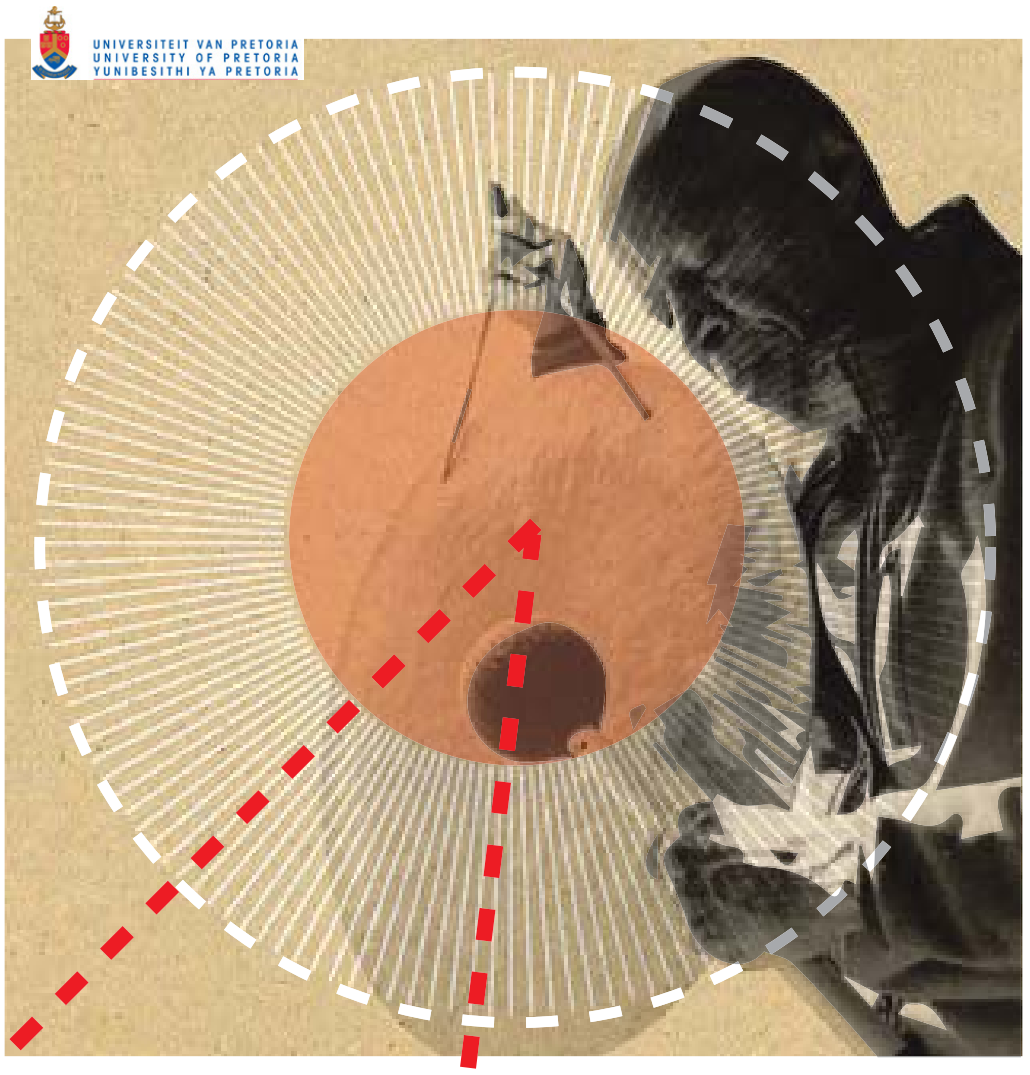
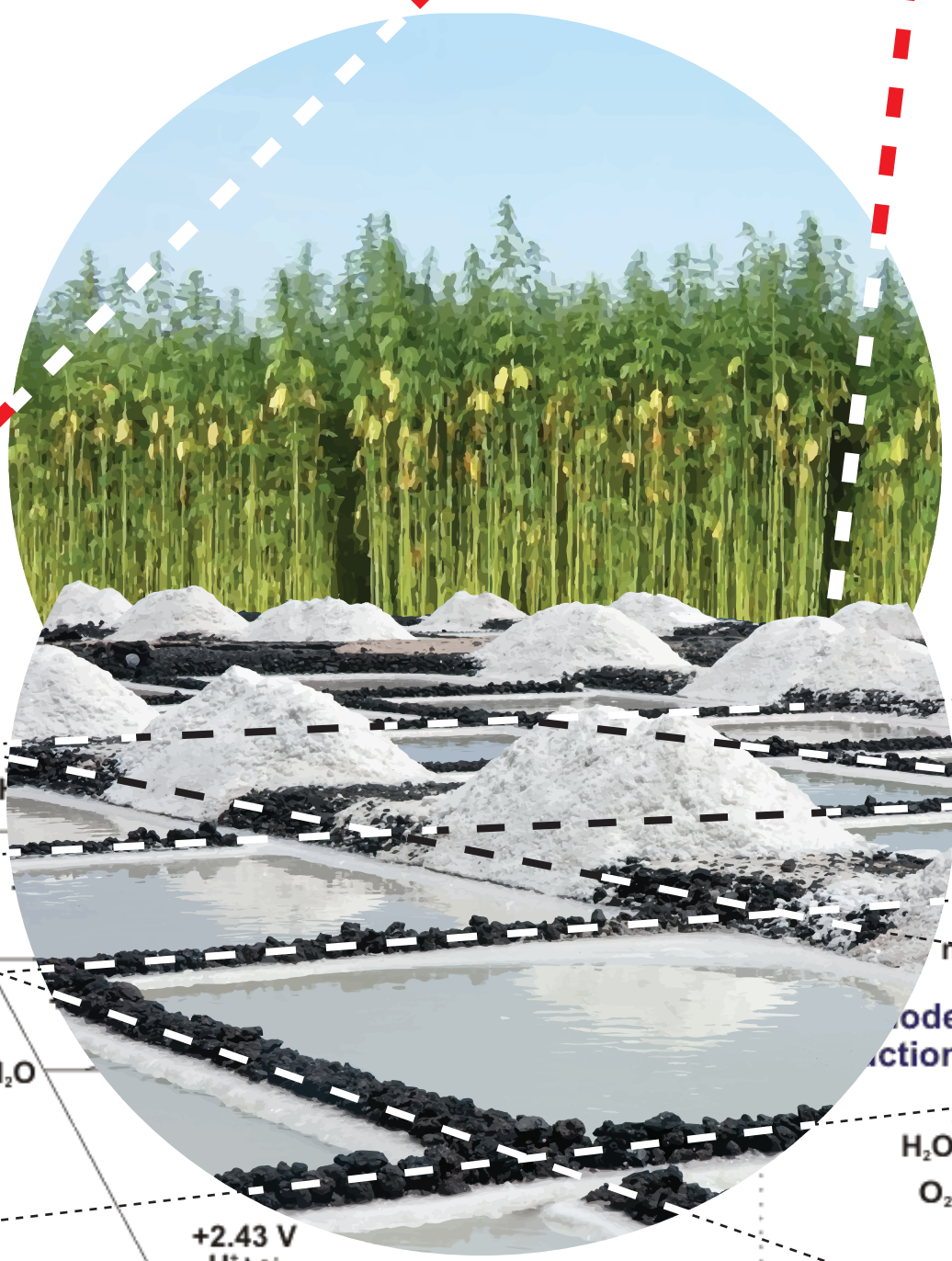
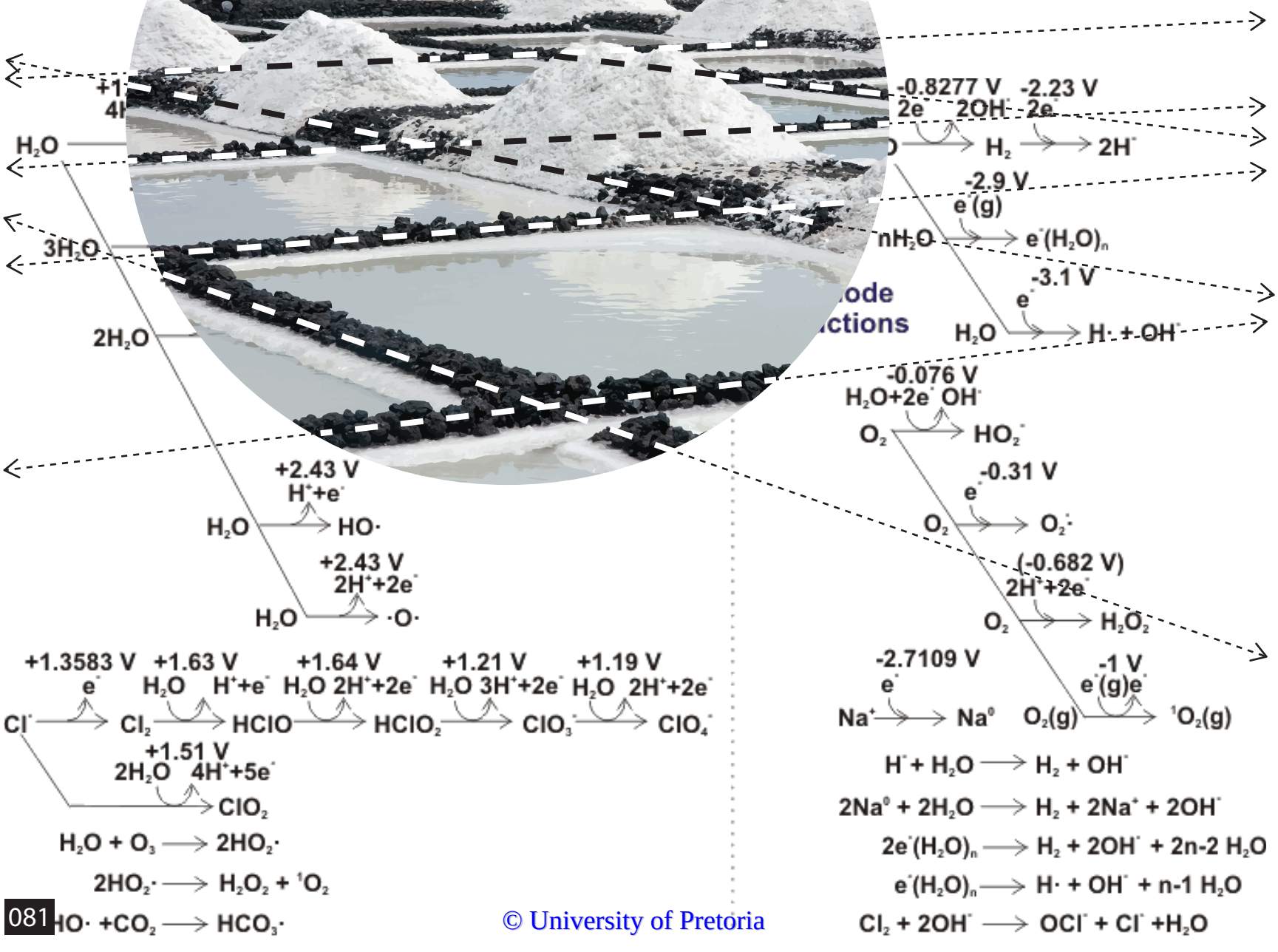
CHAPTER 04

PROGRAMME AND DESIGN



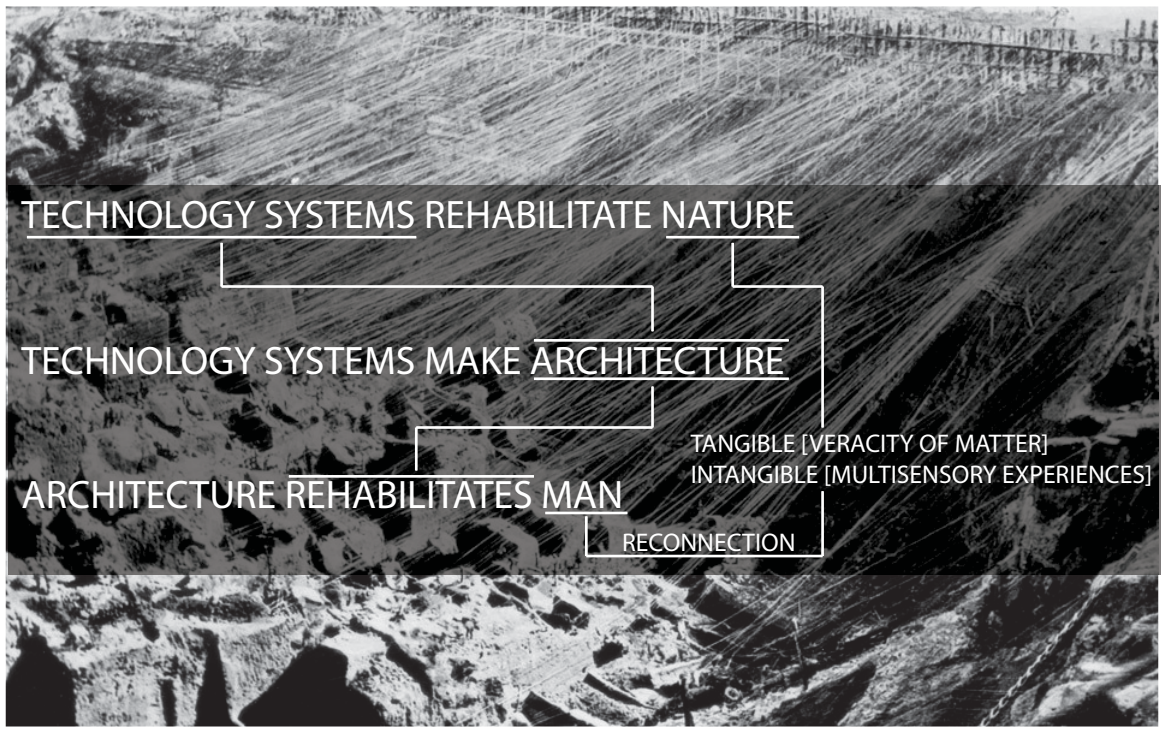
↓ 079 - Programme Graphic





4.1// INTRODUCTION

The Game of Diminishing Returns aims to rehabilitate both Man and Nature. These aims will be achieved through an architectural programme establishing three research laboratories consisting of Agriculture studies, Chemical experimentation and Technological innovation; supported by various bolt-on programmes. Three major outputs will be delivered from the architectural programme: salt extraction and purification, construction technology, and agricultural training. While the determined outputs of the programme are paramount to the success of the architectural intentions, the largest proponent of the entire project will be the physical remediation of slime dam no.7 . This will be done through the three laboratories researching methods of rehabilitation and determining their success after testing implementation.



↑ 080 - Programme Baseline

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UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

LAB 1

AGRICULTURAL SCIENCE

LAB 2

CHEMICAL RESEARCH

LAB 3

TECHNOLOGY RESEARCH

AGRICULTURAL TRAINING

SALT EXTRACTION

CONSTRUCTION TECHNIQUES

WELCOME CENTRE

MAIN SUPPORT SYSTEM

SERVICE CENTRE

SCIENTIST ACCOMMODATION

↑ 081 - Diagrammatic Programme

4.2// INPUT AND OUTPUT

AGRICULTURAL SCIENCE LABORATORY

- Testing the effects of diamond mine related chemical water contamination on various local plants species and internationally acknowledged bioremediation species.
- Researching viability and edibility of harvestable crop species after use in bioremediation and establishing codes for effective implementation.
- Agricultural community training through introduction to bioremediation and sustainability principles.
- Testing viability of agricultural zones within Refilwe, utilizing water from slime dam no.7.

CHEMICAL RESEARCH LABORATORY

- Investigations into exact chemical composition of slime dam no.7's water.
- Implementation and testing of salt extraction techniques including: electrolysis systems, active & passive filtration systems and passive settling & evaporative systems.
- Training of Refilwe residents in extraction methods and viability of salt resale for either industrial or household purposes.
- Testing bioremediation plants after water extraction to establish: chemical absorption potential, chemical neutralization potential and edibility of crops used for chemical absorption.
- Investigation chemical settling agents and testing their implementation on small scale samples; to prevent environmental damage through failed tests.

TECHNOLOGY SYSTEM RESEARCH LABORATORY

- Testing architectural technologies to help in bioremediation strategies.
- Testing onsite materials in construction systems; including extracted rock and soils from mine-material dumps.
- Building method testing and training for Refilwe residents.
- Testing passive filtration systems on the chosen site landscape.
- Investigation into passive and active systems for net zero architecture.
- Mechanical training for residents from the Refilwe community.

WELCOME CENTRE ①

PUBLIC PARKING

LOBBY

MUSEUM TYPE DISPLAY AREA **[GREEN WALL]*

VISITOR COLLECTION & DROP OFF

WAITING AREA

BOARDROOMS

PUBLIC W.C.

SITE PROCESSING ②

WASTE COLLECTION & PROCESSING

POWER PLANT

MAIN SUPPORT SYSTEM ③

PARKING *PRIORITY ORDERED*

LOADING AREA *INDUSTRIAL*

GENERAL STORAGE

WORKSHOP / MECHANIC SERVICES

MACHINERY STORAGE

W.C - MALE

LOBBY

ADMIN/SECURITY

CHANGE ROOM / SHOWER ROOM

WASHROOM

W.C - FEMALE

CHANGE ROOM / SHOWER ROOM

SERVICE CENTRE ④

OFFICE W.C. FACILITIES

PUBLIC LIAISON

MAIN OFFICES

ORDERS

I.T. SUPPORT

TRAINING FACILITY

BOARDROOM

DOCUMENT STORAGE

SLIME PUMPING SYSTEM ⑤

PUMP SYSTEM *SLIME EXTRACTION*

WATER STORAGE *DAMMING*

LABORATORY TESTING

OFF-SITE

GYPSUM SETTLING

DIAMOND PARTICULATE RECLAIM

TOP LAYER WATER EXTARCTION

BRICK PRODUCTION

PUMPING TO BIOREMEDIATION

SALT EXTRACTION ⑥

ELECTROLYSIS → PANEL DISASSEMBLY → SALT COLLECTION → SALT STORAGE → RE-INSTALLATION OF PANELS

DISSOLUTION → PUMP STATION → SALT DISSOLUTION → PUMP & FILTRATION → EVAPORATION

GREENHOUSE ⑦

FREEZER ROOM *SEED STORAGE* → SEED PROPAGATION → HYDRO PLANT GROWTH → BIOREMEDIATION SYSTEMS

CROP HARVESTING ← LABORATORY TESTING ← PLANT HARVESTING

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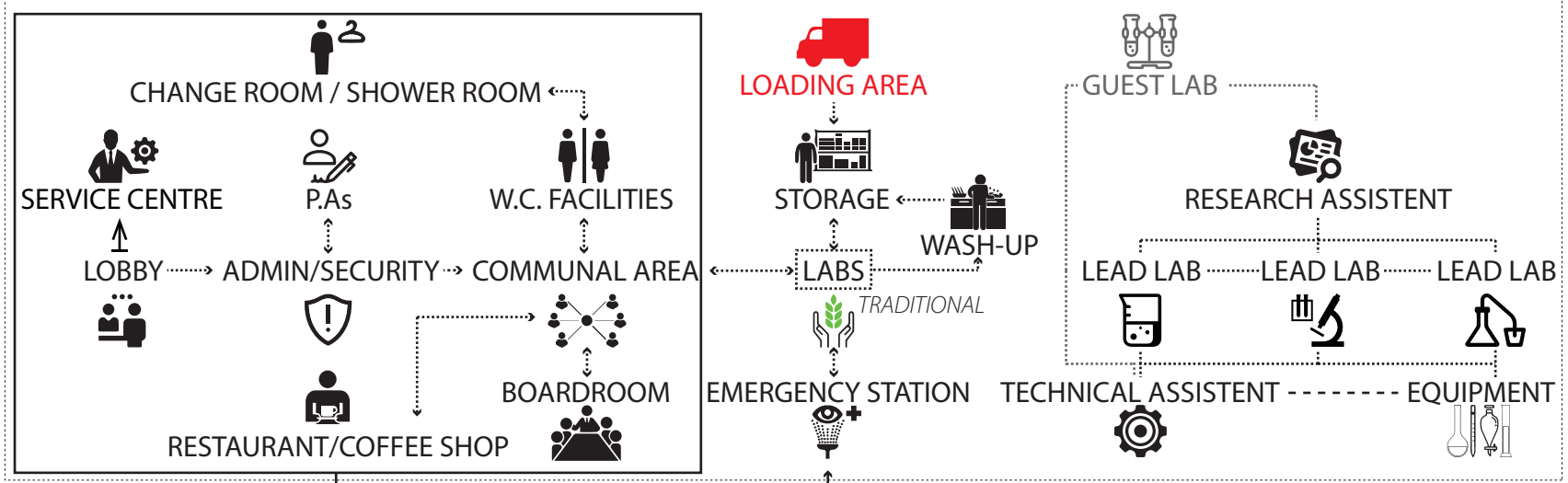
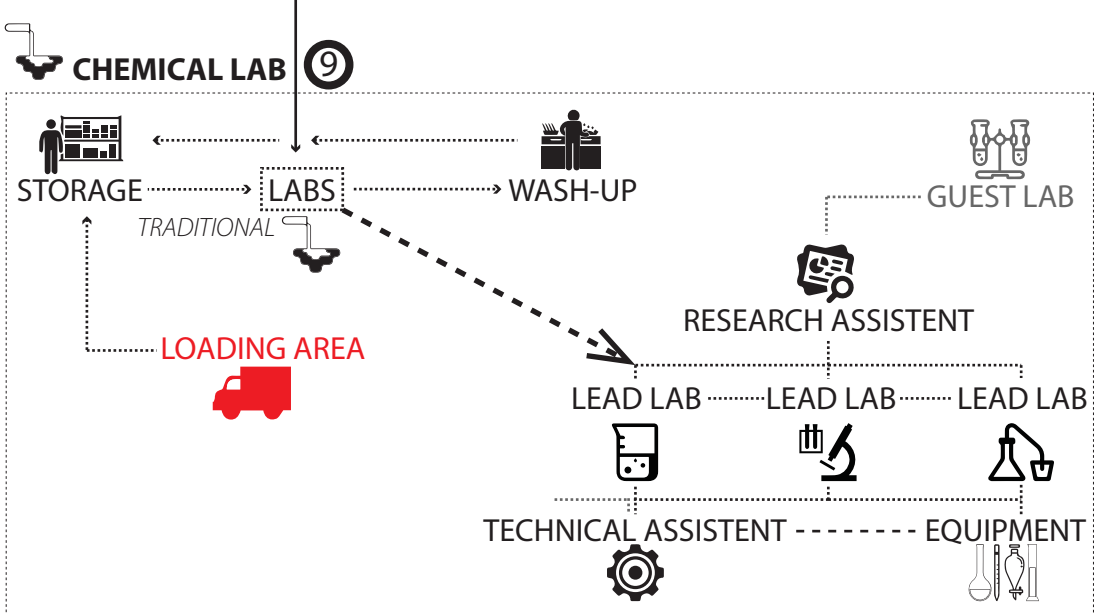
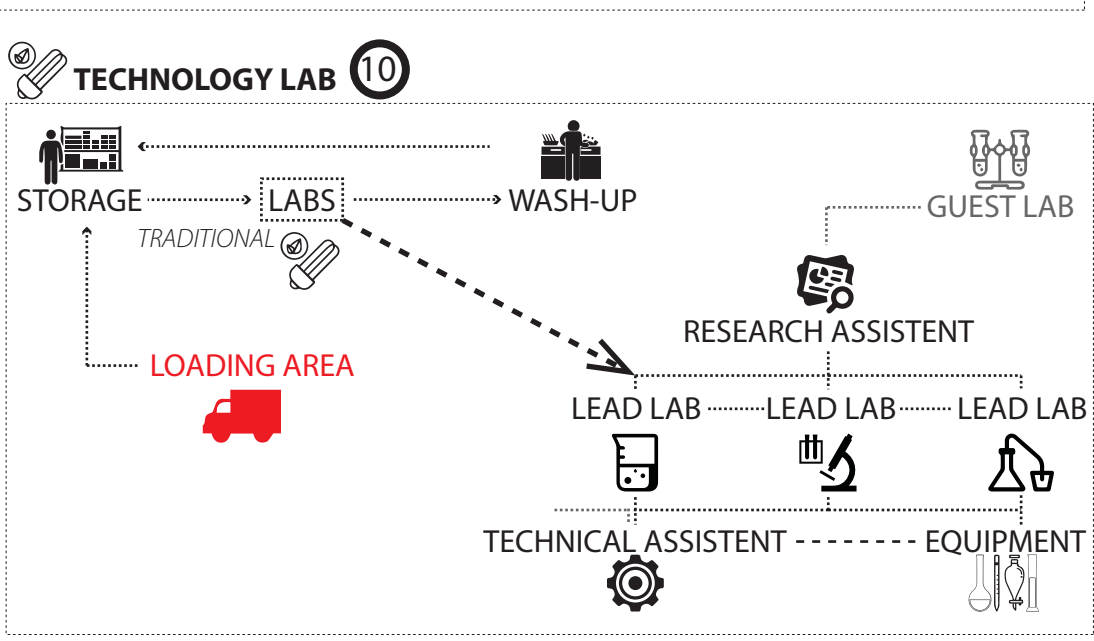
AGRICULTURAL LAB ⑧



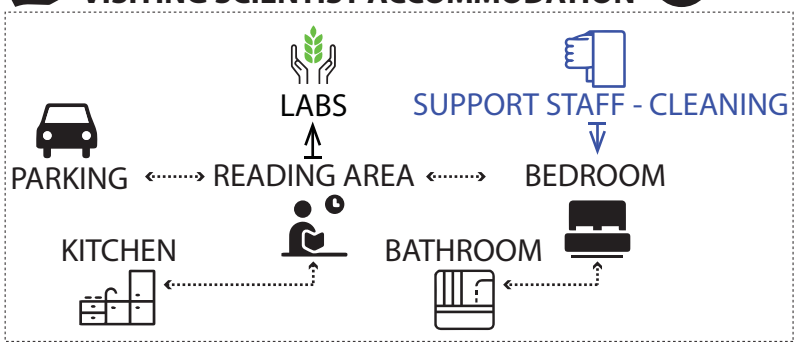
CHEMICAL LAB ⑨



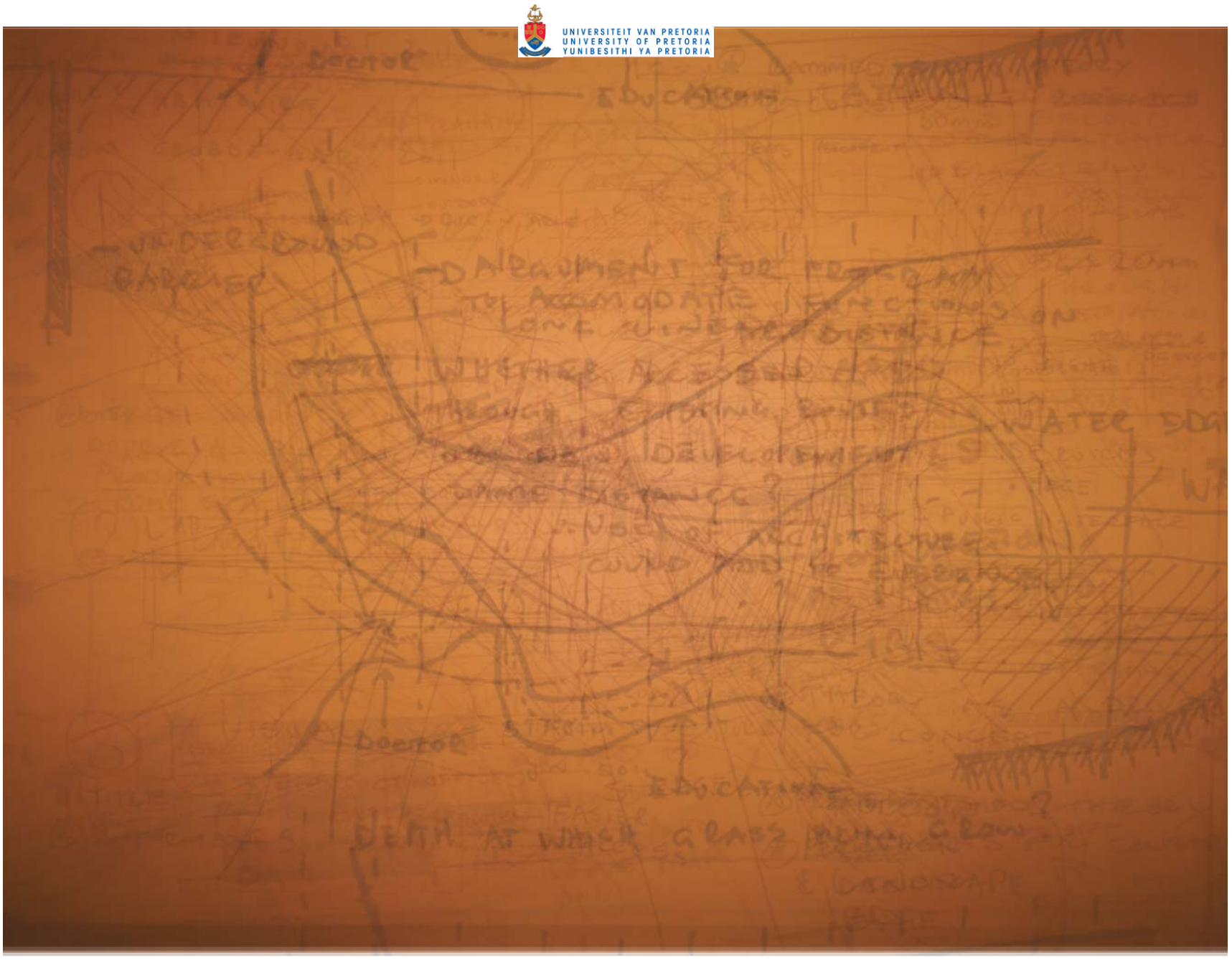
TECHNOLOGY LAB ⑩



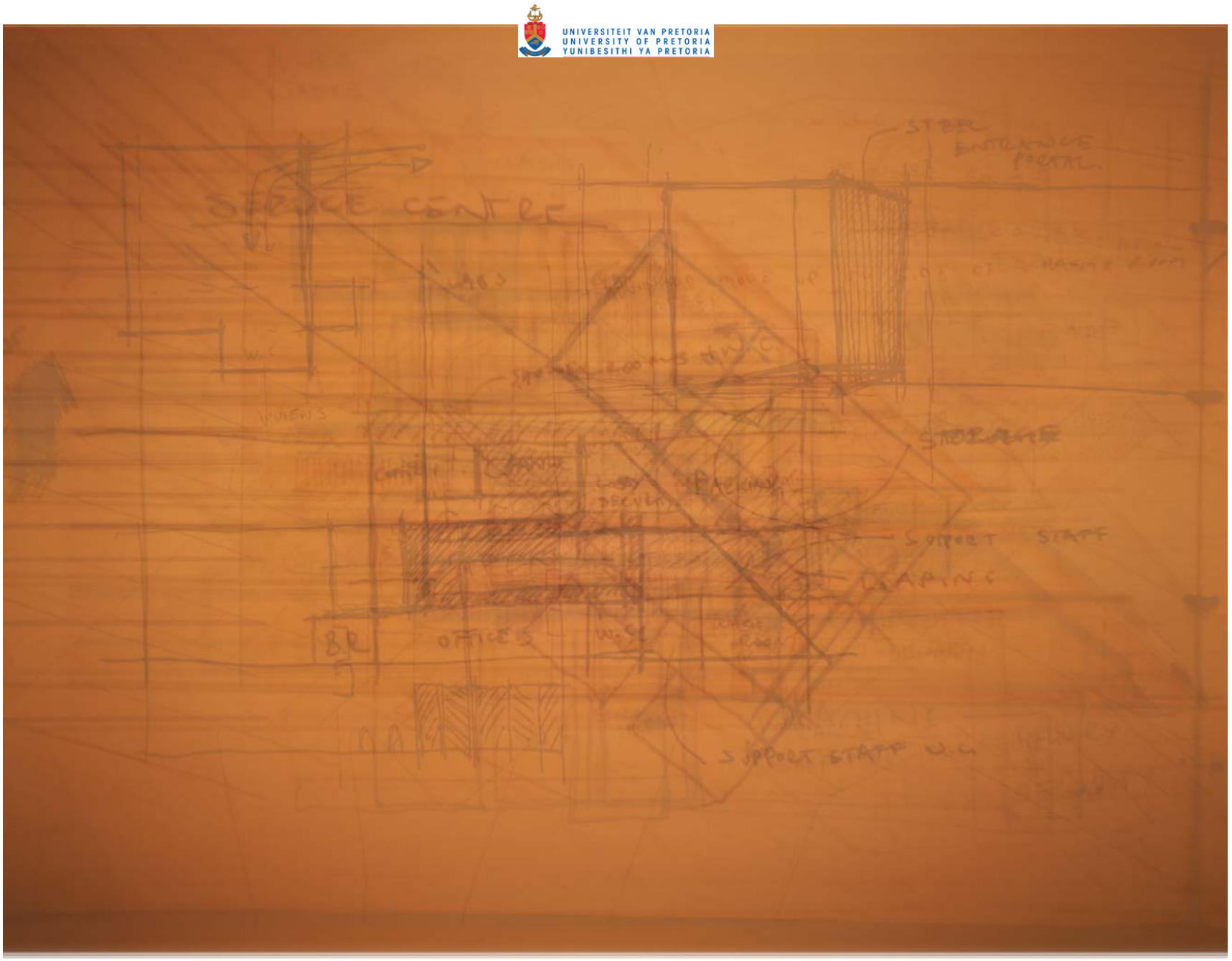
VISITING SCIENTIST ACCOMMODATION ⑪



4.4// PROGRAMME DEVELOPMENT & PLANNING



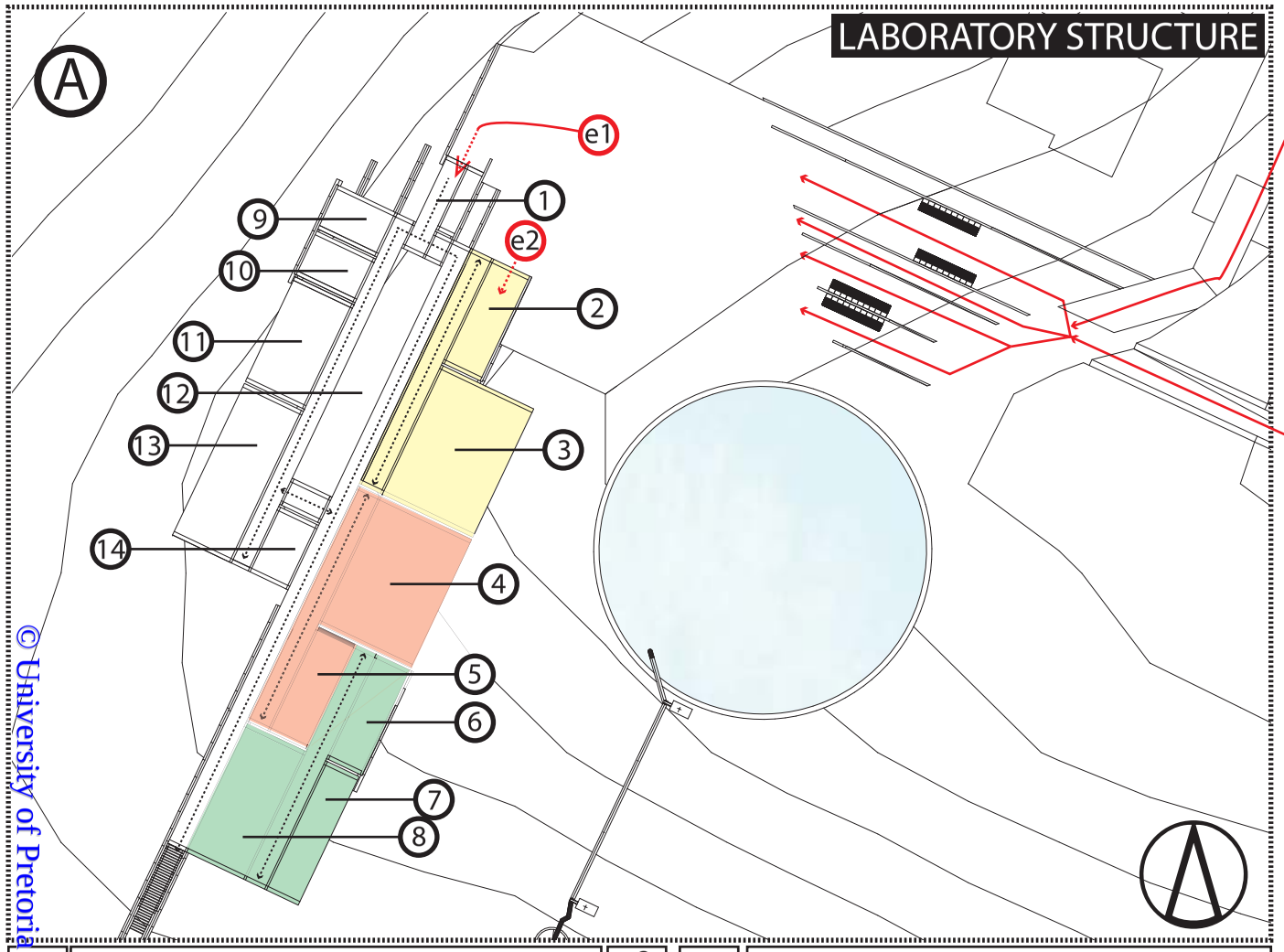
↑ 084 - Site Programme Development



↑ 085 - Architecture Programme Development

4.5// PROGRAMMATIC DISPLAY & DESIGN RESOLUTION

↓ 086 - Programme Location



no.	PROGRAMME	m2
1	Lobby and Administration desk	29
2	Delivery bay and Storage	38
3	Technology Research Laboratory	120
4	Chemical Research Laboratory	120
5	Computer Room - Serving all Laboratories	38
6	Harvested plant testing area	34
7	Agricultural Laboratory plant testing area	42
8	Agricultural Laboratory	76
9	Male W.C. and Change room	23
10	Female W.C. and Change Room	23
11	Personal Assistants and Administration	61
12	Open air courtyard	101
13	Communal research and Discussion area	90
14	First Aid and Emergency eye wash area	23

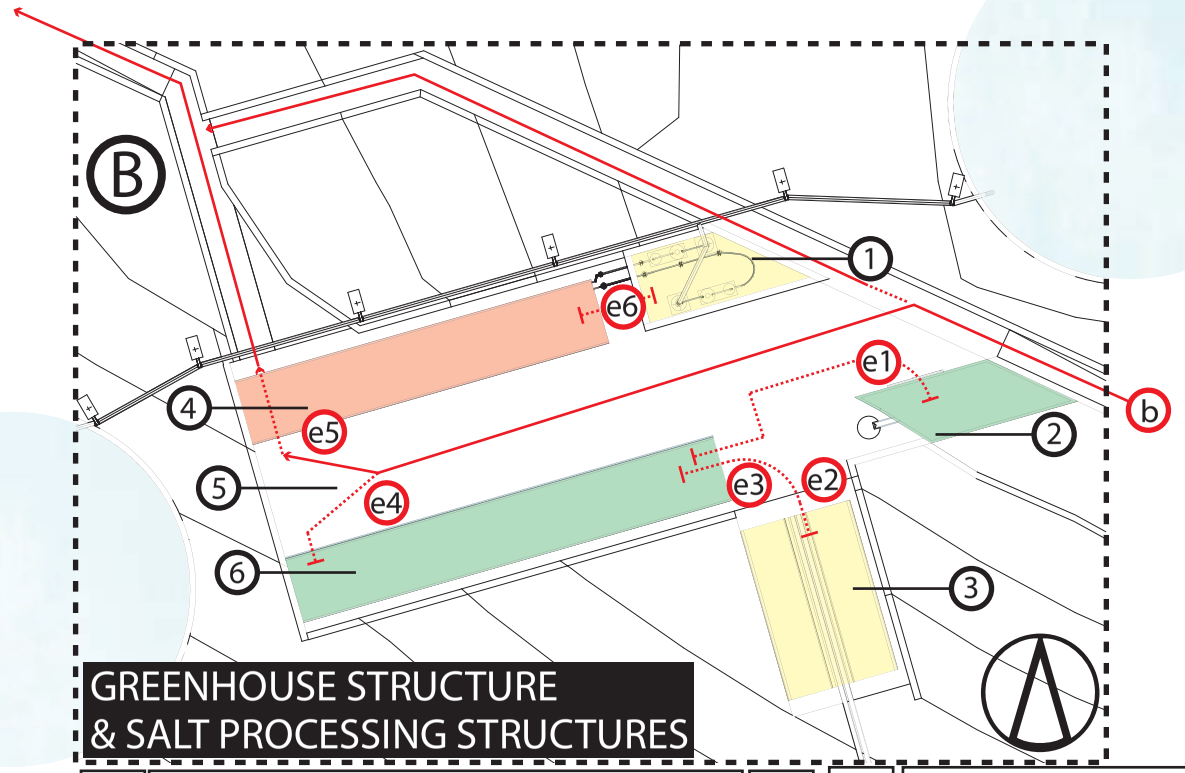
no.	ACCESS
a	Pedestrian access from Refilwe
b	Access from Eastern site operations
e1	Main Laboratory structure access
e2	Loading bay access

Agricultural programme zone

Chemical programme zone

Technological programme zone

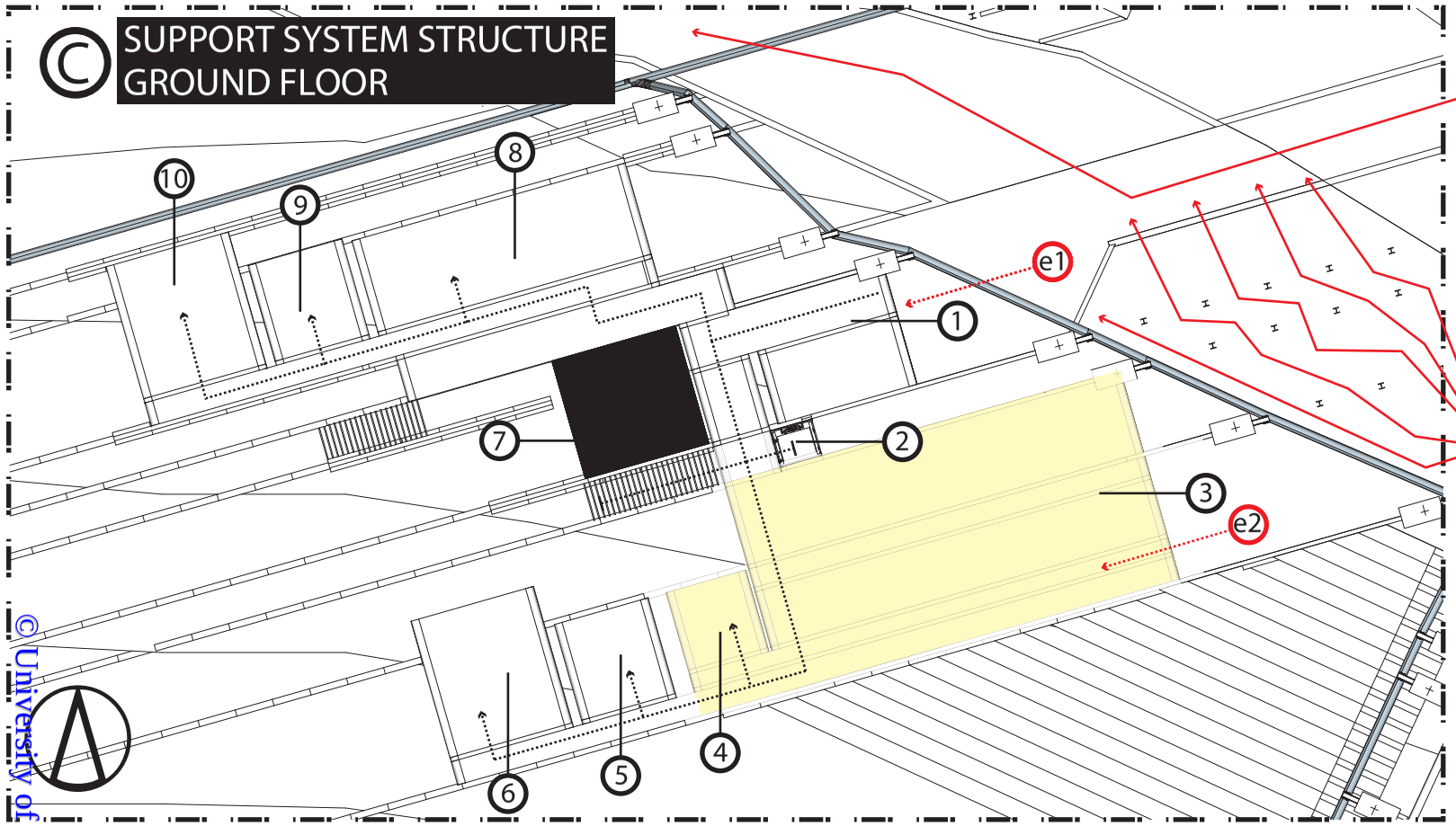
↑ 087 - Laboratory Programme

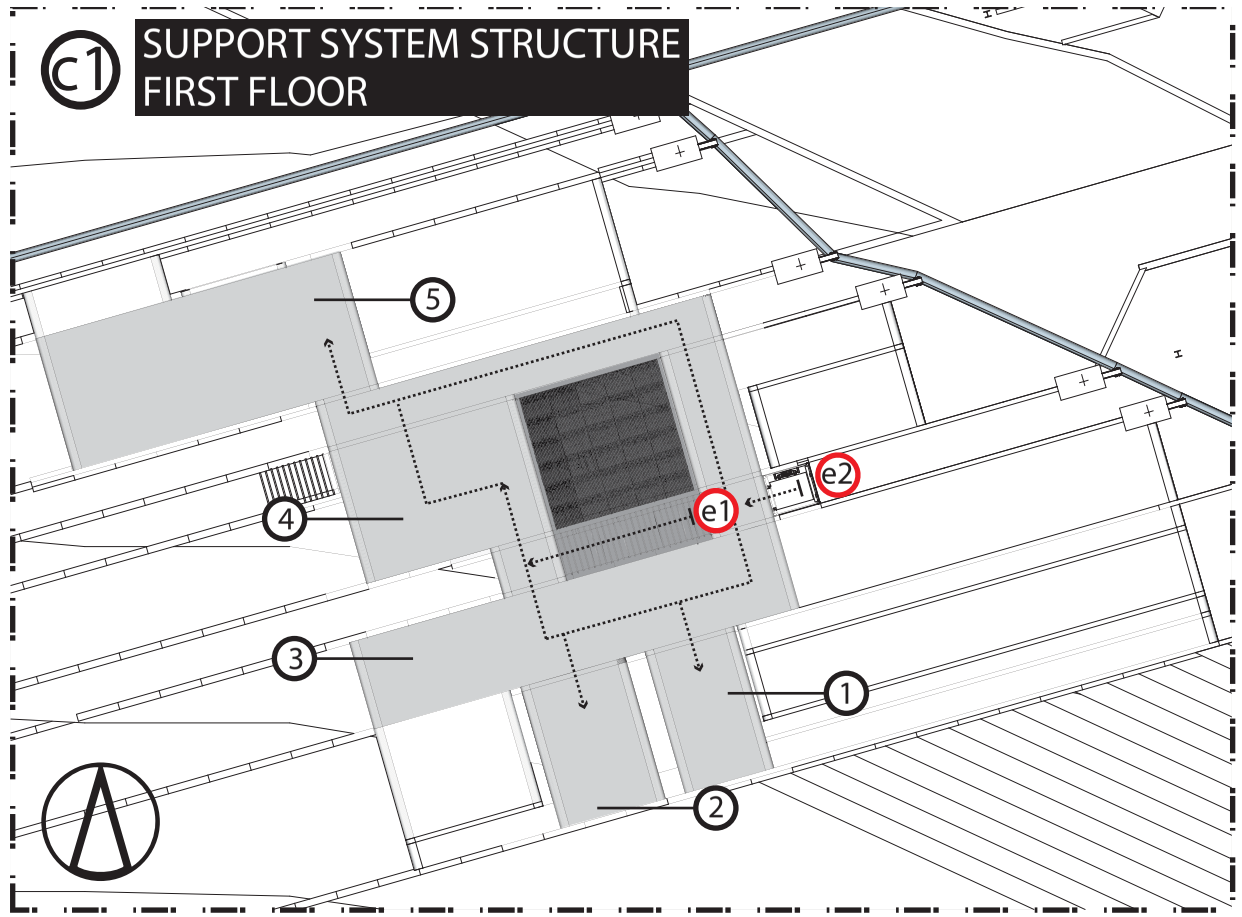


no.	PROGRAMME	m2
1	Salt Boilers - Salt Purification	67
2	Seed Bank - Freezer Room	64
3	Water pump station - Testing Point	145
4	Water evaporation area for Salt collection	175
5	Evaporation area - External area	300
6	Greenhouse - Bioremediation crop seeding	210

no.	ACCESS
b	Access from Eastern site operations
e1	Seed Bank access
e2	Access to Pump station
e3	Secondary access to Greenhouse 1
e4	Main access to Greenhouse 2
e5	Main access to Salt processing plant
e6	Secondary access to Salt processing plant

↑ 088 - Greenhouse and Salt Processing Programme





no.	PROGRAMME	m^2
1	Lobby and Administration desk	42
2	Elevator - access to First floor	4
3	Delivery bay and Technology Workshop	190
4	Storage area	12
5	Male W.C.	18
6	Male shower and Change room	34
7	Open air courtyard	34
8	Laundromat area	55
9	Female W.C.	18
10	Female shower and Change room	34

no.	ACCESS
b	Access from Parking Zone
c	Alternative access from Welcome Centre
e1	Main Support structure access
e2	Loading bay access

Agricultural programme zone

Chemical programme zone

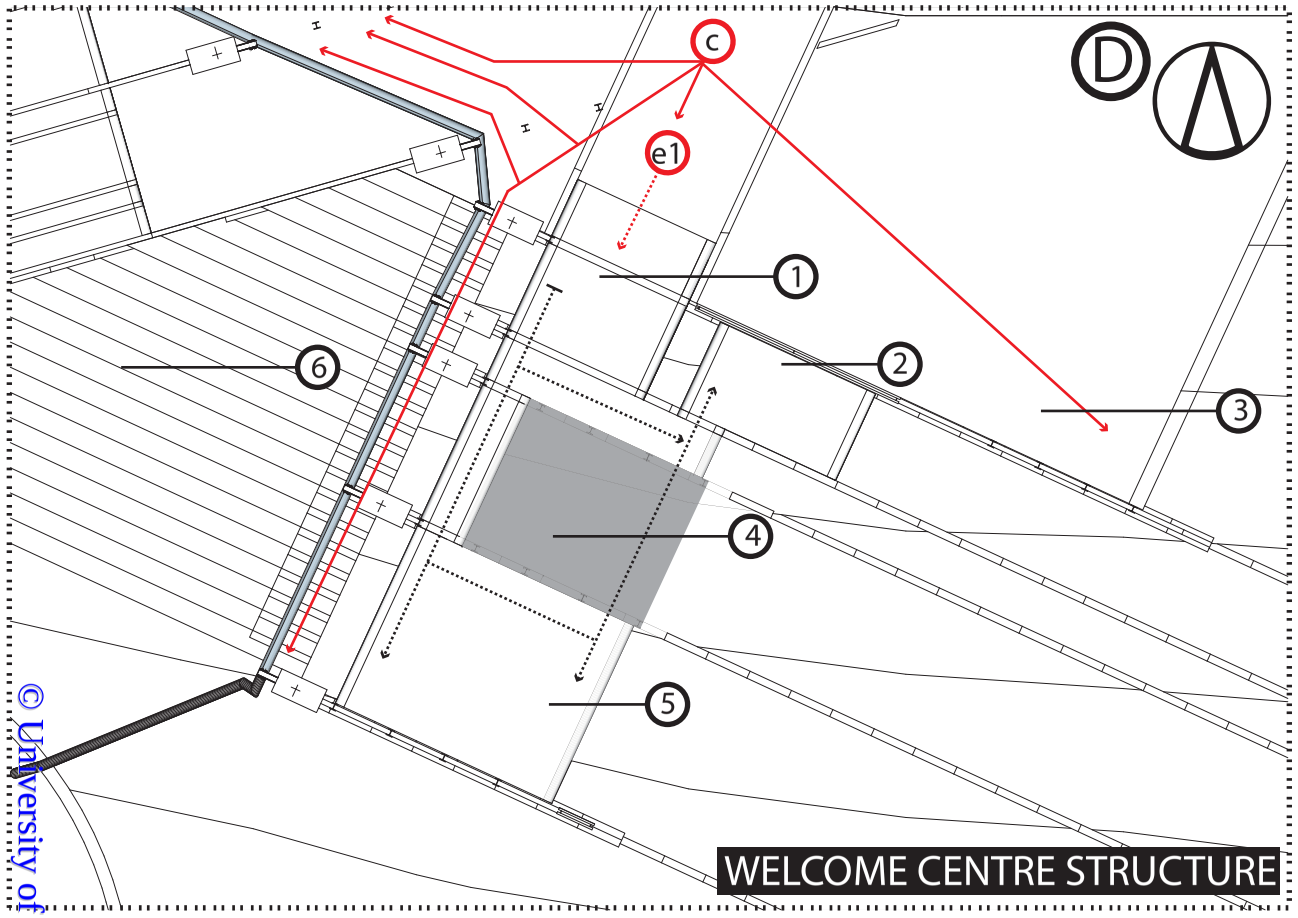
Technological programme zone

↑ 089 - Support System Programme - Ground Floor

no.	PROGRAMME	m^2
1	Storage and Filing Area - Digital data backup	19
2	Unisex W.C.	23
3	Administration staff	67
4	Boardroom	42
5	Training area	72

no.	ACCESS
e1	Access via Staircase
e2	Access via Elevator

↑ 090 - Support System Programme - First Floor

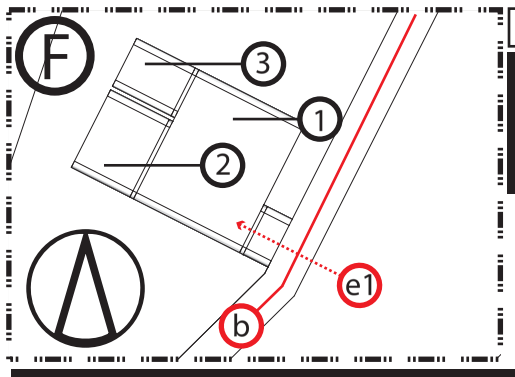


WELCOME CENTRE STRUCTURE

no.	PROGRAMME	m²
1	Lobby and Administration desk	20
2	Unisex W.C.	23
3	Lookout Area	318
4	Open air courtyard	44
5	Public Welcome area and Boardroom	67
6	Amphitheatre area	340

no.	ACCESS
c	Access from Parking Zone
e1	Welcome Centre structure access

↑ 091 - Welcome Centre Programme

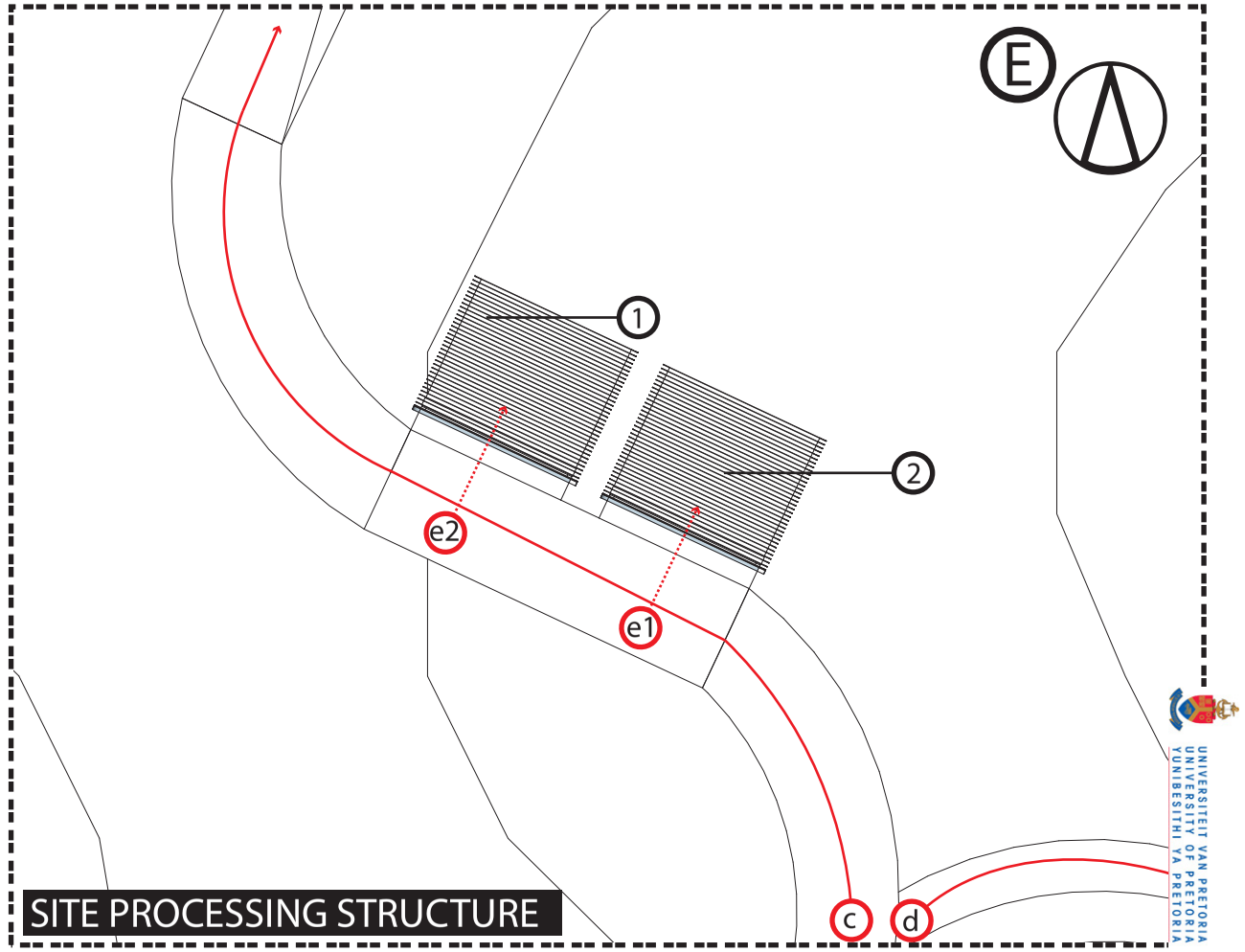


VISITING SCIENTIST ACCOMMODATION STRUCTURES

no.	PROGRAMME	m²
1	Kitchen and Dining area	45
2	Bedroom and Study area	14
3	W.C. and Shower	8

no.	ACCESS
b	Access from Eastern site operations
e1	Accommodation structure access

↑ 093 - Accomodation Programme



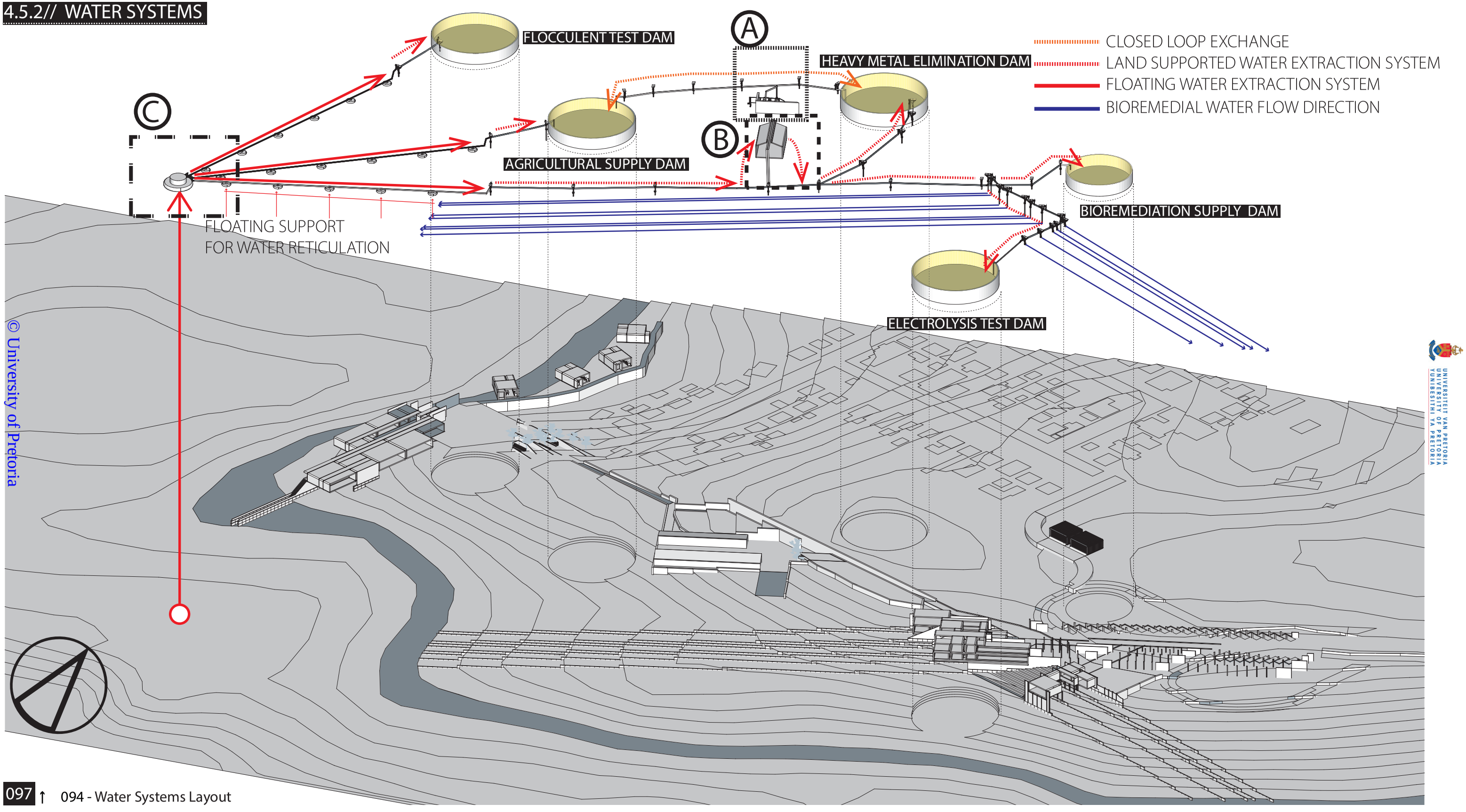
SITE PROCESSING STRUCTURE

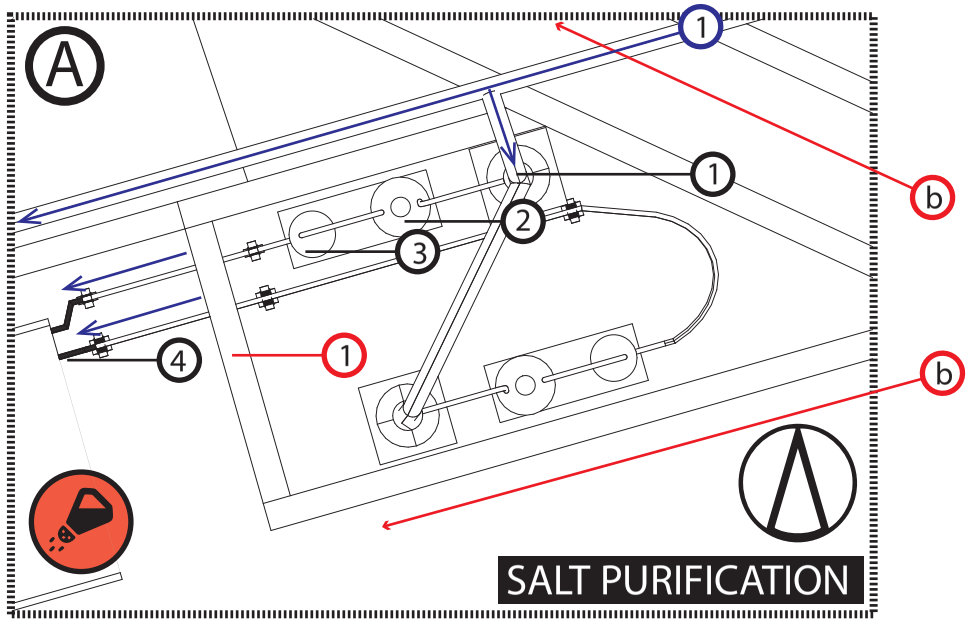
no.	PROGRAMME	m²
1	Refuse collection area	65
2	Power Plant	65

no.	ACCESS
c	Access from Parking Zone
d	Site exit - Route 1
e1	Power Plant access
e2	Refuse Processing area access

↑ 092 - Site Processing Programme

4.5.2// WATER SYSTEMS

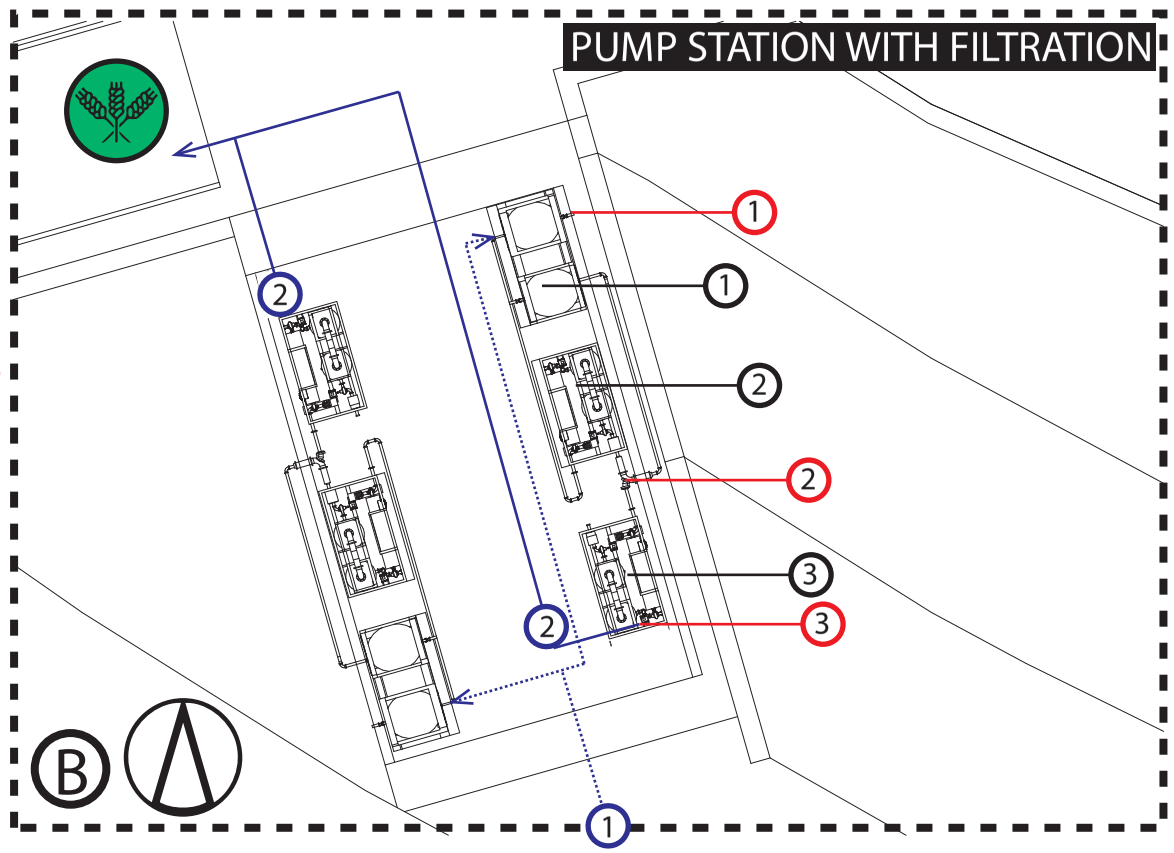




no.	PROCESS
1	Boiler
2	Calcium Extraction
3	Filtration
4	Pumping to Evaporation Tables

↑ 095 - Salt Purification Stages

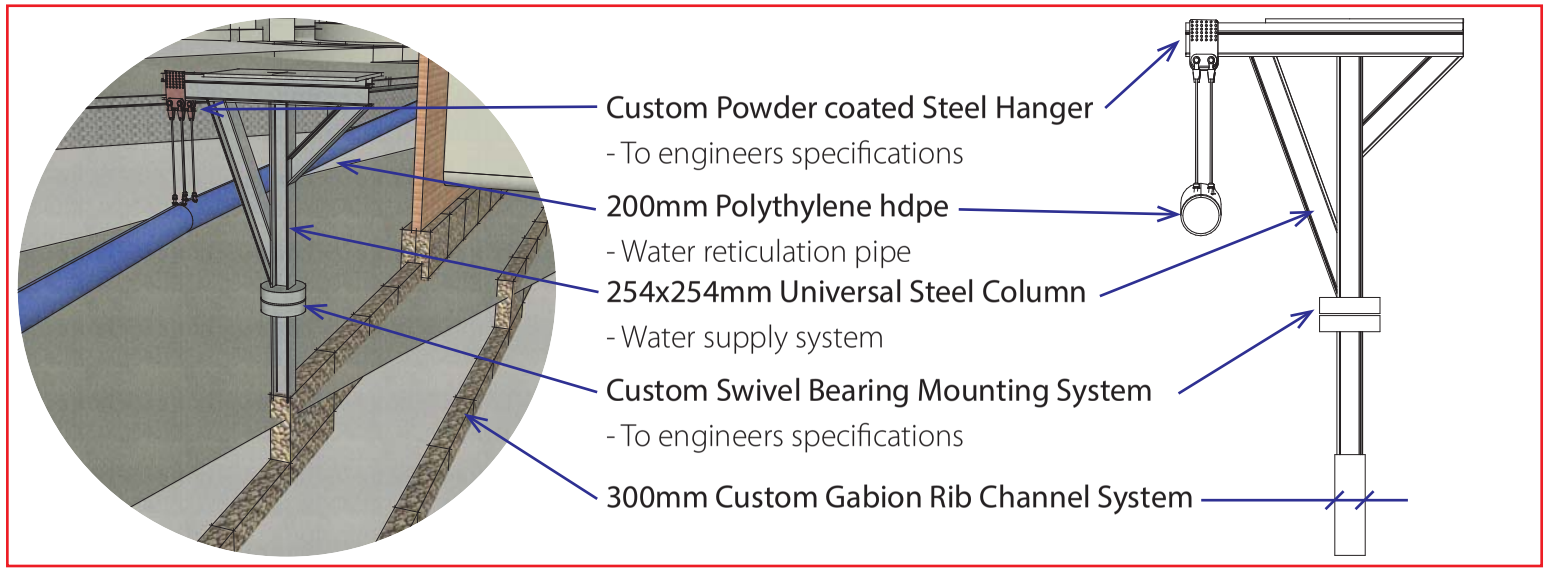
no.	ACCESS
0	Access from Eastern site operations
1	Gabion Wall Structure - Allow for steam dissipation
1	Water from Eastern Dam



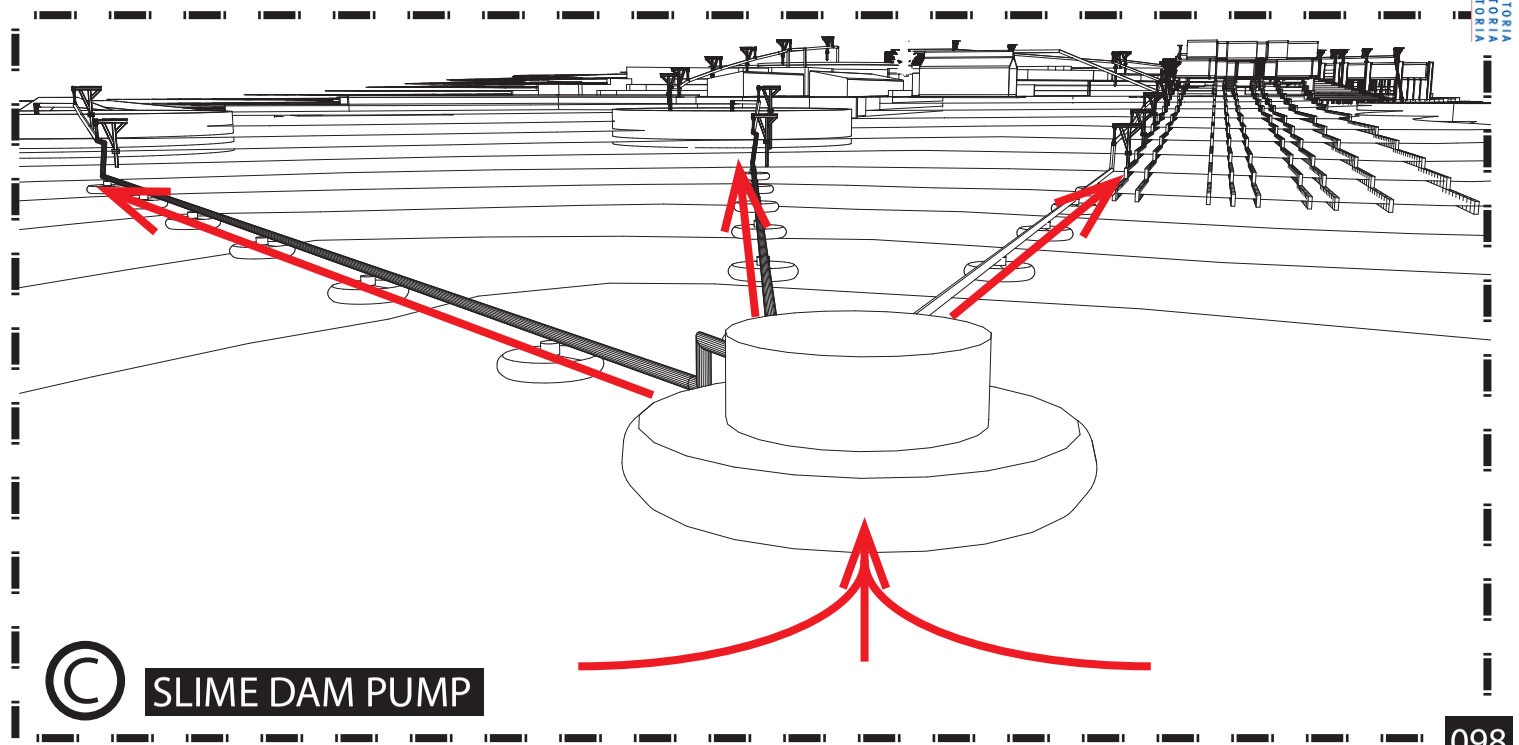
↑ 096 - Water Pumping Process

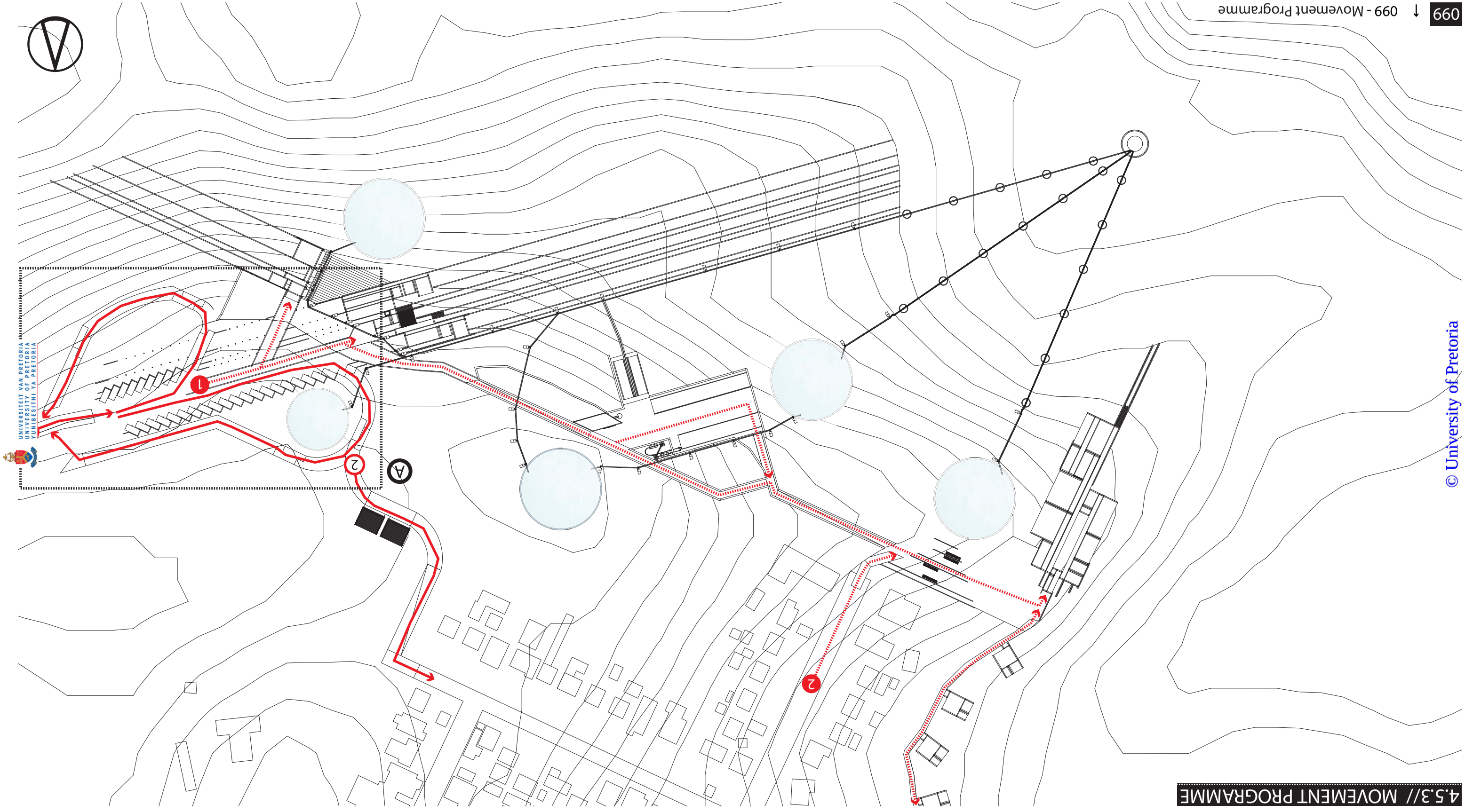
no.	PROCESS
1	Large Capacity Pump Unit
2	Primary Filtration Unit
3	Secondary Filtration Unit
1	Pump Outlet to Eastern Dams Filtration Bypass
2	Primary Filtration Link to Secondary Filtration - Test Point
3	Secondary Filtration - Pumped to Greenhouse for Seedlings
1	Water from slime dam
2	Filtered Water to Greenhouse

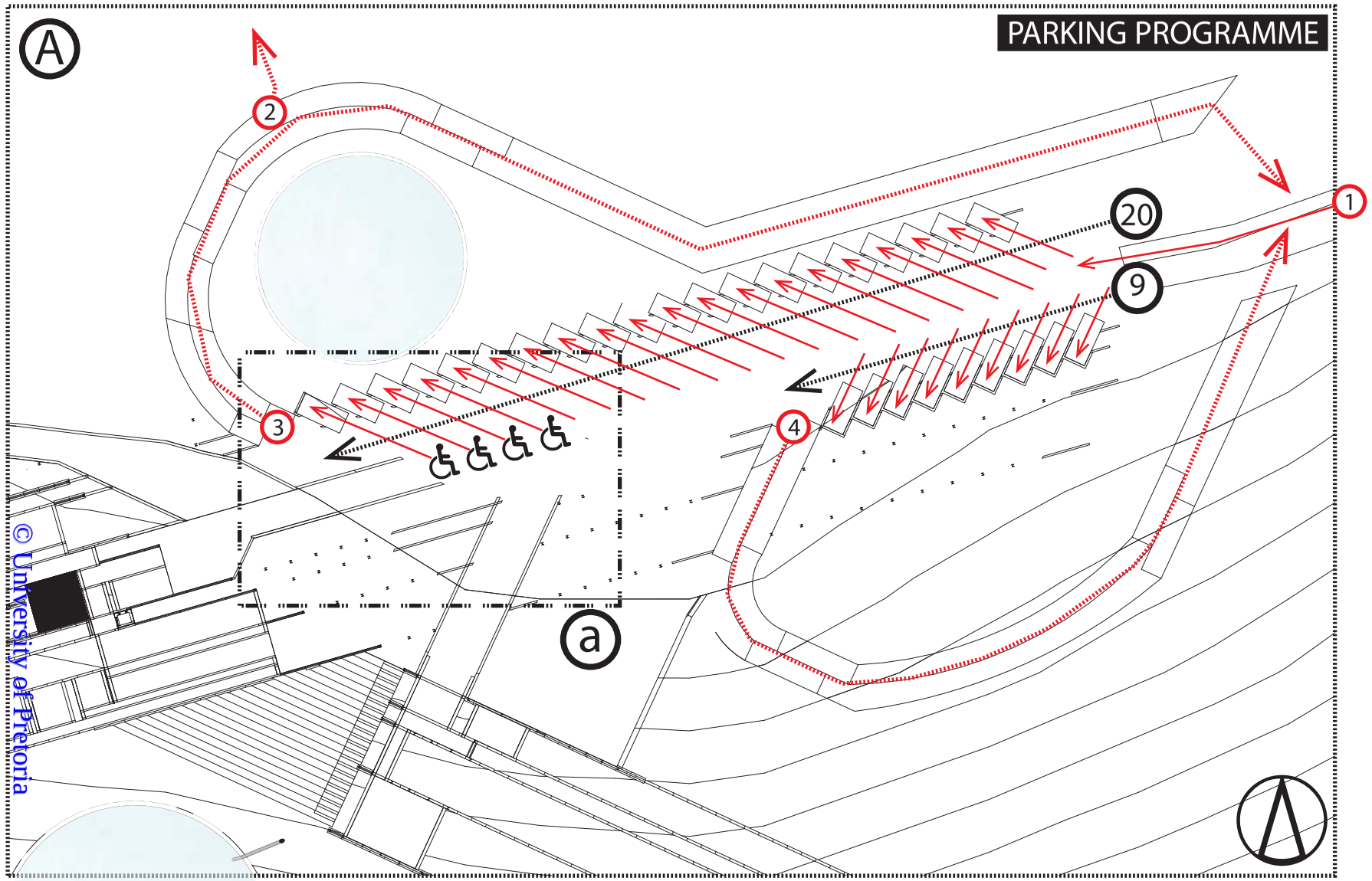
↓ 098 - Water Supply Supports



↓ 097 - Slime Dam Pump





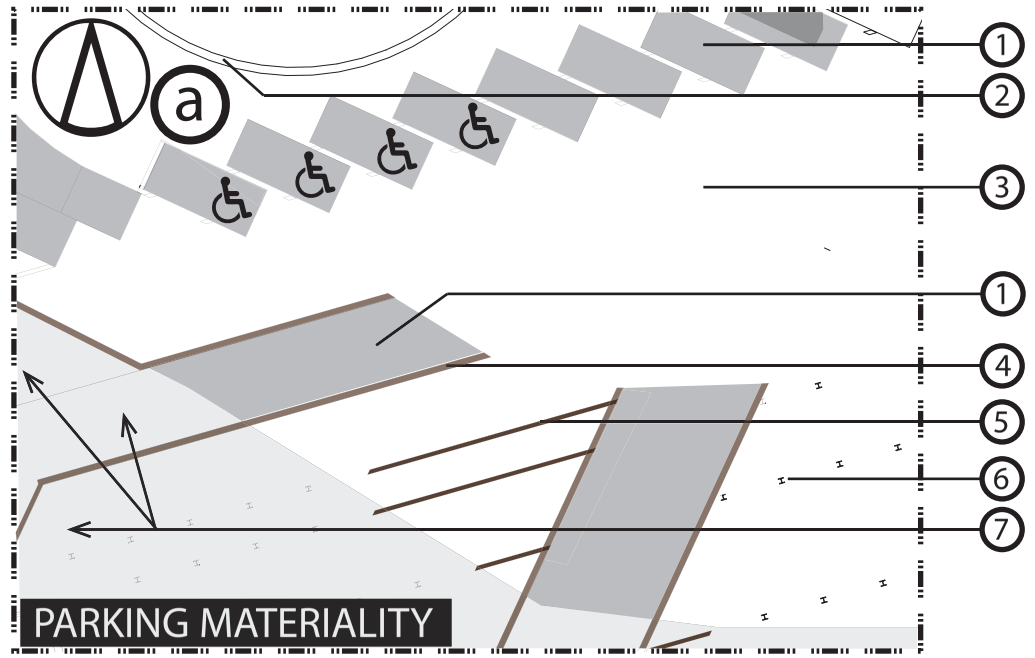


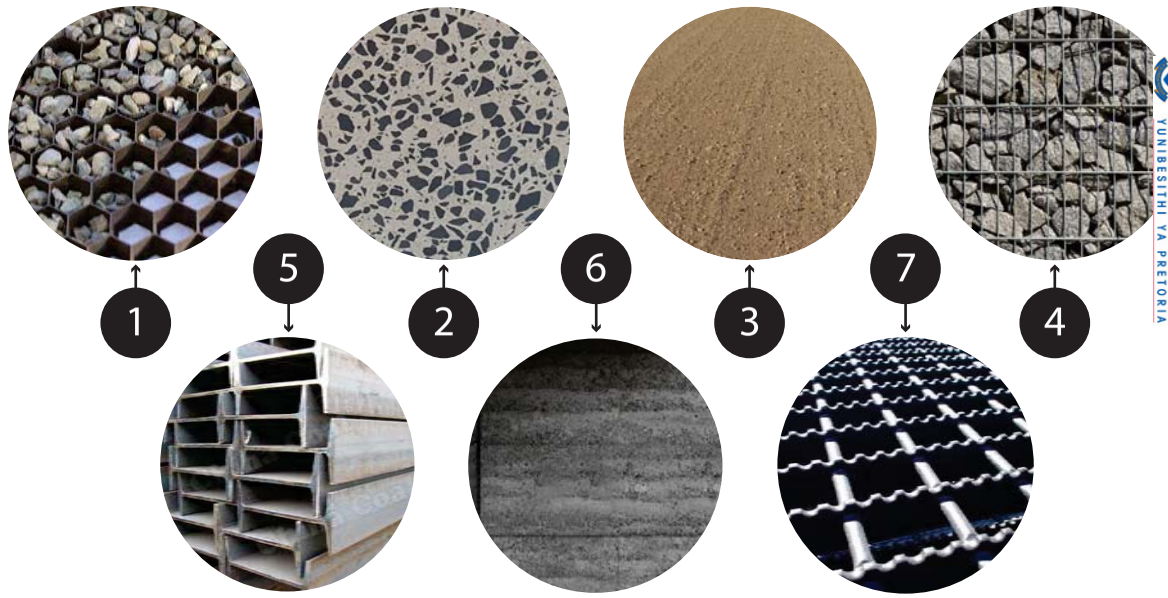
no.	PARKING
20	Twenty Parking Bays - With Priority Parking
9	Nine Parking Bays - General Parking

no.	ACCESS
1	Main Vehicular access - Existing Dirt Road
2	Alternative Site Exit - Main Refuse Exit
3	Main Exit from Site - Northern Parking
4	Main exit from Site - Southern Parking

1 Pedestrian Access to Structures

↑ 100 - Parking Programme

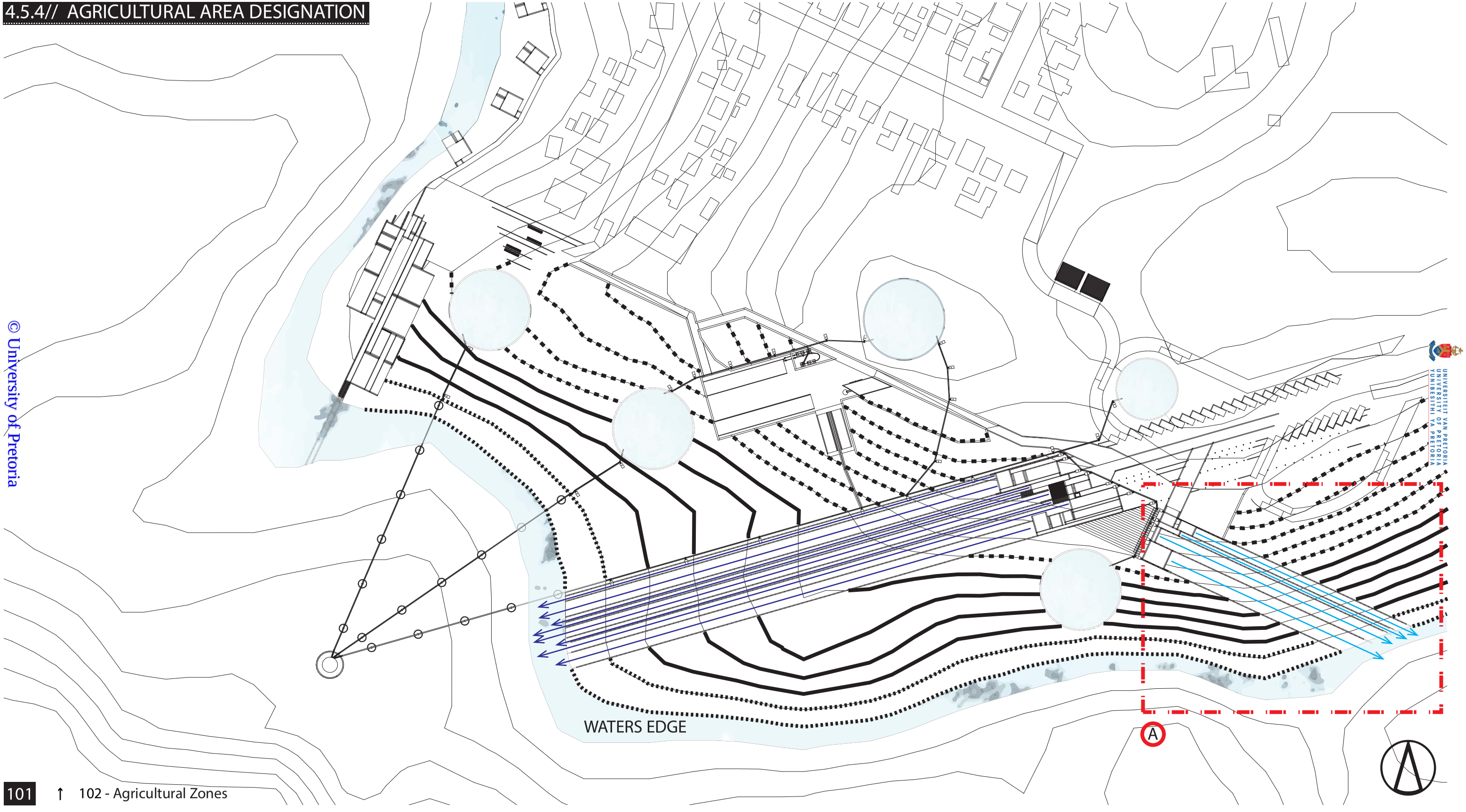




no.	PARKING
1	Core Landscape gravel retaining system - Filled with crushed black kimberlite rock
2	Reinforced Cast-in-situ Concrete Dam wall - Kimberlite aggregate
3	Natural landscape surface
4	Kimberlite filled steel gabion systems
5	254x254mm Universal Steel Column Offcuts from Structural systems
6	Rammed earth walls - Dark colouring from kimberlite rich soils
7	Galvanized steel Vitagrid plain grating system - 30x50mm grid spacing (Prevent High heel penetration)

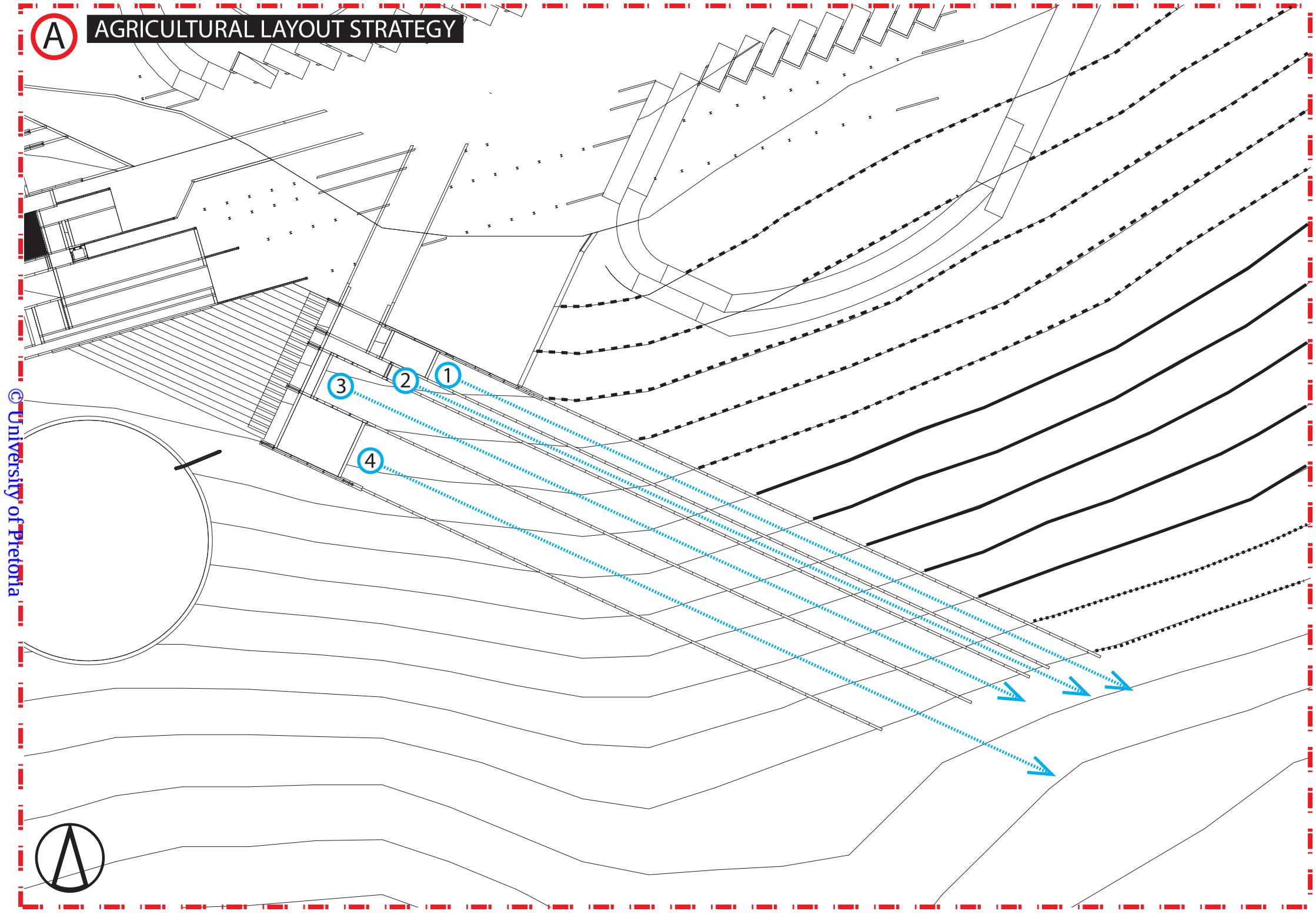
↑ 101 - Parking Materiality

4.5.4// AGRICULTURAL AREA DESIGNATION



↑ 102 - Agricultural Zones

A AGRICULTURAL LAYOUT STRATEGY



LINE	TESTED BIOREMEDIAL SPECIES
.....	Nicotiana glauca - Wild Tobacco
.....	Glycyrrhiza lepidota - American Licorice
———	Helianthus - Sunflower
———	Thlaspi caerulescens - Alpine Penny-cress
———	Brassica juncea - Chinese Mustard
- - - - -	Assorted Food Crop Species

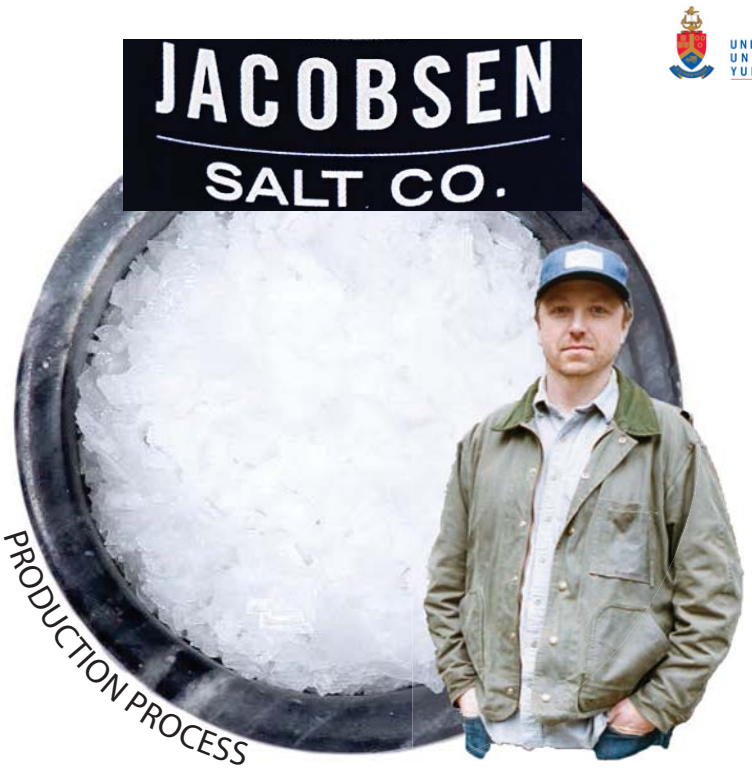
Plants with know bioremedial properties are allocated closest to the slime dam, as their effectiveness as bioremediation species is known. The secondary line of remedial species serves as a testing area, which will establish certain plants viability for human consumption. The tertiary line of plants are food related crops. Due to the distance from the slime dam, these crops should be safe for human consumption. Laboratory testing will confirm this theory, before any crops are allowed to be consumed.

LINE	BIOREMEDIAL TEST SPECIES
⇢	Existing Plants from local area

Due to the unknown capabilities of onsite plants, to act as bioremediation species, testing will occur in between gabion rib structures. As mention in Chapter 3, the variable widths and lengths of the bioremediation ribs allows for scientific testing of a certain plants bioremedial capabilities.

↑ 103 - Agricultural Layout

4.6// PROGRAMMATIC PRECEDENTS



PRODUCTION PROCESS

1

Active pumping of the Pacific Oceans water up to the processing site.

2

Gravity fed, sand filtration of the oceans water occurs before it is allowed to settle, removing any algae, which was not filtered out.

3

Water is fed into gas powered boilers.
The Brine is then boiled to remove naturally occurring Calcium to prevent bitterness in the final product.

4

The remaining brine solution is then pumped into evaporation tanks.
Salt crystals are collected by hand and added to final, moisture removing drip trays.