such as Le Corbusier, Alvar Aalto and Walter Gropius. They met for several conferences from 1928-1959. Using Modernist principles, they sought to re-design several city plans around the world and develop a structure for new city planning. They proposed a rational and 'functional' vision of superhighways, superblocks and the division of uses into zones. They focused on four idealized functions that comprise a city; work, leisure, dwelling and circulation. With these functions, they separated cities into zones.⁵ The one function they did not consider, however, was community building, and the effect that their proposed segregation would have on societies living in their 'functional cities'.



Fig. 6 C.I.A.M. Meeting

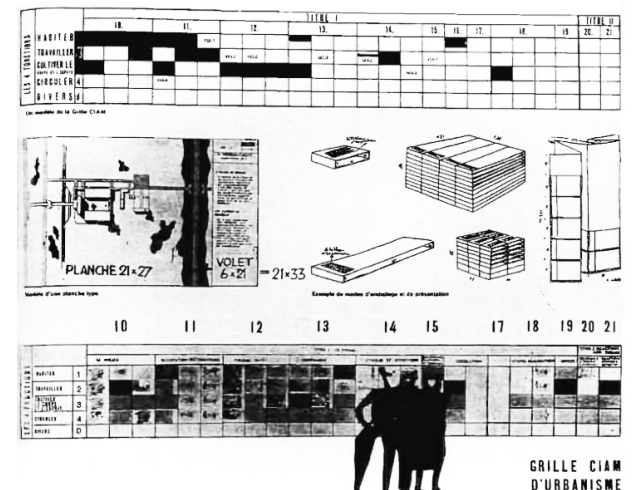


Fig. 7 C.I.A.M. urbanism grid template

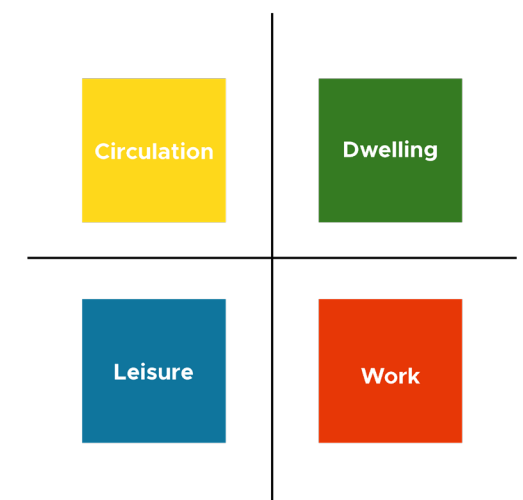


Fig. 8 C.I.A.M. 4 functions diagram

³ Peter Calthorpe, *Urbanism in the Age of Climate Change* (Washington, DC: Island Press, 2012), <https://link.springer-com.libweb.laurentian.ca/book/10.5822%2F978-1-61091-005-7>.
⁴ Ibid.
⁵ Eric Mumford, *The CIAM Discourse on Urbanism 1928-1960* (Cambridge, MA: MIT Press, 2002).



Fig. 9 American Dream Illustration

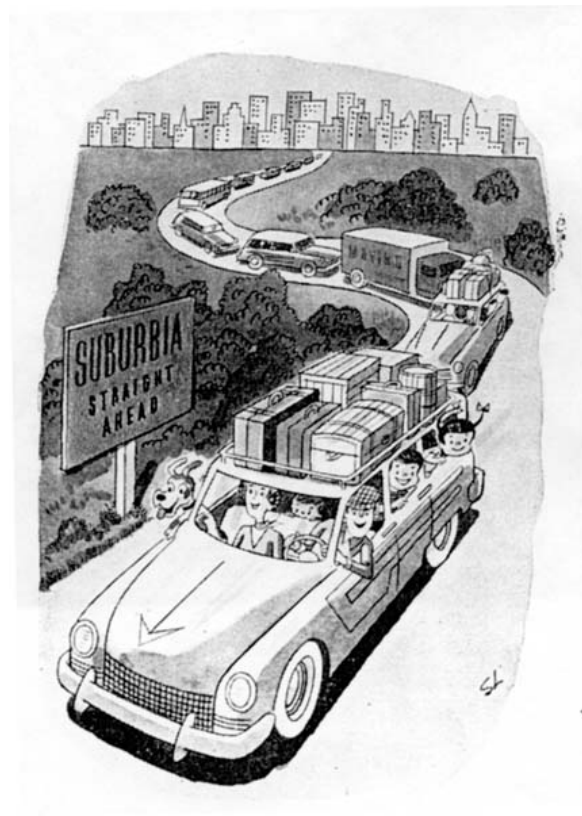


Fig. 10 Postwar suburbia cartoon

Part 2.3 | Levittown and Maryvale

The C.I.A.M. vision of separated functions came to light in the Postwar development of large residential zones filled with mass-produced tract homes. After WWII, returning white soldiers were given federal loan guarantees and low mortgage rates from the Federal Housing Administration and Veterans Affairs. Federal policy until the Fair Housing Act of 1968 prohibited African Americans, and in some cases, Hispanics from buying into the postwar suburbs. This allowed white veterans to buy homes for almost nothing with very low interest rates, creating a demand for millions of homes.⁶ From 1947-1951, the first tract home development called 'Levittown', was built in Long Island, NY.

A visit to the Ford assembly line by Levitt and Sons, a real estate and development company, inspired the production of this neighbourhood. Levittown cleared the landscape of their 6,000 acre land tract and built uniform single family homes in an assembly line fashion. Levittown inspired a new standard of development for suburban residential zones across America.⁷ An example of this can be seen in the first tract home development, 'Maryvale', in Phoenix, Arizona. Maryvale was built from 1955-1959. Though Maryvale used Concrete blocks instead of the stick framing of Levittown, the mass production model of building uniform homes in large residential zones across the United States originated with Levittown.⁸

6 Jon Talton, "Phoenix 101: Maryvale Begins," *Rogue Columnist*, 2017, https://www.roguecolumnist.com/rogue_columnist/2017/05/phoenix-101-maryvale.html.

7 Kate Kershner, "Why Do Cookie-Cutter Neighborhoods Exist?," *HowStuffWorks* (HowStuffWorks, May 2, 2012), <https://home.howstuffworks.com/home-improvement/construction/planning/why-cookie-cutter-neighborhoods-exist.htm>.

8 Talton, "Phoenix 101: Maryvale Begins".



Fig. 11 'Levittown' Postwar development, Long Island, New York



Fig. 12 'Maryvale' Postwar development, Phoenix, Arizona



Fig. 13 Present suburbs, Mesa, Arizona

Part 2.4 | Synopsis

Levittown was a valid response to fill the urgent demand for Postwar housing. However, this model has insidiously grown to define the suburbs of today. The fundamental development strategies from the Postwar suburb are no longer being used to fill an urgent need for soldier dwellings. Rather, they are being used as an efficient means for developers to obtain profit. Clearing a landscape is more efficient than working with the constraints of an existing site. Designing simple homes able to be built in an assembly line manner translates to less labour costs. Suburban development has become a very lucrative business, but in return it has devastated the character and sustainability of our neighbourhoods, cities and regions. Our society has drastically evolved since the Postwar era, but the suburbs continue to reflect the past without addressing contemporary needs.

The Postwar migration to the suburbs by white soldiers and their families contributed to a reorganization of power that affected race relations, gender roles and status within society. Homeownership suddenly became possible with federal interjection. Working class white families rose into the middle class with the postwar boom and access to housing. Those that lived in the postwar suburbs experienced a sense of 'sameness' through the overall conformity of the neighbourhood. There was little demographic difference. Families made about the same amount of money, lived in identical homes, and were in the same stage of life. Not to mention, they were all white. Society and popular culture emphasized that the woman's greatest purpose in life was raising children, tending to their husband's needs and cooking and cleaning. Minority women did not experience the suburban expectations as they were barred from suburbia altogether. Black, Hispanic and Asian people could not purchase homes in the suburbs as their presence was said to lower property values.⁹

⁹ Kim Elliot, "The Dark Side of Suburbia," *Khan Academy*, accessed March 28, 2021, <https://www.khanacademy.org/humanities/us-history/postwarera/postwar-era/a/the-dark-side-of-suburbia>.

Instead, minorities were placed in inner city neighbourhoods that were 'redlined' as areas that were "risky" investments. The "risky" nature of these redlined areas made it very difficult for residents to receive bank loans for home repairs or to purchase a new home altogether. The federal government subsidies and the prejudice against lending to minorities gradually increased the divide physically and economically between white people and people of other races.¹⁰

Though the United States has made progress over the past seventy years in advancing racial equality, there is still more work to be done. Today, 59% of black home buyers are concerned about qualifying for a mortgage, compared to 46% of white buyers. This is due to the fact that lenders are still denying Black applicants at a rate of 80% higher than white applicants. The homeownership rate of black millennials is 26.2% lower than white millennials.¹¹ The suburbs are seeing two key demographic changes that are advancing the diversity for the better. Immigrants are no longer being shoved into the inner city neighbourhoods of the past. As of 2010, 51% of immigrants resided in the suburbs. Many immigrants to the US are highly educated and are choosing to live in the suburbs to give their children access to good schools. The second factor is the overall racial transformation of the suburbs. This is partly due to immigration but it is also due to societal change and the advancement of civil rights for black people. Today minorities comprise 35% or more of the US suburban population. The suburbs are developing to have richer demographics but there is still racial inequality.¹²

The suburbs are no longer solely inhabited by married, heterosexual couples where the man works and the woman stays home with the children. The family structure, gender roles, gender identity and sexual orientation have all evolved within society over the last seventy years to be more fluid.¹³

¹⁰ Ibid

¹¹ AJ Horch, "Buying a Home: Why It's Harder for Younger Generations than Their Parents," *CNBC*, November 25, 2020, <https://www.cnbc.com/2020/11/25/buying-a-home-why-its-gotten-harder-for-younger-generations-.html>.

¹² Richard Florida, "The Changing Demographics of America's Suburbs," *Bloomberg*, November 7, 2019, <https://www.bloomberg.com/news/articles/2019-11-07/the-changing-demographics-of-america-s-suburbs>.

¹³ Pew Research center, "The American Family Today," *Pew Research Center*, December 15, 2015, <https://www.pewresearch.org/social-trends/2015/12/17/1-the-american-family-today/#:~:text=Family%20life%20is%20changing, and%20the%20drop%20in%20fertility>.

There is no longer one primary type of family. Families are more diverse and they often develop over a child's life as their parents' relationships change. In 1960, there was one dominant family form, only 5% of births were outside of marriage and 73% of children lived in a family with two married parents in their first marriage. Today 40% of births occur outside of marriage. Two-parent households are declining as divorce, remarriage and cohabitation rise. Families are also smaller now compared to the Postwar era, as women's roles have developed. Advancement in women's rights has allowed more and more women to become educated, enter the workforce and access contraception. That evolution has allowed women to have greater freedom of choice and gain a sense of purpose outside of the home. The suburbs have become more diverse to include more than one type of family. In fact, a household in the suburbs doesn't need to be a family at all. It could be a group of friends, or a single person with a well-paying job that wants to live outside of the city. The rules have changed as our society evolves.¹⁴

The American dream of buying a home still exists, but the circumstances in obtaining that goal have changed. Millennials are living at home with their parents for longer, renting in trendier places for longer and marrying later. Millennials are the most educated generation so far, but they are also the most in debt because of student loans. The rising cost of housing and saving up for a down payment has proven to be very challenging for new homebuyers. The COVID-19 pandemic has exasperated these existing economic challenges not only for millennials, but all of America.¹⁵ Prior to the pandemic, one in three households were spending more than thirty percent of their income on housing costs (a benchmark for affordability). The number of people without housing of any kind whether it's buying or renting has been increasing across America.¹⁶

¹⁴ Ibid.

¹⁵ AJ Horch, "Buying a Home: Why It's Harder for Younger Generations than Their Parents," *CNBC*, November 25, 2020, <https://www.cnbc.com/2020/11/25/buying-a-home-why-its-gotten-harder-for-younger-generations-.html>.

¹⁶ William Hanley, "Affording America - How to Solve a Housing Crisis," *Dwell Magazine*, 2020.

Prior to the pandemic, the United States was short seven million rental units for low income households. The pandemic has left over forty million people in the U.S. without jobs, facing eviction. A recession following the pandemic lays the ground for a National housing crisis. New solutions are needed for affordable housing.¹⁷

COVID-19 has altered our world. Going forward, several things in our lives will change. Remote meetings will be normalized. The shift to remote meetings has changed the way we see the necessity of in-person meetings. More employers will allow their staff to work remotely and they will use a smaller office space for periodic meetings. This gives employees more flexibility in choosing where they live. This will re-shape our communities. More people will move to the suburbs and rethink the design of their homes. People living downtown are spending an incredible amount of money on their rent to be close to their office. Without that anchor, many people will leave downtowns for affordable housing outside of the city. Socializing will happen more in the communities people live in instead of at the office. Working remotely at home will leave many with greater energy to get out of the house and socialize.¹⁸

Our informed society recognizes the urgent need for sustainable design and practices. We must adapt how we build and plan our cities to combat climate change. Sprawling tracts of single family homes ruled by the automobile are no longer in tune with the environmental challenges we face. California has recently passed a solar mandate as of January 2020 that requires all new construction to use solar energy. This saves the owner energy costs, increases the sustainability of the structure and reduces the effect of power outages.¹⁹ This type of thinking is flooding to Arizona with mass amounts of California residents moving East. The economic challenges from COVID-19 and working remotely has left many Californians abandoning their high cost lifestyles.²⁰

The California effect was seen this past election with the red state turning blue. This new demographic will continue to affect Arizona culture.

Our society has dramatically evolved since the postwar era, we have become more informed, accepting and technologically advanced. We face new challenges in light of climate change and recognize the importance of sustainability in all walks of our lives. COVID-19 has changed our lifestyles and has exasperated existing economic challenges. The postwar suburban planning model no longer meets the needs of our society and the challenges we face. An alternative development strategy is necessary to reflect how far we have come and to improve the circumstances for future generations.

¹⁷ Ibid.

¹⁸ Jessica Stillman, "Bill Gates: The World Will Be Dramatically Different After Covid-19," *Inc.*, November 18, 2020, <https://www.inc.com/jessica-stillman/bill-gates-anthony-fauci-pandemic-changes.html>.

¹⁹ Perry, "Solar Requirements for Commercial and Residential Development in California," *Cal Solar, Inc.*, August 21, 2020, <http://www.calsolarinc.com/solar-requirements-for-commercial-and-residential-development-in-california/>

²⁰ Phyllis Casillas, "Mortgage Applications Reveal a Flood of Californians Moving to Arizona," *AZ Big Media*, January 25, 2021, <https://az-bigmedia.com/lifestyle/mortgage-applications-reveal-a-flood-of-californians-moving-to-arizona/>.

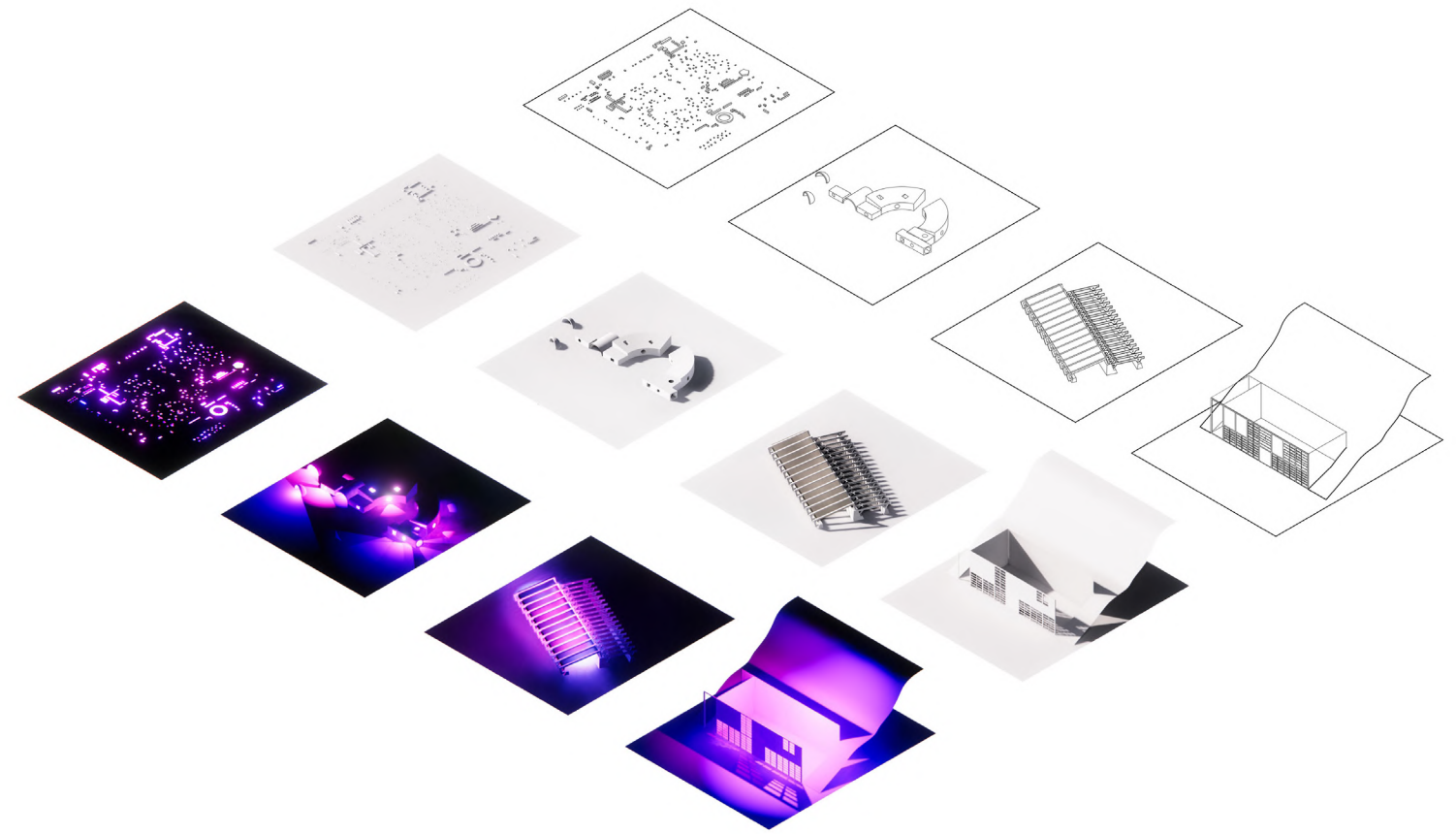


Fig. 14 Precedent 'gems' (from left to right) Broadacre city, Arcosanti, Taliesin West and the Case Study House No. 8

Part 3.1 | Building the toolkits

Historically, past subdivisions were not solely modelled on Levittown. There were idealized architectural projects and planning strategies whose original intentions were in tune with our present needs. We can search out the gems that held real optimism for a stronger social, ecological, and economic future. These gems informed a kit of parts for the design of the thesis project.

The 'Planning toolkit' looked at 'Broadacre city' from Frank Lloyd Wright, 'Arcosanti' from Paolo Soleri and Peter Calthorpe's 'Green Urbanism'. The 'Building toolkit' looked at 'Taliesin West' by Frank Lloyd Wright and the 'Case Study House No. 8' by Charles and Ray Eames.

Lessons learned from these investigations were added to the building and planning toolkits. These toolkits informed the design of the housing and the planning of the re-imagined suburb.

Part 3

Building a toolkit

Part 3.2 | Broadacre City

'Broadacre City' hoped for a more natural world. Though it did influence suburban sprawl, in its purest form, Frank Lloyd Wright intended to connect people with nature. Wright worked on this proposal from 1932 until his death in 1959. He envisioned a sprawling urban planning model as the key to individual freedom. He was adamant about freeing people from the 'sham' he called the city. He saw cities as the pollutant enemy of democracy and individuality. He hoped that this new form of urbanism would shape a stronger spirit and character. He was against mass production, as it meant the end of quality production. He was wary of any notion of 'efficiency' and 'profit-mindedness' as he knew that this meant 'quantity-minded'. He feared conformity and mediocrity would ravage society if we continued on the path of building upwards, so he proposed spreading out.²¹

In his scheme, families were given one acre of land. The land was minimally perforated in a sprawling arrangement. Residential zones were separate from amenities, only accessible by car or the imagined flying machines Wright designed. Wright used the existing landscape to inform the placement of buildings and preserved notable landscape features.²²

Unaware of the environmental effects of sprawl and the automobile, his proposal held good intentions. Ironically, his vision that feared mass-production contributed to the evolution of mass-produced and segregated suburbs we know today.



Fig. 15 Broadacre city model

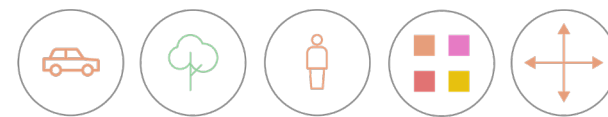


Fig. 16 Broadacre city toolkit principles

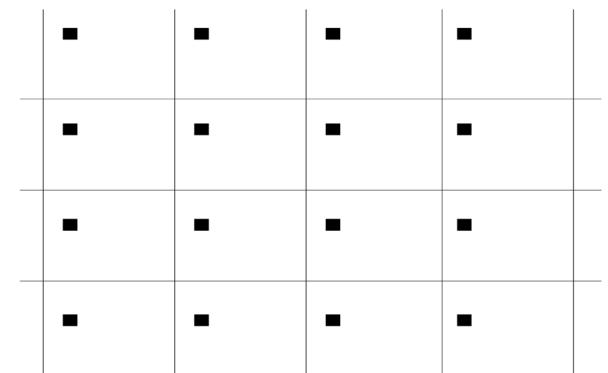


Fig. 17 Broadacre city land perforation diagram



Fig. 18 Broadacre city illustration by FLW

21 Frank Lloyd Wright, *A Testament*. (New York, NY: Bramhall House, 1957), <https://babel.hathitrust.org/cgi/pt?id=mdp.39015013177020&view=1up&seq=7>.

22 Frank Lloyd Wright, *The Living City* (New York: New American Library, 1963)

Part 3.3 | Arcosanti

Contrary to Broadacre City, Paolo Soleri, a former student of Frank Lloyd Wright, proposed 'Arcosanti', a dense model of city living. He located Arcosanti in Yavapai County, Arizona. It has been in construction since 1970 by architecture and urban planning residents of the small 'town'.²³

Soleri sought to draw a hard line in between cities and the natural world. He perforated the land in a centralized composition, leaving more open landscape. He critiqued sprawl and the destructive nature of the automobile and our consumerist culture. He built Arcosanti to advocate the importance of ecological mindfulness and the responsibility we each carry to live more consciously of our impact. With that in mind, he proposed a walkable, close knit community where dwellers lived communally to reduce their waste and energy use. He stated that as a consumerist culture with an ever increasing population, we were heading towards failure unless we chose a different path of development.²⁴

Arcosanti has dense living areas and large social gathering spaces. This encourages the residents to spend less time privately and more time engaging in social activities. The shared communal spaces create opportunity for connection. These are lessons that play into the design of the thesis project.



Fig. 19 Photograph of Arcosanti



Fig. 20 Arcosanti toolkit principles

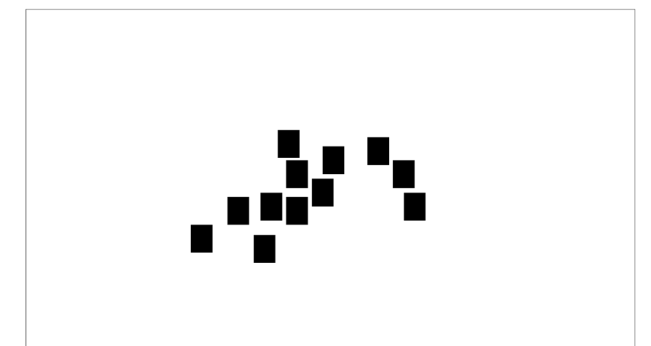


Fig. 21 Arcosanti land perforation diagram

Part 3.4 | Arcosanti and Broadacre city

Broadacre City and Arcosanti both offered alternative modes of planning. Positive aspects from each inform the urban planning of the thesis project. Broadacre city held notable intentions towards landscape preservation and connecting humans to the natural world. Arcosanti held lessons towards the importance of fostering community through social opportunities, mixing uses, developing for the pedestrian instead of the automobile and building sustainably.



Fig. 22 Arcosanti and Broadacre city tools to inform thesis

23 Richard Whittaker, "A Conversation with Paolo Soleri," *Works + Conversations* 5 (November 5, 2001): pp. 10-18.

24 Ibid.

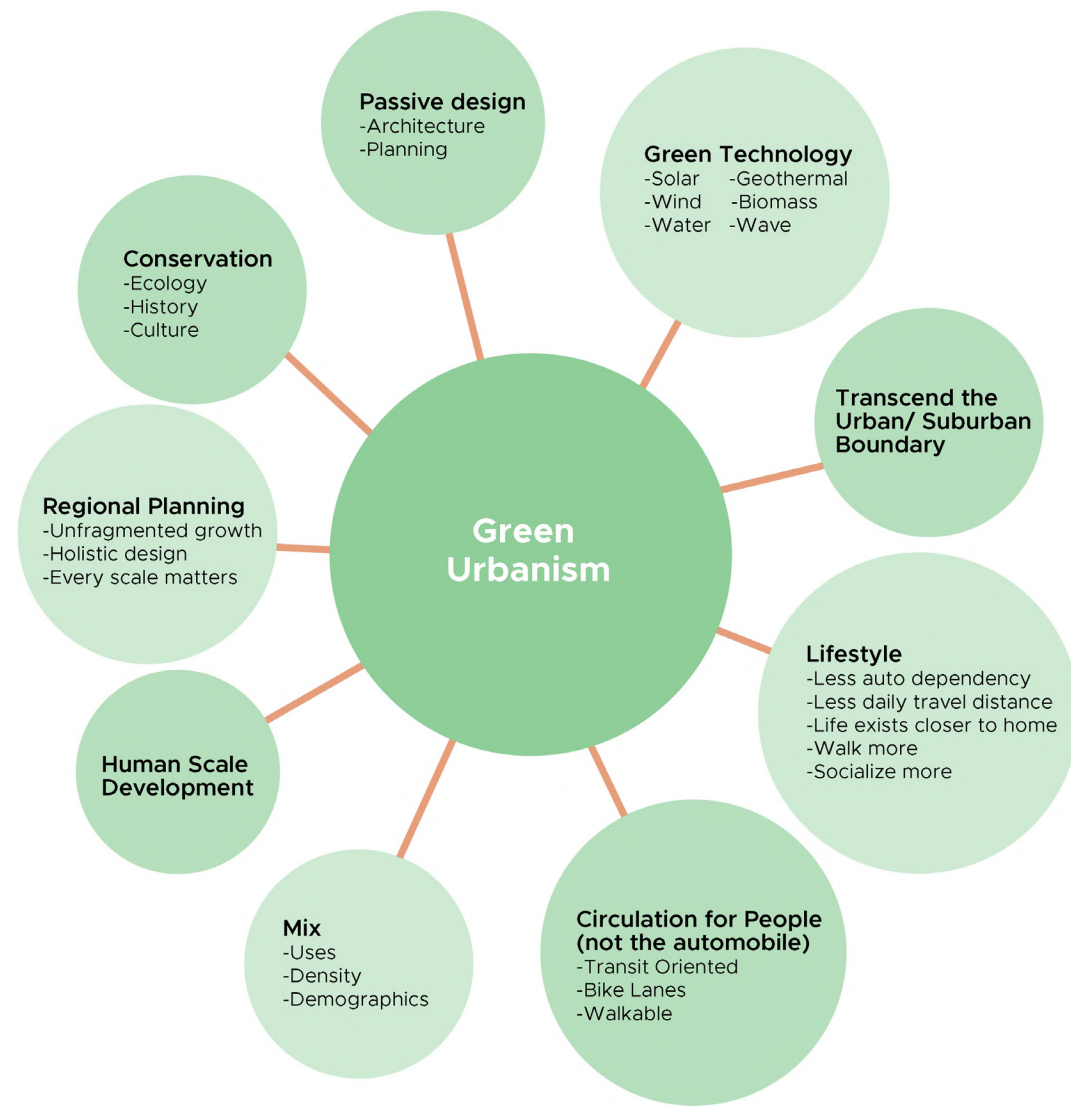


Fig. 23 Green urbanism diagram

Part 3.5 | Green Urbanism

Looking to a more recent model for sustainable planning, Peter Calthorpe offers a proposal for a new 'Green Urbanism' that resonates with the goals of this thesis. He outlines that, "responding to climate change and our coming energy challenge without a more sustainable form of urbanism will be impossible." Advances in green technology have certainly increased our odds, but even a doubling of auto efficiency cannot keep up with sprawl induced travel.²⁵

We cannot respond to climate change with individual isolated efforts, we must rethink the system as a whole. He proposes walkable and compact development combined with conservation technologies within a new urban form. Contrary to urban cities and suburban sprawl, this new form would be the most cost effective solution to combat climate change with collateral economic, social and environmental benefits. Figure 23 illustrates the elements that work together to form 'Green Urbanism'.²⁶

²⁵ Peter Calthorpe, *Urbanism in the Age of Climate Change* (Washington, DC: Island Press, 2012), <https://link-springer-com.libweb.laurentian.ca/book/10.5822%2F978-1-61091-005-7>.

²⁶ Ibid

Part 3.6 | Taliesin West

Looking at desert buildings, we cannot ignore the presence Frank Lloyd Wright held in Phoenix. He spent decades living and designing in Arizona. His personal ode to the desert is manifested in the design of Taliesin West. Taliesin West served as Wright's winter home and as a school for his students. His students would spend half of the year at Taliesin in Wisconsin and the other half at Taliesin West in Arizona. Construction began with his apprentices in 1937 and continued until 2020 on a small scale with the design and construction of student made dwellings scattered throughout the compound. Taliesin West is situated at the base of the McDowell Mountain Range, in Scottsdale. Wright was very clear that you must never build on the mountain, nature must take precedence.²⁷

Wright and his apprentices built a compound of mass masonry walled buildings with canvas roofs. The triangular geometry of the main buildings were Wright's reaction to the angular nature of the surrounding mountains. He let nature guide the form of the buildings and then literally become building through the usage of site boulders for masonry. By separating building volumes, he created a series of breezeways and courtyards for natural ventilation. This was enhanced by the evaporative effect of shallow ponds that cooled the breezeways. He used light as a tool to create the diffused quality below the canvas roofs. He celebrated sunlight by designing opportunities for light to highlight building texture and form. Dentils on the roof edges imitated the spines of cacti and created interesting shadows below. The texture of the mass masonry walls is celebrated with sunlight.²⁸

Similar to Arcosanti, the compound at Taliesin West has dwelling areas for students and generous social gathering space. This informs the planning of the thesis project. The building uses passive strategies for warm climates and allows the landscape to inform design, these strategies were added to the building toolkit.

²⁷ Suzette A. Lucas, *Taliesin West: an Interpretive Guide* (Scottsdale, AZ: Frank Lloyd Foundation, 1993).

²⁸ Ibid.



Fig. 24 Taliesin West photograph

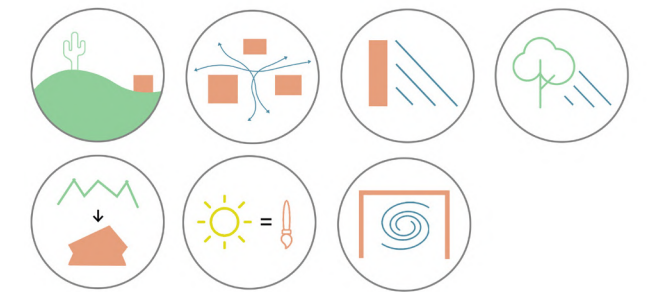


Fig. 25 Taliesin West toolkit principles

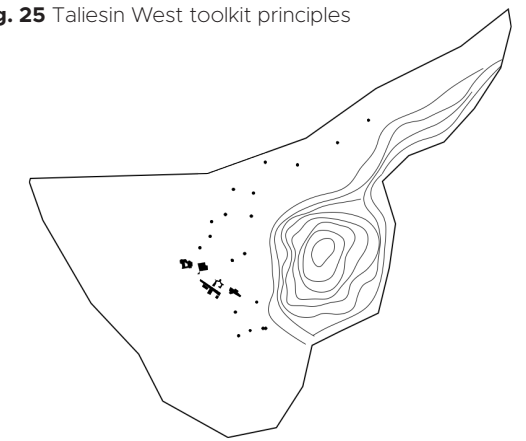


Fig. 26 Taliesin West land perforation diagram

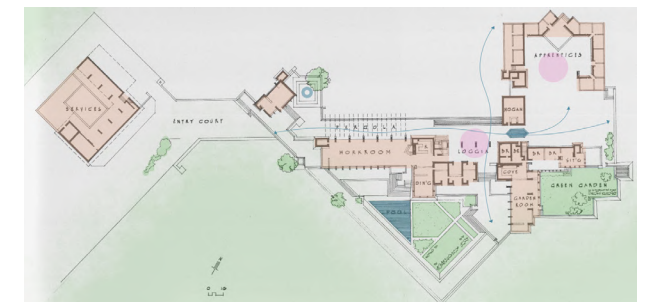


Fig. 27 Taliesin West analysis diagram in plan



Fig. 28 Photograph of the Case Study House No. 8



Fig. 29 Case Study House No. 8 toolkit principles

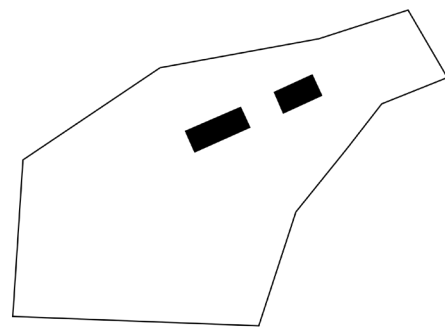


Fig. 30 Case Study House No. 8 land perforation diagram



Fig. 31 Case Study House No. 8 modulation diagram

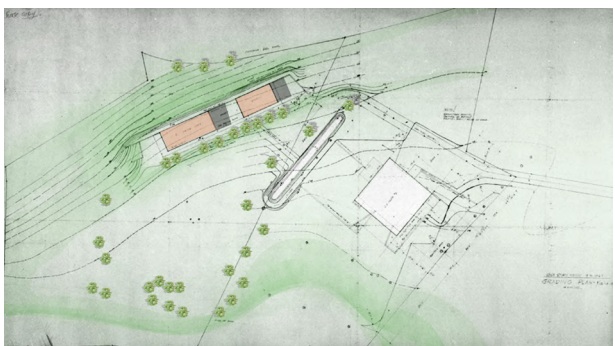


Fig. 32 Case Study House No. 8 site analysis diagram

Part 3.7 | Case Study House No. 8

The Case study House No. 8 by Charles and Ray Eames was developed within a larger project of about thirty housing prototypes aiming to solve the Postwar housing demand. The Eames' house was built in 1949 in the Pacific Palisades, California. Nestled into a hillside, the size of the Eames's home is delineated by the distance in between the line of eucalyptus trees and the edge of the hill. Though the site of the Eames' house is expansive, they located their home on the edge of the site to allow nature to take the center stage.²⁹

Instead of stick framing, they used lightweight open web steel joists to cover long distances, creating an open floorplan within. The prefabricated joists also reduced construction time and cost. They modulated the facade with different material opacities and colour, filling voids of the same size. Using these materials and building methods made the house more affordable for the potential user of this prototype. They separated building volumes to create courtyards that encouraged outdoor social activity and acted as passive microclimates for cooling. This cooling effect was reinforced by shading from the building and the surrounding eucalyptus trees. Designing their home in a modular fashion opened up the opportunity for variations of the initial proposal.³⁰

This building added further passive strategies for warm climates, prefabricated construction, and building with respect to landscape to the building toolkit. The modern aesthetic was also a quality that was admired. Their optimism for a bright postwar future comes through in a style that was highly innovative for their time.

²⁹ Catherine Ince and Lotte Johnson, *The World of Charles and Ray Eames* (New York, NY: Rizzoli ; London, 2016).

³⁰ Ibid.

Part 3.8 | Building and Planning Toolkits

From these examples, a toolkit for building and planning was created for the thesis project.

The Building toolkit includes passive strategies for warm climates, including; shading from building, shading devices and vegetation, and creating room for courtyards, and breezeways for natural cooling. Green energy in the desert can be collected with solar and rainwater harvesting during their monsoon/ flash flooding season. Aesthetically, the building design is informed by landscape, the hopefulness in modern design and creating opportunities for sunlight to highlight the architecture.

The Planning toolkit includes designing for transit, pedestrians, and cyclists at a human scale. Passive planning includes creating courtyards, breezeways, and shading. A local identity is created by preserving local historic, cultural and natural features. Connecting people by mixing uses and functions allows for a richer demographic. Walkable social areas are important in fostering a sense of community.

Re-thinking housing is not enough to reduce the damaging environmental effects of the suburbs. This thesis aims to re-think the planning of the suburbs using a 'whole systems' approach.



Fig. 33 Building toolkit

Top left to right: Vegetation shading, courtyard micro-climates, solar energy, land precedence, building clusters
Bottom left to right: breezeways, building shading, rain harvesting, landscape informing design, sun to highlight architecture



Fig. 34 Planning toolkit

Top left to right: transit-oriented, cycling-oriented, preserve local identity, unfragmented growth, community focused
Bottom left to right: pedestrian/human scale, sustainability, nature's influence, mixing uses, mixing densities

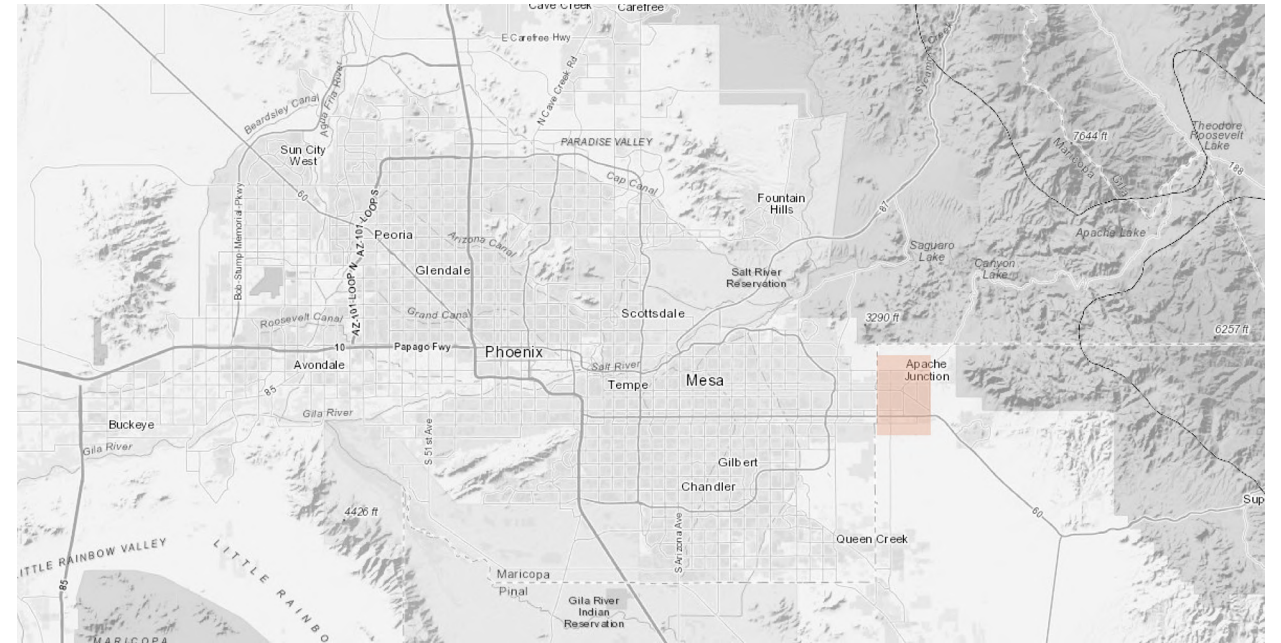


Fig. 35 Apache Junction in relation to Phoenix, Arizona

Part 4.1 | Site introduction

The site for this thesis project is located in the picturesque Sonoran desert, in a suburb of Phoenix, Arizona. The suburb is called Apache Junction, located on the East side of Phoenix. This is my second home, where my Canadian family now lives. I have been visiting Arizona twice a year since 2007.

The site is situated on one of the last remaining plots of untouched desert surrounding Apache Junction. These plots are surrounded by the incredible Tonto National Forest. They have been zoned for detached housing developments. The incredible beauty of this otherworldly landscape now faces erasure. It would be a tremendous loss for this land to become another tract home development.

The poetic nature of the desert landscape is preserved in the design of the Thesis project. The proposed development is perforated with preserved landscape and newly planted drought tolerant species. The Thesis project hopes to reinforce what is at stake when we develop within the natural world. The desert landscape has perfectly adapted to its challenging climate over millions of years. The vegetation, wildlife, and soil reflect an extensive history. Natural landscapes are often lost in suburban developments, and places become placeless. Preserving landscape preserves the local identity of place. What makes a site unique should never be overlooked. The Sonoran desert character is celebrated in the design.

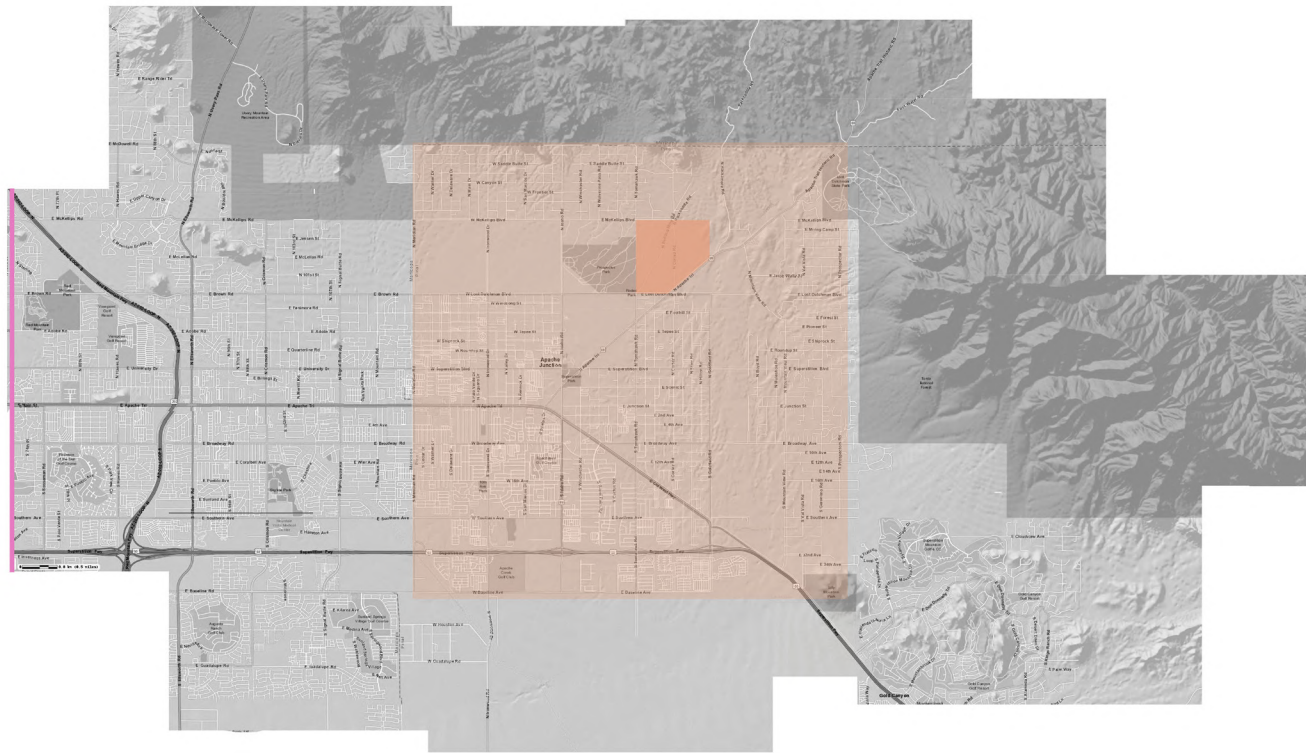


Fig. 36 Apache Junction and the lack of public transit

- Public transit ends
- Site
- Apache Junction

Part 4.2 | Site Analysis

Apache Junction is not served by public transit of any kind. The pink line in Figure 36 shows where the city of Phoenix’s transit system cuts off.³¹ Without public transit, many residents that do not drive (those under sixteen, the elderly, etc.) are often left stranded at home. The typical suburban issue of separated amenities from residential areas is amplified in Apache Junction because of their extreme reliance on automobiles. Pedestrian activity in the summer is also dangerous due to the extreme temperatures. This makes it nearly impossible for residents to access walkable amenities.

Figure 37 demonstrates a generalized zoning of Apache Junction.³² The amenities of the town are centrally located away from most of the residential zones. This mapping exercise also points out the floodplains and washes that run through AJ in blue.³³ The area experiences a regular monsoon season at the end of every summer. Washes are water eroded pathways that have been carved out over time as nature’s response to flash flooding during the monsoon season. During monsoons, the washes become raging rivers filled with rain water. The grid-like organization of the roads cut across these natural paths. With this conflict, many of the roads are washed out during floods.

³¹ “System Map,” *Valley Metro*, September 29, 2020, <https://www.valleymetro.org/system-map>.

³² “2020 General Plan,” *Apache Junction, AZ-Official website*, 2020, <https://www.ajcity.net/gp2020>.

³³ “Geographic Information Systems (GIS) Division: Apache Junction, AZ - Official Website,” *Geographic Information Systems (GIS) Division | Apache Junction, AZ*, accessed October 13, 2020, <https://www.ajcity.net/472/Maps-GIS>.

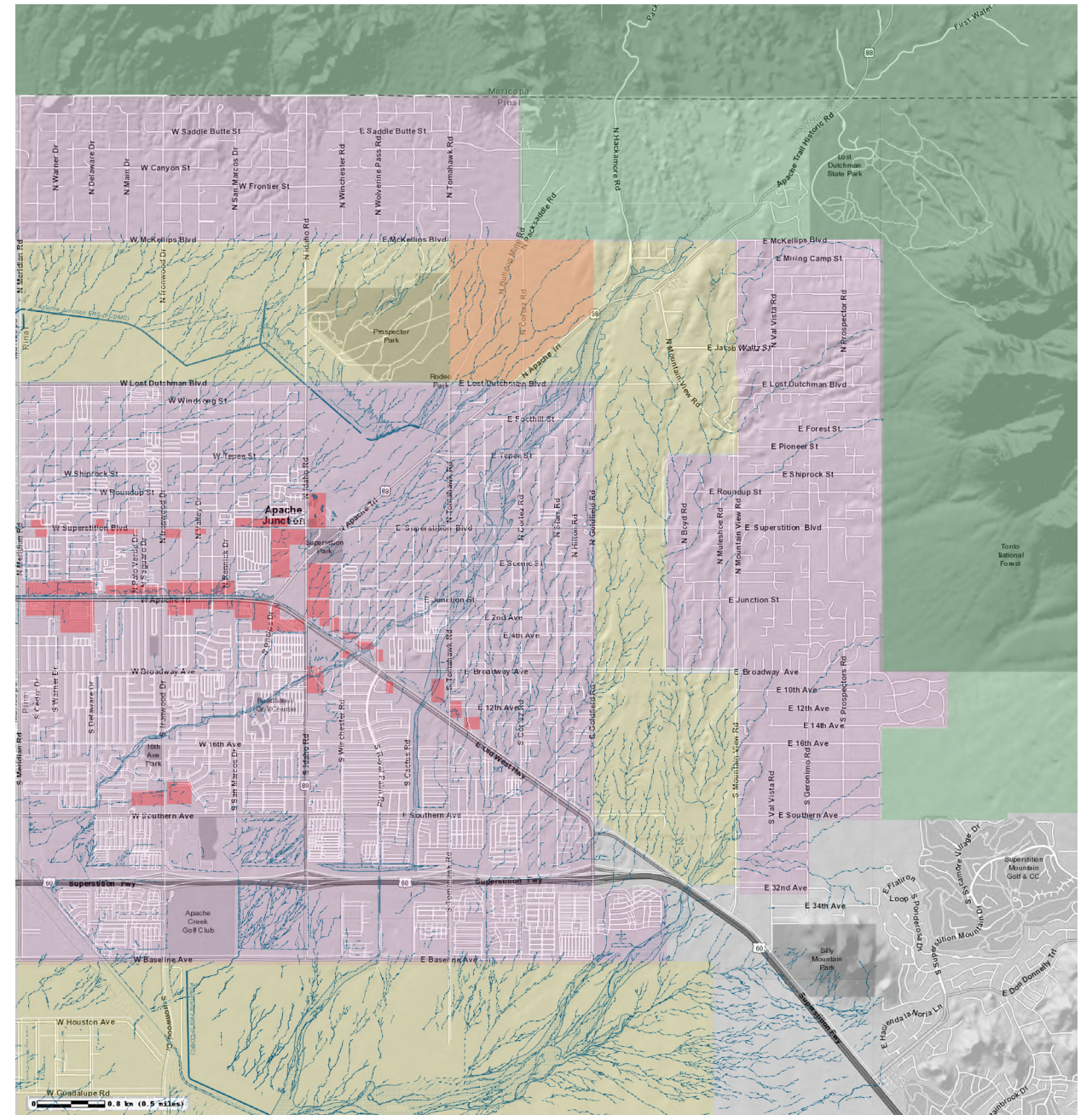


Fig. 37 Apache Junction general zoning, water and site location

- Site
- Tonto National Forest
- Residential
- Commercial, retail, institutional
- Zoned for detached housing
- Floodplains and washes

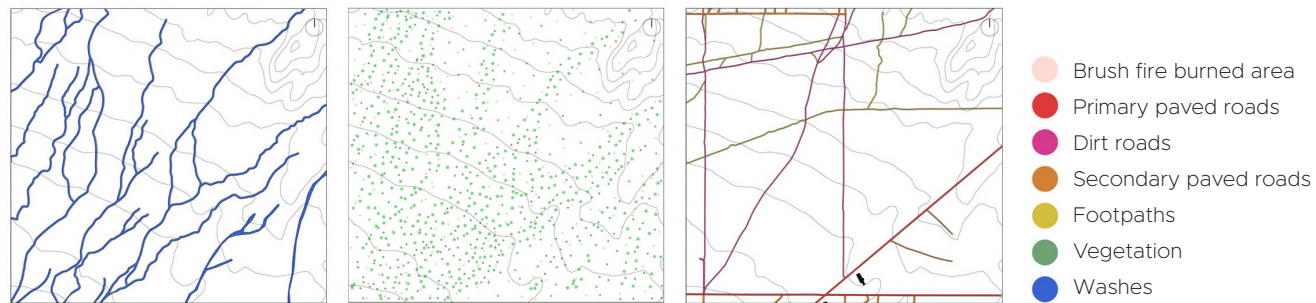
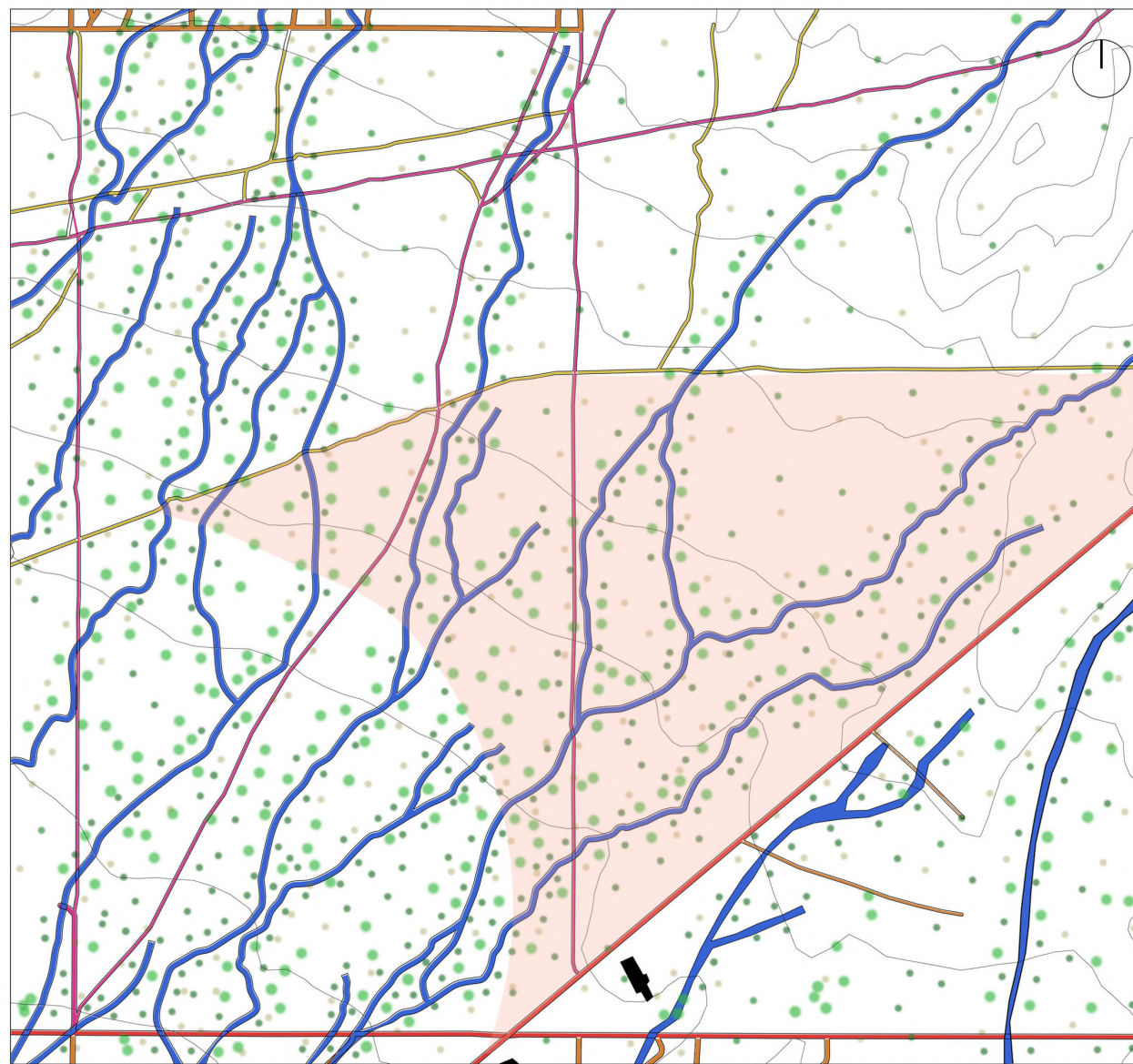


Fig. 38 from left to right: site washes, vegetation and roads/paths



0 100m 300m 600m 1000m

Fig. 39 Overall site analysis



Fig. 40 looking out towards the site

Part 4.2 | Site Analysis (continued)

Figures 38 and 39 show the analysis of the chosen site. The site is perforated by washes, vegetation and a few dirt roads and footpaths. The perimeter of the site has an angled two-lane highway and slower speed roads on the North and South edges. The footpaths are often used by horseback riders or hikers. The site vegetation consists of different cacti, agaves, and a few bush and tree types. Dense vegetation lines the washes because of the water brought to the soil during the monsoon season at the end of the summer. The washes serve as shaded areas of refuge for wildlife. Rattlesnakes, scorpions, lizards, rabbits, coyotes and birds occupy the entire site. Reptiles live in underground burrows or beneath rocks, birds commonly dig out holes in cacti or they create nests and larger animals create larger burrows or settle in to rocky areas or beneath trees.

The site faces the Superstition Mountain range to the East and the Usery mountain Range to the North. These mountain ranges are a part of the stunning Tonto National forest. Preserving these views is integral to the thesis project.

A three-minute drive East from the site is the Goldfield Ghost town. This was a former mining town in the late 1800s that was abandoned, then redeveloped as a tourist destination. Further to the East is Apache and Canyon lake. Past these lakes is the Roosevelt dam. These attractions bring tourism to the Apache Junction area.

There are Rodeo grounds close to the West side of the site. These are used for an annual fair and other rodeo events. South of the site is a small restaurant and bar called the 'Hitching Post' that hosts bull riding twice a week. The area is known for its 'Wild West' character and culture. Several businesses have hitching posts outside for horseback riders to tie up their horses, and all businesses post their gun carrying policies.

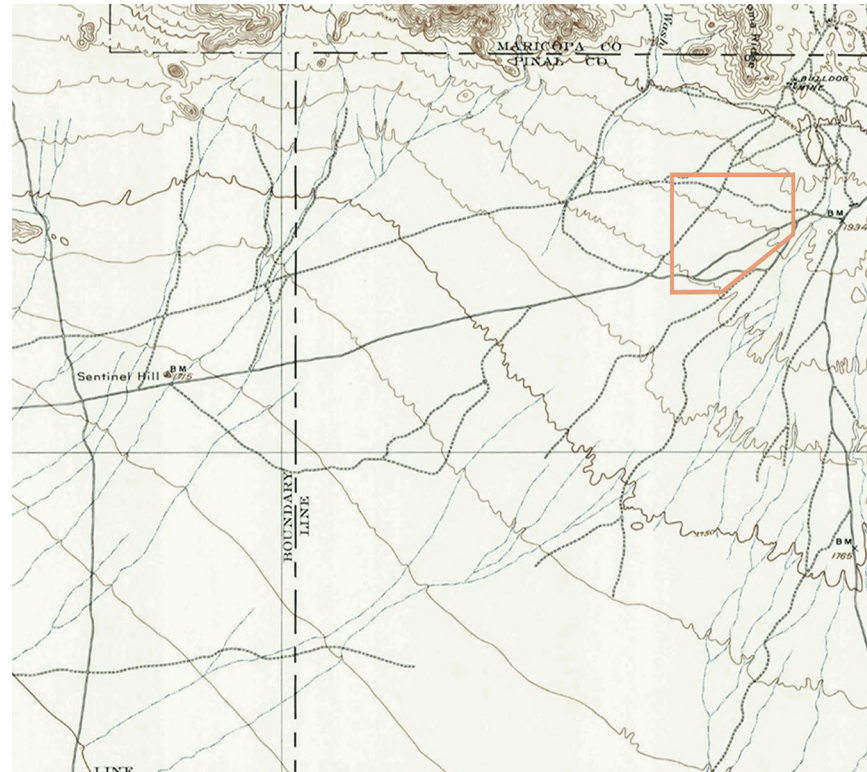


Fig. 41 Apache Junction 1906

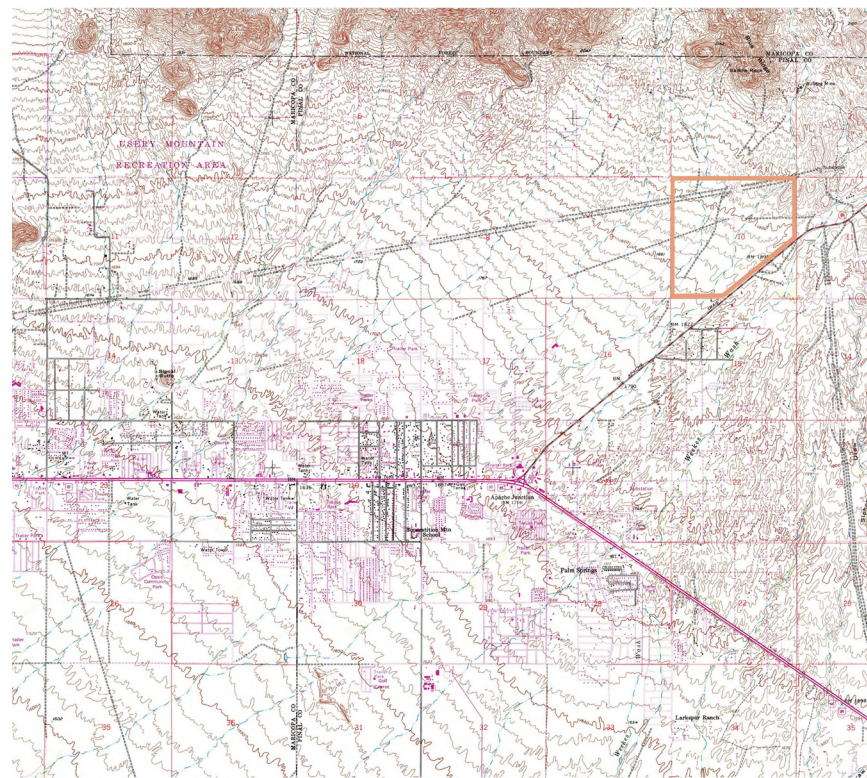


Fig. 42 Apache Junction 1956

Part 4.3 | History

The vernacular housing created by indigenous peoples in the area used mass earthen walls and small openings to keep interiors cool, they lived communally and held a strong sense of community (fig 43-44). The European influence brought over the idea of using courtyards for passive cooling and creating micro-climates within the courtyards (fig. 45). Then came ranch style compounds that also used mass adobe walls, shading and breezeways (fig. 46).³⁴

Apache Junction was once the native land of the Apache tribe. There were battles between the Apaches and the European prospectors that came to the area in 1860 in search of gold. Tensions lessened after 1886 when the Apache war chief Geronimo surrendered to the United States Army at Skeleton Canyon near the Mexican border. In 1893, the Mammoth mine near AJ was discovered after a flash flood along the Goldfield wash. A small mining camp was built called Goldfield for the miners and families of the Mammoth mine. This camp brought the first church, school, hotel, saloon, livery stable, stage line, mercantile store, butcher shop, restaurant and barber shop to the area. The mine and town boomed and died within a five year period.³⁵

In 1903, construction of the Tonto Wagon Road as well as the Tonto dam brought workers to the area. This road later became the Apache trail and the Roosevelt Dam. In 1921, another major highway was built on the opposite side of the Superstition mountains. This highway connected to the Apache trail and created a junction. This junction as well as the Apache history in the area is what led to the name 'Apache Junction'. The early town settlements lined the highway that ran through the town. The main housing typology in the early years was trailer parks. The town has been developed since to include a variety of housing types, though there are still trailer parks in the area. These trailer parks have become popular retirement communities for snowbirds.³⁶

³⁴ Bob Vint, "Southwest Housing Traditions: Design Materials Performance," *HUD User*, 2005, https://www.huduser.gov/Publications/pdf/SouthwestHousing/SW_Housing_Traditions.pdf.
³⁵ Thomas Kollenborn, "Apache Junction - A History," *Apache Junction - A History*, January 1, 1970, <http://superstitionmountaintomkollenborn.blogspot.com/2014/01/apache-junction-history.html>.
³⁶ *Ibid.*



Fig. 43 Casa Grande, Hohokam 700-1450 C.E.



Fig. 44 Acoma Pueblo, Acomans 1100-1200 C.E.

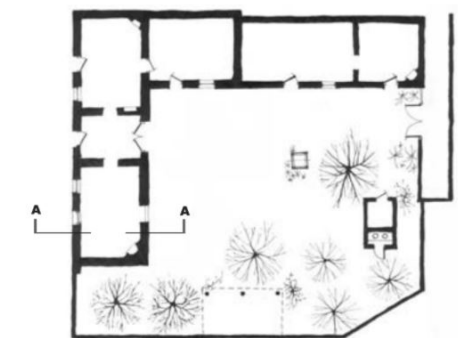


Fig. 45 Courtyard houses, late 1800's



Fig. 46 Empire Ranch, 1871



Fig. 47 Scorched desert landscape in the summer



Fig. 48 Green desert landscape in the winter



Fig. 49 Desert sunsets

Part 4.4 | Present

Apache Junction has approximately 40,500 residents. Ninety-one percent of residents are white, one percent are Black, one percent are Asian, two percent are indigenous and the remaining five percent are mixed races. Seventy-eight percent of residents only attain a high school degree and eleven percent pursue university or community college. The median household income is \$38,053.³⁷

Apache Junction experiences high temperatures during the summer months with low humidity. Most summer days have temperatures around forty degrees Celsius. Most people spend the majority of their time indoors during the summer. The extreme heat causes the desert vegetation to become very dry and lose greenery (fig. 47). In the cooler winter months, greenery usually returns to the drought tolerant landscape (fig. 48). However, during the winter of 2020-2021, there was no greenery, instead there was very dry yellow grass due to droughts.

In the Spring, all of the cacti and vegetation bloom with flowers. In the fall, winter and spring, residents and tourists return to the outdoors. Hiking is popular throughout the mountain ranges that surround Phoenix, as well as horseback riding. One of the most beautiful times of the day is when the sun sets behind the Saguaro cacti silhouettes. After the sun sets, the clear stars of the night sky appear and you hear coyotes howl nearby. The desert possesses a truly unique, otherworldly beauty that enchants many visitors to stay.

³⁷ "2020 General Plan," *Apache Junction, AZ-Official website*, 2020, <https://www.ajcity.net/gp2020>.

Tract homes and box store amenities characterize new suburban development in the area. The tract homes in Arizona are built in a Spanish traditional style. They almost exclusively use stucco finishing and terracotta or cement tile roofs. Earth tones are commonly used in Arizona architecture. In Apache Junction, box store amenities are centrally located, only accessible by car for most, and serve thousands of people.

Ecologically, Apache Junction experiences a regular monsoon season at the end of the summer. During this monsoon season, heavy rain causes flash flooding. They also experience 'haboob' sandstorms during this time. The washes become raging rivers that cross over roadways and leave people blocked from leaving their homes. When the washes are running, it's not safe to cross them, even by car.

Though this year, they experienced their driest monsoon season ever on record paired with one of the hottest summers on record. This caused several forest and brush fires.³⁸ A large brush fire passed through the Thesis site over the summer. Fortunately, the bushes and trees on site have roots that run deep to reach the water table. This vegetation will eventually return naturally. Unfortunately, the cacti in the affected area have shallow roots, and new cacti would have to be planted. The site is unchanged for this project because of the incredible views, the development opportunity with the adjacent lots and the fact vegetation will return. Rising temperatures, droughts and fires due to climate change are increasing in Arizona. This creates an urgency for sustainable development and design.

The following pages present photographs of the thesis site.

³⁸ Madeline Ackley, "Return of the Non-Soon: Arizona's Second Dry Monsoon Season Breaks Records," *The Arizona Republic (Arizona Republic)*, October 11, 2020, <https://www.azcentral.com/story/news/local/arizona-weather/2020/10/11/arizonas-monsoon-season-driest-record/5930457002/>.



Fig. 50 Present day tract housing



Fig. 51 Box store amenities



Fig. 52 Flash Flooding during monsoon season



Fig. 53 2020 brush fires



Fig. 54 Site Photos

Fig. 55 Site Photos



Fig. 56 Site Drone photo facing East, credit: Jeff Kopp



Fig. 58 Site Drone photo facing North-East, credit: Jeff Kopp



Fig. 57 Site Drone photo facing North, credit: Jeff Kopp



Fig. 59 Site Drone photo facing West, credit: Jeff Kopp



Fig. 60 Site Drone photo facing South, credit: Jeff Kopp



Fig. 62 Site Drone photo facing South-East, credit: Jeff Kopp



Fig. 61 Site Drone photo ground texture, credit: Jeff Kopp



Fig. 63 Site Drone photo ground texture, credit: Jeff Kopp

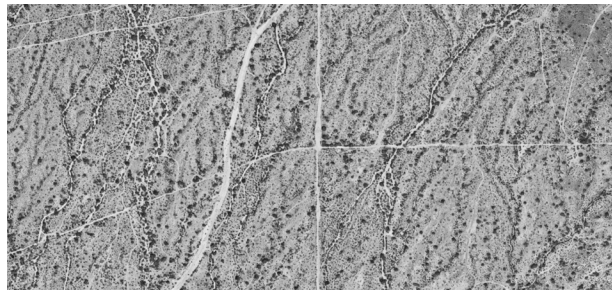


Fig. 64 Site washes + vegetation pattern

Part 4.5 | Site Interpretation

With a concentration on place, an interpretation of the site and surroundings was developed to guide the planning of the Thesis project.

A series of washes cut across the site. The washes of the site have created a natural pattern where denser vegetation exists at the washes because of the water these paths bring to the soil. In the land expanses between washes there are less dense dots of vegetation.

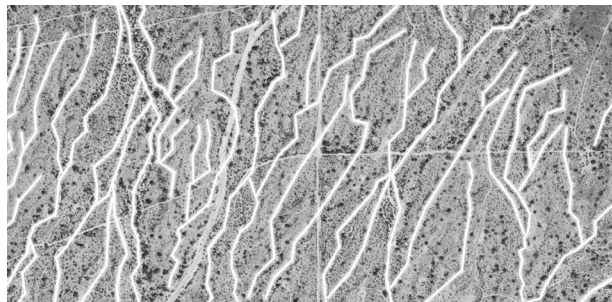


Fig. 65 Tracing the desert pattern

The Sonoran desert landscape is defined by granular to clay-like soil that ranges in colour tones of brown, grey and red. This soil is perforated by cacti, agaves, and a few tree and bush types in a xeriscaped fashion. Reptile and rodent burrows perforate the landscape at a microscale.

Following the landscape study, a site abstraction model (fig 68) was created to draw inspiration from the site. The abstraction model looks at landforms and the different ways vegetation and washes perforate the site.

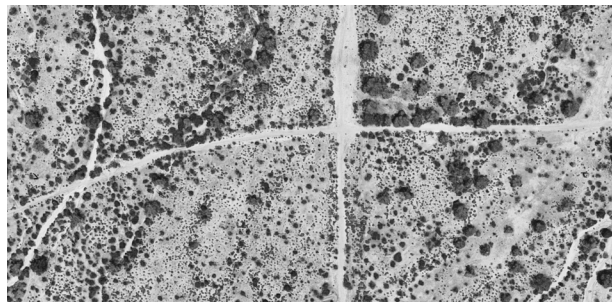


Fig. 66 Desert perforated by vegetation

The site's wash patterns guide the planning of the thesis project. The dotted pattern of the desert informs an overall theme of perforation throughout the project.

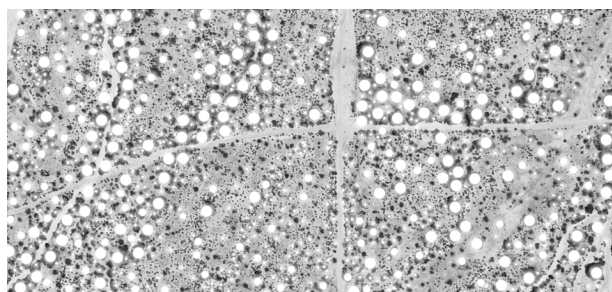


Fig. 67 Desert perforation pattern

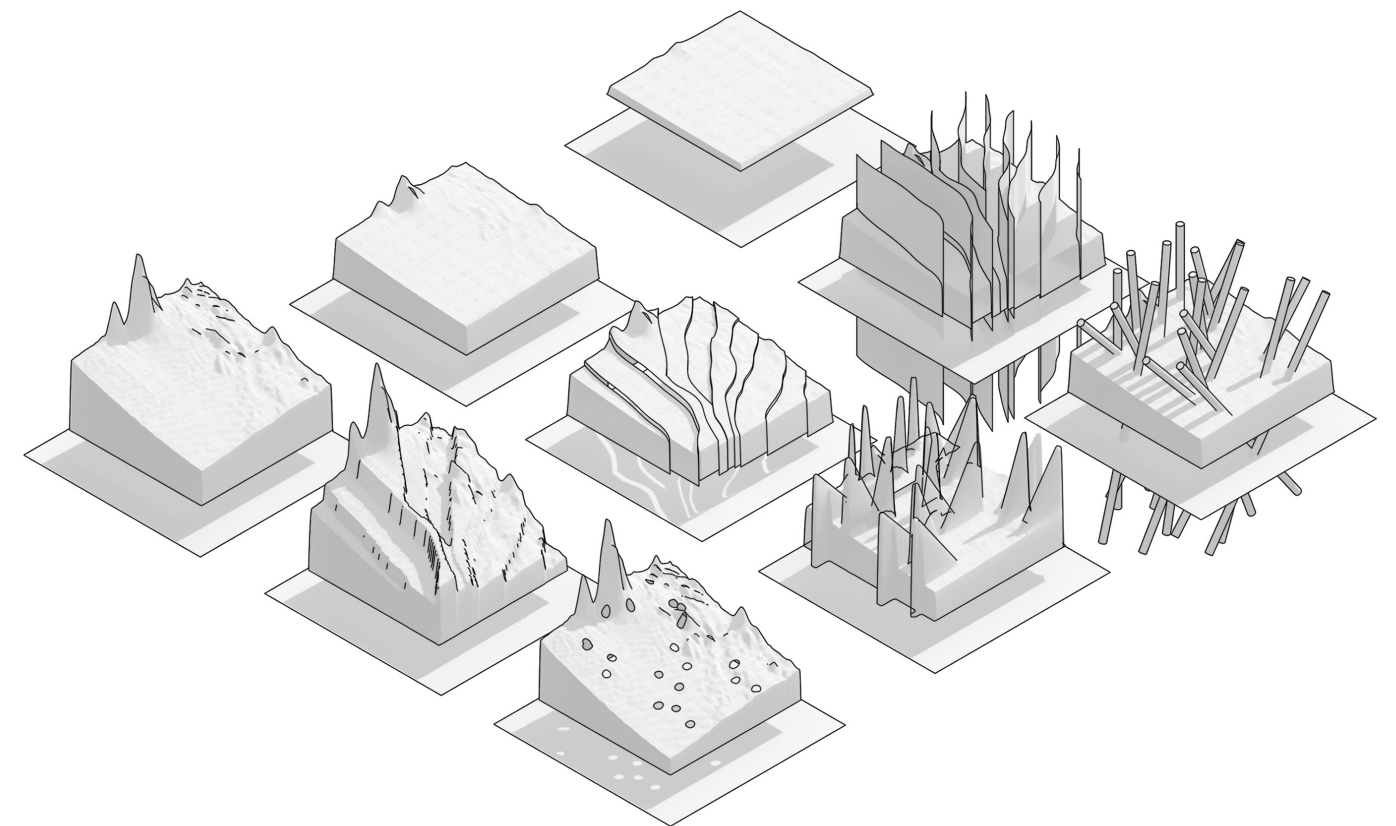


Fig. 68 Site abstraction



Fig. 69 Superstition mountain range 3D printed + painted model

The site is located in a valley surrounded by a series of mountain ranges. The defining feature of the area is the Superstition mountain and the range behind it. In an effort to draw out form, a 3D printed model of this mountain range was created and painted (fig. 69). Through this exercise, it was discovered that the mountain carried its own pattern due to water erosion, and that vegetation followed these pathways of water runoff. It also revealed that the mountain was composed of small and large triangular geometry, and the stark geometry rose from a soft landscape below.

Next, a 3D printed site model was created with the scale exaggerated four times vertically (fig. 70). Light and shadow experimentation was done to draw out the topographic features. Though the site appeared fairly flat from above, this exercise revealed a complex ecology that has been defined by water erosion and well adapted soil and vegetation. Respect for landscape and letting landscape drive design are key elements of this project. This exercise developed a deeper understanding of the site and surrounding land forms.

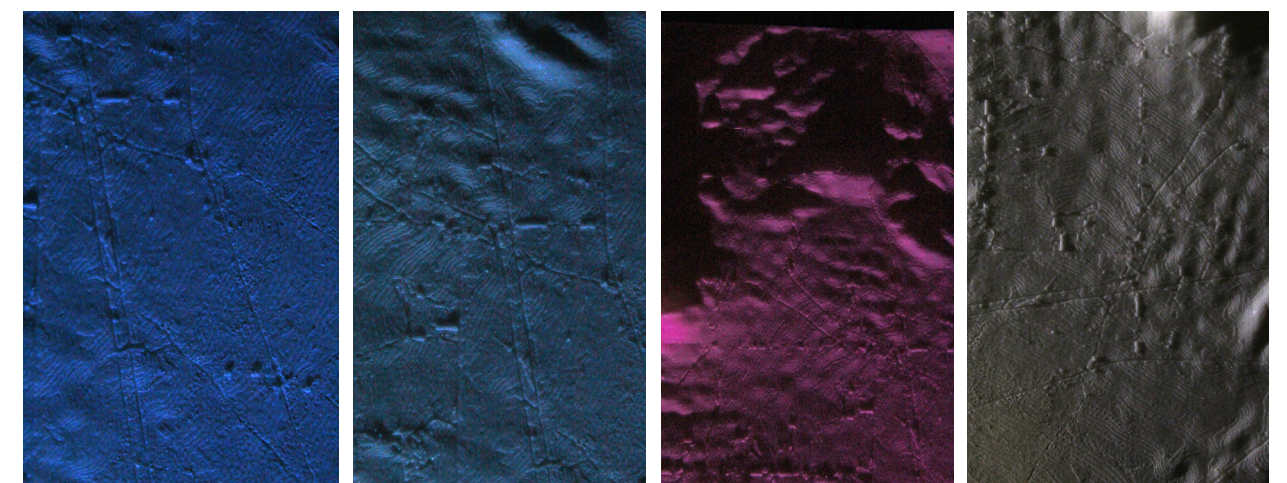
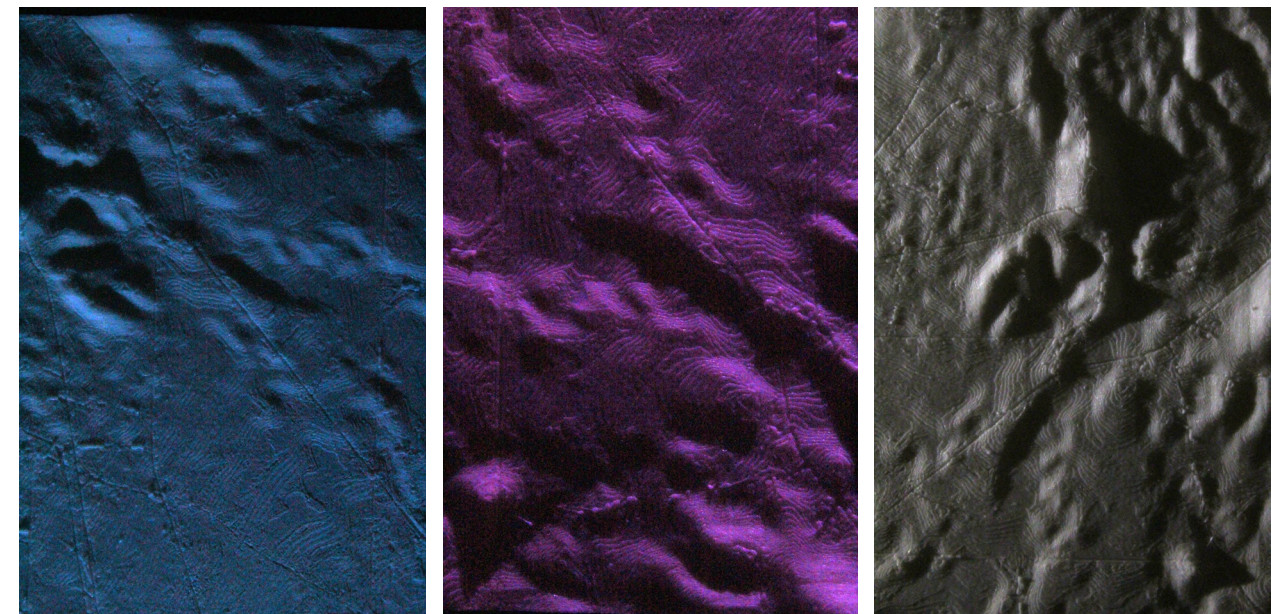
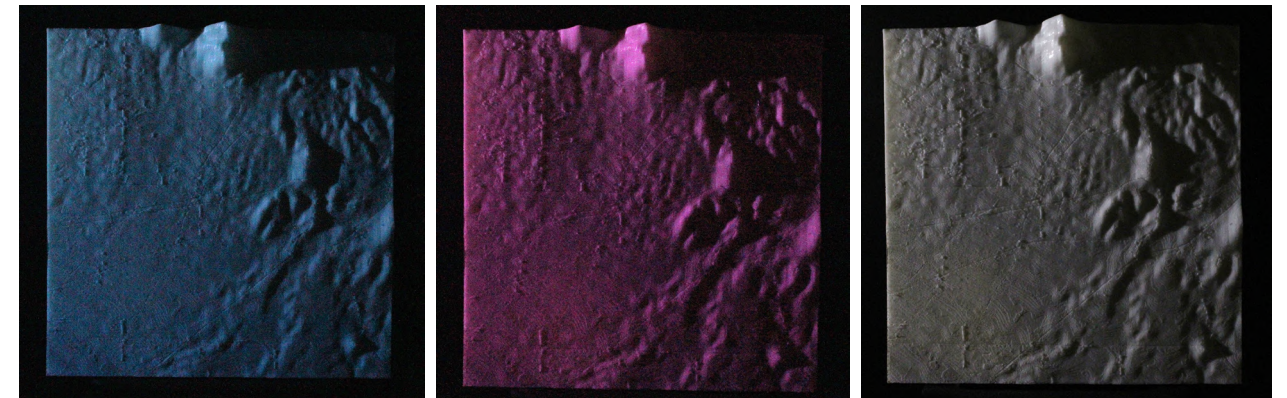


Fig. 70 3D printed model of site + surroundings, scale exaggerated 4x vertically

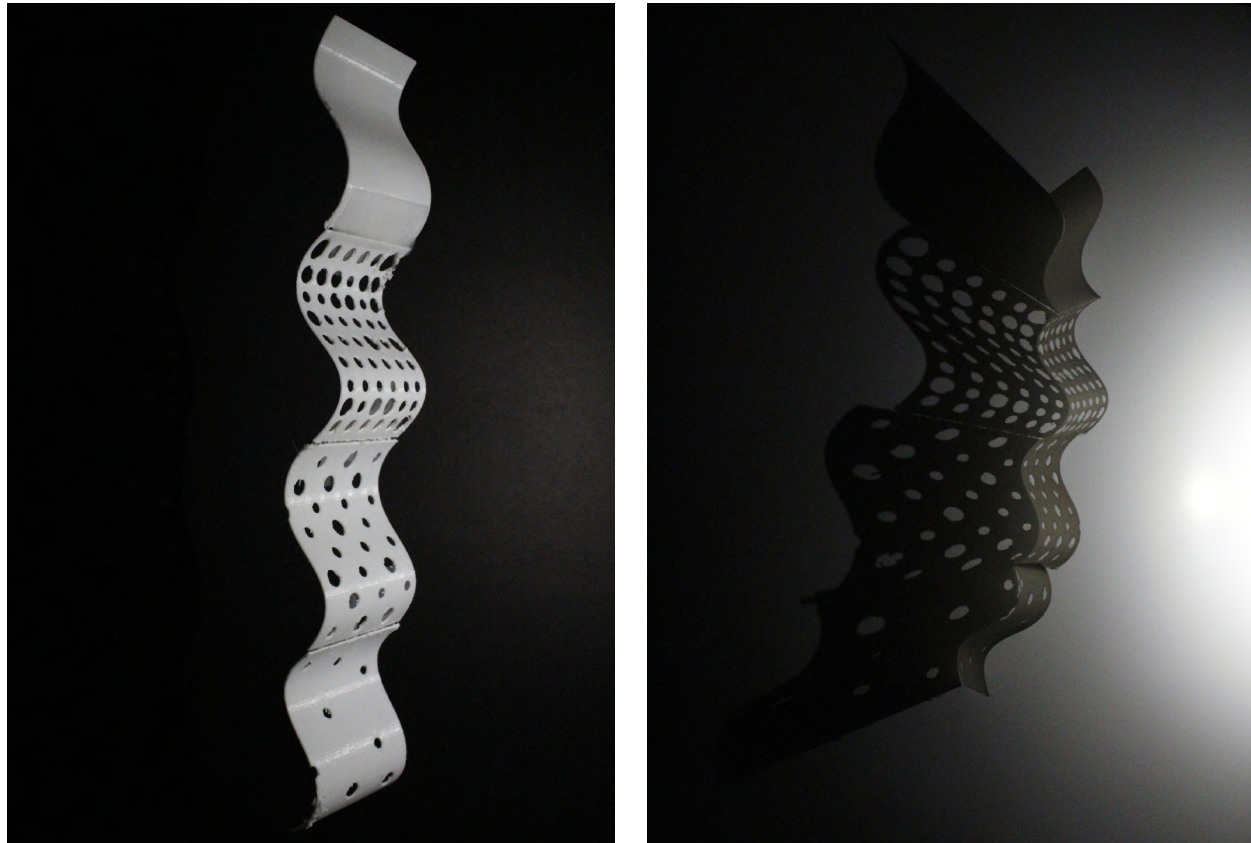


Fig. 71 3D printed model representing different levels of land perforation by architecture

Part 4.6 | Perforated Encroachment

Perforate:

“To make a hole or holes right through; to pierce;”

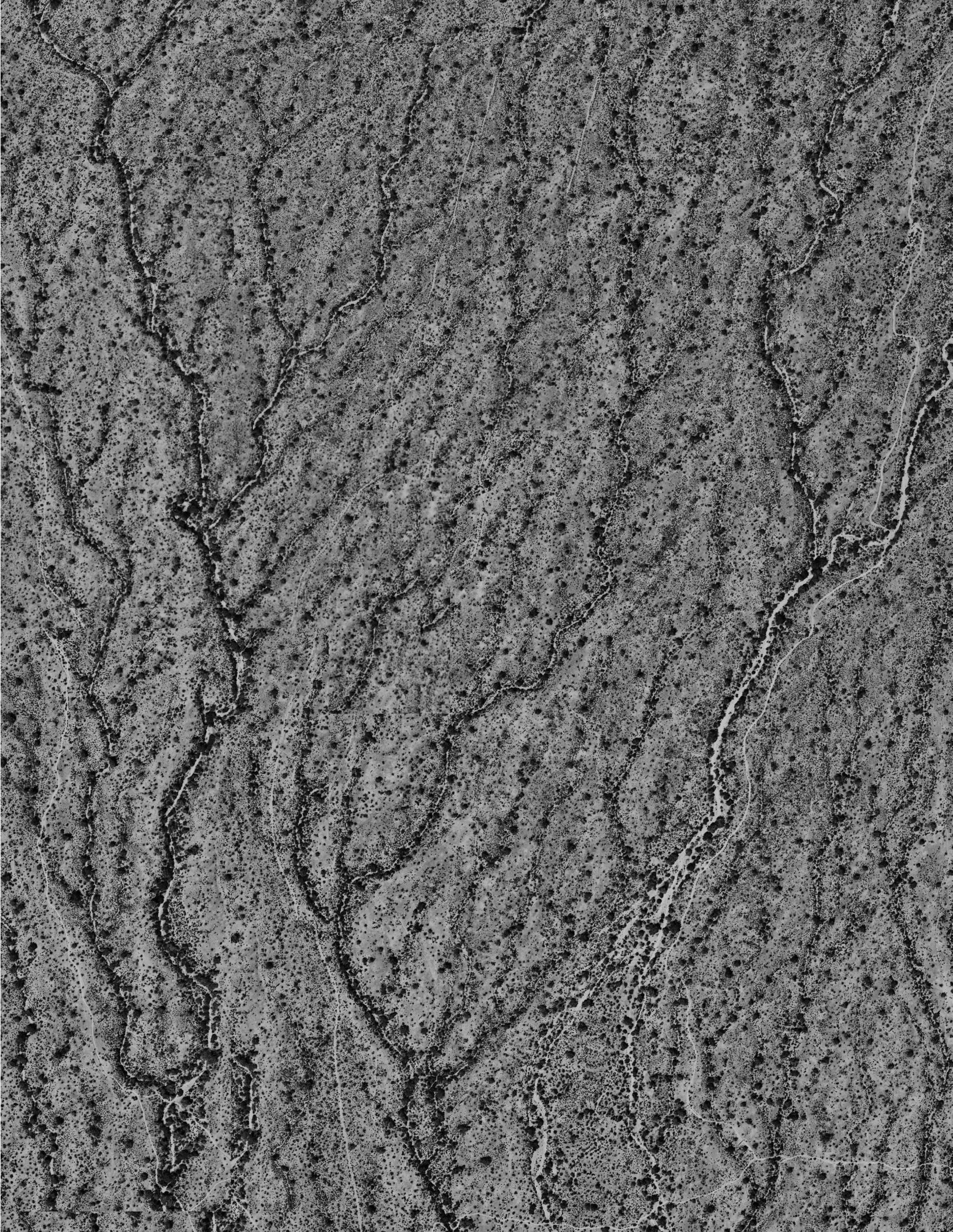
“Of a channel, passage, tunnel, network, etc.: to pass through; to extend or be continued through the substance of.”

“To make a hole or holes into the interior of (a thing); to bore into; make an opening into;”³⁹

The theme of perforation runs through this thesis project. This theme was inspired by the natural dotted pattern of the desert landscape. In an effort to sensitively develop the land, the Thesis project aimed to preserve as much of the natural landscape as possible while still offering a realistic development plan. While most recent developments in Arizona roll over landscape with an asphalt carpet, this thesis aimed to sensitively perforate landscape. The development encroaches onto the desert, mimicking the natural dotting with architecture, allowing vegetation to perforate through.

The 3D printed model (fig 71) represents the idea of perforated encroachment. The perforations range from the opaque blanket of cities that erase landscape with asphalt and buildings, to rural areas with large expanses of land perforated by a small number of buildings.

³⁹ “Oxford English Dictionary Online,” *Oxford English Dictionary*, accessed December 21, 2020, <https://www.oed-com.librweb.laurentian.ca/>.



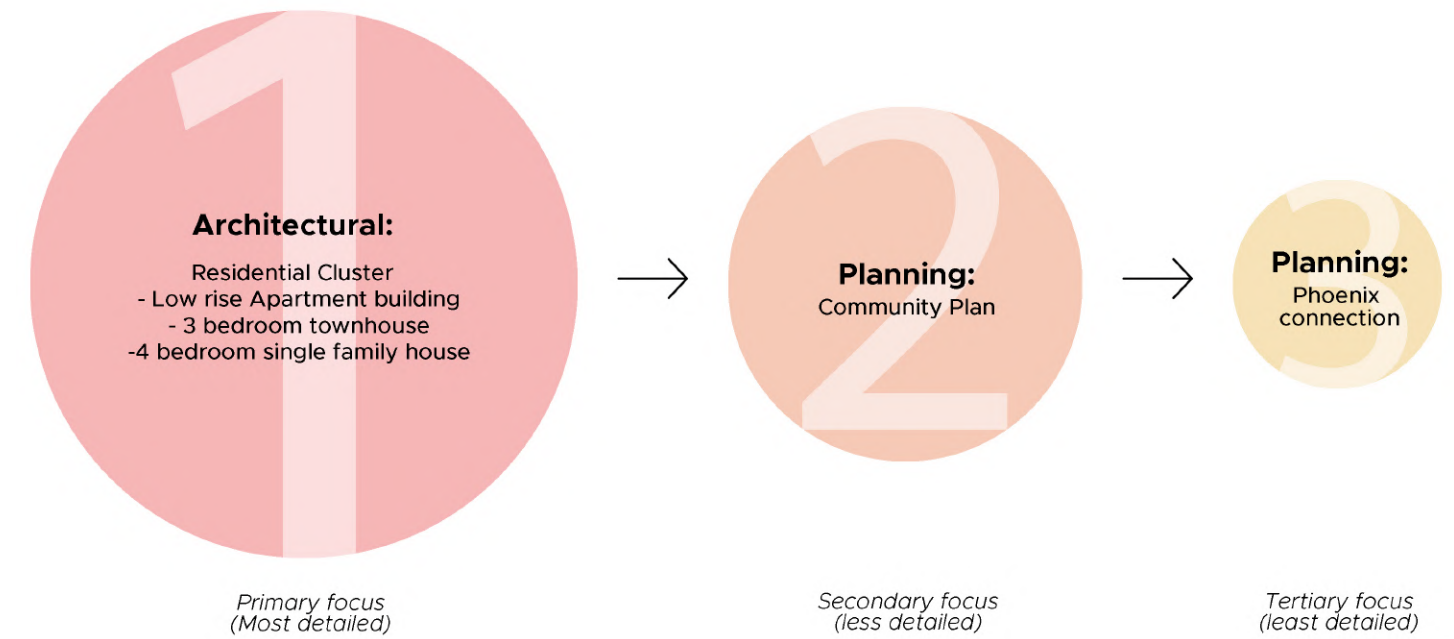


Fig. 73 Thesis project design focus diagram

Part 5.1 | Design Overview

In accordance with Peter Calthorpe's 'Green Urbanism', the effectiveness of sustainable design is achieved through designing at interconnected and varying scales. This strategy creates a greater impact compared to isolated interventions. With this in mind, the thesis project addresses several scales of design with varying levels of detail. The primary focus is the architectural design of three different housing buildings and their arrangement that is purposely designed for them to function as a set of social clusters. The secondary focus is the community plan of the site. Third, is the larger scale connection to Phoenix.

Typical tract home developments of the postwar era and today mainly function as bedroom communities. This means that the work and entertainment of the residents exists outside of the residential area with the home mainly being used for rest. This proposal seeks to change this outdated strategy and bring life, social, and interpersonal closer to home.

The case study research developed toolkits for building and planning. These toolkits were used to guide the architectural design and planning strategies. The project presents several modern options for affordable, sustainable housing with many opportunities for social interaction. The housing options are assembled into cluster groupings that vary in their compositions. The clusters support the sustainable and social goals of the project while mixing occupant demographics. The larger scale planning mixes nodes of preserved desert, amenities and residential areas. Recreation paths connect preserved desert 'green spaces' throughout. The node pattern reaches out to the larger scale and new public transit runs to connect Apache Junction to Phoenix.

This Thesis proposal re-imagines the development of subdivision neighbourhoods in Apache Junction, Arizona. The project aims to respond to our evolved society, and the new economic and ecological challenges we face.



Fig. 74 The Kaufmann Desert house by Richard Neutra, Palm Springs, completed 1946



Fig. 75 James Turrell ASU Skyspace 'Air Apparent'

Part 5.2 | Aesthetic Influence: Mid-Century Modern in California

The Thesis project takes inspiration from the hopefulness in modern design and the futuristic effect it creates when contrasted against the otherworldly landscape of the desert.

The mid-century modern movement took off in the United States during the Postwar era. It was especially seen in residential architecture. California designers took concepts from the modern Bauhaus movement and relaxed them by using warm materials and colours, and the southern climate allowed them to establish a deeper indoor-outdoor connection to nature. Using post and beam structures they included large expanses of glass to connect users to the outdoors.⁴⁰ Clean lines, angular rooflines and natural materials characterized the architecture. Joseph Eichler, a real estate developer, brought mid-century modern housing to the Los Angeles and San Francisco suburbs. He created mass-

⁴⁰ Michael Stern, "Palm Springs Tour of Mid Century Modern Homes," *YouTube*, 2016, https://www.youtube.com/watch?v=fZ-rTEu82oA&ab_channel=HometownsAndHeroes.

produced homes that still felt custom by varying the exterior design and materials. The timeless, modern designs focused on minimalism, functionalism and efficiency. They were called "Eichler homes" and about 11,000 were built from 1949 to 1966.⁴¹

The mid-century modern movement took off in Palm Springs and still defines the character of the city today. Every year, during their 'Modernism Week', over 75,000 visitors arrive to explore the fantastic modern buildings and history in the area. Architects of importance were Donald Wexler, Richard Neutra, Albert Frey (who previously worked with Le Corbusier), William Krisel and Bill Cody. During the 1990s there was a renaissance of the mid-century modern movement that continues today. These modernists looked to the future in their designs. The hope and optimism of the era is still felt in the architecture today.⁴²

⁴¹ "The History of Eichler Homes," *Medley Home*, January 8, 2018, <https://medleyhome.com/blogs/gather/the-history-of-eichler-homes>.
⁴² Stern, "Palm Springs Tour of Mid Century Modern Homes"

Part 5.2 | Aesthetic Influence: James Turrell

"I'm interested in the sense of presence of space; that is space where you feel a presence, almost an entity — that physical feeling and power that space can give." -James Turrell⁴³

James Turrell is an American artist that has created wonderful light installations, 'skyspaces' and his most ambitious project, the 'Roden Crater'. The twelve thousand hours he has spent as a pilot has allowed him to form a unique connection to the land and sky. His work plays with light and space to engage viewers with the limits and wonder of human perception. His work with light manifests light as a sensory form. He uses the sky as a medium by framing it for observation in 'skyspaces'.⁴⁴

⁴³ James Turrell, "Introduction," *James Turrell*, accessed March 29, 2021, <https://jamesturrell.com/about/introduction/>.
⁴⁴ Ibid.

The Roden Crater is situated in Northern Arizona and Turrell's work began there in 1977. Turrell has taken an extinct volcano and sculpted it into a series of chambers, tunnels and apertures that heighten our senses of the heavens and earth. *"We are living in a reality of our own creation, that is subject to our human sensory limitations and contextual and cultural norms."* He allows the user to interpret his work through their own perceived reality.⁴⁵

⁴⁵ Ibid.

Part 5.3 | Materials and Light

During the day, the project must protect itself from the sun, and also exploit it for solar gain. The sun in Phoenix will bleach, dry out and eat away at materials that are unsuitable for its extreme temperatures. Wood becomes very dry and shrinks, fabric fades and vegetation becomes crisp from sun exposure. The project protects itself from the sun by using thermal mass wall construction, overhangs over fully glazed walls, shade screens over every window and recessed balconies. Phoenix experiences an average of three hundred days of sun a year. This makes it an ideal place for solar collection. The flat roofs of the buildings are topped with angular, freestanding solar panels. Solar energy will reduce energy costs, aid in the sustainable efforts of the community and allow the user to be less reliant on the city grid.

The wall construction will be post and beam steel. In between the posts will be concrete blocks. Concrete blocks are an affordable material that will aid in creating a comfortable interior temperature because of their heat absorption qualities. The exterior walls will be finished with stucco, in a combed pattern. Stucco is the most popular exterior finish used in Arizona, making it very affordable. The combed pattern will create interesting shadows throughout the day and carry a modern aesthetic, different from the typical stucco patterns in Arizona. The combed pattern also references the vertical lines of the Saguaro cacti that inhabit the site. Perforated stainless steel shading screens are used for several applications throughout the cluster. The perforated screens are the most expensive material that will be used. The shade screens, concrete block and stucco will vary in colour from cluster to cluster.

After experiencing a few of James Turrell's works in Arizona, I have developed an appreciation for his use of colour and light, and the significance he places on the sky. The magic of the desert reveals itself at sunset when the sky is painted in beautiful warm tones contrasted against cacti silhouettes. James Turrell's work and that experience of light at dusk has inspired the use of colourful lighting on the pedestrian level. The lighting is also reminiscent of the sci-fi, futuristic aesthetic, inspired by the otherworldly nature of the desert. Instead of bright white LED streetlights, the user can experience a more relaxed atmosphere where they can interpret light and take in the stars above. The playful lighting would encourage residents to occupy the outdoor space at night, creating a third inhabitable space and an opportunity for social interaction.

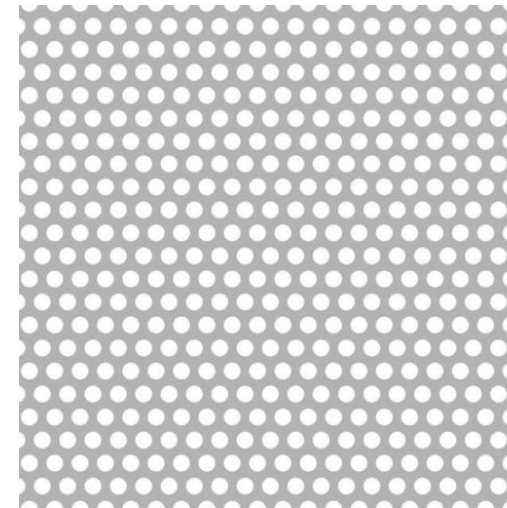


Fig. 76 Perforated steel

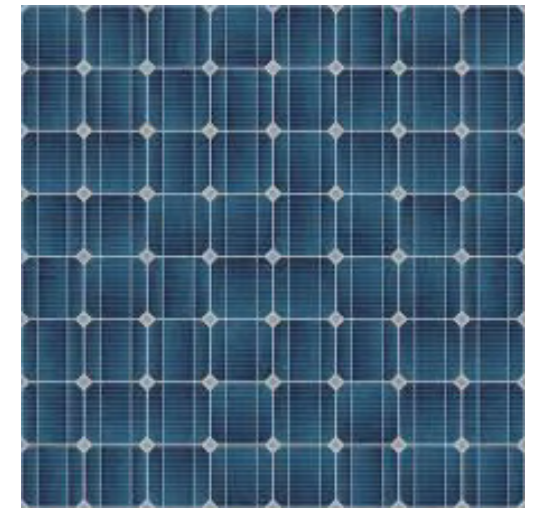


Fig. 77 Solar panels

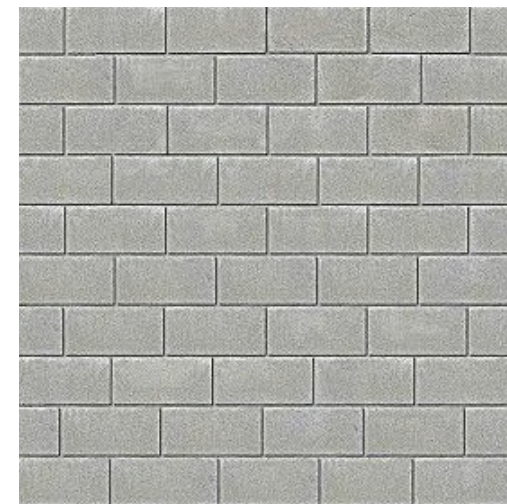


Fig. 78 Concrete blocks



Fig. 79 Combed stucco finish



Fig. 80 ground floor lighting



Fig. 81 ground floor lighting

Part 5.4 | Shade screens

Perforated shading screens are used throughout the housing cluster. 5mm stainless steel sheets are CNC punched, spray painted and baked to provide different powder coated colour options. The pattern punched into the sheets originates from the pattern of the site itself. The dotted nature of the landscape varies in dotting density. Along the washes, the dotting is dense as there is more vegetation, while in the open desert, the dotting of vegetation is more spread out. Tracing the site and playing with the dotted pattern generated the shade screen pattern.

There are three main applications for the shade screens. There is a sliding, bi-fold application for the windows (fig 82). There is a fixed balcony application, and a fixed full wall application on the apartment building. Steel frames support the perforated screens. The bracket used for fixed applications is seen in fig 87. The shading screens serve to cool occupied spaces. They also celebrate sunlight and capture that in beautiful shadows. The act of highlighting sunlight with the architecture was inspired by the textured walls at Frank Lloyd Wright's 'Taliesin West'.

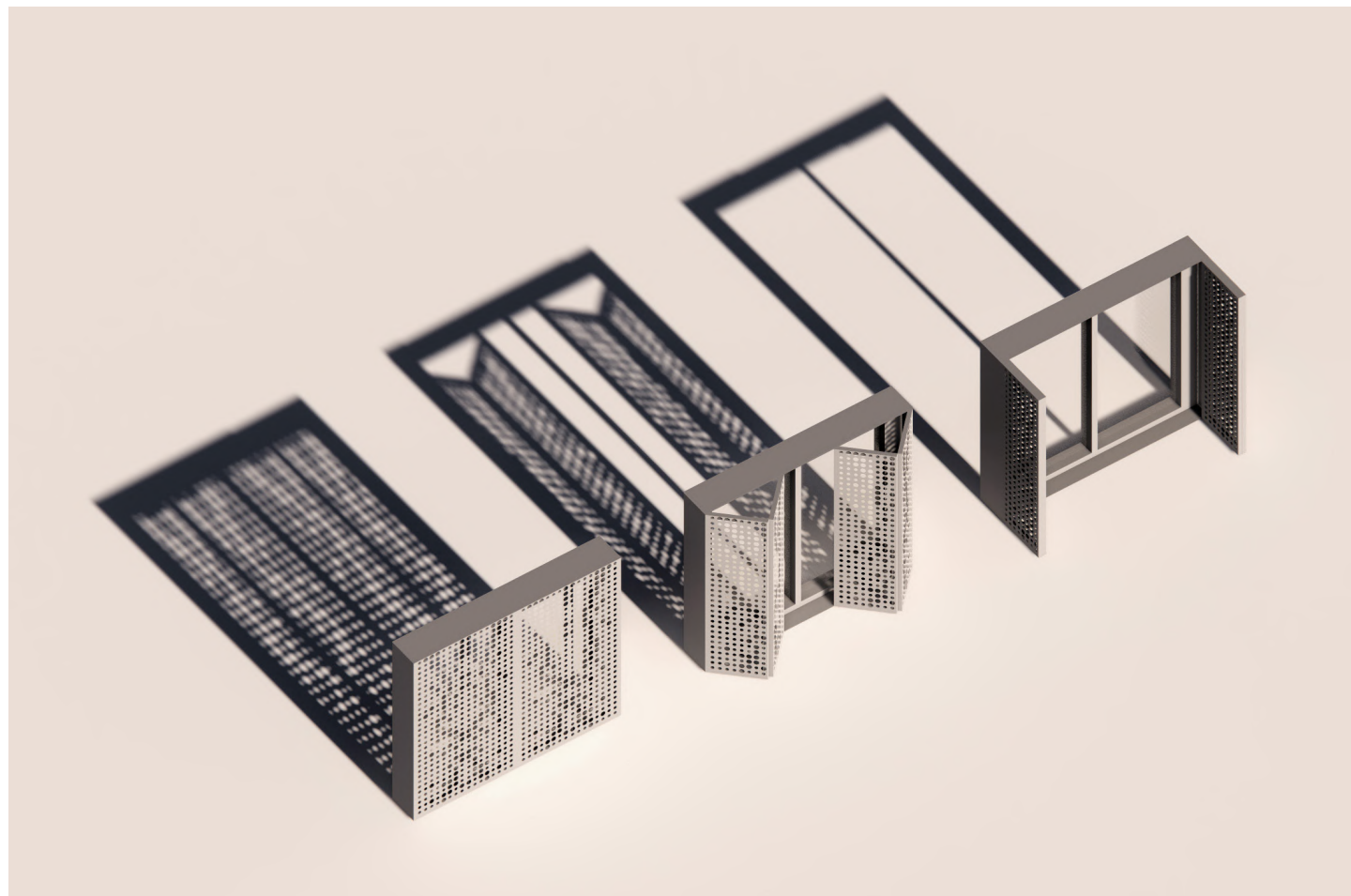


Fig. 82 Window shading screens

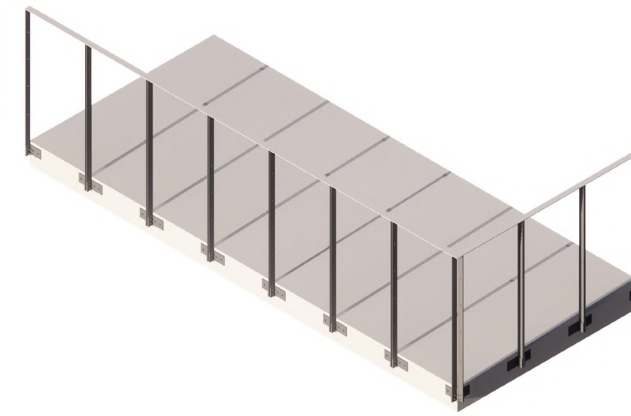


Fig. 83 Balcony steel framing

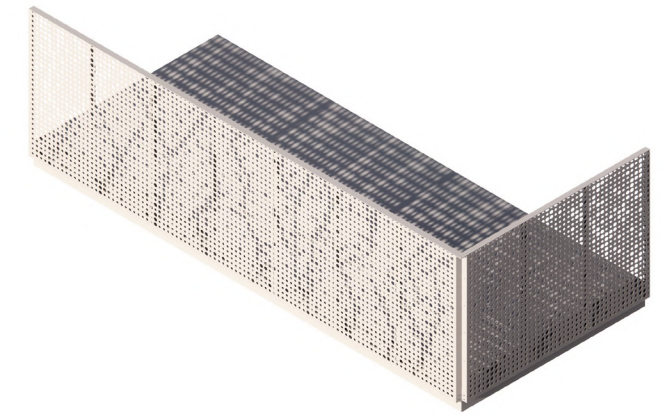


Fig. 84 Balcony perforated steel panels

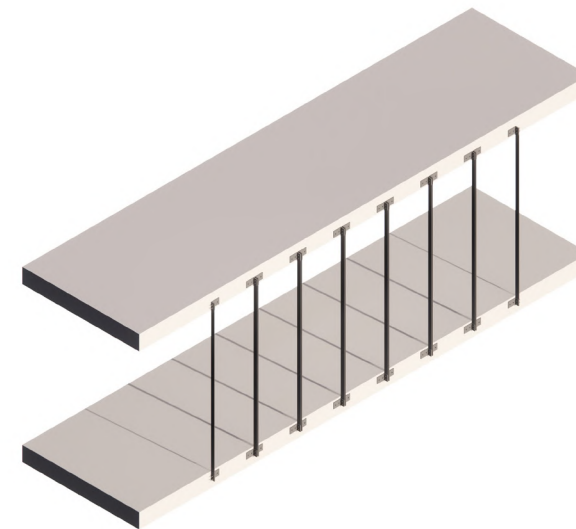


Fig. 85 Apartment walkway steel framing

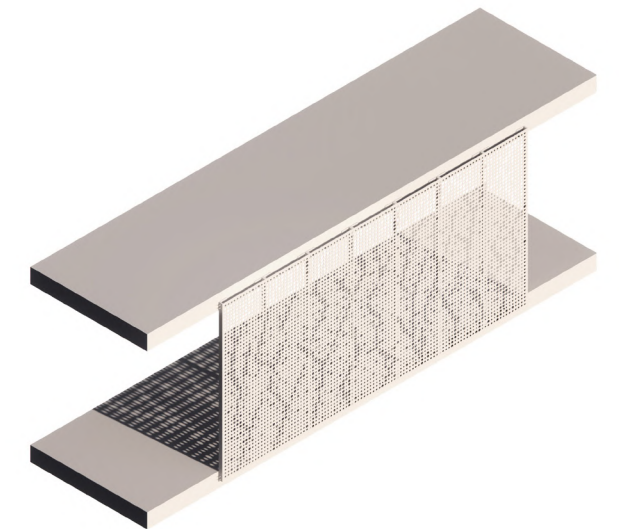


Fig. 86 Apartment walkway perforated steel panels

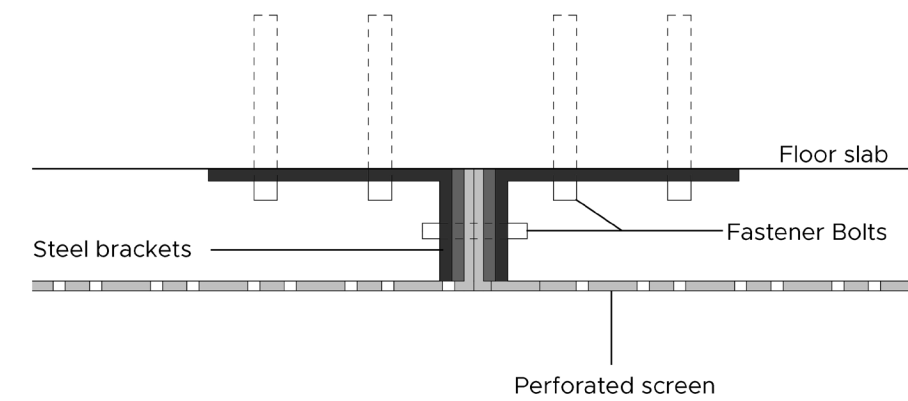


Fig. 87 Fixed panels connection bracket

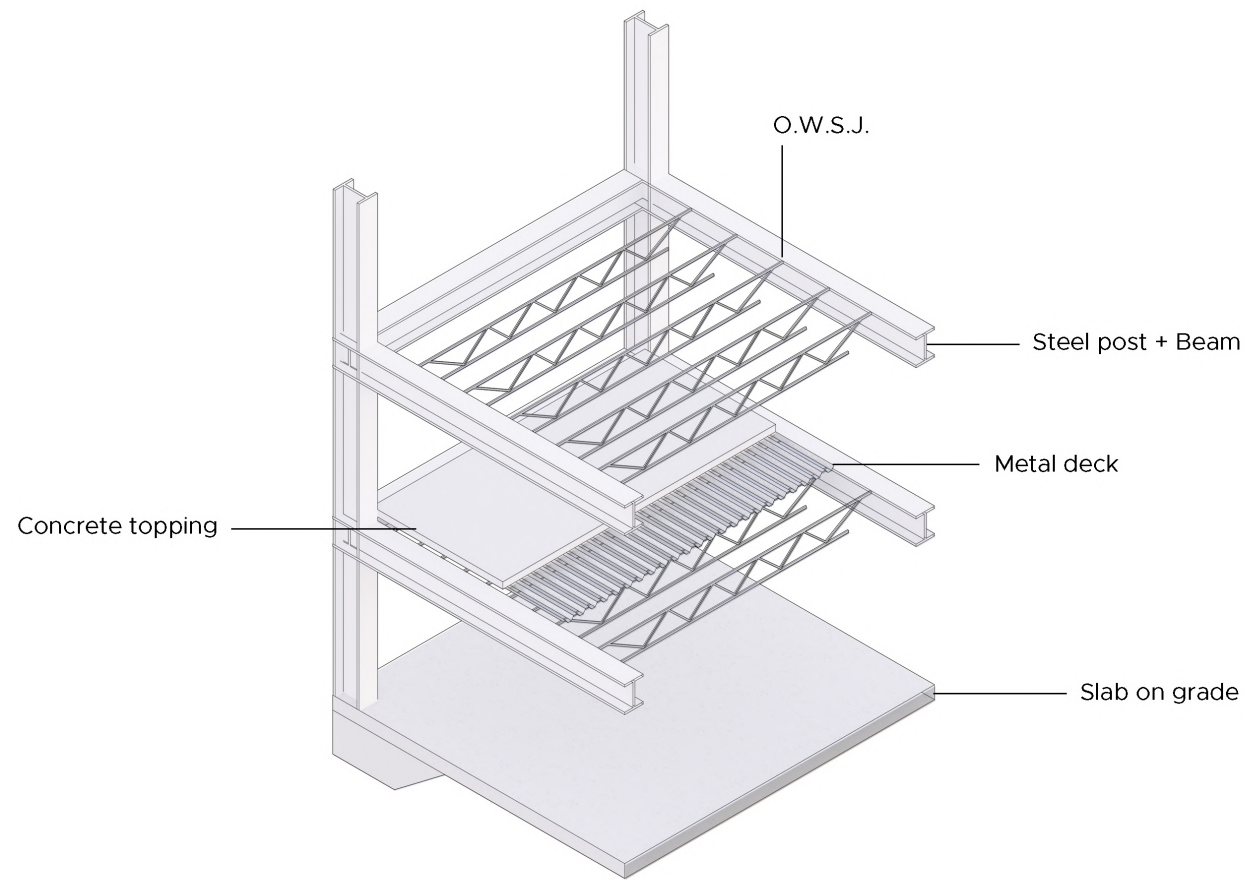


Fig. 88 Typical housing structure diagram



Fig. 89 Nature of the site

Part 5.5 | Structure

The basic structure of the housing will be steel post and beam construction. These prefabricated components will reduce construction time and cost. It would also reduce time spent in the heat. The foundation for the homes will be slab on grade. This is the most common foundation type in Arizona, as the ground is very compact and rocky. Basements are rare in Arizona because of the labour and cost involved in blasting rock. The foundation for the Apartment would use piles as this structure carries more weight. The apartment would also use steel post and beam construction. Open web steel joists would be used in between posts as they are prefabricated members. A metal deck would run over the joists and be topped with concrete. These efforts would help speed up construction time and reduce labour costs.

Part 5.6 | The Desert

The final influence on design is the site itself. Nature in Arizona is appreciated for different reasons than Northern climates. In the North, we admire tall trees, lakes and lush greenery. In the South, the Sonoran desert is admired for its sandy soil, sparse vegetation and rock formations. The horizon line is important because of the unobstructed views created from low-lying, dispersed vegetation. The site is surrounded by the incredible Superstition mountain range, the Four Peaks mountain and the Utery mountain range. Preserving the views of the Tonto National forest is important to the Thesis project. Therefore, all development, whether it is the amenity buildings or residential, is at the human scale. Respecting the site and preserving local character is of great importance to the design of this project. This goal is inspired from the principles of Peter Calthorpe's 'Green Urbanism'.

The washes on site drove the entire community design. The design runs parallel to the washes. In areas where several washes meet, there are no buildings as this area is most likely to flood. Prior iterations of the community design suggested directing wash run off into retention ponds. After studying the site with drone photography and exploring the site by foot, it was decided that the washes would not be altered. They are completely preserved for their natural flood remediation qualities, complex ecologies and beauty. Designing the roads and structures to run in parallel with them also reduces the amount of roads being crossed by flood water. This is a common occurrence in Apache Junction, due to the grid-like organization of the roads.

Part 5.7 | Townhouse

The townhouse is 1300 sqft or 125 sqm. It has three bedrooms and one and a half baths. On the ground floor, there is a one car carport and a porch outside. Inside, there is a small den or office space and a half bath.

On the second floor is the kitchen, dining, and living space. There is also a utility closet and a large outdoor balcony.

The third floor is the bedroom level. There is also a full bathroom and a stacked laundry closet. At the top of the stairs, there is a roof hatch and ladder. The observation deck on the roof offers 360 views of the mountains and neighbourhood.

While residents are on the balcony or observation deck, they can socialize with their neighbours as the townhomes are attached in groups of three.

1. porch
2. den/ office
3. half bath
4. carport
5. utility closet
6. living/ dining/ kitchen
7. terrace
8. hall and roof hatch
9. bedroom I
10. bedroom II
11. laundry
12. main bathroom
13. master bedroom
14. observation deck



Fig. 91 Interior rendering of kitchen and dining



Fig. 90 Townhouse Floorplans

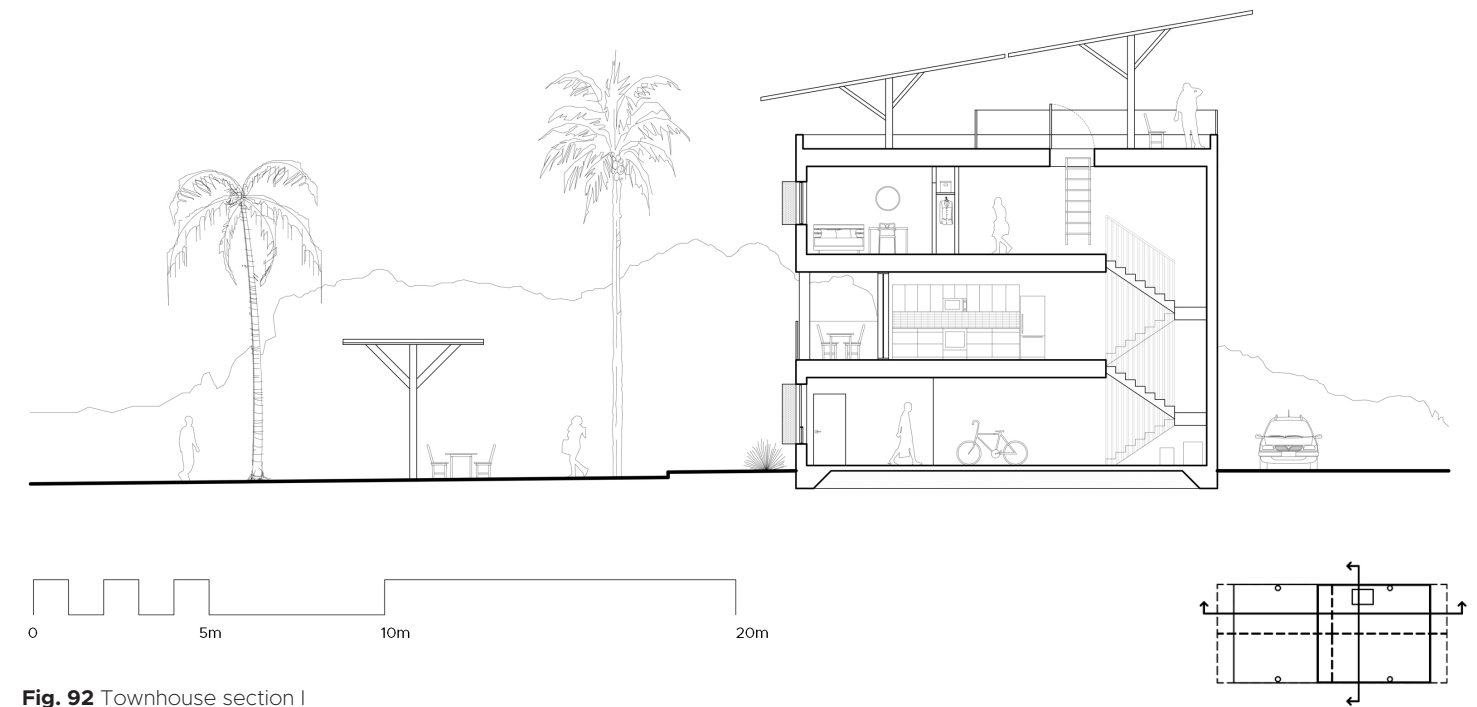


Fig. 92 Townhouse section I

Part 5.7 | Townhouse (continued)

Figure 91 shows the simple modern design of the interiors. Inexpensive materials like IKEA cabinets and Luxury Vinyl Tile flooring support affordability.

The renderings of the buildings show the shade created by the solar panel overhangs, the overhang on the balcony, the staggered walls, and the shade screens on the windows. There are also shade awnings on the ground floor for pedestrians (seen in townhouse section II).

At night, the shade screens create a beautiful glowing pattern when seen from the outside. The ground floor uses colourful lighting at night to attract users outside.



Fig. 97 Townhouse balcony rendering

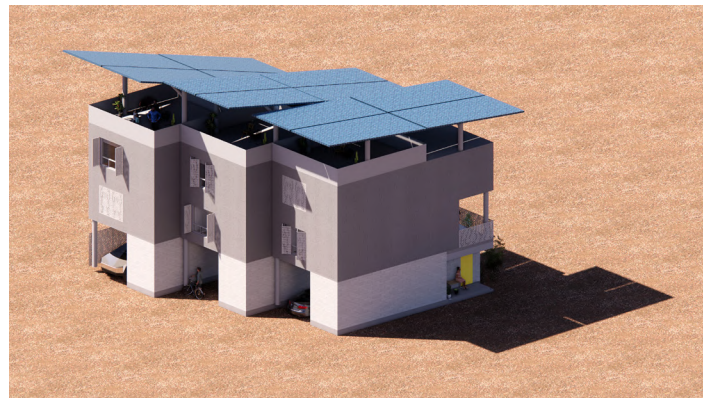


Fig. 93 Townhouse daytime perspective I



Fig. 94 Townhouse daytime perspective II



Fig. 95 Townhouse night perspective I



Fig. 96 Townhouse night perspective II

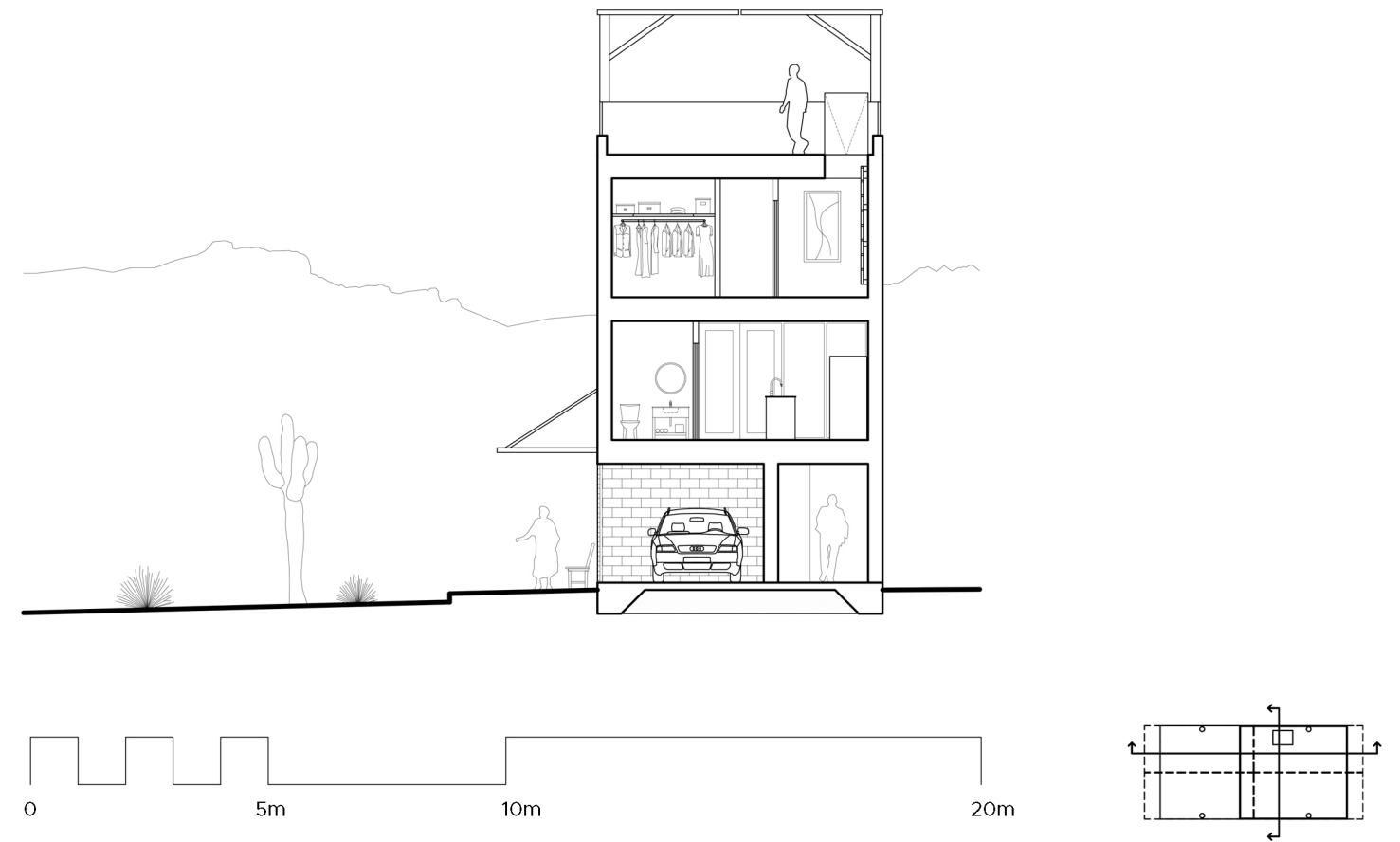


Fig. 98 Townhouse section II

Part 5.8 | Single Family Home

The single family detached home is approximately 2000 sqft or 185 sqm. It has four bedrooms, and two and a half baths. It is the most luxurious option in the housing cluster.

The ground floor has a two car carport, and a porch outside. Inside, there is a den or office space (fig 100) and a half bath.

The second floor has a large kitchen, dining and living space and a utility closet.

The third floor has three bedrooms, a full bathroom and side by side laundry.

On the fourth floor, is the master bedroom with an ensuite and large walk-in-closet. There is also a generously sized terrace (seen in fig 106).

1. porch
2. den/ office
3. half bath
4. carport
5. living/ dining/ kitchen
6. utility closet
7. hallway
8. bedroom I
9. main bathroom
10. laundry
- 11 bedroom II
12. bedroom III
13. terrace
14. master bedroom
15. master ensuite



Fig. 100 Interior rendering of ground floor den



Fig. 99 Single-family home Floorplans

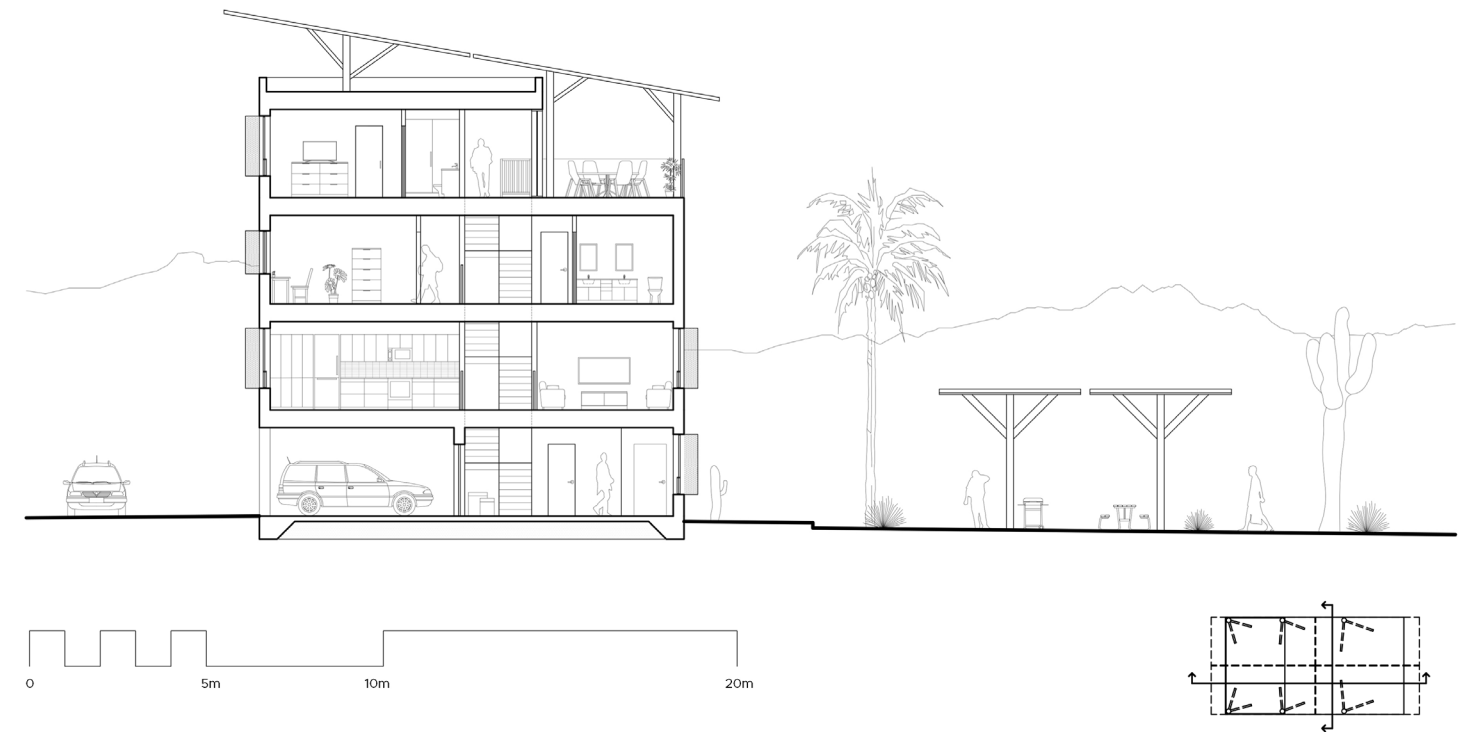


Fig. 101 Single-family home section I

Part 5.8 | Single Family Home (continued)

The single family home uses similar shading and lighting strategies as the townhome.

The interiors would use affordable materials in a modern, timeless style.

The residents could experience social activity in the shared outdoor space steps from their front door. They could also chat with their neighbours from their terraces. With their warm climate, the terrace doubles as an additional dining or lounge space for most of the year.



Fig. 106 SFH Terrace rendering



Fig. 102 SFH daytime perspective I



Fig. 103 SFH daytime perspective II



Fig. 104 SFH night perspective I



Fig. 105 SFH night perspective II



Fig. 107 Single-family home section II

Part 5.9 | Apartment

The apartment building is low-rise standing at four stories high.

The ground floor has room for some parking, but the hope is that most residents would use public transit and walk or bike to local amenities. There is also a lobby, utility room, bike racks and an aeroponic garden that is available to the entire cluster. This garden creates an opportunity for social interaction and provides fresh local produce.

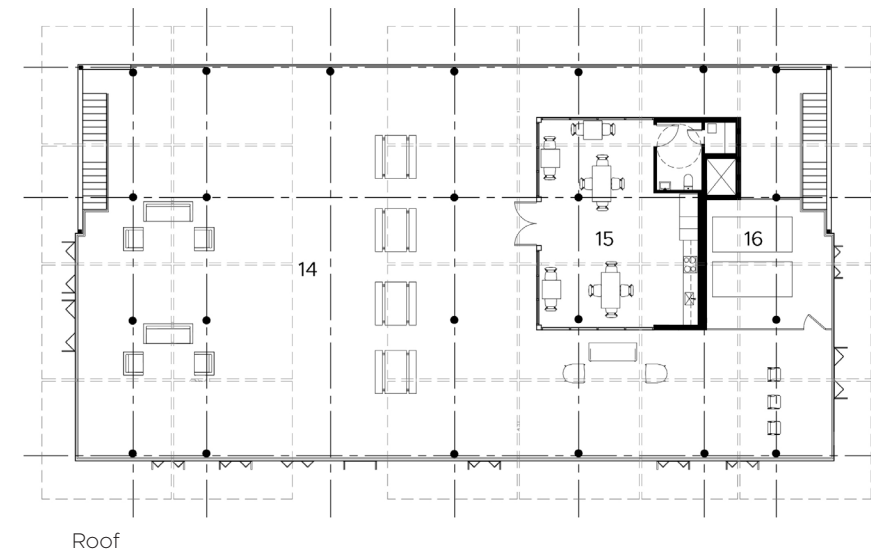
Two outdoor stairs or the elevator leads upstairs into outdoor, shaded walkways. Suites are located on the second, third and fourth floors. Each level has one accessible one-bedroom suite and one non-accessible one-bedroom suite. There is one accessible two-bedroom suite and three non-accessible two-bedroom suites. Lastly, there is one accessible three-bedroom suite. Each level has a shared laundry room to create social opportunity.

The rooftop is dedicated to social activity. Anyone in the cluster can use it. Solar panels provide shade for seating areas. There is also an enclosed space with a community kitchen, accessible washroom and seating. The enclosed space provides temperature controlled social activity even during hot summer days. The opening in the solar panels is provided for stargazing and is inspired by James Turrell's 'skyspaces'. Figures 108, 116 and 118 illustrate the rooftop space.

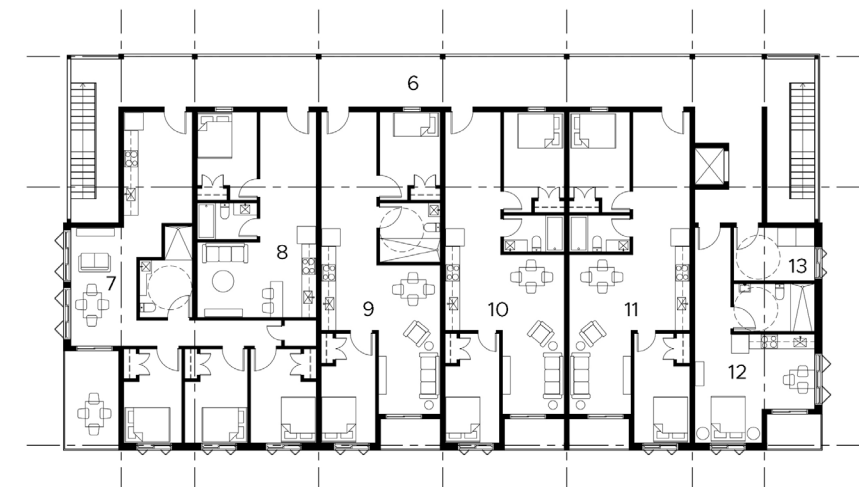
The ground floor has colourful lighting within the parking area. The generous shade screen wall creates beautiful shadows within the hallway, stairs and rooftop throughout the day.



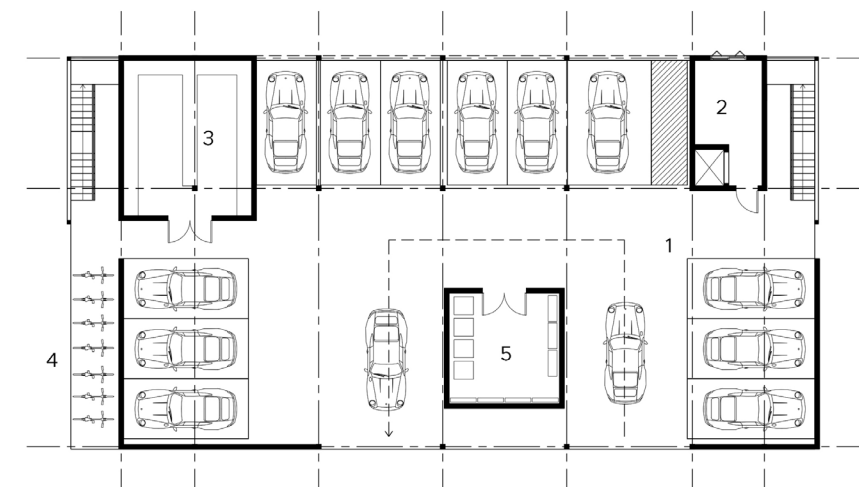
Fig. 108 Apartment roof rendering I



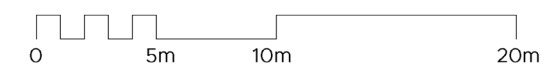
Roof



Level 2, 3, 4



Ground floor



1. parking
2. lobby
3. aeroponic garden for cluster
4. stacked bike racks
5. utility room
6. outdoor hall and stair
7. accessible 3 bed suite
8. 1 bed suite
9. accessible 2 bed suite
10. 2 bed suite
11. 2 bed suite
12. accessible 1 bed suite
13. shared laundry
14. outdoor seating
15. community kitchen
16. Mech units

Fig. 109 Apartment floorplans

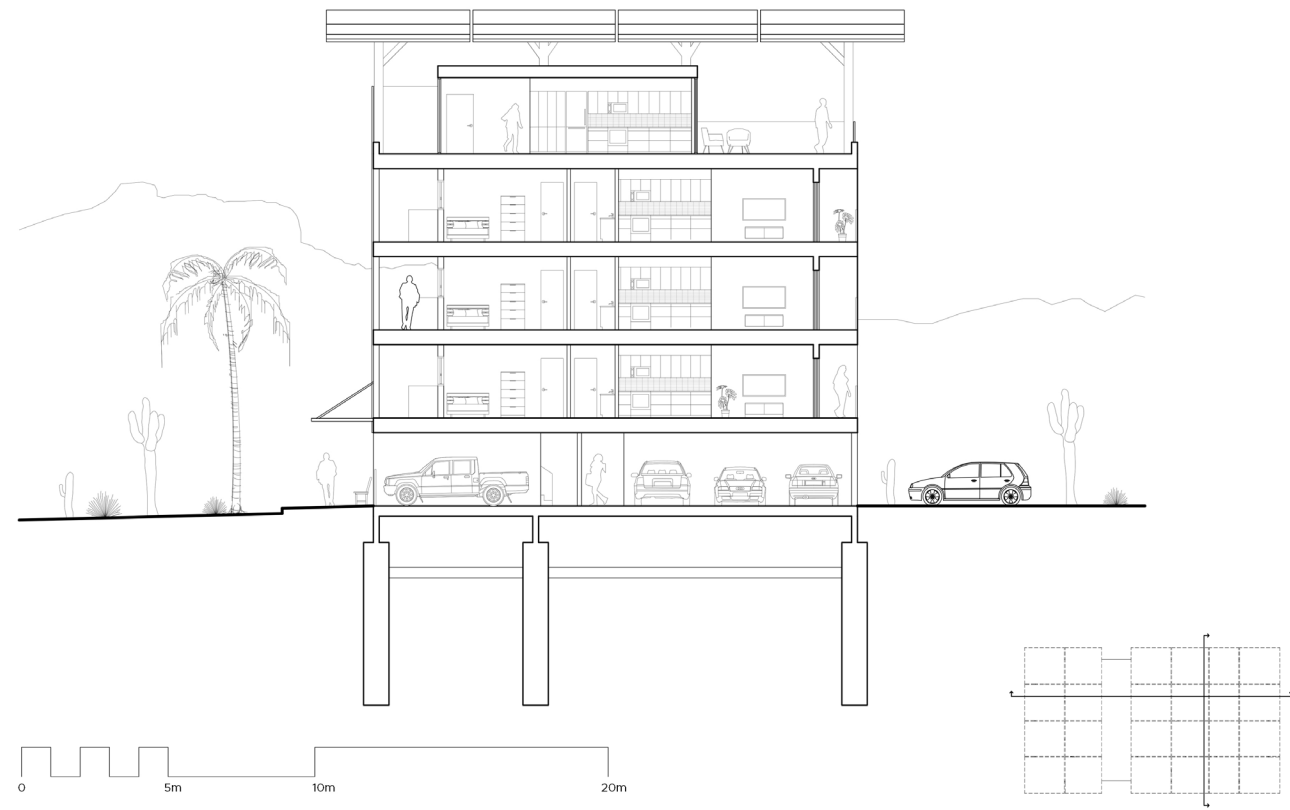


Fig. 110 Apartment section I



Fig. 112 Apartment section II

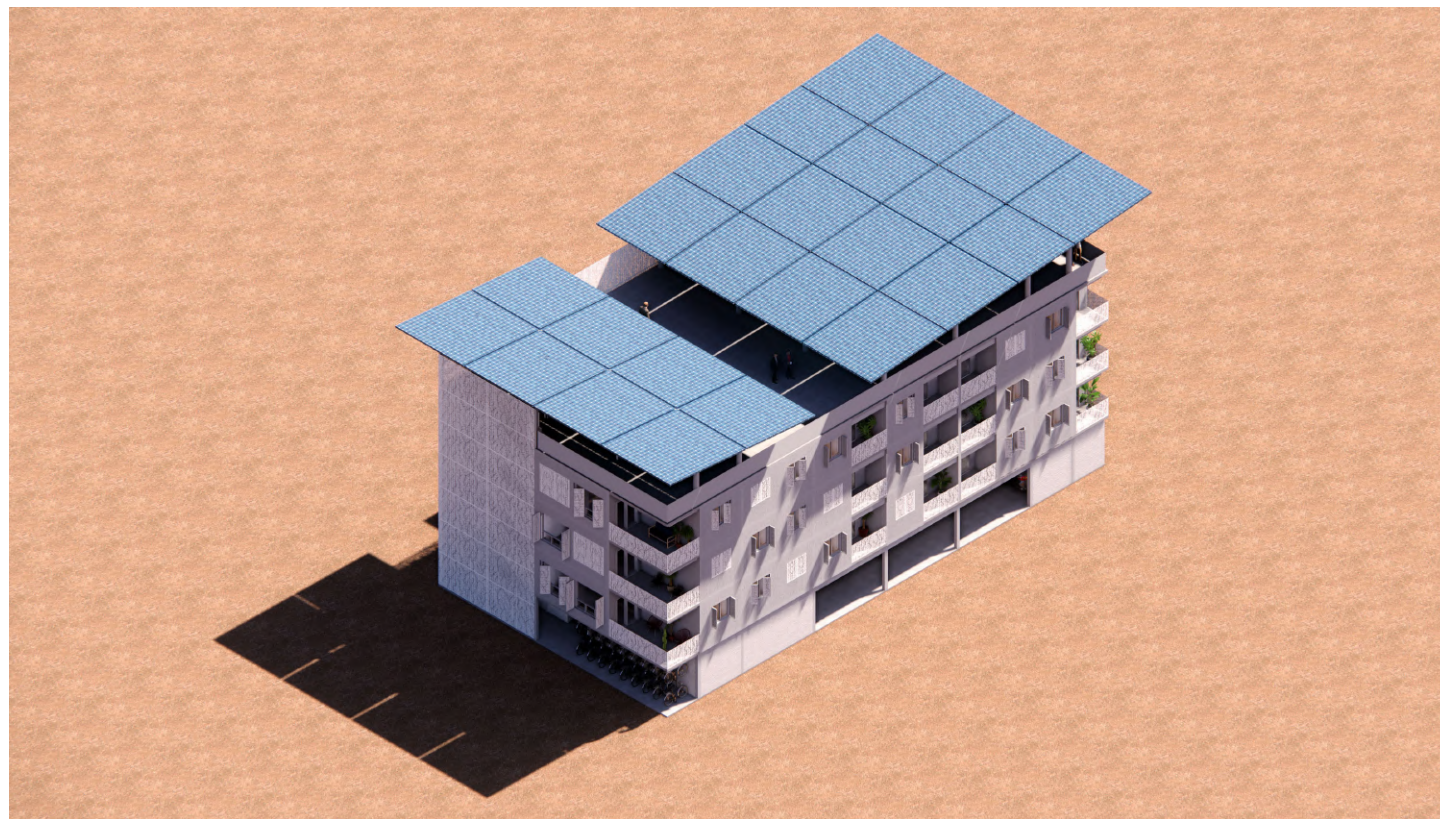


Fig. 111 Apartment Daytime perspective I

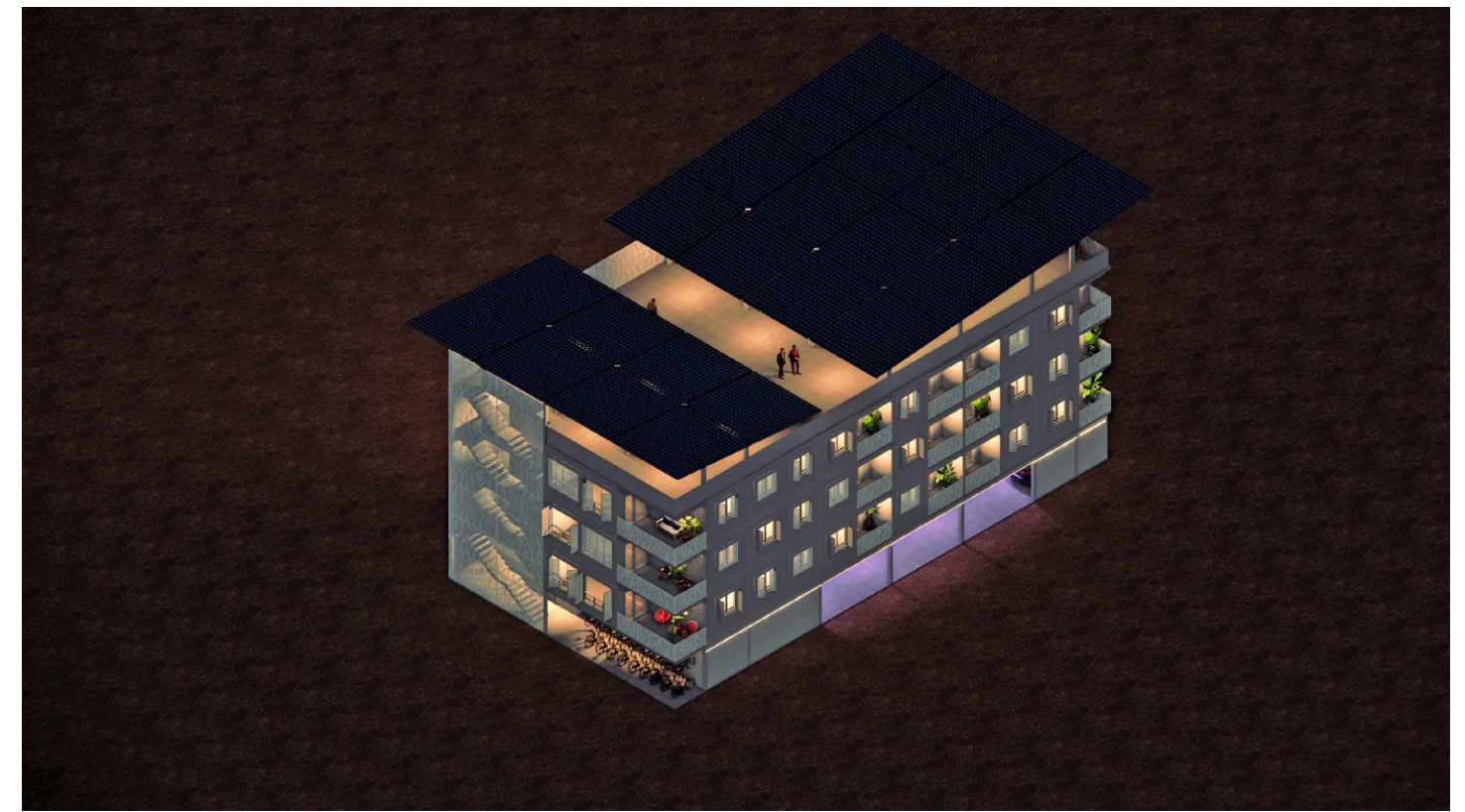


Fig. 113 Apartment night perspective I



Fig. 114 Apartment walkway rendering



Fig. 116 Apartment roof rendering II

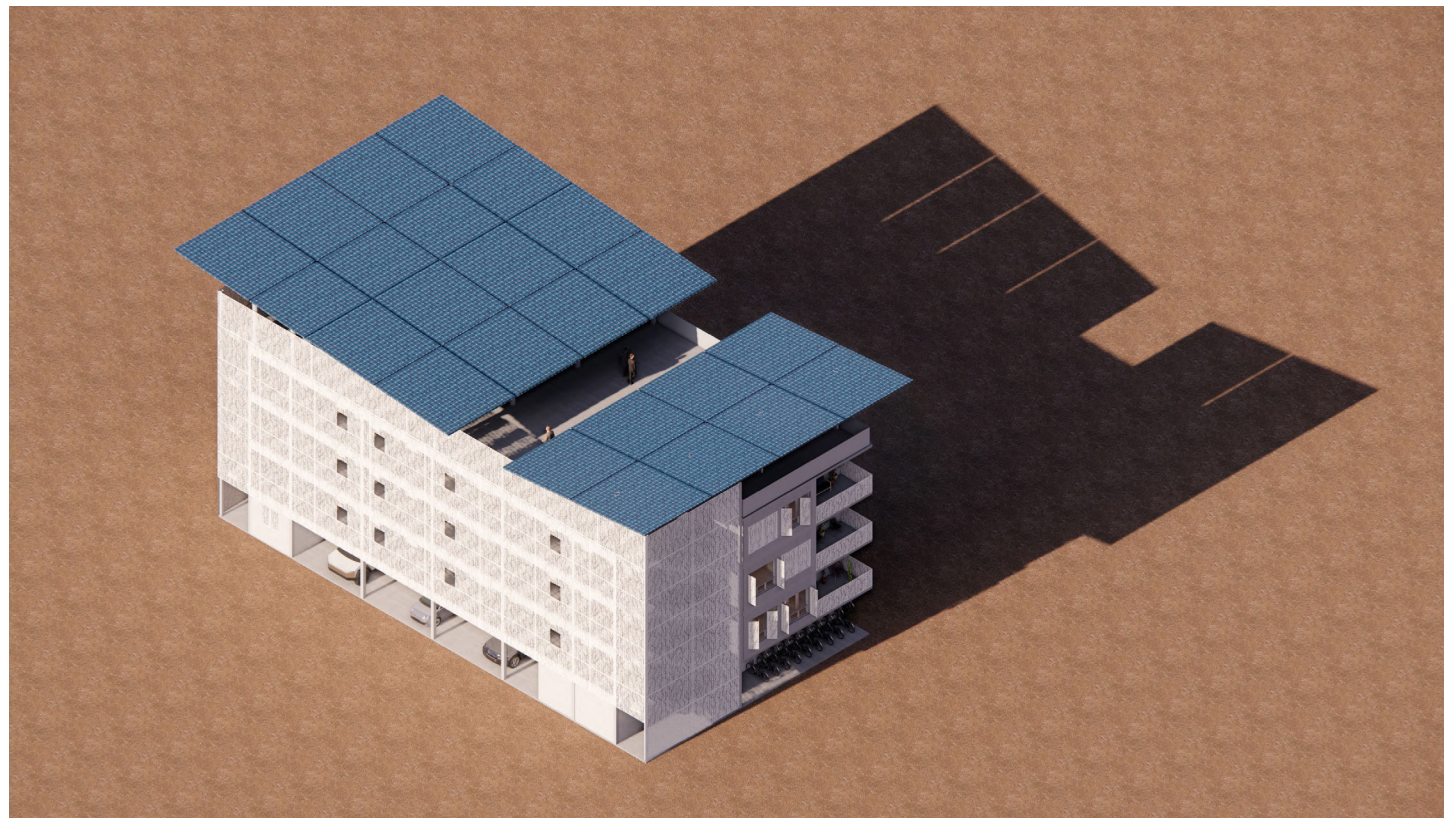


Fig. 115 Apartment Daytime perspective II

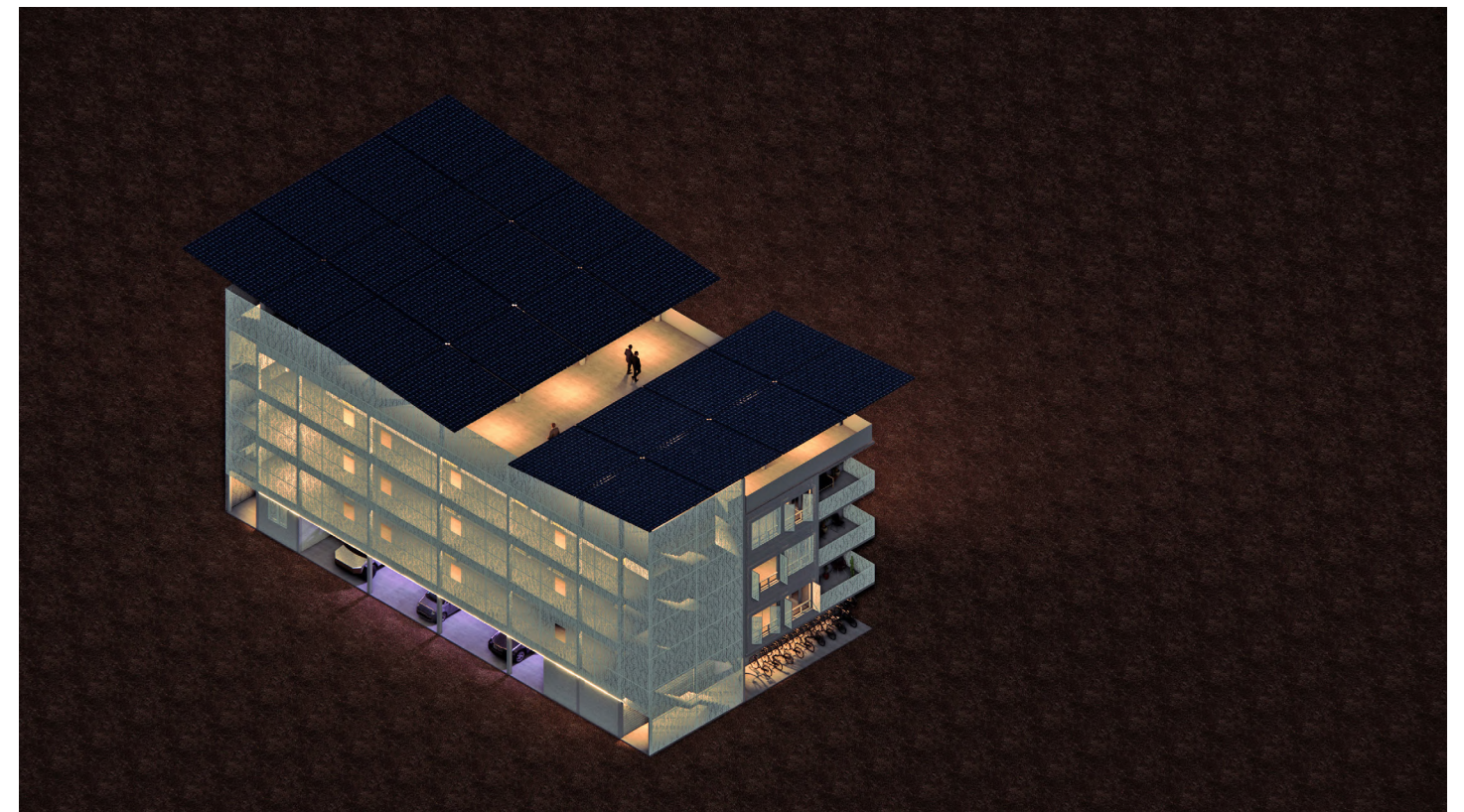


Fig. 117 Apartment night perspective II



Part 5.10 | Cluster

The housing options are arranged in clusters to support the social, sustainable and affordable goals of the thesis. There are endless variations of cluster arrangements, but they will all carry similar features.

This example demonstrates how one arrangement would work. Figure 119 points out key elements of the cluster. A parking courtyard creates a shaded microclimate condition within the cluster. In between clusters are shared outdoor spaces.

The cluster can enjoy the use of the large apartment roof deck, community kitchen, or the shaded social pads. There are shaded benches, games tables, swing sets, picnic benches and barbecues set up under the solar umbrellas.

With more people working remotely, social opportunity in the community is important. Users can expect social activity at many points throughout the cluster that aim to foster a sense of community.

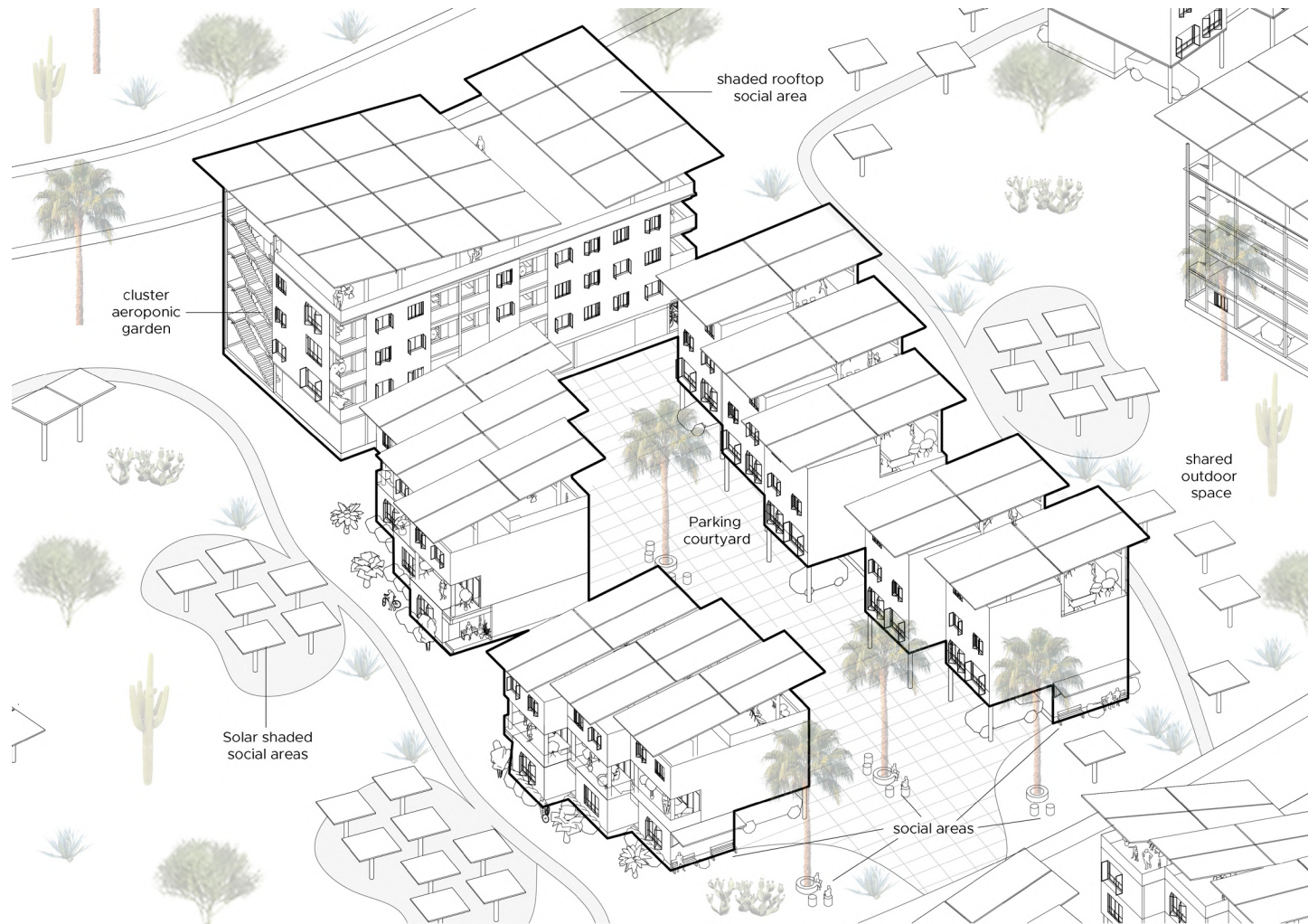


Fig. 119 Cluster axonometric diagram

Figure 120 demonstrates the sustainable efforts of the cluster. Passive cooling is created by the courtyard microclimate and breezeways, the roof overhangs, the shading screens and the masonry walls. Solar energy is collected from all roofs and solar umbrellas. The homes have small footprints because these are easier to climate control. There is also local produce that reduces the travel distance of their food.

The neighbourhood supports pedestrian activity by reducing the amount of driving for residents. This is achieved by incorporating walkable amenities, recreation paths and natural vegetation to enjoy. If they work within the community, their carbon footprint is even less. With public transit, fewer people will commute by car. As a whole system, this sets up residents to combat climate change in their daily routine.

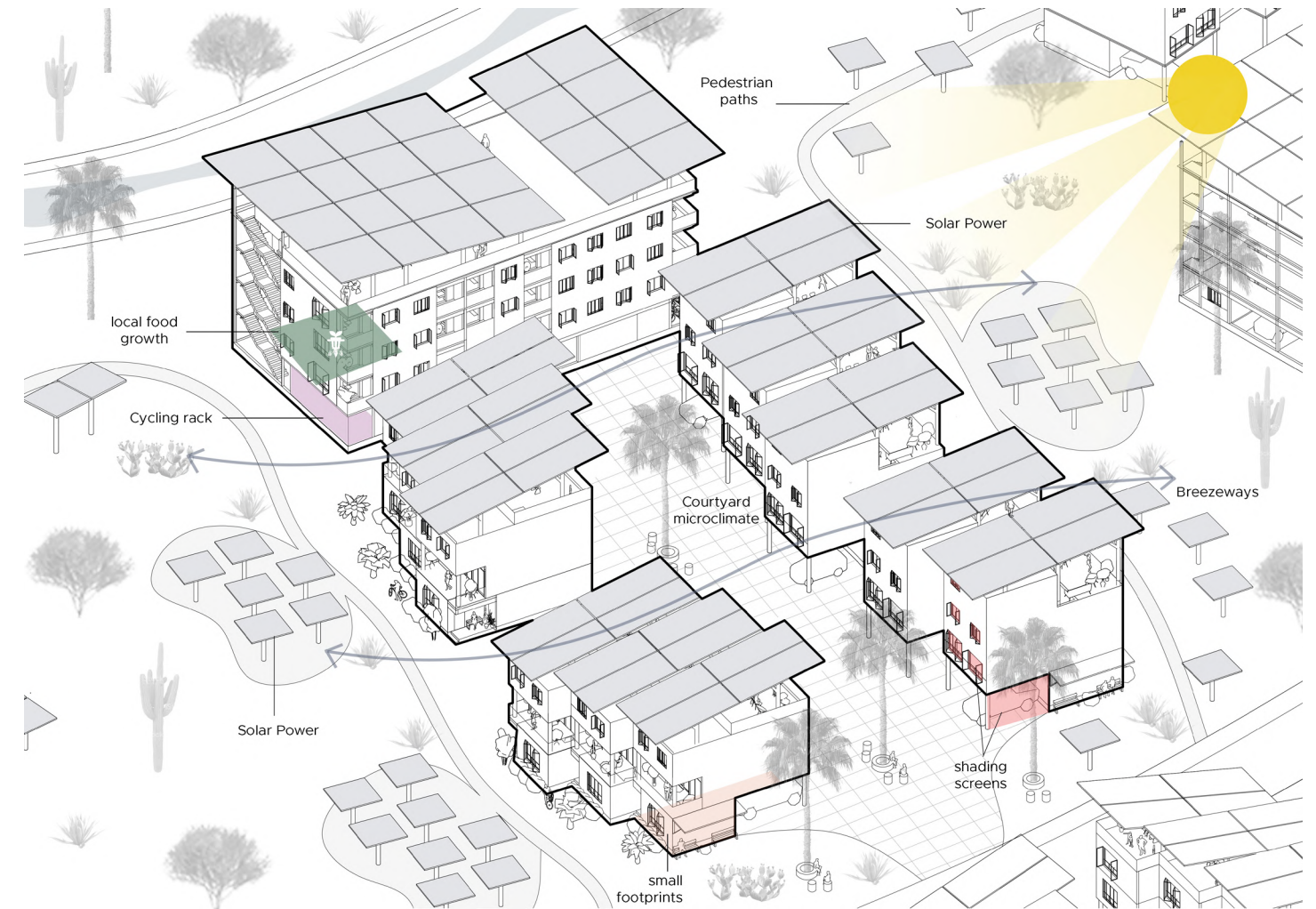


Fig. 120 Cluster sustainability axonometric diagram

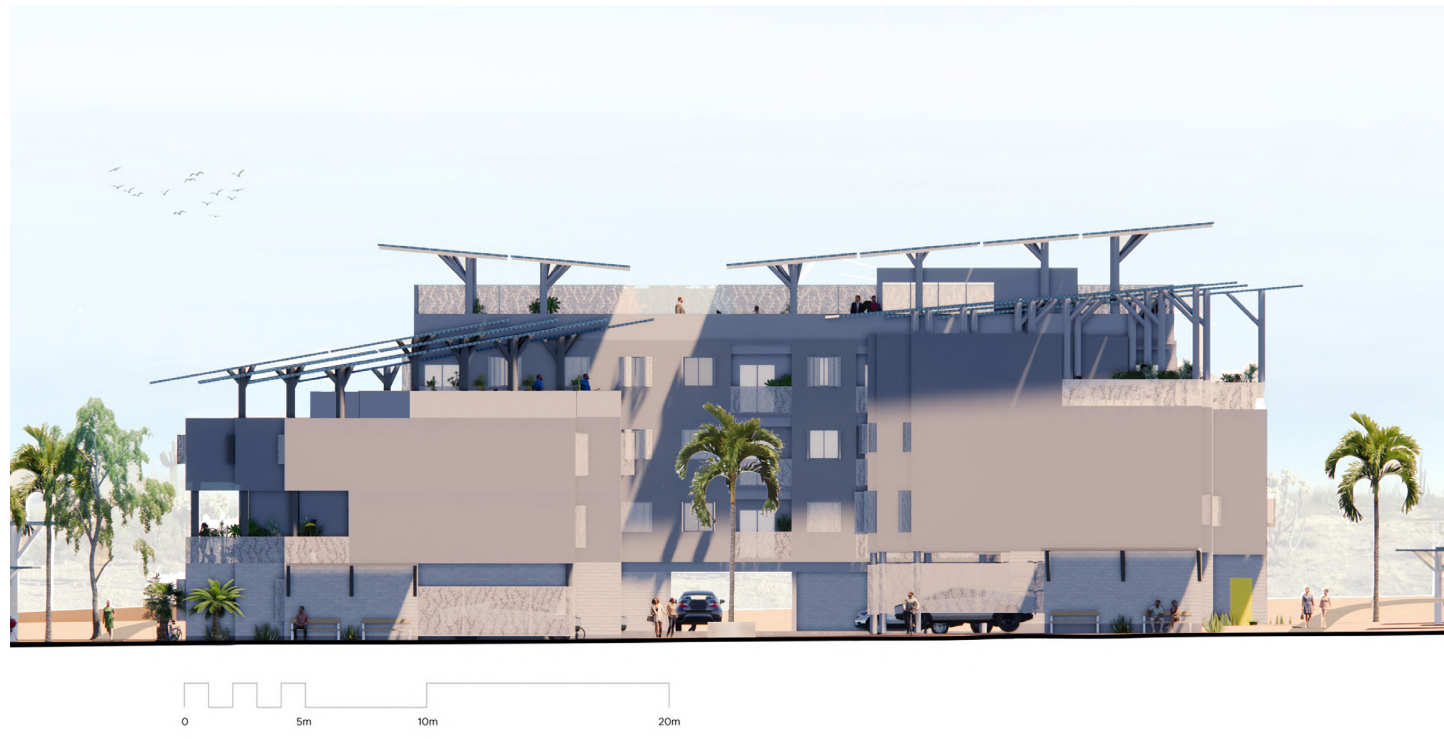


Fig. 121 Cluster Elevation I



Fig. 123 Cluster Elevation II



Fig. 122 Cluster Elevation III



Fig. 124 Cluster Elevation IV

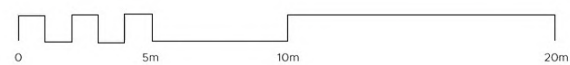


Fig. 125 Typical site section through shared outdoor space







Fig. 128 Cluster daytime rendering I



Fig. 130 Cluster daytime rendering II



Fig. 129 Cluster night rendering I



Fig. 131 Cluster night rendering II



Fig. 132 June 20 9am



Fig. 133 December 21 9am



Fig. 134 June 20 12pm



Fig. 135 December 21 12pm



Fig. 136 June 20 3pm



Fig. 137 December 21 3pm



Fig. 138 June 20 6pm



Fig. 139 December 21 6pm

Part 5.10 | Cluster (continued)

Figures 121-139 demonstrate typical cluster elevations, a site plan zoomed into one residential area, renderings of the cluster and sun studies.

These drawings show the colour variations from cluster to cluster. In typical tract housing in Arizona, the homes are usually shades of brown, sometimes pink and tan. This proposal suggests more variety in colour and the use of cool greys, greens and blues to contrast the warm ground.

The night renderings show the colourful light ambiance for pedestrians to experience, and the bright stars to be preserved. The sun studies show how the homes provide shade for one another and the shade within the parking courtyards.

Typical tract home developments in Arizona erase landscape. The site plan shows how the desert will be preserved. The shared outdoor spaces will not be covered with unnatural turf that requires extreme amounts of water. Instead, the natural beauty of the desert will perforate the shared spaces. The washes will be preserved as well. These efforts preserve the local character and identity of place.

The cluster mixes housing options to create a more diverse mix of demographics within the community. The 'sameness' of typical tract home residents would be gone. This strategy opens the suburbs up to everyone.

Part 5.11 | Community Plan

The community plan was designed using the toolkit principles for planning. The community and larger scale includes public transit, is pedestrian and cycling friendly, mixes uses, is sustainable and the layout is guided by nature.

The community considers potential flooding and brush fire activity. The buildings have been located away from areas where several washes converge. The roads run parallel to the washes to reduce water conflicting with roadways. The design of the homes locates the primary program above the ground floor. If the homes were to experience any flooding, the damage would be minimal.

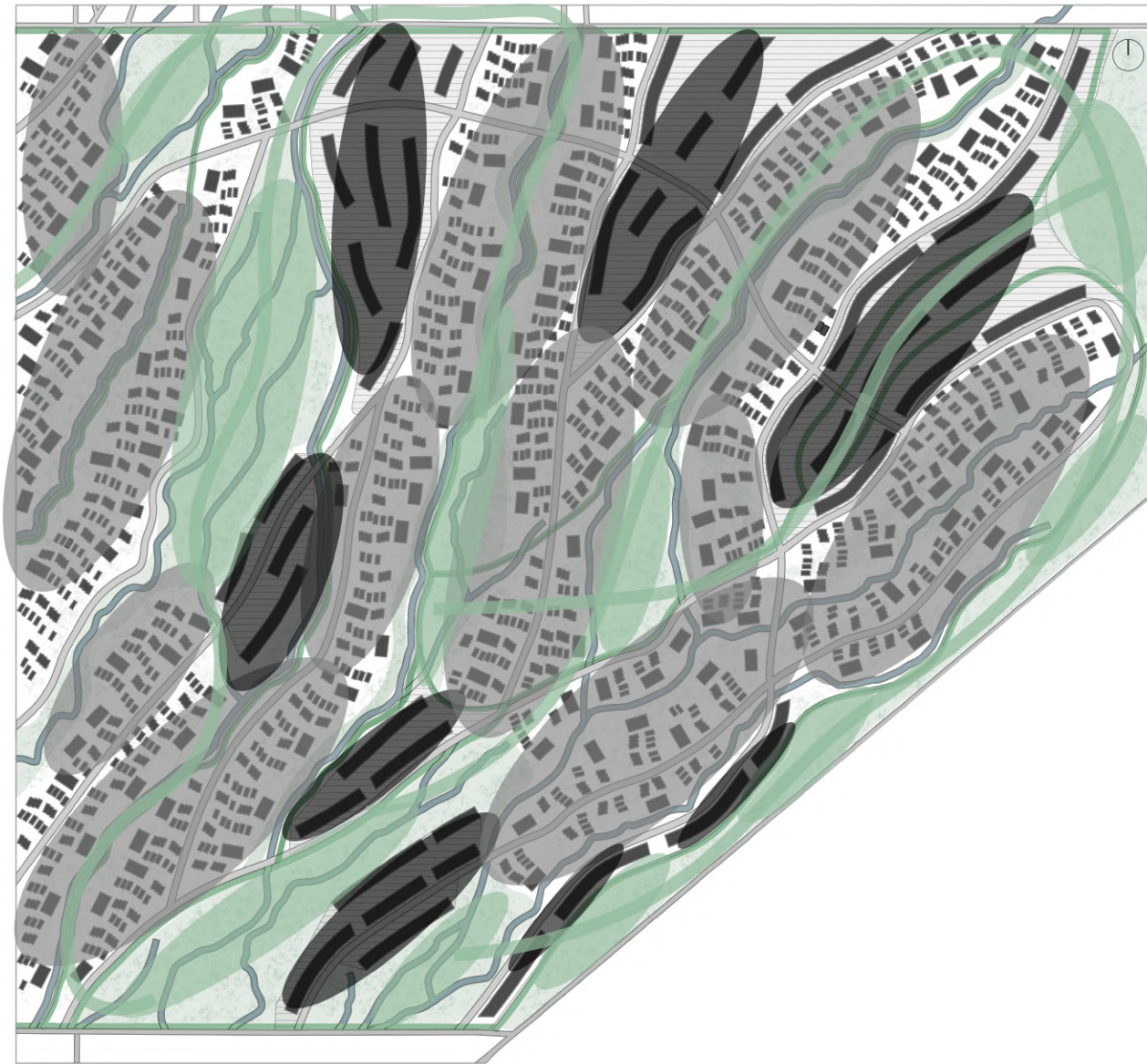
The brush fire of summer 2020 on the site ran until it met a dirt road or path. Having breaks in between brush seems to be an effective strategy to prevent brush fires. The paths on the perimeter of the site act as firebreaks.

The following pages present the planning of the community. The community is organized into nodes of residential areas, greenspace and amenities. This creates a non-hierarchical plan where amenities are always within walking distance to residential areas. Amenity buildings could be mixed use, retail, restaurant, commercial or institutional. The idea is to bring life closer to home. This reduces carbon emissions from daily driving.

The figure ground site plan (fig 140-141) shows the recreation paths that run through the community in a dark green. It also shows the variety in cluster groupings.

The axonometric (fig 142) shows the human scale of the buildings to preserve views of the surrounding mountains. It also shows how the existing site washes drove the planning layout.

The amenities in walking distance create opportunities for residents to socialize with their neighbours. They could grab lunch with a neighbour also working remotely, or walk to grab some groceries and have a barbecue night with the cluster, or meet new people at the local amenities. There are endless opportunities for residents to interact.



0 100m 300m 600m 1000m

- Greenspace nodes
- Residential nodes
- Amenity nodes

Fig. 140 Community organization diagram



0 100m 300m 600m 1000m

- Preserved Desert
- Recreation Paths
- Buildings

Fig. 141 Community site plan

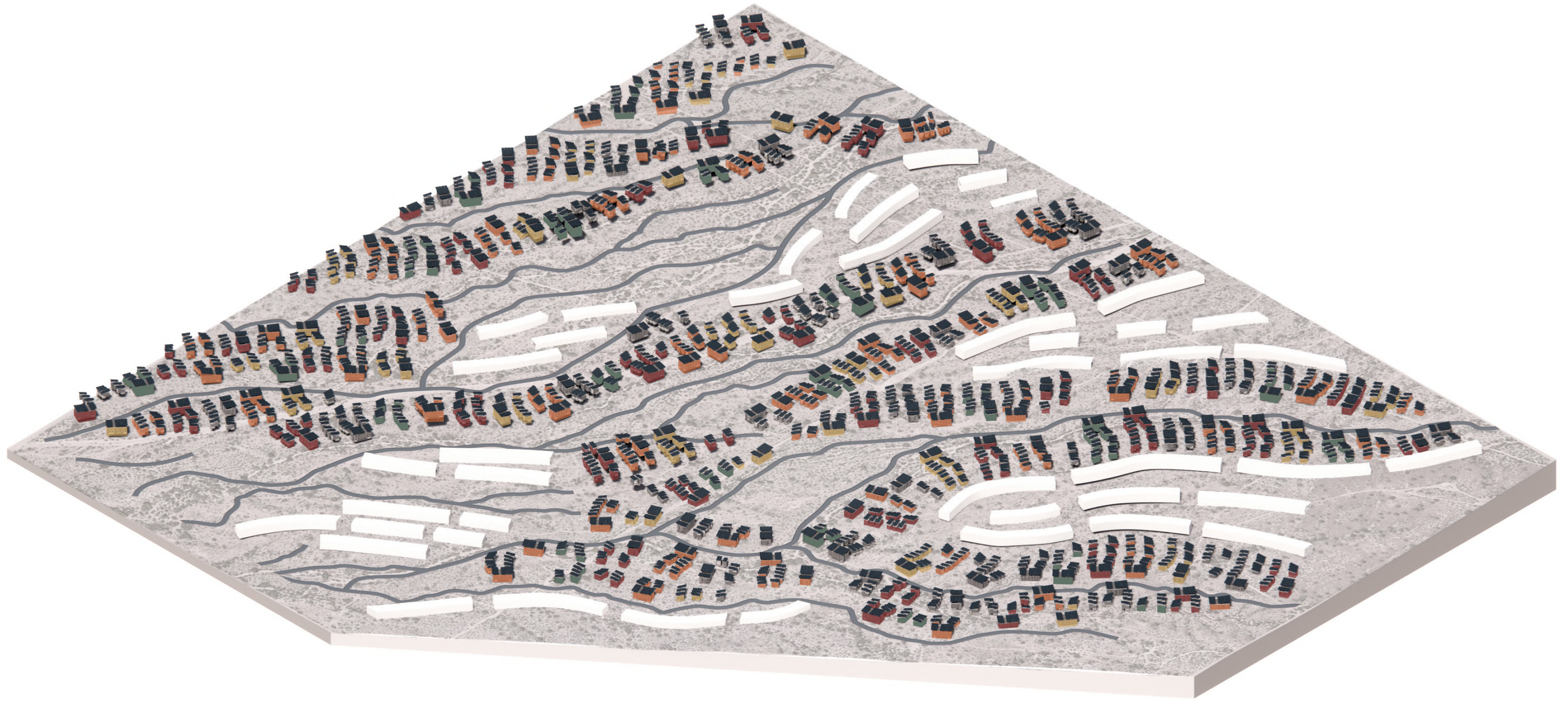


Fig. 142 Community axonometric

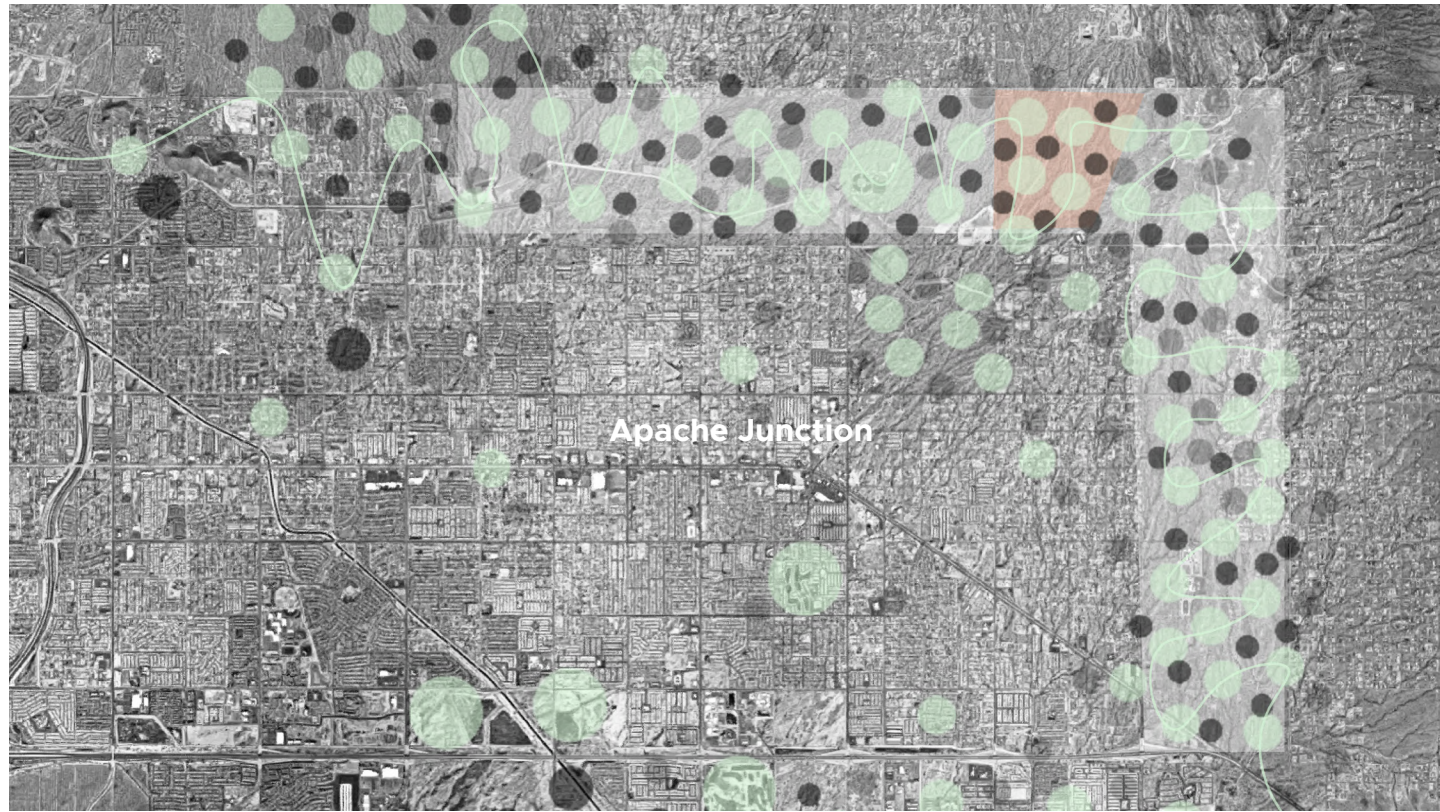


Fig. 143 Connection to empty adjacent plots diagram

- Site
- Greenspace
- Amenity nodes
- Residential nodes

Part 5.12 | Adjacent Plots

As previously mentioned, there are adjacent plots (seen in white) next to the Thesis project site (orange) that have also been zoned for detached housing developments.

Instead of the land being completely lost to a typical tract home development, this proposal suggests replicating the node style of development onto these adjacent sites. This way, the character of the desert landscape is not completely lost. The overall development would be perforated by preserved desert. It would bring amenities closer to home and reduce the typical carbon emissions created by bedroom communities.

This type of development would also bring more jobs to the Apache Junction area. This could help to develop a more diverse demographic within the city because it would attract more people to move to AJ. The selling points of the community are that it offers affordable housing, sustainable lifestyles, jobs and public transit. All of these efforts would help rejuvenate the local economy.

Part 5.13 | Phoenix Connection

Figure 144 demonstrates how public transit could be brought to Apache Junction. The diagram also suggests how the node developments can connect to greater Phoenix.

There is currently no public transit operating in the city of Apache Junction. The red node on the diagram is where the LRT to Phoenix currently ends in Mesa. The pink line is where bus transit currently ends.

This Thesis proposes that the LRT line should expand East into Apache Junction. New amenities can be built along the rail line, bringing more people and jobs to the area. The purple line suggests new bus transit that would run through the new developments.

The green nodes suggest how the larger Phoenix area could be retrofitted with greenspaces, connected by paths. Nodes of amenities in black could be introduced to existing residential areas to create pedestrian friendly neighbourhoods.

The small scale goals that begin with housing grow to the community scale, to the adjacent plots, to greater Phoenix. With this 'whole systems' approach, combatting climate change is more effective than individual, isolated efforts. This re-thinking of the suburbs aims to address the needs of our evolved society and make it feasible for the masses to combat climate change in their daily lives.

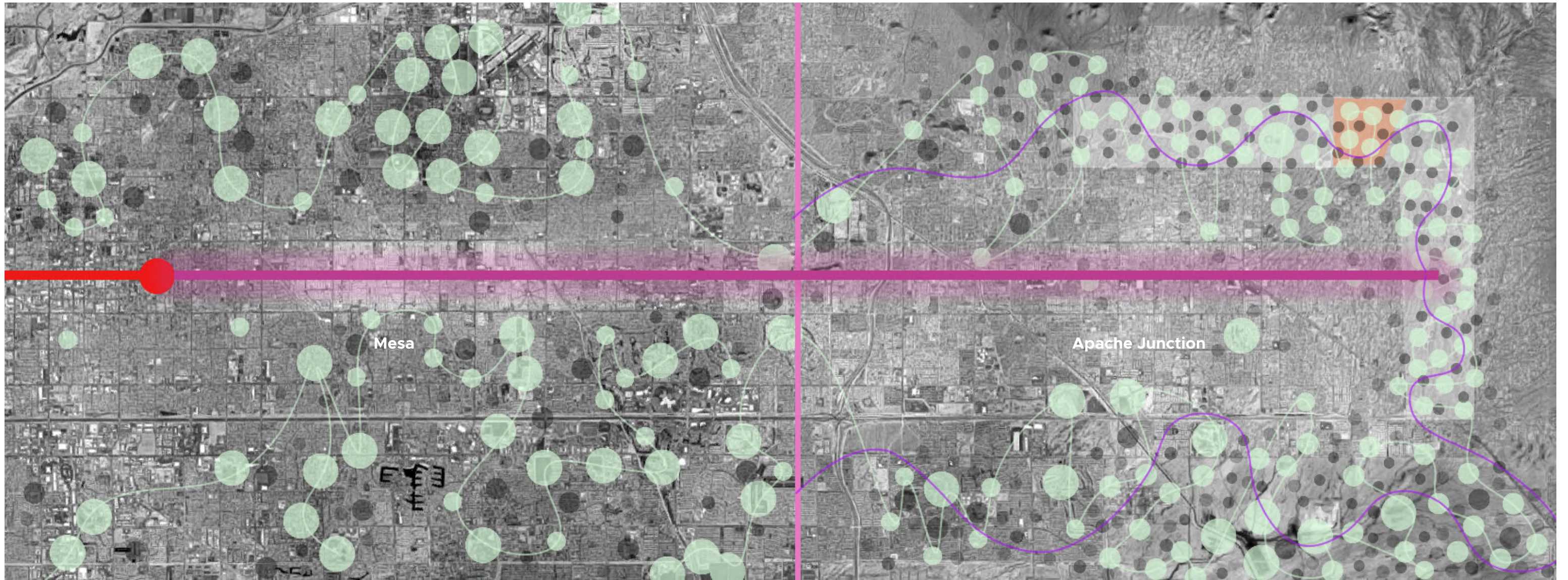


Fig. 144 Connection to Phoenix diagram

- End of Current LRT
- Proposed new bus transit
- Proposed continuation of LRT
- End of current Public transit
- Site
- Greenspace
- Amenity nodes
- Residential nodes

Part 6

Conclusion

Conclusion

This Thesis was inspired by the aerial observation that has taken place over the past ten years travelling to Phoenix, Arizona. That experience developed into an understanding that eventually grew towards a frustration. From above, it is visually evident that sprawling tract home developments tragically define the character of the greater Phoenix area. The same can be said for most cities in the American Southwest.

This Thesis began by tracing back historic influences that have shaped the suburbs today. This investigation revealed that though society, technology and our circumstances have drastically changed, the suburbs continue to reflect past development patterns. The division of zones, uniform tracts of housing, and isolated office parks and strip malls define today's suburbs. Though these patterns originate from the postwar era, they are still being used today as an efficient means for developers to generate profit. Suburban development has become a very lucrative business, but in return it has devastated the character and sustainability of our neighbourhoods, cities and regions.

Following the historic research of the suburbs, architecture and urban planning case studies were examined to develop a kit of parts for the thesis project. The intent was to search out projects that addressed missing design elements from the original postwar suburbs. The case studies included Arcosanti, Broadacre city, Taliesin West, The Case study House no.8 and the Green Urbanism planning theory by Peter Calthorpe. Positive aspects from these studies were used to develop a toolkit for building and a toolkit for planning.

The thesis project site was studied next as well as the city of Apache Junction. Physical examination of the site took place in December 2020 to January 2021 by foot and drone photography. Developing a deep understanding of place was integral to the design of the thesis project. The site ecology drove the planning and the site's climatic conditions drove the architecture. The background research uncovered clear goals for the thesis project and generated a meaningful design response.

All levels of development work together in the design towards a 'whole systems' approach. The project presented several options for affordable, sustainable housing with many opportunities for social interaction. The housing options were grouped into clusters. This strategy mixed different demographics together, utilized passive shading within courtyards and provided space for social activity. The social and sustainable goals of the project were supported on a larger scale in the community design. Residential nodes were mixed with amenity nodes and green space nodes. This brought amenities into walking distance for the residents and it preserved the unique desert character of the site. The desert patterns drove the entire community design, and on an even larger scale, they drove the development of the adjacent plots. In this strategy, the desert was not erased, instead it perforated through. This proposal aimed to attract people to the Apache Junction area for new jobs, affordable housing and eco-friendly lifestyles. To further support this, Apache Junction would connect to Phoenix with public transit.

This Thesis looked to the past for guidance and reasoning and optimistically presented an alternative for the future. The proposal is not seen as a fixed solution, but rather as a stepping stone. Continuous adaptation is necessary as our society and ecological circumstances change. We cannot continue using a suburban development model designed for an outdated society that celebrated the automobile, mass production and segregation. Our people, the planet and the significance of natural landscapes demand that we redirect our settlement patterns and lifestyles associated with them. This Thesis presents an alternative form of suburban development that encourages a stronger social, economic and ecological future.



Bibliography

Ackley, Madeline. "Return of the Non-Soon: Arizona's Second Dry Monsoon Season Breaks Records." *The Arizona Republic*, October 11, 2020. <https://www.azcentral.com/story/news/local/arizona-weather/2020/10/11/arizonas-monsoon-season-driest-record/5930457002/>.

Calthorpe, Peter. *Urbanism in the Age of Climate Change*. Laurentian University Library. Washington, DC: Island Press, 2012. <https://link-springer-com.librweb.laurentian.ca/book/10.5822%2F978-1-61091-005-7>.

Casillas, Phyllis. "Mortgage Applications Reveal a Flood of Californians Moving to Arizona." *AZ Big Media*, January 25, 2021. <https://azbigmedia.com/lifestyle/mortgage-applications-reveal-a-flood-of-californians-moving-to-arizona/>.

City of AJ. "2020 General Plan: Apache Junction, AZ - Official Website." *Apache Junction, AZ*, 2020. <https://www.ajcity.net/gp2020>.

Elliot, Kim. "The Dark Side of Suburbia." *Khan Academy*. Accessed March 28, 2021. <https://www.khanacademy.org/humanities/us-history/postwarera/postwar-era/a/the-dark-side-of-suburbia>.

Florida, Richard. "The Changing Demographics of America's Suburbs." *Bloomberg*. November 7, 2019. <https://www.bloomberg.com/news/articles/2019-11-07/the-changing-demographics-of-america-s-suburbs>.

"Geographic Information Systems (GIS) Division: Apache Junction, AZ - Official Website." *Apache Junction, AZ*, Accessed October 13, 2020. <https://www.ajcity.net/472/Maps-GIS>.

Hanley, William. "Affording America - How to Solve a Housing Crisis." *Dwell Magazine*, 2020.

Horch, AJ. "Buying a Home: Why It's Harder for Younger Generations than Their Parents." *CNBC*. November 25, 2020. <https://www.cnbc.com/2020/11/25/buying-a-home-why-its-gotten-harder-for-younger-generations-.html>.

Ince, Catherine, and Lotte Johnson. *The World of Charles and Ray Eames*. New York, NY: Rizzoli ; London, 2016.

Kershner, Kate. "Why Do Cookie-Cutter Neighborhoods Exist?" *HowStuffWorks*, May 2, 2012. <https://home.howstuffworks.com/home-improvement/construction/planning/why-cookie-cutter-neighborhoods-exist.htm>.

Kollenborn, Thomas. "Apache Junction - A History", *Tom Kollenborn Chronicles*, January 1, 1970. <http://superstitionmountaintomkollenborn.blogspot.com/2014/01/apache-junction-history.html>.

Langdon, Philip. *A Better Place to Live: Reshaping the American Suburb*. Laurentian University Library. Boston: University of Massachusetts Press, 1994. <https://web-b-ebsohost-com.librweb.laurentian.ca/ehost/ebookviewer/ebook/bmxlYmtfXzEzODc1X19BTg2?sid=b-f0299b6-8282-49c6-90f5-8e85d5ba75c9@pdc-v-sessmgr05&vid=0&format=EB&rid=1>.

Lucas, Suzette A. *Taliesin West: an Interpretive Guide*. Scottsdale, AZ: Frank Lloyd Foundation, 1993.

Mumford, Eric. *The CIAM Discourse on Urbanism 1928-1960*. Cambridge, MA: MIT Press, 2002.

"Oxford English Dictionary Online." *Oxford English Dictionary*. Accessed December 21 2020. <https://www-oed-com.librweb.laurentian.ca/>.

Perry. "Solar Requirements for Commercial and Residential Development in California." *Cal Solar, Inc.*, August 21, 2020. <http://www.calsolarinc.com/solar-requirements-for-commercial-and-residential-development-in-california/#:~:text=The%20California%20solar%20mandate%20enforces,is%20less%20than%20four%20stories>.

Pew Research center. "The American Family Today." *Pew Research Center*, December 15, 2015. <https://www.pewresearch.org/social-trends/2015/12/17/1-the-american-family-today/#:~:text=Fami-ly%20life%20is%20changing,and%20the%20drop%20in%20fertility>.

Stern, Michael. "Palm Springs Tour of Mid Century Modern Homes." *YouTube*, 2016. https://www.youtube.com/watch?v=fZ-rTEu82oA&ab_channel=HometownsAndHeroes.

Stillman, Jessica. "Bill Gates: The World Will Be Dramatically Different After Covid-19 ." *Inc.*, November 18, 2020. <https://www.inc.com/jessica-stillman/bill-gates-anthony-fauci-pandemic-changes.html>.

"System Map." *Valley Metro*, September 29, 2020. <https://www.valleymetro.org/system-map>.

Talton, Jon. "Phoenix 101: Maryvale Begins." *Rogue Columnist*, 2017. https://www.roguecolumnist.com/rogue_columnist/2017/05/phoenix-101-maryvale.html.

"The History of Eichler Homes." *Medley Home*, January 8, 2018. <https://medleyhome.com/blogs/gather/the-history-of-eichler-homes>.

Turrell, James. "Introduction." *James Turrell*. Accessed March 29, 2021. <https://jamesturrell.com/about/introduction/>.

Vint, Bob. "Southwest Housing Traditions: Design Materials Performance." *HUD User*, 2005. https://www.huduser.gov/Publications/pdf/SouthwestHousing/SW_Housing_Traditions.

Whittaker, Richard. "A Conversation with Paolo Soleri." *Works + Conversations* no.5 (November 5, 2001): 10–18.

Wright, Frank Lloyd. *A Testament*. New York, NY: Bramhall House, 1957. <https://babel.hathitrust.org/cgi/pt?id=mdp.39015013177020&view=1up&seq=7>.

Wright, Frank Lloyd. *The Living City*. New York: New American Library, 1963.